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Disposal of Construction and Demolition Debris

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[Introduction](#)

[What is C&D Debris](#)

[Regulations Governing C&D Debris](#)

[Determining if Your C&D Debris is Hazardous Waste](#)

[TCLP Analysis](#)

[C&D Debris Disposal Options](#)

[Glossary](#)

[Innovation at Lackland AFB](#)

[References](#)

Introduction

Many non-historic World War II- and Korean War-era buildings no longer meet the needs of today's Air Force, and demolition of these outdated structures is quite common. The construction of state-of-the-art buildings to replace outdated structures is a familiar site on Air Force installations. While modernization has obvious benefits, disposal of the construction and demolition debris can be a problem.

Disposing of construction and demolition debris (C&D debris) in landfills consumes enormous amounts of space and is both economically and environmentally costly. The U.S. Environmental Protection Agency (EPA) estimates C&D debris accounts for approximately 24 percent of the waste disposed of in our nation's landfills. A cornerstone of the Air Force's pollution prevention policy, set forth in AFI 32-7080, is the reduction (through source reduction and recycling) of the amount of municipal solid waste sent to landfills. Methods to decrease the landfill space consumed by C&D debris and which generate a nonhazardous waste would help the Air Force uphold its commitment to pollution prevention.

What is C&D Debris?

C&D debris refers to materials generated as a result of construction, renovation and/or demolition projects. Metals, wood, asphalt, concrete, rocks, rubble, soil, paper, plastics and glass are among the many substances that can be considered C&D debris. C&D debris can generally be divided into five categories. Table 1 presents a list of C&D debris components most commonly associated with each category. Although C&D debris is usually considered a single waste stream, the composition actually varies with each project and depends on many factors such as type, size and geographic location of the structures involved. Materials comprising C&D debris can sometimes be contaminated by undesirable components and/or toxic compounds such as asbestos, lead-based paint (LBP), varnish, creosote and adhesives. This can be complicated with demolition debris resulting from a natural disaster, i.e., hurricanes, tornadoes, floods, etc. You can coordinate with your landfill operator prior to a disaster to determine the processes necessary to reduce the volume and toxicity of the debris. Things to consider: potential sources for tub grinders, segregation of the waste, staging areas and transportation. If possible, prior to demolishing a structure, you should remove these undesirable components since they could cause the debris to require handling as a special or hazardous waste.

Regulations Governing C&D Debris

The solid waste industry is only now beginning to explore the problems posed by C&D debris disposal, and scant attention has been focused on developing regulations specific to C&D debris disposal. It is therefore essential to check with your base Environmental Office prior to disposing of C&D debris since the regulatory climate is undergoing constant change.

Federal Regulations

At the Federal level, C&D debris is considered a municipal solid waste and as such falls under the jurisdiction of the Resource Conservation and Recovery Act (RCRA). RCRA requires characterization of C&D debris to determine proper disposal criteria. C&D debris determined to be hazardous is regulated under RCRA Subtitle C, while nonhazardous C&D debris is regulated under RCRA Subtitle D.

State Regulations

State regulation of C&D debris disposal varies widely. Some states make no provisions for disposing of C&D debris, while other states have very specific regulations for C&D debris disposal. Minnesota and New York, for example, have developed extensive listings of types of C&D debris prohibited from landfill disposal.

Determining if C&D Debris is Hazardous Waste

The proper disposal method for C&D debris is determined by the debris itself. If the C&D debris is hazardous, the debris must be properly disposed at a licensed hazardous waste facility. However, debris found to be nonhazardous can be landfilled with municipal solid waste or recycled.

Sampling

The first step in disposing of C&D debris is to determine whether or not the debris is a hazardous waste. To correctly characterize the C&D debris, you must obtain a sample of the waste stream. The sample should be a composite which reflects all components of the C&D debris. Therefore, the proportion of each individual C&D debris component within the composite sample should be the same as the proportion of each C&D component within the debris.

To accurately portray the waste stream, especially when sampling multiple structures or components, the homogeneity of the C&D debris must be considered. The two most significant factors in considering homogeneity are the age and maintenance history (such as painting history) of the structure. Even if multiple contractors built various projects within the same time period, homogeneity can be assumed if the maintenance histories of the projects are similar. Once homogeneous groupings of C&D debris are made, the number of samples needed to comprise the composite can be determined.

Since sampling every structure and component would be prohibitively time consuming and expensive, a statistical sampling program is necessary in these cases. Table 2 presents guidelines which meet or exceed the statistical requirements set forth by EPA for structuring composite samples.

The waste sample will be analyzed utilizing the Toxicity Characteristic Leaching Procedure (TCLP) (discussed below). This analysis requires approximately 100 grams of the composite sample. Therefore, the individual samples should be large enough to ensure the laboratory has enough of a sample to analyze. The individual samples should also be large enough for laboratory personnel to handle safely. Generally, the minimum size of each individual sample should be 3 inches x 6 inches to allow for proper compilation of the composite sample.

Toxicity Characteristic Leaching Procedure (TCLP) Analysis

To ascertain whether C&D debris is hazardous, the debris sample must undergo Toxicity Characteristic Leaching Procedure (TCLP) analysis by a certified laboratory. The results of the analysis are then compared to levels established by the EPA for certain chemicals. If the level in the sample exceeds the established level, the waste is considered hazardous. Table 3 presents examples of TCLP levels established by the EPA for a few common contaminants.

While TCLP testing is costly, so is disposing of hazardous waste. Entire structures or groups of structures are more likely to pass TCLP testing than are single components. TCLP analysis is therefore recommended for C&D debris destined for landfill disposal because of the substantial cost savings realized from disposing of waste in a

nonhazardous waste landfill instead of in a hazardous waste landfill. Also, recyclers of C&D debris require proof the components to be recycled are nonhazardous and usually request TCLP analysis. However, if prior experience has shown a waste will fail TCLP analysis, the waste should automatically be considered hazardous and disposed accordingly.

When considering laboratory qualifications for TCLP testing and analysis, installations should determine if the laboratory participates in accreditation programs specific to hazardous waste analysis. State environmental agencies and the EPA can assist in identifying and selecting qualified laboratories for hazardous waste testing.

C&D Debris Disposal Options

Recycling

Many components of C&D debris can be recycled. Companies who recycle C&D debris have strict quality control procedures and usually require proof, via TCLP analysis, the components to be recycled are nonhazardous. Table 4 presents potential uses for materials found in C&D debris.

The savings generated from recycling C&D debris are directly proportional to rising landfill "tipping fees" (fee charged by landfill operators), providing a powerful incentive for locating markets for C&D debris. However, while there are currently many companies across the nation recycling materials derived from C&D debris, it can sometimes be difficult to locate markets for much of the potentially recyclable materials.

Landfilling

Nonhazardous C&D debris and C&D debris classified as special waste are landfilled in either municipal solid waste (MSW) landfills or in landfills which only accept C&D debris. C&D debris classified as hazardous waste can only be disposed by a licensed hazardous waste facility. C&D debris determined to be hazardous must be separated from nonhazardous waste, appropriately containerized, and labeled prior to transportation for final disposal.

TABLE 1:

Typical Components of C&D Debris

Project Category	Typical Components
Construction	Mixed rubble, wood, roofing, wall board, insulation, carpet, pipes, plastic, paper, bricks
Demolition	Mixed rubble, concrete, steel beams, bricks, wood, pipes
Excavation	Earth, sand, stones, wood
Roadwork	Asphalt, concrete, earth
Site Clearance	Trees, brush, earth, concrete, mixed rubble, sand, steel, paper, plastic

TABLE 2:

Guidelines for Structuring Composite Samples

Total Structures/Components	Structures/Components to be Sampled
1 - 9	All
10 - 15	10
16 - 20	13
21 - 30	16
31 - 40	21
41 - 100	26
100+	32

TABLE 3:

**Examples of TCLP Cutoff Points
Established by EPA for Common
Contaminants**

Contaminant	Cutoff Point (mg/L)
Arsenic	5.0
Chromium	5.0
Lead	5.0
Mercury	0.2
Pentachlorophenol	100.0

TABLE 4:

Potential Uses for Materials Commonly Found in C&D Debris

Material	Potential Use
Asphalt	Crushed and mixed to make new asphalt
Concrete	Crushed and screened aggregate can be used in: <ul style="list-style-type: none"> • road sub-base • cement blocks • asphaltic concrete • fill
Dirt	Landscaping Landfill cover
Metal	Scrap metal dealers
Wood	Timber Wood pulp Shredded for: <ul style="list-style-type: none"> • fuel • animal bedding • landscaping • manufactured building products • compost
Brick	Masonry crushed for ornamental stone
Glass	Fiberglass insulation, sand blast, aggregate in asphalt, reflective beads
Gypsum	Soil amendment, gypsum board, absorbent media
Plastic <ul style="list-style-type: none"> • ABS • PVC • Polyethylene • Polystyrene 	plastic lumber highway barriers traffic cones insulation
Porcelain	Crushed for aggregate
Corrugated cardboard	Paper mills, fuel pellets
Carpet	Landfill cover
Roofing shingles	Asphalt paving

Glossary

Composite Sample: consists of numerous individual samples of a specified waste stream.

Hazardous Waste: any waste substance which is ignitable, corrosive, reactive or toxic and that, if improperly handled, poses a substantial threat to human health and/or the environment.

Homogeneous: uniform in structure and/or composition.

RCRA: Resource Conservation and Recovery Act, passed by Congress in 1976 to provide "cradle-to-grave" management rules for hazardous waste.

Special Waste: a hybrid of hazardous and nonhazardous wastes posing some limited amount of health or environmental risks due to physical or toxicological properties.

TCLP: Toxicity Characteristic Leaching Procedure is an analytical methodology described in Appendix II to EPA regulation 40 CFR Part 261 and is designed to simulate conditions in a landfill to determine whether or not a waste can become mobile in the leaching procedure.

Innovation at Lackland AFB

Focus on Lackland AFB:

An Innovative Approach to Disposing C&D Debris

Faced with the prospect of large quantities of C&D debris infused with lead from the demolition of aging buildings containing LBP, Lackland AFB together with Region 13 of the Texas Natural Resource Conservation Commission (TNRCC) and two contracting companies formed a pollution prevention partnership. While examining various methods of reducing the volume of C&D debris and rendering it nonhazardous, the partnership hit upon a uniquely clever idea: grinding the C&D debris prior to TCLP analysis and disposal.

To test their new solution to the C&D debris disposal problem, Lackland AFB conducted a pilot study in November 1994. Two 2,000-square foot buildings on Lackland AFB from which all asbestos had been removed, were demolished, wetted to reduce air emissions and quickly fed through a large industrial tub grinder. The tub grinder used at Lackland AFB, capable of grinding 6,000 cubic yards of debris per day, ground each building in only 35 minutes. Mounted on a trailer, the tub grinder is easily transportable from site to site. Placing the grinder on an asphalt or concrete pad minimizes the potential for transfer of LBP-contaminated particles to the soil.

While pre-demolition lead levels ranged from 52 ppm to 32,884 ppm, TCLP analysis of composite samples from the grindings revealed lead levels of approximately 0.14 ppm _ well below the 5 ppm lead cutoff point for defining hazardous waste! TNRCC Region 13 designated the ground material a special waste, resulting in landfill tipping fees of only \$75 per cubic yard, compared to the \$385 per cubic yard tipping fee for hazardous waste landfills. The cost savings realized by Lackland AFB from landfilling the ground material as a "special waste" are impressive: The estimated cost to dispose of the separated LBP components and both buildings without grinding was \$28,875 while disposal costs after grinding both buildings was only \$3,125 _ a savings of over \$25,000!

Lackland AFB is also investigating potential end uses for the ground material other than landfilling. Other uses being considered are landfill void filler, particle board constituent and mulching material. Furthermore, a private company is interested in using the ground material to make charcoal. (The TNRCC has yet to approve this use.)

Encouraged by the promising results of the initial pilot study, Lackland AFB plans further trials of this cost-saving solution to the disposal of LBP-containing facilities. However, the TNRCC is still divided over the issue _ while Region 13 approves of the technology, there are still a few questions at the State level about whether tub grinding is homogenizing or dilution of waste material. Before instituting a tub grinding program for C&D debris at your installation, check with your base Environmental Office. Air Force and State representatives are awaiting the results of Phase II of the Pilot Study before approving this method.

To learn more about the C&D debris tub grinding program at Lackland AFB, contact PRO-ACT at DSN 240-4214 or Captain Mike Van Valkenburg, HQ AFCEE, at DSN 240-4192.

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