

U S A E H A

*Pentachlorophenol-Treated Materials*

*U.S. Army Environmental Hygiene Agency  
Aberdeen Proving Ground, Maryland 21010-5422*

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<p>In the past, pentachlorophenol (penta), a preservative for wood used outdoors, was primarily used by the Department of the Army (DA) for preserving ammunition boxes and pallets. While the Department of Defense (DoD) no longer procures penta-treated wood, existing stocks are significant. This guide provides information on penta-treated materials to assist--</p> <p>a. Personnel responsible for handling, transporting, and disposing of penta in:</p> <ul style="list-style-type: none"> <li>- Recognizing and controlling penta exposures.</li> <li>- Recommending proper penta protective equipment.</li> <li>- Determining proper disposal method(s) for penta-treated materials.</li> </ul> <p>b. Healthcare providers in developing a proper penta medical surveillance program.</p>				
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DEPARTMENT OF THE ARMY  
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY  
ABERDEEN PROVING GROUND, MARYLAND 21010-6422

REPLY TO  
ATTENTION OF

HSHB-ME-S

September 1991

USAEHA TECHNICAL GUIDE NO. 146  
PENTACHLOROPHENOL-TREATED MATERIALS

**Chapter 1**  
**Introduction**

**1-1. Purpose**

This guide provides information on pentachlorophenol (penta)-treated materials to assist--

a. Personnel responsible for handling, transporting, and disposing of penta in--

- (1) Recognizing and controlling penta exposures.
- (2) Recommending proper penta protective equipment.
- (3) Determining proper disposal method(s) for penta-treated materials.

b. Healthcare providers in developing a proper penta medical surveillance program.

**1-2. References**

Appendix A lists the referenced publications.

**1-3. Explanation of Abbreviations**

The glossary explains the abbreviations used in this guide.

**1-4. Technical Assistance**

Additional technical assistance and guidance may be obtained either in writing to the Commander, U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD 21010-5422, or by calling the following:

- a. Air Pollution Engineering Division, DSN 584-3500/C 301-671-3500.
- b. Industrial Hygiene Division, DSN 584-3144/C 301-671-3144.
- c. Occupational and Environmental Medicine Division, DSN 584-2464/  
C 301-671-2464.
- d. Toxicology Division, DSN 584-3627/C 301-671-3627.
- e. Entomological Sciences Division, DSN 584-4131/C 301-671-4131.
- f. Water Quality Engineering Division, DSN 584-3816/C 301-671-3816.
- g. Waste Disposal Engineering Division, DSN 584-3651/C 301-671-3651.

**CHAPTER 2  
BACKGROUND****2-1. Penta Defined**

a. Pentachlorophenol (commonly called penta) is--

(1) A buff colored crystal or powder formulated by chlorinating molten phenol with a catalyst.

(2) Either a salt form in an aqueous solution or a 5 percent solution in petroleum carrier(s), such as Type A oils (diesel) or Type C oils (mineral spirits).

b. Table 2-1 contains additional penta data.

**2-2. Identification Markings**

The letter "P" identifies wood treated with penta and other preservative items. Green dye marks pallets.

**2-3. Synonyms and Tradenames**

A list of synonyms and tradenames pertaining to pentachlorophenol is available through this Agency's Pesticide Hotline (DSN 584-3773/C 301-671-3773.)

**2-4. Preservatives**

a. In the past, penta, a preservative for wood used outdoors, was primarily used by the Department of the Army (DA) for preserving ammunition boxes and pallets. While the Department of Defense (DOD) is no longer procuring penta-treated wood, existing stocks are significant.

b. Copper-8-quinolinolate, zinc naphthenate, and copper naphthenate are now alternative preservatives to penta.

**2-5. Typical Concerns**

a. Properly treated and dried penta materials represent minimal safety, health, or environmental hazards. Personnel should, however, exercise extra care when handling these items because there may be small quantities of dioxins and furans present in the penta-treated wood.

b. Penta items showing evidence of crystallization, surface wetness, or tackiness represent potential worker safety/health hazards or environmental hazards. Ammunition boxes and pallet surfaces can contain crystallized (bloomed) penta.

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Table 2-1  
Pentachlorophenol Data

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FORMULA:  $C_6Cl_5OH$

MOLECULAR WEIGHT: 266.3

PEL: In air:  $0.5 \text{ mg/m}^3$ , with skin notation

BOILING POINT (760 mm Hg):  $311 \text{ }^\circ\text{C}$  ( $592 \text{ }^\circ\text{F}$ ) (decomposes)

SPECIFIC GRAVITY ( $H_2O = 1$ ): 2.0

VAPOR PRESSURE: 0.00011 mm Hg at  $20 \text{ }^\circ\text{C}$

SOLUBILITY IN WATER [ $\text{g}/100\text{g } H_2O$  at  $20 \text{ }^\circ\text{C}$  ( $68 \text{ }^\circ\text{F}$ )]: 0.002

MELTING POINT:  $182 - 190 \text{ }^\circ\text{C}$  ( $360 - 374 \text{ }^\circ\text{F}$ )

APPEARANCE AND ODOR: Light brown solid with a pungent odor when hot.

INCOMPATIBILITY: Contact with strong oxidizers may cause fires and explosions.

HAZARDOUS DECOMPOSITION PRODUCTS: Toxic gases and vapors (i.e., hydrogen chloride, chlorinated phenols, carbon monoxide) may release as penta decomposes.

pH: pka 5.3

ORAL-LD 50 RAT: 50 mg/kg

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c. Penta-treated wood sealers decrease volatilization by 85 percent. These sealers are not for field use and only properly trained personnel should apply sealers. Acceptable sealers include--

- (1) Urethane.
- (2) Shellac.
- (3) Latex epoxy enamel.
- (4) Varnish.

## 2-6. Current Status

a. On March 29, 1990, the Environmental Protection Agency (EPA) promulgated the toxicity characteristic (TC) final rule (55 Federal Register (FR) 11798). The rule, which became effective on September 25, 1990, adds 25 new organic compounds to the list of toxic constituents that may render a waste hazardous. That is, any solid waste capable of leaching one or more of these organic constituents in concentrations greater than regulatory limits would be regulated as hazardous waste. Penta was one of the 25 organic compounds. The regulatory limit for penta, using the Toxic Characteristic Leaching Procedure (TCLP), was set at 100 milligrams/Liter (mg/L).

b. Sampling conducted by this Agency to assess the leachability of penta from various types of treated wood indicates penta-treated wood is not a hazardous waste under current Federal regulations (see appendix B). Chapter 5 discusses available disposal options.

c. The installation environmental coordinator must determine if State regulations relative to penta-treated wood are more stringent than Federal regulations.

## 2-7. Future Considerations

The EPA has indicated that they may lower the present penta concentration limit of 100 mg/L. Because the EPA did not indicate when or to what extent they may lower the limit, closely monitor changes in the hazardous waste regulations.

## CHAPTER 3 PENTACHLOROPHENOL EXPOSURE

### 3-1. Exposure Standard

The permissible exposure limit (PEL) for airborne concentrations of penta is 0.5 mg/meter<sup>3</sup> (m<sup>3</sup>) with a skin notation. This standard--

- a. Includes both airborne penta dust and vapor.
- b. Indicates skin absorption may contribute to overall exposure.
- c. Does not consider concentrations of impurities in commercial grade penta, such as dioxins and furans. These impurities may cause acute skin, eye, and respiratory irritation in some personnel at levels far below the PEL.

(1) The forms of chlorinated dibenzo-p-dioxins most commonly found in penta (including its salts) are hexa, hepta, and octachlorodi-benzo-p-dioxins.

(2) The chlorinated dibenzofurans found in penta are the penta, hexa, tetra, hepta, and octachlorodibenzofurans.

(3) The dioxin isomer 2,3,7,8-tetrachlorodiobenzo-p-dioxin (TCDD) is generally not found in penta.

### 3-2. Sources of Exposure

The airborne exposure potential to penta is greatest in ammunition storage magazines. While these areas are closed-up and undisturbed, volatilized penta will not be dispersed. However, penta crystals on boxes are dispersed into the air during pallet movements. Personnel should understand that entering the magazine and moving ammunition boxes provides the greatest potential for airborne exposure.

### 3-3. Routes of Exposure

#### a. Inhalation.

(1) Vapor. The vapor pressure of penta is quite low (see table 2-1). Therefore, inhalation of penta in the vapor state is unlikely. However, the potential for vapor exposure is heightened in enclosed spaces during periods of hot weather when increased volatilization occurs.

(2) Dust/Crystals. Airborne dust/crystals are the major source of penta-related complaints. Crystals are dispersed into the air during handling and transport of the wood. This problem is magnified in an enclosed space (e.g., ammunition storage magazine or railroad box car). Dust that settled on the floor is often dispersed into the air simply by walking into the magazine. See paragraph 3-2.

(3) Sawdust. Inhalation of sawdust from penta-treated wood may produce an acute irritation of the nose and throat, similar to that of vapor and dust or crystal exposure. See paragraph 6-6a.

b. *Skin Absorption.* Penta readily permeates through the skin. Direct contact with crystalline penta or with tacky penta-treated wooden surfaces can result in entry of penta into the body.

c. *Ingestion.* Eating or smoking after contact with penta-treated products often causes ingestion of penta.

d. *Dermal Contact.* Irritation of the skin and eyes are noted with penta exposure. This irritation occurs even at levels below the PEL.

### 3-4. Signs of Exposure

Although the degree of safety, health, or environmental hazards associated with penta-treated materials is difficult to estimate or quantify, penta is a material with good warning properties. Exposure is detectable through its irritant effects at airborne concentrations of one-third the PEL in paragraph 3-1. Individuals with disorders to the cardiovascular system, respiratory system, liver, kidneys, or skin may develop problems at even lower levels of exposure. Personnel should understand--

a. Under warm temperatures or enclosed storage conditions, volatilized penta may cause respiratory distress and nose, throat, or eye irritation.

b. A pungent penta odor or irritation of the mucous membranes (eyes, nose, or throat) are indications of potentially harmful airborne penta dust or vapor.

**CHAPTER 4  
PROTECTIVE MEASURES****4-1. Proper Ventilation**

Ventilation, where practicable, should reduce airborne penta concentrations to levels below those presented in paragraph 3-1.

**4-2. Respiratory Protection**

When adequate ventilation is not practical to reduce airborne penta levels below the recommended standards, personnel should use proper respiratory protection. Consult AR 11-34, TB MED 502, and section 134, part 1910, title 29, Code of Federal Regulations (29 CFR 1910.134) for respiratory protection.

a. Respirators must be National Institute of Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) approved.

b. Air purifying respirators may be used where dioxin/furan contamination is low (e.g., exposure to dust contaminated with low levels of TCDD).

c. The installation commander establishes a respiratory protection program to meet the requirements of AR 11-34. This program will include, but will not be limited to--

(1) Training on respirator face-fit, use, and leak-testing.

(2) Procedures for respirator maintenance, inspection, cleaning, and evaluation.

**4-3. Personal Protective Devices for Handling Penta-Treated Materials**

a. *Gloves.* The type of gloves worn is dependent upon the characteristics of the wood being handled. Wear--

(1) Nitrile rubber or polyvinyl chloride gloves when handling wet or tacky wood.

(2) Leather-palmed gloves when handling properly treated wood. Note, however, that perspiration build-up may allow penta to permeate through leather gloves. Therefore, wear only dry leather-palmed gloves.

b. *Coveralls.*

(1) Wear only coveralls laundered on a daily basis.

(a) Advise laundry personnel to launder the coveralls separately from other clothing to reduce the possibility of cross-contamination.

(b) Do not launder severely contaminated clothing. Treat this clothing as pesticide-related waste (40 CFR 165) and dispose (40 CFR 261.33) of accordingly.

(2) Leave all coveralls at the worksite. Do not take them home.

c. *Chemical Goggles.* Wear chemical goggles when handling wood with visible crystals of penta or when generating wood dust.

**4-4. Personal Protective Devices for Handling Contaminated Waste Processor and Dunnage Incinerator Ash**

a. Instead of decontaminating clothing, use disposable outer apparel when handling Contaminated Waste Processor (CWP) and Dunnage (DUN) Incinerator ash. The protective apparel should consist of both outer and inner garments.

(1) Outer garments should include--

(a) Zippered coveralls with attached hood. Exposure to particulate or dust requires coveralls made of a nonwoven fabric, such as spunbonded polyethylene, Tyvek®, or Saranex®-coated Tyvek.

(b) Drawstring or elastic sleeves.

(c) Gloves.

(d) Closure boots.

(2) Inner garments should include--

(a) Cotton coveralls.

(b) Undershirts.

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®Tyvek and Saranex-coated Tyvek are registered trademarks of E.I. DuPont de Nemours and Co., Inc., Wilmington, DE. Use of trademarked names does not imply endorsement by the U.S. Army, but is intended only to assist in identification of a specific product.

(c) Undershorts.

(d) Gloves.

(e) Socks.

b. Place all disposable clothing in approved containers and label for proper disposal. Thoroughly clean all reusable clothing.

#### 4-5. Personal Hygiene

Personnel should--

a. Wash their hands before smoking, eating, drinking, or using toilet facilities.

b. Wash all exposed areas of the body at the end of each workday.

c. *Not* smoke, eat, or drink in the work area.

## CHAPTER 5 PENTACHLOROPHENOL WASTE MANAGEMENT

### Section I Preparation for Disposal

#### 5-1. Determining Serviceable and Unserviceable Penta-Treated Wood

Continue to use penta-treated wood products until the wood fibers deteriorate. Once the deterioration occurs, the items are unserviceable.

a. If they contain no explosive contamination, the supervisor considers the following options:

(1) Disposal in a sanitary or construction landfill (see paragraph 5-4).

(2) Turn-in to the Defense Reutilization and Marketing Office (DRMO) for resale (see paragraph 5-5b).

b. If the materials *do* contain explosive contamination, incinerate in a CWP (see paragraph 5-3).

#### 5-2. Environmental Protection Agency Guidance

##### a. *Penta-Treated Pallets and Boxes.*

(1) The EPA does not classify penta-treated pallets and boxes as hazardous waste (40 CFR 261). They recommend disposal as a nonhazardous solid waste by--

(a) Incineration in a commercial or industrial incinerator (see paragraph 5-3).

(b) Burial in a properly operated, permitted sanitary landfill (see paragraph 5-4).

(2) Some state agencies have adopted more stringent hazardous waste regulations for the management of penta-treated materials. In those states, a Resource Conservation and Recovery Act (RCRA) permit would be required for the thermal treatment of penta-treated wood (e.g., in the CWP). The installation environmental coordinator must determine if there are specific State laws and regulations concerning the classification of penta-treated materials as special or hazardous wastes.

*b. Waste Penta Formulations.* The EPA lists waste penta formulations as hazardous waste (40 CFR 261.31) because of the dioxin contamination from the manufacturing process. Combustion research on penta and sodium salt formulations of penta also indicates that polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are formed under incineration conditions. While PCDDs and PCDFs are not listed as hazardous waste, they are--

- (1) Listed in 40 CFR 261, Appendix VII (Basis for Listing Hazardous Waste).
- (2) The reason for listing F027 (e.g., penta) wastes in 40 CFR 261.31.
- (3) The constituents (along with penta) to be analyzed when determining if F027 waste can be land disposed (paragraph 5-2c).

*c. Compounds and Treatment Standards.* Under the requirements set forth in 40 CFR 268, the compounds and treatment standards in table 5-1 must be met by a TCLP extract from the waste being considered for land disposal.

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Table 5-1  
Compounds and Treatment Standards

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<i>Compound</i>	<i>Concentration</i>
HxCDD - All Hexachlorodibenzo-p-dioxins	< 1 ppb
HxCDF - All Hexachlorodibenzofurans	< 1 ppb
PeCDD - All Pentachlorodibenzo-p-dioxins	< 1 ppb
PeCDF - All Pentachlorodibenzofurans	< 1 ppb
TCDD - All Tetrachlorodibenzo-p-dioxins	< 1 ppb
TCDF - All Tetrachlorodibenzofurans	< 1 ppb
Pentachlorophenol	< 0.01 ppm

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d. *Residue.* All residue generated from the incineration of penta-treated wood is solid waste. Generators of solid waste must determine, by knowledge of the waste or by testing, whether the waste exhibits any hazardous waste characteristics (e.g., ignitability, corrosivity, reactivity, or toxicity).

## Section II Disposal Options for Penta-Treated Materials

### 5-3. Incineration of Explosive-Contaminated Penta-Treated Wood

a. Incinerate (thermally process) explosive-contaminated wastes in a CWP permitted by the appropriate State or local air pollution control agency. CWP incineration--

(1) Controls combustion and emissions.

(2) Is a viable disposal option for explosive contaminated penta-treated wood following guidelines on hydrochloric acid (HCl) emissions. Worker exposure to HCl emissions can occur during downwash meteorological conditions. Therefore, under the direction of the U.S. Army Materiel Command, incinerate penta-treated wood in a CWP unit only if meteorological conditions do not produce downwash conditions.

b. While the levels of PCDDs, PCDFs, and penta (table 5-1) in all the CWP ash waste streams greatly exceed the allowable concentration of a hazardous waste for land disposal, the waste streams, when subjected to the TCLP, show no detectable levels of regulated compounds. Therefore, the waste streams meet the treatment standards for land disposal of an F027 hazardous waste (see paragraph 5-8) and can be disposed of in a permitted hazardous waste landfill (see paragraph 5-4).

### 5-4. Landfills

a. *Sanitary.* Consult 40 CFRs 241 and 257 for specific guidance on this method of disposal.

b. *Rubble.* Because rubble landfills rarely do not meet the criteria established in 40 CFRs 241 and 257, *do not* dispose of penta-treated wood in a rubble landfill.

**5-5. Recycling/Resale**

a. Recycled penta-treated materials carry certain restrictions.

(1) *Use* penta-treated materials for--

(a) Outdoor use.

(b) Soil containers for growing ornamental plants.

(2) *Do not use* penta-treated materials for--

(a) Making furniture.

(b) Burning in fireplaces or stoves.

(c) Storage or use in human dwellings.

(d) Planing, sawing, or sanding in a home setting.

(e) Growing food items.

b. Any penta-treated materials intended for resale through DRMO, such as pallets and boxes *which are not contaminated with explosives*, require the following precautionary statement on the turn-in document:

**WOODEN AMMUNITION BOXES**

A. The wood in the ammunition boxes contains (or may contain) varying amounts of chemical preservatives. The amount of residual pentachlorophenol (penta) will vary because of the porosity of wood. To minimize the possibility of allergic reactions, such as skin rashes, take the following precautions while handling these boxes.

\* WEAR GLOVES AND APRONS OF RUBBER, VINYL, OR OTHER NONPOROUS MATERIALS.

\* DO NOT BURN PENTA-TREATED WOOD BECAUSE OF ITS VAPORIZATION POTENTIAL.

\* RECOMMEND NO CUTTING, SANDING, OR PLANING OF PENTA-TREATED WOOD.

If disturbing the penta-treated wood in any way, take the following precautions:

\* AVOID SKIN CONTACT.

\* WEAR PROTECTIVE CLOTHING, SUCH AS GLOVES, APRONS, COVERALLS, EYE PROTECTION, AND BOOTS.

\* ENSURE ADEQUATE VENTILATION TO MOVE PARTICLES AWAY FROM THE OPERATOR'S BREATHING ZONE.

\* USE RESPIRATORS TO CAPTURE AND REMOVE PENTA DUST AND VAPORS AT ALL WORK STATIONS.

\* HAVE AN INDUSTRIAL VACUUM SYSTEM AVAILABLE TO PICK UP WOOD PARTICLES.

B. Purchasers agree to include the above warning in any subsequent resale of these boxes.

*Do Not Use For Storage*

*Do Not Use Within Human Dwellings*

### Section III Special Conditions Related to Disposal

#### 5-6. Storage Containers

a. *Baghouse Bags.* Given the concerns for the levels of PCDDS, PCDFs, and penta in the CWP ash waste streams, dirty baghouse bags should not be removed from the unit for cleaning or regeneration.

(1) Use the mechanism incorporated in the baghouse for cleaning the bags (e.g., shakers or air jets) to accomplish this function.

(2) When replacing the bags, minimize dust generation and contain any dust that is generated.

(a) Use heavy plastic sheeting for bag changing operations to contain the baghouse dust and prevent contamination of the environment.

(b) Dispose of the bags, dust, and any material used to contain the dust with the same method of disposal as CWP ash (e.g., containerize and dispose of in a hazardous waste landfill).

b. *Scrap Metal.* Drums containing furnace ash, which consist mainly of nails, hinges, and banding, show levels of PCDDs and PCDFs. This material is unsuitable for turn-in to the DRMO. Dispose of this material in the same manner as other waste streams from the CWP (paragraph 5-3).

#### 5-7. Pentachlorophenol Spills

##### a. *Types of Spills.*

##### (1) Cement/Concrete Surfaces.

(a) Contain and remove all free-flowing material with absorptive materials (e.g., sawdust, vermiculite, etc.).

(b) After containment and removal, scrub the surface with rags or cloths soaked in a recommended solvent (e.g., kerosene or stoddard solvent, PD-680, type 2) at least twice. ***Never hose penta down with water.***

(c) Deposit all rags, debris, and contaminated materials in an approved container for subsequent disposal (see paragraph 5-8).

(d) Wipe test the decontaminated surface to ensure adequate clean-up. Negotiate criteria for adequate clean-up on a case-by-case basis with the applicable regulatory authority.

(2) Soil. There are no rules for determining the depth of soil to remove following penta contact. Use good judgment to determine the penetration depth of the chemical.

(a) Remove all contaminated soil immediately and place in a disposal drum.

(b) Require soil test samples to evaluate the effectiveness of the clean-up. Negotiate criteria for clean-up on a case-by-case basis with the applicable regulatory authority.

(3) Vegetation.

(a) Contact with lawns requires the entire removal of grasses and at least 2 inches of underlying soil.

(b) Remove and dispose of bushes and nongrassy plants contaminated with penta.

(4) Nonremovable/Nondisposable Items. Frequent spillage occurs on equipment or articles near penta treating equipment. Use good judgment for clean-up.

(a) Scrub surfaces with a recommended solvent (e.g., kerosene or Stoddard solvent, PD-680, type 2) at least twice.

(b) Wipe test the decontaminated surfaces to ensure adequate clean-up.

*b. Spill Prevention Control and Countermeasure Plan (SPCCP) and Installation Spill Contingency Plan (ISCP).*

(1) Any penta treatment facilities with the potential for a spill into surface waters must be included in the installation SPCCP. Additionally, provide adequate secondary containment at the site to control any spills.

(2) Penta treatment facilities will also be included in the ISCP.

(a) Ensure the installation response team is trained to respond to penta spills.

(b) Report any spills over 10 pounds to the EPA and the local emergency planning commission (LEPC).

c. *Personal Protective Measures.* Consult chapter 4 of this guide for personal protection against exposure.

d. *Disposal of Spill Clean-Up Materials.* See paragraph 5-8.

### 5-8. Hazardous Waste Turn-In

Turn-in the following to the DRMO for disposal as a hazardous waste.

a. Waste Rags (used to remove penta blooms or to clean-up penta spills) and Wipes. These items are a hazardous waste. Containerize and mark "WASTE: CONTAMINATED PENTACHLOROPHENOL RAGS/WIPES (D037)".

b. Waste Solvent Containing Penta - Listed hazardous waste (F027).

c. Unused, Excess, or Off-specification Commercial Products - Listed hazardous waste (F027).

d. Still Bottom Sludges (from the treatment of wastewaters from penta wood preserving processes) - Listed hazardous waste (K001).

e. Used Penta Solutions (excess penta solutions from wood treatment processes) - Listed hazardous waste (F027).

f. Unused, Discarded Penta Formulations. These items are a hazardous waste (F027).

### 5-9. Non-Penta-Treated Materials

The ash waste streams from burning penta-treated wood in the CWP are heavily contaminated with PCDDs and PCDFs. The burning of non-penta-treated wood in the CWP along with penta-treated wood will only increase the amount of waste requiring management as a hazardous waste. Therefore, segregate non-penta-treated wood from the penta-treated wood and use a different disposal option for this material.

## **CHAPTER 6 HEALTHCARE PROVIDER INFORMATION**

### **Section 1 Medical Surveillance**

#### **6-1. Basis for Medical Surveillance**

The installation medical authority (IMA) establishes the medical surveillance program for personnel with potential for exposure to penta.

- a. Any employee exposed at or above one-half the PEL (see paragraph 3-1) will be included in the medical surveillance program.
- b. The occupational health (OH) physician determines the need, frequency, and scope of medical surveillance for personnel potentially exposed to penta.

#### **6-2. Preplacement or Baseline Examinations**

The OH physician conducts baseline examinations on all personnel normally assigned to perform duties that result in the potential occupational exposure to penta. The examination includes--

- a. Comprehensive medical and occupational histories with focus on the cardiovascular, dermatologic, hepatic and renal systems, eyes, and upper respiratory tract. Individuals with evidence of liver and kidney disease should be excluded from work sites where penta exposures at or above the PEL (see paragraph 3-1) are likely.
- b. A physical examination, with particular attention to the skin, eyes, upper respiratory tract, liver, and cardiovascular system.
- c. Laboratory tests, including liver function tests (serum glutamate oxalacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), and alkaline phosphatase) and renal function tests (blood urea nitrogen (BUN) and creatine).

#### **6-3. Periodic Examinations**

- a. The OH physician conducts annual periodic examinations, which are the same as the baseline examinations.

b. Where laboratory services permit, biological monitoring of serum penta levels in personnel is preferable to nonspecific laboratory tests (see paragraph 6-2c). Use nonspecific laboratory tests only to evaluate whether a toxicity has occurred, or where an employee's health status has changed for other reasons and they are being considered for reassignment away from penta exposure.

#### 6-4. Toxicology

It is not always clear whether a toxic effect is from exposure to penta itself or from exposure to one of many impurities found in penta (e.g., chlorinated dibenzofurans and dibenzodioxins) (see paragraph 5-2b). Good ventilation and hygiene practices and appropriate personal protective equipment (see paragraph 4-2) should prevent the majority of routine exposure and toxicity problems.

### Section II

#### Health Effects from Exposure to Pentachlorophenol

#### 6-5. Reproductive Hazards

a. Because of the teratogenic/fetotoxic hazards from the usual contaminants of penta, pregnant workers should not--

(1) Work in areas where there is the potential for penta exposure.

(2) Handle penta or penta-treated materials.

b. Pregnant workers should inform the IMA immediately of their pregnancy. This will allow reassignment away from penta.

#### 6-6. Signs, Symptoms, and Treatment

a. *Acute Irritation of the Eyes, Nose, and Throat.* This irritation occurs even at levels below the PEL, especially in the unacclimated individual. Removal from exposure is the primary treatment for most acute irritations. However, if penta particles or solutions get in the eyes, flush the eyes with water for 15 minutes and obtain medical attention.

b. *Skin Irritation.* Personnel should--

(1) Immediately wash contaminated skin with soap or mild detergent and water.

(2) Promptly change any penta-contaminated clothing.

- (3) Shower and change to street clothes at the end of each work shift.
- (4) **Not** eat, smoke, or drink in penta work areas.

*c. Acute Systemic Intoxication.* This can occur through any of the exposure routes, but usually happens through skin absorption in hot weather. Specific symptoms include--

- (1) Weakness.
- (2) Dizziness.
- (3) Headache.
- (4) Nausea.
- (5) Vomiting.
- (6) Shortness of breath.
- (7) Chest pain.
- (8) Profuse sweating.
- (9) Extremely high body temperature.

Consider this a medical emergency. It is serious and may be fatal. **Remove affected individuals from exposure immediately.**

*d. Chronic Effects.* These are not well documented or described.

- (1) Personnel with prolonged penta exposure (1 month to years) have developed chloracne, an acne-like skin rash. Chloracne may be very resistant to therapy and can take 1 or more years to resolve.
- (2) Liver and kidney function may be altered, although it is unlikely there will be permanent damage to these organs.
- (3) Carcinogenicity of penta is still indefinite and under study.
- (4) Some animal studies show teratogenicity.

**CHAPTER 7  
ADMINISTRATIVE REQUIREMENTS****7-1. Hazard Communication Program**

The Occupational Safety and Health Administration's (OSHA's) Hazard Communication (HAZCOM) Standard (29 CFR 1910.1200) requires employers to establish a written, comprehensive HAZCOM program. This program provides for--

- a. *Labeling.* Refer to 29 CFR 1910.1200.
- b. *Material Safety Data Sheets (MSDSs).* Refer to 29 CFR 1910.1200.
- c. *Employee information and training.* Refer to paragraph 7-2.

**7-2. Employee Information and Training Program**

This information is intended to comply with the OSHA HAZCOM Standard for employee information and training.

a. *Requirement.* Installation commanders through the written HAZCOM program define the mechanism for training workers about the potential exposure to penta. Employees must receive the information and training at the time of their initial assignment to a work area. Simply making the information available to the employee for reading is not enough. Present the information in an interactive fashion where the--

(1) Employee has the opportunity and is encouraged to ask questions.

(2) Instructors ensure that the employee understands the information presented.

b. *Information.* Discussion topics include--

(1) The HAZCOM Standard (29 CFR 1910.1200).

(2) Requirements of the HAZCOM Standard.

(3) Components of the HAZCOM Program now in effect in the workplace.

- (4) Work area operations where penta is present.
- (5) Location of the--
  - (a) Employer's written hazard evaluation procedures (for manufacturers/importers only).
  - (b) HAZCOM Program document.
  - (c) Lists of hazardous chemicals.
  - (d) MSDSs.
- c. *Training.* Employee training includes--
  - (1) Implementation of the HAZCOM Program in the workplace.
  - (2) How to read and interpret information on labels and MSDS's.
  - (3) How employees can obtain and use the available hazard information.
  - (4) The hazards of penta in the work area.
  - (5) Protective measures available to the employees.
  - (6) Employer instituted or provided protective measures. These include specific engineering controls, work practices, and personal protective equipment.
  - (7) Methods and observations (e.g., appearance, smell, monitoring device alarms) by which employees can detect the presence of a hazardous chemical.

### 7-3. The Lesson Plan

The following lesson plan is for the material handler health education program. It is for safety, health, supervisory, and Army school personnel to use to educate workers on potential hazards and how to minimize exposures.

a. *Objective.* Enable employees to work with and handle penta-treated materials safely.

b. *Description and Uses.*

(1) Crystal or powder formulated as a salt in water solution or dissolved in petroleum carrier.

(2) Primary use in DA: Preservation of wooden ammunition boxes and pallets.

(3) No longer being procured, but significant stocks exist.

*c. Health Hazards from Penta Exposure.*

(1) Effects of low-level, acute exposure: Irritation of eyes, nose, throat, and skin.

(2) Effects of high-level, acute exposure: Systemic poisoning.

(3) Effects of chronic exposure: Chloracne, liver and kidney dysfunction, possible reproductive effects. Note particular risk to pregnant employees.

(4) Some effects may be due to dioxin/furan impurities.

*d. Exposure Routes and Exposure Limit.*

(1) Inhalation (dust, sawdust, vapor).

(2) Skin absorption.

(3) Ingestion.

(4) PEL to airborne dust and vapors: 0.5 mg/m<sup>3</sup>.

*e. Work Operations Where Penta is Present.* These operations are specific to each installation. Give particular attention to--

(1) Operations handling wooden ammunition boxes and pallets.

(2) Closed, heated spaces.

(3) Dusty areas.

*f. Recognition of Penta Presence.*

(1) Smell: Pungent.

(2) Blooms (recrystallized penta) and tacky surfaces.

(3) Symbols/markings: "P," green dye.

*g. Protective Measures and Controls (in approximate order of effectiveness).*

(1) Housekeeping (especially to prevent dust accumulation and dispersal).

(2) Personal hygiene: Washing after each handling.

(3) Protective clothing: Gloves, coveralls, eyewear.

(4) Ventilation.

(5) Respiratory Protection. Refer to program requirements in 29 CFR 1910.134, AR 11-34, and TB MED 502.

#### **7-4. Documentation**

Document HAZCOM training using DD Form 1556 (Request, Authorization, Certification of Training and Reimbursement) and incorporate it as a permanent part of the Official Personnel File.

APPENDIX A  
REFERENCES

A-1. Publications

AR 11-34  
The Army Respiratory Protection Program.

AR 200-1  
Environmental Protection and Enhancement.

29 CFR 1910.134  
Respiratory Protection.

29 CFR 1910.1200  
Hazard Communication.

40 CFR 60, Subpart E  
New Source Performance Standards for Incinerators.

40 CFR 165  
Regulations for the Acceptance of Certain Pesticides and Recommended  
Procedures for the Disposal and Storage of Pesticides and Pesticide  
Containers.

40 CFR 240  
Guidelines for the Thermal Processing of Solid Waste.

40 CFR 241  
Guidelines for the Land Disposal of Solid Waste.

40 CFR 257  
Criteria for Classification of Solid Waste Disposal Facilities and Practices.

40 CFR 260  
Hazardous Waste Management System: General.

40 CFR 261  
Identification and Listing of Hazardous Waste.

40 CFR 262  
Standards Applicable to Generators of Hazardous Waste.

40 CFR 263  
Standards Applicable to Transporters of Hazardous Waste.

40 CFR 264

Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

40 CFR 265

Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

40 CFR 266

Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities.

40 CFR 267

Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities.

40 CFR 268

Land Disposal Restrictions.

40 CFR 270

EPA Administered Permit Programs: The Hazardous Waste Permit Program.

DOD 4160.21-M-1

Defense Demilitarization Manual (Restructured).

DPDS-H 4160.3

Volume I: Disposal Operating Procedures (Chapter XIV, paragraph 120).

EPA Position Document 4

Wood Preservative Pesticides: Creosote, Pentachlorophenol, Inorganic Arsenicals.

49 FR 30290

Voluntary Training Guidelines, 27 July 1984.

55 FR 11798

Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Toxicity Characteristics Revisions; Final Rule.

Memorandum, Office of the Assistant Secretary of Defense, 20 Feb 85  
Used Solvent Elimination (USE) Program, Interim Guidance.

OSHA Instruction CPL 2-2.38A

Subject: Inspection Procedures for the Hazard Communication Standard (29 CFR 1910.1200), 16 May 1986.

OSHA Pamphlet 3084

Chemical Hazard Communication, 1984.

Public Law 94-580 as amended by Public Law 98-616  
Resource Conservation and Recovery Act (RCRA) of 1976; Hazardous and  
Solid Waste Amendments of 1984.

TB MED 502  
Respiratory Protection Program.

A-2. Forms

DD Form 1556  
Request, Authorization, Certification of Training and Reimbursement.

APPENDIX B  
PENTACHLOROPHENOL SAMPLING

B-1. Purpose

This Agency conducted sampling to measure the leachability of penta from various types of treated wood.

B-2. Guidelines for Sampling

a. Using the EPA TCLP and the new EPA standard of 100 mg/L, this Agency measured how much total penta would leach under landfill conditions.

b. Duplicate surveillance samples of treated wood were analyzed to determine their total penta content so the percent of leachability could be determined (see table B-1).

B-3. Sampling Summary

None of the samples of penta-treated wood analyzed by this Agency exceeded the TCLP regulatory level of 100 mg/L. However, State regulations and future EPA decisions may impact on the significance of these sampling results.

Table B-1  
Results of USAEHA Penta Leaching Sampling

Sample Number	Total Penta Concentration (mg/kg)	TCLP Leachate Concentration (mg/L)
1	8700	11.3
2	6180	17.0
3	7740	15.1
4	7030	5.6
5	2390	2.4
6	1070	5.3
7	2510	9.8
8	214	0.4
9	1281	0.1
10	121	0.1
11	7664	3.8
12	4706	1.9
13	80	0.005
14	2148	2.1
15	7114	3.6
16	1669	1.3
17	8143	6.5
<u>MEAN</u>	<u>4044.7</u>	<u>5.1</u>

GLOSSARY

BUN

blood urea nitrogen

CFR

Code of Federal Regulations

CWP

Contaminated Waste Processor

DA

Department of the Army

DoD

Department of Defense

DUN

Dunnage Incinerator

EPA

Environmental Protection Agency

DRMO

Defense Reutilization and Marketing Office

FR

Federal Register

HAZCOM

hazard communication

HCl

hydrochloric acid

HxCDD

hexachlorodibenzo-p-dioxin

HxCDF

hexachlorodibenzofuran

IMA

installation medical authority

ISCP  
Installation Spill Contingency Plan

L  
liter

LEPC  
local emergency planning commission

m  
meter

mg  
milligram

MSDS  
Material Safety Data Sheet(s)

MSHA  
Mine Safety and Health Administration

OH  
occupational health

NIOSH  
National Institute for Occupational Safety and Health

OSHA  
Occupational Safety and Health Administration

PCDD  
polychlorinated dibenzodioxins

PCDF  
polychlorinated dibenzofurans

PeCDD  
pentachlorodibenzo-p-dioxin

PeCDF  
pentachlorodibenzofuran

PEL  
permissible exposure limit

penta  
pentachlorophenol

RCRA  
Resource Conservation and Recovery Act

SGOT  
serum glutamate oxalacetic transaminase

SGPT  
serum glutamic pyruvic transaminase

SPCCP  
Spill Prevention Control and Countermeasure Plan

TAP  
toxic air pollutant

TC  
toxicity characteristic

TCDD  
tetrachlorodibenzo-p-dioxin

TCDF  
tetrachlorodibenzofuran

TCLP  
Toxicity Characteristic Leaching Procedure

Local Reproduction is  
Authorized and Encouraged

SEPTEMBER 1991



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