Newly Listed Wastes and Hazardous Debris Rule

A WORKBOOK

Recycled/Recyclable
Printed on paper that contains at least 50% recycled fiber.

Contents

Introduction

The Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris Rule was signed into law on June 30, 1992. This new rule promulgated treatment standards for 20 newly listed hazardous wastes. The rule also addresses hazardous debris and containment buildings. In addition, it significantly reduces certain paperwork requirements and provides incentives to treat particular wastes through recovery technologies.

This rule, in particular, represents an innovative approach to the regulation of hazardous debris under the Land Disposal Restrictions program. It allows owners and operators considerable flexibility in determining how to treat their debris.

This workbook, designed as part of training package which also includes a two-part video series, provides an overview of the rule, along with case studies, and sections to test your knowledge. To use this workbook, read all sections. After you have completed the reading, familiarize yourself with the key references. Then, work on the questions. Answers are given at the end of each chapter.

CHAPTER 1

Newly Listed Wastes

1.1 Definition of newly listed wastes

Newly listed wastes are those that were listed as hazardous after the passage of the Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act on November 8, 1984. The June 30 rule sets treatment standards for 20 newly listed wastes:

- Petroleum refining wastes (F037 and F038).
- 2-ethoxyethanol wastes (U359).
- Wastes from the production of unsymmetrical dimethylhydrazine (K107, K108, K109, and K110).
- Wastes from the production of dinitrotoluene and toluenediamine (K111 and K112, U328, and U353).
- Wastes from the production of ethylene dibromide (K117, K118, and K136) and methyl bromide (K131 and K132).
- Wastes from the production of ethylenebisdithiocarbamic acid (K123, K124, K125, and K126).

Soil contaminated with these wastes will be addressed in a future proposal. Newly listed wastes mixed with radioactive components, however, are subject to the treatment standards outlined in the June 30 rule.

1.2 Treatment standards

Treatment standards have been established for both wastewater and nonwastewater forms of these newly listed wastes. These standards, which are based on data from treating similar wastes using best demonstrated available technologies (BDAT), must be met before wastes can be disposed of on land. In the case of newly listed wastes:

- EPA issued concentration-based standards when it is possible to measure the organic constituents of the waste and the treatment residues reliably using analytical test methods.
- When EPA anticipates significant difficulties in measuring the organic constituents, EPA specified BDAT technologies that must be utilized.

The charts on the following pages show the treatment standards for each newly listed waste.

TREATMENT STANDARDS

Petroleum Refining Wastes

These wastes are generated in the primary and secondary separation of oil, water, and solids from petroleum refinery process wastewaters and oily cooling wastewaters.

Wastes Include:

F037
Any sludge generated from gravitational separation of oil, water, and solids.

F038
Any sludge and/or float generated from physical and/or chemical separation of oil, water, and solids.

Treatment Standards: EPA has established a number of concentration-based standards for the various hazardous substances contained in both the wastewater and nonwastewater forms of these wastes (see page 8).

Treatment Technology: Any BDAT technology capable of reaching the treatment standards listed in the rule can be used, except for impermissible dilution.

Effective Dates: November 18, 1992.

TREATMENT STANDARDS

Petroleum Refining Wastes

BDAT Treatment Standards for F037
[Nonwastewaters]

Regulated constituent	Maximum for any single grab sample—Total composition (mg/kg)
Anthracene	28
Benzene	14
Benzo(a)anthracene	20
Benzo(a)pyrene	12
Bis(2-ethylhexyl)phthalate	7.3
Chrysene	15
Di-n-butyl phthalate	3.6
Ethylbenzene	14
Naphthalene	42
Phenanthrene	34
Phenol	3.6
Pyrene	36
Toluene	14
Xylenes (total)	22
Cyanides (total)	1.8
Chromium (total)	1.7
Nickel	0.20

BDAT Treatment Standards for F037
[Wastewaters]

Regulated constituent	Maximum for any 24 composite sample—Total composition (mg/l)
Acenaphthene	0.059
Anthracene	0.059
Benzene	0.14
Benzo(a)anthracene	0.059
Benzo(a)pyrene	0.061
Bis(2-ethylhexyl)phthalate	0.28
Chrysene	0.059
Di-n-butyl phthalate	0.057
Ethylbenzene	0.057
Fluorene	0.059
Napthalene	0.059
Phenanthrene	0.059
Phenol	0.039
Pyrene	0.067
Toluene	0.080
Xylenes (total)	0.32

Regulated constituent	Maximum for any single grab sample—Total composition (mg/l)
Cyanides (total)	0.028
Chromium (total)	0.20
Lead	0.037

TREATMENT STANDARDS

Petroleum Refining Wastes

BDAT Treatment Standards for F038
[Nonwastewaters]

Regulated constituent	Maximum for any single grab sample—Total composition (mg/kg)
Benzene	14
Benzo(a)pyrene	12
Bis(2-ethylhexyl)phthalate	7.3
Chrysene	15
Di-n-butyl phthalate	3.6
Ethylbenzene	14
Naphthalene	42
Phenanthrene	34
Phenol	3.6
Pyrene	36
Toluene	14
Xylenes (total)	22
Cyanides (total)	1.8

Regulated constituent	Maximum for any single grab sample—TCLP (mg/l)
Chromium (total)	1.7
Nickel	0.20

BDAT Treatment Standards for F038
[Wastewaters]

Regulated constituent	Maximum for any 24 composite sample—Total composition (mg/l)
Benzene	0.14
Benzo(a)pyrene	0.061
Bis(2-ethylhexyl)phthalate	0.28
Chrysene	0.059
Di-n-butyl phthalate	0.057
Ethylbenzene	0.057
Fluorene	0.059
Naphthalene	0.059
Phenanthrene	0.059
Phenol	0.039
Pyrene	0.067
Toluene	0.080
Xylenes (total)	0.32

Regulated constituent	Maximum for any single grab sample—Total composition (mg/l)
Cyanides (total)	0.028
Chromium (total)	0.20
Lead	0.037

TREATMENT STANDARDS

Wastes from the Production of Ethylenebisdithiocarbamic Acid

These wastes are generated in the production of the fungicide ethylenebisdithiocarbamic acid and its salts. The Agency's preliminary contacts within industry indicate that one facility generates these wastes. This facility currently sends them to a publicly owned treatment works (POTW) after neutralization to the appropriate pH level.

Wastes Include:

K123
Process wastewater (including supernatants, filtrates, and wash waters).

K124
Reactor vent scrubber water.

K125
Purification solids (including filtration, evaporation, and centrifugation solids).

K126
Baghouse dust and floor sweepings in milling and packaging operations.

Treatment Standards:

Because ethylenebisdithiocarbamic acid is unstable in water, quantifying concentration levels in treatment residuals is difficult. Therefore, EPA has established BDAT technologies as the treatment standards for K123, K124, K125, and K126. For nonwastewater forms of these wastes, the required method of treatment is incineration. For wastewater forms, the required methods are incineration or chemical oxidation followed by biological treatment or carbon adsorption.

Effective Dates: November 18, 1992.

TREATMENT STANDARDS

Wastes from the Production of 1,1-Dimethylhydrazine

These wastes are generated in the production of 1,1-dimethylhydrazine salts from carboxylic acid hydrazines. 1,1-dimethylhydrazine is a component of jet and rocket fuels and is used in photography, chemical synthesis, and other production processes.

Wastes Include:

K107
Column bottoms from product separation.

K108
Condensed column overheads from product separation and condensed reactor vent gases.

K109
Spent filter cartridges from product purification.

K110
Condensed column overheads from intermediate separation.

Treatment Standards:

Because unsymmetrical dimethylhydrazine is unstable in water, quantifying concentration levels in treatment residuals is difficult. Therefore, EPA has established BDAT technologies as the treatment standards for K107, K108, K109, and K110 wastes. For nonwastewater forms of these wastes, the required treatment technology is incineration. For wastewater forms, the required methods of treatment are incineration or, chemical oxidation followed by carbon adsorption or biodegradation followed by carbon adsorption.

Effective Dates:

November 18, 1992.

TREATMENT STANDARDS

2-Ethoxyethanol Wastes

These wastes are generated in the printing, organic chemical manufacturing, and leather and tanning industries.

Wastes Include: **U359**

2-Ethoxyethanol is used in paint removers, cleansing solutions, and dye baths; as a solvent for inks, duplicating fluids, nitrocellulose, lacquers, and other substances; as a chemical intermediate in 2-ethoxyacetate manufacture; and in the process of leather finishing. When disposed of, 2-ethoxyethanol becomes U359 waste. EPA's preliminary contacts with industry indicate that only two facilites generate U359.

Treatment Standards: Because 2-ethoxyethanol waste is unstable in water, quantifying concentration levels in treatment residuals is difficult. Therefore, EPA has established BDAT technologies as the treatment standard for U359 wastes. For nonwastewater forms of these wastes, the required methods of treatment are incineration or fuel substitution. For wastewater forms of these wastes, the required methods of treatment are incineration or chemical oxidation with carbon adsorption or biodegradation, or biodegradation followed by carbon adsorption.

Effective Date: November 18, 1992.

TREATMENT STANDARDS

Wastes from the Production of Dinitrotoluene and Toluenediamine

These wastes are generated in the production of dinitrotoluene and toluenediamine.

Wastes Include:

K111
Product washwaters from the production of dinitrotoluene through the nitration of toluene. K111 wastes are generated at facilities engaged in manufacturing inorganic chemicals, dyes and pigments, and explosives, and organic synthesis operations.

K112
Reaction by-products from drying equipment in the production of toluenediamine. K112 wastes are generated in intermediate processes at facilities engaged in manufactuaring photographic chemicals, plastics, and resins, organic chemicals, textiles, and polyurethane, as well as in the production of toluenediamine as an end product.

U353
Para-toluidine, or when discarded U353. The textile and dyes and pigments industries generate ortho- and paratoluidine as intermediates and reagents for printing textiles and making colors fast. Both compounds also are components in ion-exchange column preparation and can be used as antioxidants in rubber manufacturing and as lab reagents in medical glucose analyses. EPA's preliminary contacts with industry indicate that one facility generates both U328 and U353.

Treatment Standards: For wastewater and nonwastewater forms of K111, EPA has set concentration-based treatment standards (see page 14).

Effective Date: November 18, 1992.

TREATMENT STANDARDS

Wastes from the Production of Dinitrotoluene and Toluenediamine

BDAT Treatment Standards for K111 [Nonwastewaters]	
Regulated constituent	Maximum for any single grab sample—Total composition (mg/kg)
2,4-Dinitrotoluene	140
2,6-Dinitrotoluene	28

BDAT Treatment Standards for K111 [Wastewaters]	
Regulated constituent	Maximum for any single grab sample—Total composition (mg/l)
2,4-Dinitrotoluene	0.32
2,6-Dinitrotoluene	0.55

TREATMENT STANDARDS

Wastes from the Production of Ethylene Dibromide and Wastes from the Production of Methyl Bromide

Although EPA banned the use of ethylene dibromide (EDB) in the United States, EPA believes that EDB wastes might still be generated by pesticide manufacturers intending to sell EDB overseas. Information available to EPA suggests that only one facility generates K118 and reports disposing of it in a Subtitle C landfill. This facility also reports recycling its K117 steam, a briny, high-bromine stream that can be returned to the bromine production unit.

Wastes Include:

From the production of ethylene dibromide through bromination of ethylene:

K117
Wastewater production from the reactor vent gas scrubber.

K118
Spent adsorbent solids from purification.

K136
Still bottoms from purification.

From the production of methyl bromide:

K131
Wastewater from the reactor and spent sulfuric acid from the acid dryer.

K132
Spent adsorbent and wastewater separator solids.

Treatment Standards:

EPA has established concentration-based standards for wastewater and nonwastewater forms of these wastes (see page 16). Any BDAT technology capable of reaching the treatment standards listed in the rule can be used, except for impermissible dilution.

Effective Date: November 18, 1992.

TREATMENT STANDARDS

Wastes from the Production of Ethylene Dibromide and Wastes from the Production of Methyl Bromide

BDAT Treatment Standards for K117, K118, and K136 [Nonwastewaters]

Regulated constituent	Maximum for any single grab sample—Total composition (mg/kg)
Ethylene dibromide	15.0
Bromomethane	15.0
Chloroform	5.6

BDAT Treatment Standards for K131 and K132 [Nonwastewaters]

Regulated constituent	Maximum for any single grab sample—Total composition (mg/kg)
Bromomethane (methyl bromide)	15

BDAT Treatment Standards for K117, K118, and K136 [Wastewaters]

Regulated constituent	Maximum for any single grab sample—Total composition (mg/l)
Ethylene dibromide	0.028
Bromomethane	0.11
Chloroform	0.046

BDAT Treatment Standards for K131 and K132 [Wastewaters]

Regulated constituent	Maximum for any single grab sample—Total composition (mg/l)
Bromomethane (methyl bromide)	0.11

1.3 Effective date

EPA has extended the effective date for compliance with the treatment standards for newly listed wastes by three months. Therefore, the effective date of compliance is November 18, 1992.

A capacity analysis conducted by EPA, however, revealed that, in some cases, additional time might be required for waste generators to comply with the standards. As a result, EPA has granted national capacity variances for some surface-disposed or deepwell-disposed wastes, as indicated in the table below.

Generators also may apply for a treatability or case-by-case variance if they are unable to satisfy the standards by the required date.

Summary of Capacity Variance Decisions for Newly Listed Wastes

Waste code	Variance for surface-disposed wastes?	Variance for deepwell-disposed wastes?
F037—removed from S.I.[a]	2-year	No.
F038—removed from S.I.[a]	2-year	No.
F037—managed in S.I.[b]	2-year	No.
F038—managed in S.I.[b]	2-year	No.
F037—Routine	1-year	No.
F038—Routine	1-year	No.
K107	No	No.
K108	No	No.
K109	No	No.
K110	No	No.
K111	No	No.
K112	No	No.
K117	No	2-year.
K118	No	2-year.
K123	No	No.
K124	No	No.
K125	No	No.
K126	No	No.
K131	No	2-year.
K132	No	2-year.
K136	No	No.
U328	No	No.
U353	No	No.
U359	No	No.
Mixed Rad. Waste	2-year	No.
Hazardous Debris	2-year	No.

[a] F037 and F038 wastes from cleanout and closure of surface impoundments.
[b] F037 and F038 managed in surface impoundments.

CASE STUDY: NEWLY LISTED WASTES

Scenario:

An environmental manager at a small chemical company is responsible for determining the appropriate treatment standards for hazardous wastes generated in the company's production processes. Because the company generates relatively small volumes of wastes, these wastes often are combined for treatment purposes. A K117 wastewater is combined with a K010 wastewater for treatment. What must the environmental manager do to determine the appropriate treatment standards for the mixture?

First, the environmental manager must determine what the treatment standards are for the K117 wastewater and the K010 wastewater. Standards are listed in 40 CFR 268.43 and in the Tables provided with this chapter.

Next, the manager must compare the two lists to determine the constituents of concern and the treatment standards for those constituents.

BDAT Treatment Standards for K009 and K010 [Wastewaters]	
Regulated constituent	Concentration (in mg/l)
Chloroform	0.10

BDAT Treatment Standards for K117, K118, and K136 [Wastewaters]	
Regulated constituent	Maximum for any single grab sample—Total composition (mg/l)
Ethylene dibromide.	0.028
Bromomethane.	0.11
Chloroform	0.046

In so doing, the manager finds that there are three constituents of concern for the mixture: ethylene dibromide, bromomethane, and chloroform. The treatment standard for chloroform, however, is different for the K117 wastewater and the K010 wastewater.

Under 40 CFR 268.41(b), "when wastes with differing treatment standards for a constituent of concern are combined for purposes of treatment, the treatment residue must meet the lowest treatment standard for the constituent of concern."

In this case, therefore, the appropriate treatment standard for chloroform is 0.046 mg/l.

TEST YOUR KNOWLEDGE

Newly Listed Wastes

These exercises are designed to help you check your understanding of the material in this chapter. Use any reference materials that you need to answer the questions. When you have completed the questions, check your answers against those provided **on the back of this page.**

1 What are newly listed wastes?

2 List the newly listed wastes included in the rule.

3 Circle the answer to the following:

These wastes are included in the June 30 rule:

T F Soil contaminated with newly listed wastes.

T F Newly listed wastes mixed with radioactive components.

4 Fill in the blanks:

a. When it is possible to measure the organic constituents of the waste and the treatment residues reliably using analytical test methods, EPA has specified________________ treatment standards.

b. When it is not possible to measure the organic constituents, EPA has specified that the wastes must be treated by ____________________.

c. A _____________ national capacity variance has been granted for petroleum refining wastes generated as a result of cleanouts or closures of surface impoundments and mixed radioactive wastes.

TEST YOUR KNOWLEDGE

Answer Key: Newly Listed Wastes

1 What are the newly listed wastes?

Newly listed wastes are those wastes listed as hazardous after the passage of the Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act on November 8, 1984.

2 List the newly listed wastes included in the rule.

Petroleum refining wastes, 2-ethoxyethanol wastes, wastes from the production of unsymmetrical dimethylhydrazine, wastes from the production of dinitrotoluene and toluenediamine, wastes from the production of ethylene dibromide, and wastes from the production of ethylenebisdithiocarbamic acid.

3 Circle the answer to the following:

These wastes are included in the June 30 rule:

T (F) Soil contaminated with newly listed wastes.

(T) F Newly listed wastes mixed with radioactive components.

4 Fill in the blanks:

a. When it is possible to measure the organic constituents of the waste and the treatment residues reliably using analytical test methods, EPA has specified <u>concentration-based</u> treatment standards.

b. When it is not possible to measure the organic constituents, EPA has specified that the wastes must be treated by <u>certain BDAT technologies.</u>

c. A <u>2-year</u> national capacity variance has been granted for petroleum refining wastes generated as a result of cleanouts or closures of surface impoundments and mixed radioactive wastes.

CHAPTER 2

Hazardous Debris

2.1 Definition of hazardous debris

Hazardous debris is any solid material intended for discard that is contaminated with hazardous waste or that exhibits one or more hazardous waste characteristics: toxicity, ignitability, corrosivity, or reactivity.

Under the rule, hazardous debris is defined as a solid material with a particle size in excess of 60 mm (2.5 inches or approximately the size of a tennis ball) that is:

- A manufactured object.
- Plant or animal matter.
- Natural geologic material (i.e. cobbles and boulders).

In addition:

- Even though debris must be a solid material, a mixture of debris and other materials such as soil or sludge is subject to regulation if, based on visual inspection, the mixture is comprised primarily of debris.
- Process residuals (such as smelter slag) and residue from the treatment of waste (i.e. incinerator ash), wastewater, sludges, or air emissions, are not considered debris.
- Intact tanks and wastes for which specific regulations already exist that consider the form of waste (such as lead acid and cadmium batteries) are not considered debris.

2.2 Treatment standards

In the past, hazardous debris destined for land disposal had to meet the treatment standard for the particular listed or characteristic waste with which the debris was contaminated. Under the June 30 rule, hazardous debris also can be treated using specific BDAT technologies based on the type of debris and the type of contaminants present in the debris. The specified technologies are from one or more of the following families of debris treatment technologies:

- Extraction (including physical, chemical, and thermal).
- Destruction.
- Immobilization.

Four technologies are expected to be used most often to treat debris. These are:

- Abrasive blasting.
- Water washing and spraying.
- Thermal destruction.
- Microencapsulation.

The remaining technologies are:

- Scarification, grinding, and planing.
- Vibratory finishing.
- High-pressure steam and water spraying.
- Liquid-phase solvent extraction.
- Vapor-phase solvent extraction.
- High-temperature metals recovery.
- Thermal desorption.
- Biodegradation.
- Chemical oxidation.
- Macroencapsulation.
- Sealing.

In addition:

- Treatment must be performed in accordance with specified performance and design and operating standards.
- The rule prohibits the use of some technologies to treat specific types of contaminants.
- Debris that no longer contains listed hazardous waste or exhibits any hazardous waste characteristic following treatment with an extraction or destruction technology is not subject to Subtitle C regulation.
- Debris is said to "contain" hazardous waste when waste is contained on the surface or in the pore structure of the debris. EPA can determine if debris no longer contains hazardous waste on a case-by-case basis, upon request.
- When hazardous debris is treated to today's treatment standards, treaters must comply with the applicable residue analysis, notification, certification, and recordkeeping and requirements.

The table on the following pages shows the proposed performance and design and operating standards for each BDAT technology.

TABLE 1. PROPOSED PERFORMANCE AND DESIGN AND OPERATING STANDARDS FOR BDAT TECHNOLOGIES

BDAT Technology	Performance and Design and Operating Standards	Contaminant Restrictions
Abrasive blasting; scarification, grinding, and planing; spalling; vibratory finishing; and high-pressure steam and water sprays	Glass, metal, plastic, and rubber must be treated to a clean debris surface.[1] Brick, cloth, concrete, paper, rock, pavement, and wood must be treated to a clean debris surface. In addition, at least 0.6 cm of the surface layer must be removed.	None.
Water washing and spraying	All debris must be treated to a clean debris surface. For brick, cloth, concrete, paper, pavement, rock, and wood, debris must not be more than 1.2 cm thick[2] unless this limit is waived under an Equivalent Technology Demonstration. This demonstration must document that the technology treats contaminants to a level equal to that required for other technologies in the table such that the residuals pose no threat to human health and the environment absent management controls. Debris surfaces must be in contact with the water solution for at least 15 minutes.	For brick, cloth, concrete, paper, pavement, rock, and wood, the contaminants must be soluble to at least 5 percent by weight in the water solution or 5 percent by weight in the emulsion, as applicable. If the debris is contaminated with a waste listed for dioxin, the treater must make an Equivalency Demonstration.
Liquid-phase solvent extraction	Same as above.	Same as above, except that contaminants must be soluble to at least 5 percent by weight in the solvent.
Vapor-phase solvent extraction	Same as above, except that brick, colth, concrete, paper, pavement, rock, and wood surfaces must be in contact with the organic vapor for more than 60 minutes.	Same as above.

[1] A clean debris surface means that surface, when viewed without magnification, shall be free of all visible contaminated soil and hazardous waste except that residual staining from soil and waste consisting of light shadows, slight streaks, or minor discoloration, and soil and waste in cracks, crevices, and pits shall be limited to no more than 5 percent of each square inch of surface area

[2]If reducing the size of debris to meet the treatment standards results in a material that no longer meets the 60 mm minimum particle size limit for debris, such material is subject to the waste-specific treatment standards for the constituents with which the debris is contaminated, unless the debris has been cleaned and separated from contaminated soil and waste prior to size reduction. At a minimum, simple physical or mechanical means must be used to provide such cleaning and separation of nondebris materials to ensure that the debris surface is free of caked soil, waste, or other nondebris material.

TABLE 1. PROPOSED PERFORMANCE AND DESIGN AND OPERATING STANDARDS FOR BDAT TECHNOLOGIES (continued)

BDAT Technology	Performance and Design and Operating Standards	Contaminant Restrictions
Thermal desorption	The treater must make an Equivalency Demonstation. Treated debris must be separated from treatment residuals using simple physical or mechanical means. These residuals must meet the treatment standards for the organic constituents with which the debris is contaminated. For brick, cloth, concrete, paper, pavement, rock, and wood, debris must be no more than 10 cm thick in one dimension, unless that limit is waived under an Equivalent Technology Demonstration.	Metals other than mercury.
Biological destruction (biodegradation), chemical oxidation, chemical reduction	The treater must make an Equivalency Demonstration. Treated debris must be separated from treatment residuals using simple physical or mechanical means. These residuals must meet the treatment standards for the organic constituents with which the debris is contaminated. For brick, cloth, concrete, paper, pavement, rock, and wood, debris must not be more than1.2 cm thick unless this limit is waived under an Equivalent Technology Demonstration.	Metal contaminants.
Thermal destruction	Treated debris must be separated from treatment residuals using simple physical or mechanical means. These residuals must meet the treatment standards for the organic constituents with which the debris is contaminated.	For brick, concrete, glass, metal, pavement, and rock, metals other than mercury. This restriction does not apply if the debris is treated by vitrification. If the debris is contaminated with a waste listed for dioxin, the treater must make an Equivalency Demonstration.

TABLE 1. PROPOSED PERFORMANCE AND DESIGN AND OPERATING STANDARDS FOR BDAT TECHNOLOGIES (continued)

BDAT Technology	Performance and Design and Operating Standards	Contaminant Restrictions
Macroencapsulation	Encapsulating materials must completely surround debris and be resistant to degradation.	None.
Microencapsulation	The leachability of contaminants must be reduced.	None.
Sealing	Sealant must completely surround debris and be resistant to degradation.	None.

CASE STUDY: HAZARDOUS DEBRIS

Scenario:

A boxcar filled with soil and construction debris, including abandoned pipes, discarded masonry bricks, and old piles of lumber, is found at a railroad yard. The boxcar belongs to XYZ Construction, a company specializing in lead abatement. What must be done to determine if this debris is subject to regulation and, if so, how must the debris be treated?

First, it must be determined if the construction debris at the railroad site meets the EPA definition of hazardous debris under the rule. The debris at the site is a solid material intended for discard with a particle size in excess of 60 mm that also is a manufactured object. In addition, based on a visual inspection of the mixture of soil and debris, the mixture is comprised primarily of debris.

Second, it must be determined if the debris is contaminated with a listed hazardous waste or exhibits a characteristic of hazardous waste (ignitability, corrosivity, reactivity, or toxicity). Guidelines for determining ignitability, corrosivity, and reactivity are found under Subpart C of Part 261. Hazardous waste lists are found under Subpart D.

It is assumed that the debris at the railroad site is contaminated with lead, an inorganic metal. The debris is tested using the Toxicity Characteristic Leaching Procedure (TCLP) and is found to contain 10 mg/l of lead. Under 40 CFR 261.24, any waste tested using the TCLP that contains more than 5 mg/l of lead is considered a hazardous waste. Therefore, the debris is subject to regulation under the rule.

There are two options for treating this debris in compliance with the rule. One, the debris could be treated using a specific BDAT technology based on the type of debris and the type of contaminants present. Two, the debris also could be treated to the treatment standard for the constituents with which the debris is contaminated. Because the second option requires extensive sampling and analysis, it is often more cost-effective to treat the debris using a specific BDAT technology.

Under the rule, there are several different technologies that could be used to treat this debris. Because of cost effectiveness and commercial availability, however, four technologies are expected to be used most often to treat debris. They are abrasive blasting, water washing and spraying, thermal destruction, and microencapsulation. Of these four technologies, abrasive blasting, water washing and spraying, and thermal destruction can be used on debris contaminated with lead. Thermal destruction cannot be used on debris contaminated with lead or other metals with the exception of mercury.

Debris that is treated using a BDAT technology must meet the performance and design and operating standards outlined in Table 1 of this chapter. Debris that is treated using abrasive blasting, for example, must be treated to a clean debris surface. In addition, when debris is treated using abrasive blasting at least 0.6 cm of the surface layer must be removed.

(continued)

CASE STUDY: HAZARDOUS DEBRIS (continued)

If water washing and spraying is used, debris also must be treated to a clean debris surface. In addition, porous debris, such as the masonry bricks and lumber at the railroad site, must not be more than 1.2 cm thick unless this limit is waived under an Equivalent Technology Demonstration. If the porous debris is more than 1.2 cm thick and if an Equivalent Technology Demonstration has not been performed, the debris must be reduced in size to meet the standard. If in so doing, however, the debris will no longer meet the 60 mm minimum particle limit, then it must be treated to the treatment standard for the waste contaminating the debris (unless it can be cleaned and separated from nondebris materials, such as the contaminated soil, before size reduction).

If microencapsulation is used, the performance and design and operating standards require that the leachibility of contaminants be reduced. More detailed explanations of each of the BDAT technologies can be found in the rule.

Residue analysis, notification, certification, and recordkeeping and requirements can be found in 40 CFR 268.7.

TEST YOUR KNOWLEDGE

Hazardous Debris

These exercises are designed to help you check your understanding of the material in this chapter. Use any reference materials that you need to answer the questions. When you have completed the questions, check your answers against those provided **on the back of this page.**

1 What is hazardous debris?

2 Fill in the blanks.

a. Under the rule, hazardous debris is defined as a solid material with a particle size in excess of ____________.

b. Hazardous debris destined for land disposal can be treating using ______________________ based on the type of debris and the type of contaminants present in the debris.

c. Alternatively, debris can be treated to ______________________________.

3 Circle the answer to the following:

T F Debris that is treated using an extraction or destruction technology and that no longer contains listed hazardous waste or exhibits any hazardous waste characteristic is no longer subject to Subtitle C regulation.

T F Debris is said to "contain" hazardous waste when waste is contained on the surface or in the pore structure of the debris.

4 Define clean debris surface.

TEST YOUR KNOWLEDGE

Answer Key: Hazardous Debris

1 What is hazardous debris?

Hazardous debris is any solid material intended for discard that is contaminated with hazardous waste, or that exhibits one or more hazardous waste characteristics (toxicity, ignitability, corrosivity, or reactivity).

2 Fill in the blanks.

a. Under the rule, hazardous debris is defined as a solid material with a particle size in excess of **60 mm**.

b. Hazardous debris destined for land disposal can be treated using **specific BDAT technologies** based on the type of debris and the type of contaminants present in the debris.

c. Alternatively, debris can be treated to **the treatment standards for the specific listed or charateristic waste.**

3 Circle the answer to the following:

(**T**) F Debris that is treated using an extraction or destruction technology and that no longer contains listed hazardous waste or exhibits any hazardous waste characteristic is no longer subject to Subtitle C regulation.

(**T**) F Debris is said to "contain" hazardous waste when waste is contained on the surface or in the pore structure of the debris.

4 Define clean debris surface.

A clean debris surface means the surface, when viewed without magnification, shall be free of all visible contaminated soil and hazardous waste except that residual staining from soil and waste consisting of light shadows, slight streaks, or minor discoloration, and soil and waste in cracks, crevices, and pits may be present provided that such staining and waste and soil in cracks, crevices, and pits shall be limited to no more than 5 percent of each square inch of surface area.

CHAPTER 3

Containment Buildings

3.1 Definition of containment buildings

Under the June 30 rule, EPA has promulgated standards allowing management of hazardous waste in units known as containment buildings. Containment buildings can be used to store and treat non-liquid wastes or wastes containing minimal amounts of liquids prior to recycling, recovery, treatment, or transport off site. Wastes can be stored on site for 90 days or less without a permit or interim status. To protect human health and the environment, EPA has restricted the types of wastes that can be stored or treated in the unit and has established design and operating standards with which the facility must comply.

3.2 Design requirements

Under the rule, a containment building must:

- Be fully enclosed to prevent exposure to precipitation and wind.
- Have floors and walls constructed of manmade materials that can withstand the movement of personnel, wastes, and handling equipment.
- Be equipped with a primary barrier to prevent migration of hazardous wastes to the ground below.
- Include a secondary barrier and leak detection system for the storage and treatment of wastes containing liquids.
- Include controls for fugitive dust.
- Be certified by a professional engineer to be in compliance with EPA standards.

3.3 Operating requirements

Owners/operators of these units must:

- Prevent visible emissions from escaping through doors, windows, or other openings.
- Adopt measures to prevent tracking of hazardous waste out of the unit.
- Ensure that the level of waste inside the unit does not exceed the height of the containment building's walls. If a containment building houses a number of stalls, however, wastes may be piled higher than the height of the stall walls.
- Have an inspection program to ensure the structural integrity of the unit and to detect leaks or releases promptly.

3.4 Retrofitting

In the past, hazardous waste was stored on concrete pads or similar floors inside buildings. This type of waste management unit is classified by EPA as a waste pile and is a form of land disposal. Untreated hazardous wastes cannot be permissably placed in a waste pile if LDR treatment standards are effective for those wastes; however, they can be placed in a containment building. Therefore, some waste piles will be converted to containment buildings. Owners/operators wishing to retrofit these units must seek a Class 2 permit modification. A temporary authorization can be granted that enables owners/operators to begin retrofitting their units before a Class 2 permit modification has been issued.

3.5 Effective date

The rule became effective on December 30, 1992.

CASE STUDY: CONTAINMENT BUILDINGS

DESIGN REQUIREMENTS

Scenario 1:

A generator who stores treated waste in a waste pile prior to disposal wants to retrofit the building in which the waste pile is located as a containment building. The building has a roof and corrugated steel walls to protect the waste pile from wind and precipitation. To retrofit the building, the owner plans to build a concrete stall inside the building that will contain the waste pile. The walls of the stall will support the weight of the hazardous waste and form an interior room in the building. Is this setup sufficient to meet the requirements?

Yes, because the stall is constructed to support the weight of the waste and all surfaces are chemically compatible with the waste, the stall is sufficient as the primary containment structure. If the stall walls divided the inside of the building into different areas used to separate piles of waste, but those walls did not entirely protect and contain the waste, the outside walls of the building would need to be retrofitted as the primary containment structure.

Scenario 2:

An indoor waste pile is being retrofitted as a containment building. Various modifications have been made, including the addition of a washdown area for equipment used inside the building, primary and secondary containment systems, and a negative air-pressure system to control dust. The waste pile was retrofitted under temporary authorization followed by a Class 2 permit modification. The manager believes that the modifications that have been made are sufficient for the structure to qualify as a containment building. Is the manager correct?

No, the company also must have an independent professional engineer certify that the building is designed and constructed with sufficient structural integrity to manage and contain the hazardous waste safely. The certification must show that the foundation, structural support, primary and secondary containment systems, fugitive dust control system, and leak detection system are designed to meet the requirements. The certification also must show that the floors and walls are compatible with the waste to be stored or treated.

(continued)

CASE STUDY: CONTAINMENT BUILDINGS (continued)

OPERATING REQUIREMENTS

Scenario 1:

A company that operates a containment building is having problems with dust generated in the handling of hazardous waste being tracked out of the containment area by workers and by machinery. What can the company do to reduce the spread of this dust?

The company can build a washdown area where trucks can be cleaned. In addition, a cleanup station for workers can be constructed. Another option is to dedicate machinery to operate solely within the containment building.

Scenario 2:

A company is temporarily storing hazardous waste that is generated through a continuous production process in a containment building that meets design standards. Each month the company generates one ton of waste that is later removed for treatment and disposal at an offsite facility. The management has made sure that wastes are removed so that at any time no more than 90 days worth of waste remains in the pile. Records are kept to show that wastes are removed each month. Does this practice comply with the requirements of an unpermitted 90-day facility?

No, even though waste is removed so there is never more than 90 days worth of waste, the waste is not divided in any manner to guarantee that the older waste has been removed. Even though the waste pile contains waste whose average age is less than 90 days, the pile might contain waste that is older than 90 days. The regulation specifies that each volume of waste can reside in such a unit for no more than 90 days.

Scenario 3:

A 90-day containment building contains a series of properly constructed stalls that separate hazardous waste by the month that it was generated. For example, the waste in the first stall was generated in the first month. This waste will need to be disposed before the fourth month. What must the company do to ensure that the facility disposes of waste in a timely fashion?

The company has two options: 1) either keep records to demonstrate that the unit is emptied of all waste at least once every 90 days, or 2) document the procedures used to ensure that wastes are segregated by age and that no portion of the stored wastes remains beyond the time limit.

TEST YOUR KNOWLEDGE

Containment Buildings

These exercises are designed to help you check your understanding of the material in this chapter. Use any reference materials that you need to answer the questions. When you have completed the questions, check your answers against those provided **on the back of this page.**

1 What is a containment building?

2 Under what conditions can wastes be stored in a containment building?

3 Fill in the blanks:

a. To protect human health and the environment, EPA has restricted ______________________ that can be stored or treated in the unit and has established ________________________ with which the facility must comply.

4 Circle the answer to the following:

T F If a containment building houses a number of stalls, wastes can be piled higher than the height of the stall walls, provided that the level of waste does not exceed the height of the containment building's walls.

T F Owners/operators of waste piles can begin retrofitting their units before a Class 2 permit modification has been issued.

TEST YOUR KNOWLEDGE

Answer Key: Containment Buildings

1 What is a containment building?

Under the June 30 rule, EPA has promulgated standards allowing management of hazardous waste in units known as containment buildings. Containment buildings are hazardous waste management units that can be used to store and treat non-liquid wastes or wastes containing minimal amounts of liquids prior to recycling, recovery, treatment, or transport off site.

2 Under what conditions can wastes be stored in a containment building?

Wastes can be stored on site for 90 days or less without a permit provided that the facility complies with building requirements to ensure containment of the wastes. If you wish to store wastes beyond the 90-day limit, you must obtain a RCRA permit.

3 Fill in the blanks.

a. To protect human health and the environment, EPA has restricted **the types of waste** that can be stored or treated in the unit and has established **design and operating standards** with which the facility must comply.

4 Circle the answer to the following:

(T) F If a containment building houses a number of stalls, wastes can be piled higher than the height of the stall walls, provided that the level of waste does not exceed the height of the containment building's walls.

(T) F Owners/operators of waste piles can begin retrofitting their units before a Class 2 permit modification has been issued.

APPENDICES

Appendix A: Treatment technology summaries for hazardous debris

EXTRACTION TECHNOLOGIES

Physical Extraction

These technologies physically remove the surface layers of contaminated debris.

- **Abrasive blasting.** Abrasive blasting involves propelling an abrasive material at high speeds at the surface of debris. The force of the impact causes the surface to chip, flake, or erode. Abrasives are propelled by either air or water pressure or by a rotating wheel. Commonly used abrasives include sand and steel shot. The choice of abrasive depends on the thickness of the surface layer that must be removed. Generally, the smaller and softer the abrasive, the thinner the surface layer removed.

  Abrasive blasting systems frequently are operated in conjunction with a vacuum system to reduce dust and to collect both the spent abrasive and the debris surface layer. The spent abrasive can be disposed along with the debris surface layer, or can be separated and recycled.

- **Scarification, grinding, and planing.** Scarification devices contain several rapidly moving pistons that strike the surface of the debris. The impact of these pistons can chip off as much as 2.5 centimeters of the surface layer. Scarification equipment can be used in conjunction with a vacuum system to collect the layers removed during treatment. The scarified surface also may require washing or vacuuming to remove residual dust. Grinding systems use grinding wheels to remove up to 2 centimeters of surface layer, leaving a rough, pitted surface. Planing systems use saws to cut off surface layers of debris. Planing is used most often to treat debris with flat surfaces such as wooden beams.

- **Spalling.** Spalling uses a two-step process to remove contaminants from the surface layers of debris. The first step involves drilling or chipping holes into the surface of the hazardous debris. The second step involves inserting the bit of a spalling tool into each hole. Hydraulic pressure then is used to force a push rod between the characteristic metal feathers of the bit. As the push rod is inserted, the feathers push outward against the sides of the hole causing up to 5 centimeters of the debris surface layer to fracture and crack off.

- **Vibratory finishing.** Vibratory finishing uses abrasives in combination with solvent washing to remove hazardous constituents. Debris is placed in a container along with abrasives (such as sand). As the container is vibrated, the abrasives scrub the debris surfaces. At the same time, a solvent is injected, which helps to dissolve the hazardous constituents and flush away particulates scrubbed from the debris.

- **High-pressure steam and water sprays.** High-pressure steam and water spray treatment technologies rely on the physical force of water or steam to remove contaminated layers of debris. In this method, steam or water is pumped through a nozzle onto the debris surface.

Chemical Extraction

These technologies use chemical agents to dissolve contaminants and flush them away from debris.

- **Water washing or spraying.** Water washing and spraying treatment technologies use water or an aqueous extracting solution of surfactants, detergents, acids, or bases to dissolve hazardous constituents and flush them away. The extracting solution may be applied by submerging debris in a treatment bath or by spraying the extracting solution onto the debris surface.

  When acids are added to the washing solution, the process may be referred to as pickling, acid dipping, brightening, descaling, or desmutting. Typical acid solutions may be made up of hydrochloric acid, sulfuric acid, nitric acid, hydrofluoric acid, chromic acid, fluoroboric acid, phosphoric acid, or a combination of these or other acids. Hydrochloric acid is used commonly to remove dirt and grime from brick building surfaces and to clean rust and scale from metal parts.

- **Liquid-phase solvent extraction.** Liquid-phase solvent extraction of hazardous debris is based on the application of a treatment solvent, either through direct surface application (for large pieces of debris) or through immersion in a treatment bath (for small pieces of debris). A wide variety of wash/soak/rinse cycles can be used to optimize hazardous constituent removal. Water washing or secondary treatment/removal (i.e., heating or vacuum removal) may be necessary to remove residual solvent from the debris. After treatment, it is sometimes possible to reuse solvent in the treatment system.

  Direct surface applications involve applying solvent to the debris surface with sprayers, brushes, or rollers. The solvent then is allowed to stand for up to one hour before it is vacuumed, rinsed, or otherwise removed from the debris surface. Some direct application processes repeat the solvent application/surface washing cycle several times. Solvent baths often agitate the debris or solvent to ensure solvent contact with all debris surfaces, and to increase the rate of solvent cleaning.

- **Vapor-phase solvent extraction.** Vapor-phase solvent extraction uses the heat of a vapor-phase organic solvent to volatilize hazardous constituents. Debris is fed into a closed treatment chamber or vessel in which a vaporized solvent is allowed to circulate inside or around the hazardous debris. The hot vapors condense on and into the surface of the debris, where they volatilize the hazardous constituents. The temperature in the debris treatment chamber or vessel should remain above the boiling point of the solvent at the chamber pressure to keep the solvent in the vapor phase and help ensure that the hazardous constituents are volatilized and removed from the debris. The hazardous constituent-laden liquid solvent is collected and treated prior to recycling or reusing the solvent.

Thermal Extraction

These technologies use heat to treat surface-level and deeply embedded contaminants in debris.

- **High-temperature metals recovery.** High-temperature metals recovery (HTMR) can be used to treat wastes containing metal oxides and metal salts, including cadmium, chromium, lead, and nickel compounds. Debris is fed into a furnace, kiln, or other heating device where the metals and salts react with carbon to produce carbon dioxide and free metal. The high temperatures in these units destroy the organic compounds in debris. The process also recovers metals, which can be used again in industrial processes.

A number of different types of high-temperature metals recovery systems are used. These include the rotary kiln process, the plasma arc reactor, the rotary hearth electric furnace system, the molten slag reactor, and the flame reactor.

- **Thermal desorption.** Thermal desorption uses heat to volatilize hazardous constituents from the surface of an object. Debris is placed into an oven or chamber and heated. Volatilized compounds are removed from the surface of the debris in the vapor stream. Temperature and residence time are the primary factors affecting performance. In addition, the volatility of the targeted waste constituents will have an affect.

  Many different types of thermal desorption processes exist, including both low-temperature and high-temperature operations. The following terms often are used to describe the various processes: directly heated, indirectly heated, and in-situ steam extraction. Direct-fired systems use a fuel burner as a heat source which can be either internal or external to the primary heating chamber. Indirectly heated systems, on the other hand, transfer heat through metal surfaces to the waste. In-situ steam extraction, however, uses steam and hot air injected through hollow-stem drills into the ground.

DESTRUCTION TECHNOLOGIES

These technologies destroy the hazardous contaminants on debris surfaces and in surface pores. The use of destruction technologies to treat debris contaminated with metals should be carefully evaluated.

- **Biodegradation.** Biological treatment or biodegradation involves the use of microorganisms (bacteria, fungi, and yeasts) to degrade hazardous organic constituents. This treatment can be performed under aerobic or anaerobic conditions.

  Aerobic biological treatment takes place in the presence of oxygen, while anaerobic digestion is an oxygen devoid process. In both cases, microorganisms break down wastewater constituents into carbon dioxide, water, nitrates, sulfates, simpler low-molecular weight organic by-products, and cellular biomass. Biomass is the net accumulation of expired microorganisms. Nutrients such as nitrogen and phosphorus are required to aid in the biodegradation process.

  Several different types of bioremediation technologies can be used to treat hazardous debris. In general, these technologies are either above ground (including slurry phase, contained solid phase, land treatment, and composting) and in situ.

  The performance of the individual technologies depends largely on the site conditions. Bioremediation might not be applicable at sites where the contaminated debris contains extremely high concentrations of heavy metals, highly chlorinated organics, pesticides, herbicides, or inorganic salts. High concentrations of these contaminants can be toxic to the microorganisms needed for biodegradation. In addition, temperature, moisture content, pH, nutrient levels, and oxygen content at the sites must be within the limits required by the microorganisms.

- **Chemical oxidation.** Chemical oxidation is a destruction technology in which inorganic cyanide, some dissolved organic compounds, and sulfides in wastes are chemically oxidized to yield carbon dioxide, water, salts, simple organic acids, and sulfates. The principal chemical oxidants used are hypochlorite, chlorine gas, chlorine dioxide, hydrogen peroxide, ozone, and potassium permanganate.

  Chemical oxidation also can be used to destroy the organic component of organometallic compounds, freeing the metal component for treatment by chemical precipitation or stabilization. (Precipitation uses a chemical agent to remove metals from wastewater. The principal precipitation agents used include lime, caustic soda, sodium sulfide, and, to a lesser extent, soda ash, phosphate, and ferrous sulfide. Stabilization uses stabilizing agents and other chemicals to immobilize metals in waste.)

- **Chemical reduction.** Chemical reduction treats halogenated organic compounds and hexavalent chromium. Chemical reduction techniques include applying foams or solutions containing reducing agents onto debris surfaces or submerging debris into solutions of reducing agents. These chemicals react with halogenated organic compounds and hexavalent chromium to form less hazardous materials. Chemical reducing agents used in treating debris include sulfur dioxide; sodium, potassium, or alkali salts of sulfites, bisulfites, metabisulfites, and polyethylene glycols; sodium hydrosulfide; and ferrous salts.

- **Thermal destruction.** Incineration uses high-temperatures (1,400 to 3,000 degrees Fahrenheit) to destroy hazardous organic constituents in wastes. As wastes are incinerated, the hazardous constituents are converted into carbon dioxide, water, and various other compounds, and can be burned in commercial incineration systems (including rotary kiln incinerators, liquid-injection incinerators, and fluidized-bed incinerators), or boilers and industrial furnaces.

  In general, incineration generates three residuals: ash, combustion gases, and wastewater. Ash generated during incineration is removed from the system and disposed of in a RCRA-approved facility. Combustion gases are treated in an air pollution control system to remove particulates, acids, and other pollutants and are released to the atmosphere. Wastewater must be be treated to comply with the requirements under the Clean Water Act.

  Vitrification technologies, including glass and slag vitrification and calcination, also use heat to destroy hazardous constituents in debris. Vitrification processes involve dissolving the debris at high temperatures into glass or a glass-like matrix. Calcination merely involves heating the material at high temperatures to remove water or oxidize the debris. Vitrification can be used on debris containing organometallic compounds, while calcination processes can be applied to debris containing inorganic constituents.

IMMOBILIZATION TECHNOLOGIES

These technologies enclose contaminants in a chemically resistant shell or chemically bind the hazardous constituents to prevent migration of hazardous constituents into the environment when the waste is disposed of on land.

- **Microencapsulation.** Microencapsulation is the containment of individual waste particles in a polymer or asphalt matrix. It involves chemically bonding the hazardous constituents in hazardous debris to the encapsulating material. Microencapsulation converts the waste into a more manageable solid and reduces hazards resulting from volatilization and leaching.

  In a typical microencapsulation process, the hazardous debris is mixed with cement, stabilizing agents, and water. Other mixtures that can be used include silicates, low-melting plastics, and asphalt. This mixed mass forms a hard, often concrete-like solid, or a soil-like product. The solid formed is usually land disposed.

- **Macroencapsulation.** Macroencapsulation involves the encasement of the debris in a thick surface coating of polymeric organics, such as resins or plastics, or inert organic material, such as asphalt. Unlike microencapsulation, the encapsulating material does not chemically bond the hazardous constitutents in the debris. To ensure that macroencapsulation effectively treats debris, the encapsulating material must be resistant to degradation to prevent the release of hazardous constituents. The requirements for effective macroencapsulation vary widely with the type of encapsulant and the waste being encapsulated.

- **Sealing.** Sealing is the application of an impervious surface coating to porous debris to prevent the release of toxic hazardous constituents trapped in the pores of the debris. In sealing, the debris surface is first cleaned to remove gross contamination and to ensure that the sealant adheres to the debris surface. Then, the surface is coated with a chemical that adheres tightly to all exposed surfaces. Sealants include epoxy-, urethane-, and silicone-based sealants. To ensure that sealing effectively treats hazardous debris, the sealant must be resistant to degradation.

Appendix B: References

This section contains documents pertaining to the Newly Listed Wastes and Hazardous Debris Rule.

FEDERAL REGISTER	DATE	SUBJECT
57 FR 37194	August 18, 1992	The U.S. EPA finalized treatment standards under the LDR program for certain hazardous wastes listed after the passage of the Hazardous and Solid Wastes Amendments to the Resource Conservation and Recovery Act on November 8, 1984. EPA also finalized revised treatment standards for debris contaminated with listed hazardous waste or debris that exhibits certain hazardous waste characteristics.
57 FR 958	January 9, 1992	This proposed rule discusses treatment standards under the LDR program for certain wastes listed after the passage of the Hazardous and Solid Wastes Amendments to the Resource Conservation and Recovery Act on November 8, 1984. EPA also proposed treatment standards for debris contaminated with listed hazardous waste or debris that exhibits certain hazardous waste characteristics.

For more information, you can refer to these documents:

EPA's Land Disposal Restrictions Program [to be published].

EPA's Hazardous Debris Implementation Document [to be published].

U.S. E.P.A. 1993

Land Disposal Restrictions:

Containment Buildings

13 minutes

U.S. E.P.A. 1993

Land Disposal Restrictions:

Treatment Technologies for Hazardous Debris

24 minutes