QUALITY ASSURANCE PROJECT PLAN
AVCO LYCOMING TEXTRON SITE
STRATFORD, CONNECTICUT
SURFACE IMPOUNDMENT CLOSURE PLAN

November 25, 1987

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1.0 Introduction

This Quality Assurance Project Plan (QAPP) describes methods and approaches for providing quality control of field sampling and laboratory activities performed as part of closure activities of four hazardous waste surface impoundments, at the AVCO Lycoming TEXTRON facility in Stratford, Connecticiut. It has been prepared in accordance with guidelines and specifications presented in the U.S. EPA document "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans", QAMS-005/80, December 29, 1980. The purpose of this QAPP is to present, in specific terms, the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the data quality goals of the sampling and testing program.

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3.0 Project Description

The soil sampling and testing program described herein is a part of the closure activities for four hazardous waste lagoons at the AVCO-TEXTRON facility.

Following the removal, treatment, and disposal of standing liquid and sludge from these lagoons, it is proposed to remove soil from the lagoon bottoms and laterally around each lagoon.

The vertical limit of excavation will be the seasonal low water table. The lateral extent of soil excavation will be determined by following an excavate and test cycle (see Section 3.2).

Upon complete removal of contaminated soils, the open excavations will be backfilled and a landfill cap will be constructed.

3.1 Background & Site Description

The Avco facility, which is owned by the U.S. Army and operated by Avco Lycoming TEXTRON, is located in Stratford, Connecticut just west (approximately 1,000 feet) of where the Housatonic River enters the Long Island Sound (see Figure 3.1 and 3.2). The activities at the facility include the manufacturing of gas turbine engines. The production of these engines includes the plating of engine and other miscellaneous parts in zinc, cadmium, chrome, copper, magnesium, nickel and black oxide baths. The spent plating baths are discharged to an equalization lagoon.

FIGURE 3.1. LOCATION MAP - AVCO LYCOMING FACILITY

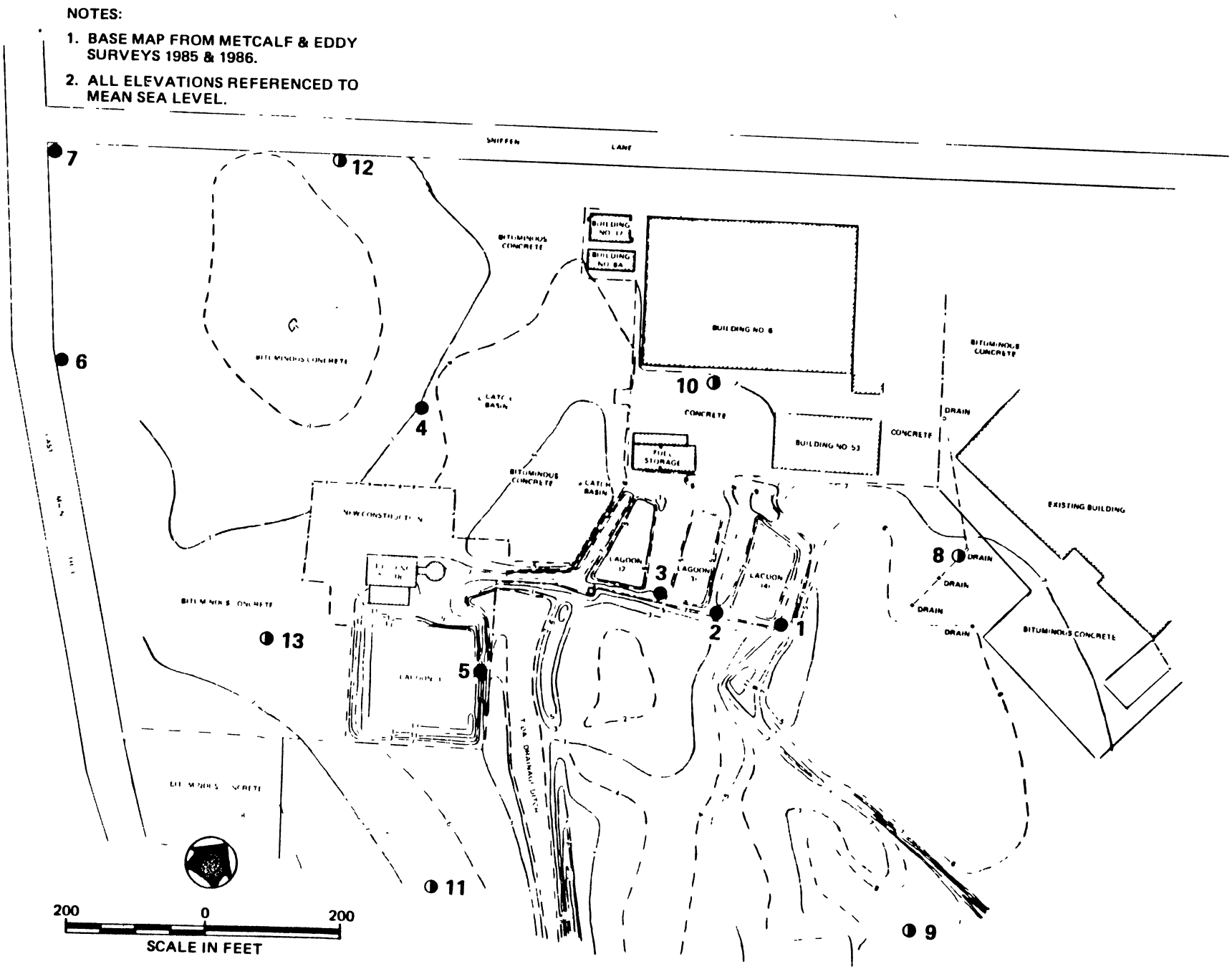


FIGURE 3.2. SITE PLAN - AVCO LYCOMING FACILITY

Wastewater from this lagoon is pumped to a chemical waste treatment plant which, in turn, produces a metal hydroxide sludge which is pumped to one of three sludge storage lagoons.

The operation of these hazardous waste surface impoundments has been regulated under the Resource Conservation and Recovery Act (RCRA) since the effective date of these regulations on November 19, 1980. In compliance with the first requirement of RCRA, Avco submitted Part A of the RCRA permit application to the U.S. EPA on November 13, 1980.

On November 8, 1984, RCRA was amended by the "Hazardous and Solid Waste Amendments of 1984" (HSWA). Section 213 of the HSWA required that all land disposal facilities either cease operation or submit a complete Part B permit application by November 8, 1985. In compliance with this requirement, Avco submitted its Part B permit application to USEPA, Region I and the Connecticut Department of Environmental Protection (DEP) on November 8, 1985. Until this permit application is reviewed and the final RCRA permit issued, Avco is considered to be operating under "interim status".

The chemical waste treatment plant at AVCO has been modified to include an equalization tank to replace the equalization lagoon, and filtration with off-site disposal to replace the three sludge lagoons. Without the need for the four surface

impoundments, Avco plans to close the impoundments. The planned start-up of the modified treatment plant was scheduled for July 1, 1987. As an interim status RCRA facility, Avco is resubmitting a partial closure plan under 40 CFR Part 265 subpart G and Connecticut Hazardous Waste Management Regulations 220-449 (c)-29. Partial closure refers to the four surface impoundments at Avco, which will be closed in a manner set forth in the interim status facility performance standards, 40 CFR 265.111. These performance standards require that Avco close its surface impoundments in a manner that:

1) Minimize the need for further maintenance
2) Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere, and
3) Complies with the closure requirements of Chapter G including, but not limited to, the requirements of 265.197, 265.228, 265.258, 265.280, 265.310, 265.351, 265.381 and 265.404.

3.2 Project Objective

The objective of the soil sampling at Avco is to confirm that all contaminated soils have been removed from the surface impoundments. During the excavation process, the walls of the excavations will be screened with a portable photoionization analyzer to help direct the excavation process toward the more highly contaminated soils. Confirmation soil samples will be obtained from the walls of the excavation when the predetermined limit of the excavation have been reached.

Because the water table represents the vertical limit of excavation, all confirmation samples will be taken from the walls of the excavation. It is assumed that because of downward and lateral contaminant migration in the unsaturated zone, more contamination will be present in lower portions of the excavation. As a result, confirmation soil sampling will take place along an imaginary horizontal line located at one-third of the total excavation depth as measured from the bottom of the excavation. In each excavation, samples will be obtained at 50-foot intervals along that horizontal line. It has been assumed that the distribution of wastes within all the surface impoundments is fairly uniform over the long period of disposal, but to address the possibility of some waste segregation the 50-foot sampling interval was selected. This interval will produce

a minimum of 14 confirmation samples from the 3 sludge lagoons and a minimum of 12 confirmation samples from the equalization lagoon. Although differing rates of contaminant migration will affect the depth of penetration, the uniform distribution of waste in these surface impoundments is considered the controlling factor. Additional soil sampling will take place at "hot spot" locations identified by either visual inspection or screening with the photoionization analyzer.

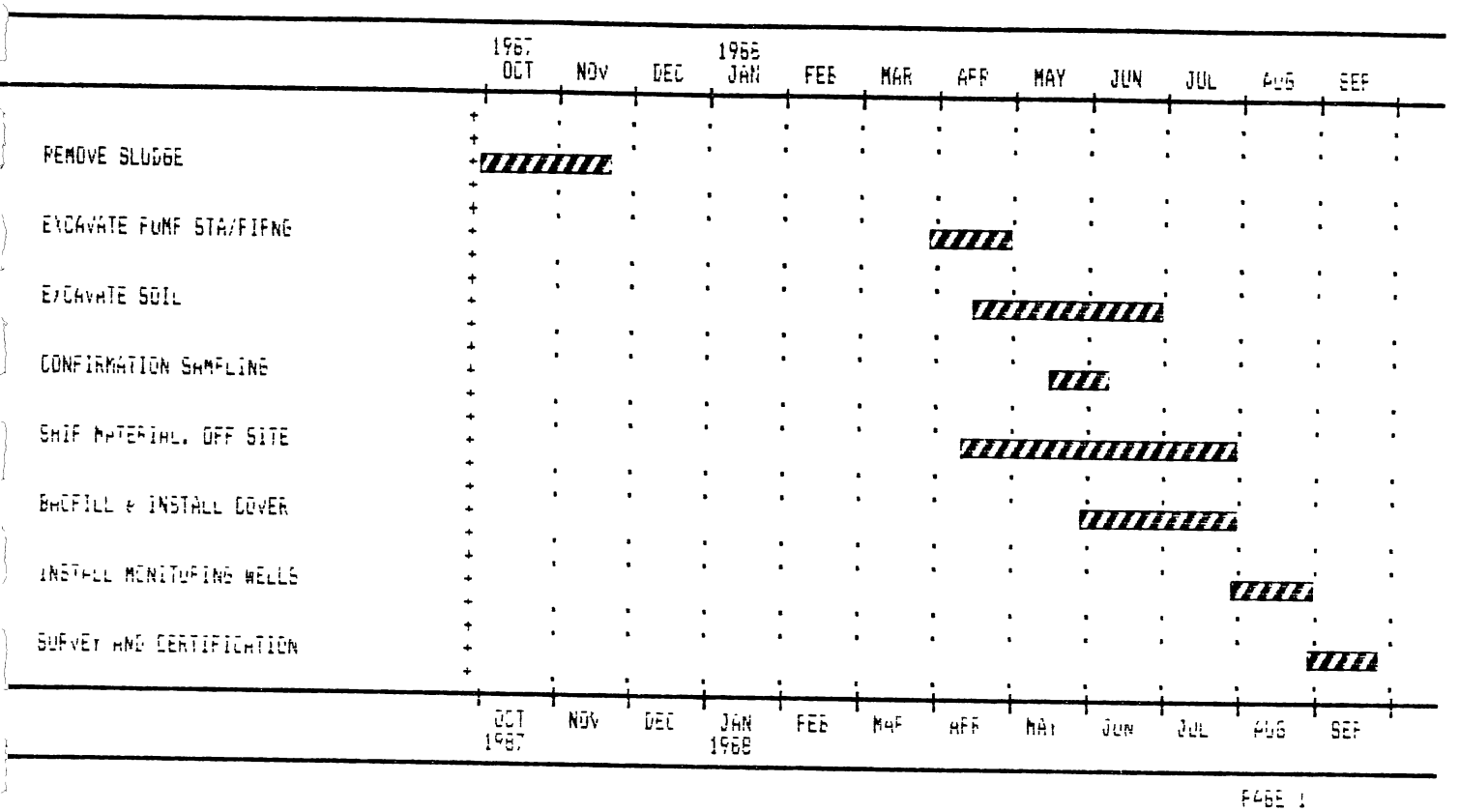
3.3 Schedule

The proposed schedule for soil sampling activities is presented in Figure 3.3.

3.4 Data Usage

Analysis of the soil samples will be conducted by a USEPA and Connecticut DEP approved Laboratory. The data obtained during the sampling and testing activities will be used to achieve the objectives outlined above (Section 3.2). For metals, cyanide and chromium, the removal standard will be ten times the Drinking Water Standards, and for volatile organics, ten times the Connecticut Action Levels.

FIG. 3.3 SCHEDULE OF CLOSURE ACTIVITIES



4.0 Project Organization

Figure 4.1 illustrates the Avco Lycoming closure project organization.

The Corps of Engineers, through its Contracting Officer, will oversee the field activities and investigations, and ensure compliance with established objectives, budgets, schedules, and scope of work.

The Contractor/Sampler will be responsible for carrying out the sampling procedures, as described herein, and will submit samples to the laboratory, for analysis in accordance with Quality Assurance Standards established in this plan.

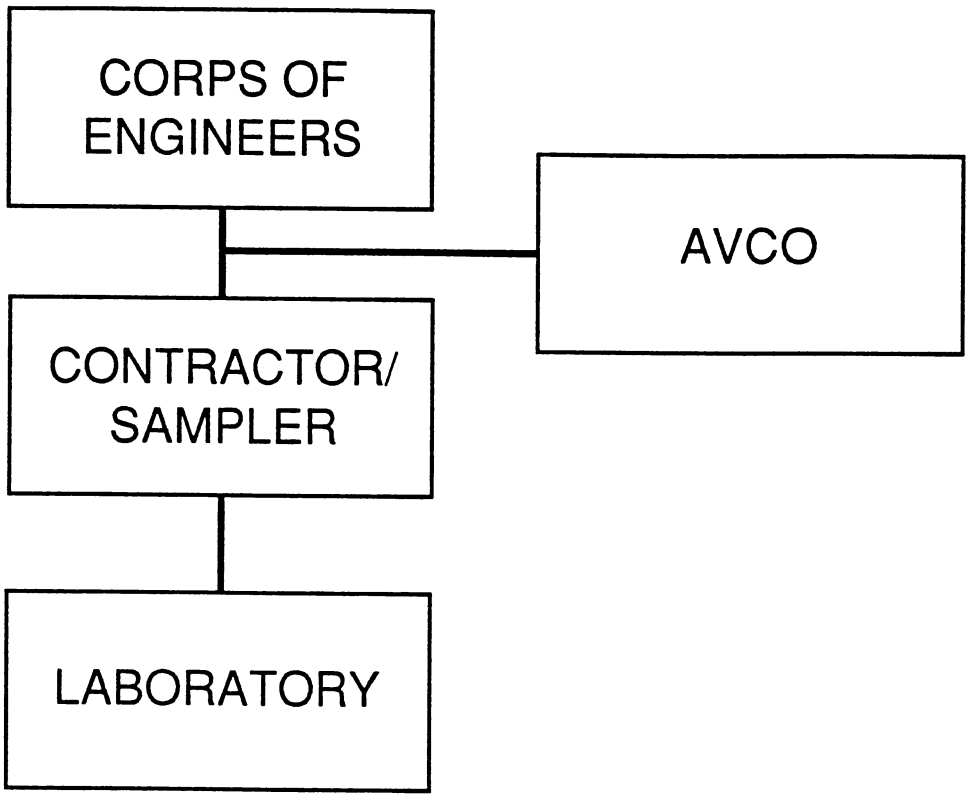


FIGURE 4.1 PROJECT ORGANIZATION

5.0 Quality Assurance for Measurement Data

The overall QA objective is to develop and implement procedures for field sampling, chain of custody, laboratory analysis and reporting that will provide legally defensible results in a court of law. Specific procedures to be used for sampling, chain of custody, calibration, laboratory analysis, reporting, internal quality control, audit, preventive maintenance and corrective actions are described in other sections of this Quality Assurance Project Plan. This section defines the goals for level of QA effort; accuracy, precision and sensitivity of analyses; and completeness, representativeness, and comparability of measurement data from all analytical laboratories. QA objectives for field measurements are also discussed.

5.1 Regulatory and Legal Requirements

There are no special regulatory or legal requirements in that compliance with regulations or laws other than RCRA is not an objective or issue at this site.

5.2 Level of QA Effort

Field duplicates and field blanks will be taken and submitted to the analytical laboratory to provide the means to

7.0 Sample Custody

An overriding consideration for environmental measurement data is the ability to demonstrate that samples have been obtained from the locations stated and that they have reached the laboratory without alteration. Evidence of collection, shipment, laboratory receipt and laboratory custody until disposal must be documented to accomplish this. Documentation is accomplished through a chain-of-custody record that records each sample and the individuals responsible for sample collection, shipment, and receipt. A sample is considered in custody if it is:

- In a person's actual possession.
- In view after being in physical possession.
- Sealed so that no one can tamper with it after having been in physical custody.
- In a secured area, restricted to authorized personnel.

Sample custody will be initiated by Contractor field personnel upon collection of samples. Documents specifically prepared for such purposes will be used for recording pertinent information about the types and numbers of samples collected and shipped for analysis. The samples collected will first be brought to an on-site location for batching and paperwork checks. Labels and log information are checked to be sure there is no error in identification. Samples are packaged to prevent breakage or leakage and labeled according to DOT regulations for

transport as laboratory samples. Copies of forms will be maintained for the project record. Originals will be maintained at the Laboratory.

7.1 Chain-of-Custody Record Form.

Figure 7.1 is an example of the chain of custody form to be used by Contractor personnel in collecting and shipping samples. The Laboratory shall not accept samples for analysis without a correctly prepared chain-of-custody form.

The chain-of-custody form shall be signed by each individual who has the samples in their possession. Preparation of the chain-of-custody form shall be as follows:

- The chain-of-custody record shall be initiated in the field by the person collecting the sample, for every sample. Every sample shall be assigned a unique identification number that is entered on the chain-of-custody form. Samples can be grouped for shipment using a single form. The form shown as Figure 7.1 allows for fifteen samples. If more than fifteen samples are shipped in the same container, more than one chain-of-custody form is required.

- The record shall be completed in the field to indicate project, sampling team, etc.

- Because the person collecting the sample does not transport the samples to the laboratory or deliver the sample containers for shipment, the first block for

  Relinquished By _____, Received By _____ shall be completed in the field.

- The person transporting the samples to the laboratory or delivering them for shipment shall sign the record form as Transported By _____.
- Because the samples are to be shipped to the laboratory by commercial carrier, the chain-of-custody form shall be sealed in a watertight envelope, placed in the shipping container, and the shipping container sealed prior to being given to the carrier.
- The commercial carriers waybill shall serve as an extension of the chain-of-custody record between the final field custodian and receipt in the laboratory.
- Upon receipt in the laboratory, the Quality Control Coordinator, or designated representative, shall open the shipping containers, compare the contents with the chain-of-custody record, and sign and date the record. Any discrepancies shall be noted on the chain-of-custody form.
- If discrepancies occur, the samples in question shall be segregated from normal sample storage and the field personnel immediately notified.
- Chain-of-custody records shall be maintained with the specific project files, becoming part of the permanent closure documentation.

7.2 Field Collection and Shipment. In addition to initiating the chain-of-custody form, field personnel are responsible for uniquely identifying (required on the chain of custody form) and labeling samples, providing proper filtration and preservation, and packaging samples to preclude breakage during shipment.

Every sample shall be labeled to identify:

- Project number
- Unique sample number

- Sample location and depth (such as borehole and depth)
- Sampling data and time
- Person obtaining the sample
- Method of sample preservation/filtration, if any.

Samples must be placed in containers compatible with the intended analysis and properly preserved. Also, collection of samples must consider the time interval between acquiring the sample and analysis (holding time) so that the sample is representative. Appendix B provides requirements for various analytical parameters with respect to the type of container, preservation methods, and maximum holding time between collection and analysis.

Shipping containers are to be sealed prior to shipment, both during direct transport via field personnel as well as when the commercial carrier is used. The only exception to this is if sufficient holding time exists so that the samples can be held in the field and it is necessary to re-ice the containers prior to or during transport. The Laboratory should be telephoned as soon as the shipping containers are consiged to the shipper, and the estimated time of arrival at the Laboratory given.

7.3 Laboratory Custody Procedures.

The Laboratory responsibility for sample security and integrity begins with the delivery of the samples to the Laboratory. Upon sample receipt, the Laboratory Quality Control Coordinator or his designee shall:

- Examine all samples and determine if proper temperature has been maintained during shipment. If samples have been damaged during shipment, the remaining samples shall be carefully examined to determine whether they were affected. Any samples affected shall also be considered damaged. It will be noted on the chain-of-custody record that specific samples were damaged and that they must be resampled, or the testing program changed, and an estimate of the cause of damage provided.

- Compare samples received against those listed on the chain-of-custody.

- Verify that sample holding times have not been exceeded.

- Sign and date the chain-of-custody form and attach the way bill to the chain-of-custody.

- Assign laboratory identification numbers to the Chemical Analysis Form and these numbers are plainly marked on the appropriate sample containers.

- Place the samples in the laboratory master log-in book which contains the following information:

  - Project identification number
  - Sample numbers
  - Type of samples
  - Date received in laboratory
  - Date put into storage after analysis is completed
  - Date of disposal.

  The last two items will be added to the log when the action is taken.

- Notify the Laboratory Manager of sample arrival.
- Place the complete chain-of-custody records in the project file.
- All laboratories are locked at the end of the day.

The laboratory project file will be submitted to Connecticut DEP as part of the final evidence files 6 months after the final acceptance of the Report.

7.4 Laboratory Storage of Samples.

The primary considerations for sample storage are:

- Maintenance of prescribed temperature, if required, which is typically four degrees Celcius
- Extracting and/or analyzing samples within the prescribed holding time for the parameters of interest.

The requirements of Appendix B for temperatures and holding times shall be used. Placement of samples in the proper storage environment is the responsibility of the Quality Control Coordinator, who should notify the Laboratory Manager or his designated representative, if there are any samples which mut be analyzed immediately because of holding-time requirements.

7.5 Initiation of Testing Program.

The Quality Control Coordinator is responsible for prioritizing samples on the basis of holding time and required reporting time into the laboratory sample stream.

7.6 Sample Disposal. The chain-of-custody for the sample is completed as part of sample disposal. There are several possibilities for sample disposition:

> Samples and sample processing products (e.g., digestate, distillate, extract) shall be held by the laboratory at 4 degrees Centrigrade for 30 days after the date of the analysis. After the 30 day holding period at 4 degrees Centrigrade, the samples shall be held for an additional 90 days (refrigeration not required for 90 day holding period). If the Department has not requested that the be returned to the Department before the end of the 90 day holding period, it is the responsibility of the laboratory to properly dispose of the samples.

DAY TE:__/__/__

CHAIN OF CUSTODY RECORD

SAMPLES SENT TO:_____

PROJ. NO.	PROJECT NAME	NO. OF CON-TAINERS								REMARKS
SAMPLERS: *(Signature)*										
STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION					

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	

Distribution: Original to Lab, Copy 1 to field files, Copy 2 to project manager

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8.0 Calibration Procedures and Frequencies

This section describes calibration procedures and policies pertinent to this project.

8.1 Calibration Practices. Instruments and equipment used in the Laboratory are controlled by a formal calibration program. The program verifies that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. All instruments and equipment which measure a quantity, or whose performance is expected at a stated level, are subject to calibration. Calibration may be performed by Laboratory personnel using reference standards, or externally by calibration agencies or equipment manufacturers.

Implementation of the laboratory calibration program is the responsibility of the Laboratory Manager and Analysts. The Laboratory Quality Control Coordinator shall review the implementation of the program.

Two types of calibration are discussed in this section:

- Operational calibration which is routinely performed as part of instrument usage, such as the development of a standard curve for use with an atomic absorption spectrophotometer. Operational calibration is generally performed for instrument systems.
- Periodic calibration which is performed at prescribed intervals for equipment, such as balances and ovens. In general, equipment which can be calibrated periodically is a distinct, single purpose unit and is relatively stable in performance.

8.1.1 Calibration Procedures Whenever possible, recognized procedures, such as those published by ASTM or the USEPA, or procedures provided by manufacturers shall be adopted.

At a minimum, the procedures shall include:

- Equipment to be calibrated
- Reference standards used for calibration
- Calibration technique and sequential actions
- Acceptable performance tolerances
- Frequency of calibration
- Calibration documentation format.

8.1.2 Equipment Identification Equipment that is subject to calibration shall be uniquely identified so that calibration records can be designated with a specific instrument.

8.1.3 Calibration Frequency Instruments and equipment shall be calibrated at prescribed intervals and/or as part of the operational use of the equipment. Frequency shall be based on the type of equipment, inherent stability, manufacturer's recommendations, values provided in recognized standards, intended use, effect of error upon the measurement process, and prior experience.

8.1.4 Calibration Reference Standards Two types of reference standards will be used within the Laboratory for calibration:

- Physical standards, such as weights for calibrating balances and certified thermometers for calibrating working thermometers and ovens, which are generally used for periodic calibration

- Chemical standards such as Standard Reference Materials (SRMs) provided by the National Bureau of Standards (NBS) which are primarily used for operational calibration.

Whenever possible, physical and chemical reference standards shall have known relationships to nationally recognized standards (e.g., NBS) or accepted values of natural physical constants. If national standards do not exist, the basis for the reference standard shall be documented.

8.1.5 Calibration Failure Equipment that fails calibration or becomes inoperable during use shall be removed from service and segregated to prevent inadvertent use, or shall be tagged to indicate it is out of calibration. Such equipment shall be repaired and satisfactorily recalibrated before reuse.

8.1.6 Calibration Records Records shall be prepared and maintained for each piece of equipment subject to calibration. Records demonstrating accuracy of reference standards shall also be maintained.

For instruments and equipment that are calibrated on an operational basis, calibration generally consists of determining instrumental response against compounds of known composition and concentration or the preparation of a standard response curve of the same compound at different concentrations. Records of these calibrations can be maintained in several ways:

- The calibration data can be kept with analytical sample data

- A log book can be prepared for each instrument which contains all calibration data.

The former method provides response factor information, etc., directly with analytical data so that the analytical data can be readily processed and verified. Also, the raw data package is complete as a unit.

The latter method provides an ongoing record of the calibration undertaken for a specific instrument; however, to process and verify the analytical data the log must be used in conjunction with the raw data.

For operational calibration of instrumentation used for this project, calibration data will be included with the raw analytical data and maintained in project files.

8.2 Operational Calibration. Operational calibration is generally performed as part of the analytical procedure. Included may be the analysis of a method blank and the preparation of a standard response (standard calibration) curve.

Following is a brief discussion of the analysis of method blanks and preparation of standard curves.

8.2.1.1 Method Blank. The Analyst defines the method blank to determine if the cumulative blank interferes with the analysis. The method blank is defined by following the procedure step by step, including the addition of all of the reagents and solvents, in the quantity required by the method. If the cumulative blank

interferes with the determination, steps must be taken to eliminate or reduce the interference to a level that will permit the combination of solvents and reagents to be used. If the blank interference cannot be eliminated, the magnitude of the interference must be considered when calculating the concentration of specific constituents in the samples analyzed.

A method blank should be determined whenever an analysis is made. The number of blanks is determined by the method of analysis and the number of samples analyzed at a given time.

8.2.1.2 Preparation of Standard Calibration Curve Concurrent with preparation of reagent and method blanks, a standard calibration curve is prepared for the instrumentation. Preparation of a standard calibration curve is accomplished by using calibration standards. The process may be summarized as follows:

- Preparation of a standard calibration curve is accomplished by using calibration standards prepared by mixing the species to be analyzed into the solvent that is to be introduced into the instrument.
- The concentration of the calibration standards are chosen to cover the working range of the instrument.
- All sample measurements are made within this working range.
- The calibration curve is prepared by plotting instrument response versus concentration of the species analyzed.

- Concentrations of the sample prepared with the same procedure are read directly from the calibration curve or determined by interpolation.

8.2.2 Calibration of the Gas Chromatograph Calibration of the gas chromatograph (GC) is performed during operation of the instrument. A three-point standard curve, consisting of a method blank and three standards should be analyzed daily to calibrate instrument response by the external standard procedure and to define the working range of the GC for the compounds of interest. A calibration standard should be repeated at the end of each day to monitor any changes in instrument response over the course of the daily analysis program.

Response factors are to be calculated for each compound at each concentration level. These RF will be averaged to generate the mean daily RF for each compound over the range of the standard curve. The mean response factor will be used to calculate the sample concentration of the compound of interest. When sample response exceed the range of the standard curve, the sample will be diluted to fall within the range of the standard curve and be reanalyzed. The results of the daily GC standardization will be tabulated and filed with the corresponding sample analyses.

8.2.3 Calibration of Inductively Coupled Argon Plasma Spectrometer (ICAP) and Atomic Absorption Spectrophotometer (AAS)

The ICAP and AAS are standardized for the metal of interest by the analysis of a set of calibration standards prepared by diluting a stock solution of known concentration, or in accordance with instrument manufacturer's recommendations. Three to five working standards are prepared by dilution of the stock standard. The concentration of the calibration standards is chosen so as to cover the working range of the instrument. Subsequently, all sample measurements are made within this working range. Once the working standards are prepared, they are analyzed on the ICAP or AAS and the instrument response is calibrated to provide a direct readout in micrograms of metal per milliliter of water or parts per million.

The calibration is accomplished by inputting the metal concentration equivalent to the readout in absorbance/emission units during analysis of the working standards.

Once the instrument has been initially calibrated, the analysis of the working standards is repeated during sample analysis to standardize instrument response during analysis and to confirm the calibration settings. A typical analysis sequence is presented below:

- Working standards are prepared by dilution of a stock standard solution of the metal of interest.

- A calibration curve within the working range of the instrument is established by analysis of three to five working standards.
- The working standards are reanalyzed to confirm the calibration settings. If the calibration settings are not confirmed, the instrument is recalibrated.
- The samples are analyzed for the metal of interest.
- During sample analysis, a midpoint standard is analyzed to monitor instrument stability. If the analysis indicates the instrument calibration has changed, the instrument is recalibrated and the analysis is repeated.
- Following completion of the sample analyses, the working standards are reanalyzed to confirm calibration settings. If calibration settings are confirmed, the analysis is completed. However, if the calibration settings are not confirmed, the problem is corrected, and the analyses are repeated.
- Analysis data may be input (if available) into a computer data file for later calculation and normalization for matrix effects.

8.3 Periodic Calibration. Periodic calibration shall be performed for equipment such as balances, thermometers, ovens, and furnaces that are required in analytical methods, but which are not routinely calibrated as part of the analytical procedure. Documentation of calibration shall be kept for each equipment item.

Calibration requirements are determined within each ITAS laboratory depending upon the equipment used and its operating function.

9.0 Analytical Methods, Precision, Accuracy and Completeness Objectives

Table 9.1 summarizes the analytical method references and the corresponding quality assurance objectives for the parameters to be analyzed off-site. The quality assurance objectives are expressed in terms of precision, accuracy and completeness.

TABLE 9.1. ANALYTICAL METHOD REFERENCES, PRECISION, ACCURACY AND COMPLETENESS OBJECTIVES OF OFF-SITE ANALYSIS

Parameter	Method (1)	Description	Precision Objective (2)	Accuracy Objective (3)	Completeness Objective (4)
Aromatic Volatile Organics	A 5030/8020	Purge and Trap Gas Chromatography/Photoionization Detection	35	25	90
Halogenated Volatile Organics	A 5030/8010	Purge and Trap Gas, Chromatography/Electrolytic Conductivity Detection	35	25	90
Total Leachable Cyanide	B 412 (p 329)	Leaching procedure	-	-	-
	A 9010	Colorimetric	10	10	95
Extraction Procedure (EP) Toxicity Test	A 1310	Extraction Procedure	-	-	-
Arsenic	A 7060	Furnace Atomic Absorption Spectroscopy (FAAS)	20	25	95
Barium	A 6010	Inductively Coupled Argon Plasma Spectroscopy (ICP)	20	25	95
Cadmium	A 6010	ICP	20	25	95
Chromium (Total)	A 6010	ICP	20	25	95

(1) A = "Test Methods for Evaluating Solid Waste (SW-846)", Third Edition, Office of Solid Waste and Emergency Response, USEPA, November 1986

B = Standard Methods for the Examination of Water and Wastewater, Sixteenth Edition, 1985.

(2) Expressed as Relative Percent Difference of duplicate measurements made on a single laboratory sample.

(3) Expressed as Percent Error.

(4) Percent Completeness = $\frac{\text{Valid Data Obtained}}{\text{Total Data Planned}} \times 100$

TABLE 9 1 (Continued). ANALYTICAL METHOD REFERENCES, PRECISION, ACCURACY AND COMPLETENESS OBJECTIVES OF OFF-SITE ANALYSIS

Parameter	Method (1)	Description	Precision Objective (2)	Accuracy Objective (3)	Completeness Objective (4)
Lead	A 7421	FAAS	20	25	90
Mercury	A 7470	Cold Vapor AAS	20	25	95
Selenium	A 7740	FAAS	20	25	95
Silver	A 6010	ICP	20	25	95
Hexavalent-Chromium	A 7196	Colormetric	10	10	95

(1) A = "Test Methods for Evaluating Solid Waste (SW-846)", Third Edition, Office of Solid Waste and Emergency Response, USEPA, November 1986

B = Standard Methods for the Examination of Water and Wastewater, Sixteenth Edition, 1985.

(2) Expressed as Relative Percent Difference of duplicate measrements made on a single laboratory sample.

(3) Expressed as Percent Error.

(4) Percent Completeness = $\frac{\text{Valid Data Obtained}}{\text{Total Data Planned}}$ X 100

10.0 Data Reduction, Validation, and Reporting

This section describes data reduction, validation, and reporting procedures which will be used at the Laboratory. Primary responsibility for implementation of these procedures within the laboratory will reside with the Laboratory Manager. The principal points of contact between the Contracting Officer and QA Program Manager will be the Laboratory Manager and the Laboratory Quality Control Program Manager.

10.1 Data Validation. Data validation begins with the processing of data and continues through review of the data and the reporting of analytical results. Data processing can be performed by the Analyst who obtained the data or another Analyst. Data review starts with an Analyst independent of the data acquisition and processing, reviewing (validating) that data processing has been correctly performed and continues through verifying that the reported analytical results correspond to the data acquired and processed. Final review of the data to be reported is by the Project Manager.

As stated, the first step in validation is data processing. In general, data will be processed by an Analyst in one of the following ways:

- Manual computation of results directly on the data sheet or on calculation pages attached to the data sheets

- Input of raw data for computer processing
- Direct acquisition and processing of raw data by a computer.

If data are manually processed by an Analyst, all steps in the computation shall be provided including equations used and the source of input parameters such as response factors, dilution factors, and calibration constants. If calculations are not performed directly on the data sheet, calculations should be attached to the data sheets.

The Analyst shall sign (full signature) and date in ink each page of calculations.

For data that are input by an Analyst and processed using a computer, a copy of the input shall be kept and uniquely identified with the project number and other information as needed. The samples analyzed shall be evident and the input signed and dated by the Analyst.

If data are directly acquired from instrumentation and processed, the Analyst shall verify that the following are correct: project and sample numbers, calibration constants and response factors, output parameters such as units and numerical values used for detection limits (if a value is reported as less than). The Analyst shall sign and date the resulting output.

10.1.1 Review of Data Processing. Following is a discussion of the method to be used for reviewing (checking) data

processing. At least 20 percent of all data shall be checked in this manner. If, during the checking process, errors are determined, checking shall be completely (100 percent) performed for the data set.

- The Analyst performing the data processing shall give an Analyst independent of the work the data package. The package shall include, as appropriate, raw data, data sheets, strip charts, computer input/output, calculations, sources for input parameters such as response factors, etc.

- The independent Analyst (checker) shall review the data for:

  - Appropriateness of equations used

  - Correctness of numerical input

  - Numerical correctness of all calculations. This should be done by reperforming numerical computations.

  - Correct interpretation of strip charts, etc.

- All entries and calculations that the checker reviews shall be marked in ink with a check mark. The checking process must be thorough enough to validate that the results are correct. If the checker disagrees with any part of the computations, the checker shall mark through the number with a single line and place the revised number above it.

- Any changes made by the checker shall be backchecked by the originator. If the originator agrees with the change, no action is necessary. If the originator disagrees, the originator and checker must resolve the difference so they agree with the result presented.

- The checker shall sign originals and date in ink all pages of the data package (except for groups of printout such as chromatograms). Signing and dating indicates that reviewer agrees with the calculations and that any changes made have been agreed to by the originator.

- If the data have been processed by computer, the reviewer shall check every input entry. Agreement should be indicated by a check mark for every line. If the checker disagrees with the input, the number should be marked through with a line and corrected number indicated above it. Corrections must be backchecked by the originator as discussed above.

- If an input error is identified and the data have been processed, it will be necessary to reprocess the data. In this event, the checker shall mark the second set of input to indicate agreement with the input changes. The checker shall sign and date in ink the computer input to indicate agreement.

- Raw data that are automatically acquired and processed do not require any validation at this point beyond that previously discussed.

10.1.2 Review of Data Reporting. Review of data reports is required to verify that information reported by the Laboratory corresponds with processed analytical results. Review is only required of the data as it is presented for issuance. Intermediate steps performed after the processed data are checked to prepare the data report (such as data summaries) do not require validation. Preparation of the report is the responsibility of the Laboratory QA Manager or her designated representative.

After the draft data report is prepared (generally in tabular form), the reported results should be checked against the reviewed processed data so that transcription errors do not occur. The checking process follows:

- Using the draft report, all data entries are checked by an Analyst. The checker is not required to be independent of the work because only the transcription from the reviewed data to the data report is being checked.

- The draft data report should be checked so that the items cited for data presentation in Section 10.2 are complete and correct. As the reviewer checks the entries on the draft report, an ink checkmark is placed beside each correct entry. Corrected entries are marked through with a single line and the correct entry provided. The reviewer will indicate that corrections have been made in the report by placing a second check mark by the correction after comparing the change with the revised copy. The checker shall sign and date every page of the data report in ink.

- Use of the draft data report results in a checkprint which should be maintained as a record to demonstrate the review.

- If data printouts, such as chromatograms or GC/MS data processing, are included in the data report, review is not required for the data printout.

- If computer output is used directly as the data report without further transcription, only the input requires review as discussed in Section 10.1.1.

After checking of the data report is complete, it is given to the Laboratory QA Manager or her designated representative for final review. This step is not intended to verify the reported data. This review is intended to determine that the report meets project requirements. The data report is approved for issue by the Laboratory QA Manager.

10.2 Data Reporting. The following are applicable to data presentation:

- The final presentation shall be checked in accordance with data verification requirements of Section 10.1.2 and approved by the Laboratory QA Manager.
- Data will be presented in a tabular format whenever possible.
- Each page of data will be identified with the project number and name; date of issue; and, if appropriate, client name.
- Data presentation will include:
  - Sample identification number used by the Laboratory and/or the sample identification provided to the Laboratory, if different than identification used in the Laboratory
  - Chemical parameters analyzed, reported values, and units of measurement
  - Detection limit of the analytical procedure if the reported value is less than the detection limit
  - Data for a chemical parameter are reported with consistent significant figures for all samples
  - Results of Quality Control sample analysis if appropriate
  - Achieved accuracy, precision, and completeness of data if appropriate
  - Footnotes referenced to specific data if required to explain reported values.
- Data will be transmitted from the laboratory only by the Laboratory Manager.

11.0 Quality Assurance/Quality Control Procedures

11.1 Quality Control Procedures

All analyses performed in support of this program will be done using standardized laboratory procedures. The QC program will make use of QC samples which are both known and unknown, or "blind", to the laboratory. These QC samples include: calibration check samples, laboratory control samples, method blanks, field blanks, trip blanks, replicates, matrix spike/matrix spike duplicates and surrogate spikes. The various types of both field and laboratory generated QC samples are described below.

FIELD GENERATED QC SAMPLES FOR OFF-SITE ANALYSES

a. One (1) trip blank with every batch of samples (both water and sludge) sent to the laboratory for the analysis of volatile organics. **Definition of trip blank:** Two 40 ml septum vials are filled with laboratory-pure, analyte-free water, transported to the site, handled like a sample, and returned to the laboratory for analysis of volatiles (trip blanks are not to be opened in the field).

b. One (1) set of equipment blanks for every day of sampling if a device other than the sample container is required to collect the sample. **Definition of Equipment Blank:** laboratory-pure, analyte-free, water is poured into the sampling device, or pumped through it (in the case of sampling pumps), transferred to the sample bottle, and then transported to the laboratory for analysis. The equipment blanks (also called De-Con blanks) are analyzed for the same parameters as the samples.

c. Ten (10) percent field duplicates for all sample types and all parameters. **Definition of Duplicate:** two samples collected independently at a sampling location during a single episode of sampling. Field duplicates shall be indistinguishable from other analytical samples so that personnel performing the analyses are not able to determine which samples are duplicates.

OFF-SITE LABORATORY GENERATED QC SAMPLES

a. One (1) Laboratory Control Standard (LCS) for every batch of samples analyzed for all parameters. **Definition of LCS:** Solutions prepared by adding known quantities of EMSL-Cincinnati or NBS Standard Reference or independently prepared stock materials to deionized water. The LCS are routinely used to establish that an instrument or procedure is in Control before analysis of samples begins. The analyst notes the LCS result in the instrument logbook and on the Control chart; the result must be within Control limits before sample analysis begins. An LCS is normally carried through the entire sample preparation and analysis procedure.

b. One (1) calibration check sample (CCS) for every 10 samples analyzed sequentially for inorganic parameters. **Definition of CCS:** one of the working calibration standards is periodically re-analyzed and the subsequent values used to demonstrate that the original calibration is still valid.

c. One (1) method/reagent blank for every batch of samples analyzed for all parameters. **Definition of method Blank:** laboratory-pure, analyte-free water carried through the entire preparation and analysis procedure.

d. Ten (10) percent laboratory replicates for all samples. **Definition of Replicate:** a single sample (e.g., one particular aliquot) is collected, then divided into two equal parts for the purpose of determining analytical precision. Replicate samples are often called "Splits" if each half of the replicate is sent to separate labs for independent analysis. Laboratory replicates can be indistinguishable from other analytical samples so that personnel performing the analyses are not able to determine which samples are replicates.

e. One (1) matrix spike and one (1) matrix spike duplicate for every ten (10) samples analyzed for volatile organics (a minimum of one per matrix).

f. One (1) matrix spike for every (10) samples analyzed for metals (a minimum of one per matrix).

g. One (1) matrix spike for every batch of samples analyzed for inorganic general chemistry parameters (cyanide and hexavalent chromium).

Every blank, standard and environmental sample analyzed for organics (including matrix spike/matrix spike duplicate samples) shall be spiked with surrogate compounds prior to purging or extraction. Surrogates shall be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries shall fall within the control limits set in accordance with procedures specified in the method or within ±20 percent for samples falling within the quantitation limits without dilution.

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12.0 Performance and Systems Audits

Audits of an analytical laboratory are described as:

- Performance audits conducted on an ongoing basis within the laboratory by the Quality Control Coordinator.
- System audits performed on a scheduled, periodic basis by the Contracting Officer and Laboratory Quality Assurance Managers.

The Laboratory will receive at least one performance audit during the period of performance of the analyses of project samples. The performance audit will cover all target parameters of the site investigation. The Laboratory QA Program Manager will collect the information and reports from these audits conducted by the Laboratory Quality Assurance Manager for project files and followup as necessary. Connecticut DEP may conduct its own independent performance audits. In addition, the Laboratory QA Program Manager will conduct at least one system audit of the Laboratory during the period of performance. He may be accompanied by the Contracting Officer and Connecticut DEP personnel, or the latter may conduct their own independent systems audit.

The content and conduct of the audits are discussed below.

12.1 Performance Audits. The inorganic and organic laboratory supervisors are responsible for the preparation of Quality Control samples, insertion into the sample stream, and analysis of the results. The samples are analyzed on a daily, ongoing basis and provide the means for demonstrating data quality by statistical analyses.

To complete internal laboratory reviews, the Quality Assurance Manager shall provide ongoing monitoring of the Laboratory Manager to verify that the laboratory Quality Assurance Program is implemented and functioning on a daily basis. The review is intended to be a spot check and should include:

- Sample maintenance
  - Are stated temperatures for sample storage provided?
  - Are samples processed and tested within prescribed holding times?
- Calibration
  - Is calibration data documented in instrument log books, or as part of project data if required?
  - Do calibration results indicate a trend in instrument performance?
- Preventive maintenance
  - Are adequate spare parts available?
  - Do specific instruments have repeated maintenance problems?
  - Is preventive maintenance performed and properly documented?
- Receipt and storage of standards, chemicals, and gases
  - Are all reagents, chemicals, and gases purchased for use in the laboratory of adequate grade for the intended use?
  - Are certifications of material compositions provided when required?

- Are materials adequately stored to prevent degradation?
- Are materials kept beyond stated shelf life?
- Are internal standards kept beyond stated shelf life?

• Data verification

- Are data processed and validated as prescribed?

• Records management

- Are the records of analyses complete and properly identified?
- Are documents submitted to the record system in a timely manner and are they properly maintained?

Nonconformances observed by the Laboratory Quality Assurance Manager shall be reported to the Laboratory Manager or Quality Assurance Program Manager, if necessary, for corrective action to be taken. The Laboratory Quality Assurance Manager shall keep a log of nonconformances observed. The log shall document the nonconformance; date of occurrence; reason for occurrence, if known; date of corrective action; and the corrective action taken.

12.2 System Audits. System audits shall be conducted by the Quality Assurance Program Manager. These audits shall be on a semiannual basis and provide a thorough overview of implementation of the Quality Assurance Program within the laboratory. The audit will focus only on the performance of the laboratory for the project.

System audits will review operation of the laboratory and resulting documentation, including all items reviewed by the Laboratory Quality Assurance Manager. Particular emphasis will be placed upon implementation of the the Quality Control sample program and nonconformance log. Review of these aspects of the laboratory Quality Assurance Program should indicate trends adverse to data quality.

13.0 Preventive Maintenance

Table 13.1 summarizes requirements for the preventive maintenance of analytical instrumentation associated with this project.

TABLE 13.1 MINIMUM PREVENTIVE MAINTENANCE REQUIREMENTS

Instrument	Maintenance	Frequency	Documentation	Reference
Atomic Absorption Spectrophotometer	Check nebulizer, mixing chamber and burner system	Daily	Log Book	Manufacturer's Manual
	Clean nebulizer, mixing chamber and burner system	As required	Log Book	Manufacturer's Manual
	Check drain trap and waste-vessel	Daily	Log Book	Laboratory SOP
	Empty waste-vessel	As required	NA	NA
	Inspect/clean sample compartment windowns	Inspect daily; clean weekly	Log Book	Manufacturer's Manual
	Check gas supplies	Daily	Log Book	Laboratory SOP
Heated Graphite Furnace	Check plumbing	Whenever turned on	Log Book	Manufacturer's Manual
	Clean/replace graphite tubes	As required	Log Book	Manufacturer's Manual
	Clean atomizer windows	Daily	Log Book	Manufacturer's Manual
	Inspect/clean sample compartment windowns	Inspect daily, clean weekly	Log Book	Manufacturer's Manual
	Check argon flow	Daily	Log Book	Manufacturer's Manual
Inductively Coupled Plasma Spectrophotometer	Inspect chamber, nebulizer and torch assembly	Daily	Log Book	Manufacturer's Manual
	Check optics	Daily	Log Book	Manufacturer's Manual
	Check pumps	Daily	Log Book	Manufacturer's Manual
	Check exhaust	Daily	Log Book	Manufacturer's Manual
Gas Chromotagraphs	Condition moisture trap	2 months, or when gas source is changed	Log Book	Manufacturer's Manual
	Repack moisture trap	Every 10 conditionings	Log Book	Manufacturer's Manual

TABLE 13.1 (Continued). MINIMUM PREVENTIVE MAINTENANCE REQUIREMENTS

Instrument	Maintenance	Frequency	Documentation	Reference
Gas Chromotagraphs (Continued)	Condition chemical filter	2 months, or when gas source is changed	Log Book	Manufacturer's Manual
	Leak check carrier and support gases	As required	Log Book	Manufacturer's Manual
	Adjust air solenoid	Initial set-up or when flow conditions change	Log Book	Manufacturer's Manual
	Condition column	When column is changed or when chrometographic conditions or samples require	Log Book	Manufacturer's Manual
	Repack/Replace column	As required	Log Book	Manufacturer's Manual
	Injection Port			
	Clean injection port	As required	Log Book	Manufacturer's Manual
	Replace septum	Every 20 Manual Injections, or as required	Log Book	Manufacturer's Manual
	Leak check injection port	As required	Log Book	Manufacturer's Manual
	Capillary Inlet			
	Leak test inlet	As required	Log Book	Manufacturer's Manual
	Replace septum	Weekly, or as required	Log Book	Manufacturer's Manual

TABLE 13.1 (Continued). MINIMUM PREVENTIVE MAINTENANCE REQUIREMENTS

Instrument	Maintenance	Frequency	Documentation	Reference
Gas Chromotagraphs (Continued)	Clean insert	Whenever insert is changed	Log Book	Manufacturer's Manual
	Replace insert seal	Whenever leak occurs, or damage is apparent	Log Book	Manufacturer's Manual
	Atmosampler			
	Align transport stops	As required	Log Book	Manufacturer's Manual
	Needle positioning	On installation, then as required	Log Book	Manufacturer's Manual
	Detectors			
	Leak check FID/NPD	As required	Log Book	Manufacturer's Manual
	Clean FID	As required	Log Book	Manufacturer's Manual
	Clean FID/NPD jet	2 months for capillary as required for packed columns	Log Book	Manufacturer's Manual
	Clean FID collector	As required	Log Book	Manufacturer's Manual
	Clean FID/NPD Air/H_2 controls	As required	Log Book	Manufacturer's Manual
	Adjust FID/NPD solenoids	Initial set-up or when flow conditions change	Log Book	Manufacturer's Manual
	Evaluate ECD carrier gas	When carrier gas is changed	Log Book	Manufacturer's Manual

TABLE 13.1 (Continued). MINIMUM PREVENTIVE MAINTENANCE REQUIREMENTS

Instrument	Maintenance	Frequency	Documentation	Reference
Gas Chromotagraphs (Continued)	Leak check ECD	When column is changed	Log Book	Manufacturer's Manual
	Thermal clean ECD	Monthly	Log Book	Manufacturer's Manual
	NRC wipe test ECD	6 months	Log Book	Manufacturer's Manual
pH Meter	Check electronics Change electrolyte	Daily Checked weekly, changed when low	Log Book Log Book	Manufacturer's Manual Manufacturer's Manual
Analytical Balance	Service internal weight train, gears, electronics	Annual service	Log Book, service sticker	Manufacturer's Manual

14.0 Routine Procedures for Assessing Precision, Accuracy and Completeness

Following are the procedures recommended for evaluating the precision and accuracy of all environmental measurement data generated in the project. Quality control sample analyses are performed as appropriate for organic or inorganic sample analyses as discussed in Section 11. The protocol used will be in accordance with specific analytical procedures if QC requirements are stated in the procedure.

14.1 Review of QC Samples Data. When the analyses of a sample set are completed, the results will be reviewed and evaluated to assess the validity of the data set. Review is based on the criteria in Section 11, applied as follows:

- Method Blank Evaluation - The reagent and/or method blank results are evaluated for high readings #haracteristic of background contaminations. If high blank values are observed, laboratory glassware and reagents will be checked for contamination and the analysis halted until the system is brought under control before further sample analysis proceeds. A high background is defined as a background value sufficient to result in a difference in the sample value, if not corrected, greater than or equal to smallest significant digit known to be true.

- Field Blank Evaluation - Field blank results are evaluated for high readings similar to the reagent and/or method blanks described above. If high field blank readings are encountered, the procedure for sample collection, shipment, and laboratory analysis should be reviewed. If both the reagent and/or method blanks and the field blanks exhibit significant background contamination, the source of contamination is probably within the laboratory.

- Matrix Spike Evaluation - The observed recovery of the spike versus the theoretical spike recovery is used to calculate accuracy as defined by the percent recovery. If the average accuracy value exceeds the acceptance criteria for the given parameters (Table 9.1) the Quality Control Coordinator is notified. The sample set may be reanalyzed for the parameter in question.

- Calibration Standard Evaluation - The calibration curve is evaluated to determine linearity through its full range, and to verify that sample values are within the range defined by the low and high standards. If the curve is not linear, as defined in Section 8.1, sample values must be corrected for nonlinearity by deriving sample concentrations from a graph or by using an appropriate algorithm to fit a nonlinear curve to the standards.

- Replicate Sample Evaluation - Duplicate sample analysis for the sample set is used to determine the precision of the analytical method for the sample matrix. The duplicate results are used to calculate the precision as defined by the relative percent difference (RPD). If the precision value exceeds the acceptance criteria for the given parameter (Table 9.1), the Quality Control Coordinator is notified. The sample set may be reanalyzed for the parameter in question. Attainable precision limits will be specified by the Quality Control Coordinators and updated periodically following review of data.

- Blind Replicate Evaluation - The blind replicate analysis is evaluated in the same manner as described above for the duplicate sample analysis and is treated as a duplicate result for purposes of evaluating the precision of the analytical method. This evaluation is performed independently by the Quality Control Coordinator.

- Reference Standard Evaluation - Standard Reference Materials analyses are compared with true values and acceptable ranges. Values outside the acceptable ranges require corrective action to determine the source of error and provide corrective action. All sample analyses should be halted pending this evaluation.

Following correction of the problem, the Standard Reference Material should be reanalyzed.

- Check Standard Evaluation - The results of check standard analysis are compared with the true values, and the percent recovery of the check standard is calculated. If correction is required, the check standard should be reanalyzed to demonstrate that the corrective action has been successful.

- Surrogate Standard Evaluation - The results of surrogate standard determinations are compared with the true values spiked into the sample matrix prior to extraction and analysis and the percent recoveries of the surrogate standards are determined.

14.2 Evaluation of Completeness. Completeness is calculated as the percentage of total usable data points out of the set of total data points collected and analyzed and available. Data points may not be usable if analytical results show samples exceeded holding times, or if quality control sample criteria were not met and reanalysis of samples is not possible, or if samples were broken in the lab.

15.0 Corrective Action

A nonconformance is any event which is beyond the limits established for laboratory operation. Nonconformances can be due to data which lie outside accepted bounds for accuracy and precision, improper equipment calibration or maintenance, or improper data verification. Any activity in the laboratory which affects data quality can result in a nonconformance.

Nonconformances associated with the statistical analysis and review of data are straightforward to identify. The Laboratory Quality Assurance Manager will be responsible for assessment of Quality Control sample information. If data lie outside accepted limits, the Laboratory Quality Assurance Manager shall immediately notify the Laboratory Manager or her designated representative. If the situation is not corrected so that an out-of-control condition occurs, or is expected to, the Laboratory Quality Assurance Manager shall notify the Laboratory Manager. The Laboratory Manager or his designated representative is responsible for action. Completion of corrective action should be evidenced by data returning to prescribed acceptable limits.

Nonconformances which do not readily result in an observed impact on data quality are more difficult to identify. Such events could be samples stored at an incorrect temperature or

held beyond prescribed holding times. All laboratory staffs have responsibility for proper maintenance of records. Everyone in the laboratory is responsible for reporting "system" nonconformances. Analysts should report nonconformances to the Laboratory Manager or his designated representative. Corrective action is again the responsibility of the Laboratory Manager or his designated representative. They shall review and approve the action taken.

Documentation of the nonconformance and the corrective action taken shall be prepared if the nonconformance directly affects data quality.

Nonconformances and required corrective action can also result from the ongoing laboratory review of the Laboratory Quality Assurance Manager and audits performed by the Quality Assurance Program Manager. These activities are discussed in Section 14.

16.0 Quality Assurance Reports to Management

The analytical work on this project will last longer than one calendar month, so monthly progress reports will be provided. The report will summarize the status of all the samples in the project, the number of samples from the project analyzed during the month, samples received during the month, samples reported during the month, the number of samples scheduled for the following month, the number and types of QC samples analyzed during the month, and any unacceptable or unusual QC or sample results. The monthly laboratory analysis report may be incorporated into monthly project progress report.

A summary report describing the performance of measurement systems and data quality will be prepared for inclusion in the final report. This report will address, at a minimum, the following:

- Results of performance audits of all field sampling and laboratory analysis activities performed during the subject reporting period

- Results of systems audits
- Assessment of measurement data accuracy, precision, and completeness, including review of all Aqualab Laboratory measurement data
- Significant QA problems and corrective actions.

APPENDIX A

STANDARD OPERATING PROCEDURES

FOR DECONTAMINATION

STANDARD DECONTAMINATION PROCEDURES

1. GENERAL

1.1 Introduction

The cleaning procedures outlined in this section are to be used by all field personnel to clean sampling and other field equipment as well as sample containers prior to field use.. Sufficient clean equipment and sample containers should be transported to the field so that an entire investigation can be conducted without the need for cleaning equipment in the field. However, this will not always be possible when using specialized field equipment. Field cleaning procedures are included to cover these special problem areas.

These procedures are the standard operating procedures (SOP) for this project; any deviation from them must be documented in field records and investigative reports.

1.2 Cleaning Materials

The cleaning materials referred to throughout this section are defined in the following paragraphs.

Tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute for tap water.

The laboratory detergent shall be a standard brand of phosphate-free laboratory detergent such as Sparkleen® or Liquinox®. The use of any other detergent must be justified and documented in the field log books.

The nitric acid solution shall be made from ACS reagent-grade nitric acid and deionized water.

The standard cleaning solvent shall be reagent-grade isopropanol. However, solvents may be substituted for a particular investigation if needed. Pesticide-grade acetone or methanol may be acceptable. However, it should be noted that if pesticide-grade acetone is used, the detection ofof acetone in samples collected with acetone rinsed equipment is suspect. Pesticide-grade methanol is much more hazardous to use than either pesticide-grade isopropanol or acetone, and its use is discouraged. Pesticide-grade hexane and petroleum ether are not miscible with water; therefore, these two solvents are not effective rinsing agents. The use of any solvent other than pesticide-grade ispropanol for equipment cleaning purposes must be justified and its use must be documented in field log books and inspection or investigation reports.

Deionized water is defined as tap water that has been treated by passing it through a standard deionizing resin column. Most commercial systems utilize a 5-micron prefilter followed by a mixed bed deionization unit to produce deionized water. The deionized water should contain no heavy metals or other inorganic compounds. Organic-free water is defined as tap water that has been treated with activated carbon and deionizing units. Usually, commercial units utilize a 5-micron prefilter, activated carbon unit, two mixed bed deionizing units (in series), a 0.2 micron post filter, and a postcarbon filter to produce organic-free water. Organic-free water should contain no pesticides, herbicides, extractable organic compounds, and less than 50 ug/l of purgeable organic compounds as measured by a low level GC/MS scan.

The brushes used to clean equipment as outlined in the various sections of this appendix shall not be of the wire-wrapped type.

The solvent, nitric acid solution, laboratory detergent, and rinse waters used to clean equipment shall not be reused, except as specifically permitted in the footnote for Step 3. Section 3.

1.3 Marking of Cleaned Sampling Equipment and Containers

All equipment and sample containers that are cleaned utilizing these procedures shall be labeled or marked with the date that the equipment was cleaned. Also, if there was a deviation from the standard cleaning procedures outlined in this appendix, this fact should be noted on the label.

When sample containers are cleaned and prepared, they should be cleaned in standard sized lots to facilitate the quality control procedures outlined in Section 2.

1.4 Marking and Segregation of Used Field Equipment

Field or sampling equipment that needs to be repaired shall be identified with a red tag. Any problems encountered with the equipment and needed repairs shall be noted on this tag. Field equipment or reusable sample containers needing cleaning or repairs shall not be stored with clean equipment' sample tubing, or sample containers. Field equipment, reusable sample containers, disposable sample containers, and sample tubing that are not used during the course of an investigation may not be replaced in storage, without being recleaned if these materials have been transported to a facility or study site where herbicides, pesticides, organic compounds, or other toxic materials are present or suspected of being present.

1.5 Decontamination of Equipment Used to Collect Samples of Toxic or Hazardous Waste

Equipment that is used to collect samples of hazardous materials or toxic wastes or materials from hazardous waste sites, RCRA facilities, or in-process waste streams shall be decontaminated before it is returned from the field. At a minimum, this decontamination procedure shall consist of washing with laboratory detergent and rinsing with tap water. More stringent decontamination procedures may be required, depending on the waste sampled.

1.6 Proper Disposal of Cleaning Materials

The solvent used to rinse sampling equipment and containers shall be collected and disposed of by allowing it to evaporate under a fume hood or be containerized and disposed of through an approved hazardous waste disposal contract. Similarly, spent nitric acid shall be collected and disposed of through the same disposal contract. These procedures apply whether the cleaning operations take place in a laboratory or in the field.

1.7 Use of Safety Procedures to be Utilized During Cleaning Operations

The materials used to implement the cleaning procedures outlined in this appendix can be dangerous if improperly handled. Caution must be exercised by all personnel and all applicable safety procedures shall be followed. At a minimum, the following precautions shall be taken in the lab and in the field during these cleaning operations:

1. Safety glasses with splash shields or goggles, neoprene gloves, and a neoprene laboratory apron will be worn during all cleaning operations.
2. All solvent rinsing operations will be conducted under a fume hood or in the open (never in a closed room).
3. No eating, smoking, drinking, chewing, or any hand to mouth contact shall be permitted during cleaning operations.

1.8 Storage of Field Equipment and Sample Containers

All field equipment and sample containers shall be stored in a contaminant free environment after being cleaned using the procedures outlined in this section.

2. SPECIFIC QUALITY CONTROL PROCEDURES FOR CLEANING OPERATIONS

2.1 Sampling Equipment Cleaned in the Field

The effectiveness of field cleaning procedures shall be monitored by rinsing field cleaned equipment with organic-free water and submitting the rinse water in standard sample containers to the laboratory for Analysis. Any time equipment is cleaned in the field, at least one such quality control sample should be collected. No more than five percent of the equipment cleaned during large scale field studies shall be subjected to these procedures.

3. CLEANING PROCEDURES FOR STAINLESS STEEL OR METAL SAMPLING EQUIPMENT USED FOR THE COLLECTION OF SAMPLES FOR TRACE ORGANIC COMPOUNDS AND/OR METALS ANALYSES*

1. Wash equipment thoroughly with laboratory detergent and hot water using a brush to remove any particulate matter or surface film.
2. Rinse equipment thoroughly with hot tap water.
3. Rinse equipment thoroughly with deionized water.

4. Rinse equipment twice with solvent and allow to air dry.
5. Wrap equipment completely with solvent rinsed aluminum foil to prevent contamination during storage and/or transport to the field.
6. Rinse the stainless steel or metal sampling equipment thoroughly with tap water in the field as soon as possible after use.

4. MISCELLANEOUS EQUIPMENT CLEANING PROCEDURES

4.1 Ice Chests and Shipping Containers

All ice chests and reusable containers will be washed with laboratory detergent (interior and exterior) and rinsed with tap water and air dried before storage. In the event that an ice

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* - When this sampling equipment is used to collect samples that contain oil, grease or other hard to remove materials, it may be necessary to rinse the equipment several times with pesticide grade acetone or hexane to remove the materials before proceeding with Step 1. In extreme cases, when equipment is painted, badly rusted, or coated with materials that are difficult to remove, it may be necessary to steam clean, wire brush, or sandblast equipment before proceeding with Step 1. Any stainless steel or other sampling equipment that cannot be cleaned using these procedures should be discarded.

chest becomes severely contaminated, in the opinion of the field investigator, with concentrated waste or other toxic material, it shall be cleaned as thoroughly as possible and disposed of properly.

4.2 Vehicles

All vehicles utilized in the field should be washed (if possible) at the conclusion of each field trip. This routine maintenance should minimize any chance of contamination of equipment or samples due to contamination of vehicles. When vehicles are used in conjunction with hazardous waste site inspections, or on studies where toxic materials are known or suspected to be present, a thorough interior and exterior cleaning is mandatory at the conclusion of such investigations. It shall be the responsibility of the project leader and/or field investigators to see that this procedure is followed.

APPENDIX B

REQUIRED CONTAINERS PRESERVATION TECHNIQUES, AND HOLDING TIMES

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES - ORGANIC TESTS[8]

Parameter name	Container[1]	Preservation[2][3]	Maximum holding time[4]
Purgeable halocarbons	G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	14 days
Purgeable aromatics	G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$, HCl to pH 2[9]	14 days
Acrolein, acrylonitrile	G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$, adjust to pH 4-5[10]	14 days
Phenols[11]	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	7 days until extraction; 40 days after extraction
Benzidines[11]	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	7 days until extraction[13]
Phthalate esters	G, Teflon-lined cap	Cool, 4°C	7 days until extraction; 40 days after extraction
Nitrosamines[11][14]	G, Teflon-lined cap	Cool, 4°C, store in dark, 0.008% $Na_2S_2O_3$[5]	
PCBs[11]	G, Teflon-lined cap	Cool, 4°C	7 days until extraction; 40 days after extraction
Nitroaromatics and isophorone	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$,[5] store in dark	7 days until extraction; 40 days after extraction

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES - ORGANIC TESTS[8] (Continued)

Parameter name	Container[1]	Preservation[2][3]	Maximum holding time[4]
Polynuclear aromatic hydrocarbons[11]	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$,[5] store in dark	7 days until extraction; 40 days after extraction
Haloethers[11]	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	7 days until extraction; 40 days after extraction
Chlorinated hydrocarbons	G, Teflon-lined cap	Cool, 4°C	7 days until extraction; 40 days after extraction
TCDD[11]	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	7 days until extraction; 40 days after extraction
Pesticides	G, Teflon-lined cap	Cool, 4°C pH 5-9[15]	7 days until extraction; 40 days after extraction

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES,
AND HOLDING TIMES - ORGANICS (Continued)

Parameter name	Container(1)	Preservation(2)(3)	Maximum holding time(4)
Acid extractables	G, Teflon-lined cap	Cool, 4°C	7 days until extraction; 30 days after extraction
Base/neutral extractables	G, Teflon-lined cap	Cool, 4°C	7 days until extraction; 30 days after extraction

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES - BACTERIAL TESTS[8]

Parameter name	Container[1]	Preservation[2][3]	Maximum holding time[4]
Coliform, fecal and total	P, G	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	6 hours
Fecal streptococci	P, G	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	6 hours

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES,
AND HOLDING TIMES - INORGANIC TESTS

Parameter name	Container(1)	Preservation(2)(3)	Maximum holding time(4)
Acidity	P, G	Cool, 4°C	14 days
Alkalinity	P, G	Cool, 4°C	14 days
Ammonia	P, G	Cool, 4°C, H_2SO_4 to pH <2	28 days
Biochemical oxygen demand	P, G	Cool, 4°C	48 hours
Bromide	P, G	None required	28 days
Biochemical oxygen demand, carbonaceous	P, G	Cool, 4°C	48 hours
Chemical oxygen demand	P, G	Cool, 4°C, H_2SO_4 to pH <2	28 days
Chloride	P, G	None required	20 days
Chlorine, total residual	P, G	None required	Analyze immediately
Color	P, G	Cool, 4°C	48 hours
Cyanide, total and amenable to chlorination	P, G	Cool, 4°C, NaOH to pH >12, 0.6 g ascorbic acid(5)	14 days(6)
Fluoride	P	None required	28 days
Hardness	P, G	HNO_3 to pH <2, H_2SO_4 to pH <2	6 months
Hydrogen ion (pH)	P, G	None required	Analyze immediately

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES,
AND HOLDING TIMES - INORGANIC TESTS (Continued)

Parameter name	Container(1)	Preservation(2)(3)	Maximum holding time(4)
Kjeldahl and organic nitrogen	P, G	Cool, 4°C, H_2SO_4 to pH <2	28 days
Metals,(7) except chromium VI and mercury	P, G	HNO_3 to pH <2	6 months
Chromium VI	P, G	Cool, 4°C	24 hours
Mercury	P, G	HNO_3 to pH <2	28 days
Nitrate	P, G	Cool, 4°C	48 hours
Nitrate-nitrite	P, G	Cool, 4°C, H_2SO_4 to pH <2	28 days
Nitrite	P, G	Cool, 4°C	48 hours
Oil and grease	G	Cool, 4°C, H_2SO_4 to pH <2	28 days
Organic carbon	P, G	Cool, 4°C, HCl or H_2SO_4 to pH <2	28 days
Orthophosphate	P, G	Filter immediately, cool, 4°C	48 hours
Oxygen, dissolved probe	G bottle and top	None required	Analyze immediately
Winkler	G bottle and top	Fix on site and store in dark	8 hours
Phenols	G only	Cool, 4°C, H_2SO_4 to pH <2	28 days
Phosphorus (elemental)	G	Cool, 4°C	48 hours

REQUIRED CONTAINERS, PRESERVATION TECHNIQUES,
AND HOLDING TIMES - INORGANIC TESTS (Continued)

Parameter name	Container(1)	Preservation(2)(3)	Maximum holding time(4)
Phosphorus, total	P, G	Cool, 4°C, H_2SO_4 to pH <2	28 days
Residue, total	P, G	Cool, 4°C	7 days
Residue, filterable	P, G	Cool, 4°C	48 hours
Residue, nonfilterable (TSS)	P, G	Cool, 4°C	7 days
Residue, settleable	P, G	Cool, 4°C	48 hours
Residue, volatile	P, G	Cool, 4°C	7 days
Silica	P	Cool, 4°C	28 days
Specific conductance	P, G	Cool, 4°C	28 days
Sulfate	P, G	Cool, 4°C	28 days
Sulfide	P, G	Cool, 4°C add zinc acetate plus sodium hydroxide to pH >9	7 days
Sulfite	P, G	None required	Analyze immediately
Surfactants	P, G	Cool, 4°C	48 hours
Temperature	P, G	None required	Analyze immediately
Turbidity	P, G	Cool, 4°C	48 hours

NOTES TO TABLES OF REQUIRED CONTAINERS,
PRESERVATION TECHNIQUES, AND HOLDING TIMES

1. Polyethylene (P) or Glass (G).
2. Sample preservation should be performed immediately upon sample collection. For composite chemical samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
3. When any sample is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (NHO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).
4. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of samples under study are stable for the longer time, and has received a variance from the Regional Administrator under §136.3(e). Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the samples for a shorter time if knowledge exists to show that this is necessary to maintain sample stability. See §136.3(e) for details.
5. Should only be used in the presence of residual chlorine.
6. Maximum holding time is 24 hours when sulfide is present. Optionally all samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.
7. Samples should be filtered immediately on-site before adding preservative for dissolved metals.
8. Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

NOTES TO TABLES OF REQUIRED CONTAINERS,
PRESERVATION TECHNIQUES, AND HOLDING TIMES (Continued)

9. Sample receiving no pH adjustment must be analyzed within 7 days of sampling.
10. The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.
11. When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to 4°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held 7 days before extraction and 40 days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (re the requirement for thiosulfate reduction of residual chlorine), and footnotes 12, 13 (re the analysis of benzidine).
12. If 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 $\pm$0.2 to prevent rearrangement to benzidine.
13. Extracts may be stored up to 7 days before analysis if storage is conducted under an inert (oxidant-free) atmosphere.
14. For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.
15. The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.

Source: 40 CFR Part 136, Friday October 26, 1984, p. 28

APPENDIX C

HEALTH & SAFETY PLAN

FOR A

SURFACE IMPOUNDMENT CLOSURE

AT

AVCO LYCOMING

NOTE:

This plan is site specific and, at a minimum, meets the requirements of 29CFR1910.120 OSHA.

TABLE OF CONTENTS

HEALTH & SAFETY PLAN

I. GENERAL INFORMATION

SITE: Avco Lycoming Textron

LOCATION: Stratford Connecticut

PREPARED BY: Dan Watton (Metcalf & Eddy) **DATE:** 16 November 1987

OBJECTIVE(S): Health Safety requirements for the closure of AVCO Lycoming Surface Impoundments

PROPOSED DATE OF INVESTIGATION: Spring 1988

BACKGROUND REVIEW: **Complete:** X **Preliminary:** _____ **Incomplete:** _____

II. SITE/HAZARD OVERVIEW

APPARENT HAZARD:		TYPE OF FACILITY:		STATUS OF FACILITY:	
Serious		Imp.	X	Active	X
Moderate	X	Dump		Inactive	
Low		Landfill		Unknown	
None		Open			
Unknown		Enc.			
		Other			

WASTE TYPE(S):		WASTE CHARACTERISTICS:		TYPE/FORM OF HAZARD:	
Gas		Toxic	X	Dust	X
Liquid	X	Corrosive	X	Liquid	X
Sludge	X	Ignitable		Fumes	
Solid		Volatile	X	Vapors	X
Unknown		Radioactive		Contact	X
Other		Reactive		Respiratory	X
		Unknown		Other	
		Other		IDLH	

III. SITE DESCRIPTION & HISTORY

DESCRIPTION:

The AVCO facility is owned by the U.S. Army and operated by Avco Lycoming TEXTRON. The site is located in Stratford Connecticut just west (approximately 1,000 feet) from where the Housatonic River enters Long Island Sound (see Figure 1). The facility activities include the manufacturing of gas turbine engines. The production of these engines includes the plating of parts in zinc, cadmium, chrome, copper, magnesium, nickel, and black oxide baths. The spent plating bath solutions are discharged to an equalization lagoon. The wastewater from this lagoon is then pumped to a chemical waste treatment plant. The waste treatment plant produces a metal hydroxide sludge which is pumped to one of three sludge storage lagoons (surface impoundments). The equalization lagoon and the three storage lagoons are now being closed.

HISTORY:

The operation of the four surface impoundments at AVCO is regulated under the Resource Conservation and Recovery Act (RCRA) since the effective date of these regulations on 19 November 1980. In compliance with the first requirement of RCRA, AVCO submitted a Part A permit application to the U.S. EPA on 13 November 1980. When RCRA was amended by the Hazardous and Solid Waste Amendments of 1984, AVCO submitted a Part B permit application to the U.S. EPA and the Connecticut Department of Environmental Protection (DEP). Until this permit application is reviewed and the final RCRA permit is issued, AVCO is considered to be operating it's four impoundments under "interim status".

FIGURE 1. LOCATION MAP

SOURCE: USGS TOPOGRAPHIC MAPS
MILFORD, CT., 1984
BRIDGEPORT, CT., 1984

AVCO has since modified it's chemical waste treatment plant to include an equalization tank to replace the equalization lagoon, and a filtration process which requires off-site disposal to replace the three sludge lagoons. AVCO now plans to close the four impoundments. These impoundments contain hazardous waste as regulated under 40 CFR.

The closure of these lagoons will require pumping of surface waters for onsite treatment, pumping out sludge for offsite disposal, excavating and decontaminating impoundment pumping equipment, excavating impoundment soils for offsite disposal, and capping impoundments for final closure.

IV. HAZARD EVALUATION

The hazard potential to workers performing surface impoundment closure activities on this site is rated at low to moderate. The highest potential for workers to be exposed to contaminants will be during sludge excavation activities. During these activities, contaminants are likely to be released in the form of vapors and toxic particulates. In addition to air contaminants, the possibility exists for workers to come in contact with contaminated surface waters and sludge. A summary of chemical hazards is provided in Table 1.

Other hazards which workers might encounter include physical injury from heavy equipment, injuries from falls and trips, and injury from heat stress and/or cold stress. Workers should be aware of the symptoms of heat stress and cold stress as provided in Appendix A, and should schedule work rest periods based on weather conditions.

TABLE 1. CHEMICAL HAZARDS

Compound	Route of Exposure	Symptoms/Target Organs
BENZENE	Inhalation Absorption Ingestion Contact	Can cause irritation to eyes, nose, and respiratory system, headaches, nausea, dermatitis, and fatigue. Can result in damage to blood, central nervous system, skin, bone marrow, eyes, and respiratory system. TLV* = 10 ppm [suspected carcinogen]
ETHYLBENZENE	Inhalation Ingestion Contact	Can cause irritation to skin, headaches, insomnia, dermatitis, and muscle fatigue. Can damage central nervous system, kidneys, and skin. TLV = 100 ppm
TRICHLOROETHYLENE	Inhalation Ingestion Contact	Can cause headaches, vertigo, visual distortion, tremors, nausea, and irritation to eyes and skin. Can result in damage to respiratory system, heart, liver, kidneys central nervous system, and skin. TLV = 50 ppm
DICHLOROBENZENE	Inhalation Absorption Ingestion Contact	Can cause irritation to nose, eyes, and skin. Can result in damage to liver, kidneys, skin, and eyes. TLV = 50 ppm

* The TLV (Threshold Limit Value) is defined as the concentration of a chemical in air to which a worker can be exposed 8 hours/day at 40 hours/week without suffering adverse effect. The TLV's given were obtained from the 1987-1988 TLV guide of the American Conference of Governmental Industrial Hygienists.

TABLE 1 (Continued). CHEMICAL HAZARDS

Compound	Route of Exposure	Symptoms/Target Organs
CYANIDE	Ingestion Contact	Can cause weakness, headaches, confusion, nausea, vomiting, slow gasping, asphyxiation, and irritation to eyes and skin. Can cause damage to central nervous system, cardiovascular system, liver, kidneys, and skin. TLV = 5 mg/m^3
CHROME (soluble)	Ingestion Contact	Can cause sensitized dermatitis resulting in skin damage. TLV = 0.05 mg/m^3 [suspected carcinogen]
TOLUENE	Inhalation Absorption Ingestion Contact	Can cause irritation to skin, headaches, insomnia, dematitis, and muscle fatigue. Can damage central nervous system, kidneys, and skin. TVL = 100 ppm

V. SITE SAFETY WORK PLAN

PERSONNEL

General:

The contractor shall identify responsible personnel who will be onsite performing the basin closure activities. These personnel shall include:

RESPONSIBILITY	NAME	TASK DESCRIPTION
Project Manager		Oversee and coordinate all technical aspects of the project.
Corporate Safety Officer		Review project scope of work and assure that all workers understand and comply with the safety plan.
Project Foreman		Coordinate project operations from onsite.
Site Safety Officer		Enforce all aspects of the safety plan and identify new hazards.

SAFETY BRIEFING

A site safety briefing will be held onsite prior to initiating operations. All workers will attend this briefing. Immediately after the discovery of real or potential hazards which were not anticipated, a safety briefing will be held. Prior to any new or non-scheduled operation, a safety briefing will be held.

The safety briefing will present the following information:

- The hazards workers face
- Hazard monitoring techniques
- Personnel protective equipment requirements

- Personnel protective equipment use
- Decontamination procedures
- Safe operation procedures for heavy equipment
- Response to injuries
- Response to fires
- Chain of command

SAFETY TRAINING/MEDICAL SURVEILLANCE

All workers shall participate in a safety training program and a medical surveillance program prior to working on this site. The regulations in 29 CFR 1910.120 (OSHA) shall be complied with regarding worker safety training and medical surveillance. A copy of 29 CFR 1910.120 is provided in Appendix B.

GENERAL SAFETY REQUIREMENTS

- All persons entering and/or working on the site shall read, sign and become familiar with this Health & Safety Plan. The master copy will be available on-site through the Health & Safety Officer.
- No employee or subcontractor may be allowed on-site without the prior knowledge and consent of the site Health & Safety Officer.
- There will be no activities conducted on-site without sufficient backup personnel. At a minimum, two persons must be present at the site.
- All contractor or subcontractor personnel shall bring to the attention of the site Health & Safety Officer or resident project representative any unsafe condition or practice associated with the site activities that they are unable to correct themselves.
- There will be no smoking, eating, chewing gun, or drinking in the restricted area.
- Hands shall be thoroughly cleaned prior to smoking, eating or other activities outside the restricted area.

- Workers must avoid unnecessary contamination (i.e., walking through known or suspected "hot" zones or contaminated puddles, kneeling or sitting on the ground, leaning against potentially contaminated equipment).

- Personnel will be fit tested and issued an individual respirator to ensure a proper face to mask seal prior to work startup.

- Respiratory devices may not be worn with beards, long sideburns, or under the conditions that prevent a proper seal.

- Respiratory devices may not be worn with contact lenses.

- Aerial obstructions such as powerlines will be identified prior to operation of large construction equipment.

- Verification of buried electrical cables, powerlines, utility lines and communications lines will proceed excavation activities.

- At a minimum all construction and excavation activities shall meet the safety requirements in 29 CFR 1926.600-.606 (OSHA).

PERSONNEL PROTECTIVE EQUIPMENT (PPE)

Equipment Staging and Preparation:

All operations required for equipment staging and preparation will be performed in Level D PPE. Level D will consist of the following:

- Hard hat and safety goggles
- Routine work clothing (e.g., coveralls)
- Disposable cotton work gloves
- Neoprene steel toe/steel shank work boots

Basin Surface Water Removal:

Removal of basin surface waters (pumping operations) will be performed in Level D PPE. Level D will consist of the following:

- Hard hat with face splash shield
- Disposable tyvek coveralls over routine work clothing

- Nitrite latex gloves over disposable vinyl gloves
- Neoprene steel toe/steel shank work boots

Sludge and Decommissioned Waste Water Piping Removal:

Removal of basin sludge and associated piping will be performed in Level C PPE. Level C will consist of the following:

- Hard hat
- Disposable tyvek coveralls over routine work clothing
- Nitrate latex gloves over disposable vinyl gloves
- Neoprene steel toe/steel shank work boots
- Full face air purifying respirator equipped with organic vapor/acid gas/toxic particulate filter cartridges or cannisters

Basin Cap Construction:

Construction of the basin cap will be performed in Level D PPE. Level D will consist of the following:

- Hard hat and safety goggles
- Routine work clothing
- Disposable cotton gloves
- Neoprene steel toe/steel shank work boots

MONITORING EQUIPMENT

General:

The site safety officer will monitor the ambient air for total organic vapor concentrations and combustible gasses during all onsite operations. The site safety officer will establish air monitoring frequency based on type of operations being performed. Air monitoring will be performed by a portable

Photo-Ionization Detector (PID) with an electron volt range able to detect BENZENE. A portable combustible gas indicator will also be used to detect percent ranges of the lower explosive limit (LEL).

All monitoring equipment will be operated, maintained an calibrated according to the manufacturers equipment operations manual.

MONITORING CONTINGENCIES

1. Any consistent "continuous reading" detection in the breathing zone of 5 ppm (1/2 the TLV of BENZENE) on the photo-ionization detector will require workers to don LEVEL C protective equipment. Level C will consist of the following:
   - Hard hat
   - Disposable tyvek coveralls over routine work clothing
   - Nitrile latex gloves over disposable vinyl gloves
   - Neoprene steel toe/steel shank work boots
   - Full face air purifying respirator equipped with Organic Vapor/Acid gas/toxic particulate filter cartridges or canisters
2. Any consistent "continuous reading" detection in the breathing zone of 100 ppm on the photo-ionization detector will require workers to egress from the site. The safety officer will then determine the need for additional air monitoring, change work procedures, or the possible use of supplied air breathing equipment for workers.
3. Any detection of 19.5% of greater on the combustible gas indicator will require an egress from the site and notification of AVCO security.

DECONTAMINATION

Personnel:

Personnel decontamination will consist of good work practice, maximum use of disposable clothing, personal hygiene and a field decontamination station

to be used at the completion of each work evolution. Because the likeliest point of personnel contact with contaminants will be the feet and hands, the field decontamination will involve the following steps:

1. Boots will be scrubbed with a water and mild soap solution before they are removed.

2. Outer gloves will be washed with a water and mild soap solution before they are removed.

3. Disposable coveralls will be removed and disposed of in a plastic trash bag.

4. Inner gloves (vinyl surgical) will be removed and disposed of in a plastic trash bag.

The personnel decontamination station will be positioned at a location just outside of the contaminated area and in the clean zone. The components of the decontamination station will consist of:

- Long handle scrub brushes (3 each)
- Metal wash basins large enough to step into (2 each)
- Hand pressurized sprayer (1 each)
- Plastic sheeting (3 rolls)
- Plastic tubs or bowls for washing hands (2 each)
- Plastic trash cans with trash liners (3 each)
- Table (1 each)
- First aid kit (1 each)
- Portable eye wash (2 each)
- Mild soap solution (1 gallon)
- 5 gallon water container (1 each)
- Class A, B, C fire extinguisher (1 each)

Equipment:

All equipment shall be decontaminated before leaving the site. Heavy equipment (trucks, backhoes, etc.) directly involved in on-site activities shall be either steam cleaned then scrubbed with a water and mild soap solution or washed under high pressure water then scrubbed with a water and mild soap solution before departing the site. Light equipment (shovels, pails, hand tools) shall be scrubbed with a mild soap and water solution followed by a rinse before being removed from the site. All electronic monitoring equipment will be wrapped in clear plastic with openings for sampling ports. Field decontamination of equipment will be performed by the following steps:

1. Physically remove packed dirt and grit with wire brushes
2. Steam clean with water/soap solution
3. Rinse with high pressure water
4. Allow to air dry before departing the site

CONSTRUCTION DERIVED WASTE

Solid Waste:

All solid waste generated onsite such as disposable coveralls, gloves, soda cans, packing boxes, and general trash will be treated as "non-hazardous". This waste will be disposed of as a municipal trash.

Liquid Waste:

All liquid waste from decontamination rinse water will be collected in the sump by the vehicle decontamination pad and pumped to the head of the existing onsite waste water treatment works.

INJURIES/EMERGENCIES

Injury:

If an injury should occur, the victim shall be removed from potentially contaminated areas if possible, immobilized if necessary, and transported to the local hospital for treatment. If the victim has received a potential spinal injury, they should be immobilized if possible and transported to the local hospital by a trained ambulance "EMS" crew. Minor injuries such as small cuts and lacerations can be treated onsite by qualified first aid trained workers. All potentially contaminated clothing should be removed from an injured worker onsite prior to medical treatment.

A copy of this plan should be given to the emergency room chief physician at the Bridgeport Hospital prior to startup of field operations.

Fire:

In the event of fire, the following steps should be taken:

1. Attempt to extinguish or control fire with Class A, B, C, fire extinguishers
2. Notify local fire department
3. Remove vehicles from area
4. Remove flammable materials such as fuels and solvents from area
5. Egress from site to an upwind position
6. Perform a personnel count "verification"
7. Await fire fighting forces

WORK ZONES

During all project operations, a series of work zones will be established as shown in Figure 2. These zones include a "Hot Zone" or area of work where contamination is probable, a "Decontamination Zone" where personnel and equipment will be decontaminated after work evolutions, and a "Cool Zone" or staging area where clean equipment can be staged and workers can rest.

NOTES:

1. BASE MAP FROM METCALF & EDDY SURVEYS 1985 & 1986.
2. ALL ELEVATIONS REFERENCED TO MEAN SEA LEVEL.

LEGEND:

= HOT AREA

= DECON AREA

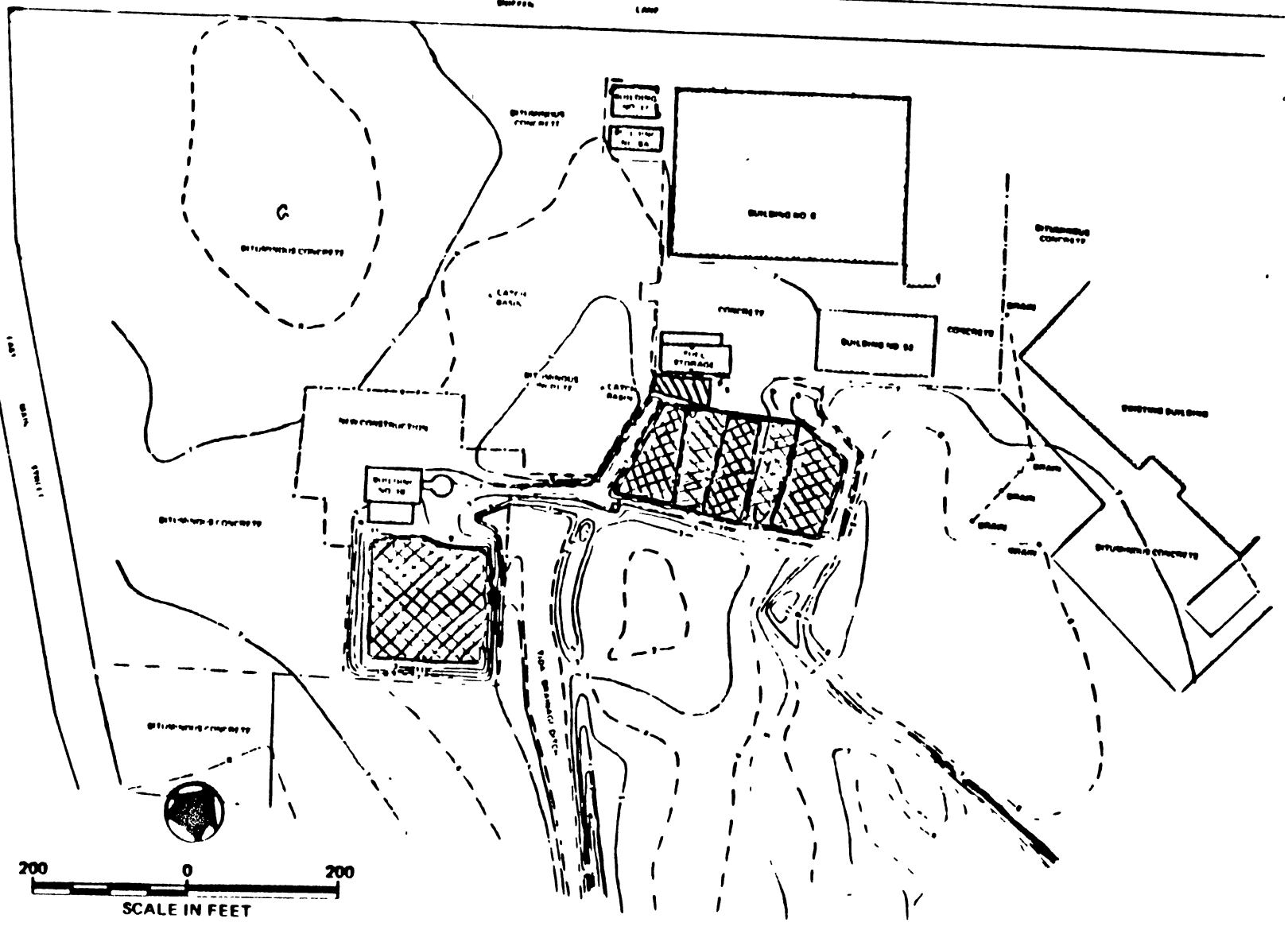


FIGURE 2.

VI. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance:	911 (Emergency Service Dispatch)
Fire:	911 (Emergency Service Dispatch)
Police:	911 (Emergency Service Dispatch)
Security:	385-2231 (AVCO Security)
Hospital:	384-3566 (Bridgeport Hospital)

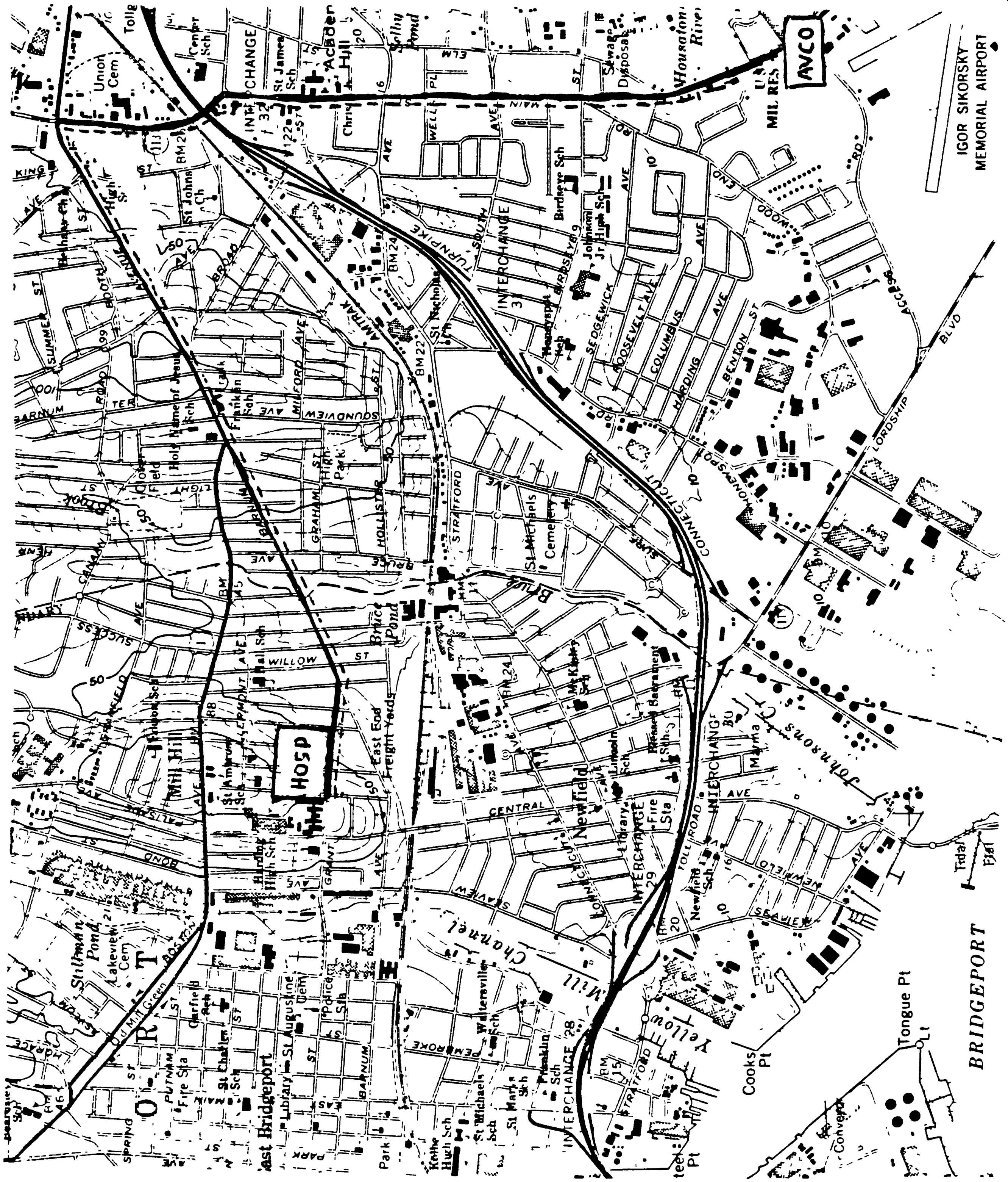
HOSPITAL LOCATION

Bridgeport Hospital
267 Grant Street
Bridgeport, Connecticut
(See Figure 3 for directions)

EMERGENCY CONTACTS

Responsibility	Name	Phone Number
Client Contact (AVCO)		
Project Manager		
Project Foreman		
Site Safety Officer		

FIGURE 3.


AVCO
IGOR SIKORSKY
MEMORIAL AIRPORT
U S
MIL RES
Housatonic
River
Sewage
Disposal
MAIN
ELM
INTERCHANGE
32
St James
Sch
Center
Sch
Union
Cem
KING
High
St
St Johns
Ch
BM 24
TURNPIKE
SOUTH
INTERCHANGE
31
AMTRAK
St Nicholas
Ch
BM 22
Birdseye Sch
Johnson
Jr High Sch
SEDGEWICK
ROOSEVELT AVE
COLUMBUS
AVE
HARDING
BENTON
ST
WOOD
END
RD
ACCESS
BLVD
LORDSHIP
CONNECTICUT
SURF
BOOTH
SUMMER
BARNUM
TER
SOUNDVIEW
AVE
MILFORD
Franklin
Sch
Holy Name of Jesus
Sch
GRAHAM
High
Park
HOLLISTER
STRATFORD
St Michaels
Cemetery
BRUCE
Bruce
Pond
CANAAN
SUCCESS
WILLOW
ST
East End
Freight Yards
HOSP
Mill Hill
St Ambrose
Sch
Harding
High Sch
CENTRAL
Newfield
Library
Fire
Sta
INTERCHANGE
29
TOLL ROAD
Newfield
Sch
NEWFIELD
SEAVIEW
Channel
Mill
Yellow
Cooks
Pt
Tongue Pt
Lt
BRIDGEPORT
Johnsons
Tidal
Flat
Stillman
Pond
Lakeview
Cem
BOSTON
Old Mill Green
Garfield
Sch
St Charles
Sch
PUTNAM
Fire Sta
East Bridgeport
Library
St Augustine
Cem
Police
Sta
BARNUM
PEMBROKE
Waltersville
Sch
Park
St Michaels
Sch
St Marys
Sch
Franklin
Sch
INTERCHANGE 28
STRATFORD
BM 15
SPRING
PARK
Steel
Pt
Conveyor

APPENDIX A

FIRST AID

COLD STRESS (Frostbite)

Symptoms:

Shivering, numbness, low body temperature, drowsiness and muscular weakness.

Can result in unconsciousness, shock, heart fibrillation and death due to heart failure.

Treatment:

Protect frozen area from injury. Wrap the victim in a blanket and place him/her in a warm vehicle or indoors. Administer warm drinks.

For frostbite, cover the frozen part, bring victim indoors and warm the frozen part quickly in warm water (102°-105°F).
DO NOT MASSAGE THE FROZEN PART.

Place sterile gauze between frozen fingers and toes and elevate.
GET MEDICAL CARE.

Prevention:

Schedule regular work breaks based on weather conditions.

HEAT STRESS (Stroke, Cramps, Exhaustion)

Symptoms:

- Stroke - high body temperature (106°F), lack of sweating, rapid pulse, unconsciousness.
  Can lead to death.
  GET MEDICAL CARE
- Cramps - muscular pains and spasms.
- Exhaustion - skin is cool and clammy, body temperature may be slightly elevated, weakness, nausea and dizziness.

Treatment:

Make victim comfortable, loosen clothing, lay victim down and elevate feet, administer drinks with electrolytes (Gator-Aid or water/salt solution). If victim vomits, do not administer any more fluids and GET MEDICAL CARE.

Prevention:

Schedule regular work breaks based on weather and protective clothing use.

EMERGENCY FIRST AID

WOUNDS

1. Control bleeding
   a. direct pressure on wound with a sterile dressing (if available)
   b. elevate injured area if possible
   c. pressure to supplying blood vessel
2. Apply dry sterile dressings and bandages
3. Cleanse minor injuries thoroughly. Use plain soap and water (your hands first)
4. If evidence of infection appears, see a doctor

FRACTURES

1. Do not move the victim
2. Keep the broken bone ends and adjacent joint quiet
3. If a wound is present, control the bleeding
4. Apply splints

SHOCK

1. Limit activity
2. Lay victim down
3. Prevent loss of body heat
4. Shock can be FATAL— send for medical help

Know what to do . . .

IN CASE OF A SERIOUS ACCIDENT:

1. RESCUE: Remove victim from a dangerous situation
2. CHECK BREATHING: give artificial respiration if necessary
3. CONTROL SEVERE BLEEDING: use direct pressure
4. DILUTE POISONS: use large quantities of milk or water
5. CALL FOR HELP— GIVE THIS INFORMATION
   - L location of emergency
   - I injury (number and type)
   - F first aid given
   - E equipment needed or available

POISONING

1. Dilute with milk or water
2. Call the poison information center
3. If breathing stops, use artificial respiration
4. Call an ambulance if necessary

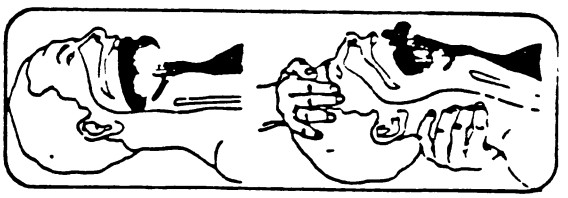
BURNS

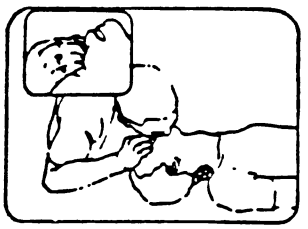
1. Relieve pain and prevent contamination
   a. small minor burns—cold water
   b. large extensive burns—dry sterile dressings
2. Treat for shock
3. Seek medical assistance

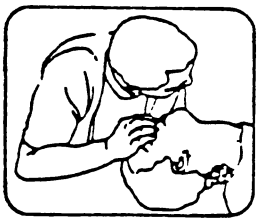
. . . take a free Red Cross course

STOPPAGE OF BREATHING

1. Give artificial respiration
   a. mouth to mouth method
      1. tilt victim's head back, chin pointing up
      2. look, listen and feel for breathing
      3. close victim's nostrils by pinching
      4. inhale
      5. make a tight seal over victim's mouth with your mouth
      6. inflate victim's lungs with 4 quick, full breaths
      7. watch victim's chest while listening for air return
      8. breathe for adults: once every 5 seconds—for children: once every 3 seconds
2. Call an ambulance







Know what to do . . .

HEART ATTACK

Symptoms: chest pain, breathing difficulty, bluish color of face and finger nails

First Aid:

1. Comfortable position
2. Raise head and chest if breathing difficult
3. If breathing stops, apply artificial respiration
4. Get medical aid fast—physician or person trained in CPR . . .

Give CPR (Cardiopulmonary resuscitation) if trained:

A—Airway opened. Look, listen, feel for breathing. Tilt head to open airway.

B—Breathing restored. Give mouth-to-mouth artificial respiration.

C—Circulation restored. Check for pulse. Use external cardiac compression.

Single rescuer: 15 chest compressions @ 80 per minute, alternate with 2 quick lung inflations.

Two rescuers: Chest compression @ 60 per minute, lung inflation every fifth compression without pause.

SIMPLE FAINTING

1. Keep victim lying down with feet elevated until recovery is complete
2. Bathe face gently with cool water

HEAT EXHAUSTION

1. Provide rest
2. Apply cool, wet cloths
3. Give sips of cool water for 1 hour (one tsp. salt per glass)

FROSTBITE

1. Cover the frozen part
2. Provide extra clothing and blankets
3. Quickly immerse chilled part in warm water (102°-105°)
4. Do not rub
5. Give a warm non-alcoholic drink
6. SEEK MEDICAL ASSISTANCE

. . . take a free Red Cross course

FIRST AID FOR CHOKING

If victim can cough, speak, breathe ➡ *Do not interfere*

If victim cannot
cough
speak
breathe

Have someone call for help.

TAKE ACTION: FOR CONSCIOUS VICTIM


4 QUICK BACK BLOWS


4 MANUAL THRUSTS

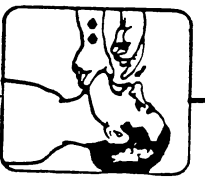
Repeat steps until effective or until victim becomes unconscious.

TAKE ACTION: FOR UNCONSCIOUS VICTIM


TRY TO VENTILATE


4 BACK BLOWS


4 MANUAL THRUSTS


FINGER PROBE

Repeat steps until effective.

Continue artificial ventilation or CPR, as indicated.

Everyone should learn how to perform the above first aid steps for choking and how to give mouth-to-mouth and cardiopulmonary resuscitation. Call your local Red Cross chapter for information on these and other first aid techniques.

Caution: Abdominal thrusts may cause injury. Do not practice on people.

AMERICAN RED CROSS

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

[Docket No. S-760A]

Hazardous Waste Operations and Emergency Response

AGENCY: Occupational Safety and Health Administration; Labor.

ACTION: Notice of proposed rulemaking and public hearings.

SUMMARY: The Occupational Safety and Health Administration (OSHA) is proposing to amend the OSHA standards for hazardous waste operations and emergency response in 29 CFR 1910.120. OSHA proposes a permanent final standard to replace the interim final rule as required by Congress in the Superfund Amendments and Reauthorization Act of 1986 (SARA) (Pub. L. 99-499). The interim final rule was published in the Federal Register on December 19, 1986 (51 FR 45654).

Employees involved in operations covered by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended (CERCLA or "Superfund" Act) [42 U.S.C. 9601 *et seq.*], in certain hazardous waste operations conducted under the Resource Conservation and Recovery Act of 1976 as amended (RCRA) [42 U.S.C. 6901 *et seq*], and in any emergency response to incidents involving hazardous substances would be covered by this proposed rule.

The issuance of this proposed rule is mandated by section 126(b) of SARA. The proposed rule will regulate employee safety and health at hazardous waste operations and during emergency response to hazardous substance incidents.

Informal public hearings on the subject of this rulemaking are scheduled to afford interested parties with the opportunity to comment on OSHA's proposals.

DATES: 1. Comments and information on this proposal must be received on or before October 5, 1987.

2. The informal public hearings will begin at 9.30 A.M. daily and are scheduled as follows:

October 13-16 and 20-23, 1987; Washington, DC

October 27-30, 1987; San Francisco, CA

3. Notices of intention to appear at the informal public hearings must be postmarked September 21, 1987.

4. Written comments, testimony, and all evidence which will be offered into the informal public hearing record must be postmarked by October 5, 1987. Because of the limited time frame allowed OSHA for development of the final rule as a result of the statutory guidance given in SARA, OSHA does not expect to grant requests for extensions of time for submitting comments in response to this notice.

ADDRESSES: 1. Comments and information on the proposal should be sent in quadruplicate to the Docket Office, Docket No. S-760A, Occupational Safety and Health Administration, Room N-3670, U.S. Department of Labor, 200 Constitution Avenue NW., Washington, DC 20210. Comments and information received, notices of intention to appear, testimony and evidence may also be inspected and copied in the Docket Office.

2. The informal public hearings will be held at the following locations:

a. Washington, DC—Frances Perkins Department of Labor Building Auditorium, 200 Constitution Avenue NW., Washington, DC 20210,

b. San Francisco, CA—Ramada Renaissance Hotel, 55 Cyril Magnin St. (Market at 5th Street), San Francisco, CA 94102. 415-392-8000.

3. Notices of intention to appear and testimony and documentary evidence which will be introduced into the informal public hearing record must be sent in quadruplicate to Mr. Thomas Hall, U.S. Department of Labor, Occupational Safety and Health Administration, Division of Consumer Affairs, Room N-3649, 200 Constitution Avenue NW., Washington, DC 20210.

FOR FURTHER INFORMATION CONTACT: *Proposed Rule:* Mr. James F. Foster, U.S. Department of Labor, Occupational Safety and Health Administration, Division of Consumer Affairs, Room N-3647, 200 Constitution Avenue, NW., Washington, DC 20210, 202-523-8151.

Public Hearing: Mr. Thomas Hall, U.S. Department of Labor, Occupational Safety and Health Administration, Division of Consumer Affairs, Room N-3647, 200 Constitution Avenue, NW., Washington, DC 20210, 202-523-8615.

SUPPLEMENTARY INFORMATION:

I. Background

The U.S. Environmental Protection Agency estimates that approximately 57 million metric tons of hazardous waste are produced each year in the United States[1]. These wastes must be treated and stored or disposed in a manner that protects the environment from the adverse affects of the various constituents of those wastes.

In response to the need to protect the environment from the improper disposal of these hazardous wastes, Congress, over the years, has enacted several pieces of legislation intended to control the nation's hazardous waste problem. Federal laws passed in 1965 [2] and 1970 [3] initially addressed solid waste disposal. Several other pieces of legislation have been enacted by Congress that have ultimately led to the development of this proposed rule and they are discussed below.

A. The Resource Conservation and Recovery Act of 1976

The first comprehensive, federal effort to deal with the solid waste problem in general, and hazardous waste specifically, came with the passage of the Resource Conservation and Recovery Act of 1976 (RCRA).[4] The act provides for the development of federal and state programs for otherwise unregulated land disposal of waste materials and for the development of resource recovery programs. It regulates anyone engaged in the creation, transportation, treatment, and disposal of "hazardous wastes." It also regulates facilities for the disposal of all solid wastes and prohibits the use of open dumps for solid wastes in favor of requiring sanitary landfills.

There are however many hazardous waste disposal sites that were created prior to the passage of RCRA. These sites are often abandoned and contain unknown quantities of unknown wastes.

B. The Comprehensive, Environmental Response, Compensation and Liability Act of 1980

In response to the need to clean-up and properly reclaim these pre-RCRA sites Congress enacted the Comprehensive, Environmental Response, Compensation and Liability Act of 1980 (CERCLA) [5] commonly known as "Superfund." Superfund established two related funds to be used for the immediate removal of hazardous substances released into the environment. Superfund is intended to establish a mechanism of response for the immediate clean-up of hazardous waste contamination from accidental

[1] U.S. Environmental Protection Agency, *Everybody's Problem Hazardous Waste* at 1 (1980).

[2] Solid Waste Disposal Act, Pub. L. No. 89-272, 79 Stat 992.

[3] Resource Recovery Act, Pub. L. No. 91-512, 84 Stat 1427 and Pub. L. 93-14, 87 Stat 11.

[4] 42 U.S.C. 6901 *et seq*

[5] 42 U.S.C. 9601 *et seq.*

spills and from chronic environmental damage such as is associated with abandoned hazardous waste disposal sites.

The treatment and disposal of hazardous wastes under RCRA and CERCLA creates a significant risk to the safety and health of employees who work in treatment and disposal operations. Exposure to hazardous wastes through skin contact, skin absorption and inhalation pose the most significant risks to employees. Employee exposure to these risks occurs when employees respond to hazardous waste emergencies, when they work with hazardous wastes during storage, treatment and disposal operations or when they participate in the clean-up of abandoned-waste sites.

This risk of exposure and the need for protecting employees exposed to hazardous wastes is addressed in the "Superfund Amendments and Reauthorization Act of 1986" (SARA).

C. Superfund Amendments and Reauthorization Act of 1986

On October 17, 1986, the President signed into law the "Superfund Amendments and Reauthorization Act of 1986" (SARA).[4] As part of SARA, in § 126 of Title I, Congress addressed the risk of injury to employees by providing that the Secretary of Labor ("Secretary") issue interim final worker protection regulations within 60 days after the date of enactment of SARA that would provide no less protection for workers engaged in hazardous waste operations than the protections contained in the U.S. Environmental Protection Agency's (EPA) "Health and Safety Requirements for Employees Engaged in Field Activities" manual (EPA Order 1440.2) dated 1981, and the existing OSHA standards under Subpart C of 29 CFR Part 1926. OSHA published those interim final regulations in the Federal Register on December 19, 1986 (51 FR 45654). A correction notice was published on May 4, 1987 (52 FR 16241). With the exception of a few provisions that had delayed start-up dates, OSHA's interim final regulations became effective on December 19, 1986 in accordance with section 126(e), and apply to all regulated workplaces until the final rule developed under sections 126(a)–(d) and proposed today becomes effective.

Section 126(a) of SARA provides that the Secretary shall "... pursuant to section 6 of the Occupational Safety and Health Act of 1970, promulgate standards for the health and safety of employees engaged in hazardous waste operations." These standards must be promulgated within one year after the date of enactment of SARA. This notice initiates the development of those standards by issuing proposed regulations as indicated in section 126(b) of SARA. SARA further provides in section 126(b), that the proposed regulations address, as a minimum, certain worker protection provisions. These are: site analysis, training, medical surveillance, personal protective equipment, engineering controls, maximum exposure limits, informational programs, materials handling, new technology programs, decontamination procedures, and emergency response. While some of these worker protection provisions were addressed in the interim final rule, this proposed rule will address, as a minimum, all provisions under section 126(b) of SARA.

Pursuant to section 126(c) of SARA, the final regulations promulgated under section 126(a) are to take effect one year after the date they are promulgated. Section 126(c) also provides that the final regulations are to include each of the worker protection provisions listed in section 126(b) unless the Secretary determines that the evidence in the public record developed during this rulemaking and considered as a whole does not support inclusion of any such provision.

This proposed rule has been adapted from the language of the interim final rule. Changes have been made to address more fully the provisions which Congress had directed the Agency to cover in the proposal. OSHA utilized the language from the EPA manual entitled "Health and Safety Requirements for Employees Engaged in Field Activities" (1981) and the language of OSHA's safety and health standards in Subpart C of 29 CFR Part 1926 to develop the interim final rule, and much of that same language is also used in this proposal. The interim final rule also contains language taken from various documents issued either jointly or by the EPA, OSHA, the U.S. Coast Guard, and the National Institute for Occupational Safety and Health (NIOSH), and that language has also been used in preparing this proposed rule.

OSHA has specifically used the joint OSHA/EPA/USCG/NIOSH manual entitled, *"Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities"* (Preamble Reference 6), as an outline in preparing the interim rule and this proposal. This manual was developed as a result of the collaborative efforts of professionals representing the four agencies. These professionals, who are knowledgeable in hazardous waste operations, worked with over 100 experts and organizations in the development of the criteria contained in this manual. The manual was published in October 1985 and is public information. The manual is a guidance document for managers responsible for occupational safety and health programs at inactive hazardous waste sites. The manual is intended for use by government officials at all levels and contractors involved in hazardous waste operations. The manual provides general guidance and is intended to be used as a preliminary basis for developing a specific health and safety program for hazardous waste operations. Further, the major subject areas listed in section 126(b) of SARA are nearly identical to the major chapters in the manual. The language of the proposed rule also clarifies some confusion in the interim rule that OSHA has identified since the promulgation of the interim final rule.

II. Summary and Explanation of the Standard

Paragraph (a)—Scope, application, and definitions

In paragraph (a)(1), *Scope*, OSHA proposes to use the scope of the interim final rule for Hazardous Waste Operations and Emergency Response as published in the Federal Register on December 19, 1986 (51 FR 45654) with some modification. The scope of the interim rule included the following.

(i) Hazardous substance response operations under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended (CERCLA), including initial investigations at CERCLA sites before the presence or absence of hazardous substances has been ascertained;

(ii) Major corrective actions taken in clean-up operations under the Resource Conservation and Recovery Act of 1976 as amended (RCRA);

(iii) Operations involving hazardous waste storage, disposal and treatment facilities regulated under 40 CFR Parts 264 and 265 pursuant to RCRA, except for small quantity generators and those employers with less than 90 days accumulation of hazardous wastes as defined in 40 CFR 262.34;

(iv) Hazardous waste operations sites that have been designated for clean-up by state or local governmental authorities, and

(v) Emergency response operations for releases or substantial threats of releases of hazardous substances, and post-emergency response operations to such releases at all workplaces including those not defined in paragraphs (a)(1)(i) through (a)(1)(iv).

OSHA is proposing to modify paragraph (a)(1) of the interim rule by

[4] Pub. L. 99-499.

moving the exception in paragraph (a)(1)(iii) to paragraph (a)(2)(iii) and by editorially revising the structure and text of the language of the interim rule without changing the scope in the proposal. The modifications to the text are to organize the various subparagraphs on scope into proper groups of coverage.

To further clarify scope, non-emergency response coverage has been left in paragraph (a)(1) and emergency response coverage has been given its own paragraph in (a)(2). The scope for emergency response has been clarified as well. The change makes clear that it is employers whose employees have a "reasonable possibility" of engaging in emergency response operations are covered. Employers whose employees would not have such a reasonable possibility are not covered.

Who is Covered?

The scope of this rulemaking has been a major issue during the development and promulgation of the interim final rule and this proposal. OSHA is requesting specific comment on whether our interpretation of scope is too broad or too narrow.

The proposed standard would cover the same three basic areas covered by the interim final rule.

I. CERCLA Facilities

For the purposes of this proposal, CERCLA sites include hazardous substance response operations at sites regulated under 40 CFR 300, Subpart F, RCRA closure activities conducted under 40 CFR 265, Subpart G, those sites similar to CERCLA sites that have been designated for clean-up by State or local governments.

II. RCRA Facilities

OSHA would also continue to regulate RCRA treatment, storage and disposal (T/S/D) facilities. T/S/D facilities range from the typical generator with a hazardous waste storage area to the large, complex hazardous waste dump. EPA estimates that approximately 80 percent of all generators also treat, store, or dispose of their hazardous wastes and thereby qualify as a T/S/D facility. Over 30,000 T/S/D facilities notified EPA in 1980 that they would qualify for regulation under section 3004 of RCRA.

The term "T/S/D" is commonly used to refer to the three different hazardous waste management activities that are regulated under RCRA section 3004, and which thus require a permit under RCRA section 3005. For the purposes of this rule treatment, storage, and disposal facilities are defined as follows:

A "treatment facility" involves any place of employment where any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to recover energy or material resources from the waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store or dispose of; or amenable for recovery, amenable for storage, or reduce in volume.[7]

The term "storage facility" refers to any place of employment used to hold hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere.[8]

The term "disposal facility" refers to any place of employment used for the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharge into any water, including ground waters.[9]

The following T/S/D facilities would not be covered by this rulemaking:

1. Facilities that dispose of hazardous waste by means of ocean disposal pursuant to a permit issued under the Marine Protection, Research, and Sanctuaries Act.

2. The disposal of hazardous waste by underground injection pursuant to a permit issued under the Safe Drinking Water Act underground injection control program.

3. A publicly owned treatment work (POTW) which treats or stores hazardous wastes which are delivered to the POTW by a transport vehicle or vessel or through a pipe.

4. T/S/D facilities which operate under a state hazardous waste program authorized pursuant to RCRA section 3006.

5. Facilities authorized by a state to manage industrial or municipal solid waste, if the only hazardous waste handled by such a facility is otherwise excluded from regulation pursuant to the special requirements for small generators (See 40 CFR 261.5).

6. A facility which treats or stores hazardous wastes that are subject to the special requirement for hazardous wastes which are used, reused, recycled or reclaimed. Note, however, that as provided by 40 CFR 261.6(b), a facility must obtain a permit as a storage facility if it stores "listed" hazardous wastes, mixtures including a "listed" hazardous waste, or sludges, prior to use, reuse, recycling, or reclaimation.

7. The accumulation of hazardous waste by generators for 90 days or less.

8. Farmers who dispose of waste pesticides from their own use in compliance with 40 CFR 262.51.

9. Owners or operators of a "totally enclosed treatment facility." A totally enclosed treatment facility is one where the treatment of hazardous waste which is directly connected to an industrial production process which is conducted and operated in a manner which prevents the release of any hazardous waste or any constituent thereof into the environment during treatment. An example is a pipe in which waste acid is neutralized.

10. Owners and operators of elementary neutralization units and waste-water treatment units.

11. Persons taking immediate action to treat and contain spills. Note that after immediate response activities are completed, any hazardous waste spill residue or debris is subject to full regulation.

12. Transporters storing manifested wastes in approved containers at a transfer facility for 10 days or less.

13. The acts of adding absorbent material to hazardous waste in a container and adding hazardous waste to absorbent material in a container, if the materials are added when wastes are first placed in the container.[10]

III. Emergency Response

This proposal would also continue to cover emergency response to releases of hazardous substances at all sites including non-CERCLA and non-RCRA sites.

OSHA believes that Congress intended the proposed rule to have such coverage. This is indicated by the language of SARA as well as the legislative history.

The language of section 126(a) mandates safety and health standards for the protection of employees engaged "in hazardous waste operations." The term "hazardous waste operation" is not limited in the legislation and a response to spills of hazardous substance on the highway or from a railway tank car in order to control and contain the hazardous substance (which has become a waste once it is not contained) is in the common sense meaning a hazardous waste operation.

This interpretation is reinforced by the fact that SARA is a free-standing

[7] 40 CFR 260.10(a).
[8] *Id.*
[9] *Id.*
[10] 40 CFR 265.1(c), 264.1(c), *as amended*, 47 FR 8306 (February 25, 1982).

statutory provision and not an amendment to CERCLA. The clear Congressional intent then is to provide protection to employees whenever they deal with hazardous wastes.

In addition section 126(d)(4) discussing training for emergency response personnel utilizes the very broad term "hazardous emergency situation." Section 126 (g)(1) indicates that training grants may be given independently for emergency response training separate from hazardous waste removal training Section 126(b)(11) also indicates emergency response is an independent concept separate from hazardous waste removal operations. For those and other reasons OSHA believes section 126 is intended to cover emergency response to hazardous substances whether on a CERCLA or RCRA site or elsewhere. However, the clarified language in the scope sections makes it clear the only employers whose employees have the reasonable possibility of engaging in emergency response are covered.

Emergency response employees who respond or will respond to incidents involving hazardous substances are covered by this proposed rule to the extent that they are exposed to hazardous substances. State and local government employees in states that have agreements with OSHA under section 18 of the OSH Act must be regulated by state regulations at least as effective as these to protect public employees. Those state regulations must be issued within six months of the date of promulgation of any final rule resulting from this rulemaking.

Municipal or other sanitary landfills that handle domestic wastes would not normally be regulated by this proposed rulemaking Similarly, waste paper or scrap metal operations would not normally be regulated because of the type of wastes they handle. However, both types of operations could be regulated if they have clean-ups for or handle hazardous wastes meeting the scope provisions of the standard.

Also, employees at hazardous waste sites who will not be exposed to, or do not have the potential to be exposed to, hazardous substances are not covered by this proposal. The provisions of these regulations are designed to protect employees who have exposures, and would not be needed for those employees who do not.

Operations with no exposure to hazardous substances, i.e., road building for site access, construction of or the setting up of temporary facilities in the clean zone, or the closure of a RCRA site involving the building of a clay cap over hazard wastes, are considered to be construction activities covered by the standards in 29 CFR Part 1926.

The scope and application provisions carry out the intent of Congress and are consistent with good occupational safety and health policy. Employees performing clean-up operations under CERCLA, RCRA (corrective actions) and state or local government designated sites—generally those employees likely to have the highest exposures to hazardous substances over a longer period—would be covered by virtually all the provisions of this proposal. Employees exposed to hazardous wastes in routine RCRA hazardous waste operations, who are regularly exposed to hazardous wastes but in a more controlled environment, would be covered by the more limited requirements of paragraphs (l) and (o) of this proposal. Emergency response workers, exposed usually for short periods to often unknown but possibly high levels of hazardous substances, would have the specific provisions of paragraph (l) directed towards this situation.

How Are They Covered?

In paragraph (a)(3), *Application,* OSHA proposes to designate the specific requirements of the proposal which apply or do not apply to the work activities covered by the proposed rule. In paragraph (a)(3)(i) the employer would have to comply with the standards in 29 CFR Parts 1910 and 1926, as well as with the requirements specifically covered in this proposed rule. If there is a conflict or overlap, the more protective provisions would apply. Since this proposed rule does not cover all of the hazards present at hazardous waste operations, other OSHA standards in Parts 1910 and 1926 would apply. Other OSHA standards regulate many other hazards, and OSHA wants to make clear that the other standards continue to apply. Also, hazardous waste operators who are not within the proposed scope of this standard would continue to be regulated by the Parts 1910 and 1926 standards.

In paragraph (a)(3)(ii) OSHA proposes that all paragraphs of this section except paragraph (o) would apply to hazardous wastes operations at CERCLA sites, at major corrective action at RCRA sites, and at sites designated for clean-up by state and local governments. This part of the proposal has been taken directly from the interim final rule.

In paragraph (a)(3)(iii), OSHA proposes that the requirements set forth in paragraph (o) of this section would specifically apply only to the hazardous waste operations at RCRA sites which are involved in treatment, storage, disposal and handling of hazardous waste. The proposed limited exclusion of small quantity generators and less than 90-day accumulators would exclude from these regulations certain operations, such as dry cleaners and gas stations, which come within the purview of RCRA, but are not hazardous waste operators in the normal meaning of the term. The exclusion would depend upon the employer's decision to provide or not provide emergency response by employees to releases of, or substantial threats of releases of, hazardous substance.

OSHA proposes to exempt totally small quantity generators and less than 90 day accumulators from the rule if they *do not* provide emergency response by their employees to releases of, or substantial threats of releases of, hazardous substances. OSHA further proposes to exempt small quantity generators and less than 90 day accumulators from all parts of the rule except paragraph (l) when they do provide emergency response by their employees to releases of, or substantial threats of releases of, hazardous substances.

OSHA recognizes that many small quantity generators and less than 90 day accumulators consist of smaller businesses with limited employee populations (less than 10 employees). Since most of these establishments rely on the emergency response services of local fire and rescue departments, OSHA is providing relief from these proposed standards when the employer can show that employees will not be exposed to hazardous substances as a result of providing employee emergency response. In cases where such establishments do provide employee emergency response, and thereby expose employees to hazardous substances, OSHA is proposing that such employers meet the emergency response requirements of paragraph (l) of this proposed rule.

Without these exemptions, these proposed regulations could be interpreted to cover gas stations, dry cleaners, and other small businesses which temporarily store small quantities of a hazardous waste. These businesses are not engaged in hazardous waste operations as that term is conceived of normally. In addition, it is not believed that Congress intended such businesses to be covered. They do not present the relatively high exposure to a number of hazardous health risks to employees that hazardous waste sites typically do.

The approximately 4,000 RCRA sites where reasonably large quantities of hazardous wastes are regularly handled,

treated and stored would be covered by the proposed rule. This reflects the legislative intent, meets the normal meaning of hazardous waste operations and covers the type of safety and health hazards that this regulation is designed to control. This limited exclusion reflects an exemption previously contained in paragraph (a)(1)(iii) of the interim final rule.

In paragraph (a)(3)(iv) OSHA proposes that the requirements set forth in paragraph (l) of this section would specifically apply to the work conducted by emergency response personnel when they respond to hazardous substance emergency incidents. Emergency response personnel include non-employees (i.e., firefighters, EMS personnel, and police) as well as employees.

OSHA requests comment on its approach to coverage and its determination of which provisions apply to various types of operations. It also requests comment on whether other operations should be and are intended to be covered by Congress, and whether specific operations should be excluded because of low exposures.

In paragraph (a)(4), *Definitions*, OSHA proposes to define various terms used in this rulemaking. The definitions for hazardous substances and hazardous wastes have been taken from the U.S. Environmental Protection Agency (EPA) and U.S. Department of Transportation (DOT) regulations and include those used in the interim rule. OSHA is proposing to modify some of the definitions used in the interim rule where some confusion occurred over the meaning of some of the definitions used in the interim rule. For example, the definition for "emergency response" has been modified to indicate more clearly the type of response that OSHA will be regulating. The definition used in the interim rule implied to many readers of that rule that any response to incidental spills would be considered emergency response. The agency did not intend to regulate employee response to incidental spills that could be cleaned-up or stabilized by the employees in the immediate spill area without the need of a coordinated spill-control response from throughout the workplace. Further, the agency did not want to cover releases of hazardous substances that did not expose employees to exposures of hazardous substances above the established permissible exposure limits of this rule.

The term "established exposure levels" is defined to indicate the levels which, if exceeded for 30 or more days per year, trigger medical surveillance of the exposed employees. The term includes not only OSHA established PELs, but also exposure limits suggested by NIOSH and ACGIH. OSHA feels that it is appropriate to go beyound the OSHA established PELs in triggering medical surveillance because of the broadly-worded language in section 126(b)(3), which requires medical surveillance for workers engaged in hazardous waste operations "which would expose them to toxic substances."

The term "permissible exposure limits" is defined as the inhalation or dermal permissible exposure limit specified in 29 CFR Part 1910, Subpart Z. These limits indicate the exposure levels to be achieved by the hierarchy of controls listed in paragraph (g)(1)(i). Employers must set appropriate exposure levels to determine PPE use for substances listed by ACGIH and NIOSH taking into account the levels recommended by those organizations.

The definition in the proposal has been changed from the interim rule. Limits not set by OSHA, NIOSH and ACGIH have been excluded. They would not be generally known and would not have the sanction of an official organization.

OSHA is also incorporating a definition for "qualified individual," a person who has qualifications by training and experience for the task(s) for which the individual is responsible. That definition is rather general, but a detailed requirement for each task would lead to a lengthy and inflexible regulation.

The use of other agency definitions has been proposed to assure consistency and compatibility between this proposed rule and the rules and regulations of the EPA and DOT. The remaining definitions have been taken for the most part from SARA, the four agency manual (Reference 6) or existing OSHA standards.

OSHA requests comment on whether its definitions of hazardous waste, health hazard and hazardous substance are consistent with EPA and DOT practice. OSHA requests comment on whether the term "established permissible exposure limit" achieves its goals.

Paragraph (b)—General Requirements

In paragraph (b)(1)(i) OSHA is proposing to require employers to develop and implement a safety and health program for employees involved in hazardous waste operations. The proposed rule makes it clear that the program is to be in writing. That was implicit in the interim rule. The program needs to be in writing so that employers and employees know clearly what to do to handle hazardous substances. If it were not in writing uncertainty could lead to injury and overexposures.

Such programs are part of the requirements mandated in section 126(b)(7) of SARA. Subpart C of 29 CFR Part 1926 requires such a program in § 1926.20(b), and EPA Order 1440.2, on page 5, further requires training in "safety plan development." OSHA's experience also establishes that a safety and health program is necessary to protect employees so that hazards are assessed and control programs are systematically laid out. OSHA section 6(b) health standards require a compliance plan to set forth a health program to protect employees from regulated hazards.

The proposed employer's safety and health program would have to provide for an organizational structure, a comprehensive workplan, and a site-specific safety and health plan as proposed in paragraph (b)(1)(ii) through (b)(1)(iv). The site-specific safety and health plan would have to address the anticipated safety and health hazards of each work operation or activity, and the means to eliminate the hazards or to effectively control them to prevent injury or illness.

The site-specific safety and health plan is necessary to help protect employee safety and health. There are many hazards at a hazardous waste operation which need to be determined and addressed prior to the exposure of employees. The proposed plan provides that this will be done in a systematic manner so that hazards will not be missed, and so that needed protective action will not be overlooked. The approach used has been adapted from reference 6.

The general requirements found in paragraph (b)(2) through (b)(13) of the interim final rule would be eliminated by this proposal. Those paragraphs of the interim final rule merely directed the reader to the appropriate paragraphs of the interim final rule for the specific regulations on a topic. The paragraphs of the interim final rule served only as an index for the interim final rule and OSHA does not believe such an index is necessary for this proposal. The duty requirement for compliance with specific requirements is implicit in the paragraphs addressing a specific hazard.

Paragraph (b)(2) would require that site excavations be shored or sloped as appropriate and the employers comply with Subpart P of 29 CFR Part 1926 for site excavations created during initial site preparation or during hazardous waste operations. The language of (b)(2)

is the same as paragraph (b)(14) of the interim rule. OSHA considers that those provisions already apply, but they are specifically cross referenced because they are particularly important since significant excavation activity often occurs on hazardous waste sites.

Paragraph (b)(3) would require employers to notify contractors and subcontractors of the hazards identified by the employer at hazardous waste operations. The language of (b)(3) is the same as paragraph (b)(15) of the interim rule. Sections 126(b)(2) and 126(e) of SARA indicate Congress's specific interest in protecting employees of contractors, and in involving contractors in the safe operation of hazardous waste sites. This provision would assist the contractor in becoming aware of the operational risks so that the contractor's employees may be better protected.

Paragraph (c)—Site Characterization and Analysis

The employer needs to know the hazards faced by employees in order to develop and implement effective control measures. Site characterization provides the information needed to identify site hazards and to select employee protection methods. The more accurate, detailed, and comprehensive the information available about a site, the more the protective measures can be tailored to the actual hazards that the employees may encounter. Congress clearly intended that such a requirement be included. Section 126(b)(1) of SARA provides that the proposal include "requirements for a formal hazard analysis of the site . . . ." Therefore, OSHA is proposing to use the language from the interim rule as the language for the proposed paragraph (c).

It is important to recognize that site characterization is a continuous process. At each phase of site characterization, information is obtained and evaluated to define the potential hazards of the site. This assessment is to be used to develop a safety and health plan for the next phase of work. In addition to the formal information gathering that takes place during the phases of site characterization described above, all site personnel should be constantly alert for new information about site conditions.

Paragraph (d)—Site Control

This paragraph would require the employer to develop a site control program, as part of the employers' site safety and health plan, to minimize potential contamination of employees. This program would be a part of the safety and health program required by paragraph (b) Several items, such as establishing work zones, need to be considered so that employees know the hazards in different areas, and this will keep out of hazardous areas where their presence is not required.

Site control is especially important in emergency situations. Paragraph (d)(2) would describe the minimum basic components of a program to control the activities and movements of employees and equipment at a hazardous waste site.

The text proposed in this paragraph has been adapted from the interim rule. The need for site control is called for in item 9 of the EPA Order 1440.2. In addition, Subpart C of 29 CFR Part 1926 provides for regular inspection of job sites so hazards on the site can be controlled.

Paragraph (e)—Training

The proposed rule includes specific provisions for initial and routine training of employees before they would be permitted to engage in hazardous waste operations that could expose them to safety and health hazards. Section 126(b)(2) of SARA requires initial and routine training to be included in the proposal. The intent of the proposed training provisions is to provide employees with the knowledge and skills necessary to perform hazardous waste clean-up operations with minimal risk to their safety and health.

The proposed requirements for training in paragraph (e) address the needs of employees who will be working at CERCLA sites, certain RCRA sites, and sites designated for clean-up by state or local governments.

The proposed provisions include a minimum of 40 hours of initial instruction off the site, and a minimum of three days of actual field experience under the direct supervision of a trained and experienced supervisor, at the time of job assignment. Congress has specifically imposed these hour and day requirements under section 126(d) of SARA for the proposed final standard. The proposed requirement is a one-time effort by the employer for each employee covered by this standard. Employees do not need to be retrained for 40 hours at each site at which they work. Employees who have received the required training at one site can use that training to meet this requirement at other sites even if it involves a different employer.

There are often many hazards at a waste site. The employee would be trained to recognize the hazards and appropriate work practices to minimize those hazards. The employee would also be well trained in the use of respirators and other forms of personal protective equipment. Without training, that equipment may not be used effectively and may not provide adequate protection. An extensive training program is necessary to assure that employees can use personal protective equipment effectively. The proposed paragraph would specify the items needed for effective training to avoid hazards.

Managers and supervisors at the waste site who are directly responsible for hazardous waste site operations would require the same training as that of employees under this proposal, and at least eight additional hours of specialized training on managing hazardous waste operations. Since these managers and supervisors are responsible for directing others, it is necessary to enhance their ability to provide guidance and to make informed decisions. Section 126(d)(2) of SARA provides that there shall be eight hours of additional training for supervisors and managers.

The provisions also propose that employees be retrained on an annual basis on relevant matters such as review of health hazards and the use of personal protective equipment. Employees at hazardous waste operations face serious health and safety risks. Reminders are needed of this and of work practices necessary to avoid hazards. Personal protective equipment provides much of this protection. If there is no retraining in the use, care and maintenance of personal protective equipment, such equipment is unlikely to be properly utilized to provide adequate protection. The proposal would provide eight hours of annual retraining The EPA manual for refresher training (item #10) requires this amount of training.

In all areas of training, whether it be for general site employees, supervisors at the site, or for the use of specific equipment, the level of training provided shall be consistent with the worker's job function and responsibilities. Refresher training shall be supplied to reemphasize the initial training and to update employees on any new policies or procedures.

Section 126(d)(3) of SARA requires that the proposal include provisions for certification that an employee has received the training required by the standard. Section 126(d)(1) provides that the proposal not require training for employees who have already received equivalent training. The proposed standard has provisions to meet this directive.

OSHA requests comment as to whether this or a greater or lesser

amount of training is appropriate for those operations.

Paragraph (f)—Medical surveillance

The proposed rule includes specific provisions for baseline, periodic and termination medical examinations. Section 126(b)(3) of SARA provides that the proposal include requirements for medical examinations of workers engaged in hazardous waste operations. In addition, the EPA manual referred to in section 126(e) of SARA has more detailed requirements for initial or baseline, periodic and termination medical examinations. The clear Congressional direction is to provide a comprehensive medical surveillance program for employees engaged in hazardous waste operations where it is medically prudent.

In paragraph (f)(1)(i) OSHA proposes that medical surveillance is to be provided to employees who have been or are expected to be exposed to hazardous substances or health hazards above established permissible exposure limits without regard to the use of respirators for 30 or more days in a 12-month period, or who wear respirators 30 days during the year. These are the employees who will be at a greater health risk, and employees who wear respirators need to be examined to determine whether they can safely do so as a routine matter. Some dividing line is needed, because employees who might be present on a hazardous waste site only a few days a year, or working in areas such as offices on the periphery of the hazardous area where exposures are low, would not have a special requirement for medical surveillance as a result of their employment. Their likely cumulative exposures to toxic chemicals would be very low, probably not significantly higher than the general population. The EPA manual indicates some dividing line is appropriate because it directs medical surveillance only for employees "routinely" exposed.

It is proposed in paragraph (f)(1)(ii) that wearing respirators for any part of each of 30 days would require medical surveillance because such usage indicates routine exposure to toxic chemicals. There is no requirement that there be 240 hours of respirator use before medical surveillance is required. Similarly being exposed over established safe levels to several chemicals each for less than 30 days, but totalling more than 30 days per year, requires medical surveillance. This exposure indicates routine exposures to hazardous substances and also combinations of chemicals, and may cause synergistic effects creating greater health hazards than exposure to an individual chemical.

For employees who may have been exposed during an emergency incident to hazardous substances at concentrations above the permissible exposure limits without the necessary personal protective equipment being used, and for employees who are injured due to overexposure during an emergency incident, OSHA is proposing in paragraph (f)(1)(iii) that a medical examination or consultation be made available by the employer to affected employees for each incident. A continued medical surveillance program for these employees is not proposed to be required unless they also are covered under the provisions of paragraphs (f)(1)(i) and (f)(1)(ii) as discussed above.

In paragraph (f)(2), OSHA is proposing the frequencies for medical examinations and consultations to be provided to employees.

OSHA's proposal would require an initial or baseline medical examination, either prior to the start-up date for employees who are currently working at hazardous waste sites or prior to initial assignment to an area where medical examinations will be required. The purpose or the intent of baseline medical examinations is to take a detailed medical history, and where possible to develop a health baseline prior to any exposures so as to be able to evaluate changes which may be connected to hazardous substance exposures. In addition, the initial examination would permit evaluation of whether the employee can appropriately wear a respirator, and whether the employee has preexisting conditions which would make exposure to hazardous substances inappropriate. An initial examination has been required by other OSHA health standards, and is recommended in Reference 6 and required by the EPA.

The periodic examinations are required yearly. OSHA's experience in other health standards has been that this is an appropriate period, and it is also recommended by Reference 6. EPA's medical monitoring program guidelines cross-referenced in the EPA manual recommends baseline annual examination generally, as well as a termination examination. It is reasonable to determine periodically whether exposures have induced medical changes and to identify conditions caused by chemicals at an early stage to permit more effective treatment. In some circumstances, the physician may advise more frequent examinations. OSHA requests comment on whether yearly or another frequency for periodic examinations is most appropriate.

Examinations are also to be provided when the employee brings to the employer's attention signs or symptoms indicating possible overexposure to hazardous substances. The employee is to be trained in recognizing what symptoms may indicate that the employee has been exposed to a hazardous substance. Examples of such systems may be dizziness or rashes. Examinations are also required, when medically appropriate, during emergencies when exposure to higher levels is possible. For example, a urinary phenol test is appropriate for employees exposed to high levels of benzene.

Finally, employees who have been required to have medical examinations must also be given an examination upon termination of employment, or upon reassignment to an area where medical examinations are not required. This examination is proposed to detect conditions which have developed prior to departure and is recommended by the EPA program. The proposed provision does not require a termination examination if the employee has had an examination within the prior six months. The EPA guideline has that exception, but qualifies it only if the employee has had no significant exposures in the interval. OSHA requests comments on the appropriate provisions for a termination examination.

In paragraph (f)(3), OSHA would establish the content of medical examinations and consultations provided to employees.

In situations where most of the employees on the site have similar exposures, the protocol may be similar for all employees. Where different groups of employees on the site have substantially different exposures, several different protocols may be appropriate for the site's workers depending on exposures.

There are a number of sources for guidance on specific medical examination protocols. Chapter 5 of Reference 6 provides such guidance by groups of chemicals likely to be present on a site. It references other authorities. The manual should be supplied to the physician. It is also a basis for the medical surveillance program required by this paragraph. In addition, the EPA medical monitoring program guidelines referenced by the EPA manual provides guidance on specific protocols.

In paragraph (f)(4), OSHA proposes that the medical examination would have to be provided under the supervision of a licensed physician. As

provided by section 8(b)(7) of the OSH Act, the employer would have to pay the cost of the examination. In addition, provisions are proposed so that the employee is not discouraged from taking the examination. The examination would have to be given at a reasonable time and place. If given during regular working hours, it is proposed that the employees shall receive their normal pay for that time. If the examination is given outside regular working hours, it is proposed that the employee shall be paid regular wages for the time spent taking and waiting for the examination.

In paragraph (f)(5), OSHA proposes that the appropriate medical tests and examinations depend on the substances to which an employee is exposed, and to whether or not the employee wears a respirator. As employees on hazardous waste sites may be be exposed to differing substances, the proposed paragraph can not specifically state the required tests. Consequently the proposal states that the employer provide to the physician information on exposures, respirator use, and duties on the site. The physician is then to determine the appropriate medical surveillance protocol in terms of specific tests and examinations. As a result of the employer specifying duties, the physician can also judge whether the employee can handle the physical difficulty of the work. OSHA requests comment on whether it should include protocol for medical surveillance, and if so what that protocol should be.

In paragraph (f)(6) OSHA is proposing that the physician make a report to the employer of medical conditions which may make the employee at increased risk to work at the site, and any recommendations on limitations on use of respirators and other PPE as a result of the medical conditions. This will provide guidance for the safe employment of the employee at the site. Under the proposal, the physician could not reveal to the employer diagnoses or conditions unrelated to employment, but could inform the employee directly of those conditions and any and all occupationally related conditions. OSHA requests comment on whether medical removal protective provisions are medically necessary, feasible and appropriate.

In paragraph (f)(7) OSHA would that appropriate records be kept to assist in future evaluation of the employee's health. Secondarily, this information may assist in research on occupational related disease. It is proposed that records should be kept pursuant to the provisions of 29 CFR 1910.20. Full consideration was given in that standard to appropriate retention periods.

OSHA specifically requests comment on whether these or other criteria are the most appropriate for determining which employees should receive medical surveillance, taking into account both medical and administrative factors.

Paragraph (g)—Engineering Controls, Work Practices, and Personal Protective Equipment

It is proposed that anyone entering a hazardous waste site be protected against potential hazards. The purpose of proposing engineering controls, work practices, and personal protective equipment (PPE) is to shield or isolate employees from the chemical, physical, and biologic hazards that may be encountered at a hazardous waste site. Careful selection and use of appropriate engineering controls, work practices, and PPE should protect any employee from health and other hazards, including hazards to the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing.

Congress required in section 126(b) (4) and (5) of SARA that the proposal have provisions for the use of engineering controls and personal protective equipment. Section 126(b)(6) states that the proposal shall contain "requirements for maximum exposure limitations for workers engaged in hazardous waste operations." In addition existing OSHA regulations which apply in general to hazardous waste operations, in 29 CFR Part 1910, Subpart Z, require exposures to various toxic and hazardous substances to be controlled with engineering controls if feasible, otherwise with PPE.

Paragraph (g)(1) would carry over the existing requirements of the interim rule. It provides that toxic and hazardous substances regulated by OSHA are to be controlled to the permissible exposure limit with engineering controls if feasible. If such control is not feasible, the exposure is to be controlled with PPE.

Paragraph (g)(2) would provide that to achieve as appropriate established exposures levels for substances not regulated by OSHA in Subpart Z, the employer may use an appropriate combination of engineering controls, work practices, and PPE.

OSHA believes that the approach in paragraph (g)(2) accurately reflects Congress' guidance. OSHA requests comment on whether the approach it has followed is appropriate for hazardous waste operations and is protective of workers, taking into account that in some circumstances engineering controls are not available for those operations, and also the large number of chemicals which may be present at such sites.

OSHA is currently considering upgrading its respirator program requirements and is reviewing its current methods of compliance policy to determine if revision would be appropriate. A proposed rule on methods of compliance is scheduled for later in 1987. If as a result of this review the general policy is modified, these modifications would also apply to this standard.

Examples of engineering controls which may be feasible are pressurized cabs on materials handling equipment, or pressurized control rooms in materials handling areas. However, in many cases personal protective equipment will be the only feasible means for providing protection to employees engaged in hazardous waste operations.

It is proposed that the selection of personal protective equipment (PPE) be based on the information obtained during the site characterization and analysis, as is proposed by paragraph (g)(3)(i) of this standard. Once an estimate of the types of hazards and their potential concentration has been obtained, the proper respirators and protective clothing can be selected based on the performance characteristics of the PPE relative to the site hazards and work conditions, as is proposed by paragraph (g)(3)(ii) of the standard. These requirements are derived from Reference 6, and are also supported by a NIOSH document, "Personal Protective Equipment for Hazardous Materials Incidents: A Selection Guide." These two documents also support the proposals of paragraphs (g)(3)(iii) and (g)(3)(iv) which would require positive pressure respirators with escape provisions to be used in IDLH atmospheres, and totally-encapsulating chemical protective suits to be used where skin absorption of the substance would result in an IDLH situation.

Paragraph (g)(3)(v) would require that the level of protection provided by PPE selection be increased when additional information onsite conditions show that increased protection is necessary. The purpose of this regulation is to assure that employees do not become exposed to levels of hazardous substances above what is permitted after initial monitoring has been completed. It is possible that increased protection may become necessary due to unexpected releases of unknown substances or due to new

information developed about the substances being cleaned up.

Paragraph (g)(3)(vi) would require that PPE be chosen to keep exposures at or below established permissible exposure limits. This is a restatement of paragraph (g)(3)(vi) of the interim rule.

Proper respirator selection, as proposed by this standard, involves providing a sufficient protection factor through the type of respirator used, respirator fitting, worksite conditions, and a respirator selection and use program. Proper protective clothing selection, as proposed by this standard, involves choosing protective clothing made of materials and construction which will prevent breakthrough of hazardous substances by permeation and penetration, or will reduce the level of exposure to a safe level during the employee's duration of contact. Information on the performance characteristics of PPE is available from MSHA/NIOSH certifications, test reports and manufacturer's literature. OSHA is proposing an Appendix B that would provide non-mandatory guidelines on classifying substance hazards at four levels (A, B, C, and D), and on matching four levels of appropriate protection provided by different protective ensembles. These guidelines may be used as a basis for protective clothing selection, and the selection further refined when more information is obtained, as proposed in paragraph (g)(3)(v) of the standard. (In certain circumstances, this standard would specify the appropriate level of protection. See paragraph (c)(4)(iii).) Paragraph (g)(3)(vi) would cross-reference the existing requirements to select and use PPE pursuant to the requirements of 29 CFR 1910, Subpart I.

In paragraph (g)(4), OSHA proposes to require totally-encapsulating suit materials used for Level A protection (the highest level of protection) to provide protection from the specific hazards which have been identified as requiring that level of protection. The purpose of this proposal is to be certain that the suit selected is comprised of materials which will provide the necessary protection, since no one material will provide protection from all hazards. Paragraphs (g)(4)(ii) and (g)(4)(iii) would require totally-encapsulating suits to be capable of maintaining positive air pressure to help prevent inward leakage of hazardous substances, and to be capable of preventing inward gas leakage of more than 0.5 percent. These proposals, which are based on testing of totally-encapsulating suits, are included to establish a minimum level of suit performance so that their level of protection can be quantified for proper selection. OSHA is proposing in Appendix A to list the example test methods for totally-encapsulating chemical protective suits. OSHA believes that a higher degree of leak protection than 0.5 percent may be appropriate if both practical suits and test methods exist to achieve and demonstrate greater levels of protection. OSHA also believes that a qualitative test method utilizing a non-hazardous challenge agent or a quantitative test method for the suits would be preferable. It requests comments on these issues.

In paragraph (g)(5), OSHA would require a PPE program to be established as part of the site safety and health plan. This proposal is based upon reference 6, 29 CFR 1926.28, EPA manual items 4 and 7(g), and is included since PPE will be the only protection feasible for employee protection, in most cases, and because the amount of protection afforded by PPE is dependent upon so many factors, such as selection, fit, work duration and conditions, and decontamination. The PPE program would be required to insure that the level of protection afforded by PPE is sufficient and continues to be sufficient for employee safety during hazardous waste operations.

Paragraph (h)—Monitoring

It is essential that employers be provided with accurate information on employee exposures in order to implement the correct PPE, engineering controls, and work practices. Airborne contaminants can present a significant threat to employee safety and health. Thus, identification and quantification of these contaminants through air monitoring is an essential component of a safety and health program at a hazardous waste site. Reliable measurements of airborne contaminants are useful for selecting personal protective equipment, determining whether engineering controls can achieve permissible exposure limits and which controls to use, delineating areas where protection is needed, assessing the potential health effects of exposure, and determining the need for specific medical monitoring. Section 126(b) of SARA also mandates the inclusion of the necessary monitoring and assessment procedures in this proposed rule.

In paragraph (h)(1), OSHA proposes to require that air monitoring be used to identify and quantify airborne levels of hazardous substances. This language has been taken from the interim final rule.

In paragraph (h)(2), OSHA is proposing to require monitoring for airborne hazardous substances at uncontrolled hazardous waste sites. The purpose is to detect IDLH conditions, flammable conditions, or exposures to hazardous substances. Over exposure limits can be detected and controls can be instituted or suitable PPE selected and worn to protect employees from the hazard. Representative initial monitoring would be required for these conditions. Subsequent monitoring would be required whenever the possibility of an IDLH or flammable atmosphere has developed.

In paragraph (h)(3), OSHA proposes that additional remonitoring is necessary when, as a result of various changes, increased exposures are suspected. No specific interval of monitoring is proposed because of the variations present at each individual work station. Monitoring would not be required just because a condition changes; it would be necessary only when the change may lead to higher exposures.

In paragraph (h)(4), OSHA proposes to continue requiring personal monitoring of high-risk employees as is contained in paragraph (h)(4) of the interim final rule. The language of the proposal differs from that of the interim rule, however, the requirement remains the same. A note has also been proposed to clarify the intent of the proposed requirement. The language of this paragraph was adapted from reference 6.

Because of the large number of substances which may be present at a hazardous waste site, OSHA does not believe it is possible to specify a detailed monitoring protocol as it has done in substance specific standards. OSHA requests comment on whether alternate monitoring provisions would be more appropriate.

Paragraph (i)—Informational Programs

Congress provided in § 126(b)(7) of SARA that the proposal include an "Informational Program" to "inform workers engaged in hazardous waste operations of the nature and degree of toxic exposure likely as a result of such hazardous waste operation." Paragraph (i) in the proposal is designed to carry out this Congressional directive.

Paragraph (i) provides that employees, contractors, and subcontractors (or their representatives) be informed of the hazardous substances health hazards and other hazards to which they are exposed.

Employees covered by this proposal will normally be informed as part of their initial and refresher training

required by paragraph (e). Some of the training time required in paragraph (e) can be allocated to this information so that this provision does not increase training time over that which Congress has directed.

This provision is intended to cover employees who are exposed to greater hazards than the general employee population. Consequently a clerk in an office on the periphery of a site who does not enter the operations part of a site, and is exposed only to background levels of hazardous substance, would not be covered. Employees who regularly enter the operations areas on the site and are exposed to levels significantly over background would be covered.

The information program should concentrate on those substances which will create the greater risk to the employee, either because of their hazardousness or because of the likely higher degree of exposure, and for which precautions are most essential. For example, a level of exposure not higher than background to a general population would not normally require notification. Similarly a level of exposure above background, but well below established permissible exposure limits of chemicals, would not require the specific notification of this provision.

The identification of exposure level provisions are tied in with the monitoring provision of the standard, and do not create requirements to monitor additional to those created elsewhere in this proposed standard. Similarly there is no requirement to make risk estimates or to undertake original research on the degree of risks. The requirement is to inform the employee, contractor, or subcontractor of estimates in the literature or made by authoritative organizations. As the employers here are in the business of handling hazardous wastes, they should be familiar with this literature in order to manage their operations properly. Therefore extensive literature searches should not be necessary.

OSHA requests comments on whether these or other provisions of the proposal are a more effective method than the method used in the interim final rule for informing employees of the hazards they face in a manner that concentrates on the more important hazards and the methods by which they can be controlled.

Paragraph (j)—Handling Drums and Containers

In paragraph (j), OSHA is proposing procedures for the handling of drums and containers. The handling of drums and containers at hazardous waste sites poses one of the greatest dangers to hazardous waste site employees. Hazards include detonations, fires, explosions, vapor generation, and physical injury resulting from moving heavy containers by hand and working around stacked drums, heavy equipment, and deteriorated drums. While these hazards are always present, proper work practices can minimize the risks to site personnel. Section 126(b)(8) of SARA directs that the proposal contain provisions on the handling and storage of hazardous substances and this paragraph addresses that concern.

Containers (less than 30 gallons) are also handled during characterization, removal of their contents and during other operations. Many of the hazards encountered during the handling of drums also occur during the handling of smaller containers. The relative size of a smaller container when compared to the size of a drum is no indication of the degree of hazard posed by the container. They both should be treated in accordance with the level of hazard posed by their contents not by their size. The language used in this paragraph was adapted from Reference 6.

Paragraph (k)—Decontamination

Section 126(b)(10) of SARA provides that the OSHA proposal contain requirements for decontamination procedures. Decontamination is a necessary practice to protect those employees properly who may be exposed to hazardous substances. Decontamination provisions protect an employee from being exposed to hazardous substances which might otherwise be on the employee's PPE when it is removed. OSHA is proposing that a decontamination plan be developed and implemented before any employees or equipment may enter areas on site where potential exists for exposure to hazardous substances.

As proposed in this standard, decontamination procedures and areas must be developed to minimize hazardous exposures to employees whose equipment and PPE are being decontaminated, as well as to employees who are assisting in the decontamination of workers and equipment. These measures are proposed since without proper procedures and decontamination areas, employees may be unknowingly exposed to hazardous substances which have contacted or otherwise adhered to equipment and clothing. OSHA is also proposing that all employees be decontaminated and that all clothing, equipment and decontamination fluids and equipment be decontaminated or disposed of before leaving a contaminated area. These provisions are proposed so that contaminated persons and materials do not leave the "hot zone" and thereby expose other employees and persons to hazardous substances.

Decontamination methods and cleaning fluids must be matched to the particular hazardous substance at the site in order for the decontamination procedures to be effective in removing the hazards from PPE and other equipment. No one decontamination fluid will be effective for all hazardous substances. As proposed in this standard, the decontamination program must be effective and it must be monitored by the site safety and health supervisor to maintain its effectiveness. These proposals are made so that employees are not exposed to hazardous substances by re-using PPE and other equipment which are still contaminated.

Effective employee decontamination also requires clean change rooms and showers. There must be an area where the employees can remove the contaminated work clothing and where it will not contaminate the employees' street clothing. In addition, the employees must be able to shower after removing contaminated work clothing and then go into a clean area where the employee can put on street clothing. Paragraph (k) contains these decontamination requirements. Somewhat different provisions are required for sites of less than six-month duration because more permanent facilities are not as feasible for short-term operations. The language used in this paragraph was adapted from reference 6.

Paragraph (l)—Emergency Response

Section 126(b)(11) of SARA specifically provides that the proposal contain "requirements for emergency response." In addition, the EPA manual under items 4 and 9, and 29 CFR 1926.23 and 1926.24 require preparations and planning for emergencies. Congress made its intent clear that emergency planning and response is an important part of any employer's safety and health program, and directed that it is to be addressed in the proposed rule.

The Congressional concerns on toxic emergencies is discussed in *Task Force on Toxic Emergencies*, Environmental and Energy Study Conference Special Report, September 18, 1986. This report stresses the need for training of emergency response personnel as well as emergency response planning and related areas.

In paragraph (l)(1)(i), *Emergency Response, General*, OSHA is proposing

at employers who are involved in ergency response to hazardous waste cidents develop and implement an mergency response plan for mergencies. Employers would have to form all their employees about the ergency response plan. The plan would also have to be available for use prior to the start of work on the site. It ould have to be in writing and ailable for inspection by employees, eir representatives, and OSHA personnel. OSHA proposes to exempt nployers from the rest of paragraph (l) they provide an emergency action an in accordance with 29 CFR 1910.38 that requires the total and immediate acuation of employees from the lease site.

In paragraph (l)(1)(ii), OSHA is proposing that the emergency response lan include the following elements: (1) ecognition of emergencies; (2) methods procedures for alerting employees onsite; (3) evacuation procedures and routes to places of refuge or safe stances away from the danger area; (4) eans and methods for emergency medical treatment and first aid; (5) line of authority for employees; (6) contamination procedures; and (7) site ntrol means and methods for valuating the plan.

Local fire departments, police epartments or emergency medical rvices would also be required to have h emergency response plan. These employees which may be called upon to spond to hazardous substance mergency incidents involving a railroad nk car, motor carrier tank truck or to a plant location where they do not gularly work are considered involved emergency response activities at ther than hazardous waste clean-up sites under this section. However, work by maintenance or repair personnel who re called upon to replace a leaking alve or a section of pipe damaged by an unexpected release, or to restore a highway surface or railroad track bed at may have been damaged in an ccident causing the release of a azardous substance, are not considered as being part of the "emergency sponse" for the purpose of this oposal. Such employees routinely spond to accident sites to restore equipment to a functional level after an ccident has occurred. Typically the ccident scene will have been declared non-hazardous" in regards to employee exposure to hazardous substances. Should a health exposure exist, these mployees would be covered by SHA's General Industry health standards in Subpart Z. Safety hazards related to their work would be covered by the appropriate Part of Title 29 related to their work (i.e., 1910, 1926, etc.)

The emergency response plan would have to include the incident command system required in paragraph (l)(3) of this section. OSHA believes that a generic emergency response plan is feasible for employers.

In paragraph (l)(3), *Emergency response at hazardous waste clean-up sites*, OSHA is proposing requirements for emergency response at hazardous waste clean-up sites. The title for this paragraph would be changed from the title *"On-site emergency response"* as used in the interim rule to *"Emergency response at hazardous waste clean-up sites"* to clarify the intent of the type of response OSHA is proposing to cover in this paragraph. Further the term "on-site" would be replaced with the phrase "at hazardous waste clean-up site" as appropriate.

An employer's emergency response personnel at hazardous waste clean-up site operations must have the same basic training as for the other employees involved in routine hazardous waste clean-up operations plus the training needed to develop and retain the necessary skills for anticipated emergency response activities. CERCLA sites, major corrective actions at RCRA sites, sites designated for clean-up by state and local governments and other similar hazardous waste clean-up sites require more training because there is the possibility of uncontrolled hazards.

Note.—Emergency response personnel from other places of employment of different employers who respond to the site must comply with the training requirements of paragraph (l)(3).

In paragraph (l)(3), *Emergency response at other than hazardous waste clean-up sites*, OSHA is proposing requirements for emergency response at other than hazardous waste clean-up sites. The title for this paragraph would be changed from the title *"Off-site emergency response"* as used in the interim rule to *"Emergency response at other than hazardous waste clean-up sites"* to clarify the intent of the type of response OSHA is proposing to cover in this paragraph. Further the term "off-site" would be replaced with the phrase "at other than hazardous waste clean-up site" as appropriate.

Fire departments, emergency medical and first-aid squads, fire brigades, and other similar emergency response teams would have to conduct monthly training sessions for their employees, except as provided in (l)(3)(i)(A)(*3*) and (l)(3)(i)(A)(*4*). Regular training is needed so that the employees with responsibility for controlling, containing and extinguishing fires of hazardous substances know the proper techniques and equipment to use. They must also know the appropriate PPE to use and how to wear it and how to coordinate with fellow employees. Without this knowledge their lives would be in jeopardy. The training needs to be recurring because quick decisions will have to be made in the dangerous emergencies of chemical fires, acid spills, poisonous fumes, etc. where there often will not be time to consult manuals and the information needs to be fresh and accurate in the employees' minds.

Some changes have been made in the proposal from the interim rule. The interim rule required 24 hours of training and monthly sessions. OSHA believes that is a reasonable amount of training required and it is retained as an option in the proposal.

However, a prescription of a number of hours does not necessarily indicate proficiency and employees could develop proficiency in fewer hours. Therefore, OSHA is proposing an alternative. The alternative would provide that employees be trained sufficiently so that they demonstrate competency in the relevant areas of their duties.

In addition, the interim rule clarifies that training need be given only to those employees who will be engaged in controlling toxic chemical fires and containing spills. Employees who may be first on the scene, but not expected to engage in response activities, may be trained only in hazard recognition if they are instructed to call others to control hazardous substance spills and fires. Employees for whom there is no reasonable possibility of making an emergency response need not be trained in making such a response.

In addition, the proposal clarifies that the intent of the training requirements is to ensure that fully-trained personnel are available to respond to hazardous substance emergencies. Accordingly, each individual emergency response organization is not required to have a fully-trained hazardous substance response team if arrangements have been made in advance to ensure that such a team is available to respond in a reasonable period if summoned. If any emergency response organization chooses to rely on an outside team for hazardous substance emergencies, then its members must be sufficiently trained to recognize that an emergency situation exists which requires the intervention of the designated hazardous spill response team and to know how the spill response team should be contacted. An

example may be a metropolitan area in which an emergency spill team is available to respond immediately to spills anywhere within the area. In such a case, each emergency response organization in the area would not have to train individual member to the degree specified in paragraph (l)(3)(i)(A)(*1*) if the members knew when and how to call in the designated spill response team.

However, the employees fully trained must be sufficient to handle reasonable possible emergency response situations. There are additional requirements for HAZMAT teams because they face the greater hazards of stopping leaks of hazardous chemicals.

It is noted that OSHA does not have direct jurisdiction over state and local government employees. OSHA state plan states must regulate state and local government employees in the state. State and local government employees in non-OSHA state plan states will be covered by EPA. [See section 126(f) of SARA.]

Training sessions on activities such as breathing apparatus use, hose handling and preplanning may be used as training subjects for the monthly sessions, provided hazardous substance incident operations are included in the presentation, discussion or drill. It is proposed that these training sessions and drills contain at least 24 hours of training on an annual basis.

It is also proposed that an incident command system be established by employers for the incidents that will be under their control, and that the system be interfaced with the other organizations or agencies who may respond to such an incident. The National Transportation Safety Board, as a result of its investigation of hazardous materials incidents, has consistently recommended that better state and local emergency response planning be done to reduce the loss of life and property, and that a system using a command post and on-scene commander be implemented. (See *Special Investigation Report. On-scene Coordination Among Agencies at Hazardous Materials Accidents*, NTSB-HZM-79-3, September 13, 1979; and *Multiple Vehicle Collisions and Fire, Caldecott Tunnel near Oakland, California*, NTSB/HAR-83/01, National Transportation Safety Board, Washington, DC, April 7, 1982, for further information.) OSHA is proposing that where available, state and local district emergency response plans would be utilized in developing the incident command system and the emergency response plan to assure compatability with the other emergency responding agencies or employers.

In paragraph (l)(4), *Hazardous materials teams*, OSHA is proposing to require employers, who utilize specially trained teams involved in intimate contact with controlling or handling hazardous substances, to provide special training for the affected employees in such areas as care and use of chemical protective clothing, techniques and procedures for stopping or controlling leaking containers, and decontamination of clothing and equipment after hazardous substance incidents. The employer would have to implement a medical surveillance program in accordance with the proposed requirements of paragraph (f) of this section. It should be noted that employees of employers covered by paragraph (a)(2)(ii) already would receive these protections as a result of other provisions in this proposal. However, this paragraph does not require any employer to form or organize a hazardous materials team. It only applies when such a team has been organized and utilized.

In paragraph (l)(5)(i), OSHA is proposing to require that employers who will be involved in cleaning up hazardous waste after the emergency response activities are concluded, comply with the same requirements that apply to others involved with hazardous waste clean-up operations. These hazardous waste clean-up operations will be typically accomplished by special contractors, and not by those agencies involved in responding to the initial emergency incident.

However, this paragraph does not apply to those employees who clean-up a spill in their work area which did not involve an emergency response by the fire brigade, fire department or similar organization.

After an emergency response incident is brought under control on plant property, and post-emergency clean-up of hazardous materials begins, paragraph (l)(5)(ii) would permit the employer whose facility was affected by the incident to use plant employees to decontaminate the workplace. This provision has been addressed and permitted in the past by specific OSHA health standards such as 29 CFR 1910.1017(h)(2)(i), 29 CFR 1910 1008(d)(2) and others. The employees who may take part in the clean-up would have to have completed the full training program required in 29 CFR 1910 1200, and the respirator training required in 29 CFR 1910.134 Emergency action plans would have to be provided in accordance with § 1910.38(a). Any appropriate safety and health training required by the specific tasks to be completed as part of the clean-up effort would also have to be provided. Employers whose employees will be performing post-emergency cleaning of workplaces would be exempt from paragraph (l)(5)(i) of this section if they comply fully with paragraph (l)(5)(ii) of this section.

OSHA requests comment on whether the proposals it has made and distinctions it has drawn for emergency response are appropriate, or whether improvements can be made.

Paragraph (m)—Illumination

In paragraph (m), *Illumination*, OSHA is proposing to require certain minimum illumination levels for work areas that are occupied by employees. OSHA was mandated by SARA in section 126(e) to include illumination requirements in the interim final rule published in December 1986. OSHA believes that the intent of Congress is to provide coverage concerning illumination, and has therefore proposed to regulate it in this proposed final standard. The provisions come from OSHA's construction industry requirements for illumination at construction sites issued at 29 CFR 1926.56. SARA calls upon OSHA to use the requires of Subpart C in Part 1926. Subpart C references the requirements of Subpart D which contains § 1926 56. OSHA request comment on whether these or other provisions are more appropriate for hazardous waste operations.

Paragraph (n)—Sanitation for Temporary Worksites

In paragraph (n), *Sanitation for temporary worksites*, OSHA is proposing minimum requirements for potable and non-potable water supplies, toilet facilities, and other areas related to sanitation at temporary workplaces. OSHA was mandated by SARA in section 126(e) to include sanitation requirements in the interim final rule. The provisions in this proposed standard come from OSHA's construction industry requirements for sanitation at construction sites issued at 29 CFR 1926.51 with one addition SARA calls upon OSHA to use the requirements of Subpart C in Part 1926. Subpart C references the requirements of Subpart D which contains § 1926.51. OSHA is proposing to expand the referenced construction standard in this rulemaking with requirements for showers and change rooms Regulation of these facilities was not a part of the interim final rule. The proposed addition has been made to address the installation and operation of employee

showers and change rooms at worksites where clean-up operations are expected to take six months or more to complete.

OSHA requests comment on whether these or other provisions are more appropriate for hazardous waste operations.

Paragraph (o)—Operations Conducted Under the Resource Conservation and Recovery Act of 1976 (RCRA)

OSHA is proposing a separate paragraph for operations conducted at worksites involving hazardous waste storage, disposal and treatment operating under the Resource Conservation and Recovery Act of 1976 (RCRA). This separate paragraph of requirements is appropriate because RCRA site operations (not including major corrective actions and their associated hazards which are similar to CERCLA sites, and are covered by the main part of the standard) generally are different from the operations and hazards found on a CERCLA clean-up site. For example, RCRA sites that would be covered by this paragraph tend for the most part to be fixed on-going operations involving the receiving, processing, storage, treatment, and disposal of hazardous wastes or substance from outside sources. CERCLA sites, on the other hand, are temporary emergency clean-up operations involving often undefined and substantial quantities of hazardous substances.

Consequently hazards should be better controlled and more routine and stable for the RCRA sites covered by this paragraph, and therefore less extensive requirements are appropriate. OSHA requests comment on whether the provisions of paragraph (o) are appropriate for general RCRA sites.

In paragraph (p), *New technology programs*, OSHA proposes to address new technology programs. New technology programs are intended to provide employees with means to become aware of new equipment, processes, and procedures that may contribute to improving their safety and health on the job. Paragraph (b)(9) of SARA also requires the agency to address new technology programs as part of this proposal.

III. References

1. Superfund Amendments and Reauthorization Act of 1986 (SARA), Pub. L. 99-499.

2. Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA or "Superfund"), Pub. L. 96-510, December 11, 1980, 94 Stat. 2767.

3. Resource Conservation and Recovery Act of 1976 (RCRA), Pub. L. 94-580, October 21, 1976, 90 Stat. 2795.

4. "Health and Safety Requirements for Employees Engaged in Field Activities," Environmental Protection Agency Order 1440.2, U.S. Environmental Protection Agency, July 12, 1981.

5. Subparts C and D of 29 CFR Part 1926.

6. "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," Occupational Safety and Health Administration, Environmental Protection Agency, U.S. Coast Guard, and National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 85-115, October 1985.

IV. Issues for Comment

OSHA requests comments on all issues raised by this proposal, including the issues specifically raised throughout the preamble. OSHA also requests comment on the following issues:

1. Ninety days after the promulgation of the final OSHA regulations that result from this notice of proposed rulemaking, section 126 (f) of the Superfund Amendment and Reauthorization Act of 1986 (SARA) requires the Administrator of the Environmental Protection Agency (EPA) to promulgate standards identical to those promulgated by OSHA pursuant to this rulemaking for employees of State and local governments in each state which does not have in effect an approved State plan under section 18 of the Occupational Safety and Health Act of 1970. EPA is to provide standards for the health and safety protection of employees engaged in hazardous waste operations. Does the requirement that EPA apply identical standards to employees of State and local governments engaged in hazardous waste operations raise any issues about the substance of the standards that would not be raised by their application to other workers? EPA will conduct its own rulemaking to define those employees to whom the standards will apply.

2. OSHA has defined the term "established permissible exposure limit" to cover the many hazardous substance and health hazards possibly present in hazardous waste operations. Is another definition or term more appropriate and, if so, how should it be defined? Should several terms be used for different purposes, such as site entry or guidance on use of PPE? How should OSHA determine safe levels of exposure for unknown substances or mixtures of substance?

3. In order to perform a Regulatory Impact Analysis and a Regulatory Feasibility Analysis for the final standard, OSHA requests information concerning the following general topics: The type, number, and characteristics of the contractors and other entities involved in hazardous waste operations; the number of potentially affected employees at hazardous waste operations; the available fatality, injury, and illness statistics associated with hazardous waste operations; current industry practices in hazardous waste operations; the potential costs of compliance; and the potential economic impact of the proposed standard upon the economy and upon small entities. In addition to any other information that is supplied on these issues, OSHA is particularly interested in information concerning the specific questions found in Issues 4 through 18. OSHA already has substantial information in these areas, but more information would be helpful in improving the regulation and making more detailed estimates of impacts.

4. What type of contractors and other entities are involved in hazardous waste operations? How many are there? What are their characteristics? What is the typical scale of clean-up operations? Numerous local construction contractors may be employed in clean-up activities at uncontrolled hazardous waste sites. What are the characteristics of these firms? Are they typical of construction firms (particularly excavation contractors) in general or not? Are these contractors able to specialize in work at uncontrolled hazardous waste sites?

5. For investigation and clean-up of uncontrolled hazardous waste sites, can you estimate the split between government and privately funded clean-up work? Can you describe/estimate the components of the privately funded work between (1) private actions in direct response to government enforcement efforts, (2) voluntary private actions (apparently) preceding direct enforcement actions, (3) voluntary private actions in preparation for sale of property, and (4) voluntary private actions without any encouragement from enforcement or other external factors? The government-funded work at uncontrolled hazardous waste sites may continue for a decade or more. Can you estimate the duration of work in the private sector? What are the differences, if any, between clean-up project characteristics of government sponsored activities and private clients?

6. How often do emergency spills occur at a clean-up site, and how often do they occur off the site? How many of

these emergency spills are cleaned up by private contractors? Are these private contractors the same as those contractors performing hazardous waste clean-ups on hazardous waste clean-up sites? How often are emergency spills cleaned up by state and local employees? How many fires occur that require state and local firefighters to enter a hazardous waste site?

7. Do industrial establishments with industrial fire brigades generally ask those brigades to respond to in-house hazardous material spills or releases? If not, who does respond? Are other response groups designated? What provisions do other establishments (i.e., those without brigades) make for responses to hazardous material spills or releases?

8. How may private HAZMAT teams (response groups) are there? Are many of the teams designated for responses for several emergency networks (e.g., for responding to CHEMNET emergencies, Chlorine Institute emergencies and others)? How many HAZMAT specialists, advisors or consultants, or other groups are there that may respond to incidents but who do not physically get involved in the response action?

9. How many employees are exposed to hazardous substances during clean-ups at a typical CERCLA site, at a typical RCRA site; and at an emergency spill? What are the typical hazardous substances found at a CERCLA site and at a RCRA site? What are the typical exposure levels? How many average daily hours of exposure to site hazards would a typical employee face during clean-up operations, and during final site reclamation work? At how many waste sites does the average employee work during a year? What are the training and experience levels of these employees? What is the labor turnover rate? What percentage of these employees have previously worked at CERCLA or RCRA sites?

10. The proposed standard covers employers and employees engaged in operations regulated under 40 CFR Parts 264 and 265 pursuant to RCRA. Are there other RCRA operations involving hazardous waste handling covered by other Parts in Title 40 of the Code of Federal Regulations which OSHA should include in the scope of this standard? Are there any other paragraphs of this proposal not specifically referenced in paragraph (o) for applicability to RCRA sites that should be made applicable to RCRA sites?

11. What are the current industry practices with respect to the provisions in the proposed standard? What actions would be necessary for compliance? Does the current degree of compliance depend upon the type of site? Are there any provisions that would, in some specific situations, be either technologically or economically infeasible? What would those specific situations be?

12. How much training is being provided for various types of employees? Who has provided this training? How often is training repeated? Are truck drivers who haul the hazardous substance from the site trained and, if so, to what extent and by whom? Are monthly drills or other training provided for emergency responders to spills?

13. What preparations are made for emergency situations that may arise at CERCLA or RCRA hazardous waste sites?

14. What are the typical practices concerning air monitoring? How extensive is the information concerning the specific hazardous substances at a CERCLA site and at a RCRA site?

15. Do employees receive medical exams prior to the first site assignment? Are exit exams provided? Are medical exams given annually? Are these exams given to HAZMAT team members? Which tests and analyses are included in the medical exam?

16. Is personal protective equipment used in accordance with the proposed standard? If not, why not? Is a self-contained breathing apparatus worn at all times during emergencies with hazardous substances? If not, what types of instances might not require their use?

17. What sources of fatality, illness, or injury statistics are available for hazardous waste operations? What are the causes of these fatalities and injuries? What types of site characteristics or employee actions have contributed to fatalities and injuries? Are there specific cases of acute or chronic illnesses occurring to employees performing hazardous waste operations? Would specific provisions in the proposed standard have prevented these cases? Which provisions?

18. What would be the unit costs of complying with each of the provisions for which there is current non-compliance? What would be the annual costs by provision and by site? What would be the capital costs? What would be the one-time expenditures? What would be the typical total, annual and capital costs of compliance for a contractor? What would be the typical receipts, profits, and investment of these firms? To what extent would this cost of compliance be passed onto the price of the clean-up operation? What would be the typical impact of compliance upon the price charged to clean-up of a CERCLA site, a RCRA site, and a private site? Would small entities be faced with an adverse impact that would be significantly greater than the adverse impact faced by the larger entities? If so, what particular provisions would cause this impact?

19. OSHA is proposing certain training requirements for employees who are expected to work with hazardous substances. The Agency proposes to require certification to show that training has been completed. Should it set criteria for the persons doing the training? Is the requirement of a written certification upon completion of training given to the employee sufficient to show that training has been completed? With regard to the various training requirements in the standard, should OSHA require specific training courses or curriculum? What should a training certification include? If the employer is allowed to certify that an employee has been trained, what format should this certification follow?

20. In the issue of medical surveillance and the surveillance records necessary to show employee exposures, how should OSHA provide for records transfer when an employee moves from one job site to another job site, or from one employer to another employer?

21. Test methods for evaluating the performance of totally-encapsulating chemical protective suits are included in Appendix A of this standard. A pressure test using compressed air and a qualitative leak test using vapors from concentrated aqueous ammonia are included. Are these test methods adequate for ensuring the integrity of totally-encapsulating chemical protective suits? Are other test methods available which would be more suitable? Is there a danger to employees from the use of such a volume of concentrated aqueous ammonia?

22. The standard and appendices do not contain any test methods for other chemical protective clothing such as overalls, chemical-splash suits and chemical-resistant gloves. Are there any tests methods available which evaluate the performance of these types of protective clothing and gloves as they would perform when worn? Is there a need to include test methods for chemical protective clothing and gloves?

23. The standard requires that clothing and equipment leaving a contaminated area be appropriately disposed of or decontaminated. What methods are available to evaluate the effectiveness of decontamination procedures? What methods are available to determine when decontaminated clothing and

equipment are safe to reuse? What guidelines or procedures are available to ensure proper disposal of contaminated clothing and equipment?

24. The practical health benefit of annual medical examinations for workers in hazardous waste operations may be, however, uncertain. Hazardous waste operations often involve exposure to numerous chemicals some of which may be unknown, to which workers may be exposed once, intermittently, or regularly. Consequently, it may not be possible to determine in advance what particular biological markers are relevant in determining over-exposure; which medical tests should be conducted; or even if the same medical tests should be conducted with each yearly examination. One consequence of this uncertainty may be over-testing—the application of a battery of medical tests simply in order to cover the full spectrum of possibilities. Such testing would be costly and in some circumstances of limited health benefit, and would not assure the worker that health effects have not occurred as a result of over-exposure. This situation differs from that in most other activities regulated by OSHA, in which specific exposures have been identified and specific tests can be conducted to determine if workers have been over-exposed.

Since, in some circumstances, it may not be possible to determine in advance what doctors should look for in workers engaged in hazardous waste operations, it may be more useful to follow the initial or baseline exam with periodic examinations of those workers who show symptoms indicating sensitivity or possible over-exposure to hazardous substances. Follow-up exams would occur at intervals recommended by the physician. The effectiveness of this approach in identifying workers in need of medical surveillance would be enhanced by worker training on recognition of symptoms indicating possible over-exposures. OSHA solicits comments on the appropriateness and effectiveness of this alternative to annual medical examinations.

V. Regulatory Impact Analysis, Regulatory Flexibility Analysis and Environmental Impact Assessment

Introduction. Executive Order 12291 (46 FR 13197, February 19, 1981) requires that a regulatory impact analysis be conducted for any rule having major economic consequences for the national economy, individual industries, geographical regions, or levels of government. In addition, the Regulatory Flexibility Act of 1980 (Pub. L. 96-353, 94 Stat. 1164 [5 U.S.C. 601 *et seq.*]) requires the Occupational Safety and Health Administration (OSHA) to determine whether a proposed regulation will have a significant economic impact on a substantial number of small entities, and the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321, *et seq.*) requires the agency to assess the environmental consequences of regulatory actions.

In order to comply with these requirements, OSHA has prepared a Preliminary Regulatory Impact and Regulatory Flexibility Analysis (PRIA) for the proposed hazardous waste operations and emergency response standard. This analysis includes a profile of the industries that would be affected, the estimated number of employees who would be at risk from occupational exposures to hazardous wastes, technological feasibility, costs, benefits, and an overall economic impact of the proposed standard. The PRIA is available in the OSHA Docket Office.

Data Sources. The primary sources of information for this analysis are an April 1986 report by The Eastern Research Group (ERG) entitled, "Preparation of Data to Support A Regulatory Analysis and Environmental Assessment of the Proposed Standard for Working at Hazardous Waste Sites." Most of the information contained in this report was gathered from Environmental Protection Agency sources, industry sources, experts in the area of hazardous waste management, etc. OSHA welcomes additional comments and all information supplied will be carefully reviewed and evaluated for incorporation into the Regulatory Impact Analysis (RIA) that will accompany the final rule.

Industry Profile. The proposed standard would affect about 20,000 uncontrolled hazardous waste sites, about 4,000 hazardous waste operations conducted under the Resource Conservation and Recovery Act (RCRA) of 1976, about 13,600 spills of hazardous materials that occur annually outside a fixed facility, and about 11,000 spills of hazardous materials that annually occur inside a fixed facility. The firms that would be affected by this proposed standard are as follows: about 100 contractors that perform hazardous waste cleanups; about 50 engineering or technical services firms that perform hazardous waste preliminary assessments or site investigations and remedial investigations or feasibility studies for hazardous waste site cleanups; about 300 RCRA-regulated commercial treatment, storage and disposal facilities; about 3,700 RCRA-regulated facilities that are operated by a hazardous waste generator; about 28,000 fire departments; about 750 private hazardous materials (HAZMAT) response teams; and about 22,000 manufacturers that use in-house personnel who respond to emergency spills of hazardous material within the facility.

Population at Risk. As many as 1,191,950 employees may be at risk from exposure to hazardous waste. Of these 1,191,950 employees, about 12,100 are employed at government-mandated uncontrolled hazardous waste site cleanups, about 52,700 are employed at RCRA-regulated facilities, about 944,500 are firefighters, about 7,500 are private HAZMAT members, and about 176,000 are members of industrial fire brigades that provide in-plant emergency responses to hazardous materials spills. Most of these employees, however, do not work full-time around hazardous waste. In fact, nearly all of the 1,120,500 firefighters and industrial fire brigade personnel who are at risk are annually exposed to hazardous materials for only a few hours. Virtually all of the public firefighters will be directly regulated by either individual state OSHA standards or the U.S. EPA standard.

Feasibility. The proposed standard does not require the use of any large-scale capital equipment that is not currently used in normal work operations. In addition, each proposed provision requires equipment and work practices that are currently available. Thus, OSHA has preliminarily determined that the proposed standard is technologically feasible.

Benefits. Numerous case studies indicate that exposures to hazardous waste cause adverse health consequences. Compliance with the proposed standard, therefore, would prevent employee fatalities and illnesses resulting from these acute and chronic exposures. OSHA has not quantified the expected reduction in the number of these occupational fatalities and illnesses because time was not sufficient to conduct field data collections on current and future exposures to hazardous waste. The probability that a significant number of excess fatalities and illnesses will occur in the absence of a proposed standard was clearly recognized by Congress in its mandate to OSHA to promulgate a standard within one year from the date that the Superfund Amendments and Regulations Act (SARA) became law. Compliance with the proposed standard will reduce the number of these fatalities and injuries by reducing

employee exposures to hazardous waste.

Cost of Compliance. OSHA has used current work practices as its baseline for estimating the cost of full compliance with the proposed standard. This estimated cost does not include any cost that is currently being incurred by employers as part of their work practices because those work practices, and therefore those costs, would continue whether or not the proposed standard were promulgated.

TABLE A—TOTAL ANNUAL COST OF COMPLIANCE FOR THE PROPOSED STANDARD

(Millions of 1986 dollars)

Provision	Government-mandated cleanups of uncontrolled waste sites	RCRA-regulated facilities	Fire departments	Private HAZMAT teams	Fire brigades	Total
Monitoring	2.606					2.606
Medical	1.262	13.866		1.483		16.611
Training:						
(Direct)	($3 148)	($5.929)	(24.052)	($0.317)	(19 926)	($53 982)
(Indirect)	(17.500)	(—)	(—)	(—)	(—)	(17 500)
	20 648	5.929	24.052	0.317	19.526	71.482
Decontamination	2.047		5.687	0.827	3.529	11.890
SCBA	0.225		4.250	0.226	4.979	4.682
Emergency Response Plans		0.157	3.341	0.096	1.819	5.415
Emergency Plan Rehearsal		1.320				1.320
Operating Procedures		0.426				0.426
Plan to Minimize Exposure			5.707	0.153	3.084	8.944
PPE Plan			5.376	0.955	1.840	7.271
TECP			61.200	0.155		11.355
Other	1.982		0 101	0.005		1.468
Total	28 152	22.718	59.714	3.101	34.787	148.472

Source. U.S. Department of Labor, OSHA, Office of Regulatory Analysis, as derived from ERG report [1, Appendix C].

As seen in Table A, OSHA has estimated that the total annualized incremental cost of full compliance with the proposed standard would be about $148 472 million, of which $28 152 million would be spent by contractors on government-mandated uncontrolled hazardous waste site cleanups, $22.718 million would be spent by operators on RCRA-regulated facility cleanups and operations, $59 714 million would be spent by fire departments, $3 101 million would be spent by private HAZMAT teams, and $34.787 million would be spent by industrial fire brigades.

Although OSHA's proposed standard does not directly cover state and local government employees, SARA requires that the U.S. EPA adopt the standard to cover state and local government employees in non-state plan states, and the OSH Act requires that state plan states adopt a comparable standard to cover state and local government employees. Thus, virtually all of the $59.714 million cost to fire departments will be directly mandated by either the individual states or the U.S. EPA.

The provision with the largest annual cost of compliance is the employee training provision ($71.482 million), followed by the medical surveillance provision ($16 611 million), the provision requiring the decontamination of personnel and equipment ($11.890 million), and the provision governing the use of totally encapsulating chemical protective (TECP) suits ($11.355 million).

Economic Impacts. Most of the incremental cost of compliance will be paid by the government or the private firm responsible for the hazardous waste cleanup and OSHA has calculated that it is economically feasible for every affected industry or group to comply with the proposed standard. There may be an impact upon some labor markets as a consequence of the proposed provision that only sufficiently experienced employees, or employees certified to have received a week's training at an appropriate training facility, will be allowed to work on hazardous waste site. This proposed provision would effectively curtail the current practice of using local subcontractors to provide short-term employees for hazardous waste site cleanups and limit the number of employees eligible to work at hazardous waste sites. This, in turn, may increase future wage rates and the cost of hazardous waste site cleanups.

Regulatory Flexibility Analysis

Pursuant to the Regulatory Flexibility Act of 1980, the Assistant Secretary has preliminary assessed the expected impacts of the proposed standard on small entities. Based on the available information, OSHA has determined that the proposed standard may have some impact upon some small entities. The cost of training an employee for five days prior to working at a hazardous waste site cleanup would substantially reduce the use of subcontractor labor on a one-time basis. Thus, some local subcontractors face a potential reduction in hazardous waste site cleanup work. The majority of this subcontracted work will probably be performed by those subcontractors who concentrate upon this type of work. Subcontractors who have performed cleanup work but who do not elect to train employees needed to qualify for future work will probably be excluded from working in this market. OSHA does not have information concerning the importance of this potential loss of future business for some local subcontractors. Therefore, OSHA is soliciting information on this issue and any comments received will be carefully reviewed and evaluated for incorporation into the RIA that will accompany the final rule.

Environmental Impact Assessment—Finding of No Significant Impact

OSHA has reviewed the interim final and proposed standards for hazardous waste operations and emergency response and has concluded that no significant environmental impacts are likely to result from the promulgation of these regulations. OSHA reserves the right to perform additional environmental analyses that may be appropriate as a result of information and comments received in response to this Notice.

In OSHA's December 19, 1986, interim final rule for the protection of workers engaged in hazardous waste and emergency response operations, information was solicited from the public on various issues, including possible environmental impacts on the

regulation. To date, no comments have been received on the question of environmental impact. On the basis of the review detailed below, and in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969 [42 U.S.C. 4321, *et seq.*], the Council on Environmental Quality (CEQ) NEPA regulations (40 CFR Part 1500, *et seq.*), and the Department of Labor's implementing regulations for NEPA compliance (29 CFR Part 11), the Assistant Secretary has determined that the proposed rule will not have a significant impact on the external environment.

The preceding description of the proposed standard and its supporting rationale, together with the following discussion, constitute OSHA's environmental assessment and finding of no significant impact.

In most OSHA regulatory actions, two environments may be affected: (1) the workplace environment, and (2) the general human environment external to the workplace, including impacts on air and water pollution, solid waste, and energy and land use. The proposal for hazardous waste operations, however, is unique in that it focuses on the external environmant because during these operations, the workplace and the external environment are usually one and the same. The proposed rule is also unusual in that it is the first regulation since the passage of the Occupational Safety and Health Act of 1070 (the Act) to be mandated specifically by Congress under Section 126 of the Superfund Amendments and Reauthorization Act of 1986 (SARA). As indicated in earlier sections of this Notice, the provisions of Section 126 detail those protection that OSHA must include for workers at hazardous waste and emergency response operations. For example, Section 126 requires that provisions for site analysis, training, and medical surveillance, among other, be included in the proposed rule. In addition, there is a wide range of OSHA, EPA, and other standards that already apply to some activities that occur at hazardous waste sites and during emergency response operations. For example, there are existing OSHA standards that cover construction activities, onsite machinery and equipment, selection and use of persons protective equipment, handling of toxic and explosive materials, and general environmental and safety issues such as walking-working surfaces, noise, and illumination. Moreover, the interim final and proposed rules, in many instances, either reflect OSHA regulations, procedures adopted by other federal agencies (e.g., EPA), or practices that are commonly used by those knowledgable in hazardous waste and emergency response operations. To illustrate, Subsection (j)(6) of the proposed standard requires special controls for handling laboratory waste packs, and these controls have already become accepted practice during such operations. To the extent that existing standards, rules, or standard operating procedures are incorporated into this rule, no significant change in the environment is anticipated.

As the interim final and proposed rules largely follow current operating practices, and the technology is available to implement the OSHA provisions, compliance is not anticipated to be a difficulty. For example, section (c)(4)(iii) of the interim final rule proposes that if preliminary site evaluation cannot identify hazards or suspected hazards at the site, a Level B ensemble of personal protective equipment shall be used and direct-reading instruments shall also be carried. OSHA analysis indicates that these procedures are already accepted industry practice.

Potential Positive Environmental Effects. While OSHA does not anticipate any significant environmental effects as a result of this proposal, there is a potential for some beneficial impacts. In general, the work practices and procedures requirements of the proposal improve worker effectiveness and reduce the incidence of employee injury. Their indirect result should be to reduce the likelihood of environmental releases of hazardous materials. (Virtually all provisions of the proposed standard can be categorized in this manner, because once they are implemented, they will have a positive influence on worker safety and performance.) Because these requirements also provide guidance for routine reactions to situations encountered in emergencies, they may help to reduce the severity of such emergencies. Additional potentially positive impacts might be categorized as follows: (1) Direct benefits associated with reduced incidences in, or the severity of, the release of hazardous materials, and (2) indirect benefits associated with the improved flow of information and increased worker awareness of hazardous materials or with improved worker preparedness (either for normal site operations or for unexpected accidents). The following discussion highlights those provisions with potentially beneficial environmental effects.

Paragraph (h)—Monitoring

The requirements of this provision will increase the amount of monitoring for airborne hazardous substances at uncontrolled hazardous waste sites. In some cases, hazardous materials will be detected, and steps will be taken to more quickly control the release to the atmosphere, thereby providing an environmental benefit.

Paragraph (j)—Handling Drums and Containers

A number of specific requirements of this paragraph will result in potentially positive environmental impacts. Relevant subsections include those for inspecting drums and containers; making salvage drums or absorbents available; initiating a spill containment program; emptying unsound drums and containers; requiring ground penetrating radar; and decontamination procedures. These are discussed briefly in the following sections.

Inspection of drums/containers before moving [(j)(1)(ii)]. This section would require that drums and containers be inspected for their integrity prior to handling and moving. Under current practices at hazardous waste clean-up sites, drums and containers are often handled with mechanized equipment (e.g., a barrel grapple on a backhoe arm) before being inspected; if unsound drums rupture or leak, any soil contaminated by the rupture or leak is removed for disposal upon completion of drum handling operations. The proposed provision will, through worker awareness, increase the probability of averting ruptures and leakage. In addition, any hazardous materials in containers that cannot be moved without rupturing will have to be transferred to safe containers (as required in (j)(1)(vii)), with obvious positive environmental effect. These procedures should reduce the volume of contaminated soil requiring disposal; they should also lower the possibility that leachate or runoff will carry contaminants offsite. This requirement does not have an impact on emergency response actions because the routines outlined are already standard procedure.

Availability of salvage drums/absorbents [(j)(1)(vi)]. This provision specifies that salvage drums or containers as well as suitable amounts of proper absorbent be kept available for use in areas where spills, leaks, or ruptures might occur. This requirement will result in increased availability of salvage drums and spill absorbents at uncontrolled hazardous waste sites and

in emergency response situations where spills are imminent, thereby reducing the environmental consequences related to spills of hazardous materials. In those instances where salvage drums/ absorbents would have been inadequate without this requirement, there is a potential benefit to the environment.

Implement a spill containment program [(j)(1)(vii)]. The purpose of this provision is to develop a program to be implemented, in the event of a major spill, that would contain and isolate hazardous materials being transferred into containers and drums. To the extent that this program is implemented, there is a potential for reducing the negative environmental effects that occur as a result of spills, leakage, etc. This requirement should reduce the environmental impact of potential spills at clean-up sites.

Empty unsound drums/containers [(j)(1)(viii)]. Unsound containers often rupture during handling operations. This provision requires that drums and containers that cannot be moved without spillage, leakage, or rupture be emptied into a sound container. This requirement should reduce the incidence of drum and container rupture and would provide concomitant environmental benefits.

Use of ground penetrating radar to estimate depth and location of containers [(j)(1)(ix)] At present, when preliminary investigations at hazardous waste sites indicate that buried drums or containers may be present, ground penetrating systems are frequently used to determine the depth and location of the drums. The requirements of this provision will very likely cause an increase in the use of these systems, thereby reducing the number of instances in which buried containers would go undetected or where undetected containers would be accidently ruptured during excavation activities. Where it applies, the requirement will help prevent accidental ruptures and spills, improve the thoroughness of remedial actions, and benefit the site environment.

Develop decontamination procedures [(k)]. The requirement to clean and decontaminate equipment, personnel, and personal protective equipment will prevent the migration of hazardous substances out of the worksite, thereby benefitting the surrounding environment. It will also eliminate or minimize the contamination of personnel. Decontamination is already standard practice at most cleanup sites.

Inform Contractors of Existing Hazards [(b)(15)] Under this provision, contractors are to be informed of any "fire, explosion, health or other safety hazards" that are present. By ensuring that contractors know the location and nature of site hazards, this requirement reduces the possibility that contractor activities will result in inadvertent releases or spills of hazardous materials.

Gather Information Before Site Entry [(c)(3)]. Among the various requirements for site evaluation are those for information to be gathered regarding the (a) pathways for hazardous substance dispersion, and (b) status and capability of emergency response teams. These procedural requirements will result in an increased ability to predict and prevent movement offsite of hazardous materials, mitigate emergency situations quickly and effectively, and reduce the possibility or severity of contaminant release. Since the requirements of this section mirror current practices, compliance should be accomplished with little difficulty.

Provide worker training [(e)]. Training is required for all workers who are, or could be, exposed to hazardous substances, health hazardous, or safety hazards. In addition, all managers or supervisors responsible for employees at hazardous waste operations must receive preparatory training. This training assures that site activities will be carried out by qualified personnel, with the knowledge and ability to fulfill their job functions in a safe and responsible manner. To the extent that this occurs, there is a potential benefit to the environment (in emergency response situations, this training should assure a more efficient and effective cleanup of hazardous materials or a quicker response to avert further hazardous material releases).

Informational programs [(i)]. These provisions include requirements for a site safety and health plan, pre-entry briefings, and site inspections. The site plan provides information on key personnel, risk analyses for each site task and operation, employee training assignments, personal protective equipment, medical surveillance, frequency and types of air monitoring, personal monitoring, and environmental sampling techniques, site control measures, decontamination procedures, standard operating procedures, emergency response contingency plans, and entry procedures for confined spaces. These requirements will not directly affect the existing environment; their purpose is to provide workers with the information necessary to carry out their activities safely. To the extent that this occurs, there is a potential benefit to the environment. For example, implementing comprehensive site plans could reduce the incidence of accidental releases of hazardous materials. Similarly, requiring pre-entry briefings will reduce the likelihood of employees unknowingly encountering contaminants or allowing their improper release or disposal.

Emergency response plan [(l)(1)]. The development and implementation of a response plan for emergencies provide for greater worker preparedness. In emergencies, workers should be able to respond more quickly and effectively, thereby benefitting the environment.

Potentially negative impacts. Finally, it is necessary to consider the potential for adverse impacts to the environment that might occur as a result of the proposed standard. In some situations, there may be a potential for negative effects on the environment. Any potential negative impacts, however, are not expected to be significant. To illustrate, negative impacts may occur if there is an increase in the time required to implement specific cleanup and spill response activities, or to implement safe work practices or procedures required by the proposal. Any such effects are likely to be negligible, however. For example, CERCLA sites where site plans have not been developed there could be a potential negative impact as result of the time it might take to develop such a plan. In these cases, however, since site cleanup activities are carried out on a specific EPA timetable, it is not anticipated that OSHA requirements will alter these time frames. In fact, OSHA's intent was expressed clearly in the preamble to the interim final rule: ". . . It is not OSHA's intention that emergency actions necessary to protect the public safety and health be prevented because in a particular circumstance it is not feasible to carry out particular requirements of this standard in the time needed to respond to the emergency." In emergency response situations, therefore, OSHA work practices and procedures should not cause significant delays in response or slow the mitigation of environmental effects because, in most cases, response teams already have established operating procedures similar to those in OSHA's proposed rule.

Another potential negative impact may result from the requirement that salvage drums and absorbents be readily available. This may increase the number of repacked hazardous waste drums and the amount of spent absorbent used, which could add to the amount of material that would require safe disposal. Similarly, the requirement for implementation of proper decontamination procedures for all equipment, personal protective gear, and personnel at hazardous waste

emergencies, cleanup sites, and RCRA sites may result in an increase in the frequency and use of decontamination materials. This, in turn, could generate a larger volume of spent decontamination fluids which would then require proper handling and disposal. Again, any such impact should be negligible since decontamination is largely standard procedure for most hazardous waste operations. A possible exception may be during activities that take place in the early stages of site evaluation before cleanup, or at spill responses, where decontamination procedures are not yet standardized.

Conclusion. To the extent that the proposed work practices and procedures are implemented, increased worker awareness and preparedness will result in a safer and more healthful work environment, which may indirectly benefit the environment. Any negative impacts that may occur as a result of the implementation of these work practices or procedures are expected to be negligible. Based upon this assessment and the information presented earlier in the preamble, OSHA concludes that no significant environmental changes are anticipated as a result of the proposal. OSHA will review any comments or information received in response to this Notice and reserves the right to perform additional environmental analysis, if necessary.

VI. International Trade

OSHA has evaluated the potential impact that this proposed standard would have upon international trade. OSHA has determined that the proposed standard would have a minimal potential impact upon the prices of products, so that there would be no effective change in the level of exported or imported products.

VII. Recordkeeping

The proposed standard contains "collection of information" (recordkeeping) requirements pertaining to preparation of a written safety and health plan, site characterization and analysis, site control, training, medical surveillance, emergency controls, work practices, PPE, monitoring, informational programs, handling drums and containers, decontamination, emergency response planning, and emergency response drills. In accordance with 5 CFR Part 1320 (Controlling Paperwork Burdens on the Public), OSHA has submitted the proposed recordkeeping requirements to the Office of Management and Budget (OMB) for review under section 3504(h) of the Paperwork Reduction Act. Comments regarding the proposed recordkeeping requirements may be directed to the Office of Information and Regulatory Affairs, OMB, Attention: Desk Officer of the Occupational Safety and Health Administration, Washington, DC 20508.

VIII. State Plan States

This Federal Register document proposes to amend an interim final rule § 1910.120, "Hazardous Waste Operations and Emergency Response") in Subpart H of 29 CFR Part 1910, OSHA's general industry standards on hazardous materials. The 25 States with their own OSHA approved occupational safety and health plans must develop a comparable standard applicable to both the private and public (State and local government employees) sectors within six months of the publication date of a permanent final rule or show OSHA why there is no need for action, e.g., because an existing state standard covering this area is already "at least as effective" as the new Federal standard. These states are Alaska, Arizona, California, Connecticut (for state and local government employees only), Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York (for state and local government employees only), North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington, and Wyoming. After the effective date of a final Federal rule, until such time as a state standard is promulgated, Federal OSHA will provide interim enforcement assistance, as appropriate, in these states.

IX. Public Participation—Public Hearings

Interested persons are invited to submit written data, views, and arguments with respect to OSHA's proposed rule. These comments must be postmarked on or before October 5, 1987 and submitted in quadruplicate to the Docket Officer, Docket S-760A, Room N-3670, U.S. Department of Labor, Washington, DC 20210. Written submissions must clearly identify the specific provisions of the proposal which are addressed and the position taken with respect to each issue.

The data, views, and arguments that are submitted will be available for public inspection and copying at the above address. All timely submissions received will be made a part of the record of this proceeding. The preliminary regulatory impact assessment, regulatory flexibility assessment, and the exhibits cited in this document will be available for public inspection and copying at the above address. OSHA invites comment concerning the conclusions reached in the economic impact assessment.

OSHA recognizes that there may be interested persons who, through their knowledge of safety or their experience in the operations involved, would wish to endorse or support certain provisions of the standard. OSHA welcomes such supportive comments, including any pertinent accident data or cost information which may be available, in order that the record of this rulemaking will present a balanced picture of the public response on the issues involved.

Notice of Intention to Appear at the Informal Hearings

Pursuant to section 6(b)(3) of the OSHA Act, informal public hearings will be held on this proposal as follows (see the beginning of this notice for specific addresses):

October 13-16 and 20-23, 1987; Washington, DC

October 27-30, 1987; San Francisco, CA

Persons desiring to participate at the informal public hearing must file a notice of intention to appear by September 21, 1987. The notice of intention to appear must contain the following information:

1. The name, address, and telephone number of each person to appear;
2. The capacity in which the person will appear;
3. The city where the person intends to appear;
4. The approximate amount of time required for the presentation;
5. The specific issues that will be addressed;
6. A detailed statement of the position that will be taken with respect to each issue addressed; and
7. Whether the party intends to submit documentary evidence and, if so, a detailed summary of the evidence.

Filing of Testimony and Evidence Before the Hearing

Any party requesting more than ten (10) minutes for presentation at the informal public hearing, or who will submit documentary evidence, must provide in quadruplicate, the complete text of testimony including all documentary evidence to be presented at the informal public hearing. These materials must be provided to Mr. Thomas Hall, OSHA Division of Consumer Affairs at the address given in the "ADDRESSES" section of this notice by October 5, 1987.

Each submission will be reviewed in light of the amount of time request in the Notice of Intention to Appear. In instances where the information contained in the submission does not

justify the amount of time requested, a more appropriate amount of time will be allocated and the participant will be notified of that fact prior to the informal public hearings.

Any party who has not substantially complied with the above requirement may be limited to a ten-minute presentation and may be requested to return for questioning at a later time.

Any party who has not filed a notice of intention to appear may be allowed to testify, as time permits, at the discretion of the Administrative Law Judge, but will not be allowed to question witnesses.

Notices of intention to appear, testimony and evidence will be available for inspection and copying at the Docket Office, Docket S-760A, U.S. Department of Labor, Occupational Safety and Health Administration, Room N-3670, 200 Constitution Avenue, NW., Washington, DC 20210. (202) 523-7894.

Conduct of Hearings

The informal public hearings will commence at 9.30 a.m. at the scheduled locations with the resolution of any procedural matters relating to the proceeding. The informal public hearing will be presided over by an Administrative Law Judge who will have the power necessary and appropriate to conduct a full and fair informal public hearing as provided in 29 CFR Part 1911, include the power to:

1. Regulate the course of the proceedings;

2. To dispose of procedural requests, objections and comparable matters;

3. To confine the presentation to the matters pertinent to the issues raised;

4. To regulate the conduct of those present at the informal public hearing by appropriate means;

5. In the Judge's discretion, to question and permit questioning of any witness; and

6. In the Judge's discretion, to keep the record open for a reasonable time to receive written information and additional data, views, and arguments from any person who has participated in the oral proceedings.

Following the close of the informal public hearing, the presiding Administrative Law Judge will certify the record of the informal public hearing to the Assistant Secretary of Labor for Occupational Safety and Health. The notice of proposed rulemaking will be reviewed in light of all testimony and written submissions received as part of the record, and the proposed standard will be modified or a determination will be made not to modify the proposed standard based on the entire record of the proceeding.

List of Subjects in 29 CFR Part 1910

Containers, Drums, Emergency response, Flammable and combustible liquids, Hazardous materials, Hazardous substances, Hazardous wastes, Incorporation by reference, Materials handling and storage, Personal protective equipment, Storage areas, Training, Waste disposal.

Authority

This document has been prepared under the direction of John A. Pendergrass, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210. Pursuant to section 126 of the Superfund Amendments and Reauthorization Act of 1986 (Pub. L. 99-499), sections 6 and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 655, 657), section 4 of the Administrative Procedures Act (5 U.S.C. 553), 29 CFR Part 1911 and Secretary of Labor's Order 9-83 (48 FR 35736), it is proposed to amend 29 CFR Part 1910 by revising § 1910.120, Hazardous Waste Operations, as set forth below.

Signed at Washington, DC this 5th day of August 1987.

John A. Pendergrass,

Assistant Secretary of Labor.

For the reasons set out in the preamble, Title 29, Part 1910, of the Code of Federal Regulations is amended as follows:

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

1. The authority citation for Subpart H of Part 1910 is proposed to be amended by adding the following citation:

Authority:

Section 1910.120 issued under the authority of Section 126 of the Superfund Amendments and Reauthorization Act of 1986 (Pub. L. 99-499). Sections 6 and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 655, 657), sections 3 and 4 of the Administrative Procedure Act (5 U.S.C. 552(a), 553), 29 CFR Part 1911 and Secretary of Labor's Order 9-83 (48 FR 35736).

2. Section 1910.120 of Title 29 of the Code of Federal Regulations is proposed to be revised to read as follows:

§ 1910.120 Hazardous waste operations and emergency response.

(a) *Scope, application, and definitions*—(1) *Scope for operations other than emergency response.* This section covers employers and employees engaged in the following operations:

(i) Operations involving hazardous substances that are conducted under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended (42 U.S.C. 9601 *et seq.*) (CERCLA), including initial investigations at CERCLA sites before the presence or absence of hazardous substances has been ascertained;

(ii) Clean-up operations involving major corrective actions conducted under the Resource Conservation and Recovery Act of 1976 as amended (42 U.S.C. 6901 *et seq.*) (RCRA);

(iii) Operations at hazardous waste sites that have been designated for clean-up by state or local governmental authorities; and

(iv) Storage, treatment, and disposal facilities involving hazardous wastes regulated under 40 CFR Parts 264 and 265 pursuant to RCRA; and

(2) *Scope for emergency response operations.* This section also covers employers whose employees have a reasonable possibility of engaging in emergency response operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

(3) *Application.* (i) All requirements of Part 1910 and Part 1926 of Title 29 of the Code of Federal Regulations apply pursuant to their terms to hazardous waste operations whether covered by this section or not. In addition, the provisions of this section apply to operations covered by this section. If there is a conflict or overlap, the provision more protective of employee safety and health shall apply without regard to 29 CFR 1910.5(c)(1).

(ii) All paragraphs of this section except paragraph (o) apply to operations involving hazardous substances conducted under CERCLA, major corrective actions taken in clean-up operations under RCRA, and hazardous waste operations that have been designated for clean-up by state or local governmental authorities.

(iii) Only the requirements of paragraphs (l) and (o) of this section apply to those operations involving hazardous waste treatment, storage, and disposal facilities regulated under 40 CFR Parts 264 and 265.

Exceptions For small quantity generators and generators with less than 90 days accumulation of hazardous wastes who have emergency response teams that respond to releases of, or substantial threats of releases of, hazardous substances, only paragraph (l) is applicable. Small quantity generators and generators with less than 90 days

accumulation of hazardous wastes who do not have emergency response teams that respond to releases of, or substantial threats of releases of, hazardous substances are exempt from the regulations of this section.

(iv) Paragraph (l) of this section applies to all emergency response operations for releases of, or substantial threats of releases of, hazardous substances including those releases of or substantial threats of releases that occur at worksites other than those sites identified in paragraphs (a)(2)(i) through (a)(2)(iii) of this section.

(4) *Definitions. "Buddy system"* means a system of organizing employees into work groups in such a manner that each employee of the work group is designated to observe the activities of at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to those other employees in the event of an emergency.

"Decontamination" means the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health affects.

"Emergency response" means a coordinated response effort by employees from outside the immediate release area or by outside responders (i.e., mutual-aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area are not considered to be emergency responses within the scope of this standard. Responses to releases of hazardous substances where the concentration of a hazardous substance is below the established permissible exposure limits established in this standard are not considered to be emergency responses.

"Established exposure levels" means the inhalation or dermal permissible exposure limit specified in 29 CFR Part 1910, Subpart Z; or if none is specified, the exposure limits in "NIOSH Recommendations for Occupational Health Standards" dated 1986 incorporated by reference, or if neither of the above is specified, the standards specified by the American Conference of Governmental Industrial Hygienists in their publication "Threshold Limit Values and Biological Exposure Indices for 1986–87" dated 1986 incorporated by reference. The two documents incorporated by reference are available for purchase from the following:

NIOSH, Publications Dissemination, Division of Standards Development and Technology Transfer, National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH 45226, (513) 841–4287

American Conference of Governmental Industrial Hygienists, 6500 Glenway Ave., Building D–7, Cincinnati, OH, 45211–4438, (513) 661–7881

and are available for inspection and copying at the OSHA Docket Office, Docket No. S–760, Room N–3671, 200 Constitution Ave., NW., Washington, DC 20210.

"Facility" means (A) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or (B) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any vessel.

"Hazardous materials (HAZMAT) team" means an organized group of employees, designated by the employer, who are knowledgeable and specifically trained and skilled to handle and control leaking containers or vessels, use and select special chemical protective clothing and perform other duties associated with accidental releases of hazardous substances. The team members perform responses to releases of hazardous substances for the purpose of control or stabilization of the release. A HAZMAT team is not a fire brigade nor is a typical fire brigade a HAZMAT team. A HAZMAT team, however, may be a separate component of a fire brigade.

"Hazardous substance" means any substance designated or listed under (A) through (D) below, exposure to which results or may result in adverse affects on the health or safety of employees:

(A) Any substance defined under section 101(14) of CERCLA;

(B) Any biological agent and other disease-causing agent as defined in section 104 (33) of CERCLA;

(C) Any substance listed by the U.S. Department of Transportation as hazardous materials under 49 CFR 172.101 and appendices; and

(D) Hazardous waste.

"Hazardous waste" means (A) a waste or combination of wastes as defined in 40 CFR 261.3, or (B) those substances defined in 49 CFR 171.8.

"Hazardous waste operation" means any operation conducted within the scope of this standard involving employee exposure to hazardous wastes, hazardous substances, or any combination of hazardous wastes and hazardous substances.

"Hazardous waste site" or "site" means any facility or location within the scope of this standard at which hazardous waste operations take place.

"Health hazard" means a chemical, mixture of chemicals or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. Further definition of the terms used above can be found in Appendix A to 29 CFR 1910.1200.

"IDLH" or *"Immediately dangerous to life or health"* means an atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.

"Oxygen deficiency" means that concentration of oxygen by volume below which air supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

"Permissible exposure limit" means the inhalation or dermal permissible exposure limit specified in 29 CFR Part 1910, Subpart Z.

"Post emergency response" means that portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the site has begun. If post emergency response is performed by an employer's own employees as a continuation of initial emergency response, it is considered to be part of the initial response and not post emergency response.

"Qualified person" means a person with specific training, knowledge and experience in the area for which the person has responsibility.

"Site safety and health supervisor (or official)" means the individual located on a hazardous waste site who is responsible to the employer and has the authority and knowledge necessary to implement the site safety and health

plan and verify compliance with applicable safety and health requirements.

"Small quantity generator" means a generator of hazardous wastes who in any calendar month generates no more than 1000 kilograms (2210 pounds) of hazardous waste in that month.

(b) *General requirements*—(1) *Safety and health program*—(i) *General.* Employers shall develop and implement a written safety and health program for their employees involved in hazardous waste operations. The program shall be designed to identify, evaluate, and control safety and health hazards and provide for emergency response for hazardous waste operations. The program shall incorporate as separate chapter the following:

(A) Organizational structure chapter;

(B) A comprehensive workplan chapter; and

(C) A site-specific safety and health plan chapter.

(ii) *Organizational structure chapter.* (A) The organizational structure chapter shall establish the specific chain of command and specify the overall responsibilities of supervisors and employees. It shall include at a minimum, the following elements:

(*1*) A general supervisor who has the responsibility and authority to direct all hazardous waste operations.

(*2*) A site safety and health supervisor who has the responsibility and authority to develop and implement the site safety and health plan and verify compliance.

(*3*) All other personnel needed for hazardous waste site operations and emergency response and their general functions and responsibilities.

(*4*) The lines of authority, responsibility, and communication.

(B) The organizational structure shall be reviewed and updated as necessary to reflect the current status of waste site operations.

(C) The original organizational structure plan and any changes to the overall organizational structure shall be made available to all affected employees.

(iii) *Comprehensive workplan chapter.* The comprehensive workplan chapter shall address the tasks and objectives of site operations and the logistics and resources required to reach those tasks and objectives.

(A) The comprehensive workplan shall address anticipated clean-up activities as well as normal operating procedures.

(B) The comprehensive workplan shall define work tasks and objectives and identify the methods for accomplishing those tasks and objectives.

(C) The comprehensive workplan shall establish personnel requirements for implementing the plan.

(D) The comprehensive workplan shall provide for the implementation of the training required in paragraph (e) of this section.

(E) The comprehensive workplan shall provide for the implementation of the required informational programs required in paragraph (i) of this section.

(F) The comprehensive workplan shall provide for the implementation of the medical surveillance program described in paragraph (f) of this section.

(iv) *Site-specific safety and health plan chapter.* The site safety and health plan, which is part of the overall safety and health program shall be available on the site for inspection by employees, their designated representatives, and OSHA personnel, shall address the safety and health hazards of each phase of site operation; and include the requirements and procedures for employee protection.

(A) The site safety and health plan, as a minimum, shall address the following:

(*1*) Names of key personnel and alternates responsible for site safety and health, including a site safety and health supervisor.

(*2*) A safety and health risk or hazard analysis for each site task and operation found in the workplan.

(*3*) Employee training assignments to assure compliance with paragraph (e) of this section.

(*4*) Personal protective equipment to be used by employees for each of the site tasks and operations being conducted as required by the personal protective equipment program in paragraph (g)(5) of this section.

(*5*) Medical surveillance requirements in accordance with the program in paragraph (f) of this section.

(*6*) Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used including methods of maintenance and calibration of monitoring and sampling equipment to be used.

(*7*) Site control measures in accordance with the site control program required in paragraph (d) of this section.

(*8*) Decontamination procedures in accordance with paragraph (k) of this section.

(*9*) An emergency response plan meeting the requirements of paragraphs (l)(1)(i) and (l)(1)(ii) of this section for safe and effective responses to emergencies, including the necessary PPE and other equipment.

(*10*) Confined space entry procedures.

(B) Pre-entry briefings shall be held prior to initiating any site activity and at such other times as necessary to ensure that employees are apprised of the site safety and health plan and that this plan is being followed.

(C) Inspections shall be conducted by the site safety and health supervisor or, in the absence of that individual, another individual acting on behalf of the employer as necessary to determine the effectiveness of the site safety and health plan. Any deficiencies in the effectiveness of the site safety and health plan shall be corrected by the employer.

(*11*) When major spills may be anticipated due to the type of work involved, a spill containment program meeting the requirements of paragraph (j)(1) of this section shall be included.

(2) *Site excavation.* Site excavations created during initial site preparation or during hazardous waste operations shall be shored or sloped as appropriate to prevent accidental collapse in accordance with Subpart P of 29 CFR Part 1926.

(3) *Contractors and sub-contractors.* (i) An employer who retains contractor or sub-contractor services for work in hazardous waste operations shall inform those contractors, sub-contractors, or their representatives of any potential fire, explosion, health, safety or other hazards of the hazardous waste operation that have been identified by the employer including the employer's information program.

(ii) The safety and health program required in paragraph (b)(1) of this section shall be made available to any subcontractor or its representative who will be involved with the hazardous waste operation and employees, their designated representatives, and OSHA personnel.

(c) *Site characterization and analysis.* Hazardous waste sites shall be evaluated in accordance with this paragraph to identify specific site hazards and to determine the appropriate safety and health control procedures needed to protect employees from the identified hazards.

(1) A preliminary evaluation of a site's characteristics shall be performed prior to site entry by a qualified person in order to aid in the selection of appropriate employee protection methods prior to site entry. Immediately after initial site entry, a more detailed evaluation of the site's specific characteristics shall be performed by a qualified person in order to further identify existing site hazards and to further aid in the selection of the appropriate engineering controls and

personal protective equipment for the tasks to be performed.

(2) All suspected conditions that may pose inhalation or skin absorption hazards that are immediately dangerous to life or health (IDLH) or other conditions that may cause death or serious harm, shall be identified during the preliminary survey and evaluated during the detailed survey. Examples of such hazards include, but are not limited to, confined space entry, potentially explosive or flammable situations, visible vapor clouds, or areas where biological indicators such as dead animals or vegetation are located.

(3) The following information to the extent available shall be obtained by the employer prior to allowing employees to enter a site:

(i) Location and approximate size of the site.

(ii) Description of the response activity and/or the job task to be performed.

(iii) Duration of the planned employee activity.

(iv) Site topography.

(v) Site accessibility by air and roads.

(vi) Pathways for hazardous substance dispersion.

(vii) Present status and capabilities of emergency response teams that would provide assistance to hazardous waste clean-up site employees at the time of an emergency.

(viii) Hazardous substances and health hazards involved or expected at the site and their chemical and physical properties.

(4) Personal protective equipment (PPE) shall be provided and used during initial site entry in accordance with the following requirements:

(i) Based upon the results of the preliminary site evaluation, an ensemble of PPE shall be selected and used during initial site entry which will provide protection to a level of exposure below established permissible exposure limits for known or suspected hazardous substances and health hazards, and which will provide protection against other known and suspected hazards identified during the preliminary site evaluation.

(ii) During initial site entry an escape self-contained breathing apparatus of at least five minutes' duration shall be carried by employees or kept available at their immediate work station if positive-pressure self-contained breathing apparatus is not used as part of the entry ensemble.

(iii) If the preliminary site evaluation does not produce sufficient information to identify the hazards or suspected hazards of the site, an ensemble providing protection equivalent to Level B PPE shall be provided as minimum protection, and direct reading instruments shall be used as appropriate for identifying IDLH conditions. (See Appendix B for a description of Level B hazards and the requirements for Level B protective equipment.)

(iv) Once the hazards of the site have been identified, the appropriate PPE shall be selected and used in accordance with paragraph (g) of this section.

(5) The following monitoring shall be conducted during initial site entry when the site evaluation produces information that shows the potential for ionizing radiation or IDLH conditions, or when the site information is not sufficient to reasonably eliminate these possible conditions:

(i) Monitoring for hazardous levels of ionizing radiation.

(ii) Monitoring the air with appropriate test equipment for IDLH and other conditions that may cause death or serious harm (combustible or explosive atmospheres, oxygen deficiency, toxic substances).

(iii) Visually observing for signs of actual or potential IDLH or other dangerous conditions.

(6) Once the presence and concentrations of specific hazardous substances and health hazards have been established, the risks associated with these substances shall be identified. Employees who will be working on the site shall be informed of any risks that have been identified. In situations covered by the Hazard Communication Standard, 29 CFR 1910.1200, training required by that standard need not be duplicated.

Note.—Risks to consider include, but are not limited to:

a. Exposures exceeding the appropriate established Permissible Exposure Limits (PELs), Threshold Limit Values (TLVs), or Recommended Exposure Limits (RELs), etc.

b. IDLH Concentrations.

c. Potential Skin Absorption and Irritation Sources.

d. Potential Eye Irritation Sources.

e. Explosion Sensitivity and Flammability Ranges.

(7) Any information concerning the chemical, physical, and toxicologic properties of each substance known or expected to be present on site that is available to the employer and relevant to the duties an employee is expected to perform shall be made available to the affected employees prior to the commencement of their work activities.

(8) An ongoing air monitoring program in accordance with paragraph (h) of this section shall be implemented after site characterization has determined the site is safe for the start-up of operations.

(d) *Site control.* Appropriate site control procedures shall be implemented before clean-up work begins to control employee exposure to hazardous substances.

(1) A site control program for protecting employees which is part of the employer's safety and health program required in paragraph (b) of this section shall be developed during the planning stages of a hazardous waste operation clean-up and modified as necessary as new information becomes available.

(2) The site control program shall, as a minimum, include: A site map; site work zones; the use of a "buddy system"; site communications; the standard operating procedures or safe work practices; and, identification of the nearest medical assistance.

(e) *Training.* Initial or review training meeting the requirements of this paragraph shall be provided to employees before they are permitted to engage in hazardous waste operations that could expose them to hazardous substances, safety, or health hazards.

(1) All employees (such as but not limited to equipment operators and general laborers) exposed to hazardous substances, health hazards, or safety hazards shall be thoroughly trained in the following:

(i) Names of personnel and alternates responsible for site safety and health;

(ii) Safety, health and other hazards present on the site;

(iii) Use of personal protective equipment;

(iv) Work practices by which the employee can minimize risks from hazards;

(v) Safe use of engineering controls and equipment on the site;

(vi) Medical surveillance requirements including recognition of symptoms and signs which might indicate overexposure to hazards; and

(vii) The contents of paragraphs (7) through (10) of the site safety and health plan set forth in paragraph (b)(1)(iv)(A) of this section.

(2) All employees shall at the time of job assignment receive a minimum of 40 hours of initial instruction off the site, and a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training. The level of training provided shall be consistent with the employee's job function and responsibilities.

(3) On-site management and supervisors directly responsible for, or who supervise employees engaged in,

hazardous waste operations shall receive training as provided in paragraph (e)(1) and (e)(2) of this section, and at least eight additional hours of specialized training at the time of job assignment on such topics as, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring techniques.

(4) Trainers shall be qualified to instruct employees about the subject matter that is being presented in training.

Note.—Trainers can show their qualifications by having the knowledge or training equivalent to a level of training higher than the level they are presenting. This may be shown by academic degrees, training courses completed and/or work experience.

(5) Employees shall not be permitted to participate in field activities until they have been trained to a level required by their job function and responsibility.

(6) Employees and supervisors that have received and successfully completed the training and field experience specified in paragraphs (e)(1), (e)(2) and (e)(3) of this section shall be certified by their instructor as having completed the necessary training. A written certificate shall be given to each person so certified. Any person who has not been so certified nor meets the requirements of paragraph (e)(9) of this section shall be prohibited from engaging in hazardous waste operations.

(7) Employees who are engaged in responding to hazardous emergency situations at hazardous waste clean-up sites that may expose them to hazardous substances shall be trained in how to respond to expected emergencies.

(8) Employees specified in paragraph (e)(1), and managers and supervisors specified in paragraph (e)(3) of this section, shall receive eight hours of refresher training annually on the items specified in paragraph (e)(1) and/or (e)(3) of this section and other relevant topics.

(9) Employers who can show that an employee's work experience and/or training has resulted in initial training equivalent to that training required in paragraphs (e)(1), (e)(2), and (e)(3) of this section shall not be required to provide the initial training requirements of those paragraphs. Equivalent training includes the training that existing employees might have already received from actual site work experience.

(f) *Medical surveillance* Medical surveillance shall be provided in accordance with this paragraph for employees exposed or potentially exposed to hazardous substances or health hazards or who wear respirators.

(1) *Employees covered.* A medical surveillance program which is part of the employer's safety and health program required in paragraph (b) of this section or required in paragraphs (l)(4) or (o)(3) of this section, shall be instituted by the employer for:

(i) All employees who are or may be exposed to hazardous substances or health hazards at or above the established exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.

(ii) All employees who wear a respirator for 30 days or more a year or as required by § 1910.134.

(iii) All employees who are injured due to overexposure from an emergency incident involving hazardous substances or health hazards.

(2) *Frequency of medical examinations and consultations.* Medical examinations and consultations shall be made available by the employer to each employee covered under paragraph (f)(1) of this section on the following schedules:

(i) For employees covered under paragraphs (f)(1)(i) and (f)(1)(ii):

(A) Prior to assignment;

(B) At least once every twelve months for each employee covered;

(C) At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months;

(D) As soon as possible upon notification by an employee that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards or that the employee has been exposed above the established exposure levels in an emergency situation;

(E) At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary.

(ii) For employees covered under paragraph (f)(1)(iii) and for all employees who may have been exposed during an emergency incident to hazardous substances at concentrations above the established exposure levels without the necessary personal protective equipment being used:

(A) As soon as possible following the emergency incident;

(B) Additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.

(3) *Content of medical examinations and consultations.* (i) Medical examinations required by paragraph (f)(2) of this section shall include a medical and work history (or updated history if one is in the employee's file) with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

(ii) The content of medical examinations or consultations made available to employees pursuant to paragraph (f) shall be determined by the examining physician.

(4) *Examination by a physician and costs.* All medical examinations and procedures shall be performed by or under the supervision of a licensed physician, and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(5) *Information provided to the physician.* The employer shall provide one copy of this standard and its appendices to the examining physician, and in addition the following for each employee:

(i) A description of the employee's duties as they relate to the employee's exposures.

(ii) The employee's exposure levels or anticipated exposure levels.

(iii) A description of any personal protective equipment used or to be used.

(iv) Information from previous medical examinations of the employee which is not readily available to the examining physician.

(v) Information required by § 1910.134.

(6) *Physician's written opinion.* (i) The employer shall obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following.

(A) The results of the medical examination and tests if requested by the employee.

(B) The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirators use as required by § 1910.134.

(C) The physician's recommended limitations upon the employee's assigned work.

(D) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

(ii) The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposure.

(7) *Recordkeeping.* (i) An accurate record of the medical surveillance required by paragraph (f) of this section shall be retained. This record shall be retained for the period specified and meet the criteria of 29 CFR 1910.20.

(ii) The record required in paragraph (f)(7)(i) of this section shall include at least the following information:

(A) The name and social security number of the employee;

(B) Physicians' written opinions, recommended limitations, and results of examinations and tests;

(C) Any employee medical complaints related to exposure to hazardous substances;

(D) A copy of the information provided to the examining physician by the employer, with the exception of the standard and its appendices.

(g) *Engineering controls, work practices, and personal protective equipment for employee protection.* Engineering controls, work practices, personal protective equipment, or a combination of these shall be implemented in accordance with this paragraph to protect employees from exposure to hazardous substances and health hazards.

(1) *Engineering controls, work practices and PPE for substances regulated in Subpart Z.* (i) Engineering controls and work practices shall be instituted to reduce and maintain employee exposure to or below the permissible exposure limits for substances regulated by 29 CFR Part 1910, Subpart Z, except to the extent that such controls and practices are not feasible.

Note.—Engineering controls which may be feasible include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment. Work practices which may be feasible are removing all non-essential employees from potential exposure during opening of drums, wetting down dusty operations and locating employees upwind of possible hazards.

(ii) Whenever engineering controls and work practices are not feasible, PPE shall be used to reduce and maintain employee exposures to or below the permissible exposure limits or dose limits for substances regulated by 29 CFR Part 1910, Subparts G and Z.

(iii) The employer shall not implement a schedule of employee rotation as a means of compliance with permissible dose limits except when there is no other feasible way of complying with the airborne or dermal dose limits for ionizing radiation.

(2) *Engineering controls, work practices, and personal protective equipment for substances not regulated in Subpart Z.* An appropriate combination of engineering controls, work practices, and personal protective equipment shall be established to reduce and maintain employee exposure to or below appropriate exposure levels for hazardous substances and health hazards not regulated by 29 CFR Part 1910, Subparts G and Z taking into account the established exposure levels.

(3) *Personal protective equipment selection.* (i) Personal protective equipment (PPE) shall be selected and used which will protect employees from the hazards and potential hazards they are likely to encounter as identified during the site characterization and analysis.

(ii) Personal protective equipment selection shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site.

(iii) Positive pressure self-contained breathing apparatus, or positive pressure air-line respirators equipped with an escape air supply, shall be used in IDLH conditions.

(iv) Totally-encapsulating chemical protective suits (Protection equivalent to Level A protection as specified in Appendix B) shall be used in conditions where skin absorption of a hazardous substance may result in an IDLH situation.

(v) The level of protection provided by PPE selection shall be increased when additional information on site conditions show that increased protection is necessary to reduce employee exposures below established permissible exposure limits for hazardous substances and health hazards. (See Appendix B for guidance on selecting PPE ensembles.)

Note.—The level of employee protection provided may be decreased when additional information or site conditions show that decreased protection will not result in increased hazardous exposures to employees.

(vi) Personal protective equipment shall be selected and used to meet the requirements of 29 CFR Part 1910, Subpart I, and additional requirements specified in this section.

(4) *Totally-encapsulating chemical protective suits.* (i) Totally-encapsulating suit materials used for Level A protection shall protect employees from the particular hazards which are identified during site characterization and analysis.

(ii) Totally-encapsulating suits shall be capable of maintaining positive air pressure. (See Appendix A.)

(iii) Totally-encapsulating suits shall be capable of preventing inward test gas leakage of more than 0.5 percent. (See Appendix A.)

(5) *Personal protective equipment (PPE) program.* A written personal protective equipment program, which is part of the employer's safety and health program required in paragraph (b) of this section or required in paragraph (1)(4) of this section, shall be established for hazardous waste operations which shall be part of the site-specific safety and health plan. The PPE program shall address the following elements:

(i) Site hazards,

(ii) PPE selection,

(iii) PPE use,

(iv) Work mission duration,

(v) PPE maintenance and storage,

(vi) PPE decontamination,

(vii) PPE training and proper fitting,

(viii) PPE donning and doffing procedures,

(ix) PPE inspection,

(x) PPE in-use monitoring,

(xi) Evaluation of the effectiveness of the PPE program, and

(xii) Limitations during temperature extremes, and other appropriate medical considerations.

(h) *Monitoring.* Monitoring shall be performed in accordance with this paragraph to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed established permissible exposure limits for hazardous substances.

(1) Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on site.

(2) Upon initial entry, representative air monitoring shall be conducted to identify any IDLH condition, exposure over established exposure levels, exposure over a radioactive material's dose limits or other dangerous condition such as the presence of flammable atmospheres or oxygen-deficient environments.

(3) Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen since prior monitoring. Situations where it shall be considered

whether the possibility that exposures have risen are when:

(i) Work begins on a different portion of the site.

(ii) Contaminants other than those previously identified are being handled.

(iii) A different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling).

(iv) Employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon).

(v) A sufficient reasonable interval has passed so that exposures may have significantly increased.

(4) After hazardous waste clean-up operations commence, the employer shall monitor those employees likely to have the highest exposures to hazardous substances and health hazards likely to be present above established permissible exposure limits by using personal sampling frequently enough to characterize employee exposures. The employer may utilize a representative sampling approach by documenting that the employees and chemicals chosen for monitoring are based on the criteria stated above.

Note.—It is not required to monitor employees engaged in site characterization operations covered by paragraph (c) of this section.

(l) *Informational programs.* Employers shall develop and implement a program, which is part of the employer's safety and health program required in paragraph (b) of this section, to inform employees, contractors, and subcontractors (or their representative) actually engaged in hazardous waste operations of the nature, level and degree of exposure likely as a result of participation in such hazardous waste operations. Employees, contractors and subcontractors working outside of the operations part of a site are not covered by this standard.

(j) *Handling drums and containers.* Hazardous substances and contaminated soils, liquids, and other residues shall be handled, transported, labeled, and disposed of in accordance with this paragraph.

(1) *General.* (i) Drums and containers used during the clean-up shall meet the appropriate DOT, OSHA, and EPA regulations for the wastes that they contain.

(ii) When practical, drums and containers shall be inspected and their integrity shall be assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions (i.e., buried beneath the earth, stacked behind other drums, stacked several tiers high in a pile, etc.) shall be moved to an accessible location and inspected prior to further handling.

(iii) Unlabelled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled.

(iv) Site operations shall be organized to minimize the amount of drum or container movement.

(v) Prior to movement of drums or containers, all employees exposed to the transfer operation shall be warned of the potential hazards associated with the contents of the drums or containers.

(vi) U.S. Department of Transportation specified salvage drums or containers and suitable quantities of proper absorbent shall be kept available and used in areas where spills, leaks, or ruptures may occur.

(vii) Where major spills may occur, a spill containment program, which is part of the employer's safety and health program required in paragraph (b) of this section, shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred.

(viii) Drums and containers that cannot be moved without rupture, leakage, or spillage shall be emptied into a sound container using a device classified for the material being transferred.

(ix) A ground-penetrating system or other type of detection system or device shall be used to estimate the location and depth of buried drums or containers.

(x) Soil or covering material shall be removed with caution to prevent drum or container rupture.

(xi) Fire extinguishing equipment meeting the requirements of 29 CFR Part 1910, Subpart L, shall be on hand and ready for use to control incipient fires.

(2) *Opening drums and containers.* The following procedures shall be followed in areas where drums or containers are being opened:

(i) Where an airline respirator system is used, connections to the bank of air cylinders shall be protected from contamination and the entire system shall be protected from physical damage.

(ii) Employees not actually involved in opening drums or containers shall be kept a safe distance from the drums or containers being opened.

(iii) If employees must work near or adjacent to drums or containers being opened, a suitable shield that does not interfere with the work operation shall be placed between the employee and the drums or containers being opened to protect the employee in case of accidental explosion.

(iv) Controls for drum or container opening equipment, monitoring equipment, and fire suppression equipment shall be located behind the explosion-resistant barrier.

(v) When there is a reasonable possibility of flammable atmospheres being present, material handling equipment and hand tools shall be of the type to prevent sources of ignition.

(vi) Drums and containers shall be opened in such a manner that excess interior pressure will be safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding shall be placed between the employee and the drums or containers to reduce the risk of employee injury.

(vii) Employees shall not stand upon or work from drums or containers.

(3) *Material handling equipment.* Material handling equipment used to transfer drums and containers shall be selected, positioned and operated to minimize sources of ignition related to the equipment from igniting vapors released from ruptured drums or containers.

(4) *Radioactive wastes.* Drums and containers containing radioactive wastes shall not be handled until such time as their hazard to employees is properly assessed.

(5) *Shock sensitive wastes.*

Caution.—Shipping of shock sensitive wastes may be prohibited under U.S Department of Transportation regulations. Employers and their shippers should refer to 49 CFR 173.21 and 173.80.

As a minimum, the following special precautions shall be taken when drums and containers containing or suspected of containing shock-sensitive wastes are handled:

(i) All non-essential employees shall be evacuated from the area of transfer.

(ii) Material handling equipment shall be provided with explosive containment devices or protective shields to protect equipment operators from exploding containers.

(iii) An employee alarm system capable of being perceived above surrounding light and noise conditions shall be used to signal the commencement and completion of explosive waste handling activities.

(iv) Continuous communications (i.e., portable radios, hand signals, telephones, as appropriate) shall be maintained between the employee-in-charge of the immediate handling area and the site safety and health supervisor or command post until such time as the handling operation is completed. Communication equipment or methods

hat could cause shock sensitive materials to explode shall not be used.

(v) Drums and containers under pressure, as evidenced by bulging or swelling, shall not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from explosive relief of the drum.

(vii) Drums and containers containing packaged laboratory wastes shall be considered to contain shock-sensitive or explosive materials until they have been characterized.

(6) *Laboratory waste packs.* In addition to the requirements of paragraph (j)(5) of this section, the following precautions shall be taken, as a minimum, in handling laboratory waste packs (lab packs):

(i) Lab packs shall be opened only when necessary and then only by an individual knowledgable in the inspection, classification, and segregation of the containers within the pack according to the hazards of the wastes.

(ii) If crystalline material is noted on any container, the contents shall be handled as a shock-sensitive waste until the contents are identified.

(7) *Sampling drums and containers.* Sampling of containers and drums shall be done in accordance with a sampling procedure which is part of the site safety and health plan developed for and available to employees and others at the specific worksite.

(8) *Shipping and transport.* (i) Drums and containers shall be identified and classified prior to packaging for shipment.

(ii) Drum or container staging areas shall be kept to the minimum number necessary to identify and classify materials safely and prepare them for transport.

(iii) Staging areas shall be provided with adequate access and egress routes.

(iv) Bulking of hazardous wastes shall be permitted only after a thorough characterization of the materials has been completed.

(9) *Tank and vault procedures.* (i) Tanks and vaults containing hazardous substances shall be handled in a manner similar to that for drums and containers, taking into consideration the size of the tank or vault.

(ii) Appropriate tank or vault entry procedures meeting paragraph (b)(1)(iv)(A)(*10*) of this section shall be followed whenever employees must enter a tank or vault.

(k) *Decontamination.* Procedures for all phases of decontamination shall be developed and implemented in accordance with this paragraph.

(1) A decontamination procedure shall be developed, communicated to employees and implemented before any employees or equipment may enter areas on site where potential for exposure to hazardous substances exists.

(2) Standard operating procedures shall be developed to minimize employee contact with hazardous substances or with equipment that has contacted hazardous substances.

(3) Decontamination shall be performed in geographical areas that will minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment.

(4) All employees leaving a contaminated area shall be appropriately decontaminated; all clothing and equipment leaving a contaminated area shall be appropriately disposed of or decontaminated.

(5) Decontamination procedures shall be monitored by the site safety and health supervisor to determine their effectiveness. When such procedures are found to be ineffective, appropriate steps shall be taken to correct any deficiencies.

(6) All equipment and solvents used for decontamination shall be decontaminated or disposed of properly.

(7) Protective clothing and equipment shall be decontaminated, cleaned, laundered, maintained or replaced as needed to maintain their effectiveness.

(8) Employees whose non-impermeable clothing becomes wetted with hazardous substances shall immediately remove that clothing and proceed to shower. The clothing shall be disposed of or decontaminated before it is removed from the work zone.

(9) Unauthorized employees shall not remove protective clothing or equipment from change rooms.

(10) Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures to hazardous substances.

(11) Where the decontamination procedure indicates a need for regular showers and change rooms outside of a contaminated area, they shall be provided and meet the requirements of 29 CFR 1910.141. If temperature conditions prevent the effective use of water then other effective means for cleansing shall be provided and used.

(l) *Emergency response.* Emergency response at hazardous waste operation incidents shall be conducted in accordance with this paragraph.

(1) *General*—(i) *Emergency response plan.* An emergency response plan shall be developed and implemented by all employers within the scope of this section to handle anticipated emergencies prior to the commencement of hazardous waste operations. The plan shall be in writing and available for inspection and copying by employees, their representatives and OSHA personnel. Employers who will evacuate their employees from the workplace when an emergency occurs and who do not permit any of their employees to respond to assist in handling the emergency are exempt from the requirements of this paragraph if they provide an emergency action plan complying with section 1910.38(a) of this part.

(ii) *Elements of an emergency response plan.* The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following:

(A) Pre-emergency planning.

(B) Personnel roles, lines of authority, training, 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.

(H) Emergency medical treatment and first aid.

(I) Emergency alerting and response procedures.

(J) Critique of response and follow-up.

(K) PPE and emergency equipment.

(2) *Emergency response at hazardous waste clean-up sites*—(i) *Training.* (A) Training for emergency response employees at clean-up operations shall be conducted in accordance with paragraph (e) of this section for employers covered by paragraph (a)(1)(i) through (iii) of this section and in accordance with paragraph (o)(5) of this section for those employers covered by paragraph (a)(1)(iv) of this section.

(B) Employers who can show that an employee's work experience and/or training has resulted in training equivalent to that training required in paragraph (l)(2)(i)(A) of this section shall not be required to provide the initial training requirements of those paragraphs. Equivalent training includes the training that existing employees might have already received from actual site work experience.

(ii) *Procedures for handling emergency incidents.* (A) In addition to the elements for the emergency response plan required in paragraph (l)(1)(ii) of this section, the following elements shall

be included for emergency response plans:

(*1*) Site topography, layout, and prevailing weather conditions.

(*2*) Procedures for reporting incidents to local, state, and federal governmental agencies.

(B) The emergency response plan shall be a separate section of the Site Safety and Health Plan.

(C) The emergency response plan shall be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies.

(D) The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations.

(E) The site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information.

(F) An employee alarm system shall be installed in accordance with 29 CFR 1910.165 to notify employees of an emergency situation; to stop work activities if necessary; to lower background noise in order to speed communication; and to begin emergency procedures.

(G) Based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.

(3) *Emergency response at sites other than hazardous waste clean-up sites*—(i) *Training.* Employers shall provide the training specified by this paragraph for those employees for whom there exists the reasonable possibility of responding to emergencies at sites other than hazardous waste clean-up sites.

(A) *Emergency response organizations or teams.* Employees on emergency response organizations or teams such as fire brigades, fire departments, plant emergency organizations, hazardous materials teams, spill response teams and similar groups with responsibility for emergency response shall be trained to a level of competence to protect themselves and other employees in the recognition of health and safety hazards, methods to minimize the risk from safety and health hazards, safe use of control equipment, selection and use of appropriate personal protective equipment, safe operating procedures to be used at the incident scene, techniques of coordination with other employees to minimize risks, appropriate response to over exposure from health hazards or injury to themselves and other employees and recognition of subsequent symptoms which may result from over exposures.

(*1*) Competency may be demonstrated by 24 hours of training annually in those areas with training sessions at least monthly or by demonstrations by the employee of competency in those areas at least quarterly.

(*2*) A certification shall be made of the training or competency and if certification of competency is made, the employer shall keep a record of the methodology used to demonstrate competency.

(*3*) An employer of employees for whom the reasonable possibility of responding to emergencies at other than hazardous waste clean-up sites exists need not train all such employees to the degree specified in paragraph (l)(3)(i)(A)(*1*) of this section if the employer divides the work force such that sufficient employees who have responsibility to control the emergency have the training specified in this paragraph and other employees who may first respond to the incident have sufficient awareness training to recognize that an emergency response situation exists and are instructed in that case to summon the employees who are fully trained and not attempt control activities for which they are not trained.

(*4*) An employer of employees for whom the reasonable possibility exists of responding to emergencies at other than hazardous waste clean-up sites need not train such employees to the degree specified in paragraph (l)(3)(i)(A)(*1*) of this section if:

(*i*) arrangements have been made in advance for a fully-trained emergency response team to respond in a reasonable period; and

(*ii*) employees who may come to the incident first have sufficient awareness training to recognize that an emergency response situation exists and are instructed to call the designated fully-trained emergency response team for assistance.

(B) *Specialist employees.* Employees who, in the course of their regular job duties, work with and are trained in the hazards of specific materials covered by this standard, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident, are exempt from the monthly training sessions required in paragraph (l)(3)(i)(A) of this section. They must, pursuant to paragraph (l)(3)(i)(A) however, receive at least 24 hours of training annually or demonstrate competency in the area of their specialization.

(C) *Skilled support personnel.* Personnel, not necessarily an employer's own employees, who are needed to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer's own employees, and who will be or may potentially be exposed to the hazards at an emergency response scene, are not required to have the 24 hours of annual training or demonstrate the competency required for the employer's regular employees. However, the senior official cited in paragraph (l)(3)(ii) of this section shall ensure that these personnel are given an initial briefing at the site of emergency response prior to their participation in that response that shall include instruction in the wearing of appropriate personal protective equipment, what chemical hazards are involved, and what duties are to be performed. All appropriate safety and health precautions provided to the employer's own employees shall be used to assure the safety and health of these personnel.

(ii) *Procedures for handling emergency response.* (A) The senior official responding to an emergency at other than hazardous waste clean-up sites involving a hazardous substance or health hazard shall establish and become the individual in charge of a site-specific Incident Command System (ICS). All emergency responders and their communications shall be coordinated and controlled through the individual in charge of the ICS assisted by the senior official present for each employer.

Note: The "senior official" at an off-site emergency response is the most senior official on the site who has the responsibility for controlling the operations at the site. Initially it is the senior officer on the first-due piece of responding emergency apparatus to arrive on the incident scene. As more senior officers arrive (i.e., fire chief, battalion chief, site coordinator, etc.) the position is passed up the line of authority.

(B) The individual in charge of the ICS shall identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies.

(C) Based on the hazardous substances and/or conditions present, the individual in charge of the ICS shall implement appropriate emergency operations, and assure that the personal protective equipment worn is appropriate for the hazards to be encountered. However, personal protective equipment shall meet, at a minimum, the criteria contained in 29

CFR 1910.156(e) when worn while performing fire fighting operations beyond the incipient stage.

(D) Employees engaged in emergency response and exposed to hazardous substances shall wear positive pressure self-contained breathing apparatus while engaged in emergency response until such time that the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposures to employees.

(E) The individual in charge of the ICS shall limit the number of emergency response personnel at the emergency site to those who are actively performing emergency operations. However, operations in hazardous areas shall be performed using the buddy system in groups of two or more.

(F) Back-up personnel shall stand by with equipment ready to provide assistance or rescue. Qualified basic life support personnel, as a minimum, shall also stand by with medical equipment and transportation capability.

(G) The individual in charge of the ICS shall designate a safety official, who is knowledgable in the operations being implemented at the emergency response site, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations for the emergency at hand.

(H) When activities are judged by the safety official to be an IDLH condition and/or to involve an imminent danger condition, the safety official shall have the authority to alter, suspend, or terminate those activities. The safety official shall immediately inform the individual in charge of the ICS of any actions taken to correct these hazards at an emergency scene.

(I) After emergency operations have terminated, the individual in charge of the ICS shall implement appropriate decontamination procedures.

(J) When deemed necessary for meeting the tasks at hand, approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus shall meet U.S. Department of Transportation and National Institute for Occupational Safety and Health criteria.

(4) *Hazardous materials teams (HAZMAT).* (i) Employees who are members of a HAZMAT team shall be given training in accordance with paragraph (l)(3) of this section that includes the care and use of chemical protective clothing, and procedures to be followed when working on leaking drums, containers, tanks, or bulk transport vehicles.

(ii) Members of HAZMAT teams shall receive a base line physical exam and have medical surveillance as required in paragraph (f) of this section.

(iii) Chemical personal protective clothing and equipment to be used by HAZMAT team members shall meet the requirements of paragraph (g) of this section.

(5) *Post-emergency response operations.* Upon completion of the emergency response, if it is determined that it is necessary to remove hazardous substances, health hazards, and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident the employer conducting the clean-up shall comply with one of the following:

(i) Meet all of the requirements of paragraphs (b) through (n) of this section; or

(ii) Where the clean-up is done on plant property using plant or workplace employees, such employees shall have completed the training requirements of the following: 29 CFR 1910.38(a); 1910.134; 1910.1200, and other appropriate safety and health training made necessary by the tasks that they are expected to be performed. All equipment to be used in the performance of the clean-up work shall be in serviceable condition and shall have been inspected prior to use.

(m) *Illumination.* Areas accessible to employees shall be lighted in accordance with the requirements of this paragraph.

(1) Work areas shall be lighted to not less than the minimum illumination intensities listed in the following Table H-102.1 while any work is in progress:

TABLE H-102.1—MINIMUM ILLUMINATION INTENSITIES IN FOOT-CANDLES

Foot-candles	Area or operations
5	General site areas.
3	Excavation and waste areas, accessways, active storage areas, loading platforms, refueling, and field maintenance areas.
5	Indoors: warehouses, corridors, hallways, and stairways.
5	Tunnels, shafts, and general underground work areas (Exception: Minimum of 10 foot-candles is required at tunnel and shaft heading during drilling, mucking, and scaling. Mine Safety and Health Administration approved cap lights shall be acceptable for use in the tunnel heading.)
10	General shops (e.g., mechanical and electrical equipment rooms, active storerooms, barracks or living quarters, locker or dressing rooms, dining areas, and indoor toilets and workrooms.)
30	First aid stations, infirmaries, and offices.

(n) *Sanitation at temporary workplaces.* Facilities for employee sanitation shall be provided in accordance with this paragraph.

(1) *Potable water.* (i) An adequate supply of potable water shall be provided on the site.

(ii) Portable containers used to dispense drinking water shall be capable of being tightly closed, and equipped with a tap. Water shall not be dipped from containers.

(iii) Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purpose.

(iv) Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

(2) *Nonpotable water.* (i) Outlets for nonpotable water, such as water for firefighting purposes shall be identified to indicate clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.

(ii) There shall be no cross-connection, open or potential, between a system furnishing potable water and a system furnishing nonpotable water.

(3) *Toilets facilities.* (i) Toilets shall be provided for employees according to the following Table H-102.2.

TABLE H-102.2—TOILET FACILITIES

Number of employees	Minimum number of facilities
20 or fewer	One.
More than 20, fewer than 200	One toilet seat and 1 urinal per 40 employees.
More than 200	One toilet seat and 1 urinal per 50 employees.

(ii) Under temporary field conditions, provisions shall be made to assure that at least one toilet facility is available.

(iii) Hazardous waste sites not provided with a sanitary sewer shall be provided with the following toilet facilities unless prohibited by local codes:

(A) Chemical toilets;

(B) Recirculating toilets;

(C) Combustion toilets; or

(D) Flush toilets.

(iv) The requirements of this paragraph for sanitation facilities shall not apply to mobile crews having transportation readily available to nearby toilet facilities.

(v) Doors entering toilet facilities shall be provided with entrance locks controlled from inside the facility.

(4) *Food handling.* All food service facilities and operations for employees shall meet the applicable laws, ordinances, and regulations of the jurisdictions in which they are located.

(5) *Temporary sleeping quarters.* When temporary sleeping quarters are provided, they shall be heated, ventilated, and lighted.

(6) *Washing facilities.* The employer shall provide adequate washing facilities for employees engaged in operations where hazardous substances may be harmful to employees. Such facilities shall be in near proximity to the worksite; in areas where exposures are below established permissible exposure limits and which are under the controls of the employer; and shall be so equipped as to enable employees to remove hazardous substances for themselves.

(7) *Showers and change rooms.* When hazardous waste clean-up or removal operations commence on a site and the duration of the work will require six months or greater time to complete, the employer shall provide showers and change rooms for all employees exposed to hazardous substances and health hazards involved in hazardous waste clean-up or removal operations.

(i) Showers shall be provided and shall meet the requirements of 29 CFR 1910.141(d)(3).

(ii) Change rooms shall be provided and shall meet the requirements of 29 CFR 1910.141(1). Change rooms shall consist of two separate change areas separated by the shower area required in paragraph (n)(7)(i). One change area, with an exit leading off the worksite, shall provide employees with a clean area where they can remove, store, and put on street clothing. The second area, with an exit to the worksite, shall provide employees with an area where they can put on, remove and store work clothing and personal protective equipment.

(iii) Showers and change rooms shall be located in areas where exposures are below the established permissible exposure limits. If this cannot be accomplished, then a ventilation system shall be provided that will supply air that is below the established permissible exposure limits.

(iv) Employers shall assure that employees shower at the end of their work shift and when leaving the hazardous waste site.

(o) *Certain Operations Conducted Under the Resource Conservation and Recovery Act of 1976 (RCRA).* Employers conducting operations specified in paragraph (a)(2)(iii) of this section shall:

(1) Develop and implement a written safety and health program for employees involved in hazardous waste operations which shall be available for inspection by employees, their representatives and OSHA personnel. The program shall be designed to identify, evaluate and control safety and health hazards in their facilities for the purpose of employee protection, and provide for emergency response meeting the requirements of paragraph (l) of this section and it shall address as appropriate site analysis, engineering controls, maximum exposure limits, hazardous waste handling procedures and uses of new technologies;

(2) Implement a hazard communication program as part of the employer's safety and program meeting the requirements of 29 CFR 1910.1200.

Note.—The exemptions provided in § 1910.1200 are applicable to this section.

(3) Implement a medical surveillance program meeting the requirements of paragraph (f) of this section;

(4) Develop and implement a decontamination procedure in accordance with paragraph (k) of this section, and

(5)(i) Develop and implement a training program, which is part of the employer's safety and health program, for employees involved with hazardous waste operations to enable each employee to perform their assigned duties and functions in a safe and healthful manner so as not to endanger themselves or other employees. The initial training shall be for 24 hours and refresher training shall be for eight hours annually.

(ii) Employers who can show by an employee's previous work experience and/or training that the employee has had training equivalent to the initial training required by this paragraph, shall be considered as meeting the initial training requirements of this paragraph as to that employee. Equivalent training includes the training that existing employees might have already received from actual site work experience. Employees who have received the initial training required by this paragraph shall be given a written certificate attesting that they have successfully completed the necessary training.

(p) *New technology programs.* (1) The employer shall develop and implement procedures for the introduction of effective new technologies and equipment developed for the improved protection of employees working with hazardous waste clean-up operations, and the same shall be implemented as part of the site safety and health program to assure that employee protection is being maintained.

(2) New technologies, equipment or control measures available to the industry, such as the use of foams or other means to suppress the level of air contaminates while excavating the site or for spill control, shall be evaluated by employers or their representatives to determine their effectiveness before implementing their use on a large scale for employee protection. Such evaluations shall be made available to OSHA upon request.

Appendices to § 1910.120—Hazardous Waste Operations and Emergency Response

Note.—*The following appendices serve as non-mandatory guidelines to assist employees and employers in complying with the appropriate requirements of this section. However paragraph 1910.120(g) makes mandatory in certain circumstances the use of Level A and Level B PPE protection.*

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—*Definition 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, and legs, may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer by itself or in combination with the wearer's respiratory equipment, 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 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 test 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 = three inches water gauge and B = two 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-encapsulating 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.

2.0—*Definition 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, and legs; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer by itself or in combination with the wearer's respiratory equipment, 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 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.

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 shall leave the test room immediately.

4.0—*Required supplies.*

4.1 A supply of concentrated aqueous ammonia (58 percent ammonium hydroxide 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 shallow 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 ±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 the test shall review the MSDS for aqueous ammonia.

5.2 Since the established permissible exposure limit for ammonia is 50 ppm, only persons wearing a 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 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 aqueous 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 the 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 the 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 sections 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 ammonia (NH_3) or more for the length of stain detector tube) indicates that 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.

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 data.

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.

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 must 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, or the exposure after breakthrough must not pose a hazardous level.

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, must 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. Pressure-demand, full face-piece self-contained breathing apparatus (SCBA), or pressure-demand 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.*
4. Long underwear.
5. Gloves, outer, chemical-resistant.
6. Gloves, inner, chemical-resistant.
7. Boots, chemical-resistant, steel toe and shank.
8. Hard hat (under suit).*
9. Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit).
10. Two-way radios (worn inside encapsulating suit).

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. Pressure-demand, full-facepiece self-contained breathing apparatus (SCBA), or pressure-demand 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.*
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).*
8. Hard hat.
9. Two-way radios (worn inside encapsulating suit).
10. Face shield.*

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.*
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)*.
8. Hard hat.
9. Escape mask.*
10. Two-way radios (worn under outside protective clothing).
11. Face shield.*

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.*
3. Boots/shoes, chemical-resistant steel toe and shank.
4. Boots, outer, chemical-resistant (disposable).*
5. Safety glasses or chemical splash goggles*.
6. Hard hat.
7. Escape mask.*
8. Face shield.*

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 intact 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;

Note.—This involves atmospheres with IDLH concentrations of specific substances that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

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 intact skin.

III. 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 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.

Appendix C—Compliance Guidelines

1. *Occupational Safety and Health Program.* Each hazardous waste site clean-up effort will require an occupational safety and health program headed by the site

* Optional, as applicable.

coordinator or the employer's representative. The program will be designed for the protection of employees at the site. The purpose of the program will need to be developed before work begins on the site and implemented as work proceeds. The program is to facilitate coordination and communication 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 or the employer's manager on the site 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.

Also those employers involved with treating storing or disposal of hazardous waste as covered in paragraph (o) must have implemented a safety and health plan for their employees. This program is to include the hazard communication program required in paragraph (o)(1) and the training required in paragraph (o)(5) as parts of the employers comprehensive overall safety and health program. This program is to be in writing.

Each site or workplace 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 supervisor 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 or workplace 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).

2. *Training.* The employer is encouraged to utilize those training programs that have been recognized by the National Institute of Environmental Health Sciences through its training grants program. These training and educational programs are being developed for employees who work directly with hazardous substances. For further information about these programs contact: National Institute of Environmental Health Sciences, P.O. Box 12233, Research Triangle Park, NC 27709.

The training programs for employees subject to the requirements of paragraph (e) of this standard are expected to address: the safety and health hazards employees should expect to find on 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; 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.

Training programs for emergency service organizations are available from the U.S. National Fire Academy, Emmitsburg, MD and the various state fire training schools. The International Society of Fire Service Instructors, Ashland, MA is another resource.

The training programs for employees covered by the requirements of paragraph (l)(3) of this standard are expected to address 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 any evaluation of what worked and what did not and how can we do better the next time may be counted as training time.

For hazardous materials teams, the training will need to 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 use of plugging and patching equipment and other subject areas.

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

Technical experts or 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 need not have monthly training sessions, however, they will be required to have the 24 hours of training on an annual basis. Their training must include the care and use of personal protective equipment including respirators; knowledge of the incident command system, and those areas needed to keep them current in their respective field as it relates to safety and health involving specific hazardous substances.

Those employees who work for public works departments or special equipment operators who operate bulldozers, sand trucks, backhoes, etc., who may be called to the incident scene to provide emergency support assistance, will need at least a safety and health briefing before entering the area of potential or actual exposure. These specially skilled persons, who have not been a part of the emergency plan and do not meet the required training hours, must be made aware of the hazards they face and be provided all necessary protective clothing and equipment required for their tasks. If respirators are to be worn, the specially skilled person shall be trained in accordance with § 1910.134 before proceeding into the hazardous area to do their assigned job.

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 re-using PPE. References in Appendix D may be used for guidance in 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 are to be utilized in the emergency response plans called for in this standard. Each employer needs to assure that its emergency response plan is compatible with the local plan. In addition, the Chemical Manufacturers' Association (CMA) is another helpful resource in formulating an effective emergency response plan. Also the current Emergency Response Guidebook from the U.S. Department of Transportation, CMA's CHEMTREC and the Fire Service Emergency Management Handbook should be used as resources.

Appendix D—References

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

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*, International Association of Fire Chiefs Foundation, 101 East Holly Avenue, Unit 10B, Sterling, VA 22170, January 1985.

15. *Emergency Response Guidebook*, U.S. Department of Transportation, Washington, DC, 1983.

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 V. Brunacini, National Fire Protection, 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.

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