LDR Treatment Standards for the Contaminated Debris

View Record Detail

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

June 3, 1994

Mr. Kenneth M. Kastner
Bryan Cave
700 Thirteenth Street, N.W.
Washington, D.C. 20005-3960

Dear Mr. Kastner:

Thank you for your letter of February 24, 1994, on behalf of Rohm and Haas Company, requesting clarification of the Resource Conservation and Recovery Act (RCRA) regulations applicable to hazardous debris. Specifically, you asked EPA to clarify how the "contaminated debris" rule applies to the removal of contaminants from an intact manufacturing building prior to its demolition.

You state that removing contaminants from a standing, intact building before demolishing the structure often provides the most environmentally sound and technically practical approach to decontaminating the building. Your question is whether removal of contaminants from a building prior to demolition constitutes RCRA treatment for which a permit is required. You also ask if incidental holding of removed contaminants within the building could be considered to be "storage." The answer depends primarily on whether the contaminants are considered a newly generated waste upon removal or are hazardous wastes prior to their removal from the building. RCRA defines "generation" as any activity that first causes a material to become "subject to RCRA regulation." In the situation you describe, involving physical removal of contaminants from a standing building, EPA considers the actual removal of the contaminants to be the point of waste generation and consequently, the point at which the RCRA regulations become applicable.

We take this position because we believe that an intact, standing building continues to perform the essential functions of a building and so need not, and should not be considered to be "discarded" under §261.2(a)(2)(i) until it is actually destroyed. We also note that the situation is analogous to that of wastes removed from product storage units in which wastes do not become subject to regulation until they are removed from those units. §261.4(c).

In this case, after the contaminating materials have been removed from a building and are

destined for disposal, RCRA requirements apply if the contaminating chemicals are RCRA hazardous wastes. The Part 262 Generator standards would apply, which do allow accumulation of waste for up to 90 days without a permit, if the conditions of §262.34 are met. Further, if the materials meet the definition of debris, such "hazardous" debris may be treated to meet the applicable treatment standard for the contaminating hazardous wastes found at 40 CFR 268.41, 268.42, and 268.43, or it may be treated to comply with the alternative hazardous debris treatment standards of 268.45. If the materials do not meet the definition of debris, they would be subject to the treatment standards for the contaminating hazardous wastes §§ 268.41, 268.42, and 268.43. The facility performing treatment to meet these treatment standards would be subject to applicable RCRA permit requirements.

Having explained how the RCRA regulations apply in the situation you describe, I should note that I realize that the preamble to the hazardous debris rule may be somewhat misleading regarding how the removal of contaminants from a building prior to demolition is regulated. The preamble language you cite, which states that physical extraction of contaminants from a contaminated building prior to demolition is subject to permit requirements, presumes that the building itself is determined to be a hazardous waste prior to demolition. As stated earlier in this letter, an intact building would not yet be a solid waste, and therefore, extraction of contaminants would not involve hazardous waste treatment.

Finally, you should note that EPA Regions and States authorized to implement the hazardous waste program make determinations regarding the requirements that apply to specific materials and facilities. Some States have programs more stringent than the Federal hazardous waste program. I hope this addresses your concerns. If you have any further questions, please contact Richard Kinch of the Waste Treatment Branch at (703) 308-8434.

Sincerely yours,

Michael Shapiro,
Director
Office of Solid Waste

530-Z-93-010

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Part II

Environmental Protection Agency

40 CFR Part 148 et al.

Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris; Rule

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RIN 2050-AD36

Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Environmental Protection Agency (EPA) is finalizing treatment standards under the land disposal restrictions (LDR) program for certain hazardous wastes listed after November 8, 1984, pursuant to a proposed consent decree filed with the District Court that established a promulgation date of June 1992 (*EDF* v. *Reilly*, Civ. No. 89-0598, D.D.C.). EPA is also finalizing revised treatment standards for debris contaminated with listed hazardous waste or debris that exhibits certain hazardous waste characteristics (hereinafter referred to as hazardous debris), and several revisions to previously promulgated standards and requirements. These actions are being taken as part of the RCRA Reform Initiative, and are expected to facilitate implementation of the LDR program.

EFFECTIVE DATES: This final rule is effective on June 30, 1992, except for §§ 148.17(a), 260.10, 261.3(c)(2)(ii)(C), 268.2, 268.5, 268.7, 268.9, 268.36(a), 268.40, 268.41, 268.42, 268.43, 268.45, 268.46, 268.50, 270.14, 270.42, 270.72, and 271.1, which are effective November 16, 1992; and §§ 262.34, 264.110, 264.111, 264.112, 264.140, 264.142, part 264 subpart DD, 265.110, 265.111, 265.112, 265.140, 265.142, 265.221, and part 265 subpart DD, which are effective February 18, 1993.

ADDRESSES: The official record for this rulemaking is identified as Docket Number F-92-CD2F-FFFFF, and is located in the EPA RCRA Docket, room 2427, 401 M Street SW., Washington, DC 20460. The docket is open from 9 a.m. to 4 p.m., Monday through Friday, except on Federal holidays. The public must make an appointment to review docket materials by calling (202) 260-9327. A maximum of 100 pages from the docket may be copied at no cost. Additional copies cost $.15 per page.

FOR FURTHER INFORMATION CONTACT: For general information, contact the RCRA Hotline at (800) 424-9346 (toll free) or (703) 920-9810 locally. For information on treatment standards for newly listed wastes or hazardous debris, contact the Waste Treatment Branch, Office of Solid Waste (OS-322W), U.S. Environmental Protection Agency, 401 M St., SW., Washington, DC 20460, (703) 308-8434. For information on capacity determinations or national capacity variances, contact the Capacity Programs Branch, Office of Solid Waste (OS-321W), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, (703) 308-8440.

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I. Background

A. Summary of the Hazardous and Solid Waste Amendments of 1984

The Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), enacted on November 8, 1984, allow hazardous wastes to be land disposed only if they satisfy either of two conditions: (1) They can either be treated, or otherwise satisfy, the requirement of section 3004(m), which provision requires EPA to set levels or methods of treatment, if any, which substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste so that short-term and long-term threats to human health and the environment are minimized; or (2) they can be land disposed in units satisfying the so-called no-migration standard in sections 3004 (d)(1), (e)(1), and (g)(5). Land disposal includes any placement of hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave. RCRA section 3004(k).

EPA was required to promulgate land disposal prohibitions and treatment standards by May 8, 1990 for all wastes that were either listed or identified as hazardous at the time of the 1984

closure, commenters pointed out (correctly) that this would entail removal not only of accumulated sludges but subsurface contaminated soils as well which are not the focus of the treatment requirements, and that forcing clean closure could interfere with otherwise available and potentially more cost-effective types of closure options.

EPA finds many of these comments persuasive and believes that the following interpretation best resolves these issues. First, EPA is not interpreting these provisions as necessitating annual dredging of accumulated sludges. Either the impoundment will close in a short time (no more than four years), or it will be retrofitted and become subject to the annual dredging requirement in section 3005(j)(11) (as implemented by § 268.4(a)(2)(ii)). If the impoundment closes, EPA is interpreting the provisions to allow closure with wastes in place (unless the unit operator chooses to clean close the impoundment). Thus, under this reading, continued use of the impoundment would be allowed during the four-year retrofit/closure period (as explained in section 1 above), use of the impoundment during that time would not be disrupted by a dredging requirement, and the impoundment would be allowed to close with wastes in place. These are the same options that were available to impoundments in 1984 managing wastes already identified or listed as hazardous.

3. Technical Analysis

a. *Introduction.* Owners or operators of surface impoundments managing newly listed or characteristic hazardous wastes have several options for complying with the minimum technological requirements. Facilities may retrofit the surface impoundments with liners and leak detection systems in compliance with the requirements of section 3004(o)(1)(A)(i). Alternatively, facilities may replace their treatment surface impoundments with wastewater treatment tanks regulated under the Clean Water Act or may opt to close the surface impoundments and send the waste off-site.

EPA believes that very few facilities managing newly regulated wastes in surface impoundments will choose to retrofit their impoundments. For example, the Chemical Manufacturers Association (CMA) conducted an informal survey of 582 chemical manufacturing facilities in the fall of 1989 to obtain information about the management of "non-hazardous wastes" in surface impoundments. Twenty-seven facilities reported that 85 surface impoundments would be newly regulated as a result of the Toxicity Characteristic rule (55 FR 11798, March 29, 1990); of these 85, only 9 would be retrofitted with liners and leak detection systems. Replacing surface impoundments with tank systems was the most frequently planned method of compliance for the respondents to this survey. Past experience also indicates that surface impoundment owners or operators are more likely to replace their surface impoundments with tank systems than to retrofit the impoundments. RCRA section 3005(j)(1) required surface impoundments that were in existence and that qualified for interim status on the date of enactment of HSWA to come into compliance with the MTRs by November 8, 1988. Most facilities with surface impoundments replaced their impoundments with tanks in response to this deadline. Less than five percent of these facilities actually retrofitted their surface impoundments.

To support today's rulemaking, EPA undertook an analysis to determine how much time is needed for owners or operators of newly regulated surface impoundments to comply with the MTRs either by replacing the impoundments with wastewater treatment tanks exempt from RCRA subtitle C standards, or by retrofitting the surface impoundments with liners and leak detection systems according to the requirements of section 3004(o)(1)(A)(i). EPA collected information from a variety of sources, including facilities that have implemented these practices in the past or plan to do so in the future (e.g., in response to the TC), tank manufacturers, and engineers. The results were summarized in the proposed rule (57 FR 4170), and are available in the background document.[8]

4. Conclusion

EPA found that the time needed to comply with the MTRs varies considerably based on case-by-case factors (e.g., current waste management practices, land availability) and regional factors (e.g., climate). According to EPA's information sources, six months appears not to be enough time to either retrofit a surface impoundment or replace the impoundment with a wastewater treatment tank. Replacing a surface impoundment with a tank frequently takes two to four years, and retrofitting a surface impoundment frequently takes two to three years.

EPA believes that most interim status surface impoundments managing wastes newly identified or listed as hazardous will be able to comply with the surface impoundment MTRs within four years of the date promulgating the listing or characteristic. Thus, the four-year period allowed in section 3005(j)(6) is a reasonable period within which to come into compliance.

V. Detailed Discussion of Final Rule: Hazardous Debris

A. Overview

The Agency is today promulgating a final rule for the treatment of hazardous debris. Until today, debris destined for land disposal that was contaminated with a prohibited RCRA hazardous waste or that exhibited a prohibited RCRA hazardous characteristic was subject to the treatment standard for that listed waste or characteristic. See, e.g., 55 FR 22649 and RCRA sections 3004 (d)(3) and (e)(3). Although hazardous waste debris (as well as contaminated media) is subject to the LDR prohibitions, there is no requirement that it have the same treatment standards as the wastes with which it is contaminated. Indeed, because hazardous debris may be a matrix significantly different from the underlying prohibited waste, it is appropriate as a technical matter to determine whether different treatment standards were appropriate.

Today, EPA is promulgating treatment standards for hazardous debris prohibited from land disposal. Under today's rule, hazardous debris must be treated by specified technologies based on the type of debris and type of contaminant(s) present or, as an alternative, meet the LDRs for the specified prohibited listed or characteristic waste with which it is contaminated.

EPA has specified a number of BDAT technologies for hazardous debris, with the choice of technology left up to the generator and/or treater managing the waste. The technologies include widely used treatment methods. EPA thus believes that it is preserving in this rule as much flexibility for the treatment of hazardous debris as possible.

[8] It should be noted that the potential statutory conflict at issue in this rulemaking is most immediately relevant to wastes newly regulated as a result of the Toxicity Characteristic (TC) rule (55 FR 11798, March 29, 1990). According to the regulatory impact analysis for the TC, about 730,000,000 metric tons per year of wastewaters managed in surface impoundments at over 2,000 facilities are estimated to exhibit the TC (U.S. EPA, OSW. U.S. EPA Background Document. Toxicity Characteristic Regulatory Impact Analysis. Final Report. March 1990). This potential conflict will also arise with respect to all future newly identified or listed hazardous wastes; however, the TC rule is used as an example throughout this section.

Prohibited hazardous debris is defined generally as solid material (that is not a process waste) having a particle size of 60 mm or larger and that is intended for land disposal and exhibits a prohibited characteristic of hazardous waste or that is contaminated with a prohibited listed hazardous waste. Hazardous debris must be treated by one of the specified treatment technologies for each "contaminant subject to treatment" defined as: (1) The BDAT constituents for the listed waste that are subject to land disposal restriction standards (as found in § 268.41 and 268.43); and (2) the RCRA hazardous waste constituent(s) for which the hazardous debris fails the Extraction Procedure toxicity - characteristic, in addition to any other characteristic which causes the debris to be hazardous (i.e., ignitability, reactivity). As an alternative, the generator of the hazardous debris may choose to treat the hazardous debris to the existing waste-specific treatment standards for the waste contaminating the debris. However, in choosing this alternative, the generator or treater would be required to sample and analyze the treated debris to ensure compliance with the treatment standards prior to disposal in a Subtitle C land disposal unit.

To ensure effective treatment, the treatment unit would be required to meet performance standards or design and operating conditions specified in the rule. In addition, the treatment unit would generally be subject to the Part 264 and 265 standards for treatment facilities to ensure protection of human health and the environment.

The rule addresses not only the issue of when hazardous debris is sufficiently treated, but the further question of when it is a hazardous waste. Under the rule, treated hazardous debris would be excluded from the definition of hazardous waste provided that: (1) The debris is treated to the performance or design and operating standards by an extraction or destruction technology rather than an immobilization technology [9]; and (2) the treated debris does not exhibit a characteristic of hazardous waste. If an immobilization technology is used, the treated debris would not be automatically deemed a nonhazardous waste. In addition, the Agency could determine on a case-by-case basis under today's rule that debris no longer "contains" hazardous waste and is excluded from Subtitle 6 regulation.

Residuals generated by the treatment of hazardous debris are subject to the numerical treatment standards for the waste contaminating the debris.

B. Definitions of Debris and Hazardous Debris

1. Definition of Debris

EPA is today defining debris as solid material exceeding 60 mm (2.5 inch) particle size that is: (1) A manufactured object; or (2) plant or animal matter; or (3) natural geologic material (e.g., cobbles and boulders), except that any material for which a specific treatment standard is provided in Subpart D, part 268, is not debris.[10] A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection. Process residuals such as smelter slag and residues from the treatment of waste (e.g., incinerator ash), wastewater, sludges, or air emissions residues (e.g., collected particulate matter) are not debris. We discuss below that debris must be intended for discard (i.e., rather than continued use), that debris must be a solid material, the rationale for selecting a 60 mm particle size criterion for debris (i.e., as opposed to the 9.5 mm particle size proposed) and for applying the size criterion to all debris (i.e., not just to geologic materials as proposed), the rationale for regulating as debris mixtures of primarily debris and other materials, the rationale for not regulating process residuals as debris, and the rationale for regulating nonempty containers as hazardous waste subject to existing LDRs rather than as debris.

a. *Debris Must Be Discarded or Intended for Discard.* Debris must of course be either a solid waste or media (e.g., boulders) that is discarded or intended for discard to be subject to the treatment standards in today's rule. Those commenters on the proposed rule expressing concern that the proposed rule in some way vitiated (or was intended to vitiate) this basic principle were mistaken. This means that such materials that might at some later time become debris, such as equipment or building structures, but that are still in use are not subject to the treatment standards. Such in-use material is not a solid waste because it has not been discarded or intended for discard, as these terms are used in § 261.33 (i.e., likely abandoned, as defined in § 261.2 (a)(2)(i) and (b))

Media debris (e.g., boulders) is also not subject to regulation as solid waste unless discarded or intended for discard and so is not automatically subject to the treatment standards.

Once debris becomes a solid waste by virtue of being discarded (including media debris that becomes subject to regulation as solid waste by virtue of being discarded), it is not necessarily subject to the treatment standards. For example, contaminated debris that is not actively managed after the effective date of the prohibitions (i.e., the effective date of the LDRs for the hazardous waste contaminating the debris) would not be subject to the standards. See 53 FR 31148 (Aug. 17, 1988). On the other hand, debris which is contaminated with hazardous waste disposed before the hazardous waste listing effective date and which is actively managed is subject to the prohibitions and so would have to be treated to satisfy the treatment standards promulgated today before the debris could be land disposed (assuming disposal will not occur in a no-migration unit). *Chemical Waste Management v. EPA*, 869 F. 2d 1526 (D.C. Cir. 1989).

b. *Debris Must Be a Solid Material.* The rule defines debris as a "solid material." This means solid in a literal sense as defined in a common dictionary. A solid material is a material that retains its volume at room temperature without the need for support by a container. Examples of solid materials that are debris if intended for discard and if their particle size is 60 mm (2.5 inches) or greater include: (1) Glass; (2) concrete (excluding cementitious or pozzolanic stabilized hazardous wastes); (3) masonry and refractory bricks; (4) nonintact containers [11] e.g., crushed drums); (5) tanks; (6) pipes, valves, appliances, or industrial equipment; (7) scrap metal (as defined in 40 CFR 261.1(c)(6)); (8) animal carcasses; (9) tree stumps and other plant matter; (10) rock (e.g., cobbles and boulders); and (11) paper, plastic, and rubber. Not only is defining debris as solid material in accord with the common-sense view of what debris is, but, more importantly, it is geared to the treatment standards adopted today that ensure effective decontamination of solid materials by removal or destruction of hazardous waste. Clearly, if a liquid could be

[9] In the Phase II land disposal restrictions rule, the Agency will reopen and request comment on the issue of whether immobilized debris should be excluded from Subtitle C regulation. (See discussion in Section V.D.2.)

[10] For example, lead acid or cadmium batteries are not debris because they are subject to specific treatment standards under § 268.42.

[11] See discussion in section V.B.1.f of the text regarding regulation of intact and nonintact containers.

considered debris, the concept of cleaning off the outer surface to remove contamination does not make sense.[12]

Even though debris must be a solid material, it may contain or be mixed with free liquids.[13] The liquids may be waste or ground or surface water that may be entrapped in the debris (e.g., in partially crushed containers (see discussion below on regulation of containers)) or may be still oozing from the debris if the debris was newly generated or newly excavated from a remediation site. (If liquids separate from hazardous debris prior to treatment of the debris, they must be managed as hazardous waste.) Liquids that are entrapped in debris will be effectively treated under today's treatment standards for extraction or destruction technologies. If an extraction technology is used, the toxic constituents in the liquid will be removed from the debris as a treatment residue and is subject to the LDRs for the waste contaminating the debris. If a destruction technology is used, the toxic constituents in the liquid should be destroyed.

We note, however, that debris that is immobilized prior to land filling may not contain free liquids as provided by §§ 264.314 and 265.314. Thus, free liquids (including liquids in crushed containers) cannot be present in debris that is macroencapsulated or sealed, and cannot be present in debris that has been micorencapsulated.

c. *Debris Has a Particle Size Larger Than 60 mm.* Today's rule defines debris as solid material with a particle size of 60 mm (2.5 inches) or greater. We discuss below the rationale for increasing the particle size to 60 mm from the proposed 9.5 mm particle size, the rationale for applying the size criterion to all debris, not just to geologic matter as proposed, the rationale for defining 60 mm or larger clumps of fine-grained materials (e.g., clumps of compacted clay) as nondebris material, and how the particle size criterion is to be implemented.

(1) Rationale for Increasing the Particle Size of Debris From 9.5 mm to 60 mm. The Agency is today defining debris as solid material with a particle size of 60 mm (2.5 inches) or greater for a number of reasons: (a) Fine grain materials (e.g., soil, glass cullet) are not amenable to the surface removal technologies specified in today's rule and are not commonly thought of as debris; (b) fine grain materials are likely to be amenable to the treatment technologies that were the basis for the LDRs for the waste contaminating the material; (c) fine grain materials, unlike large particle size materials, can be reasonably sampled for analysis to document compliance with the concentration-based LDRs for the waste contaminating the material; (d) material normally considered to be soil should be subject to the Agency's planned LDRs for contaminated soil rather than defined as debris [14]; (e) the selection of a 60 mm particle size criterion is within the range of reasonable particle sizes the Agency could have selected for defining debris; and (f) many commenters suggested a larger particle size, and the only commenters that suggested a particular size suggested 60 mm.

We note that a number of commenters suggested that the Agency consider raising the particle size breakpoint as the Agency is doing here. Two commenters suggested an alternative sieve size of 60 mm, stating that existing soil-washing equipment such as rotary screens and wet vibratory screens are capable of handling particles sizes of several inches, and the suggested 60 mm cut-off size would result in more soil being subject to the existing LDRs which require sampling and analysis to document compliance with concentration-based treatment standards.

While the Agency believes that it could have selected other particle sizes, the Agency selected the 60 mm (2.5 inch) particle size from the range of 9.5 mm (⅜ inch) to 200 mm (8 inches) because: (1) It is a commonly used sieve size that is commercially available, (2) it would define as soil pebbles and smaller particles, and define as debris cobbles and boulders [15] in accord both with common understanding and with materials most amenable to effective treatment by the methods adopted today; and (3) it meets the criteria discussed above (e.g., smaller particle size material can be readily sampled to document compliance with the numerical LDR treatment standards for the waste contaminating the material).[16] In addition, this size object is normally readily amenable to effective treatment by the methods specified in today's rule.

(2) Rationale for Applying the Particle Size Criterion to All Debris. The Agency has broadened the particle size test to apply to all debris, not just to geologic debris as proposed. We believe that the reasons enumerated above for increasing the particle size to 60 mm apply equally to applying the particle size to all debris (e.g., small particle size objects—e.g., glass, metal fragments—can be readily sampled representatively to document compliance with the LDRs for the waste contaminating the material).

(3) Compacted Clumps of Fine Grained Materials are not Defined as Debris. The Agency is basing the size criterion on the particle size of the solid material rather than the sieve size to ensure that 60 mm (or larger) compacted clumps of materials with a particle size less than 60 mm are not defined as debris. The most common example is clayey soil. Clay particles are extremely cohesive and can form clumps during normal excavation and handling operations. The contaminated debris treatment methods are not intended to clean clumps of clay. Clumps of agglomerated clay soil are subject to the treatment standards for the waste contaminating the soil.

In addition, the Agency is concerned that generators may have the incentive to intentionally agglomerate small particle size materials (e.g., soil or even manufactured materials) so that they would meet the definition of debris and so be excluded from regulation under subtitle C upon treatment by an extraction or destruction technology. If such contaminated materials were not

[12] While most of the debris treatment methods are extraction methods, some methods destroy the hazardous constituents; although these would be applicable to liquid material, most of the treatment methods simply remove the contamination from the debris for subsequent detoxification treatment.

[13] To determine otherwise would result in large quantities of solid materials being subject to the existing LDRs for the waste contaminating the materials. Those solid materials would be very difficult to sample representatively to document compliance with the LDRs. Further, the solid materials would be readily amenable to the debris treatment standards promulgated today notwithstanding the presence of free liquids, and hence appropriately classified as debris.

[14] We note that numerous commenters were concerned that the proposed particle size criterion of 9.5 mm would inappropriately define most soil as debris. (We note further that the proposed rule could have been interpreted to define as debris geologic material that was comprised of only one particle (e.g., a rock) with a particle size of 9.5 mm or greater. Thus, fine grain soil containing one 9.5 mm or greater sized rock could have been considered debris. The final rule addresses mixtures by defining as debris mixtures of primarily debris with other materials. See discussion in the text in Section V.B.1.d).

[15] See the May 11, 1992, memorandum from Kerry Rice, Radian to Mark Mercer, EPA, entitled "Particle Size Definitions and Sieve Sizes"; and the May 18, 1992, memorandum from Peter Shields, Radian, to Mark Mercer, EPA, entitled "Sieves with Openings Greater than Four Inches".

[16] We note that the Agency is considering proposing Phase II land disposal restrictions that would establish treatment standards for contaminated soil. In that proposal, the Agency is considering requesting comment in particular on whether soils with a particle size between 9.5 mm and 60 mm can be effectively treated under those proposed standards.

regulated as debris, they would be subject to the LDRs for the waste contaminating them and would remain subject to subtitle C regulation after treatment. Basing the size criterion on particle size rather than sieve size precludes the potential for such sham activities.

(4) Implementation of the Particle Size Criterion. To make today's rule workable, equipment operators need to be able to determine quickly whether material being remediated is debris or nondebris (e.g., soil, waste). In some cases, the determination will vary from one front end loader bucketfull of material to another. Accordingly, the Agency intends for the size criterion to be implemented by visual observation. Screening is not required. If screening is used, however, the screen may be either a square grid with openings 60 mm on a side or a circular grid with circles with a 60 mm diameter.

(d) Waste for Which a Specific Treatment Standard Has Been Established is not Debris. There is one further exception to this definition of debris. EPA is indicating that debris-like material for which the Agency has promulgated a specific treatment standard is not considered to be debris. The reason is that the Agency will have determined that specific treatment standards are appropriate for the material, rather than the assortment of technologies adopted for debris generally. See 57 FR 983 c.3 (Jan. 9, 1992).

The chief examples of a material subject to a specific treatment standard rather than the general debris standards are lead acid batteries and cadmium batteries. EPA has promulgated a treatment standard of metal recovery for each of these materials. See § 268.42. Thus, this more specific treatment standard takes precedence over the more general debris standard adopted today.[17]

d. Mixtures of Debris with Other Materials are Subject to Regulation as Debris if Debris is the Primary Material Present. A further issue needing to be addressed is the status of mixtures of debris and other materials such as soils or sludge. This situation arises often, particularly in remedial situations where debris is rarely present in a pristine state. Since the treatment standards for debris and other materials—sludge or contaminated soil—differ, the issue of classification is an important one. In developing a means of classification, the Agency on the one hand is seeking to prevent the debris classification from invariably overriding the treatment standards for other hazardous wastes. On the other hand, it is important to have a means of classification that is easy to apply by equipment operators in the field.

The Agency has therefore decided to classify [18] as debris any mixture where the debris portion comprises the largest amount of material present by volume, to be determined by visual inspection.[19] Thus, for example, if upon examination, a mixture of cobbles (i.e., with a particle size of 60 mm or more), soil, and sludge is comprised mostly of cobbles, the mixture is classified as debris. After being treated by one of the treatment methods for debris promulgated in today's rule, it could then be land disposed. (Residues from applying the treatment method could be land disposed after being treated to meet the treatment standards for the prohibited waste contaminating the debris.)

The definition of debris encompasses this classification principle by stating that "A mixture of debris and other material such as soil or sludge is also debris if the mixture is comprised primarily of debris by volume, based on visual inspection." It should be clear from this discussion that the rule does not require debris and nondebris materials to be separated prior to treatment (an unintended implication of the proposed rule). Rather, mixtures are either classified as debris or some other type of waste treatability group according to the classification test discussed above.

We note that the "primary material" test for classifying debris does not apply to intact, nonempty containers. Given that such containers are not debris (see discussion below in section V.B.1.f) and can be readily separated from debris (or mixtures of debris and other materials), they are not considered in applying the "primary material" test. Consequently, intact, nonempty containers must not be included in making the volume determinations to classify mixtures of debris.

There is one further point to be made. Although EPA is classifying mixtures that are predominantly debris as debris, this does not mean that debris can be deliberately mixed with other wastes in order to change their treatment classification. Such mixing is impermissible dilution under § 268.3 since it is a substitute for adequate treatment. See also 53 FR 31145 (Aug. 17, 1988); dilution to change treatability groups is ordinarily impermissible. In addition, such situations where debris is used merely to dilute another prohibited waste, the mixture would remain subject to the most stringent treatment standard of any waste that is part of the mixture. See § 268.41(b).

e. *Process Residuals Are Not Debris.* Today's definition of debris explicitly excludes process residuals by stating: "Process residuals such as smelter slag and residues from the treatment of waste (e.g., incinerator ash), wastewater, sludges, or air emissions residues (e.g., collected particulate matter) are not debris." The Agency believes that debris should be limited to manufactured objects (e.g., metal, glass) and naturally occurring objects (e.g., boulders, tree stumps). The Agency developed the treatment standards generally to ensure effective treatment of hazardous waste contaminating an object, rather than effective treatment of a large particle size hazardous waste such as slag.[20]

Several commenters requested clarification as to what the Agency meant in the proposed rule by excluding from the definition of debris "solids that are listed wastes or can be identified as being residues from treatment of wastes and/or wastewaters." The commenters felt that it was unclear whether this phrase exempts from the definition of debris only pollution control residues, or material such as metal filters, ceramic column packing, or discarded pollution control equipment. Commenters suggested that EPA clarify, through examples, that discarded industrial equipment (such as filters, pumps, etc.) would be included in the definition of

[17] A number of commenters questioned the jurisdictional basis for regulating battery plates and groups from lead acid batteries as "solid wastes" subject to subtitle C regulation. EPA adheres to the response set out at 57 FR 960–961 in the proposed rule.

[18] We note that although such mixtures are classified as debris and are subject to the debris treatment standards, if the nondebris materials are separated from the debris prior to treatment by a specified technology, the separated material is no longer classified as debris. If the separated material is a hazardous waste (or soil contaminated with a hazardous waste), it is subject to the waste-specific treatment standards. When treatment residue (i.e., soil, waste, or other nondebris material) is separated from treated debris as required by today's debris standards for extraction or destruction technologies, the residue is subject to the waste-specific standards for the waste contaminating the debris.

[19] Some materials (e.g., soil) mixed with debris may contain free liquids that may still be oozing from the material. The volume of such entrapped liquids need not be considered in determining whether the mixture is primarily debris because it is impracticable to determine the volume of such liquids by visual inspection.

[20] We note that previous debris definitions (see § 268.2(g)) considered "slag" as debris. The Agency has reconsidered this issue and has determined the slag is not debris because it is not the type of material for which today's debris treatment standards were developed—objects contaminated (generally surficially) with hazardous waste.

hazardous debris. The basis for these determinations is discussed below.

(1) Electropolishing Is Not BDAT. The Agency has determined that electropolishing is not BDAT for hazardous debris because of concerns that the technology is intended primarily for smoothing clean metal parts. Painted or contaminated metal parts might not be effectively treated by this method. A contaminating organic waste or paint could electrically insulate the surface from the solution and prevent surface removal of contaminants.

(2) Ultraviolet Radiation Is Not BDAT. The Agency deleted ultraviolet radiation treatment from the list of BDAT technologies for hazardous debris because of difficulties of specifying performance standards that would ensure effective treatment in all cases. This technology is primarily intended for liquid waste treatment where the fluid is passed by a ultraviolet radiation source in a thin stream. This approach is designed to ensure that the ultraviolet light reaches all of the toxic molecules and detoxifies them. If the technology were to be applied to hazardous debris, it would be virtually impossible to ensure that all toxic molecules contaminating the debris were adequately radiated. Sludge and soil caked onto debris would preclude radiation of both inner layers of caked material and the debris surface. Further, even for debris that is relatively free of caked-on materials, the debris would have to be systematically turned to expose all contaminated surfaces to the radiation. The use of sunlight to provide the ultraviolet radiation as proposed as an alternative to an artificial source poses even greater problems of ensuring exposure to ultraviolet radiation at levels that would ensure effective treatment. The Agency's effort to provide for innovative debris treatment at proposal simply went too far.

(3) High Temperature Metal Recovery Is BDAT. The Agency has added high temperature metal recovery (HTMR) to the list of acceptable debris treatment technologies. It is a very effective method for treatment of recoverable metal values in both metal debris and debris that is contaminated with metal-bearing hazardous waste. The Agency did not include HTMR as BDAT at proposal simply because of oversight. Several commenters suggested that we include this method, and the Agency agrees.

We note that HTMR can also effectively treat toxic organic contaminants. If the debris contains more than a total of 500 ppm of toxic organic compounds listed in appendix VIII, part 261, the HTMR facility is subject to the Boiler and Industrial Furnace (BIF) Rule. See § 266.100. The HTMR would be subject to the same controls on organic emissions [22] as other BIFs burning hazardous waste. When the total concentration of toxic organic compounds in the waste is less than 500 ppm, the Agency believes that any emissions of organic compounds attributable to those organic compounds will not pose a hazard to human health and the environment.

3. Contaminants Subject to Treatment

Today's rule requires hazardous debris to be treated by one of the specified technologies [23] for each "contaminant subject to treatment" defined as: (1) the BDAT constituents identified in §§ 268.41 and 268.43 for the listed waste contaminating the debris that are present at detectable levels; [24] (2) the constituents for which the debris exhibits Extraction Procedure toxicity; and (3) cyanide or sulfide if debris exhibits reactivity due to the presence of those constituents. As discussed in section V.C.5 below, although debris may contain several contaminants subject to treatment, the treatment standards generally do not require treatment by multiple technologies (i.e., a treatment train). This is because many of the specified technologies effectively treat various types of contaminants (e.g., metals, aromatic and aliphatic organic compounds, halogenated and nonhalogenated organic compounds).

In the proposed rule, the Agency proposed a broader definition of "contaminants subject to treatment" that would have included constituents on appendix VIII, part 261, that the generator could reasonably know may contaminate the debris at detectable levels. Further, the Agency requested comment on whether the rule should require that debris that is hazardous solely because it exhibits a characteristic (i.e., toxicity, ignitability, or reactivity) be treated for all constituents on appendix VIII, part 261, that the generator could reasonably know may contaminate the debris at detectable levels. The Agency addressed these provisions at proposal because of concern that all toxic constituents present be effectively treated given that debris treated by an extraction or destruction technology and that does not exhibit a characteristic is excluded from subtitle C regulation.

We have determined, however, that neither of these provisions is likely to be necessary to ensure effective treatment of hazardous debris for a number of reasons. Thus, these provisions are not included in today's rule. First, we believe that enough contaminants subject to treatment will be identified for most debris to ensure effective treatment of other toxic contaminants that may be present. Given that most debris is generated by remediation, the debris is often associated with a variety of wastes that will result in a number of contaminants being designated contaminants subject to treatment—either because listed wastes or known to be present, or more likely, because the debris fails the EP [25] for one or more constituents. For example, it is highly unlikely that debris will exhibit only ignitability or reactivity and not fail the TC or be contaminated with a listed waste (and thus, require only deactivation of the ignitability or reactivity characteristic under today's rule) if, in fact, toxic constituents are present at significant levels. Given that most of the debris treatment technologies specified in today's rule are not restricted to specific contaminants other than metal vs. nonmetal contaminants and that many technologies (e.g., surface removal, incineration) have no contaminant restrictions (see section V.C.5 below), the designation of a few contaminants subject to treatment should be sufficient to ensure effective treatment of other toxic contaminants that may be present.

Further, commenters argued, and the Agency agrees, that it would be difficult to implement and enforce a rule that required generators to treat toxic constituents that they have reason to know are present at detectable levels. First, whether the generator, in fact, could have reason to know that a toxic constituent is present is highly

[22] Emissions of metals, HCl, Cl_2, and particulate matter are also controlled by the BIF rule.

[23] Unless EPA determines the hazardous debris no longer contains hazardous waste (see discussion in section V.B.2 of the text) or unless the generator elects to comply with the waste-specific treatment standards for the waste contaminating the debris (see discussion in section V.C.4 of the text).

[24] We note that the generator may presume that the BDAT constituents for the listed waste are present at detectable levels and is not required to sample and analyze the debris to make that determination. If, however, the generator elects to sample and analyze the debris, the Agency acknowledges that this may be a difficult task for many types of debris and debris mixtures. In this situation, the generator must use best engineering judgement to obtain samples that are as representative as practicable.

[25] We note that the Agency is considering proposing treatment standards for TC wastes and debris contaminated with TC wastes. If that rule is promulgated, debris will be identified as hazardous debris if it exhibits the TC for an additional 26 organic compounds many of which are commonly found at remediation sites. Thus, over time, additional debris contaminants will become designated contaminants subject to treatment.

subjective and difficult to enforce. Second, the Agency upon additional consideration believes that, if treatment of such additional toxic constituents were to be required, treatment should only be required if the constituent is present at significant levels, not merely at detection levels. This raises the issue of what is a significant level. Possible criteria include a level of potential health significance or the F039 treatment levels. (We note that the Agency, in fact, requested comment on using these criteria to determine when these other (i.e., other than BDAT constituents for listed waste contaminating the debris and the constituents for which the debris fails the EP) toxic constituents known to be present would be contaminants subject to treatment. See 57 FR 984, n. 11.) Not only is the Agency unsure which approach would be more appropriate, but under either approach—i.e, health-based levels or F039 levels—sampling and analysis would be required if the generator did not want to presume that a toxic constituent known to be present was present at the trigger level. Since it is particularly difficult to take representative samples of untreated debris, EPA considers this approach to be inadvisable.

4. Debris May Be Treated to the Existing Waste-Specific LDRs in Lieu of Today's Debris Treatment Standards

Today's rule gives generators the option of treating hazardous debris to the existing waste-specific treatment standards for the waste contaminating the debris. The treated debris, however, must continue to be managed under subtitle C. If land disposed, the debris must be disposed in a subtitle C landfill. However, such debris would be excluded from subtitle C regulation if the Agency determined that it no longer contained hazardous waste (see discussion above in section V.B.2) or if the treater determined that the debris no longer contained hazardous constituents at levels that may be established under a final Hazardous Waste Identification Rule (see discussion above in section V.B.3).

The Agency is providing this option in today's rule based on the request of numerous commenters. For example, one commenter routinely adds the tyvek suits and rubber gloves worn by facility operators to the waste stream leaving his factory, and wishes to continue doing so. The proposed rule would have required the tyvek suits and rubber gloves (as debris) to be separated from the waste for treatment by the specified technology. The commenter preferred to treat the waste/debris mixture to the waste-specific standards and the Agency believes that this practice is appropriate to provide an additional means of treating debris that substantially reduces toxicant mobility or concentration.

The Agency developed special treatment standards for hazardous debris because of concern that, in most cases, the waste-specific standards would not be practicable for debris given the difficulty in obtaining representative samples of treated debris to document compliance with the concentration-based waste-specific standards. The Agency acknowledges, however, that some types of debris may be amenable to representative sampling and therefore compliance with the waste-specific standards may be workable.[26]

Debris that is treated to the waste-specific treatment standards rather than today's debris treatment standards remains subject to subtitle C regulation because toxic constituents may continue to be present at levels that could pose a hazard to human health and the environment. EPA believes that this position is appropriate for two reasons. First, there is no reason to exclude from subtitle C regulation hazardous debris treated to the waste-specific standards when the waste itself is not excluded when treated to those standards. Second, and moreover, the Agency believes that today's treatment standards will treat debris to levels resulting in minimum threat to human health and the environment. See discussion below. Although meeting the waste-specific standards may result in some cases in levels of toxic constituents in the treated debris that do not pose a hazard to human health and the environment, the Agency is not certain that this will be the case in all situations (and in any case, the issue is more appropriate for resolution in the context of the May 20, 1992, proposed rule, 57 FR 21450).

5. Treatment Standards

In this section, we provide the rationale for the treatment standards for each technology and explain how the standards work, and we explain how the final treatment standards differ from those proposed.

a. *Overview.* Today's rule establishes performance and/or design and operating requirements for 17 treatment technologies that the Agency has designated as BDAT for hazardous debris. See Table I of § 268.45. Although any technology may be used to treat any debris, the treatment standards vary for many technologies according to the type of debris treated.[27] In addition, the rule prohibits the use of some technologies to treat specific types of contaminants. For example, the physical extraction technologies (e.g., abrasive blasting) have no contaminant type restrictions, while thermal desorption may not be used to treat metals other than mercury. Generators (and owners and operators of treatment facilities) may select any treatment technology that is not restricted for the contaminant subject to treatment.

The Agency has attempted to establish performance or design and operating requirements for each of the extraction and destruction technologies that will optimize treatment effectiveness such that hazardous contaminants would not be present at residual levels in the debris that could pose a hazard to human health and the environment. Thus, the treated debris could be excluded from subtitle C regulation. Unfortunately, the Agency was not able to develop objective performance or design and operating standards for all extraction and destruction technologies that would ensure treatment to minimum threat levels (e.g., thermal desorption, biodegradation, and chemical destruction; see discussion below). For these technologies, the Agency is concerned that residual levels of hazardous contaminants may remain in the debris at levels that could pose a hazard to human health and the environment. Consequently, today's rule requires for these technologies that the owner or operator of the treatment unit must make an "Equivalency Demonstration" to the Agency under existing § 268.42(b) that documents that the technology treats contaminants subject to treatment to a level equivalent to that required by the performance and design and operating standards for the other technologies in

[26] We note that commenters may have requested this option out of frustration that the proposed rule did not effectively address the issue of debris mixtures. The proposed rule appeared to require either separation of debris types prior to treatment or the extensive use of treatment trains to treat different debris types. This problem has been remedied in today's final rule by acknowledging the ability of the treatment technologies to treat a greater variety of debris types than proposed. See discussion in section V.C.5 of the text.

[27] In addition, although the rule does not prohibit treatment of specific debris types by a technology, the treatment standards cannot be met as a practical matter for certain debris/technology combinations (e.g., high pressure steam and water sprays cannot remove 0.6 cm of the surface layer of brick, concrete, etc). In other situations, the definition of the technology as a practical matter precludes the use of some technologies for some debris types (e.g., the definition of spalling cannot be met when applied to treat cloth).

Table 1, § 268.45, such that residual levels of hazardous contaminants will not pose a hazard to human health and the environment absent subtitle C control.

Today's treatment standards establish performance standards rather than design and operating standards where supporting data were available. The Agency believes that performance standards will better ensure effective treatment given the variability in contaminant and debris types and properties that affect treatability. Further, performance standards give the owner and operator of the treatment unit the flexibility to tailor the design and operation of the unit to the specific debris/contaminant(s) being treated. An example of a performance standard is the standard for physical extraction technologies (e.g., abrasive blasting) used to treat a metal object where the standard requires decontamination to a "clean metal finish" as defined in the regulation. An example of a design and operating standard is the standard for thermal desorption that limits the thickness of porous debris to 10 cm (4 inches).

EPA recommends that the generator or owner or operator of the treatment facility consider the thermal, chemical, and physical properties of the debris and the contaminants on the debris before selecting a treatment technology to ensure that the performance or design and operating requirements can by achieved. The Agency plans to develop a nonregulatory implementation assistance document to provide assistance on how to select the most appropriate technologies for a given debris/contaminant combination.

Although hazardous debris treatment operations are generally subject to regulation under the interim status or permit standards of parts 270 and 264, 265, or 266,[28] today's hazardous debris performance or design and operating standards are neither interim status nor permit standards. The hazardous debris treatment standards are adopted pursuant to section 3004(m) of RCRA to ensure that debris is treated to minimize the hazardous constituents' toxicity or mobility during future management, while the interim status and permit standards are designed to protect human health and the environment from the operation of the storage, treatment, or disposal facility itself. It is for this reason that today's treatment standards do not address control of emissions that can occur from debris treatment; the Agency is relying on the applicable interim status and permit standards to control treatment emissions. See discussion below in section V.F.

The Agency has grouped the various treatment technologies into categories of like treatment type. Each category is based on the same (or similar) performance or design and operating standards. See Table 1 of § 268.45. We discuss below for each group of treatment technologies the basis for the standards and how the standards will work. Note that the performance or design and operating standards must be met for all debris surfaces that are contaminated with hazardous waste. Thus, if a pipe or pump was used to manage hazardous waste, the performance standards must be met for the inside surfaces of the pipe or pump. Decontamination of the outer surfaces only does not constitute compliance with the debris treatment standards.

b. *Extraction Technologies.* The Agency has classified the extraction technologies as physical extraction, chemical extraction, and thermal extraction.

(1) Physical Extraction Technologies. The physical extraction technologies are: abrasive blasting; scarification, grinding, and planing; spalling; vibratory finishing; and high pressure steam and water sprays. For these technologies, the rule establishes performance standards based on removal of the contaminated layer of the debris. Any contaminant subject to treatment may be treated by these technologies,[29] because the contaminants are removed as residue [30] subject to the treatment standards for the waste contaminating the debris.

In addition, any debris type (e.g., metal, concrete, wood, paper, cloth) may be treated by these technologies. The Agency reasoned that any debris type would be effectively treated provided that the contaminated layer of the debris is removed. We note that, although the rule allows the use of physical extraction technologies on any debris type, it will be impracticable to use these technologies on some debris types and the performance standards cannot be met for some technology/debris combinations. For example, it is impracticable to spall paper or cloth. However, we realize that debris often is comprised of a mixture of debris types, and physical extraction may be the most reasonable technology for the predominate debris type while other types of debris present would be removed as residue. An example is large chunks of concrete that have paper labels adhered to them. Spalling or another physical extraction technology may be practicable for the concrete and the paper labels will be removed as residue. An example of where the performance standard cannot be met for a technology/debris combination is high pressure steam and water spray used to treat brick or concrete. As discussed below, because these debris types are porous and toxic contaminants may be adsorbed below the surface of the debris, the performance standard requires removal of at least the outer 0.6 centimeter surface layer. This technology cannot meet that performance standard for those types of debris. Rather than explicitly prohibiting such practices, however, such practices will be precluded because of the inability to comply with the standards.

To ensure that the contaminated layer of debris is removed and to account for the physical properties of different types of debris, the rule establishes different performance standards for different types of debris.

(a) Metal Objects. Metal objects must be treated to remove foreign matter adhering to the metal to produce a "clean debris surface". The rule defines a "clean debris surface" as a surface that, when viewed without magnification, shall be free of all visible contaminated soil and hazardous waste, except that residual staining caused by soil and waste consisting of light shadows, slight streaks, or minor discolorations, and soil and waste in cracks, crevices, and pits may be present provided that such staining and soil and waste in cracks, crevices, and

[28] Unless treatment occurs in an on-site container, tank, or containment building, the hazardous debris is treated within 90 days of generation, and the unit complies with the appropriate standards of part 265, or unless the treatment occurs within the Area of Containment (AOC) at a Superfund remediation site and the generator complying with today's treatment standards in order to remove the treated debris from the AOC and manage it as debris excluded from subtitle C. See discussion in section V.F. of the text.

[29] As discussed below in the text, today's rule establishes additional requirements for certain technologies in order to exclude the treated debris from subtitle C when the debris is contaminated with waste that is listed for dioxins (EPA Hazardous Waste Numbers F020, F021, F022, F023, F026, or F027). The Agency did establish such additional requirements for treatment of debris contaminated with dioxin-listed waste when treated by the physical extraction technologies, however, because the Agency believes that it is highly unlikely that compliance with the rigorous performance standards for these physical extraction technologies will allow significant residual levels of contaminants such that even highly toxic contaminants could pose a hazard to human health and the environment absent subtitle C control.

[30] Except that for spalling, the spalled material is considered untreated debris, not residue, and must be treated before land disposal. See additional discussion in the text.

pits shall be limited to no more than 5% of each square inch of surface area.

The rule allows minor residual staining caused by soil and waste and soil and waste to remain in cracks, crevices, and pits of up to 5% of each square inch of surface area [31] because of the impracticability of cleaning metal debris to a "white metal finish" as proposed. The Agency selected the 5% surface area criterion because: (1) it is within the range of reasonable levels—1% to 10%—that could have been selected; (2) it is generally equivalent to the Steel Structures Painting Council's specification for "Near-White Blast Cleaning" for cleaning steel surfaces by the use of abrasives; [32] and (3) it should not allow toxic contaminants to remain at levels that could pose a hazard to human health and the environment absent subtitle C regulation, and should remove contaminants so that threats posed by disposal of the debris are minimized.

(b) Brick, Cloth, Concrete, Paper, Rock, Pavement, and Wood. The performance standard for these types of debris requires: (1) Removal of at least 0.6 centimeters of the surface layer; and (2) treatment to a "clean debris surface." Removal of 0.6 centimeters of the surface layer is required for these types of debris because they may be porous and toxic contaminants may by absorbed within the debris. (The Agency recognizes that, as a practical matter, the 0.6 cm surface removal requirement precludes the use of this technology for most porous debris.) To ensure removal of contaminants that may be absorbed to depths beyond 0.6 centimeters, the rule requires removal of virtually all staining that could be indicative of the presence of toxic contaminants. The rule allows minor residual staining and foreign matter in cracks and crevices on up to 5% of the surface area (on a square inch basis) as a reasonable and practicable method to help ensure that the standards do not require treatment to a level beyond that necessary to ensure that the treated debris does not pose a hazard to human health and the environment absent subtitle C regulation. We note that staining that is not indicative of the potential presence of hazardous waste or contaminated soil (e.g., rust stains on concrete adjacent to steel reinforcing bars) need not be removed and is not considered in determining compliance with the maximum 5% surface area limit on residual staining. The basis for the 5% surface area limit (on a square inch basis) on residual staining and foreign matter in cracks and crevices is the same as the basis discussed above for the definition of clean metal finish.

(c) Glass, Rubber, Plastic. The physical extraction performance standards for these types of debris are the same as for brick, concrete, etc., except that removal of at least 0.6 centimeters of the surface layer is not required. Removal of the surface layer for glass, rubber, or plastic is not required because glass is nonporous and will not absorb contaminants below the surface, and rubber and plastic, although permeable, are not likely to leach absorbed contaminants at substantial rates.

(2) Chemical Extraction. The technologies classified as chemical extraction are water washing and spraying; liquid phase solvent extraction; and vapor phase solvent extraction. The performance standards for these technologies are based on dissolution of the contaminants into the cleaning solution. Removal of the outer debris layer is not intended.

(a) Water Washing and Spraying. Water sprays or water baths will effectively treat debris when sufficient temperature, pressure, residence time, agitation, surfactants, acids, bases, and/or detergents are used to meet the performance standards in accord with the contaminant restrictions. The rule requires that the debris must be treated to a "clean debris surface" (see discussion above) to ensure effective treatment to levels of hazardous contaminants that are not likely to pose a hazard to human health and the environment absent subtitle C control.

For porous debris—brick, cloth, concrete, paper, pavement, rock, and wood—the rule provides two other requirements. The thickness (i.e., one dimension) of each piece of porous debris may not be more than 1.2 cm (i.e., ½ inch), and the contaminants must be soluble to at least 5% by weight in the water solution or 5% by weight in the emulsion, as applicable. The Agency is applying these standards for porous debris to ensure effective extraction of toxic contaminants that may be absorbed below the surface layer of the debris.

If reducing the thickness of debris to 1.2 cm to meet the treatment standards results in debris 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 waste contaminating the material, unless the debris has been cleaned and separated from contaminated soil and hazardous waste before size reduction. This is consistent with the Agency's position that material with a particle size less than 60 mm is amenable to conventional treatment for process waste and small particle-sized material (i.e., as opposed to large debris objects) and that such material can be reasonably sampled for analysis to document compliance with the concentration-based treatment standards for the waste contaminating the material.

If the debris has been cleaned and separated from contaminated soil and hazardous waste before size reduction the material remains classified as debris subject to today's treatment standards even if it no longer has a 60 mm particle size. The Agency believes that cleaning and separation of contaminated soil and hazardous waste will substantially reduce the concentration of toxic constituents such that the debris should contain minimum threat levels subsequent to treatment by an extraction or destruction technology. The level of cleaning and separation that is required is the same as required for separation of treatment residue from treated debris. See Note 9 to Table 1, § 268.45. At a minimum, simple physical or mechanical methods must be used such as vibratory or trommel screening or water washing. The debris surface need not be cleaned to a "clean debris surface" as defined in Table 1; rather, the surface must be free of caked soil, waste, or other nondebris material. Nondebris materials so separated are subject to the waste-specific treatment standards for the waste contaminating the material.

Porous debris (i.e., brick, cloth, concrete, paper, pavement, rock, or wood) that is contaminated with a waste listed for dioxin—EPA Hazardous Waste Numbers F020, F021, F022, F023, F026, or F027—is subject to additional controls. Because of the potential toxicity of the constituents in these wastes, the Agency believes that it is prudent to require additional controls to ensure that the potentially highly toxic constituents in these wastes are extracted from below the debris surface and that the treated debris poses minimum threat to human health and the environment absent subtitle C control. Accordingly, the rule requires the treater to make an "Equivalency Demonstration" to the Agency under

[31] Note that the 5% surface area criterion is applied to each square inch of the debris surface that has been contaminated with hazardous waste. The area covered by large stains cannot be averaged against large unstained areas. Only 5% of the area within any square inch can contain a residual stain.

[32] See the May 18, 1992, memorandum from Peter Shields, Radian, to Mark Mercer, EPA, entitled "Industry Standards for Cleanliness of Metal Surfaces".

existing § 268.42(b) that documents that the technology treats contaminants subject to treatment in these dioxin-listed wastes to a level equivalent to that required for these contaminants by the performance and design and operating standards for other technologies in Table 1, § 268.45, such that residual levels of hazardous contaminants will not pose a hazard to human health and the environment absent subtitle C control.

(b) Liquid Phase Solvent Extraction. This technology decontaminates debris surfaces by applying a nonaqueous liquid or liquid solution which causes the toxic contaminants to enter the liquid phase and be flushed away from the debris along with the liquid or liquid solution using agitation, temperature, and residence time sufficient to meet the performance standards. The treatment standards for this technology are the same as for water washing and spraying because the technologies use the same principles to extract toxic contaminants from debris.

(c) Vapor Phase Solvent Extraction. This technology decontaminates debris surfaces by applying an organic vapor which causes the toxic contaminants to enter the vapor phase using sufficient agitation, residence time, and temperature and to be flushed away with the organic vapor such that the performance standards are achieved. The treatment standards for this technology are the same as for water washing and spraying, except that porous debris surfaces must be in contact with the organic vapor for more than 60 minutes. This treatment time is consistent with state-of-the-art practices and is necessary to ensure effective extraction of contaminants.

(3) Thermal Extraction. The Agency has classified two technologies as thermal extraction: High temperature metals recovery and thermal desorption.

(a) High Temperature Metals Recovery (HTMR). HTMR furnaces are smelting, melting, or refining furnaces (including pyrometallurgical devices such as cupolas, reverberator furnaces, sintering machines, roasters, and foundry furnaces (see § 260.10 definition of "industrial furnace")) that use sufficient heat, residence time, mixing, fluxing agents, and/or carbon to extract metals from debris. HTMR furnaces are potentially subject to regulation under the Boiler and Industrial Furnace (BIF) Rule (subpart H, part 266) when they burn hazardous debris.[33]

Today's rule requires that, for nonslagging furnaces (e.g., refining furnaces), treatment residuals must be separated from the debris. In addition, such separated residue must meet the waste-specific treatment standards for organic compounds in the waste contaminating the debris prior to further treatment. Further, these residues must meet the waste-specific treatment standards for all BDAT constituents in the waste contaminating the debris prior to land disposal. Finally, if debris is contaminated with a dioxin-listed waste, HTMR is not BDAT and the treated debris is not excluded from subtitle C unless the treater makes an "Equivalent Technology" demonstration to the Agency under § 268.42(b) that documents that the technology treats contaminants subject to treatment to a level equivalent to that required by the performance and design and operating standards for other technologies in Table 1, § 268.45, such that residual levels of hazardous contaminants will not pose a hazard to human health and the environment absent subtitle C control.

Today's rule does not establish performance or design and operating standards for slagging HTMR furnaces (other than the requirements inherent in the definition—a melting or smelting furnace must melt metals and extract the metals from debris) because a slagging furnace is likely to provide effective treatment for all contaminants, except perhaps for chlorinated dioxins as discussed below, and for all debris types.

For nonslagging (i.e., refining furnaces such as roasters) HTMR furnaces, the rule ensures treatment of both metal and organic contaminants. First, the definition of HTMR furnaces requires that metals must be separated from the debris. Thus, not only will metals be removed, but temperatures hot enough to separate metals from debris should also remove organic contaminants from the debris (with perhaps the exception of dioxins, as discussed below). Second, to help ensure that the HTMR unit has effectively removed organic contaminants in the debris the rule requires that the residue be separated from the treated debris and that the separated residue must meet the waste-specific treatment standards for the BDAT organic contaminants in the waste contaminating the debris prior to further treatment.

In addition, the Agency is concerned that potentially extremely toxic contaminants may not be destroyed (or removed with the residue) to levels that would not pose a hazard to human health and the environment absent subtitle C control. Consequently, if debris is contaminated with a dioxin-listed waste, HTMR is not BDAT for the debris and the debris is not excluded from subtitle C after treatment unless the treater obtains approval from the Director under an equivalent technology demonstration provided by § 268.42(b) for the design and operating conditions of the HTMR unit. The rule provides this restriction for dioxin-listed waste because of concern that if such contaminants remained undestroyed even at low concentrations in the residue and were not completely removed from the treated debris, that the debris could pose a health or environmental hazard absent subtitle C control.

(b) Thermal Desorption. Thermal desorption is heating in an enclosed chamber under either oxidizing or nonoxidizing atmospheres at sufficient operating temperature and residence time such that the contaminants subject to treatment are vaporized and removed from the heating chamber in a gaseous exhaust streams.[34] The rule establishes operating and performance standards and contaminant restrictions, and requires the treater to make a demonstration of "Equivalent Technology" under § 268.42(b) to document that the technology treats contaminants subject to treatment to a level equivalent to that required by the performance and design and operating standards for other technologies in Table 1, § 268.45, such that residual levels of hazardous contaminants will not pose a hazard to human health and the environment absent subtitle C control.

The Agency attempted to develop objective treatment standards that would obviate the need for an equivalency demonstration (see discussion above). The Agency determined, however, that it was very difficult to establish universal operating

[33] See § 266.100(c) that states generally that a smelting, melting, or refining furnace that burns a hazardous waste with a heating value of 5,000 Btu/lb or more or that contains a total concentration of toxic organic compounds exceeding 500 ppm by weight is subject to the BIF Rule.

[34] We note that a thermal desorber is regulated either as an incinerator (if the device is direct-fired or if the off-gas is burned in an afterburner) under subpart O of part 264 or 265, or as a thermal treatment unit under subpart X, part 264 or subpart P, part 265. To distinguish between thermal desorption and thermal destruction (for which separate debris treatment standards are provided) for purposes of complying with this rule, the primary purpose of thermal desorption is to volatilize contaminants and to remove them from the treatment chamber for subsequent destruction or treatment. We note that the treatment standards in Table 1, § 268.45 for thermal destruction specifically excludes thermal desorbers.

limits for the key operating parameters that affect treatment efficiency—temperature, residence time, size of porous debris, bed depth, and volatility of the contaminant—that would strike a balance between ensuring treatment to minimum threat levels and establishing requirements that could grossly over-regulate in many situations. Rather, the Agency believes that operating requirements can best be determined on a case-by-case basis (i.e., under an equivalent technology demonstration under § 268.42(b)) considering the parameters listed above. In addition, the Agency believes that the performance standard used for physical and chemical extraction—treatment to a clean debris surface—is not practicable for thermal desorption because treated debris surfaces will continue to have a dusting of residue after separation of the debris from the residue by simple, physical or mechanical means (unless water washing is used). See discussion below regarding the requirement for separation of debris from residue.

The treatment standards for thermal desorption require, in addition to the case-by-case Agency approval of design and operating conditions, that hazardous contaminants be vaporized (by virtue of the definition of thermal desorption), and restricts the use of the technology for metal contaminants other than mercury (i.e., thermal desorption is not BDAT for metals other than mercury). In addition, to help ensure extraction of contaminants from below the surface of porous debris, the rule establishes a maximum thickness (in one dimension) for porous debris of 10 cm (4 inches).[35] The 4 inch maximum thickness limit is consistent with state-of-the-art practices. The restriction on metals other than mercury is provided because they are not likely to be extracted from below the debris surface at normal desorption temperatures and residence times.

We note that we considered restricting the use of thermal desorption for only porous debris that is contaminated with a metal other than mercury. We reasoned that metal contaminants in soil or waste on the surface of nonporous debris will be physically separated from the debris along with the soil or waste during or after desorption, and thus a restriction would not be necessary. However, we are also concerned about metal contaminants that may remain on the surface of nonporous (and porous) debris after desorption and after separation of the treated debris from the residue. An example is a piece of steel contaminated with a metal-bearing paint that causes the steel to fail the TC. The metal may not be desorbed and the paint would not be separated from the steel during the simple physical or mechanical separation of residue from debris. Although the steel would continue to fail the TC, it would have been treated to meet BDAT and could be land disposed in a subtitle C facility. This is inconsistent with the Agency's view that BDAT for a TC waste must cause the waste to no longer exhibit the TC.

The treatment standard for thermal desorption also requires separation of the treated debris from treatment residuals and soil, waste, or other nondebris material (collectively referred to as residuals) because residuals are subject to the treatment standards for the waste contaminating the debris. See discussion in Section V.E. Not only will these residuals contain unvolatilized metals that require further treatment, but the Agency is using the residue separated from debris as a surrogate means to ensure effective debris treatment. The rule achieves this objective by requiring that the residue separated from the treated debris must meet the waste-specific treatment standards for organic compounds in the waste contaminating the debris. If the residue (prior to further treatment) does not meet applicable treatment standards for organic compounds, it is an indication that the desorption process did not effectively extract the organic contaminants subject to treatment. Thus, the treatment is not BDAT, the treated debris is not excluded from subtitle C, and both the residues and the debris cannot be land disposed without further treatment.

Separation of the desorbed debris from treatment residuals (i.e., soil, waste, or other nondebris materials) must be accomplished using simple physical or mechanical means such as vibratory or trommel screens or water washing. The separation process need not produce a "clean debris surface" [36] as discussed above, however; rather the debris surface must be free of caked residuals or nondebris materials such as soil or waste. For example, debris need not be water washed after trommel screening to remove dust from residuals or nondebris material. (Note that the use of water washing to separate thermally desorbed debris from residuals and nondebris materials need not comply with the treatment standards for water washing (e.g., treatment to a "clean debris surface") because the debris has already been treated by an alternative technology.)

c. *Destruction Technologies.* The Agency has identified two classifications of destruction technologies: chemical destruction and thermal destruction. These technologies are designed and operated to destroy hazardous contaminants on debris surfaces and in surface pores.

(1) Biodegradation. Biodegradation is the removal of hazardous contaminants from debris surfaces and surface pores in an aqueous solution and biodegradation of organic or nonmetallic inorganic compounds (i.e., inorganics that contain phosphorus, nitrogen, or sulfur) in units operated under either aerobic or anaerobic conditions. The rule establishes operating and performance standards and contaminant restrictions, and requires the treater to make a demonstration of "Equivalent Technology" under § 268.42(b) to document that the technology treats contaminants subject to treatment to a level equivalent to that required by the performance and design and operating standards for other technologies in Table 1, § 268.45, such that residual levels of hazardous contaminants will not pose a hazard to human health and the environment absent subtitle C control.

The Agency attempted to develop objective treatment standards that would obviate the need for an equivalency demonstration (see discussion above). The Agency determined, however, that it was very difficult to establish universal operating limits for the key operating parameters that affect treatment efficiency—type of matrix contaminating the debris, biological proprieties of the contaminant, temperature, pH, treatment time, biomass concentration, moisture level, and for aerobic biodegradation, oxygen concentration—that would strike a balance between ensuring treatment to minimum threat levels and establishing requirements that could

[35] See previous discussion in the text that, if size reduction of debris to meet the treatment standards reduces the particle size to below the minimum 60 mm size limit for the definition of debris, such nondebris material is subject to the waste-specific treatment standards for the waste contaminating the material, unless the debris has been cleaned and separated from contaminated soil and waste prior to size reduction.

[36] "Clean debris surface" means the surface, when viewed without magnification, shall be free of all visible soil, waste, paint, or other foreign (i.e., nondebris) matter, except that residual staining consisting of light shadows, slight streaks, or minor discolorations, and foreign matter in cracks and crevices may be present provided that such staining and foreign matter in cracks and crevices shall be limited to no more than 5% of each square inch of surface area.

grossly over-regulate in many situations. Rather, the Agency believes that operating requirements can best be determined on a case-by-case basis (i.e., under an equivalent technology demonstration under § 268.42(b)) considering the parameters listed above.

In addition, the Agency believes that the performance standard used for physical and chemical extraction—treatment to a clean debris surface—is not practicable for biodegradation because treated debris surfaces are likely to fail that standard even though organic contaminants may have been destroyed and metal contaminants may have been extracted. Further, the Agency could not identify a generic standard that would ensure effective treatment of organic contaminants that may be beneath the surface of porous debris.

In addition to the requirement to make an equivalency demonstration, the treatment standards establish a maximum thickness (in one dimension) for porous debris of 1.2 cm (½ inch.[37] These requirements will help ensure extraction of contaminants from below the surface of porous debris.

The rule also restricts the use of biodegradation for metal contaminants because metals are not destroyed by the biomass (i.e., biodegradation is not BDAT for metals). Further, the performance and design and operating standards would not ensure that undestroyed metal would partition to the biomass for treatment to the numeric standards for the waste contaminating the debris. This is because the performance standard does not require treatment to a "clean debris surface" as discussed above, so that neither the performance standard nor the requirement to separate treated debris from residuals (see discussion below) would ensure that metal contaminants would partition to the residue.

The treatment standard for biodegradation requires separation of the treated debris from treatment residuals (i.e., soil, waste, or other nondebris material) because residuals are subject to the numerical treatment standards for the waste contaminating the debris. See discussion in section V.E. Not only will these residuals contain metal contaminants that require further treatment, but the Agency is using the residue separated from debris as a surrogate means to ensure effective debris treatment. Accordingly, the debris treatment standard also requires that the residue separated from the treated debris must meet the waste-specific treatment standards for organic compounds in the waste contaminating the debris prior to further treatment. If the residue (prior to further treatment) does not meet applicable treatment standards for organic compounds, it is an indication that the biodegradation process did not effectively destroy the organic contaminants subject to treatment. Thus, the treatment is not BDAT, treated debris is not excluded from subtitle C, and both the residues and the debris cannot be land disposed without further treatment.

Separation of the biodegraded debris from treatment residuals, soil, waste, or other nondebris materials (collectively referred to as residuals and subject to the treatment standards for residuals) must be accomplished using simple physical or mechanical means such as vibratory or trommel screens or water washing. The separation process need not produce a "clean debris surface" as discussed above, however; rather the debris surface must be free of caked biomass or nondebris materials such as soil or waste. For example, the use of water to wash off the biomass or other foreign matter from the debris after removal from the treatment process does not subject the debris to the treatment standards for water washing (e.g., treatment to a "clean debris surface"). This is because the debris has already been treated by an alternative technology.

(2) Chemical Destruction. The rule establishes two chemical destruction technologies as BDAT: Chemical oxidation and chemical reduction.

(a) Chemical Oxidation. Chemical oxidation is chemical or electolytic oxidation utilizing the following oxidation reagents (or waste reagents) or combination of reagents: Hypochlorite (e.g., bleach); chlorine; chlorine dioxide; ozone or UV (ultraviolet light) assisted ozone; peroxides; persulfates; perchlorates; permanganates; and/or other oxidizing reagents of equivalent destruction efficiency. Chemical oxidation specifically includes what is referred to as alkaline chlorination.

The Agency was not able to develop objective performance or design and operation standards because of the variety of oxidation reagents that could be used and the variety of chemical and physical properties of debris and hazardous contaminants. In addition, the Agency believes that the performance standard used for physical and chemical extraction—treatment to a clean debris surface—is not practicable for chemical oxidation because treated debris surfaces are likely to fail that standard even though organic contaminants may have been destroyed and metal contaminants may have been extracted. Further, the Agency could not identify a generic standard that would ensure effective treatment of organic contaminants that may be beneath the surface of porous debris. Consequently, the primary treatment standard for chemical oxidation requires the treater to make a demonstration of "Equivalent Technology" under § 268.42(b) to document that the technology treats contaminants subject to treatment to a level equivalent to that required by the performance and design and operating standards for other technologies in Table 1, § 268.45, such that residual levels of hazardous contaminants will not pose a hazard to human health and the environment absent subtitle C control. See discussion above.

The rule also restricts the use of chemical oxidation for metal contaminants because metals are not destroyed by the chemical reagents (i.e., chemical oxidation is not BDAT for metals). Further, the performance and design and operating standards would not ensure that undestroyed metal would partition to the residue for treatment to the numeric standards for the waste contaminating the debris. This is because the performance standard does not require treatment to a "clean debris surface" as discussed above, so that neither the performance standard nor the requirement to separate treated debris from residuals (see discussion below) would ensure that metal contaminants would partition to the residue.

In addition, to help ensure effective treatment, the treatment standard requires that porous debris—brick, cloth, concrete, paper, pavement, rock, and wood—cannot have a thickness exceeding 1.2 cm (½ inch) [38] prior to treatment to ensure effective treatment of contaminants absorbed beyond the debris surface.

Finally, the rule requires that the treated debris must be separated from

[37] See previous discussion in the text that, if size reduction of debris to meet the treatment standards reduces the particle size to below the minimum 60 mm size limit for the definition of debris, such nondebris material is subject to the waste-specific treatment standards for the waste contaminating the material, unless the debris has been cleaned and separated from contaminated soil and waste prior to size reduction.

[38] See previous discussion in the text that, if size reduction of debris to meet the treatment standards reduces the particle size to below the minimum 60 mm size limit for the definition of debris, such nondebris material is subject to the waste-specific treatment standards for the waste contaminating the material, unless the debris has been cleaned and separated from contaminated soil and waste prior to size reduction.

treatment residues, and that such separated residue must meet the waste-specific treatment standards for organic compounds for the waste contaminating the debris. See discussion above for rationale and information on how this provision works.

(b) Chemical Reduction. Chemical reduction is a chemical reaction utilizing the following reducing reagents (or waste reagents) or a combination of reagents: Sulfur dioxide; sodium, potassium, or alkali salts of sulfites, bisulfites, and metabisulfites, and polyethylene glycols (e.g., NaPEG and KPEG); sodium hydrosulfide; ferrous salts; and/or other reducing reagents of equivalent efficiency. The treatment standards for chemical reduction are identical to those for chemical oxidation because the technologies are based on similar chemical reactions.

(3) Thermal Destruction. Thermal destruction is treatment in an incinerator operating in accordance with subpart O of part 264 or 265, a boiler or industrial furnace operating in accordance with subpart H of part 266, or other thermal treatment unit operated in accordance with subpart X, part 264 (permit standards) or subpart P, part 265 (interim status standards).

As noted above in the discussion of treatment standards for thermal desorption, a thermal desorber is regulated either as an incinerator (if the device is direct-fired or if the off-gas is burned in an afterburner) under subpart O of part 264 or 265, or as a thermal treatment unit under subpart X, part 264 or subpart P, part 265. To distinguish between thermal desorption and thermal destruction (for which separate debris treatment standards are provided) for purposes of complying with this rule, the primary purpose of thermal desorption is to volatilize contaminants and to remove them from the treatment chamber for subsequent destruction or treatment. The definition of thermal destruction in Table 1, § 268.45, specifically excludes thermal desorbers.

Today's rule requires that treatment residuals be separated from the debris and restricts the use of thermal destruction (i.e., thermal treatment is not BDAT) for inorganic debris contaminated with a metal other than mercury. In addition, if debris is contaminated with a dioxin-listed waste, thermal destruction is not BDAT and the treated debris is not excluded from subtitle C unless the treater makes an "Equivalent Technology" demonstration to the Agency under § 268.42(b) that documents that the technology treats contaminants subject to treatment to a level equivalent to that required by the performance and design and operating standards for other technologies in Table 1, § 268.45, such that residual levels of hazardous contaminants will not pose a hazard to human health and the environment absent subtitle C control. (Note as discussed below that these restrictions do not apply to vitrification.)

Given that thermal destruction uses substantially higher temperatures and often longer residence times than thermal desorption, the Agency believes that thermal destruction will destroy all but the most toxic hazardous nonmetal contaminants to minimum threat levels. Although metal contaminants will not be destroyed, metal contaminants in organic debris (e.g., wood, paper) will be removed from the treated debris. Metals in organic debris will partition to the residue (i.e., the material resulting from treatment that remains subject to numerical treatment standards) because the organic debris will be destroyed. Given that the treatment standards require separation of treated debris from the residue, the metals from the organic debris will partition to the residue for subsequent treatment to the waste-specific treatment standards for the waste contaminating the debris.[39] Thus, only metals contaminating inorganic debris (e.g., concrete, bricks) may remain untreated if they are not volatilized. To ensure treatment of such metals, the rule restricts the use of thermal destruction (i.e., thermal treatment is not BDAT) for inorganic debris contaminated with a metal other than the highly volatile mercury.

The treatment standards also require that the residue separated from the treated debris must meet the waste-specific treatment standards for the BDAT organic contaminants in the waste contaminating the debris prior to further treatment. This will help ensure that the thermal destruction unit has effectively destroyed organic contaminants in the debris.

In addition, the Agency is concerned that extremely toxic contaminants may not be destroyed (or removed with the residue) to levels that would not pose a hazard to human health and the environment absent subtitle C control. Consequently, if debris is contaminated with a dioxin-listed waste, incineration is not BDAT for the debris and the debris is not excluded from subtitle C after treatment unless the treater obtains approval from the Director of the design and operating conditions of the thermal destruction unit. We considered applying this restriction only to porous, inorganic debris under the reasoning that the contaminants in dioxin-listed waste would partition to the residue for nonporous debris (e.g., metal) and organic, porous debris (e.g., wood). We were concerned, however, that if such contaminants remained undestroyed even at low concentrations in the residue and were not completely removed from the treated debris, that the debris could pose a health or environmental hazard absent subtitle C control. Given that the requirements for separation of residue and treated debris do not require a "clean debris surface" but, rather allow a dusting of residue to remain on the debris, we believe that it is prudent to establish this restriction on dioxin-listed waste.

Finally, we note that vitrification is a type of thermal destruction and that the rule establishes special (i.e., reduced) requirements for vitrification. Although the Agency classified vitrification as both thermal destruction and an immobilization technology at proposal (57 FR 1036), the Agency believes that the regulation is more easily understood if vitrification is classified only as thermal destruction with appropriate consideration given to the fact that vitrification heats the debris to extremely high temperatures resulting in the formation of nonasbestiform glass. The fact that vitrification transforms debris into a glass-like residue is the basis for the special requirements established for vitrification: (1) The restriction on metal contaminants for porous, inorganic debris does not apply; and (2) the requirement for Agency approval of design and operating conditions to treat debris contaminated with dioxin-listed waste does not apply. Nonetheless, the vitrified residue, like all debris treatment residue, is subject to the waste-specific treatment standards for the waste contaminating the debris.

d. *Immobilization Technologies.* The Agency has identified three immobilization technologies as BDAT for hazardous debris: macroencapsulation, microencapsulation, and sealing. Immobilized debris must be land disposed in a subtitle C facility;[40] it is not excluded from subtitle C regulation because the contaminants have not been destroyed or removed but rather contained indefinitely. Today's rule

[39] Although metals in soil or waste contaminating the debris may be removed by separation of the treated debris from these materials as the rule requires, metals in metal-bearing, heat resistant coatings on inorganic debris may neither be volatilized nor separated from the treated debris.

[40] In the Phase II land disposal restrictions rule, the Agency will reopen and request comment on the issue of whether immobilized debris should be excluded from subtitle C regulation.

establishes only general, nonobjective performance standards for these technologies rather than the more prescriptive standards that were proposed (57 FR 1035–1036) because, based on public comment and the Agency's re-evaluation, the Agency is concerned that the proposed prescriptive standards may be overly restrictive (i.e., by requiring conditions that are more than necessary to ensure immobilization prior to subtitle C management) [41] in some cases and ineffective in others. Nonetheless, the Agency believes that the performance standards promulgated will substantially reduce the likelihood of migration of hazardous constituents from the debris as required by RCRA section 3004(m)(1).

(a) Macroencapsulation. Macroencapsulation is the application of surface coating materials such as polymeric organics (e.g., resins and plastics) or the use of a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. The treatment standard requires that the encapsulating material must completely encapsulate the debris (i.e., the encapsulant must completely surround the debris and be unbroken). Further, the encapsulating material must be resistant to degradation by the debris and its contaminants and materials into which it may come into contact after placement (leachate, other waste, microbes) to ensure that the likelihood of migration of toxic contaminants has been substantially reduced.

(b) Microencapsulation. Microencapsulation is stabilization of the debris with the following reagents (or waste reagents) such that the leachability of the hazardous contaminants is reduced: Portland cement; or lime/pozzolans (e.g., fly ash and cement kiln dust). Reagents (e.g., iron salts, silicates, and clays) may be added to enhance the set/cure time and/or compressive strength, or to reduce the leachability of the hazardous constituents. The performance standard for microencapsulation requires that the leachability of the hazardous contaminants must be reduced.

We note that the proposed rule would have prohibited the presence of free liquids in the microencapsulated debris. Today's rule does not provide this explicit prohibition because free liquids are prohibited from land disposal facilities under existing requirements—§ 264.314 or 265.314.

If the treater reduces the particle size of debris to make it amenable to microencapsulation so that the debris no longer meets the 60 mm minimum particle size limit for debris, such material is subject to the waste-specific treatment standards for the waste contaminating the material, unless the debris has been cleaned and separated from contaminated soil and waste before size reduction. This is consistent with the Agency's position that material with a particle size less than 60 mm is amenable to conventional treatment for process waste and small particle-sized material (i.e., as opposed to large debris objects) and that such material can be reasonably sampled for analysis to document compliance with the concentration-based treatment standards for the waste contaminating the material.

If the debris has been cleaned and separated from contaminated soil and hazardous waste [42] before size reduction, the material remains classified as debris subject to today's treatment standards even if it no longer has a 60 mm particle size. The Agency believes that cleaning and separation of contaminated soil and hazardous waste will substantially reduce the concentration of toxic constituents such that, upon microencapsulation and placement in a subtitle C unit, the toxic constituents should not pose a hazard to human health and the environment.

The level of cleaning and separation that is required is the same as required for separation of treatment residue from treated debris. See Note 9 to Table 1, § 268.45. At a minimum, simple physical or mechanical methods must be used such as vibratory or trommel screening or water washing. The debris surface need not be cleaned to a "clean debris surface" as defined in Table 1; rather, the surface must be free of caked soil, waste, or other nondebris material. Nondebris materials so separated are subject to the waste-specific treatment standards for the waste contaminating the material.

(c) Sealing. Sealing is the application of an appropriate material which adheres tightly to the debris surface to avoid exposure of the surface to potential leaching media. When necessary to effectively seal the surface, sealing entails pretreatment of the debris surface to remove foreign matter and to clean and roughen the surface. Sealing materials include epoxy, silicone, and urethane compounds; paint may not be used as a sealant.

The performance standard requires that the sealing must be performed to avoid exposure of the debris surface to potential leaching media—that is, the sealant must completely enclose the debris. Further, the sealant must be resistant to degradation by the debris and its contaminants and materials into which it may come into contact after placement (leachate, other waste, microbes) to ensure that the likelihood of migration of toxic contaminants has been substantially reduced.

e. *Changes to the Proposed Rule.* In addition to the changes from proposal discussed above, today's final rule greatly simplifies presentation of the treatment standards. Proposed Table 1 (indicating by YES or NO which technologies would be BDAT for which debris types when specific contaminant categories were present) and Table 2 (classifying contaminants by category) are not promulgated. Nonetheless, the final rule will operate essentially as the Agency had intended for the proposal rule. Rather than explicitly identifying acceptable technology/debris/contaminant combinations in two tables and providing the performance or design and operating standards in a third table as proposed, the final rule establishes the treatment standards in a single table—Table 1 of § 268.45. Not only was the proposed approach confusing, but proposed Table 1 forced unintended consequences.

Proposed Table 1 would have prohibited the use of particular technologies to treat certain debris types contaminated with certain hazardous constituents. In most cases, the proposed prohibition was based on the impracticability of applying the technology to the debris type rather than a determination as to whether the technology would effectively treat the debris if it was (or could be) applied. An example is the proposed prohibition on using abrasive blasting for paper, cloth, rubber, and plastic. The Agency has determined that abrasive blasting should be allowed for these types of debris because they may be mixed with debris that is amenable to the technology and would be converted to a treatment residue. An example is a steel I-beam that has paper labels on it. If abrasive blasting was used to treat the I-beam, the performance standards would ensure that the paper labels became part of the treatment residual subject to the treatment standard for the waste contaminating the debris.

We note, however, that depending on the type of contaminants subject to

[41] For example, by requiring a minimum 7 day cure time for microencapsulation when some reagents can adequately stabilize some debris types in much less time.

[42] We note that mixtures of contaminated soil, waste, and debris are regulated as debris if the mixture is at least 50% debris by volume. Thus, materials regulated as debris may contain high concentrations of toxic constituents.

treatment and the technology selected to treat the debris, more than one treatment technology may be required to meet the standards. For example, if water washing was used as an extraction technology for a porous debris (e.g., concrete) with a contaminant subject to treatment that was not soluble to at least 5% by weight in the water solution, another technology (e.g., thermal desorption) must be used to treat that contaminant.

In summary, today's final rule uses the definition of the technology, the performance or design and operating standards, and the contaminant restrictions provided by Table 1 of § 268.45 to ensure effective treatment of hazardous debris.

6. Treatment of Characteristic Debris

EPA proposed that debris that exhibits a characteristic of ignitability or reactivity, or that is contaminated with wastes that are ignitable, reactive, or corrosive, be treated to deactivate the waste. See 57 FR 1021. The Agency solicited comment on the question of whether such debris should also be treated for all Appendix VIII constituents that could reasonably be expected to be contaminating the debris (see 57 FR 984–85), and whether simple dilution should be allowed as a means of achieving deactivation, *id.* at 990.

In the third third final rule, EPA established deactivation as a treatment standard for certain ignitable, corrosive, and reactive wastes, and allowed dilution as a means of achieving this standard. In large part, this was due to the enormous diversity of wastes exhibiting these characteristics and the difficulty of ascertaining the existence or extent of contamination not attributable to the characteristic property itself for this enormously disparate group of wastes. See 55 FR 22654. These concerns are less apparent for debris exhibiting ignitability or reactivity, or contaminated with ignitable, corrosive or reactive wastes, because there appears to be much less of it (almost no debris could be ignitable, given that most ignitable wastes must be liquids (see § 261.21(a)(1) and (2)), none is corrosive (only liquids can be corrosive wastes), and also because a large proportion of debris would likely be contaminated with hazardous constituents because most hazardous debris comes from remediation sites. *Id.* at 985.

Most commenters opposed requiring treatment for specific hazardous contaminants. They also urged that all dilution be allowed as a form of treatment. Some commenters argued that this result was compelled by the statute. (This issue is presently awaiting decision by a panel of the District of Columbia Circuit Court of Appeals.) Others expressed concern with the practical difficulties inherent in sampling for hazardous constituents, or otherwise ascertaining their presence.

After considering the record, the Agency has decided to adopt the same treatment standards for ignitable, corrosive, or reactive (ICR) debris as for other hazardous debris because ICR debris is just as likely to be contaminated with hazardous constituents. See 55 FR 22654. (EPA will subcategorize ICR wastes and develop specific treatment standards, rather than allowing all types of dilution as treatment when a specific toxicity threat is apparent.) We are adopting a treatment standard of deactivation for these wastes but are requiring that the standard be achieved by use of the treatment methods adopted for other debris, unless the generator or treater demonstrates to the Agency that the debris does not contain toxic constituents. See discussion on codification of the contained-in principle above in Section V.B.2.b. (If necessary, petitioners could also make an equivalency demonstration under § 268.42(b) if they wish to treat by some means other than one of the methods set out in the rule.) This will result in some treatment of hazardous constituents that are present, rather than allowing simple dilution to be used. (Many treatment methods for debris involve some type of dilution, and are permissible under today's rule. The effect of today's rule is to prohibit dilution other than that occurring as a result of a designated treatment method. An example of impermissible dilution could be packing ignitable, corrosive, or reactive debris in sand.) In addition, the types of concerns voiced by the Agency in the third third rule against adopting this type of standard for all ignitable, corrosive, and reactive wastes are not present for debris. The Agency is not requiring identification of hazardous contaminants that may be present, as proposed, in part due to the practical concerns voiced by commenters, in part because the Agency is not adopting this approach for other debris, and because most of the treatment methods will provide some treatment of most if not all hazardous contaminants.

EPA is not providing the option of treating by existing treatment standards for these wastes. This is because the existing treatment standard for most ignitable, corrosive, or reactive wastes can be achieved by deactivation involving any type of dilution. Since this is the very result that the Agency is seeking to avoid, EPA is indicating in the rule that this option is not available for this one class of debris.

EPA noted at proposal that special rules would be needed for debris that is reactive due to presence of cyanide in order that cyanide by treated adequately. See 57 FR 990. We are adopting this approach in the final rule. Any such debris must therefore be treated by one of the specified technologies for which the treatment standards can be achieved for cyanide. In addition, any residues of such treatment may not be disposed until cyanide is treated to levels established in existing Table CCW of § 268.43 (the treatment standard for waste that is reactive because of cyanide). This approach is consistent with that adopted for reactive cyanide wastes in the third third rule and should ensure that the cyanide known to be present is treated adequately before land disposal.

7. Special Requirements for Inherently Hazardous Debris

The proposed rule also considered the regulatory status of debris that is itself hazardous because it is fabricated with toxic constituents. Because such debris will continue to exhibit the toxicity characteristic after treatment by an extraction or destruction technology, today's rule requires treatment by an immobilization technology to reduce the likelihood of migration of hazardous contaminants. See § 268.45(b)(4). Examples are lead pipe, or refractory brick containing chromium. See 57 FR 990. (This debris is referred to in this preamble discussion as "inherently hazardous debris".) Such debris can also be contaminated with listed wastes. In the proposed rule, the Agency discussed how the land disposal restrictions would apply if such debris were disposed of, and also indicated that an alternative for much of this debris would be to recycle it as scrap metal, in which case an existing regulatory exemption could apply. *id.* EPA also solicited comment on what standards should apply to residues from treating inherently hazardous debris, and also requested comment on whether there were situations when immobilization would not be an appropriate treatment technology for such debris. *Id.* at n. 26 and 990–91.

The Agency is essentially adopting the proposed approach in the final rule. However, some of the issues raised in the proposal require additional clarification, which is provided below.

a. *Inherently Hazardous Debris that Is Disposed.* When recycling of inherently hazardous debris is not

practicable and it is to be disposed, today's rule requires treatment by an immobilization technology to reduce the likelihood of migration of hazardous contaminants, followed by disposal in a subtitle C facility. In response to commenters' concerns about the need for size reduction for immobilization, we note that the treatment standards for macroencapsulation and sealing may be achieved in some cases without size reductions.[43]

A number of commenters questioned whether any treatment was needed to be performed on inherently hazardous debris or whether it could simply be disposed directly. The statute forecloses that option. Section 3004(m)(1) indicates that the Agency is to establish "levels or methods of treatment, if any" which substantially reduce waste toxicity and mobility and minimize threats. If there are not such methods, the situation EPA believes contemplated by the clause "if any" in section 3004(m), the waste cannot be land disposed. See section 3004 (d), (e), and (g); see also *API* v. *EPA*, 906 F. 2d 729, 738 (D.C. Cir. 1990) (use of comparative risk assessment to compare safety of treatment methods versus land disposal of untreated wastes is unnecessary given that the statute forecloses land disposal as an option). Thus, some treatment of inherently hazardous debris is needed in order for it to be land disposed. As indicated above, the Agency believes that such methods exist (i.e., immobilization).

If inherently hazardous debris is also contaminated with listed wastes, then that waste also must be treated by one of the prescribed treatment methods, the same approach adopted for all other debris. Note that the contaminants in the waste contaminating the debris need not be treated prior to immobilization of the debris if the performance standards for the immobilization technology can be achieved without such prior treatment.

Residues from treating inherently hazardous debris would not require further treatment unless the residues also exhibited a prohibited hazardous waste characteristic. However, if the inherently hazardous debris is contaminated with a listed waste, residues from treating the debris would remain subject to the numerical standards applicable to that listed waste. Furthermore, if the debris were treated first to remove or destroy the listed waste (i.e., treated by an extraction or destruction technology prescribed in today's rule) and subsequently treated again by immobilization due to its inherent content, the Agency would not consider the debris to be contaminated any longer with a listed waste, since the initial treatment would have removed or destroyed it. Thus, any residues from subsequent immobilization would not be subject to treatment standards unless those residues exhibited a characteristic. For example, if lead pipe contaminated with listed solvents was first treated to remove the solvent and then treated to immobilize the lead, only residues from removing the solvent would have to meet the numerical solvent treatment standards. This approach mirrors that adopted for all other hazardous debris.

b. *Inherently Hazardous Debris that Is Scrap Metal and Is Recycled.* EPA's rules provide for an exemption from regulation for scrap metal that is recycled. See § 261.6(a)(3)(iv); scrap metal is defined at § 261.1(c)(6). EPA consequently indicated at proposal that the land disposal prohibitions would not apply to inherently hazardous debris that was also scrap metal being recycled. EPA adheres to that approach, which simply restates current rules (and was not reopened for reconsideration). The only obligation for generators handling such scrap metal is to keep a record of the scrap and its subsequent disposition or recycling by metal reclamation. See § 268.7(a)(6). If the scrap metal is also contaminated with listed waste, the exemption continues to apply since the material would still meet the regulatory definition of scrap metal. However, any residues from processing the waste would remain hazardous by the derived from rule, and would require treatment to meet the standard for that listed waste before it could be land disposed. Thus, persons treating such scrap metal would become hazardous waste generators, and would also incur responsibilities under the land disposal restriction rules (see § 268.7(a) (1) and (2)). As explained in the previous section, however, if the scrap metal were to be treated first by a prescribed removal or destruction technology, it would no longer be considered to be contaminated with a listed waste, and any residues generated subsequently would not be hazardous wastes unless they exhibited a hazardous waste characteristic. Thus, it may be advantageous to arrange for pretreatment of contaminants before this type of scrap metal is recycled.

c. *Status of Stainless Steel Debris.* The Agency provided an example in the proposed rule of demolition of a building containing stainless steel fixtures and indicated that if a representative sample of the demolition debris exhibited a characteristic debris would be hazardous waste. The Agency noted that stainless steel could also be removed before demolition and managed separately, perhaps by recycling it as scrap metal. See 57 FR 990.

In providing this example, the Agency was not stating that discarded stainless steel artifacts are hazardous wastes, and in fact has no information indicating that such materials, much less demolition debris containing small bits of stainless steel, would exhibit a characteristic. Although it may be worthwhile (for environmental and economic reasons) to remove metal artifacts for recycling rather than destroying them when demolition occurs, today's rule does not mandate any such conduct.

8. Relationship of the TSCA PCB Rules to Today's Rule

As proposed, the final rule requires that hazardous debris that is also a waste PCB under 40 CFR part 761 must comply with both the applicable PCB requirements and today's debris treatment standards, by satisfying the more stringent applicable requirements.

The treatment standards for hazardous debris also apply to debris contaminated with both PCBs and RCRA hazardous wastes. See § 268.45(a)(5). This is consistent with the approach taken in the third third final rule. See 55 FR 22678 (June 1, 1990). Debris treated to today's performance standards by an extraction or destruction technology (and that does not exhibit a hazardous characteristic) remains subject only to TSCA rules because it is excluded from subtitle C regulation, whereas debris treated by an immobilization technology remains subject to applicable requirements under both statutes.

Under the Toxic Substances Control Act (TSCA), disposal of debris contaminated with PCBs is regulated under 40 CFR 761.60. In addition, disposal of debris and materials resulting from the cleanup of certain PCB spills is subject to the PCB Spill Cleanup Policy, as provided under 40 CFR 761.125.

9. Relationship of Existing Agency Standards for Asbestos to Today's Rule

As proposed, the Agency is today requiring that the treatment standards for hazardous debris also apply to debris subject to standards for asbestos

[43] Certainly, size reduction to that normally achieved prior to microencapsulation is not necessary.

under OSHA, TSCA, and NESHAPs.[44] EPA acknowledges that many of the treatment technologies specified in today's rule for hazardous debris would not be practicable for asbestos debris because of the potential for occupational exposure or environmental release of asbestos. However, the Agency believes that several technologies could be used to treat hazardous debris in compliance with the applicable OSHA, NESHAPs, and TSCA by using filtration devices on air and water emissions to control asbestos—water washing and spraying; liquid phase solvent extraction; vapor phase solvent extraction; biodegradation; chemical oxidation; chemical reduction; and macroencapsulation.

The Agency considered the argument made by several commenters that asbestos-contaminated hazardous debris and hazardous debris contaminated with asbestos should be managed according to existing EPA and OSHA regulations (i.e., bagging) and placing the bagged material in a subtitle C facility. The Agency agrees with the commenters that, if bagging meets the performance standard for macroencapsulation, such debris may then be disposed of in a subtitle C facility.

10. Special Requirements for Radioactive Debris

The Agency is today requiring that hazardous debris that is subject to regulations under the Atomic Energy Act (AEA) because of its radioactivity (i.e., mixed waste) is also subject to today's debris treatment standards.[45] This is consistent with the Agency's regulation of the waste that is contaminating the debris—if a prohibited waste is also a mixed waste, it is nonetheless subject to the treatment standards for the waste.

Commenters expressed concern that the treatment of certain radioactive mixed waste debris may pose an unreasonable risk to human health and the environment due to the radiological nature of the waste. The Agency understands commenters' concerns but believes that there is sufficient flexibility in the debris treatment standards to enable generators or treaters to select a technology that will effectively treat the hazardous contaminants without posing an unreasonable risk to human health and the environment because of the radiological nature of the waste.

11. Documentation of Compliance With the Treatment Standards

When hazardous debris is treated to today's treatment standards, treaters must comply with the applicable residue analysis, notification, certification, and recordkeeping and requirements of revised § 268.7. In today's rule, the Agency has revised several paragraphs in § 268.7 and added one paragraph to accommodate hazardous debris.

Paragraph (a)(1) is revised to require generators who ship their hazardous debris to a storage or treatment facility to provide a notice that includes the information already required for restricted wastes as well as a listing of the contaminants subject to treatment. This will assist the treater in determining which treatment technology is appropriate for the debris. In addition, the notice must inform the treater that the debris is subject to (i.e., eligible for) the alternative treatment standards of Table 1; § 268.45.

Paragraph (a)(2) is revised to exempt generators of hazardous debris who obtain a determination from the Agency that the debris does not contain hazardous waste (see § 261.3(e)(2)) from the notification requirements of that paragraph for facilities receiving the shipment. Given that such debris is no longer hazardous waste, the notification requirement is not necessary.

Paragraph (a)(3) is revised to require generators whose restricted hazardous debris is not yet prohibited debris (because of, for example, the capacity variance discussed in section V.G below) to provide a notice that includes the information already required for restricted wastes as well as a listing of the contaminants subject to treatment and a statement that the debris is subject to (i.e., eligible for) the alternative treatment standards of Table 1, § 268.45. See discussion above for the rationale for requiring that this additional information be submitted to the receiving facility.

Paragraph (a)(4) is revised to exempt generators who treat their debris by one of the technologies specified in Table 1, § 268.45, from the waste analysis requirements of that paragraph. As discussed elsewhere in today's notice, the debris treatment standards are technology-specified standards rather than numerical concentration standards. Thus, analysis of the debris is generally not necessary (except to determine where knowledge about the debris is not available whether the debris exhibits a characteristic of hazardous waste).

Paragraph (b)(4) is revised to exempt facilities that treat hazardous debris so that it is excluded from the definition of hazardous waste under § 261.3(e) (i.e., debris treated by an extraction or destruction technology provided by Table 1, § 268.45, and debris that the Agency has determined does not contain hazardous waste) from the notification requirements of that paragraph. Paragraph (b)(4) requires treaters of prohibited waste to notify the land disposal facility receiving each shipment of waste of information including the treatment standards applicable to the waste. We revised this requirement because notification of receiving facilities is not necessary for debris that is excluded from subtitle C regulation. We note, however, that treaters of excluded debris are subject to the new notification (to EPA) and certification requirements provided by paragraph (d), as discussed below.

Paragraph (b)(5) is revised to exempt facilities that treat hazardous debris so that it is excluded from the definition of hazardous waste under § 261.3(e) from the certification requirements of that paragraph. Such facilities are subject to the new certification requirements, however, provided by paragraph (d), as discussed below.

Finally, paragraph (d) is added to subject generators and treaters who first claim that their debris is excluded from the definition of hazardous waste under § 261.3(e) to notification and certification requirements. Such generators and treaters are required to submit to EPA a one-time notice identifying the name and address of the subtitle D facility receiving the excluded debris, a description of the debris before treatment (i.e., as-generated), and, if the debris is excluded because it was treated by an extraction or destruction technology specified in Table 1, § 268.45 (i.e., it is not excluded as a result of a contained-in determination), the treatment technology used. The Agency will use this information for enforcement purposes. Not only will the notification identify those facilities that claim that hazardous debris is excluded from regulation, but the information on the type of debris treated and the technology used will enable the Agency to establish a priority for inspections taking into account how difficult it may be to treat the debris to the performance and design and operating standards with the selected technology.

In addition, for debris treated by a technology specified in Table 1, § 268.45

[44] For a summary of OSHA, TSCA, and NESHAP controls on asbestos, see the proposed rule at 57 FR 993–994.

[45] We note that the Agency has established treatment standards in § 268.42 for several types of radioactive wastes (e.g., D008: Radioactive lead solids subcategory) that may be generated in particle sizes greater than 60 mm, the minimum size limit for debris. Nonetheless, such wastes are excluded from the definition of debris (see § 268.2(g)) and are subject to the waste-specific treatment standards.

(i.e., debris not excluded as a result of a contained-in determination), the treater must document and certify compliance with the treatment standards specified in Table 1. The rule requires the treater to record in the facility's files all inspections, evaluations, and analyses (e.g., determinations that a physical extraction technology has removed at least 0.6 cm of the debris surface and that the debris is treated to a "clean debris surface") of the treated debris that the treater made to determine compliance with the standards, as well as any data or information pertaining to key operating parameters the treater may have generated during treatment of the debris (e.g., exit gas temperature and feed rate, of a thermal desorber). The rule also requires the treater to place a certification in the facility's files for each shipment of excluded debris that the debris has been treated in accordance with the standards specified in Table 1. These requirements will enable the Agency to enforce the debris treatment standards.

D. Exclusion of Hazardous Debris From Subtitle C Regulation

Under today's rule, hazardous debris may be excluded from subtitle C regulation either by: (1) the Agency's determination that the debris no longer contains hazardous waste (i.e., the contained-in policy discussed in section V.B.2) as provided by new § 261.3(e) (2); or (2) by compliance with the debris treatment standards for extraction or destruction technologies for exclusion from subtitle C provided in Table 1 of § 268.45 (and provided the debris does not exhibit a hazardous characteristic after treatment). The basis for excluding debris determined to no longer contain hazardous waste is discussed above in section V.B.2. We discuss here the basis for excluding from subtitle C regulation debris that is treated to meet today's performance standards requisite to such exclusion.

1. Basis for Excluding Debris Treated by Extraction or Destruction Technologies and That Is Not Characteristic

Debris treated by a prescribed extraction or destruction technology and that does not exhibit a hazardous characteristic is excluded from subtitle C regulation. As discussed in section V.C.5 above, the Agency has given careful consideration as to whether each debris/contaminant type would be effectively treated by each BDAT technology to levels that present minimum risk (i.e., would no longer pose a hazard to human health or the environment). The Agency believes that debris treated to those standards would pose minimum risk for a number of reasons. First, the Agency has deleted two technologies (i.e., electropolishing and ultraviolet radiation) from the proposed list of BDAT technologies because they are not likely to provide effective treatment. Second, the final rule requires separation of nonempty intact containers of hazardous waste from debris for treatment to the waste-specific treatment standards. Thus, containerized waste that is readily amenable to separation from debris by equipment operators in the field and that may have high concentrations of toxic constituents will be subject to concentration-based, waste-specific treatment standards rather than to the debris standards. Third, the final rule raises the particle size used to define debris from 9.5 mm to 60 mm and applies the size limit to all debris, not just geologic matter. Thus, materials that should be amenable to treatment methods for process waste are subject to the waste-specific treatment standards rather than to the debris standards. Fourth, the final rule specifically excludes process waste of any particle size (e.g., slag) from the definition of debris. Thus, process wastes with potentially high concentrations of hazardous constituents will be subject to the waste-specific treatment standards rather than to the debris standards.

Most important, the performance and design and operating standards that the rule establishes for exclusion of treated debris from subtitle C are rigorous standards. Examples are the requirements that physical extraction technologies treat metal to a "clean metal finish" and other debris surfaces to a "clean debris surface". A minimum of 0.6 cm of the surface layer of porous debris must be removed as well. Another example is the maximum thickness standard for porous debris that is to be treated by chemical extraction.

For several technologies, the Agency was concerned that the performance and design and operating standards may not ensure treatment to minimum risk levels. Consequently for these technologies—thermal desorption, biodegradation, chemical oxidation and reduction and thermal destruction of debris contaminated with dioxin-listed wasted [46]—treated debris would be excluded only after the treater successfully makes an equivalent technology demonstration to the Agency under § 268.42(b) documenting that the technology treats a particular type of debris/contaminant combination as effectively as the other BDAT technologies to residual levels of hazardous contaminants that would not pose a hazard to human health and the environment absent management controls.

Finally, the rule requires separation of the treated debris from all treatment residues, including soil, waste, or other nondebris material that could remain adhered to the debris surface. This will ensure that metal contaminants in the residue will not continue to contaminate the treated debris and that any waste or contaminated soil in a primarily debris mixture as it was generated is separated from the treated debris prior to exclusion from subtitle C.

The philosophy underlying this approach is similar to that contained in principle: It is not normally the debris itself that is hazardous, but rather hazardous waste that is contaminating the debris. Thus, the goal of treatment should be to destroy or remove the contamination (if possible) and if this is achieved, to dispose of the cleaned debris as a nonhazardous waste. The removed residues from this treatment contain the contamination, and must meet numerical concentration levels before they can be land disposed.

Not only are the treatment methods developed to achieve this objective, but the various separation requirements (both before and after treatment) forcing removal of all nondebris materials such as soil and other wastes, and the definition of debris itself (which limits the debris classification to materials most amenable to the treatment methods, and classifies materials most amenable to meaningful sampling as nondebris subject to numerical treatment standards) are intended to achieve the same goal. As discussed above, the debris treatment standards are written wherever possible as performance standards to ensure that contamination is in fact removed from the debris. In addition, the rule specifies which contaminants are unsuitable for certain of the treatment methods. In short, the Agency believes that treatment of contaminated debris by the methods established here will result in clean debris which may then be land disposed, and should also no longer be regulated as a hazardous waste.

EPA notes, however, that the notion of excluding wastes from subtitle C regulation without sampling for hazardous constituent concentration levels is potentially at odds with many of the approaches recently proposed for public comment in the Hazardous Waste

[46] Note that the standards provide other restrictions for debris contaminated with dioxin-listed waste.

Identification Rule (HWIR). See 57 FR (May 20, 1992). In that rule, the Agency asked for comment on means of identifying and excluding hazardous wastes from subtitle C regulation that potentially take into account presence of a majority of the hazardous constituents listed in appendix VIII of part 261. If these approaches are adopted, they could provide a principled means of evaluating wastes heretofore excluded from subtitle C regulation without requiring analysis of hazardous constituent concentrations, such as the debris being excluded in today's rule, or residues from "empty containers" discussed above in Section V.B.2. EPA expects that hazardous constituent levels in debris treated by the methods adopted today will be consistent with levels resulting from the May 20 proposal, and in addition, for many types of treated debris there remain difficulties in obtaining representative samples necessary to make hazardous waste identification and listing determinations, and for this reason is finalizing the rule today rather than delaying action pending the results of the May 20 rulemaking. Nevertheless, the Agency believes it an appropriate issue for comment in the HWIR rulemaking the extent to which those standards should be used to replace exclusions from the definition of hazardous waste that are established without requiring analysis of hazardous constituent levels in the excluded waste.

2. Rationale for Continued Subtitle C Regulation of Debris Treated by Immobilization

Debris treated by an immobilization technology would remain subject to subtitle C regulation. EPA currently has insufficient data to demonstrate generically that debris which can be contaminated with both organic and inorganic constituents would be nonhazardous when treated by any of the immobilization technologies. Until the Agency gathers further data, EPA is concerned that, absent subsequent subtitle C management, hazardous contaminants may migrate from certain immobilized debris at levels that could pose a hazard to human health and the environment. Thus, EPA believes it inappropriate to promulgate a self-implementing exclusion at this time. Nonetheless, in the Phase II land disposal restrictions rule, the Agency will reopen and request comment on the issue of whether immobilized debris should be excluded from subtitle C regulation. The Agency plans to investigate this issue further and will publish in the Phase II proposed rule any information or data that are available. In addition, the Agency will specifically explore the potential of using the TCLP, and if so, under what circumstances, in determining whether immobilized hazardous debris should be excluded from subtitle C control. To assist the Agency in this effort, we ask for data on the performance of specific immobilization technologies and short- or long-term leachibility studies. Based on past experiences, the Agency has found that uncertainty over the technical performance of immobilization precludes a general exemption from subtitle C for all types of immobilized hazardous debris. However, the Agency will continue to evaluate all available and new information about the performance of immobilization technologies which could limit the technical uncertainty. To the extent that sufficient information that meets proper quality assurance/quality control procedures is available, the Agency plans to propose in the Phase II LDR rule an exclusion from subtitle C for those immobilized hazardous debris.

E. Regulation of Treatment Residuals

1. Overview

In this section, we discuss: (1) The rationale for subjecting treatment residues to the waste-specific treatment standards for the waste contaminating the debris; (2) separation of treated debris from treatment residue; (3) special requirements for debris treated by spalling; (4) special requirements for residue from the treatment of debris contaminated with cyanide reactive waste; and (5) special requirements for ignitable wastewater residue.

2. Treatment Residues Are Subject to the Waste-Specific Treatment Standards for the Waste Contaminating the Debris

Residuals from the treatment of hazardous debris are subject to the waste-specific treatment standards for the waste contaminating the debris. The residual must be treated to those standards for all BDAT constituents specified in §§ 268.41, 268.42 and 268.43 for the waste.

The Agency had proposed to require treatment of nonsoil residuals to the multi-source leachate F039 levels and soil residuals to the waste-specific treatment standards for the waste contaminating the debris. Based on public comment and the Agency's re-evaluation of this issue, the Agency had determined that it is more appropriate to subject all treatment residues—soil, wastewater, and nonwastewater—to the waste-specific treatment standards for the waste contaminating the debris for a number of reasons. First, the waste-specific treatment standards currently apply to treatment residuals, and the Agency does not know of a compelling reason to change that position. Second, requiring compliance with the waste-specific treatment standards rather than the F039 standards may be somewhat easier to understand and implement because the treatment standards for the BDAT constituents in the residue can be determined at the same time that the BDAT constituents are identified as contaminants subject to treatment (i.e., the contaminants subject to treatment in the contaminated debris are the same contaminants that must be treated in treatment residuals). Third, the Agency is considering simplifying and revising the treatment standards for all prohibited waste to "universal standards" in the Phase II proposed land disposal restrictions rule.

Several commenters suggested that the thermal destruction process of vitrification should be considered immobilization of debris. Thus, commenters argued that such vitrified debris could be land disposed under subtitle C without being subject to the waste-specific treatment standards for the waste contaminating the debris. The Agency disagrees with this view. Vitrification is a type of thermal destruction that produces a residue that is vitrified. Thus, the vitrified residue is subject to the same treatment standards as any debris treatment residue—the waste-specific standards for the waste contaminating the debris. This is consistent with the Agency's position that slag from high temperature metals recovery is residue, not debris, subject to the waste-specific treatment standards.

3. Treated Debris Mixed With Treatment Residue Is Subject to Regulation as Residue

As discussed above in section V.C.5, treatment residues generally contain high levels of toxic contaminants removed from the debris. Examples are residue from thermal desorption or incineration of debris contaminated with metal-bearing waste, and residue from water washing of debris. As discussed below, treatment residuals are subject to the waste-specific treatment standards for the waste contaminating the debris. Thus, to ensure that treatment residuals are treated effectively before land disposal, and to ensure that treated debris is not contaminated with the treatment residue, the treatment standards require that the treated debris must be separated from the treatment residue. If the debris is not separated from the

treatment residue, it remains a prohibited waste and may not be land disposed. It also remains subject to all other subtitle C standards.

The Agency defines treatment residuals as residuals such as biomass from biodegradation and ash from incineration as well as soil, waste, or other nondebris material that may remain adhered to the treated debris. We note further that slag from a high temperature metals recovery furnace and vitrified residue from a thermal destruction unit are treatment residues rather than debris. In both cases, the original debris no longer exists and the residuals from soil or waste contaminating the debris are integral components of the slag and vitrified residue.

Separation of the treated debris from treatment residuals must be accomplished using simple physical or mechanical means such as vibratory or trommel screens or water washing. The separation process need not produce a "clean debris surface" [47] as discussed above, however; rather the debris surface must be free of caked residuals or nondebris materials such as soil or waste. For example, thermal desorption debris need not be water washed after trommel screening to remove dust from residuals or nondebris material. (Note that the use of water washing to separate thermally desorbed debris from residuals and nondebris materials need not comply with the treatment standards for water washing (e.g., treatment to a "clean debris surface") because the debris has already been treated by an alternative technology.)

4. Special Requirements for Debris Treated by Spalling

As proposed and as discussed in Section V.C.5, debris removed by spalling remains debris subject to the debris treatment standards. Debris surfaces removed by spalling are, by definition of the technology, large pieces of debris. The Agency believes that such pieces of spalled debris are more debris-like than waste or residual-like and are more amenable to treatment by the debris treatment standards than the waste-specific treatment standards.

[47] "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 consisting of light shadows, slight streaks, or minor discolorations, and soil and waste in cracks, crevices, and pits may be present provided that such staining and soil and waste in cracks, crevices, and pits shall be limited to no more than 5% of each square inch of surface area.

5. Special Requirements for Residue From the Treatment of Debris That Is Cyanide-Reactive

As proposed, the final rule requires that residues from the treatment of debris that is reactive because of cyanide is subject to the waste-specific treatment standards for cyanide under § 268.43. As with cyanide-reactive waste, EPA believes that BDAT for cyanide-reactive debris requires treatment of cyanide because of its toxicity.

6. Special Requirements for Ignitable Nonwastewater Residue

As proposed, the final rule requires that ignitable nonwastewater residue containing greater than or equal to 10% total organic carbon be subject to the technology-based standards for D001: "Ignitable Liquids based on 261.21(a)(1)" under § 268.42. This residue must be treated by fuel substitution (i.e., burning as fuel in a boiler or industrial furnace), recovery of organic constituents (e.g., distillation, carbon adsorption), or incineration. EPA has established these technologies as BDAT for high total organic carbon ignitable liquids because they will effectively remove or destroy the toxic organic constituents.

F. Permit Requirements for Treatment Facilities

Treatment of hazardous debris (except as discussed below for 90-day on-site treatment in a container, tank, or containment building) is currently subject to the applicable interim status and permit standards of parts 264, 265, 266, and 270 that ensure protection of human health and the environment from the operation of the treatment unit. (We note that, for containment buildings, interim status and permit standards and requirements for 90-day on-site treatment are promulgated in today's rule as discussed elsewhere in this notice.) Today's debris treatment standards to implement the land disposal restrictions of section 3004(m) of the statute do not affect those existing facility standards. For example, today's treatment standards do not reopen interim status eligibility for debris treatment facilities. (We note, however, that today's rule does establish the interim status eligibility date for containment buildings given that these units are newly regulated by this rule, assuming that such buildings are located at facilities containing no other regulated units.) Rather, today's debris treatment standards subject generators and treaters to additional requirements to ensure effective treatment of hazardous debris prior to exclusion from subtitle C (for debris treated by an extraction or destruction technology and that does not exhibit a hazardous characteristic) or land disposal in a subtitle C facility (for debris treated by an immobilization technology).

As information for the reader, we note that the existing facility standards for the following common debris treatment operations (other than for 90-day on-site treatment in a container, tank, or containment building) are:

- Debris treatment technologies conducted in tanks such as high pressure steam and water spraying, chemical extraction, and biodegradation are subject to the standards for tank facilities in subpart J of part 264 (permit standards) and part 265 (interim status standards).
- Storage or treatment in containment buildings is subject to the subpart DD, parts 264 and 265, standards also promulgated today (see discussion elsewhere in today's notice).
- Physical extraction technologies such as abrasive blasting or spalling used to treat debris in place but that is intended for discard (e.g., treatment of a contaminated building prior to demolition) are subject to the permit standards of subpart X, part 264 for miscellaneous units or the interim status standards for chemical, physical, or biological treatment in subpart Q, part 265.
- Incinerators are subject to subpart O, part 264 (permit standards) and part 265 (interim status standards).
- High temperature metal recovery furnaces are conditionally exempt from the rules for boilers and industrial furnaces burning hazardous waste in subpart H, part 266.
- Thermal desorbers are subject either to the incinerator or thermal treatment standards, depending on whether the unit meets the incinerator definition. Thermal treatment units are subject to subpart X, part 264 (permit standards for miscellaneous units) and subpart P, part 265 (interim status standards).

1. Adding Capacity for Debris Treatment to Existing Facilities

Today's rule amends the permit and interim status standards of part 270, as proposed, to facilitate the expansion of existing debris treatment capacity and the addition of new debris treatment capacity at existing facilities currently subject either to permit or interim status standards for managing hazardous waste. However, if an owner or operator of a facility that is not currently managing hazardous waste under the permit or interim status standards wants

to construct a debris treatment facility, he must first obtain a RCRA permit.

a. *Facilities With a RCA Permit.* Facilities with a RCRA permit may add new treatment processes and additional capacity by applying for a permit modification under § 270.42. See 53 FR 37912 (Sept. 28, 1988). Although regulations at § 270.42 were promulgated under pre-HSWA authority, EPA may use these regulations in authorized States when necessary to implement HSWA provisions such as the land disposal restrictions. See 53 FR 37933.

The types of modifications needed to add new capacity or processes would likely require submittal of a Class 2 or 3 modification. The Class 2 modification process requires Agency action on the request within 120 days. This action would consist of approval or denial, reclassification as a Class 3 modification, or authorization to conduct activities (in containers, tanks, and containment buildings, as discussed below) for up to 180 days pending Agency action. Further, for Class 2 modifications, construction to implement the requested facility change may commence 60 days after submission of the request. There is no deadline for Agency action for Class 3 modifications, which apply to more substantial changes.

Permitted facilities may apply under existing § 270.42(e)(3)(ii)(B) for a temporary authorization to initiate necessary activities to treat or store restricted wastes (e.g., hazardous debris) in tanks or containers while a Class 2 or 3 permit modification is undergoing review, or to undertake a treatment or storage activity which will be of short duration (e.g., decontamination of a building intended for demolition). Today's rule revises that section to enable the Agency also to grant a temporary authorization for containment buildings meeting the requirements promulgated today in subpart DD of parts 264 and 265.

Any request for a temporary authorization must demonstrate compliance with the part 264 standards and also meet the criteria of § 270.42(e) for approval. Interested members of the public (i.e., those that have previously expressed interest in any permitting action for the facility) will receive notice by mail of a facility's request for a temporary authorization. The temporary authorization may be renewed once if the additional procedures of § 270.42(e) are followed, including submission of appropriate permit modification information and the initiation of public meetings and public comment period. See 53 FR 37919.

b. *Facilities Operating Under Interim Status.* Facilities managing hazardous waste under interim status may add new treatment processes or additional treatment or storage capacity by using the existing procedures for changes during interim status in § 270.72. Under these procedures, a facility must submit to EPA a revised Part A permit application and justification explaining the need for the change. The change must then be approved by EPA.

Such changes must meet one of several criteria specified in § 270.72, such as being necessary to comply with a Federal, State, or local requirement. However, changes generally may not be made if they amount to reconstruction of the facility. The Agency considers the facility to be "reconstructed" if the capital investment for the changes to the facility exceed 50% of the capital cost of a comparable entirely new facility.

Existing § 270.72(b)(6) lifted the reconstruction limit for changes to treat or store in tanks and containers hazardous waste subject to land disposal restrictions imposed by part 268, provided that such changes are made solely for the purpose of complying with part 268 land disposal restrictions. Today's rule revises that paragraph to lift the reconstruction limit for containment buildings as well. See the the new subpart DD, part 264 and 265, standards for containment buildings that are also promulgated today.

2. On-Site Treatment of Debris in Containers, Tanks, and Containment Buildings

Existing § 262.34 exempts from permit requirements generators who store or treat hazardous debris on-site in tanks or containers for a period not exceeding 90 days provided that the tank or container is designed and operated in compliance with subpart I (for containers) and subpart J (for tanks) of part 265. Today's rule revises § 262.34, as proposed, to also provide this exemption to containment buildings designed and operated in compliance with the subpart DD, part 265, standards also promulgated today.

G. Capacity Variance for Hazardous Debris

In the May 15, 1992, Notice to Approve Hazardous Debris Case-By-Case Capacity Variance, the Agency approved a generic, one year extension of the LDR effective date applicable to all persons managing hazardous debris (57 FR 20766). For the purpose of the extension, the term "debris" was defined as set out in the preamble to the June 1, 1990 Third Third final rule. See 55 FR 22650 and § 268.2(g). Furthermore, the Agency indicated that it will explain in the debris rule how a change in definition will affect the case-by-case extensions.

Although in general, both definitions will identify the same materials as debris, there are differences that may result in situations where either definition could include debris not included by the other. Of concern is the situation where someone has entered into contracts for, or actually initiated the process of, removing for disposal debris which met the old definition but does not meet the current definition. To avoid possible disruption of on-going activities, which have relied on the previous definition of debris, the Agency will allow the extension to apply to materials meeting either definition through May 8, 1993.

H. Other Issues

1. Applicability of Standards to Contaminated Structures and Equipment

a. *Structures and Equipment Contaminated With Hazardous Waste and Intended for Discard Are Regulated Debris.* As discussed above in section V.B.1.a of the preamble, structures and equipment contaminated with hazardous waste and that are intended for discard are hazardous debris subject to today's treatment standards. Thus, if a contaminated tank or building is decontaminated before demolition, the debris may not be land disposed unless the tank or building was decontaminated in compliance with today's treatment standards. (We note that, as discussed above in section F.2, such treatment is subject to the permit standards unless conducted in a tank, container, or containment building.)

If the contaminated structure or equipment is being decontaminated for subsequent use, however, the structure or equipment is not debris and the decontamination is neither subject to today's debris treatment standards nor the permit standards for hazardous waste management facilities. Thus, cleaning a building that is in use is not treatment of debris.

b. *Treatment Standards for Concrete Pads and Walls Intended for Discard.* The Agency believes that concrete pads and walls are typically decontaminated using "water washing" techniques. These techniques include the following technologies specified in today's rule: Abrasive blasting using water to propel abrasive media, high pressure steam or water sprays, and water washing and spraying.

We note that the performance standards for abrasive blasting and high

pressure water sprays require removal of 0.6 cm of the surface because these are physical extraction technologies designed to remove the surface layer of the debris. The performance standards for water washing and spraying limits the thickness of the concrete to 3/8 inch because this technology relies on chemical extraction (i.e., dissolving or removing with surfactants) of contaminants below the concrete surface. If the treater believes that treatment to these performance standards is not necessary to ensure effective treatment to residual levels of hazardous constituents that will not pose a hazard to human health and the environment absent management controls, the treater may: (1) Obtain a waiver of the standards (e.g., the thickness limit for water washing) under an equivalent technology demonstration under § 268.42(b); or (2) demonstrate to the Agency that the debris upon alternative treatment does not contain toxic constituents under the contained-in principle codified in today's rule. See discussion in section V.B.2.b above.

c. *Relation of Debris Standards to Closure Rules.* Existing closure standards for hazardous waste management facilities require "decontamination" of contaminated structures and equipment. See, e.g., §§ 264.114 and 265.114. The precise meaning of decontamination presently is determined on a case-by-case basis through review of the facility's closure plan. However, if such structures or equipment is also debris which is going to be land disposed, which could often be the case, an issue arises regarding the relationship of the "decontamination" standard in the closure rule and the treatment methods adopted in today's rule.

The Agency believes that the treatment methods in today's rule would always satisfy the decontamination standard in the closure provisions. After all, the purpose of these treatment methods is to decontaminate. EPA also interprets the land disposal and closure rules to require that all hazardous debris be treated to meet the debris treatment standards, even if the debris is generated during closure. (Put another way, the debris standards normally would be appropriate for any debris generated as a result of closure.)

If the debris treatment standards appear to be inappropriate for debris (such as contaminated structures or equipment) generated during closure, a site-specific treatability variance pursuant to § 268.44(h) may be available. The Agency believes that such a variance could be processed administratively as part of the closure procedures.

2. Mixing of Hazardous Waste or Contaminated Soil With Debris To Avoid the Waste-Specific Treatment Standards Is Prohibited

Today's rule prohibits the intentional mixing of hazardous waste or contaminated soil with debris to avoid the concentration-based treatment standards for the waste or soil. The Agency is prohibiting such sham mixing to ensure that hazardous waste and contaminated soil are treated to the existing treatment standards given that the waste [48] is amenable to treatment to those levels and that the waste and soil are likely to be much more heavily contaminated with hazardous constituents than debris and, thus, should be subject to such concentration-based treatment levels.

The prohibition on mixing applies to debris treated by any technology: Immobilization as well as extraction or destruction. Although the debris treatment standards require separation of the waste or contaminated soil from debris treated by an extraction or destruction technology and that the residue must meet the waste-specific treatment standards for the waste contaminating the debris, the treatment process itself could enable the residue to meet the concentration-based waste treatment standards by virtue of dilution during treatment. An example is water washing of debris intentionally mixed with a prohibited listed waste. The water residue may easily meet the waste-specific treatment standard by virtue of dilution rather than treatment.

We note that this prohibition on sham mixing does not affect implementation of the principle discussed above in section V.B.1 to classifying mixtures of debris with contaminated soil or waste as debris. That principle says that if debris is the primary material in a mixture by volume based on visual observation, the mixture is subject to regulation as debris. Thus, for example, when debris is initially excavated in a mixture of debris and nondebris materials, and debris is the primary material present, the mixture is appropriately regulated as debris and sham mixing has not occurred. However, if debris is intentionally mixed with contaminated soil or hazardous waste (e.g., after excavation), and the mixture is regulated as debris by the application of the mixture principle and subsequently immobilized, prohibited sham mixing has occurred.

3. Procedures for Demonstrating Equivalency of Alternative Technologies

As discussed at proposal, existing § 268.43(b) provides the generator or treater an opportunity to demonstrate to the Agency than an alternative technology can achieve the equivalent level of performance as that of the specified treatment method. We note that this variance procedure can also be used to demonstrate that one of the technologies specified in today's rule can be designed or operated under conditions other than those established in Table 1, § 268.45, to provide equivalent treatment (i.e., meet the performance standard for the technology) or that a specified technology can treat hazardous contaminants to levels that do not pose a hazard to human health and the environment absent subtitle C control without achieving the performance and design and operating standards established in Table 1.

In addition, the Agency is requiring in the treatment standards of Table 1, § 268.45, that treaters must make an Equivalency Demonstration under § 268.43(b) in order for certain technologies to be considered BDAT. See discussion above for thermal desorption, biodegradation, and chemical destruction.

VI. Capacity Determinations

This section presents the data sources, methodology, and results of EPA's capacity analysis for today's newly listed wastes. Specifically, section VI summarizes the results of the capacity analysis for petroleum refining wastes and other organic wastes; wastes mixed with radioactive contaminants; and debris contaminated with the newly listed wastes. Soil and debris contaminated with newly listed wastes for which standards are finalized today will be addressed in future proposals.

The capacity analysis for the newly listed wastes for which the Agency is today promulgating treatment standards relied on information obtained from several sources. Primary data sources include the National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities (the TSDR Survey), the National Survey of Hazardous Waste Generators (the Generator Survey), data received in response to the proposed rule (57 FR 957), data received in response to the ANPRM for the Newly Identified and

[48] We note that the Agency is concerned that the waste treatment standards may not be appropriate for soil contaminated with the waste and, consequently is considering proposing in summer 1992 treatment standards for contaminated soil.

268.43.—TABLE CCW.—CONSTITUENT CONCENTRATIONS IN WASTES—Continued

Waste code	Commercial chemical name	See also	Regulated hazardous constituent	CAS number for regulated hazardous constituent	Wastewaters		Nonwastewaters	
					Concentration (mg/l)	Notes	Concentration (mg/l)	Notes
K052	NA	Table CCWE in 268.41.	o-Cresol	95-48-7	0.11	(2)	6.2	(1)
			p-Cresol	106-44-5	0.77	(2)	6.2	(1)
			2,4-Dimethylphenol	105-67-9	0.036	(2)	NA	
			Ethylbenzene	100-41-4	0.057	(2)	14	(1)
			Naphthalene	91-20-3	0.059	(2)	42	(1)
			Phenanthrene	85-01-8	0.059	(2)	34	(1)
			Phenol	108-95-2	0.039	(2)	3.6	(1)
			Toluene	108-88-3	0.08	(2)	14	(1)
			Xylenes		0.32	(2)	22	(1)
			Cyanides (Total)	56-12-5	0.028	(1)	1.8	(1)
			Chromium (Total)	7440-47-32	0.2		NA	
			Lead	7439-92-1	0.037		NA	
*	*	*	*	*	*		*	
K087	NA	Table CCWE in 268.41.	Acenaphthalene	208-96-8	0.059	(2)	3.4	
			Benzene	71-43-2	0.14	(2)	0.071	(1)
			Chrysene	218-01-9	0.059	(2)	3.4	(1)
			Fluoranthene	206-44-0	0.068	(2)	3.4	(1)
			Indeno (1,2,3-cd) pyrene	193-39-5	0.0055	(2)	3.4	(1)
			Naphthalene	91-20-3	0.059	(2)	3.4	(1)
			Phenanthrene	85-01-8	0.059	(2)	3.4	(1)
			Toluene	108-88-3	0.08	(2)	0.65	(1)
			Xylenes		0.32	(2)	0.07	(1)
			Lead	7439-92-1	0.037		NA	
K093	NA		Phthalic anhydride (measured as Phthalic acid).	85-44-9	0.069		28	(1)
K094	NA		Phthalic anhydride (measured as Phthalic acid).	85-44-9	0.069		28	(1)
*	*	*	*	*	*		*	
K111	NA		2,4-Dinitrotoluene	121-14-2	0.32		140	(1)
			2,6-Dinitrotoluene	606-20-2	0.55		28	(1)
*	*	*	*	*	*		*	
K117	NA		Ethylene dibromide	106-93-4	0.028		15	(1)
			Methyl bromide	74-83-9	0.11		15	(1)
			Chloroform	67-66-3	0.046		5.6	(1)
K118	NA		Ethylene dibromide	106-93-4	0.028		15	(1)
			Methyl bromide	74-83-9	0.11		15	(1)
			Chloroform	67-66-3	0.046		5.6	(1)
K131	NA		Methyl bromide	74-83-9	0.11		15	(1)
K132	NA		Methyl bromide	74-83-9	0.11		15	(1)
K136	NA		Ethylene dibromide	106-93-4	0.028		15	(1)
			Methyl bromide	74-83-9	0.11		15	(1)
			Chloroform	67-66-3	0.046		5.6	(1)
*	*	*	*	*	*		*	
U028	Bis(2-ethylhexyl) phthalate.		Bis(2-ethylhexyl) phthalate	117-81-7	0.28		28	(1)
*	*	*	*	*	*		*	
U069	Di-n-butyl phthalate.		Di-n-butyl phthalate	84-74-2	0.057		28	(1)
*	*	*	*	*	*		*	
U088	Diethyl phthalate		Diethyl phthalate	84-66-2	0.2		28	(1)
*	*	*	*	*	*		*	
U102	Dimethyl phthalate		Dimethyl phthalate	131-11-3	0.047		28	(1)
*	*	*	*	*	*		*	
U107	Di-n-octyl phthalate.		Di-n-octyl phthalate	117-84-0	0.017		28	(1)
*	*	*	*	*	*		*	
U190	Phthalic anhydride (measured as Phthalic acid).		Phthalic anhydride (measured as Phthalic acid).	85-44-9	0.069		28	(1)
*	*	*	*	*	*		*	

[1] Treatment standards for this organic constituent were established based upon incineration in units operated in accordance with the technical requirements of 40 CFR 264 Subpart O or Part 265 Subpart O, or based upon combustion in fuel substitution units operating in accordance with applicable technical requirements. A facility may certify compliance with these treatment standards according to provisions in 40 CFR Section 268.7.

[2] Based on analysis of composite samples.

* * * * * * *

NOTE: NA means Not Applicable.

38. In subpart D, § 268.45 with Table 1 is added to read as follows:

§268.45 Treatment standards for hazardous debris.

(a) *Treatment standards.* Hazardous debris must be treated prior to land disposal as follows unless EPA determines under § 261.3(e)(2) of this chapter that the debris is no longer contaminated with hazardous waste or

the debris is treated to the waste-specific treatment standard provided in this subpart for the waste contaminating the debris:

(1) *General.* Hazardous debris must be treated for each "contaminant subject to treatment" defined by paragraph (b) of this section using the technology or technologies identified in Table 1 of this section.

(2) *Characteristic debris.* Hazardous debris that exhibits the characteristic of ignitability, corrosivity, or reactivity identified under §§ 261.21, 261.22, and 261.23 of this chapter, respectively, must be deactivated by treatment using one of the technologies identified in Table 1 of this section.

(3) *Mixtures of debris types.* The treatment standards of Table 1 in this section must be achieved for each type of debris contained in a mixture of debris types. If an immobilization technology is used in a treatment train, it must be the last treatment technology used.

(4) *Mixtures of contaminant types.* Debris that is contaminated with two or more contaminants subject to treatment identified under paragraph (b) of this section must be treated for each contaminant using one or more treatment technologies identified in Table 1 of this section. If an immobilization technology is used in a treatment train, it must be the last treatment technology used.

(5) *Waste PCBs.* Hazardous debris that is also a waste PCB under 40 CFR part 761 is subject to the requirements of either 40 CFR part 761 or the requirements of this section, whichever are more stringent.

(b) *Contaminants subject to treatment.* Hazardous debris must be treated for each "contaminant subject to treatment." The contaminants subject to treatment must be determined as follows:

(1) *Toxicity characteristic debris.* The contaminants subject to treatment for debris that exhibits the Toxicity Characteristic (TC) by § 261.24 of this chapter are those EP constituents for which the debris exhibits the TC toxicity characteristic.

(2) *Debris contaminated with listed waste.* The contaminants subject to treatment for debris that is contaminated with a prohibited listed hazardous waste are those constituents for which BDAT standards are established for the waste under §§ 268.41 and 268.43.

(3) *Cyanide reactive debris.* Hazardous debris that is reactive because of cyanide must be treated for cyanide.

(c) *Conditioned exclusion of treated debris.* Hazardous debris that has been treated using one of the specified extraction or destruction technologies in Table 1 of this section and that does not exhibit a characteristic of hazardous waste identified under subpart C, part 261, of this chapter after treatment is not a hazardous waste and need not be managed in a subtitle C facility. Hazardous debris contaminated with a listed waste that is treated by an immobilization technology specified in Table 1 is a hazardous waste and must be managed in a subtitle C facility.

(d) *Treatment residuals*—(1) *General requirements.* Except as provided by paragraphs (d)(2) and (d)(4) of this section:

(i) Residue from the treatment of hazardous debris must be separated from the treated debris using simple physical or mechanical means; and

(ii) Residue from the treatment of hazardous debris is subject to the waste-specific treatment standards provided by subpart D of this part for the waste contaminating the debris.

(2) *Nontoxic debris.* Residue from the deactivation of ignitable, corrosive, or reactive characteristic hazardous debris (other than cyanide-reactive) that is not contaminated with a contaminant subject to treatment defined by paragraph (b) of this section, must be deactivated prior to land disposal and is not subject to the waste-specific treatment standards of subpart D of this part.

(3) *Cyanide-reactive debris.* Residue from the treatment of debris that is reactive because of cyanide must meet the standards for D003 under § 268.43.

(4) *Ignitable nonwastewater residue.* Ignitable nonwastewater residue containing equal to or greater than 10% total organic carbon is subject to the technology-based standards for D001: "Ignitable Liquids based on § 261.21(a)(1)" under § 268.42.

(5) *Residue from spalling.* Layers of debris removed by spalling are hazardous debris that remain subject to the treatment standards of this section.

TABLE 1.—ALTERNATIVE TREATMENT STANDARDS FOR HAZARDOUS DEBRIS [1]

Technology description	Performance and/or design and operating standard	Contaminant restrictions [2]
A. Extraction Technologies:		
1. Physical Extraction		
a. *Abrasive Blasting:* Removal of contaminated debris surface layers using water and/or air pressure to propel a solid media (e.g., steel shot, aluminum oxide grit, plastic beads).	*Glass, Metal, Plastic, Rubber:* Treatment to a clean debris surface.[3] *Brick, Cloth, Concrete, Paper, Pavement, Rock, Wood:* Removal of at least 0.6 cm of the surface layer; treatment to a clean debris surface.[3]	*All Debris:* None.
b. *Scarification, Grinding, and Planing:* Process utilizing striking piston heads, saws, or rotating grinding wheels such that contaminated debris surface layers are removed.	Same as above	Same as above
c. *Spalling:* Drilling or chipping holes at appropriate locations and depth in the contaminated debris surface and applying a tool which exerts a force on the sides of those holes such that the surface layer is removed. The surface layer removed remains hazardous debris subject to the debris treatment standards.	Same as above	Same as above.
d. *Vibratory Finishing:* Process utilizing scrubbing media, flushing fluid, and oscillating energy such that hazardous contaminants or contaminated debris surface layers are removed.[4]	Same as above	Same as above.

TABLE 1.—ALTERNATIVE TREATMENT STANDARDS FOR HAZARDOUS DEBRIS [1]—Continued

Technology description	Performance and/or design and operating standard	Contaminant restrictions [2]
e. *High Pressure Steam and Water Sprays:* Application of water or steam sprays of sufficient temperature, pressure, residence time, agitation, surfactants, and detergents to remove hazardous contaminants from debris surfaces or to remove contaminated debris surface layers.	Same as above	Same as above.
2. Chemical Extraction		
a. *Water Washing and Spraying:* Application of water sprays or water baths of sufficient temperature, pressure, residence time, agitation, surfactants, acids, bases, and detergents to remove hazardous contaminants from debris surfaces and surface pores or to remove contaminated debris surface layers.	*All Debris:* Treatment to a clean debris surface; [3] *Brick, Cloth, Concrete, Paper, Pavement, Rock, Wood:* Debris must be no more than 1.2 cm (½ inch) in one dimension (i.e., thickness limit,[5] except that this thickness limit may be waived under an "Equivalent Technology" approval under § 268.42(b);[6] debris surfaces must be in contact with water solution for at least 15 minutes	*Brick, Cloth, Concrete, Paper, Pavement, Rock, Wood:* Contaminant must be soluble to at least 5% by weight in water solution or 5% by weight in emulsion; if debris is contaminated with a dioxin-listed waste,[6] an "Equivalent Technology" approval under § 268.42(b) must be obtained.[6]
b. *Liquid Phase Solvent Extraction:* Removal of hazardous contaminants from debris surfaces and surface pores by applying a nonaqueous liquid or liquid solution which causes the hazardous contaminants to enter the liquid phase and be flushed away from the debris along with the liquid or liquid solution while using appropriate agitation, temperature, and residence time.[4]	Same as above	*Brick, Cloth, Concrete, Paper, Pavement, Rock, Wood:* Same as above, except that contaminant must be soluble to at least 5% by weight in the solvent.
c. *Vapor Phase Solvent Extraction:* Application of an organic vapor using sufficient agitation, residence time, and temperature to cause hazardous contaminants on contaminated debris surfaces and surface pores to enter the vapor phase and be flushed away with the organic vapor.[4]	Same as above, except that brick, cloth, concrete, paper, pavement, rock and wood surfaces must be in contact with the organic vapor for at least 60 minutes.	Same as above.
3. Thermal Extraction		
a. *High Temperature Metals Recovery:* Application of sufficient heat, residence time, mixing, fluxing agents, and/or carbon in a smelting, melting, or refining furnace to separate metals from debris.	For refining furnaces, treated debris must be separated from treatment residuals using simple physical or mechanical means,[9] and, prior to further treatment, such residuals must meet the waste-specific treatment standards for organic compounds in the waste contaminating the debris.	*Debris contaminated with a dioxin-listed waste:*[5] Obtain an "Equivalent Technology" approval under § 268.42(b).[6]
b. *Thermal Desorption:* Heating in an enclosed chamber under either oxidizing or nonoxidizing atmospheres at sufficient temperature and residence time to vaporize hazardous contaminants from contaminated surfaces and surface pores and to remove the contaminants from the heating chamber in a gaseous exhaust gas.[7]	*All Debris:* Obtain an "Equivalent Technology" approval under § 268.42(b);[6] treated debris must be separated from treatment residuals using simple physical or mechanical means,[9] and, prior to further treatment, such residue must meet the waste-specific treatment standards for organic compounds in the waste contaminating the debris. *Brick, Cloth, Concrete, Paper, Pavement, Rock, Wood:* Debris must be no more than 10 cm (4 inches) in one dimension (i.e., thickness limit),[5] except that this thickness limit may be waived under the "Equivalent Technology" approval	*All Debris:* Metals other than mercury.
B. Destruction Technologies:		
1. *Biological Destruction (Biodegradation):* Removal of hazardous contaminants from debris surfaces and surface pores in an aqueous solution and biodegration of organic or nonmetallic inorganic compounds (i.e., inorganics that contain phosphorus, nitrogen, or sulfur) in units operated under either aerobic or anaerobic conditions.	*All Debris:* Obtain an "Equivalent Technology" approval under § 268.42(b);[6] treated debris must be separated from treatment residuals using simple physical or mechanical means,[9] and, prior to further treatment, such residue must meet the waste-specific treatment standards for organic compounds in the waste contaminating the debris. *Brick, Cloth, Concrete, Paper, Pavement, Rock, Wood:* Debris must be no more than 1.2 cm (½ inch) in one dimension (i.e., thickness limit),[5] except that this thickness limit may be waived under the "Equivalent Technology" approval	*All Debris:* Metal contaminants.
2. Chemical Destruction		
a. *Chemical Oxidation:* Chemical or electolytic oxidation utilizing the following oxidation reagents (or waste reagents) or combination of reagents—(1) hypochlorite (e.g., bleach); (2) chlorine; (3) chlorine dioxide; (4) ozone or UV (ultraviolet light) assisted ozone; (5) peroxides; (6) persulfates; (7) perchlorates; (8) permanganates; and/or (9) other oxidizing reagents of equivalent destruction efficiency.[4] Chemical oxidation specifically includes what is referred to as alkaline chlorination.	*All Debris:* Obtain an "Equivalent Technology" approval under § 268.42(b);[6] treated debris must be separated from treatment residuals using simple physical or mechanical means,[9] and, prior to further treatment, such residue must meet the waste-specific treatment standards for organic compounds in the waste contaminating the debris. *Brick, Cloth, Concrete, Paper, Pavement, Rock, Wood:* Debris must be no more than 1.2 cm (½ inch) in one dimension (i.e., thickness limit),[5] except that this thickness limit may be waived under the "Equivalent Technology" approval	*All Debris:* Metal contaminants.

TABLE 1.—ALTERNATIVE TREATMENT STANDARDS FOR HAZARDOUS DEBRIS [1]—Continued

Technology description	Performance and/or design and operating standard	Contaminant restrictions [2]
b. *Chemical Reduction:* Chemical reaction utilizing the following reducing reagents (or waste reagents) or combination of reagents: (1) sulfur dioxide; (2) sodium, potassium, or alkali salts of sulfites, bisulfites, and metabisulfites, and polyethylene glycols (e.g., NaPEG and KPEG); (3) sodium hydrosulfide; (4) ferrous salts; and/or (5) other reducing reagents of equivalent efficiency.[4]	Same as above	Same as above.
3. *Thermal Destruction:* Treatment in an incinerator operating in accordance with Subpart O of Parts 264 or 265 of this chapter; a boiler or industrial furnace operating in accordance with Subpart H of Part 266 of this chapter, or other thermal treatment unit operated in accordance with Subpart X, Part 264 of this chapter, or Subpart P, Part 265 of this chapter, but excluding for purposes of these debris treatment standards Thermal Desorption units.	Treated debris must be separated from treatment residuals using simple physical or mechanical means,[9] and, prior to further treatment, such residue must meet the waste-specific treatment standards for organic compounds in the waste contaminating the debris.	*Brick, Concrete, Glass, Metal, Pavement, Rock, Metal:* Metals other than mercury, except that there are no metal restrictions for vitrification. *Debris contaminated with a dioxin-listed waste.*[6] Obtain an "Equivalent Technology" approval under § 268.42(b),[8] except that this requirement does not apply to vitrification.
C. Immobilization Technologies:		
1. *Macroencapsulation:* Application of surface coating materials such as polymeric organics (e.g., resins and plastics) or use of a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media.	Encapsulating material must completely encapsulate debris and be resistant to degradation by the debris and its contaminants and materials into which it may come into contact after placement (leachate, other waste, microbes).	None.
2. *Microencapsulation:* Stabilization of the debris with the following reagents (or waste reagents) such that the leachability of the hazardous contaminants is reduced: (1) Portland cement; or (2) lime/pozzolans (e.g., fly ash and cement kiln dust). Reagents (e.g., iron salts, silicates, and clays) may be added to enhance the set/cure time and/or compressive strength, or to reduce the leachability of the hazardous constituents.[5]	Leachability of the hazardous contaminants must be reduced.	None.
3. *Sealing:* Application of an appropriate material which adheres tightly to the debris surface to avoid exposure of the surface to potential leaching media. When necessary to effectively seal the surface, sealing entails pretreatment of the debris surface to remove foreign matter and to clean and roughen the surface. Sealing materials include epoxy, silicone, and urethane compounds, but paint may not be used as a sealant.	Sealing must avoid exposure of the debris surface to potential leaching media and sealant must be resistent to degradation by the debris and its contaminants and materials into which it may come into contact after placement (leachate, other waste, microbes).	None.

[1] Hazardous debris must be treated by either these standards or the waste-specific treatment standards for the waste contaminating the debris. The treatment standards must be met for each type of debris contained in a mixture of debris types, unless the debris is converted into treatment residue as a result of the treatment process. Debris treatment residuals are subject to the waste-specific treatment standards for the waste contaminating the debris.

[2] Contaminant restriction means that the technology is not BDAT for that contaminant. If debris containing a restricted contaminant is treated by the technology, the contaminant must be subsequently treated by a technology for which it is not restricted in order to be land disposed (and excluded from Subtitle C regulation).

[3] "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 discolorations, 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% of each square inch of surface area.

[4] Acids, solvents, and chemical reagents may react with some debris and contaminants to form hazardous compounds. For example, acid washing of cyanide-contaminated debris could result in the formation of hydrogen cyanide. Some acids may also react violently with some debris and contaminants, depending on the concentration of the acid and the type of debris and contaminants. Debris treaters should refer to the safety precautions specified in Material Safety Data Sheets for various acids to avoid applying an incompatible acid to a particular debris/contaminant combination. For example, concentrated sulfuric acid may react violently with certain organic compounds, such as acrylonitrile.

[5] If reducing the particle size of debris to meet the treatment standards results in 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 waste contaminating the material, 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.

[6] Dioxin-listed wastes are EPA Hazardous Waste numbers FO20, FO21, FO22, FO23, FO26, and FO27.

[7] Thermal desorption is distinguished from Thermal Destruction in that the primary purpose of Thermal Desorption is to volatilize contaminants and to remove them from the treatment chamber for subsequent destruction or other treatment.

[8] The demonstration "Equivalent Technology" under § 268.42(b) must document that the technology treats contaminants subject to treatment to a level equivalent to that required by the performance and design and operating standards for other technologies in this table such that residual levels of hazardous contaminants will not pose a hazard to human health and the environment absent management controls.

[9] Any soil, waste, and other nondebris material that remains on the debris surface (or remains mixed with the debris) after treatment is considered a treatment residual that must be separated from the debris using, at a minimum, simple physical or mechanical means. Examples of simple physical or mechanical means are vibratory or trommel screening or water washing. The debris surface need not be cleaned to a "clean debris surface" as defined in note 3 when separating treated debris from residue; rather, the surface must be free of caked soil, waste, or other nondebris material. Treatment residuals are subject to the waste-specific treatment standards for the waste contaminating the debris.

39. In subpart D, § 268.46 is added to read as follows:

§ 268.46 Alternative treatment standards based on HTMR.

Table 1 identifies alternative treatment standards for F006 and K062 nonwastewaters.