DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

[Docket No. S-019]

RIN 1218-AA51

Permit-Required Confined Spaces

AGENCY: Occupational Safety and Health Administration (OSHA), U.S. Department of Labor.

ACTION: Final rule.

SUMMARY: The Occupational Safety and Health Administration (OSHA) hereby promulgates safety requirements, including a permit system, for entry into those confined spaces, designated as permit-required confined spaces (permit spaces), which pose special dangers for entrants because their configurations hamper efforts to protect entrants from serious hazards, such as toxic, explosive or asphyxiating atmospheres. The new standard provides a comprehensive regulatory framework within which employers can effectively protect employees who work in permit spaces.

Few OSHA standards specifically address permit space hazards. These standards, in turn, provide only limited protection. OSHA has determined, based on its review of the rulemaking record, that the existing standards do not adequately protect workers in confined spaces from atmospheric, mechanical and other hazards. The Agency has also determined that the ongoing need for monitoring, testing and communication at workplaces which contain entry permit confined spaces can be satisfied only through the implementation of a comprehensive confined space entry program. OSHA anticipates that compliance with the provisions of this standard will effectively protect employees who work in permit- required confined spaces from injury or death.

EFFECTIVE DATE: This final rule will become effective on April 15, 1993.

ADDRESSES: In compliance with 28 U.S.C. 2112(a), the Agency designates for receipt of petitions for review of the standard, the Associate Solicitor for Occupational Safety and Health, Office of the Solicitor, Room S-4004, U.S. Department of Labor, 200 Constitution Avenue NW., Washington, DC 20210.

FOR FURTHER INFORMATION CONTACT: Mr. James F. Foster, U.S. Department of Labor, Occupational Safety and Health Administration, Office of Information and Consumer Affairs, Room N3647, Washington, DC 20210, (202) 523-8151.

SUPPLEMENTARY INFORMATION:

I. Background

Many workplaces contain spaces which are considered "confined" because their configurations hinder the activities of any employees who must enter, work in, and exit them. For example, employees who work in process vessels generally must squeeze in and out through narrow openings and perform their tasks while cramped or contorted. For the purposes of this rulemaking, OSHA is using the term "confined space" to describe such spaces. In addition, there are many instances where employees who work in confined spaces face increased risk of exposure to serious hazards. In some cases, confinement itself poses entrapment hazards. In other cases, confined space work keeps employees closer to hazards, such as asphyxiating atmospheres or the moving parts of a mixer, than they would be otherwise. For the purposes of this rulemaking, OSHA is using the term "permit-required confined space" (permit space) to describe those spaces which both meet the definition of "confined space" and pose health or safety hazards.

In its June 5, 1989 NPRM (54 FR 24080), OSHA determined, based on its review of accident data, that asphyxiation is the leading cause of death in confined spaces. The asphyxiations that have occurred in permit spaces have generally resulted from oxygen deficiency or from exposure to toxic atmospheres. In addition, there have been cases where employees who were working in water towers and bulk material hoppers slipped or fell into narrow, tapering, discharge pipes and died of asphyxiation due to compression of the torso. Also, employees working in silos have been asphyxiated as the result of engulfment in finely divided particulate matter (such as sawdust) that blocks the breathing passages.

The Agency has, in addition, documented confined space incidents in which victims were burned, ground-up by auger type conveyors, or crushed or battered by rotating or moving parts inside mixers. Failure to deenergize equipment inside the space prior to employee entry was a factor in many of those accidents. OSHA notes that the NPRM (54 FR 24080-24085) discussed the hazards which confront employees who enter permit spaces and the inadequacy of existing regulation in greater detail. Additionally, Section II of this preamble, *Hazards*, presents a detailed discussion of the hazards to which permit-space entrants have been exposed, demonstrating that this final rule is reasonably necessary to protect affected employees from significant risks.

OSHA has determined, based on its review of the rulemaking record, including investigation reports covering "permit space" fatalities (Exhibits (Ex.) 10 through 13 and 16), that many employers have not appreciated the degree to which the conditions of permit space work can compound the risks of exposure to atmospheric or other serious hazards. Further, the elements of confinement, limited access, and restricted air flow, can result in hazardous conditions which would not arise in an open workplace. For example, vapors which might otherwise be released into the open air can generate a highly toxic or otherwise harmful atmosphere within a confined space. Unfortunately, in many cases, employees have died because employers improvised or followed "traditional methods" rather than following existing OSHA standards, recognized safe industry practice, or common sense. The Agency notes that, as documented in the NPRM, many of the employees who died in permit space incidents were would-be rescuers who were not properly trained or equipped.

In addition, OSHA believes that, as noted in the NPRM (54 FR 24098), the failure to take proper precautions for permit space entry operations has resulted in fatalities, as opposed to injuries, more frequently than would be predicted using the applicable Bureau of Labor Statistics models. The Agency notes that, by their very nature and configuration, many permit spaces contain atmospheres which, unless adequate precautions are taken, are immediately dangerous to life and health (IDLH). For example, many confined spaces are poorly ventilated—a condition that is favorable to the creation of an oxygen deficient atmosphere and to the accumulation of toxic gases. Furthermore, by definition, a confined space is not designed for continuous employee occupancy; hence little consideration has been given to the preservation of human life within the confined space when employees need to enter it.

Accordingly, the Agency has determined that it is necessary to promulgate a comprehensive standard to require employers to take appropriate measures for the protection of any employee assigned to enter a permit space. OSHA believes this new standard will help eliminate confusion and misunderstanding by clearly stating employer responsibilities.

The record and determinations that are discussed in this final rule

culminate a series of efforts by OSHA, the National Institute for Occupational Safety and Health (NIOSH), the American National Standards Institute (ANSI) Z117 Committee, and others to address permit space hazards. The chronology of those efforts is set forth in the following paragraphs.

On July 24, 1975, OSHA issued an Advance Notice of Proposed Rulemaking (ANPR), "Standard for Work in Confined Spaces," for the purpose of obtaining data and information to be used in developing a confined spaces standard (40 FR 30980). This ANPR sought comments on 14 issues, including problems with existing regulations, factors involved in confined space injuries and deaths, and the steps necessary for the control of hazards in confined spaces.

On August 26, 1977, ANSI adopted ANSI Z117.1–1977, "Safety Requirements for Working in Tanks and Other Confined Spaces" (Ex. 13–5). That standard set "minimum requirements for safe entry, continued work in, and exit from tanks and other confined spaces at normal atmospheric pressure." The ANSI standard defined confined spaces as enclosures with limited means of access and egress, such as storage tanks, open-topped spaces more that four feet in depth with poor natural ventilation, and sewers. Explanatory information accompanying the standard stated that the standard addressed atmospheric hazards, physical hazards, the possibility of liquids, gases, or solids entering a space (e.g., drowning or engulfment hazard) and isolation of entrants in case of need (e.g., hazard of entrapment due to configuration). The ANSI standard set: (1) general precautions (such as testing, evaluation, ventilation and lockout) to be followed before entry, (2) procedures to be followed when confronting particular environmental hazards (such as oxygen-deficient, flammable and toxic atmospheres, noise, and radiation exposure), (3) entry procedures (including the use of permit to authorize entry and illumination of the space), and (4) special procedures for hot work (e.g., welding) or removal or application of preservative coatings or linings performed in confined spaces.

Citing both "the complexity of the issues and the period of time since the previous Advance Notice," OSHA issued another ANPR, "Entry and Work in Confined Spaces" (44 FR 60334), on October 19, 1979. The 24 questions raised in the 1979 ANPR were similar to, but more detailed than, the 14 issues raised in the 1975 ANPR.

The 1979 ANPR again requested suggestions for a definition of "confined space," as well as information regarding the appropriate procedures for addressing confined space hazards, and the cost of those procedures. OSHA received 68 comments in response to the 1979 ANPR. These comments, while similar to those received in response to the 1975 ANPR, broadened the informational base which supported OSHA regulatory action to address confined spaces hazards.

Most commenters suggested that OSHA develop a performance- oriented standard similar to OSHA's "fire protection standard" (29 CFR Part 1910, Subparts E, H, and L), which was then being revised and which was subsequently published as a final rule on September 12, 1980 (45 FR 60704). Also, many commenters suggested that defining the hazards confronted in confined spaces was more important than defining the term "confined space."

In December 1979, NIOSH issued a criteria document, "Working in Confined Spaces" (Ex. 13–9), which recommended procedures for protecting employees from the hazards of entering, working in, or exiting confined spaces. NIOSH defined the term "confined space" to mean "a space which by design has limited openings for entry and exit, unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy." The criteria document states: "The standard is designed not only to make the confined space safe for the worker, but also to make the worker cognizant of the hazards associated with this work area and the safe work practices necessary to deal with these hazards."

The NIOSH recommended standard included provisions for permit to authorize entry, testing and monitoring, precautions (such as ventilation, purging and lockout), medical surveillance, training, labeling and posting of confined spaces, entry procedures (such as planning for entry, standby person, communications, and rescue), personal protective equipment, rescue equipment and recordkeeping. NIOSH would require employers whose confined spaces were immediately dangerous to life or health (categorized as "Class A") or dangerous (categorized as "Class B") to implement all of these measures, except that employers with Class B confined spaces would have a qualified person determine if it was necessary to conduct monitoring. Employers with confined spaces "in which the potential hazard would not require any special modification of the work procedure" (categorized as "Class C") would be required to implement a permit system, atmospheric testing, training, labeling and posting, entry procedures (except for stationing of standby person), and recordkeeping and to provide rescue equipment. Other measures would be taken if a qualified person determined that they were necessary.

On March 25, 1980, OSHA issued an ANPR (Construction ANPR) "Entry and Work in Confined Spaces" (45 FR 19266), to obtain information which could be used "to revise its existing standards in order to effectively cover hazards connected with these (confined space) activities in construction." The Agency stated its belief that "the hazards of work in confined spaces are also significant in the construction industry." The Construction ANPR posed 31 questions, similar to those presented in the 1979 General Industry ANPR, regarding the appropriate precautions and procedures for controlling confined space hazards which construction workers may confront. The Agency received 75 comments, most of which restated general industry-related concerns that were raised in response to the 1979 ANPR.

On April 4, 1980, OSHA scheduled public meetings (45 FR 22978) where interested parties could make oral presentations regarding confined space hazards in general industry and in construction. Those meetings were held during May 1980 in Houston, Texas, in Denver, Colorado, and in Washington, D.C. There were approximately 30 participants at these meetings.

In January 1986, NIOSH published an "Alert" titled "Request for Assistance in Preventing Occupational Fatalities in Confined Spaces" (Ex. 13–16). The Alert described the circumstances under which 16 workers died (14 of them due to atmospheric hazards) in confined space incidents. NIOSH focused on problems employers have in three areas: (1) recognizing confined spaces; (2) testing, evaluating, and monitoring confined space atmospheres; and (3) developing and implementing rescue procedures. It was noted, for example, that "[m]ore than 60% of confined space fatalities occur among would-be rescuers." The Alert recommended that employers protect employees who enter confined spaces by implementing measures similar to those presented in the 1979 Criteria Document.

In July 1987, NIOSH published "A Guide to Safety in Confined Space" (Ex. 14–145). The Guide addressed identification of confined spaces, measures to take when a confined space presents atmospheric hazards, and

incidents where "[l]ack of hazard awareness and unplanned rescue attempts led to [employee] deaths." NIOSH also described other potential confined space hazards (temperature extremes, engulfment, noise, slick or wet surfaces, and falling objects) and provided a checklist for employers to follow in evaluating confined spaces and in planning entry operations.

In addition, NIOSH's Fatal Accident Circumstances and Epidemiology (FACE) project focused much of its effort on confined space-related fatalities from 1984 to 1988 (Ex. 14-145). Personnel from NIOSH's Division of Safety Research evaluated numerous incidents and prepared reports which contained recommendations for improved employee protection. Those reports, which constituted the primary data base for the 1986 "Alert" and the 1987 "Guide", contributed significantly to OSHA's understanding of the broad range of hazards posed by confined spaces.

In May 1988, the ANSI Z117.1 Committee withdrew ANSI Z117.1-1977 because the committee had not completed action to renew or revise the standard within the 5-year period required by ANSI procedures for such action.

On June 5, 1989, OSHA issued a notice of proposed rulemaking (NPRM) (54 FR 24080) to set requirements for the protection of employees who work in or near permit-required confined spaces (permit spaces). In brief, the proposal required employers to identify any permit spaces in their workplaces, prevent unauthorized entry into such spaces, and protect authorized entrants from permit space hazards through a permit space program. As proposed, the permit space program, in turn, required employers to control hazards; properly inform, train and equip affected employees; document compliance with the program and authorize any entry operations through written permits; station an attendant to monitor entry operations; take the appropriate precautions for rescuing entrants from permit spaces; and assist any contractors hired for entry operations in complying with the program requirements by informing them of the hazards identified and any procedures developed for dealing with them. In addition, the NPRM presented 18 issues regarding which OSHA solicited comments and information. Detailed discussion of the proposed rule and issues raised during the rulemaking may be found in Section III, *Summary and Explanation of the Standard*, later in this preamble.

The NPRM set a comment period which ended on August 4, 1989. On July 21, 1989, in response to several requests, OSHA published a notice (54 FR 30557) which extended the time in which written comments and requests for hearing could be submitted through October 4, 1989.

On September 1, 1989, (54 FR 36644) the Agency promulgated a standard for "The control of hazardous energy (lockout/tagout)", 29 CFR 1910.147, to address "the *unexpected* energization or start up of machines or equipment, or release of stored energy [that] could cause injury to employees." OSHA anticipates that compliance with the lockout/tagout standard, in conjunction with the permit-space standard, will effectively protect employees who work in permit spaces from mechanical and other energy hazards. (See the discussion of issue 7 under *NPRM Issues*, later in this preamble, for further information on the relationship between the two standards.)

On October 5, 1989, the ANSI Z117 Committee approved ANSI Z117.1-1989, "Safety Requirements for Confined Spaces." The 1989 edition differs from the 1977 edition in two major respects: First, it distinguishes between confined spaces based on their potential to pose hazards. Under ANSI Z117.1-1989, employers would not need written permits to authorize work or attendants for spaces which fit the definition of permit-required confined space but have low potential to pose hazards. Second, it provides more specific guidance regarding the identification and evaluation of confined spaces, the training of personnel, and the appropriate procedures for having contractors work in confined spaces and for providing rescue and emergency services.

On October 10, 1989, OSHA issued a notice of informal public hearing (54 FR 41461), which announced that hearings would be held in Washington, D.C. and in Houston, Texas. The notice set out 15 issues regarding which the Agency solicited testimony, with supporting information. The testimony and other information received regarding those issues are discussed in Section III, *Summary and Explanation of the Standard*, later in this preamble. In addition, OSHA extended the written comment period through November 1, 1989.

On November 14, 1989, OSHA issued a notice of additional hearing site (54 FR 47498), which announced that the Agency would hold a hearing in Chicago, Illinois to facilitate participation by interested parties in the Chicago area.

On November 14-15, 1989, OSHA convened public hearings on the NPRM, with Administrative Law Judge Aaron Silverman presiding. Hearings were also held in Houston, Texas (December 5-6, 1989) and in Chicago, Illinois (January 30-February 2, 1990).

At the conclusion of the hearings, Judge Silverman set a post- hearing period for the submission of additional data (ending on April 18, 1990) and for the submission of additional briefs, arguments and summations (ending on May 3, 1990). On April 11, 1990, in response to requests from several parties, Judge Silverman extended the post-hearing comment periods, so that hearing participants had until May 18, 1990 to submit additional data and until June 4, 1990 to submit briefs, arguments or summations. On November 9, 1990, Judge Silverman closed and certified the hearing record for the rulemaking. The rulemaking record contains 137 exhibits and 2,279 pages of hearing transcript. OSHA received 227 comments on the proposal and 51 post-hearing comments.

In the course of drafting the final standard, OSHA has carefully reviewed the record for this rulemaking. In addition to comments and testimony at the public hearings, the Agency has also studied confined space regulations generated by states and other countries; materials generated by NIOSH; both editions of ANSI Z117.1; and the guidelines developed by other organizations (such as the American Petroleum Institute (Ex. 13-14) and the UAW-GM Human Resource Center (Ex. 64, 65, 66, 67)).

While the Agency has gained many valuable insights from the documents reviewed, OSHA believes that some standard-setting groups have not focused sufficiently on non-atmospheric hazards and have concentrated largely on air contaminants and oxygen-deficient atmospheres. For example, both the 1979 NIOSH Criteria Document and ANSI Z117.1-1989 require atmospheric testing before entry into a "confined space", even though those standards also recognize that some such spaces will pose mechanical and physical hazards rather than atmospheric hazards. Consequently, the OSHA permit-required confined space standard diverges from the approaches taken in the ANSI and NIOSH documents as necessary to indicate clearly that the OSHA standard is intended to protect employees from exposure to all permit space hazards.

Section 6(b)(8) of the Occupational Safety and Health Act of 1970 (the OSH Act) requires OSHA to explain "why a rule promulgated by the Secretary differs substantially from an existing

national consensus standard," by publishing " a statement of the reasons why the rule as adopted will better effectuate the purposes of the Act than the national consensus standard." In compliance with that requirement, the Agency has reviewed the standards proposed through this rulemaking with reference to the pertinent consensus standards. OSHA discusses the relationship between individual regulatory provisions and the corresponding consensus standards in Section III, *Summary and Explanation of the Standard*, later in this preamble.

The materials upon which OSHA has relied in drafting this final rule are available for review and copying in the OSHA Docket Office. Those materials include, among others, transcripts of the 1989 and 1990 informal public hearings, documents received by OSHA at the hearings and during the post- hearing comment periods, public comments on the NPRM, accident reports, existing regulatory language, responses to the 1975 and 1979 ANPRs, transcripts of the 1980 public meetings and the sources listed in the "References" sections of both the NPRM and this final rule.

II. Hazards

OSHA has determined, based upon the information presented in this section and upon the complete record developed as a result of this rulemaking, that working in permit-required confined spaces involves significant risks for employees and that this standard is necessary to alleviate or control such risks.

Incident Data and Confined Space Hazards Analysis.

The 1979 NIOSH Criteria document, "Working in Confined Spaces", cites a study by the Safety Sciences Division of WSA, Inc., San Diego, California, which was titled "Search of Fatality and Injury Records for Cases Related to Confined Spaces". The Safety Sciences study reviewed approximately 20,000 reports covering industrial accidents nationally for the period 1974—1977. Even with this limited sample, 276 confined space accidents which resulted in 234 deaths and 193 injuries were identified. Safety Sciences conducted its study to determine if regulatory action was needed to control confined space hazards, not to identify the exact causes of death and injury. OSHA, in turn, has been unable to connect the 234 fatalities and 193 injuries to specific industry segments or work activities.

More recently, OSHA examined its records of accident investigations for fatal confined space incidents. In particular, OSHA sought to identify the specific hazards and work activities involved. OSHA concluded during this review that, where multiple deaths occurred, the majority of the victims in each event died trying to rescue the original entrant from a confined space. This determination is consistent with the finding by NIOSH in its 1986 "Alert" that "rescuers" accounted for more than 60 percent of confined space fatalities. This evidence indicates that untrained or poorly trained rescuers constitute an especially important "group at risk." This group is protected from permit space hazards under the terms of this final rule.

OSHA has also gathered incident data from a number of other sources, such as the Fatal Accidents Circumstances and Epidemiol- ogy (FACE) reports produced by NIOSH and reports produced by the states. That information has been very useful to OSHA, even though in some cases there was not enough detail for OSHA to evaluate the circumstances of the incidents.

The OSHA-investigated cases which OSHA analyzed to determine the cause of death in confined spaces have been compiled in four reports prepared by OSHA's Office of Statistical Studies and Analyses. These are: "Selected Occupational Fatalities Related to Fire and/or Explosion in Confined Work Spaces as Found in Reports of OSHA Fatality/Catastrophe Investigations" (Ex. 13–10), "Selected Occupational Fatalities Related to Lockout/Tagout Problems as Found in Reports of OSHA Fatality/Catastrophe Investigations" (Ex. 13–11), "Selected Occupational Fatalities Related to Grain Handling as Found in Reports of OSHA Fatality/ Catastrophe Investigations" (Ex. 13–12), and "Selected Occupational Fatalities Related to Toxic and Asphyxiating Atmospheres in Confined Work Spaces As Found in Reports of OSHA Fatality/ Catastrophe Investigations" (Ex. 13–15).

These four reports focused on fatalities because OSHA found that the reporting of injuries from permit space incidents was frequently incomplete. OSHA observes that injuries are most likely to be reported when they occur as part of an incident where fatalities do occur. The Agency anticipates that this rulemaking will lead to improved data collection regarding injuries because employers and employees are being clearly alerted to OSHA's concern about permit space hazards.

OSHA analyzed the studies to determine the underlying causes of the conditions which existed when confined space related accidents occurred. From this information, OSHA has developed measures that would have prevented virtually all of the accidents in the studies and has used those measures as the basis for both the proposed standard and the final rule. OSHA notes that many of the reports did not fully document the circumstances of the accidents covered. The Agency has determined, however, that the available accident data, despite its limitations, provides the necessary basis for characterizing permit space hazards and for requiring protective measures. OSHA has continued to collect accident data during the course of this rulemaking.

OSHA has determined that a variety of confined space hazards have caused deaths and injuries. The following discussion describes the hazards identified by OSHA. Where the Agency has obtained incident data subsequent to the publication of the NPRM, the circumstances of some of those incidents are summarized as "examples". The discussion also references the portions of the NPRM where pertinent incidents were described.

1. *Atmospheric Hazards.*

OSHA's review of accident data indicates that most confined space deaths and injuries are caused by atmospheric hazards. OSHA has classified those hazards into three categories: toxic; asphyxiating; and flammable or explosive atmospheres, in order to account for their differing effects.

Some chemical substances present multiple atmospheric hazards, depending on their concentration. Methane, for example, is an odorless substance that is nontoxic and is harmless at some concentrations. Methane, however, can displace all or part of the atmosphere in a confined space;[1] and the hazards presented by such displacement can vary greatly, depending on the degree of displacement. With only 10 percent displacement, methane produces an atmosphere which, while adequate for respiration, can explode violently. By contrast, with 90 percent displacement, methane will not burn or explode, but it will asphyxiate an unprotected worker within about 5 minutes.

OSHA is concerned that employees may be exposed to atmospheric hazards because the employer has not properly

[1] Methane is lighter than air when both are at the same temperature (the normal case), and the configuration of some confined spaces can trap accumulating methane at "ceiling" level. On the other hand, in the unlikely event that liquified methane is released into the atmosphere of a confined space, the methane released would be heavier than air and would displace the air from the "ground" level up.

evaluated the work operations or the conditions within the permit space. Problems can arise, for example, where an employer has not selected the necessary atmospheric test instruments or has not ensured their proper use. Problems have arisen because most of the instruments used to test the flammability of a permit space atmosphere do not identify oxygen deficient atmospheres. In fact, because some of these instruments rely on the presence of oxygen, their readings can be inaccurate in oxygen-depleted atmospheres.

For example, instruments of the hot-platinum-filament type are designed to measure flammable gases and vapors in air. The depend on oxidation for their operation, and normal quantities of oxygen in the air are necessary for their correct operation. Any reduction in oxidation caused by lack of oxygen will result in a lower flammability reading. Such test instruments would indicate the absence of an explosion hazard simply because the atmosphere did not contain sufficient oxygen for combustion but would not indicate the oxygen deficiency that posed an asphyxiation risk.

On the other hand, a test performed only to determine the oxygen level might indicate that conditions are acceptable for entry without respiratory protection, despite the presence of 10 percent methane, an explosive level, in the atmosphere. Therefore, in the final rule, OSHA is requiring that employers test and monitor their entry spaces with instruments which will detect all aspects of hazardous atmospheres that may be encountered in the spaces.

OSHA presents the following examples regarding atmospheric hazards to illustrate how a relatively uncomplicated series of events can lead to workplace deaths and injuries. In each case, OSHA believes that death and injury would have been prevented if the procedures and safeguards required in this rule had been used. OSHA notes that the hazards confronted could only have been controlled effectively through the use of mechanical ventilation. OSHA recognizes that many confined space workplaces present situations which are more complex than those described in the following discussion.

a. *Fatalities in asphyxiating atmospheres.* In its analysis of these confined space incidents, OSHA uses the term "asphyxiating atmosphere" when referring to an atmosphere which contains less than 19.5 percent oxygen. Oxygen levels under 19.5 percent are inadequate for an entrant's respiratory needs when performing physical work, even if the space contains no toxic materials.

There are many potential causes of asphyxiating atmospheres. For example, the oxygen in a space may have been absorbed by materials, such as activated charcoal, or consumed by chemical reaction, such as the rusting of a vessel or container. In another situation, the original atmosphere in the space may intentionally have been wholly or partly inerted using such gases as helium, nitrogen, argon, or carbon dioxide. Victims of asphyxiation often are unaware of their predicament until they are incapable of saving themselves or even calling for help.

Three incidents involving fatalities in asphyxiating atmospheres were discussed in the preamble of the NPRM (54 FR 24083). In addition, OSHA has received information during the rulemaking (Ex. 14–159) that further documents the hazards of exposure to asphyxiating atmospheres in permit-required confined spaces.

Example #1. A worker at a Texas steel mill was assigned the task of clearing a blockage at The No. 2 degasser vessel dust collector. He entered the vessel through an access manhole and proceeded to clear the obstruction. A coworker, assigned to assist, left the area to locate an electrical receptacle. About 10 or 15 minutes later, the coworker returned and found the worker who had entered the vessel unconscious. The coworker was able to remove the unconscious man and called for assistance. Unfortunately, the worker died. An oxygen test showed a level of 10% oxygen in the vessel. (The coworker was not injured.)

Example #2. A steel worker was asphyxiated when he entered a tank in the reagent storage building. There were no witnesses to the incident, but, since the tank had been used for the transport of nitrogen, it was assumed that the atmosphere within the tank was oxygen deficient.

b. *Fatalities in toxic atmospheres.* The term "toxic atmospheres" refers to atmospheres containing gases, vapors or fumes known to have poisonous physiological effects. The toxic effect is independent of the oxygen concentration. The most commonly encountered toxic gases are carbon monoxide and hydrogen sulfide.

Some toxic atmospheres may have severe harmful effects which may not manifest until years after exposure, while others may kill quickly. Some can produce both immediate and delayed effects. For example, while carbon disulfide at low concentrations may exhibit no immediate sign of exposure, it can cause permanent and cumulative brain damage as a result of repeated "harmless" exposures. At higher concentrations, it can kill quickly.

Two incidents involving fatalities in toxic atmospheres were discussed in the preamble of the NPRM (54 FR 24083, 24084). In addition, OSHA has received information during the rulemaking (Ex. 14–63, 14–159) that further documents the hazards of exposure to toxic atmospheres in permit-required confined spaces.

Example #1. A worker in Maryland entered a 6500 gallon tank trailer to finish cleaning the inside. He had with him a bucket containing about a gallon of a cleaning solvent (identified in the accident abstract only as "Niagara Trex 1900 Presol"). In only five to seven minutes the employee passed out and fell to the tank bottom. There was no ventilation, respirator or safety harness with lifeline provided. The outside "standby man" only checked the employee periodically (every three to five minutes). When the outside man discovered the unconscious employee, he attempted a rescue (without benefit of any protective equipment for himself) but was unsuccessful. He left the tank and called emergency personnel. The unconscious employee was rescued by emergency personnel and immediately transported to a hospital, where he was declared dead.

Example #2. An employee of a zinc refinery was working in a zinc dust condenser when he collapsed. Another employee donned a self-contained breathing apparatus (SCBA) and attempted to enter the condenser to rescue the downed employee. He was not able to fit through the portal wearing the SCBA, so he removed it, handed it to another employee and then entered the condenser. He planned to have the other employee hand the SCBA to him through the portal, re-don it and then continue with the rescue. He collapsed and fell into the condenser before he could re-don the SCBA. The first employee was declared dead at the scene; the would-be rescuer died two days later. The toxic air contaminant was later determined to be carbon monoxide.

c. *Fatalities due to flammable or explosive atmospheres.* OSHA considers an atmosphere to pose a serious fire or explosion hazard if a flammable gas or vapor is present at a concentration greater than 10 percent of its lower flammable limit or if a combustible dust is present at a concentration greater than or equal to its lower flammable limit. (See the definition of "hazardous atmosphere" in §1910.146(b) and the discussion of the definition of "hazardous atmosphere", which

appears in Section III, *Summary and Explanation of the Standard*, later in this preamble.) This category of hazardous atmospheres includes atmospheres containing gases such as methane or acetylene; vapors of solvents or fuel such as carbon disulfide, gasoline, kerosene, or toluene; or combustible dusts, such as coal or grain dusts.

An incident involving five fatalities in flammable or explosive atmospheres was discussed in the preamble of the NPRM (54 FR 24084). In addition, OSHA has received information during the rulemaking (Ex. 14–145) that further documents the hazards of exposures to flammable or explosive atmospheres in permit-required confined spaces.

Example. An employee of a trailer service company entered a 8500 gallon cargo tank to weld a leak on the interior wall of the tanker. Despite the presence of strong fumes of lacquer- thinner (the material previously carried in the tanker) the welder decided to proceed with the repairs even though the written company safety policy required the use of an explosion meter at that point. When he began welding, an explosion occurred. The employee was removed from the tank and taken to a nearby hospital, where he was declared dead by the attending physician.

2. *Other Hazards.*

Fatalities from engulfment. "Engulfment" refers to situations where a confined space entrant is trapped or enveloped, usually by dry bulk materials. The engulfed entrant is in danger of asphyxiation, either through filling of the victim's respiratory system as the engulfing material is inhaled, or through compression of the torso by the engulfing material. In some cases, the engulfing materials may be so hot or corrosive that the victims sustain fatal chemical or thermal burns, but are never buried to the extent that they cannot breathe.

Two incidents involving fatalities from engulfment were discussed in the preamble of the NPRM (54 FR 24084). In addition, OSHA has received information during the rulemaking (Ex. 14–159) that further documents the hazards of engulfment in permit-required confined spaces.

Example. Two Ohio foundry employees entered a sand bin to clear a jam. While they were working, sand which had adhered to the sides of the bin began to break loose and fall on them. One employee quickly became buried up to his chest, just below his armpits. The other employee left the bin to obtain a rope, intending to use it to pull his coworker out of the sand. He returned to the bin, tied the rope around the partially buried employee and tried to pull him free. He was unsuccessful. During his attempted rescue, additional sand fell, completely covering and suffocating the employee who had been only partially buried.

Fatalities due to mechanical hazards. OSHA has determined that accidents have resulted in confined spaces when employers failed to isolate equipment within the space from sources of mechanical or electric energy or when the equipment was improperly guarded. In each case reviewed, death resulted from mechanical force injury, such as the crushing of the victim. OSHA has determined from its review of accidents involving mechanical hazards that the correct preventive action would have been to secure the machinery or equipment so that it would not have been inadvertently activated while employees were exposed to it. This procedure is commonly called "lockout".

When servicing or maintenance work is being performed on machinery or equipment located in a confined space, OSHA's standard on the control of hazardous energy sources (lockout/tagout), §1910.147, also applies. When work inside a permit space does not involve servicing or maintenance of machinery or equipment in the permit space, OSHA's standards on machine guarding, in Subpart O of Part 1910, require the equipment to be guarded to protect employees from any mechanical hazards posed by the machine. In any event, this final rule on permit-required confined spaces, §1910.146, requires employers to evaluate any mechanical hazards found in permit spaces and to take all steps necessary to protect entrants.

An incident involving a fatality due to a mechanical hazard is discussed in the preamble of the NPRM (54 FR 24085).

Fatalities due to untrained rescuers. As noted previously, OSHA has determined that a high percentage of confined space accident victims have been untrained rescuers. Indeed, in some cases, the unsuccessful rescuers have died while the initial entrants have recovered. The likelihood that good intentions and poor preparation will lead to tragedy has led the Agency to establish criteria for rescue which will protect co-workers or volunteers from accidental injury or death.

Two incidents involving untrained rescuers were discussed in the preamble to the NPRM (54 FR 24085). In addition, OSHA has obtained information (Ex. 14–145) during the rulemaking that further documents the hazards of allowing untrained rescuers to enter permit spaces.

Example. A maintenance worker entered a sewer manhole to repair a pipe and collapsed at the bottom. A coworker, who had been observing the initial entrant, entered the manhole, lost consciousness, and fell to the bottom. A supervisor looked in the manhole, saw the would-be rescuer, and entered to attempt rescue. The supervisor became dizzy, climbed from the manhole, and passed out. When he regained consciousness, the supervisor summoned rescue and emergency services. Both the initial entrant and the first would-be rescuer died of hydrogen sulfide poisoning.

Conclusion. OSHA has determined, based upon the information presented in this section of the preamble and upon the complete record developed as a result of this rulemaking, that working in permit-required confined spaces involves significant risks for employees and that this standard is necessary to alleviate or control such risks. This conclusion is further supported in the next section of this preamble, *Summary and Explanation of the Standard.*

III. Summary and Explanation of the Standard

The following discussion, which tracks the final rule paragraph by paragraph, summarizes the significant substantive differences between this final rule and the proposed rule and explains how OSHA determined what the final rule would require. This section covers the comments, testimony, and information received regarding the proposed standard, the 18 issues raised in the NPRM, and the 15 issues raised in the hearing notice. Each issue is addressed under the appropriate provision of the final rule or, if the issue does not relate to a particular provision of the standard, in a separate discussion at the end of this section of the preamble. References in parentheses are to exhibits and transcript pages [2] in the rulemaking record. These references are not meant to be exhaustive but are examples of sources that support statements made in the preamble discussion.

As noted in Section I, *Background*, earlier in this preamble, section 6(b)(8) of the OSH Act requires OSHA to explain why a rule which deviates

[2] Chicago Tr.—Transcript pages from the hearing held in Chicago, IL, on January 30 to February 2, 1990.

Houston Tr.—Transcript pages from the hearing held in Houston, TX, on December 5–6, 1989.

Washington Tr.—Transcript pages from the hearing held in Washington, DC, on November 14–15, 1989.

substantially from a pertinent consensus standard better effectuates the purposes of the Act. In a case where the Agency has determined that ANSI language should be adopted, the Summary and Explanation so indicates. In addition, this section of the preamble addresses any case where the Agency has determined that adoption of the pertinent ANSI language would not provide appropriate requirements for employee safety.

Paragraph (a), Scope and Application.

Paragraph (a) states that §1910.146 contains requirements for practices and procedures to protect employees from the hazards of entry into permit-required confined spaces. This paragraph explicitly excludes agriculture, construction, and shipyard employment from the scope of the standard. This language simplifies and clarifies the proposed provision. The proposed rule stated that the section set requirements for permit-required confined spaces (PRCSs) in General Industry that could "be identified by an employer exercising reasonable care." Proposed paragraph (a) also would have excluded electric power generation and transmission, grain handling facilities, and onshore operations of the maritime industry from the scope of proposed §1910.146, to the extent that PRCSs in those industries were "regulated by a more specific confined space entry standard."

As discussed in the preamble of the NPRM (54 FR 24089), OSHA considered proposed §1910.146 to be a generic standard. Therefore, the proposed rule was intended to apply except where superseded, in whole or in part, by industry-specific regulations. The text of proposed paragraph (a) reflected the Agency's understanding of the relationship between proposed §1910.146 and the other OSHA standards. OSHA solicited comments on the scope of the standard in Issue 8 of the NPRM and in Issues 1 and 2 of the hearing notice.

Some rulemaking participants (Ex. 14–38, 14–41, 14–44, 14–54, 14–57, 14–61, 14–63, 14–94, 14–127, 14–148, 14–151, 14–163, 14–173, 14–208, 14–213, 14–216; Chicago Tr. 220–222) stated that OSHA should expand the proposed scope. These commenters asserted that all employees who work in "permit spaces" should be afforded the protection provided by compliance with proposed §1910.146, regardless of the classification of the industry in which they work. One commenter (Ex. 14–61) stated:

> OSHA's contention that the excluded industries are adequately covered by existing standards is wishful thinking at best. The very same hazards that are faced by general industry are found in the agriculture, construction and maritime sectors.... There are [repeated] references in the news media about confined space accidents in all three exempted industries.

Agreeing with this point of view, another commenter (Ex. 14–54) said:

> With the numerous confined spaces in agriculture, construction, maritime, electric generation and transmission industries, and grain handling facilities and the number of fatalities that occur in these areas, they should not be exempt!

Still another commenter (Ex. 14–163), bolstering his arguments with OSHA statistics, stated:

> I find it a grave error not to include construction in the proposed rulemaking. As your statistics succinctly point out, between 1974 and 1977, 276 confined space accidents claimed 234 lives and injured an additional 193 individuals. Electrical, Gas and Sanitary Services recorded the highest average annual fatalities of all industries listed in the Average Annual Fatality Table in this proposed rule making. The majority of the tasks that this industry performs falls into the construction field. Based upon these figures, why would you want to exclude construction?

Other rulemaking participants (Ex. 14–35, 14–43, 14–53, 14–101, 14–110, 14–153, 14–165, 14–180, 14–226; Washington Tr. 173, 176, 178–180, 182, 199, 209–210) stated that the proposed scope should be narrowed. These commenters believed that proposed paragraph (a) did not sufficiently take into account other OSHA standards that already adequately protected employees in certain industries from confined space hazards. For example, some suggested that OSHA exempt all maritime operations because there was already adequate regulation for that industry (Ex. 14–42, 14–58, 14–62, 14–198, 14–212, 14–220). Supporting this view, the National Fire Protection Association (NFPA, Ex. 14–212) stated:

> The NFPA feels that the present maritime industry standard addressing entry and work in confined and enclosed spaces exceeds the provisions of the generic standard and has years of practical application evidence to support this claim.

Representatives of the telecommunications industry (Ex. 14–39, 14–53, 14–104, 14–106, 14–110; Washington Tr. 146–148, 174–183, 196–199) formed a large portion of the group of commenters supporting a narrowing of the scope of §1910.146. This group insisted that confined space hazards found in telecommunications work are already adequately and properly addressed in §1910.268(o), covering work in manholes and unvented underground vaults. For example, Mr Donald Espach, testifying on behalf of GTE Service Corporation (Washington Tr. 175–182), made the case for this industry's view. He noted that GTE is a multi-national corporation that is made up of three core businesses: telecommunications, lighting products, and precision materials. He maintained that this diversity provided a unique perspective on OSHA's proposed permit-required confined space standard. With respect to the proposal's application to general industry, he stated:

> Based on our experience in Towanda and other manufacturing sites in GTE, GTE believes that procedures similar to the OSHA proposals are appropriate to the general industry. The OSHA proposal will ensure that facilities without comprehensive confined space entry program will develop it. Compliance with such programs will save lives.

He argued that applying the proposed rule to telecommunications manhole entry operations was not appropriate, as follows:

> But there are huge differences in confined spaces in chemical and manufacturing plants in telecommunication manholes. First and foremost, the inherent hazard of telecommunications manholes is significantly less. Telecommunication manholes are not designed to contain any kind of chemical or hazardous substance. They do not contain a residual hazardous atmosphere. Telecommunication manholes exist to provide access to underground telephone cables and conduits during splicing, testing, maintenance and air pressurization operations. In most cases, the atmosphere in telecommunication manholes is the same as that outside the manhole.
>
> Secondly, telecommunications manholes are located in and around public roads and rights-of-way all over the United States. GTE alone has over 70,000 telecommunications manholes and the entire industry probably has about 1,000,000. GTE has about 8,700 employees who will enter telecommunications manholes approximately 320,000 times a year.
>
> While there is no question as to the need for special procedures to protect employees who enter telecommunications manholes, to be effective in saving lives, these procedures must reflect the difficulties inherent in having such a large, widely-scattered workforce. Telecommunications manhole entries are routine, performed on a daily basis and, based on data in OSHA's current record, done safely.
>
> The third major difference is that entry into telecommunications manholes is already regulated by OSHA. Entry into telecommunications manholes and unvented cable vaults is currently regulated by Section 1910.268(o)(2). This regulation requires that telecommunications manholes and unvented cable vaults be tested for combustible gas and provided with continuous forced ventilation to assure an adequate oxygen supply and

remove any contaminants which may be present. It is an industry-specific regulation, which assures the safety of the employees of this industry.

Mr. Espach further stated that, based on GTE's experience with manhole operations, which included 4.5 million entries with no deaths or serious injuries, §1910.268(o)(2) provided adequate protection to telecommunications employees. He contended that applying §1910.146 to telecommunications manhole work would be unnecessary.

A third group of commenters (Ex. 14–42, 14–55, 14–58, 14–62, 14–198, 14–212, 14–220), mainly from the construction and maritime industries, stated that OSHA should promulgate the scope of §1910.146 as proposed, asserting that the proposed exclusions were justified by differences between the included and excluded industries. One commenter (Ex. 14–206) from the grain handling industry explained:

> We concur with the scope and application in the proposal which exempts confined spaces in grain handling facilities. OSHA has already addressed the significant confined space entry hazards in grain handling facilities through 29 CFR 1910.272(g) which has been in effect since March 30, 1988. Since employers in the grain industry are already subject to an industry-specific standard, they should not be required to implement the permit system set out in the proposed generic standard.

As noted earlier, proposed paragraph (a) stated "...this section [does not] apply to confined spaces in electric generation and transmission industries, grain handling facilities, or onshore operations of the maritime industries wherever these confined spaces are regulated by a more specific confined space entry standard." Some of those commenting on the scope of the proposal mistakenly assumed that the proposed language would exempt all confined spaces within the listed industries and no others. For example, the Tennessee Valley Authority (Ex. 14–36) indicated that it understood the language of proposed paragraph (a) to be an unqualified exclusion of electric generation and transmission from the scope of proposed §1910.146. On the other hand, the comments from the telecommunications industry clearly indicate that they believe their manhole and underground vault work would have been covered under proposed §1910.146, since a specific exclusion was not given.

The language proposed in paragraph (a) clearly indicated that the exclusion of the pertinent industries is conditioned upon the promulgation of standards which specifically address any permit spaces found in those industries. In particular, OSHA notes that the Notice of Proposed Rulemaking for Electric Power Generation, Transmission, and Distribution (54 FR 5023) stated that proposed §1910.269 addressed "enclosed spaces", which are defined to be spaces that contain no atmospheric hazards under normal conditions, rather than "permit spaces".[3] In addition, the preamble to proposed §1910.269 explicitly stated (54 FR 4984) that any spaces at electric generation or transmission facilities that met the definition of "permit space" would be regulated under proposed §1910.146.

Unfortunately, in spite of the language of the two proposals (§§1910.146 and 1910.269), a few commenters appeared to be confused by the extent of the exclusionary language in proposed §1910.146(a). Therefore, the Agency believes the best approach is not to carry forward the proposed scope language that appeared to exclude all permit spaces in industries that are or are to be covered by other sections of Part 1910. OSHA notes that §1910.5(c), *Applicability of standards*, already provides necessary guidance in the application of generic standards. In particular, existing §1910.5(c)(1), which provides for a specific standard to supersede a generic standard, states, in part:

> If a particular standard is specifically applicable to a condition, practice, means, method, operation, or process, it shall prevail over any different general standard which might otherwise be applicable to the same condition, practice, means, method, operation , or process.

In addition, existing §1910.5(c)(2), which provides for application of a generic standard, states, in part:

> On the other hand, any standard shall apply according to its terms to any employment and place of employment in any industry, even though particular standards are also prescribed for the industry, as in subpart B and subpart R of this part, to the extent that none of such particular standards applies.

Under current OSHA practice, as outlined in §1910.5(c), confined spaces that are presently regulated in other sections of Part 1910 will continue to be regulated under those sections, to the extent that permit spaces are already regulated under those sections. For example, telecommunications work in manholes and underground vaults is normally covered under §1910.268(o). Such work will continue to be covered under the telecommunications standard, and the provisions of §1910.146 would not apply as long as the provisions of §1910.268(o) protect against the hazards within the manhole.[4] Confined spaces that are not covered by any other OSHA rule will fall under §1910.146. Thus, confined spaces other than manholes and underground vaults (such as boilers and tanks) being entered by telecommunications employees would be covered by §1910.146.

Accordingly, based on the rulemaking record and on the language of existing §1910.5(c), OSHA has determined that the detailed exclusionary language in proposed §1910.146(a) is unnecessary and potentially confusing. Therefore, paragraph (a) of the final rule contains no references to industry-specific regulations in Part 1910.

With respect to the agriculture, construction, and shipyard employment industries, on the other hand, OSHA is retaining the proposed language exempting these industries from §1910.146, except for editorial changes. OSHA is aware that confined space accidents occur in agriculture, construction, and maritime and that employees in those industries do face a significant risk of death and serious injury from these accidents. (See Table 1 for a breakdown of the number of confined space accidents in the relevant industries.) However, the Agency believes that sufficient differences exist between these industries and general industry to warrant separate rulemaking activities. For example, Part 1926, OSHA's Construction Standards, contains requirements dealing with confined space hazards in underground construction and in underground electric transmission and distribution work (Subpart S and §1926.956, respectively). In fact, the data presented in Table 1 are based on accidents occurring well before the recent revision of Subpart S of Part 1926. OSHA believes that more current data would show a decline in the number of permit space injuries and deaths in the construction industry.

The Agency also believes that agriculture, construction, and shipyard

[3] The question of whether or not all confined spaces found in electric power generation, transmission, and distribution work should be addressed in a separate standard was an issue in the rulemaking on proposed §1910.269 (54 FR 4974, January 28, 1989). The resolution of this issue will be discussed as part of the preamble to the final §1910.269.

[4] Taking the telecommunications examples further, the Agency can envision manholes that may be more appropriately covered by §1910.146. Although it is rare, manholes can become overwhelmingly contaminated with toxins or other hazardous chemicals (Washington Tr. 159, 165). If the work area could not be made safe before entry, as required by §1910.268(o)(2)(i)(B), entry would have to be performed under the provisions of §1910.146.

work are likely to pose permit-space working conditions that are unique to these industries. OSHA has a statutory mandate to consult the Advisory Committee on Construction Safety and Health and uses the Shipyard Employment Standards Advisory Committee to obtain recommendations on rules for industries within their purview. These advisory committees frequently identify working conditions that are unique and need separate treatment in the OSHA standards. Except as discussed in the following paragraphs, the Agency has not yet submitted the generic permit space standard to these committees for their review. A review of the data in this rulemaking record can enable these committees to recommend whatever action is necessary, be it rulemaking, enforcement of existing standards, or a combination of the two. Therefore, OSHA believes that confined space standards for agriculture, construction, and shipyard work should be addressed separately so that the Agency can focus on aspects of permit space safety that are specifically appropriate for these areas. Accordingly, §1910.146(a), as promulgated, retains the proposed language exempting these industries from the requirements of the generic permit space standard.

Table 1—Confined Space Accidents in Ariculture, Construction, and Maritime

	Source		
	Safety Sciences[1]	OSHA[2]	OSHA[3]
Agriculture	10		
Construction.	95	13	40
Maritime	23	20	8

[1] "Search of Fatality and Injury Records For Cases Related to Confined Spaces" prepared by Safety Sciences, San Diego, CA, for NIOSH, February 1978, as recorded in Ex. 14–82.

[2] "Selcted Occupational Fatalities Related to Fire and/or Explosion in Confined Work Spaces as Found in Reports of OSHA Fatality/Catastrophe Investigations" prepared by OSHA Office of Statistical Studies and Analyses, Washington, D.C., April 1982, as recorded in Ex. 13–10.

[3] "Selcted Occupational Fatalities Related to Toxic and Asphyxiating Atmospheres in Confined Work Spaces as Found in Reports of OSHA Fatality/Catastrophe Investigations" prepared by OSHA Office of Data Analysis, Washington, D.C., July 1985, as recorded in Ex. 13–15.

Questions have also arisen regarding the proper manner in which to regulate land-based shipyard permit spaces. OSHA published proposed Subpart B of Part 1915 (53 FR 48092, November 29, 1988), Explosive and Other Dangerous Atmospheres in Vessels and Vessel Sections, to revise the requirements for safe entry and work in confined spaces on vessels. In particular, proposed Subpart B addressed atmospheric hazards (oxygen deficiency, toxic contamination, fire and explosion) that may arise in those spaces. Therefore, that proposal did not cover non-atmospheric hazards in vessels or vessel sections. In addition, that proposal did not cover any confined space hazards in land-based shipyard confined spaces.

At the time OSHA was drafting the proposed general industry permit space standard, the Agency had not yet decided how it would address the shipyard confined spaces that were not covered by proposed Subpart B. Therefore, proposed paragraph (a) explicitly excluded the workplaces covered by proposed Subpart B from the scope of proposed §1910.146 but provided that onshore shipyard "permit spaces" would be excluded from the scope only insofar as those spaces were regulated by a more specific standard. This left open the prospect that, if no action were taken to extend the coverage of proposed Subpart B to the entire shipyard, the final rule for general industry permit spaces would apply to the shipyard permit spaces not covered by proposed Subpart B. As noted earlier, some rulemaking participants supported total exclusion of shipyards from §1910.146, while others supported their coverage under that proposed rule.

On June 24, 1992, OSHA published a notice (57 FR 28152) reopening the rulemaking record for proposed Subpart B to receive the recommendations of the Shipyard Employment Standards Advisory Committee regarding shipyard confined spaces and to solicit comments regarding the appropriateness of expanding the scope of Subpart B of Part 1915 to cover the entire shipyard and of incorporating certain provisions of proposed §1910.146 into Subpart B. The comment period is scheduled to end on September 22, 1992. Once the record has been closed again, the Agency will review the rulemaking record and, based on that review, proceed to draft a final rule for Subpart B.

OSHA notes that, under the terms of proposed paragraph (a) of the general industry standard and §1910.5, the promulgation of §1910.146 before the promulgation of revised Subpart B would have resulted in the regulation of land-based shipyard permit spaces and shipyard permit spaces with non-atmospheric hazards under the general industry standard. However, given the Agency's general policy in favor of setting vertical standards for the shipyard industry and the recent efforts (for example, the reopening of the Subpart B record) to develop a basis for a Subpart B standard that could cover all shipyard confined spaces, OSHA believes that it would be inappropriate for the general industry standard to regulate any shipyard confined spaces at present.

Furthermore, the Agency believes that imposing the general industry standard on some shipyard spaces for the period OSHA needs to complete action on proposed Subpart B would generate confusion regarding what shipyard employers are required to do. The Agency also notes that it would be unreasonable to impose the costs of attaining compliance with the general industry standard on the shipyard industry when OSHA has not yet determined how closely the final rule for Subpart B will resemble §1910.146.

Therefore, OSHA is exempting shipyard confined spaces from compliance with final §1910.146. The Agency will continue its efforts to promulgate the revision of Subpart B and will determine what further action should be taken regarding the application of §1910.146 to shipyard confined spaces under the Subpart B rulemaking. To make this clear in the final rule, OSHA is specifying that §1910.146 does not apply to the "shipyard employment" industry, rather than "purely maritime" industry, as proposed. Additionally, the Agency has listed the standards, by Part number, that apply to the exempt industries.

Pending the resolution of this issue, OSHA will continue to protect employees who are exposed to "permit space" hazards in land-based shipyard confined spaces or who are exposed to non-atmospheric "permit space" hazards in any shipyard confined spaces by using the general duty clause (§5(a)(1)) of the OSH Act. The Agency believes that most shipyard employers comply with Subpart B of Part 1915 throughout the shipyard, not only in vessels and vessel sections. Also, OSHA does not consider it reasonable for these employers to enforce two different permit space standards. Therefore, in applying the general duty clause, OSHA will use the terms of Subpart B as guidelines for land-based permit spaces found in shipyard work.

Also, OSHA has not carried forward the language "which can be identified by an employer exercising reasonable care" from proposed paragraph (a), because the Agency has determined that this text, which addresses how OSHA would assess an employer's compliance with the standard, is not appropriate regulatory language. This standard indicates clearly that employers are responsible for identifying their permit spaces and for protecting their employees from the hazards of any such

spaces. Therefore, while an employer's "reasonable care" might be directly relevant to an enforcement proceeding, it is inappropriate to include "reasonable care" as a criteria in the standard itself.

Paragraph (b), Definitions.

Paragraph (b) sets forth the major terms, with definitions, used in the final rule. Where appropriate, proposed terms and definitions have been revised or deleted, and new terms and definitions have been added, for the sake of clarity and to reflect the rulemaking record. OSHA has revised the format for the proposed paragraph, by not numbering the definitions, because the Agency determined that presenting the terms in alphabetical order both provided adequate guidance and was consistent with acceptable Federal Register format and with OSHA's approach to definitions in other standards.

The term "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.

The proposed standard defined the term "acceptable environmental conditions." That definition focused on the absence of "uncontrolled hazardous atmospheres." OSHA has determined that the term "acceptable entry conditions" should replace the proposed term so the final rule clearly indicates that no unreasonable permit space hazards of any kind may be present when entry is authorized. In addition, the Agency has revised the proposed definition, omitting the discussion of "uncontrolled hazardous atmospheres", so it is clear that air contaminants are not the only hazards addressed.

The term "attendant" means an individual who is stationed outside one or more permit spaces, who monitors the authorized entrants, and who performs all duties assigned to the attendant by the employer's permit program. While this definition is substantially the same as that contained in the proposed standard, it has been simplified by eliminating proposed language pertaining to training and the number of spaces and entrants to be monitored, because those substantive provisions are more properly covered in the regulatory text of the final standard.

The term "authorized entrant" means an employee who is authorized by the employer to enter a permit space. This definition, which is substantially the same as that presented in the proposed standard, has been simplified by the elimination of language that more properly appears in the standard's regulatory text.

The term "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.

The proposed definition of this term differed in that it specified "a solid plate ... which extends at least to the outer edge of the flange". The proposed definition was based on OSHA's belief that it was necessary to completely occlude the bore, and that it was necessary to have the edge of the occluding plate extend beyond the flange. The Agency expected that this approach would provide appropriate protection that could be verified without difficulty.

Testimony and comments (Ex. 14–88, 14–118, 14–170, 14–188; Houston Tr. 727–728, 772–773; Chicago Tr. 91) indicated that blanking or blinding, as defined in the proposal, would be unnecessarily costly and difficult to accomplish or verify. The rulemaking participants demonstrated that the use of skillet blinds or spectacle blinds would provide equivalent protection without imposing the costs and difficulties of the proposed definition. Additionally, the American Petroleum Institute (API) testified (Houston Tr. 727):

> The definition of blanking or blinding in paragraph (b)(4) requires this device to extend to the outer edge of the flange. The standard blind used in our industry extends to the outer edge of the gasket surface and not to the outer edge of the flange. The bolts that hold the blind in place are inserted through bolt holes in the flange so that the blind must necessarily be smaller in diameter than the inner diameter of the bolt circle. Given the nature of this device, it is not possible for it to extend to the outer edge of the flange.
>
> Currently, a typical refinery has hundreds of such blinds which would become obsolete if this provision remains and would have to be replaced. Our experience has been that this device is safe and effective so there is no valid reason to mandate a change. We hope that the proposed definition of blind was only an inadvertent technical error.

The Agency notes that blanking and blinding were not specifically required by the proposal (nor are they absolutely required by the final rule). This was just one recognized method of achieving the isolation of a permit space. In fact, the only place this term is used is in the definition of isolation. However, OSHA agrees that the use of skillet blinds and spectacle blinds will adequately protect employees and that the proposed definition was unnecessarily restrictive. Therefore, the Agency has changed the definition of "blanking or blinding" by removing the "requirement" that the solid plate extend at least to the outer edge of the flange. Additionally, spectacle blinds and skillet blinds are listed as examples of solid plates which will provide adequate blanking or blinding.

The term "confined space" means a space that:

1) Has adequate size and configuration for employee entry; and

2) Has limited means of access or egress; and

3) Is not designed for continuous employee occupancy.

In the NPRM, OSHA only defined a "permit required confined space"; "confined space" was not defined. The final rule contains definitions for "confined space", "permit-required confined space", and "non-permit confined space". The final rule's definition of "confined space" has been taken directly from the portion of the proposal's definition of "permit required confined space" that dealt with the confinement properties of the space (§1910.146(b)(23)(i) through (iii)). The remainder of the proposal's definition of "permit required confined space" addressed the other hazards that may be present within the space and has been retained in the final definition of that term. (See the discussions of the definitions of "non-permit confined space" and "permit-required confined space" later in this preamble. Issues and comments relating to proposed §1910.146(b)(23)(i) through (iii) are addressed under the discussion of the definition of "permit-required confined space.") OSHA believes that the addition of this definition will assist employers in understanding the relationship between the three types of spaces and in making a determination of what spaces, if any, in their workplaces are covered by the standard (that is, are "permit- required" spaces).

The term "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. The proposed definition was essentially identical, except for provision that a drain or vent valve would be "open to the atmosphere", rather than simply "open" as provided in the final rule. This change was made in response to concerns expressed by the Texas Chemical Council (Ex. 14–86), the Department of Defense (Ex. 14–219)

and the National Association of Manufacturers (Chicago Tr. 91) who pointed out that the definition as proposed could require employers to violate EPA emission standards by preventing the use of scavenger systems. OSHA's sole concern is to prevent the passage of toxic material into the permit space during occupancy. The Agency recognizes that the original wording could have been construed to prevent the use of scavenger systems. Additionally, OSHA notes that the use of scavenger systems would probably contribute to control of permit space atmospheric hazards. Therefore, OSHA has revised the proposed definition.

The definition of the term "emergency" in the final rule has been taken without substantive change from the corresponding definition in the proposed standard.

The term "engulfment" means the surrounding and effective capture of a person by a finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that exerts enough force on the body to cause death by strangulation, constriction, or crushing. The proposed definition was similar, except that it provided less information regarding what constitutes engulfment.

Some hearing witnesses (Chicago Tr. 365–366, 458–460; Houston Tr. 1060, 1088–1090) expressed concern that the proposed definition did not recognize all types of engulfment by a solid substance. For example, Mr. Richard Monczka, representing the United Automobile and Agricultural Implement Workers of America, testified that the solids covered by the definition should cover any material capable of flowing into and filling the space.

In response to these comments, OSHA has revised the language of the proposal so that the definition in the final rule reads as follows:

> 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.

OSHA believes that this definition clearly indicates that any solid or liquid that can flow into a confined space and that can drown or suffocate an employee can be the engulfing medium.

The term "entry" refers to the act by which a person passes through an opening into a permit space and to the work performed in that space. Entry is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

The proposed definition of this term was similar to the one in the final rule, except that it provided that entry began when the entrant's face broke the plane of a permit space opening and that it addressed only "intentional" entry. Testimony and comments (Ex. 14–62, 14–71, 14–76, 14–80; Houston Tr. 827) indicated that, under this definition, an entrant would not be considered inside a space, if he entered feet first, until the last part of his body, his face, broke the plane of the opening. Under that concept an employee could clearly be within a confined space but not have "entered", because his face had not yet entered the space. Voicing these arguments, Mr. Terry Krug of the Atchison, Topeka and Santa Fe Rail System (Houston Tr. 827) testified:

> So the entrant could get almost all the way into the space, [for] example, arms, legs, torso, and potentially come into contact with rotating parts, bare electrical wiring, fluids, corrosives, skin absorbing toxicants, spiders, snakes, biological, radiation, et cetera and by your present definition would not even have entered the space.
>
> So I would propose to change that particular wording to "any part of the person's body which breaks the plane of the space".

A commenter (Ex. 14–173) stated:

> In our opinion, this definition will limit protection of worker health and safety by defining entry too narrowly. Entry should occur when *any* part of the body breaks the plane of the opening. Reference to the face recognizes the respiratory hazards, but ignores physical and chemical hazards to other body systems. [Emphasis supplied in original.]

OSHA believes that the proposed definition, while adequate for permit spaces that present atmospheric hazards, did not take into account non-atmospheric hazards. OSHA agrees that exposure to permit space hazards such as caustic chemicals and dangerous mechanical devices can begin as soon as any part of an entrant's body breaks the plane of the entry portal and has revised the language contained in the proposed definition accordingly.

Other commenters (Ex. 14–116, 14–160) maintained that the definition of entry should include unintentional entry because the proposal should also address the hazards of accidental entry.

OSHA also agrees with these comments. Paragraphs (c)(3) and (d)(1) require the employer to take steps to prevent unauthorized entry into permit-required confined spaces. These steps are intended to include measures, such as guarding and barricading, necessary to protect employees from accidentally entering a permit space. In order to ensure that employees are adequately protected against falling into or otherwise inadvertently entering a permit space, the Agency has revised the language in the proposed definition to include unintentional as well as intentional entry.

The Agency notes that "entry" under final §1910.146 does not include entry into any confined space that does not pose a hazard to employees. Only entries into confined spaces that are permit-required confined spaces are covered.

The definition of an "entry permit" in the final rule has been changed slightly to read as follows:

> *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.

Although the definition is essentially the same as proposed, it has been shortened and simplified by eliminating the list of items contained on the permit and replacing that list with a reference to paragraph (f), where the items contained on a permit are specified.

The term "entry supervisor" has been added and is defined as:

> ... 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.

The proposed rule contained no definition of the entry supervisor. However, the AFL-CIO, in its post-hearing comment (Ex. 142), requested that such a definition be added. The AFL-CIO correctly pointed out that the proposed rule outlined the duties of the entrant, the attendant, and the entry supervisor. They further noted that, of these three groups, only the entry supervisor (individual authorizing or in charge of entry) was undefined.

OSHA agrees that a definition of the entry supervisor is needed. Under the final rule, the entry supervisor:

(1) evaluates the conditions in and around any permit space that is to be entered;

(2) oversees entry operations, as necessary, to determine if the conditions are acceptable for entry;

(3) where acceptable entry conditions are present, either authorizes entry to begin or allows entry operations that are already underway to continue; and

(4) takes the necessary measures to protect personnel from permit space hazards.

Where acceptable entry conditions are not present, the entry supervisor either

prohibits entry or, if entry is already underway, orders the authorized entrants out of the permit space and cancels the entry permit.

OSHA has determined that adding the definition of "entry supervisor" will more clearly indicate the responsibilities imposed by paragraphs (e) and (j) (proposed as paragraphs (d) and (g)). In conjunction with this action, OSHA is relocating the language of proposed (g)(1)(vi), which allowed entry authorizers to serve as attendants or authorized entrants, to a parenthetical note in the new definition. The language of that proposed paragraph was informational rather than regulatory or definitional in nature, in that it simply describes something an entry supervisor is permitted to do. The Agency anticipates that there will be many entry situations, especially if an employer has only a few employees, where the entry supervisor will serve either as the attendant or as an authorized entrant. The language of the note indicates that this is acceptable as long as the entry supervisor is trained and equipped for each role he or she fills. All pertinent requirements relating to the duties of attendants and authorized entrants would still apply to the entry supervisor who serves as an attendant or an authorized entrant. The Agency notes that the responsibilities of the entry supervisor, as revised, are set out in paragraph (j) of the final rule.

OSHA recognizes that there are circumstances, such as when the entry permit's stated duration exceeds one workshift, under which more than one person may serve as entry supervisor for a particular entry operation. The final rule does not require the employer to repeat the entry authorization process when an entry supervisor is replaced, if there is continuous direct responsibility for the entry, with direct transfer from one entry supervisor to next, and if the successor has the necessary training and performs the required duties.

The term "hazardous atmosphere" means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue, serious injury or acute illness due to:

(1) flammable gas, vapor, or mist in excess of 10 percent of the lower flammable limit (LFL),

(2) airborne combustible dust at a concentration that exceeds its LFL,

(3) atmospheric oxygen concentration that is less than 19.5 percent or greater than 23.5 percent,

(4) atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G or Subpart Z of Part 1910 and that could result in employee exposure above the pertinent dose limit or permissible exposure limit, and

(5) any other atmospheric condition recognized as immediately dangerous to life or health.

This definition, which is very similar to the proposed definition, reflects the wide range of atmospheric conditions that can pose permit space hazards. The language from the proposed definition has been modified in three respects. First, the phrase "impairment of ability to self-rescue (that is, escape unaided from a permit space)" has been added to the definition's introductory text, so that that text now reads:

... 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:

The intent of this addition is to provide consistency between the "immediately dangerous to life or health" definition, which includes the phrase "interfere with an individual's ability to escape from a hazardous atmosphere", and the definition of "hazardous atmosphere" itself.

Subheading (1) of the definition, dealing with lower flammable limits, is identical to the equivalent proposed provision.

Some commenters (Ex. 14–134, 14–172) objected to OSHA's adoption of the 10 percent of LFL level proposed in paragraph (b)(11)(i). They argued that a 20 percent level was more appropriate. One of them (Ex. 14–134) maintained that existing "combustible gas meters are calibrated at 20% [of the lower flammable limit]".

OSHA does not agree with these comments. The 10 percent level is widely recognized as being the threshold value for a hazardous atmosphere. This value is used in ANSI Z117.1–1977 (Ex. 13–5), in the NIOSH criteria document for "Working in Confined Spaces" (Ex. 13–9), and in other OSHA standards (for example, §1926.800(j)(1)(viii)). The Agency believes that these national guidelines provide much stronger support for the 10 percent limit than existing company practice provides for those who have adopted a higher limit. Additionally, the fact that combustible gas meters are calibrated at 20 percent of the LFL is irrelevant. Meter calibration procedures are usually recommended by the manufacturer. The fact that certain meters are calibrated at 20 percent of the LFL means only that they are the most accurate at that level; it does not mean that these meters are significantly inaccurate at 10 percent of the LFL.

The second change is in subheading (2), addressing airborne combustible dusts, which, as proposed, included the phrase "[a concentration] that obscures vision at a distance of five feet (1.52 m) or less". This provision has been changed in the final rule to read:

Airborne combustible dust at a concentration that meets or exceeds its LFL;

The reference to visibility in the proposal was meant as an aide to employers and employees in approximating the LFL of the dust. OSHA believed that the proposed language would provide the best possible guidance, given that there was no reliable equipment available to provide on-site combustible dust concentration measurements. However, some commenters (Ex. 14–143, 14–161; Chicago Tr. 31) stated that the proposed language would be unsafe, as there are some dusts which are combustible at concentrations that would not obscure vision at 5 feet or less. OSHA agrees that this portion of the proposed definition was deficient and could have allowed a hazard to arise. OSHA has corrected this deficiency by changing the concentration of combustible dust to one that meets or exceeds the lower flammable limit. The "rule of thumb" criteria of obscured vision at a distance of 5 feet or less has been retained, for informational purposes only, in an explanatory note.

The 10 percent limitation applied to flammable gases, vapors, and mists has not been applied to combustible dust. This is because the Agency believes that the difficulty in measuring combustible dust concentrations make such a limit infeasible. Also, there is no evidence in the record to support lowering OSHA's proposed limit, which was equivalent to the lower flammable limit itself. The Agency believes that, because air- borne dust concentrations do not change rapidly and because the flammability hazard posed by air-borne dust can usually be judged visually, employees will be adequately protected.[5]

The third change is in subheading (3), addressing atmospheric oxygen concentration. The proposed provision (paragraph (b)(11)(iii)) stated that an atmospheric concentration of oxygen

[5] A level of 100 percent of the lower flammable limit for dusts as the lower limit of what is considered to be a hazardous atmosphere with respect to combustible dust may still appear to be high. Unfortunately, the rulemaking record does not include any information that the Agency could use to set a lower limit. The final rule, by requiring employers to take measures to control hazards, will force the employer to use procedures that ensure that the levels of combustible dust do not reach the lower flammable limit or that otherwise protect employees from the hazards of fire and explosion.

above 22 percent was hazardous. OSHA was concerned that an atmosphere with an oxygen concentration greater than 22 percent would be "oxygen enriched" and, therefore, would pose a hazard of fire and explosion. This is because excess oxygen can extend the flammable range of gases and vapors and make combustible materials ignite easily and burn rapidly.

Some of the rulemaking participants (Ex. 14–46, 14–47, 14–86, 14–103, 14–179; Washington Tr. 452–453, 577) expressed the view that the 22 percent threshold for oxygen enrichment was too low and that it excessively restricted the range of acceptable oxygen concentrations. A few of the commenters suggested values of 25 or 26 percent for the oxygen enriched atmosphere limit. For example, CECOS International (Ex. 14–46) stated:

> In proposed 29 CFR 1910.146(b)(11), the definition of a hazardous atmosphere would include an atmospheric oxygen concentration above 22 percent. This limit, which is only 0.5% above the normal ambient concentration presents a likelihood that a hazardous atmosphere might be falsely identified when normal conditions exist. CECOS suggests that an oxygen-enriched atmosphere be defined as one containing greater than 25% oxygen.

In support of this view, the NIOSH Criteria Document (Ex. 13–9) set 25 percent as the concentration at which an atmosphere was considered oxygen enriched. NIOSH reaffirmed that position in its hearing testimony (Washington Tr. 131).

Other comments (Ex. 14–57, 14–179, 14–187) received suggested that 23 or 23.5 percent would be a more appropriate number. The Motor Vehicle Manufacturers Association (Ex. 14–179) explained:

> The definition for "hazardous atmosphere" ... identifies an oxygen concentration above 22 percent as unacceptable. We recommend the unacceptable level be designated as more than 23.5 percent oxygen by volume. This is consistent with other OSHA regulations, such as 29 CFR 1910.134. If there is some other scientific or policy rationale for this deviation, OSHA should explain it and allow opportunity for comment.

Some rulemaking participants (Ex. 14–47, 14–179; Washington Tr. 452–453, 577) argued that the OSHA standard should be consistent with the 1989 ANSI standard (Z117.1) and other standards addressing safe upper limits on oxygen concentration. In particular, one commenter (Ex. 14–61) observed that the proposed 22 percent level was well within the acceptable range set by ANSI (19.5 to 23.5 percent) and stated "[oxygen sensors] could easily experience false alarm signals of oxygen enrichment due to possible combined effects of humidity, temperature or barometric pressure interference due to this small differential from the oxygen level of normal air."

OSHA agrees that the proposed threshold for oxygen enrichment was too close to the normal range of oxygen concentration. The Agency has determined, based on the rulemaking record, that setting the threshold for oxygen enrichment at 23.5 percent is appropriate to control fire and explosion hazards. OSHA has relied heavily on the expertise of the ANSI Z117 Committee in making this determination. Although a 25 percent level was recommended by NIOSH, the 23.5% figure in the ANSI standard appears to be more widely accepted. Therefore, the definition of "hazardous atmosphere" in final §1910.146(b), in conjunction with the definition of "oxygen deficient atmosphere" and "oxygen enriched atmosphere", sets the acceptable concentration of oxygen at 19.5 to 23.5 percent.

Subheading (4) has not been substantively changed from proposed paragraph (b)(11)(iv), except that a reference to Subpart G, *Occupational Health and Environmental Control*, of Part 1910 has been added because that subpart contains dose exposure limits that are pertinent to protection of employees who enter permit spaces. The proposed parenthetical text dealing with the situation in which OSHA has not determined a dose or permissible exposure limit has been titled as a "note" in the final standard to indicate clearly that the pertinent language is not part of the regulatory text. The note, which has been placed after subheading (5), gives other sources of information that can be used to determine appropriate exposure limits for substances not addressed in Subparts G and Z of the OSHA General Industry Standards. While the Agency will not be enforcing the note as it appears in the final rule, OSHA will use these other sources to assess an employer's compliance with subheading (5) of the definition of "hazardous atmosphere". Possession of Material Safety Data Sheets as required by §1910.1200 will put employers on notice of the potential for IDLH atmospheres under subheading (5), which OSHA will enforce.

OSHA has included a note after this subheading in the definition of hazardous atmosphere to clarify that 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. In other words, an atmosphere that contains a substance at a concentration exceeding a permissible exposure limit intended solely to prevent long-term adverse health effects is not considered to be a hazardous atmosphere on that basis alone.

Subheading (5) of the final rule's "hazardous atmosphere" definition, dealing with any atmospheric condition immediately dangerous to life or health not listed in subheadings (1) through (4), is identical to the proposed provision (paragraph (b)(11)(v)). There was no substantive objection to this provision of the proposal.

The term "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.

The definition has not been changed substantively from that contained in the proposed standard. (It has only been reworded slightly to provide added clarity.) No significant comments were received on this provision in the proposal.

The term "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.

The final definition differs from the proposed one in that it explicitly includes delayed as well as immediate threats to life and omits any reference to eye damage or irritation. Several rulemaking participants (Ex. 14–45, 138; Chicago Tr. 93, 177; Houston Tr. 775, 814) stated that, since a definition of IDLH has already been promulgated in paragraph (b) of §1910.120 (OSHA's standard on hazardous waste operations and emergency response), the definition in the confined space final rule should be consistent with that in §1910.120 and should include delayed as well as immediate adverse health effects.

OSHA has accepted these comments and has adopted a definition of "immediately dangerous to life or health" that is consistent with §1910.120. OSHA notes that the proposed definition of "immediate severe health effects", a term used in the proposed definition of IDLH, covered exposure-related reactions manifested within 72 hours after exposure to a permit space hazard. For the sake of consistency with the standard on hazardous waste operations and emergency response, the Agency is not carrying forward the proposed definition of "immediate severe health effect" and is incorporating the concept

of delayed effects directly into the definition of IDLH. OSHA has also included a note that provides an example of a delayed health effect.

The reference to eye damage or irritation in the proposed standard was included to indicate conditions that could interfere with an individual's ability to escape from a hazardous atmosphere. Because the use of these examples seemed to cause some confusion (Ex. 14–45; Houston Tr. 774), OSHA has eliminated them from the definition. In their place, the definition explicitly includes any condition that "would interfere with an individual's ability to escape unaided from a permit space" as a criterion for the determination of whether a hazard is IDLH. This change also make the IDLH definitions in the OSHA confined space and hazardous waste standards more consistent.

The proposed term "immediate-severe health effects" has not been carried forward into the final rule, as discussed earlier in relation to the definition of "immediately dangerous to life or health".

The term "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.

The definition in the final rule replaces the proposed phrase "non-flammable, non-explosive or otherwise chemically non-reactive" with "noncombustible" and lists nitrogen as an example of a non- combustible gas. The Agency believes that these changes simplify and clarify the definition. The term "chemically non-reactive" could have been interpreted in absolute terms, rather than as OSHA intended with respect to the hazards of fire and explosion.

Some commenters (Ex. 14–94, 14–118, 14–161) suggested that the final rule note the hazards presented by inerting a space. They pointed out that, while inerting a space reduces the risk of fire and explosion, it creates an IDLH atmosphere, which must be eliminated or controlled before permit entry is allowed.

OSHA has accepted this suggestion and has incorporated their warning into a note following the definition of "inerting".

The final rule does not contain the proposed term "in-plant rescue team". In its place OSHA is using the term "rescue service", which covers both rescuers who are employees of the employer whose workplace contains the permit spaces and those who are employees of another employer. The use of this term, its definition, and issues related to rescue services are addressed under the summary and explanation of paragraph (k) of the final rule.

The term "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.

The proposed definition of this term, on which no substantive comments were received, included language relating to the types of hazards for which isolation would be required ("which could be a serious hazard to permit space entrants"). The definition in the final rule does not carry forward that language, focusing instead on describing what "isolation" is.

The final rule's definition of "line breaking" is identical to that contained in the proposed rule. OSHA received no substantive comments on this definition.

The proposed term "low hazard permit space" has not been carried forward, since it is not used in this final rule. Many comments (Ex. 14–47, 14–76, 14–86, 14–118) indicated that the term only generated confusion and might lead to a false sense of security for employees entering a confined space designated as a "low hazard permit space". They argued that the term gave a misleading impression of the dangers that could be faced on entry into permit spaces. Based on its review of the rulemaking record, OSHA agrees with these comments and has carried forward neither the proposed definition nor proposed paragraph (i) into the final rule. A detailed discussion of the "low hazard" issue is contained later in the summary and explanation of paragraph (c)(5) of the final rule.

A definition for the new term "non-permit confined space" has been included in the final standard. It is defined as:

... 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.

Some commenters (Ex. 14–94, 14–150, 14–168, 14–219, 14–225) felt that the proposed definition of a permit-required confined space was not entirely clear and that misinterpretations were possible. They suggested that modifications be made to that definition. To solve this problem, OSHA has decided to define a "confined space" and "non-permit confined space", as well as a "permit-required confined space". (See the related discussions of the definitions of "confined space" and "permit-required confined space" elsewhere in this preamble.) The definition of a "non-permit confined space" makes it clear that a space must contain or, with respect to atmospheric hazards, must have the potential to contain a hazard capable of causing death or serious physical harm, in addition to having the configuration of a confined space, to be considered a permit-required confined space.

Examples of non-permit confined spaces include vented vaults, motor control cabinets, and dropped ceilings. Although they are "confined spaces", these spaces have either natural or permanent mechanical ventilation to prevent the accumulation of a hazardous atmosphere, and they do not present engulfment or other serious hazards.

The term "oxygen deficient atmosphere" in the final rule is identical to that contained in the proposal.

OSHA received one comment on this definition (Ex. 14–103). The commenter, the ANSI Z88 committee for respiratory protection, stated that the 19.5 percent concentration for oxygen deficiency should be changed to 12.5 percent. Their reasoning was based on the work of the ANSI Z88.2 subcommittee, which found that no respiratory protection was needed at 16 percent oxygen concentration, and that 12.5 percent oxygen concentration was the level that should be considered immediately dangerous to life and health (IDLH).

Rebutting the ANSI comment at the Washington hearing (Washington Tr.132–133), Mr. Theodore Pettit and Mr. Laurence Reed of the National Institute of Occupational Safety and Health (NIOSH), stated:

MR. PETTIT: ANSI hasn't resolved the 12.5 that they are throwing around or the 16 percent, but I served on the ANSI committee on confined spaces. The 117.1 revision is coming out 19.5, which is the consensus industry and labor [standard], so 19.5 is still the standard as far as we are concerned. And 19.5 is also the safeguard, but with the 12.5 you have absolutely no safeguard.

MR. REED: In the development of its [Respirator Decision Logic], the literature which I believe at that time was published in 1986 and we determined that 19.5 percent was the cut-off for oxygen sufficiency.

In Issue 15 of the NPRM (54 FR 24087), OSHA requested information on the extent to which employees would work in permit spaces which have oxygen-deficient atmospheres. OSHA also sought information on actual

oxygen levels encountered in oxygen-deficient permit spaces and on the effects on employees of entering oxygen-deficient atmospheres.

Several commenters (Ex. 14–4, 14–27, 14–57, 14–61, 14–62, 14–71, 14–94, 14–219) addressed Issue 15. None of them provided information on the number of employees who work in oxygen-deficient atmospheres. However, results of oxygen deficiency that were reported (Ex. 14–4, 14–57, 14–61, 14–94, 14–219) included dizziness, tiredness, difficulty in breathing, confusion, unconsciousness, and death. The U.S. Air Force (Ex. 14–219) sent a copy of a report addressing exposure to atmospheres containing 13 to 21 percent oxygen for long periods of time (not in confined spaces).

In Issue 16 of the NPRM (54 FR 24087), OSHA requested information, based on actual recorded atmospheric measurements, on any physical or physiological effects caused by rapid transition from breathing normal air (21% oxygen content) to breathing atmospheres with less than normal oxygen content. Only the U.S. Air Force (Ex. 14–219) commented on this issue. Their view was that, in general, the suddenness of the reduction of the oxygen level was not nearly as important as the physiological effect of the final oxygen level.

OSHA has not accepted the ANSI Z88 recommended change. The 19.5 percent oxygen level is widely recognized as being the minimum level needed to ensure an adequate supply of oxygen. The NIOSH Respirator Decision Logic (Ex. 14–145) utilizes 19.5 percent oxygen concentration as the decision level for use of a respirator, and the ANSI Z117.1 standard itself recognizes this concentration as a minimum. Considering the possible consequences of exposure to atmospheres containing too little oxygen as described in the record, the Agency believes, in the absence of compelling evidence to the contrary, that the proposed level is necessary to ensure an adequate oxygen supply for entrants. Therefore, OSHA has not changed the definition of oxygen deficient atmosphere.

The term "oxygen enriched atmosphere" means:

> ... an atmosphere containing more than 23.5 percent oxygen by volume.

As noted earlier in reference to the definition of "hazardous atmosphere", the final rule has adopted a safe upper limit on oxygen content of 23.5 percent rather than the proposal's 22 percent level. The comments received on the definition of "oxygen enriched atmosphere" have been addressed under the discussion of that term.

The term "permit-required confined space (permit space)" means a confined space that presents or has a potential to present one or more of the following:

(1) an atmospheric hazard;
(2) an engulfment hazard;
(3) a configuration hazard; or
(4) any other recognized serious hazard.

As noted in Section I, *Background*, earlier in this preamble, OSHA has determined that a clear definition for "permit-required confined space (permit space)" will provide the necessary guidance for employers to determine when they are subject to the permit space standard. The Agency has determined that there are three circumstances (mobility-limiting size and configuration, limited means of access and egress, and unsuitability for continuous employee occupancy) that are common to all confined spaces. As noted earlier, those are the elements that OSHA has included in the definition of "confined space". OSHA recognizes that the hazard element that differentiates permit spaces from confined spaces may vary in its nature, so the Agency has set out several ways in which a confined space could qualify as a permit space. Thus, a permit space is a confined space that has certain characteristics that make it hazardous for employees to enter without taking special precautions.

Section II, *Hazards* earlier in this preamble, discusses most of these characteristics. That discussion documents confined space accidents that were caused by atmospheric, engulfment, and other serious (such as mechanical) hazards.[6] Atmospheric hazards (such as oxygen deficiency, toxic atmospheres, and flammable atmospheres) are the most common cause of confined space accidents. Engulfment hazards, though not as widely recognized, also cause the deaths of many confined space entrants by suffocating or drowning the victims. Confined spaces that can wedge or otherwise pin an employee and cause his or her suffocation have also caused at least one of the deaths[7] described in the record (Ex. 14–145). These are the hazard characteristics specifically enumerated in the definition of "permit-required confined space". However, as noted earlier, the types of confined spaces posing serious hazards to employees are wide ranging. Therefore, the definition of PRCS also requires confined spaces that pose other unspecified serious hazards to be considered permit spaces, as well.

The definition proposed in §1910.146(b)(23) was similar to the definition promulgated in the final rule. OSHA has made some changes for the sake of clarity. As noted earlier, provisions corresponding to the first three subheadings under the proposed definition (paragraphs (b)(23)(i) through (iii)) have been put under the generic definition of "confined space", so that there is no need to repeat them in the definition of PRCS. Other editorial changes have also been made to the language of proposed §1910.146(b)(23)(iv), which has been incorporated into the definition of "permit-required confined space" in the final rule.

In Issue 3 of the NPRM, OSHA requested comments regarding the adequacy of the proposed definition of permit-required confined space and solicited suggestions for additional or alternative language.

Over 50 commenters responded to this issue. Most of the commenters suggested that OSHA revise the proposed definition. Several commenters (Ex. 14–61, 14–86, 14–145, 14–168, 14–219) stated that poor natural ventilation should be a component of the definition.

Poor natural ventilation is not a necessary condition for a confined space to be a permit space. (It should be noted that the presence or absence of natural ventilation is not relevant to whether a space is confined; it can only be relevant to whether a confined space is considered a permit-required confined space.) OSHA believes that the definition of hazardous atmosphere adequately addresses the safety of the atmosphere within the space without regard to whether or not the space is poorly ventilated. While natural ventilation can sometimes prevent the accumulation of a hazardous atmosphere, the Agency considers the most important distinguishing characteristic, with respect to atmospheric hazards, that can make a confined space a permit space to be the content of the air itself. Even with good ventilation in a confined space, certain areas within the space may be able to accumulate a hazardous atmosphere.

[6] Section II of the preamble also discusses accidents related to the lack of training for rescuers. The actual hazard present within the permit space in these accidents was actually an atmospheric one.

[7] Although very few of the accident descriptions in the record illustrate the hazard posed by spaces that can entrap and cause the asphyxiation of a worker, OSHA believes that it is important to specifically spell out the hazard in the definition. It is something that may easily be overlooked in the evaluation of a confined space; and, by highlighting the entrapment hazard, the final rule will best protect employees.

Another commenter (Ex. 14–191) was concerned that proposed paragraph (b)(23) was unclear with respect to which subparagraphs ((i), (ii), (iii), and (iv)) a space had to meet in order to qualify as a permit space. They recommended that a space be required to satisfy all the criteria set forth in proposed paragraphs (b)(23)(i) through (iii) plus any one of the additional criteria set forth in paragraph (b)(23)(iv) in order to be considered a confined space.

OSHA intended that, in order to qualify as a permit space, a space have all three of the first three characteristics (paragraphs (b)(23)(i) through (iii)) and at least one of the characteristics listed under paragraph (b)(23)(iv) of the NPRM's definition. In the final rule, OSHA has clarified this intent in two ways.

First, the final rule separates the PRCS definition into two components: "confined space" and "permit-required confined space". The characteristics common to all confined spaces (proposed paragraphs (b)(23)(i) through (iii)) are now contained in the definition of "confined space", which clearly indicates that all three criteria must be met in order for a space to be considered "confined". A permit space is now defined to be a "confined space" meeting one of four criteria corresponding to those listed in proposed paragraph (b)(23)(iv).

Second, OSHA has adopted language clarifying the intent of these two definitions. The word "and" has been inserted between the first and second criteria and between the second and third criteria of the definition of a "confined space" to indicate clearly that all three criteria must be met. The introductory text of the definition of "permit-required confined space" states that "one or more of the [listed] characteristics" (corresponding to those given in proposed paragraph (b)(23)(iv)) must be met before a confined space is considered a permit space.

The Agency believes that the final rule clearly states the criteria for determining what spaces qualify as permit-required confined spaces.

Proposed paragraph (b)(23)(i) stated, as the first criterion, that a space had to be "large enough and so configured that an employee can bodily enter and perform assigned work" in order to be considered a permit-required confined space. Several commenters (Ex. 14–4, 14–42, 14–94, 14–99, 14–143) stated that it was confusing for proposed paragraph (b)(23)(i) to provide that a permit space was sized and configured for bodily entry when the definition of "entry" provided that entry began when the employee's face broke the plane of the opening into the space. Some of the commenters (Ex. 14–42, 14–94) noted that the proposed definition excluded spaces which contained hazardous atmospheres and into which employees were able to insert only their heads and shoulders. For example, Mr. Martin Finkel, a Certified Marine Chemist with Marine & Environmental Testing, Inc. (Ex. 14–4) stated:

> The definition of Permit Required Confined Space, as stated, does not allow for small space[s] which permit entry of a worker[']s head, but not his/her whole body. Such a space may prove just as hazardous if it contains an IDLH atmosphere which the worker breathes. I recall seeing photos of a [fatality] on a barge where only the worker's head was in the tank—his body remained sprawled on deck—yet the worker was just as dead as if he had entered bodily. Therefore, I suggest removing [paragraph (b)](23)(i) entirely from the definition of Permit Required Confined Space.

The Agency has not adopted this suggestion. While OSHA is concerned that spaces that are too small for complete bodily entry may pose hazards for employees, the Agency did not intend to cover such spaces under the permit space standard. OSHA believes that the NPRM preamble discussion of permit space incidents and of proposed provisions clearly indicates that the proposed rule was intended to cover only spaces that were large enough for the entire body of an employee to enter. As commenters have correctly noted, the proposed definition of "permit required confined space" did not cover the "small" spaces. Such spaces do not meet the definition of "confined space", nor do they pose hazards comparable to those associated with confined spaces. Since an employee cannot totally enter such spaces, he or she should not have difficulty withdrawing from the space. In order for a space to be considered a permit-required confined space, it must first be a confined space. A space that cannot be entered is not confined; therefore, it does not pose hazards related to the difficulty of exiting the space.

OSHA realizes that an employee may still be injured or killed as a result of some atmospheric hazard within such an enclosed area; however, this standard is not intended to address all locations that pose atmospheric hazards. The Agency believes that the procedures necessary to protect workers from atmospheric hazards alone are not those required by this standard, but are required by other OSHA standards, such as Subpart Z of the General Industry Standards. The exposed employee must also have difficulty exiting the space for many the requirements of §1910.147 to apply. For example, the need for an attendant to be present is doubtful. Spaces that cannot be entered are small enough to be readily ventilated,[8] and in many cases a reaccumulation of a hazardous atmosphere is highly unlikely. Because the requirements set forth in final §1910.146 are not appropriate for application to spaces into which an employee cannot completely enter, OSHA has retained the language proposed in paragraph (b)(23)(i), which appears under the definition of "confined space" in the final rule.

OSHA notes that, as discussed previously in the preamble, "entry" as defined in the final rule begins when any part of the entrant's body breaks the plane of the entry portal. This language indicates the Agency's concern that exposure to a permit space hazard can occur before the entire body of the entrant is inside the space. The definition of "entry" is not intended to indicate that a space large enough to accommodate only part of an employee's body constitutes a permit space. Therefore, OSHA has determined that the definitions of "entry" and "permit-required confined space" are consistent.

Proposed paragraph (b)(23)(ii) stated, as the second criterion, that a space had to have "limited or restricted means for entry or exit" in order to be considered a permit-required confined space. The proposed paragraph listed tanks, vessels, silos, storage bins, hoppers, vaults, pits, and diked areas as examples of spaces with this characteristic. Some commenters (Ex. 14–69) felt that it was appropriate for the definition to cover open top spaces, such as dikes and excavations, while others (Ex. 14–185) stated that those same spaces should not be included.

OSHA listed these spaces as examples of limited or restricted entry or exit, not as examples of permit spaces, as some rulemaking participants believed. The final rule, under the definition of "confined space", adopts a slightly revised version of the language enumerating the examples to state this intent more clearly. As indicated in the preamble to the proposal (54 FR 24089), OSHA notes that doorways and other portals through which a person can

[8] Subpart Z of part 1910 would require the employer to use feasible engineering controls to maintain atmospheric contaminants below permissible exposure limits. Normally, ventilation would be used to meet the Subpart Z requirements, and the accident information contained in the rulemaking record does not indicate a need for additional regulation of spaces that cannot be entered completely.

walk are not considered to be limited means for entry or exit.

Proposed paragraph (b)(23)(iii) stated, as the third criterion, that a space had to be "not designed for continuous employee occupancy" in order to be considered a permit-required confined space. Some commenters expressed concern regarding the use of the phrase "continuous occupancy" in this proposed paragraph. Some of them (Ex. 14–94, 14–143, 14–163) argued that many spaces are not designed for continuous employee occupancy but should not be considered as confined spaces. They suggested rewording the proposed definition to "an enclosure with a primary function other than human occupancy." (The suggested language is essentially identical to language in the ANSI Z117.1–1989 definition of "confined space".)

OSHA notes that the criterion "not designed for continuous human occupancy" is but one of the necessary three criteria required for a space to be designated a confined space. Thus, there may be any number of spaces that are not designed for continuous human occupancy, but that cannot be considered to be confined spaces (or, subsequently, "permit-required confined spaces") under OSHA's definitions because they do not meet both of the other two criteria set forth in the "confined space" definition.

The Agency has determined that the suggested language from the ANSI standard is not appropriate. The ANSI language focuses on what the primary function of the space is, whereas OSHA's definition focuses on what the space is designed for. If the space is truly designed for human occupancy, then the primary function of the space is irrelevant. For example, a vented telecommunications vault is typically designed for continuous human occupancy—the ventilation for the vault ensures the presence of a normal atmosphere for an occupant to breathe, and the working dimensions of the space are large enough to allow an adult to work and move around while erect. It could be argued, however, that the primary function of the vault is to house telecommunications equipment. Although the distinction between the "primary function" and the "design" of a space may seem inconsequential, OSHA believes that the final rule's definition properly places the focus on the design of the space, which is the key to whether a human can occupy the space under normal operating conditions.

Another commenter (Ex. 14–144) stated that OSHA should eliminate "continuous" from the definition because its "Manholes and vaults—to the extent they are covered—are designed for employee entry and occupancy in order to service telephone cables."

OSHA has not accepted this recommendation. One of the characteristics of a confined space is that it is not designed for humans to enter and work for prolonged periods without any additional consideration for safety and health. With respect to manholes and unvented vaults, the Agency notes that atmospheric testing and portable mechanical ventilation are among the recognized procedures that must be undertaken (as required by §1910.268(o)) before employees can safely enter these spaces.[9] Therefore, the final rule's definition of confined space retains the proposed phrase "continuous human occupancy".

OSHA notes that the meaning of proposed paragraph (b)(23)(iii) has been a factor in general duty clause (section 5(a)(1)) enforcement actions brought by the Agency. For example, General Dynamics Land Systems Division (General Dynamics) contested a citation for a willful violation of section 5(a)(1) for failure to protect employees from confined space hazards. The employer referenced the proposed language to contend that an M-1 tank is not a (permit-required) confined space because the assembled tank is "intended" for continuous employee occupancy. The Occupational Safety and Health Review Commission (OSHRC) held in *General Dynamics Land Systems Div.* (15 OSHRC 1275, September 11, 1991) that the classification of a space would be based on its condition at the time employees would enter, not on the ultimate use of the space. The OSHRC determined that assembled tanks posed a recognized hazard (freon exposure) and that it was feasible to abate the hazard. Therefore, the OSHRC held that OSHA properly cited General Dynamics for failure to implement a permit space program when employees were assigned to enter assembled M-1 tanks in which freon was being used.

Additionally, the Agency notes that the preamble of the NPRM (54 FR at 24097) stated "Some products are considered permit spaces while they are being built, and entries by workers are required as part of the manufacturing process." This language reflects OSHA's recognition that there are spaces (such as assembled M-1 tanks) that may be permit spaces during fabrication, because hazards might be introduced at that time and because they are not designed for continuous occupancy until their manufacture has been completed. However, after they are completed and put to use, the hazards created by the manufacturing process are not present, and they are then designed and intended for continuous occupancy. Thus, they would not be permit spaces in actual use.

Proposed paragraph (b)(23)(iv) stated, as the fourth criterion, that a space had to contain one or more of a list of four specified hazards in order to be considered a permit- required confined space. The four listed hazards were:

(1) Atmospheric hazards (proposed paragraph (b)(23)(iv)(A)),

(2) Engulfment hazards (proposed paragraph (b)(23)(iv)(B)),

(3) Entrapment hazards that also pose the hazard of asphyxiation (proposed paragraph (b)(23)(iv)(C)), and

(4) Any other recognized serious safety or health hazard (proposed paragraph (b)(23)(iv)(D)).

The first three hazard characteristics provoked no controversy or substantive comment. However, some commenters (Ex. 14–84, 14–160, 14–171, 14–179) objected to proposed paragraph (b)(23)(iv)(D) arguing that the criterion set out therein was so broad and vague that its application could result in some spaces being inappropriately designated as permit spaces. For example, The National Solid Waste Management Association (Ex. 14–84) felt that:

> The definition contained in [proposed] §1910.146(b)(23)(iv) is too vague as currently written to be workable, specifically the provision in subparagraph (D).

Another commenter (Ex. 14–62) suggested that OSHA delete the proposed criterion because "Regulation of these hazards is best left to other specific OSHA standards for these hazards." Still another commenter (Ex. 14–63) stated that OSHA should require employers to document their determinations regarding this criterion "to assure that this [criteria] is properly considered in assessing the space."

OSHA does not agree with the comments regarding proposed paragraph (b)(23)(iv)(D). In particular, the Agency has determined that the provision needs to be worded in the broadest possible terms so that employers are required to protect affected employees from any serious hazards which may be confronted in a

[9] Telecommunications manholes and unvented vaults do pose confined space hazards (though they are not regulated under §1910.146). The necessary precautions for protecting employees entering these spaces from confined space hazards are prescribed by §1910.268(o). As noted earlier, work in such manholes or vaults need not comply with §1910.146 unless they contain hazards not fully addressed by §1910.268(o).

permit space. Examples of "other" serious hazards are radiation, noise, electricity, and moving parts of machinery. OSHA also believes that it is unnecessary to specify that employers document their compliance with this provision. The Agency will be able to determine, based on an inspection of a confined space, whether or not the conditions found pose hazards serious enough to warrant designating the space as a permit-required confined space. In making this determination, OSHA will use the same sources of information any knowledgeable person would: national consensus standards and government and industry guidelines.

OSHA is promulgating the definitions of "confined space", "non-permit confined space", and "permit-required confined space" as previously described. The Agency believes, based on the rulemaking record considered as a whole, that the final rule's definitions of these terms properly describe the spaces being regulated here, that these provisions will provide guidance to employees and employers for complying with §1910.146, and that this will result in the best protection for employees exposed to permit space hazards.

The term "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.

Paragraph (c)(4) of final §1910.146 requires employers whose employees enter a permit space to develop and implement a written "permit-required confined space program". In promulgating this requirement, OSHA has used this term to stress the importance of taking a systematic approach to permit space operations. Except for editorial changes, the definition in the final rule is very similar to the proposed definition of this term. OSHA has replaced the proposed language addressing the prevention of unauthorized employee entry with language that more accurately indicates the general purpose of a permit space program, that is, "regulating employee entry into permit spaces".

The term "permit system" in this final rule replaces the proposed term "entry permit system". "Permit system" is defined as:

... the employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

The final rule's definition is essentially the same as the proposed definition except that the language specifying that the permit system designates, by name or title, the individuals who may authorize entry has been removed. That provision is regulatory in nature rather than definitional.

The term "prohibited condition" in the final rule replaces the proposed term "not-permitted condition". "Prohibited condition" is defined as:

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

"Prohibited condition" is the term used in the final standard's regulatory text. Although no substantive comments were received on the proposed term, the Agency is using "prohibited" because the term "not-permitted" is stilted. The new term certainly conveys the same meaning and improves the readability of the standard. The definition itself has been clarified to state specifically that the term "prohibited condition" applies only to the period during which entry into the permit space is authorized. OSHA notes that there is no reason for a condition, or set of conditions, to be prohibited in a permit space until employee entry is authorized. While this meaning was intended in the proposed definition, it was not stated clearly.

The term "rescue service" means:

... the personnel designated to rescue employees from permit spaces.

The definition of this term has been taken from the proposed definition of "in-plant rescue team". This is the term that has been adopted to apply to both in-plant as well as outside rescue services. The use of this term in place of the proposed term and the rationale behind the definition are explained under the discussion of paragraph (k) later in this preamble.

The final rule substitutes the term "retrieval system" for the proposed term "retrieval line" and defines a "retrieval system" as:

... 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.

The proposed definition was similar, except that it recognized the use of wristlets as an acceptable alternative to the use of a chest or body harness. A representative of the Chevron Corporation (Houston Tr. 862) has stated:

We believe that wristlet devices interfere with effective work and expose the employee to additional injury in the [event] of a rescue.

OSHA agrees with this comment and has therefore changed the definition of "retrieval system" to make it clear that wristlets are not ordinarily acceptable for use by themselves. Wristlets may be used only in conjunction with a chest or body harness, unless 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. (See the summary and explanation of paragraph (k)(3)(i) of the final rule.) Furthermore, OSHA will permit the use of wristlets only if such use will not interfere with the work (for example, by entangling entrants) and will not expose the employee to additional injury in case of a rescue.

The Chevron representative further stated (Houston Tr. 862):

We also believe that continuously attached retrieval lines present entanglement problems. Therefore, we recommend that the definition read "Means a line or rope secured at one end to the worker by a chest, waist or full-body harness of the type that suspends a person in the upright position and with its other end secured to a lifting device or to an anchor point outside the entry."

Chevron had also suggested (Ex. 14-174) that the proposed definition be revised to state: "The retrieval line may be disengaged at the worker during those periods of activity that the employer identifies as creating hazards of entanglement."

While OSHA recognizes that entanglement can pose difficulties for entries performed using retrieval systems, the Agency has not made the suggested changes. First, the Agency believes that adding the suggested language "of the type that suspends a person in the upright position" would not address concerns regarding potential entanglement hazards. OSHA also believes that compliance with the requirements of paragraphs (d) and (k) of the final rule (regarding rescue equipment and procedures) will minimize entanglement hazards. Therefore, the Agency believes that concerns regarding entanglement can be addressed without revising the proposed definition. Second, OSHA believes that, considering the suddenness with which permit space hazards often manifest themselves, entrants who have disengaged from their retrieval lines are not adequately protected from permit space hazards. Therefore, the Agency expects that employers who have a reasonable basis for determining that the use of retrieval systems will pose excessive risk of entanglement will implement other rescue equipment and procedures.

Also, a hearing participant testified (Chicago Tr. 96):

> In [§1910.]146(b)(25), we do, however, recommend some different wording for retrieval line in that it appears in this section that a retrieval line is required in each and every confined space entry situation. There are situations where retrieval lines are ineffective, or inappropriate, or simply not required.

In particular, the hearing participant stated that retrieval lines are not needed for work inside the mud drum of a steam boiler because entrant's feet never enter the permit space and that "the configuration of the interior of a distillation column or more complex vessel will make a retrieval line inappropriate." OSHA notes that the proposed definition was provided simply for the guidance of those employers who choose to comply with the proposed requirement for rescue capability (proposed §1910.146(c)(8)) through the use of retrieval lines. OSHA recognizes that the use of retrieval systems is not always feasible for permit space entry. Therefore, as discussed further under the summary and explanation of paragraph (k)(3) of the final rule, the Agency is requiring the use of retrieval systems unless the system would increase the risk to authorized entrants or the system would not contribute to rescue. OSHA believes employers should have rescue personnel perform their duties from outside the permit space wherever possible, so that rescuers are not exposed to permit space hazards.

In addition, OSHA has clarified the proposed definition by specifying the means by which the retrieval system is attached to the authorized entrant and the means by which the authorized entrant is lifted from the permit space. The definition, as revised, also clearly indicates that retrieval systems are to be used only for non-entry rescues.

The term "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.

This definition, which did not appear in the NPRM, was added to indicate clearly what the term "testing" means. The final rule, like the NPRM, sets testing requirements (in §1910.146(d)(2) and (d)(5), for example). The final rule also contains non-mandatory Appendix B, which contains guidance for employers who perform atmospheric testing. OSHA intends the term to cover the evaluation of permit space conditions both at the time an employer initially identifies the hazards and devises control measures and at the time entry would actually take place. Additionally, the Agency has determined that it is appropriate to specify that the testing process includes specifying the tests to be performed, so that OSHA can determine if the tests performed correspond to the identified permit space hazards. A note has been included to indicate the purpose of testing.

Paragraph (c), General Requirements.

Paragraph (c) sets forth general requirements for employers whose operations are within the scope of §1910.146. This paragraph reflects the Agency's determination, discussed earlier in this preamble, that it is necessary to establish a comprehensive regulatory framework under which employers are explicitly required to identify any permit spaces at their workplaces and to take the appropriate measures for the protection of affected employees.

Proposed paragraph (c) contained general requirements for the identification of permit spaces and for the protection of affected employees from the hazards posed by any permit spaces identified. The introductory text of proposed paragraph (c) would have required employers to identify any permit spaces in their workplaces, to determine if their employees would enter any such spaces, and to take the appropriate action (closing off the permit space, retaining a contractor, or instituting a permit space program) based on that determination. The balance of the paragraph (proposed paragraphs (c)(1) through (c)(10)) specified the elements of the permit space program to have been followed by employers who had employees (either their own or those of contractors) enter permit spaces.

The permit space program requirements from proposed paragraph (c) have, in general, been placed in paragraph (d) of final §1910.146. (For a cross-reference of the destinations of the provisions of the proposal, see the Distribution Table.) A discussion of these paragraphs can be found in the summary and explanation of paragraph (d) later in this preamble.

Redesignation Table to §1910.146

Proposed paragraph	*Final paragraph*
(a)	(a)
(b)	(b)
(c) intro text first sentence.	(c)(1)
second sentence	(c)(6)
third sentence	(c)(3)
fourth sentence	(c)(4)

Redesignation Table to §1910.146 Continued

Proposed paragraph	*Final paragraph*
(c)(1)	(d)(2)
(c)(2)	(d)(3)
(c)(3)	(d)(10)
(c)(4)	(c)(2)
(c)(5)	(d)(1)
(c)(6)	(g)
(c)(7)	(d)(4)
(c)(8)	(d)(4)(viii), (d)(9)
(c)(9)	(d)(3)(iv), (d)(4)(vi)
(c)(10)	(c)(8)
(d)(1)	(e)(1)
(d)(2)(i)	(f)(7)
(d)(2)(ii)	(f)(8)
(d)(2)(iii)	(f)(8)
(d)(2)(iv)	(f)(9)
(d)(2)(v)	(f)(13)
(d)(2)(vi)	(f)(11)
(d)(2)(vii)	(f)(13)
(d)(2)(viii)	(f)(12), (f)(13)
(d)(2)(ix)	(f)(13)
(d)(2)(x)	(f)(14)
(d)(3) intro text	Removed
(d)(3)(i)	(f)(1)
(d)(3)(ii)	(f)(2)
(d)(3)(iii)	(f)(3)
(d)(3)(iv)	(f)(4)
(d)(3)(v)	(f)(5)
(d)(3)(vi)	(f)(6)
(d)(3)(vii)	(f)(6)
(d)(4)	(f)(15)
(d)(5)	(e)(2)
(d)(6)	(e)(5)
(e) intro text	(g)
(e)(1)	(h)(1)
(e)(2)(i)	(h)(3)
(e)(2)(ii)	(h)(4)
(e)(3)	(h)(2)
(e)(4)	(h)(5)
(f) intro text	(g), (i)(4)
(f)(1)	(i)(3)
(f)(2)	(i)(1), (i)(6)
(f)(3)(i)	(i)(5)
(f)(3)(ii)	(i)(6)
(f)(3)(iii)	(i)(7)
(f)(3)(iv)	(i)(8)
(f)(4)	(i)(9)
(g) intro text	(g)
(g)(1)(i)	(j)(2)
(g)(1)(ii)	(j)(2)
(g)(1)(iii)	(j)(6)
(g)(1)(iv)	(j)(3)
(g)(1)(v)	(j)(3)
(g)(1)(vi)	Removed
(g)(2)	(j)(5)
(h) intro text	(k) intro text
(h)(1)(i)	(k)(1)(i)
(h)(1)(ii)	(k)(1)(ii)
(h)(1)(iii)	(k)(1)(iii)
(h)(1)(iv)	(k)(1)(iv)
(h)(2)	(k)(2)
(i)	(c)(5)

Paragraph (c), titled "General requirements" in this final rule, corresponds generally to the introductory text of paragraph (c) in combination with paragraphs (c)(4), (5) and (10) of the proposed rule. The introductory text of the proposed paragraph (c) (titled *Permit required confined space program (entry permit*

program)) did not pertain directly to the establishment of a permit program, but contained information and requirements leading up to the development of a permit program. OSHA has decided that the inclusion of these requirements in a separate paragraph, preceding the paragraph pertaining to the permit entry program, is logical and adds clarity to the final rule. Therefore, paragraph (c), titled *General requirements*, has been added to the final rule.

Paragraph (c)(1) of the final rule requires employers to evaluate their workplaces and to determine if they contain permit-required confined spaces. This provision corresponds to, and is essentially the same as, the first sentence of the introductory text of proposed paragraph (c). OSHA has included a note referencing Appendix A, the decision flowchart, to facilitate compliance with the final rule.

A few rulemaking participants (Ex. 14–116, 14–170, 138) stated that it was inappropriate to require an initial survey of workplaces to identify permit spaces. For example, the Chemical Manufacturers Association (CMA), in its post-hearing comment (Ex. 138), objected to proposed paragraphs (c) and (c)(1). CMA interpreted the proposal to require a "grand survey" of the workplace to identify permit-required confined spaces, followed by an analysis of the severity of the associated hazards in those spaces. Another commenter, the Monsanto Company (Ex. 14–170), stated:

> Paragraph (c)(1) could be interpreted to require an initial survey to identify all confined spaces and to assess the severity of the hazards that would be encountered by those who may enter these confined spaces at any future time. Monsanto *agrees* with the concept of identifying confined spaces and their hazards but strongly *disagrees* that an initial survey, should that be OSHA's intent, is necessary. In fact, it could be counterproductive to good hazard control. Not only do confined spaces change, as OSHA acknowledges, but the hazards involved in the confined spaces often change. The hazards could be different for the same confined space depending on the work that is planned to be done inside the space. For all of these reasons, Monsanto believes that, and has demonstrated that, employees can identify confined spaces and the hazards thereof by 1) training them to recognize confined spaces, 2) to identify the hazards and assess their severity, and 3) select and implement their protective measures just prior to executing the entry and as a part of the preparation of the entry permit. We would strongly recommend that OSHA not require an initial identification of all spaces and their severities. [Emphasis supplied in original.]

NIOSH testified (Washington Tr. 110) in favor of the proposed requirement stating: "In 37 of the 44 incidents [investigated as part of the FACE project through December 1988] failures to recognize the operations as involving a confined space was a contributing factor."

OSHA has determined that workspaces that meet the definition of permit space need to be identified at the time the final rule goes into effect rather than when the employer decides that certain workspaces will be entered. The Agency believes that the initial workplace survey is essential because, at the very least, it alerts the employer to the need for measures to prevent unauthorized entry. Also, delays in efforts to identify permit spaces could compromise the safety of entry operations undertaken to deal with emergencies or other unforeseen circumstances. If an employer has not evaluated the workplace, he or she would not even be able to provide the necessary training to employees so that they can indeed readily identify permit spaces. In any event, relying on employees as the primary source of information for identifying and controlling permit-required confined spaces would improperly place the principal burden for worker safety on the employee rather than on the employer, who is in the better position to identify hazards present in his or her own workplace.

OSHA has also determined, based on the incident data in the rulemaking record (Ex. 13–10, 13–15, 13–16, 14–159), that the failure to identify permit spaces properly has resulted in many fatalities and injuries. The Agency believes that the initial survey will facilitate employers' efforts to develop and implement appropriate measures so that a protective permit space program is in place when entry operations are initiated.

OSHA notes that the comments opposing this provision in its proposed form were more concerned that the Agency would require a detailed hazard analysis for each space identified as a possible permit-required confined space. Final §1910.146(c)(1) requires only the identification of permit spaces. The detailed evaluation and classification of hazards found within the space is addressed by paragraph (d)(2), which is discussed later in this preamble. OSHA further notes that any entry into a confined space performed in order to determine whether or not that space is a permit space must be performed as if the space were known to be a permit space.

Paragraph (c)(2), which corresponds to proposed paragraph (c)(4), addresses the employer's responsibility to inform their employees of the presence of permit-required confined spaces. This paragraph in the final rule requires employers who find permit spaces in their workplaces to inform exposed employees of the existence and location of those permit spaces.

Proposed paragraph (c)(4) would have required all permit spaces to be posted with signs indicating what hazards were present and that only authorized entrants could enter. Some respondents to the NPRM (Ex. 14–76, 14–77) objected to this paragraph of the proposal, basing their objections on the opinion that such a requirement would be prohibitively expensive and an invitation to unauthorized entries, particularly by teenagers, and to vandalism. In Issue 14 of the hearing notice (54 FR 41463), OSHA asked for further information on the proposed requirement for the posting of informational signs near permit spaces. OSHA asked, in its hearing notice, how such spaces should be identified to protect employees. The Agency also requested actual and projected costs of informing employees that a workplace contains permit spaces.

The Agency received extensive written comments addressing paragraph (c)(4) (Ex. 14–9, 14–30, 14–45, 14–52, 14–57, 14–59, 14–68, 14–76, 14–78, 14–80, 14–86, 14–88, 14–91, 14–94, 14–101, 14–111, 14–133, 14–143, 14–150, 14–153, 14–157, 14–163, 14–188, 14–170, 14–173, 14–174, 14–176, 14–178, 14–179, 14–184, 14–189, 14–191, 14–214, 14–222). There also was discussion of the issue during the public hearings (Houston Tr. 779–780, 940–942; Chicago Tr. 272–274, 447–448).

One commenter offered support for the proposed requirement to require signs at all confined spaces. The Quaker Oats Company (Ex. 14–173) stated:

> We recommend that all permit spaces be posted, notifying employees that hazards may be present and only authorized entrants [may] enter. These signs would be appropriate postings during non-entry times and during the permitted entry. All employees should be instructed as to restricted areas, and confined spaces should be secured whenever feasible with positive barriers such as locks.

An overwhelming majority of commenters, however, objected to the proposed requirement for posting signs identifying all permit-required confined spaces and the hazards contained within the spaces (Ex. 14–9, 14–76, 14–78, 14–80, 14–88, 14–94, 14–111, 14–143, 14–153, 14–170, 14–176, 14–189, 14–222, 138). The commenters who objected to the proposed requirement identified several burdens related to the proposed rule.

Some objections cited the great expense and total impracticality of posting a sign at the entrance to every confined space in the workplace. For example, S.C. Johnson & Son, Inc. (Ex.14-222) stated:

The problem with this provision is that it would require signs to be posted at hundreds of thousands of locations. Virtually every piece of equipment, vault, or pit large enough for an employee to "stick his head in" would qualify as a potential confined space.

In a similar vein, the Eastman Kodak Company (Ex. 14-176) stated:

In a complex chemical plant, there will be hundreds of tanks, reactors, columns, and other process vessels which qualify under the proposed definitions.

Union Carbide (Ex. 14-88) also objected to the numerous signs that would be required as follows:

The problem with both provisions is that, as applied to a modern chemical plant, they would require identification, evaluation, and notification of hundreds or thousands (perhaps tens of thousands) of confined spaces. Virtually every piece of equipment, vault or pit large enough for an employee to enter would qualify as a confined space, and there are uncounted numbers of those.

Every manhole into a sewer or electrical or telecommunications area is a confined space. Would OSHA require every manhole cover throughout the United States have a sign warning of the hazards which may be present?

OSHA also received testimony at the hearings (Chicago Tr. 272-274; Houston Tr 779-780, 940-942) regarding the number of signs that would be required. For example, Rohm & Haas (Houston Tr. 941) testified as follows:

This aspect would require us to post up to 3000 additional signs in our plant. This type of labelling would be counter-productive and would also detract from the performance-oriented goal of the standard.

Posting of signs would create over-reliance on a sign to identify a confined space. We are concerned that we may miss identifying many of these spaces during the plant-wide survey mentioned above, and as a result some spaces will not have signs posted. If an employee relies on a sign to tell him that a confined space hazard exists, he may determine that a confined space hazard is not present if a sign is not posted.

Similarly, AMOCO testified (Chicago Tr. 272) as follows:

Paragraph (c)(4) requires the posting of signs near the entrance of confined spaces. There is no qualifier to indicate that the signs would be required only when there is a potential access to the space. A broad interpretation of this paragraph would require us to post signs at the potential entrances of confined spaces regardless of whether access to the space is physically possible.

In our facilities, there are literally thousands of potential entrances to confined spaces.

Some commenters identified the impracticality of identifying such spaces as storm and sanitary sewers. For example, United Technologies (Ex. 14-178) stated:

We know of no practical method of posting signs near, yet outside of, manholes located at grade level in roadways, parking lots, floor spaces, etc.

The City of Cincinnati (Ex. 14-9) also noted the impracticality of applying the posting requirement to manholes and sewers as follows:

Many areas in the municipality meet the criteria of "permit required confined spaces," but do not allow for the posting of signs. All of our sewers fall into this category, both storm water and combined sewers.

In a public environment, signs on every manhole in the street is impractical!

Other commenters identified the burden of listing individual hazards in a confined space on the sign. They argued that the burden of updating or replacing signs whenever the hazards within a confined space changed or whenever the sign was destroyed was unreasonable. For example, Union Carbide (Ex. 14-88) commented as follows:

Besides the burdens associated with those requirements, Union Carbide is concerned that they may actually pose hazards to employees. The main hazard is an overreliance on lists and signs. The presence of hundreds or thousands of signs throughout a chemical plant would tend to downgrade awareness on the part of employees, who would come to assume that if a space is not on a list or lacks a sign, then it is not a permit-required confined space. Yet, the large number of such spaces creates the very real possibility that some may be overlooked, despite the most vigilant of programs. The result could be employee entry into permit-required confined spaces without taking the necessary precautions. Even if every single permit space were identified on a list and with a sign, signs fall off or are obscured, particularly in chemical plants where sign maintenance is a major undertaking. Where hazards change with changes in service, a posted sign may be outdated and hence dangerously misleading.

Organizational Resources Counselors, Inc. (ORC, Ex. 14-143) echoed this concern:

Also, even when a sign has been posted outside a confined space, it can deteriorate, be removed, or become obscured. Where hundreds of such signs must be posted, it is even more likely that at least some of the signs will be damaged, removed, or obscured.

Finally, requiring each sign to list the hazards which could be present in each confined space would be an administrative nightmare, especially where the hazards of confined spaces change frequently or are varied. For example, the hazards posed by entry into a tank or vessel will depend on the last contents. Are new signs to be posted every time a new chemical is introduced?

One hearing participant (Chicago Tr. 273) also claimed that sign maintenance would be costly, testifying as follows:

Since most of the signs in a refinery or chemical plant are exposed to weather, their maintenance would be extremely expensive.

The Chemical Manufacturers Association (Ex. 138) maintained that signs can create a false sense of security and can lead to information overload. They contended that a large number of warning signs, which would be required in many chemical plants, would be ineffective because employees tended to ignore them.

As an alternative to posting signs, many commenters suggested the use of an effective confined space permit entry system in combination with training as an alternative to posting signs (Ex. 14-57, 14-76, 14-78, 14-86, 14-88, 14-91, 14-94, 14-111, 14-143, 14-157, 14-170, 14-176, 14-184, 138). For example, Beaumont & Associates (Ex. 14-57) stated:

Employee training about confined spaces should be allowed in place of signs designating confined spaces.

Also, the Texas Chemical Council, (Ex. 14-86) said:

It is critical that employees be trained, as well as, possibly reminded, depending upon the entry condition.

Union Carbide (Ex. 14-88) supported the training alternative as follows:

In its years of experience with confined space permit programs, Union Carbide has learned that proper employee training and education to identify permit spaces and their hazards are more effective, more efficient, and safer than the overly burdensome approach proposed.

Still another commenter (Ex. 14-91) agreed with this point, stating:

Training is a more appropriate and effective means of informing employees of permit space hazards.

One commenter (Ex. 14-68) disagreed, arguing that training was an ineffective means of preventing unauthorized entry, as follows:

Training is *not* an effective means of preventing unauthorized entry nor is a posted sign. The use of the conjunction, "or," in the proposed standard leaves the employer a choice among providing a positive denial of entry provision such as a locked barrier, posting a warning sign or providing training. There should be no doubt that the first choice will usually be "training" such as "Don't go in there." At most, a sign may be posted to supplement the instructions. These

precautions are so inadequate as to be no precaution. [Emphasis supplied in original.]

Many of the accidents in the rulemaking record resulted when an employee failed to recognize the hazards involved in entering a permit-required confined space. Therefore, OSHA has determined that it is important to identify permit spaces and to inform employees of their presence and the hazards involved.

At the time of the proposal, OSHA believed that the posting of warning would be the most cost effective method of warning employees. In that regard, the Agency recognized that training all employees in the location of all permit spaces and in the hazards involved in each space could impose significant costs on employers. However, as brought out by the rulemaking participants, the posting requirement in the proposal did not account for existing permit space programs that have been successfully protecting employees, using a wide range of approaches to providing the necessary information to employees.

The record also indicates that some rulemaking participants interpreted proposed paragraph (c)(4) to require the specific hazards posed by the space to be listed on the sign. OSHA did not intend the sign to contain a list of all the specific hazards posed by the permit space. Rather, the proposed rule would simply have required the basic type of hazard (such as asphyxiation and engulfment) to be mentioned. In fact, in explaining this provision of the proposal (54 FR 24091), OSHA stated:

> The Agency believes that employees need this information to understand the seriousness of potential hazards in the workplace. The Agency anticipates that compliance with this requirement would ensure that employees who are not involved in permit space operations would be sufficiently informed so that they would not attempt to enter permit spaces. OSHA notes that only personnel who work with permit spaces would need to know more about the potential hazards.

In order to recognize all methods of informing employees and to clarify the intent of the rule, OSHA is adopting a performance-oriented version of proposed paragraph (c)(4) in the final standard. Paragraph (c)(2) of final §1910.146 reads as follows:

> 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.

OSHA believes that this language will require employers to protect their employees but will also allow them to use the most cost-effective method available. For example, employers who are already providing sufficient training to protect their employees effectively need not purchase and maintain unnecessary signs. On the other hand, employers can choose to post danger signs to protect employees if they desire. Whatever method is used, the standard requires it to inform employees exposed to the hazards posed by permit-required confined spaces of the existence, location, and danger of those spaces. Additionally, the provision in the final rule makes it clear that the sign is to indicate the danger involved in permit space entry, not to list all the specific hazards that might be encountered.

In enforcing this provision, OSHA will check to ensure that methods other than warning signs are truly effective in imparting the required information to employees. General training in the OSHA standard, for example, cannot be expected to adequately inform employees of the location of permit spaces in the workplace. The final rule places the burdens of identifying the spaces and of controlling the resultant hazards on the employer not on the employee.

Some commenters suggested that OSHA adopt a limited posting rule that would recognize the posting of copies of the entry permit at the entrance to those spaces that are opened for entry or that would require signs only for permit spaces that could be entered inadvertently. For example, the Monsanto Company (Ex. 14–170) suggested:

> We recommend that, instead of this burdensome approach, the permit itself serve as the communication of the hazards since it will be posted during an actual entry. If a vessel has multiple entry points during a confined space entry then additional signs or copies of the permit could be posted at those points to serve as the hazard advisory.

The Chevron Corporation (Ex. 14–174) added:

> We believe that this section should be reworded to allow either signs *or copies of completed permits* that are posted near or at the entrance to the permit space to be used to notify employees of the hazards and that only authorized individuals may enter the permit space. The permit system is intended to provide all information about the permit space on the permit itself and it only seems reasonable that a copy of the permit should be able to serve as the written means of information about the space.

In its prehearing comment (Ex. 14–143), the Organization Resources Counselors, Inc. (ORC) stated:

> ORC believes that posting a sign at or near every identified permit space is unnecessary, costly, and inappropriate for those spaces which do not provide an opportunity for random or inadvertent entry. In an average chemical plant or refinery, there will be hundreds of vessels, columns, tanks, and other pieces of process equipment which would meet the criteria for definition as permit required confined spaces, but which offer no opportunity for casual or inadvertent entry because these spaces are closed when in service, and cannot be opened to permit entry without significant amounts of labor and tools.
>
> It is appropriate to post a sign where there is opportunity for random unauthorized, or casual or inadvertent [entry], such as an open pit. In addition, it would be appropriate to post signs near spaces that have been opened to permit entry by authorized employees to make others aware that entry into the space is prohibited to unauthorized individuals.

OSHA has not adopted any of these suggestions. Posting the entry permit would not serve to inform unauthorized employees of the danger of entry. If there is no authorized entry being conducted, there would be no permit to post. Thus, posting entry permits would not function to warn employees of spaces that were not the subject of an entry permit. Additionally, once authorized entry was underway, an attendant would be stationed to prevent unauthorized employees from gaining access to the space (final §1910.146(i)(8)).

ORC's suggested approach would seemingly allow permit spaces to be configured so that employees could enter them "casually" or "inadvertently".[10] The Agency believes that it is important to ensure that unauthorized employees cannot enter permit spaces unintentionally. Paragraphs (c)(3), (d)(1), (i)(8), and (j)(5) of the final rule specifically require employers to take measures intended to prevent such entry. Allowing permit spaces to remain unguarded to the extent that employees could "casually" or "inadvertently" enter them is prohibited by the standard altogether. For example, assuming that they are configured as permit-required confined spaces, open pits would have to be guarded in some manner to prevent access to the spaces except when an authorized entry was undertaken.

[10] ORC also suggested that it would be appropriate to post permit spaces where there is "opportunity for random unauthorized" entry. OSHA considers all unauthorized entry to be basically random in nature. Because of the nature of their comments and of their example (open pits), the Agency does not believe that ORC intended to recommend posting all permit spaces subject to unauthorized entry with signs. Therefore, OSHA has discussed their suggestion of posting permit spaces subject to "casual" or "inadvertent" entry. While it is possible that ORC and others who made similar comments intended something else, OSHA could not determine what that intent might be.

Therefore, OSHA is not adopting the ORC suggestion.

OSHA believes that ORC's concerns regarding the number and types of spaces that need to be posted are being addressed by the final rule. The final rule would not require the posting of any permit space whose only means of access necessitates the use of tools or keys, provided that the employees who are expected to gain entry into these spaces are trained to recognize the hazards involved. Restricting access to permit spaces in this manner protects employees effectively without the use of signs.

Paragraph (c)(3) of the final rule addresses employers who decide that their employees will not enter permit spaces. This provision requires such employers to take effective measures to prevent their employees from entering permit spaces. These measures could include permanently closing the space and barriers, supplemented by training employees and posting danger signs. In any event, the steps taken by the employer must be effective in preventing employee entry into permit spaces.

Paragraph (c)(3) of the final rule has been taken from the third sentence of the introductory text of proposed paragraph (c), on which OSHA received no substantive comment. The proposed introductory text simply referred to proposed paragraph (c)(10), relating to duties to other employers, as being the only requirement other than those in the introductory text that applied to employers whose employees do not enter permit-required confined spaces. In the final rule, due to the change in format of paragraph (c) discussed earlier, §1910.146(c)(3) lists all other requirements that must be met by these employers:

(1) Paragraph (c)(1) relating to identification of permit spaces in the workplace (first sentence of introductory text);

(2) Paragraph (c)(2) relating to informing employees of the presence of permit spaces (proposed paragraph (c)(4));

(3) Paragraph (c)(6) relating to changes in confined spaces (second sentence of introductory text); and

(4) Paragraph (c)(8) relating to work by contractors (proposed paragraph (c)(10)).

OSHA believes that these provisions in the final rule will protect employees in workplaces where permit space entry is prohibited.

Paragraph (c)(4) of the final rule requires that employers who decide to have employees enter permit spaces establish written permit space programs (permit programs) which comply with §1910.146. This provision is based on the fourth sentence of the introductory text of proposed paragraph (c).

OSHA notes that the final rule, unlike the proposed rule, specifies that the program must be written. A written plan is necessary so that confusion or misunderstanding regarding the program's requirements is avoided.

A written permit program was strongly supported by Mr. John Moran, an OSHA expert witnesses who testified at the Washington, D.C., public hearing. In his written testimony (Ex. 22), Mr. Moran stated his views regarding a written program:

> The preparation of an employer-specific written confined space program is essential, in my view. It serves not only as an essential reference for supervisors and operators, but forces—or should force—thoughtful consideration of employer-specific issues relevant to development and implementation of an effective confined spaces program.

The Food and Allied Service Trades (FAST) of the AFL-CIO (Ex. 14-213) also supported a written program, as follows:

> We cannot overstate the importance of a *written plan*. Having the plan maintained in this form and available for worksite inspection offers an invaluable set of protections for the workers employed at facilities where confined spaces may exist. [Emphasis supplied in original.]

Mr. Keith Mestrich of FAST testified at the Chicago public hearing (Chicago Tr. 37) concerning the benefits of a written plan:

> With a written pla[n] it provides workers and the representatives a chance to go into the plant and take a look exactly how the employer plans to fill out the permits; who he plans to allow in entry spaces; the training that's going to go on; everything that should be happening whenever a worker goes into a confined space.

Mr. Robert Hill of the Oil, Chemical and Atomic Workers International Union (Houston Tr. 1063) also felt that the permit program should be in writing:

> This standard should state that the permit required confined space entry program must be written and accessible to employees.... It is the workers who enter and perform work in the permit spaces.

The Utility Workers Union also recommended that a written permit space program be required. Mr. Michael Kenny, testifying on their behalf (Chicago Tr. 649), stated:

> Accountability rates an equal place with training for a successful confined space program. A written permit system identifying hazards in the permit space, restricting access to authorized employees, will provide accountability.

OSHA agrees with these commenters that a written program provides the very basis of any permit space entry operation, providing a reference for guidance and direction to supervisors and employees alike. A program that is in writing will also serve to place accountability for all functions related to permit space entry and will aid in avoiding mistakes and misunderstandings. Additionally, because of the flexibility and discretion which the standard provides to the employer in achieving compliance, a written plan is essential to demonstrate that all aspects of permit space entry have been taken into consideration. For these reasons, OSHA has decided to specify in the final rule that the permit space program be in writing. The requirement for a written program has also been added to the introductory text of paragraph (d) of the final rule. Additionally, OSHA is requiring employers to make the written program available for inspection by employees and their authorized representatives. The agency believes that such access is essential for the successful implementation of a permit space entry program.

Issue 3 of the hearing notice (54 FR 41462) requested comment on the subject of worker participation in the design and implementation of a permit-required confined spaces program. In particular, OSHA was interested in information about successful programs and the costs and benefits associated with employee participation.

The Agency received several comments on the subject (Ex. 14–38, 14–210, 14–215, 14–220, 14–222) and some testimony at the public hearings (Washington Tr. 225–226, 251, 386, 589–590; Houston Tr. 1063–1064; Chicago Tr. 317–318, 348–352, 356, 376, 379–380, 411, 427–428, 532–533, 612–613, 622–623). However, most of these commenters did not respond directly to the issue. The majority of the commenters expressed support for the concept of employee participation in the creation of a permit program. Some commenters (Ex. 14–38, 14–210; Washington Tr. 225–226, 251, 386, 589–590; Houston Tr. 1063–1064; Chicago Tr. 317–318, 348–352, 356, 379–380, 427–428) even felt that OSHA should promulgate a provision in the final rule requiring joint management-employee committees for the creation of such programs. Others (Ex. 14–215, 14–220, 14–222; Chicago Tr. 532–533, 613, 622–623) stated that OSHA should not interfere with what these commenters believed was primarily a labor-management issue.

The commenters who were in favor of requiring employee participation in a permit program cited the benefits of increased compliance and improved procedures. For example, Mr Eric Frumin of the Amalgamated Clothing and Textile Workers Union testified at the Washington hearing (Washington Tr. 589–590). Mr. Frumin said that:

> We don't know who is going to be responsible for designing the confined space program to comply with this standard, but the chances are quite high, it's going to be someone who does a lot of things other than just safety.
>
> Whatever you call them—employer relations, personnel, security, and that problem is not unique to one plant in Williamsburg, Virginia. All over this country company management is taking on more and more diverse responsibilities and less specialization in the area of safety.
>
> And the only effective check on whether untrained managers are implementing inadequate confined space programs will be the ability of workers to be involved in that process and to make sure that the programs are adequate.
>
> Given the extent of union participation in the chemical and other industries, absent a mandate from OSHA, that involvement will never take place until after an accident or catastrophe and maybe not even then.

The Independent Liquid Terminals Association (ILTA, Ex. 14–210) agreed, and also pointed out that employee involvement would increase compliance. They stated:

> ILTA is in favor of involving employees in the design and implementation of permit space programs. The employees can offer invaluable feedback on real dangers versus perceived ones. In addition, involving the employees will contribute to the successful implementation of the program since it will not be viewed as a program forced upon them without their input. This is not to say that every employee should be involved. In the terminal business[,] involving terminal operations personnel, i.e., superintendents, engineers etc., would be helpful.

Other commenters also agreed that employee involvement was desirable, but believed that OSHA should not dictate worker involvement. For example, one commenter (Ex. 14–215) said:

> Amoco considers employee suggestions when making decisions concerning confined space entry however we have no formal procedures for soliciting and reviewing employee input. Such a formalized system could delay decision-making regarding confined space entry. If any problems occur with the confined space entry program, the employer, not the employee representatives, will be held responsible. Therefore, we believe that the employer should have the ultimate authority for making decisions concerning confined space entry. How an employer addresses employee input should be a matter between management and labor and employee participation should not be mandated by regulation.

Another commenter (Ex. 14–222) stated the view that employee involvement was impossible to mandate if such involvement was to be effective,as follows:

> While employee participation in procedures development can have many benefits, it cannot be mandated. It must be voluntary.
>
> Effective communication is the key to assuring employee feedback and suggestions. Such communication must be voluntary; it cannot be forced/mandated. (Where poor employer/employee communications exist, there is little effective feedback.) For this reason, we suggest that OSHA endorse, but not require, that active employee participation be a part of the design/implementation of a firm's permit space program.

The Agency agrees that involvement by employees is vital to the creation of an effective permit space program and that such involvement should be encouraged. However, OSHA has determined that it would be very difficult to mandate labor-management collaboration in the development of the permit program. None of the respondents suggested language that would provide for employee input into an employer's permit space program without dictating how any disagreements would be resolved. Additionally, the standard does provide opportunity for the contribution of employees involved in permit space entry in paragraph (d)(13) on permit space program review and in paragraph (g)(2)(iv) on review of employee training upon evidence of deficiencies. Therefore the Agency, has decided not to require the creation of a formal system for employee input and review of entry procedures.

Paragraph (c)(5) of the final rule sets provisions that employers can follow in lieu of complying with paragraphs (d) through (f) and (h) through (k), if the employer can demonstrate that the permit space contains only atmospheric hazards and that continuous forced air ventilation will maintain those permit spaces safe for entry. This paragraph is based, in part, on paragraph (i) of the proposed rule.

Paragraph (i) of the proposal, *Special permits for entry into low hazard permit spaces,* would have allowed employee entry into a "low-hazard" permit-required confined space without an attendant on hand. OSHA included this provision in the proposal based on the belief that either the space posed a low level of risk or its hazards were controlled so as to reduce the level of risk. The Agency regarded these spaces as posing a low enough risk that an attendant would not have been necessary and that more limited procedures could have been used for entry. While a permit would still have been required, it could have been issued to authorize entry as often as necessary for up to a year.

In regard to proposed paragraph (i), Issue 11 of the NPRM asked the following questions:

(1) To what extent should permit requirements be differentiated based upon level of risk?

(2) What criteria should an employer use to determine if the use of a special permit is appropriate?

(3) Should OSHA limit an employer's ability to qualify for use of a special permit once he or she has had a special permit revoked?

In Issue 13 of the hearing notice (54 FR 41461), OSHA asked for comment on an issue raised by a commenter (Ex. 14–45) concerning how employers would document the decision that a certain permit space was a low hazard space. OSHA also asked several other questions related to the documentation of an employer's determination of a space as "low hazard". In addition, Issue 17 of the NPRM solicited comments regarding the existence of work areas that would not need all of the protective measures required by the proposed rule.

Many rulemaking participants addressed the question of to what extent the permit requirements should be differentiated based on the risk posed by the space. Some favored separate treatment of different levels of risk, either explicitly (Ex. 14–50, 14–81, 14–102, 14–149, 14–167, 14–182, 14–199, 14–221) or implicitly by their support of proposed paragraph (i) (Ex. 14–22, 14–27, 14–52, 14–57, 14–153, 14–170, 14–183; Washington Tr. 359; Chicago Tr. 617; Houston Tr. 943). Others (Ex. 14–28, 14–94, 14–99, 14–111, 14–178, 14–184, 14–193, 14–217, 119; Washington Tr. 383; Houston Tr. 789; Chicago Tr. 214, 235, 370, 674) argued that the requirements should be the same for all permit-required confined spaces.

Two commenters (Ex. 14–81, 14–167) supported OSHA's statement in the preamble to the proposal (54 FR 24087) that there are permit spaces that either pose such a low level of risk or have their hazards so controlled that they could be safely entered without an attendant under a permit lasting as long as a year. For example, the National Ready Mixed Concrete Association (Ex. 14–81) stated:

> As indicated in our general comments above, NRMCA strongly believes OSHA

should differentiate permit-requirements based on the level of risk involved in particular confined spaces. OSHA correctly states that there are confined spaces which, while subject to the proposed standard, either pose such a low level of risk or have had their hazards so controlled, that they could be entered without an attendant on hand under a permit, which could last as long as a year.

Other rulemaking participants (Ex. 14–22, 14–27, 14–52, 14–57, 14–153, 14–170, 14–183; Washington Tr. 359; Chicago Tr. 617; Houston Tr. 943) lent their support to this concept by advocating separate requirements for low hazard permit spaces. Mr. Donald Martin, testifying on behalf of Rohm and Haas, Texas (Houston Tr. 943), supported paragraph (i), as follows:

[P]aragraph (i) allows for special permits for entry into low hazard permit spaces without an attendant to up to a period of one year, under certain provisions. We generally support this concept because it requires us to formally address potential hazards that could exist in our motor control centers, drive-in storage trailers and diked areas around our storage tank farms.

Although we have never experienced an injury or fatality related to this type of confined space entry, we believe it should be addressed nonetheless.

In their initial comments on the proposal, Monsanto (Ex. 14–170) agreed with the reasoning behind paragraph (i), as follows:

Monsanto endorses the concept of OSHA allowing a confined space entry without an attendant in certain types of situations.

However, on the basis of the hearing testimony, Monsanto did reconsider their support and, in their post-hearing comment (Ex. 140), recommended a single level of permit space, as follows:

In continuing to reflect on this issue, we believe that the "low hazard" or ["]non-permitted" space may well turn out to be a confusing point to employers and to the compliance process in OSHA. A better approach may be to specify one level of confined space instead of two. The one level would require a permit and an attendant. Any other spaces would fall outside the scope of this standard.

Many of those supporting the concept of a "low-hazard" confined space (Ex. 14–27, 14–81, 14–95, 14–124; 14–139, 14–149, 14–150, 14–153, 14–162, 14–164, 14–169, 14–221; Washington Tr. 553; Chicago Tr. 189; Houston Tr. 943) noted its application to specific types of spaces. These rulemaking participants cited diked areas, manholes, and tanks as examples of spaces that posed an extremely low probability of having an IDLH atmosphere, resulting in a "low hazard" classification.

Other rulemaking participants (Ex. 14–28, 14–94, 14–99, 14–111, 14–178, 14–184, 14–193, 14–217, 119; Washington Tr. 383, 547; Chicago Tr. 214, 235, 370, 674; Houston Tr. 789) disagreed with the concept of treating any permit-required confined spaces in a different manner. Many of the commenters addressing this issue (Ex. 14–94, 14–111, 14–193, 14–217; Washington Tr. 547), felt that the creation of a special "low risk" category of permit spaces only increased the likelihood of confusion, misunderstanding and misplaced confidence, possibly increasing the chances of an accident. For example, Mr. Robert J. Cordes (Ex. 14–28) stated:

I do not like the idea of a special confined space permit based upon the level of risk. There should be no differentiation in permits based upon level of risk. When the employer initially makes his judgments about those spaces which will need a permit, he has done just that. A space either needs a permit or it does not. If, as an example, a below-grade pit containing a water pump is judged to be a permit required space, then a permit, including a test for oxygen, etc. is required every time the pit is entered. An attendant should be required every time a permit is required. On the other hand, if the initial analysis determined that there is no need to require a permit when the pit is entered, none is needed unless something special such as hot work is scheduled. No attendant is needed at those sites which do not require a permit. If a permit is required, then a qualified (i.e. competent) person, who could also be an attendant, should conduct all tests and complete the permit form. One form and one procedure should exist. We don't want to introduce possibilities for confusion and mistakes by having special rules apply to lower level risks...

Texaco's post-hearing submission (Ex. 119) reinforced their objection to "low hazard" permit spaces:

As stated in Texaco's testimony, we do not support the concept of "low hazard permit spaces". Texaco believes that paragraph (i) simply leads to confusion, dilutes the scope, application, and protection offered by the Standard and renders the Standard unreasonably vague. We again recommend that this section be deleted in its entirety.

OSHA has decided not to carry proposed paragraph (i) forward into the final rule. The Agency agrees with the view that a "low hazard" designation for certain permit-required confined spaces would lead to confusion and reduce the protection afforded employees under final §1910.146. While OSHA believes that different levels of risk should lead to different levels of protection, the permit space program will necessarily require the employer to implement protective measures that will address the hazards in the permit spaces adequately and appropriately. Under the final rule, employers will need to take increasingly stronger steps to ensure the safety of employees involved in entry operations in more and more hazardous permit spaces. The basic performance-oriented nature of OSHA's permit space standard forces employers to develop whatever procedures are necessary to eliminate or control hazards in permit-required confined spaces. Spaces posing the least risk (above the threshold set by the definition of permit-required confined space) will necessitate the fewest procedures to ensure safe entry. Spaces containing severe or multiple hazards will require more detailed and comprehensive procedures. Lastly, confined spaces not posing the minimum risk set by the definition of permit-required confined space require the least amount of effort to render them safe for employees; such spaces need neither attendants nor permits. [11]

On the other hand, there are some confined spaces that do not normally contain a hazardous atmosphere, but that might under certain conditions. These spaces are typically designed for employees to enter periodically, but they usually lack adequate ventilation to prevent the accumulation of a toxic or flammable atmosphere or to prevent the depletion of oxygen. Many of the "low-hazard" spaces mentioned in the record are spaces of this type. For example, diked areas, as noted by several commenters (Ex. 14–124, 14–150, 14–168, 14–184, 113, 140), do not normally pose hazards severe enough to warrant the issuance of permits or the presence of attendants. The telecommunications industry (Ex. 14–95, 14–104, 14–110, 14–139, 14–149, 14–162, 14–169, 14–188) contended that their manholes do not contain sufficient hazards to justify coverage under the permit space standard. Under industry practices currently used for entry into such spaces, these confined spaces do not have a potential to contain any hazard capable of causing death or serious physical harm, except in very rare circumstances.

OSHA believes that the practices necessary to make confined spaces that merely have the potential to contain hazardous atmospheres (as opposed to one that contains a hazardous atmosphere under normal conditions) safe are widely recognized and used throughout various industries. OSHA requirements for such spaces are contained in §§1910.268(o), for

[11] These spaces are addressed in the definition of non-permit-required confined space and in paragraphs (c)(1) and (c)(8) of the final rule. These provisions require employers to evaluate these confined spaces to ensure tha. they are not permit spaces and to re-evaluate them if their use or configuration changes in a manner that might pose hazards to entrants.

underground telecommunications manholes and unvented vaults, and 1926.956, for underground electric transmission and distribution work. The Agency included similar requirements in §1910.269(e), for "enclosed spaces" in its proposed standard for electric power generation, transmission, and distribution work (54 FR 5012), and in proposed §1910.146(i), for "low-hazard" permit spaces. The practices necessary for eliminating the potential hazardous atmosphere for these spaces as set out in these documents include checking the cover for evidence of possible hazards, placing barriers after the removal of the cover, performing atmospheric testing, and providing continuous mechanical ventilation. Atmospheric testing includes testing for oxygen content, for the presence of flammable vapors and gases, and for potential toxic air contaminants. Mechanical ventilation is provided if a hazardous atmosphere is detected.

OSHA believes that these practices can be adopted to ensure safe entry into any confined space that can be maintained safe for entry by ventilation alone. Some confined spaces are designed for employees to enter under normal operating conditions, although they do not provide sufficient natural or mechanical ventilation to ensure an adequate supply of oxygen or to disperse flammable gases and vapors and toxic air contaminants that may be introduced accidentally into the permit space environment. Testing the atmosphere within the space and providing adequate continuous ventilation can normally eliminate the hazardous atmosphere, producing the equivalent of a non- permit confined space. Other types of permit spaces with only atmospheric hazards can be isolated, purged, and ventilated from outside the space. If no entry is needed to achieve a safe atmosphere, then procedures similar to those described earlier for the telecommunications and electric utility industries can be followed to ensure the safety of entrants.

By contrast, however, for a permit space that contains a hazardous atmosphere under normal operating conditions, it is usually necessary to make an initial entry in order to control the hazards within the space. The initial entry involves the exposure of the entrant to any hazards within the space, since the purpose of the entry is to control the hazards for future entries. The measures that must be taken to control the hazards, such as cleaning the space, vary with the types of hazards present within the space. Similarly, permit spaces into which hazards (such as welding or toxic or flammable cleaning materials) are introduced during entry need the protection afforded by the complete permit space program in order to assure that all measures, in addition to ventilation, necessary for the protection of entrants are followed. In these cases, the employer's evaluation of the space before entry must take into account these additional sources of hazardous atmospheres that will be introduced into the space during entry. Pre-entry monitoring will not provide the needed assurances of safety in these situations. Accordingly, the permit system is necessary to provide protection form hazards in the permit space during these types of entries. The permit identifies the measures that must be taken to ensure that employees can safely enter the permit space, and the attendant watches for conditions not envisioned during the preparation of the permit and for other prohibited conditions. These two elements of the permit space program are essential for the safety of authorized entrants working in spaces that would contain a hazardous atmosphere under normal operating conditions.

Additionally, ANSI Z117.1–1989 (Ex. 129), Section 2, provides that a space which, by configuration, meets the definition of a confined space but which is found, after evaluation, to have little potential for the generation of hazards or to have had its hazards eliminated by engineering controls is to be considered as a non-permit confined space. The ANSI standard treats these spaces separately from permit-required confined spaces, applying only the requirements for identification of confined spaces and evaluation of their hazards and for atmospheric testing, along with special provisions for non-permit confined spaces. The ANSI standard does not apply the other requirements of the consensus standard to such spaces, but provides only that these other requirements be considered for application to the procedures used for entry.

OSHA has determined that it is not appropriate to require the entry permit program to be implemented for entries into permit spaces that contain only atmospheric hazards which the employer demonstrates can be controlled with ventilation alone. These spaces can be made safe for entry following specific procedures that are spelled out in paragraph (c)(5) of the final rule. Paragraph (c)(5) of the final rule allows employers to conduct entry operations for such spaces in accordance with these procedures without following the non-training related provisions of the permit space program (paragraphs (d) through (f) and (h) through (k) of the final rule). The procedures in paragraph (c)(5) are based on proposed paragraph (i), with modifications supported by the rulemaking record, and are explained in the following discussion.

Additionally, OSHA has determined that spaces that have had all hazards eliminated can be reclassified as non-permit spaces for as long as the hazards remain eliminated. (It should be noted that continuous forced air ventilation controls atmospheric hazards—it does not eliminate them.) For spaces posing only non-atmospheric hazards, if those hazards can be removed without entry into the space, the permit space may be reclassified as a non-permit confined space after the hazards are removed. For example, the engine for a cement mixer can be locked out, and the mixer can then be safely entered for maintenance (assuming there are no other hazards inside the mixing drum). For spaces with atmospheric hazards and for spaces with non-atmospheric hazards that can only be eliminated through entry into the space, the permit space can first be entered following all the requirements spelled out in paragraphs (d) through (k) of the final rule; and, after the employer certifies that the hazards have been eliminated, the space can be reclassified as a non-permit confined space. Requirements for the procedures to be used in reclassifying permit spaces are contained in final §1910.146(c)(7), discussed later in this section of the preamble.

OSHA believes that the approach taken in paragraphs (c)(5) and (c)(7) of the final rule is consistent with that taken in ANSI Z117.1–1989. The major difference is that the consensus standard treats all non-permit required confined spaces [12] alike, whereas the OSHA standard separates them into two categories—permit spaces with atmospheric hazards controlled by

[12] The ANSI definitions of "confined space", "permit-required confined space", and "non-permit confined space" differ somewhat from OSHA's definitions of these terms. OSHA's definition of "permit-required confined space" is basically the same as ANSI's definition of "confined space". Under the ANSI definition, all confined spaces have an actual or potential hazard, while OSHA's definition of "confined space" includes spaces with no hazards at all (which are not regulated under final §1910.146). The final rule's definition of "non-permit-required confined space" covers these hazard-free confined spaces, as well as spaces that have had their hazards eliminated under paragraph (c)(7). The ANSI definition of "non-permit-required confined space" covers confined spaces whose hazards have been eliminated by engineering controls and confined spaces that have "little potential for generation of hazards". It is the ANSI "non-permit-required confined spaces" that are regulated under paragraphs (c)(7) and (c)(5) of the final rule.

means of ventilation alone and permit spaces that have been reclassified as non-permit confined spaces because the hazards have been eliminated.

This two-pronged approach better protects employees than the ANSI standard for two basic reasons. First, by minimizing the amount of regulation that applies to spaces whose hazards have been eliminated, it encourages employers to actually remove all hazards from permit spaces, which is the best possible protection for entrants. The rules that do apply in such situations (paragraph (c)(7), discussed later in this section of the preamble) are only those necessary to ensure that the hazards have indeed been removed. Second, for permit spaces that can be maintained safe by ventilation alone, the regulation specifies exactly what is required of the employer. As noted earlier, the practices required by paragraph (c)(5) for these spaces have been demonstrated in the telecommunications and electric utility industries as being highly effective in protecting entrants from the limited hazards present in such spaces (Ex. 14–7, 14–39, 14–53, 14–80, 14–171; Washington Tr 180–181). The ANSI standard does not specifically require such protective measures as ventilation in such cases. If the employer needs additional flexibility in controlling the hazards in these permit spaces, it is available by following the full permit procedures outlined in paragraphs (d) through (k) of the final rule. These provisions, although they require additional protection in the form of attendants and permits, give the employer more flexibility in applying different controls to the hazards that are present.

Based on review of the record, OSHA has determined that there are circumstances in which employers can control atmospheric hazards without following the full permit procedures outlined in paragraphs (d) through (k) of the final rule. As noted earlier, some industries, such as telecommunications (regulated under §1910.268(o)), have successfully protected employees from atmospheric hazards in workspaces through testing and continuous ventilation, without following all the requirements proposed in §1910.146. OSHA believes that such experience indicates that ventilation and testing could protect employees throughout general industry from atmospheric hazards posed by similar types of permit spaces. Accordingly, OSHA has decided to allow employers, under certain conditions, to control atmospheric hazards within a permit space following specific procedures that are spelled out in the final rule in lieu of compliance with paragraphs (d) through (f) and (h) through (k) of the final rule. The only requirements from the full permit space program that would apply to entry following these procedures are the training provisions in paragraph (g) of the final rule. The Agency has determined that training employees in the procedures is necessary and appropriate and that paragraph (g) contains the relevant requirements for this training.

Paragraph (c)(5)(i) of the final rule sets forth the conditions that must be met before a permit space may be entered under the alternative procedures, which are specified in paragraph (c)(5)(ii).

The first condition, set out in paragraph (c)(5)(i)(A) of the final rule, is that the employer must be able to demonstrate that the only hazard posed by the permit space is an actual or potential hazardous atmosphere. The procedures required under paragraph (c)(5)(ii) are only appropriate for atmospheric hazards, and the spaces for which these procedures can be used pose only this type of hazard. If the space poses other hazards as well, either all the hazards must be eliminated, under paragraph (c)(7) of the final rule, or the space may only be entered following the full permit space procedures set out in paragraphs (d) through (k).

The second condition, set out in paragraph (c)(5)(i)(B) of the final rule, is that the employer must be able to demonstrate that ventilation alone is sufficient to maintain the permit space safe for entry. In order for the space to be considered safe, the atmosphere within the space after ventilation may not be expected to approach a hazardous atmosphere. This is necessary so that, if the ventilation shuts down for any reason (such as loss of power), the employees will have enough time to recognize the hazard and either exit the space or restore the ventilation. A guideline of 50 percent of the level of flammable or toxic substances that would constitute a "hazardous atmosphere" may be used by employers in making the determination required under paragraph (c)(5)(i)(B). [13] Additionally, the work to be performed within the space must not introduce any hazards—work with hazardous quantities of flammable or toxic substances and hot work are not permitted. This type of work would introduce hazards beyond those accounted for by the determination that the permit space can be maintained safe for entry. Paragraph (c)(5)(i)(B) indicates clearly that an employer who relies on continuous forced air ventilation to maintain spaces safe for entry must be able to establish that other measures are not needed to protect entrants.

The third condition, set out in paragraph (c)(5)(i)(C) of the final rule, is that the employer must develop monitoring and inspection data that supports the demonstrations required by paragraphs (c)(5)(i)(A) and (c)(5)(i)(B). The atmospheric monitoring data must show that ventilation will keep the air inside the permit space within the guidelines of paragraph (c)(5)(i)(B), discussed earlier. The data required by paragraph (c)(5)(i)(C) are essential for the employer and employees, as well as OSHA, to be able to determine whether or not the space can be maintained safe for entry with the use of ventilation alone.

The fourth condition, set out in paragraph (c)(5)(i)(D) of the final rule, is that, if an initial entry is performed to gather the data required under paragraph (c)(5)(i)(C), it be conducted in accordance with the full permit space program requirements given in paragraphs (d) through (k). The Agency recognizes that monitoring and inspection data may be obtained either through entry into a space, or from outside the space, as long as the data provide complete and accurate information on air contaminants throughout the confined space. In many instances, however, it will be necessary to make an initial entry into the space in order to make the necessary determination. Paragraph (c)(5)(i)(D) requires that any entry to obtain the data be performed in accordance with all the provisions of the standard, because any relief from permit space program requirements is not allowed until the process of demonstrating, inspecting, monitoring, and documenting the conditions to be expected during entry is completed.

The fifth condition, set out in paragraph (c)(5)(i)(E) of the final rule, is that the determinations and supporting

[13] Two examples may help to clarify this guideline.

(1) The LFL for methane is a concentration of 5 percent by volume. Ten percent of this value is 0.5 percent, a concentration which would be considered hazardous, by definition. Under the guideline, the measured concentration of methane should not exceed 0.25 percent after ventilation in order for the procedures specified in paragraph (c)(5)(ii) of the final rule to be acceptable.

(2) The 8-hour time weighted average PEL for chlorine, under Table Z-1, is 0.5 parts per million. This concentration of chlorine would be considered hazardous by the definition of "hazardous atmosphere". Under the guideline, the measured concentration of chlorine should not exceed 0.25 parts per million after ventilation in order for the procedures specified in paragraph (c)(5)(ii) of the final rule to be acceptable.

data required by paragraphs (c)(5)(i)(A) through (c)(5)(i)(C) be documented and made available to employees who enter the spaces under the terms of paragraph (c)(5). This documentation will enable the employer, employees, and OSHA to evaluate the determination that paragraph (c)(5) applies to a given permit space.

The sixth, and final, condition, set out in paragraph (c)(5)(i)(F) of the final rule, is that the entry be performed in accordance with the specific procedures required by paragraph (c)(5)(ii).

Paragraph (c)(5)(ii) of the final rule sets forth the procedures that must be followed for entries under paragraph (c)(5). The procedures detailed in this paragraph have been derived from several sources. Proposed paragraph (i) set out procedures that could be used for spaces that presented an extremely low probability of encountering atmospheric hazards. Proposed paragraphs (i)(1) and (i)(2) would have required testing, ventilation, and other measures necessary to ensure that the space remained safe for entry. These provisions, modified as warranted by the public record, have formed the basis of most of the requirements contained in paragraph (c)(5)(ii) of the final rule.

Section 4 of ANSI Z117.1–1989 provides requirements necessary for safe entry into non-permit confined spaces. OSHA also relied on some of these provisions, specifically the training and testing requirements contained in Sections 4.2 and 4.4, respectively, in the development of paragraph (c)(5)(ii) of the final rule.

Lastly, the Agency based some of the provisions of this paragraph of the final rule on the existing telecommunications and proposed electric power generation, transmission, and distribution standards. Paragraph (o) of §1910.268 sets forth requirements for the protection of employees performing telecommunications work. Current industry practice in compliance with these requirements has provided effective protection for employees performing work in such spaces as manholes and unvented vaults. Paragraph (e) of proposed §1910.269 set out provisions that OSHA believed were necessary (and widely used) for the protection of employees performing electric power generation, transmission, and distribution work in "enclosed spaces".[14] (This proposed paragraph was also based largely on §1910.268(o).) These proposed and existing standards provide provisions that OSHA believes are necessary and appropriate for the protection of employees in the two industries from atmospheric hazards that can be controlled through the use of ventilation alone. OSHA has determined that these standards, with appropriate modification, can also be used to protect employees in general industry from permit spaces presenting atmospheric hazards that can be maintained safe for entry by means of ventilation alone.

Paragraph (c)(5)(ii)(A) of the final rule requires that any conditions that make it unsafe to remove an entrance cover be eliminated before the cover is removed. Some conditions within a permit space, such as high temperature and high pressure, may make it hazardous to remove a cover from the space. For example, if the atmospheric hazards within the space cause high pressure to be present within the space, the cover could be blown off in the process of removing it. To protect employees from such hazards, a determination must be made as to whether or not it is safe to remove the cover. Such a determination would require the employer to examine the conditions that are expected to be in the permit space. The cover would be checked to see if it is hot; and, if it is fastened in place, it would be loosened gradually to release any residual pressure. An evaluation must also be made of whether conditions at the site could cause a hazardous atmosphere to accumulate in the space, which would make it unsafe for employees to remove the cover. The cover could not be removed until it is safe to do so.

Paragraph (c)(5)(ii)(B) of the final rule requires that openings to permit spaces be guarded to protect employees from falling into the space and to protect employees in the permit space from being injured by objects entering the space. The guard could be in the form of a railing, a temporary cover, or any other temporary barrier that provides the required protection. If the opening to the space is situated so that employees and objects cannot fall into the space, no additional guarding is necessary. This provision was taken from existing §1910.268(o)(1)(i), which sets forth an equivalent requirement for underground telecommunications work.

Paragraph (c)(5)(ii)(C) of the final rule requires the internal atmosphere of the permit space to be tested with a calibrated, direct-reading instrument before any employee enters the space. The atmosphere must be tested, in sequence, for oxygen content, for flammable gases and vapors, and for potential air contaminants. This provision, which is based on proposed paragraph (i)(1)(ii), is necessary to determine whether or not ventilation alone will be able to maintain the space safe for entry. The results of this testing must be within the expected range for the space, based on the employer's determination under paragraph (c)(5)(i)(A).

Paragraph (c)(5)(ii)(D) of the final rule prohibits employees from being in the space when a hazardous atmosphere is present. Any entry into a permit space containing a hazardous atmosphere must be conducted in accordance with the full permit space program requirements given in paragraphs (d) through (k).

Paragraph (c)(5)(ii)(E) of the final rule sets out requirements for the continuous forced air ventilation that must be used to maintain the permit space safe for entry. First, no employee may enter the space until the forced air ventilation has eliminated any hazardous atmosphere found within the space. Second, the ventilation must be directed to ventilate the immediate areas where an employee is or will be present within the space and must continue until all employees have left the space. Third, the air supply for the ventilation must be from a clean source and must not increase the hazards in the space. These provisions, which have been taken from ANSI Z117.1–1989 Sections 9.1 and 9.1.1 and from proposed §1910.269(e)(10) and (11), ensure that the atmosphere within the permit space remains safe during the entire entry operation.

Paragraph (c)(5)(ii)(F) of the final rule requires the permit space to be periodically tested as necessary during the entry to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. The frequency at which such testing would have to be performed is dependent on the nature of the permit space and the results of the initial testing performed under paragraph (c)(5)(ii)(C) of the final rule. For example, if the initial testing found no evidence of flammable gases or vapors and if the permit space is not normally expected to present the hazards posed by such gases and vapors, no further testing would be necessary. If a flammable gas or vapor is initially detected, frequent or continuous testing would be appropriate. The testing required by final paragraph (c)(5)(ii)(F), in combination with continuous forced air ventilation required by paragraph (c)(5)(ii)(E), ensures that entrants remain

[14] Defined in proposed §1910.269 as a working space, such as a manhole, vault, tunnel, or shaft, that has a limited means of egress or entry, that is designed for periodic employee entry under normal operating conditions, and that under normal conditions does not contain a hazardous atmosphere, but that may contain a hazardous atmosphere under abnormal conditions.

protected the entire time they are present within the permit space.

Paragraph (c)(5)(ii)(G) of the final rule requires employees to exit the permit space immediately if a hazardous atmosphere is detected. Additionally, the employer is required to evaluate the permit space to determine how the hazardous atmosphere developed and to implement measures to protect employees from the hazardous atmosphere before any subsequent entry under paragraph (c)(5) procedures is undertaken. Obviously, if a hazardous atmosphere is detected during entry, the permit space has not been maintained safe for entry. For any subsequent entries to be authorized under paragraph (c)(5), the employer must determine what went wrong, must take whatever measures are needed to prevent a recurrence, and must demonstrate that the subsequent entries can be performed safely, as required by paragraph (c)(5)(i).

Paragraph (c)(5)(ii)(H) of the final rule requires the employer to verify that the permit space is safe for entry and that the measures required by paragraph (c)(5)(ii) have been taken. The verification must be in the form of a certification that contains the date, the location of the space, and the signature of the certifying individual and that is made available to entrants. The certification documents the employer's compliance efforts. The certification, in combination with the documentation required under paragraph (c)(5)(i)(E), will maintain employer accountability for compliance with paragraph (c)(5)(ii), will enable OSHA to evaluate compliance with the standard, and, where permit space incidents have occurred, will assist OSHA in ascertaining how those incidents arose.

Paragraph (c)(6) of the final rule requires employers to reevaluate non-permit confined spaces whenever changes in the use or configuration of the space might increase hazards to entrants. If the reevaluation warrants, the space must be reclassified as a permit space.

The second sentence of the introductory text of proposed §1910.146(c), from which final paragraph (c)(6) was taken, would have required employers to reevaluate confined spaces in which changes have occurred to determine whether the space has become a permit space. This provision read as follows:

> If there are changes in a confined space which previously was not a permit space, the employer shall reevaluate that space to determine if it has become a permit space.

One commenter (Ex. 14–45) was concerned that all non-permit confined spaces would have to be reassessed for every change, however minor. In response to this comment, OSHA requested, in Issue 7 of the notice of public hearing (54 FR 41462), information on whether guidelines should be listed to indicate when work spaces would need reevaluation. The Agency also sought information on what those guidelines should be.

Most of the testimony on this issue dealt with the conditions under which a permit space should be "reevaluated" after entry. For example, Mr. Tom Lawrence, representing the Monsanto Company (Washington Tr. 520–528), testified that the atmosphere in the permit space would have to be retested if the entrants left the space unoccupied or if nearby environmental conditions were to impact the confined space adversely.

These comments are not directly relevant to the issue raised in the hearing notice, that is, under what conditions should a non-permit confined space be reevaluated. The final rule contains separate requirements intended to protect employees from hazards arising when conditions in a permit-required space change. For example, final paragraph (i) requires the employer to ensure that attendants know of and can recognize potential permit space hazards and that they monitor activities inside and outside the space to determine if it is safe for entrants to remain inside. It is the duty of the attendant to order entrants to leave when evidence of an uncontrolled hazard exists (final paragraph (i)(6)). Also, it is the duty of the entry supervisor to determine, at appropriate intervals, whether the conditions within the space remain safe for the presence of employees and to cancel the permit whenever conditions are otherwise (final paragraph (j)(6)). The Agency believes that the final rule fully addresses the hazards of changes within permit spaces during entry and that the wide ranging circumstances causing new hazards not addressed by the permit are too numerous to list in the standard.

The issues at hand, however, are: (1) whether OSHA should revise the language of the introductory text of proposed paragraph (c) to present guidelines as to what types of changes in confined spaces would necessitate reevaluation of non-permit spaces and (2) what types of changes would result in the reclassification of a non-permit space into a permit space. Only three commenters (Ex. 14–45, 14–57, 14–178) addressed these issues. S. C. Johnson and Son, Inc. (Ex. 14–45) suggested that the language be revised to indicate that reevaluation would only be necessary when the changes introduced increased hazards. The other two argued that periodic evaluation should be required as changes warrant.

OSHA believes that the language contained in the proposal was widely understood. However, the Agency is revising the text of this provision to indicate more clearly that reevaluation is required only when changes "that might increase the hazards to entrants" occur and to indicate that reclassification of a non- permit confined space to a permit-required confined space may be necessary. OSHA believes that this modification will clarify the standard and will result in a more performance-oriented final rule. OSHA does not expect employers to reevaluate spaces because trivial changes have occurred that do not affect the nature of the space or the work performed in the space.

Paragraph (c)(7) of the final rule gives procedures under which the employer may eliminate hazards within a permit space so that it may be reclassified as a non-permit confined space. OSHA believes that this paragraph will protect employees by encouraging employers to eliminate (as opposed to control) hazards within permit spaces. OSHA anticipates that some spaces will be reclassified back and forth from time to time, because of changes in their configuration or use. Accordingly, the Agency has included language in this paragraph to indicate clearly that the reclassification is valid only as long as the hazards remain eliminated.

Paragraph (c)(7) reflects the public input on Issues 11 and 17 of the NPRM and Issue 13 of the hearing notice, as discussed earlier under the summary and explanation of paragraph (c)(5). As noted in that discussion, OSHA believes that employees are fully protected from the hazards of permit space entry once all hazards within the space have been eliminated. Clearly, if there are no hazards within the permit space, an entrant is in no danger. By contrast, if the hazards are simply controlled rather than removed, the entrant could be injured upon failure of the control system. Therefore, the Agency has determined that it is appropriate to allow employers who eliminate hazards within permit spaces to reclassify those spaces as non-permit confined spaces.

Paragraph (c)(7)(i) of the final rule allows the employer to reclassify a permit space as a non-permit confined space if there are no actual or potential atmospheric hazards and if all other hazards within the space are eliminated

without entry into the space. The reclassification would be valid as long as the non- atmospheric hazards remain eliminated.

This paragraph applies only to permit spaces containing no actual or potential atmospheric hazards. OSHA expects that this provision will apply primarily to spaces containing hazardous energy sources or containing engulfment hazards. The control of hazardous energy sources is addressed by existing §1910.147, *The control of hazardous energy sources (lockout/tagout)*. That standard covers the service and maintenance of machines and equipment in which the unexpected energizing or start up of the machines or equipment or release of stored energy could cause injury to employees. OSHA believes that it is possible in some cases to deenergize and lockout machinery and equipment, using the procedures specified in §1910.147,[15] so that the energy hazards are eliminated without any entry into the permit space. For spaces posing only engulfment hazards, it may be possible to remove the hazard by removing the engulfing material from the space before entry. In these cases, the Agency believes that entry into these spaces, after the hazards have been removed, is at least as safe as (if not safer than) entry in accordance with the full permit space program requirements given in paragraphs (d) through (k). Paragraph (c)(7)(i), therefore, allows the reclassification of these types of spaces after their hazards have been eliminated.

The reclassification of permit spaces allowed under paragraph (c)(7)(i) of the final rule recognizes that spaces such as mixers and material bins can have their hazards removed before entry, so that entrants are fully protected without the need for permits, attendants, or other features required by the full permit space program requirements given in paragraphs (d) through (k). Mixers can be locked out before it is entered for servicing or maintenance, removing the mechanical hazards. A material bin posing an engulfment hazard can be emptied before entry, thus removing that hazard. These are the types of spaces that can be made safe for entry following paragraph (c)(7)(i) of the final rule.

[15] If the equipment or machinery is not deenergized and locked out or tagged in accordance with §1910.147, then it must be guarded as required in other general industry standards, such as Subpart O, for machine guarding, and §1910.303(g) and (h), for the guarding of electric equipment. As long as the equipment or machinery inside the permit space remains guarded, employees within the space are not considered to be exposed to any equipment-related hazards.

Permit spaces that contain or have the potential to contain hazardous atmospheres may also be reclassified as non-permit spaces, under paragraph (c)(7)(ii) of the final rule. The Agency believes that these spaces need to be treated the same as any space that must be entered in order to eliminate hazards. After this type of space is isolated, purged, and ventilated from outside, it must be entered to test the atmosphere and inspect conditions within the space in order to ensure that the hazards have indeed been eliminated. (Once again, control of a hazardous atmosphere is not the same as its elimination.)

Paragraph (c)(7)(ii) of the final rule allows the employer to reclassify a permit space as a non-permit confined space after a permit entry is performed to eliminate hazards within the space. The permit entry with must be conducted in accordance with the full permit space program requirements given in paragraphs (d) through (k). This reclassification would also be valid only as long as the hazards remain eliminated.

As noted earlier, OSHA believes that entry into a permit space whose hazards have been removed is safe. Some spaces, however, must be entered either to remove the hazards or to verify that the hazards have been eliminated. For example, if the disconnecting means for an energy source is inside the permit space, the space must be entered in order to deenergize it and lock it out. Also, as noted previously, if the permit space poses any atmospheric hazards, it must first be entered in order to perform the testing and inspection that is necessary to determine whether the hazards have been eliminated. As long as the entry to remove the permit space hazards is conducted in accordance with the full permit space program requirements given in paragraphs (d) through (k), the space can be considered as safe and reclassified after the hazards have been removed.

The types of permit spaces that could fall under paragraph (c)(7)(ii) include such spaces as chemical tanks and boilers. Chemical tanks can frequently be made safe by draining them of their contents, purging any residual chemicals with water, and ventilating the space after purging is complete. Boilers can be made safe for entry by shutting them down, opening the access ports to allow for temperature reduction and natural ventilation, and entering the space to remove any residual hazards, such as loose buildup that could fall onto entrants. In each case, an entry, conducted in accordance with the full permit space program requirements given in paragraphs (d) through (k), must be performed in order to ensure that the hazards have been eliminated.

Paragraph (c)(7)(iii) of the final rule requires employers seeking to reclassify a permit space to document the basis for the determination that all permit space hazards have been eliminated, through a certification that contains the date, the location of the space, and the signature of the certifying individual. The certification must be made available to each employee entering the space.

This provision is basically equivalent to paragraphs (c)(5)(i)(E) and (c)(5)(ii)(H) of the final rule. In each case, the employer must substantiate all determinations that compliance with the alternate provisions is appropriate, so that employers, employees, and the Agency have the means by which to evaluate those determinations. Compliance with this provision will require careful consideration of the spaces to be reclassified. OSHA believes that this paragraph imposes a reasonable burden, considering that compliance will enable employers to have employees enter these reclassified spaces without the need to implement the full array of permit space program requirements.

If a permit space hazard arises in a space that has been reclassified under paragraph (c)(7), paragraph (c)(7)(iv) of the final rule requires employees to exit the space and requires employers to reevaluate the space to determine if the space must be reclassified again as a permit space.

This provision indicates clearly that employers retain responsibility for the safety of employees who enter spaces after the spaces have been reclassified as non-permit confined spaces. The employer must determine if it is still appropriate, under the circumstances identified through the reevaluation, to classify the space where the hazard arose as a non-permit confined space. A reevaluation aimed at reestablishing compliance with paragraph (c)(7) will encompass the demonstrations, testing, inspection, and documentation required in paragraphs (c)(7)(i) through (c)(7)(iii) of the final rule. OSHA anticipates that some employers will seek to reestablish compliance with paragraph (c)(7), while others will choose to conduct the entries in accordance with the full permit space program requirements given in paragraphs (d) through (k). The Agency's concern is that the approach chosen adequately protect employees who enter the spaces.

Paragraph (c)(8) of the final rule contains requirements pertaining to the responsibilities of host employers to employees of other employers (contractors) who are to perform permit-

required confined space entry. This provision corresponds to paragraph (c)(10) of the proposed rule. Host employers who comply with these requirements will enable their contractors to develop and implement permit space programs that satisfy §1910.146. As noted in the preamble to the proposal (54 FR 24091), a contractor who is unfamiliar with a particular workplace may experience difficulties in identifying and controlling permit space hazards, especially where the host employer assumes that the contractor knows how to operate safely in a particular permit space simply because the contractor has a particular professional expertise.

In Issue 18 of the NPRM (54 FR 24088), OSHA asked if the term "contractor" was sufficiently inclusive to ensure that all employers who have permit space operations in workplaces they do not control benefit from the provision in proposed paragraph (c)(10). OSHA also asked if there were employers who, while neither being contractors nor having control of the workplace, would have employees enter permit spaces.

Many commenters responded to the questions posed in Issue 18 (Ex. 14–61, 14–62, 14–63, 14–123, 14–132, 14–158, 14–161, 14–162, 14–170, 14–171, 14–182, 14–183, 14–185, 14–219). The majority felt that no further clarification of the term "contractor" was necessary. For example, the Department of Defense, Force Management and Personnel (Ex. 14–219) stated:

> The term "contractor" used in the proposed standard is suitably defined to ensure that all individuals that may have to work in confined spaces would be covered under the requirements.

The Duquesne Light Company (Ex. 14–182) agreed:

> The term "contractor" is sufficiently inclusive to ensure that noncompany employees are made aware of permit space hazards at the site on which they work.

Three commenters (Ex. 14–63, 14–158, 14–171) believed that the term "contractor" was not sufficiently inclusive. The comments of the American Insurance Association (Ex. 14–158) were typical of these:

> ... we believe that the term "contractor" does not accurately describe all employers whose employees may be required to enter into confined spaces at the premises of a host employer, and may in fact mischaracterize the nature of the relationship between the host and the visiting or guest employee in many instances. As an example, although insurance company personnel on occasion are called upon to make inspections or observations of the premises of their insureds for insurance and related purposes, insurers do not typically act as "contractors" for their insureds in that regard. We request that OSHA use another term such as "dispatching employer" or a similar term when referring to an employer whose employees are sent to the premises of a host employer.

The Atlantic Richfield Company (Ex. 14–123) recommended that "contractor" be changed to read "contractor/subcontractor" in the final rule, since many primary contractors subcontract out specific tasks. The State of Maryland (Ex. 14–63) recommended that the term "contractor" be expanded by adding to it "or temporary employment agency or service."

On the basis of the information submitted to the record, OSHA believes that the term "contractor", as it is used in the regulatory text, is inclusive enough to cover all employees who may be required to enter permit spaces. The Agency has continued to use the term, unchanged, in the final rule. Temporary employment agencies or subcontractors are considered to be "contractors" by OSHA. In any case, OSHA only uses the term "contractor" as an example (parenthetical) of the usual type of "personnel other than its own employees" that a host employer is likely to encounter. In this final rule, OSHA intends to cover the operations of all employers whose employees enter permit spaces.

Paragraph (c)(8) requires host employers:

(1) To inform the contractor that the workplace has permit spaces that may be entered only under a permit space program;

(2) To apprise the contractor of hazards associated with the permit space;

(3) To apprise the contractor of any permit space procedures the host employer has implemented;

(4) To coordinate entry operations with the contractor; and

(5) To debrief the contractor at the conclusion of entry operations.

This provision of the final rule is based on paragraph (c)(10) of the NPRM.

Several comments were received concerning the host employer's responsibilities to the contractor. The commenters agreed that the host employer should be required to inform contractors of the hazards present in, and the precautions the host employer has previously taken regarding, the host employer's permit spaces (Ex. 14–81, 14–86, 14–107, 14–111). However, there was some objection to the proposed requirement that the host employer provide "all available information" on permit space hazards to the contractor (Ex. 14–30, 14–157, 14–161, 14–171, 113). These commenters suggested that the requirement was too broad and recommended that the host employer provide only "pertinent" information to the contractor. For example, the American Petroleum Institute (Ex. 14–168) had this concern with paragraph (c)(10) of the NPRM:

> In many circumstances, it is absolutely vital to the safety of all workers that confined space entries in existing process facilities remain under the close control of the host company, using one common *and consistent set of procedures established for the facility*, conforming to the OSHA rule.
>
> However, the language proposed seems to preclude this approach, and instead requires that the host company provide the contractors with all the necessary information, and that the contractors then independently comply with the regulation through their own diverse programs. [Emphasis was supplied in original.]

The Hartford Steam Boiler Inspection and Insurance Company (Ex. 14–131) brought up a subject (identification of permit entry permit spaces) which was not covered in the NPRM. They stated:

> The regulation is unclear as to who would identify the entry permit spaces[,] the contractor or the host employer.

A comment from S.C. Johnson & Son, Inc. (Ex. 14–45) asked that OSHA "further clarify" the requirements concerning a host employer's duty to other employer's employees. Other commenters (Ex 14–111, 14–131, 14–150), while not disagreeing with the intent of proposed paragraph (c)(10), also asked that it be clarified or provided recommended language for amending the provision.

In response to the concerns expressed relating to proposed paragraph (c)(10), OSHA has rewritten and reorganized the standard's provisions. The final rule breaks out the different provisions in the proposed paragraph into separate requirements.

In paragraph (c)(8)(i), OSHA is requiring that the host employer inform the contractor that the workplace contains permit spaces, and that entry into those spaces is allowed only through compliance with a permit space program meeting the requirements of this standard. This very basic information would have been required to be provided to contractors in any case, under the proposed provision to provide "all available information"; but OSHA has decided, in order to eliminate any confusion or misunderstanding, to specifically require the host employer provide it to the contractor.

This is the type of approach taken throughout final paragraph (c)(8)—OSHA has provided more specific language with respect to what is

required, as opposed to the relatively open-ended general language contained in the proposal. The Agency believes that this approach is responsive to the comments received on proposed paragraph (c)(10) and that the final provisions give better guidance to employers as to what is expected in terms of compliance.

In paragraph (c)(8)(ii), OSHA is requiring the host employer to provide the contractor with the elements (the hazards posed by and the host employer's experience with the space) that indicate that the space in question is a permit space. This provision does not require a host employer to make a detailed investigation of any permit spaces, but merely to provide to the contractor whatever information the host employer used in identifying a permit space.

In paragraph (c)(8)(iii) of the final rule, OSHA is requiring the host employer to apprise the contractor of the precautions or procedures, if any, that the host employer has implemented for the protection of employees in or near permit spaces where contractor personnel will be working.

OSHA considers that the information required from the host employer, clearly set out in paragraphs (c)(8)(i) through (c)(8)(iii), is the minimum needed by a contractor to perform permit space entries at a host employer's workplace. This is the same information that the Agency would have required under proposed paragraph (c)(10), but it has been presented in a more precise manner. Except for the open-ended nature of proposed paragraph (c)(10), there was no substantive objection to the provision itself.

OSHA has included paragraphs (c)(8)(iv), (c)(8)(v), and (c)(9) in the final rule to further address the relationship between the host employer and the contractor. These provisions, which have no counterparts in the proposal, cover coordination of efforts to provide safe permit space entry operation and the exchange of information between the host and the contractor. They are also a direct outgrowth of the recognition, as reflected in the record, that coordination between host employers and contractors is essential to the safety of all employees who must enter permit spaces.

Various witnesses and commenters (Ex. 14–63, 14–111, 14–124, 14–147) recommended that additional coordination between host employer and contractor was desirable (see the previous discussion of paragraph (c)(8)). With respect to this question, some commenters (Ex. 14–63, 14–178, 14–183, 113, 138) recommended that the rule address the responsibilities of contractors in more detail. For example, the State of Maryland's Occupational Safety and Health Program (Ex. 14–63) stated: "Maryland strongly recommends that ... consideration be given to expanding Section (c)(10) to more clearly define the role of the contractor. Although (c)(10) indicates to the 'host employer' that he/she has obligations to the contractor, the obligations of the contractor are not clearly defined." The State of Maryland concluded that the contractor's obligation to comply with §1910.146, which was clearly noted in the preamble to the NPRM (54 FR 24091) should be made explicit in the standard as well.

Another commenter (Ex. 14–111) suggested that proposed paragraph (c)(10) require contractors to comply with all provisions of §1910.146 and that contractors be required to "... obtain all relevant information from the host employer regarding specific workplace hazards that could only be recognizable by the host employer." The commenter suggested that the host employer, in turn, be required to "provide the relevant information to the contractor."

Another rulemaking participant (Ex. 14–124) noted, however, the lack of information a host employer may have, as follows:

> ... OSHA should recognize that the owner/operator may not have expertise in confined space entry and may only be able to provide the contractor with a list of chemicals, their MSDSs and physical information on the confined space. The owner/operator may be hiring an experienced contractor to perform the work precisely because he recognizes that he does not have the expertise to perform the task safely. In such a situation, the owner could not be expected to advise the contractor.

This commenter recommended that OSHA revise proposed paragraph (c)(10) to require that contractors communicate and coordinate with host employers as necessary to comply with proposed paragraphs (c)(1) through (c)(9) and to provide that the host employer's failure to provide information requested by the contractor does not relieve the contractor from the requirement to comply with the standard.

OSHA has decided that the regulatory burdens placed upon host employers concerning permit space entry in paragraph (c)(8) of this final rule should also be placed upon contractors where applicable. Therefore, the Agency is including new paragraph (c)(9) in the final rule to address the duties of the contractor with respect to safe permit space entry operations. OSHA believes that these additional requirements will contribute significantly to the increased safety and health of host employer and contractor employees where such employees are involved in permit space entry operations.

Paragraph (c)(9)(i) of the final rule is the corollary of paragraph (c)(8)(ii) and requires that the contractor obtain any available information concerning permit space hazards and entry operations from the host employer. As noted earlier, this exchange of information should help the contractor to anticipate the permit space hazards that may be present during entry.

Numerous witnesses at the hearings commented about the host employer-to-contractor relationship. The opinion was virtually unanimous that coordination, including coordination of joint permit space entry operations between the two employers, was essential (Ex. 138; Washington Tr. 540; Houston Tr. 632, 724, 780; Chicago Tr. 302). These hearing participants argued that it is vital that each employer be aware of the other's tasks and work procedures.

Some who testified (Washington Tr. 418) felt strongly that contractors should be required to comply with the host employer's entry program, because they have observed cases where the contractor either had an inadequate program or no program at all. In their written comment (Ex. 14–188), the American Petroleum Institute (API) complained that proposed paragraph (c)(10) might be construed to prohibit a host employer from requiring a contractor to use the host's permit program. API recommended in its post-hearing comment (Ex. 113) that contractors, to minimize confusion and possible misunderstanding, adhere to the host employer's permit program when employees of each employer simultaneously conduct entry operations, stating:

> Often, contractors and the host employer's employees enter the same confined space to perform work activities. Confusion and misunderstanding could result if such a space is subject to two or more confined space programs. It is preferable in such a situation for a single confined space program to govern. Usually the host employer is in the best position to understand the hazards, and require a uniform plant-wide procedure for confined space entry.

Another commenter (Ex. 14–86) also expressed concern about situations in which both host employers and contractors have employees working in permit spaces. The commenter suggested that the standard allow contractors either to develop their own permit space programs or adopt the program used by the host employer. Additionally, this rulemaking

participant testified (Houston Tr. 781) that "[s]uch flexibility is needed to accommodate the wide variety of experience levels among contractors regarding confined space work and the wide variety of tasks required."

Some rulemaking participants (Ex. 14–131, 14–138, 117; Washington Tr. 359–360), representing companies who inspect boilers and pressure vessels, stated that proposed paragraph (c)(10) should require host employers to take all measures necessary to render permit spaces safe for entry and, where possible, "low-hazard" before having contractors enter those spaces. One witness stated (Washington Tr. 360), "Such a requirement would not put an additional burden on the host employer, while it would provide the most effective means of protecting the safety of our employees and those of other contractors or similar employers." The Factory Mutual Engineering Association, an organization whose employees are required to enter confined spaces owned and controlled by other employers, recommended in its post-hearing comment (Ex. 117) that host employers be given virtually all responsibility for testing and preparation of a permit space for entry by contractors, unless the host's employees never enter the permit spaces.

OSHA agrees with the testimony advocating coordination between the host employer and contractor and has included paragraphs (c)(8)(iv), (c)(9)(ii), and (d)(11) in the final rule to require such coordination. Paragraph (d)(requires employers to coordinate entry operations when employees of more than one employer are working simultaneously as authorized entrants in a permit space, so that employees of one employer do not endanger the employees of any other employer. This provision applies generally to all multi-employer permit space entry operations, so as to address the relevant hazards under the variety of conditions actually encountered. The hazards of multi-employer permit space entry operations exist whether or not one of the employers acts as a host employer.[16] Therefore, OSHA has adopted paragraph (d)(11) to cover coordination among all employers whose employees are present during entry operations. Paragraphs (c)(8)(iv) and (c)(9)(ii) direct the host employer and contractor, respectively, to the basic requirement for coordination of efforts to protect employees from permit space hazards. This coordination should include a determination of what permit program is to be used by the contractor. The final rule does not prohibit the host employer from requiring a contractor to use the host's permit program, nor does it require the contractor to use the host's program. The host employer may choose to condition its contract on the contractor's compliance with the host's program, as is often the case in the petrochemical industry.

While OSHA agrees that a specified division of responsibilities may be appropriate in some cases, it may not be so in others. The rulemaking record indicates that there is a wide range of circumstances in which contractor personnel enter permit spaces. There are circumstances in which contractors set up complete permit space programs at host employers' workplaces, and there are situations in which both contractor and host employer employees are working side-by-side in a permit space. For example, one commenter (Ex. 14–63) stated, "... the general industry employer often will leave to a contractor the job of cleaning, repairing and maintaining confined spaces, such as tanks, vaults and vessels."

Because of this, OSHA believes that flexibility is necessary and that the host and contractor should cooperate and should make arrangements to implement a permit program best suited to their particular situation. The final rule provides this flexibility.

Paragraph (c)(8)(v) of the final rule requires the host employer to debrief the contractor at the end of entry operations concerning any hazards confronted or created during entry operations. Paragraph (c)(9)(iii) of the final rule requires the contractor to inform the host employer of the permit program followed and of any hazards confronted or created in permit spaces. These provisions had no counterpart in the proposal.

During the hearings several witnesses were asked, because they had complained about poor contractor performance and lack of accountability, if they would favor a provision in the final rule requiring contractors to report back to the host employer concerning any problems encountered, and procedures used, during permit entry operations. Many witnesses (Washington Tr. 420; Houston Tr. 743–744; Chicago Tr. 158) agreed that such a provision would be desirable. For example, in its post-hearing comment (Ex. 119), Texaco stated:

> The contractor should be required to notify the host in case of a hazard development in order that steps may be taken for: protection of personnel, protection of personnel possibly in adjacent facilities, protection of equipment and adjacent equipment (that is, if a hazard develops, then not only could the contractor be affected, but the adjacent host's employees and equipment as well). The host must be informed in order to investigate and take corrective action if warranted.

The Agency agrees that the host employer needs to be informed of the permit space program the contractor is using. This information will enable the host employer to take steps to coordinate its efforts to protect employees from permit space hazards with the contractor. Additionally, it is necessary for the host employer to receive information on any hazards found or created within the space during entry operations in order to enable the host employer to deal with these hazards during the current entry and to take measures to control them in subsequent entries. Additionally, the host employer will have this information available to assist future contractors who may be called upon to perform permit space entry. OSHA has therefore added a provision, paragraph (c)(9)(iii), that requires contractors to inform host employers of the permit program followed and of any hazards confronted or created in the permit space during entry operations. To help ensure that such information is provided to the host employer, OSHA has included a requirement in the final rule, paragraph (c)(8)(v), that the host employer debrief the contractor at the conclusion of entry operations, seeking the same information that the contractor is required by paragraph (c)(9)(iii) to provide the host employer. This exchange of information is thus required by OSHA of both host employer and contractor.

Paragraph (d), Permit space entry program.

As noted previously, requirements proposed in paragraph (c) that related to the permit space program have been included in paragraph of the final rule. The Agency believes that separating general provisions from requirements pertaining only to the program will make the final standard more understandable. Accordingly, paragraph (d) sets forth requirements for the design and implementation of permit-required confined space programs. The Agency notes that, except insofar as paragraph (d)(2) allows employers to defer hazard evaluation until actual entry operations are planned, employers are expected to begin developing their permit space

[16] A manhole that is shared by two utility companies (gas and water, for example) is one case in which neither employer may be considered the host employer. If employees of both employers are present, but neither employer acts as the host, paragraph (d)(11) would still require coordination of permit space entry operations.

programs (such as arranging for designation and training of personnel to be involved in entry operations and for rescue and emergency services) when they identify permit spaces that are to be entered by their employees. The Agency observes that an employer who waits until the last minute before entry operations begin to develop an permit space program is unlikely to have properly trained and equipped personnel available. Paragraph (d) sets forth requirements for planning of entries, so that by the time entry begins all of the program elements are in place and entries are conducted safely.

The introductory text of paragraph (d) provides that, under the permit-required confined space program required by paragraph (c)(4) of final §1910.146, the employer must comply with all the rules given in the remaining paragraphs of paragraph (d). The introduction serves merely to introduce the list of duties of an employer under a permit space entry program.

Paragraph (d)(1) of the final rule requires the employer to implement measures necessary to prevent unauthorized entry. This provision corresponds to proposed paragraph (c)(5). As noted previously, OSHA believes that it is very important to prevent unauthorized access to permit spaces. The rulemaking record demonstrates that such entry is frequently fatal.

Some commenters (Ex. 14–124, 14–130, 14–163, 14–189) argued that proposed paragraph (c)(5) was unnecessary, because proposed paragraph (c)(4) covering the posting of warning signs provided sufficient protection.[17] For example, Amoco Corporation (Ex. 14–124) stated:

> We do not think that it is necessary to post signs *and* provide barriers in lieu of training to restrict unauthorized entry. The employer should have the option of using either signs or barriers depending on the conditions. Therefore, we suggest that the phrase, 'signs and barriers' should be replaced by 'signs or barriers.' [Emphasis supplied in original.]

Similarly, another commenter (Ex. 14–163) found the two proposed provisions redundant, as follows:

> I find paragraphs (c)(4) and (c)(5) to be redundant. Both of these issues could be dealt with in one paragraph. Perhaps, (c)(4) could read: "Information. shall post signs near permit spaces to notify employees what hazards may [be] present and that only authorized entrants may enter the permit spaces. Training and, as necessary, signs or barriers shall be used to prevent unauthorized entry into permit spaces."

Monsanto Company (Ex. 14–170), on the other hand, supported proposed paragraph (c)(5), stating:

> Again, an important element in a successful confined space entry program is training in the recognition of confined spaces and the potential hazards. As OSHA acknowledges in the next definition, (c)(5), training is an alternative to posting signs and barriers.
>
> Paragraph (c)(5)—Monsanto supports OSHA's proposal to use training or other forms of warning as equivalent means for preventing unauthorized entry into confined spaces.

Some commenters (Ex. 14–68, 14–173) felt that OSHA's proposal was too weak in this area. They felt that training and signs would not prevent employee entry into permit spaces. For example, the Quaker Oats Company (Ex. 14–173) argued:

> These sections address notification (with signs) to employees that hazards exist and that only authorized entrants may enter the permit space. Paragraph (c) (5) additionally requires training *or* signs and barriers as a means of preventing unauthorized entry. We feel that these paragraphs can be combined and strengthened.
>
> We recommend that all permit spaces be posted, notifying employees that hazards may be present and only authorized entrants enter. These signs would be appropriate postings during non-entry times and during the permitted entry. All employees should be instructed as to restricted areas, and confined spaces should be secured whenever feasible with positive barriers such as locks. [Emphasis was supplied in original.]

Another commenter (Ex. 14–68) also contended that the proposal would not provide effective protection, as follows:

> Training is *not* an effective means of preventing unauthorized entry nor is a posted sign. The use of the conjunction, 'or,' in the proposed standard leaves the employer a choice among providing a positive denial of entry provision such as a locked barrier, posting a warning sign or providing training. There should be no doubt that the first choice will usually be 'training,' such as, 'Don't go in there.' At most, a sign may be posted to supplement the instructions. These precautions are so inadequate as to be no precaution. [Emphasis was supplied in original.]

OSHA believes employees need to be informed of the hazards of permit spaces (paragraph (c)(2)) and need to be protected again the hazard of accidental entry into these spaces (paragraphs (c)(3) and (d)(1)). In the proposal, these two considerations were addressed in paragraph (c)(4), *Employee information*, and in paragraph (c)(5), *Prevention of unauthorized entry*, respectively, for employers whose employees would be entering permit spaces. In the final rule, these two considerations are addressed in paragraphs (c)(2) and (d)(1), respectively, for these same employers.

Normally, training and signs are methods of informing employees of the presence and hazards of permit spaces, and they do little to prevent unauthorized access. However, if the workplace is so configured as to prevent access of unauthorized entrants into areas containing permit spaces, training, alone or in combination with signs, may prevent the unauthorized access to the spaces. Otherwise, covers, guardrails, fences, or locks will be necessary. It is the employers responsibility to use whatever measures are necessary to prevent unauthorized entry.

Additionally, OSHA intends this provision to require the employer to take administrative measures to ensure that all entries into permit spaces are authorized entries. Unauthorized entrants are hazards to themselves and to other personnel, because they expose themselves to permit space hazards without the necessary equipment or training. Furthermore, they disrupt entry operations, jeopardizing the safety of personnel who are working in the space or who are sent in to rescue or remove them from the space. The Agency believes that many of the permit space accidents documented in the rulemaking record resulted from an overly casual attitude about the authorization of entry.

Paragraph (c)(5) of the proposal was designed to underscore the importance of allowing employees to enter permit spaces only after the employer has taken the measures necessary for safe entry. However, in view of the wide variety of possible permit spaces and assortment of protective techniques, the Agency is adopting a performance-oriented approach to this provision in the final rule. The examples given in proposed paragraph (c)(5) have not been carried forward, and paragraph (d)(1) in the final rule simply requires employers to take whatever steps are necessary to prevent unauthorized employee into permit spaces. This approach will provide the flexibility employers need to provide the most effective protection for their employees.

Paragraph (d)(2) of the final rule requires the employer to identify and evaluate the hazards of permit spaces that employees will enter before they actually do so.

This provision corresponds to paragraph (c)(1) of the proposal, which read as follows:

> [The employer shall i]dentify and evaluate each hazard of the permit spaces, including determination of severity;

[17] See the summary and explanation of final paragraph (c)(2) earlier for a discussion of the issues regarding informing employees about the presence and hazards of permit spaces.

Many commenters (Ex. 14–86, 14–88, 14–124, 14–143, 14–150, 14–177, 138) complained that the phrase "including determination of severity" was ambiguous and unneeded. In its comment, Organization Resources Counselors, Inc. (Ex. 14–143) stated:

> It is difficult to understand what OSHA intends that the employer do relative to making a "determination of severity". Neither the standard, nor the preamble, offer guidance on what this phrase means or what additional action or information should be secured by the employer under his permit required confined space program. The extensive definitions of hazardous atmosphere, IDLH, immediate-severe health effects, permit required confined space, low hazard permit space, etc., provide sufficient guidance in evaluating the hazards of a space without the need for this ambiguous phrase, therefore, we recommend that it be deleted.

Another commenter, API (Ex. 14–168), stated:

> API agrees in general with this item, but the requirement for 'including determination of severity' is undefined, impractical, and totally unnecessary, given the extensive definitions of hazardous atmosphere, IDLH, immediate severe health effects, permit required confined space, and low-hazard permit space. These definitions, woven into the employer's entry permit program, ensure adequate protection without the additional ambiguous burden of 'including determination of severity'. The preamble offers no guidance on interpreting this requirement. The phrase should be deleted.

OSHA agrees that the phrase is unnecessary and possibly confusing. Specifically, the Agency concurs with the Texas Chemical Council (Ex. 14–86), who stated:

> By definition a confined space entry has the potential for the most severe penalty—death. Therefore, to define determination of severity as death under hazard identification would not be productive nor necessary for industry.Therefore, the proposed phrase "including determination of severity" has not been carried forward into the final rule.

Some commenters (Ex. 14–94, 14–118, 14–157, 14–170, 14–176) expressed concern over when OSHA expected employers to identify and evaluate hazards to comply with proposed paragraph (c)(1). For example, The Department of the Navy (Ex. 14–91) stated:

> It is important to identify and evaluate the hazards of permit spaces, and this must be done prior to entry. Is the intent of this section to require an initial facilities inspection for permit spaces or to require inspection and evaluation as work occurs? If initial facilities inspections are required, how soon must they be completed?

CMA (Ex. 14–118) had a similar concern, saying:

> The Hazard Identification section, 29 C.F.R. 1910.146(c)(1), appears to require an initial grand survey of workplaces to identify confined spaces and an analysis of the severity of their hazards. CMA members believe very strongly that this approach is misguided and could contribute to the very hazard this standard is designed to reduce.
>
> OSHA's proposed approach would be reasonable in a static work environment. Today's business environment in the chemical industry and many others is a dynamic one. Manufacturing equipment and processes are designed to be flexible to adapt to rapidly changing product demands. Consequently, the confined space hazards in this dynamic environment are also in a state of flux. The most effective approach to hazard identification will take into account the dynamic nature of today's workplace.

Still another commenter (Ex. 14–176) agreed with this assessment, explaining:

> The potential hazard of each [permit space] will depend upon the last contents and this may change frequently in batch operations. The nature and severity of the potential hazard can only be determined just prior to actual entry into the confined space.

Paragraph (c)(1) of the NPRM would have applied only to employers whose employees would enter permit spaces. Those employers would have been the ones to develop and implement a permit program. Moreover, OSHA expected that the detailed hazard identification required by proposed paragraph (c)(1) need only be performed if actual entry into a permit space was contemplated. OSHA did not intend that the hazard identification required by proposed paragraph (c)(1) be performed as part of the initial determination of the presence or lack of permit spaces in the employer's workplace under the introductory text of proposed paragraph (c). (A discussion of the initial determination of whether or not the workplace contains permit spaces is contained under the discussion of final paragraph (c)(1) earlier in this section of the preamble).

The Agency notes that the identification of a permit space inherently involves the identification of a hazard (at least in broad terms). OSHA expects that the general information obtained through compliance with paragraph (c)(1) of final §1910.146 will facilitate compliance with paragraph (d)(2). Identification of the hazards (so that entry can be safely planned for and authorized) need only be undertaken before entry—when the entry permit is being prepared. In order to make this clear in the final rule, paragraph (d)(2) specifies that the hazards be identified before employees enter the permit space.

OSHA anticipates that employers will identify and evaluate permit space hazards as necessary for development of permit space programs. For example, the Agency expects that employers who conduct frequent entries into permit spaces will be identifying and evaluating permit space hazards at the same time they are identifying permit spaces. On the other hand, OSHA understands that employers may not need to identify or evaluate the hazards of permit spaces that are entered at 5- or 10-year intervals until several years after the identification of those spaces. In the interim, since there are no authorized entries into those spaces, the program would only require that unauthorized entries be prevented. The hazards in the spaces need only be evaluated in detail some time before entry (for example, when the entry permit is prepared). The final rule makes this clear—the basic identification of permit spaces required by paragraph (c)(1) of the final rule must be performed by the effective date of the final rule; the evaluation of the specific hazards posed by permit spaces identified under paragraph (d)(2) is required "before" entry.

Paragraph (d)(3) of the final rule requires the employer to establish the means, procedures, and practices necessary for safe permit space entry operations. This requirement has been taken from proposed paragraph (c)(2).

In reaction to the general nature of the language contained in proposed paragraph (c)(2), the State of Maryland Occupational Safety and Health Program (Ex. 14–63) stated "Although industries currently using permit entry may be familiar with these requirements, an employer to whom all of this is new will never know what to do without further guidance." They noted that, as indicated in the preamble to the NPRM (54 FR 24090), the identification of hazards does not protect affected employees during entry if the employer does not follow through with the necessary hazard controls. The State recommended that OSHA include a list of measures that would be required for hazard control.

The Agency agrees that the standard should provide some indication of the types of measures that employers will be required to take to control permit space hazards. Given the variety of permit space configurations and hazards, as well as the Agency's policy favoring performance-oriented standards, OSHA has added a list of control measures for use in permit space programs. The list,[18] which is not meant

[18] The list of control measures was taken from provisions in the final rule or the proposal, as identified in the brief discussion of each measure.

to be all inclusive, lists the common types of general control methods used to ensure safe permit space entry, as follows:

(1) *Specifying acceptable entry conditions.* This control measure ensures that the employer has identified the hazards that could reasonably be expected to be found in the space and has limited entry conditions to those that are safe for entry. For example, if a space could contain a flammable gas, the employer would set a limit of 10 percent of the LFL of the gas [19] as an entry condition. This would ensure that a flammable mixture is not present upon entry into the space. (See the summary and explanation of paragraph (f)(9), which requires the entry conditions to be specified on the entry permit, for a fuller discussion of acceptable entry conditions.)

(2) *Isolating the permit space.* The permit space must be isolated from serious hazards. For example, if energized parts of electric equipment are exposed, the circuit parts must be deenergized and locked out in accordance with §1910.333(b). Mechanical equipment posing a hazard within the space must be locked out or tagged in accordance with §1910.147 or guarded in accordance with Subpart O of the General Industry Standards. Chemical or gas lines that are open within the permit space must be isolated by such means as blanking or blinding, misaligning or removing section of lines, pipes, or ducts, or a double block and bleed system. (See the summary and explanation of paragraph (f)(8), which requires the isolation measures used to be specified on the entry permit, and the definition of "isolation" for a fuller discussion of isolation.)

(3) *Purging and ventilating the atmosphere of the space.* If the atmosphere of a permit space is IDLH, it must be made safe for employees to enter. This is accomplished by ventilating the atmosphere, after purging if the space is a flammable liquid container or if purging is otherwise necessary, before an employee enters the space. This cleans the air within the permit space so that it is no longer IDLH and, thus, safe for employees to breathe. (See the summary and explanation of paragraph (f)(8), which requires the hazard control measures, such as purging and ventilation of permit-required confined spaces, to be specified on the entry permit, for a fuller discussion of purging and ventilating permit spaces.)

(4) *Barriers.* Barriers must be provided around the permit space opening for two reasons: (1) to prevent unauthorized entry into the space [20] and (2) to protect employees inside the space from objects and persons outside the space. Paragraph (d)(3) requires barriers whenever they are necessary to protect employees within the permit space. If entrants face a substantial risk of injury due to unauthorized entry, due to objects falling into the space, or due to vehicular hazards during entry into and exit from the space, then barriers would be required. (See the discussion of proposed paragraph (c)(9), which would have required the use of barriers and which has not been carried forward into the final rule, later in this preamble.)

(5) *Testing and monitoring.* The employer must ensure that conditions in the permit space are acceptable for entry throughout the duration of entry operations. This is accomplished through the use of test instruments to monitor the atmosphere within the space, the use of ventilation to maintain a safe atmosphere, and the use of inspections to ensure that isolation is being maintained for the space. (See the summary and explanation of paragraphs (d)(5) and (f)(10), which relate to the testing and monitoring of permit-required confined spaces, for a fuller discussion of testing and monitoring conditions within these spaces.)

Paragraph (d)(4) of the final rule requires the employer to provide the equipment necessary for safe entry into and rescue from permit spaces at no cost to employees, to maintain that equipment properly, and to ensure its proper use by employees.

This provision has been taken from paragraph (c)(7) of the proposal, which read as follows:

> [The employer shall p]rovide, maintain and ensure the proper use of the equipment necessary for safe entry, including testing, monitoring, communication and personal protective equipment;

One commenter (Ex. 14–86) argued that the equipment listed in this proposed paragraph was not always necessary. The commenter recommended revising the rule to make this clear.

OSHA has adopted language in paragraph (d)(4) of the final rule that clarifies the intent of this provision. The rule now requires the employer to provide the equipment necessary for safe entry into and rescue from [21] permit spaces, as well as maintain it and ensure its safe use. The list of equipment contained in the proposal has been revised to indicate that these are among the types of equipment covered by the rule, with an indication of when each type of equipment would be necessary. Also, the equipment list has been expanded by adding ventilating, lighting, rescue, barriers, and ingress and egress equipment. These are the types of equipment normally expected to be used in permit entry operations.

In Issue 4 of the hearing notice (54 FR 41462), OSHA asked several questions concerning the accuracy of monitoring and testing devices, which might be affected by humidity or other factors. OSHA requested information on the reliability, or lack thereof, of test instruments under adverse conditions. OSHA also asked which types of devices cause the most problems, and which the least, as well as what the specific problems were and when they most often occur.

One commenter had expressed concern about the accuracy of test instruments prior to publication of the hearing notice (Ex. 14–70), but did not speak directly to the questions asked in Issue 4. Another commenter, the Johnson Wax Company (Ex.14–222), submitted a comment after the hearing notice had been published and which responded directly to Issue 4. Johnson Wax noted that the accuracy of oxygen meters was affected by altitude, in that the meters would give increasingly lower readings as the altitude increased. They also noted that oxygen meters must be allowed to "acclimate" in very cold or very humid situations.

Johnson Wax also stated that combustible gas meters had the same problems as oxygen meters, with the additional problem of degradation in the presence of chlorinated solvent or silicon fluid vapors. Lastly, Johnson Wax emphasized the importance of calibrating combustible gas meters using the gas expected to be present in the confined space. According to the commenter, calibration with a gas not encountered would result in an inaccurate reading.

In the Washington, D.C. public hearing, Mr Robert Gilardi of the

For a discussion of the comments on the individual control methods, see the summary and explanation of the relevant paragraph later in this preamble.

[19] See the definition of hazardous atmosphere for the source of the 10 percent limit.

[20] Barriers for this purpose are not addressed by paragraph (d)(3), which treats entrant safety; they are addressed by paragraph (d)(1), which treats safety for unauthorized employees.

[21] Rescue equipment is mentioned in final §1910.146, though it was not in proposed paragraph (c)(7). In the proposal, this equipment was specifically addressed under paragraph (c)(8). The Agency decided that it would be clearer if all equipment associated with entry operations was addressed in a single provision. The remainder of proposed paragraph (c)(8), on rescue procedures, has been retained in paragraph (d)(9) of the final rule.

Compressed Gas Association (CGA, Washington Tr. 456) gave his opinion of the accuracy of testing and monitoring devices used by CGA:

> We feel that the accuracy of the instruments is very adequate and, in addition, they're calibrated before they're used. For example, without mentioning commercial names, there are small oxygen analyzers that are used by the commercial diving industry that are very accurate and they're a fairly low cost item.

The National Institute for Occupational Safety and Health (NIOSH) submitted a very helpful and detailed discussion of hearing Issue 4 in its post-hearing comment (Ex. 134). NIOSH discussed the effects of high relative humidity, altitude, and ambient temperatures on oxygen monitors, concluding that such monitors are significantly affected by high humidity only at levels exceeding 90% relative humidity, that most oxygen monitors automatically compensate for changes in temperature,[22] and that the effect of atmospheric pressure changes on oxygen monitors can be significant if they are not calibrated at the ambient pressure in which they will be operated.

NIOSH also tested combustible gas meters, concluding that the variations found were within acceptable limits. NIOSH did not test combustible gas meters for accuracy in varying pressure and temperature environments, but stated that such meters should not be significantly affected by these changes.

Regarding the use of specific material monitors (such as those for CO, CO_2, SO_2, and H_2O), NIOSH recommended adherence to manufacturer's instructions concerning temperature limits, relative humidity ranges, and any known chemical interferences. The NIOSH comment also contained information and recommendations concerning non-specific monitors.

NIOSH concluded its comment with recommendations concerning the care of batteries used in monitors and a strong emphasis on the proper calibration and maintenance of monitoring equipment. NIOSH also concluded that operator training and skill levels are very important factors to be considered in the monitoring of workplace atmospheres, to the extent that such monitoring cannot be effectively accomplished without a trained and skilled operator.

OSHA has concluded, based upon the information received in response to the questions asked in hearing Issue 4, that the accuracy of testing and monitoring equipment may be significantly affected under certain conditions of humidity, pressure, or temperature or by the presence of interfering chemicals. However, if the equipment is properly selected, calibrated, and maintained and if it is operated by well trained employees, the testing and monitoring needs for entry and work in permit-required confined spaces can be effectively met.

Paragraph (d)(5) of the final rule requires employers to evaluate permit space conditions when conducting entry operations. This paragraph also sets forth specific requirements for testing conditions within the space to ensure that hazards inside the space are eliminated or controlled. This entire paragraph is new, except for paragraph (d)(5)(iii), which pertains to the proper sequence for testing for atmospheric hazards and which was taken from proposed paragraph (i)(1)(ii).

The State of Maryland (Ex. 14-63) criticized proposed paragraph (c), covering the permit-required confined space program, in the following manner:

> It does not appear to require that any protective action be taken! All the employer would have to do is have a permit that covered these things.... For example, without the implementing language, for item (c)(1) all the employer would have to do is make a list.They went on to state:
>
> Actually the low hazard permit space requirements are more clearly spelled out in section (i) than high hazard requirements are in (c) (2).
>
> (c)(2) could benefit from the testing language in [(i)](1)(ii).

Several commenters (Ex. 14-68, 14-116, 14-147) stressed the importance of testing in the determination of acceptable entry conditions within a permit space before entry and during work inside the space. For example, one rulemaking participant (Ex. 14-147) stated:

> Prior to entry, atmospheric testing would have to be performed to ensure that the conditions under which the permit was originally issued had not changed. This is an essential requirement of ensuring that the confined workspace is safe to enter.

Several more commenters (Ex. 14-63, 14-123, 14-154) specifically recommended placing requirements relating to testing in the general paragraph (proposed paragraph (c)). Typical of these, Boeing Support Services (Ex. 14-154) stated:

> Specific references to instruments for testing procedures and to testing and ventilation requirements are stated only in the low-hazard portion. These references need to be given in the main text as well, which has only nonspecific references...

The proposed rule required evaluation of permit space conditions in an indirect way (as, for example, in proposed paragraph (d)(2)(v), which provided that the entry permit specify the testing and monitoring procedures to be used); but, as Maryland has stated, the proposal never specifically and directly required testing. OSHA agrees with the State's and other's criticisms in this regard and has included paragraph (d)(5) in the final rule to address this concern. Paragraph (d)(5) contains language that clearly requires the employer to evaluate permit space conditions before and during entry operations and that sets forth the elements of that evaluation.

Paragraph (d)(5)(i) of the final rule requires the employer to test conditions in the permit space to determine if acceptable entry conditions exist before entry is authorized to begin. As previously noted this testing is important to detect any hazardous atmosphere or other hazards that may be present in the permit space. However, if isolation of the space is infeasible because the space is large or is part of a continuous system, the employer must perform pre-entry testing to the extent feasible before authorizing entry and, if entry is authorized, must continuously monitor entry conditions in the areas where authorized entrants are working.

The type of testing that needs to be performed is dependent on the hazards that are present within the space. For permit spaces posing atmospheric hazards, atmospheric testing would be necessary. For other hazards, different tests will be necessary. For example, if the permit space poses thermal hazards, the temperature within the space would need to be tested. Paragraph (d)(5)(i) requires the employer to conduct whatever tests are necessary to ensure that acceptable entry conditions are present.

Because sewers and similar permit spaces are large, continuous systems, conditions encountered at the point of entry may not be indicative of conditions at distances further from the point of entry. Also, since the space usually cannot be effectively isolated, conditions at any particular point in the space may deteriorate suddenly due to the introduction of a material from another point in the system that creates a hazardous environment for the entrants. Under these conditions, pre-entry testing often will not detect such hazards, and the need for continuous atmospheric monitoring becomes paramount. Atmospheric monitoring is necessitated virtually from the time pre-entry testing is done until the last entrant leaves the permit space. Because of these conditions, the procedure for authorizing entry into sewers has

[22] For best results, NIOSH recommends calibration of oxygen monitors at the temperature at which it is to be operated.

evolved so that authorization is usually granted immediately before entry. In their testimony, the Service Employees Union indicated that their members who work in sewers do perform pre-entry testing, usually with a 12 to 18 inch or longer wand attached to the test instrument (Washington Tr. 403, 404). They also indicated that entrants wear monitoring equipment at all times (Washington Tr. 434) after they have entered and as they perform entry operations within the permit space.

Paragraph (d)(5)(ii) of the final rule requires permit spaces to be tested or monitored, as necessary, to determine if acceptable-entry conditions are being maintained during the course of entry operations. This provision is derived from paragraph (d)(2)(v) of the proposed rule, which would have required that the procedures and equipment necessary for such testing or monitoring be placed on the permit. Such testing or monitoring would thus have been required by the proposal, but only in an indirect way. (See the preceding discussion of final paragraph (d).) To eliminate any possible doubt or confusion regarding this matter, appropriate testing or monitoring during the course of entry operations is specifically required by this final rule. This provision requires whatever periodic or continuous monitoring would be necessary to protect employees. For example, as noted earlier, sewer entry operations preclude complete pre-entry testing, and continuous monitoring is necessary to assure the safety of sewer workers. Paragraph (d)(5)(ii) of the final rule would require this continuous monitoring to be performed.

Paragraph (d)(5)(iii) of the final rule specifies the proper sequence to be used when permit spaces are tested for atmospheric hazards. This provision requires employers to test first for oxygen, then for combustible gases and vapors, and then for toxic gases and vapors.

This requirement has been taken from paragraph (i)(1)(ii) of the proposal. Proposed paragraph (i) only applied to entry into "low hazard" permit spaces. However, since the proper sequence for testing for atmospheric hazards should be the same regardless of the characterization of the permit space, this provision should be applied equally to all permit entries. By placing this provision in paragraph (d) of final §1910.146, which applies generally, the proper sequence of testing for atmospheric hazards is assured for all types of permit-required confined spaces. Paragraph (d)(5)(iii) reflects generally accepted safe work practice, as adopted in Section 6.1 of ANSI Z117.1 (Ex. 14–4, 14–127). As noted earlier, its general application was recommended by several commenters (Ex. 14–63, 14–123, 14–154).

A test for oxygen must be performed first because most combustible gas meters are oxygen dependent and will not provide reliable readings in an oxygen deficient atmosphere. In fact, the Johnson Wax Company (Ex. 14–222) stated that "there is [a] specific (sensor dependent) oxygen level below which the combustible gas sensor will *not* respond at all [emphasis was supplied in original]." Combustible gases are tested for next because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gases.

Additionally, this provision contains a note indicating that atmospheric monitoring in accordance with non-mandatory Appendix B, supplemented by reference to non-mandatory Appendix E for permit space operations in sewers would be considered as satisfying the requirements of this paragraph. OSHA has included these non-mandatory appendices for use by any employers who might not have the resources to design their own atmospheric monitoring programs. The presence of these appendices in the final rule is not intended to restrict an employer's ability to design and implement an atmospheric monitoring program that meets the needs of a particular workplace.

Paragraph (d)(6) of the final rule requires an attendant to be stationed outside a permit space into which entry is authorized for the duration of entry operations. This paragraph has been taken from the introductory text of paragraph (f) of the proposal. OSHA has included a note in the final rule to explain that attendants may be assigned to monitor more than one space and that they may be stationed at any location outside the permit space, as long as they can effectively perform the duties set by paragraph (i) of final §1910.146.

The Agency has determined, based on its review of the rulemaking record, that stationing an attendant to monitor permit space entry is a critical element of an effective permit space program. In particular, OSHA believes that an attendant's ability to communicate with the authorized entrants and with the designated rescue and emergency services maximizes the likelihood that information on hazards arising in permit spaces will be transmitted in time for safe evacuation or rescue of entrants. Because of the importance of the role attendants play in permit space entry operations, OSHA believes that it is necessary to highlight the requirement for their presence outside permit spaces. Therefore, the Agency has placed this requirement in final §1910.146(d), which contains the basic rules on permit- required confined space programs, rather than in §1910.146(i), relating to the duties of attendants. OSHA believes that this stresses the importance of this requirement and that, as a result, employers will be more aware of the need to station attendants outside permit spaces during entry operations.

As noted in the summary and explanation of the definition of "attendant", the proposed definition of this term addressed the number of spaces or entrants an attendant could monitor, providing that an attendant could not monitor more spaces or entrants than specifically authorized by the entry permit. A number of commenters (Ex. 14–28, 14–45) objected to the proposed provision and suggested that OSHA allow the attendant to monitor only one permit space at a time. As a result of these early comments, the Agency listed their concerns as one of the issues in the notice of public hearing (54 FR 41462). In Issue 8 of the hearing notice, OSHA asked if the final rule should limit the number of entrants, entry portals, or permit spaces an employer may assign a single attendant to monitor. OSHA also asked what limits would be appropriate, what criteria should be used by employers in deciding on the number of attendants, and where, in relation to the entry portal, attendants should be stationed.

Several rulemaking participants (Ex. 14–179, 14–200, 14–208, 14–210, 14–215, 142; Washington Tr. 466, 551, 575; Houston Tr. 1057; Chicago Tr. 185, 245, 311, 364, 498, 534, 597, 615) addressed this issue. Some of the rulemaking participants (Ex. 14–210; Washington Tr. 575–576; Chicago Tr. 185–186, 310–311; Houston Tr. 1057) believed that attendants should not be allowed to monitor more than one permit space at a time because if an emergency developed in one space the attendant's attention would be fully taken for that space and the attendant would not be able to monitor other spaces adequately. For example, the Independent Liquid Terminals Association (ILTA, Ex. 14–210) said:

> ILTA still maintains that an attendant must be allowed to monitor only a single entry portal at one time.... How can an attendant monitor an entrant in more than one place? If the entrant's breathing apparatus breaks in any way while the attendant is at another location, how can the attendant respond to the entrant's predicament? In addition, how can the attendant protect the entrant from

external hazards or unauthorized entry if he/she is not present?

Others opposed to the language in the proposed definition (Ex. 14–38, 14–61, 14–63; Chicago Tr. 363) were more concerned that the attendant would be allowed, under a series of permits issued by an employer, to monitor more spaces than he or she can effectively handle. They argued that the standard should limit in some fashion the number of spaces that an attendant would be allowed to monitor. For example, the UAW (Ex. 14–38) stated:

> The statement that the "attendant may monitor not more entrants or more permit spaces than the entry permit specifically authorizes is vague.
>
> This definition could allow an attendant to monitor more spaces than should be safely monitored.

Still others (Ex. 14–200; Washington Tr. 466, 551–552; Chicago Tr. 534) were concerned that the standard retain its flexibility by not specifying a limit on the number of spaces that could be monitored by a single attendant. The Longview Fibre Company's comment (Ex. 14–200) was illustrative of these commenters, as follows:

> If the attendant's responsibility is only to monitor the entry work, and summon a rescue team, but not participate in actual entry for rescue purposes, the attendant should be allowed to monitor as many entries or entry points as is practical based on the work environment, work being performed and method of monitoring, i.e. radio, T.V. camera, handline or voice.
>
> * * * * *
>
> An example of monitoring various points of entry into a confined space would be a power or recovery boiler fire box, a continuous cooking pulp digester or paper machine dryer drums. Although the equipment may be entered simultaneously by various employees from different entry points, the monitoring of any of the crew members may be successfully accomplished by a single attendant. The rescue may be achieved from a common entry point, radio communications may allow for multiple monitoring, and the size of the vessels or confined spaces and/or scope of work may allow for visual monitoring of more than one entry at a time.

In response to the NPRM, another commenter (Ex. 14–34) suggested that OSHA specifically recognize the use of radios so that a single attendant could monitor as many as 32 entrants. Acknowledging the possibility that electronic surveillance and communication equipment could assist attendant in carrying out their duties and might allow the safe monitoring of multiple permit space entry operation by a single attendant, OSHA raised Issue 9, which related to the use of such equipment. In the hearing notice (54 FR 41463), OSHA observed that, if attendants were not permitted to enter permit spaces for rescue purposes, an attendant's chief responsibility with respect to rescue could be to summon the rescue team. In that case, the Agency recognized that the attendant's ability to detect that entrants need help and to summon the rescue team, not the attendant's proximity to the entrants, could be of critical importance. Therefore, OSHA requested information on the issue of whether or not the Agency should permit reliance on electronic surveillance and communication equipment and on how the permit-required confined space standard should treat this equipment.

OSHA received few comments and little testimony concerning this issue. The Longview Fibre Company (Ex. 14–200) had this to say about Issue 9:

> In many confined space entries actual visual contact is not possible due to the size of the particular vessel or complexity of the structure. In such cases, alternate means of communications such as radios may be the only workable alternative.

The Independent Liquid Terminals Association (Ex. 14–210) had this opinion:

> Remote radios would be useful in conjunction with visual observation of the entrant especially in extremely large or dark confined spaces. However, the radios under no circumstances should replace the attendant. Working inside a confined space often requires cumbersome personal protective equipment or other mechanical equipment. Handling a remote radio while wearing industrial rubber gloves would be difficult.

The Amoco Corporation (Ex. 14–215) also believed that electronic monitoring equipment should be permitted, stating:

> We do not believe that the entrant needs to be in direct line of sight of the attendant for effective monitoring.... In such circumstances [line of sight not possible], we use two-way radios to keep the entrants in contact with the attendants and have found this to be an effective monitoring system.... Different types of monitoring equipment will be suitable for monitoring different numbers of entrants safely. Setting an arbitrary upper limit based on the most sophisticated equipment will not be suitable for less sophisticated technologies. Likewise, setting a limit based on a less sophisticated technology will cause underutilization of more advanced technologies. Rather than set an arbitrary upper limit, we believe that the limit should be determined by the capabilities and limitations of the monitoring equipment used as well as other pertinent factors at the site. Therefore, we support a performance oriented approach with the employer making the determination of how many entrants can be safely monitored by an attendant.

In light of the comments and testimony received concerning these two issues, OSHA has decided to expand on the performance- oriented approach taken in the proposal. The final rule has adopted a rule in paragraph (d)(6), under the general provisions for permit-required confined space programs, that requires the employer to provide at least one attendant outside the permit space into which entry is authorized. As noted earlier, this requirement has been taken from the introductory text of proposed paragraph (f). To address the issue of how many spaces an attendant is allowed to monitor, OSHA is including an explanatory note following paragraph (d)(6) to indicate that an attendant can monitor as many spaces as is possible while complying with paragraph (i) of the final rule, which sets forth attendants' duties. The note also indicates that the attendant may be stationed in any position from which he or she can perform the duties required by paragraph (i).[23] The Agency notes that the attendant could be stationed in a control room that allows him or her to monitor entrants remotely. Electronic monitors, television monitors, public address systems, and barricades could be used to assist the attendant in performing duties required under paragraph (i). In addition, OSHA has adopted a provision requiring employers to adopt procedures to enable the attendant respond to emergencies without distraction from his or her responsibilities under paragraph (i). This provision appears in paragraph (d)(7 of the final rule.

In this manner, attendants may monitor no more permit space entry operations than they can safely handle. For example, if the attendant is communicating with authorized entrants by voice contact only, that attendant would not be able to monitor any other permit spaces that were not within voice contact, under paragraph (i)(5). Also, if the number of spaces and the number of authorized entrants are too much for one attendant to keep track of, as required by paragraph (i)(3), then additional attendants would be required. This protects authorized entrants from working in permit spaces that are not being adequately monitored.

On the other hand, this approach also provides the flexibility employers need to protect employees in a manner best suited to their permit space operations.

[23] These duties include keeping an accurate count of authorized entrants, communicating with these entrants, monitoring activities inside and outside the space for hazards, summoning rescue services, and keeping unauthorized persons out of the space.

The final rule allows the use of electronic surveillance and other devices as aids or augmentations to the monitoring process so that the attendant's duties described in paragraph (i) of the final rule can be effectively performed for each permit space being monitored. In most cases, the use of such a device would allow an employer to economize by increasing the number of permit spaces a single attendant could effectively and simultaneously monitor (although OSHA is not permitting the use of such devices to replace an attendant entirely). Additionally, the attendant would normally be stationed near the entry point of the permit space, but the use of an electronic monitoring device makes it possible for an attendant to effectively perform his assigned duties from a remote location. Television monitors, public address systems, and barricades can also be used to assist the attendant in monitoring activities outside the space and in warning unauthorized personnel away from the space.

Paragraph (d)(8) of the final rule requires the employer to designate the persons who are to have active roles in entry operations, to identify the duties of these employees, and to provide such employees with the training required by paragraph (g). This provision addresses such personnel as entry supervisors, authorized entrants, and attendants.

Paragraph (d)(8) in the final rule has been taken from proposed paragraph (c)(6), which would have required the employer to train entrants, attendants, and entry supervisors. Two commenters (Ex. 14–88, 14–163) argued that proposed (c)(6), in conjunction with proposed paragraphs (e) , (f), and (g), were too general in nature. These commenters believed that the regulation should be more specific as to the content of training, the evaluation of the training received, follow up training, and the qualifications of the trainers.

OSHA agrees with these commenters that the training provisions contained in the proposal were too general. Follow up training was not addressed in proposed paragraphs (c)(6), (e), (f), or (g), and the proposal was too vague in certain areas. To address these problems, the Agency has incorporated into the final rule a paragraph dedicated to training requirements—paragraph (g). All the specific training requirements spread throughout the proposed standard have been placed in this one paragraph to provide better guidance as to what is required and to emphasize the importance of training in the permit-required confined space program. (See the summary and explanation of paragraph (g) of the final rule for a detailed discussion of issues related to training.) OSHA has also revised the language proposed in paragraph (c)(6) so that the general program requirement for training to be provided references the specific training provisions in paragraph (g) of the final rule. Paragraph (d)(8) of the final rule also requires the employer to designate which employees will perform the various functions assigned by the standard and to identify their duties under the permit space program. This will enable employers, employees, and OSHA to identify which employees need to receive what training under final §1910.146.

Paragraph (d)(9) of the final rule requires the employer to establish procedures for summoning rescue and emergency services (to rescue entrants from permit spaces and to provide necessary emergency services to rescued employees) and for preventing unauthorized personnel from attempting a rescue. The Agency anticipates that employers will choose between entry and non- entry rescue as part of compliance with paragraph (d)(9) of the final rule.

This provision was taken from proposed paragraph (c)(8), which would have required that procedures and equipment necessary to rescue entrants be provided and implemented. For the reasons noted under the discussion of paragraph (d)(4) of final §1910.146, the Agency has placed the requirements relating to rescue equipment proposed in paragraph (c)(8) under final §1910.146(d)(4), which sets forth requirements relating to all types of equipment used in permit space entry operations. Additionally, although the Agency received no comments recommending the revision of the proposed language, OSHA has adopted wording for this requirement that is different from that in proposed paragraph (c)(8). The final rule clarifies that rescue procedures include procedures both for summoning rescue and emergency services and for preventing unauthorized rescue (that is, rescue by employees who are prohibited by the standard from performing this function).

Paragraph (d)(10) of the final rule requires the employer to establish a system for the preparation, issuance, use, and cancellation of entry permits as required by the standard.

This provision was taken from proposed paragraph (c)(3), on which no substantive comments were received. This requirement in the final rule is essentially the same as proposed paragraph (c)(3), except that "cancellation" has been added as a part of the system of permit use. Cancellation of a permit is required by various provisions in the final standard and is part of the permit's proper use. For further clarification, the language in the final rule replaces the proposed word "proper" (which was ambiguous) with the phrase "as required by this section". The "proper" preparation, issuance, use, and cancellation of permits is spelled out in paragraphs (e), (f), and (j) of final §1910.146.

Paragraph (d)(11) of the final rule requires employers to coordinate entry operations when employees of more than one employer are working simultaneously as authorized entrants in a permit space, so that employees of one employer do not endanger the employees of any other employer. The summary and explanation of this requirement can be found under the discussion of paragraphs (c)(8)(iv) and (c)(9)(ii), addressing the issue of coordination of efforts to protect employees during multi- employer permit space entry operations.

Paragraph (d)(12) of the final rule requires employers to establish the necessary procedures for concluding the entry once entry operations have been completed.

This provision was taken from proposed paragraph (d)(6), which would have required the individual authorizing the entry to cancel the permit after completion of work and after the exit of all entrants, and from proposed paragraph (g)(1)(v), which would have required the person authorizing the entry to take measures necessary for concluding the entry. Although the comments received on the proposal contain no specific recommendations for placing the two proposed provisions among the general requirements, the final rule reflects the Agency's determination that employers need to conduct their entry operations in a carefully planned and systematic fashion from start to finish, so that authorized entrants and other employees affected by entry operations are protected from permit space hazards. In particular, the cancellation of the permit would alert the employer to take the appropriate measures for the shut down of the space, the closing of the entry portal, and the return of the space to normal operating conditions. Without these procedures, employees would be exposed to such hazards as being locked inside the space, accidentally entering the space, and possible fire or explosion when the space is returned to its normal operating mode. OSHA has placed the proposed requirements among the general requirements applying to the overall permit space program in order to alert

employers to the need for planning these procedures before entry into the space.

Final paragraph (d)(12) is effectively identical to proposed paragraphs (d)(6) and (g)(1)(v). Proposed paragraph (d)(6) would have required the cancellation of the permit after entry operations were completed. Proposed paragraph (g)(1)(v) would have required the person in charge of the entry to take measures (such as closing off the permit space and canceling the permit) necessary for concluding the entry once the work authorized by the permit was completed. The requirement proposed by paragraphs (d)(6) and (g)(1)(v) that the entry supervisor actually cancel the permit and execute the shutdown procedures has been retained in the final rule as paragraphs (e)(5) and (j)(3), and the concerns raised by commenters in regards to the two proposed provisions are addressed under the discussion of paragraph (e)(5) of the final standard. Paragraph of final §1910.146 is couched in performance-oriented terms, because the Agency recognizes that the measures needed for compliance with final paragraph (d)(12) will vary from workplace to workplace. The Agency believes that combining and redesignating the language from the two proposed provisions into paragraph (d)(12) of the final rule will clearly indicate the importance of an orderly transition between periods when entry is authorized and periods when entry is not authorized.

While the preamble to the proposed rule (54 FR 24091, 24092) indicated that OSHA expected employers to review and revise their permit space programs in light of entry experience, the proposal did not specifically require such review. In Issue 6 of the notice of public hearing (54 FR 41462), OSHA raised a series of questions related to the issue of whether or not the rule should explicitly specify review of permit entry programs. The Agency was interested in gathering information on what conditions necessitated review, on the needed frequency of review, and on appropriate administrative measures for implementing the evaluation of programs.

Witnesses at the hearings and commenters who addressed this issue generally agreed that some form of review process was a part of successful permit entry programs (Ex. 14–184, 14–210, 109, 129; Washington Tr. 85, 466–467; Chicago Tr. 128–129, 166–167, 495, 523, 533, 614; Houston Tr. 1093). Most agreed that any requirement OSHA set for such a review should be performance oriented and should allow the employer the flexibility to review the permit space program as conditions at the workplace warrant. For example, the Independent Liquid Terminals Association (Ex. 14–210) stated:

> Permit programs should be reviewed on a site-by-site basis. The criteria for designating the review period should be the frequency with which personnel enter confined spaces. Facilities in which personnel routinely enter confined spaces should review their program annually, incorporating any newly identified hazards or procedures.

Similarly, Mr. Jack Dobson, representing the American Society of Safety Engineers, testified (Chicago Tr. 614) supported the ANSI Z117.1 performance-oriented approach, as follows:

> Issue No. 6. The ANSI Standard Z117 appropriately addresses the review process regarding confined space entry programs. Conformity to Sections 3.3 regarding hazard evaluation, 3.5 hazard reevaluation, and 15.5 regarding verification of training would greatly enhance the continuity of a confined space safety program.
>
> We do agree that the review process is an essential element of any safety and health program, however, we feel that any language relative to such a review should be performance oriented, thus allowing employers to develop a review system which would be consistent with their particular operation.

The Agency believes that employers have an ongoing responsibility to reevaluate their permit space programs periodically and to revise their programs based on changes in permit space hazards and on the employer's experience with their entry operations. In regard to periodic evaluation of permit space hazards, ANSI Z117.1–1989 (Ex. 129) Section 3.5 states:

> A qualified person(s) shall determine the need for periodic identification and re-evaluation of the hazards based on possible changes in activities in the space, or other physical or environmental conditions, or both, which could adversely affect the space. When need is determined, a qualified person(s) shall conduct the identification and re-evaluation process.

This language indicates that review and revision of permit space programs [24] are generally accepted practices to ensure the efficacy of these programs. OSHA has determined that, while many employers already review and revise their permit space programs, it is appropriate to require all employers to undertake such a review.

In response to the questions OSHA raised on the appropriate frequency of program evaluation, three rulemaking participants, the Independent Liquid Terminals Association (Ex. 14–184, 14–210), Midwest Consortium for Hazardous Waste Worker Training the (Ex. 109), and the National Safety Council (Ex. 129; Chicago Tr. 495), supported an annual evaluation. The Midwest Consortium for Hazardous Waste Worker Training supported their recommendation as follows:

> Annual evaluation should include evaluation of the total program as well as the identified confined spaces to assure that the program is being implemented fully. The requirements of the program specified in (c)(1—10) need to be reviewed. Monitoring the space is just one component of the evaluation. Changes in company policy, federal, state and local regulations, conditions and processes in the plant or advances in the field may impact this review. Prudent industrial hygiene practice generally includes annual review of standard operating procedures in order to provide adequate protection of employee safety and health.

Others argued, however, that periodic review should not be specified by the OSHA standard (Washington Tr. 466–467; Chicago Tr. 166–167). For example, the American Gas Association (AGA, Washington Tr. 466–467) stated:

> For the same reason, prescribing the type and extent of training, experience or qualifications of individuals who would evaluate spaces is extremely problematic and is better left to individual employers who are better suited to make that determination. We also agree with OSHA's statement in the preamble not to establish program review criteria when OSHA said it believes compliance with the proposed rule will necessitate on-going evaluation of program effectiveness. That statement reflects exactly what performance based language is all about and AGA support[s] such performance language.

OSHA believes that review of the permit space program by the employer is an important element of a successful confined space program. The record contains ample evidence of this: every employer representative questioned about program review responded that periodic review was conducted, normally every year. The question is how should the final rule address this matter. The Agency has concluded that a two-pronged approach is needed.

First, the employer should be required to review the permit space program any time conditions at the workplace indicate that the existing procedures provide inadequate protection. Several commenters and witnesses mentioned "near misses" as being indications of possible problems (Ex. 101; Chicago Tr. 166–167; Houston Tr. 1093). Other

[24] Although this ANSI requirement applies specifically to reevaluation of hazards for a particular permit space entry, OSHA views this section in the broader sense as compelling a reevaluation of the entire permit space program in order to meet the provision. Such an interpretation provides the best possible protection for employees.

conditions warranting review of an permit space program include: the detection of a hazard not addressed by the entry permit, the detection of a condition forbidden by the entry permit, a change in the use or configuration of the confined space, and employees complaints about the effectiveness of the program. This type of review will ensure that the program is updated as needed for continued employee protection.

Second, the employer should be required to review the permit program within one year from entry. This would result in an annual review for employers whose have at least one permit space entered each year. As noted in the post-hearing comment of the Midwest Consortium for Hazardous Waste Worker Training (Ex. 109), such factors as changes in company policy, new or revised governmental regulation, and changes in technology and design make a periodic review desirable, even in the absence of problems in actual entry. Additionally, annual review was common among employers who testified about periodic program evaluation. The Agency believes that an annual review can promote necessary changes to the permit space program before an employee is actually injured. An evaluation of the program each year will also force employers, who may become complacent about the hazards of confined space entry at their workplaces, into serious consideration of whether their permit space program are truly effective. Obviously, if no permit spaces were entered during the year, there would be no cancelled permits to review, and no review would be required in that year.

The review process is covered under final paragraphs (d)(13) and (d)(14), which had no counterparts in the proposal. Under paragraph (d)(13), the employer is required to review entry operations when the employer has reason to believe that the measures taken under the permit program may not protect employees. The employer must then revise the program, responding to problems brought out by the review, before any subsequent entry is authorized. Paragraph (d)(14) requires an employer to conduct a review of the permit space program, using canceled permit retained as required under paragraph (e)(6), within one year after each entry. An annual review process could be used to meet this provision; however, if permit spaces were entered less frequently than once per year, no review would be required until one year after an entry. Again, any inadequacies would have to be corrected. Both paragraphs include notes containing information to assist employers in complying with the requirements. OSHA believes that these provisions are reasonably necessary to protect employees who enter permit entry spaces, in order to assure that the permit program reflects the conditions currently encountered in the workplace.

Paragraph (e), Permit System.

Paragraph (e) specifies the elements of the permit system required by paragraph (d)(10) of the final rule. The single most important feature of the permit system is the creation and use of an entry permit. An employer uses the permit to authorize employees to enter permit spaces and to document the measures taken to protect authorized entrants from permit space hazards. (Requirements pertaining to the contents of an entry permit are set out in paragraph (f) of the final rule.)

OSHA has determined that the preparation of a permit will help the employer determine if conditions in a permit space are safe for employee entry. A permit will also provide a concise summary of the entry procedure that will be useful to the personnel who are conducting the entry operations and to any personnel who need to review the conduct of entry operations after entry has been completed.

The permit system set forth in paragraph (e) of the final rule also requires the involvement of a person (the entry supervisor) who authorizes the entry and has responsibility for entry operations. This involvement will ensure that a person with the qualifications to identify permit space hazards and the authority to order corrective measures for their control will oversee entry operations. It will also compel employers to take direct responsibility for the safety of employees working in permit- required confined spaces.

Proposed paragraph (d) contained requirements on permit systems and on the permit itself (although the title of this paragraph was *Permit system*). In the final rule, OSHA has separated the requirements into two distinct paragraphs—paragraph (e), *Permit system*, and paragraph (f), *Entry permit*. As discussed in Section I, *Background*, and in Section II, *Hazards*, earlier in this preamble, numerous injuries and fatalities have occurred because employers did not take the proper precautions for the safety of employees working in permit spaces. All too often, employers either did not recognize permit space hazards or they failed to follow through with the necessary measures for employee protection. The Agency has determined that employers who require their employees to enter permit spaces must systematically implement permit space programs to prevent injuries and fatalities. OSHA believes that separating the requirements for a permit system from those for the content of the permits themselves will alert employers to the need for adopting an overall system for authorizing entries into permit-required confined spaces. The Agency further believes that permit systems that comply with paragraph (e) will enable employers to maintain control over permit space entry operations throughout the entry's duration so as to ensure the protection of authorized entrants.

Paragraph (e)(1) of the final rule requires employers to document the completion of the measures necessary for safe entry operations through the preparation of an entry permit.

This paragraph in the final rule was based on proposed paragraph (d)(1). The rulemaking participants who addressed this proposed paragraph supported the need for a written permit. For example, the Marine Chemist Association Inc. (Ex. 14–55) stated that a permit is the essential ingredient of a permit space program, in that it establishes responsibility. The Monsanto Company (Ex. 14–170) also agreed with the requirement for a permit system that serves to identify hazards and the measures taken or to be taken during entry to control them. In support of the requirement for a permit system, Mr. Ray Witter, an OSHA expert witness, testified (Houston Tr. 639) as follows:

> Well, in my opinion, you need to prepare a written permit system because that is the only way that you can ensure that people have looked at the various hazards that exist and have decided what has to be done or if nothing has to be done. If you do not provide a permit, it is left to the evaluation of the individual, and all of us, as people, can forget something.

As discussed previously, OSHA has determined that it is necessary to require explicitly that the list of measures taken for protection of employees who enter permit spaces be recorded on a permit along with a notation that all these measures have been completed before entry. OSHA wishes to emphasize that the permit is considerably more than a simple checklist; it requires careful thought and planning. All measures necessary for making the particular permit space safe for entry must be listed; otherwise, it is likely that some procedures will be omitted, with serious consequences. The permit enables the entry supervisor and the other personnel involved in entry operations to keep track of the

precautions taken to protect employees. It also allows authorized entrants to verify that each protective measure has been checked by someone.[25]

Paragraph (e)(1) also contains a note indicating that non- mandatory Appendix D contains examples of permits whose elements are considered to comply with the requirements of this section. The precise elements that must be listed on a permit for a given permit space entry are dependent on the hazards within the space and, perhaps, on the operations to be performed during entry operations.

As noted above, this provision is based on proposed paragraph (d)(1), which required that employers prepare permits through which all conditions to be evaluated to ensure safe entry were identified. OSHA has determined that the proposed language, insofar as it focused on the "conditions" to be evaluated, did not clearly indicate what information was required in the permit. In particular, the Agency observes that proposed paragraphs (d)(2) and (d)(3) required information that did not relate to "conditions". Therefore, paragraph (e)(1) of the final rule (in conjunction with paragraph (f)) has been written to clearly indicate the breadth of the information required in the permit. Specifically, paragraph (e)(1) of final §1910.146 requires the permit to document the completion of measures required by §1910.146(d)(3). Additionally, OSHA is requiring the entry permit to be completed before entry is authorized.

Paragraph (e)(2) of the final rule requires the entry supervisor identified on the permit to sign the entry permit to authorize entry.

This provision was taken from proposed paragraph (d)(5), which would have required the signature of the person authorizing the permit before entry began but after safe entry conditions were established. (Paragraph (e)(1) of the final rule requires the employer to establish safe entry conditions before the permit is authorized.) The few rulemaking participants (Ex. 14–63, 14–170; Houston Tr. 1061) who addressed proposed paragraph (d)(5) advocated the provision. The State of Maryland's Occupational Safety and Health Program (Ex. 14–63) succinctly stated the purpose of this requirement in their support for a requirement that the person authorizing the permit sign it, as follows:

> [T]he signature establishes individual accountability. If a person is asked to sign the form, there is a greater chance that the items the form requires will be addressed than if no one has to sign the form.

Proposed paragraphs (d)(2) and (d)(3) set out the elements that would have been required on permits. Proposed paragraph (d)(2) listed the elements (the "checklist" portion of the permit) that had to be present on all permits, while paragraph (d)(3) listed additional elements that would also have had to be listed, unless the entry supervisor assumed direct charge of the entry operation for its duration. The items that would not have been required to be listed were:

(1) The identity of the permit space;
(2) The purpose of the entry;
(3) The date of the entry and the authorized duration;
(4) A list of the authorized entrants;
(5) A list of eligible attendants;
(6) A list of individuals eligible to be in charge of the entry; and
(7) The signature and printed name of the entry supervisor originally authorizing entry.

In issue 5 of the NPRM (54 FR 24086), OSHA asked several questions pertaining to the use of a "checklist" permit for permit-required permit space entry when the employer directly supervised entry operations. The questions were directed to whether or not a the use of a checklist permit in lieu of a full permit would be effective in protecting employees. OSHA also requested information on projected cost savings, actual workplace experience using the checklist approach, and examples of actual procedures and permits that have been used.

OSHA received many written comments and some hearing testimony concerning this issue. Several of the commenters (Ex. 14–47, 14–91, 14–94, 14–98, 14–119, 14–123, 14–161, 14–170, 14–179, 14–183, 14–193) who addressed this issue misunderstood the intent of the proposed standard, which was to allow the omission of several items from the written permit if the individual authorizing the entry was in direct control of the entry for its duration. These commenters apparently believed that OSHA was proposing that no permit at all be required when the entry authorizer is present for the duration of the entry. In a representative comment, the Monsanto Company (Ex. 14–170) stated:

> Our experience is that the confined space entry permit serves to assist in effective preparation of the space as well as communication about the space during the entry period. We may utilize direct supervision for a particularly difficult confined space entry but that would be in addition to, not in lieu of, a permit.

Other commenters (Ex. 14–86, 14–99, 14–153, 14–184; Chicago Tr. 102) did not directly answer the questions posed in Issue 5, choosing instead to address other related concerns. For instance, the Texas Chemical Council (Ex. 14–86) wondered how shift changes would affect the proposed provision:

> Often entries are worked on [a] 24 hour a day basis and no one individual can be there during that time period. The authority or responsibility for the job transfers between individuals. Therefore, it is necessary to have an extension of authority beyond the singular person.

These commenters apparently believed that the proposal would have required a single entry supervisor for the entire entry. Their concerns were unfounded since the proposed provision would have accepted transfer of responsibility between on-coming and off-going entry supervisors (although the proposal did not state this explicitly).

Several commenters (Ex. 14–27, 14–28, 14–30, 14–88, 14–99, 14–119, 14–137) were critical of the checklist system, as a form of abbreviated permit. Some of the commenters felt that inclusion of all the information (as listed in proposed (d)(3) as well as proposed (d)(2)) was necessary. For example, the Northwest Pipeline Corporation (Ex. 14–27) said:

> It is Northwest's opinion that a permit form requiring all information pertinent to the entry is necessary to ensure a safe entry into confined spaces and compliance with this proposed standard.

In a similar vein, the Union Carbide Corporation (Ex. 14–88) stated:

> It is important for all critical information to appear on the permit in writing. Union Carbide requires permits to include in writing the place, time, purpose, personnel assigned, and name of authorizing individual, among other information, even when the authorizing individual assumes direct charge of the entry for its duration. The potential risk of miscommunication where critical information is not written down significantly outweighs the incremental benefits of not using a written permit containing all necessary information.

Still other commenters (Ex. 14–81, 14–123, 14–137), while not objecting to the "checklist permit" provision, felt

[25] Although the entry permit does not provide an absolute method of verifying that entry conditions are acceptable, it does provide a ready means to check that all items listed on the permit have been accounted for. If no one remembered to take one of the listed precautions, it would not be documented on the permit—a hazard that should be caught by the entry supervisor during his or her review. The entry supervisor and other employees can also verify that the test results given on the permit are within the range allowed. The final rule makes the entry supervisor responsible for ensuring that the elements listed on the permit have been completed. The signature of the entry supervisor who originally authorized the entry signifies that these measures have been taken.

that the intended relief would be of little value to them. The National Ready Mixed Concrete Association (NRMCA, Ex. 14–81) commented that:

> While NRMCA has no objection to the exemption of permit required confined spaces for situations in which the person who authorizes entry assumes direct charge for the duration, we consider it unlikely that much benefit would accrue to the ready mixed concrete industry by virtue of such an exemption. It is unlikely that the authorizing supervisor could often be directly in charge of a confined space entry for its duration.

A few commenters (Ex. 14–57, 14–73, 14–98) favored the exemption. For example, Beaumont & Associates (Ex. 14–57) supported the exemption, as follows:

> It would be appropriate to allow an entry permit which did not specify location, time, purpose, persons allowed entry, and duration of permit, if the person authorizing the entry remained at the entry location for the duration of the entry.

OSHA believes that the proposed provision was, unfortunately, misunderstood by many commenters, causing them, in many instances, to generate responses not pertinent to the issue. OSHA also believes that some of the objections stemmed, to a large extent, from a misunderstanding of this provision.

Based upon the rulemaking record, OSHA has decided not to allow the use of an abbreviated, or "checklist" permit in the final rule. OSHA agrees with the Union Carbide Corporation that it is important that all critical information appear on the permit in writing for two reasons. First, all the pertinent information will then be available, on the permit, to the entrants who will then be better equipped to make independent judgments as to the adequacy of pre-entry preparations. Second, the inclusion of all critical information on the permit will facilitate the program reviews required under paragraphs (d)(12) and (d)(13) of the final rule. In fact, the elements that the proposal would have allowed to be omitted are essential for the identifying the permit space and for identifying employees who could provide information about problems that may have arisen. OSHA believes that the benefits of including all the permit items (as listed in paragraph (f) of the final rule) far outweigh the slight cost savings that might have accrued through the use of an abbreviated permit. (The employer may, however, use a preprinted, checklist-type permit, provided it contains all the information required under paragraph (f) of the final rule, with all entries completed and with the signature of the entry supervisor.)

Paragraph (e)(3) of the final rule requires the employer to make the completed permit available to all entrants at the time of entry, such as by posting it at the entry portal, so that the entrants can confirm that performance of all necessary pre-entry measures has been indicated on the permit.

This requirement was not contained in the proposed rule. However, several commenters (Ex. 14–4, 14–124, 14–157, 14–161, 14–170, 14–174) suggested that OSHA make posting a copy of the permit a requirement in the final rule or stated that their company required such posting and that they believed such posting of the permit was appropriate. They argued that this posting would alert employees to the presence of hazards within the space and of the measures necessary for the protection of employees.

OSHA agrees that making the permit available to all authorized entrants would provide them with information on protective measures to be taken to make the permit space safe for entry. By inspecting the permit and observing recorded test results and the tester's signature or initials, the authorized entrants could check to see if pre-entry preparations have been completed. OSHA agrees that making the completed permit available to the entrants (whose safety and health, after all, is most at stake during entry operations) is important enough to be required in this final rule. Entrants will then be able to make their own judgments as to the completeness of pre-entry preparations and to point out any deficiencies that they believe exist. A requirement that the completed permit be posted at the entry portal or otherwise be made available to the entrants at the time of entry has therefore been incorporated into this final rule.

Paragraph (e)(4) of the final rule requires that the duration of a permit not exceed the time required to complete the assigned task or job identified on the permit in accordance with paragraph (f)(2) of the final rule.

This provision has been taken from paragraph (d)(3)(iii) of the proposal, under which a permit would have been allowed to remain valid for up to 1 year, so long as all conditions required by the permit were maintained. The comments OSHA received concerning the proposed provision (Ex. 14–28, 14–57, 14–63, 14–80, 14–109, 14–116, 14–151, 14–161) objected to allowing permits to be valid for so long. These commenters said that the 1-year limit was arbitrary, because it was unreasonable to expect that entry conditions would remain acceptable for that long. They pointed out that conditions within the space would almost certainly change over that amount of time and that the hazards within the space would have to be reevaluated. For example, the International Brotherhood of Teamsters (Ex. 14–109) stated:

> In Section (d)(3)(iii), OSHA proposes to allow a confined space permit to be issued for as long as a year at a time "so long as all conditions under which the permit was issued are maintained." For OSHA to suggest that a permit could be good for a year defeats much of the purpose of having a permit system at all. It invites complacency, and invites workers and supervisors to make unwarranted assumptions about conditions that may affect the safety of the entry. For example, it would not be appropriate to rely on one long-term entry permit for a tank in a brewery that had to be entered repeatedly—but not continuously —over the course of a year. Even a much shorter term, designated rescuers may go home at the end of their shift. Additionally, issuance of a long-term permit means that the authorizing person, who likely only works about 40 hours a week, may very well be unaware and unavailable at times when conditions change that should cause the permit to be amended or revoked.
>
> For reasons such as these, we strongly favor the recommendation on p. 7 of the NIOSH Criteria Document on Working In Confined Spaces: "The permit shall be dated and carry an expiration time that will be valid for one shift only. The permit shall be updated for each shift with the same requirements."

OSHA has decided to limit entry permit duration to whatever period of time is necessary for completion of the assigned task or job, which is identified on the permit under paragraph (f)(2) of the final rule. The duration of the permit is not directly relevant to the safety of employees working in permit-required confined spaces. As long as acceptable entry conditions are present, employees can safely enter and perform work in permit spaces. The length of time entry operations take should not be a factor in whether acceptable entry conditions exist in the space, as long as the permit system conforms to the requirements of final §1910.146. If conditions within the space change so that entrants are endangered, then the following steps should fully protect these employees:

(1) The entry supervisor, when he or she assumes responsibility for a space and when he or she performs periodic checks, ensures the presence of acceptable entry conditions (paragraph (j)(6)).

(2) If the hazard being introduced is atmospheric in nature, the testing and monitoring of the space will detect it (paragraph (d)(5)(ii)).

(3) If other hazards are being introduced, the entry supervisor, the

attendant, and authorized entrants are trained to detect their presence (paragraphs (g), (h)(1), (i)(1), and (j)(1)).

(4) Entrants would vacate the permit space (paragraphs (h)(4) and (h)(5), (i)(6), and (j)(3)).

These steps fully protect entrants from hazards developing during entry operations. Limiting the duration of the permit to an arbitrary length of time would not reduce the risk of entry into permit spaces because the conditions within the space are required to be monitored periodically.[26] On the other hand, the permit should not be valid for a period longer than necessary to complete the task being performed inside the space. Otherwise, entrants could be unnecessarily exposed to the residual hazards of permit spaces. Therefore, OSHA has decided to adopt a requirement that the permit be valid for a period not to exceed that necessary to complete the task or job for which the permit was obtained in place of the proposed requirement that it be valid for no longer than 1 year.

In complying with paragraph (e)(4) of the final rule, the employer need not, but may, state a specific time period (a number of hours or days) on the permit. For instance, the permit's duration could be stated in terms of the removal and installation of a relief valve or the cleaning of the inside surfaces of a tank. OSHA's intent here is merely to place some reasonable limitation on permit validity.

Paragraph (e)(5) of the final rule covers cancellation of entry permits. It requires the entry supervisor to terminate the entry and cancel the permit when the entry operation covered by the permit has been completed or when a prohibited condition arises in or near the permit space.

This provision in the final rule is based upon proposed paragraphs (d)(6) and (g)(1)(iv). Specifically, paragraph (d)(6) of the proposed rule would have required the "individual authorizing the entry" to cancel the permit. Many commenters (Ex. 14–80, 14–86, 14–88, 14–94, 14–118, 14–123, 14–143, 14–150, 14–188) stated that the proposed provision was unduly restrictive because the individual who originally authorized entry was often not present upon completion of entry operations. For example, the Chemical Manufacturers Association (Ex. 14–118) argued as follows:

Paragraph (d)(6) requires that the individual who authorized the entry must cancel the permit. This requirement could pose unwarranted inefficiencies and hazards. In many cases, the original authorizing individual will be away from the worksite and unavailable to cancel the permit. In addition, another individual trained to authorize and cancel a permit may note a condition that warrants canceling the permit. Any individual trained to authorize entry should be able to cancel the permit.

The Agency acknowledges that there are situations where more than one entry supervisor is needed over the course of entry operations. For example, when multi-shift entry operations are conducted, more than one entry supervisor would be used for a permit space. Additionally, even for entry operations that do not extend across more than one shift, the original entry supervisor may be absent from the workplace for other reasons. Therefore, the Agency has adopted language to provide that the entry supervisor, not the person who authorized entry, will cancel the permit. As noted under the discussion of the term "entry supervisor", OSHA does not intend to restrict the position of entry supervisor to a single individual. Any individual who has been designated as the entry supervisor has the authority to terminate entry and cancel a permit. Of course, the entry supervisor on duty at the completion of the entry operation will normally be the one to terminate and cancel the permit.

Paragraph (e)(6) of the final rule requires that canceled entry permits be retained for at least 1 year to facilitate the annual review of the permit space program required under paragraph (d)(14). Paragraph (e)(6) had no counterpart in the proposed rule. Its inclusion in the final rule is based on OSHA's conclusion that the permit space program needs to be reviewed at least once per year. Canceled permits are among the materials that need to be covered by the annual review (as required by paragraph (d)(14)). OSHA believes that information on any problems that arise during entry operations should be available to the personnel who perform the review. For example, there may be information which, while not alarming when related to a single entry, may in fact turn out to be important evidence of a problem or of a trend that could lead to a problem. Indeed, Mr. Dan Glazier, representing the Motor Vehicle Manufacturers Association (Chicago Tr. 187–188), noted this very point in his testimony, as follows:

If you have an indication that the oxygen level has dropped in this confined space or that the combustible level has exceeded 5 percent of the [LFL], then certainly there is something unique about [that] confined space that is causing it to go bad.

Therefore, I would want to track that for a certain period of time and we never really outlined that. But to try to determine what is causing that confined space, what is unique about that [confined] space which is causing it to go bad. That lends some credibility to I think to keeping the permits for a certain period of time so that you can track confined spaces that I should say, "are known bad actors".

For these reasons, paragraph (e)(6) also requires the employer to annotate its permits to indicate any problems so that the appropriate revisions to the program can be made.

Paragraph (f), Entry Permit.

Paragraph (f) of the final rule specifies the information that must be included in the permit prepared under paragraph (e) of final §1910.146. As noted previously in the discussion of paragraph (e), that information sums up the employer's efforts to identify and control conditions in permit spaces. OSHA has determined that the preparation of the permit will be a central part of the employer's determination as to whether conditions in a permit space are safe for employee entry. The permit itself will provide a concise summary of the permit space program requirements for a particular entry that will be useful to the personnel who are conducting the entry operations and to any personnel who need to review the conduct of entry operations after the operations have been terminated. Additionally, OSHA believes that properly prepared entry permits will assure employees that the employer's permit space program will protect them from permit space hazards.

The remaining discussion of paragraph (f), following, provides a summary and explanation of each of the items required to be identified on a permit. The introductory language of paragraph (f) explicitly requires all the information listed in paragraphs (f)(1) through (f)(15) to be included on an entry permit.

Paragraph (f)(1) requires an identification of the space to be entered. This is effectively identical to paragraph (d)(3)(i) of the proposed standard. OSHA received no substantive comments on the proposed paragraph.

Paragraph (f)(2) requires the purpose of the entry to be listed on the permit. This is identical to paragraph (d)(3)(ii) of the proposed standard, on which no substantive comments were received.

Paragraph (f)(3) requires the date and the authorized duration of the entry permit to be entered. The duration of

[26] Since the final rule requires the entry supervisor to re-evaluate the space upon assuming responsibility for it (under paragraph (j)(6) of the final rule), entry conditions will be checked at least once per shift.

the entry permit need not be stated in terms of actual time, but may be stated in terms of the completion of the task for which permit space entry is being performed. This provision corresponds to paragraph (d)(3)(iii) of the proposed standard. (See the summary and explanation of paragraph (e)(4) of the final rule, earlier in this preamble for further discussion of the acceptable duration of a permit and for a discussion of the comments received on paragraph (d)(3)(iii)).

Paragraph (f)(4) requires a listing of the authorized entrants. The employer may place the names of authorized entrants on the permit or may choose to track them by any other effective means.

This provision corresponds to paragraph (d)(3)(iv) of the proposed standard. Many rulemaking participants objected to the proposed provision (Ex. 14–28, 14–86, 14–94, 14–111, 14–118, 14–124, 14–125, 14–143, 14–150, 14–161, 14–170, 14–176, 14–188, 119), citing concerns about the infeasibility of placing a large number of names on the entry permit itself. These rulemaking participants argued that, while it was important to track the presence of employees working within the space, maintaining an accurate list of authorized entrants for a particular permit space entry operation was unnecessary. They also contended that maintaining such a list would be nearly impossible for large entry operations involving hundreds of authorized entrants. Most of these rulemaking participants suggested using a performance- oriented approach that recognized all types of tracking means, such as rosters, having the attendant keep an accurate count of entrants, and sign-in and sign-out sheets.

In its post-hearing comment (Ex. 119), which was typical of the objections to proposed paragraph (d)(3)(iv), Texaco stated:

> The point is that there may be 50 to 60 people working in this one vessel and due to the complexity of the work, the personnel will change constantly. The contractor plans the work in advance, the operations personnel check and assure that the vessel is safe for entry and does this without the knowledge of the actual names of personnel who will be entering the vessel. The names of the personnel are assigned by the contractor(s) just prior to the start of the shift, *at the same time that the operator is checking the vessel for entry.* The problem with assigning *actual names* for vessel entry is compounded by the fact that the personnel change at the last moment due to absences, etc., and the fact that workers are constantly changing even throughout the shift.
>
> In *summation*, actual names on the permit would greatly delay the start of the work at each shift and Texaco submits that this delay is not warranted *since it provides no greater worker protection.* With the personnel inside the tower constantly changing, the listing of actual names *on the permit* would be a virtual impossibility. The point is to assure that all get out if an alarm is sounded. The Standard should contain performance oriented language that would allow an employer the flexibility to decide upon and implement *the most reasonable safety procedure for tracking personnel inside a particular permit space.* Of course in practical situations, this would include either sign in sheets, entry badges, or tag boards. [Emphasis supplied in original.]

The main purpose of the proposed requirement was to provide an accurate list of employees inside the space so that it would be possible to determine quickly and accurately whether all entrants had been rescued in an emergency. A second purpose was to provide assurance that all employees had evacuated the space at the end of entry operations. To achieve these goals, the proposal would have required the permit to list the names of all authorized entrants within the permit space.

Based on the rulemaking record, OSHA concludes that the proposed provision would have been unduly restrictive and somewhat impractical for permit space entry operations involving large numbers of entrants. However, the Agency is still concerned that, without an accurate entrant tracking system, entrants may be left inside permit spaces after the operation is complete.

The rulemaking participants (Ex. 14–34, 14–111, 14–118, 14–124, 14–170, 14–188, 119) mentioned several possible alternatives to the listing of entrants names on the permit: tag boards, entry badges, sign-in sheets, and electronic tracking systems. Many of these systems provide the attendant with enough information to keep accurate track of authorized entrants. OSHA believes that, as long as the system accurately traces who is in the permit space at any given moment and as long as the attendant has immediate access to the system, the attendant will be able to order the complete evacuation of a space as required by paragraph (i)(6) of the final rule. Additionally, the rescue and emergency service will be able to account for all employees working inside the permit space in the event of an emergency. Other systems, which only keep a count of the employees inside the permit space, would not be acceptable. A simple count of the number of authorized entrants would not be sufficient to ensure that all entrants have been rescued in case of emergency. Under such conditions, it would be easy to lose track of exactly how many employees have exited the space. Further, without a more systematic approach to tracking employees, entrants performing self-rescue might not inform the attendant of their emergence from the space. The rescue and emergency service employees would then be exposed, unnecessarily, to the hazards posed by entry into the permit space under hazardous circumstances. Unauthorized entrants, who might have gotten into the space and who might even have caused the emergency, could easily be counted as they exit the space, which would result in the attendant's losing track of some of the authorized entrants still in the space. These employees might then suffer further injury or death as a result.

For these reasons, paragraph (f)(4) of the final rule requires a system of tracking authorized entrants that will accurately trace who is in the permit space at any one time and that will enable the attendant to identify these employees quickly and accurately. Any system that meets the goal set by the performance-oriented language is acceptable.

Paragraphs (d)(3)(v) and (d)(3)(vi) of the proposed standard would have required a listing of all eligible attendants and individuals eligible to be in charge of the entry, respectively. Many commenters (Ex. 14–28, 14–80, 14–86, 14–94, 14–116, 14–118, 14–123, 14–124, 14–130, 14–143, 14–150, 14–157, 14–161, 14–170, 14–176, 14–188) also objected to these proposed provisions. The commenters noted that there could be large numbers of employees who were eligible to serve as attendants or as entry supervisors, even if the number who actually serve in such capacities was small. Again, the commenters urged OSHA to adopt a performance- oriented approach. For example, Dow Chemical USA (Ex. 14–130) stated:

> A list of those that are trained (or eligible) to perform the work involved in the confined space entry could be long. While a list of those directly involved and authorized for entry will be short and beneficial.

Several rulemaking participants (Ex. 14–80, 14–124, 14–188) argued that methods such as identifying attendants and entry supervisors by job title, by logs, or by badges could provide the required information in a much less burdensome fashion. Others (Ex. 14–88, 14–116, 14–130, 14–161) urged OSHA to require only the identification of attendants and entry supervisors that are involved in a particular entry operation. Some of those objecting to the proposed provision (Ex. 14–80, 14–94, 14–118, 14–157, 14–161, 14–170) noted that the information the Agency

would be requiring on the permit could be gleaned from other, more appropriate, sources (namely, personnel training files).

As discussed in the summary and explanation of paragraph (f)(4) earlier in this preamble, OSHA agrees that there are conditions, especially if large numbers of employees are involved in entry operations, under which it is unreasonable to list by name on the permit all individuals who might serve as attendants or entry supervisors. OSHA further agrees that there are methods of identifying attendants and entry supervisors other than naming them on the permit itself. Employees have another method of ensuring that individuals serving as authorized entrants, attendants, and entry supervisors are qualified. Under paragraph (g) (discussed later in this section of the preamble), the employer is required to certify that employees have received the requisite training. This certification is required to be available to employees and their representatives so that employees can verify that individuals have been appropriately trained. As a result, listing the names of eligible attendants and entry supervisors on the permit itself is not necessary.

The primary basis for proposing to require the names of the attendants and entry supervisors on the permit was that it is important for all affected employees to be able to know who the persons responsible for the safety of entrants are. If an employee notices a hazard developing, it is important for him or her to be able to notify a person with the responsibility and authority for abating the hazard or for evacuating the permit space. The proposal took the approach that the easiest method for the identification of these individuals was to name them on the permit. As noted by the comments on proposed paragraphs (d)(3) (v) and (vi), the proposal did not account for other equally effective means of identifying the appropriate persons.

At the same time, the proposal would not have afforded entrants the most effective protection. Unless provision was made for identifying the individuals currently acting as attendants or entry supervisors, permits that identify all persons eligible to fulfill those roles do not enable employees quickly or easily to identify and contact the persons actually having responsibility for safe permit entry operations at a given time. In an emergency, an employee could waste valuable time inquiring of all the individuals named on the permit to find the person that can take steps necessary to protect entrants. Meanwhile the employees inside the permit space would be endangered.

In the final rule, OSHA is requiring the employer to identify by name the current attendants (paragraph (f)(5)) and current entry supervisor (paragraph (f)(6)) for a permit space entry. Whenever new attendants or entry supervisors assume their roles, they are required to have their names placed on the permit. This provides a sure means of distinguishing these important individuals quickly and easily. It also provides the opportunity for these individuals to review the permit and entry conditions to ensure that entry conditions remain safe. In fact, under paragraph (j)(6), the new entry supervisor is required to undertake this review.

OSHA has determined that it is not necessary to identify all eligible attendants or entry supervisors on the permit. As indicated in the public comment, the list of eligible individuals could be lengthy and is of little actual use during the entry operation. Also, this information, if needed, is readily available in training records, as noted by the commenters. In fact, the employer is required to certify the training of these individuals and to make the certification available to employees and their representatives under paragraph (g)(4) of the final rule. The presence of this information on the permit would not contribute to employee safety and, as noted previously, might even hinder efforts to protect entrants in an emergency.

Paragraph (f)(7) requires the permit to contain a listing of the hazards of the permit-required space to be entered. This provision is essentially identical to paragraph (d)(2)(i) of the proposed standard on which OSHA received no significant comments.

Paragraph (f)(8) requires the permit to contain a list of the specific measures to be used for isolating the permit space and for eliminating or controlling permit space hazards before entry.

This provision combines language from proposed paragraphs (d)(2)(ii) and (iii), which proposed that the measures to be taken for isolating the permit space and for removing or controlling hazards be identified on the permit. Some commenters (Ex. 14–86, 14–124, 14–143, 14–150, 14–188) maintained that the standard operating procedures that would be used to take these measures were detailed and highly specific in nature. They argued that such detailed information was not needed on the permit itself and suggested that the final rule allow only a reference to these standard operating procedures.

With respect to these comments, OSHA notes that the entry permit need only identify the measures (such as the use of blanking to isolate a permit space) used to perform the specified steps in the permit space program. The final rule does not require the exact procedures used to be identified, because, as noted in the comments, including that degree of detail on the entry permit itself would not be practical. The detailed procedures for making the permit space safe for entry are required to be established, under paragraph (d)(3), and authorized entrants, attendants, and entry supervisors are required to be trained in their use, under paragraph (g). (See the summary and explanation of these two paragraphs for a discussion of the establishment and implementation of procedures for making spaces safe for entry and for a discussion of training requirements, respectively.) The permit need only refer to these procedures in sufficient detail to enable employees to determine what measures should be taken and how to perform those measures. (The detail to be provided on the permit is dependent, to some extent, on the training provided under paragraph (g).)

Paragraph (f)(9) requires the permit to contain a list of the acceptable entry conditions for the permit space.

This provision has been taken from proposed paragraph (d)(2)(iv), which would have required the "acceptable environmental conditions, quantified with regard to the hazards identified in the permit space, which must be maintained during entry". As noted earlier in this preamble, the proposed term "acceptable environmental conditions" has been replaced with "acceptable entry conditions" in the final rule. (See the summary and explanation of the term "acceptable entry conditions" for a discussion of the reasons for this change in terminology.)

One commenter (Ex. 14–123) argued that the acceptable entry conditions that were required to be listed on the permit were more appropriate as part of the hazard control procedures and practices required by proposed paragraph (c)(2) (paragraph (d)(3) of the final rule).

Measures for obtaining acceptable entry conditions are dependent upon the acceptable entry conditions for a given permit space. These measures must be listed on the permit under paragraph (f)(8). The entry conditions that must be present within the space must also be listed on the permit so that authorized entrants, attendants, and entry supervisors have this information on hand at the worksite. These conditions include such criteria as the

oxygen, flammable gas and vapor, and toxic substance levels that must be met before the permit space is safe for entry.[27] They also include the energy control considerations that apply to the permit space. Because the hazard control measures to be taken are directly related to the particular acceptable entry conditions for the permit space, employers will likely combine these two elements on the permit. In fact, the example permits presented in Appendix D list acceptable entry conditions as part of the hazard control measures to be taken.

Paragraph (f)(10) requires the recorded test results corresponding to the specified entry conditions, along with the signature or initials of the tester and an indication of when the tests were performed, to be entered on the permit. The results of initial and periodic tests performed under paragraph (d)(5) of the final rule would have to recorded.

This provision did not appear in the proposal. The proposal required the employer to set acceptable entry conditions (paragraphs (c)(2) and (d)(1)), to ensure that they were met before entry (paragraphs (d)(2) and (d)(5)), and to ensure that they were maintained during permit entry operations within the space (paragraphs (f)(2) and (g)(1)). The proposal required the permit to contain testing procedures and equipment necessary to verify the presence of acceptable entry conditions, and the Agency anticipated that the employer would test conditions within the space as necessary to meet these provisions.

In response to information received as part of the rulemaking record, OSHA has adopted specific requirements for the testing of conditions within permit spaces to verify that they are acceptable. (See the summary and explanation of paragraph (d)(5) for a discussion of these requirements.)

Several commenters (Ex 14–4, 14–116, 14–118, 14–148, 14–164) recommended that the results of testing performed under the standard be documented. They argued that this information would dictate the protective measures to be taken. Supporting the view that recording the results of testing was an important part of a permit system, Allwaste Tank Cleaning Company (Ex. 14–164) stated:

> The only required information should be the space identification and results of atmosphere testing. In an industry such as ours, these results will dictate the measures employed.

Additionally, there is some evidence in the record that documenting test results is a practice in current permit space programs. Three witnesses at the Chicago hearings (Chicago Tr. 123, 146, 209) agreed that documentation of test results was needed and testified that such documentation was a common practice in their particular operation.

As a result of this testimony and evidence, OSHA has concluded that recording the results of initial and periodic testing is a necessary feature of permit space programs. If the results of testing are entered on the permit, the entry supervisor has before him or her readily available evidence that pre-entry conditions have been checked and what the test results were. Additionally, the entrants themselves will be able to check the permit for themselves to see that the testing has been done and that safe conditions exist. Entrants and attendants can also use the test results as guidance on conditions to which they should pay close attention. For example, if the oxygen concentration is 19.6 percent, the attendant and entrants should be alert for signs of oxygen deficiency, such as increased breathing rate, dizziness, rapid heart beat, and headache. Furthermore, documentation of test results on the permit also facilitates the review of canceled permits required under paragraph (d)(14). If testing indicates that levels of hazardous substances are increasing, the increased hazard will be easy to recognize through a review of the recorded test results on the canceled permit. For these reasons, the Agency has concluded that a requirement to record, on the permit, the results of initial and periodic testing performed under paragraph (d)(5) is necessary and appropriate for the protection of employees entering permit- required confined spaces. This requirement appears in paragraph (f)(10) of the final rule.

Triodyne Environmental Engineering, Inc. (Ex. 14–50), stated:

> Requiring a checklist on an entry permit provides for a repetitive method which can recognize individual responsibility by requiring initials next to each task.

OSHA agrees with the commenter and has decided to require that the initials or name of the person who performed the test be placed on the permit. OSHA has also decided to require that an indication of when the tests were performed be placed on the permit as well. This information will enable the entry supervisor and the attendants to establish the identity of the person who performed the tests in case any questions arise. The date and time (or other indication of when the test was performed) will give a quick indication of when additional testing is needed. The Agency has concluded that this information is integral to the test data and that its presence on the permit is also necessary. Therefore, paragraph (f)(10) of the final rule also requires the permit to contain this information along with the results of the tests.

Paragraph (f)(11) requires the permit to list the rescue and emergency services that can be summoned and the means for summoning those services. The identification of the rescue and emergency services and the means for summoning them enable the attendant to summon the rescue and emergency services immediately in case of emergency. This provision corresponds to, and is substantively the same as, paragraph (d)(2)(vi) of the proposal. The comments on this paragraph of the proposal are discussed under the summary and explanation of paragraph (f)(13) of the final rule.

Paragraph (f)(12) requires the permit to contain a list of the communication procedures to be used by attendants and authorized entrants during entry. This provision corresponds to proposed paragraph (d)(2)(viii). The phrase "during the entry"[28] has been added in the final rule to ensure that it is understood that this provision applies only to communication equipment and procedures used during entry operations. Except as noted under the summary and explanation of paragraph (f)(13), OSHA received no significant comments on the provision as proposed.

Paragraph (f)(13) requires that the permit contain a list of equipment to be provided for compliance with the permit space standard. This equipment includes personal protective equipment, testing equipment, communications equipment, alarm systems, rescue equipment, and other equipment that the employer intends to provide to ensure compliance with final §1910.146.

Paragraph (f)(13) of the final rule has been taken from proposed paragraphs (d)(2) (v) through (ix). Requirements relating to equipment in these proposed paragraphs have been placed in one place in the final rule. OSHA believes that this simplifies these provisions. Paragraphs (d)(2)(v) through (d)(2)(viii) of the proposal would have required the permit to list the test equipment and procedures, the rescue and emergency

[27] An atmosphere meeting these levels must be not be a hazardous atmosphere, as defined in final §1910.146(b), except as otherwise permitted by §1910.132.

[28] "Entry." is defined to include the initial entry into and subsequent operations within the permit space.

services, the rescue equipment, and the communication equipment and procedures for the permit space, respectively. A few commenters (Ex. 14–28, 14–86, 14–123, 14–143, 14–170, 14–188) stated that these items were equipment and procedures that are more appropriately addressed in training or in the hazard control procedures provided under the permit space standard. Although each of these commenters was concerned about a different item to be listed, they all argued that the permit itself should be as simple as possible and that the details of the individual items are covered in more detail in training of employees or in operating procedures.

The Agency disagrees with these comments. OSHA has concluded that the permit needs to identify the equipment, as well as the procedures, necessary to ensure safe entry operations and to facilitate rescue. The authorized entrants and attendants need to know what equipment will be needed for a particular space so that the entrants spend as little time exposed to the hazards presented by permit space entry as possible. Without the proper equipment, these entrants might have to exit the space and reenter after the proper equipment has been obtained. As a result, they would be exposed to increased hazards unnecessarily. Therefore, paragraph (f)(13) of the final rule requires the permit to identify the necessary equipment.

Paragraph (f)(14) requires that the permit contain any other information whose inclusion is necessary, given the circumstances of the particular confined space, in order to ensure employee safety.

This provision is identical to proposed paragraph (d)(2)(x). One commenter (Ex. 14–161) considered the proposed requirement to be too open-ended.

OSHA believes that this performance-oriented requirement is necessary for the protection of employees involved in permit space entry operations. Due to the wide-ranging types of hazards found in permit-required confined spaces, there are many hazards that cannot be adequately addressed with any precision in a generic permit space standard. Therefore, the provision needs to be general in nature.

Paragraph (f)(15) requires that any additional permits, such as hot work permits, that have been issued to authorize work in the permit space, be identified on the permit. If the other permits are attached to the entry permit, they are considered to be part of it. This provision is essentially the same as proposed paragraph (d)(4), on which no significant comments were received.

Paragraph (g), Training.

The record strongly demonstrates a need for training employees in the hazards posed by permit spaces and in the procedures for controlling those hazards. Many of the accident descriptions in the record indicate that one of the major factors causing these accidents is a lack of employee awareness of the dangers involved in entry into permit spaces. Employees who entered these spaces were unaware of the possibility that the atmosphere inside could be immediately dangerous to life or health. In some cases, they also did not recognize the symptoms of exposure to certain life- threatening atmospheres. In other cases, they did not realize that sometimes there are no obvious symptoms. Employees who attempted to rescue fallen coworkers inside permit spaces were also unaware of the hazards involved and of the procedures for safe rescue. The result of this lack of training was often the deaths of these employees.

OSHA proposed in the NPRM to establish training requirements for permit space entrants (paragraph (e)), for attendants (paragraph (f)), and for persons authorizing or in charge of an entry (paragraph (g)). The training requirements were combined with provisions related to the duties to be performed by each of these classes of employees to stress that employees had to be instructed in these specific duties. It was the Agency's belief that these provisions would go far towards the goal of protecting employees from the hazards of permit space entry.

Some commenters (Ex. 14–62, 14–63, 14–151, 14–163, 14–173, 14–174, 14–208, 14–214) were concerned that this approach did not stress the need for training enough or that it omitted important elements. For example, several rulemaking participants (Ex. 14–63, 14–151, 14–163, 14–208, 14–214) suggested that the standard address follow-up training and instruction in cardiopulmonary resuscitation. Others (Ex. 14–45, 14–63, 14–86, 14–109) argued that the training provisions should be clarified in one way or another. To address their concerns, the State of Maryland Occupational Safety and Health Program (Ex. 14–63) recommended the incorporation of a special section on training, as follows:

> There should be a training section or an Appendix incorporated into the standard, which offers an outline or a lesson plan which addresses each item to be covered, such as reading instruments, monitoring, ventilation, rescue, etc.

The Agency agrees that the best way to address the valid concerns of these rulemaking participants is to adopt a separate paragraph on training. This approach will not only stress the overall importance of training in a permit-required confined space entry program, but will ensure consistency among the different elements required for each class of employees and will allow OSHA to treat additional considerations supported by the record.

OSHA has not provided specific training elements in the text of paragraph (g). Many of the elements of training are listed in paragraphs (h), (i), (j), and (k) for authorized entrants, attendants, entry supervisors, and rescue personnel, respectively. These other paragraphs succinctly state the duties of these individuals, and paragraph (g) requires them to be trained in these duties. Other sources also provide guidance in selecting elements of training for employees involved in permit space entry operations. For example, ANSI Z117.1–1989 (Ex. 129) lists specific elements for authorized entrants, attendants, entry supervisors, and personnel performing testing for entry operations. Employers can utilize these sources of information in developing programs for teaching employees about permit space entry operations and the hazards involved.

Paragraph (g)(1) of the final rule requires employers to provide training so that employees whose work is regulated by §1910.146 acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under that section. This provision combines the training requirements proposed under paragraph (f), (g), and (h) in one place.

The Agency proposed to establish training requirements for entrants, attendants, and persons to whom the employer would delegate authority to be in charge of an entry. OSHA did not specify the experience or training necessary for employees who would initially evaluate spaces or who would formulate the requirements and the procedures that employees must use for safe entry into permit spaces. Also, OSHA did not specify what experience or training would be necessary to qualify a person to perform pre-entry testing and verification of permit conditions.

In Issue 1 of the proposal, OSHA asked if the Agency should set experience, proficiency, or other criteria to qualify employees assigned to evaluate spaces initially or those assigned to develop appropriate entry procedures. OSHA also asked what those criteria should be, and if persons

with the training and experience equivalent of a certified safety professional (CSP), a registered professional safety engineer (PE), an industrial hygienist, or a marine chemist should qualify. OSHA also wanted to know if the Agency should specify experience and training requirements for persons who perform the pre-entry tests or who monitor conditions during entry and, if so, what these employees should need to know and understand.

OSHA received many comments on this issue (Ex. 14–11, 14–27, 14–35, 14–42, 14–43, 14–44, 14–45, 14–62, 14–88, 14–111, 14–118, 14–126, 14–137, 14–147, 14–157, 14–161, 14–178, 14–179, 14–182, 14–184, 14–185, 14–189, 14–193, 113, 138). The issue was also discussed during the public hearings (Washington Tr. 466; Houston Tr. 631, 1056–1057; Chicago Tr. 150–151, 314–315, 320, 370–371, 610–611, 636–637, 642).

All the commenters agreed that employees entering and attending confined spaces had to be properly trained or experienced in the duties they were to perform. Some of them (Ex. 14–11, 14–44, 14–45, 14–63, 14–163, 14–173, 14–208; Chicago Tr. 320, 642) suggested that the requirement contain specific criteria either in a separate list or in the rule itself. For example, Warren Industries (Ex. 14–44) suggested a performance standard with a list of major topics. They stated:

> OSHA should only specify the required training to the extent that they specify that "All persons dealing with Confined Spaces must have special training on these subjects" and then list certain major topics to be covered.

Marshall Hicks of the Utility Workers' International Union (Chicago Tr. 642) testified that OSHA should be more specific in its requirement. He stated:

> We would propose that the OSHA regulation specifically state what the training requirements are and the qualifications for persons who will be making a determination of whether a confined space is safe for entry or not. We believe that that particular individual is going to be determining whether or not the worker who enters is going to be able to exit and we think that the specific qualifications in training ought to be set forth in the regulation for that individual as well as others.

However, the majority of commenters recommended that OSHA should require training in a performance-oriented manner, without specifying the content of that training or the qualifications of the trainer (Ex. 14–27, 14–35, 14–43, 14–137, 14–147, 14–157, 14–161, 14–178, 14–179, 14–182, 113, 138; Houston Tr. 631). These rulemaking participants argued that there was no practical way for OSHA to itemize the training for employees because of the wide variety of hazards posed by the different types of permit spaces encountered throughout general industry. They maintained that experience was frequently the best qualification for persons who determine the appropriate measures for safe permit space entry operations. For example, Union Carbide (Ex. 14–88) stated:

> Union Carbide endorses the "competent person" concept adopted in the lockout/tagout proposed rule as the acceptable standard for proficiency. We have found that experience can be more valuable in this area than formal training.

United Technologies (Ex. 14–178) agreed that OSHA should not set detailed training criteria, stating:

> OSHA should not set experience, proficiency or other criteria for qualified individuals who are expected to evaluate spaces. Training should be a requirement but the level of training will vary with the responsibility of the individual and the complexity of the entries. The training should be appropriate for the hazards to be encountered. A uniform training requirement can only cover suggested topics (i.e. definitions, using test equipment etc.). Specific requirements will not be appropriate for many of the situations encountered. In some cases spaces may be of sufficient complexity as to require evaluation by a trained safety/Health professional.
>
> For basic programs with more limited hazards and types of spaces, adequate training may be as little as attending a short formalized training session. Field testers must be trained in hazard recognition, use of instrumentation and field checks to insure that instruments are functioning properly. Their training should be commensurate with their responsibilities. The Confined Space Program must stand alone and be evaluated on the needs and concerns of the location and hazards for which it is designed.

Ray Witter, one of OSHA's expert witnesses (Houston Tr. 631), testified as follows in support of these comments:

> There have been many comments suggesting that OSHA should specify the qualifications required to be a certified trainer. This is an impossible task so I recommend that OSHA should not even attempt to set such criteria. OSHA has set performance criteria for all other requirements and training should be no different. Thus the qualifications of the trainers must vary greatly depending on the situation facing the employer.

The Agency agrees that the wide-ranging hazards found and the various control measures to be used to control them makes specifying the types of material to be covered in training courses for workers involved in permit space entry a nearly impossible task. Furthermore, it is OSHA's policy, as set out in section 6(b)(5) of the OSH Act to state safety and health standards in terms of performance desired wherever possible. Therefore, paragraph (g)(1) does not specify the courses to be provided or otherwise detail the exact training to be provided employees involved in permit space entry operations; rather, the standard requires training employees so that they acquire the understanding, knowledge, and skills necessary to perform their duties, as required by final §1910.146. The Agency believes that this approach sets the desired objective of the training, that is, to train employees to comply with the standard.

Most rulemaking participants believed that OSHA should not require the use of professionally certified individuals, such as CSPs, Pes, certified industrial hygienists, and Marine Chemists (Ex. 14–27, 14–44, 14–45, 14–111, 14–147, 14–184; Chicago Tr. 34). For example, the Northwest Pipeline Corporation (Ex. 14–27) stated:

> OSHA should not specifically require certain criteria such as professional engineer or safety professional certification, in order to qualify for initial evaluation and procedure development. Specifications of this type would be contrary to the overall performance oriented language [of] which the rest of the document is composed.

Warren Industries (Ex. 14–44) noted that professional certification did not automatically qualify a person to evaluate permit space hazards, as follows:

> There should be NO requirement that ties the criteria for experience or proficiency to such people as CSPs, RPSEs, Ihs [industrial hygienist], or Marine Chemists. Being in one of these categories in no way gives automatic qualifications for dealing with Confined Spaces and their unique problems. While the experience and education of these groups of people could be valuable in their learning the additional specifics of Confined Spaces, there is no reason to believe that a person with equivalent backgrounds would automatically be qualified to handle Confined Spaces.

S.C. Johnson & Son. (Ex. 14–45) also questioned the validity of automatic acceptance of professional certification, stating:

> A registration or certification as a safety professional (e.g., a registered professional safety engineer, industrial hygienist, a marine chemist) will not automatically qualify that person to evaluate spaces and to develop appropriate entry procedures. I have met many registered safety professionals and CIHs [certified industrial hygienist] who have little or no real world experience in the use of simple testing equipment (e.g., never used a detector tube, never calibrated a combustible gas/oxygen meter). Their entire "understanding" of confined space entries is theoretical in nature.

Texaco, USA (Ex. 14–147) noted that, while registration as a safety and health professional gives a person a portion of the training needed to identify permit space hazards, additional specific training in permit spaces would be necessary. They argued:

> The fact that a person has been classified as a CSP, a registered professional engineer, an industrial hygienist, or a maritime chemist should not automatically qualify that person as having sufficient training and experience to evaluate spaces and develop appropriate entry procedures. Although it is likely that professionals with these designations have the proper academic background, they, as well as anyone else, should not be designated as qualified until training in confined space hazard evaluations and entry procedures has been received.

The Independent Liquid Terminals Association (Ex. 14–184) identified the burden that would be placed upon small businesses, if certified or registered professionals were required, as a major reason for not including this type of provision in the final permit space standard. This commenter was concerned that small employers would be forced to hire a contractor to evaluate the permit space and to develop entry procedures even though a person capable of performing those duties, but without the proper professional certification, was available.

There were other rulemaking participants, however, who supported the required use of certified or registered professionals (Ex. 14–42, 14–62), particularly in maritime industries. The National Fire Protection Association (Ex. 14–42) supported this view, stating:

> A similar application of the two-tier approach used by the marine industry would require use of a professionally qualified tester for those confined spaces containing or capable of producing a toxic atmosphere during entry or work in the confined space or which pose a risk from fire or explosion. In these instances a professionally qualified tester, like a Marine Chemist or other certified professional, with demonstrated experience and training in evaluating confined spaces should be required to perform initial inspections and tests of the confined spaces prior to any entry.
>
> Confined spaces whose only hazard is oxygen deficiency, engulfment, or other mechanical hazards may be tested and inspected by a person trained to recognize, evaluate and control these hazards.

The Shipbuilder's Council of America (Ex. 14–62) agreed with the need to specify proficiency and knowledge criteria. They argued that small employers who do not have qualified individuals should hire a contractor to evaluate the hazards in their permit spaces, as follows:

> OSHA should determine experience, proficiency and knowledge criteria similar to those in 29 CFR 1915.7 [29] for the person who is qualified to evaluate the hazards associated with entering and working in confined spaces. Small businesses which do not have such persons available should be required to contract with an outside firm to perform this work.

OSHA has determined that it is not appropriate to require professional certification for persons who evaluate the hazards of permit spaces and who determine the procedures needed to control those hazards. The Agency agrees with the commenters who maintained that professional certification is not an automatic guarantee of competence. (However, OSHA recognizes that Marine Chemists are required to have extensive experience with permit space entry hazards.) Additionally, professional certification may not always be necessary for the safety of authorized entrants. The extent of knowledge required of certified safety and health professionals may simply not apply to an employer's particular permit space hazards. In such cases, a person with knowledge of the unique aspects of the employer's permit spaces may be better able to protect authorized entrants from the relevant hazards.

[29] Section 1915.4 defines "competent person." as:

> The term "competent person." for purposes of this part means a person who is capable of recognizing and evaluating employee exposure to hazardous substances or to other unsafe conditions and is capable of specifying the necessary protection and precautions to be taken to ensure the safety of employees as required by the particular regulation under the condition to which it applies. For the purposes of Subparts B, C, and D of this part, except for 1915.35(b)(8) and 1915.36(a)(5), to which the above definition applies, the competent person must also meet the additional requirements of 1915.7.

Paragraph (b) of §1915.7 sets forth the criteria for designating "competent persons" as follows:

> (b) *Criteria.* The following criteria shall guide the employer in designating employees as competent persons:
>
> (1) Ability to understand the meaning of designations on certificates and of any qualifications relating thereto and to carry out any instructions, either written or oral, left by the National Fire Protection Association Certified Marine Chemist or person authorized by the U.S. Coast Guard referred to in 1915.14.
>
> (2) Ability to use and interpret the readings of an oxygen indicator and a combustible gas indicator. The ability to use and interpret the readings of a carbon monoxide indicator and a carbon dioxide indicator, if the operations involved such hazardous gases.
>
> (3) Familiarity with and understanding of Subparts B, C, D, and H of this part.
>
> (4) Familiarity with the structure and knowledge of the location and designation of spaces of the types of vessels on which repair work is done.
>
> (5) Capability to perform the tests and inspections required by Subparts B, C, D, and H of this part and to write the required logs.

Therefore, the final rule does not require that a CSP, PE, certified industrial hygienist, or Marine Chemist perform the permit space evaluation or develop the hazard control measures to be used during entry. Paragraph (g)(1) does require, however, that the person performing these duties have the understanding, knowledge, and skills necessary to perform this task. OSHA would recognize such safety professionals as having the generalized understanding, knowledge, and skills required; however, they would also have to have experience with the type of permit space found in the workplace. As noted earlier, Marine Chemists do have extensive experience with the types of permit spaces found in the maritime industry. Their experience and education would also be recognized in non-maritime workplaces without the need for supplemental training if the types of permit spaces in those workplaces were found to be comparable to those in the maritime industry. (As noted under the discussion of paragraph (a) earlier in this section of the preamble, OSHA is currently exploring the possibility of expanding the scope of Subpart B of Part 1915 to cover confined spaces throughout shipyards. Based on the rulemaking record on Subpart B, OSHA will determine whether there is a unique need for Marine Chemists in those workplaces.)

Many commenters addressed training for employees who perform pre-entry testing or who monitor conditions during permit space entry operations (Ex. 14–27, 14–35, 14–42, 14–43, 14–44, 14–45, 14–62, 14–88, 14–118, 14–126, 14–147, 14–161, 14–179, 14–182, 14–185). Some commenters gave specific criteria for the training of employees who test or monitor confined spaces (Ex. 14–42, 14–44, 14–45, 14–182). For example, NFPA (Ex. 14–42) suggested a more specific rule to qualify testers and monitors:

> Training for the "qualified tester" would not require the same exposure to the breadth of hazards [as Marine Chemists require], but should stress the importance of testing every space prior to entry, what to do when results are unacceptable, and link the "qualified tester" with the "professional tester" in some follow-up capacity. The "qualified tester" should also be required to complete some minimum number of confined space inspections and tests of atmospheres prior to being designated by the employer.
>
> * * * * *
>
> The emphasis should be placed upon the ability of the testers to recognize various confined spaces and the potential hazards and then evaluate those hazards with the proper techniques (testing of the atmosphere or other). The case histories continue to point

out that if spaces had been evaluated many of the fatalities would not have occurred. Testers need to demonstrate performance in the evaluation phase of the recognition, evaluation and control system.

For those employers without staff professional testers, these individuals could be hired in a consultant capacity to assist with the development of the safe work practice and identify instances requiring the more advanced level of testing capability. The consultant could then be used on an as needed basis to actually test and inspect spaces. This practice is presently followed by some segments of industry who use NFPA Certificated Marine Chemists or Certified Industrial Hygienists to inspect and test storage tanks in refineries and underground storage tanks prior to removal and disposal.

In its recommendations, NFPA presented an extensive list of subjects in which they thought testers should be knowledgeable. The subjects included in the list ranged from test instrument calibration and use to hazard controls and rescue.

S.C. Johnson & Son, Inc. (Ex. 14–45), suggested similar criteria for employees who test and monitor permit spaces. Although their list was less extensive, it also included subjects, such as inspecting for safety hazards and the use of personal protective equipment, that were not directly related to testing.

Two other commenters (Ex. 14–44, 14–182) stated that personnel performing pre-entry testing and monitoring should be trained in field calibration and response checks, in limitations of the monitoring equipment, and in interpretation of results.

Other commenters stated that OSHA should not specify the criteria for individuals who perform pre-entry tests or who perform monitoring of the permit space (Ex 14–27, 14–35, 14–43, 14–126, 14–179). These commenters supported a more performance- oriented approach to the rule. For example, Transco Energy Company (Ex. 14–35) stated:

> OSHA should not establish experience and training requirements for persons who perform pre-entry tests and monitor conditions during entry. A comment to the effect of, "An individual familiar with the manufacturers' testing and calibration equipment and trained in Company testing procedures shall conduct pre-entry and/or continuous monitoring of the space," should be specified instead. Rigid training and experience specifications cannot adequately cover variations in the myriad of testing equipment currently on the market.

The Motor Vehicle Manufacturers Association (MVMA, Ex. 14–179) also supported the use of performance language, as follows:

> In any case, MVMA believes it is inappropriate for OSHA to specify any requirements, proficiency or other criteria to qualify individuals for any of these jobs. Training will be necessary but OSHA should allow employers to identify and delegate responsibility for these assignment based on training and experience of individuals.

The proposal did not contain any requirements pertaining to the training of employees performing testing or monitoring of permit spaces, unless the employee was performing such duties in the role of attendant, authorized entrant, or entry supervisor. The response to the issue of whether or not employees performing such testing or monitoring should be trained indicated overwhelmingly that these employees need to be knowledgeable in certain areas if the results of the testing or monitoring are to be meaningful. The rulemaking record indicates that those using test instruments need to be familiar with the use and calibration of the instruments, at a minimum. If these employees are involved in determining whether acceptable entry conditions have been achieved, they also need to know about the limitations of the instruments being used and about the meaning of the results obtained. If these employees also have to select the equipment to be used, they must also be trained in the selection of the proper equipment. The need for training employees performing testing and monitoring of permit spaces is clear. Therefore, the final rule adopts language that requires the employer to provide training so that all employees regulated by the standard will have the necessary understanding, knowledge, and skills.

On the other hand, the Agency is not convinced that training requirements for employees performing the testing or monitoring, or for any other employee having duties under final §1910.146 for that matter, can be specified with any precision. It is clear from the record that employers having permit space programs in place currently require attendants, authorized entrants, and entry supervisors to perform duties that are different across the various programs. Thus, for example, one employer might have the attendant perform the testing of the atmosphere within a permit space; another might have testing done by a specially trained person without other permit space duties; and a third might have the entry supervisor perform this duty. The person conducting the testing might have different responsibilities under each of these scenarios.

For these reasons, OSHA has determined that a performance- oriented approach is necessary for setting criteria on employee training, regardless of the duties involved. As noted earlier, the duties of authorized entrants, attendants, entry supervisors, and rescue personnel are spelled out in detail in paragraphs (h), (i), (j), and (k) of the final rule. Paragraph (g)(1) requires the training to impart the understanding, knowledge, and skills necessary for the safe performance of duties assigned under those paragraphs. In this way, the Agency is requiring the employer to provide whatever training is necessary to achieve this goal. The performance language used in paragraph (g)(1) will allow the employer to develop and implement the most effective confined space training program to meet the needs of the specific workplace. At the same time, by requiring employees to be trained in the duties addressed by §1910.146 and by specifying what those duties are (in paragraphs (h) through (k), in particular, and in other paragraphs of the final rule generally), the final rule sets forth guidance as to what how the training must be directed and what its content should be.

Paragraph (g)(2) of the final rule sets out the conditions under which training would have to be provided.

This provision had no counterpart in the proposed rule. Several rulemaking participants (Ex. 14–63, 14–151, 14–163, 14–208, 14–214; Chicago Tr. 316) recommended that training be provided under certain conditions. For example, the Communications Workers of America (Ex. 14–208) stated that "retraining is a very important issue" and recommended that OSHA specifically require refresher training in the final rule because of the decreasing frequency of confined space entry, at least among members of the CWA. Other commenters (Ex. 14–151, 14–214) were concerned that the proposed rule did not specify when the initial training was to be provided. The American Federation of State, County and Municipal Employees (Ex. 14–151) suggested that the rule require that training be provided before any entry is allowed.

Because of these concerns, OSHA is adopting provisions setting forth the circumstances under which training is required. OSHA has found, where training has been addressed in its standards, that refresher or ongoing safety instruction has invariably been an important component of training programs. Requirements for ongoing or refresher training can be found in many other OSHA standards, such as §1910.120, *Hazardous waste operations and emergency response*, §1910.147, *Control of hazardous energy sources (lockout/tagout)*, §1910.1025, *Lead*, and §1928.51, *Roll-over protective structures*

(ROPS) for tractors used in agricultural operations. OSHA has therefore adopted provisions specifying the conditions under which training is required by the final rule. These provisions address initial training, training based upon changes affecting safe permit space entry operations, and refresher training. The following paragraphs describe and explain each of the conditions triggering the requirement to train employees assigned duties under §1910.146.

Paragraph (g)(2)(i) requires training before an employee is first assigned duties under this section. As noted earlier, some commenters recommended that OSHA require that employees be trained before permit space operations begin. The rulemaking record strongly indicates that lack of training is one of the major causes of deaths and injuries resulting from permit space entries. The record also demonstrates that employees who have not been trained adequately endanger fellow employees as well as themselves. Because of the danger involved in allowing untrained employees to take part in permit space entry operations, OSHA is requiring employees to be trained before first being assigned duties under final §1910.146. OSHA is not providing any additional delay for training beyond the effective date. However, employees who are currently performing duties outlined in the standard and who have previously been trained need further instruction only insofar as they are unfamiliar with the hazards involved and must change their work practices so as to conform to §1910.146. The employer must still certify the training of these individuals, as required by paragraph (g)(4). Additionally, OSHA will accept on-the-job training as long as the employee involved is under the direct supervision of a trained individual and has received sufficient instruction to enable the trainee to work safely at his or her level of training.

Paragraphs , (g)(2)(iii), and (g)(2)(iv) of the final rule address the issue of refresher training. Paragraph (g)(2)(ii) requires training before there is a change in assigned duties. Such changes could be the result of new equipment or techniques introduced into the entry operations, promotions, or simple reassignments. If an employee has been previously trained in the new duties, then additional training is not required under this paragraph, provided the employer has no reason to believe that there are inadequacies in the employee's knowledge or use of the relevant permit space procedures. (If there is reason to believe such inadequacies exist, training is required under paragraph (g)(2)(iv).)

Paragraph (g)(2)(iii) requires training before there is a change in permit space operations that presents a hazard about which an employee has not previously been trained.

Paragraph (g)(2)(iv) requires training whenever the employer has reason to believe that there are deviations from the permit space entry procedures or that there are inadequacies in the employee's knowledge or use of these procedures.

Several rulemaking participants (Ex. 14–50, 14–61, 14–63, 14–82, 14–151, 14–163, 14–214) recommended that the standard require refresher training and evaluation of employee knowledge and skills to maintain employee knowledge and skills. For example, the American Federation of State, County and Municipal Employees (AFSCME, Ex. 14–151) made the following comment:

> AFSCME further believes that all training must be completed before any entry into a confined space is allowed and that training must be repeated on an annual basis or any time the hazards associated with the entry change.

Mr. Timothy Grabenstein (Ex. 14–163) supported periodic evaluation of the effectiveness of training, as follows:

> Also periodic follow-up evaluation must be included as part of this rule making to assure competency.

OSHA acknowledges the need for refresher training. Paragraphs (g)(2)(ii), (g)(2)(iii), and (g)(2)(iv) require "refresher" or "follow-up" training whenever there is a demonstrated need for it. Changes in assigned permit space program duties or exposure to hazards for which an employee has not been trained are obvious indications of a need for additional or refresher training. Similarly, any deficiency noted in an employee's work performance that is related to the safety and health of entrants would probably be a strong indication of the need for training for that employee. If training proves to be insufficient to improve the employee's performance (eliminate the unsafe acts), the employer then might consider other means of action, such as clarification of the procedures involved or disciplinary action. However, OSHA believes that training is normally the primary corrective action to be taken. Other evidence of the need for additional training may be brought out in the review of permit space program under paragraphs (d)(13) and (d)(13) of the final rule. Certainly, incidents during entry operations that employees were nearly injured are evidence of a possible need for additional training. The Agency believes that paragraph (g)(2) of the final rule will ensure that employers provide ongoing training to their employees and evaluate their permit space programs to confirm that employees have the understanding, knowledge, and skills needed for safe permit space entry operations.

Paragraph (g)(3) of the final rule requires the training to establish employee proficiency and to introduce new or revised procedures, as necessary, to assure compliance with this final rule.

As noted earlier under this discussion of paragraph (g), OSHA has decided based on the rulemaking record to set performance- oriented requirements for permit space training. Although the Agency has concluded that it is inappropriate to set specific criteria for the areas in which training is to be provided, OSHA has determined that it is necessary to set the overall objective for the training program itself. Paragraph (g)(3) of the final rule reflects this determination by requiring the training to establish proficiency in the tasks performed under §1910.146 and to introduce new or revised procedures developed under this section.

Paragraph (g)(4) of the final rule requires the employer to certify that employee training required by paragraphs (g)(1) through (g)(3) has been accomplished. This certification must contain each employee's name, the signature or initials of the trainers, and the dates of training.

As noted under the discussion of paragraphs (f)(4), (f)(5), and (f)(6), several commenters (Ex. 14–80, 14–94, 14–118) suggested that lists of trained employees be kept with training records. Local 660 of the Service Employees International Union (Washington Tr. 383) suggested that the dates of training certification be listed on each entry permit. The State of Maryland Occupational Safety and Health Program (Ex. 14–63) suggested that training records or certifications be maintained.

On the other hand, Monsanto (Ex. 14–170) urged the Agency not to adopt a certification requirement, as follows:

> Monsanto also believes that extensive certification of training, such as is required in the recent lockout/tagout standard, is a paperwork burden that is unnecessary for safety or for compliance checking and we would strongly urge that concept not be included in this or any future standards. It adds only to the burden of compliance and has very little to do with effective training or effective hazard control.

OSHA strongly believes that certification of employee training provides a valuable record to employers, employees, and OSHA in determining whether or not required training has

been accomplished. Standards on employee training commonly incorporate requirements for the certification of training, and OSHA has not found compliance with these rules to be a problem. The employer need not fill out extensive forms or individual certificates to meet this requirement. The employer could certify the training of any number of employees on a list or roster just as effectively as through the use of individual certificates. In fact, OSHA's experience under the certification requirements of other standards indicates that employers typically use existing training records to meet these requirements.

Paragraph (h), Duties of authorized entrants.

An authorized entrant is an employee authorized by the employer to enter a permit space. This is the person who faces the greatest risk of death or injury from exposure to the hazards contained within the space. Although the permit program is intended to provide protection to authorized entrants during permit space entry operations, the entrants themselves must also perform duties to assure their own safety. The employer is responsible to ensure that authorized entrants perform these duties. This is accomplished by means of training, communication of effective work rules, and internal administration.

Paragraph (h) of the final rule, which is based, in part, on proposed paragraph (e), addresses the duties required of authorized entrants. As discussed previously, paragraph (d)(8) of the final rule requires the employer to designate the employees who will have roles (such as authorized entrants) in entry operations, to identify the duties of each such employee, and to train those employees to perform their duties. OSHA has determined that while the training required for all personnel involved in entry operations under paragraph (d)(8) can properly be covered in a single paragraph (§1910.146(g)), the duties of the three classes of employees (authorized entrants, attendants, and entry supervisors) differ sufficiently that those duties need to be addressed in separate paragraphs. Training under paragraph (g) of the final rule must focus on the duties spelled out in these paragraphs.

Paragraph (h)(1) of the final rule requires entrants: (1) to know the hazards that may be faced during entry, including information on the mode of exposure, (2) to be able to recognize the signs or symptoms of exposure, and (3) to understand the consequences of exposure to the hazards.

This provision is essentially the same as proposed paragraph (e)(1), which would have required entrants to know the hazards to which they may be exposed, including only the signs or symptoms and the consequences of exposure. The Service Employees Union (Washington Tr. 428) testified that death and injury in confined spaces can be caused by skin penetrating agents and that entrants should have an understanding of the hazardous chemicals and materials to which they may be exposed, including its mode of action, so that they can better protect themselves.

OSHA believes this is a valid point. For toxic substances, the mode of exposure could be by inhalation or by dermal absorption. Unless employees are knowledgeable about the mode of exposure, they may not fully understand the nature of the hazard involved. As noted in the preamble to the proposal (54 FR 24093), the Agency believes that authorized entrants who know the permit space hazards they may confront, who can recognize the effects of those hazards, and who can understand the consequences of exposure will be significantly more likely to detect a hazard in time for successful rescue. Therefore, OSHA has included the Service Employees Union's recommendation in the final rule.

OSHA notes that, if the employer knows what substance or material will be present in the permit space and if a Material Safety Data Sheet for that substance is required to be present at the workplace by the hazard communication standard (§1910.1200) information concerning that substance, including its mode of action, will be readily available at the worksite and accessible to all personnel involved in the permit space entry.

Another commenter (Ex. 14–62) suggested that the rule contain a provision requiring the entrant to know the characteristics of a permit space. They argued that "[o]ne of the key elements of any confined space training program is to ensure the entrants can recognize a confined space before they have to enter one."

OSHA has not made the suggested change. The Agency believes that, given the requirements in paragraphs (c)(2), (g), and (h)(1) of the final rule, such a requirement is not needed. Paragraph (c)(2) requires employers to inform their employees of the existence and location of permit spaces; paragraph (g) requires employees to be trained in the understanding, knowledge, and skills needed to perform their duties safely; and paragraph (h)(1) requires authorized entrants to be trained in the hazards of the permit space to be entered. Additionally, the particular permit space and the purpose of the entry are required to be entered on the permit under paragraph (f). OSHA believes that compliance with these provisions will adequately inform authorized entrants of what a permit space is and how to recognize one.

Paragraph (h)(2) requires that entrants properly use equipment as required by paragraph (d)(4) of the final rule. Paragraph (d)(4) requires employers to provide employees with the equipment necessary for safe entry operations at no cost to employees, to maintain that equipment, and to ensure that the equipment is used properly. The failure to provide and ensure the proper use of personal protective equipment has been a factor in many of the permit space fatalities and injuries documented in the rulemaking record. Therefore, the Agency believes a reference to the requirement for the use of protective and rescue equipment is appropriate to stress the importance of this provision. Additionally, stating the reference under paragraph (h) indicates clearly that it is one of the required duties of an authorized entrant and that it must, therefore, be the subject of training required under paragraph (g) of the final rule.

Paragraph (h)(2) of the final rule has been taken from proposed paragraph (e)(3), which would have required authorized entrants to be aware of the necessary protective equipment, be provided with this equipment, use it properly, and be aware of barriers and of their proper use. The Agency has not carried forward these more detailed provisions from the proposal because they would be redundant with paragraph (d)(4) of the final rule. OSHA believes that it is better to address these provisions in one place in the final standard so as to avoid any misinterpretation that might result from having two requirements that address the same subject matter but that are worded differently.

One commenter (Ex. 14–151) suggested that OSHA require all authorized entrants to wear monitoring devices that detect oxygen deficiency and other atmospheric hazards and that can activate an alarm if conditions within the permit space become hazardous.

OSHA has not adopted this recommendation. Some permit spaces do not pose atmospheric hazards. For example, a permit space could pose only mechanical hazards. In such cases, a monitoring device would serve no useful function. Additionally, the Agency believes that, even where

atmospheric hazards predominate, isolation of the space, testing of the atmosphere, and ventilation can be effective means of controlling those hazards. The successful permit space programs described in the record amply demonstrate this. OSHA believes that personal monitoring devices can be used to facilitate compliance with the requirement for effective communication with attendants; however, there are other effective options for protecting employees from atmospheric hazards.

Paragraph (h)(3) of the final rule requires that the entrant communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert them of the need to evacuate the space. OSHA believes that the authorized entrant's communication with the attendant provides information that the attendant needs in order to determine if the entry can be allowed to continue. Depending on the types of atmospheric contaminants that might be present within a permit space, subtle behavioral changes detected in the authorized entrant's speech or deviation from set communication procedures could alert the attendant that it is necessary for the authorized entrant to evacuate the space or be rescued. Additionally, the attendant needs to be able to communicate with authorized entrants to order them to evacuate the space in an emergency.

Paragraph (h)(3) of the final rule is based on paragraph (e)(2) of the proposal. Proposed paragraph (f)(3)(i) contained a corresponding requirement that attendants maintain contact with authorized entrants. Although the two proposed provisions addressed the same topic (albeit from different perspectives), they were not worded consistently. Proposed paragraph (e)(2)(i) required authorized entrants to "[m]aintain contact with the attendant"; paragraph (f)(3)(i) required the attendant to "[m]aintain effective and continuous contact with authorized entrants during entry". Several commenters (Ex. 14–80, 14–94, 14–109, 14–118, 14–150, 14–157, 14–170, 14–188) requested clarification of the two proposed requirements. Two (Ex. 14–80, 14–109) noted the inconsistency in language between the two provisions. Some of these commenters (Ex. 14–80, 14–94, 14–150, 14–188) objected to the word "continuous" in proposed paragraph (f)(3)(i). They argued that this term was unclear, undefined, and impractical. The International Brotherhood of Teamsters suggested that both provisions use the phrase "effective and continuous" to describe the duty involved. They argued that schemes that provide, as the only means of communications, an electronic monitoring devices that transmit a signal at periods up to several minutes do not provide effective communications with the authorized entrants. On the other hand, most of those commenting on the two provisions (Ex. 14–94, 14–118, 14–157, 14–170) recommended that the final rule contain a flexible requirement that recognizes any effective means of communicating with employees in the permit space.

OSHA agrees that the language in the two paragraphs addressing communications between the attendant and the authorized entrants must be consistent. They are, after all, meant to accomplish the same objective, that is, to enable the attendant to monitor entrant status and to alert them of the need to evacuate the space. It is important for the attendant to know whether or not authorized entrants are in danger. At the first signs of impairment of function, the attendant must take steps to alert entrants to the danger involved and to evacuate them from the permit space. Conversely, it is important for the entrants to remain in contact with the attendant. If they recognize any symptoms of exposure to hazardous substances or if they are otherwise in immediate danger, they must be able to contact the attendant as quickly as possible.

To assure these common objectives, OSHA has adopted language in paragraphs (d)(4)(iii), (h)(3), and (i)(5) of the final rule that requires the establishment of communications enabling the attendant to monitor the status of authorized entrants and to alert them of the need to evacuate the space. The language of these provisions is performance oriented, allowing any effective means of accomplishing the goal set by the two paragraphs. Successful permit space programs currently in effect use such systems as two-way radios, television or other continuous electronic monitoring equipment in combination with alarms, and voice contact as effective methods of communication between attendants and authorized entrants. While these types of systems (because they were selected by the employer involved on the basis of experience) are acceptable, the exact type and extent of communication needed to meet paragraph (h)(3) of the final rule are dependent on the hazards that might arise and the operations being performed within the permit space. For example, work that must be performed in IDLH atmospheres (because engineering controls are infeasible) might necessitate the use of continuous monitoring equipment. In contrast, authorized entrants performing work in spaces that pose only mechanical hazards would need a communication system that provides only periodic monitoring.

Paragraph (h)(4) of the final rule requires authorized entrants to alert the attendant when the entrant recognizes any warning sign or symptom of exposure to a dangerous condition or when the entrant detects a prohibited condition. An authorized entrant who recognizes the signs or symptoms of a hazardous condition or who detects a prohibited condition maximizes his or her own chances of evacuating safely in the same permit space by exiting the space in accordance with paragraphs (h)(5)(ii) and (h)(5)(iii). The entrant ensures that other entrants are protected by informing the attendant of the presence of these conditions, which make the space hazardous to other entrants as well.[30]

Paragraph (h)(4) of the final rule is based on proposed paragraph (e)(2)(ii). The proposed provision required simply that the authorized entrant alert the attendant when self- initiating evacuation from a permit space. OSHA has revised the language from the proposed paragraph for consistency with paragraph (h)(5) of the final rule. Paragraphs (h)(5)(ii) and (h)(5)(iii) list the conditions under which authorized attendants are required to exit the permit space (that is, "self-rescue"). The text from these two paragraphs has simply been repeated in paragraph (h)(4) for clarity.

Several commenters (Ex. 14–118, 14–157, 14–161, 14–170) stated that OSHA should emphasize training of authorized entrants to exit permit spaces, because

[30] Alerting other authorized entrants can also improve their changes of escape as well. However, there are several reasons why OSHA is not requiring this. First, the permit space may well be so large that the entrant who detects a hazard cannot quickly or efficiently communicate with other authorized entrants. Under paragraph (i)(5) of the final rule, the attendant is required to have the means of communicating with all authorized entrants in the space. The quickest and most effective means of ordering the evacuation of the space is therefore normally through the attendant. In fact, this is required under paragraph (i)(6) of the final rule. Furthermore, the Agency does not believe that it is appropriate to require one employee to risk injury or death to warn another. While in some cases it may be reasonable for entrants to inform each other of the presence of uncontrolled hazards and in other cases an employee may voluntarily risk injury or death to warn his or her fellow employees, OSHA has determined that the final rule should only require authorized entrants to inform attendants. OSHA notes that the standard does permit entrants to alert other authorized entrants when the presence of prohibited conditions or warning signs or symptoms are detected.

the employer can train an authorized entrant to understand the consequences of exposure to permit space hazards and the need to evacuate but cannot ensure that an authorized entrant will exit a permit space when necessary.

In response, OSHA notes that training is not the only measure an employer can take to ensure that employees follow work rules. Company attitude and policy towards permit space safety can also influence employee behavior. The Agency notes that many of the permit space incidents reported to OSHA occurred because supervisors failed to see that employees complied with the employer's procedures for safe entry. OSHA has determined that it is necessary to set clear requirements which, when followed conscientiously by employers, will minimize the likelihood of permit space incidents.

Paragraph (h)(5) of the final rule requires the entrant to exit from the permit space as quickly as possible whenever the attendant or entry supervisor orders evacuation, whenever the authorized entrant recognizes any warning sign or symptom of exposure to a hazardous substance, whenever the entrant detects a prohibited condition, and whenever an evacuation alarm is activated. Given the speed with which permit space hazards can incapacitate and kill entrants, it is essential that the entrants evacuate permit spaces as soon as any one of the four conditions set out in paragraphs (h)(5)(i) through (h)(5)(iv) exists. As noted in the preamble to the proposal (54 FR 24093), OSHA believes that self-rescue will often provide the entrant's best chance of escaping a permit space when a hazard is present. Additionally, the time lost waiting for someone outside the space to commence rescue could be the difference between life and death. Also, narrowly configured openings of many permit spaces can make it very difficult for personnel outside those spaces to extricate victims of permit space hazards. Therefore, although OSHA recognizes that self-rescue may sometimes be impossible, the Agency stresses the importance of attempting self-rescue as a means of saving lives and minimizing injuries.

Paragraph (h)(5) of the final rule is based on proposed paragraph (e)(4), which would have required authorized entrants to exit the permit space, unless it was physically impossible to do so, whenever: (1) the attendant ordered evacuation; (2) an automatic alarm was activated; or (3) the authorized entrants perceived that they were in danger. OSHA has made some editorial revisions to the language of proposed paragraph (e)(4) in the course of drafting the final rule. For example, the phrase "unless it is physically impossible to do so" has been removed from the introductory text of the proposed provision. With this standard, as is the case with so many other standards, impossibility of compliance will be a factor to be evaluated in enforcement proceedings. Also, the Agency has included the phrase "entry supervisor" in paragraph (h)(5)(i) to reflect the entry supervisor's authority to terminate entry (as provided in paragraph (j)(3) of the final rule). Additionally, OSHA has replaced the word "automatic" with "evacuation" in paragraph (h)(5)(iv), in response to comments (Ex. 14–150, 14–168) noting that a workplace could contain many different automatic alarms, few of which may have anything to do with evacuation from a permit space. Those commenters suggested "evacuation" as a replacement for "automatic".

Several commenters (Ex. 14–161, 14–168, 14–178, 14–193) objected to the phrase "perceive that they are in danger" proposed in paragraph (e)(4)(iii). They stated that this language was too vague and was subject to misinterpretation and possible employee abuse. These commenters recommended that the provision be clarified.

OSHA has accepted this recommendation. Final paragraph (h)(5) sets out two separate conditions (paragraphs (h)(5)(ii) and (h)(5)(iii)) that address the need for evacuation of the permit space when hazards are recognized by authorized entrants. Paragraph (h)(5)(ii) requires authorized entrants to exit the space whenever they recognize "any warning sign or symptom of exposure to a dangerous situation", which they are required to know under paragraph (h)(1) of the final rule. Paragraph (h)(5)(iii) requires them to exit the space whenever they detect a prohibited condition, which, by definition, indicates that acceptable entry conditions are no longer present. The Agency believes that these two provisions in the final rule address the commenters' concerns about proposed paragraph (e)(4)(iii).

Paragraph (i), Duties of attendants.

One of the major problems in permit space entry operations is that, if an entrant within the space is injured or incapacitated, he or she cannot normally be seen from outside the space. For example, if an employee working inside a storage tank were to lose consciousness because of oxygen deficiency, employees working nearby might not see that the entrant is incapacitated, and the unconscious employee would probably die before anyone realized that something was wrong. In fact, many of the accident summaries in the record describe an employee who entered a permit space alone, was overcome by hazards within the space, and was not found until it was too late for rescue. Providing an attendant outside a permit space is a widely accepted method of monitoring the status of authorized entrants within the space, as well as conditions (relative to safety) within the space, and of providing for the summoning of rescue services. The need for an attendant outside permit spaces is recognized by other OSHA standards (for example, §§1910.252(b)(4)(iv), 1910.268(o), 1910.272(g)(3), and 1926.956), by various national consensus standards (for example, ANSI C2, ANSI Z49.1, and ANSI Z117.1), and by permit-required confined space programs currently in use by employers (Ex. 14–4, 14–57, 14–73, 14–88, 14–170, 14–209, 97, 104, 119, 143). As discussed earlier, paragraph (d)(6) of the final rule requires the employer to provide an attendant outside the space to monitor the status of authorized entrants and the conditions within the permit space.

Paragraph (i) of the final rule, which is based, in part, on proposed paragraph (f), sets forth the duties of the attendant. These duties include knowing and watching for the hazards that may be present within the space, monitoring the status of authorized entrants, keeping unauthorized employees out of the space, and evacuating entrants or summoning rescue services in the event of emergency. The introductory text of paragraph (i) requires the employer to ensure that these duties, as set out in paragraphs (i)(1) through (i)(10), are performed. As noted earlier, this is accomplished by means of training, communication of effective work rules, and administration.

Paragraph (i)(1) of the final rule requires the attendant to know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of exposure. This provision is identical to a corresponding provision for authorized entrants in paragraph (h)(1) and is based on the first part of proposed paragraph (f)(2), which would have required the attendant to know of and to be able to recognize potential permit space hazards and on which OSHA received no substantive comment. For consistency with the corresponding provision in paragraph (h)(1), paragraph (i)(1) simply states that the attendants know the hazards that may be faced. OSHA believes that it is clear that knowing the hazards includes

being able to recognize them (except for being able to detect behavioral effects of hazards, which is addressed in paragraph (i)(2) of the final rule). The Agency has worded paragraphs (h)(1), (i)(1), and (j)(1) of the final rule identically because it is important that attendants, authorized entrants, and entry supervisors receive the same training on hazards and hazard recognition. The language from proposed paragraph (f)(2) addressing monitoring activities inside and outside the space has been placed in paragraph (i)(6) of the final rule.

Paragraph (i)(2) of the final rule requires the attendant to be aware of possible behavioral effects of hazard exposure on authorized entrants. This provision, as noted previously, is based on proposed paragraph (f)(2), which would have required attendants to be able to "recognize potential permit space hazards", and on proposed paragraph (f)(3)(ii)(B), which would have required the attendant to order the evacuation of the space when the attendant detects the behavioral effects of hazard exposure. OSHA believes that setting out the requirement for attendants to be aware of possible behavioral effects of hazard exposure will alert employers and attendants to the importance of this aspect of safe permit space entry operations. As noted earlier, subtle behavioral changes detected in the authorized entrant's speech or deviation from set communication procedures could alert the attendant that it is necessary for the authorized entrant to evacuate the space or be rescued.

Paragraph (i)(3) of the final rule requires the attendant to maintain a continuous accurate count of all authorized entrants in the permit space and to ensure that the means used to identify authorized entrants, under paragraph (f)(4) of the final rule, accurately identifies who is in the space.

This provision is equivalent to proposed paragraph (f)(1), which would have required an attendant to keep an accurate count of all persons within the space. The phrase "all persons" has been changed to "authorized entrants" in the final rule. It is important for the attendant to keep track of authorized entrants as they enter and exit the space. The count and identity of entrants will be necessary during rescue operations for the determination of whether all authorized entrants have been evacuated from the space.

In response to proposed paragraph (f)(1), some commenters (Ex. 14–63, 14–119) recommended that OSHA require some type of check- in, check-out procedure for tracking entrant entry and exit. They were concerned about improperly placing responsibility for this task on employees and about the attendant's being able to maintain an accurate count by memory only.

The employer is required to keeping track of authorized entrants within the space by listing them by name or by identifying them by some other means under paragraph (f)(4) of the final rule, discussed earlier in this section of the preamble. The system identified on the permit is required to enable the attendant to determine quickly and accurately which authorized entrants are inside the permit space. Paragraph (i)(3) of the final rule requires the attendant to ensure that this system is used to accurately identify who is in the permit space.

Paragraph (i)(4) of the final rule requires the attendant to remain outside the permit space during entry operations until he or she is relieved by another authorized attendant. This provision is substantially the same as that contained in the introductory text of proposed paragraph (f). Paragraph (i)(4) of the final rule also provides a note clarifying OSHA's intent concerning the issue of using attendants to perform rescue. It states that attendants may enter a permit space to attempt a rescue if it is allowed by the employer's permit program, if they have been properly equipped and trained, and if they have been relieved by another attendant.

Under paragraph (f)(4) of the proposal, attendants would have been forbidden to enter a permit space to attempt a rescue. The proposed language did not make clear, however, that, once relieved, the individual who had been acting as the attendant would no longer be the attendant for that particular permit space and then would not be precluded from attempting a rescue. Paragraph (f)(4) of the proposed standard mistakenly gave the impression that a person designated as an attendant could never enter a permit space to attempt a rescue.

In Issue 10 of the hearing notice (54 FR 41463), OSHA requested comment on the Agency's proposed prohibition of rescue by confined space attendants. The Agency asked interested parties participating in the rulemaking if circumstances existed where OSHA should permit attendants to enter permit spaces for rescue purposes.

OSHA received considerable comment on this issue (Ex. 14–47, 14–64, 14–69, 14–72, 14–80, 14–88, 14–118, 14–125, 14–143, 14–148, 14–150, 14–151, 14–153, 14–157, 14–170, 14–171, 14–174, 14–177, 14–184, 14–193, 14–200, 14–201, 14–208, 14–210, 14–217). There was also considerable discussion of this issue in the public hearings (Washington Tr. 319, 388, 422–424, 465, 477–481, 517–518, 541–543, 552; Houston Tr. 630, 735–736, 787, 861, 865–869, 896; Chicago Tr. 179, 191–192, 203–205, 263–264, 372–373, 432, 496, 499, 535, 565–566, 616).

Several commenters (Ex. 14–47, 14–118, 14–125, 14–151, 14–157, 14–170, 14–171) acknowledged that a safety or health hazard exists if OSHA permits untrained, poorly equipped attendants to enter a permit space for rescue. For example, the Monsanto Company (Ex. 14–170) stated:

> We recognize that there have been a number of fatalities from attendants or other would-be rescuers attempting to enter a confined space without the proper protective equipment or training.

The American National Can Company (Ex. 14–47) agreed, stating:

> The high incidence of "rescuer" death is most often from untrained, ill-prepared, emotional response on the part of by-standers, friends, etc.

During discussions about the hazards associated with untrained employees entering spaces to perform rescue (Washington Tr. 543), Mr. Thomas Lawrence, testifying on behalf of the Chemical Manufacturer's Association, stated:

> This is the same kind of thing that happens when attendants get in trouble when they go into spaces willy nilly without any backup or proper equipment or training. That's the whole data situation that we've been talking about, about what happens with attendants going inside.

The American Petroleum Institute (Washington Tr. 735) also shared OSHA's concern about fatalities that occur when unprepared and unqualified personnel attempt rescue.

All of the participants in this rulemaking agreed that entry into permit spaces by untrained, poorly equipped persons, whether they are attendants or not, for any purpose, including rescue, is hazardous and should be prohibited. OSHA agrees with this point. In fact, the major purpose of this rulemaking is to ensure that all employees who enter permit spaces are properly trained and equipped to do so and that they are otherwise protected from the hazards of permit space entry.

One commenter (Ex. 14–153) supported a total prohibition of permit space rescue by any attendant, as follows:

> As stated previously, it is The Heil Co.'s position that attendants should not be permitted to rescue a down entrant.

However, as noted in the following discussion, many rulemaking participants recognized the need to permit some level of limited emergency response by an attendant. They suggested that some rescue response could be provided by a person stationed outside a permit space to monitor the activities of authorized entrants.

Several rulemaking participants (Ex. 14–47, 14–64, 14–69, 14–80, 14–88, 14–111, 14–118, 14–125, 14–143, 14–150, 14–151, 14–157, 14–170, 14–171, 14–184, 14–193, 14–200, 14–201, 14–208, 14–210, 14–217; Washington Tr. 465, 478) understood the importance of having a qualified, properly equipped person available and ready to begin rescue of an entrant impaired by a hazardous atmosphere. Some of the commenters (Ex. 14–47, 14–64, 14–72, 14–88, 14–111, 14–118, 14–125, 14–143, 14–150, 14–151, 14–157, 14–170, 14–171, 14–174, 14–184, 14–193, 14–200, 14–208, 14–210) identified the attendant as being the most readily available, qualified, properly equipped rescuer.

Some rulemaking participants suggested that OSHA permit attendants to perform rescue under certain limited circumstances. Several suggested that OSHA permit rescue entry by attendants once the attendant notifies outside emergency rescue personnel to respond (Ex. 14–148, 14–174, 14–177, 14–200, 14–201, 14–217; Chicago Tr. 372–373, 496, 499).

For example, the GTE Service Corporation (Ex. 14–201) stated:

> With regard to permitted duties for attendants, GTE also believes that attendants should be able to assist with a rescue if they have first summoned help and are trained in rescue procedures.

The Longview Fibre Company (Ex. 14–200) supported this view, as follows:

> Attendants should be allowed to enter permit spaces to perform a rescue under certain conditions where time is a critical factor in obtaining a successful rescue: The attendant must first be required to summon additional rescue assistance and be certain help is on the way prior to rescue entry.

Additionally, the National Safety Council (Chicago Tr. 496) testified:

> The employer could use the attendant as rescuer provided that the attendant is properly trained and equipped. Prior to becoming the rescuer, this individual should assure that an emergency notification system has been activated and calls for backup.

Under questioning by Mr. Chappell Pierce of the OSHA panel, Mr. Irvin Etter, representing the National Safety Council (Chicago Tr. 499), further clarified their testimony as follows:

> MR. PIERCE: ... one question on a clarification of Issue No. 10 regarding rescue by the attendant. You advocate that the attendant would be allowed to perform the rescue if he has the training and necessary equipment. Do you also advocate that he be allowed to enter before another attendant is in place?
>
> MR. ETTER: Yes. This is what we discussed in our deliberation.
>
> *****
>
> MR. PIERCE: Okay. I would like clarification on that one point.
>
> MR. ETTER: Our consideration on this was it's very difficult for the individual, if there's only one attendant on topside, to keep from going in and try to rescue a person and we feel that if the person is properly qualified, he can be making the rescue and possibly save the life if he has the proper equipment and the proper training before other people might be able to get there to perform the rescue.

Other rulemaking participants recommended a more limited rule for attendants attempting rescue, suggesting that OSHA permit a properly trained and equipped attendant to conduct a rescue after a second attendant has arrived and assumed the duties of attendant. Most of them (Ex. 14–88, 14–118, 14–125, 14–143, 14–148, 14–150, 14–170, 14–193; Washington Tr. 541–543, 630, 735–736) recommended that OSHA permit attendants to perform rescue entry after the employer notifies outside emergency responders and after the employer stations another attendant outside the permit space. For example, the Union Carbide Corporation (Ex. 14–88) stated:

> In proposed paragraph (f)(4)(i), the attendant would be prohibited from entering the permit space to attempt rescue of entrants. OSHA should clarify that once another attendant has arrived and been briefed by the first attendant, the first attendant may, if properly trained, change his or her status from attendant to member of rescue team.

The Monsanto Company (Ex. 14–170) agreed, stating:

> However, we recommend that the attendant be permitted to enter the confined space to start rescue so long as he/she is properly trained in rescue techniques *and a new attendant is in place.* In many instances, a properly trained and equipped attendant starting the rescue operation could cut valuable time off the amount of time that would be required to rescue personnel from the confined space if that rescue can begin only after the arrival of the rescue team. [Emphasis was supplied in original.]

Further support for this position came from Mr. Thomas Lawrence, representing the Chemical Manufacturer's Association (Washington Tr. 542), in response to a question from Mr. Thomas Seymour of the OSHA panel, as follows:

> MR. SEYMOUR: Is there really any reason or rationale whether [rescue by attendant] should be permitted?
>
> MR. LAWRENCE: Our position should be and is that—the discussions we've had is, hey, the attendant can go in and we want him to be able to go in if he has proper training, which he should have ... Number two, has the right equipment, which he should have. That's part of the preparation. And three, there's another person there to back him up, another attendant.

OSHA's expert witness, Ray E. Witter (Houston Tr. 630), also testified in support of allowing attendants to attempt rescue after being relieved, as follows:

> However, attendants should be allowed to enter confined spaces *only* when all of the following requirements have been met. First, the replacement attendant is present, and has been properly briefed. Second, the attendant is properly trained in rescue operations and third, the necessary protective personal equipment is used. [Emphasis was supplied in original.]

Additionally, the American Petroleum Institute (Houston Tr.735, 736) testified, as follows:

> However, an attendant that has been appropriately trained and qualified for entry, and properly equipped with breathing apparatus and protective equipment is an extremely valuable rescue resource. Such an attendant could undoubtedly perform a rescue much more expeditiously than any rescue team.
>
> For example, after an attendant has determined that an entrant needs assistance and a rescue call has been dispatched, the attendant would first attempt to perform a rescue without entering the permit confined space, using retrieval lines or devices. Should this prove to be ineffective, the attendant would then prepare for entry by donning the appropriate respiratory and personal protective equipment. Upon arrival of another qualified attendant, the original attendant could enter the permit confined space and attempt rescue.

Still other commenters (Ex. 14–47, 14–151, 14–171, 14–174, 14–184, 14–208, 14–210) suggested that OSHA allow attendants to perform rescue without prior notification of outside emergency responders and without assignment of a new attendant. For example, the American National Can Company (Ex. 14–47) stated:

> We believe [that] prohibiting attendant [rescue] is ill- advised. The high incidence of "rescuer" death is most often from untrained, ill-prepared, emotional response on the part of by-standers, friends, etc. The attendant may be in a position to provide the most immediate assistance, if well educated and trained to assess emergency conditions. The attendant may first communicate for assistance and possibly render aid or evaluate conditions prior to help arriving ... time is of the essence.

One commenter (Ex. 14–111) suggested that OSHA permit rescue entry by the attendant as long as the substitute attendant is "enroute" to the permit space.

Based upon the rulemaking record, OSHA has determined that it is necessary for anyone attempting rescue to be properly trained and equipped for rescue. As discussed further under the summary and explanation of paragraph (k), *Rescue and emergency services*, properly equipping a rescuer is important for him or her to enter a permit space safely and to be able to physically remove an incapacitated employee from the space. Proper training is necessary to ensure that the rescuer does not injure himself or herself or others during rescue operations. Therefore, the Agency is applying paragraph (k) to anyone who has rescue duties (indicating that he or she is part of the rescue service).

OSHA also believes that the evidence strongly supports the need for an attendant at all times during entry operations to monitor and protect all entrants. The presence of an attendant outside the permit space at all times during entry operations is important for three reasons:

(1) The attendant must keep unauthorized persons out of the space. This is particularly important in an emergency, when the atmosphere within the space might be IDLH and when bystanders unqualified in permit space entry might otherwise attempt rescue of injured entrants from the space.

(2) The attendant has a duty to other authorized entrants to remain outside the space, to remain alert for hazards, and to be able to assist in their evacuation as necessary. It is possible that an entrant may become incapacitated for reasons other than permit space hazards (for example, because of heart attack). Any other authorized entrants remaining in the space would still be dependent on the attendant for their safety.

(3) The attendant must be available outside the permit space to provide information to the rescue service. The information the attendant can supply the rescue services includes how many authorized entrants are within the space, what the hazards of the space are, and what prompted the emergency in the first place (for example, the injured employee's symptoms).

Therefore, OSHA has determined that the attendant's presence outside the permit space is vital even after an emergency has arisen. Accordingly, the final rule continues to require the presence of an attendant at all times during permit space entry operations.

However, after an attendant is relieved by someone who assumes the attendant's required duties, the original attendant, if trained and equipped as required by §1910.146(k)(1), can safely enter the permit space to begin a rescue attempt. Permission for the relieved attendant to do this is explicitly stated in a note following paragraph (i)(4). Although the language in the note makes no change to what was proposed, it does clarify the status of authorized attendants regarding rescue attempts that involve entry into the permit space.

Paragraph (i)(5) of the final rule requires the attendant to communicate with entrants as necessary to monitor entrant status and to alert authorized entrants of the need to evacuate the space under paragraph (i)(6) of the final rule. OSHA believes that the authorized entrant's communication with the attendant provides information that the attendant needs in order to determine if the entry can be allowed to continue. Subtle behavioral changes detected in the authorized entrant's speech or deviation from set communication procedures could alert the attendant that it is necessary for the authorized entrant to evacuate or be rescued from the space. Additionally, the attendant needs to be able to communicate with authorized entrants to order them to evacuate the space in an emergency. This provision is discussed under the summary and explanation of paragraph (h)(3) of the final rule, which contains a corresponding requirement for authorized entrants.

Paragraph (i)(6) of the final rule requires the attendant to monitor activities inside and outside the permit space to determine if it is safe for entrants to remain in the space. The attendant is also required to order authorized entrants to exit the permit space as quickly as possible whenever the attendant detects a prohibited condition, behavioral effects of hazard exposure in an authorized entrant, or a situation outside the space that could endanger the authorized entrants, or whenever the attendant, for any reason, can no longer perform the duties required under paragraph (i) of the final rule. Given the speed with which permit space hazards can incapacitate and kill entrants, it is essential that the entrants evacuate permit spaces as soon as any one of the four conditions set out in paragraphs (i)(6)(i) through (i)(6)(iv) exists. As noted in the preamble to the proposal (54 FR 24093) and in the summary and explanation of final paragraph (h)(5) earlier in this section of the preamble, OSHA believes that self-rescue will often provide the entrant's best chance of escaping a permit space when a hazard is present. Therefore, although OSHA recognizes that self-rescue may sometimes be impossible, the Agency stresses the importance of attempting self-rescue as a means of saving lives and minimizing injuries.

Paragraph (i)(6) of the final rule is based on proposed paragraph (f)(3)(ii), which would have required attendants to order the evacuation of a space whenever: (1) the attendant observed a condition that was not allowed in the permit, (2) the attendant detected behavioral effects of hazard exposure, (3) the attendant detected a situation outside the space that could endanger the entrants, (4) the attendant detected an uncontrolled hazard within the permit space, (5) the attendant was monitoring entry in more than one permit space and had to focus attention on the rescue of entrants from more than one space, and (6) the attendant had to leave the work station. OSHA has made some editorial revisions to the language of proposed paragraph (f)(3)(ii) in the course of drafting the final rule. For example, the Agency has replaced the phrase "condition which is not allowed in the entry permit" with "prohibited condition". ("Prohibited condition" is defined in the final rule as a condition that is not allowed by the permit.) Additionally, the condition listed in proposed paragraph (f)(3)(ii)(D) (that is, when the attendant detects an uncontrolled hazard) has not been carried forward into the final rule. Uncontrolled hazards are conditions not allowed by entry permits; thus, this condition is already included in the first condition (final paragraph (i)(6)(i)).

All of the substantive comments on proposed paragraph (f)(3)(ii) were in regard to paragraph (f)(3)(ii)(E), which addressed attendants monitoring more than one space at a time. The number of permit space entry operations that an attendant may monitor was the subject of Issue 8 of the hearing notice, which is addressed under the summary and explanation of final paragraph (d)(6) earlier in this section of the preamble. The Agency has decided to allow an attendant to monitor any number of permit space entry operations so long as the attendant continues to comply with the provisions of paragraph (i) of the final rule. Accordingly, OSHA is combining the last two conditions from the proposal (paragraph (f)(3)(ii)(E), when the attendant was monitoring more than one space and had to focus attention on the rescue of entrants from another space, and paragraph (f)(3)(ii)(F), when the attendant had to leave the work station). In accordance

with the Agency resolution of hearing issue 8, paragraph (i)(6)(iv) requires the attendant to order evacuation of the space whenever he or she can no longer perform the duties required under paragraph (i) of the final rule. This performance-oriented approach covers any circumstances in which an attendant cannot effectively monitor a permit space entry operation, such as emergency conditions that distract the attendant's attention [31] and any condition that forces an attendant to leave the work station. Obviously, if another attendant relieves the first one, the latter is no longer considered the attendant and is free to leave.

Paragraph (i)(7) of the final rule requires the attendant to summon rescue and other emergency services as soon as it is determined that an emergency exit from the permit space is necessary.

This provision has been taken from proposed paragraph (f)(3)(iii). Several commenters (Ex. 14–86, 14–143, 14–150, 14–157, 14–174, 14–178, 14–188) objected to the wording of this requirement in the proposal. They argued that the provision would require rescue services to be summoned whether or not they were needed. For example, Pennzoil Company (Ex. 14–150) stated:

> Item (f)(3)(iii) presents unnecessary constraints, since it does not allow the attendant to decide if employees will be able to effect an orderly withdrawal or a self-rescue from the space. Many times when the attendant recognizes cause to evacuate entrants from the space, the entrants can effect an orderly withdrawal or self-rescue. In most of these situations, the summoning of rescue and emergency services will be unnecessary. In order to correct this problem, we propose that item (f)(3)(iii) be revised as follows:
>
> "Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards."

OSHA has accepted these recommendations. The Agency agrees that there may be times when authorized entrants can perform self-rescue from the permit space in an emergency. On the other hand, OSHA is believes that help must be summoned if there is any doubt as to whether it will be necessary. Therefore, paragraph (i)(7) of the final rule requires attendants to summon rescue and emergency services if they determines that assistance may be necessary. As long as the attendant is certain that self-rescue can be performed, no rescue summons would be necessary. However, if the attendant has any doubts as to whether an authorized entrant can exit the space under his or her own power, then the attendant is required to summon rescue and emergency services.

Paragraph (i)(8) of the final rule requires that the attendant take the following actions when unauthorized persons approach or enter a permit space while entry is underway:

(1) Warn the unauthorized persons that they must stay out of the permit space;

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

(3) Inform the authorized entrants and any other persons specified by the employer if unauthorized persons have entered the permit space.

This provision of the final rule has been taken from proposed paragraph (f)(3)(iv). Some commenters (Ex. 14–86, 14–150, 14–161, 14–170, 14–188) noted that some unauthorized person may have legitimate reasons for being near a permit space. As noted under the summary and explanation of paragraph (j)(5) of the final rule, OSHA agrees and has revised the language of proposed paragraph (f)(3)(iv)(A) so that unauthorized persons are warned to stay out of the space instead of being warned away from the space.

The Agency has also made some editorial changes to the language contained in the proposed paragraph, on which no other substantive comments were received. The changes are not significant, except that paragraph (i)(8)(iii) replaces the term "any other persons designated by the employer" from proposed paragraph (f)(3)(iv)(C) with "entry supervisor". As noted under the summary and explanation of the definition of "entry supervisor", this term is being used throughout the rule to identify the person responsible for overseeing permit space entry operations. This is the person who is responsible for the safety of authorized entrants and who should be informed of the presence of unauthorized persons inside the permit space. (See the summary and explanation of paragraph (j)(5) for a discussion of the duties of an entry supervisor in the event of unauthorized entry.)

Paragraph (i)(9) of the final rule requires the attendant to perform non-entry rescues as specified by the employer's rescue procedure.

This provision has been taken from proposed paragraph (f)(4)(ii), which would have required the attendant to use any rescue equipment provided for his or her use and would have required the attendant to perform any assigned rescue and emergency duties, without entering the space. The only comments addressing this proposed requirement concerned attendant rescue, which was discussed under the summary and explanation of paragraph (i)(4) earlier. As noted in that discussion, a person whose duties as attendant have been assumed by another is allowed to perform rescue entry following the provisions of paragraph (k). Paragraph (i)(9) of the final rule relates only to persons who remain on duty as attendants.

OSHA has not carried forward language from proposed paragraph (f)(4)(ii) relating to the use of equipment. This consideration is addressed in paragraph (d)(4) of the final rule.

OSHA wishes to emphasize that attendants monitoring more than one space must not perform any duties that would distract them from their responsibilities for all the spaces being monitored. The Agency does expect such attendants to be permitted to perform any type of rescue, including non-entry rescue, as long as they are still acting as attendants. As noted earlier, the employer's permit space program must establish 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 the final rule.

Paragraph (i)(10) of the final rule prohibits the attendant from performing other duties that may interfere with the attendant's primary duty to monitor and protect the safety of the authorized entrants. OSHA notes that keeping unauthorized persons out of the space protects authorized entrants and that the attendant would not be able to perform tasks that interfere with this duty. As noted previously, paragraph (d)(9) requires the employer to develop and implement procedures for summoning rescue services. These procedures should assist the attendant in complying with paragraph (i)(10) of the final rule.

This provision was not contained in the proposed standard. In Issue 6 of the NPRM, OSHA requested comments on the duties of an individual who would serve as an attendant for a permit-required confined space. Specifically, OSHA asked if the Agency should prohibit attendants from performing any duties other than monitoring the entrants. OSHA also asked if attendants should be permitted to pass tools or other materials to entrants and how much attention, if any, should an

[31] Under paragraph (d)(7) of the final rule, if the attendant monitors more than one space at a time, the employer's permit program must adopt procedures to enable the attendant to respond to emergencies in one space without distraction from his or her responsibilities for all the spaces.

attendant be permitted to spare for other activities.

Many rulemaking participants responded to Issue 6 (Ex. 14–4, 14–27, 14–28, 14–30, 14–35, 14–43, 14–44, 14–57, 14–61, 14–62, 14–63, 14–73, 14–78, 14–81, 14–91, 14–94, 14–98, 14–99, 14–101, 14–109; Houston Tr. 629–630, 925–926; Chicago Tr. 39–42, 643). All of them agreed that it was important that the attendant not be distracted from the primary duties of monitoring and protecting authorized entrants. Some, however, held a stricter view about the types of permitted activities than others.

For example, the National Ready-Mixed Concrete Association (Ex. 14–81) took a limited view of what activities should be permitted, stating:

> Where attendants are required those attendants should not perform any other work that would take away from the attendant's ability to assist a person in trouble in a confined space.

The American Industrial Hygiene Association (Ex. 14–61) suggested that the attendant be limited to such additional tasks as observation and monitoring of the space, as follows:

> The underlying conflict over the attendant's duties stems from what is expected of the attendants, and who the attendant is. Within some organizations, the attendant may be a health and safety professional charged with directing the entry operation. In such a case, duties beyond that directly associated with observing the entrants and monitoring instrumentation may be too distracting.

Another commenter, Marine & Environmental Testing, Inc. (M&ET, Ex. 14–4) argued that the attendant should not be assigned duties that might interfere with the primary duty of watching out for the safety of workers inside of permit spaces.

During the public hearings in Chicago, the Food and Allied Service Trades Union (FAST) testified in opposition to allowing the attendant to perform other duties in responding to questions from Mr. Steve Jones, a member of the OSHA panel (Chicago Tr. 39). A portion of that interchange included the following:

> MR. JONES: In your written comment from October 31, you also express concern about possibility that attendants will be assigned other duties while they are serving as attendants. In fact, I get the impression that you would want the attendant to simply stand by the entire time, is that correct?
>
> MR. MESTRICH: Precisely.
>
> MR. JACKSON: Absolutely.
>
> MR. DONATOO: Can I give an example of that please?
>
> MR. JONES: Please do, Mr. Donatoo.
>
> MR. DONATOO: My duties [are] to be a grain mixer and many times I have been sent down with a man to clean a bin as a watchman. At this time, I may be running grain in. If I happen to get a ring off, or I am to shut the grain off, I have to leave this man. So, he is by himself in a bin for maybe a five minute period. If he would fall or something would crush him, in five minutes time it's too late.[32]

Later in the hearing (Chicago Tr. 41–42), Mr. Jones continued his questioning of the FAST workers:

> MR. JONES: We do have a separate requirement in the proposed standard which would have the attendant maintain continuous communication with the entrant. In fact, we have gotten a great deal of input that infers, that in some cases, that passing the tool or receiving the tool from an entrant is one of the best ways in which to maintain continuous contact.
>
> I guess that's where we are going and what I would be interested in, is if viewed in its totality the requirement for continuous contact and duties which do not interfere with the continuous contact so that you could accept such a provision.
>
> MR. JACKSON: Working with the individual down there in whatever form we would have no problem with; with the individual that he is actually working there with passing tools, or sending down another rope, or whatever. But working with anyone else around the area, that we would have difficulty with.

Other commenters (Ex. 14–27, 14–28, 14–73, 14–78) suggested that OSHA, in some way, permit the attendant to perform other duties. These commenters suggested that OSHA permit attendants to pass tools, machinery or other equipment to the entrant, but emphasized that the attendant must not leave the immediate area of the confined space entrance. For example, Robert J. Cordes & Associates (Ex. 14–28) stated:

> There is nothing wrong with the attendant performing duties which you mentioned (passing tools, etc.). The important thing is that the attendant stay at the opening and not go 100 feet away to get pipe for a job.

Arizona Electric Power Company (AEPCO, Ex. 14–73) agreed, stating:

> AEPCO feels if work inside the space is dangerous enough to require an attendant, that attendant needs to remain at the entrance and devote his attention to the safety of those inside. We see no problem with the attendant passing tools or supplies to those inside provided sight or voice contact remains possible during said duties.

Northwest Pipeline Corporation (NPC, Ex. 14–27) suggested that OSHA not prohibit additional duties by the attendant because other language in the proposal prohibited the attendant from leaving the permit space. NPC stated:

> Paragraph (f) seems clear enough to prohibit the attendant from leaving the permit space, particularly in light of the requirement for keeping accurate count of all entrants, determination of the suitability of the space for continued occupancy and maintenance of effective and continuous communication. Activities directly related to the entry, such as passing tools, should be allowed but the attendants' attention should not be distracted by assignment of unrelated tasks.

Some commenters (Ex. 14–28, 14–78) suggested that OSHA, by allowing the attendant to perform other activities related to attending the space involving contact with the entrants, could even increase entrant safety. For example, Pennwalt Corporation (Ex. 14–78) stated:

> As noted by OSHA, the provisions covering attendants and entrants are designed to complement each other. It is important that the entrant maintain contact with the attendant in order to determine any behavioral changes or changes in work environment. A most effective and practical method of maintaining this contact is for the attendant to pass and receive tools and materials and to discuss the progress of the job with the entrant or entrants. This provides routine contact and alerts the attendant to any change in either behavior or conditions that would require termination of the entry. This allows the attendant, when necessary, to order evacuation and summon rescue teams promptly.

Robert J. Cordes & Associates (Ex. 14–28) also took this position, arguing as follows:

> There is good derived from the attendant keeping active; he does not become as bored with his job, he is aware of the status of the job, and he knows the locations of employees inside the confined space. The attendant should also be certain the atmosphere and working conditions have not changed; he can be the person who conducts tests.

OSHA concludes that it is essential for the attendant to maintain his or her efforts to monitor and protect authorized entrants. The Agency believes that authorized entrants will be endangered if the attendant is distracted from these duties. If an attendant performs tasks that devote his or her attention to jobs that are unrelated to the safety of employees within the permit space, an emergency condition inside or outside the space could go undetected until injury or death results. Those who commented on Issue 6 of the NPRM obviously agree with this conclusion. However, OSHA also recognizes that

[32] OSHA notes that this testimony implies that the "watchman" identified by Mr. Donatoo is considered an attendant. In this particular case, once the "watchman" entered the confined space, that employee would no longer be considered an attendant. Paragraph (i)(4) of the final rule requires an attendant to be stationed outside the permit space at all times during entry operations. Duties that would require the attendant to enter a confined space to help another employee are not permitted by the final rule. The attendant must not place any portion of his or her body into the permit space. However, tools and equipment may be passed to authorized entrants by means of handlines.

some tasks, particularly those that enhance the attendant's knowledge of conditions in the permit space, can be performed safely by the attendant. Accordingly, in order to protect authorized entrants from unnecessary hazards, OSHA has decided to allow attendants to perform only such duties as will not hinder their primary function of monitoring and protecting authorized entrants. Therefore, paragraph (i)(10) of the final rule prohibits attendants from performing duties that will interfere with this function. Passing tools to authorized entrants and monitoring the atmosphere of the permit space are among the types of duties that would be permitted, provided the attendant does not break the plane of an opening into the space. The repair of equipment, on the other hand, would distract an attendant, so that he or she could not adequately monitor or protect authorized entrants, and would be prohibited.

Paragraph (j), Duties of entry supervisors.

Many of the accidents in the rulemaking record resulted from the employer's lack of enforcement of confined space entry rules. Under the OSH Act, employers bear the primary responsibility for their employees' safety. Employers must take responsibility to ensure that acceptable entry conditions exist before entry begins and during entry operations and to enforce work practices necessary for employee safety. Too many times, a permit space entrant has been made responsible for his or her own safety, even when that employee was dependent on others to ensure the presence of acceptable entry conditions.

In order to place the burden of employee safety on employers, the final rule requires each permit space entry to have an entry supervisor, who has overall accountability for safe entry operations. The final rule requires the entry supervisor to verify the existence of acceptable entry conditions and the presence of rescue and emergency services, to authorize the entry (which is evidenced by his or her signature on the permit), to remove unauthorized persons from the space, and to terminate the entry operation when necessary. OSHA believes that these rules will compel employers to assume responsibility for safety during permit space entry operations.

Paragraph (j) of the final rule, the equivalent of the "duties" portion of paragraph (g) of the proposed rule, enumerates the duties of the entry supervisor. In proposed paragraph (g), the individual responsible for the entry was called the "individual authorizing or in charge of entry". As noted in the summary and explanation of the definition of "entry supervisor" earlier in this section of the preamble, OSHA is using this term in the final rule in place of the proposed term.

Paragraph (j)(1) of the final rule requires the entry supervisor to know the hazards which may be faced during entry.

This provision was not contained in the proposed standard. Some commenters (Ex. 14–174, 14–173) specifically recommended that entry supervisors receive the same training regarding hazard recognition as authorized entrants.

OSHA has accepted these recommendations. As noted in the summary and explanation of final paragraph (g)(1) earlier in this section of the preamble, the rulemaking participants agreed that personnel involved in permit space entry operations should have whatever training is needed to be able to perform duties under the final rule. In paragraphs (h)(1) and (i)(1) of the final rule, authorized entrants and attendants respectively are required to know what hazards may be faced during a permit space entry operation. Since the entry supervisor is responsible for all aspects of the entry operation it is only reasonable that he or she be expected to know at least as much, if not more, than authorized entrants and attendants. Therefore, OSHA has adopted a specific requirement for the entry supervisor to know the hazards which may be faced during entry.

Paragraph (j)(2) of the final rule requires the entry supervisor to verify, by checking that the appropriate entries have been made on the permit, that all tests specified on the permit have been conducted and that all procedures and equipment specified on the permit are in place, before endorsing the permit and allowing entry to begin.

This provision corresponds to proposed paragraphs (g)(1)(i) and (g)(1)(ii), on which no substantive comments were received. These two paragraphs from the proposal have been combined in the final rule to clarify that the entry supervisor is required to check that the permit has been completed and that the entry conditions meet those specified on the permit. The language from the proposal has been modified somewhat to specify precisely what the entry supervisor is require to check. For example, proposed paragraph (g)(1)(i) contained the term "requisite information", and paragraph (g)(1)(ii) contained the term "necessary procedures, practices and equipment". So that it is clear what information is required to be examined, the Agency has substituted the terms "tests specified by the permit" and "procedures and equipment specified by the permit". These clarifications to language of the proposed provisions provide consistency between paragraphs (f) and (j)(2) of the final rule.

Paragraph (j)(3) of the final rule requires the entry supervisor to terminate the entry and cancel the permit as required by paragraph (e)(5) of the final rule. This provision combines the requirements proposed in paragraphs (g)(1)(iv) and (g)(1)(v), on which no significant comments were received. The substantive portion of the proposed provisions (that, is when these actions are required) has been placed in paragraph (e)(5) of the final rule, discussed earlier.

Paragraph (j)(4) of the final rule requires the entry supervisor to verify that rescue services are available and that the means for summoning them are operable. The proposed rule did not contain a corresponding provision explicitly imposing this duty on the entry supervisor. Proposed paragraph (h), however, would have required the employer to have an in-plant rescue team or an arrangement under which an outside rescue team would respond in an emergency. Additionally, OSHA proposed (in paragraph (c)(8)) that employers implement and provide the procedures and equipment necessary to rescue entrants from permit spaces and (in paragraph (g)(1)(ii)) that the entry supervisor determine that the necessary procedures, practices, and equipment for safe entry are in effect. OSHA believes that the inclusion of paragraph (j)(4) in the final rule will emphasize the need for the entry supervisor to assure that rescue and emergency services are indeed readily available before entry. Since the employer delegates responsibility for safe permit entry to the entry supervisor, it is reasonable and consistent with the rescue provisions in the permit program to specify that the entry supervisor verify the availability of rescue services and the operability of the means for summoning them.

Paragraph (j)(5) of the final rule requires the entry supervisor to remove unauthorized individuals who enter or who attempt to enter the permit space during entry operations.

This provision is based on proposed paragraph (g)(2), which would have required the entry supervisor to remove "unauthorized personnel who are in or near entry permit spaces." This provision of the proposal was criticized by some commenters (Ex. 14–86, 14–150, 14–161, 14–170, 14–188) as being

too vague or too restrictive. They argued that the proposal would preclude the presence "near" permit spaces of employees who have legitimate duties there. Some of these commenters recommended that OSHA require the removal of unauthorized persons who enter or attempt to enter the space.

The Agency recognizes that some persons near a permit space may have legitimate reasons for being there. These persons will have been warned by the attendant (under paragraph (i)(8)(i)) to stay out of the permit space. They will know of the danger involved and, under the observation of the attendant, can safely remain near the space. Therefore, OSHA has incorporated the recommendation of these commenters in paragraph (j)(5) of the final rule.

Paragraph (j)(6) of the final requires the entry supervisor to determine, 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.

This provision is based on paragraph (g)(1)(iii) of the proposal, which would have required reevaluation of the conditions within the space at "appropriate intervals". As noted under the summary and explanation of final paragraph (e)(4) earlier in this section of the preamble, several commenters (Ex. 14–28, 14–57, 14–63, 14–80, 14–109, 14–116, 14–151, 14–161) pointed out that conditions within the space could change over time and that the hazards within the space would have to be reevaluated. One of them (Ex. 14–109) specifically recommended limiting the duration of the permit to the length of a work shift.

Although OSHA has not accepted this latter recommendation, the Agency agrees that the conditions within the space need to be reevaluated at regular intervals. For entries lasting more than one work shift, the original entry supervisor will normally have to be relieved at the end of his or her shift. The responsibilities of the entry supervisor will then be passed on to someone else. OSHA believes that it is important for the new entry supervisor to review the permit and to determine that acceptable entry conditions have been maintained. The Agency also believes that guidance, beyond that of transfer of responsibility, must be given as to what "appropriate intervals" might be. In order to accomplish these goals, paragraph (j)(6) final rule specifies that reevaluation of conditions within the space must occur whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space.

Paragraph (k), Rescue services.

Most of the requirements of the permit-required confined space standard are in place to ensure that employees can safely enter and work inside permit spaces. The hazards within the space must be eliminated or controlled before entry is allowed. Testing and monitoring must be performed in order to ensure that entry conditions are acceptable before entry and that they remain so during the entire entry operation. Authorized entrants, attendants, entry supervisors, and others with duties performed under §1910.146 must be trained to perform those duties safely and to recognize permit space hazards if they arise. Attendants must be stationed outside the space to keep unauthorized persons out of the space and to monitor the status of entrants to ensure (among other things) that hazards do not arise and that employees are evacuated quickly if they do.

Unfortunately, in spite of all these precautions, hazards may arise so quickly or unexpectedly that authorized entrants are unable to escape from the permit space without assistance. Paragraph (k) of the final rule addresses the rescue and emergency services needed in such an event.

Paragraph (k) of the final rule, which is based on proposed paragraph (h), sets requirements for the rescue and emergency services provided to comply with paragraph (d)(9) of the final rule. Compliance with these provisions will enable an employer to extricate authorized entrants from permit spaces where uncontrolled hazards have arisen and will maximize the likelihood that any extricated personnel are not killed or permanently injured by exposure to permit space hazards. The Agency recognizes that an employer whose permit space program complies with this section may never need to have authorized entrants rescued. However, there are permit space hazards that could arise in permit spaces during entry operations against which the other elements of the permit space program do not provide sufficient protection. This could occur in several ways—because of extraordinary circumstances that appear suddenly without warning or because of some deficiency in the permit space program. Accordingly, the Agency has determined that employers must include in their permit program the means to rescue authorized entrants.

In an emergency, rescue personnel would either enter a permit space to remove authorized entrants or would remain outside the permit space and pull out authorized entrants with retrieval lines attached to chest or full body harnesses worn by the entrants. OSHA requires simply that, whatever means are chosen, the employer arrange for the necessary rescue and emergency services. As noted earlier, the Agency anticipates that employers will choose between entry and non-entry rescue as part of compliance with paragraph (d)(9) of the final rule.

The introductory text of paragraph (k) requires employers to arrange for rescue and emergency services. Some employers may prefer to establish an on-site rescue service. The on-site service normally provides the fastest response in an emergency. Other employers may prefer to rely on off-site rescue services, perhaps because they believe that they do not have the resources to train employees to perform rescue or because the ready availability of an adequate off-site rescue service makes an on- site capability unnecessary. The final rule allows employers to make arrangements for either on-site or off-site services.

Paragraph (h) of the proposal was entitled "Rescue team". As noted by several rulemaking participants (Washington Tr. 68; Chicago Tr. 496, 564–566; Houston Tr. 952–953), rescue of entrants from permit spaces also involves provisions of emergency medical services after (and sometimes before) an entrant is removed from a permit space. Additionally, proposed paragraph (h)(1)(iv) addressed the emergency, as opposed to rescue, training that the in-plant rescue team was to have. To eliminate any ambiguity, paragraph (k) of the final rule explicitly covers emergency services provided after a rescue and is titled "Rescue and emergency services".

Proposed paragraph (h) set requirements for rescue services, which were called "rescue teams" in the proposal. The introductory language of the proposed paragraph would have required employers to have either an "in-plant" rescue team or an arrangement under which an "outside" rescue team would respond to a request for rescue services. Some commenters (Ex. 14–118, 14–123, 14–161, 14–168, 14–170) stated that the proposed term "in-plant rescue team" was too restrictive and possibly misleading. For example, Atlantic Richfield Company (ARCO, Ex. 14–123) stated:

"In plant rescue" is too restrictive a term. In some cases the rescue team is not "in plant" but "on site", and in other cases, such as at remote operations it is difficult to define

the confined space entry as being in a "plant".

Also, the Service Employees Industrial Union (Ex. 14–148) stated that the term "rescue crew" should be used because "Many confined space workers do not work in a plant setting." Additionally, the American Petroleum Institute (Ex. 14–168) stated:

> API requests this term be changed to "site rescue capability", since some member companies have expert employee rescue personnel available on call (not necessarily in-plant) that can provide rescue as rapidly as an independent outside rescue team.
> * * * * * *
> In addition, the definition should be expanded to recognize that the rescue capability may comprise other workers (outside the permit space) who have been trained to perform rescues in the particular type of permit space. At issue is the best way to provide rescue capability at the small, remote installations where outside rescue teams do not exist.

OSHA agrees with these comments. Also, the term "rescue team" is a misnomer, because there could be cases, such as when non-entry rescue systems are used, in which one person will be responsible for the rescue of authorized entrants. As discussed under the summary and explanation of paragraph (k)(1) of the final rule, OSHA is treating all rescue services alike, whether they are provided by the employer whose permit space is being entered or by another employer and whether they are stationed on- site or off-site. Therefore, the Agency has adopted the term "rescue service" to refer to all rescue personnel provided to remove injured entrants from permit spaces.

The introductory language of proposed paragraph (h) treated "in-plant" and "outside" rescue teams as equally acceptable options for employers. In the prehearing comment period, OSHA received several comments (Ex. 14–41, 14–45, 14–54, 14–63, 14–94) contending that employers should take into account the response time for rescuers when choosing between the use of in-plant and outside rescue services. In particular, these commenters were concerned that authorized entrants who were not rescued from a hazardous atmosphere within 4 to 6 minutes would be incapacitated or killed. For example, one of the commenters (Ex. 14–41) stated:

> The outside rescue team is a fine choice for small employers but fails to consider response times involved (the time [interval] between calling the rescue squad for help and the time they arrive on the scene.) A person can only go four to six minutes without oxygen before brain damage begins. After six minutes the [likelihood] of the victim recovering from the lack of oxygen is minimal. Therefore an outside rescue team needs to be able to arrive within four minutes in order to do the victim any good.

Another commenter (Ex. 14–54) expressed the following concerns about the response times of outside rescue services:

> The fourth point is on Page 24094 as to employers who choose to use outside rescue services.
> There is no mention of *Response Times*. If they cannot get there in 4 to 6 minutes, they will not be doing rescue! They will be doing body recovery!
> Your Proposed Standard should read: "Employers who choose to use outside rescue services should evaluate realistic response times, and training and equipment that the outside rescue service has available." Then have the outside rescue service train and practice at various locations throughout your facility. Only then can you make a sensible decision to use an outside rescue team or form your own in-house team. [Emphasis was supplied in original.]

Still another commenter (Ex. 14–94) noted the ANSI recommendation on response times, as follows:

> ANSI Z117 advises that treatment/rescue of a person suffering cardio/pulmonary arrest in a confined space should begin within four minutes for the victim to have the best chance of full recovery.

Some commenters recommended that OSHA not permit the use of outside rescue teams. For example, the Tennessee Valley Authority (Ex. 14–36) stated:

> We recommend that employees should not have the option of having either an in-plant rescue team or an outside rescue team because accidents associated with confined spaces require an immediate response and rescue efforts [to] begin quickly.

The International Brotherhood of Teamsters (Ex. 14–109) argued that outside rescue services could not respond quickly enough, as follows:

> Keeping in mind the risk of asphyxiation, we object to Section (h)(2) which allows the employer to use outside rescue services. In confined space emergencies, outside rescue teams will very rarely be able to respond quickly enough. As NIOSH points out on p. 40 of the *Citation Document on Working in Confined Spaces*, "Since irreversible brain damage can occur in approximately 4 minutes in an oxygen deficient atmosphere, it is essential that resuscitation attempts occur within that time." In two fatality cases involving entry into tanker trucks where we have information on response time by outside emergency responders, the time it took to retrieve the victims from the cargo tanks was more than 20 minutes, and approximately 30 minutes. (See NIOSH FACE–87–27–11, and the case file on OSHA Inspection 101314110.) [Emphasis was supplied in original.]

The Quaker Oats Company (Ex. 14–173) presented several reasons why OSHA should not allow outside rescue services to be used, as follows:

> The employer has an option of either using outside rescue services or forming an in-plant rescue team. This option poses at least three problems:
> 1. Response time of an outside team may be quite lengthy and unpredictable.
> 2. Capabilities of an outside rescue team cannot be assured without extensive evaluation on a local basis.
> 3. Outside rescue teams will likely lack the additional preparation time needed to identify and develop entry procedures for the multitude of confined spaces to which they will be exposed?
> Our recommendation would be to place primary responsibility for rescue on the employer. An in-house rescue team has a lower response time, can be better equipped, and has specific knowledge about the confined space they will be entering.

On the other hand, some of the comments argued that, if the outside rescuer's response time was reasonable, employers should be allowed to use outside rescue services in lieu of an in-house team. For example, AMOCO Corporation (Ex. 14–124) stated:

> The term "in plant" implies that OSHA intends for the rescue team to be physically present in the plant during the entire time an entrant is inside of a permit required confined space. An "in plant" rescue team is not required in the proposed rule and employers may [choose] to use an outside rescue team instead. Clearly, response time is a critical factor in determining whether an off site rescue team is sufficient to protect the entrants. Certainly, the response time for an employee response team which is on call could be comparable to an outside team. Therefore, we believe that OSHA should allow the employer to decide for which conditions or spaces, the rescue team could be on call.

The American Feed Industry Association (Ex. 14–160) also supported the flexibility set out in the proposal, stating:

> AFIA supports OSHA's basic approach of permitting the use of either an in-plant rescue team or an outside rescue team. This flexibility allows individual employers to adopt the approach that is best for their needs.

In response to these comments, the Agency solicited testimony and comments regarding the use of outside rescue teams in Issue 12 of the hearing notice. In the hearing notice (54 FR 41463), OSHA noted that atmospheric hazards which deprive authorized entrants of a safe air supply generally pose life- threatening situations after about five minutes, though some hazards incapacitate or kill even faster.

Some hearing participants testified against the use of outside rescue teams.

For example, Mr. Eric Frumin, representing the Amalgamated Clothing and Textile Workers Union (Washington Tr. 580–581), testified at the Washington hearing as follows:

I'd like to just make one followup comment as to what brother Walker stated regarding the question of rescue teams, outside rescue teams. He mentioned a necessity of establishing some sort of time to travel requirement and the whole notion of how far away can a rescue team legitimately be.

I went through an experience recently of trying to get fire insurance on a house in a relatively rural area. And if you have ever done that, you'll discover that if you're a certain number of miles from a fire house, you can forget getting fire insurance. And the insurance industry understands quite well what it means to establish strict criteria, quantitative criteria, to determine distance when those distances make all the difference in preserving property. And we think that OSHA should recognize the importance of reasonable and protective quantitative criteria for the acceptability of outside rescue teams regarding time to travel.

Otherwise, we are going to have a lot of outside rescue teams who are basically nothing more than an ambulance squad that take[s] people to the morgue.

Additionally, Ms. Diane Factor, representing the AFL-CIO (Chicago Tr. 318–319), testified:

The employer should be required to have an in-plant rescue team whenever possible. The team needs to be available within three minutes of an emergency to begin rescue. An outside rescue team can never be as effective as a well-trained in-plant team. Drills should be mandated as part of the standard to ensure that rescue skills are up-to-date. An outside team should only be used it is absolutely impossible to prepare an in-plant team. This option should be available to employers upon request using the variance procedure.

Mr. Corley, representing the National Association of Manufacturers (Chicago Tr. 124), testified as follows when asked what the appropriate response time would be for an outside rescue service:

I don't mean to be cute when I say this, but the only answer I can come up with is as quickly as possible. I don't know what the appropriate time is for people who don't have trained first-aiders, but who have a nearby medical facility. I don't know [what] that time is. In general, if the rescue capability takes more than five minutes it's generally too late.

On the other hand, some hearing participants recognized the problems faced by small employers in training and maintaining on- site rescue teams (Ex. 69, 106; Washington Tr. 286, 480–481; Chicago Tr. 318–319, 536). They argued that it was not always practical for such employers to train employees at the worksite in rescue techniques. For example, Dow Chemical Company (Ex. 69) discussed the problems involved, as follows:

We require the best effort possible to prevent or minimize any hazard prior to the entry of personnel. Our experience indicates that this provides the best results no rescues necessary. However, we recognize that the potential need for rescue exist[s] so we expect our locations to develop an on site rescue plan which will include where appropriate an off site rescue (fire department ... emergency response team, etc.) team. The three previous witnesses have a site rescue team at their respect[ive] locations that have special training. However, we have several locations that don't have the frequency of confined space entry or the resources to have dedicated rescue teams that would meet the criteria mentioned on issue eleven [rescue team qualifications and training] so they [coordinate] efforts with the local emergency effort, e.g. 15 person operation in Columbus, Ohio. And as previous testimony indicated even an [on-]site team can not always respond within four minutes of the first perceived problem with an entrant.

The American Society of Safety Engineers (ASSE, Chicago Tr. 617) argued that the important factor was whether or not an employee could be rescued quickly enough. On behalf of ASSE, Mr. Jack Dobson testified as follows:

Regarding Issue No. 12, the criteria to be used should be the safe removal of an entrant in time to save a life. If a life can be saved by outside rescue teams, then they should be allowed. In an immediately dangerous to life and health atmosphere or asphyxiation, time should be the parameter for decision making. The explanatory paragraph in the ANSI Standard in Section 14.1.2 addresses emergency treatment beginning within four minutes for persons with cardiopulmonary arrest.

Several witnesses (Chicago Tr. 537; Houston 869, 956, 1009) related the response times of their on-site rescue teams. Only half of these teams could always respond in under 4 minutes, and the times included only that necessary to arrive at the permit space. Additional time would be necessary to enter the space and remove the entrant. Other witnesses (Ex. 14–208; Washington Tr. 427, 480–481, 576) stated that no rescue team could adequately respond within 4 minutes.

OSHA believes that the need to respond as quickly as possible to an emergency within a permit spaces indicates a preference for on-site rescue teams wherever it is practical for the employer to provide a rescue capability. The response times of on-site rescuers will usually be much shorter than those for typical off- site rescue and emergency services. Unfortunately, the response of on-site teams is not always sufficient to ensure to rescue of entrants within the 4-minute time period acknowledged as the goal for successful rescue of entrants overcome by oxygen deficiency.[33] Additionally, the Agency realizes that some employers (small business employers in particular) will not be able to provide the type of in-house rescue expertise required by the final standard. Furthermore, because they are dedicated to responding to all types of medical emergencies, off-site rescue services are typically better equipped to treat injured employees.

In light of the fact that even the best rescue methods can barely respond to an emergency or retrieve an incapacitated employee from a permit space within 4 minutes and that many cannot respond that quickly, OSHA believes that it is simply not reasonable for the Agency to require employers to develop capability to provide rescue within 4 minutes of an emergency alert, regardless of cost or practicality. More importantly, OSHA is concerned that requiring employers to provide any set response time would encourage the attempted rescue of entrants before all precautions necessary to ensure the safety of rescue personnel were taken. The Agency believes that emergency conditions may induce rescuers (especially those who are not full time rescuers) to rush into the permit space, in spite of the training required under the final rule. Considering that the incident data in the record document that most of those killed in permit space entries are would-be rescuers, the Agency believes that the final rule should stress non-entry rescue methods and provisions for the safety of rescue personnel rather than the time for such personnel enter a permit space and to remove an entrant.

For these reasons, OSHA has taken several actions.

(1) The Agency has carried forward the proposal's acceptance of both on-site and off-site rescue services. The employer whose employees enter permit spaces must arrange for rescue and emergency services to be provided.

(2) The final rule incorporates a provision (discussed under the summary and explanation of paragraph (k)(1) later in this section of the preamble) for employers providing rescue services to equip and train the rescue personnel properly. This

[33] OSHA realizes that oxygen deficiency is not the only hazard faced by authorized entrants, though, as noted earlier, it is the leading cause of death of permit space entrants. Some hazards will require a quicker response in order to save the entrant, other hazards need not be responded to as quickly. OSHA does believe that a 4-minute time limit on removing an incapacitated entrant from a permit space should be the goal of every rescue plan.

provision applies equally to employers who provide rescue services for their own entrants and to employers who provide rescue services for other employers' authorized entrants.

(3) OSHA has incorporated a provision (discussed under the summary and explanation of paragraph (k)(3) later in this section of the preamble) requiring employers to provide retrieval systems or methods whenever an authorized entrant enters a permit space, unless the employer can demonstrate that the retrieval equipment would increase the overall risks of entry or that it would not contribute to the rescue of the entrant.

The Agency believes that these actions will help to ensure the safe and effective rescue of injured employees and will also provide flexibility for employers to choose the type of rescue service that best meets the demands of the workplace. OSHA acknowledges that the rescue provisions of the final rule will not ensure that all incapacitated entrants will be successfully rescued from permit spaces. However, OSHA believes that prevention of emergencies in permit spaces is the most effective approach to this problem. The basic thrust of this final rule is to require the employer to plan for entries into permit spaces and to provide for acceptable entry conditions, in order to minimize the chances that emergency conditions will arise during entry. OSHA further believes that when rescue is necessary, the rescue provisions of the final rule ensure the safety of employees performing rescue duties. This is particularly important in light of the accident data in Exhibit 13-16, which indicate that more would-be rescuers have been killed than entrants. (This point was noted in the preamble to the proposal, 54 FR 24082.)

Paragraph (k)(1) of the final rule, which is based on proposed paragraph (h)(1), sets requirements for rescue services. These provisions apply to any employer who has employees enter permit spaces to perform rescue duties.

Proposed paragraph (h)(1) would have applied only to in-plant rescue teams. Several rulemaking participants (Ex. 14-54, 14-61, 14-63, 14-148, 14-213; Washington Tr. 250-251; Chicago Tr. 374; Houston Tr. 880) recommended that the capabilities of outside rescue services be addressed as well. For example, the American Industrial Hygiene Association (Ex. 14-61) stated:

> Minimum qualifications for outside rescue teams should also be specified. These teams should comply with the same training requirements as the in-plant teams.

The commenters who objected to the term "in-plant rescue team" (Ex. 14-118, 14-123, 14-161, 14-168, 14-170) recommended using the term rescue capability so that the regulation would treat all rescue services alike.

Additionally, Mr. Dick Monczka of the International Union, United Automobile and Agricultural Implement Workers of America - UAW, testified (Chicago Tr. 374) as follows:

> If an outside rescue team is utilized by the plant, there must be provisions in the standard to require the outside rescue service to review all confined space at least on an annual basis. The outside team must also review on at least a bi-annual basis all previously issued confined space permits so they understand the type of work performed and the hazards encountered. In addition, a written rescue plan must be developed by the outside rescue service and made part of the company's confined space program. Practice sessions must occur at least annually.

Mr. Jerry Walker of Chevron was questioned by Mr. Thomas H. Seymour of the OSHA panel in the Houston public hearing. The discussion (Houston Tr. 880) went as follows:

> SEYMOUR: You mentioned about outside rescue teams or off-site rescue teams, and the employers are going to rely on them. What kinds of criteria do you think is appropriate that the employer should utilize if he is going to rely on such an outside unit to determine whether they, in fact, can be relied upon. What kind of questions or evaluations a prudent employer make in finally determine this part of his program to rely on those outside services?
>
> WALKER: Well, typically that should be trained to the level of what we have as a low-level emergency medical technician training which we call rescue training. And we would expect that the people that we would contract with or that we would have respond would [meet] that low-level of rescue training that we have put together.
>
> SEYMOUR: Would you think it would be appropriate for the host employer who is going to rely on this outside service would make available possibly training assistance that they can come in and actually see what kinds of space that they may be called upon to render assistance in and so on, as part of their orientation or possible training?
>
> WALKER: Yes. And we have done that.
>
> SEYMOUR: Would that be a normal practice? Should that be a normal practice?
>
> WALKER: I am not prepared to say that. I am saying that we would do that.
>
> SEYMOUR: I am speaking in the Chevron orientation, not say speaking for Shell or anybody else. From Chevron's point of view is that considered a normal practice, and they would do that if they were going to rely on outside people for assistance?
>
> WALKER: Right. Yes.

Mr. John Moran, OSHA's expert witness, noted the need for training of all rescuers (Washington Tr. 68), as follows:

> Rescue. In none of the confined space events previously analyzed was rescue planned. Where impromptu rescue efforts occurred, they were largely unsuccessful and often resulted in additional fatalities. Indeed, of the cases, 40 percent of the victims were would be rescuers. NIOSH's estimate is somewhat higher than that. Workers within confined spaces who are exposed to oxygen deficient, asphyxiating and similar atmospheres can often be saved, if rescue is prompt and appropriate emergency medical care is provided within four minutes. This argues for continuous communication, appropriate and timely removal from the space and prompt proper emergency medical care, including, at a minimum, CPR and first aid skills application. Rescue attempts resulting in the death of rescuers have been conducted by untrained on-site fellow workers and by rescue or police personnel from the local community. Where local community responders attempt rescues in confined spaces, they are in great jeopardy, unless they have had confined spaces rescue training and are aware of the hazards presented by the specific space they are entering. When such rescuers die, the tragedy of a confined space event is extended to the community as well, which is all [too] often already operating with scarce resources and marginal fire and rescue coverage.

As noted earlier, OSHA believes that it is important to protect employees who enter permit spaces to perform rescue duties regardless of who their employer is. The proposal did address the safety of rescue personnel in paragraph (h)(1); however, those requirements would have applied only to in-plant rescue teams. The proposal did not explicitly address the safety of rescuers of outside rescue providers. In the final rule, OSHA is applying provisions corresponding to proposed paragraph (h)(1) (final §1910.146(k)(1)) to all employers providing rescue services. The Agency has determined that this action is necessary to provide protection for employees of outside rescue services as well as those of in-plant rescue teams.

Paragraph (k)(1)(i) requires the employer to ensure that personnel assigned as rescuers are equipped with, and trained to use, all personal protective equipment and rescue equipment necessary to enable them to enter and perform rescue operations in the employer's permit required confined spaces. This provision is basically the same as proposed paragraph (h)(1)(i), on which no substantive comments were received. OSHA has made some editorial changes to the language contained in the proposal. For example, as noted earlier, the final rule uses the term "rescue service" in place of the proposed term "in-plant rescue team".

Paragraph (k)(1)(ii) requires the members of the rescue service to be

trained to perform their assigned rescue duties. They are also required to receive the training required of authorized entrants under paragraph (g) of the final rule. This is basically the same as proposed paragraph (h)(1)(ii), on which no substantive comments were received. OSHA made editorial changes to the language contained in the proposal in order to correct the syntax.

Paragraph (k)(1)(iii) of the final rule requires rescuers to 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 must, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed.

This provision is based on proposed paragraph (h)(1)(iii). Some commenters (Ex. 14–45, 14–63) supported the proposed paragraph. They regarded rescue practice as an essential part of a successful entry system. They pointed out that the practice readies the rescue team for emergencies and highlights deficiencies in rescue procedures. For example, one commenter (Ex. 14–63) stated:

> Simulated rescue practices are strongly endorsed. The employer may find the respirators provided cannot fit through the entry/exit. Maryland employers and firefighters have had this unfortunate experience, resulting in fatalities. Such simulations should be practiced every six months.

On the other hand, ARCO (14–123) stated:

> [T]he requirement for practice rescues that would be representative of a rescue is again, not written as a performance standard. Rescue teams at some facilities may be called upon for a rescue in a very wide range of different confined space situations, and it is unclear how they could determine a confined space with representative size, configuration, and accessibility. ARCO recommends modifying this requirement to train rescue teams simply to be able to meet their goal, which is performing rescues quickly and competently.

Another commenter (Ex. 14–160) was concerned that this requirement was too burdensome and that the phrase "representative openings and portals whose size, configuration and accessibility closely approximate those of the permit spaces" could be interpreted to require different practice sessions over the course of the year if many different size openings were found at the workplace. This commenter recommended the elimination of the word "closely" from the text.

The Agency agrees that the language of the proposal did not account for the wide diversity of types of rescue services covered by the final rule. While some rescue services have ready access to the actual permit spaces or to exact replicas of the permit spaces for practice, others do not. OSHA does not believe that it is always appropriate for employers to make the actual permit spaces safe for entry simply to allow the rescue service to practice. (Of course, if the space must be made safe for entry for other reasons, practice could be scheduled as part of the entry operation.) On the other hand, OSHA has determined that rescue service personnel must develop and maintain familiarity with the types of permit spaces from which rescue may be required.

For these reasons, OSHA has revised the language of paragraph (h)(1)(iii) so that the final rule recognizes practice in actual permit spaces or in representative spaces that simulate (rather than "closely approximate") the permit spaces to be entered. In this way, the rule would not require multiple practice sessions for different permit spaces with similarly sized and configured openings. The rule anticipates that there will be variations between similar permit space openings. Additionally, the rule allows outside rescue services to practice in representative spaces that simulate the permit spaces they might have to enter. Thus, these services would not be required to visit every permit space every year, as long as practice rescue are conducted in representative spaces sometime during the year. It is important that the practice openings resemble those of the actual spaces, especially in means of access and egress. Otherwise, as noted earlier, the rescue service members may find that they have trouble getting into the space wearing personal protective equipment and carrying rescue equipment. In applying this rule, the Agency expects employers to conduct practice sessions using representations of the types of permit spaces the rescue service is expected to enter if the actual spaces are not available for entry. The final rule facilitates practice by outside rescue services by requiring the "host" employer to provide access to the permit spaces for planning and practice purposes.

OSHA disagrees with the commenter (Ex. 14–123) who stated that it was sufficient to require simply that employers train rescue teams to meet their goals. The Agency believes that the training requirements in paragraphs (k)(1)(i) and (k)(1)(ii) of the final rule do not, on their own, adequately ensure that the personnel assigned to perform rescues can function properly. OSHA believes that a periodic demonstration of the on-site rescue service's ability to extract authorized entrants from permit spaces will provide the necessary feedback regarding the adequacy of the rescue equipment, the rescue procedures and the training provided for performance of rescue from permit spaces.

The language incorporated in paragraph (k)(1)(iii) allows the satisfactory performance of one or more actual rescues during the 12-month period to substitute for a practice rescue from a given space. (Practices in other types of spaces would still be required.) OSHA has previously recognized in other standards (such as §1910.120, *Hazardous waste operations and emergency response*) that actual experience at a particular task is at least as valuable as a practice session or other type of training. It should be noted that the unsatisfactory performance of a rescue indicates the need for further training and does not substitute for a practice rescue. The intent of this exception is that if the rescuers performed their assigned tasks in a satisfactory manner, they need not perform a practice rescue for that 12-month period, regardless of the outcome of the rescue attempt. OSHA also notes that a rescue can be performed in a satisfactory manner and the entrants, through factors beyond the rescuers' control, still not survive.

Paragraph (k)(1)(iv) requires all members of a rescue service to be trained in basic first-aid and in cardiopulmonary resuscitation (CPR). In addition, at least one of the members on site during rescue operations must hold current certification in first-aid and in CPR.

This provision is based on proposed paragraph (h)(1)(iv), which would have required simply that at least one member of each rescue team hold current certification in first-aid and CPR. S. C. Johnson and Son, Inc. (Ex. 14–45), suggested that at least two members of each rescue team be trained in first aid and be CPR certified, that entry not be allowed unless the in-house rescue is at full strength, and that an in-plant rescue team "should not be credited as available" if either member trained in first aid and CPR is unavailable. Noting S. C. Johnson and Son's comment, OSHA requested information regarding the resources needed and available to comply with proposed paragraph (h)(1)(iv) in Issue 11 of the hearing notice (54 FR 41463).

The Agency also asked what criteria should be set to indicate what a rescue team must do in order to function effectively.

Many commenters called for more training of rescue personnel (Ex. 14-54, 14-61, 14-63, 14-111). For example, one of these commenters (Ex. 14-63) suggested that all members of the rescue team be trained in first-aid and CPR. Another (Ex. 14-54) suggested that the member of the rescue team designated to provide CPR and first-aid "should be First Responder and preferably EMT [emergency medical technician]," because this training is needed to extricate an injured employee from a permit space without exacerbating his or her injuries.

Several hearing participants also responded to this issue. (Washington Tr. 226, 251, 385; Chicago Tr. 383, 387, 434-435, 536; Houston Tr. 952-953). Some called for more training for rescuers (Washington Tr. 226, 251; Chicago Tr. 383, 387; Houston Tr. 952-953). For example, representatives of the Communications Workers of America (Washington Tr. 226, 251) testified that all members of the rescue team should be trained in first aid and CPR. Additionally, the UAW testified (Chicago Tr. 383, 387) in support of additional training requirements, as follows:

> We recommend extensive training in CPR, use, care and inspection of breathing and ventilation gear, emergency evacuation equipment, use of two-way radios and fire fighting equipment.
>
> * * * * *
>
> There is still a need for a more comprehensive training for rescue teams, the person in charge of the testing and, most importantly, the individuals who will enter these confined spaces. We recommend that every worker receive training and that individuals who may be participating in rescue teams receive additional training.

Mr. Jack Dobson, testifying on behalf of ASSE (Chicago Tr. 616-617), recommended the use of ANSI language dealing with training of emergency response personnel. Section 15.4 of ANSI Z117.1-1989 (Ex. 129) reads as follows:

> 15.4 *Training for Emergency Response Personnel.* Training shall include:
>
> 15.4.1 the rescue plan and procedures developed for each type of confined space they are anticipated to encounter;
>
> 15.4.2 use of emergency rescue equipment;
>
> 15.4.3 first aid and cardiopulmonary resuscitation (CPR) techniques;
>
> 15.4.4 work location and confined space configuration to minimize response time.

Rohm and Haas, Texas, testified (Houston Tr. 952-953) on the utility of having some advanced emergency responder medical training, as follows:

> All of them are what, in the State of Texas, is called ECA, their ECA minimum, Emergency Care Attendant. Minimum, which is about one or two levels below a paramedic. It is higher than first aid and CPR, however. It requires 40 hours of training and a State-administered exam.

On the other hand, some rulemaking participants questioned the need for the rescue personnel to be certified in CPR (Ex. 14-86, 14-160, 14-221; Chicago Tr. 536). They argued that the initial CPR course would suffice and that the annual refresher training required to maintain current certification would be burdensome. For example, the A. E. Staley Manufacturing Co. (Ex. 14-221) stated:

> OSHA has proposed requiring in-plant or outside rescue teams. (54 FR 24095 and 24105 as well as 54 FR 4163) Staley submits that formal rescue teams may not be necessary under many specific situations such as those covered by the low hazard classification.
>
> In situations where a hazard team is appropriate, greater flexibility in structuring the team should be given e.g. OSHA should consider changing the wording of proposed paragraph 1910.146 (h)(1)(iv) to allow greater program flexibility by not requiring one person to be trained in both first-aid and CPR. Equal or better treatment could be given by two people each trained in one of the two skills.

OSHA believes that rescue personnel need instruction in first aid and CPR. It is recognized (Ex. 14-45; Washington Tr. 226; Houston Tr. 953) that yearly recertification is needed to maintain one's proficiency. Therefore, the Agency has carried forward the requirement for at least one member to be certified in CPR. OSHA has not, however, extended the provision to require medical training more advanced than that proposed. Although other forms of medical training (such as for an emergency care attendant or an emergency responder) may be beneficial, such training is not necessary because the medical capabilities resulting from this training is very likely to be available from other emergency responders who will be treating the entrant after he or she is removed from the permit space. In fact, paragraph (d)(9) requires the employer to ensure the availability of necessary emergency services (such as paramedic services).

In light of the evidence on this issue, the Agency has concluded that a requirement for a lone person certified in first aid and CPR is not sufficient protection for injured permit space entrants. If that one rescuer were to depart after entry has begun or were to become incapacitated during rescue, there would be no one to render this all important first treatment in an emergency. For this reason, OSHA has incorporated into the final rule a requirement for all rescue team members to be trained in first aid and CPR (§1910.146(k)(1)(iv)). Only one member of the rescue service needs to have a current CPR and first aid certification, however.

Paragraph (k)(2) of the final rule, which is based on proposed paragraph (h)(2), sets requirements for employers who retain outside rescue services to enter permit spaces for rescue of entrants.

Proposed paragraph (h)(2) required that employers who retain outside rescue teams ensure that the designated rescuers are aware of the hazards they may confront when called on to perform rescues, so that the outside rescue team can equip, train, and conduct itself appropriately. Virtually all of the comments regarding proposed (h)(2) addressed the advisability of permitting the use of off-site rescuers. Those comments have already been addressed in the discussion of the introductory language to paragraph (k).

The requirement proposed in paragraph (h)(2) that employers inform outside rescue services of the hazards that may be faced during entry has been retained as paragraph (k)(2)(i). The language from the proposed rule has been modified for consistency with the terminology of the final rule.

The AFIA (Ex. 14-160) stated "In the interest of eliminating possible confusion, AFIA requests that OSHA confirm in the final rule itself that an employer has no equipment and training obligations with respect to an outside rescue team." The Agency acknowledges that an employer is not required to train or equip off-site rescuers. This does not mean, however, that the employer who retains an off-site rescue service has no responsibility for the adequacy of the rescue services provided. OSHA notes that both the proposal, through proposed paragraphs (c)(8) and (h)(2), and the final rule, through paragraphs (d)(9) and (k)(2), require the employer to take measures to enable the rescue of injured entrants.

Paragraph (k)(2)(ii) of the final rule requires an employer who retains off-site rescue services to provide the designated rescuers with access to permit spaces as necessary for those rescuers to develop an appropriate rescue plan and as necessary for the designated rescuers to practice rescue procedures in permit spaces whose features approximate those of the permit

spaces from which rescue may be necessary.

This provision had no counterpart in the proposal. As noted in the summary and explanation of paragraphs (k)(1)(iii) and (k)(1)(iv), earlier, several comments suggested that all rescuers have the training and the practice necessary for the performance of their duties. OSHA agrees with those commenters. A rescue service needs to know the location, configuration and other circumstances of a permit space in order to develop and practice effective rescue procedures. OSHA has determined that the off- site rescuer's need for information on the permit spaces and for opportunities to perform practice rescues can be satisfied only through access to permit spaces whose size, configuration, and accessibility approximate those of the permit spaces from which rescue may be required. The Agency believes that compliance with this requirement, while minimally disrupting an employer's operations, will greatly increase the effectiveness of off-site rescue services. It should be noted that this provision does not require the outside rescue service to actually use the permit spaces for practice; paragraph (k)(2)(ii) simply requires that the host employer provide access to the space. In performing practice rescues, the outside service may use any representative permit spaces that replicate those from which rescue may be performed, in accordance with paragraph (k)(1)(iii) of the final rule.

Paragraph (k)(3) of the final rule sets requirements for non- entry rescue systems. OSHA has incorporated this provision into the final rule so that employers will have guidance regarding the proper use of harnesses and retrieval lines in non-entry rescue.

The performance-oriented language of proposed paragraph (c)(7) required employers to provide, maintain and ensure the proper use of the equipment, including personal protective equipment, necessary for safe entry. OSHA notes that proposed paragraph (d)(2)(ix) included retrieval lines among the examples of the personal protective equipment required to be listed in the checklist portion of the permit. In addition, proposed paragraph (c)(8) required employers to ensure that the procedures and equipment necessary to rescue authorized entrants from permit spaces were implemented and provided, and proposed paragraph (d)(2)(vii) required listing of the rescue equipment provided in the checklist portion of the permit. In the proposal, OSHA anticipated that many employers would use retrieval lines for rescue of entrants. However, the Agency also understood that some employers might use other rescue methods, particularly when retrieval lines would pose an entanglement hazard. In Issue 12 of the NPRM (54 FR 24087), OSHA requested information on retrieval lines and other types of non-entry rescue methods.

Many rulemaking participants responded to this issue. Some of them stated that retrieval lines are the most appropriate form of rescue equipment, especially when connected to a powered winch or a device with a mechanical advantage (Ex. 14–30, 14–35, 14–43, 14–61, 14–162, 14–166, 14–182; Washington Tr. 394–395). Most advocates of retrieval lines based their support on successful experience with the devices. For example, Wisconsin Natural Gas Company (Ex. 14–185) stated it "has only used retrieval lines. Records of cost or effectiveness are not maintained. Performance history, however, indicates that our procedures are effective."

At the Chicago hearing, the AFL-CIO supplied information regarding near misses (Chicago Tr. 311–312). This information regarded employees who, while wearing retrieval lines, entered a space that used baffles. The employees were overcome, but were rescued using the retrieval lines.

The use of a full body harness was also recommended by some of these commenters (Ex. 14–61, 14–63, 14–68, 14–182).

Other rulemaking participants stated that retrieval lines are not always appropriate and that the use of retrieval lines should not be required under every circumstance (Ex. 14–28, 14–62, 14–73, 14–99, 14–153, 14–183, 14–187; Houston Tr. 730–731, 862; Chicago Tr. 96–97). Some pointed out that these lines pose an entanglement hazard in certain types of confined spaces, especially if air lines and electric cords are run into the same space. Most of these commenters supported OSHA's performance- oriented approach and suggested that retrieval lines only be required where they are appropriate. For example, Mr. Roger Corley, representing the National Association of Manufacturers (Chicago Tr. 96–97), testified:

> ... it appears in this section that a retrieval line is required in each and every confined space entry situation. There are situation[s] where retrievable lines are ineffective, or inappropriate, or simply not required. As a brief example in a large steam boiler, for example, which is a common piece of equipment, the steam drum or mud drum often are horizontal cylinders of less than 24 inches in diameter. When people enter those cylinders to inspect the inner surface and perhaps their feet never enter the steam drum - their feet are extended. But that's treated as a confined space entry that a standby person and all of those arrangements are there, but obviously a retrieval line would serve no purpose there.
>
> In other instances the configuration of the interior of a distillation column or more complex vessel will make a retrieval line inappropriate. In that case, we recommend language that would say retrieval line is a standard piece of equipment for a confined space entry unless it's somehow or other rendered ineffective or inappropriate by the configuration of the space being entered.

Frank Rapp of the UAW also testified (Chicago Tr. 439) that wristlets were sometimes used where the configuration of permit space prevented the use of body harness.

Although information on other non-entry rescue methods was requested, no commenters or witnesses identified such other methods. (OSHA did receive comments regarding the proposed definition of "retrieval line". These are addressed under the summary and explanation of paragraph (b), earlier in this preamble.)

OSHA believes that retrieval lines can be very effective in assisting in the rescue of an unconscious employee from a confined space. Their other major advantage in rescue is that it is not necessary for a rescuer to be placed at risk in entering the permit space to help remove an injured entrant. The effectiveness of retrieval lines in rescue is amply demonstrated by the experience of employers currently using this equipment for confined space entries. On the other hand, the Agency realizes that many spaces do not readily or safely accommodate the use of retrieval lines. As the rulemaking participants noted, obstructions can snag the retrieval line or the entrant, and air lines and electric cords within the space can pose entanglement hazards. In order to provide the greatest degree of safety while recognizing these problems, the final rule requires the use of retrieval systems or methods whenever an authorized entrant enters a permit space, except in situations, such as those described in the record, in which the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue. This is the approach taken in ANSI Z117.1. OSHA believes that adopting the ANSI requirement will provide the most effective protection for employees, with due regard for situations in which retrieval systems should not be used.

In enforcing this provision, OSHA will inspect the permit space to determine whether or not a retrieval system would contribute to a rescue without increasing the overall risk of

entry. The Agency will use the following guidelines to make this determination:

(1) A permit space with obstructions or turns that prevent pull on the retrieval line from being transmitted to the entrant does not require the use of a retrieval system.

(2) A permit space from which an employee being rescued with the retrieval system would be injured because of forceful contact with projections in the space does not require the use of a retrieval system.

(3) A permit space that was entered by an entrant using an air supplied respirator does not require the use of a retrieval system if the retrieval line could not be controlled so as to prevent entanglement hazards with the air line.

Paragraphs (k)(3)(i) and (k)(3)(ii) set forth requirements for the proper use of retrieval systems. Paragraph (k)(3)(i) requires the authorized entrants to wear a chest or full body harness with retrieval line attached. The point of attachment of the retrieval line must be at the center of the entrant's back, near shoulder level, or above the entrant's head so that the entrant will present the smallest possible profile during removal, in case a rescue becomes necessary. The use of wristlets in place of the full body harness is recognized, if their use is appropriate (that is, if a full body harness cannot be used because of the configuration of the space).

Paragraph (k)(3)(ii) requires the outside end of the retrieval line to be attached to a fixed point or a lifting (or other retrieval) device in such a manner that rescue can begin as soon as the rescuer (in most cases the attendant) becomes aware that rescue is necessary. (As noted earlier, the attendant is only allowed to participate actively in non-entry rescue.) A mechanical device is required for vertical permit spaces more than 5 feet deep.

Some commenters (Ex. 14–62, 14–182) suggested that the retrieval line be attached to a mechanical lifting device. Another commenter (Ex. 14–63) focused on the need for mechanical systems "whenever practical" to remove entrants from permit spaces. That commenter stated:

> Securing the line to an anchor point does not afford the entrant an equal level of protection. It is difficult to move dead weight without mechanical assistance.

S.C. Johnson and Son, Inc. (Ex. 14–99) provided a summary of conclusions based on their near miss experiences. Their experiences,showed that mechanical assistance, though difficult to provide, was necessary for retrieval.They stated:

> We found that using a simple pulley was not "sufficient" to lift anyone from inside a vertical entry confined space. An attendant did not, by himself, have sufficient strength to "remove" anyone from such a space.... Providing such mechanical assistance is complicated by a general lack of room to position such equipment above the entry point of such spaces and the need to keep that entryway "cleared" for the attendant to "observe" the entrants while they are working.

Additionally, some commenters addressed the advisability of using powered winches to remove authorized entrants from permit spaces. One commenter (Ex. 14–54) stated:

> Used powered winches, overhead cranes, etc. is the easiest way to impale victims, tear off limbs and retrieve pieces and parts of victims. The word "Rescue" means to remove a victim from danger to safety, not to add danger.

Also, Caterpillar, Inc. (Ex. 14–137) commented:

> Power [winches] will not be used where additional harm to employees may occur.

Another commenter (Ex. 14–166) stated:

> Powered retrieval winches should be recommended where depths exceed 50 ft and should be equipped with torque limiters of approx. 450 lbs to avoid damaging the incapacitated person.

Frank Rapp of the UAW testified (Chicago Tr. 440):

> Some plants we usually [use a] fork truck, attach the lifeline onto the fork over a pit and lift them up by fork truck. You can do an extreme amount of damage to that person as they're ricocheting off a wall coming up.

ANSI Z117.1, Section 12.2.1 requires a mechanical device to be available to retrieve personnel from vertical type permit spaces greater than 5 feet in depth (Ex. 129).

OSHA believes that there are circumstances where the attachment of a retrieval line to a fixed point would enable the attendant or other rescue personnel to safely extract an entrant without the need to enter the space. OSHA further recognizes that a mechanical device will usually be necessary to enable rescuers outside the space to lift entrants out of vertical permit spaces. Therefore, the OSHA has adopted the ANSI approach requiring a mechanical device to be available, if a retrieval system is used, during entry operations involving vertical type permit spaces more than 5 feet deep. (Any permit space whose opening is above the entrant is considered to be a "vertical- type permit space".) The mechanical device used should be appropriate for rescue service. The employer should not use any mechanical device, such as a fork lift, that could injure the entrant during rescue.

In response to a comment (Ex. 14–11), OSHA raised Issue 15 of the hearing notice (54 FR 41463). This issue requested testimony and evidence regarding the need to require that the applicable Material Safety Data Sheet (MSDS) accompany an injured employee to the hospital if the injury was caused by a hazardous substance and regarding the need to require the permit to contain the names and phone numbers of persons who would make important decisions regarding rescue operations in a permit space.

OSHA received a comment (Ex. 14–210) on this issue which indicated that an MSDS would be of limited usefulness to emergency services, and that the administrative burden associated with tracking and locating the MSDS would be excessive. This commenter wrote:

> While providing [an] MSDS to accompany an injured entrant to the hospital may help in some cases, the injury may not be related to a chemical. The administrative burden of constantly tracking which chemical or gas the entrant is exposed to during a repair would be onerous. Emergency information can be provided promptly to the hospital without specifically requiring it in the proposed regulation.

OSHA also received testimony on Issue 15 at the hearings (Washington Tr. 896–897; Houston Tr. 909–910, 981; Chicago Tr. 168–170, 368, 497, 539, 617–618).

For example, one witness (Chicago Tr. 368) testified that while an MSDS was important, its usefulness might be limited, stating:

> Hazardous chemicals go unlisted by the companies [or they] fail to research other sources of data as required by the standard, such as RTECS. Unfortunately, much of the material found in confined spaces is waste material and is not covered by 1910.1200 Hazard Communication Standard.
>
> The availability of MSDSs is an important issue and the individual who authorized entry must assure to themselves that this information is available during the evaluation. MSDSs must also be available for any necessary emergency treatment provided at the job site or at least a list of chemicals that are involved in the confined space entry.

Other commenters at the public hearings expressed the same views. A commenter (Houston Tr. 896–897) at the hearings in Houston, Texas, said:

> Issue No. 15, access to material safety data sheets and other information. We recommend that the supplying of the appropriate MSDSs to accompany an injured employee to medical attention should only be required where it is clear which substance or substances caused the injury and as long as

a timely card to obtain the MSDSs does not delay the medical attention for the injured employee.

This is an area that must be dealt with very carefully. It is highly likely that in the course of an accident, an incorrect MSDS or an incomplete set of MSDSs in the case of exposure to more than one chemical, may accompany an employee to medical attention.Should medical professionals change their diagnosis or treatment procedures based on incorrect or incomplete MSDSs, the results could be tragic.

We recommend that unless those conditions can be met, OSHA should not require that a MSDS accompany an injured [employee].

Another hearing participant (Chicago Tr. 539) also testified that methods other than providing MSDS's were available to provide medical personnel with information on chemical exposures. This witness stated:

Issue 14 [sic] regards chemical information, MSDSs, be communicated to the emergency medical treatment personnel treating an injured employee. We encourage our facilities to identify local medical treatment centers where employees may be taken or that may be impacted by local emergency responses and establish a communication method appropriate for their system, and whenever an employee—what we do is even our small sites go out and identify the hospital or medical treatment area, review with those emergency people the chemicals or hazards that our employees may be exposed to or our contractors, and then give them a list and review and provide access, and also, we have a policy that any time an employee is injured on the site, that a company representative will travel with that employee to the treatment area.

The Agency believes that the identification of, and the means to notify a responsible person during rescue operations is a necessary part of rescue planning. Compliance with paragraph (d)(9) of the final rule, which requires employers to implement proper procedures for rescuing employees from a permit space, will necessarily involve provision for proper notification of the appropriate management personnel.

In addition to the comments and testimony, OSHA notes that the Superfund Amendments and Reauthorization Act of 1986 (SARA) (Subtitle B, Section 311) requires employers who produce, use, or store hazardous chemicals (as defined in 29 CFR §1910.1200) in excess of Environmental Protection Agency (EPA) limits to provide MSDSs to the state emergency planning commission, the local emergency planning committee, and the local fire department. OSHA notes that hospitals are represented on the local emergency planning committee and therefore should be aware of the types of chemicals in the community. OSHA also recognizes that in some cases an existing procedure, not involving MSDS's, may exist which provides an equal or more effective means of providing chemical exposure data to medical personnel.

A proper analysis of the hazards in a permit space under paragraph (d)(2) of the final rule will provide a list of possible chemical exposures, which will be included on the permit. Therefore, employers should be able to determine whether an MSDS is available for any substance to which an employee is likely to be exposed.

OSHA believes that it is important to ensure that medical treatment facilities are provided with any available information concerning the substances to which entrants have been exposed. While OSHA recognizes that while such information may already be available to medical facilities from other sources (such as state emergency planning commissions), and that MSDS's or similar written information may not be available at all in some instances, the Agency believes, based upon the comment and testimony received in response to issue 15 of the hearing notice, that it would be reasonable and prudent to require an employer to provide MSDS's or other written information to a treating medical facility when such MSDS's or other similar written information is already required to be kept at the worksite. The employer would only have to provide the information under the following conditions:

(1) If the MSDS or other written information is already required to be kept at the worksite by other applicable Federal (such as §1910.1200, *Hazard communication*) or state regulation, and

(2) If there exists an MSDS or other written information for the specific substance or substances to which the entrant has been exposed.

Accordingly, OSHA has included paragraph (k)(4) in the final rule to requires that, if an injured entrant is exposed to a substance for which an MSDS or other similar written information is already required to be kept at the worksite, the MSDS or other written information be provided to the treating medical facility. Employers can comply with this provision by having that information accompany the employee to the medical facility or by providing it to the facility as soon as practicable after the employee's arrival there. *Appendices*

OSHA is including five non-mandatory appendices (Appendix A—Decision flow chart, Appendix B—Procedures for atmospheric testing, Appendix C—Examples of permit programs, Appendix D—Sample permits, and Appendix E—Recommended procedures for sewer entry) with the final standard.

In Issue 13 of the NPRM (54 FR 24087), public comment was requested on the use of an appendix to the confined space standard as a source of general guidance for employers in understanding and complying with the standard. OSHA asked for specific recommendations and suggestions of subjects, such as personal protective equipment or rescue procedures, that commenters thought should be added to such an appendix. The Agency, in Issue 14 of the proposal and Issue 5 of the hearing notice, also requested information on industries which might be unable to develop permit programs because of their size. OSHA received many comments on these issues. Many rulemaking participants submitted sample procedures or permits (Ex. 14-4, 14–49, 14–57, 14–73, 14–88, 14–170, 14–171, 14–183, 14–209, 57, 58, 97, 98, 99, 101, 104, 105, 106, 118, 119, 127, 128, 131, 132, 143).

Some commenters (Ex. 14–81, 14–95, 14–219) offered brief statements of support for the use of an appendix as a source of general guidance. For example, the American Industrial Hygiene Association (AIHA, Ex. 14–61) in its response to Issue 1 in the proposal said that:

...there should at the very least be guidance to the employer in an appendix to the standard, as how to evaluate a potential confined space. In that manner, the small employer in particular would derive much needed direction from the agency on how to protect their employees.

AIHA maintained that information was especially needed on the subjects of hazard recognition and emergency planning.

A comment from the National Fire Protection Association (Ex. 14–42) recommended the use of national consensus standards in the formulation of appendix material, as follows:

If the American National Standards Institute issues the revised ANSI Z117, reference to it may be helpful, since it contains mandatory and explanatory guidance. The regulations should include a model confined space program, with samples of permits which are being used.

Another commenter (Ex. 14–44) noted that an appendix could provide valuable information to employers who do not have experience in permit space programs, as follows:

There are a number of items which would be helpful in an appendix as a source of general guidance. Due to the broad industrial application of this document the information

will have to be rather generic in nature, but could still be helpful in guiding the uninitiated in developing a good program. This information could include: types of protective equipment; types of retrieval equipment; types of acceptable lighting and electrical equipment; types of detection equipment; types of acceptable communications; typical permits and modifications; basic entry procedure; etc.

The State of Maryland Occupational Safety and Health Program (Ex. 14–63) responded at length to the importance of using appendices, stating, in part:

As an absolute minimum, Maryland would recommend an Appendix providing guidance in each of the [following] areas[:] hazard identification procedures, the monitoring and evaluation procedures, personal protective equipment requirements, rescue equipment and procedures and training of personnel. OSHA notes, on p. 24092 of the preamble, "That employers have not been sufficiently careful about authorizing permit space entry, and believes that only a systematic approach will ensure that entrants receive the necessary protection." If this is true in industries already using permit entry, it is more important to offer guidance through a series of systematic steps to employers who will encounter these requirements for the first time and who may have little competence in this area.

* * * * *

There should be a training section or an Appendix incorporated into the standard, which offers an outline or a lesson plan which addresses each item to be covered, such as reading instruments, monitoring, ventilation, rescue, etc.

* * * * *

Since most confined space fatalities are multiple fatalities created by the attempts of rescuers, improperly trained and equipped, to bring the fallen employee out of the space, this is one of the crucial factors in the training. If an *appendix* is prepared with a training outline, this should be stressed. [Emphasis was supplied in original.]

Maryland also suggested that the appendix be used to address the requirements in proposed paragraph (d)(4) relating to hot-work permits. In their statement directed specifically at NPRM Issue 13, they remarked that the appendices should explain each individual paragraph of the standard and provide additional information on them. They also listed the following suggested subjects: Permit vs. non-permit spaces, approaches to ventilation, instrumentation, isolation, lockout and tagging, draining and flushing, testing, personal protective equipment, check in and out, attendants, rescue, and training.

In their comments addressing proposed paragraphs (d)(2)(i) through (v), relating to information to be placed on the permit, Organization Resources Counselors, Inc. (Ex. 14–143), recommended that OSHA make the standard addressing these elements as short as possible and that OSHA put the details of these provisions in the appendix. ORC specifically endorsed the use of an appendix, stating:

ORC supports the publication of non-mandatory appendices which contain information and additional guidance on compliance with the standard. Samples of specific procedures, examples of permits, etc., might be quite useful to employers who do not have permit programs now and wish to understand the type of information that they will need to evaluate and the type of program they will have to implement to be in compliance with the standard.

Other commenters (Ex. 14–170, 14–195) supported the view that the appendices could be used to assist employers in their efforts to comply with the standard. Still another commenter (Ex. 14–208) stated that additional guidance was needed concerning the content of the permit, as follows:

To further assist employers in complying with the standard, CWA District 1 recommends that OSHA require employers to adopt the sort of checklist that has been developed by NIOSH in its *Guide to Confined Spaces*. The NIOSH checklist or its equivalent could be made an additional appendix to 1910.146. [Emphasis was supplied in original.]

By contrast, Edison Electric Institute (Ex. 14–171) was concerned that the sample permits found in the proposed appendix would pose compliance problems for employers who did not follow them exactly, stating:

EEI is concerned with the use of the forms listed in the non-mandatory appendix C to the proposal. Although they are advisory in nature, failure of an employer to include all of the suggested points could be considered as evidence of a violation or negligence. Although OSHA could not base a citation on the appendix, it could be used by a claimant to establish a standard of care in a third party lawsuit initiated after an accident.

Some of the participants in the public hearings also addressed appendices. For example, Keith Mestrich, on behalf of the Food and Allied Service Trades - AFL-CIO, recommended that OSHA include sample permits in an appendix (Chicago Tr. 42). John Nicol, testifying for the Chemical Manufacturers Association, recommended that OSHA include a sample training program in the appendix (Chicago Tr. 142).

Two commenters (Ex. 14–14, 14–98) responded specifically to Issue 14 in the proposal, suggesting that the rendering industry and the wastewater industry may not have sufficient resources to develop their own permit programs.

OSHA believes that non-mandatory appendices are a valuable tool to convey helpful information to assist employers in complying with the standard. OSHA does not agree with the view that the information in these non-mandatory appendices will be used for enforcement of the standard by the Agency's compliance staff. Based on the needs of employers and employees as described in the record, OSHA has carried forward two of the proposed appendices (the decision flowchart and the sample permit), has not carried forward one (the list of references) and has incorporated three others not included in the proposal (the procedures for atmospheric testing, the examples of permit programs and the recommended procedures for sewer entry).

Appendix A, *Permit-required Confined Space Decision Flowchart*, has been updated to be consistent with the final standard's provisions. The information in the flowchart is based on the Agency's analysis of how the requirements of the final rule would be applied to any given workplace.

Appendix B, *Procedures for Atmospheric Testing*, has been included in the final rule. It contains detailed recommendations on the purpose and types of atmospheric testing. Information of this type, though vital to an employer's permit program, is too lengthy and detailed to be placed within the regulatory text. OSHA has therefore incorporated Appendix B into the final rule. The information in this appendix is based on the many actual permit space programs submitted to the record.

Appendix C, *Examples of Permit-required Confined Space Programs*, has been incorporated into the final rule. OSHA believes it would be helpful to provide sample permit programs as well as samples of permits. The information in this appendix is based on the many actual permit space programs submitted to the record.

Appendix D contains sample permits. OSHA, responding to comments concerning proposed Appendix C, which also contained sample permits, has improved and upgraded the examples from the proposal. The information in this appendix is based on the many actual permit space programs submitted to the record.

Appendix E, *Sewer System Entry*, has been included in the final rule. Sewer entry differs in several respects from most other types of permit entry. (The appendix itself discusses these differences.) OSHA believes that these differences, while not so great so as to require separate treatment in the standard's regulatory text, do dictate at least a detailed discussion in a non-mandatory appendix.

Proposed Appendix B, which contained references for further information, has not been carried forward into the final rule. OSHA believes that the inclusion of this list in the actual standard is unnecessary. Much of the information from these references is already outdated, and the remainder will likely become outdated in a few years. OSHA has, however, presented a list of references for interested parties in Section IV, *References*, later in this preamble.

Discussion of Issues

The NPRM (54 FR at 24086) set out 18 issues regarding which OSHA sought information. The hearing notice (54 FR 41461) set out 15 issues, based on the NPRM comments, on which the Agency requested testimony, evidence, and additional comments. Most of the NPRM and hearing notice issues related to particular provisions of the proposed rule. The comments, evidence, and testimony received in response to those issues are covered in the Summary and Explanation discussion for the pertinent provisions of the final rule. The rest of the issues requested information that would assist OSHA in evaluating the impact of the proposed rule. The comments and testimony received in response to those issues are discussed in the following paragraphs and in Section VI, *Summary of the Final Regulatory Impact Analysis and Regulatory Flexibility Analysis*, later in this preamble.

Issue 7 of the NPRM (54 FR 24087) noted the proposed rule's emphasis on engineering and work practice controls for atmospheric hazards and asked what provisions OSHA should add to address nipping or crushing hazards. Several commenters (Ex. 14–4, 14–30, 14–35, 14–50, 14–57, 14–62, 14–63, 14–71, 14–81, 14–88, 14–94, 14–110, 14–111, 14–118, 14–131, 14–137, 14–157, 14–161, 14–162, 14–170, 14–179, 14–182, 14–187, 14–193, 14–199, 14–219) responded to this issue. The great majority of these commenters were of the opinion that mechanical hazards, such as nipping or crushing, would be best handled by other standards, such as §1910.147, *Control of hazardous energy sources (lockout/tagout*, already in existence. For example, The Shipbuilders Council of America (Ex. 14–62) said:

> Confined space standards should address those hazards peculiar to confined spaces, and not address all of the hazards to which entrants could be exposed. SCA believes that other safety hazards, such as heights, falls, surfaces, lighting, machine guarding, tagout/lock-out, etc. should be governed by their respective standards.

Likewise, the Kerr-McGee Corporation (Ex. 14–161) expressed the view that other standards should address mechanical and physical hazards, stating:

> OSHA asks what additional provisions would be appropriate to protect employees against physical and mechanical hazards. Kerr-McGee believes that adequate protection against such hazards is already provided by other OSHA standards including, but not limited to, Subpart O and the new lockout/tagout rule, 1910.147, effective October 31, 1989. While permit entries *may* require control of hazardous energy sources (lockout/tagout), OSHA should keep the two rules separate by referencing, rather than incorporating portions of one rule in the other. [Emphasis was supplied in original.]

Some commenters (Ex. 14–4, 14–35, 14–50), while not exclusively addressing physical hazards, did provide examples of specific equipment or procedures that would be involved with hazards other than atmospheric. Some of the equipment listed in these comments were non-sparking tools and various explosion- proof devices. One commenter (Ex. 14–50) mentioned that permit spaces should be evaluated for excessive temperature and noise, in addition to proper levels of lighting.Another commenter (Ex. 14–63) believed that these hazards needed to be addressed in the final standard.

Under most conditions, the lockout/tagout standard in §1910.147 properly addresses the control of hazardous energy sources within permit spaces. In fact, employers must deenergize and lock out or tag energy sources for machinery within a permit space with §1910.147, in addition to taking other measures required by final §1910.146, whenever servicing and maintenance is performed on that equipment. However, even if servicing and maintenance is not being performed (in which case §1910.147 would not apply), §1910.146 requires the employer to isolate hazards within the space to protect employees from any mechanical or other energy sources that may be present in the permit space. This approach is not only performance oriented, but it also avoids placing unnecessary details in the Permit-Required Confined Space final rule. The Agency has addressed the hazards associated with energy sources in paragraph (d)(3)(ii), which requires the employer to take measures to isolate the space, and in paragraph (f)(8), which requires the permit to list the measures used to isolate the space. OSHA believes that these requirements will ensure that employers have considered the energy-related hazards that may be found in permit spaces and that employers have taken measures to eliminate or control those hazards before employees enter those spaces.

The proposed rule took a performance-oriented approach to regulating employee safety in permit space entry operations. In the preamble to the proposal (54 FR 24087), OSHA explained that this approach was chosen to provide employers with maximum flexibility in determining how to protect their employees and raised Issue 9 of the NPRM, in which public comment was requested on whether or not this approach was appropriate and on what proposed provisions should be revised to use specification language. Additionally, OSHA asked if there were any provisions that used specification-type language where performance-oriented language should be substituted.

A substantial number of the commenters who responded to this issue (Ex. 14–27, 14–28, 14–30, 14–35, 14–43, 14–47, 14–50, 14–57, 14–73, 14–98, 14–161, 14–170, 14–183) expressed overall agreement with the use of performance language. Many supported the use of performance language with a few brief words. For example, Transco Energy Company (Ex. 14–35) stated:

> [Performance language] is desirable and will allow employers maximum flexibility in establishing their safe work practices and procedures.

In the same vein, the American National Can Company (Ex. 14–47) stated:

> Generally, we endorse the performance-oriented style of the proposed standard and support its intent and objective. We believe it represents a professional effort to produce a constructive framework for reducing the national casualty rate associated with the entry of confined spaces.

Another commenter (Ex. 14–50) expressed his opinions, as follows:

> ... it is better to provide performance language for many of these items as opposed to specific non-flexible requirements.

Monsanto Company (Ex. 14–170) offered support for the use of performance-oriented language in OSHA standards, but recommended that the rule provide clarification with respect to what is expected of the employer in terms of compliance, as follows:

> The standard should have clarity of language supported by examples so that employers can understand the range of methods for acceptable compliance.

The GATX Terminals Corporation (Ex. 14–183) stated their reasons for supporting performance language, as follows:

I concur with your performance-oriented, systematic approach and highly recommend that the flexibility that you are trying to build into the program remains a viable part of the final rule. I [emphasize] this due to the fact that confined space 'hazards' vary from one extreme to the other and the characteristics of each are directly contingent on site-specific hardware and the individual [company's] standard operating procedures. If companies do not have the flexibility to develop what they feel to be the priorities, the 'real' hazards may continue to exist. On the same note, employees who are involved with confined space entry (CSE) are already required (and sometimes frustrated) to follow a variety of procedures. If additional procedures are required in the future and they are perceived to be redundant or unnecessary by the workforce, an attitude of non- importance may develop—which is the last thing that OSHA or industry wants to happen when addressing this subject.

The National Fire Protection Association (Ex. 14–42) also agreed that the proposal's performance approach was appropriate, stating:

The accident statistics indicate for the most part that it is the failure of management to actively identify confined spaces and hazards in their workplace and provide adequate awareness training for all employees. Accidents have not occurred because the wrong hazards are identified or because the wrong atmospheric exposure levels were applied. No, accidents have occurred because no one even bothers to identify and evaluate the hazards.

It should be the function of this regulation to provide the framework for management to use to develop individual systems for recognition, evaluation and control of hazards associated with confined spaces which their workers will enter. The system should be in the form of a written safe work practice and should include designation of testers (professional and qualified as necessary). The system should include performance evaluation of the testers and workers. The system should also address non-routine entry, such as emergency or rescue.

Another commenter (Ex. 14–28) noted the difficulty of applying specification-type standards to industries with widely varying circumstances, as follows:

The performance oriented approach is appropriate. I've been involved with two ANSI standards and find that what is fine for one industry is impractical for another. I did not note any language problems, i.e., performance versus specification.

The comment and testimony received in response to Issue 9 in the NPRM serve to confirm OSHA's belief that performance, rather than specification type standards, best serve the purpose of protecting employees from the hazards of permit space entry while allowing employers to choose the best methods and procedures available to them for carrying out their responsibilities under the permit-required confined space standard. OSHA has therefore carried forward to the final rule the approach of using performance language whenever possible.

In spite of their support for the performance-oriented language contained in the proposal, some rulemaking participants (Ex. 14–62, 14–118, 14–143, 14–150, 14–168) found certain proposed requirements to be too specification oriented. For example, the Chemical Manufacturers Association (Ex. 14–118) supported the performance-oriented approach of the proposal. However, they did object to proposed §1910.146(c)(1), stating:

... the hazard identification and employee information sections do not adhere to the performance philosophy. This departure from that approach compromises the overall effectiveness of the standard.

The Shipbuilders Council of America (Ex. 14–62) argued that proposed paragraph (i) was not sufficiently performance oriented, as follows:

OSHA should modify paragraph (i) [Special permits for entry into low-hazard permit spaces] to provide more performance-oriented language...

Organization Resources Counselors, Inc. (Ex. 14–143) offered two examples of regulatory language they believed to be too detailed and inconsistent with a performance standard approach, as follows:

Paragraph (d)(2)(iii) states that "procedures for purging, inerting, ventilating and flushing..." should be included on the permit. Further, paragraph (d)(2)(v) calls for "testing and monitoring equipment and procedures..." to be included in the permit. Procedures for these items can be extensive. They are part of the preparation for entry, and their accomplishment should be addressed by the checklist, but the procedures themselves should not be part of the permit.

The Pennzoil Company (Ex. 14–150) echoed the same concern about permit systems addressed in proposed paragraph (d)(2). They stated:

[We] believe that the specifications listed include too much detail to be consistent with a performance- oriented approach, and are not achievable in some instances. An excellent example is [paragraph (d)(2)(iii)] which requires "...procedures for purging, inerting, ventilating, and flushing..." These procedures are very extensive, and are part of the preparation, not part of the *permit*. The entry permit approval process will ensure completion of these steps. We believe that [paragraph (d)(2)(iii)] should simply state "...the measures used to remove or control potential hazards." [Emphasis was supplied in original.]

Similar concerns about permit systems as addressed in proposed §1910.146(d)(2), (d)(3) and performance language were raised by the American Petroleum Institute (Ex. 14–168). In discussing proposed paragraph (d)(2), API stated:

While agreeing in concept, the specifications listed in this section are far too detailed, inconsistent with the desired performance approach, and in some cases simply are not achievable.

OSHA has taken these and all other comments, testimony, and evidence into consideration in the promulgation of the individual requirements of the final rule. OSHA believes that the final rule is written in terms of performance to be achieved rather than in terms of how to achieve the desired performance to the greatest extent consistent with effective employee protection from the hazards of permit space entry. Comments on the individual provision of the proposal that were thought to be too detailed are discussed under the summary and explanation of the corresponding provision of the final rule.

OSHA recognizes that the hazards associated with particular permit spaces differ in nature and degree according to the type of space being entered. In the notice of proposed rulemaking, the Agency proposed to allow employers the flexibility to tailor their permit space programs so that the particular conditions encountered are taken into account. However, the preamble to the proposal noted that the relative cost effectiveness of the rule (as calculated in the preliminary regulatory analysis) varied greatly from SIC to SIC. If this analysis were correct, the rule as proposed would have been much more cost effective in some industries than in other industries.

To ensure the greatest cost effectiveness for the final rule, OSHA posed, in Issue 17 of the NPRM (54 FR 24087), a series of questions related to minimizing the burden of the rule on employers while maximizing safety for employees. Commenters were requested to identify areas where the hazards posed by the spaces involved were not as great as those anticipated by the standard and, alternatively, areas where the hazards were more serious.

Interested parties responding to this issue identified several types of spaces that they claimed were covered by proposed §1910.146(i) but that were not hazardous enough to be regulated as permit-required confined spaces. Some of these commenters identified open trenches, ditches, excavations, and diked areas as examples of such spaces (Ex. 14–35, 14–43, 14–126, 14–183, 14–184). The commenters noted the lack of full enclosure of the spaces'

atmospheres (the tops of the spaces are open) and the relative ease of egress from these areas. Because of this, they maintained that trenches, ditches, excavations, and diked areas do not pose sufficient hazards to warrant regulation as permit-required confined spaces.

OSHA agrees with these comments. The Agency believes that these areas will not normally meet the definition of "permit- required confined space" and will not, therefore, usually be subject to final §1910.146. A detailed discussion of issues related to proposed paragraph (i) is contained in the summary and explanation of paragraph (c)(5) of the final rule.

Many other commenters argued that telecommunication manholes and vaults did not warrant all the procedures required under proposed §1910.146 (Ex. 14–104, 14–106, 14–108, 14–110, 14–139, 14–142, 14–162, 14–167, 14–187, 14–194, 14–195, 14–207). They maintained that such manholes and vaults were adequately covered by existing §1910.268(o) and argued that accident experience under the telecommunication standard clearly demonstrated that employees working in these manholes and vaults were adequately protected without further regulation. These commenters also pointed out that manhole entry posed limited hazards in comparison to entry into permit-required confined spaces, especially when all the requirements of §1910.268 are followed.

OSHA also agrees with these commenters. In fact, under the final rule, employee entry into telecommunications manholes and vaults will normally be covered under §1910.268 rather than §1910.146. (This was also true under the proposal, although it may not have been clear.) For additional information regarding the application of §1910.146 to the telecommunications work, see the discussion of final §1910.146(a) earlier in this preamble.

With regard to the question of why the cost effectiveness of §1910.146 varied widely from SIC to SIC, very few commenters had concrete answers. Three respondents doubted the accuracy of the underlying data (Ex. 14–62, 14–63, 14–172). For example, the State of Maryland's Occupational Safety and Health program stated:

> MOSH would certainly question the data collection of several of the industries for which there appear to be no fatalities on the chart provided. It is hard to believe that in agriculture (silos), textile mill products (process vessels, bleaching vats), tobacco manufacturing (mixers, vats), printing and publishing (tanks for inks and solvents) that there have been no confined space fatalities, especially since MOSH recalls articles on such, although no specifics are readily available.

Most commenters argued that the best way to handle the problem of maximizing the cost effectiveness of the rule was to promulgate a performance-oriented standard that provides the employer with the flexibility to adapt his or her confined space entry program to the hazards posed by the spaces found in the workplace (Ex. 14–35, 14–43, 14–57, 14–73, 14–81, 14–137, 14–161, 14–170, 14–193). In this manner, they contended, the employer assumes the responsibility for employee safety and has the freedom to choose the least costly method for adequately protecting his or her employees. One of these commenters, Mr. Gerald Beaumont of Beaumont and Associates (Ex. 14–57), recognized that, even with the wide range of hazards posed by confined spaces, there are certain common dangers:

> It is appropriate to allow trained supervisors and safety professionals to apply their judgement in protecting employees within the structure of this proposed standard. Some industries may not have confined space fatalities listed because of limited exposure to confined spaces. However, the hazards of oxygen deficiency and naturally generated toxic gases are potentially present in all confined spaces along with the possible release of flammable or toxic materials by the work activity, and thus should be evaluated prior to authorizing entry.

OSHA agrees that a performance-oriented standard is the most cost effective approach to regulation. The Agency took this approach in proposing §1910.146 and has refined it in the final rule. The final rule permits employers to specify whatever procedures he or she believes will best protect his or her employees. However, OSHA is requiring certain precautions to be taken for all permit-required confined space entries, because, as noted by Mr. Beaumont and as conclusively demonstrated by the many accident descriptions in the record, certain hazards are common to all regulated spaces. There is no evidence in the record that spaces regulated by the final rule are safer in any one industry than in another. The Agency strongly believes that this final rule will prove to be cost effective in preventing the deaths of and injuries to employees from the hazards posed by confined spaces.

IV. References

1. B.F. Goodrich Chemical Company. "General Notice: SA–5, Rev.3 'Vessel Entry -Procedure'" Cleveland, Ohio 44131.

2. Commonwealth of Pennsylvania. Department of Environmental Resources. "Entry to Confined Spaces" Harrisburg, Pennsylvania 17120.

3. State of California, Department of Industrial Relations. General Industry Safety Orders s5182, "Confined Spaces" Sacramento, California 95814.

4. E.I. DuPont de Nemours and Company. Safety Engineering Standard, "Vessel and Confined Space Entry" Wilmington, Delaware 19898.

5. Organization Resource Counselors, Inc. "Sixth Draft of Proposed Performance Standard for Confined Spaces" Washington, DC 20006.

6. Michigan Department of Public Health, Division of Occupational Health. "Control Measures for Hazardous Atmospheres (Including Tank and Vessel Entry)", Lansing, Michigan 48909.

7. Kentucky Department of Labor, Occupational Safety and Health Program. "Kentucky Occupational Safety and Health General Industry Standards, 803 Kar 2:015 section 3, Confined Spaces," Frankfort, Kentucky 40601.

8. U.S. Department of Health, Education, and Welfare, National Institute for Occupational Safety and Health (USDHEW/NIOSH). "Criteria for a Recommended Standard * * * Working in Confined Spaces" Cincinnati, Ohio 45226 U.S. USDHEW/NIOSH 1979.

9. U.S. Department of Labor, Occupational Safety and Health Administration (U.S. DOL/OSHA). "Selected Occupational Fatalities Related to Fire and/or Explosion in Confined Work Spaces as Found in OSHA Fatality/Catastrophe Investigations", Washington, DC 20210. U.S. DOL/OSHA, 1982.

10. U.S. Department of Labor, Occupational Safety and Health Administration (U.S. DOL/OSHA). "Selected Occupational Fatalities Related to Lockout/Tagout Problems As Found in Reports of OSHA Fatality/Catastrophe Investigations", Washington, DC 20211. U.S. DOL/OSHA, 1982.

11. U.S. Department of Labor, Occupational Safety and Health Administration (U.S. DOL/OSHA). "Selected Occupational Fatalities Related to Grain Handling As Found in Reports of OSHA Fatality/Catastrophe Investigations", Washington, DC 20210. U.S. DOL/OSHA, 1983.

12. West Virginia University. "'Confined Space Entry. An Evaluation of Current Practices and Procedures used by General Industry with Recommendations for Improvements to the Confined Space Entry Standard", 1984. Morgantown, West Virginia 26505.

13. American Petroleum Institute (API). Draft s3, "Guidelines for Working in Inert' Confined Spaces in the Petroleum Industry", AOSC, 1985. Washington, DC 20005.

14. U.S. Department of Labor, Occupational Safety and Health Administration (U.S. DOL/OSHA). "Selected Occupational Fatalities Related To Toxic and Asphyxiating Atmospheres In Confined Spaces As Found In Reports of OSHA Fatality/Catastrophe Investigations", Washington, DC 20210. U.S. DOL/OSHA, 1985.

15. U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health (DHHS/NIOSH). "Request for Assistance in Preventing Occupational Fatalities in Confined Spaces", Cincinnati, Ohio 45226. HHS/PHS/CDC/NIOSH, 1986.

16. State of New Jersey, Department of Labor and Industry, Bureau of Engineering and Safety. New Jersey Administrative Code Title 12, Chapter 170, "Work in Confined Spaces", April 1971. Trenton, New Jersey 08625.

17. State of Florida, Department of Commerce, Bureau of Workmen's Compensation. "Regulation Relating to Hazardous Atmospheres in Confined Spaces", 1969. Tallahassee, Florida 32301.

18. American National Standards Institute (ANSI). "Safety Requirements for working in Tanks and other Confined Spaces", ANSI Z117.1–1989. New York, New York 10018.

V. Statutory Considerations

A. Introduction.

OSHA has described the hazards confronted by employees who enter permit spaces and the measures required to protect affected employees from those hazards in Section I, *Background*, and Section III, *Summary and Explanation of the Standard*, respectively, earlier in this preamble. The Agency is providing the following discussion of the statutory mandate for OSHA rulemaking activity to explain the legal basis for its determination that the permit space standard, as promulgated, is reasonably necessary to protect affected employees from significant risks of injury and death.

Section 2(b)(3) of the Occupational Safety and Health Act authorizes "the Secretary of Labor to set mandatory *occupational safety and health standards* applicable to businesses affecting interstate commerce", and section 5(a)(2) provides that "[e]ach employer shall comply with *occupational safety and health standards* promulgated under this Act" (emphasis added). Section 3(8) of the OSH Act (29 U.S.C. § 652(8)) provides that "the term 'occupational safety and health standard' means a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment."

In two recent cases, reviewing courts have expressed concern that OSHA's interpretation of these provisions of the OSH Act, particularly of section 3(8) as it pertains to safety rulemaking, could lead to overly costly or under-protective safety standards. In *International Union, UAW v. OSHA*, 938 F.2d 1310 (D.C. Cir. 1991), the District of Columbia Circuit rejected substantive challenges to OSHA's lockout/tagout standard and denied a request that enforcement of that standard be stayed, but it also expressed concern that OSHA's interpretation of the OSH Act could lead to safety standards that are very costly and only minimally protective. In *National Grain & Feed Ass'n v. OSHA*, 866 F.2d 717 (5th Cir. 1989), the Fifth Circuit concluded that Congress gave OSHA considerable discretion in structuring the costs and benefits of safety standards but, concerned that the grain dust standard might be under-protective, directed OSHA to consider adding a provision that might further reduce significant risk of fire and explosion.

It is, of course, beyond doubt that OSHA rulemakings involve a significant degree of agency expertise and policy-making discretion to which reviewing courts must defer. (See for example, *Building & Constr. Trades Dep't, AFL-CIO v. Brock*, 838 F.2d 1258, 1266 (D.C. Cir. 1988); *Industrial Union Dep't, AFL-CIO v. American Petroleum Inst.*, 448 U.S. 607, 655 n. 62 (1980).) At the same time, the agency's technical expertise and policy-making authority must be exercised within discernable parameters. The lockout/tagout and grain handling standard decisions sought from OSHA more clarification on the agency's view of the scope of those parameters. In light of those decisions, OSHA believes it would be useful to include in the preamble to this safety standard a statement of its view of the limits of its safety rulemaking authority and to explain why it is confident that its interpretive views have in the past avoided regulatory extremes and continue to do so in this rule.

Stated briefly, the OSH Act requires that, before promulgating any occupational safety standard, OSHA demonstrate based on substantial evidence in the record as a whole that: (1) the proposed standard will substantially reduce a significant risk of material harm; (2) compliance is technologically feasible in the sense that the protective measures being required already exist, can be brought into existence with available technology, or can be created with technology that can reasonably be developed; (3) compliance is economically feasible in the sense that industry can absorb or pass on the costs without major dislocation or threat of instability; and (4) the standard is cost effective in that it employs the least expensive protective measures capable of reducing or eliminating significant risk. Additionally, proposed safety standards must be compatible with prior agency action, must be responsive to significant comment in the record, and, to the extent allowed by statute, must be consistent with applicable Executive Orders. These elements limit OSHA's regulatory discretion for safety rulemaking and provide a decision-making framework for developing a rule within their parameters.

B. Congress concluded that OSHA regulations are necessary to protect workers from occupational hazards and that employers should be required to reduce or eliminate significant workplace health and safety threats.

At section 2(a) of the OSH Act (29 U.S.C. § 651(a)), Congress announced its determination that occupational injury and illness should be eliminated as much as possible: "The Congress finds that occupational injury and illness arising out of work situations impose a substantial burden upon, and are a hindrance to, interstate commerce in terms of lost production, wage loss, medical expenses, and disability compensation payments." Congress therefore declared "it to be its purpose and policy ... to assure so far as possible every working man and woman in the Nation safe ... working conditions [29 U.S.C. § 651(b)]."

To that end, Congress instructed the Secretary of Labor to adopt existing federal and consensus standards during the first two years after the OSH Act became effective and, in the event of conflict among any such standards, to "promulgate the standard which assures the greatest protection of the safety or health of the affected employees [29 U.S.C. § 655(a)]." Congress also directed the Secretary to set mandatory occupational safety standards [29 U.S.C. § 651(b)(3)], based on a rulemaking record and substantial evidence [29 U.S.C. § 655(b)(2)], that are "reasonably necessary or appropriate to provide safe ... employment and places of employment." When promulgating permanent safety or health standards that differ from existing national consensus standards, the Secretary must explain "why the rule as adopted will better effectuate the purposes of this Act than the national consensus standard [29 U.S.C. § 655(b)(8)]." Correspondingly, every employer must comply with OSHA standards and, in addition, "furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees [29 U.S.C. § 654(a)]."

"Congress understood that the Act would create substantial costs for

employers, yet intended to impose such costs when necessary to create a safe and healthful working environment. Congress viewed the costs of health and safety as a cost of doing business.... Indeed, Congress thought that the *financial costs* of health and safety problems in the workplace were as large as or larger than the *financial costs* of eliminating these problems [*American Textile Mfrs. Inst. Inc. v. Donovan*, 452 U.S. 490, 519-522 (1981) (*ATMI*); emphasis was supplied in original]." "[T]he fundamental objective of the Act [is] to prevent occupational deaths and serious injuries [*Whirlpool Corp. v. Marshall*, 445 U.S. 1, 11 (1980)]." "We know the costs would be put into consumer goods but that is the price we should pay for the 80 million workers in America [S. Rep. No. 91-1282, 91st Cong., 2d Sess. (1970); H.R. Rep. No. 91-1291, 91st Cong., 2d Sess. (1970), *reprinted in* Senate Committee on Labor and Public Welfare, *Legislative History of the Occupational Safety and Health Act of 1970*, (Committee Print 1971) ("Leg. Hist.") at 444 (Senator Yarborough)]." "Of course, it will cost a little more per item to produce a washing machine. Those of us who use washing machines will pay for the increased cost, but it is worth it, to stop the terrible death and injury rate in this country [*Id.* at 324; see also 510-511, 517]."

> [T]he vitality of the Nation's economy will be enhanced by the greater productivity realized through saved lives and useful years of labor.
>
> When one man is injured or disabled by an industrial accident or disease, it is he and his family who suffer the most immediate and personal loss. However, that tragic loss also affects each of us. As a result of occupational accidents and disease, over $1.5 billion in wages is lost each year [1970 dollars], and the annual loss to the gross national product is estimated to be over $8 billion. Vast resources that could be available for productive use are siphoned off to pay workmen's compensation and medical expenses....
>
> Only through a comprehensive approach can we hope to effect a significant reduction in these job death and casualty figures. [*Id.* at 518-19 (Senator Cranston)]

Congress considered uniform enforcement crucial because it would reduce or eliminate the disadvantage that a conscientious employer might experience where inter-industry or intra-industry competition is present. Moreover, "many employers—particularly smaller ones—simply cannot make the necessary investment in health and safety, and survive competitively, unless all are compelled to do so [Leg. Hist. at 144, 854, 1188, 1201]."

Thus, the statutory text and legislative history make clear that Congress conclusively determined that OSHA regulation is necessary to protect workers from occupational hazards and that employers should be required to reduce or eliminate significant workplace health and safety threats.

C. As construed by the courts and by OSHA, the OSH Act sets a threshold and a ceiling for safety rulemaking that provide clear and reasonable parameters for agency action.

OSHA has long followed the teaching that section 3(8) of the OSH Act requires that, before it promulgates "*any* permanent health or safety standard, [it must] make a threshold finding that a place of employment is unsafe—in the sense that significant risks are present and can be eliminated or lessened by a change in practices [*Industrial Union Dep't, AFL-CIO v. American Petroleum Inst.*, 448 U.S. 607, 642 (1980) (plurality) (*Benzene*); emphasis was supplied in original]." When, as frequently happens in safety rulemaking, OSHA promulgates standards that differ from existing national consensus standards, it must explain "why the rule as adopted will better effectuate the purposes of this Act than the national consensus standard [29 U.S.C. § 655(b)(8)]." Thus, national consensus and existing federal standards that Congress instructed OSHA to adopt summarily within two years of the OSH Act's inception provide reference points concerning the least an OSHA standard should achieve (29 U.S.C. §§ 655(a)).

As a result, OSHA is precluded from regulating insignificant safety risks or from issuing safety standards that do not at least lessen risk in a significant way.

The OSH Act also limits OSHA's discretion to issue overly burdensome rules, as the agency also has long recognized that "any standard that was not economically or technologically feasible would *a fortiori* not be 'reasonably necessary or appropriate' under the Act. See *Industrial Union Dep't v. Hodgson*, [499 F.2d 467, 478 (D.C. Cir. 1974)] ('Congress does not appear to have intended to protect employees by putting their employers out of business.') [*American Textile Mfrs. Inst. Inc.*, 452 U.S. at 513 n. 31 (a standard is economically feasible even if it portends 'disaster for some marginal firms,' but it is economically infeasible if it 'threaten[s] massive dislocation to, or imperil[s] the existence of,' the industry)]."

By stating the test in terms of "threat" and "peril," the Supreme Court made clear in *ATMI* that economic infeasibility begins short of industry-wide bankruptcy. OSHA itself has placed the line considerably below this level. (See for example, *ATMI*, 452 U.S. at 527 n. 50; 43 FR 27,360 (June 23, 1978). Proposed 200 µg/m3 PEL for cotton dust did not raise serious possibility of industry-wide bankruptcy, but impact on weaving sector would be severe, possibly requiring reconstruction of 90 percent of all weave rooms. OSHA concluded that the 200 µg/m3 level was not feasible for weaving and that 750 µg/m3 was all that could reasonably be required). See also 54 FR 29,245-246 (July 11, 1989); *American Iron & Steel Institute*, 939 F.2d at 1003. OSHA raised engineering control level for lead in small nonferrous foundries to avoid the possibility of bankruptcy for about half of small foundries even though the industry as a whole could have survived the loss of small firms.) Although the cotton dust and lead rulemakings involved health standards, the economic feasibility ceiling established therein applies equally to safety standards. Indeed, because feasibility is a necessary element of a "reasonably necessary or appropriate" standard, this ceiling boundary is the same for health and safety rulemaking since it comes from section 3(8), which governs all permanent OSHA standards.

All OSHA standards must also be cost-effective in the sense that the protective measures being required must be the least expensive measures capable of achieving the desired end (*ATMI*, at 514 n. 32; *Building and Constr. Trades Dep't AFL-CIO v. Brock*, 838 F.2d 1258, 1269 (D.C. Cir. 1988)). OSHA gives additional consideration to financial impact in setting the period of time that should be allowed for compliance, allowing as much as ten years for compliance phase-in. (See *United Steelworkers of Am. v. Marshall*, 647 F.2d 1189, 1278 (D.C. Cir. 1980), *cert. denied*, 453 U.S. 913 (1981).) Additionally, OSHA's enforcement policy takes account of financial hardship on an individualized basis. OSHA's Field Operations Manual provides that, based on an employer's economic situation, OSHA may extend the period within which a violation must be corrected after issuance of a citation (CPL. 2.45B, Chapter III, paragraph E6d(3)(a), Dec. 31, 1990).

To reach the necessary findings and conclusions that a safety standard substantially reduces a significant risk of harm, is both technologically and economically feasible, and is cost effective, OSHA must conduct rulemaking in accord with the requirements of section 6 of the OSH

Act. The regulatory proceeding allows it to determine the qualitative and, if possible, the quantitative nature of the risk with and without regulation, the technological feasibility of compliance, the availability of capital to the industry and the extent to which that capital is required for other purposes, the industry's profit history, the industry's ability to absorb costs or pass them on to the consumer, the impact of higher costs on demand, and the impact on competition with substitutes and imports. (See *ATMI* at 2501–2503; *American Iron & Steel Institute* generally.) Section 6(f) of the OSH Act further provides that, if the validity of a standard is challenged, OSHA must support its conclusions with "substantial evidence in the record considered as a whole," a standard that courts have determined requires fairly close scrutiny of agency action and the explanation of that action. (See *Steelworkers*, 647 F.2d at 1206–1207.)

OSHA's powers are further circumscribed by the independent Occupational Safety and Health Review Commission, which provides a neutral forum for employer contests of citations issued by OSHA for noncompliance with health and safety standards (29 U.S.C. §§ 659–661; noted as an additional constraint in *Benzene* at 652 n. 59). OSHA must also respond rationally to similarities and differences among industries or industry sectors. (See *Building and Constr. Trades Dep't, AFL-CIO v. Brock*, 838 F.2d 1258, 1272–73 (D.C. Cir. 1988).)

Finally, it is axiomatic that significant departures from prior practice must be justified (*International Union, UAW v. Pendergrass*, 878 F.2d 389, 400 (D.C. 1989)). In the twenty years since enactment of the OSH Act, OSHA has promulgated numerous safety standards—standards that provide benchmarks for judging risks, benefits, and feasibility of compliance in subsequent rulemakings. (OSHA's Hazardous Waste Operations and Emergency Response Standard, for example, required use of existing technology and well accepted safety practices to eliminate at least 32 deaths and 18,700 lost workday injuries at a cost of about $153 million per year (54 FR 9311–9312; March 6, 1989). The Excavation standard also drew on existing technology and recognized safety practices to save 74 lives and over 800 lost workday injuries annually at a cost of about $306 million. (54 FR 45,954; Oct. 31, 1989). OSHA's Grain Handling Facilities standard relied primarily on simple housekeeping measures to save 18 lives and 394 injuries annually, at a total net cost of $5.9 to $33.4 million (52 FR 49,622; Dec. 31, 1991).)

OSHA safety rulemaking is thus constrained first by the need to demonstrate that the standard will substantially reduce a significant risk of material harm, and then by the requirement that compliance is technologically capable of being done and not so expensive as to threaten economic instability or dislocation for the industry. Within these parameters, further constraints such as the need to find cost-effective measures and to respond rationally to all meaningful comment militate against regulatory extremes.

D. The Permit-Required Confined Space standard complies with the statutory criteria described above and is not subject to the additional constraints applicable to section 6(b)(5) standards.

As explained in Section I, *Background*, and Section III, *Summary and Explanation of the Standard*, earlier in this preamble, and in Section VI, *Summary of the Final Regulatory Impact Analysis and Regulatory Flexibility Analysis*, later in this preamble, OSHA has determined that permit spaces pose significant risks to employees (62 fatalities and 12,643 injuries and illnesses annually) and estimates that compliance with the Permit-Required Confined Space standard will reduce the risk of permit space hazards by 85 percent (preventing 53 fatalities and 10,746 injuries and illnesses annually). This constitutes a substantial reduction of significant risk of material harm. The Agency believes that compliance is technologically feasible because the rulemaking record indicates that the hazard control measures required by the standard have already been implemented, to some extent, at all the types of spaces covered by the standard. Additionally, OSHA believes that compliance is economically feasible, because, as documented by the Regulatory Impact Analysis, all regulated sectors can readily absorb or pass on compliance costs during the standard's first five years, and economic benefits will exceed compliance costs thereafter.

The standard's costs, benefits, and compliance requirements are reasonable, amounting to approximately $202.4 million annually, preventing 53 fatalities and 10,746 injuries and illnesses per year. These amounts are consistent with those of other OSHA safety standards. OSHA considered and responded to all substantive comments regarding the proposed rule on their merits. In particular, OSHA evaluated all suggested changes in terms of their impact on worker safety, their feasibility, their cost effectiveness, and their consonance with the OSH Act.

Further, the additional constraint found in section 6(b)(5) of the OSH Act, that standards dealing with employee exposure to "toxic materials or harmful physical agents" must also assure, "to the extent feasible ... that no employee will suffer material impairment of health or functional capacity even if [he is exposed] to the hazard dealt with by the standard for the period of his working life," does not apply to this rule. Standards subject to section 6(b)(5), which regulate insidious hazards that are frequently undetectable because they are subtle or develop slowly or after long latency periods, are frequently referred to as "health" standards, while those that regulate hazards, like explosions or electrocution, that cause immediately noticeable physical harm, are called "safety" standards. (See *National Grain & Feed Ass'n v. OSHA (NGFA II)*, 866 F.2d 717, 731, 733 (5th Cir. 1989). Section 6(b)(5) applies only to substances that take their toll over time or "whose deleterious effect is not readily apparent, such as a carcinogen or a harmful physical agent such as noise," not to "hazards such as explosives, that are every bit as lethal but whose impact is immediate").

The OSH Act and its legislative history clearly indicate that Congress intended this distinction between safety standards and health standards. For example in section 2(b)(6) of the OSH Act, Congress declared that the goal of assuring safe and healthful working conditions and preserving human resources would be achieved, in part:

> ... by exploring ways to discover latent diseases, establishing causal connections between diseases and work in environmental conditions, and conducting other research relating to health problems, in recognition of the fact that occupational health standards present problems often different from those involved in occupational safety.

The legislative history makes this distinction even clearer:

> [The Secretary] should take into account that anyone working in toxic agents and physical agents which might be harmful may be subjected to such conditions for the rest of his working life, so that we can get at something which might not be toxic now, if he works in it a short time, but if he works in it the rest of his life might be very dangerous; and we want to make sure that such things are taken into consideration in establishing standards. [*Leg. Hist.* at 502–503 (Sen. Dominick), quoted in *Benzene* at 648–49]

Additionally, Representative Daniels distinguished between "insidious 'silent

killers' such as toxic fumes, bases, acids, and chemicals" and "violent physical injury causing immediate visible physical harm" (*Leg. Hist.* at 1003), and Representative Udall contrasted insidious hazards like carcinogens with "the more visible and well-known question of industrial accidents and on-the-job injury" (*Leg. Hist.* at 1004). (See also, for example, S.Rep. No. 1282, 91st Cong., 2d Sess 2–3 (1970), U.S. Code Cong. & Admin. News 1970, pp. 5177, 5179, reprinted in Leg. Hist. at 142–43, discussing 1967 Surgeon General study that found that 65 percent of employees in industrial plants "were potentially exposed to harmful physical agents, *such as severe noise or vibration*, or to toxic materials"; Leg. Hist at 412; *id.* at 446; *id.* at 516; *id.* at 845; *International Union, UAW* at 1315.)

Congress addressed this concern that insidious, long term hazards might not receive sufficient protection through section 6(b)(5), which requires OSHA to set "the most protective standard consistent with feasibility" (*Benzene* at 643 n. 48). As Justice Stevens observed:

> The reason that Congress drafted a special section for these substances ... was because Congress recognized that there were special problems in regulating health risks as opposed to safety risks. In the latter case, the risks are generally immediate and obvious, while in the former, the risks may not be evident until a worker has been exposed for long periods of time to particular substances. [*Benzene*, at 649 n. 54.]

The permit space standard addresses hazards, such as asphyxiation, explosion, and engulfment, that are immediately dangerous to life or health, not the longer term, less obvious hazards subject to section 6(b)(5). The definition of "immediately dangerous to life or health" in paragraph (b) of the final rule covers conditions that pose immediate or delayed threats to life, would cause irreversible adverse health effects or would interfere with an individual's ability to escape unaided from a permit space. The definition contemplates that any "delayed" health effects would arise within 72 hours of exposure to a permit space hazard. Accordingly, the mention of delayed effects simply reflects OSHA's recognition that some acute health effects may not manifest themselves at the very same time as the permit space incidents which trigger them. While some of the materials, particularly the air contaminants, that have been detected in permit spaces could also have long-term adverse effects on employees, those long-term effects are not addressed by the permit space standard.

Challenges to the grain dust and lockout/tagout standards included assertions that grain dust in explosive quantities and uncontrolled energy releases that could expose employees to crushing, cutting burning or explosion hazards were harmful physical agents so that OSHA was required to apply the criteria of section 6(b)(5) when determining how to protect employees from those hazards. Reviewing courts have uniformly rejected such assertions. For example, the Court in *International Union, UAW v. OSHA*, 938 F.2d 1310 (D.C. Cir. 1991) rejected the view that section 6(b)(5) provided the statutory criteria for regulation of uncontrolled energy, holding that such a "reading would obliterate a distinction that Congress drew between 'health' and 'safety' risks." The Court also noted that the language of the OSH Act and the legislative history supported the OSHA position (*International Union, UAW* at 1314). Additionally, the Court stated: "We accord considerable weight to an agency's construction of a statutory scheme it is entrusted to administer, rejecting it only if unreasonable" (*International Union, UAW* at 1313, citing *Chevron U.S.A., Inc. v. NRDC*, 467 U.S. 837, 843 (1984)).

The Court reviewing the grain dust standard also deferred to OSHA's reasonable view that the Agency was not subject to the feasibility mandate of section 6(b)(5) in regulating explosive quantities of grain dust (*National Grain & Feed Association v. OSHA (NGFA II)*, 866 F.2d 717, 733 (5th Cir. 1989)). It therefore applied the criteria of section 3(8), requiring the Agency to establish that the standard is "reasonably necessary or appropriate" to protect employee safety.

OSHA has determined that the permit space standard, like other safety standards, is subject to the constraints of section 3(8) of the OSH Act, that it be "reasonably necessary or appropriate to provide safe or healthful employment and places of employment." But the standard is not subject to the section 6(b)(5) requirement that it limit significant risk "to the extent feasible."

The Agency believes that permit spaces pose significant risks and that the provisions of the final rule are reasonably necessary to protect affected employees from those risks. It has also determined that compliance with the permit space standard is technologically feasible because the rulemaking record indicates that the hazard control measures required by the standard have already been implemented, to some extent, at all the types of spaces covered by the standard. In addition, OSHA believes that compliance is economically feasible, because, as documented by the "*Final Regulatory Impact Analysis and Regulatory Flexibility Analysis of the Final Permit-Required Confined Space Standard*",[34] all regulated sectors can readily absorb or pass on compliance costs during the standard's first five years, and economic benefits will exceed compliance costs thereafter. In particular, the Agency believes that compliance with the permit space standard will result in substantial cost savings and productivity gains at manufacturing facilities that might otherwise be disrupted by permit space incidents.

As detailed in Section VI, *Summary of the Final Regulatory Impact Analysis and Regulatory Flexibility Analysis*, later in this preamble, the standard's costs, benefits, and compliance requirements are consistent with those of other OSHA safety standards. For example, the Hazardous Waste Operations and Emergency Response standard (29 CFR 1910.120) requires the use of existing technology and well accepted safety practices to eliminate at least 32 deaths and 18,700 lost workday injuries at a cost of about $153 million per year (54 FR 9311–9312; March 6, 1989). The Excavations standard (29 CFR 1926, Subpart P) also drew on existing technology and recognized safety practices to save 74 lives and over 800 lost workday injuries annually at a cost of about $306 million (54 FR 45,954; Oct. 31, 1989). Additionally, the Grain Handling Facilities standard (29 CFR 1910.272) relied primarily on simple housekeeping measures to save 18 lives and 394 injuries annually, at a total net cost of between $5.9 million and $33.4 million (52 FR 49,622; Dec. 31, 1987). Also, compliance with the planning, work practice, and training provisions of the Process Safety Management standard (29 CFR 1910.119) will reduce the risk of catastrophic fire and explosion (330 fatalities and 1917 injuries and illnesses annually) by 80 percent, at an annualized cost of $888.7 million in the first five years and at an annualized cost of $470.8 million in the following five years.

OSHA has considered and responded to all substantive comments regarding the proposed permit space standard on their merits in the Section III, *Summary and Explanation of the Standard*, earlier in this preamble. In particular, OSHA evaluated all suggested changes to the

[34] This document is available for inspection and copying in Docket S–019 in the Docket Office, Rm. N2634, U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Ave., NW, Washington, DC 20210; telephone: 202–219–7894.

proposed rule in terms of their impact on worker safety, their feasibility, their cost effectiveness, and their consonance with the OSH Act.

E. The permit space standard is necessary to address the significant risks of material harm posed by permit spaces.

OSHA believes that Section , *Background*, Section II, *Hazards*, and Section III, *Summary and Explanation of the Standard*, earlier in this preamble have clearly and comprehensively set out the Agency's bases for concluding that permit spaces pose significant risks and that the provisions of the final rule are reasonably necessary to protect affected employees from those risks. In particular, as detailed in Section VI, *Summary of the Final Regulatory Impact Analysis and Regulatory Flexibility Analysis*, later in this preamble, OSHA estimates that exposure to permit spaces hazards causes at least 62 fatalities and 12,643 injuries and illnesses annually and that compliance with the Permit-Required Confined Space standard will reduce the risk of permit space hazards by 85 percent (preventing 53 fatalities and 10,746 injuries and illnesses annually). This constitutes a substantial reduction of a significant risk of material harm to the exposed population of approximately 1,629,000 permit space entrants.

OSHA emphasizes that its risk assessment is based on employee exposure to the particular hazard of permit-required confined spaces, a hazard that exists in a large range of industries. Although Section VI, *Summary of the Final Regulatory Impact Analysis and Regulatory Flexibility Analysis*, later in this preamble, presents OSHA's estimate of the costs and benefits of the permit space standard in terms of the Standard Industrial Classification (SIC) codes for the industries regulated, OSHA does not believe that the risk associated with this hazard varies according to what SIC code a particular space may be found in. Thus, some of the industry categories within the scope of the final rule which will have compliance costs have had few or no documented permit space-related injuries or fatalities during the period covered by the RIA. In this case, OSHA has defined the scope of the rule to cover those situations it has determined to be hazardous. As explained more fully below, OSHA has determined that the lack of prior documented injuries and deaths in some SIC Codes does not indicate that the employees in those industries are not exposed to significant risks from permit spaces and permit space entry.

As the summary of the RIA explains in detail, OSHA has determined that it is appropriate to include those industries within the scope of the permit space standard because employees in those industries are exposed to the same kinds of hazards as employees in industries for which there are reported injuries and fatalities. For example, employers classified in SIC 391 (Jewelry, Silverware and Plated Ware) and in SIC 3949 (Sporting and Athletic Goods) have employees enter tanks, pits, and dust collectors that meet the permit space definition, but that have not caused any documented injuries or fatalities during the 5-year time period covered by the RIA tables. The Agency has found, however, that the permit spaces identified in SIC 391 and SIC 3949 are closely analogous, and in many cases virtually identical, to permit spaces in other SIC categories (such as SIC 28, Chemicals & Allied Products) where OSHA has documented injuries and fatalities.

As regards the other SICs for which injury and fatality data are not available, OSHA has set out the bases for concluding that permit spaces in those SICs pose significant risk of material harm in Table III–5 and the accompanying text of Chapter III of the "*Final Regulatory Impact Analysis and Regulatory Flexibility Analysis of the Final Permit-Required Confined Space Standard*". Even in industry sectors in which no injuries or fatalities have been reported, the Agency believes there is sufficient information for OSHA to determine that employees who enter permit spaces in those sectors face significant risks, based on analysis of the elements of the hazards identified and based on the similarity of hazard elements between industry sectors. Therefore, the Agency has determined that all employees who enter permit spaces face a significant risk of material harm and that compliance with the permit space standard is reasonably necessary to protect affected employees from that risk, regardless of the number of permit space incidents reported for the SIC code to which the employer has been assigned.

Also, because of the difficulties the Agency has experienced in compiling a database for permit space incidents, injuries or fatalities may have occurred in industries, including those for which no incidents have been documented, without being recorded. For example, as noted in Table I–7 of the "*Final Regulatory Impact Analysis and Regulatory Flexibility Analysis of the Final Permit-Required Confined Space Standard*", 7 of the 53 permit space fatalities (nearly 15 percent) OSHA believes will be prevented each year through compliance with the permit space standard could not be classified with a particular 2-digit SIC classification. The frequent use of contractors for permit space entry operations raises further questions regarding the reliability of incident data organized according to SIC code, because a fatality report will usually include the SIC code for the employer whose employee was killed but not necessarily the SIC code for the workplace where the permit space fatality occurred.

In addition, the SIC code-based organization of incident data may mask actual or potential permit space hazards because, while a business is classified for SIC purposes according to its principal activity, the workplace may also contain permit spaces, entered for "secondary" purposes, that have caused permit space-related injuries or fatalities. For example, a permit space incident in the utility room boiler at a new car dealer would be classified under the new car dealer SIC, even though the hazard and the incident had nothing to do with selling new cars. Therefore, OSHA believes, based on the limitations of the incident data and the circumstantial nature of many permit space incidents, that it is appropriate to require that employers protect affected employees from permit space hazards in all workplaces where permit spaces have been identified, rather than to characterize workplaces according to the injury or fatality experience of the SIC codes in which they have been classified.

The Agency also notes that, as discussed in the NPRM (54 FR 24082, 24086), permit space injuries and "near misses" are underreported, because the data collection system has focused on documenting fatalities and because the employees often "recover" without hospitalization or seeking medical attention. Based on these considerations, OSHA believes it is reasonable to conclude that permit space injuries and some of the unclassified permit space fatalities occurred in SIC categories that have no documented permit space injuries or fatalities.

Finally, it is well established in the OSH Act enforcement context that the lack of injuries or deaths to a particular employer's employees does not establish that the employees are not exposed to a hazard. In a frequently quoted passage, the Fifth Circuit long ago observed that "the goal of the Act is to prevent the first accident, not to

serve as a source of consolation for the first victim or his survivors" (*Mineral Industries & Heavy Construction Group v. OSHRC*, 639 F.2d 1289, 1294 (5th Cir. 1981)). This principle applies to regulatory actions as well. Once the agency determines that exposure to a particular condition constitutes a significant risk, it need not repeat that analysis for every situation or type of workplace in which the condition is found.

For all of the foregoing reasons, OSHA has determined that it is inappropriate to exclude any of the SICs merely because they have not recently had documented permit space injuries or fatalities, insofar as those SICs contain confined spaces which meet the configuration and hazard criteria to qualify as permit spaces.

VI. Summary of the Final Regulatory Impact Analysis and Regulatory Flexibility Analysis

A. Introduction

The Occupational Safety and Health Administration (OSHA) has determined that there is a significant risk to the health and safety of workers who enter certain types of confined spaces. To protect workers from the hazards encountered in these unique work environments, OSHA is issuing this final permit-required confined space standard (29 CFR §1910.146). This comprehensive standard supplements the existing OSHA standards that address permit space hazards in particular work settings.

Executive Order 12291 (46 FR 13197) requires that a regulatory analysis be conducted for any rule having major economic consequences on the national economy, individual industries, geographical regions, or levels of government. In addition, the Regulatory Flexibility Act of 1980 (5 U.S.C. 601 et seq.) requires federal agencies to determine whether a regulation will have a significant economic impact on a substantial number of small entities.

Consistent with these requirements, OSHA has prepared a Regulatory Impact and Regulatory Flexibility Analysis for the standard on permit spaces, the full body of which is available in OSHA Docket S-019. This summary of the analysis includes an overview of affected industries and employees, estimated benefits, the technological feasibility of the standard, estimated compliance costs, economic and environmental impacts, and a discussion of the nonregulatory alternatives to this final standard.

B. Industries and Employees Affected by the Standard

Based on a report prepared under contract to OSHA by CONSAD Research Corporation (CONSAD) [1], OSHA estimates that the standard will have cost impacts in 34 two-digit Standard Industrial Classification industry groups. Affected industries are found in Agricultural Services, Oil and Gas Extraction, Manufacturing, Transportation and Utilities, Wholesale Trade, Retail Trade, and Miscellaneous Services.

Permit-required confined spaces (or permit spaces, for short), as defined in §1910.146(b), vary in size, configuration, process use and hazard across industries where the risks are present. In Manufacturing, permit spaces include storage vessels, furnaces, tank degreasers and other types of equipment requiring human entry for maintenance and repair. Permit space hazards can also appear during production itself, such as in the manufacture of railroad tank cars and aircraft parts. Examples of permit spaces found elsewhere in industry include manholes serviced in SIC 49, Electric, Gas, and Sanitary Services, and cooking vessels cleaned in SIC 70, Hotels, Rooming Houses, Camps, and Other Lodging Places.

Employees encounter a variety of hazards while working in permit spaces, chief among these being asphyxiation and poisoning from toxic atmospheres. Explosions and fires caused by a sudden exposure to a flammable source or by a dangerous reaction among volatile chemicals have also caused a number of fatalities and injuries. In some environments, worker engulfment by fine particulate, such as grain or sawdust, have resulted in deaths and injuries. When an employee is overcome by the atmosphere in a permit space, fellow employees sometimes enter in a rescue attempt. Often these would-be rescuers are unaware of or not equipped for the hazard and are overcome along with the original victim.

Many permit spaces are infrequently entered to inspect, clean, or repair equipment. Where products become permit spaces as they are built, entries during the manufacturing process can be frequent and routine. The risk associated with each entry in workplaces with frequently entered spaces may, however, be lower than in workplaces with infrequent entries. Degree of risk in this context depends more on atmospheric conditions in the space rather than on frequency of entry.

Table 3 presents, for each two-digit industry affected by the permit space standard, the number of establishments with permit spaces, the number of permit spaces, the number of employees and the number of scheduled entrants. Not all establishments in affected industries contain permit spaces. OSHA estimates that 238,853 establishments employing 12.2 million workers, have permit spaces. At these establishments, there are about 1.6 million workers, including contractors, who enter approximately 4.8 million permit spaces annually.

Table 3—Profile of Affected Establishments Employees

SIC	Industry	Number of Establishments with Permit Spaces	Number of Permit Spaces	Number of Employees	Number of Permit Space Entrants
07	Agricultural Services	10,864	79,821	62,990	25,748
13	Oil & Gas Extraction	10,000	12,477	155,660	11,239
20	Food and Kindred Products	10,236	142,727	805,247	99,420
21	Tobacco Products	69	776	37,845	2,007
22	Textile Mill Products	1,491	17,062	186,752	27,831
24	Wood Products (except furniture)	10,290	39,409	146,042	31,035
25	Furniture and Fixtures	5,254	26,012	224,589	35,424
26	Paper Products	4,397	95,533	475,171	46,208
27	Printing and Publishing	47	206	2,196	94
28	Chemicals & Allied Products	8,098	170,982	593,738	71,962
29	Petroleum Refining	1,644	93,700	104,704	15,560
30	Rubber Products	6,282	143,818	319,262	143,522

Table 3—Profile of Affected Establishments Employees—Continued

SIC	Industry	Number of Establishments with Permit Spaces	Number of Permit Spaces	Number of Employees	Number of Permit Space Entrants
31	Leather and Leather Products	151	514	6,395	1,055
32	Stone, Clay, Glass & Concrete	12,290	116,708	366,454	110,568
33	Primary Metals Industry	2,788	35,521	463,942	56,669
34	Fabricated Metal Products	8,441	88,507	346,800	33,959
35	Machinery, Except Electrical	4,330	34,670	437,200	116,987
36	Electric/Electronic Equipment	6,610	176,895	892,336	111,087
37	Transportation Equipment	3,302	1,085,966	1,043,403	31,706
38	Instruments & Related Products	64	901	7,296	514
39	Miscellaneous Manufacturing	885	31,267	18,926	5,744
42	Motor Freight Transportation	14,583	201,680	201,679	40,336
49	Electric, Gas, Sanitary Services	28,444	1,575,170	410,290	263,217
50	Wholesale Trade/Durables	2,753	3,965	36,465	3,359
51	Wholesale Trade/Nondurables	36,913	411,095	358,647	194,454
54	Food Stores	10,073	10,073	318,010	10,073
59	Miscellaneous Retail	7,149	28,201	57,923	10,694
65	Real Estate (Commercial)	13,582	45,190	391,923	12,442
70	Hotels and Other Lodging	5,099	77,672	163,323	80,442
72	Personal Services	3,577	24,604	198,447	7,154
76	Miscellaneous Repair Services	752	802	3,718	752
78	Motion Pictures	11	33	16,500	66
80	Health Services	8,252	71,709	3,357,391	27,308
84	Museums, Botanical Gardens, Zoos	130	1,183	7,338	781
	TOTAL	238,853	4,844,849	12,218,622	1,629,201

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis, based on CONSAD [1]
[1] Includes contractors.

C. Benefits

OSHA searched its Fatality/Catastrophe database [5] over the period 1986–1990 to identify accidents associated with permit-required confined spaces. Based on its review of OSHA accident reports and injury data from the Bureau of Labor Statistics, OSHA estimates that 63 fatalities, 5,931 lost-workday cases and 6,951 non-lost-workday cases occur annually in workplaces affected by the standard.

The final standard mandates a comprehensive approach for the control of permit space hazards. Included in the standard are provisions for entry permits, training, hazard recognition, isolation procedures, atmospheric testing, mechanical ventilation, and personal protective equipment. OSHA estimates that compliance with all requirements in the standard will result in an 85 percent reduction in baseline fatalities, injuries, and illnesses associated with permit spaces. Applying this safety effectiveness rate to the baseline accident statistics given earlier, OSHA predicts that 54 fatalities, 5,041 lost-workday cases and 5,908 non-lost-workday cases will be prevented as a result of the standard. Benefits by industry group are shown in Table 4.

Table 4—Annual Fatalities, Injuries, and Illnesses Preventable by the Permit Space Standard

SIC	Industry	Fatalities			Injuries					
					Lost-Workday			Non-Lost-Workday		
		Large	Small	Total	Large	Small	Total	Large	Small	Total
07	Agricultural Services	0.0	0.3	0.3	-[1]	18	18	-	17	17
13	Oil & Gas Extraction	3.1	3.7	6.8	73	89	163	54	66	120
20	Food and Kindred Products	2.0	0.7	2.7	303	101	404	384	128	513
21	Tobacco Products	0.3	0.0	0.3	51	-	51	64	-	64
22	Textile Mill Products	0.3	0.0	0.3	51	-	51	64	-	64
24	Wood Products (except furniture)	1.0	0.0	1.0	152	-	152	192	-	192
25	Furniture and Fixtures	0.0	0.0	0.0[2]	-	-	-	-	-	-
26	Paper Products	0.7	0.0	0.7	101	-	101	128	-	128
27	Printing and Publishing	0.0	0.0	0.0	-	-	-	-	-	-
28	Chemicals & Allied Products	3.4	0.7	4.1	506	101	607	641	128	769
29	Petroleum Refining	0.0	0.0	0.0[3]	-	-	-	-	-	-
30	Rubber Products	0.7	0.0	0.7	101	-	101	128	-	128
31	Leather and Leather Products	1.0	0.0	1.0	152	-	152	192	-	192
32	Stone, Clay, Glass & Concrete	0.7	0.0	0.7	101	-	101	128	-	128
33	Primary Metals Industry	2.0	0.0	2.0	303	-	303	384	-	384
34	Fabricated Metal Products	4.4	0.7	5.1	657	101	758	833	128	961
35	Machinery, Except Electrical	1.0	0.0	1.0	152	-	152	192	-	192
36	Electric/Electronic Equipment	0.0	0.0	0.0[4]	-	-	-[5]	-	-	-
37	Transportation Equipment	2.0	0.0	2.0	303	-	303	384	-	384

Table 4—Annual Fatalities, Injuries, and Illnesses Preventable by the Permit Space Standard—Continued

SIC	Industry	Fatalities			Injuries					
		Large	Small	Total	Lost-Workday			Non-Lost-Workday		
					Large	Small	Total	Large	Small	Total
38	Instruments & Related Products	0.3	0.0	0.3	51	-	51	64	-	64
39	Miscellaneous Manufacturing	0.3	0.0	0.3	51	-	51	64	-	64
42	Motor Freight Transportation	2.7	2.4	5.1	119	104	223	87	76	163
49	Electric, Gas, Sanitary Services	3.1	3.7	6.8	134	163	297	98	119	217
50	Wholesale Trade/Durables	0.0	0.3	0.3	-	42	42	-	48	48
51	Wholesale Trade/Nondurables	0.3	0.7	1.0	42	83	125	48	97	145
54	Food Stores	0.0	0.0	0.0[6]	-	-	-[7]	-	-	-
59	Miscellaneous Retail	0.0	0.3	0.3	-	42	42	-	48	48
65	Real Estate (Commercial)	0.0	0.0	0.0[8]	-	-	-	-	-	-
70	Hotels and Other Lodging	0.0	0.0	0.0[9]	-	-	-	-	-	-
72	Personal Services	0.0	0.0	0.0	-	-	-	-	-	-
76	Miscellaneous Repair Services	0.0	3.1	3.1	-	374	374	-	436	436
78	Motion Pictures	0.0	0.0	0.0	-	-	-	-	-	-
80	Health Services	0.0	0.3	0.3	-	42	42	-	48	48
84	Museums, Botanical, Zoos	0.0	0.0	0.0	-	-	-	-	-	-
	Host Employer Unidentified	3.1	4.1	7.1	229	151	380	265	171	436
	TOTAL[11]	32.6	21.1	53.7	3,630	1,411	5,041	4,396	1,512	5,908

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis

[1] Dashes indicate that prevented injuries could not be estimated utilizing injury/fatality factor (see Table III–3 in the Regulatory Analysis) due to the absence of reported fatalities during the investigated period.

[2] One pre-1986 fatality in SIC 25 reported by NIOSH [2], and one post-1990 fatality in SIC 25 reported by OSHA [5].

[3] Ten fatalities prior to 1986 reported for SIC 29 by OSHA [3], [4] and NIOSH [2].

[4] One fatality and three injuries prior to 1986 reported for SIC 36 by NIOSH [2].

[5] Twelve hospitalized injuries prior to 1986 reported for SIC 36 by OSHA [5].

[6] Three fatalities prior to 1986 reported for SIC 54 by NIOSH [2] and OSHA [5].

[7] Two hospitalized injuries prior to 1986 reported for SIC 54 by OSHA [5].

[8] One fatality and one injury reported prior to 1986 for SIC 65 by NIOSH [2].

[9] Three fatalities reported prior to 1986 for SIC 70 by OSHA [4] and NIOSH [2].

[10] Includes contractors and other service employers whose host employer at the time of the accident could not be identified in the OSHA abstracts.

[11] Row and column totals may not equal the sum of the data due to rounding.

For some affected sectors, there were no recorded accidents in the OSHA database for the five-year period ending in 1990. However, accidents in a number of these sectors were identified in other databases for earlier time periods (see, for example, [2], [3], [4]) and the same types of hazards related to permit space entry continue to be present in all of these industries. In addition, for those industries for which fatalities and injuries have not been recorded during the 1986–1990 period, OSHA has determined that the permit spaces in those industries have configurations and hazards that are closely analogous to those of permit spaces in industries for which fatality and injury data are available. The basis for this determination is presented in Table III–5 and in the accompanying text of Chapter III of the Regulatory Analysis. In some sectors, the absence of accident records for the reference period may also indicate, for example, that employers in those sectors have begun implementing protective measures for permit space entry. OSHA has determined that compliance with this final standard will protect employees from significant risks associated with entry into permit spaces throughout general industry.

D. Technological Feasibility

To assess the feasibility of complying with the final standard using applicable technologies and work practices, OSHA reviewed the rulemaking record and the compliance profile developed by CONSAD [1]. OSHA believes that the final standard will cause some firms to adopt technologies and work practices that are readily available but in limited use today. While not specifically mandated, the standard should also encourage technological innovation to achieve compliance, as well as to reduce the need to enter spaces. As reported by CONSAD [1], technologies such as atmospheric testing instruments, ventilation equipment, respirators and retrieval devices, are already in widespread use throughout industry.

Application of permit space technologies will vary according to configuration and circumstance. Where a particular piece of equipment may not be appropriate, alternative control devices can be employed effectively. For example, in spaces where atmospheric hazards may be present and ventilation is not practical, respirators are required. In entry situations in which the use of retrieval lines is counterproductive, the standard provides for entry rescue by properly equipped rescue personnel. In general, although some situations might limit the use of a particular technology, use of other pieces of equipment or work practices is permitted.

Therefore, on the basis of testimony in the record and OSHA's assessment of current industry practice for protecting workers in permit spaces, OSHA has determined that the final standard is technologically feasible.

E. Costs of Compliance

OSHA estimated compliance costs of the standard by combining the industry profile information summarized above with data on current compliance rates, unit costs for required equipment, and hourly compensation of labor. For each provision of the standard, OSHA estimated initial costs and ongoing costs. Initial costs represent up-front expenditures for program development and equipment; these costs were annualized over the expected life of the resource in order to show such costs on an annual basis. Other ongoing expenditures incurred annually include refresher training and equipment maintenance. OSHA summed annualized initial costs and ongoing costs to estimate total annual costs.

OSHA estimates that the annual cost of compliance for the permit spaces standard will total $202.4 million. Table

5 presents annual compliance costs by provision. The largest compliance expenditures are associated with atmospheric testing ($46.6 million), respiratory protection ($38.6 million), and the provision for attendants ($37.3).

Table 5—Summary of Annual Compliance Costs

Provision	Annual Costs
Establish Permit Entry Program/System	$10,955,165
Training	9,204,484
Inform Non-Entrants	7,968,174
Isolation Procedures	1,752,744
Mechanical Ventilation	27,541,362
Respiratory Protection	38,615,993
Atmospheric Testing	46,573,456
Vehicle/Pedestrian Barriers	128,233
Attendant	37,284,569
Retrieval Devices	3,185,009
Issue Permits	17,800,417
Rescue Teams	1,360,141
TOTAL	$202,369,752

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis

The final permit-required confined space standard strives to prescribe the appropriate level of safeguards for the level of risk encountered in a given confined space situation. As an extension of its general performance-oriented nature, the standard sets up a hierarchy in which some provisions, such as the requirement for attendants, are reserved for only situations in which an entrant may encounter a hazardous atmosphere. As shown in Table 6, the number of applicable requirements and cost of compliance per space rises with the level of hazard encountered. Most permit spaces fall under exemptions provided under paragraph (c)(5) of the standard.

Table 6—Cost of Complying With the Permit Space Standard by Type of Space

Type of Space	Provision	Cost	Number of Spaces (Millions)	Incremental Cost per Space[1]
Non-Entry Permit Spaces	Inventory Spaces	$1,095,517	1.5	$0.73
Spaces Declassifiable [(c)(7)(i)]	Inventory Spaces/Establish Program	328,655		
	Inform Non-Entrants	318,727		
	Isolation Procedures	70,110		
	Vehicle/Pedestrian Barriers	5,129		
	TOTAL	$722,621	0.2	$3.61
Tested and Ventilated [(c)(5)]	Establish Permit Entry Program/System	5,148,928		
	Training	5,259,705		
	Inform Non-Entrants	4,462,178		
	Isolation Procedures	981,537		
	Mechanical Ventilation	21,639,642		
	Respiratory Protection	2,325,535		
	Atmospheric Testing	26,613,404		
	Vehicle/Pedestrian Barriers	71,811		
	Certification of Conditions	4,450,104		
	TOTAL	$70,952,843	2.7	$26.28
Full Permit-Required Spaces	Establish Permit Entry Program/System	4,382,066		
	Training	3,944,779		
	Inform Non-Entrants	3,187,270		
	Isolation Procedures	701,098		
	Mechanical Ventilation	5,901,721		
	Respiratory Protection	36,290,459		
	Atmospheric Testing	19,960,053		
	Vehicle/Pedestrian Barriers	51,293		
	Attendant	37,284,569		
	Retrieval Devices	31,185,009		
	Issue Permits	13,350,313		
	Rescue Teams	1,360,142		
	TOTAL	$129,598,771	1.9	$68.21

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis.
[1]Figures in this column represent the annualized cost of coming into compliance with the standards, for average establishment, given current compliance.

OSHA also estimated compliance costs by industry, shown in Table 7. Electric, gas and sanitary services (SIC 49) are estimated to incur costs of $72.6 million, primarily in public water and sewer utilities. The relatively large number of permit spaces and permit space entrants in this sector contributes to the magnitude of their compliance

costs. Most affected sectors will incur compliance costs under $10 million.

Table 7—Summary of Annual Compliance Costs of the permit Space Standard by Industry

SIC	Industry	Total Annual Compliance Costs (Thousands of Dollars)
07	Agricultural Services	7,881
13	Oil & Gas Extraction	85
20	Food and Kindred Products	12,472
21	Tobacco Products	32
22	Textile Mill Products	263
24	Wood Products (except furniture)	1,740
25	Furniture and Fixtures	750
26	Paper Products	4,028
27	Printing and Publishing	--[1]
28	Chemicals & Allied Products	1,581
29	Petroleum Refining	2,418
30	Rubber Products	6,910
31	Leather and Leather Products	37
32	Stone, Clay, Glass & Concrete	12,150
33	Primary Metals Industry	5,801
34	Fabricated Metal Products	13,490
35	Machinery, Except Electrical	2,999
36	Electric/Electronic Equipment.	13,354
37	Transportation Equipment	6,946
38	Instruments & Related Products	6
39	Miscellaneous Manufacturing	1,197
42	Motor Freight Transportation	12,958
49	Electric, Gas, Sanitary Services	72,636
50	Wholesale Trade/Durables	263
51	Wholesale Trade/Nondurables	15,792
54	Food Stores	244
59	Miscellaneous Retail	18
65	Real Estate (Commercial)	1,561
70	Hotels and Other Lodging	831
72	Personal Services	311
76	Miscellaneous Repair Services	6
78	Motion Pictures	—
80	Health Services	3,603
84	Museums, Botanical Gardens, Zoos	5
	TOTAL	$202,370

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis

[1] Hyphens denote compliance costs of under $1,000.

OSHA believes that direct compliance costs will be offset by a reduction in administrative costs associated with permit space accidents. These costs usually involve such activities as preparing insurance claims, completing accident reports, and hiring and training replacement workers. In addition, OSHA anticipates that improved worker productivity as a result of the standard will help to lower production costs and contribute to higher quality output. Although OSHA did not quantify these cost offsets, the Agency believes they will be substantial.

F. Economic Impact and Regulatory Flexibility Analysis

OSHA assessed the potential economic impact of the final standard on affected two-digit industry sectors and has determined that impacts on prices, profits, and sales will be modest for most industries. If affected establishments added the entire cost of compliance to the price of their final goods, OSHA estimates that the average price increase would not exceed 0.01 percent, based on the ratio of compliance cost to average establishment revenue. The maximum price increase in any industry sector would be 0.23 percent (SIC 07, Agricultural Services).

OSHA assessed the impact on firm profits (Table 8) under the assumption that costs would be fully absorbed internally and are not passed forward to consumers. Computing the ratio of costs to pre-tax profits, OSHA determined that the percentage of profits represented by compliance costs in this worst-case scenario would average 0.17 percent. In only two industry sectors are average profit impacts expected to exceed 1 percent, assuming zero cost pass-through. Therefore, on the basis of these results, OSHA concludes that the standard is economically feasible.

Table 8—Cost Impact by Industry

SIC	Industry	Number of Affected Firms	Number of Permit Spaces Total	Total Annual Compliance Costs	Average Cost of Rule		Cost As A Percent of Profit	
					Large Firms	Small Firms	Large Firms	Small Firms
07	Agricultural Services	10,864	79,821	$7.880.523	$3,102	$607	1.08%	4.99%
13	Oil & Gas Extraction	10,000	12,477	84,509	20	7	0.00%	0.01%
20	Food and Kindred Products	10,236	142,727	12,472,105	1,620	843	0.06%	0.53%
21	Tobacco Products	69	776	32,215	442	542	0.00%	0.00%
22	Textile Mill Products	1,491	17,062	262,733	195	104	0.02%	0.05%
24	Wood Products (except furniture)	10,290	39,409	1,739,695	161	175	0.04%	0.60%
25	Furniture and Fixtures	5,254	26,012	749,673	267	31	0.04%	0.07%
26	Paper Products	4,397	95,533	4,028,205	1,265	118	0.05%	0.04%
27	Printing and Publishing	47	206	618	14	11	0.00%	0.04%
28	Chemicals & Allied Products	8,098	170,982	1,581,380	399	26	0.01%	0.01%
29	Petroleum Refining	1,644	93,700	2,418,236	4,040	262	0.01%	0.02%
30	Rubber Products	6,282	143,818	6,910,246	1,411	725	0.15%	0.61%
31	Leather and Leather Products	151	514	36,948	603	3	0.13%	0.00%
32	Stone, Clay, Glass & Concrete	12,290	116,708	12,149,864	1,407	799	0.17%	1.17%
33	Primary Metals Industry	2,788	35,521	5,801,382	2,228	95	0.09%	0.02%
34	Fabricated Metal Products	8,441	88,507	13,490,158	2,942	604	0.41%	0.97%
35	Machinery, Except Electrical	4,330	34,670	2,999,427	1,182	303	0.04%	0.20%
36	Electric/Electronic Equipment	6,610	176,895	13,354,277	2,126	1,901	0.14%	2.10%
37	Transportation Equipment	3,302	1,085,966	6,945,783	5,097	153	0.05%	0.05%
38	Instruments & Related Products	64	901	6,262	268	2	0.00%	0.00%

Table 8—Cost Impact by Industry—Continued

SIC	Industry	Number of Affected Firms	Number of Permit Spaces Total	Total Annual Compliance Costs	Average Cost of Rule		Cost As A Percent of Profit	
					Large Firms	Small Firms	Large Firms	Small Firms
39	Miscellaneous Manufacturing	885	31,267	1,196,552	1,556	1,017	0.13%	2.67%
42	Motor Freight Transportation	14,583	201,680	12,958,195	1,038	839	0.30%	4.07%
49	Electric, Gas, Sanitary Services	28,444	1,575,170	72,636,019	10,250	3,943	0.06%	1.00%
50	Wholesale Trade/Durables	2,753	3,965	262,586	204	65	0.03%	0.12%
51	Wholesale Trade/Nondurables	36,913	411,095	15,792,089	627	407	0.04%	0.51%
54	Food Stores	10,073	10,073	243,950	38	13	0.01%	0.07%
59	Miscellaneous Retail	7,149	28,201	18,286	12	2	0.00%	0.01%
65	Real Estate (Commercial)	13,582	45,190	1,561,156	256	79	0.03%	0.19%
70	Hotels and Other Lodging	5,099	77,672	831,454	213	128	0.05%	0.47%
72	Personal Services	3,577	24,604	310,564	87	0	0.05%	0.00%
76	Miscellaneous Repair Services	752	802	6,173	25	7	0.02%	0.10%
78	Motion Pictures	11	33	26	2	0	0.00%	0.00%
80	Health Services	8,252	71,709	3,603,226	566	35	0.04%	0.04%
84	Museums, Botanical Gardens, Zoos	130	1,183	5,238	40	0	0.01%	0.00%
	TOTAL	238,853	4,844,849	$202,369,752	$1,272			
	$655	0.05%	0.75%					

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis

As required by the Regulatory Flexibility Act of 1980, OSHA assessed the economic burden faced by small establishments. Assuming inelastic demand and full cost pass-through, price impacts would average 0.04 percent for firms with 19 or fewer employees. Profit impacts under the opposite assumption of zero cost pass-through would average 0.75 percent. Profit impacts would be less than 5 percent for small firms in all sectors. In two sectors (agricultural services and motor freight transportation), costs will exceed 4 percent of profits, but in only three other industries will costs exceed 1 percent of profits. These profit impacts depict worst-case, perfectly elastic demand conditions. OSHA anticipates that given imperfectly elastic demand conditions found in most markets, and the negligible price increases necessary to offset cost increases, impacts on net earnings will be minimal due to the ability of firms to pass some of the costs forward to buyers. Therefore, OSHA has determined that the final standard is economically feasible for small establishments.

G. Industry-Specific Hazard Analysis

For affected industry sectors, OSHA compared the fatalities, injuries and illnesses avoided with cost of compliance, to assess the benefit-to-cost relationship. Annual benefits and costs of the standard are shown in Table 9. In general, employee benefits are correlated with compliance costs: industries with relatively higher total costs or costs per establishment are expected to experience a relatively greater reduction in permit-space fatalities, injuries, and illnesses.

Table 9—Annual Benefits and Cost of the Permit Space Standard

SIC	Industry	Fatalities Avoided Total[1]	Injuries and Illnesses Avoided		Compliance Costs (Thousands of Dollars) Total	Cost per Establ. (Dollars) Total
			Lost-Workday Total[1]	Non-Lost-Workday Total[1]		
07	Agricultural Services	0.3	18	17	$7,880.5	$752.4
13	Oil & Gas Extraction	6.8	163	120	84.5	8.5
20	Food and Kindred Products	2.7	404	513	12,472.1	1,218.5
21	Tobacco Products	0.3	51	64	32.2	467.8
22	Textile Mill Products	0.3	51	64	262.7	176.2
24	Wood Products (except furniture)	1.0	152	192	1,739.7	169.1
25	Furniture and Fixtures	0.0[2]	-[3]	-	749.7	142.7
26	Paper Products	0.7	101	128	4,028.2	916.0
27	Printing and Publishing	0.0	-	-	0.6	13.2
28	Chemicals & Allied Products	4.1	607	709	1,581.4	195.3
29	Petroleum Refining	0.0[2]	-	-	2,418.2	1,470.0
30	Rubber Products	0.7	101	128	6,910.2	1,099.9
31	Leather and Leather Products	1.0	152	192	36.9	245.2
32	Stone, Clay, Glass & Concrete	0.7	101	128	12,149.9	988.6
33	Primary Metals Industry	2.0	303	384	5,801.4	2,080.8
34	Fabricated Metal Products	5.1	758	961	13,490.2	1,598.1
35	Machinery, Except Electrical	1.0	152	192	2,999.4	692.7
36	Electric/Electronic Equipment	0.0[2]	-[3]	-	13,354.3	2,020.2
37	Transportation Equipment	2.0	303	384	6,945.8	2,103.8
38	Instruments & Related Products	0.3	51	64	6.3	97.8

Table 9—Annual Benefits and Cost of the Permit Space Standard—Continued

SIC	Industry	Fatalities Avoided Total[1]	Injuries and Illnesses Avoided		Compliance Costs (Thousands of Dollars) Total	Cost per Establ. (Dollars) Total
			Lost-Workday Total[1]	Non-Lost-Workday Total[1]		
39	Miscellaneous Manufacturing	0.3	51	64	1,196.6	1,351.8
42	Motor Freight Transportation	5.1	223	163	12,958.2	888.6
49	Electric, Gas, Sanitary Services	6.8	297	217	72,636.0	2,553.6
50	Wholesale Trade/Durables	0.3	42	48	262.6	95.4
51	Wholesale Trade/Nondurables	1.0	125	145	15,792.1	427.8
54	Food Stores	0.0[2]	-[2]	-	243.9	24.2
59	Miscellaneous Retail	0.3	42	48	18.3	2.6
65	Real Estate (Commercial)	0.0[2]	-	-	1,561.2	114.9
70	Hotels and Other Lodging	0.0[2]	-	-	831.5	163.0
72	Personal Services	0.0	-	-	310.6	86.8
76	Miscellaneous Repair Services	3.1	374	436	6.2	8.2
78	Motion Pictures	0.0	-	-	0.0	2.4
80	Health Services	0.3	42	48	3,603.2	436.6
84	Museums, Botanical Gardens, Zoos	0.0	-	-	5.2	40.2
	Host Employer Unidentified[4]	7.1	380	436		
	TOTAL $695.0	53.7	5,041	5,908	$202,369.8	

Source: U.S. Department of Labor, OSHA, Office of Regulatory Analysis

[1] Assumes that projected permit space-incidents would be distributed in the same SICs in which incidents were reported from 1986–1990.

[2] Fatalities, injuries or illnesses were reported prior to 1986 or after 1990 by OSHA [3], [4], [5] or NIOSH [2].

[3] Dashes indicate that prevented injuries could not be estimated utilizing an injury/fatality factor (see Chapter III, Benefits, of the Regulatory Analysis, Table III–3) due to the absence of reported fatalities during the investigated period.

[4] Includes contractors and other service employers whose host employer at the time of the accident could not be identified in the OSHA abstracts.

For four industries where accidents could not be identified in either OSHA or NIOSH databases, OSHA notes that costs per establishment are significantly below the overall industry average of $695. OSHA's analysis of these affected industries in Chapter III of the Regulatory Analysis indicates that they contain the same spaces and hazards as other industries with recorded accidents.

H. International Trade

In accordance with Executive Order 12291, OSHA assessed the effects of the final standard on international trade. The standard is expected to affect a wide range of industrial and commercial enterprises, many of whom compete against foreign competitors in both foreign markets and the U.S. markets. If the OSHA regulation significantly increased the price of products and services of domestic producers, foreign producers could benefit. OSHA believes, however, that price impacts from this standard will be minor and have little effect on American trade overseas and on domestic sales.

I. Environmental Impact

The permit-required confined spaces standard has been reviewed in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.), the regulations of the Council on Environmental Quality (CEQ, 40 CFR Part 1500), and DOL NEPA Procedures (29 CFR Part 11). OSHA anticipates that greater use of mechanical ventilation to reduce atmospheric hazards in permit spaces may result in additional release of hazardous substances to the air. Incremental release quantities related to the permit space standard are not determinable at present, but are expected to be minor relative to current overall releases. Releases of substances regulated under EPA's SARA Title III or EPA NESHAP standards are subject to reporting and control requirements in those rules.

J. Nonregulatory Alternatives

The primary objective of OSHA's standard for permit spaces is to reduce the number of employee fatalities and injuries associated with catastrophic releases of hazardous substances. OSHA believes the standard will eliminate to a considerable degree the worker risk experienced in the confined spaces falling within the scope of the rule.

The Agency examined the nonregulatory approaches for promoting the implementation of permit space programs, including (1) economic forces generated by the private market system, (2) incentives created by workers' compensation programs or the threat of private suits, and (3) related activities of private agencies. Following this review, OSHA determined that the need for government regulation arises from the significant risk of job-related injury or death caused by inadequate permit space safety programs. Private markets fail to provide enough safety and health resources due to the lack of information on risk, immobility of labor, and externalization of part of the social cost of worker injuries and deaths. Workers compensation systems do not offer an adequate remedy because premiums do not reflect specific workplace risk and liability claims are restricted by statutes preventing employees from suing their employers. While certain voluntary industry standards exist, as well as rules and recommended procedures in a limited number of states, their scope and approach fail to provide adequate protection for all workers. Thus, OSHA has determined that a federal standard is necessary.

K. References

1. CONSAD Research Corporation. "Development of Industry Profile Data for OSHA's Draft Proposed Standard for Permit Entry Confined Spaces", prepared for the U.S. Department of Labor, Occupational Safety and Health Administration under Contract No. J–9–F–0024. Pittsburgh, May 20, 1988 (Ex. 16).

2. U.S. Department of Health, Education, and Welfare. Public Health Service. Center for Disease Control. National Institute for Occupational Safety and Health. "Criteria for a Recommended Standard ... Working in Confined Spaces", DHEW (NIOSH) Publication No. 80–106. Cincinnati: NIOSH, December 1979 (Ex. 13–9).

3. U.S. Department of Labor. Occupational Safety and Health Administration. Directorate of Policy. "Selected Occupational Fatalities Related to Toxic and Asphyxiating Atmospheres in Confined Work Spaces as

Found in Reports of OSHA Fatality/Catastrophe Investigations", Washington, D.C., July 1985 (Ex. 13-15).

4. U.S. Department of Labor. Occupational Safety and Health Administration. Directorate of Technical Support. "Selected Occupational Fatalities Related to Fire and/or Explosion in Confined Work Spaces as Found in Reports of OSHA Fatality/Catastrophe Investigations", Washington, D.C., April 1982 (Ex. 13-10).

5. OSHA Integrated Management Information System, Fatality/Catastrophe Database. OSHA Office of Management Data Systems.

VII. Federalism

This regulation has been reviewed in accordance with Executive Order 12612 regarding Federalism. This order requires that agencies, to the extent possible, refrain from limiting state policy options and consult with states prior to taking any action. Agencies may act only when there is clear constitutional authority and the presence of a problem of national scope. The order provides for preemption of state law only if there is a clear congressional intent for the Agency to do so. Any such preemption is to be limited to the extent possible.

Section 18 of the Occupational Safety and Health Act of 1970 expresses Congress' clear intent to preempt state laws relating to issues on which Federal OSHA has promulgated occupational safety and health standards. Under the OSH Act, a state can avoid preemption only if it submits, and obtains Federal approval of, a plan for the development of such standards and their enforcement. Occupational safety and health standards developed by such Plan-States must, among other things, be at least as effective in providing safe and healthful employment and places of employment as Federal Standards. Where such standards are applicable to products distributed or used in interstate commerce, they may not unduly burden commerce and must be justified by compelling local conditions (See Section 18(c)(2) of the OSH Act).

This regulation is drafted so that employees in every state would be protected by general, performance-oriented standards. To the extent that there are state or regional peculiarities caused by the terrain, the climate or other factors, states would be able, under the OSH Act, to develop their own state standards to deal with any special problems. And, under the Act, if a state develops an approved state program, it could make additional requirements in its standards. Moreover, the performance nature of this standard, of and by itself, allows for flexibility by states and employers to provide as much safety as possible using varying methods consonant with conditions in each state.

In short, there is a clear national problem related to occupational safety and health concerning entry into confined spaces. Those states which elect to participate under the statute would not be preempted by this regulation and would be able to address special, local conditions within the framework provided by this performance-oriented standard.

OSHA notes that California, Kentucky, Maryland, Michigan, New Jersey, and Virginia currently have regulations dealing with confined space entry. Of these six state regulations, none would be preempted. New Jersey is not a state-plan state, but their confined space standard applies only to public (state and local government) employees. An analysis of state confined space rules and procedures is contained in Section VI, Summary of the Final Regulatory Impact Analysis and Regulatory Flexibility Analysis, earlier in this preamble.

VIII. State Plan States

The 25 states and territories with their own OSHA-approved occupational safety and health plans must adopt a comparable standard within six months of the publication date of this final standard. These 25 states are: Alaska, Arizona, California, Connecticut (for state and local government employees only), Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York (for state and local government employees only), North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington and Wyoming. Until such time as a state standard is promulgated, Federal OSHA will provide interim enforcement assistance, as appropriate, in these states.

List of Subjects in 29 CFR Part 1910

Attendant, Confined Spaces, Entry permit system, Hazardous atmospheres, Hazardous materials, Incorporation by reference, Monitoring, Occupational safety and health, Permits, Personal protective equipment, Rescue equipment, Respiratory protection, Retrieval lines, Safety, Signs, Tags, Tools, Welding.

IX. Authority

This document was prepared under the direction of Dorothy L. Strunk, Acting Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue, N.W., Washington, D.C. 20210.

Accordingly, pursuant to sections 6(b) and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 655, 657), Secretary of Labor's Order No. 1-90 (55 FR 9033), and 29 CFR Part 1911, Title 29, Chapter XVII, of the Code of Federal Regulations is amended as follows.

Signed at Washington, D.C., this 6th day of January, 1993.

Dorothy L. Strunk

Acting Assistant Secretary of Labor

PART 1910--OCCUPATIONAL SAFETY AND HEALTH STANDARDS

1. The authority citation for Subpart J of Part 1910 is revised to read as follows:

AUTHORITY: Secs. 4, 6, and 8, Occupational Safety and Health Act of 1970, 29 USC 653, 655, 657; Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736) or 1-90 (55 FR 9033), as applicable.

Sections 1910.141, 1910.142,1910.145, 1910.146, and 1910.147 also issued under 29 CFR Part 1911.

2. Section 1910.146 is added to read as follows:

§1910.146 Permit-required confined spaces.

(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.

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.

(H) 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 employees of one employer do not endanger the employees of any other employer;

(12) Develop and implement procedures (such as closing off a permit space and canceling the permit) necessary for concluding the entry after entry operations have been completed;

(13) Review entry operations when 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 (e)(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.

(e) *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;

(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 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.

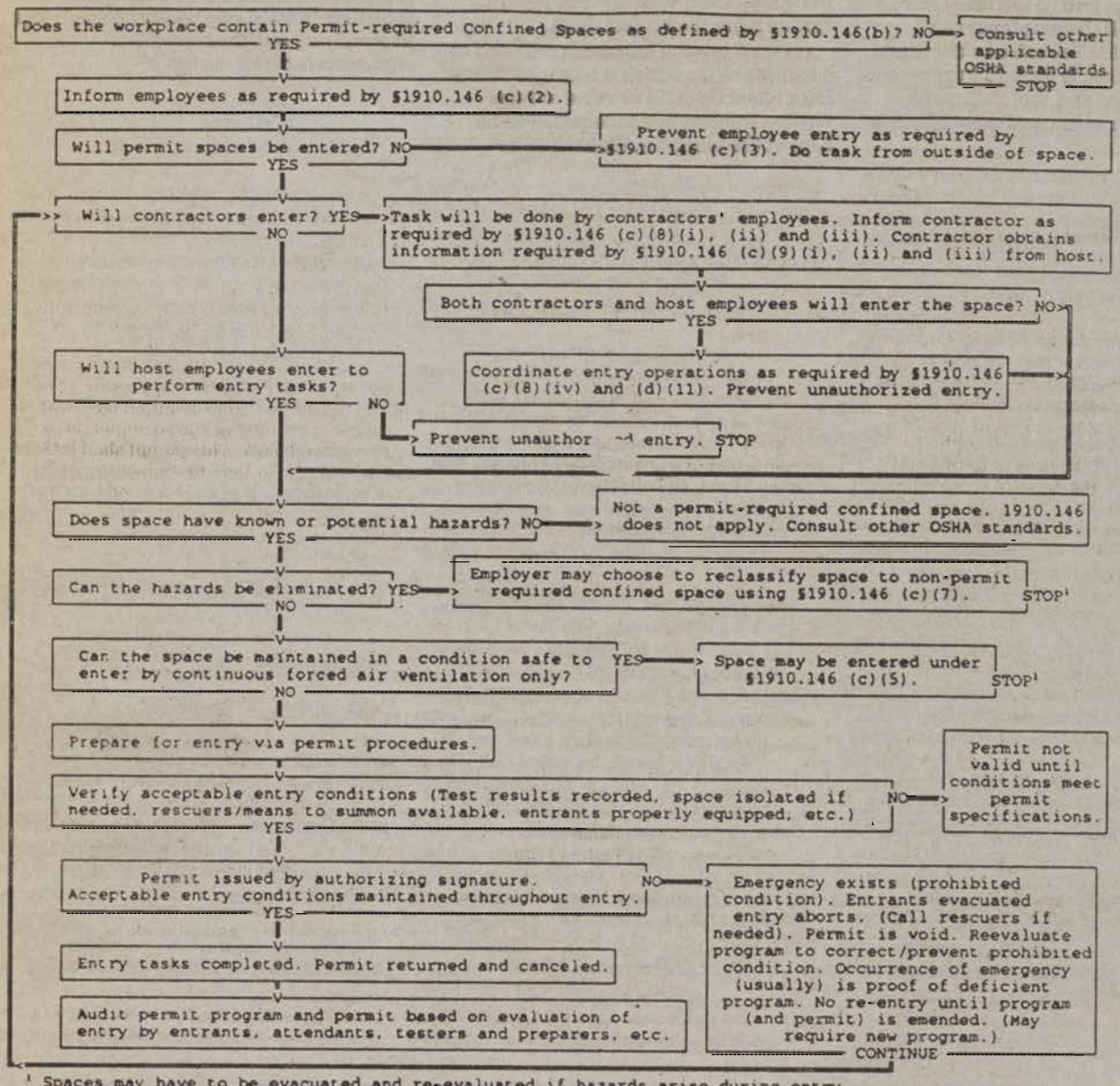
APPENDICES TO §1910.146—PERMIT-REQUIRED CONFINED SPACES

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.

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

Appendix A

Permit-required Confined Space Decision Flow Chart



[1] Spaces may have to be evacuated and re-evaluated if hazards arise during entry

Appendix B to §1910.146—Procedures for Atmospheric Testing

Atmospheric testing is required for two distinct purposes: evqaluation 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 Spece 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 an 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 explosive 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 chipping, 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 to §1910.146—Sample Permits

Appendix D - 1A Sewer Entry Permit-

Confined Space Pre-Entry Check List

See Safety Procedure.
A confined space either is entered through an opening other than a door (such as manhole or side port) or requires the use of a ladder or rungs to reach the working level and test results are satisfactory. This check list must be filled out whenever the job site meets this criteria.

		Yes	No
1.	Did your survey of the surrounding area show it to be free of hazards such as drifting vapors from tanks, piping or sewers?	( )	( )
2.	Does your knowledge of industrial or other discharges indicate this area is likely to remain free of dangerous air contaminants while occupied?	( )	( )
3.	Are you certified in operation of the gas monitor to be used?	( )	( )
4.	Has a gas monitor functional test (Bump Test) been performed this shift on the gas monitor to be used?	( )	( )
5.	Did you test the atmosphere of the confined space prior to entry?	( )	( )
6.	Did the atmosphere check as acceptable (no alarms given)?	( )	( )
7.	Will the atmosphere be continuously monitored while the space is occupied?	( )	( )

Contact County Centrex for personnel rescue by local fire department in the event of an emergency. If on-site at the Regional Treatment Plant, contact the Plant Control Center (PCC).

Notice: If any of the above questions are answered "no" do not enter. Contact your immediate supervisor.

Job Location_____

LEAD MAN signature_____Date_____

Appendix D - 1B

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

Date and Time Issued:_____

Job site:_____

Equipment to be worked on:_____

Date and Time Expires:_____

Job Supervisor_____

Work to be performed: _____

Pre-Entry (See Safety Procedure)

1. Atmospheric Checks: Time _____
   Oxygen _____%
   Explosive _____% L.F.L.
   Toxic _____PPM

2. Source isolation (No Entry):	N/A	Yes	No
Pumps or lines blinded,	( )	( )	( )
disconnected, or blocked	( )	( )	( )

3. Ventilation Modification:	N/A	Yes	No
Mechanical	( )	( )	( )
Natural Ventilation only	( )	( )	( )

4. Atmospheric check after isolation and Ventilation:

Oxygen_____%	>	19.5 %	
Explosive_____% L.F.L.	<	10 %	
Toxic_____PPM	<	10	PPM H_2S

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.

Entry (See Safety Procedure)

1. Entry, standby, and back up persons:	Yes	No
Successfully completed required training?		
Is it current?	( )	( )

2. Equipment:	N/A	Yes	No
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 Class I, Division I, Group D and Non-sparking tools	( )	( )	( )

3. Rescue Procedure:

_____

_____

_____

_____

_____

_____

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) Hard(Job site)

Appendix D - 2

ENTRY PERMIT

_____CONFINED SPACE _____HAZARDOUS AREA

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/Try-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** TEST(S) TO BE TAKEN	Permissible Entry 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 IS REQUIRED FOR ALL CONFINED SPACE WORK

SAFETY STANDBY PERSON(S) CHECK # NAME OF SAFETY STANDBY PERSON(S) CHECK #

_____ _____ _____ _____

_____ _____ _____ _____

SUPERVISOR AUTHORIZING ENTRY

ALL ABOVE CONDITIONS SATISFIED_____

DEPARTMENT_____Phone_____

AMBULANCE 2800 FIRE 2900

Safety 4901 Gas Coordinator 4529/5387

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 (ESCBA) with at least 10 minute air supply (or other NIOSH approved self-rescuer), and waterproof flashlights, and may also include boats and rafts, radios and rope stand-offs for pulling around bends and corners as needed.

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