
1910.120 Appendices A-H

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1910.120 Appendix A - Personal protective equipment test methods.

This appendix sets forth the non-mandatory examples of tests which may be used to evaluate compliance with paragraphs 1910.120(g)(4) (ii) and (iii). Other tests and other challenge agents may be used to evaluate compliance.

A. **Totally-Encapsulating chemical protective suit pressure test**

1.0 - Scope

1.1 - This practice measures the ability of a gas tight totally-encapsulating chemical protective suit material, seams, and closures to maintain a fixed positive pressure. The results of this practice allow the gas tight integrity of a total-encapsulating chemical protective suit to be evaluated.

1.2 - Resistance of the suit materials to permeation, penetration, and degradation by specific hazardous substances is not determined by this test method.

2.0 - Description of Terms

2.1 "Totally-encapsulated chemical protective suit (TECP suit)" means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, legs and respirator; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer and respirator by itself or in combination with the wearer's gloves and boots.

2.2 "Protective clothing material" means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.

2.3 "Gas tight" means, for the purpose of the test method, the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

3.0 - Summary of test method

3.1 The TECP suit is visually inspected and modified for the test. The test apparatus is attached to the suit to permit inflation to the pre-test suit expansion pressure for removal of suit wrinkles and creases. The pressure is lowered to the test pressure and monitored for three minutes. If the

pressure drop is excessive, the TECP suit fails the test and is removed from service. The test is repeated after leak location and repair.

4.0 - Required Supplies

4.1 Source of compressed air.

4.2 Test apparatus for suit testing including a pressure measurement device with a sensitivity of at least 1/4 inch water gauge.

4.3 Vent valve closure plugs or sealing tape.

4.4 Soapy water solution and soft brush.

4.5 Stop watch or appropriate timing device.

5.0 - Safety Precautions

5.1 Care shall be taken to provide the correct pressure safety devices required for the source of compressed air used.

6.0 - Test Procedure

6.1 Prior to each test, the tester shall perform a visual inspection of the suit. Check the suit for seam integrity by visually examining the seams and gently pulling on the seams. Ensure that all air supply lines, fittings, visor, zippers, and valves are secure and show no signs of deterioration.

6.1.1 Seal off the vent valves along with any other normal inlet or exhaust points (such as umbilical air line fittings or face piece opening) with tape or other appropriate means (caps, plugs, fixture, etc.). Care should be exercised in the sealing process not to damage any of the suit components.

6.1.2 Close all closure assemblies.

6.1.3 Prepare the suit for inflation by providing an improvised connection point on the suit for connecting an airline. Attach the pressure test apparatus to the suit to permit suit inflation from a compressed air source equipped with a pressure indicating regulator. The leak tightness of the pressure test apparatus should be tested before and after each test by closing off the end of the tubing attached to the suit and assuring a pressure of three inches water gauge for three minutes can be maintained. If a component is removed for the test, that component shall be replaced and a second test conducted with another component removed to permit a complete tests of the ensemble.

6.1.4 The pre-test expansion pressure (A) and the suit test pressure (B) shall be supplied by the suit manufacturer, but in no case shall they be less than: (A) = 3 inches water gauge and (B) = 2 inches water gauge. The ending suit pressure (C) shall be no less than 80 percent of the test pressure (B); i.e., the pressure drop shall not exceed 20 percent of the test pressure (B).

6.1.5 Inflate the suit until the pressure inside is equal to pressure (A), the pre-test expansion suit

pressure. Allow at least one minute to fill out the wrinkles in the suit. Release sufficient air to reduce the suit pressure to pressure (B), the suit test pressure. Begin timing. At the end of three minutes, record the suit pressure as pressure (C), the ending suit pressure. The difference between the suit test pressure and the ending suit test pressure (B - C) shall be defined as the suit pressure drop.

6.1.6 If the suit pressure drop is more than 20 percent of the suit test pressure (B) during the three minute test period, the suit fails the test and shall be removed from service.

7.0 - Retest Procedure

7.1 If the suit fails the test check for leaks by inflating the suit to pressure (A) and brushing or wiping the entire suit (including seams, closures, lens gaskets, glove-to-sleeve joints, etc.) with a mild soap and water solution. Observe the suit for the formation of soap bubbles, which is an indication of a leak. Repair all identified leaks.

7.2 Retest the TECP suit as outlined in Test procedure 6.0.

8.0 - Report

8.1 Each TECP suit tested by this practice shall have the following information recorded.

8.1.1 Unique identification number, identifying brand name, date of purchase, material of construction, and unique fit features; e.g., special breathing apparatus.

8.1.2 The actual values for test pressures,(A), (B), and (C) shall be recorded along with the specific observation times. If the ending pressure (C) is less than 80 percent of the test pressure (B), the suit shall be identified as failing the test. When possible, the specific leak location shall be identified in the test records. Retest pressure data shall be recorded as an additional test.

8.1.3 The source of the test apparatus used shall be identified and the sensitivity of the pressure gauge shall be recorded.

8.1.4 Records shall be kept for each pressure test even if repairs are being made at the test location.

Caution

Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked. Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

B. Totally-encapsulated chemical protective suit qualitative leak test

1.0 - Scope

1.1 This practice semi-qualitatively tests gas tight totally-encapsulating chemical protective suit integrity by detecting inward leakage of ammonia vapor. Since no modifications are made to the

suit to carry out this test, the results from this practice provide a realistic test for the integrity of the entire suit.

1.2 Resistance of the suit materials to permeation, penetration, and degradation is not determined by this test method. ASTM test methods are available to test suit materials for these characteristics and the tests are usually conducted by the manufacturers of the suits.

2.0 - Description of Terms

2.1 "Totally-encapsulated chemical protective suit (TECP suit)" means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, legs and respirator; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer and respirator by itself or in combination with the wearer's gloves, and boots.

2.2 "Protective clothing material" means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.

2.3 "Gas tight" means, for the purpose of this practice the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

2.4 "Intrusion Coefficient" means a number expressing the level of protection provided by a gas tight totally-encapsulating chemical protective suit. The intrusion coefficient is calculated by dividing the test room challenge agent concentration by the concentration of challenge agent found inside the suit. The accuracy of the intrusion coefficient is dependent on the challenge agent monitoring methods. The larger the intrusion coefficient the greater the protection provided by the TECP suit.

3.0 - Summary of recommended practice

3.1 The volume of concentrated aqueous ammonia solution (ammonia hydroxide, NH_4OH) required to generate the test atmosphere is determined using the directions outlined in 6.1. The suit is donned by a person wearing the appropriate respiratory equipment (either a self-contained breathing apparatus or a supplied air respirator) and worn inside the enclosed test room. The concentrated aqueous ammonia solution is taken by the suited individual into the test room and poured into an open plastic pan. A two-minute evaporation period is observed before the test room concentration is measured using a high range ammonia length of stain detector tube. When the ammonia vapor reaches a concentration of between 1000 and 1200 ppm, the suited individual starts a standardized exercise protocol to stress and flex the suit. After this protocol is completed the test room concentration is measured again. The suited individual exits the test room and his stand-by person measures the ammonia concentration inside the suit using a low range ammonia length of stain detector tube or other more sensitive ammonia detector. A stand-by person is required to observe the test individual during the test procedure, aid the person in donning and doffing the TECP suit; and monitor the suit interior. The intrusion coefficient of the suit can be calculated by dividing the average test area concentration by the interior suit concentration. A colorimetric indicator strip of bromophenol blue is placed on the inside of the suit face piece lens so that the suited individual is able to detect a color change and know if the suit has a significant leak. If a color change is observed the individual should leave the test room immediately.

4.0 - Required supplies

- 4.1 A supply of concentrated aqueous ammonium hydroxide (58 percent by weight).
- 4.2 A supply of bromophenol/blue indicating paper, sensitive to 5-10 ppm ammonia or greater over a two-minute period of exposure.[pH 3.0(yellow) to pH 4.6(blue)]
- 4.3 A supply of high range (0.5 - 10 volume percent) and low range (5 - 700 ppm) detector tubes for ammonia and the corresponding sampling pump. More sensitive ammonia detectors can be substituted for the low range detector tubes to improve the sensitivity of this practice.
- 4.4 A plastic pan (PVC) at least 12":14":1" and a half pint plastic container (PVC) with tightly closing lid.
- 4.5 A graduated cylinder or other volumetric measuring device of at least 50 milliliters in volume with an accuracy of at least + or - 1 milliliters.

5.0 - Safety precautions

- 5.1 Concentrated aqueous ammonium hydroxide, NH_4OH , is a corrosive volatile liquid requiring eye, skin, and respiratory protection. The person conducting test shall review the MSDS for aqueous ammonia.
- 5.2 Since the established permissible exposure limit for ammonia is 35 ppm as a 15 minute STEL, only persons wearing a positive pressure self-contained breathing apparatus or a supplied air respirator shall be in the chamber. Normally only the person wearing the total-encapsulating suit will be inside the chamber. A stand-by person shall have a positive pressure self-contained breathing apparatus, or a supplied air respirator, available to enter the test area should the suited individual need assistance.
- 5.3 A method to monitor the suited individual must be used during this test. Visual contact is the simplest but other methods using communication devices are acceptable.
- 5.4 The test room shall be large enough to allow the exercise protocol to be carried out and then to be ventilated to allow for easy exhaust of the ammonia test atmosphere after the test(s) are completed.
- 5.5 Individuals shall be medically screened for the use of respiratory protection and checked for allergies to ammonia before participating in this test procedure.

6.0 - Test procedure

- 6.1.1 Measure the test area to the nearest foot and calculate its volume in cubic feet. Multiply the test area volume by 0.2 milliliters of concentrated aqueous ammonia solution per cubic foot of test area volume to determine the approximate volume of concentrated aqueous ammonia required to generate 1000 ppm in the test area.
- 6.1.2 Measure this volume from the supply of concentrated ammonia and place it into a closed

plastic container.

6.1.3 Place the container, several high range ammonia detector tubes, and the pump in the clean test pan and locate it near the test area entry door so that the suited individual has easy access to these supplies.

6.2.1 In a non-contaminated atmosphere, open a pre-sealed ammonia indicator strip and fasten one end of the strip to the inside of suit face shield lens where it can be seen by the wearer. Moisten the indicator strip with distilled water. Care shall be taken not to contaminate the detector part of the indicator paper by touching it. A small piece of masking tape or equivalent should be used to attach the indicator strip to the interior of the suit face shield.

6.2.2 If problems are encountered with this method of attachment, the indicator strip can be attached to the outside of the respirator face piece being used during the test.

6.3 Don the respiratory protective device normally used with the suit, and then don the TECP suit to be tested. Check to be sure all openings which are intended to be sealed (zippers, gloves, etc.) are completely sealed. DO NOT, however, plug off any venting valves.

6.4 Step into the enclosed test room such as a closet, bathroom, or test booth, equipped with an exhaust fan. No air should be exhausted from the chamber during the test because this will dilute the ammonia challenge concentrations.

6.5 Open the container with the pre-measured volume of concentrated aqueous ammonia within the enclosed test room, and pour the liquid into the empty plastic test pan. Wait two minutes to allow for adequate volatilization of the concentrated aqueous ammonia. A small mixing fan can be used near the evaporation pan to increase the evaporation rate of ammonia solution.

6.6 After two minutes a determination of the ammonia concentration within the chamber should be made using the high range colorimetric detector tube. A concentration of 1000 ppm ammonia or greater shall be generated before the exercises are started.

6.7 To test the integrity of the suit the following four minute exercise protocol should be followed:

6.7.1 Raising the arms above the head with at least 15 raising motions completed in one minute.

6.7.2 Walking in place for one minute with at least 15 raising motions of each leg in a one-minute period.

6.7.3 Touching the toes with a least 10 complete motions of the arms from above the head to touching of the toes in a one-minute period.

6.7.4 Knee bends with at least 10 complete standing and squatting motions in a one-minute period.

6.8 If at any time during the test the colorimetric indicating paper should change colors, the test should be stopped and section 6.10 and 6.12 initiated (See 4.2).

6.9 After completion of the test exercise, the test area concentration should be measured again using the high range colorimetric detector tube.

6.10 Exit the test area.

6.11 The opening created by the suit zipper or other appropriate suit penetration should be used to determine the ammonia concentration in the suit with the low range length of stain detector tube or other ammonia monitor. The internal TECP suit air should be sampled far enough from the enclosed test area to prevent a false ammonia reading.

6.12 After completion of the measurement of the suit interior ammonia concentration the test is concluded and the suit is doffed and the respirator removed.

6.13 The ventilating fan for the test room should be turned on and allowed to run for enough time to remove the ammonia gas. The fan shall be vented to the outside of the building.

6.14 Any detectable ammonia in the suit interior (five ppm (NH₃)) or more for the length of stain detector tube) indicates the suit has failed the test. When other ammonia detectors are used a lower level of detection is possible, and it should be specified as the pass/fail criteria.

6.15 By following this test method, an intrusion coefficient of approximately 200 or more can be measured with the suit in a completely operational condition. If the coefficient is 200 or more, then the suit is suitable for emergency response and field use.

7.0 - Retest procedures

7.1 If the suit fails this test, check for leaks by following the pressure test in test A above.

7.2 Retest the TECP suit as outlined in the test procedure 6.0.

8.0 - Report

8.1 Each gas tight totally-encapsulating chemical protective suit tested by this practice shall have the following information recorded.

8.1.1 Unique identification number identifying brand name, date of purchase, material of construction, and unique suit features; e.g., special breathing apparatus.

8.1.2 General description of test room used for test.

8.1.3 Brand name and purchase date of ammonia detector strips and color change date.

8.1.4 Brand name, sampling range, and expiration date of the length of stain ammonia detector tubes. The brand name and model of the sampling pump should also be recorded. If another type of ammonia detector is used, it should be identified along with its minimum detection limit for ammonia.

8.1.5 Actual test results shall list the two test area concentrations, their average, the interior suit concentration, and the calculated intrusion coefficient. Retest data shall be recorded as an additional test.

8.2 The evaluation of the data shall be specified as "suit passed" or "suit failed," and the date of the test. Any detectable ammonia (five ppm or greater for the length of stain detector tube) in the suit interior indicates the suit has failed this test. When other ammonia detectors are used, a lower level of detection is possible and it should be specified as the pass fail criteria.

Caution

Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked. Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

1910.120 Appendix B - General description and discussion of the levels of protection and protective gear.

This appendix sets forth information about personal protective equipment (PPE) protection levels which may be used to assist employers in complying with the PPE requirements of this section. As required by the standard, PPE must be selected which will protect employees from the specific hazards which they are likely to encounter during their work on-site.

Selection of the appropriate PPE is a complex process which should take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards; their routes of potential hazard to employees (inhalation, skin absorption, ingestion, and eye or skin contact); and the performance of the PPE materials (and seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases the breakthrough time of the protective material should exceed the work durations.(end of sentence deleted - FR 14074, Apr 13. 1990)

Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, should be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits or equipment.

The more that is known about the hazards at the site, the easier the job of PPE selection becomes. As more information about the hazards and conditions at the site becomes available, the site supervisor can make decisions to up-grade or down-grade the level of PPE protection to match the tasks at hand.

The following are guidelines which an employer can use to begin the selection of the appropriate PPE. As noted above, the site information may suggest the use of combinations of PPE selected from the different protection levels (i.e., A, B, C, or D) as being more suitable to the hazards of the work. It should be cautioned that the listing below does not fully address the performance of the specific PPE material in relation to the specific hazards at the job site, and that PPE selection, evaluation and

re-selection is an ongoing process until sufficient information about the hazards and PPE performance is obtained.

Part A.

Personal protective equipment is divided into four categories based on the degree of protection afforded. (See Part B of this appendix for further explanation of Levels A, B, C, and D hazards.)

- I. Level A - To be selected when the greatest level of skin, respiratory, and eye protection is required. The following constitute Level A equipment; it may be used as appropriate;
 - 1. Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
 - 2. Totally-encapsulating chemical-protective suit.
 - 3. Coveralls.(1)
 - 4. Long underwear.(1)
 - 5. Gloves, outer, chemical-resistant.
 - 6. Gloves, inner, chemical-resistant.
 - 7. Boots, chemical-resistant, steel toe and shank.
 - 8. Hard hat (under suit).(1)
 - 9. Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit).

Footnote(1) Optional, as applicable.

- II. Level B - The highest level of respiratory protection is necessary but a lesser level of skin protection is needed. The following constitute Level B equipment; it may be used as appropriate.
 - 1. Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved).
 - 2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).
 - 3. Coveralls.(1)
 - 4. Gloves, outer, chemical-resistant.
 - 5. Gloves, inner, chemical-resistant.
 - 6. Boots, outer, chemical-resistant steel toe and shank.

7. Boot-covers, outer, chemical-resistant (disposable).(1)
8. Hard hat.(1)
9. [Reserved]
10. Face shield.(1)

Footnote(1) Optional, as applicable.

III. Level C - The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met. The following constitute Level C equipment; it may be used as appropriate.

1. Full-face or half-mask, air purifying respirators (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.(1)
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots (outer), chemical-resistant steel toe and shank.(1)
7. Boot-covers, outer, chemical-resistant (disposable).(1)
8. Hard hat.(1)
9. Escape mask.(1)
10. Face shield.(1)

Footnote(1) Optional, as applicable.

IV. Level D - A work uniform affording minimal protection: used for nuisance contamination only.

The following constitute Level D equipment; it may be used as appropriate:

1. Coveralls.
2. Gloves.(1)
3. Boots/shoes, chemical-resistant steel toe and shank.
4. Boots, outer, chemical-resistant (disposable).(1)

5. Safety glasses or chemical splash goggles.(1)
6. Hard hat.(1)
7. Escape mask.(1)
8. Face shield.(1)

Footnote(1) Optional, as applicable.

Part B.

The types of hazards for which levels A, B, C, and D protection are appropriate are described below:

I. Level A - Level A protection should be used when:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin,
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or
3. Operations must be conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

II. Level B protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection.
2. The atmosphere contains less than 19.5 percent oxygen; or
3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin. Note: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

III. Level C - Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;
2. The types of air contaminants have been identified, concentrations measured, and an

air-purifying respirator is available that can remove the contaminants; and

3. All criteria for the use of air-purifying respirators are met.

IV. Level D - Level D protection should be used when:

1. The atmosphere contains no known hazard; and
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Note: As stated before, combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection. As an aid in selecting suitable chemical protective clothing, it should be noted that the National Fire Protection Association (NFPA) has developed standards on chemical protective clothing. The standards that have been adopted by include: NFPA 1991 - Standard on Vapor-Protective Suits for Hazardous Chemical Emergencies (EPA Level A Protective Clothing) NFPA 1992 - Standard on Liquid Splash-Protective Suits for Hazardous Chemical Emergencies (EPA Level B Protective Clothing) NFPA 1993 - Standard on Liquid Splash-Protective Suits for Non-emergency, Non-flammable Hazardous Chemical Situations (EPA Level B Protective Clothing) These standards apply documentation and performance requirements to the manufacture of chemical protective suits. Chemical protective suits meeting these requirements are labeled as compliant with the appropriate standard. It is recommended that chemical protective suits that meet these standards be used. [59 FR 43268, Aug. 22, 1994]

1910.120 Appendix C - Compliance guidelines.

1. Occupational Safety and Health Program.

Each hazardous waste site clean-up effort will require a site specific occupational safety and health program headed by the site coordinator or the employer's representative. The purpose of the program will be the protection of employees at the site and will be an extension of the employer's overall safety and health program work. The program will need to be developed before work begins on the site and implemented as work proceeds as stated in paragraph (b). The program is to facilitate coordination and communication of safety and health issues among personnel responsible for the various activities which will take place at the site. It will provide the overall means for planning and implementing the needed safety and health training and job orientation of employees who will be working at the site. The program will provide the means for identifying and controlling worksite hazards and the means for monitoring program effectiveness. The program will need to cover the responsibilities and authority of the site coordinator for the safety and health of employees at the site, and the relationships with contractors or support services as to what each employer's safety and health responsibilities are for their employees on the site. Each contractor on the site needs to have its own safety and health program so structured that it will smoothly interface with the program of the site coordinator or principal contractor.

Also those employers involved with treating, storing or disposal of hazardous waste as covered in

paragraph (p) must have implemented a safety and health program for their employees. This program is to include the hazard communication program required in paragraph (p)(1) and the training required in paragraphs (p)(7) and (p)(8) as parts of the employers comprehensive overall safety and health program. This program is to be in writing.

Each site safety and health program will need to include the following:

1. Policy statements of the line of authority and accountability for implementing the program, the objectives of the program and the role of the site safety and health officer or manager and staff;
2. means or methods for the development of procedures for identifying and controlling workplace hazards at the site;
3. means or methods for the development and communication to employees of the various plans, work rules, standard operating procedures and practices that pertain to individual employees and supervisors;
4. means for the training of supervisors and employees to develop the needed skills and knowledge to perform their work in a safe and healthful manner;
5. means to anticipate and prepare for emergency situations and;
6. means for obtaining information feedback to aid in evaluating the program and for improving the effectiveness of the program. The management and employees should be trying continually to improve the effectiveness of the program thereby enhancing the protection being afforded those working on the site.

Accidents on the site or workplace should be investigated to provide information on how such occurrences can be avoided in the future. When injuries or illnesses occur on the site or workplace, they will need to be investigated to determine what needs to be done to prevent this incident from occurring again. Such information will need to be used as feedback on the effectiveness of the program and the information turned into positive steps to prevent any reoccurrence. Receipt of employee suggestions or complaints relating to safety and health issues involved with site activities is also a feedback mechanism that can be used effectively to improve the program and may serve in part as an evaluative tool(s).

For the development and implementation of the program to be the most effective, professional safety and health personnel should be used. Certified Safety Professionals, Board Certified Industrial Hygienists or Registered Professional Safety Engineers are good examples of professional stature for safety and health managers who will administer the employer's program.

2. Training.

The training programs for employees subject to the requirements of paragraph (e) of this standard should address: the safety and health hazards employees should expect to find on hazardous waste clean-up sites; what control measures or techniques are effective for those hazards; what monitoring procedures are effective in characterizing exposure levels; what makes an effective employer's safety and health program; what a site safety and health plan should include; hands on

training with personal protective equipment and clothing they may be expected to use; the contents of the OSHA standard relevant to the employee's duties and function; and employee's responsibilities under OSHA and other regulations. Supervisors will need training in their responsibilities under the safety and health program and its subject areas such as the spill containment program, the personal protective equipment program, the medical surveillance program, the emergency response plan and other areas.

The training programs for employees subject to the requirements of paragraph (p) of this standard should address: the employer's safety and health program elements impacting employees; the hazard communication program; the hazards and the controls for such hazards that employees need to know for their job duties and functions. All require annual refresher training.

The training programs for employees covered by the requirements of paragraph (q) of this standard should address those competencies required for the various levels of response such as: the hazards associated with hazardous substances; hazard identification and awareness; notification of appropriate persons; the need for and use of personal protective equipment including respirators; the decontamination procedures to be used; preplanning activities for hazardous substance incidents including the emergency response plan; company standard operating procedures for hazardous substance emergency responses; the use of the incident command system and other subjects. Hands-on training should be stressed whenever possible. Critiques done after an incident which include an evaluation of what worked and what did not and how could the incident be better handled the next time may be counted as training time.

For hazardous materials specialists (usually members of hazardous materials teams), the training should address the care, use and/or testing of chemical protective clothing including totally encapsulating suits, the medical surveillance program, the standard operating procedures for the hazardous materials team including the use of plugging and patching equipment and other subject areas.

Officers and leaders who may be expected to be in charge at an incident should be fully knowledgeable of their company's incident command system. They should know where and how to obtain additional assistance and be familiar with the local district's emergency response plan and the state emergency response plan.

Specialist employees such as technical experts, medical experts or environmental experts that work with hazardous materials in their regular jobs, who may be sent to the incident scene by the shipper, manufacturer or governmental agency to advise and assist the person in charge of the incident should have training on an annual basis. Their training should include the care and use of personal protective equipment including respirators; knowledge of the incident command system and how they are to relate to it; and those areas needed to keep them current in their respective field as it relates to safety and health involving specific hazardous substances.

Those skilled support personnel, such as employees who work for public works departments or equipment operators who operate bulldozers, sand trucks, backhoes, etc., who may be called to the incident scene to provide emergency support assistance, should have at least a safety and health briefing before entering the area of potential or actual exposure. These skilled support personnel, who have not been a part of the emergency response plan and do not meet the training requirements, should be made aware of the hazards they face and should be provided all necessary protective clothing and equipment required for their tasks.

There are two National Fire Protection Association standards. NFPA 472 - "Standard for Professional Competence of Responders to Hazardous Material Incidents" and NFPA 471 - "Recommended Practice for Responding to Hazardous Material Incidents", which are excellent resource documents to aid fire departments and other emergency response organizations in developing their training program materials. NFPA 472 provides guidance on the skills and knowledge needed for first responder awareness level, first responder operations level, hazmat technicians, and hazmat specialist. It also offers guidance for the officer corp who will be in charge of hazardous substance incidents.

3. Decontamination.

Decontamination procedures should be tailored to the specific hazards of the site and will vary in complexity and number of steps, depending on the level of hazard and the employee's exposure to the hazard. Decontamination procedures and PPE decontamination methods will vary depending upon the specific substance, since one procedure or method will not work for all substances. Evaluation of decontamination methods and procedures should be performed, as necessary, to assure that employees are not exposed to hazards by reusing PPE. References in Appendix D may be used for guidance in establishing an effective decontamination program. In addition, the U.S.Coast Guard's Manual, "Policy Guidance for Response to Hazardous Chemical Releases," U.S. Department of Transportation, Washington, DC (COMDTINST M16465.30) is a good reference for establishing an effective decontamination program.

4. Emergency response plans.

States, along with designated districts within the states, will be developing or have developed emergency response plans. These state and district plans should be utilized in the emergency response plans called for in the standard. Each employer should assure that its emergency response plan is compatible with the local plan. The major reference being used to aid in developing the state and local district plans is the Hazardous Materials Emergency Planning Guide, NRT - 1. The current Emergency Response Guidebook from the U.S. Department of Transportation, CMA's CHEMTREC and the Fire Service Emergency Management Handbook may also be used as resources.

Employers involved with treatment, storage, and disposal facilities for hazardous waste, which have the required contingency plan called for by their permit, would not need to duplicate the same planning elements. Those items of the emergency response plan may be substituted into the emergency response plan required in 1910.120 or otherwise kept together for employer and employee use.

5. Personal protective equipment programs.

The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biologic hazards that may be encountered at a hazardous substance site.

As discussed in Appendix B, no single combination of protective equipment and clothing is capable of protecting against all hazards. Thus PPE should be used in conjunction with other protective methods and its effectiveness evaluated periodically.

The use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress, and impaired vision, mobility and communication. For any given situation, equipment and clothing should be selected that provide an adequate level of protection. However, over-protection, as well as under-protection, can be hazardous and should be avoided where possible. Two basic objectives of any PPE program should be to protect the wearer from safety and health hazards, and to prevent injury to the wearer from incorrect use and/or malfunction of the PPE. To accomplish these goals, a comprehensive PPE program should include hazard identification, medical monitoring, environmental surveillance, selection, use, maintenance, and decontamination of PPE and its associated training.

The written PPE program should include policy statements, procedures, and guidelines. Copies should be made available to all employees, and a reference copy should be made available at the worksite. Technical data on equipment, maintenance manuals, relevant regulations, and other essential information should also be collected and maintained.

6. Incident command system (ICS).

Paragraph 1910.120(q)(3)(ii) requires the implementation of an ICS. The ICS is an organized approach to effectively control and manage operations at an emergency incident. The individual in charge of the ICS is the senior official responding to the incident. The ICS is not much different than the "command post" approach used for many years by the fire service. During large complex fires involving several companies and many pieces of apparatus, a command post would be established. This enabled one individual to be in charge of managing the incident, rather than having several officers from different companies making separate, and sometimes conflicting, decisions. The individual in charge of the command post would delegate responsibility for performing various tasks to subordinate officers. Additionally, all communications were routed through the command post to reduce the number of radio transmissions and eliminate confusion. However, strategy, tactics, and all decisions were made by one individual. The ICS is a very similar system, except it is implemented for emergency response to all incidents, both large and small, that involve hazardous substances.

For a small incident, the individual in charge of the ICS may perform many tasks of the ICS. There may not be any, or little, delegation of tasks to subordinates. For example, in response to a small incident, the individual in charge of the ICS, in addition to normal command activities, may become the safety officer and may designate only one employee (with proper equipment) as a backup to provide assistance if needed. OSHA does recommend, however, that at least two employees be designated as back-up personnel since the assistance needed may include rescue.

To illustrate the operation of the ICS, the following scenario might develop during a small incident, such as an overturned tank truck with a small leak of flammable liquid.

The first responding senior officer would implement and take command of the ICS. That person would size-up the incident and determine if additional personnel and apparatus were necessary; would determine what actions to take to control the leak; and determine the proper level of personal protective equipment. If additional assistance is not needed, the individual in charge of the ICS would implement actions to stop and control the leak using the fewest number of personnel that can effectively accomplish the tasks. The individual in charge of the ICS then would designate himself as the safety officer and two other employees as a back-up in case rescue

may become necessary. In this scenario, decontamination procedures would not be necessary.

A large complex incident may require many employees and difficult, time-consuming efforts to control. In these situations, the individual in charge of the ICS will want to delegate different tasks to subordinates in order to maintain a span of control that will keep the number of subordinates, that are reporting, to a manageable level.

Delegation of task at large incidents may be by location, where the incident scene is divided into sectors, and subordinate officers coordinate activities within the sector that they have been assigned.

Delegation of tasks can also be by function. Some of the functions that the individual in charge of the ICS may want to delegate at a large incident are: medical services; evacuation; water supply; resources (equipment, apparatus); media relations; safety; and, site control (integrate activities with police for crowd and traffic control). Also for a large incident, the individual in charge of the ICS will designate several employees as back-up personnel; and a number of safety officers to monitor conditions and recommend safety precautions.

Therefore, no matter what size or complexity an incident may be, by implementing an ICS there will be one individual in charge who makes the decisions and gives directions; and, all actions, and communications are coordinated through one central point of command. Such a system should reduce confusion, improve safety, organize and coordinate actions, and should facilitate effective management of the incident.

7. Site Safety and Control Plans.

The safety and security of response personnel and others in the area of an emergency response incident site should be of primary concern to the incident commander. The use of a site safety and control plan could greatly assist those in charge of assuring the safety and health of employees on the site.

A comprehensive site safety and control plan should include the following: summary analysis of hazards on the site and a risk analysis of those hazards; site map or sketch; site work zones (clean zone, transition or decontamination zone, work or hot zone); use of the buddy system; site communications; command post or command center; standard operating procedures and safe work practices; medical assistance and triage area; hazard monitoring plan (air contaminate monitoring, etc.); decontamination procedures and area; and other relevant areas. This plan should be a part of the employer's emergency response plan or an extension of it to the specific site.

8. Medical surveillance programs.

Workers handling hazardous substances may be exposed to toxic chemicals, safety hazards, biologic hazards, and radiation. Therefore, a medical surveillance program is essential to assess and monitor workers' health and fitness for employment in hazardous waste operations and during the course of work; to provide emergency and other treatment as needed; and to keep accurate records for future reference.

The Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities developed by the National Institute for Occupational Safety and Health (NIOSH), the

Occupational Safety and Health Administration (OSHA), the U.S. Coast Guard (USCG), and the Environmental Protection Agency (EPA); October 1985 provides an excellent example of the types of medical testing that should be done as part of a medical surveillance program.

9. **New Technology and Spill Containment Programs.**

Where hazardous substances may be released by spilling from a container that will expose employees to the hazards of the materials, the employer will need to implement a program to contain and control the spilled material. Diking and ditching, as well as use of absorbents like diatomaceous earth, are traditional techniques which have proven to be effective over the years. However, in recent years new products have come into the marketplace, the use of which complement and increase the effectiveness of these traditional methods. These new products also provide emergency responders and others with additional tools or agents to use to reduce the hazards of spilled materials.

These agents can be rapidly applied over a large area and can be uniformly applied or otherwise can be used to build a small dam, thus improving the workers' ability to control spilled material. These application techniques enhance the intimate contact between the agent and the spilled material allowing for the quickest effect by the agent or quickest control of the spilled material. Agents are available to solidify liquid spilled materials, to suppress vapor generation from spilled materials, and to do both. Some special agents, which when applied as recommended by the manufacturer, will react in a controlled manner with the spilled material to neutralize acids or caustics, or greatly reduce the level of hazard of the spilled material.

There are several modern methods and devices for use by emergency response personnel or others involved with spill control efforts to safely apply spill control agents to control spilled material hazards. These include portable pressurized applicators similar to hand-held portable fire extinguishing devices, and nozzle and hose systems similar to portable fire fighting foam systems which allow the operator to apply the agent without having to come into contact with the spilled material. The operator is able to apply the agent to the spilled material from a remote position.

The solidification of liquids provides for rapid containment and isolation of hazardous substance spills. By directing the agent at run-off points or at the edges of the spill, the reactant solid will automatically create a barrier to slow or stop the spread of the material. Clean-up of hazardous substances is greatly improved when solidifying agents, acid or caustic neutralizers, or activated carbon absorbents are used. properly applied, these agents can totally solidify liquid hazardous substances or neutralize or absorb them, which results in materials which are less hazardous and easier to handle, transport, and dispose of. The concept of spill treatment, to create less hazardous substances, will improve the safety and level of protection of employees working at spill clean-up operations or emergency response operations to spills of hazardous substances.

The use of vapor suppression agents for volatile hazardous substances, such as flammable liquids and those substances, such as flammable liquids and those substances which present an inhalation hazard, is important for protecting workers. The rapid and uniform distribution of the agent over the surface of the spilled material can provide quick vapor knockdown. There are temporary and long-term foam-type agents which are effective on vapors and dusts, and activated carbon adsorption agents which are effective for vapor control and soaking-up of the liquid. The proper use of hose lines or hand-held portable pressurized applicators provides good mobility and permits the worker to deliver the agent from a safe distance without having to step into the untreated

spilled material. Some of these systems can be recharged in the field to provide coverage of larger spill areas than the design limits of a single charged applicator unit. Some of the more effective agents can solidify the liquid flammable hazardous substances and at the same time elevate the flashpoint above 140 degrees F so the resulting substance may be handled as a nonhazardous waste material if it meets the U.S. Environmental Protection Agency's 40 CFR part 261 requirements (See particularly 261.21).

All workers performing hazardous substance spill control work are expected to wear the proper protective clothing and equipment for the materials present and to follow the employer's established standard operating procedures for spill control. All involved workers need to be trained in the established operating procedures; in the use and care of spill control equipment; and in the associated hazards and control of such hazards of spill containment work.

These new tools and agents are the things that employers will want to evaluate as part of their new technology program. The treatment of spills of hazardous substances or wastes at an emergency incident as part of the immediate spill containment and control efforts is sometimes acceptable to EPA and a permit exception is described in 40 CFR 264.1(g)(8) and 265.1(c)(11).

1910.120 Appendix D - References.

The following references may be consulted for further information on the subject of this standard:

1. OSHA Instruction DFO CPL 2.70 - January 29, 1986, Special Emphasis Program: Hazardous Waste Sites.
2. OSHA Instruction DFO CPL 2-2.37A - January 29, 1986, Technical Assistance and Guidelines for Superfund and Other Hazardous Waste Site Activities.
3. OSHA Instruction DTS CPL 2.74 - January 29, 1986, Hazardous Waste Activity Form, OSHA 175.
4. Hazardous Waste Inspections Reference Manual, U.S. Department of Labor, Occupational Safety and Health Administration, 1986.
5. Memorandum of Understanding Among the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, the United States Coast Guard, and the United States Environmental Protection Agency, Guidance for Worker Protection During Hazardous Waste Site Investigations and Clean-up and Hazardous Substance Emergencies. December 18, 1980.
6. National Priorities List, 1st Edition, October 1984; U.S. Environmental Protection Agency, Revised periodically.
7. The Decontamination of Response Personnel, Field Standard Operating Procedures (F.S.O.P.) 7; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, December 1984.

8. Preparation of a Site Safety Plan, Field Standard Operating Procedures (F.S.O.P.) 9; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, April 1985.
9. Standard Operating Safety Guidelines; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, Environmental Response Team; November 1984.
10. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute for Occupational Safety and Health (NIOSH), Occupational Safety and Health Administration (OSHA), U.S. Coast Guard (USCG), and Environmental Protection Agency (EPA); October 1985.
11. Protecting Health and Safety at Hazardous Waste Sites: An Overview, U.S. Environmental Protection Agency, EPA/625/9-85/006; September 1985.
12. Hazardous Waste Sites and Hazardous Substance Emergencies, NIOSH Worker Bulletin, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; December 1982.
13. Personal Protective Equipment for Hazardous Materials Incidents: A Selection Guide; U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; October 1984.
14. Fire Service Emergency Management Handbook, Federal Emergency Management Agency, Washington, DC, January 1985.
15. Emergency Response Guidebook, U.S. Department of Transportation, Washington, DC, 1987.
16. Report to the Congress on Hazardous Materials Training. Planning and Preparedness, Federal Emergency Management Agency, Washington, DC, July 1986.
17. Workbook for Fire Command, Alan V. Brunacini and J. David Beageron, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269, 1985.
18. Fire Command, Alan B. Brunacini, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269, 1985.
19. Incident Command System, Fire Protection Publications, Oklahoma State University, Stillwater, OK 74078, 1983.
20. Site Emergency Response Planning, Chemical Manufacturers Association, Washington, DC 20037, 1986.
21. Hazardous Materials Emergency Planning Guide, NRT-1, Environmental Protection Agency, Washington, DC, March 1987.
22. Community Teamwork: Working Together to Promote Hazardous Materials Transportation Safety. U.S. Department of Transportation, Washington, DC, May 1983.

23. Disaster Planning Guide for Business and Industry, Federal Emergency Management Agency, Publication No. FEMA 141, August 1987.

(The Office of Management and Budget has approved the information collection requirements in this section under control number 1218-0139)

1910.120 Appendix E - Training Curriculum Guidelines - (Non-mandatory)

The following non-mandatory general criteria may be used for assistance in developing site-specific training curriculum used to meet the training requirements of 29 CFR 1910.120(e); 29 CFR 1910.120(p)(7), (p)(8)(iii); and 29 CFR 1910.120(q)(6), (q)(7), and (q)(8). These are generic guidelines and they are not presented as a complete training curriculum for any specific employer. Site-specific training programs must be developed on the basis of a needs assessment of the hazardous waste site, RCRA/TSD, or emergency response operation in accordance with 29 CFR 1910.120.

It is noted that the legal requirements are set forth in the regulatory text of Sec. 1910.120. The guidance set forth here presents a highly effective program that in the areas covered would meet or exceed the regulatory requirements. In addition, other approaches could meet the regulatory requirements.

Suggested General Criteria

Definitions:

"Competent" means possessing the skills, knowledge, experience, and judgment to perform assigned tasks or activities satisfactorily as determined by the employer.

"Demonstration" means the showing by actual use of equipment or procedures.

"Hands-on training" means training in a simulated work environment that permits each student to have experience performing tasks, making decisions, or using equipment appropriate to the job assignment for which the training is being conducted.

"Initial training" means training required prior to beginning work.

"Lecture" means an interactive discourse with a class lead by an instructor.

"Proficient" means meeting a stated level of achievement.

"Site-specific" means individual training directed to the operations of a specific job site.

"Training hours" means the number of hours devoted to lecture, learning activities, small group work sessions, demonstration, evaluations, or hands-on experience.

Suggested core criteria:

1. Training facility.

The training facility should have available sufficient resources, equipment, and site locations to

perform didactic and hands-on training when appropriate. Training facilities should have sufficient organization, support staff, and services to conduct training in each of the courses offered.

2. Training Director.

Each training program should be under the direction of a training director who is responsible for the program. The Training Director should have a minimum of two years of employee education experience.

3. Instructors.

Instructors should be deemed competent on the basis of previous documented experience in their area of instruction, successful completion of a "train-the-trainer" program specific to the topics they will teach, and an evaluation of instructional competence by the Training Director. Instructors should be required to maintain professional competency by participating in continuing education or professional development programs or by completing successfully an annual refresher course and having an annual review by the Training Director. The annual review by the Training Director should include observation of an instructor's delivery, a review of those observations with the trainer, and an analysis of any instructor or class evaluations completed by the students during the previous year.

4. Course materials.

The Training Director should approve all course materials to be used by the training provider. Course materials should be reviewed and updated at least annually. Materials and equipment should be in good working order and maintained properly. All written and audio-visual materials in training curricula should be peer reviewed by technically competent outside reviewers or by a standing advisory committee. Reviews should possess expertise in the following disciplines where applicable: occupational health, industrial hygiene and safety, chemical/environmental engineering, employee education, or emergency response. One or more of the peer reviewers should be an employee experienced in the work activities to which the training is directed.

5. Students.

The program for accepting students should include:

- a. Assurance that the student is or will be involved in work where chemical exposures are likely and that the student possesses the skills necessary to perform the work.
- b. A policy on the necessary medical clearance.

6. Ratios.

Student-instructor ratios should not exceed 30 students per instructor. Hands-on activity requiring the use of personal protective equipment should have the following student-instructor ratios. For Level C or Level D personal protective equipment the ratio should be 10 students per instructor. For Level A or Level B personal protective equipment the ratio should be 5 students per instructor.

7. Proficiency assessment.

Proficiency should be evaluated and documented by the use of a written assessment and a skill demonstration selected and developed by the Training Director and training staff. The assessment and demonstration should evaluate the knowledge and individual skills developed in the course of training. The level of minimum achievement necessary for proficiency shall be specified in writing by the Training Director. If a written test is used, there should be a minimum of 50 questions. If a written test is used in combination with a skills demonstration, a minimum of 25 questions should be used. If a skills demonstration is used, the tasks chosen and the means to rate successful completion should be fully documented by the Training Director. The content of the written test or of the skill demonstration shall be relevant to the objectives of the course. The written test and skill demonstration should be updated as necessary to reflect changes in the curriculum and any update should be approved by the Training Director. The proficiency assessment methods, regardless of the approach or combination of approaches used, should be justified, documented and approved by the Training Director. The proficiency of those taking the additional courses for supervisors should be evaluated and documented by using proficiency assessment methods acceptable to the Training Director. These proficiency assessment methods must reflect the additional responsibilities borne by supervisory personnel in hazardous waste operations or emergency response.

8. Course certificate.

Written documentation should be provided to each student who satisfactorily completes the training course. The documentation should include:

- a. Student's name.
- b. Course title.
- c. Course date.
- d. Statement that the student has successfully completed the course.
- e. Name and address of the training provider.
- f. An individual identification number for the certificate.
- g. List of the levels of personal protective equipment used by the student to complete the course.

This documentation may include a certificate and an appropriate wallet-sized laminated card with a photograph of the student and the above information. When such course certificate cards are used, the individual identification number for the training certificate should be shown on the card.

9. Recordkeeping.

Training providers should maintain records listing the dates courses were presented, the names of the individual course attenders, the names of those students successfully completing each course, and the number of training certificates issued to each successful student. These records should be

maintained for a minimum of five years after the date an individual participated in a training program offered by the training provider. These records should be available and provided upon the student's request or as mandated by law.

10. Program quality control.

The Training Director should conduct or direct an annual written audit of the training program. Program modifications to address deficiencies, if any, should be documented, approved, and implemented by the training provider. The audit and the program modification documents should be maintained at the training facility. Suggested Program Quality Control Criteria Factors listed here are suggested criteria for determining the quality and appropriateness of employee health and safety training for hazardous waste operations and emergency response.

A. Training Plan.

Adequacy and appropriateness of the training program's curriculum development, instructor training, distribution of course materials, and direct student training should be considered, including:

1. The duration of training, course content, and course schedules/agendas;
2. The different training requirements of the various target populations, as specified in the appropriate generic training curriculum;
3. The process for the development of curriculum, which includes appropriate technical input, outside review, evaluation, program pretesting.
4. The adequate and appropriate inclusion of hands-on, demonstration, and instruction methods;
5. Adequate monitoring of student safety, progress, and performance during the training.

B. Program management, Training Director, staff, and consultants.

Adequacy and appropriateness of staff performance and delivering an effective training program should be considered, including:

1. Demonstration of the training director's leadership in assuring quality of health and safety training.
2. Demonstration of the competency of the staff to meet the demands of delivering high quality hazardous waste employee health and safety training.
3. Organization charts establishing clear lines of authority.
4. Clearly defined staff duties including the relationship of the training staff to the overall program.
5. Evidence that the training organizational structure suits the needs of the training

program.

6. Appropriateness and adequacy of the training methods used by the instructors.
 7. Sufficiency of the time committed by the training director and staff to the training program.
 8. Adequacy of the ratio of training staff to students.
 9. Availability and commitment of the training program of adequate human and equipment resources in the areas of:
 - a. Health effects,
 - b. Safety,
 - c. Personal protective equipment (PPE),
 - d. Operational procedures,
 - e. Employee protection practices/procedures.
 10. Appropriateness of management controls.
 11. Adequacy of the organization and appropriate resources assigned to assure appropriate training.
 12. In the case of multiple-site training programs, adequacy of satellite centers management.
- C. Training facilities and resources. Adequacy and appropriateness of the facilities and resources for supporting the training program should be considered, including:
1. Space and equipment to conduct the training.
 2. Facilities for representative hands-on training.
 3. In the case of multiple-site programs, equipment and facilities at the satellite centers.
 4. Adequacy and appropriateness of the quality control and evaluations program to account for instructor performance.
 5. Adequacy and appropriateness of the quality control and evaluation program to ensure appropriate course evaluation, feedback, updating, and corrective action.
 6. Adequacy and appropriateness of disciplines and expertise being used within the quality control and evaluation program.
 7. Adequacy and appropriateness of the role of student evaluations to provide feedback

for training program improvement.

D. Quality control and evaluation.

Adequacy and appropriateness of quality control and evaluation plans for training programs should be considered, including:

1. A balanced advisory committee and/or competent outside reviewers to give overall policy guidance;
2. Clear and adequate definition of the composition and active programmatic role of the advisory committee or outside reviewers.
3. Adequacy of the minutes or reports of the advisory committee or outside reviewers' meetings or written communication.
4. Adequacy and appropriateness of the quality control and evaluations program to account for instructor performance.
5. Adequacy and appropriateness of the quality control and evaluation program to ensure appropriate course evaluation, feedback, updating, and corrective action.
6. Adequacy and appropriateness of disciplines and expertise being used within the quality control and evaluation program.
7. Adequacy and appropriateness of the role of student evaluations to provide feedback for training program improvement.

E. Students

Adequacy and appropriateness of the program for accepting students should be considered, including:

1. Assurance that the student already possess the necessary skills for their job, including necessary documentation.
2. Appropriateness of methods the program uses to ensure that recruits are capable of satisfactorily completing training.
3. Review and compliance with any medical clearance policy.

F. Institutional Environment and Administrative Support

The adequacy and appropriateness of the institutional environment and administrative support system for the training program should be considered, including:

1. Adequacy of the institutional commitment to the employee training program.
2. Adequacy and appropriateness of the administrative structure and administrative

support.

G. Summary of Evaluation Questions

Key questions for evaluating the quality and appropriateness of an overall training program should include the following:

1. Are the program objectives clearly stated?
2. Is the program accomplishing its objectives?
3. Are appropriate facilities and staff available?
4. Is there an appropriate mix of classroom, demonstration, and hands-on training?
5. Is the program providing quality employee health and safety training that fully meets the intent of regulatory requirements?
6. What are the program's main strengths?
7. What are the program's main weaknesses?
8. What is recommended to improve the program?
9. Are instructors instructing according to their training outlines?
10. Is the evaluation tool current and appropriate for the program content?
11. Is the course material current and relevant to the target group?

Suggested Training Curriculum Guidelines

The following training curriculum guidelines are for those operations specifically identified in 29 CFR 1910.120 as requiring training. Issues such as qualifications of instructors, training certification, and similar criteria appropriate to all categories of operations addressed in 1910.120 have been covered in the preceding section and are not re-addressed in each of the generic guidelines. Basic core requirements for training programs that are addressed include:

1. General Hazardous Waste Operations
2. RCRA operations--Treatment, storage, and disposal facilities.
3. Emergency Response.

A. General Hazardous Waste Operations and Site-specific Training

1. Off-site training. Training course content for hazardous waste operations, required by 29 CFR 1910.120(e), should include the following topics or

procedures:

a. Regulatory knowledge.

1. An review of 29 CFR 1910.120 and the core elements of an occupational safety and health program.
2. The content of a medical surveillance program as outlined in 29 CFR 1910.120(f).
3. The content of an effective site safety and health plan consistent with the requirements of 29 CFR 1910.120(b)(4)(ii).
4. Emergency response plan and procedures as outlined in 29 CFR 1910.38 and 29 CFR 1910.120(l).
5. Adequate illumination.
6. Sanitation recommendation and equipment.
7. Review and explanation of OSHA's hazard-communication standard (29 CFR 1910.1200) and lock-out-tag-out standard (29 CFR 1910.147).
8. Review of other applicable standards including but not limited to those in the construction standards (29 CFR Part 1926).
9. Rights and responsibilities of employers and employees under applicable OSHA and EPA laws.

b. Technical knowledge.

1. Type of potential exposures to chemical, biological, and radiological hazards; types of human responses to these hazards and recognition of those responses; principles of toxicology and information about acute and chronic hazards; health and safety considerations of new technology.
2. Fundamentals of chemical hazards including but not limited to vapor pressure, boiling points, flash points, ph, other physical and chemical properties.
3. Fire and explosion hazards of chemicals.
4. General safety hazards such as but not limited to electrical hazards, powered equipment hazards, motor vehicle hazards, walking- working surface hazards, excavation hazards, and

hazards associated with working in hot and cold temperature extremes.

5. Review and knowledge of confined space entry procedures in 29 CFR 1910.146.
6. Work practices to minimize employee risk from site hazards.
7. Safe use of engineering controls, equipment, and any new relevant safety technology or safety procedures.
8. Review and demonstration of competency with air sampling and monitoring equipment that may be used in a site monitoring program.
9. Container sampling procedures and safeguarding; general drum and container handling procedures including special requirement for laboratory waste packs, shock-sensitive wastes, and radioactive wastes.
10. The elements of a spill control program.
11. Proper use and limitations of material handling equipment.
12. Procedures for safe and healthful preparation of containers for shipping and transport.
13. Methods of communication including those used while wearing respiratory protection.

c. Technical skills.

1. Selection, use maintenance, and limitations of personal protective equipment including the components and procedures for carrying out a respirator program to comply with 29 CFR 1910.134.
2. Instruction in decontamination programs including personnel, equipment, and hardware; hands-on training including level A, B, and C ensembles and appropriate decontamination lines; field activities including the donning and doffing of protective equipment to a level commensurate with the employee's anticipated job function and responsibility and to the degree required by potential hazards.
3. Sources for additional hazard information; exercises using relevant manuals and hazard coding systems.

d. Additional suggested items.

1. A laminated, dated card or certificate with photo, denoting limitations and level of protection for which the employee is trained should be issued to those students successfully completing a course.
2. Attendance should be required at all training modules, with successful completion of exercises and a final written or oral examination with at least 50 questions.
3. A minimum of one-third of the program should be devoted to hands-on exercises.
4. A curriculum should be established for the 8-hour refresher training required by 29 CFR 1910.120(e)(8), with delivery of such courses directed toward those areas of previous training that need improvement or reemphasis.
5. A curriculum should be established for the required 8-hour training for supervisors. Demonstrated competency in the skills and knowledge provided in a 40-hour course should be a prerequisite for supervisor training.

2. Refresher training.

The 8-hour annual refresher training required in 29 CFR 1910.120(e)(8) should be conducted by qualified training providers. Refresher training should include at a minimum the following topics and procedures:

- a. Review of and retraining on relevant topics covered in the 40-hour program, as appropriate, using reports by the students on their work experiences.
- b. Update on developments with respect to material covered in the 40-hour course.
- c. Review of changes to pertinent provisions of EPA or OSHA standards or laws.
- d. Introduction of additional subject areas as appropriate.
- e. Hands-on review of new or altered PPE or decontamination equipment or procedures. Review of new developments in personal protective equipment.
- f. Review of newly developed air and contaminant monitoring equipment.

3. On-site training.

- a. The employer should provide employees engaged in hazardous waste site activities with information and training prior to initial assignment into their work area, as follows:
 1. The requirements of the hazard communication program including the location and availability of the written program, required lists of hazardous chemicals, and material safety data sheets.
 2. Activities and locations in their work area where hazardous substance may be present.
 3. Methods and observations that may be used to detect the present or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearances, or other evidence (sight, sound or smell) of hazardous chemicals being released, and applicable alarms from monitoring devices that record chemical releases.
 4. The physical and health hazards of substances known or potentially present in the work area.
 5. The measures employees can take to help protect themselves from work-site hazards, including specific procedures the employer has implemented.
 6. An explanation of the labeling system and material safety data sheets and how employees can obtain and use appropriate hazard information.
 7. The elements of the confined space program including special PPE, permits, monitoring requirements, communication procedures, emergency response, and applicable lock-out procedures.
- b. The employer should provide hazardous waste employees information and training and should provide a review and access to the site safety and plan as follows:
 1. Names of personnel and alternate responsible for site safety and health.
 2. Safety and health hazards present on the site.
 3. Selection, use, maintenance, and limitations of personal

protective equipment specific to the site.

4. Work practices by which the employee can minimize risks from hazards.
 5. Safe use of engineering controls and equipment available on site.
 6. Safe decontamination procedures established to minimize employee contact with hazardous substances, including:
 - A. Employee decontamination,
 - B. Clothing decontamination, and
 - C. Equipment decontamination.
 7. Elements of the site emergency response plan, including:
 - A. Pre-emergency planning.
 - B. Personnel roles and lines of authority and communication.
 - C. Emergency recognition and prevention.
 - D. Safe distances and places of refuge.
 - E. Site security and control.
 - F. Evacuation routes and procedures.
 - G. Decontamination procedures not covered by the site safety and health plan.
 - H. Emergency medical treatment and first aid.
 - I. Emergency equipment and procedures for handling emergency incidents.
- c. The employer should provide hazardous waste employees information and training on personal protective equipment used at the site, such as the following:
1. PPE to be used based upon known or anticipated site hazards.
 2. PPE limitations of materials and construction; limitations during temperature extremes, heat stress, and other

appropriate medical considerations; use and limitations of respirator equipment as well as documentation procedures as outlined in 29 CFR 1910.134.

3. PPE inspection procedures prior to, during, and after use.
 4. PPE donning and doffing procedures.
 5. PPE decontamination and disposal procedures.
 6. PPE maintenance and storage.
 7. Task duration as related to PPE limitations.
- d. The employer should instruct the employee about the site medical surveillance program relative to the particular site, including:
1. Specific medical surveillance programs that have been adapted for the site.
 2. Specific signs and symptoms related to exposure to hazardous materials on the site.
 3. The frequency and extent of periodic medical examinations that will be used on the site.
 4. Maintenance and availability of records.
 5. Personnel to be contacted and procedures to be followed when signs and symptoms of exposures are recognized.
- e. The employees will review and discuss the site safety plan as part of the training program. The location of the site safety plan and all written programs should be discussed with employees including a discussion of the mechanisms for access, review, and references described.

B. RCRA Operations Training for Treatment, Storage and Disposal Facilities.

1. As a minimum, the training course required in 29 CFR 1910.120 (p) should include the following topics:
 - a. Review of the applicable paragraphs of 29 CFR 1910.120 and the elements of the employer's occupational safety and health plan.
 - b. Review of relevant hazards such as, but not limited to, chemical, biological, and radiological exposures; fire and explosion hazards; thermal extremes; and physical hazards.

- c. General safety hazards including those associated with electrical hazards, powered equipment hazards, lock-out-tag-out procedures, motor vehicle hazards and walking-working surface hazards.
- d. Confined-space hazards and procedures.
- e. Work practices to minimize employee risk from workplace hazards.
- f. Emergency response plan and procedures including first aid meeting the requirements of paragraph (p)(8).
- g. A review of procedures to minimize exposure to hazardous waste and various type of waste streams, including the materials handling program and spill containment program.
- h. A review of hazard communication programs meeting the requirements of 29 CFR 1910.1200.
- i. A review of medical surveillance programs meeting the requirements of 29 CFR 1910.120(p)(3) including the recognition of signs and symptoms of overexposure to hazardous substance including known synergistic interactions.
- j. A review of decontamination programs and procedures meeting the requirements of 29 CFR 1910.120(p)(4).
- k. A review of an employer's requirements to implement a training program and its elements.
- l. A review of the criteria and programs for proper selection and use of personal protective equipment, including respirators.
- m. A review of the applicable appendices to 29 CFR 1910.120.
- n. Principles of toxicology and biological monitoring as they pertain to occupational health.
- o. Rights and responsibilities of employees and employers under applicable OSHA and EPA laws.
- p. Hands-on exercises and demonstrations of competency with equipment to illustrate the basic equipment principles that may be used during the performance of work duties, including the donning and doffing of PPE.
- q. Sources of reference, efficient use of relevant manuals, and knowledge of hazard coding systems to include information contained in hazardous waste manifests.

- r. At least 8 hours of hands-on training.
 - s. Training in the job skills required for an employee's job function and responsibility before they are permitted to participate in or supervise field activities.
2. The individual employer should provide hazardous waste employees with information and training prior to an employee's initial assignment into a work area. The training and information should cover the following topics:
- a. The Emergency response plan and procedures including first aid.
 - b. A review of the employer's hazardous waste handling procedures including the materials handling program and elements of the spill containment program, location of spill response kits or equipment, and the names of those trained to respond to releases.
 - c. The hazardous communication program meeting the requirements of 29 CFR 1910.1200.
 - d. A review of the employer's medical surveillance program including the recognition of signs and symptoms of exposure to relevant hazardous substance including known synergistic interactions.
 - e. A review of the employer's decontamination program and procedures.
 - f. An review of the employer's training program and the parties responsible for that program.
 - g. A review of the employer's personal protective equipment program including the proper selection and use of PPE based upon specific site hazards.
 - h. All relevant site-specific procedures addressing potential safety and health hazards. This may include, as appropriate, biological and radiological exposures, fire and explosion hazards, thermal hazards, and physical hazards such as electrical hazards, powered equipment hazards, lock-out-tag-out hazards, motor vehicle hazards, and walking-working surface hazards.
 - i. Safe use engineering controls and equipment on site.
 - j. Names of personnel and alternates responsible for safety and health.

C. Emergency response training.

Federal OSHA standards in 29 CFR 1910.120(q) are directed toward private sector emergency responders. Therefore, the guidelines provided in this portion of the appendix are directed toward that employee population. However, they also impact indirectly through State OSHA or USEPA regulations some public sector emergency responders. Therefore, the guidelines provided in this portion of the appendix may be applied to both employee populations. States with OSHA state plans must cover their employees with regulations at least as effective as the Federal OSHA standards. Public employees in states without approved state OSHA programs covering hazardous waste operations and emergency response are covered by the U.S. EPA under 40 CFR 311, a regulation virtually identical to Sec. 1910.120. Since this is a non-mandatory appendix and therefore not an enforceable standard, OSHA recommends that those employers, employees or volunteers in public sector emergency response organizations outside Federal OSHA jurisdiction consider the following criteria in developing their own training programs. A unified approach to training at the community level between emergency response organizations covered by Federal OSHA and those not covered directly by Federal OSHA can help ensure an effective community response to the release or potential release of hazardous substances in the community.

a. General considerations.

Emergency response organizations are required to consider the topics listed in Sec. 1910.120(q)(6). Emergency response organizations may use some or all of the following topics to supplement those mandatory topics when developing their response training programs. Many of the topics would require an interaction between the response provider and the individuals responsible for the site where the response would be expected.

1. Hazard recognition, including:
 - A. Nature of hazardous substances present,
 - B. Practical applications of hazard recognition, including presentations on biology, chemistry, and physics.
2. Principles of toxicology, biological monitoring, and risk assessment.
3. Safe work practices and general site safety.
4. Engineering controls and hazardous waste operations.
5. Site safety plans and standard operating procedures.
6. Decontamination procedures and practices.

7. Emergency procedures, first aid, and self-rescue.
 8. Safe use of field equipment.
 9. Storage, handling, use and transportation of hazardous substances.
 10. Use, care, and limitations of personal protective equipment.
 11. Safe sampling techniques.
 12. Rights and responsibilities of employees under OSHA and other related laws concerning right-to-know, safety and health, compensations and liability.
 13. Medical monitoring requirements.
 14. Community relations.
- b. Suggested criteria for specific courses.
1. First responder awareness level.
 - A. Review of and demonstration of competency in performing the applicable skills of 29 CFR 1910.120(q).
 - B. Hands-on experience with the U.S. Department of Transportation's Emergency Response Guidebook (ERG) and familiarization with OSHA standard 29 CFR 1910.1201.
 - C. Review of the principles and practices for analyzing an incident to determine both the hazardous substances present and the basic hazard and response information for each hazardous substance present.
 - D. Review of procedures for implementing actions consistent with the local emergency response plan, the organization's standard operating procedures, and the current edition of DOT's ERG including emergency notification procedures and follow-up communications.
 - E. Review of the expected hazards including fire and explosions hazards, confined space hazards, electrical hazards, powered equipment hazards, motor vehicle hazards, and walking-working surface hazards.
 - F. Awareness and knowledge of the competencies for the First Responder at the Awareness Level covered in the National Fire Protection Association's Standard No. 472, Professional Competence of Responders to Hazardous Materials

Incidents.

2. First responder operations level.

- A. Review of and demonstration of competency in performing the applicable skills of 29 CFR 1910.120(q).
- B. Hands-on experience with the U.S. Department of Transportation's Emergency Response Guidebook (ERG), manufacturer material safety data sheets, CHEMTREC/CANUTEC, shipper or manufacturer contacts, and other relevant sources of information addressing hazardous substance releases. Familiarization with OSHA standard 29 CFR 1910.1201.
- C. Review of the principles and practices for analyzing an incident to determine the hazardous substances present, the likely behavior of the hazardous substance and its container, the types of hazardous substance transportation containers and vehicles, the types and selection of the appropriate defensive strategy for containing the release.
- D. Review of procedures for implementing continuing response actions consistent with the local emergency response plan, the organization's standard operating procedures, and the current edition of DOT's ERG including extended emergency notification procedures and follow-up communications.
- E. Review of the principles and practice for proper selection and use of personal protective equipment. (F) Review of the principles and practice of personnel and equipment decontamination.
- F. Review of the expected hazards including fire and explosions hazards, confined space hazards, electrical hazards, powered equipment hazards, motor vehicle hazards, and walking-working surface hazards.
- G. Awareness and knowledge of the competencies for the First Responder at the Operations Level covered in the National Fire Protection Association's Standard No. 472, Professional Competence of Responders to Hazardous Materials Incidents.

3. Hazardous materials technician.

- A. Review of and demonstration of competency in performing the applicable skills of 29 CFR 1910.120(q).

- B. Hands-on experience with written and electronic information relative to response decision making including but not limited to the U.S. Department of Transportation's Emergency Response Guidebook (ERG), manufacturer material safety data sheets, CHEMTREC/CANUTEC, shipper or manufacturer contacts, computer data bases and response models, and other relevant sources of information addressing hazardous substance releases. Familiarization with OSHA standard 29 CFR 1910.1201.
- C. Review of the principles and practices for analyzing an incident to determine the hazardous substances present, their physical and chemical properties, the likely behavior of the hazardous substance and its container, the types of hazardous substance transportation containers and vehicles involved in the release, the appropriate strategy for approaching release sites and containing the release.
- D. Review of procedures for implementing continuing response actions consistent with the local emergency response plan, the organization's standard operating procedures, and the current edition of DOT's ERG including extended emergency notification procedures and follow-up communications.
- E. Review of the principles and practice for proper selection and use of personal protective equipment.
- F. Review of the principles and practices of establishing exposure zones, proper decontamination and medical surveillance stations and procedures.
- G. Review of the expected hazards including fire and explosions hazards, confined space hazards, electrical hazards, powered equipment hazards, motor vehicle hazards, and walking-working surface hazards.
- H. Awareness and knowledge of the competencies for the Hazardous Materials Technician covered in the National Fire Protection Association's Standard No. 472, Professional Competence of Responders to Hazardous Materials Incidents.

D. Hazardous materials specialist.

- A. Review of and demonstration of competency in performing the applicable skills of 29 CFR 1910.120(q).
- B. Hands-on experience with retrieval and use of written and electronic information relative to response decision making including but not

limited to the U.S. Department of Transportation's Emergency Response Guidebook (ERG), manufacturer material safety data sheets, CHEMTREC/CANUTEC, shipper or manufacturer contacts, computer data bases and response models, and other relevant sources of information addressing hazardous substance releases. Familiarization with OSHA standard 29 CFR 1910.1201.

- C. Review of the principles and practices for analyzing an incident to determine the hazardous substances present, their physical and chemical properties, and the likely behavior of the hazardous substance and its container, vessel, or vehicle.
 - D. Review of the principles and practices for identification of the types of hazardous substance transportation containers, vessels and vehicles involved in the release; selecting and using the various types of equipment available for plugging or patching transportation containers, vessels or vehicles; organizing and directing the use of multiple teams of hazardous material technicians and selecting the appropriate strategy for approaching release sites and containing or stopping the release.
 - E. Review of procedures for implementing continuing response actions consistent with the local emergency response plan, the organization's standard operating procedures, including knowledge of the available public and private response resources, establishment of an incident command post, direction of hazardous material technician teams, and extended emergency notification procedures and follow-up communications.
 - F. Review of the principles and practice for proper selection and use of personal protective equipment.
 - G. Review of the principles and practices of establishing exposure zones and proper decontamination, monitoring and medical surveillance stations and procedures.
 - H. Review of the expected hazards including fire and explosions hazards, confined space hazards, electrical hazards, powered equipment hazards, motor vehicle hazards, and walking-working surface hazards.
 - I. Awareness and knowledge of the competencies for the Off-site Specialist Employee covered in the National Fire Protection Association's Standard No. 472, Professional Competence of Responders to Hazardous Materials Incidents.
- E. Incident commander.

The incident commander is the individual who, at any one time, is responsible for and in control of the response effort. This individual is the person responsible for the direction and coordination of the response effort. An

incident commander's position should be occupied by the most senior, appropriately trained individual present at the response site. Yet, as necessary and appropriate by the level of response provided, the position may be occupied by many individuals during a particular response as the need for greater authority, responsibility, or training increases. It is possible for the first responder at the awareness level to assume the duties of incident commander until a more senior and appropriately trained individual arrives at the response site. Therefore, any emergency responder expected to perform as an incident commander should be trained to fulfill the obligations of the position at the level of response they will be providing including the following:

- A. Ability to analyze a hazardous substance incident to determine the magnitude of the response problem.
- B. Ability to plan and implement an appropriate response plan within the capabilities of available personnel and equipment.
- C. Ability to implement a response to favorably change the outcome of the incident in a manner consistent with the local emergency response plan and the organization's standard operating procedures.
- D. Ability to evaluate the progress of the emergency response to ensure that the response objectives are being met safely, effectively, and efficiently.
- E. Ability to adjust the response plan to the conditions of the response and to notify higher levels of response when required by the changes to the response plan.

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