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UNIFIED FACILITIES CRITERIA (UFC)

SELECTION OF METHODS FOR THE REDUCTION, REUSE, AND RECYCLING OF DEMOLITION WASTE

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UNIFIED FACILITIES CRITERIA (UFC)

SELECTION OF METHODS FOR THE REDUCTION, REUSE, AND RECYCLING OF DEMOLITION WASTE

U.S. ARMY CORPS OF ENGINEERS (Preparing Activity)

NAVAL FACILITIES ENGINEERING COMMAND

AIR FORCE CIVIL ENGINEER SUPPORT AGENCY

Record of Changes (changes are indicated by **1**\ ... /**1**/)

Change No.	Date	Location

FOREWORD

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CHAPTER 1

INTRODUCTION

1-1 **PURPOSE.** The purpose of this UFC is to provide guidance for recovery and recycling of building demolition waste. It will assist DoD facilities in determining the most feasible methods to reduce the amount of construction and demolition (C&D) waste material being disposed of in landfills.

1-2 **APPLICABILITY.** This UFC applies to installations or facilities involving facility disposal and construction.

1-3 **REFERENCES.** Appendix A contains a list of references used in this UFC.

1-4 **DISCUSSION.** Outlined in this UFC are demolition, recovery, recycling, and deconstruction techniques for more efficient landfilling practices along with project objectives and conditions for which each of these methods is economically and practically viable. An interactive matrix contains information to assist personnel at installations and facilities in determining the appropriate strategy to divert C&D waste from landfills. The management of demolition projects is largely at the discretion of the individual installation or facility. It is important to investigate prior to any demolition activity to determine which method is most desirable. Building demolition poses unique challenges in the area of waste management. Since each project is different, generating its own unique combination of wastes, a project manager must be flexible and creative in finding ways to reduce, reuse, or recycle the various types of waste.

1-4.1 **Benefits.** C&D debris accounts for an estimated 35 to 40 percent of the municipal solid waste stream. Disposing of debris in landfills is both economically and environmentally costly. Landfilling debris unnecessarily wastes both natural resources and valuable landfill space. Alternatives to conventional demolition and landfilling wastes have proven to reduce solid waste volume, avoid costs for landfill tipping fees, and even provide a source of revenue from the sale or reuse of building materials.

1-4.2 **Policy.** AR 420-49, Chapter 3, contains policy for Solid Waste Management. AR 420-49, paragraph 3-6, sub-paragraph d., states that construction and demolition debris should be recycled when possible. There is a need for effective procedures for evaluating and selecting methods to assist installations and facilities in the reduction, recovery, and recycling of C&D waste. Air Force Instruction (AFI) 32-7042, *Waste Management,* states that installations should pursue cost-effective management approaches that decrease the landfill space required for C&D debris, decrease the amount of HW contaminating C&D debris, and help the Air Force uphold its commitment to pollution prevention. OPNAVINST 5090.1B, Chapter 14 contains the Navy's Solid Waste Management And Resources Recovery Ashore instructions and policy and Chapter 3, Pollution Prevention contains waste minimization and prevention policy. Qualified Recycling Program (QRP) Guide, UG-0039-ENV, July 2000 provides Navy and Marine Corps guidance in operating an installations QRP. The Marines have a

similar instruction, Marine Corps Order MCO P5090.2A of 10 July 1998. See Chapters 15, Pollution Prevention and Chapter 17 Solid Waste Management and Resource Recovery. UFGS 01572, Construction and Demolition Waste Management requires contractors to devise a construction waste management plan that will address recycling, reuse, and other waste diversion methods.

1-4.3 **Army's Future Demolition.** Under Defense Reform Initiative Directive 36, the Army's goal for FY 1998-2003 is to reduce excess space by 53 million SF. Installations continue to maintain excess and/or obsolete structures. The demolition of these structures will cut costs and improve safety but will produce significant amounts of solid waste.

1-4.4 **Requirements.** Requirements for reducing the generation of solid waste are contained in Executive Order 13101. For recycling and waste prevention, each agency is required to establish a goal for diversion of solid waste from landfilling or incineration. The current DoD goal is in the Measure of Merit (MoM) "Non-Hazardous Solid Waste Diversion Rate" issued 13 May 1998. By the end of FY 2005, the goal is to ensure that the diversion rate for nonhazardous solid waste is greater than 40 percent, while ensuring that integrated nonhazardous solid waste management programs provide an economic benefit when compared with disposal using landfilling and incineration alone.

1-4.5 **Planning and Execution Guidance.** This UFC contains information that will help with planning and execution of projects involving the recovery and recycling of building demolition waste to reduce landfill volume. Tables 2-1 and 2-2 list parameters (Objectives and Conditions) associated with the methods for disposing of demolition waste (Demolish, Recycle, Recover, and Deconstruct). In electronic form, each element of the matrices is hyperlinked to its associated text paragraph for easy document browsing.

1-4.6 **Definition of Terms.** Appendix B contains definitions of terms. Appendix C lists State-by-State resources for C&D waste recovery, recycling, and reuse. The first page of the Appendix contains a map, which, in electronic form, contains hyperlinks between the mapped State and that State's listed resources.

1-4.7 **EPA Information.** Please check out EPA's new website on the issue of construction and demolition (C&D) debris at http://www.epa.gov/epaoswer/non-hw/debris. C&D debris, the waste from the construction, renovation and demolition of buildings (and other structures), constitutes an enormous volume of materials. This website includes information and links to many diverse resources and organizations covering the characterization, reduction, reuse, recycling and management of C&D debris.

CHAPTER 2

SELECTION OF DEMOLITION WASTE REDUCTION, REUSE AND RECYCLING METHODS SELECTION OF DEMOLITION WASTE REDUCTION, REUSE AND RECYCLING METHODS

2-1 **GENERAL.** There is a significant amount of C&D waste developed due to construction activities and structure demolition. For example, at Army installations actively involved in a Facility Reduction Program, C&D waste accounts for up to 80 percent of the solid waste stream. At both active and inactive Army installations, there are about 26,000 WWII structures Army-wide that, if demolished, will produce approximately 6 billion lb, or roughly 10.6 million cu yd of debris. Demolishing and landfilling the building waste incurs significant life-cycle expense to the government as landfill space is diminishing. Landfilling debris unnecessarily wastes both natural resources and valuable landfill space.

2-2 **DEMOLITION.** Traditionally, buildings are removed by means of conventional mechanical demolition techniques. “Demolition” refers to the razing of a building with heavy equipment in such a way that the building components are rendered into rubble and are fit for nothing more than landfill. Demolition provides no opportunity for cost offsets or to generate income. Many alternatives are being practiced in the commercial market and have proven to be successful at reducing the amount of demolition debris that ends up in the landfill.

2-3 **ALTERNATIVES TO DEMOLITION.** Alternatives to demolition include recycling, recovery, and deconstruction. Recycling includes diverting materials that are not reusable from the solid waste stream and using these extracted materials as feedstock for reprocessing into other useful products. Recovery includes the removal of materials or components from the solid waste stream in a manner that retains its original form and identity, for the purpose of reuse in the same or similar form as it was produced. Deconstruction means systematic dismantling of a building, preserving the integrity of the materials, with the goal of maximizing the recovery of salvageable materials for potential reuse and recycling. While these all sound very logical and simple, there is no “one size fits all” solution. Some options that will work for certain situations will not be feasible in others.

2-4 **DECISION MATRIX.** Personnel involved in demolition activities need some method to quickly evaluate alternatives to traditional demolition relevant to specific project objectives and conditions. The attached decision matrix includes various project objectives and project conditions that are matched with the alternative methods of building removal. Conventional demolition is considered a benchmark for comparison. Comparing the performance of each of the alternative approaches will enable personnel to assess their feasibility under the specific project limitations. The requirements and constraints surrounding demolition are defined and included in this matrix as project objectives and project constraints. Certain parameters generally govern the successful completion of a demolition requirement. These objectives include: cost constraints; time

constraints; quality or expected results; safety; risk tolerance; and ease of implementation and opportunity. Other factors that affect the feasibility include such project conditions as: scope or magnitude of the demolition requirement; type of construction and materials involved; condition of materials that can potentially be salvaged; presence of hazardous materials; wage structures; time constraints; landfill burden; environmental conditions; and availability of market outlets.

2-4.1 **How to Use Tables.** Tables 2-1 and 2-2 list these project objectives and project conditions along with the alternative methods of building removal. Each intersection in the table indicates which paragraph number to reference for the corresponding information. In an electronic version of this matrix, each intersection contains a hyperlink that references information for the corresponding cell. For example, to use this matrix, select the cell at the intersection of **DEMOLITION** and **COST**. A hyperlink takes you to paragraph 2-1.1. The costs relative to a standard demolition contract are presented here along with any cost advantages or disadvantages to the owner. This information may then be used for comparison with each alternative method by selecting the hyperlinks in the table or by referencing the paragraph number. For example, selecting the intersection of **DECONSTRUCTION** and **COST** hyperlinks to paragraph 2-1.4, which states that the method of deconstruction, as compared to traditional demolition, has high initial costs with the potential to offset costs and even generate income. Each installation or facility will need to determine, based on individual circumstances, which of these alternatives, or combination thereof, may be acceptable. This matrix is a tool that can be used for this evaluation. The problem of what to do with the waste generated through demolition activities will not simply “go away.” Building waste as a result of demolition activities will increasingly tax the capacity of the nation’s overflowing landfills. This matrix will provide direction and assistance in the recovery and recycling of building demolition waste to reduce landfill volume and conserve resources.

Table 2-1. Project Objectives.

	DEMOLISH	RECYCLE	RECOVER	DECONSTRUCT
COST	[3-1.1]	[3-1.2]	[3-1.3]	[3-1.4]
TIME	[3-2.1]	[3-2.2]	[3-2.3]	[3-2.4]
QUALITY/RESULTS	[3-3.1]	[3-3.2]	[3-3.3]	[3-3.4]
SAFETY	[3-4.1]	[3-4.2]	[3-4.3]	[3-4.4]
RISK	[3-5.1]	[3-5.2]	[3-5.3]	[3-5.4]
IMPLEMENTATION	[3-6.1]	[3-6.2]	[3-6.3]	[3-6.4]
OPPORTUNITY	[3-7.1]	[3-7.2]	[3-7.3]	[3-7.4]

Table 2-2. Project Conditions.

		DEMOLISH	RECYCLE	RECOVER	DECONSTRUCT
PROJECT SCOPE		[4-1.1]	[4-1.2]	[4-1.3]	[4-1.4]
HAZARDOUS MATERIALS	**Asbestos Containing Material (ACM)**	[4-2.1.1]	[4-2.1.2]	[4-2.1.3]	[4-2.1.4]
	Lead-Based Paint (LBP)	[4-2.2.1]	[4-2.2.2]	[4-2.2.3]	[4-2.2.4]
SITE ACCESSIBILITY		[4-3.1]	[4-3.2]	[4-3.3]	[4-3.4]
LANDFILL BURDEN		[4-4.1]	[4-4.2]	[4-4.3]	[4-4.4]
RESOURCES		[4-5.1]	[4-5.2]	[4-5.3]	[4-5.4]
MARKETS		[4-6.1]	[4-6.2]	[4-6.3]	[4-6.4]

CHAPTER 3

PROJECT OBJECTIVES

3-1 **COST.** There will be a cost associated with each method of building removal. For comparison, costs relative to conventional demolition with a standard demolition contract will be used as a benchmark. Total costs include the cost for demolition and the cost for disposal. According to case study data, the cost of disposal can represent up to 50 percent of the total demolition cost. This makes it desirable to explore alternative methods to reduce disposal costs. Project objectives to minimize the cost of building removal should consider initial costs, cost offsets, income potential, and life cycle costs associated with each alternative.

3-1.1 **Demolish (Cost).** Initial costs for demolition are low. The cost of conventional demolition (not including asbestos removal or tipping fees) ranges from $3 to $4 per square foot of floor area. If all debris is landfilled, tipping fees may add $2 to $3 per square foot of floor area.

Landfill tipping fees for C&D waste landfills vary widely depending on geographic location. Studies show that the national average for C&D tipping fees has risen over the past 20 years from $4.90 to $32.00 per ton. In Portland, OR, tipping fees for C&D debris are high, around $75 per ton. In densely populated areas like northern New Jersey, tipping fees exceed $140 per ton.

Demolishing and landfilling building waste incurs significant life cycle expense to the government as landfill space diminishes. The cost of managing and maintaining landfills, along with rising tipping fees, makes this option the least preferable.

3-1.2 **Recycle (Cost).** The cost of a recycling program includes payment of wages for separation and removal of desired materials either on-site or off-site. Separating recyclable materials on-site as they are removed from the building adds to the initial cost, but increases the value of the recycled material. These additional costs to extract materials range from $1 to $2 per square foot of building area. The need for added recycling collection containers at the site also increases costs. Table 3-1 lists rental rates for dumpsters.

Table 3-1. Typical Rental Rates for Dumpsters.

	(Cubic Yard)	(Ton)	(Cost)
Weekly Dumpster Rental	6	2	$300.00
	10	4	$385.00
	30	10	$650.00
	40	13	$775.00

If waste materials are commingled for delivery to a materials recovery facility for recycling, the costs associated with transportation are a significant part of the dynamics

of a recycling operation. The distance that aggregates can be hauled economically varies regionally. Each kilometer that a ton of aggregates is hauled can add 10 to 20 cents to its costs, depending on local aggregates supply and market conditions.

In many instances, a demolition budget can be reduced with a carefully planned salvage and recycle operation. Experience shows that recycling can help achieve cost savings of $1 to $2 per square foot of building floor area. If the contractor saves money by recycling, these savings can be passed on to the government in the bid or price for demolition. The more material that is recycled, the less waste that ends up in the landfills.

Reducing the volume of debris also reduces tipping fees at the landfill. In the recycling industry, landfill-tipping fees have a major impact on the success of a recycling operation. When tipping fees are high, there is more incentive to recycle to save money. In rural areas where land is relatively inexpensive, the economics of recycling are such that it costs less money to landfill C&D debris. The tipping fee in Moscow, ID, is $20 per ton compared to $75 per ton in Portland, OR. When landfill-tipping fees are low, there is a higher tendency to landfill the material even though it is not environmentally preferable.

Materials with high recycle potential include aggregates, metals, wood, asphalt, concrete, and cardboard. Materials with possible recycle potential include glass, plastics, carpeting, and gypsum wallboard. A large quantity of a recyclable material has potential of returning a profit if there is a market demand for it. Handling and hauling costs may be recovered through the value of the recycled materials. However, there is little potential to generate income from simple recycling.

There is a wide variation in product prices for processed C&D waste. For example, highly specialized products such as painted landscape rock may sell for as much as $15 per ton, while poor quality fill material might sell for less than $1 per ton. The price for roadbase, the principal market for recycled aggregates, is much narrower. The reported U.S. sales prices for roadbase ranges from $2.76 to $6.70 per ton. The U.S. market price for wood, sold as a cogeneration fuel, ranges from $5.00 to $17.50 per ton.

Using recycled materials in place of virgin materials is a closed loop process that extends the life of natural resources. Life cycle costs can be reduced depending on the level of recycling done. Also, recycled products of all types require less energy to create than their virgin-material counterparts do. As the C&D recycling infrastructure grows, these benefits will begin to contribute to reduced construction product costs.

3-1.3 **Recover (Cost).** The handling of materials during salvage creates the cost of recovery. Extra care is needed in the removal of salvageable materials so that they are not damaged. This, in turn, results in additional costs. Additional costs to remove components from a building before demolition can range from $2 to $3 per square foot of building floor area. Table 3-2 lists typical components/materials with a high recovery potential.

Table 3-2. Typical Components/Materials with a High Recovery Potential

Appliances	Dimensional Lumber	LightFixtures	Plywood	Tile
Bathroom Fixtures	Doors	Marble	Shelving	Trim
Bricks	Ductwork	Metal Framing	Siding	Windows
Cabinets	Flooring	Paneling	Soil	Wood Beams
Carpeting	Insulation	Pipes	Stairs	

Buildings containing large quantities of these specialty items may offer significant returns through the resale of the recovered materials. Proceeds from the sale or reuse of the salvaged materials can be used to offset the cost of recovery. Salvaged building materials generally sell for about half the price of new materials. If the materials are sold to a scrap dealer, the return is about half of that, or about 25 percent of the purchase price for new materials. Table 3-3 lists estimated salvage values for some commonly recovered materials. Prices will vary regionally and over time. Table 3-3 includes reasonable estimates based on the year 1999 values.

Table 3-3. Estimated Salvage Values for Some Commonly Recovered Materials

Item	Description	Unit	Retail Unit Value	Estimated Salvage Value
Metals	Aluminum Scrap	Ton		$480.00
	Brass Scrap	Ton		$560.00
	Copper Scrap	Ton		$980.00
	Lead Scrap	Ton		$380.00
	Steel Scrap	Ton		$35.00
Oak Flooring	2-1/4" wide	SF	$2-$2.50	$0.65-$1.00
	3-1/4" wide	SF	$2-$2.50	$0.65-$1.00
Framing Lumber "higher" quality (#2 grade)	2 x 4 (8'-10')	EA	$≅3.00	$0.90-$1.10
	2 x 4 (12'-14')	EA	$≅4.50	$2.00-$2.40
	2 x 8 (12')	EA	$≅8.75	$3.90-$4.80
	2 x 8 (14'-15')	EA	$≅10.00	$4.50-$5.50
Framing Lumber "lower" quality (construction grade)	2 x 4 (8'-10')	EA	$≅3.00	$0.30-$0.75
	2 x 4 (12' x 14')	EA	$≅4.50	$0.45-$1.10
	2 x 8 (12')	EA	$≅8.75	$0.90-$2.20
	2 x 8 (14'-15')	EA	$≅10.00	$1.00-$2.50
	2 x 12 (10')	EA	$≅10.00	$1.00-2.50
Brick	Flush	EA	$0.30-$0.35	$0.10-$0.20
Windows (double-glazed, aluminum replacements)	31" x 54"	EA	$90-150	$15-$30
	34" x 45"	EA	$90-150	$15-$30
	20" x 36"	EA	$90-150	$10-$15
Doors	36" ext. panel	EA		$0-$15
	18" paneled	EA		$5-$10
	24" paneled	EA		$5-$10
	30" paneled	EA		$5-$10
Tubs/toilets/sinks	Cast iron tub/ stainless steel	EA		$5-$10
Stair units, treads	Oak treads/ units include stringers	EA		$25-$50

Extra resources are required to handle and manage a resale operation. Recovered materials need to be stored and if no space is available, renting storage space will add to the overall cost. The government can benefit if the recovered material can be utilized for another project, thus avoiding costs elsewhere. For example, concrete can be crushed and reused on-site as fill material. This saves money by avoiding the hauling and dumping charges as well as the cost of the new material.

Recovering materials not only keeps them from filling up the landfills, but also

conserves natural resources. The availability of natural resources varies from region to region. Where these resources are scarce, an active resale industry exists. Regions with high demand and markets for used materials include the West Coast (California, Nevada, Oregon, Washington and Idaho) and the southwest (Arizona, New Mexico, Texas, Oklahoma, Arkansas, and Louisiana).

Recovering materials for reuse has a high potential to reduce the cost for building removal. However, there is relatively little potential of generating income through reuse. The value of recovered material along with reduced dump fees can enable a contractor to reduce the bid price for demolition. Case studies show that recovery and reuse of components can yield a cost avoidance of a few cents to $4 or $5 per square foot of building.

3-1.4 **Deconstruct (Cost).** Initial costs for deconstruction are relatively high. Based on case studies, the cost for deconstruction can add up to an additional $2 to $3 per square foot of building floor area. The single most expensive element of deconstruction is labor. Careful dismantling is labor intensive. Other costs include equipment rental, storage of materials before resale, and transportation of materials.

However, decreased costs from avoided time and expense needed to bring heavy machinery to a job site, salvage values, and reduced disposal costs can make deconstruction a viable alternative to conventional demolition. Case studies show that the sale of recovered materials could offset expenses by $2 to $3 per square foot of building floor area. When the costs associated with long-term landfill life are considered, deconstruction is the preferable method. In an area with high tipping fees and well-established end-use markets, it may even be possible to profit from the deconstruction of a building.

3-2 **TIME.** If time is critical, then conventional demolition may be the only feasible option. Other methods require additional time for contract development, salvage, on-site waste separation and waste removal. “Time is money.” For recycling to be feasible, the additional time spent segregating waste must be offset by the revenue of materials and reduced disposal costs for alternative methods of building removal.

3-2.1 **Demolish (Time).** Mechanical demolition is the most time efficient method in terms of physical work. It requires the least amount of on-site labor hours. Mechanical demolition yields a commingled pile of debris that can be quickly loaded up and hauled away. Unless there is some contaminated debris requiring mitigation, a demolition operation can be completed within a matter of days as opposed to weeks or even months with some other methods.

3-2.2 **Recycle (Time).** There is no specific time disadvantage to removing materials for recycling if all debris is removed and separated off-site. The time required for on-site removal and separation increases depending on the degree of separation. To save time, a salvage outlet may be contracted to pick up and haul away the materials from the site.

Initially, additional time will be required for contract development. Once a recycling contract has been developed and accepted, future contracts for recycling can be readily implemented and contract development is no longer a factor.

3-2.3 **Recover (Time).** Recovering building materials for reuse is a viable option when time is not constrained. The time involved in handling, sorting, cleaning, cutting, and selling second hand building materials is substantial and can undermine the feasibility of salvage at a demolition job. Duration on-site depends on the extent of the recovery and hand labor required to extract recoverable materials. Extra care and time must be taken to reduce the chances of damaging the materials as they are removed. Separating and sorting materials as they are recovered from the building will increase the total time for on-site removal, but will produce higher quality materials and much higher financial returns. References for deconstruction can also be used for determining the time requirements for recovery. These references are included in the paragraphs below.

3-2.4 **Deconstruct (Time).** Relocating or removing the entire building intact and panelized deconstruction, are rapid forms of deconstruction. However, manual deconstruction is labor intensive and will naturally increase the overall duration of the project. The time requirements for disassembly may vary between three to eight times that of mechanical wrecking. Case studies conducted in the military and private sector show that manual deconstruction proceeds at a rate of about 0.3 SF per man-hour for a wood frame building. For example, a 3,600 SF typical wood frame WWII building, at 0.3 SF per man-hour, with a 10-person crew, requires roughly 3 weeks to manually deconstruct. This figure includes handling, on-site processing and project management and is consistent with R.S. Means productivity data.

Table 3-4 lists labor hours recorded for the disassembly and salvage of components from a 2,000 square foot building made up of four residential units that was deconstructed as part of the Riverdale Case Study. The Riverside Case Study was a multi-agency (EPA/NAHB/HUD) deconstruction project in Baltimore that implemented pilot deconstruction.

These labor hours can be used in combination with more comprehensive references, such as R.S. Means *Building Construction Cost Data*, Micro Computer-Aided Cost Engineering Systems (MCACES), and a Job Order Contracting (JOC) handbook for estimating deconstruction/demolition square foot costs.

Table 3-4. Labor Hours for Disassembly and Salvage of a 2,000 SF Building.

Component	Tasks (hours)			Component Total	Labor Hours	Unit
	Disassembly	Processing	Support			
Interior						
Doors, frames	5.75	5.25		11.0	0.55	EA
Trim, baseboards	4.75	5.0		9.75	0.19	LF
Cabinets	2.75	0.5		3.25	0.27	EA
Plumbing fixtures	7.75	1.75		9.5	0.59	EA

Component	Tasks (hours)			Component Total	Labor Hours	Unit
	Disassembly	Processing	Support			
Radiators	1.5	0.5		2.0	0.13	EA
Appliances	0.25	2.75		3.0	0.60	EA
Bathroom floor tile	2.5	0.50		3.0	0.038	SF
Oak strip flooring	19.25	27.0	0.25	46.50	0.038	SF
Plaster – 1st level	34.25	10.0	5.50	49.75	0.012	SF (plaster area)
Plaster – 2nd level	23.75	10.75	2.0	36.50	0.009	SF (plaster area)
Piping and wiring	6.75	3.25	0.50	10.50	0.0072	LBS
Partition walls	6.25	24.75	3.0	34.0	0.18	LF
Windows and trim	10.0	2.5	0.50	13.0	0.54	EA
Ceiling joists	1.0	4.75	0.5	6.25	0.0075	LF
Load-bearing walls	2.75	15.5	1.75	20.0	0.027	LF
Sub-floor – 2nd	16.0	6.0	1.25	23.25	0.023	SF
Joists – 2nd level	7.25	16.25	1.5	25.0	0.027	LF
Sub-floor – 1st	7.75	8.0		15.75	0.016	SF
Joists – 1st level	7.0	10.0		17.0	0.020	LF
Stairs	2.5	0.75	0.75	4.0	0.3	Riser
Exterior						
Gutters, fascias	2.25	1.0		3.25	0.014	LF
Chimney	33.25	40.5	4.75	78.5	0.16	CU FT
Gable Ends	8.0	3.0	0.75	11.75	0.053	SF
Masonry walls – upper	14.75	104.5	20.5	139.75	0.25	SF (brick area)
Masonry walls – lower	15.75	84.0	5.25	105.0	0.078	SF (brick area)
Roof						
Roofing material	17.75	18.25	1.75	37.75	2.68	SF
Sheathing boards	21.25	14.5	1.5	37.25	0.028	100 SF
Framing	7.25	9.75	7.0	24.0	0.021	LF
Shed roof framing	1.25	2.25		3.5	0.036	LF

While the R.S. Means approach does not address deconstruction specifically, it does provide labor costs associated with selective demolition tasks. For a more complete cost estimate, refer to *R.S. Means Building Construction Cost Data*, 57th Annual Edition, 1999, R.S. Means Publishers, Kingston, MA.

The MCACES is a multi-user software program used for the preparation of detailed construction cost estimates for military, civil works, and Hazardous, Toxic, and Radiological Waste (HTRW) programs. The supporting databases include a unit price book (UPB), crews, assemblies, labor rates, equipment ownership schedule costs and models. All databases work in conjunction with each other to produce a detailed cost estimate. For additional information on the MCACES program, call or e-mail Jim Nichols, CEHNC-ED-ES-A, at (256) 895-1842 or:
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The JOC technique is based on a comprehensive set of general specifications and a related Unit Price Book (UPB) adjusted for the area where the work will be performed to reflect the cost and type of work anticipated. The UPB contains between 40,000 and 60,000 priced line items, organized in 16 Construction Specification Institute (CSI) divisions, which, when factored by the contractor's pricing coefficient, are used to establish firm fixed price delivery orders under the contract. For additional information on the JOC program write or call Marie Raglind, CEHNC-CT-S, at the U.S. Army Engineering and Support Center, Huntsville, AL (256) 895-1139 or e-mail at:
marie.raglind@hnd01.usace.army.mil.

The MCACES databases and the JOC book list specific demolition jobs with the cost and time requirements. The JOC also includes an added line item for the cost of demolition and removal before selective remodeling tasks. The labor and cost required for a salvage or deconstruction operation can be calculated using this data.

3-3 **QUALITY / RESULTS.** Future plans for the use of the site may affect the selection of the method for removal. Mechanical equipment may be required for cleaning up the site and restoring it to grade. The quality of work and results will vary for each alternative method of building removal and for each building type. If performance objectives are based on volume of waste reduction the following results can be expected for each building type.

Brick or concrete structures generate about 3.0 cu ft of demolition debris per square foot of floor area and wooden structures generate about 4.5 cu ft of demolition debris per square foot of total floor area. A predominately brick structure can contain up to 80 percent brick by volume. Thus, an active brick-salvaging program could eliminate much of the solid wastes resulting from demolition of this type of structure. For concrete structures, approximately 50 percent of the demolition waste is composed of concrete——most of which can be recycled and reused. A "typical" WWII barracks, which is a predominately wood structure, contains up to 90 percent wood. A careful salvaging operation can provide high-quality lumber and reduce solid waste generation.

3-3.1 **Demolish (Quality/Results).** Demolition takes down the entire structure and

hauls away the debris leaving nothing behind. The site surface is typically cleared to grade on completion of the demolition project or contract. Subsurface components are typically abandoned.

All debris is landfilled under a conventional demolition project contrary to the objective of reducing solid waste. Opportunities exist to reduce the volume of solid waste using different machinery or techniques for the demolition.

3-3.2 **Recycle (Quality/Results).** Recycling is generally efficient for site surface restoration. Recycling bins are organized at the site and site clean up is coordinated with other demolition activities to clear the site to grade on completion of the project.

Recycling is favorable for waste diversion and potentially reduces the amount of solid waste that ends up in a landfill. Site/source separation will yield a greater amount of material that can be recycled. Approximately 70 percent of demolition debris can be diverted from the landfill and recycled, but this figure will vary depending on the type of building being demolished, and the effectiveness of the local recycling infrastructure

3-3.3 **Recover (Quality/Results).** This method is generally efficient for site surface restoration. Provisions for removing and disposing of unrecoverable materials and restoration of the site to grade would have to be included in the contract. Typically, subsurface components would be abandoned.

With recovery and reuse, there is significant potential to reduce solid waste. Depending on the condition of the structure and material removed, the volume of waste ending up in a landfill can be greatly reduced. Typically, recovering selected building materials for reuse (in addition to the recycling activities described above) can divert as much as 85 percent of the demolition waste.

3-3.4 **Deconstruct (Quality/Results).** Manual deconstruction may leave the site with some building structure remaining. Restoring the site to grade will generally require heavy machinery to remove such elements as the concrete foundation. If the deconstruction requires that materials be sorted and stored before resale or reuse, clean up may be a problem. The site is likely to be neglected and left disorderly.

Deconstruction dramatically reduces the amount of waste that must be shipped to landfills. The amount of reusable lumber and architectural fixtures that can be salvaged for reuse increases with hand demolition. As materials are removed, they can be carefully separated to avoid cross-contamination, thus yielding a higher volume of material for recycling or reuse. Removing a building or major portions thereof intact (in addition to the recycling and recovery activities described above) can typically divert as much as 90 percent of building waste from the landfill.

3-4 **SAFETY.** The Occupational Safety and Health Administration (OSHA) governs demolition safety with published rules in 29 CFR 1926. Also USACE EM 385-1-1 and UFGS 01525N Safety Requirements address safety and health requirements for demolition activities. These requirements address in detail the types of worker

activities and the materials that are regulated. Two materials used extensively in buildings are asbestos and lead-based paint (LBP). Both of these are occupational health hazards and require special management and removal in compliance with OSHA and USACE safety standards. Unified Facilities Guide Specifications (UFGS) address Asbestos Abatement activities, including demolition and Lead Hazard Control Activities ,. (See various specifications in Division 13 – *Special Construction* Series. Contracts for demolition activities should include these UFGS, as appropriate. For in-house activities, the procedures described in the UFGS should be implemented.

3-4.1 **Demolish (Safety).** Demolition contractors are required by OSHA to take appropriate safety measures when removing hazardous waste and operating heavy mechanical equipment. Noise, dust, and falling debris are the major environmental problems associated with mechanical demolition. Airborne asbestos and/or lead-containing dust is possible if either is found in high concentrations. Suitable measures to prevent dust formation during wrecking should be instituted. Other hazardous materials such as polychlorinated biphenyls (PCB) and mercury may also be encountered in demolition debris. All workers must be protected in accordance with applicable OSHA regulations.

3-4.2 **Recycle (Safety).** Recycling, with the separation of materials, increases the number of tasks performed and creates additional physical and environmental exposure to hazards. Effective implementation of OSHA, USACE, and Navy safety and health regulations will control exposure of hazards to personnel performing recycling operations. There may be some concern about asbestos and LBP-contaminated materials being introduced into the recycled materials market. Effective removal of asbestos, LBP, PCB, mercury, and other hazardous materials must be monitored to ensure that they are not recycled into feedstock. Generally, recycling does not pose a hazard to the public.

3-4.3 **Recover (Safety).** Recovering materials may result in additional occupational exposure to physical and environmental hazards. Workers need to take extra safety precautions when manually removing building components, including asbestos and LBP. Effective implementation of OSHA, USACE, and Navy safety and health regulations will control exposure of hazards to personnel performing recycling operations.

3-4.4 **Deconstruct (Safety).** Deconstruction, like recycling, is labor intensive, increases the number of tasks performed, and creates additional physical and environmental exposure to hazards. Effective implementation of OSHA, USACE, and Navy safety and health regulations will control exposure of hazards to personnel performing deconstruction operations.

3-5 **RISK.** Certain risks are associated with jobsite physical and environmental hazards. The government is responsible for requiring and enforcing appropriate control measures, but the contractor is ultimately responsible for maintaining appropriate control measures. There is typically no risk to the public if a demolition project is performed in accordance with prevailing safety and environmental standards.

3-5.1 **Demolish (Risk).** The government is in a generally favorable position to manage risk relative to cost, time, and environmental hazards. The government is in somewhat of a less favorable position to manage risk relative to contractor performance. The government assumes risk and liability for differing conditions encountered during demolition. The government can reduce the probability of differing conditions through a thorough survey of the building and an accurate description of conditions in the contract documents. The government is exposed to time and cost impacts relative to differing project conditions resulting in contract changes. If a demolition project is performed in accordance with prevailing safety and environmental standards, there is typically no risk to the public.

3-5.2 **Recycle (Risk).** A recycling program may delay subsequent activities such as the ability to use the site. Unless sufficient liquidated damage provisions are included in the contract, the government assumes indirect effects of deficient contract performance. There is typically no risk to the public if a demolition project is performed in accordance with prevailing safety and environmental standards. There is possible exposure to the hazards of asbestos and/or lead if contaminated materials are released to the public through recycling or reuse. The government should require a contractor to monitor and control release of contaminated materials into recycled material feedstock.

3-5.3 **Recover (Risk).** The government assumes the risk and liability for differing conditions encountered during recovery and removal. The contractor assumes the risk of recovery expenses and the value of recovered materials. Transferring this risk holds the government harmless, but at a reduced income due to contingencies. There is possible exposure to the hazards of asbestos and/or lead if contaminated materials are released to the public through recovery and reuse.

3-5.4 **Deconstruct (Risk).** Personal injury liability is an issue when deconstructing a building since manual labor is used to perform most of the work. The probability of jobsite hazards can be reduced through the administration of a safety management program and adherence to safety and health regulations. With deconstruction, there is a risk of encountering unforeseen conditions. The government can transfer the risk of differing conditions, but at a significant price due to inflated contractor contingencies.

3-6 **IMPLEMENTATION.** Solicitations for traditional demolition contracts are generally in the form of a Request for Proposal (RFP). The lowest qualified bidder is generally selected as the contractor. A typical demolition RFP requires contractors to submit such information as qualifications and description of the proposing organization, a list of sub-contractors, a project schedule, and a list of completed projects and references. Since the method of demolition is irrelevant, no plan or proposal beyond a schedule is usually required. Where UFGS 01572 *Construction and Demolition Waste Management* is included in the contract documents, a waste plan is required that encourages reuse and recycling, and explicit requirements can be added.

To achieve higher rates of recovery, building material reuse and recovery must be part of the project planning and contracting process. A typical demolition contract, however,

will not work well to ensure maximum waste reduction, reuse, and recycling. These goals need to be explicitly outlined and negotiated before selection of a contractor.

Some standard contract formats limit the feasibility of reuse and recycling. Federal, State, and local contracting authorities should identify and remove barriers to material reuse, and recycling in the language, process, and procedures of public contracting. There are model contracts for past projects that can be customized for individual agencies. For example, East Bay Conversion and Reinvestment Commission developed a model Request for Proposal and Scope of Work for building deconstruction at the former Alameda Naval Air Station. The scope includes specific deconstruction, salvage, reuse, and recycling requirements. The following paragraphs are examples of language found in the Request for Proposals from two different projects.

Excerpt from the East Bay Conversion and Reinvestment Commission for deconstruction, demolition, and removal at the former Alameda Naval Air Station:

Deconstruction Plan: Submit proposed deconstruction, salvage, demolition and removal procedures to the City Contract Administrator for approval before work is started. The deconstruction/demolition plan shall include procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, and a detailed description of all shoring, equipment, and methods to be used for each operation and the sequence of deconstruction operations. Include statements affirming Contractor inspection of the existing roof deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, State provisions for securing the safety of the workers throughout the performance of this work.

Excerpt from the Bayview Military Housing Project RFP Amendment encouraging material recovery:

The Contractor is encouraged to recycle salvageable materials such as doors and windows that are unpainted, plumbing fixtures, lighting fixtures, and other materials that are not contaminated by hazardous materials such as asbestos and lead paint, and that are easily removed and reused. A public offering to sell or give away materials on government property is allowed if the following conditions are met:

The materials to be given away or sold on the premise must be marshaled in a location approved by the Contracting Officer.

The traffic of buyers or takers of the sale or give away materials shall provide adequate safety for all concerned. The traffic routing must be approved by the Contracting Officer.

Compliance with all laws and regulations.
The proposer/contractor is encouraged to recycle concrete and asphaltic concrete materials to be reused as fill under new paved areas, and under building foundation and slabs on grade. The recycled concrete and asphalt concrete are required to have all

hazardous materials and reinforcing steel removed before being crushed for use as fill materials. Crushing operation is allowed at the job site as allowed by local laws and regulations. Compliance with local Air Quality control and safety regulations will be required.

3-6.1 **Demolish (Implementation).** Demolition requirements are implemented as standard practice for building removal in DoD projects for new construction, and contract methods for standard demolition are already established. However, all new demolition contracts need to include specification requirements for the contractor to track and report the amount of waste disposed in landfills in order to satisfy installation reporting requirements under the DoD Solid Waste Measure of Merit. Demolition is typically executed through competitive bidding or an existing JOC contract. Boilerplate language from a standard model is used in the contract. The nature and extent of the work to be performed is usually described in the “scope of work” section of the document. The same language is also included in the bid solicitation.

3-6.2 **Recycle (Implementation).** The requirement to recycle materials is typically not included in a standard demolition contract, but an incentive clause can simply be added to the contract. In an incentive contract, the contractor has a cost for traditional demolition and waste disposal, but is encouraged to use waste reduction and recycling techniques. The contractor gets paid fully for his awarded bid, but is allowed to profit from any cost reductions realized through recycling. Provisions for handling tasks and the recyclable materials will have to be added to the scope of work.

In general, technical requirements and contract provisions shall be developed to include:

- control of physical hazards
- control of environmental hazards
- procedures and points of contact for the installation recycling program manager to work with the contractor to identify local markets for recycled materials
- disposition of recyclable material and material to be landfilled
- DRMO (Defense Reutilization Marketing Office) (Defense Reutilization Marketing Office) practices for items removed from buildings
- procedures for tracking and reporting the amounts of waste recycled and disposed in order to satisfy the Solid Waste Measure of Merit metrics of others.

3-6.3 **Recover (Implementation).** Most demolition contracts do not contain special language requiring materials recovery. Alternative procedures will have to be described in detail to explain how contractors plan to achieve maximum recovery in their bid response. The weight of materials recovered must be tracked and reported along with

the weight of materials recycled, to support the DoD Solid Waste Measure of Merit metrics. A standard demolition contract with bid alternatives allows contractors to submit an alternate bid for reducing and reusing the predominant C&D materials found in the building. The variations for bid alternatives are endless and offer maximum flexibility.

The sale of the building materials from demolition is atypical of traditional practices and may necessitate the development of an entirely new type of agreement. Provisions for transfer of property and material recovery will have to be included in the contract's scope of work.

3-6.4 **Deconstruct (Implementation).** Development of a contract for deconstruction will require additional time and advanced planning. There are many issues that need to be addressed, as conditions will vary greatly from one project to the next so no standard contract may be acceptable. One way to handle this is to issue a RFP similar to a traditional design or construction RFP. Here the contractor would be given a delivery order for an entire deconstruction project. Another strategy is to use a standard contract with bid alternatives in which bidders are asked to submit an alternate bid for deconstructing the building. This plan for deconstruction before the award of the contract can require guaranteed minimum salvage quantities and allow the contracting entity to compare proposed deconstruction plans to meet project goals.

3-7 **OPPORTUNITY.** The manual disassembly of wood-framed WWII barracks, as well as other construction types, represents an excellent opportunity to train low-skilled workers or military personnel with an aptitude and interest in learning the building trades. Trainees learn carpentry and physical worksite-related skills, including safety procedures, equipment operation and maintenance, and proper material handling. Also, trainees gain general employment skills, build a work ethic, and learn about leadership, decision-making and team building.

3-7.1 **Demolish (Opportunity).** In demolition there is little potential for construction-related training for military personnel. Demolition jobs require skilled labor in the areas of transportation and heavy equipment operation.

3-7.2 **Recycle (Opportunity).** The same is true for recycling as for demolition. There is limited potential for construction-related training for military personnel. Contractors hire trained crews to perform these operations.

3-7.3 **Recover (Opportunity).** If hand demolition techniques are used to disassemble a building and separate out the recoverable materials, there is significant potential for construction-related training.

3-7.4 **Deconstruct (Opportunity).** The highest potential exists for construction-related training in a building deconstruction project. Unskilled labor can obtain necessary experience. Deconstruction introduces opportunities for training at a level requiring only worker endurance, ability, and willingness to learn. Trainees can learn and practice construction-related skills by performing necessary tasks, but with less concern for risks

of poor workmanship.

CHAPTER 4

PROJECT CONDITIONS

4-1 **PROJECT SCOPE.** The scope of a project will affect the viability of each method of building removal. Depending on the method of building removal, there will be certain project constraints. An installation or facility can package projects to optimize the alternative methods. In most cases, the most successful strategy of building removal will involve a combination of demolition and deconstruction to recycle and recover useful materials.

4-1.1 **Demolish (Project Scope).** The scope of a project has no impact on the viability of landfilling debris from demolition.

4-1.2 **Recycle (Project Scope).** A project in which materials are recycled instead of landfilled is viable if the scope of the project is such that there is a high yield of materials for reprocessing. The overall size of the demolition project affects the feasibility, but the success of a recycling operation will also depend on the available recycling facilities in the area. Lack of these facilities in a project area may make the recycling of some materials expensive and/or impractical. The economies of transporting the materials long distance must be weighed against local disposal.

4-1.3 **Recover (Project Scope).** A recovery operation is generally effective if the scope of the project contains a large square footage of building to be removed. Larger projects can take advantage of economies of scale to reduce the extra labor costs of on-site preparation and save on landfill fees. Success will depend on the condition and the quantity of the recovered materials. Recovery is feasible if the total value of the items removed, plus the avoided costs for landfill disposal, compensates for the added cost of removal and storage.

4-1.4 **Deconstruct (Project Scope).** Buildings should be identified and deconstructed for their suitable components. Warehouses and certain types of industrial buildings are often good deconstruction candidates, since they are relatively simple structures with few interior partitions and are often unpainted. Valuable materials, (e.g., wood) are relatively easy to access, debris is minimized, and LBP is less likely to be an issue. Barracks are generally the second most desirable group of buildings to deconstruct since they are also relatively simple. Although offices and residences are usually less desirable structures, they should still be surveyed for deconstruction since some structures may contain valuable materials or fixtures. Case studies show that a scope of less than five buildings (approximately 10,000 total SF) is still sufficient to attract participation in a deconstruction operation. On the other hand, if a great number of buildings are to be removed at one time (hundreds), the glut of recovered materials may depress resale prices, thus inhibiting economic benefits.

4.2 **HAZARDOUS MATERIALS AND WASTE MANAGEMENT.** Check specific environmental requirements while in the project planning phase. Federal requirements

are found in the Code of Federal Regulations (40 CFR for environmental, 49 CFR for transportation, and 29 CFR for OSHA) and will apply in all states. State environmental requirements may be more stringent; if so, they are layered on top of the Federal requirements and must also be followed to avoid potential legal liability and/or fines. The States will have varying disposal and notification requirements for asbestos-containing material (ACM), lead based paint (LBP) debris, polychlorinated biphenyls (PCB), mercury and other materials. Due to the vintage of military facilities, many structures on military bases contain these hazardous materials. Because of the presence of these materials, additional measures and precautions are necessary to both demolish a structure and/or recover materials for reuse and recycling. It is the responsibility of the property owner to make reasonable efforts to identify hazardous materials on the site before demolition. Asbestos, lead, PCB and mercury abatement should occur in advance for every building that is being demolished, deconstructed, or relocated. More detailed information about establishing an installation-wide C&D management program and the specific environmental requirements for handling contaminated C&D debris, is found in the AFCEE *C&D Waste Management Guide* is available for downloading at http://www.afcee.brooks.af.mil/eq/programs/summary.asp?rscID=870. This Guide also includes seven self-calculating spreadsheets for estimating and tracking the amounts and costs for C&D materials that are recycled and disposed in renovation and demolition projects.

4-2.1 **ASBESTOS CONTAINING MATERIAL (ACM).** At one time, many different types of building materials contained asbestos because it was plentiful, inexpensive, nonflammable, strong yet flexible, resistant to chemical corrosion, and a good thermal and sound insulation. Asbestos is most commonly found in beam spray, insulation, mastic, floor tile, ceiling tile, siding, transite board and roof shingles. Asbestos is only a health concern when it is exposed, disturbed, and friable. Materials become friable if asbestos is liberated from the material matrix. Substances easily crumbled or reduced to powder by hand pressure are termed “friable.” Friable ACM requires full containment, monitoring, notification, and disposal at a special hazardous waste landfill. Substances not producing powder with hand pressure are “non-friable” and can be removed with minimal amount of containment. Unified Facilities Guide Specifications in Division 13 describe asbestos related safety, health, and disposal requirements and procedures to be implemented for building demolition activities. Public Works Technical Bulletin 420-70-8, *Installation Asbestos Management Program*, provides the latest information for the Army on asbestos management and safety procedures.

A building probably has asbestos if:

- it was built 1955-1978 and has ceilings that are bumpy, as if coated with cottage cheese or popcorn
- it was built 1940-1955 and has hard, rock-like shingles or siding
- it was built 1940-1983 and has vinyl flooring
- it was built 1955-1978 and has gypsum drywall walls
- it has ductwork sealed with white duct tape
- it has steam lines
- it has pipe insulation that looks like corrugated cardboard

- it was built 1920-1978 and has pipe insulation that is wrapped in canvas.

To be certain if a building material contains asbestos, a pre-design survey must be accomplished to obtain detailed data regarding ACM locations and content in building areas to be impacted. Samples must be taken by a person trained to do so and analyzed in an accredited laboratory. The results will indicate whether the material is positive (>1 percent asbestos) or negative (=<1 percent asbestos). Engineering Pamphlet (EP) 1110-1-30 details a scope of work for such asbestos surveys.

The OSHA construction industry asbestos standard**,** 29 CFR 1926.1101 (http://www.access.gpo.gov/nara/cfr/waisidx_01/29cfrv8_01.html) provides detailed work practice and engineering control requirements for asbestos work.

EPA's National Emission Standards for Hazardous Air Pollutants (NESHAPs) protect the public from exposure to airborne contaminants, including asbestos. The complete text is found at http://www.access.gpo.gov/nara/cfr/waisidx_01/40cfr61_01.html. Sections 140, 141, 145, and 150 apply.

The asbestos NESHAP requires the owner or operator of a demolition or renovation activity to thoroughly inspect the facility for the presence of asbestos, including nonfriable ACM. If a threshold amount of asbestos will be disturbed, then the installation must provide written notification at least 10 days before beginning work, to the local Pollution Control Agency responsible for NESHAP enforcement in accordance with Title 40 CFR 61.145(b), "Notification requirements." The installation must also comply with asbestos emission control requirements contained in Title 40 CFR 61.145(c), "Procedures for asbestos emission control." If less than the threshold amount of asbestos will be disturbed, only the reporting requirements of Title 40 CFR 61.145(b) apply. Neither the reporting or emission control requirements apply if less than the threshold amount of asbestos is disturbed in a building undergoing renovation.

The threshold asbestos amounts that trigger the reporting requirements are:

- 80 linear meters (260 linear feet) of regulated asbestos-containing materials (RACM) on pipes
- 15 square meters (160 square feet) of RACM on other facility components
- One cubic meter (35 cubic feet) of facility components where the amount of RACM previously removed from pipes and other facility components could not be measured before stripping.

Roofing materials have been specially addressed by EPA in Appendix A to the asbestos NESHAPS. The notification, wetting, and disposal requirements are defined for different situations and materials. A/C shingles that are removed and disposed of without crumbling, pulverizing, or reducing them to powder, are not subject to the NESHAP waste disposal requirements. This Appendix is not found on the CFR web site, so please consult your legal office or environmental management function for the details.

Wallboard typically does not contain asbestos, but the joint compound may. OSHA considers the joint compound and wallboard separate materials. NESHAPs considers them as a whole. Therefore, it may be necessary to test samples of both wallboard and joint compound separately to determine worker safety requirements, and also test composite samples of wallboard and joint compound to determine disposal requirements.

DEMOLISH (ACM)

Materials that have a high probability of being crumbled, pulverized, or reduced to powder as part of demolition must be removed before demolition begins. Friable and most non-friable ACM should be removed by qualified personnel using appropriate controls and protective devices in accordance with OSHA standards and the Clean Air Act Asbestos NESHAP. The disposal of non-friable ACMs is not regulated at the Federal level; however, States may have more stringent regulations. ACM that is removed must be labeled as such, wetted, bagged, transported in covered vehicles with no visible emissions, and disposed of at an authorized landfill. In most cases, these materials can be disposed of in a C&D or municipal solid waste landfill, but State and local regulations should be checked beforehand. State and local agencies which require handling and licensing procedures for landfills can supply a list of "approved" or licensed asbestos disposal sites upon request.

Specific demolition and cleanup practices for ACM are provided in Corps of Engineers Guide Specification (UFGS13280), Asbestos Abatement, and the Environmental Protection Agency publication, *Demolition Practices Under the Asbestos NESHAP*, EPA/340/1-92-013, 1992.

RECYCLE (Asbestos Containing Material)

Any materials containing asbestos shall not be recycled and must be disposed of properly in accordance with State and local landfill regulations.

RECOVER (Asbestos Containing Material)

Any materials containing asbestos shall not be recovered or reused. Asbestos removal and remediation cost will be a strong factor in the fate of a structure, whether or not it is economical to reuse or demolish.

DECONSTRUCT (Asbestos Containing Material)

Before deconstruction and any further activity, all the ACM must be removed by qualified personnel using the appropriate control and protective devices in accordance with OSHA standards and the Clean Air Act Asbestos NESHAP (40 CFR 61sections140 - 157, http://www.access.gpo.gov/nara/cfr/waisidx_00/40cfr61_00.html).

OFFSITE TRANSPORTATION

Offsite transportation of asbestos material is regulated under 40 CFR 61 part 150 (http://www.access.gpo.gov/nara/cfr/waisidx_00/40cfr61_00.html)and also the Department of Transportation regulations in 49 CFR 171 – 178 (http://www.access.gpo.gov/nara/cfr/waisidx_01/49cfrv2_01.html). These regulations should be consulted prior to transportation.

4-2.2 **Lead-Based Paint (LBP).** If a structure was built before 1978, it should be assumed that it is coated with LBP. LBP was primarily applied in kitchens, baths, and on wood trim and siding. When an architectural component coated with LBP is displaced and separated from a building during abatement or demolition activities, lead-contaminated debris is generated.

Public Works Technical Bulletin 420-70-2 provides technical guidance to identify and control lead hazards from lead-contaminated paint, dust, soil, and from other sources in Army-owned facilities constructed before 1978. Unified Facilities Guide Specifications in Division 13 describes the safety, health, and disposal requirements and procedures to be implemented for LBP removal and material handling activities.

The rules for storing, handling, record keeping, and disposing of LBP debris are changing. To reduce the costs and remove the obstacles associated with disposal of LBP debris, the USEPA is proposing a rule to shift the regulations from management and disposal of LBP from the Resource Conservation and Reservation Act (RCRA) to a tailored program under the Toxic Substances Control Act (TSCA). Currently, Federal facilities are required under Title IV of the Toxic Substance Control Act, Lead Exposure Reduction (Public Law 102-550), to comply with State and local regulations on LBP. Under the RCRA, installations and facilities are currently required to characterize their LBP waste and dispose of it by an approved method. If LBP debris is determined to be hazardous (equaling or exceeding 5 mg/liter lead according to the EPA Toxicity Characteristic Leaching Procedure, or TCLP), then the waste is strictly managed from identification to disposal.

Many states have regulations that are more stringent than the Federal standards and installations are required to comply with these more restrictive state standards. Workers exposed to lead are protected by standards established by OSHA.

In August 2000, the USEPA issued a policy clarification on how they will regulate the disposal of LBP debris under RCRA. Essentially, any LBP debris from a "residential" building will be considered non-hazardous, by definition. See the following URL for the latest EPA guidance: http://www.epa.gov/lead/fslbp.htm . Of course, states will have their own interpretations.
DEMOLISH (Lead-Based Paint)

LBP debris can be removed from the C&D waste stream and be managed separately, or it can remain in the larger contaminated waste stream which will then all have to be managed as LBP debris. Waste managers must determine whether it is more cost effective to simply dispose of the commingled debris in appropriate landfills, or to remove LBP debris and handle it separately so that the rest of the waste can be reused

or recycled.

Whole Building Demolition waste, as one commingled pile of rubble, is seldom regarded as hazardous waste under the RCRA. Often, LBP in demolition debris is not found in high enough concentrations to be hazardous waste and may be disposed of in a C&D landfill among other options. Burning of wood LBP debris, however, may result in lead releases since lead is a metal that is not destroyed through burning. The burning of LBP debris should be discouraged due to potential liabilities associated with disposal of the ash resulting from the burn. Before accepting LBP debris for burning activities, a facility should ensure that there would be no violations of the Clean Air Act permit conditions for burning buildings and that the facility will handle all ash in accordance with Federal/State hazardous waste regulations.

During demolition, mitigation measures to reduce the dust clouds associated with common demolition should be employed to decrease the exposure to lead. Exposure occurs through the inhalation of lead dust or ingestion of deteriorated LBP. Fugitive dust blown to neighboring property can contaminate soil and pass through open windows to settle on exposed surfaces. Typical mitigation involves spraying with water during demolition, watering down rubble pile, and spraying with water during loading and handling. A HEPA vacuum may be used on-site for cleaning up small debris and for vacuuming clothes and tools before exiting the site.

RECYCLE (Lead-Based Paint)

LBP debris may be recycled and reused in situations where there will be no human contact. The recycling and reuse of LBP debris as mulch, ground cover, or topsoil may cause health risks through ingestion of LBP, dust, or contaminated soil and should be avoided. If the wood waste is going to be recycled and reprocessed for mulch, composting or biomass fuel, painted or treated wood in general is highly undesirable.

RECOVER (LBP)

There are essentially three options available for the recovery and reuse of lumber that is coated with LBP. Each of these options must be looked at very carefully. If the building, intact, would be hazardous waste, then the performance of any of these three treatments would require a RCRA permit prior to execution of the work. One option is to remove the lead paint from the wood. All LBP removed from a substrate by virtually any method will, almost without exception, be hazardous waste and will be subject to RCRA disposal requirements. The second option is to encapsulate the LBP by painting over it, thus eliminating the exposure pathway of the lead. However, in future demolition, the LBP will be exposed again. The third option is to enclose and permanently seal lead painted materials in place. This process has many applications such as covering lead-painted drywall with new drywall, or reversing the painted surface of lumber to expose the unpainted portion of the lumber. Again, this eliminates the pathway for human contact, but would lead to re-exposure under future demolition of the structure. If LBP is transferred to another party for any reason you must notify the recipient in writing of the presence of LBP debris.

If the proposed USEPA regulation takes effect, items such as doors and windows that

contain lead-based paint could not be reused because the lead could still be harmful to children. According to the proposed rule, LBP components, which have deteriorated LBP on them, must be stripped completely of LBP before being reused. This stipulation severely limits materials that can be recovered and recycled because the cost of removing lead-based paint becomes too expensive.
DECONSTRUCT (Lead-Based Paint)

Deconstruction results in the disturbance or removal of painted surfaces. Effective implementation of OSHA, USACE, and Navy safety, health, and disposal requirements and procedures will control LBP exposure hazards to personnel performing deconstruction operations.
OFFSITE TRANSPORTATION

The offsite transportation of LBP contaminated debris will be subject to RCRA waste manifest and requirements only if the debris has been characterized as hazardous waste under RCRA. . If so, 40 CFR Parts 262 and 263 (http://www.access.gpo.gov/nara/cfr/waisidx_01/40cfrv22_01.html) should be consulted prior to packaging, labeling and transportation.

4-2.3 **POLYCHLORINATED BIPHENYLS (PCB).** At one time PCBs were common components of hydraulic fluids, lubricants, heat transfer fluids, and insecticides. They were also used as plasticizers in paints, plastics, and rubber products. PCBs were primarily manufactured as dielectric fluid for transformers and capacitors because of their ability to absorb heat, low flammability, low electrical conductivity, and favorable dielectric constant. Currently, heat transfer fluids residing in old transformers and capacitors used in power distribution systems are the main sources of PCBs. There may also be PCB-contaminated soil in places where transformers and capacitors have been stored or serviced, transformer fires have occurred, or PCBs have been sprayed as insecticides. Non-Liquid PCBs (NLPCBs) can be found in various items such as fluorescent light ballast potting material, ceiling tile coatings, and certain painted surfaces.

PCBs are regulated before disposal by their use (i.e., transformers, carbon paper, etc.). However, once the decision is made to end their use, disposal is regulated differently. PCB disposal requirements depend on the type of material being disposed, and the concentration of PCBs in the waste. C&D debris is usually regulated as “PCB bulk product waste.” However, PCB bulk product waste does not include debris from the demolition of buildings or other man-made structures that is contaminated by spills from regulated PCBs which have not been disposed of, decontaminated, or otherwise cleaned up in accordance with USEPA requirements.

Other types of PCB bulk product wastes are PCB-containing wastes from the shredding of automobiles, household and industrial appliances, or other white goods; PCB impregnated electrical, sound deadening, or other types of insulation and gaskets; or fluorescent light ballasts containing PCBs in the potting material.

DEMOLISH (PCB)

The Toxic Substances Control Act (TSCA) requires mixtures like construction and demolition debris that include PCB-containing materials to be regulated to the requirements of the highest classification of PCB concentration. For this reason, all known PCB materials should be removed and disposed properly prior to demolition. Manufacturers of PCB-containing materials and equipment were required to label these items with the PCB classification. Where this was not done, owners of these items were required to affix classification labels. Yet even fluorescent light ballasts labeled "no PCB" may contain PCBs in the potting material. Therefore, waste managers must use the TCLP sampling method to characterize waste known to contain either potting material that may contain PCBs or unlabeled capacitors and lighting ballasts.

Federal disposal requirements apply to C&D debris contaminated by 50 parts per million (ppm) or greater NLPCBs when originally removed from service, even if the current NLPCB concentration is less than 50 ppm. C&D debris that contained less than 50 ppm NLPCBs before removal from service is not regulated.

PCB disposal requirements are contained in 40 CFR Part 761, *Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce and Use Prohibitions* (http://www.access.gpo.gov/nara/cfr/waisidx_00/40cfr761_00.html) and applicable state and local regulations. ***NOTE:*** Several states regulate PCBs and NLPCBs as hazardous waste, and in those states, HW disposal requirements must be followed in addition to the federal PCB requirements.

PCB bulk product wastes may be disposed of in an incinerator, chemical waste landfill, or hazardous waste landfill, or may be decontaminated in accordance with the detailed procedures in 40 CFR 761.79. The selection of disposal methods is detailed in 40 CFR 761.62.

There is also an option to dispose of certain PCB bulk product wastes in a State-permitted municipal landfill or non-municipal non-hazardous waste landfill. These items include:

- Plastics (such as plastic insulation from wire or cable; radio, television and computer casings; vehicle parts; or furniture laminates); preformed or molded rubber parts and components; applied dried paints, varnishes, waxes or other similar coatings or sealants; caulking; Galbestos; non-liquid building demolition debris; or non-liquid PCB bulk product waste from the shredding of automobiles or household appliances from which PCB small capacitors have been removed (shredder fluff); and

- Other PCB bulk product waste, sampled in accordance with the protocols set out by the EPA that leaches PCBs at 10 µg/L of water measured using a procedure used to simulate leachate generation.

In order to dispose of PCB bulk product waste in a State-permitted municipal landfill or non-municipal non-hazardous waste landfill, there may be additional sampling,

recordkeeping and performance requirements that must be satisfied. Carefully review 40 CFR 761.62 if selecting this disposal option.

RECYCLE (PCB)

PCB bulk wastes must be disposed in accordance with 40 CFR 761.62 and shall not be recycled.

RECOVER (PCB)

PCB bulk wastes must never be recovered and reused without decontamination. The USEPA regulations for decontaminating PCB bulk product wastes are in two parts:

- The first part is a performance-based standard that specifies decontamination standards and requires analytical testing to demonstrate that decontamination has been achieved. Refer to 40 CFR 761.79 for the specific performance requirement. It allows PCBs from liquids, concrete, and non-porous surfaces to be removed using chopping, distilling, filtering, oil/water separation, stripping of insulation, spraying, soaking, wiping, scraping, and use of abrasives or solvents. Decontamination waste must be disposed as required based on the concentration of PCBs in the waste.

- The second part of the regulation provides a self-implementing decontamination procedure for PCB containers, movable equipment contaminated with PCBs, non-porous surfaces in contact with free flowing mineral oil dielectric fluid (MODEF), piping and hoses in air compressor systems, and decontamination of metal surfaces using thermal processes. Confirmatory sampling is not required for self-implementing decontamination procedures; however, documentation of compliance with the procedures must be maintained for 3 years after completion of the decontamination procedures (e.g., video recordings, photographs).

DECONSTRUCT (PCB)

Deconstruction may result in the disturbance or removal of PCB bulk wastes. Effective implementation of OSHA and USACE safety, health, and disposal requirements and procedures will control PCB exposure hazards to personnel performing deconstruction operations.

OFFSITE TRANSPORTATION

The offsite transportation of PCB contaminated debris is subject to RCRA waste manifest requirements (40 CFR Parts 262 and 263, (http://www.access.gpo.gov/nara/cfr/waisidx_01/40cfrv22_01.html) and is also subject to Department of Transportation regulations 49 CFR Parts 171-178 (http://www.access.gpo.gov/nara/cfr/waisidx_01/49cfrv2_01.html). These regulations should be consulted prior to transportation.

4-2.4 MISCELLANEOUS HAZARDOUS MATERIALS.

Many common items contain hazardous waste that will contaminate the rest of the C&D materials if left onsite during demolition. The best management practice is to remove these items prior to demolition or during deconstruction.

- Mercury-containing materials and treated lumber are commonly found in construction and demolition debris. Mercury or mercury vapor can be found in fluorescent light bulbs, high-intensity discharge lamps, thermostats, old mercury-bearing wall switches, and a variety of switches, relays and gauges. Wastes containing these items must be characterized as hazardous or not using the TCLP method.

- Batteries are found in emergency lighting, exit signs, security systems and other alarms. They may contain lead and cadmium.

- Roof vent flashings often contain pure lead. Lead pipes may also be found in older buildings.

- Lumber treated with chemicals and preservatives and considered for disposal or reuse in a project may require special handling. It should never be shredded for composting or for use as mulch. Burning is inappropriate if the treatment chemical concentrations are high enough to cause the ash to be hazardous waste, or the smoke to be a pollutant. Treated lumber includes marine piling and fenders, utility poles, rail ties, and other dimensional lumber that has been coated or impregnated with pentachlorophenol, creosotes, and arsenic compounds. Project managers can reduce treated lumber waste by reusing it in landscaping, berms, parking barriers, retaining walls, fencing, pole barns, and other applications calling for treated lumber. Coordinate with environmental managers before reusing treated lumber in situations where chemicals could leach into the ground, or to determine disposal requirements if it cannot be reused.

- Buildings where plating operations or extensive parts cleaning occurred may have materials containing regulated heavy metals or solvent chemicals that were spilled. Paint, oil, pesticides or other materials stored on the site must always be removed and properly disposed before demolition.

- Blue and yellow paints and coatings may contain regulated levels of cadmium and chromium.

Project managers should coordinate with environmental managers when planning demolition or deconstruction. Environmental Impact Analysis Process (EIAP) and Installation Restoration Program (IRP) documents will provide clues to hazardous materials likely to be encountered. Ensure unspecified materials are sampled, tested, and characterized as hazardous or not and manage them accordingly.

4-3 **SITE ACCESSIBILITY.** The site's accessibility to equipment, the contractor or the public affects the viability of each method. Site conditions may be favorable for one method of building removal and less favorable for another. Deconstruction is generally

applicable to specific sites and situations where demolition by other methods cannot be employed either due to severe restrictions on site access or because it can cause serious nuisance and damage. Such sites are usually found in downtown areas, underground facilities, etc. In these situations, manual deconstruction is a matter of necessity.

4-3.1 **Demolish (Site Accessibility).** Conventional demolition requires that the site be accessible by truck. This method is generally efficient regardless of accessibility to the site and site conditions. High-rise buildings that are higher than 15 stories must be partially demolished by manual methods. Use of mechanical demolition methods for higher multi-story buildings can cause serious air pollution and hazard problems in the vicinity of these tall structures.

4-3.2 **Recycle (Site Accessibility).** If debris is separated for recycling off-site, site accessibility and site conditions have no impact on the effectiveness of recycling. If debris is separated on-site for pick-up, space will need to be available to accommodate separation activities and collection receptacles. On-site processing requires allocation of space for mobile crushers and screens, and space to pile sorted materials. Such space may not always be available.

4-3.3 **Recover (Site Accessibility).** Additional square footage at each building site should be available for separating, processing, and removing materials recovered from the building. The most desirable option is to reuse the recovered materials on site. However, that is not always possible and the recovered materials have to be transported to local markets. Truck access should be available around each building's perimeter. Extremely limited space availability and/or truck access to each building may adversely impact the effectiveness of recovery/reuse strategy.

4-3.4 **Deconstruct (Site Accessibility).** Deconstruction is most feasible if there is an open site that allows ample space for on-site handling and processing of materials as they are removed from the building. The site should be organized so that different types of materials can be segregated simultaneously without conflicting during processing. Marking on the ground with paint for varying dimensional lengths facilitates sorting by size and saves time. Where buildings (or major portions thereof) are to be removed intact, large clearances will be required. If heavy equipment is needed for removal, this will also require additional space on the site.

4-4 **LANDFILL BURDEN.** Tables 4-1 and 4-2 list the relative landfill burdens per building type. The amount of material generated from demolition activities is generally proportional to the size of the structure being demolished. The materials generated vary according to the construction type. The following examples (of commercial buildings) can be used to estimate the materials of value that can be extracted with each method.

Table 4-1. Waste Generation Rates per Building Type.

	cubic feet of debris per square foot of floor area (cu ft/SF)
Wood Building	4.5
Brick Building	3.0
Concrete Building	3.0

Table 4-2. Waste Composition per Building Type.

	% Wood	% Brick	% Concrete	% Metal	% Paper Board
Wood Building	60-75	17-22	10-30	2.5-3	<1
Brick Building	12-32	53-82	12-20	3	1-2
Concrete Building	18-20	20-22	50-51	3	5-7

4-4.1 **Demolish (Landfill Burden).** This method of building removal has the greatest adverse impact on landfills. The traditional method of mechanical demolition was developed without regard to potential environmental impacts. The disposal of wastes generated from conventional mechanical demolition consumes valuable landfill space. One way to reduce the landfill burden is to grind up the resulting demolition debris such that it will require less landfill volume. While this may not save on weight-based commercial tipping fees, it will save the life span of government-owned landfills. Grinding also affords the opportunity to liberate some recyclables, such as steel rebar.

4-4.2 **Recycle (Landfill Burden).** Recycling selected materials can typically divert 70 percent of the waste from ending up in a landfill. Using a sophisticated system of crushers, shakers, screens, magnets, and blowers, larger recovery operations can achieve diversion rates as high as 82 percent. Including a recycling operation into the demolition project is an effective means of reducing the landfill burden.

4-4.3 **Recover (Landfill Burden).** Recovering selected building materials for reuse, in conjunction with recycling, can typically divert as much as 85 percent of the waste from ending up in a landfill. Recovering for reuse is an effective means of reducing the landfill burden. According to the Center for Economic Conversion, the reuse of 1,000 board feet of properly salvaged lumber can replace the harvesting of approximately 10,000 board feet of standing timber

4-4.4 **Deconstruct (Landfill Burden).** Recent deconstruction demonstration projects show that high diversion rates may be achieved. Removing buildings (or major portions thereof) intact can divert up to 98 percent of building waste from landfilling. Deconstruction is highly effective in reducing landfill burden by diverting valuable materials from the nation's overflowing landfills. Relocation preserves both tangible and intangible resources embodied in the structure.

4-5 **RESOURCES**. Typical building removal requires certain labor and equipment

resources. Alternative methods may require other specialized resources that may create an advantage or disadvantage to the owner.

4-5.1 **Demolish (Resources).** The type of construction, building height, proximity to neighboring structures, and rights-of-way are some of the factors that determine the method of demolition. Wood-framed buildings are generally demolished by bulldozer, while masonry or concrete buildings are more likely to be demolished by wrecking ball. Mechanical demolition requires the use of heavy equipment including dump trucks, tractors, and loaders. Demolition requires workers with experience in the areas of transportation and heavy equipment operation. These jobs are typically high paying and require skilled labor.

4-5.2 **Recycle (Resources).** Common equipment and labor skills are used for on-site separation of materials. Manual labor is required to supplement mechanical equipment. The type of construction will determine what tools and equipment are required. “If you don’t have the right tools, generating a profit from a C&D debris recycling operation can be as difficult as crushing a one-ton slab of concrete with your fist” (World Wastes, May 1998, p 62). Materials that are not recycled and reused on the site will need to be hauled away by dump trucks.

4-5.3 **Recover (Resources).** Recovery is generally effective using commonly available construction equipment and labor resources. Manually removing materials for reuse requires workers with common building construction skills. Some training may be required if non-construction labor is employed. If larger structural members are removed heavy equipment, such as a crane, is required. High-value/low-salvage cost items such as appliances, cabinets, lighting fixtures and architectural elements are targeted and salvaged before the heavy equipment is brought in to clean up the remaining items. More labor hours are required for a salvage operation. These additional handling costs can be reduced if the efficiency of the equipment is increased.

4-5.4 **Deconstruct (Resources).** Deconstruction is very labor intensive. Workers do not need to be highly skilled, but they do need to have endurance, ability, and willingness to learn. Deconstruction also adds another level of jobs including material handlers and distributors. In piece-by-piece wrecking, workers usually employ simple hand tools such as crowbars, sledgehammers, flat screwdrivers, wire-cutting pliers, a utility knife etc.

4-6 **MARKETS.** Markets and outlets for building construction materials greatly influence reuse and recycling activities. If reasonable profits can be expected from the sale of recycled materials there is a greater incentive for efficient recovery. If there is not a high demand for a commodity, the material may not be salvaged or recycled.

There are several sources that can provide information as to the local market demand, value, and outlets for each material or component type. Through DoD, and the Defense Reutilization and Marketing Service (DRMS) Reutilization Program, excess property no longer needed by the military is made available for redistribution. An installation may be able to use the DRMS to implement deconstruction and salvage. APPENDIX C to this

PWTB contains various Federal, State, and local resources throughout the United States for salvaged C&D waste materials.

4-6.1 **Demolish (Markets).** Demolition operations generate a far less desirable waste due to the non-uniform nature of the waste that is commingled with other materials. Very little reusable waste is yielded due to the practice of using heavy equipment to demolish structures.

4-6.2 **Recycle (Markets).** Recycling facilities will use their resources to recover materials if reasonable profits can be expected from the sale of recycled materials. If the commodity does not command a high enough price in the market, recycling may prove to be costly. Each project's unique regional situation influences how much profit a recycling operation can expect to make. Recycling rates continue to improve, but one undeniable roadblock to a successful recycling program is the lack of markets for some materials.

4-6.3 **Recover (Markets).** The most desirable option, and most cost effective, is to reuse recovered material on the site. For example, concrete can be crushed and used for fill on site. Salvaged lumber and other building materials that can be used on the site for new construction will minimize the cost associated with transportation and market development. One major barrier to increased recovery rates is the low cost of virgin construction materials. Recycled content materials often cost the same or more than new materials. However, salvaged materials can often be of higher quality than comparable new materials. Old-growth timber is one such example.

4-6.4 **Deconstruct (Markets).** Deconstruction minimizes contamination of demolition debris, thus increasing the potential for marketing the recovered materials. Before deconstruction, it helps to know what materials are worth salvaging so that materials with potential value are not inadvertently destroyed. Hand demolition significantly increases the amount of materials that can be reused and yields materials that are available for immediate resale or reuse.

APPENDIX A

REFERENCES

GOVERNMENT PUBLICATIONS:

1. Executive Orders — EO 13101, Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition, 14 September 1998.

2. OSHA — 29 CFR 1926, Safety and Health Regulations for Construction (Source: 44 FR 8577, Feb. 9, 1979; 44 FR 20940, Apr. 6, 1979).

3. EPA
   a. Demolition Practices Under the Asbestos NESHAP, EPA/340/1-92-013, 1992
   b. Construction & Demolition Debris Website at http://www.epa.gov/epaoswer/non-hw/debris.

4. Department of Defense
   a. Defense Reform Initiative Directive 36, 05 May 1998, Subject: "Disposal/Demolition of Excess Structures, the Army's goal for FY 1998-2003".
   b. Deputy Under Secretary of Defense (Environmental Security) Memorandum, 13 May 1998, Subject: New DoD Pollution Prevention Measure of Merit. http://www.afcee.brooks.af.mil/eq/programs/summary.asp?rscID=416
   c. Defense*Link* Publications Internet site http://www.defenselink.mil/pubs/

5. Department of Army	a. AR 420-49, Utility Services, 28 May 1997.
	b. Public Works Technical Bulletin 420-49-30, Alternatives to Demolition for Facilities Reduction, 10 February 2000.
	c. Public Works Technical Bulletin 420-70-2, *Installation Lead Hazard Management*, 20 February 1997.
	d. EM 385-1-1, Safety - Safety and Health Requirements, 3 September 1996.
	e. Public Works Technical Bulletin 420-70-8, *Installation Asbestos Management Program*, 23 March 1998.
	f. CERL Technical Report N-15, Development of Predictive Criteria for Demolition and Construction Solid Waste Management, October 1976.
	g. CERL Technical Report 99/58, Concepts for the Reuse and Recycling of Construction and Demolition Waste, June 1999.
6. U.S. Air Force	Construction and Demolition Waste Management Guide http://www.afcee.brooks.af.mil/eq/programs/summary.asp?rscID=870
7. U.S. Navy	OPNAVINST 5090.1B Environmental and Natural Resources Manual, September 1999
	NFESC QRP Program http://es.epa.gov/program/p2dept/defense/navy/nvy-recy.html

7. Unified Facilities Guide Specifications and Unified Facilities Criteria

a. 01525N Safety Requirements, December 2001
b. 01572 Construction and Demolition Waste Management November 2001
c. 02220A Demolition, May 2001
d. 02220N Site Demolition, March 2000
e. UFGS 13280A, Asbestos Abatement, November 2001.
f. UFGS 13281N, Engineering Control of Asbestos Containing Material, January 2002
g. UFGS 13281A, Lead Hazard
h. UFGS 13282N Lead in Construction, February 2002
i. 13283N Removal/Control and Disposal of Paint with Lead, February 2002

UFC 3-260-01 (TM 5-803-7/ Airfield and Heliport Planning and Design

AFMAN 32-1123(I)/NAVFAC P-971)
UFC 3-260-03 (TI 826-01/ Airfield Pavement Evaluation
AFMAN 32-1121V1(I)/
NAVFAC DM 21.7)

NON-GOVERNMENT PUBLICATIONS:

1. Institute of Electrical and Electronics Engineers Inc. (IEEE)
445 Hoes Lane, P.O. Box 1331
Piscataway, NJ 08855-1331

Standard for Use of the International System of Units (SI): the Modern Metric System

World Wastes

May 1998 edition, p 62

APPENDIX B

DEFINITIONS

DEMOLISH
Demolition refers to the razing of a building with heavy equipment in such a way that the building components are rendered into rubble and are fit for nothing more than landfill.

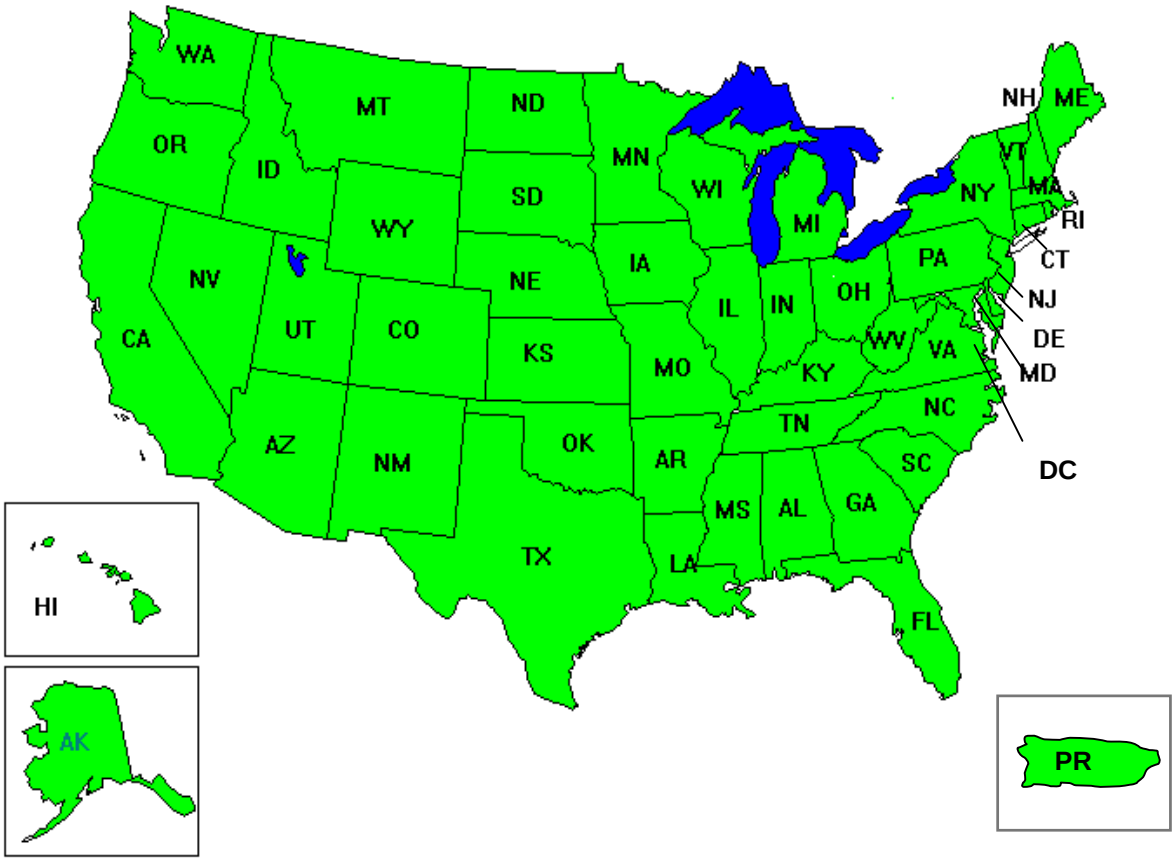
RECYCLE
Recycling includes diverting materials that are not reusable in their current form from the solid waste stream and using these extracted materials as feedstock for reprocessing into useful products.

RECOVER
Recovery includes the removal of materials or components from the solid waste stream in a manner that retains its original form and identity, for the purpose of reuse in the same or similar form as it was produced.

DECONSTRUCT
Deconstruction means systematic dismantling of a building, preserving the integrity of the materials, with the goal of maximizing the recovery of salvageable materials for potential reuse and recycling.

APPENDIX C

INFORMATION RESOURCES FOR C&D WASTE RECOVERY, RECYCLING AND REUSE



Note: This is a selective, not a comprehensive, list of resources. This information is provided to increase the recycling and reuse of materials that would otherwise need to be disposed. The references listed below and for information purposes only and are not endorsements by the Department of the Army (DA). The DA is neither liable nor responsible for the character or content of any item listed or sold at non-profit or for-profit material exchanges.

FEDERAL AND NATIONAL ORGANIZATIONS AND ASSOCIATIONS

Air Force Center for Environmental Excellence
"C&D Waste Management Guide"
HQ AFCEE/EQ
3207 North Road
Brooks AFB, TX 78235-5363
DSN 240-4191
E-mail: karen.kivela@HQAFCEE.BROOKS.AF.MIL
http://www.afcee.brooks.af.mil/

Aluminum Association
900 19th Street, NW, Suite 300
Washington, DC 20006-2168
(202) 862-5100; Fax: (202) 862-5164
http://www.aluminum.org/

American Institute of Constructors
466 94th Avenue North
St. Petersburg, FL 33702
(813) 578-0317; Fax (813) 578-9982
E-mail: AICnatl@aol.com
http://www.aicnet.org/

American Iron and Steel Institute
1101 17th St., NW, Suite 1300
Washington, DC 20036
(202) 452-7100; 1-800-YES-1-CAN (937-1226)
http://www.steel.org/environment/

American Plastics Council
1300 Wilson Blvd., Suite 800
Arlington, VA 22209
(800) 2-HELP-90 (hotline) or (202) 974-5413
http://www2.plasticsresource.com/

Appliance Recycling Information Center
701 Pennsylvania Avenue NW, Suite 900
Washington, DC 20004
(202) 434-7492; Fax: (202) 434-7400
http://www.aham.org/mfrs/aric/aric.htm

The Association of State and Territorial Solid Waste Management Officials
444 North Capitol St., NW Suite 315
Washington, DC 20001-1512
(202) 624-5828; Fax: (202) 624-7875
E-mail: swmtrina@sso.org
http://www.astswmo.org/

Community Environmental Council
930 Miramonte Drive
Santa Barbara, CA 93109
(805) 963-0583; Fax: (805) 962-9080
http://www.grc.org/

Construction Materials Recycling Association
P.O. Box 644
Lisle, IL 60532
(630) 548-4510; Fax: 630-548-4511

Defense Reutilization and Marketing Service
Federal Center
74 North Washington St.
Battle Creek, MI 49017
(888) 352-9333; Fax: (616) 961-4201
E-Mail: custservice@dlis.dla.mil
http://www.drms.dla.mil/
Earth's 911
1-800-CLEANUP
http://www.1800cleanup.org/

Environmental Industry Associations
4301 Connecticut Avenue, NW
Suite 300, Washington, DC 20008
(202) 244-4700 or (800) 424-2869; Fax: (202) 966-4818
http://www.envasns.org/

Glass Packaging Institute
1627 K Street N, Suite 800
Washington, DC 20006
(202) 887-4850
http://www.gpi.org/

Global Recycling Network
Brookhaven, NY 11719
Fax: (516) 286-8471
E-mail: grn@grn.com
http://grn.com/

Gypsum Association
810 First St., NE, Suite 510
Washington, DC 20002
(202) 289-5440

Institute for Local Self-Reliance, Midwest Office
1313 Fifth Street SE
Minneapolis, MN 55414-1546
(612) 379-3815; Fax: (612) 379-3920
http://ilsr.org/

Institute for Local Self-Reliance, National Office
2425 18th Street, NW
Washington, DC 20009-2096
(202) 232-4108; Fax: (202) 332-0463
http://ilsr.org/

Institute of Scrap Recycling Industries
1325 G Street, NW, Suite 1000
Washington, DC 20005-3104
(202) 737-1770; Fax: (202) 626-0900
E-mail: isri@isri.org
http://www.isri.org/

Investment Recovery Association
5800 Foxridge Drive, Suite 115
Mission, KS 66202-2333
(913) 262-4597; Fax: (913) 262-0174
E-mail: ira@invrecovery.org
http://www.invrecovery.org/

Keep America Beautiful
1010 Washington Boulevard
Stamford, CT 06901-2202
(203) 323-8987; Fax: (203) 325-9199
E-mail: keepamerbe@aol.com
http://www.kab.org/

Mid-America Council of Recycling Officials
1818 Fountain Square Court F-2
Columbus, OH 43224
(614) 265-6333

Minerals, Metals & Materials Society
184 Thorn Hill Road
Warrendale, PA 15086
(724) 776-9000, ext. 270; Fax: (724) 776-3770

National Association of Demolition Contractors
16 N. Franklin Street, Suite 200B
Doylestown, PA 18901-3536
(215) 348-4949 or (800)-541-2412; Fax: (215)348-8422
E-mail: nadc@voicenet.com
http://www.demolitionassn.com/

National Association of Home Builders
400 Prince George's Blvd.
Upper Marlboro, MD 20774-8731
(202) 822-0200
http://www.nahbrc.org/builders/green/Decon_br.pdf
http://www.nahb.org/

National Association of Resale & Thrift Shops
P.O. Box 80707
St. Clair Shores, MI 48080-0707
(800) 544-0751; Fax: (810) 294-6776

National Recycling Coalition
1727 King Street, Suite 105
Alexandria, VA 22314-2070
(703) 683-9025; Fax (703) 683-9026
http://www.nrc-recycle.org/

National Solid Wastes Management Association
4301 Connecticut Avenue, NW, Suite 300
Washington, DC 20008
(202) 244-4700; Fax: (202) 966-4841
http://www.envasns.org/nswma/

Northeast Recycling Council
139 Main Street Suite 401
Brattleboro, VT 05301
(802) 254-3636; Fax: (802) 254-5870
E-mail: nerc@sover.net
http://www.nerc.org/

Solid Waste Association of North America
P.O. Box 7219
Silver Spring, MD 20907-7219
(301) 585-2898
http://www.swana.org/

Steel Recycling Institute
680 Anderson Dr., Foster Plaza 10
Pittsburgh, PA 15220-2700
(800) 876-7274
http://www.recycle-steel.org/

United States Environmental Protection Agency
Office of Solid Waste
http://www.epa.gov/osw/
"Characterization of Building-Related Construction and Demolition Debris in the United States."

US Green Building Council
110 Sutter Street, Suite 410
San Francisco, CA 94104
(415) 445-9500; Fax: (415) 445-9911
E-mail: info@usgbc.org
http://www.usgbc.org/

Waste Policy Center
211 Loudon St. SW
Leesburg, VA 20175-2718
(703) 777-9800; Fax: (703) 777-3733
http://www.winporter.com/

Waste Wise
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460
800 EPA-WISE (372-9473); Fax (703) 308-8686
E-mail: Tumarkin.Jeff@epamail.epa.gov
http://www.epa.gov/wastewise/

ALABAMA

Alabama Department of Environmental Management
P.O. Box 301463
Montgomery, AL 36130-1463
(334) 271-7700
http://www.ademstate.al.us/

Alabama Cooperative Extension Service
202 Duncan Hall
Auburn, AL 36849-5614
(205) 844-4451; Fax: (205) 844-9650
E-mail: rmcoord@acenet.auburn.edu

Alabama Waste Materials Exchange
411 East Irvine Avenue
Florence, AL 35630-4621

ALASKA

Alaska Department of Environmental Conservation
Compliance Assistance Office
555 Cordova Street
Anchorage, AK 99501
(800) 510-ADEC (inside AK) or (907) 269-7586 (outside AK); Fax: (907) 269-7600
E-mail: CompAsst@envircon.state.ak.us
http://www.state.ak.us/dec/dsps/compasst/cao_home.htm

Cooperative State Research, Education, and Extension Service
University of Alaska Fairbanks
2221 E. Northern Lights Blvd, Suite 118
Anchorage, AK 99508-4143
(907) 279-6575; Fax: (907) 277-5242
E-mail: afwgv@acad2.alaska.edu

Alaska Materials Exchange
Compliance Assistance Office
555 Cordova Street
Anchorage, AK 99501
(907) 269-7586 or (800) 510) 2332; Fax: (907) 269-7600
E-mail: compasst@envircon.state.ak.us
http://www.state.ak.us/dec/dsps/compasst/answers.htm

Anchorage Recycling Center
6161 Rosewood Street
Anchorage, AK 99518
(907) 562-2267; Fax: (907) 273-2799
http://www.anchoragerecycling.com/

ARCO & BP Investment Recovery
P.O. Box 196612
Anchorage, AK 99516
(907) 659-4205; Fax: (907) 659-4369
E-mail: pbusurplusteamleader@bp.com

ARIZONA

Arizona Department of Environmental Quality
3033 North Central Avenue
Phoenix, AZ 85012
(602) 207-2300 or (800) 234-5677 (inside AZ)
Solid Waste: (602) 207-4117
Recycling and Data Management Unit: (602) 207-4171
Recycling Database: (602) 207-4173
http://www.adeq.state.az.us/

Arizona Recycling Coalition
P.O. Box 2533
Phoenix, AZ 85002-2533
(602) 264-5466
http://www.azrc.org/

Regional Recycling Information Exchange
Maricopa Association of Governments
Environmental Planner
302 N. 1st Avenue, Suite 300
Phoenix, AZ 85003
E-mail: ddudley@mag.maricopa.gov

http://www.mag.maricopa.gov/rrie/rrie.htm**Southwest Public Recycling Association**
P.O. Box 27210
Tucson, AZ 85726
(520) 791-4069
http://www.spra-recycling.org/

Cooperative State Research, Education, and Extension Service
University of Arizona
450 S. Haskell Ave
Wilcox, AZ 85643
(602) 384-3594; Fax: (602) 384-3681

Arizona Resource Exchange
University of Arizona
Facility Management #49
Tucson, AZ 85721-0049
(520) 626-1266; Fax: (520) 621-6086
E-mail: azre@mail.fm.arizona.edu

Arizona Waste Exchange
4725 E. Sunrise Dr., # 215
Tucson, AZ 85718
(520) 626-1266

Valley of the Sun Habitat for Humanity ReStore
P.O. Box 20186
Phoenix, AZ 85036-0186
(602) 268-9022

ARKANSAS

Department of Environmental Quality
8001 National Drive
Little Rock, AR 72209
(501) 682-0744
Solid Waste Management Division: (501) 682-0600
Material Recovery Facilities: (501) 682-0608
Transfer Stations: (501) 682-0601
http://www.adeq.state.ar.us/solwaste/main.htm

Pulaski County Regional Solid Waste Management District
100 South Broadway
Little Rock, AR 72201
(501) 340-8787; Fax (501) 340-8785
E-mail: sgele@aristotle.net
http://www.pulaskiswdistrict.org/

East Arkansas Planning & Development District
P.O. Box 1403
Jonesboro, AR 72403
(870) 932-3957; Fax: (870) 932-0135
E-mail: eastdist@eapdd.com
http://www.eapdd.com/

Arkansas Recycling Coalition
312 South Pulaski
Little Rock, AR 72201
(501) 399-9696; Fax: (501) 374-2217
E-mail: mail@recycleark.org
http://www.recycleark.org/

Arkansas Cooperative Extension Service
P.O. Box 391
Little Rock, AR 72203
(501) 671-2080; Fax: (501) 671-2251
E-mail: triley@uaex.edu

Arkansas Industrial Development Council
1 Capitol Mall, Room 4B215
Little Rock, AR 72201
(501) 682-1370; Fax: (501) 682-7341

ScrapMatch

Arkansas Department of Economic
One State Capitol Mall
Little Rock, AR 72201
(501) 682-7332 or (501) 682-7317; Fax: (501) 682-2703
http://www.aedc.state.ar.us/

CALIFORNIA

Environmental Protection Agency
Cal/EPA Communications Office
555 Capitol Mall Suite 525
Sacramento, CA 95814
(916) 445-3846
E-mail: cepacomm@calepa.ca.gov
http://www.calepa.ca.gov/

California Integrated Waste Management Board
8800 Cal Center Drive
Sacramento, CA 95826
(916) 255-2200
http://www.ciwmb.ca.gov/
Construction & Demolition: (916) 255-2495
http://www.ciwmb.ca.gov/ConDemo/
E-mail: Mark Fong: mfong@ciwmb.ca.gov

Alameda County Waste Management Authority
Alameda County Source Reduction and Recycling Board
777 Davis Street, Suite 100
San Leandro, CA 94577
(510) 614-1699; Fax: (510) 614-1698
Recycling Hotline: (877) STOPWASTE (786-7927)
http://www.stopwaste.org/

Fort Ord Reuse Authority
100 12th Street, Bldg. 2880
Marina, CA 93933
(831) 883-3672; Fax: (831) 883-3675
http://www.fora.org/

The East Bay Conversion and Reinvestment Commission
1333 Broadway, Suite 1020
Oakland, CA 94612
(510) 834-6928; Fax: (51) 834-8913
Urban Ore
1333 Sixth Street
Berkeley, CA 94710
(510) 559-4454; Fax: (510) 235-0198
http://bayarea.citysearch.com/E/V/SFOCA/0010/52/88/1.html

California Resource Recovery Association
P.O. Box 162789
Sacramento, CA 95816
916-441-CRRA (441-2772); Fax: 916-451-9150
E-mail: crra@aol.com
http://www.crra.com/

Cooperative State Research, Education, and Extension Service
University of California
Riverside, CA 92521
(909) 787-3333; Fax: (909) 787-5522
E-mail: david.crohn@ucr.edu

Green Building Resource Guide Salvaged Building Materials Exchange
The Architectural Machine
P.O. Box 3808
Redwood City, CA 94064
Fax: (650) 364-5116
http://www.greenguide.com/exchange/

Beyond Waste
3262 Wilder Rd.
Santa Rosa, CA 95407
(707) 792-2555; Fax: (707) 792-2565
E-mail: precycle@sonic.net
http://www.sonic.net/~precycle/

California Materials Exchange (CalMAX)
California Integrated Waste Management Board
8800 Cal Center Drive, MS23
Sacramento, CA 95826-3268
(916) 255-2369; Fax: (916) 255-4580
E-mail: CalMAX@ciwmb.ca.gov
http://www.ciwmb.ca.gov/calmax/

California Waste Exchange
Department of Toxic Substances Control
P.O. Box 806
Sacramento, CA 95812-0806
(916) 322-4742; Fax: (916) 327-4495
E-mail: KPAYNE@DTSC.CA.GOV
http://www.dtsc.ca.gov/hwcwe.htm

Tijuana/San Diego Habitat for Humanity ReStore
3562 Grove Street
Lemon Grove, CA 91945
(619) 465-7576

San Fernando/Santa Clarita Valley Habitat for Humanity ReStore
5525 Cahuenga Blvd.
North Hollywood, CA 91601-2920
(818) 487-9600

Habitat for Humanity of Ventura County ReStore
167 Lambert Street
Oxnard, CA 93030-1044
(805) 485-6065

Habitat for Humanity Riverside ReStore
P.O. Box 70 -R
San Bernardino, CA 92492
(909) 787-6754

Los Angeles County Materials Exchange
900 South Fremont Avenue
Alhambra, CA 91803
(626) 458-5167 or (626) 458-3593; Fax: (626) 458-3593
E-mail: rbarker@dpw.co.la.ca.us
http://dpw.co.la.ca.us/epd/lacomax/

ProMax
Ecology Action
P.O. Box 1188
Santa Cruz, CA 95061-1188
(408) 426-5925, x12; Fax: (408) 425-1404
E-mail: promax@ecoact.org
http://www.crutio.com/~ecoact/ProMax.html

The Reuse People
477 Marina Parkway
Chula Vista, CA 91910
(619) 427-0430; Fax: (619) 427-0020

Sonoma County Materials Exchange (SonoMax)
575 Administration Drive, Room 117A
Santa Rosa, CA 95403
(707) 527-3668; Fax: (707) 527-3701
Eco-Desk Hotline (707) 565-DESK(3375).
E-mail: sonomax@ap.net
http://www.recyclenow.org/sonomax/

Ventura County Material Exchange (VCMAX)
Ventura County Solid Waste Management Department
800 S. Victoria Ave.
Ventura, CA 93009
(805) 648-9226; Fax (805) 648-9233
E-mail: swmd@rain.org
http://www.rain.org/~swmd/vcmax/vcmaxfrm.html

COLORADO

Colorado Department of Public Health and Environment
Hazardous Materials and Waste Management
4300 Cherry Creek Drive South
Denver, CO 80222
(303) 692-3445 or (303) 692-3300; Fax: (303) 759-5355
E-mail: glenn.mallory@state.co.us
http://www.cdphe.state.co.us/cdphehom.asp

Governor's Office of Energy Management and Conservation
1675 Broadway, Suite 1300
Denver, CO 80202-4613
(303) 620-4292 or (800) OEC-6662; Fax: (303) 620-4288
E-mail: oec@csn.net
http://www.state.co.us/oec/

Solid Waste Association of North America
Rocky Mountain Chapter
Mark McMullen, President
165 S. Union Blvd., Suite 1000
Lakewood, CO 80220
(303) 914-1768; Fax: (303) 914-1709

Southwest Public Recycling Association
Colorado Office
216 16th St., Suite 1500
Denver, CO 80202
(303) 640-7497; Fax: (303) 640-3233
E-mail: hfowler452@aol.com

Southeast/East Central Recycling Association
P.O. Box 1412
Lamar, CO 81502
(719) 336-2384; Fax: (719) 336-2384
Colorado Recycles
8745 W. 14th Ave., Suite 216
Lakewood, CO 80215-4850
(303) 231-9972

Colorado Association for Recycling
4591 Ivy St.
Denver, CO 80216
(303) 322-7887; Fax: (303) 322-9757
http://www.cafr.org/

Colorado State University Cooperative Extension
Room 1, Administration Bldg.
Fort Collins, CO 80523-0002
(970) 491-6281; Fax: (970) 491-6208
E-mail: dlamm@vines.colostate.edu

Rocky Mountain Institute
1739 Snowmass Creek Road
Snowmass, CO 81654-9199
(303) 927-3851; Fax: (970) 927-3420
http://www.rmi.org/

Colorado Materials Exchange (COMEx)
University of Colorado - Boulder
Campus Box 207
Boulder, CO 80309-0207
(303) 492-8307; Fax: (303) 492-1897
E-mail: debell@spot.colorado.edu
http://www.colorado.edu.cure/

Rocky Mountain Materials Exchange
999 18th Street, Suite 2750
Denver, CO 80202
(303) 297-0180, ext.103; Fax: (303) 297-0188
E-mail: rmorris@csn.net
http://www.rmmex.com/

Habitat for Humanity of Loveland, Colorado ReStore
1410 East Eisenhower-R
Loveland, CO 80537
(970) 669-7343

TSDX Corporation
1667 Cole Blvd. Suite 400
Golden, CO 80401
(303) 202-6620; Fax: (303) 237-1103
E-mail: edc@tsdx.com
http://www.tsdcentral.com/

CONNECTICUT

Art Barber Excavating, Inc.
New State Road
Manchester, CT 06040
(203) 875-3892

American Materials Corp.
100 Old Iron Ore Rd.
Bloomfield, CT 06095
(203) 242-6023

Hubert E. Butler
Route 66
Portland, CT 06480
(203) 342-3880

Department of Environmental Protection
Waste Management Bureau
Source Reduction and Recycling Program
79 Elm Street
Hartford, CT 06106-5127
(860) 424-3365
Beneficial Use of Solid Waste: (860) 424-3022
http://dep.state.ct.us/

Cooperative State Research, Education, and Extension Service
University of Connecticut
1376 Storrs Road
Storrs, CT 06269-4087
(860) 486-2840; Fax: (860) 486-5408
E-mail: jbartok@canr1.cag.uconn.edu

The EnviroXchange
11 Mountain Ave., Suite 203
Bloomfield, CT 06002
(860) 286-0666; Fax: (860) 286-0671
E-mail: Feedback@enviroxchange.com
http://www.enviroxchange.com/

ConnTAP Materials Exchange
50 Columbus Boulevard, 4th Floor
Hartford, CT 06106
(203) 241-0777; Fax: (203) 244-2017
Construction & Demolition Aggregate Recycling Facilities
http://dep.state.ct.us/wst/recycle/constrct.htm

Recycled Concrete Products
Apothecaries Road
East Windsor, CT 06106
(800) 742-6701
Bedrock, Inc.
15 South Smith Street
East Norwalk, CT 06855
(203) 348-2775

Roncari Industries
1776 South Main
East Granby, CT 06026
(203) 527-1825

Soneco Services
185 South Road
Groton, CT 06340
(203) 445-2457

Tilcon Connecticut
Colt Highway, Route 6
Farmington, CT 06032
(203) 677-1643

Valley Sand & Gravel
400 North Frontage Road
North Haven, CT 06473
(203) 467-6328

Waste Conversion Technologies, Inc.
221 Old Gate Lane
Milford, CT 04460
(203) 445-2457

John J. Brennan Construction
2 Riverdale Avenue
Shelton, CT 06484
(203) 929-6314

Burns Construction
Housatonic Avenue
Bridgeport, CT 06604
(203) 375-1383

O & G Industries, Inc.
240 Bostwick Avenue
Bridgeport, CT 06604
(203) 366-4586

Wilcox Trucking
83 Old Windsor Road
Bloomfield, CT 06095
(203) 243-8870

DELAWARE

Department of Natural Resources and Environmental Control
89 Kings Highway
Dover, DE 19901
Solid Waste Management Branch: (302) 739-3820
Pollution Prevention Program: (302) 739-3822 or (302) 739-6400
http://www.dnrec.state.de.us/del-cnst.htm

Delaware Solid Waste Authority
RECYCLE DELAWARE Program
1128 South Bradford Street
Dover, DE 19901
(302) 739-5361
http://www.dswa.com/

Delaware Recycling Exchange
Delaware Manufacturing Extension Partnership
400 Stanton - Christiana Rd. Suite A-158
Newark, DE 19713
(302) 283-3131; Fax: (302) 283-3137
E-mail: demep@demep.org
http://www.demep.org/

Cooperative State Research, Education and Extension Service
University of Delaware
Newark, DE 19717
(302) 831-2468; Fax: (302) 831-3651
E-mail: william.ritter@mvs.udel.edu

DISTRICT OF COLUMBIA

Metropolitan Washington Council of Governments
Department of Environmental Programs
Regional Recycling Programs
777 North Capitol Street Northeast
Washington, DC 20002
(202) 962-3200; Fax: (202) 962-3203
http://www.mwcog.org/

Cooperative State Research, Education and Extension Service
University of District of Columbia
901 Newton Street, NE
Washington, DC 20017
(202) 576-6951; Fax: (202) 576-8712
E-mail: jhazel@eslusda.gov

USDA-Cooperative State Research, Education, and Extension Service
USDA-CSREES
Natural Resources & Environment
Waste Management Program
Stop 2210
Washington, DC 20250-2210
(202) 401-4601; Fax: (202) 401-1706
E-mail: awidener@reeusda.gov

FLORIDA

Florida Department of Environmental Protection
Division of Waste Management
2600 Blair Stone Road
Tallahassee, FL 32399
(904) 487-3299
http://www.dep.state.fl.us/dwm/

University of Florida
M.E. Rinker, Sr. School of Building Construction
Center for Construction and Environment
Fine Arts C 101
P.O. Box 115703
Gainesville, FL 32611-5703
(352) 392-9029; Fax: (352) 392-9606
http://www.bcn.ufl.edu/sustainable

Florida Center for Solid and Hazardous Waste Management
2207-D NW 13th Street
Gainesville, Florida 32609
(352) 392-6264; Fax: (352) 846-0183
E-mail: center@floridacenter.org
http://www.floridacenter.org/

RecycleFlorida Today, Inc.
1015 US 301 S., # 2425
Tampa, FL 33619
(813) 441-6425; Fax: (813) 626-5865
http://www.enviroworld.com/Resources/RFT.html

Cooperative State Research, Education and Extension Service
University of Florida
P.O. Box 110415
Gainesville, FL 32611-0415
(352) 392-1511; (352) 392-2389
E-mail: whs@gnv.ifas.ufl.edu

American Salvage
9200 NW 27th Avenue
Miami, FL 33147
(305) 691-2455
E-mail: trw@americansalvage.com
http://www.americansalvage.com/

Commercial Materials Exchange
6 South Wadworth Road
Beverly Hills, FL 34465
(352) 527-1897; Fax: (352) 527-2872
E-mail: dburtfl@juno.com

Florida Waste Exchange
A Service of Environmental Research and Restoration Corp.
2848 N State Road #7
Hollywood, FL 33021
(954) 967-0011 or (877) 663-5336; Fax: (954) 989-3377
E-mail: dpkart@icanect.net

Alachua Habitat for Humanity ReStore
2317 SW 13th St.
Gainesville, FL 32608
(352) 378-4663

Habitat's Builders' Surplus ReStore
8100 N. Florida Avenue
Tampa, FL 33604
(813) 935-8805

Industrial Materials Exchange, Inc.
1001 SW 2nd Avenue, Suite 234
Boca Raton, FL 33487
(800) 541-9444; Fax: (407) 995-7156

Intercontinental Waste Exchange
6401 Congress Avenue, Suite 200
Boca Raton, FL 33487
(800) 541-9444; Fax: (407) 367-0499

Southern Waste Information Exchange (SWIX)
P.O. Box 960
Tallahassee, FL 32302
(800) 441-SWIX (7949); Fax: (850) 386-4321
E-mail: swix@mailer.fsu.edu
http://www.wastexchange.org/

GEORGIA

Department of Natural Resources
Environmental Protection Division
205 Butler Street, S.E. Suite 1258 East Tower
Atlanta, GA 30334
(404) 362-2692
http://www.dnr.state.ga.us/

Georgia Department of Community Affairs
Office of Waste Management
60 Executive Park South
Atlanta, GA 30329
(404) 679-4940
http://www.dca.state.ga.us/
http://www.dca.state.ga.us/waste/waste2.html

Georgia Pollution Prevention Assistance (P2AD)
Department of Natural Resources
7 Martin Luther King, Jr. Drive, Suite 450
Atlanta, GA 30334-9004
(404) 651-5120 or (800) 685-2443; Fax: (404) 651-5130
E-mail: p2ad@ix.netcom.com
http://www.ganet.org/dnr/p2ad/

Georgia Environmental Facilities Authority
2090 Equitable Building
100 Peachtree Street, NW
Atlanta, GA 30303
(404) 656-0939
http://www.gefa.org/

Cooperative State Research, Education and Extension Service
University of Georgia
Athens, GA 30602
(706) 542-2340; Fax: (706) 542-2375
E-mail: wmclauri@uga.cc.uga.edu

EnviroShare Materials Exchange
Hall County Resource Recovery
Post Office Drawer 1435
Gainesville, GA 30503
(770) 535-8284; Fax: (770) 531-3966
E-mail: rfoote@mindspring.com
http://www.enviroshare.org/

Habitat for Humanity ReStore
Habitat for Humanity International
121 Habitat Street
Americus, GA 31709-3498
(912) 924-6935
http://www.habitat.org/env/restoreusa.html

Fint River Habitat for Humanity ReStore
P.O. Box 710
Albany, GA 31702-0710
(912) 430-7942

HAWAII

Department of Land and Natural Resources
1151 Punchbowl Street, Room 311
Honolulu, HI 96813
(808) 587-0077; Fax: (808) 587-0080
E-mail: dlnr@pixi.com
http://www.state.hi.us/dlnr

Cooperative State Research, Education and Extension Service
University of Hawaii Department of Agriculture Engineering
3050 Maile Way, Gilmore 203
Honolulu, HI 96822
(808) 956-9459; (808) 956-6442
E-mail: agng8uhunix.uhcc
Hawaii Materials Exchange (HIMEX)
P.O. Box 121
Wailuku, HI 96793
(808) 667-7744 or (808) 572-6668; Fax: (808) 572-4817
E-mail: sjoy@maui.net
http://www.maui.net/~mrghimex

IDAHO

Division of Environmental Quality
1410 N. Hilton
Boise, ID 83706
(208) 373-0502; Fax: (208) 373-0417
http://www.state.id.us/deq/

Cooperative State Research, Education and Extension Service
University of Idaho Biology & Agriculture Engineering
Engineering/Physics Building
Moscow, ID 83844-0904
(208) 885-7626; (208) 885-8923
E-mail: rrynk@uidaho.edu

ILLINOIS

Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276
Helpline: (888) EPA-1996
http://www.epa.state.il.us/

Department of Commerce and Community Affairs
620 East Adams Street
Springfield, IL 62701
(217) 782-7500; Fax: (217) 524-3701
Environmental Assistance Helpline: (800) 252-3998
“Construction and Demolition Site Recycling Guidebook”
“Construction and Demolition Site Recycling Directory”
http://www.commerce.state.il.us/

Illinois Waste Management and Research Center
One East Hazelwood Drive
Champaign, IL 61820
(217) 333-8940; Fax: (217) 333-8944
http://www.wmrc.uiuc.edu

Illinois Recycling Association
P.O. Box 3717
Oak Park, IL 60303-3717
(708) 358-0050; Fax: (708) 358-0051
E-mail: ilrecycle@aol.com
http://www.ilrecyclingassn.org/

Cooperative State Research, Education and Extension Service
University of Illinois
116 Mumford Hall
1301 Gregory Drive
Urbana, IL 61801
(217) 333-9025; (217 0-333-1952
E-mail: bloomep@cesadmin.ag.uiuc.edu

Chicago Board of Trade Recyclables Exchange
141 West Jackson Boulevard
Chicago, IL 60604-2994
(312) 435-3500; Fax: (516) 286-8471
http://www.cbot-recycle.com/

Industrial Materials Exchange Service
1021 North Grand Ave., East
P.O. Box 19276, #34
Springfield, IL 62794-9276
(217) 782-0450; Fax: (217) 782-9142
E-mail: epa8605@epa.state.il.us

Habitat for Humanity of McLean County ReStore
P.O. Box 3432
Bloomington, IL 61702-3432
(309) 827-3931

Habitat for Humanity/Lake County, Illinois ReStore
3601 N. Hwy 41-R
North Chicago, IL 60085-4207
(847) 623-1020

INDIANA

Department of Environmental Management
Office of Solid & Hazardous Waste Management
Indiana Government Center North
100 N. Senate
P.O. Box 6015
Indianapolis, IN 46206-6015
(317) 233-3656 or (800) 451-6027 (inside IN); Fax: (317) 232-3403
http://www.state.in.us/idem/index.html

Association of Indiana Solid Waste Management Districts
899 South College Mall Road
Bloomington, IN 47401
(812) 349-2117; Fax: (812) 349-2872
E-mail: aiswmd@aol.com

Solid Waste Association of North America
Indiana Hooiser Chapter
401 Pennsylvania Parkway, Suite 104
Indianapolis, IN 46280
(317) 581-9585; Fax: (317) 581-9635
E-mail: burgessma@cdm.com

Indiana Recycling Coalition, Inc.
P.O. Box 20444
Indianapolis, IN 46220-0444
(317) 283-6226 or (877) 283-9550 (inside IN); Fax: (317) 283-6111
E-mail: recyclin@in.net
http://www.papertrail.com/irc/

Indiana Institute on Recycling
921 School of Education,
Indiana State University
Terre Haute, IN 47809
(812) 237-3000 or (800) 242-4467 (inside IN); Fax: (812) 237-4371
http://web.indstate.edu/recycle/home.html

Cooperative State Research, Education and Extension Service
Purdue University
Krannert Building
West Lafayette, IN 47907
(317) 494-0594; Fax (317) 494-5876
E-mail: cp1@mace.cc.purdue.edu

Indiana Materials Exchange
P.O. Box 2931
Indianapolis, IN 46206-2931
(740) 397-7675 or (800) 968-8764 (inside IN); Fax: (740) 397-7649
E-mail: IMExchange@ecr.net
http://www.state.in.us/idem/imex/

Reuse Development Organization (ReDO)
P.O. Box 441363
Indianapolis, IN 46244
(317) 631-5395; Fax: (317) 631-5396
E-mail: info@redo.org
http://www.redo.org/

IOWA

Department of Natural Resources
Waste Management Assistance Division
502 E. 9th Street
Des Moines, IA 50319-0034
(515) 281-4367; Fax: (515) 281-8895
E-mail: blaning@max.state.ia.us
http://www.state.ia.us/dnr/organiza/wmad/index.html

On-line Recycling Directory
http://www.state.ia.us/dnr/organiza/wmad/directories/recycling/introduction_i.html
Recycle Iowa
Iowa Department of Economic Development
200 East Grand Ave.
Des Moines, IA 50312
(515) 242-4755 or (800) 532-1216; Fax: (515) 242-4776
E-mail: david.cretors@ided.state.ia.us
http://www.recycleiowa.org/

Iowa Waste Exchange (IWE)
University of Northern Iowa
75-BRC
Cedar Falls, IA 50614-0185
(800) 422-3109 or (319) 273-2079: Fax: (319) 273-2893
E-mail: jennifer.drenner@uni.edu
http://www.recycleiowa.org/exchange.htm

IWE Area Resource Specialists

AREA "A"

Iowa Western Community College
2700 College Road, P.O. Box 4-C
Council Bluffs, IA 51502
(712) 325-3309 or (800) 432-5852, ext. 309; Fax: (712) 325-3408
E-mail: bpendgraft@iwcc.cc.ia.us

Western Iowa Tech Community College
4647 Stone Avenue, P.O. Box 5199
Sioux City, IA 51102-5199
(712) 274-8733 or (800) 352-4649, ext. 1560; Fax: (712) 274-6429
E-mail: demilif@witcc.com

AREA "B"

Region XII Council of Governments
1009 East Anthony St., P.O. Box 768
Carroll, IA 51401
(712) 792-9914; Fax: (712) 792-1751
E-mail: rxiicog@netins.net

AREA "C"

Iowa Northland Regional Council of Governments
501 Sycamore Street, Suite 333
Waterloo, IA 50703
(319) 235-0311; Fax: (319) 235-2891
E-mail: jbeneke@inrcog.org

North Iowa Area Community College
500 College Drive
Mason City, IA 50401
(515) 422-4352; Fax: (515) 422-4129
E-mail: tornqpat@niacc.cc.ia.us

AREA "D"

Eastern Iowa Community College
306 West River Dr.
Davenport, IA 52801-1221
(319) 336-3319 or (800) 462-3255; Fax: (319) 336-3350
E-mail: sheil@eiccd.cc.ia.us

Northeast Iowa Community College
10250 Sundown Road
Peosta, IA 52068-9988
(319) 556-5110 or (800) 728-7367, ext. 327; Fax: (319) 557-0349
E-mail: mihalakm@nicc.cc.ia.us

AREA "E"

Des Moines Area Community College
Economic Development Group, Bldg. 18
2006 South Ankeny Blvd.
Des Moines, IA 50021-3993
(515) 964-6346; Fax: (515) 964-6206
E-mail: dahayworth@dmacc.cc.ia.us

AREA "F"

Kirkwood Community College
6301 Kirkwood Blvd. S.W., P.O. Box 2068
Cedar Rapids, IA 52406
(319) 398-5665 or (319) 398-4904; Fax: (319) 398-5432
E-mail: rmeyers@kirkwood.cc.ia.us or btjaden@kirkwood.cc.ia.us

AREA "G"

Indian Hills Community College
623 Indian Hills Drive
Ottumwa, IA 52501
(515) 683-5269 or (800) 726-2585, ext. 5269; Fax: (515) 683-5263
E-mail: ecdev@ihcc.cc.ia.us

Iowa Waste Reduction Center
University of Northern Iowa
1005 Technology Parkway
Cedar Falls, IA 50614-0185
(800) 422-3109 or (319) 273-8905; Fax: (319) 268-3733
E-mail: jennifer.drenner@uni.edu

Recycling Reuse Technology Transfer Center
University of Northern Iowa
2244 McCollum Science Hall
Cedar Falls, IA 50714-0421
(319) 273-7090; Fax: (319) 273-5815
E-mail: catherine.zeman@uni.edu
http://www.rrttc.uni.edu/

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Dept of Agriculture & Biosystems Engineering
200A Davidson Hall
Iowa State University
Ames, IA 50011-3080
(515) 294-0463; Fax: (515) 294-9973
E-mail: tglanvil@iastate.edu

By-Products & Waste Search Service
Waste Reduction Center
University of Northern Iowa
Cedar Falls, IA 50614-0185
(319) 273-2079; Fax: (319) 273-2926

KANSAS

Department of Health and Environment
Bureau of Waste Management
Forbes Field, Building 740
Topeka, KS 66620
(785) 296-1600; Fax: (785) 296-1592
http://www.kdhe.state.ks.us/waste.html

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Kansas State University
2014 Throckmorton Hall
Manhattan, KS 66506-5504
(913) 532-5776; Fax: (913) 532-6315
E-mail: weberle@oz.oznet.ksu.edu

Kansas Materials Exchange
P.O. Box 70
Hutchinson, KS 67504-0070
(316) 662-0551; Fax: (316) 662-1413

Surplus Exchange
121 N. Mead
Wichita, KS 67211
(316) 267-2553; Fax: (316)-274-8068

KENTUCKY

Department for Environmental Protection
Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601
(502) 564-6716 or (502) 564-2225, ext. 240
E-mail: Gruzesky_r@NRDEP.nr.state.ky.us

The Northern Kentucky Solid Waste Management Area
16 Spiral Drive
P.O. Box 668
Florence, KY 41022-0668
(606) 283-1885; Fax: (606) 283-8178
E-mail: trashnate@writeme.com
http://www.nkadd.org/

Cooperative State Research, Education and Extension Service
Department of Agriculture Engineering
217 Agriculture Engineering Building
Lexington, KY 40546-0276
(606) 257-3000, ext. 217; Fax: (606) 257-5671
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Cooperative Extension Program
Kentucky State University
Box 196
Frankfort, KY 40601
(502) 227-6389; (502) 227-5933
E-mail: nwilliam@ca.uky.edu

Kentucky Industrial Materials Exchange
Kentucky Pollution Prevention Center
420 Academic Building, U of L
Louisville, KY 40292
(502) 852-0965 or (800) 334-8635, ext. 0965; Fax: (502) 852-0964
E-mail: kime@kppc.org
http://www.kppc.org/

LOUISIANA

Department of Environmental Quality
Office of Waste Services
P.O. Box 82178
Baton Rouge, LA 70884-2178
(225) 765-0261; Fax: (225) 765-0617
http://www.deq.state.la.us/
http://www.deq.state.la.us/oshw/oshw.htm

Louisiana Energy & Environmental Resource & Information Center
Louisiana State University
One East Fraternity Circle
Baton Rouge, LA 70803-0301
(225) 388-4600; Fax: (225) 388-4541
http://www.leeric.lsu.edu/

War On Waste
P.O. Box 86 St.
Martinville, LA 70582
(318) 394-3217

Louisiana Cooperative Extension Service
185 Knapp Hall
Baton Rouge, LA 70803-1900
(504) 388-6998; (504) 388-2478
E-mail: xtbran@lsuvm.sncc.lsu.edu

Habitat for Humanity St. Tammany West ReStore
P.O. Box 3082
Covington, LA 70434-3082
(504) 893-3172

Louisiana/Gulf Coast Waste Exchange
Baton Rouge, LA
(504) 388-4594; Fax: (504) 388-4945

Transcontinental Materials Exchange
College of Civil & Environmental Engineering
1419 CEBA
Baton Rouge, LA 70803
(504) 388-4594; Fax: (504) 388-8652
E-mail: rlcce@uno.edu

MAINE

Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333-0017
(207) 287-7688 or (800) 452-1942
Bureau of Remediation and Waste Management: (207) 287-2651
http://janus.state.me.us/dep/home.htm

Maine State Planning Office
Waste Management and Recycling Program
38 State House Station
Augusta, ME 04333-0038
(207) 287-8050 or (800) 662-4545
E-mail: lisa.m.baldwin@state.me.us
http://www.state.me.us/spo

WasteCap Maine
317 Main St.
Yarmouth, ME 04096
(207) 846-0935; Fax: (207) 846-8079
E-mail: WasteCapME@aol.com.
http://mainetoday.koz.com/maine/wastecap

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5741 Libby Hall
Orono, ME 04469-5741
(207) 581-2722; Fax: (207) 581-1387
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Building Materials Exchange
169 Lewiston Rd.
Gray, ME 04039
(207) 657-2957; Fax: (207) 657-5910

Mid Coast Habitat for Humanity ReStore
P.O. Box 785
Camden, ME 04843-0785
(207) 236-4974

Maine Materials Exchange (M2X)
93 Maquoit Drive
Freeport, ME 04032
(207) 865-6621; Fax: (207) 865-6621
E-mail: H.Arndt@Juno.com

MARYLAND

Department of the Environment
Waste Management Administration
2500 Broening Highway
Baltimore, MD 21224
(410) 631-3336

Recycling Services Division: (410) 631-3315
Waste Management Administration: (410) 631-3305
E-mail: hmiller@mde.state.md.us
http://www.mde.state.md.us/was/solidwaste/index.html

Maryland Recyclers Coalition
584 Bellerive Drive, Suite 3-D
Annapolis, MD 21401
(410) 974-4472
http://www.marylandrecyclers.org/

Cooperative State Research, Education and Extension Service
University of Maryland
4701 Cliff City Rd
Chestertown, MD 21620
(410) 778-7676; (410) 778-9075
E-mail: hb23@umail.umd.edu

The Loading Dock, Inc.
2523 Gwynns Falls Pkwy
Baltimore, MD 21216
(410) 728-DOCK; Fax: (410) 728-3633
http://www.loadingdock.org/

Millennium Exchange, Ltd.
P.O. Box 4875
Annapolis, MD 21403
(410) 280-2080; Fax; (410) 280-0025
E-mail: trade@mmex.com
http://www.mmex.com/

Northeast Industrial Waste Exchange, Inc.
P.O. Box 2171
Annapolis, MD 21404-2171
(410) 280-2080; Fax: (410) 280-0025
E-mail: niwe@pop.erols.com

MASSACHUSETTS

Department of Environmental Protection
1 Winter Street
Boston, MA 02108
(617) 292-5500
Solid Waste: (617) 292-5988
Bureau of Waste Prevention: (617) 292-5963 or (617) 292-5574
Greg.Cooper@state.ma.us
http://www.magnet.state.ma.us/dep/dephome.htm

Department of Environmental Management
100 Cambridge Street, 19th Floor
Boston, MA 02202
(617) 626-1250
http://www.magnet.state.ma.us/dem/dem.htm

WasteCap of Massachusetts
376 Boylston Street, Suite 303
Boston, MA 02116
(617) 236-7715; Fax: (617) 236-7141
E-mail: wastecap@wastecap.org
http://www.wastecap.org/

Center for Ecological Pollution Prevention
P.O. Box 1330,
Concord, MA 01742-1330
(978) 369-3951
E-mail: EcoP2@hotmail.com

Cooperative State Research, Education and Extension Service
Amherst University
Stockbridge Hall, Room 218
Amherst, MA 01003
(413) 545-2188; Fax: (413) 545-6555
E-mail: gwalker@umass.coopext.edu

South Shore Habitat for Humanity ReStore
28 River Street
Braintree, MA 02184-3235
(781) 843-9080

Western Massachusetts Material Exchange
Center for Ecological Technology
26 Market Street
Northampton, MA 01060
(413) 586-7350; Fax: (413) 586-7351
E-mail: cetnoho@aol.com

MICHIGAN

Department of Environmental Quality
Environmental Assistance Division
Town Center, 2nd floor
P.O. Box 30457
333 S. Capitol
Lansing, MI 48909-7957
(517) 373-1322; Fax: (517) 335-4729
http://www.deq.state.mi.us/ead/recycle/

University of Michigan
National Pollution Prevention Center for Higher Education
Dana Bldg., 430 E. University
Ann Arbor, MI 48109-1115
(734) 764-1412; Fax: (734) 647-5841
E-mail: nppc@umich.edu
http://www.umich.edu/~nppcpub/index.html

Michigan Recycling Coalition
1609 E Kalamazoo St., Suite 1
P.O. Box 10240
Lansing, MI 48912
(517) 371-7073; Fax: (517) 371-1509
http://www.mienv.org/mrc/

Waste Reduction Information Network
(517) 485-WRIN (9746)

Upper Peninsula Recycling Coalition
(906) 387-4127 or (906) 786-9212

Washtenaw County Department of Environment and Infrastructure Services
P.O. Box 8645
Ann Arbor, MI 48107-8645
(734) 971-6947; Fax: (734) 971-4542 or (734) 971-1441
http://www.co.washtenaw.mi.us/DEPTS/eis.htm

Cooperative State Research, Education and Extension Service
Michigan State University
311 Natural Resources Building
East Lansing, MI 48824-1222
(517) 355-9578; Fax: (517) 353-8994
E-mail: 22331fri@msu.edu

Michigan Resources Exchange Services
P.O. Box 18036
Lansing, MI 48901-8036
(517) 371-7171

Recycle Ann Arbor
Ecology Center of Ann Arbor
2420 South Industrial Highway
Ann Arbor, MI 48104
(734) 662-6288; Fax: (734) 662-7749
E-mail: recyclea2@aol.com
http://comnet.org/recycleannarbor/

Michigan On-line Waste Exchange
Michigan Dept of Environmental Quality
Pollution Prevention Section - Environmental Assistance Division
P.O. Box 30457
Lansing, MI 48909-7957
(800) 662-9278 or (517) 373-1322; Fax: (517) 335-4729
E-mail: doroshkl@state.mi.us
http://www.co.washtenaw.mi.us/depts/eis/eisex.htm

MINNESOTA

Office of Environmental Assistance
520 Lafayette Rd.
St. Paul, MN 55155
(612) 296-3417
(612) 215-0246
http://www.moea.state.mn.us/

Environmental Quality Board at Minnesota Planning
658 Cedar St.
St. Paul, MN 55155
(651) 296-3985; Fax: (651) 296-3698

Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194
(651) 296-6300 or (800) 657-3864
http://www.pca.state.mn.us/waste/index.html

Minneapolis Division of Solid Waste & Recycling
309 2nd Avenue South, Room 210
Minneapolis, MN 55401
(612) 673-2917

http://www.ci.minneapolis.mn.us/citywork/public-works/solid-waste/**Sharing Environmental Education Knowledge (SEEK)**
525 S. Lake Ave., Ste. 400
Duluth, MN 55802
(218) 529-6258 or (800) 657-3843
http://www.seek.state.mn.us/
Association of Recycling Managers, Inc.
E-mail: armweb@concentric.net
http://www.mnrecyclingmanagers.org/

Recycling Association of Minnesota
890 Dawn Avenue
Shoreview MN 55126-6403
(651) 486-0455; Fax: (651) 766-7948

City of Bloomington Solid Waste Division
Bloomington City Hall
2215 West Old Shakopee Road
Bloomington MN 55431-3096
(612) 948-8750; Fax: (612) 948-3868
E-mail: jbuckley@ci.bloomington.mn.us
http://www.ci.bloomington.mn.us/cityhall/dept/pubworks/solidwas/solidwas.htm

Twin Cities Free Market
Saint Paul Neighborhood Energy Consortium
624 Selby Avenue
Saint Paul, MN 55104.
(651) 222-SORT (7678); Fax: (651) 221-9831
E-mail: info@twincitiesfreemarket.org
http://www.twincitiesfreemarket.org/

Minnesota Materials Exchange (MnTAP)
Minnesota Technical Assistance Program
1313 Fifth St. S.E., Suite 207
Minneapolis, MN 55414-4504
(612) 627-4646 or (800) 247-0015; Fax: (612) 627-4769
E-mail: neshe005@maroon.tc.umn.edu
http://www.mntap.umn.edu/

Metro Area eXchange (MAX)
1313 Fifth St. S.E., Suite 207
Minneapolis, MN 55414-4504
(612) 627-4646 or (800) 247-0015; Fax: (612) 627-4769

Olmsted County Materials Exchange:
2122 Campus Dr. S.E.
Rochester, MN 55904
E-mail: stansfield.jack@co.olmsted.mn.us
(507) 285-8231; Fax: (507)287-2320

Southeast Minnesota Recyclers' Exchange (SEMREX):
(800)247-0015
http://www.semrex.org/

Northeast Minnesota Material Exchange
Western Lake Superior Sanitary District
2626 Courtland St.
Duluth, MN 55806
(218) 722-3336, ext. 440; Fax: (218) 727-7471
E-mail: heidi.carlson@wlssd.duluth.mn.us

Minnesota Environmental Initiative
219 North Second Street #201
Minneapolis, MN 55401-1453
(612) 334-3388; Fax: (612) 334-3093
http://www.mn-ei.org/

The Green Institute
1433 E. Franklin Avenue, Suite 7A
Minneapolis, MN 55404
(612) 874-1148; Fax: (612) 874-6470
E-mail: green@greeninstitute.org
http://www.greeninstitute.org/

The ReUse Center
2216 East Lake Street
Minneapolis, MN 55407
(612) 724-2608; Fax: (612) 724-2288

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247 Coffey Hall
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216 Soils Building
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(612) 625-3135; Fax: (612) 625-2208
E-mail: thalbach@mes.umn.edu

American Plastics Exchange, Inc.
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Minneapolis, MN 55426
(612) 544-1100 or (800) 746-2739; Fax: (612) 544-9811
E-mail: apexq@concentric.net

Minnesota Materials Exchange
Minnesota Office of Environmental Assistance
520 Lafayette Road, Second Floor
St. Paul, MN 55155-4100
(612) 215-0216; Fax: (612) 215-0246
E-mail: stacy.stinson@moea.state.mn.us
http://www.mnexchange.org/

Minnesota Materials Exchange Alliance
1313 5th St SE, Suite 207
Minneapolis, MN 55414
(612) 627-1900; Fax: (612) 627-4769

Olmsted County Materials Exchange
Olmsted County Public Works
2122 Campus Drive
Rochester, MN 55904
(507) 285-8231; Fax: (507) 287-2320
E-mail: olmpwhh1@millcomm.com
http://www.olmstedcounty.com/publicworks/solidwaste/wastereduction/exchange.htm

Southeast Minnesota Recycler's Exchange (SEMREX)
171 West 3rd Street
Winona, MN 55987
(507) 457-6464; Fax: (507) 457-6469
E-mail: amorse@NT1.co.winona.mn.us
http://www.wis.com/SEMREX

MISSISSIPPI

Department of Environmental Quality
Environmental Resource Center
P.O. Box 20305
Jackson, MS 39289-1385
(601) 961-5666; Fax: (601) 961-5349
http://www.deq.state.ms.us/newweb/homepages.nsf

Mississippi Cooperative Extension Service
P.O. Box 5446
Mississippi State, MS 39762
(601) 325-3141; Fax: (601) 325-8407
E-mail: joes@mces.msstate.edu

Metro Jackson Habitat for Humanity ReStore
P.O. Box 55634
Jackson, MS 39296-5634
(601) 353-6060

MISSTAP
P.O. Box 9595
Mississippi State, MS 39762
(601) 325-8454; Fax: (601) 325-2482

MISSOURI

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Division of Environmental Quality
Solid Waste Management Program
P. O. Box 176
Jefferson City, MO 65102
(573) 751-5401
E-mail: swmp@mail.dnr.state.mo.us
http://www.dnr.state.mo.us/deq/swmp

Division of Environmental Quality
P. O. Box 176
Jefferson City, Missouri 65102
(800) 361-4827 or (800) 334-6946
E-mail: tap@mail.dnr.state.mo.us
http://www.dnr.state.mo.us/deq/homedeq.htm

Missouri Recycling Association
P.O. Box 2144
Jefferson City, MO 65102
(888) 325-MORA
http://www.mora.org/

Region D Solid Waste District
P.O. Box 164
Clarksdale, MO 64430
(816) 393-5250; Fax: (816) 393-5269
E-mail: regiond@ccp.com
http://www.ccp.com/~regiond/

University of Missouri Extension
1031 E. Battlefield, Suite 214
Springfield, MO 65807
(417) 889-5000; Fax: (417) 889-5012
E-mail: steinwam@ext.missouri.edu

St. Louis Habitat for Humanity ReStore
4501 Westminster Place
St. Louis, MO 63108-1801
(314) 367-6869

MONTANA

Department of Environmental Quality
Air & Waste Management Bureau: (406) 444-3490

Metcalf Building Office:
1520 E. Sixth Avenue
P.O. Box 200901
Helena, MT 59620
(406) 444-2544

Phoenix Building Office:
2209 Phoenix
P.O. Box 200901
Helena, MT 59620-0901
http://www.deq.state.mt.us/

Center for Resourceful Building Technology
P.O. Box 100
Missoula, MT 59806
(406) 549-7678
E-mail: crbt@montana.com
http://www.montana.com/crbt/

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Montana Material Exchange
Montana Pollution Prevention Program
MSU Extension Service
Taylor Hall, P.O. Box 173580
Bozeman, MT 59717-3580
(406) 994-3451 or (888) MSU-MTP2; Fax: (406) 994-5417
E-mail: uedld@montana.edu
http://www.montana.edu/wwwated

NEBRASKA

Department of Environmental Quality
Integrated Waste Management: (402) 471-4210
1200 "N" Street, Suite 400
P.O. Box 98922
Lincoln, NE 68509
(402) 471-2186; Fax: (402) 471-2909
http://www.deq.state.ne.us/

Nebraska State Recycling Association
1941 S. 42nd St., # 512
Omaha, NE 68105
(402) 444-4188; Fax: (402) 444-3953

Cooperative State Research, Education and Extension Service
University of Nebraska-Lincoln
253 L.W. Chase Hall
Lincoln, NE 68583-0726
(402) 472-8656; Fax: (402) 472-6338
E-mail: bsen010@unlvm.unl.edu

Nebraska Materials Exchange Program
Keep Nebraska Beautiful, Inc.
3201 Pioneers Blvd., Suite 306
Lincoln, NE 68502
(402) 486-4563 or (800) 486-4562
E-mail: egilmore@knb.org
http://www.knb.org/knb/exchange.html

NEVADA

Division of Environmental Protection
333 W. Nye Lane, Room 138
Carson City, NV 89706-0851
(775) 687-4670; Fax: (775) 687-5856

Bureau of Waste Management
123 West Nye Lane, Room 120
Carson City, NV 89706-0851
(775) 687-4670; Fax: (775) 687-6396
http://www.state.nv.us./ndep/
Nevada Recycling Hotline
(800) 597-5865

Solid Waste Association of North America
Great Basin Chapter
1711 N. Roop St.
Carson City, NV 89701
(775) 887-2190 ext. 106

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Las Vegas, NV 89127-0902
(702) 383-1027

Douglas County Community Development
P.O. Box 218
Minden, NV 89423
(775) 782-9010

Environmental Leadership
P.O. Box 10786
Reno, NV 89510
(702) 323-3433
http://www.environleader.org/

Keep Truckee Meadows Beautiful
P.O. Box 7412
Reno, NV 89510-7412
(775) 328-3698

Rebel Recycling Program
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(702) 734-5607

Nevada Recycling Coalition
P.O. Box 5515
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Nevada Recyclers Association
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Las Vegas, NV 89104
(702) 796-9100

Waste Not
893 Southwood Blvd.
Incline Village, NV 89451
(775) 831-8603

RSW Recycling
100 Vassar Street
Reno, NV 89520
(775) 329-8822 ext. 310

Silver State Disposal
P.O. Box 98508
Las Vegas, NV 89193
(702) 399-1112

Washoe County (Nevada) Materials Exchange Network
P.O. Box 10786
Reno, NV 89510
(702) 323-2866; Fax: 702 323-3766
E-mail: ahabwolf@aol.com
http://www.environleader.org/intro.html

NEW HAMPSHIRE

Department of Environmental Services
Waste Management Division, Solid Waste Management Bureau
6 Hazen Drive, P.O. Box 95
Concord, NH 03301-6509
(603)271-2900; Fax: (603)271-2456
http://www.des.state.nh.us/sw-6.htm

Department of Resources and Economic Development
P.O. Box 1856
Concord, NH 03302-1856
(603) 271-2591
NH Governor's Recycling Program
2 1/2 Beacon Street
Concord, NH 03301-4497
(603) 271-1098

Northeast Resource Recovery Association
P.O. Box 721
Concord, NH 03302-0721
(6030 224-6996; Fax (603) 226-4466
E-mail: nrra@conknet.com

University of New Hampshire Cooperative Extension
122 Taylor Hall
Durham, NH 03824
(603) 862-2033; Fax: (603) 862-1585
E-mail: b_marriott.unh.edu

New Hampshire Materials Exchange
WasteCap of New Hampshire
122 N. Main Street
Concord, NH 03301
(603) 224-1517; Fax: (603) 224-2872
E-mail: exchange@wastecapnh.org
http://www.wastecapnh.org/

NEW JERSEY

Department of Environmental Protection
Division of Solid & Hazardous Waste
P.O. Box 414
401 E. State Street
Trenton, NJ 08625
(609) 984-6880; Fax: (609) 984-6874
Bureau of Recycling and Planning: (609) 984-3438; Fax: (609) 777-0769
Bureau of Landfill and Recycling Management: (609) 984-6650; Fax: (609) 777-0769
http://www.state.nj.us/dep/dshw/

Association of New Jersey Recyclers
120 Finderne Avenue
Bridgewater, NJ 08807
(908) 722-7575; Fax (908) 722-8344
E-mail: info@ANJR.com
http://anjr.com/

Cooperative State Research, Education, and Extension Service
15 South Munn Ave.
East Orange, NJ 07018
(201) 678-7988; Fax: (201) 676-9826
E-mail: essex@aesop.rutgers.edu

Morris County MUA's Material Exchange Program
P.O. Box 370
Mendham, NJ 07945-0370
(973) 829-8006; Fax: (973) 285-8397
E-mail: greengal@njhazwaste.com

New Jersey Industrial Waste Information Exchange
50 West State Street, Suite 1310
Trenton, NJ 08608
(609) 989-7888; Fax: (609) 989-9696

NEW MEXICO

Environment Department
Solid Waste Bureau
P.O. Box 26110
Santa Fe, NM 87502
(505) 827-0197
http://www.nmenv.state.nm.us/

New Mexico Recycling Coalition
P.O. Box 16123
Santa Fe, NM 87506
(505) 473-7202; Fax: (505) 438-1447
E-mail: info@nmrecycle.org
http://www.nmrecycle.org/

getrecycled.com
c/o New Mexico Recycling Coalition
P.O. Box 16123
Santa Fe, NM 87506
E-mail: service@getrecycled.com

Build New Mexico Beautiful
Construction and Demolition Recycling Program
(505) 344-3294 or (505) 883-5559
http://nmrecycle.org/builderguide.htm

Energy, Minerals, and Natural Resources Department
State of New Mexico-Recycling
408 Galisteo
P.O. Box 1948
Santa Fe, NM 87504
(505) 827-7474

Wemagination
4010 Copper, NE
Albuquerque, NM 87108
(505) 277-4236

Southwest Public Recycling Association
Albuquerque, NM
(505) 466-9715
E-mail: dthornton@aol.com.
http://www.spra-recycling.org/

City of Santa Fe
P.O. Box 909
Santa Fe, NM 87504-0909
(505) 473-7209; Fax: (505) 438-1447
E-mail: cpadilla@ci.santa-fe.nm.us
http://ci.santa-fe.nm.us/

Los Alamos County
P.O. Box 30
Los Alamos, NM 87544
(505) 662-8050: Fax: (505) 662-8051
E-mail: sisnerosr@lac.losalamos.nm.us

Cooperative State Research, Education, and Extension Service
New Mexico State University
9301 Indian School Rd, NE, Suite 201
Albuquerque, NM 87112
(505) 275-2576; (505) 292-9815

Albuquerque Habitat for Humanity ReStore
3501 Campus Blvd. NE
Albuquerque, NM 87106-1311
(505) 265-0057

New Mexico Material Exchange
P.O. Box 904
Farmington, NM 87499
(505) 325-2157; (505) 326-0015

NEW YORK

New York State Department of Environmental Conservation
Bureau of Waste Reduction and Recycling
50 Wolf Road
Albany, NY 12233-4015
(518) 457-6934; Fax: (518) 457-1283
http://www.dec.state.ny.us/

New York State Association for Reduction, Reuse and Recycling, Inc.
P.O. Box 3913
Albany, NY 12203
(888) 925-7329; Fax: (888) 925-7329

Cornell Waste Management Institute
Rice Hall, Room 100A
Ithaca, NY 14853
(607) 255-8576; Fax: (607) 255-8207
E-mail: ezhl@cornell.edu

Association for Resource Conservation
9 Bittersweet Court
Centerport, NY 11721
(516) 757-0894; Fax: (516) 757-0896
E-mail: arclink@Juno.com

Barn Raisers, Inc.
227 S. Pearl Street
Albany, NY 12202
(518) 462-0139

Hudson Valley Materials Exchange, Inc.
207 Miton Turn Pike
Milton, NY 12547
(914) 795-5507; Fax: (914) 795-2892

MAT-EX Western New York Materials Exchange
GLOW Region Solid Waste Management Committee
420 E. Main Street, 3rd Floor
Batavia, NY 14020
(800) 836-1154 or (716) 344-4035; Fax: (716) 344-4037
E-mail: glow@eznet.net
http://www.recycle.net/matex/view.html

Recycler's World
RecycleNet Corporation
P.O. Box 1910
Richfield Springs, NY 13439
Recycler's World Help Line (519) 767-2913
http://www.recycle.net
Used Building Materials Section
http://www.recycle.net/recycle/build/index.html

Wa$teMatch
253 Broadway, Room 302
New York, NY 10007
(212) 240-6920; Fax: (212) 240-6879
E-mail: wstmatch@tecnet.org
http://www.itac.org/industry/waste.html

NORTH CAROLINA

Department of Environment and Natural Resources
Division of Pollution Prevention and Environmental Assistance
2728 Capital Boulevard
Raleigh, NC 27605
(919) 715-6500 or (800) 763-0136
E-mail: nowaste@p2pays.org
http://www.p2pays.org/

Department of Environment and Natural Resources
Division of Waste Management: Solid Waste Section
401 Oberlin Road, Suite 150
Raleigh, NC 27605
(919) 733-4996 or (919) 733-0692
http://wastenot.enr.state.nc.us/

North Carolina Recycling Business Assistance Center (RBAC)
Division of Pollution Prevention and Environmental Assistance
RBAC Market Development Team
(919) 715-6500 or (800) 763-0136

North Carolina Recycling Association
7330 Chapel Hill Rd., Suite 207
Raleigh, NC 27607
(919) 851-8444; Fax: (919) 851-6009
E-mail: NCRecycles@aol.com
http://www.recycle.net/recycle/ncra/

Solid Waste Association of North America
North Carolina Chapter
Cumberland County Solid Waste Management
147 Harbor View
Sanford, NC 27330
(919) 499-5549; Fax: (919) 498-1834
E-mail: topsy@alltel.net
http://www.nc-swana.org/

Triangle J Council of Governments
P.O. Box 12276
Research Triangle Park, NC 27709
(919) 549-0551; (919) 549-9390
E-mail: tjcog@tjcog.org
http://www.tjcog.dst.nc.us/tjcog.htm

The Green Building Products and Materials Resource Directory
http://www.recycle.net/recycle/ncra/gbdbase.html

North Carolina Extension Service
NC State University
Box 7602
Raleigh, NC 27695
(919) 515-3252; Fax: (919) 515-5950
E-mail: jzublena@amaroz.ces.ncsu.edu

Cooperative State Research, Education and Extension Service
P.O. Box 7625
Raleigh, NC 27695-7625
(919) 515-6770; Fax: (919) 515-6772
E-mail: sherman@eos.ncsu.edu

Charlotte Habitat for Humanity ReStore
P.O. Box 34397
Charlotte, NC 28234-4397
(704) 376-2054

Catawba Valley Habitat for Humanity ReStore
772 4th St. Dr., SW
Hickory, NC 28602
(828) 345-1256

New Bern Habitat for Humanity ReStore
P. O. Box 1231
New Bern, NC 28563-1231
(252) 633-9599

Wake County Habitat for Humanity ReStore
2300 Capital Blvd.
Raleigh, NC 27604-1440
(919) 833-1999

Harmony Industries, Inc.
607 W Grimes Ave.
High Point, NC 27260
(336) 886-7225; Fax: (336) 886-7586
E-mail: dpendle@nr.infi.net
http://www.cebunet.com/harmony/

Southeast Waste Exchange
Urban Institute
UNC Charlotte
9201 University Blvd.
Charlotte, NC 28223-0001
(704) 547-4289; Fax: (704) 547-3178
E-mail: mlmay@email.uncc.edu

NORTH DAKOTA

The State of North Dakota Office of Management and Budget
Risk Management Division
Norwest Bank Building
400 E Broadway Ave, Suite 613
Bismarck, ND 58501
(701) 328-6514; Fax: (701) 328-6515
Waste Management: (701) 328-5166
http://www.state.nd.us/risk/

Cooperative State Research, Education and Extension Service
North Dakota State University
P.O. Box 5437
Fargo, ND 58105
(701) 237-7377; Fax: (701) 237-7044
E-mail: gflasker@ndsuext.nodak.edu

OHIO

Department of Natural Resources
Division of Recycling & Litter Prevention
Fountain Square, Building F-2
Columbus, OH 43224
(614) 265-6333; Fax: (614) 262-9387
E-mail: drlp@dnr.state.oh.us
http://www.dnr.state.oh.us/odnr/recycling/

Ohio Environmental Protection Agency
Office of Pollution Prevention
P.O. Box 1049
Columbus, OH 43216-1049
(614) 644-3469: Fax (614) 728-1245
E-mail: p2mail@epa.state.oh.us
http://www.epa.ohio.gov/opp/wastex.html

Ohio Environmental Protection Agency
Division of Solid and Infectious Waste Management
Lazarus Government Center
P.O. Box 1049
Columbus, OH 43216-1049
(614) 644-2621; Fax: (614) 728-5315
http://www.epa.ohio.gov/dsiwm/dsiwmain.html

Solid Waste Authority of Central Ohio
Virtual Landfill
4149 London-Groveport Road
Grove City, OH 43123
(614) 871-8105; Fax: (614) 871-8116
E-mail: ischuber@BEOL.net
http://www.virtuallandfill.com/

Association of Ohio Recyclers
P.O. Box 70
Mount Vernon, OH 43050
(614) 397-7680; Fax: (614) 397-7649

Cuyahoga County Solid Waste District
323 Lakeside Avenue W., Suite 400
Cleveland, OH 44113
(216) 443-3749; Fax: (216) 443-3737
E-mail: ccswd@en.com
http://www.cyahogaswd.org/

Lake County Solid Waste District
P.O. Box 70
Mount Vernon, OH 43050
(740) 397-7652; Fax: (740) 397-7649
E-mail: wastealt@aol.com

Ottawa/Sandusky/Seneca Solid Waste District
610 Court Street
Fremont, OH 43420
(419) 334-7223; Fax: (419) 334-8626
E-mail: tw@ossjswmd.org

Community Resource Center
2630 Glendale-Milford Rd.
Cincinnati, OH 45241
(513) 554-4944; Fax: (513) 554-4966

Extension CNRD
2120 Fyffe Road
Columbus, OH 43210
(614) 292-8436; Fax: (614) 292-7443
E-mail: heimlich.l@agvax2.ohio-state.edu

OMEx: Ohio's Materials Exchange
c/o Assoc. of Ohio Recyclers
P. O. Box 70
Mt. Vernon, OH 43050
(888) 718-OMEx (6639); Fax-on-Demand: (888) 718-OMEx (6639); Fax: (740) 397-7649
E-mail: Tryomex@ecr.net
http://www.epa.state.oh.us/opp/recyc/omex.html

The Interchange Materials Exchange Service
Hamilton County Environmental Services
1632 Central Parkway
Cincinnati, OH 45210
(513) 333-4705; Fax: (513) 651-9528
E-mail: holly.miller@does.hamilton-co.org

Mahoning Valley Materials Exchange
YSU CERTT
One University Plaza
Youngstown, OH 44555
(330) 742-2742; Fax: (330) 742-1542
E-mail: certt@cc.ysu.edu

Northwest Ohio Commodities Exchange
University of Toledo - MIME Department
Toledo, OH 43606
(419) 530-8202; Fax: (419) 530-8206
E-mail: muerling@eng.utoledo.edu

ReUse Industries
74815 US Highway 50
Albany, OH 45710
(740) 698-8200 or (800) 837-7600 (inside 740 area code); Fax: (740) 698-4014
E-mail: reuse@eurekanet.com
http://www.eurekanet.com/~reuse

Center for Environmental Science Technology and Policy
Cleveland State University
Cleveland, OH 44115-2440
(216) 687-9306; Fax: (216) 687-5429
E-mail: h.merwin@mail.asic.csuohio.edu
http://www.cestp.csuohio.edu/orphan/orphan.html

Greater Columbus Habitat for Humanity ReStore
3529 Cleveland Avenue
Columbus, OH 43224-0309
(614) 267-7778

South Dayton Waste Exchange
3848 Ellsworth Drive
Beavercreek, OH 45431
(937) 429-5998; Fax: (937) 429-5998
E-mail: sdwe@infinet.com
http://www.sdwe.com/

Wastelink, Division of Tencon, Inc.
140 Wooster Pike
Milford, OH 45150
(513) 248-0012; Fax: (513) 248-1094

OKLAHOMA

Department of Environmental Quality
Waste Management Division
P.O. Box 1677
Oklahoma City, OK 73101-1677
(405) 702-5100; Fax: (405) 702-5101
http://www.deq.state.ok.us/

Cooperative State Research, Education, and Extension Service

Oklahoma State University
508 Agriculture Hall
Stillwater, OK 74078
(405) 744-6081; Fax: (405) 744-8210
E-mail: gad@okway.okstate.edu

Oklahoma Waste Exchange Program (OKMaX)
Oklahoma Department of Environmental Quality
P.O. Box 1677
Oklahoma City, OK 73101-1677
(800) 869-1400 or (405) 702-9100; Fax: (405) 271-8425
E-mail: deq.OKMaX@deqmail.state.ok.us
http://www.deq.state.ok.us/okmax.htm

OREGON

Department of Environmental Quality
Solid Waste Policy and Program Development Section
811 SW Sixth Avenue
Portland, OR 97204
(503) 229-5913 or (800) 452-4011 (inside OR)
E-mail: ALSDORF.william.h@deq.state.or.us
http://www.deq.state.or.us/wmc/solwaste/rsw.htm

METRO, Portland
Solid Waste Department
600 NE Grand Ave
Portland, OR 97232
(503) 797-1650; Fax: (503) 797-1797
Metro Recycling Information: (503) 234-3000; Fax: (503) 797-1851
E-mail: mri@metro.dst.or.us
http://www.metro-region.org/

River City Resource Group, Inc.
P.O. Box 22744
Portland, OR 97269
(503) 654-7570 or (503) 248-4550

Association of Oregon Recyclers
P.O. Box 483
Gresham OR 97030-0107
(503) 661-4475; Fax: (503) 524-2373
E-mail: aor@mindspring.com
http://www.mindspring.com/~aor/

Oregon Environmental Council
520 SW 6th Avenue, Suite 940
Portland, OR 97204-1535
(503) 222-1963; Fax: (503) 222-1405
E-mail: oec@orcouncil.org
http://www.orcouncil.org/

Cooperative State Research, Education, and Extension Service
1421 S. Hwy 97
Redmond, OR 97756
(541) 548-6088; Fax: (541) 548-8919
E-mail: bauerm@oes.orst.edu

Hippo Hardware and Trading Company
1040 E. Burnside
Portland, OR 97214
(503) 213-1444 or (800) 869-1444; Fax: (503) 231-5708
E-mail: sales@hipponet.com
http://www.hipponet.com/

Portland Chemical Consortium
P.O. Box 751
Portland, OR 97207-0751
(503) 725-4270; Fax: (503) 725-3888
http://www.adm.pdx.edu/user/pcc/default.htm

Rejuvenation House Parts
1100 SE Grand Avenue
Portland, OR 97214
(503) 238-1900; Fax; (503) 230-2656
E-mail: store@rejuvenation.com
http://www.rejuvenation.com/

PENNSYLVANIA

Department of Environmental Protection
Bureau of Land Recycling and Waste Management
P.O. Box 8471
Harrisburg, PA 17105-8471
(717) 783-2388 or (717) 787-9871
E-mail: snyder.james@dep.state.pa.us
http://www.dep.state.pa.us/

Elk County Solid Waste Authority
P.O. Box 448
Ridgway, PA 15853
(814) 776-5373; Fax: (814) 776-5379

Professional Recyclers of Pennsylvania
P.O. Box 25
Bellwood, PA 16617
(800) 769-PROP (7767) or (814) 742-7777; Fax: (814) 742-8838
E-mail: prop@epix.net
http://www.proprecycles.org/

Pennsylvania Resources Council

Environmental Center
3606 Providence Road
Newtown Square, PA 19073
(610) 353-1555; Fax: (610) 353-6257

Pittsburgh Office of PRC:
64 South 14th Street
Pittsburgh, PA 15203
(412) 488-7490; PenFax Fax On Demand: (610) 353-5696
http://www.prc.org/

The Pennsylvania State University Cooperative Extension
246 Agriculture Engineering Bldg.
University Park, PA 16802
(814) 865-7154; Fax: (814) 863-1031
E-mail: jwg10@psu.edu

PUERTO RICO

Agricultural Extension Service
P.O. Box 21120
San Juan, PR 00928-1120
(787) 751-1784; Fax: (787) 250-8659
E-mail: g_pico@seam.upr.clu.edu

Puerto Rico Waste Exchange
West 339 Calderon Street
San Juan, PR 00926
(809) 748-0433
E-mail: sanchez@coqui.net

RHODE ISLAND

Department of Environmental Management
Office of Waste Management
235 Promenade Street
Providence, RI 02908
(401) 222-2797; Fax: (401) 222-3812
E-mail: ashulman@dem.state.ri.us
http://www.state.ri.us/dem/

Cooperative State Research, Education and Extension Service
University of Rhode Island
Kingston, RI 02881
(401) 792-4540; Fax: (401) 792-2494

Southern New England Materials Exchange
Rhode Island Resource Recovery Corporation
65 Shun Pike
Johnston, RI 02919-4512
(401) 942-1430, ext. 115; Fax: (401) 946-5174
E-mail: recycle@loa.com
http://www.rirrc.org/

SOUTH CAROLINA

Department of Health and Environmental Control
Bureau of Land and Waste Management
Division of the Office of Solid Waste Reduction and Recycling
2600 Bull Street
Columbia, SC 29201
(803) 896-4201
http://www.state.sc.us/dhec/eqc/lwm/

Department of Natural Resources
P.O. Box 167
Rembert C. Dennis Building
Columbia, SC 29202

Land Resources Division
2221 Devine St., Suite 222
Columbia, SC 29205-2418
(803) 734-9100
http://water.dnr.state.sc.us/

Cooperative State Research, Education and Extension Service
Clemson University
260 Barre Hall
P.O. Box 340355
Clemson, SC 29634-0355
(803) 656-3475; Fax: (803) 656-5776
E-mail: ewynn@clemson.edu

South Carolina Waste Exchange
Rt. 1, Box 388A
Prosperity, SC 29127
(803) 364-1008; Fax: (803) 364-0667

SOUTH DAKOTA

Department of Environment & Natural Resources
Waste Management Program
523 East Capitol Avenue
Pierre, SD 57501-3181
(605) 773-3153 Fax: (605) 773-6035.

Rapid City Office:
2050 West Main, Suite 1
Rapid City, SD 57702-2493
(605) 394-2229; Fax: (605) 394-5317

Watertown Office:
913 5th Street Southeast
Watertown, SD 57201-5134
(605) 882-5111; Fax: (605) 882-5066
http://www.state.sd.us/state/executive/denr/des/wastemgn/wasteprg.htm

Cooperative State Research, Education and Extension Service
Room 152 Agriculture Hall
P.O. Box 2207 D
South Dakota State University
Brookings, SD 57007
(605) 688-5131; Fax: (605) 688-6347
E-mail: ag04@sdsumus

TENNESSEE

Department of Environment and Conservation
Division of Solid/Hazardous Waste Management
401 Church Street
Nashville, TN 37243-1535
(615) 532-0780 or (888) 891-TDEC (8332)
http://www.state.tn.us/environment/waste.htm
http://www.state.tn.us/environment/swm/index.html

Tennessee Recycling Coalition
P.O. Box 23796
Nashville, Tennessee 37202
E-mail: info@trc-online.org
http://www.trc-online.org/

Knoxville Recycling Coalition
1904 Ailor Avenue, Suite 206
Knoxville, TN 37921
(423) 525-9694 or the Hotline: (423) 521-9900
E-mail: knoxrecycl@aol.com
http://www.korrnet.org/recycle/

The Tennessee Volunteer Chapter of the Solid Waste Association of North America
304 Ben Lomond Drive
McMinnville, TN 37110
(931) 473-8235; Fax: (931) 473.1717
Email: info@swana-volunteer.org
http://www.swana-volunteer.org/

Recycling Marketing Cooperative for Tennessee, Inc.
501 Union Street, 6th Floor
P.O. Box 190447
Nashville, TN 37219
(615) 880-3538; Fax: (615) 880-3539
http://www.rmct.org/

The Tennessee Materials Exchange
University of Tennessee Center for Industrial Services (CIS)
226 Capitol Boulevard, Suite 606
Nashville, Tennessee 37219-1804
(615) 532-8881 or (615) 532-8657; Fax: (615) 532-4937
E-mail: buggeln@utk.edu
http://web.utk.edu/~cis/tme_frm.htm

Cooperative State Research, Education and Extension Service
University of Tennessee
P.O. Box 1071
Knoxville, TN 37901
(615) 974-1840; Fax: (615) 974-2765

TEXAS

Natural Resource Conservation Commission
Office of Waste Management
12100 Park 35 Circle
P.O. Box 13087
Austin, TX 78711-3087
(512) 239-2104; Fax: (512) 239-5151
http://www.tnrcc.state.tx.us/

City of Austin Solid Waste Services
P.O. Box 1088
Austin, TX 78767
(512) 494-9400
http://www.ci.austin.tx.us/sws/

City of Austin Green Builder Program
P.O. Box 1088
Austin, TX 78767
(512) 505-3703
http://www.greenbuilder.com/

Recycle Texas Online
http://www.recycletexasonline.org/

Recycling Coalition of Texas

Central Texas Recycling Association
P.O. Box 220
Austin, TX 78767-0220
(512) 473-4085 or (512) 469-6079; Fax: (512) 473-3390
E-mail: info@recycletx.org
http://www.recycletx.org/

Texas Recycled
(512) 239-3100
E-mail: recycle@tnrcc.state.tx.us
http://www.texasrecycled.org/

Texas Agricultural Extension Service
P.O. Box 38
Overton, TX 75684
(903) 834-6191; Fax: (903) 834-7140
E-mail: ml-baker@tamu.edu

Texas Agricultural Extension Service
Texas A&M University
Agricultural Communications
Mail Stop 2112
College Station, TX 77843-2112
(409) 847-9318; Fax: (409) 845-2214
E-mail: echenualt@taexco3n.tamu.edu

RENEW
Texas Natural Resource Conservation Commission
P.O. Box 13087, MC-112
Austin, TX 78711-3087
(512) 239-3171; Fax: (512) 239-3165
E-mail: hcastill@tnrcc.state.tx.us
http://www.tnrcc.state.tx.us/exec/oppr/renew/renew.html

UTAH

Department of Environmental Quality
Division of Solid and Hazardous Waste
288 North 1460 West
P.O. Box 144880
Salt Lake City, UT 84114-4880
(801)538-6170; Fax: (801)538-6715
http://www.deq.state.ut.us/eqshw/dshw-1.htm

Recycling Coalition of Utah
P.O. Box 112045
Salt Lake City, UT 84147-2045
http://www.recycle.utah.org/

Recycle Utah
1951 Woodbine Way
P.O. Box 682998
Park City, UT 84068-2998
http://www.recycleutah.org/

Cache Valley Clean Team
Logan Department of Environmental Health
950 W. 600 N
Logan, UT 84321-7806
(435) 750-9953; Fax: (435) 752-4007
http://www.cvcleanteam.org/home.html

Cooperative State Research, Education and Extension Service
Utah State University
Logan, UT 84322-2300
(801) 750-3389; Fax: (801) 750-3268

VERMONT

Environmental Board & Waste Facility Panel
National Life Records Center Building, Drawer 20
Montpelier, VT 05620-3201
(802) 828-3309
E-mail: mzahner@envboard.state.vt.us
http://www.state.vt.us/envboard/

Agency of Natural Resources Department of Environmental Conservation
Waste Management Division
West Office Building, 103 S. Main Street
Waterbury, VT 05671-0407
(802) 241-3444; Fax: (802) 241-3296
http://www.anr.state.vt.us/

Association of Vermont Recyclers
P.O. Box 1244
Montpelier, VT 05601
(802) 229-1833
E-mail: recycle@sover.net
http://www.vtrecyclers.org/

Vermont Business Materials Exchange
P.O. Box 430
Newfane, VT 05345
(800) 895-1930; Fax: (802) 365-7996
Email: ppress@sover.net
http://www.enviro-source.com/vbmx/

UVM Extension System
RR 4, Box 2298
Comstock Road, Berlin
Montpelier, VT 05602-8927
(802) 223-2389; Fax: (802) 223-6500

VIRGINIA

Department of Environmental Quality
629 East Main Street
P.O. Box 10009
Richmond, VA 23219
(804) 698-4000 or (800) 592-5482 (inside VA)

Waste Management: (804) 698-4155
E-mail: wmb@deq.state.va.us
http://www.deq.state.va.us/

Virginia Tech Extension Service
424 Smyth Hall
Crop & Soil Environmental Sciences
Blacksburg, VA 24061-0403
(540) 231-9739; Fax: (540) 231-3075
E-mail: gevanylo@vt.edu

WasteNot Recycling, Inc.
13852 Park Center Road, Bay-A
Herndon, VA 20171
(703) 787-0200; Fax: (703) 787-0660
E-mail: wastenot@aol.com

WASHINGTON

Department of Ecology
Northwest Regional Office: Solid Waste Services Program
3190 160th Avenue SE
Bellevue, WA 98008-5452
Recycling Hotline: (800) RECYCLE
(206) 649-7048; Fax: (206) 649-7098
http://www.wa.gov/ecology/
http://www.wa.gov/ecology/swfa/swhome.html

King County Solid Waste Division
King Street Center
201 S. Jackson Street, Suite 701
Seattle, WA 98104
(206) 296-6542 or (800) 325-6165, ext. 6542; Fax: (206) 296-0197
E-mail: website.swd@metrokc.gov
http://www.metrokc.gov/dnr/swd/index.htm

Clean Washington Center
2001 6th Avenue, Suite 2700
Seattle, WA 98121
(206) 464-7040; Fax: (206) 464-6902
E-mail: info@cwc.org
http://www.cwc.org/

Pierce County Public Works & Utilities
Solid Waste Division
9116 Gravelly Lake Drive S.W.
Lakewood, WA 98499-3190
(253) 798-4050
E-mail: pcsolidwaste@co.pierce.wa.us
http://www.co.pierce.wa.us/services/home/environ/waste/recycle/cdl.htm

Seattle Solid Waste Utility
710 Second Avenue, Suite 505
Seattle, WA 98104
(206) 684-7666; Fax (206) 684-8529

Washington State Recycling Association
6100 Southcenter Blvd., Suite 180
Tukwila, WA 98188
(206) 244-0311; Fax: (206) 244-4413
E-mail: wsra@wsra.net
http://www.wsra.net/

Washington State Community, Trade and Economic Development
906 Columbia Street S.W.
P.O. Box 48300
Olympia, WA 98504-8300
(360) 753-7426; Fax: (360) 586-3582
http://www.cted.wa.gov/

Business and Industry Recycling Venture
1301 5th Avenue, Suite 2400
Seattle, WA 98101
(206) 389-7304; Fax: (206) 903-3462
http://www.seattlechamber.com/BIRV/

Pacific Northwest Pollution Prevention Resource Center
1326 Fifth Ave., Suite 650
Seattle, WA 98101
(206) 223-1151
E-mail: office@pprc.org
http://www.pprc.org/pprc/
1-800-RECYCLE ONLINE

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600
(800) RECYCLE or (360) 407-6352; Fax: (360) 407-6305
http://1800recycle.wa.gov/

CRD Cooperative Extension
Washington State University
411 Hulbert Hall
Pullman, WA 99164-6230
(509) 335-2937; Fax: (509) 335-2926

Cooperative Extension
7612 Pioneer Way East
Puyallup, WA 98371-4998
(206) 840-4512; Fax: (206) 840-4721

Industrial Materials Exchange (IMEX)
Local Hazardous Waste Management Program in King County
Seattle-King County Dept. of Public Health
1st Interstate Center
999 3rd Ave., Suite 700
Seattle, WA 98104-4099
(206) 296-4899; Fax: (206) 296-3997
E-mail: imex@metrokc.gov
http://www.metrokc.gov/hazwaste/imex/

Pacific Materials Exchange
1522 N. Washington, # 202
Spokane, WA 99205
Reusable Building Materials Exchange
Climate Solutions
610 East Fourth Avenue
Olympia, WA 98501
(360) 943-4595; Fax: (360) 943-4977
E-mail: info@climatesolutions.org
http://www.rbme.com/

WEST VIRGINIA

Division of Environmental Protection
Office of Waste Management
1356 Hansford St.
Charleston, WV 25301
(304) 558-5929; Fax: (304) 558-0256
http://www.dep.state.wv.us/wm/index.html

Solid Waste Management Board
1615 Washington Street, East
Charleston, WV 25311-2126
(304) 558-0844; Fax: (304) 558-0899
E-mail: cjordan@gwmail.state.wv.us
http://www.state.wv.us/swmb/

Cooperative State Research, Education and Extension Service
2104 Agriculture Science Building
P.O. Box 6108
Morgantown, WV 26506-6108
(304) 293-3408; Fax: (304) 293-6954
E-mail: hooper@wvnvms.wvnet.edu
Materials Exchange

West Virginia Solid Waste Management Board
(304) 558-0844
E-mail: swmbexch@mail.wvnet.edu

West Virginia Materials Exchange
1615 Washington Street, East
Charleston, WV 25311-2126
(304) 558-0844; Fax: (304) 558-0899
E-mail: swmbexch@mail.wvnet.edu
http://www.state.wv.us/swmb/exchange/

WISCONSIN

Department of Natural Resources
Waste Management Program WA/3
P.O. Box 7921
Madison, WI 53791-9087
(608) 266-2111; Fax: (608) 267-2768

Construction and Demolition Waste: (608) 267-7574
E-mail: connej@dnr.state.wi.us
http://www.dnr.state.wi.us/

Wisconsin Recycling Markets Directory
DNR Recycling at (608) 267-7566
E-mail: WRMD@mail01.dnr.state.wi.us

Waste Management Program Waste Reduction & Recycling Information
Markets for Recyclable Materials
Construction & Demolition Debris
(414) 483-3842

WasteCap Wisconsin
2647 N. Stowell Avenue
Milwaukee, WI 53211-4299
(414) 961-1100; Fax: (414) 961-1105
E-mail: wastecap@envirolink.org
http://www.enviroweb.org/wastecap-wi/

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1997 University of Wisconsin-Stevens Point
Stevens Point, WI 54481
(715) 346-0123
E-mail: webmaster@uwsp.edu

University of Wisconsin-Madison Campus Ecology
1225 University Avenue, Room 205A
Madison, WI 53706
E-mail: daniel.einstein@ccmail.adp.wisc.edu
http://wiscinfo.doit.wisc.edu/campusecology/

University of Wisconsin Extension
Solid and Hazardous Waste Education Center (SHWEC)
432 North Lake Street, Room 625
Madison, WI 53706
(608) 262-1748; Fax: (608) 262-9166
E-mail: walshp@wisplan.uwex.edu
http://www.uwex.edu/shwec/index.htm

Business Material Exchange of Wisconsin (BMEX)
136 West Grand Ave.
Beloit, WI 53511
(608) 364-1131; Fax: (608) 364-1161
E-mail: bmex@wr.net
http://www.bmex.org/

SWAP
Solid Waste Alternatives Program (Surplus With a Purpose)
University of Wisconsin-Madison
2102 Wright St.
Madison, WI 53704
(608) 245-2908
E-mail: swap@bussvc.wisc.edu
http://www.bussvc.wisc.edu/swap/swap.html

WYOMING

Department of Environmental Quality
Solid and Hazardous Waste Division
122 West 25th Street, Herschler Building, 4th Floor West
Cheyenne, WY 82002
(307) 777-7752; Fax: (307) 777-5973

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250 Lincoln Street,
Lander, WY 82520
(307) 332-6924; Fax: (307) 332-7726

3030 Energy Lane, Suite 200
Casper, WY 82604
(307) 473-3450; Fax: (307) 473-3458
E-mail: DEQWYO@missc.state.wy.us
http://deq.state.wy.us/shwd.htm

Wyoming Recycling Association
P.O Box 539
Laramie, WY 82070
(307) 332-6924
http://www.trib.com/WYOMING/RECYCLE/

Cooperative State Research, Education and Extension Service
University of Wyoming
P.O. Box 3354
Laramie, WY 82071
(307) 766-5479; Fax: (307) 766-3998 or 766-6403
E-mail: jhiller@uwyo.edu