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# Closing the Circle News

Recycling programs can be as small as an extra bin in the corner of a room to as large as an entire building worth of materials. Recycling can be as simple as separating white paper from mixed paper or as complicated as demilitarizing a missile to recover valuable parts. No matter what level, recycling is one of the tools we use to minimize our environmental footprint, and when that foot is the size of the Federal government's, we can make huge strides through both the most simple and the most complex means of recycling.

The Federal government continues to recognize the importance of recycling and expanding its recycling activities. Recycling prevents emissions of many air and water pollutants, saves energy, supplies valuable raw materials to industry, creates jobs, reduces greenhouse gas emissions, stimulates the development of greener technologies, and conserves resources, including landfill space, for our children's future.<sup>1</sup> By reducing the need for virgin resources, for example, we can reduce greenhouse gas emissions resulting from industrial processes required for the extraction and processing of new materials. Diverting materials from landfills and incinerators reduces emissions of potent greenhouse gases such as methane and carbon dioxide.

As the Federal community meets the E.O. 13423 objective of making its operations more sustainable, recycling continues to be a significant natural resource conservation tool. In this edition of *Closing the Circle News*, we examine some of the ways that agencies are meeting and exceeding their recycling goals. We highlight examples of Federal agencies recycling despite geographic and other location obstacles. We also provide a lot of resources for recycling of various materials, including construction and demolition debris.

We will examine some of these innovative recycling programs in hopes that they can help other agencies in complying with E.O. 13423. We are seeing Federal agencies look at their outdated materials in a new light – as a recoverable material rather than a waste. Many report recycling materials that once would have

simply accumulated in storage or have been quickly hauled to the landfill. But now nothing is off limits – from personal computers to entire buildings, it can be recycled. ■



<sup>1</sup> "Recycling... for the future Consider the benefits," Office of the Federal Environmental Executive, November 1998.



# Overcoming Logistical Challenges the Size of Alaska

The U.S. Fish and Wildlife Service (FWS) is a biologically based organization acting as a trustee of natural resources throughout the U.S. Its mission is to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. It manages nine different regions, all with unique issues of geography, wildlife, and climate. Much of the land placed in FWS' trust is remote, presenting unique challenges for environmental stewardship. Because of its size and remoteness, recycling is very challenging in Region 7, the Alaska Region. It has offices in 16 communities spread throughout a state with 571,951 square miles of land area. Region 7 manages 16 different refuges of the National Wildlife Refuge system. Among its many responsibilities is the management of Alaskan endangered species, habitat restoration, and law enforcement.

Region 7 had been accumulating outdated, government-owned electronic equipment with few end-of-life management options except donation of the usable equipment to local schools or landfill disposal for unusable materials. This equipment had been accumulating in remote field stations, where large logistical challenges stand in the way of managing end-of-life electronics in a more environmentally friendly manner.

To overcome the difficulties of recycling in a remote region, the region formed the FWS Alaska Regional Office Electronic Equipment Recycling Team, including personnel from several divisions of the Alaskan National Wildlife Refuge system. The idea was for a massive consolidation, encouraging field stations to recycle their outdated electronic equipment by shipping it to the Regional Office in Anchorage. By consolidating collection in the Regional Office, the team saw potential for one large recycling event

rather than more difficult individual efforts at the field stations. The team faced large logistics challenges in simply transporting the materials to the Regional Office. For example, three communities covered under the plan were not on the Alaskan road system, and air freight had to be utilized. However, by consolidating efforts and getting the materials to the Regional Office in Anchorage, the team now had recycling options for the mountains of electronic equipment it had collected.

After wiping the hard drives, the Team had to find a way of moving the materials from the Regional Office to a recycler, which would be achieved through cooperation with the Municipality of Anchorage. Anchorage holds an annual "Green Star" Recycling Event, sponsored by the Municipality and several large companies. The Green Star Recycling Committee operates a warehouse in the Ted Stevens Anchorage International Airport (TSAIA), where it ships old equipment to an authorized recycling company in the lower 48 states. This event was traditionally designed for businesses and citizens of the Anchorage community, but through a partnership, the Regional Office team sought a great opportunity to provide electronics recycling for the field stations.

FWS Region 7 first participated in

the Green Star Recycling Event in 2004, without extensive advertising and promotion, but it learned that the event could be a feasible option for the region's nascent recycling program. The following year, FWS greatly increased promotion of the event to increase its numbers. In late April, 2005, field station electronics were loaded onto pallets and shipped to the TSAIA Center to unload in time for the Green Star Recycling Event. In all, the Team shipped 6,600 pounds of stored electronic equipment at a cost of about \$6,000, or \$.91 per pound.

Following the 2005 success, the Team repeated with an event in 2006. In all, 255 pieces of equipment were recycled, with 13 offices participating. The Team donated the remainder of unusable equipment to local technical colleges, allowing schools to break down and study the electronic equipment.

In 2006, FWS Region 7 began working with Total Reclaim, a computer and electronics recycling service in Anchorage, to make electronics recycling available year-round. Field stations in Alaska can

now recycle electronics throughout the year. Larger events still make economic sense for many of the more remote stations, sending materials in bulk during the summer when there is more staff and more favorable weather. For further information, please contact



# TSA's Recycling Program

On November 19, 2001, the Aviation and Transportation Security Act established the Transportation Security Administration (TSA). TSA faced the daunting challenge of federalizing security screening at our Nation's airports. As a key component of its core transportation security mission, TSA embarked on the development of a comprehensive environmental program to ensure compliance with environmental requirements and eliminate or reduce significant environmental impacts from its activities.

TSA's Designated Environmental Official tasked the Office of Occupational Safety, Health, and Environment (OSHE) with developing a national recycling program for TSA's Headquarters, operations facilities, and airport operations. Both the scope and the tempo of TSA's operations made this especially challenging; TSA has a large Headquarters, several large facilities, and more than 450 high-paced airport operations with a screening force of more than 42,000 that screen approximately 600 million passengers (and their baggage) annually.

A team of OSHE employees and support contractors developed and implemented TSA's Recycling Program. The team worked closely with TSA's Office of Chief Counsel and Office of Communications and Public Information, met with recycling experts from other Federal and regulatory agencies, and received substantial input from TSA facilities managers and airport operations staff. Program development commenced in the spring of 2005.

OSHE surveyed 100 percent of the 450-plus TSA airport operations and analyzed the feasibility of establishing



recycling programs at each airport. OSHE provided the logistical support services for supplying recycling materials (bins, bags and boxes, etc.) to the field operations. All orders for materials were entered into a centrally managed database for processing monthly. Blanket Purchase Agreements were issued through TSA's Office of Acquisition for recycling bins (which are made with recycled material), plastic bags, and battery recycling mail-back boxes. Printer cartridge recycling mail-back containers were obtained through a no-cost contract.

At the end of 2007, TSA's Headquarters, its operations facility, and 373 airport operations were actively participating in the recycling program. TSA's FY 2007 extrapolated recycling total was more than 1.2 million pounds of plastics, metals, corrugated cardboard, mixed paper,

and newspaper.

OSHE worked with the Office of Chief Counsel to develop a template for a Memorandum of Agreement (MoA) between TSA and Airport Authorities or non-profit organizations regarding disposal of recyclable materials. One of the unique challenges presented to the TSA is its wide geographic range, and the broad number of county and state environmental regulations and guidelines that must be met. However, this challenge is overcome by allotting power to airport authorities to run individual programs in ways that meet their unique needs. OSHE sets up a field for the program to play within, but the Memorandum of Agreement leaves options open for individual airport authorities. TSA feels that this encourages more participation. >>>

>>> The MoA can be used to develop three types of airport partnership arrangements: Donations, Partnering, and Employee Morale Groups. Following are examples of each arrangement. **Donations** - TSA employees at Charleston (S.C.) International Airport are donating their recycling proceeds to a non-profit organization, the Ronald McDonald House. **Partnering** - TSA is partnering with Baltimore-Washington International Airport (BWI) to help the airport meet its recycling volume goals. BWI's Airport Authority provided recycling stations at TSA locations in the airport. The partnering effort has helped to strengthen the relationship between

TSA and the airport authority. **Employee Morale Group** - TSA's Employee Association at Logan International Airport, Boston, is using the recycling revenue for workforce activities and events, which help to improve employee morale.

Many of TSA's airport operations have enthusiastically worked to start a recycling program from scratch. "Baggage screening is a fast-paced, highly stressful job with few 'creature comforts.' The establishment of recycling funds in an Employee Association has increased morale among the TSA Transportation Security Officer workforce," stated Kathryn Jones, TSA's Recycling Program Manager. "At McCarran International

Airport in Las Vegas, for example, TSA employees funded a holiday buffet with recycling proceeds."

Materials abandoned to the Federal government, such as items left in airport checkpoints by travelers like tools, sports equipment, banned items, are primarily donated to state agencies as surplus property. TSA set up this program ensuring that the donations would be geared solely to public concerns, and state laws require equitable distribution of the surplus property among state and local agencies and non-profit organizations. Although these materials do not fall into TSA's recycling program, most will end up being directly reused.

OSHE has taken multiple actions to ensure that TSA continues to recycle. The Recycling Program is part of TSA's Environmental Management System, which is currently being implemented at 130 appropriate facilities. For the remaining operations, OSHE will continue to conduct program outreach and increase the support services provided to the field. TSA's Recycling Program actions also include partnership in the Federal Electronics Challenge (FEC). TSA, having won a FEC Silver award, is now a Gold level partner and will work to increase recycling of used computers and other electronics equipment in 2008.

For further information, please contact Kathy Jones at (571)227-1116 or by email at [Kathryn.Jones@dhs.gov](mailto:Kathryn.Jones@dhs.gov). ■



# Quantifying the Benefits of Recycling

**W**e often hear that recycling provides resource conservation, pollution reduction, greenhouse gas emissions (GHG), energy, and economic benefits, including job creation. In November of 1998, OFEE published *Recycling...for the future: Consider the benefits*, which provided quantification of these benefits. You can find it on our web site, at <http://ofee.gov/wpr/future.pdf>.

Since then, recycling of materials from municipal solid waste and construction and demolition debris

has continued to expand in the U.S. and at Federal facilities. The Environmental Protection Agency reports that in 2006, U.S. residents, businesses, and institutions produced more than 251 million tons of municipal solid waste. Recycling, including composting, diverted 82 million tons of materials from disposal, for a national recycling rate of nearly 35 percent. In 2006, many Federal agencies met or exceeded EPA's national 35 percent recycling goal in 2006, as shown in the following table.

There are several tools that will help you to calculate the benefits of your facility's or organization's recycling activities.

## The Paper Calculator

The Paper Calculator is a web-based tool that enables companies, communities, schools, NGOs and other organizations to understand and improve their paper use. Developed by Environmental Defense, the Paper Calculator calculates the U.S. average energy and wood consumption and environmental releases of different paper types across their full lifecycle. For each of thirteen major grades of paper and paperboard, it allows the user to compare the environmental impacts of papers made with different levels of recycled content, ranging from 0 percent (virgin paper) to 100 percent. It also allows the user to see how using less paper or changing other specifications can reduce environmental impacts. The Paper Calculator can compare individual papers, or groups of papers. Finally, the Paper Calculator generates easy-to-read reports that help communicate the environmental benefits of better paper choices.

For example, using the Paper Calculator to compare a decision to purchase one ton of 30 percent postconsumer content copier paper instead of one ton of virgin paper shows that purchasing the recycled content paper will result in:

- The use of 1 ton less of wood (approximately 7 trees)
- Total energy use reductions of 5 million BTUs
- Greenhouse gas emission savings of 632 pounds of carbon dioxide equivalent

[www.papercalculator.org](http://www.papercalculator.org)

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## Agencies Exceeding the National 35 Percent Recycling Goal (FY 2006)

Agency	Percentage
Department of Commerce	35
Office of Personnel Management	37
Department of Energy	37
Environmental Protection Agency	39
Department of the Treasury	42
Nuclear Regulatory Commission	51
General Services Administration	52
Army	59*
National Institutes of Health	60
Veterans Affairs	62
Air Force	64*
NASA	64

\*includes C&D

## EPA's Waste Reduction Model (WARM)

The Waste Reduction Model was created to help solid waste planners and organizations calculate the impacts of waste management options and to track and voluntarily report greenhouse gas emissions reductions and energy savings from waste management practices. However, it can be used by anyone to calculate the benefits of recycling. It currently covers 26 material types and six categories of mixed materials (paper, metals, plastics, organics, municipal solid waste, and recyclables).

[http://www.epa.gov/climatechange/wycd/waste/calculators/Warm\\_home.html](http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html)

## EPA's Durable Goods Calculator

The Durable Goods Calculator (DGC) helps companies and individuals understand the greenhouse gas (GHG) emission implications of various disposal methods for durable goods. The Calculator estimates GHG emissions benefits in metric tons of carbon equivalent (MTCE) and energy savings in MMBtu for recycling, landfilling and combustion of 14 typical durable goods.

## A Sunny Way to Manage Materials

The U.S. Department of Agriculture's Headquarters uses solar powered "Big Belly" trash compactors. Located on



Washington, DC's Mall area adjacent to the Smithsonian Institution museums, USDA's grounds are traversed by tourists as well as USDA's employees. USDA installed exterior receptacles and the big bellies to help accommodate all the tourists and employees. The big bellies compact the non-recyclable trash so USDA can reduce the number trips to collect the trash.

USDA installed three solar trash compactors, one in August 2007 and the other two in October 2007 for energy awareness month. It put a recycling container next to the big bellies so recyclable materials do not go in the big bellies. For further information, please contact Ed. Murtagh at 202-720-5961. ■

## Recycling Rates in the United States

- 76.4 percent of old corrugated containers
- 72.3 percent of newspaper
- 68.7 percent of steel
- 62.9 percent of steel cans
- 53.4 percent of paper
- 51.6 percent of aluminum cans
- 49.0 percent of printing & writing paper
- 23.5 percent of PET bottles

Sources: Environmental Protection Agency, PaperRecycles.org, Glass Packaging Institute, Institute of Scrap Recycling Industries, National Association for PET Container Resources, Steel Recycling Institute. ■



The DGC calculates GHG emissions and energy consumption related to disposal activities using analyses of baseline and alternative disposal scenarios. For example, the tool will allow the user to estimate the GHG emissions and energy benefits of disposing of appliances with varying percentages being recycled, combusted, or landfilled.

[http://www.epa.gov/climatechange/wycd/waste/calculators/DGC\\_home.html](http://www.epa.gov/climatechange/wycd/waste/calculators/DGC_home.html)

## National Recycling Coalition's Recycling Calculator

NRC's "Conversionator" provides fun facts about recycling aluminum cans, newspapers, glass bottles, and plastic soda bottles. In addition, NRC members can access an Environmental Benefits Calculator.

## Northeast Recycling Council's (NERC) Environmental Benefits Calculator

NERC's Environmental Benefits Calculator generates estimates of the environmental benefits of a study area, based on the tonnages of materials that are source reduced, reused, recycled, landfilled, or incinerated (includes waste-to-energy). The Calculator is based on per ton figures of the estimated energy use and emissions from several lifecycle analysis studies. The estimates are average figures based on "typical" facilities and operating characteristics existing in the United States. The Calculator incorporates U.S. EPA's most recent WARM Calculator, as well as, facts and figures from the U.S. Department of Energy, industry trade associations, and other sources. ■

[http://www.nerc.org/documents/environmental\\_benefits\\_calculator.html](http://www.nerc.org/documents/environmental_benefits_calculator.html)

# Redefining Hard-to-Handle Materials Recycling

The word “recycling” typically conjures images of recycling bins filled with office paper, beverage containers, and newspapers. For some of us, it also means recycling of electronics, batteries, and other, harder to handle materials. However, it usually does not make one think about weapons. For one Army depot, it means exactly that.

Anniston Army Depot (ANAD), located in northeastern Alabama, has gained a reputation since its creation in 1942 as a leading maintenance facility. Earning a title of the “Tank Rebuild Center of the World,” ANAD has been a leader in innovative maintenance techniques of military equipment as well as the maintenance of the 15,246 acres of woodland which the depot encompasses. Through introduction of an innovative process, ANAD is the first major recycler of missiles.

Open burning/open detonation (OB/OD) is the traditional method for disposing of missiles. This process releases a variety of pollutants into the air, water, and soil, including quantities of aluminum, chromium, and lead. With a Congressional directive to destroy 600,000 of these weapons in the next ten to 15 years, demilitarizing missiles presents a new environmental concern.

However, technology developed at the U.S Army Research, Development, and Engineering Center (AMRDEC) is attempting to change obsolete missiles from a disposal problem to a recoverable waste stream. In keeping with its reputation, ANAD saw another opportunity for innovative weapons maintenance. ANAD is the nation’s first facility to use the AMRDEC technology to demilitarize and recycle missiles in a more environmentally and economically sound manner.



ANAD remains the only facility capable of utilizing this process, though other bases are striving to also conduct missile recycling.

ANAD’s Missile Recycling Center can recover up to 98 percent of missile components during disassembly. The hardware components can be decontaminated to be recycled and reused. Currently, ANAD is storing the energetic materials of the warhead, such as the LX14 warhead materials and propellants, awaiting technology that is being developed so that these components can be completely recycled. All fuel components of the missile can be reclaimed, and some of these components hold high value both for military and commercial applications. Many of the inert missile parts can be simply reused to create new missiles or resold as scrap metal. All of this is accomplished without the damaging release of pollutants such as lead.

ANAD can currently only process tube-launched, optically sighted, and wire-guided (TOW) missiles; however research at AMRDEC will likely make new technologies available to expand

the capacity of missile recycling. Currently ANAD is working to expand the program to include Multiple-Launch Rocket Systems, a larger missile system than can currently be recycled. ANAD hopes to create a warhead disassembly function that is entirely robotic. The technologies should be applicable to missiles in the inventories of any of the military services.

The Missile Recycling Center helped decrease the Depot’s Toxic Release Inventory reporting due to avoided emissions from minimizing the use of OB/OD disposal. Environmentally, ANAD estimated in 2007 that out of 40,000 disassembled missiles, 935,200 pounds of aluminum emissions were avoided, as well as 2,720 pounds of lead emissions. Economically, for the same 40,000 missiles, 6,483 tubes were reused to make new missiles, and more than 850,000 pounds of scrap metal was resold. ANAD has recycled more than 53,000 missiles to date.

For further information, contact LTC Garry McClendon at (256)235-7570, or by email at [Garry.McClendon@us.army.mil](mailto:Garry.McClendon@us.army.mil) ■

# Intravenous Fuel

**M**ost Department of Veteran's Affairs (VA) facilities across the country have an established VA Pharmaceutical Cache Program in operation. Because the cache is to be used in the event of a significant emergency, such as a terror attack or national disaster, it must be maintained in a constant state of readiness. All stock remains in the cache location until stock is replaced, regardless of the expiration date, and subsequent replenishment and disposal is closely tracked. The multi-step process for rotation of supplies with expiration dates was clear but tedious, and required a significant level of accountability.

The system used by most facilities, including the Louisville VA Medical Center (VAMC), to manage the disposal/destruction of expired intravenous (IV) solutions required shipping expired IV fluids to the government-contracted vendor. This vendor did not offer a recycling option for IV solutions and charged \$0.32 per pound for disposal of IV solutions. As a result, a facility could spend \$13,000 or more on solutions sent for destruction. This is due to the expense involved in appropriately disposing of the fluids – the labor-intensive process of cutting the bags open and draining them.

In 2005, Keith C. Davis, Industrial Hygienist at the Louisville VA Medical Center, began an effort to improve waste reduction in the center. As part of the VAMC's recycling program, he looked for an alternative to IV

solution disposal through the contract vendor. The option of employees cutting open and draining the bags was rejected as labor-intensive, a potential source of worker injury, and requiring acquisition of an Unusual Discharge Permit from the Metropolitan Sewer District. In addition, a modification of the discharge permit and increased monitoring requirements would increase costs to \$450.00 per month.

Mr. Davis found a perfect partner that could not only reduce VA's waste stream, but turn it into new energy. Parallel Products produces ethanol out of food and beverage waste streams. The company works with other businesses to recover discarded liquids that would have otherwise been wasted. These liquids are then fermented and distilled by Parallel Products to create fuel-grade alcohol, which can be sold and replace conventional fuel sources such as fossil-fuels.

For the past 15 years, Parallel Products has been recovering ethyl alcohol from pharmaceuticals. With Parallel Products' main office in Louisville, Mr. Davis found just the answer he was looking for. The option of recycling through Parallel Products was a win-win: the IV solutions would now be converted into a new source of energy, and Parallel Products offered cost-savings of \$10 per case. The program began in the fall of 2006 with one type of solution, and expanded to four additional types in 2007. During this time, Mr. Davis has

promoted the program to other VA facilities nationwide, emphasizing that any solution containing sugar or ethanol can be recycled through this program to utilize the ethyl alcohol.

The process actually produces three separate recovered materials streams handled by Parallel Products. Recovered packaging materials such as corrugated cardboard and plastics are sold as commodities. The saline-based IV solutions are used to clean and purge production machines. The real benefit comes from the sugar-containing IV solutions which are converted to 190-200 proof ethanol. The medical center receives credit for the recycling of the packaging and the creation of the new fuel source.

The cost-benefit advantage of the recycling option was clear. One pallet of 14-liter bags disposed of through the conventional disposal contract costs VA \$694, as opposed to only \$78 through the recycling option with Parallel Products. The recycling option also reduces environmental compliance requirements by greatly reducing water-use and the handling of non-hazardous materials. Mr. Davis emphasized the cost savings and environmental benefits to expand this recycling option nationally throughout the VA system. In FY 2007, VA estimated nationwide cost savings of nearly \$99,500, with almost 10,000 cases shipped to Parallel Products from 14 VA facilities.

For further information, please contact Keith Davis at (502)287-6854. ■



# Tools and Tips for Recycling Construction and Demolition Materials

by Nicole Villamizar, MPA and Kimberly Cochran, PhD

**W**ith the signing of Executive Order (E.O.) 13423, Strengthening Federal Environmental, Energy, and Transportation Management, Federal agencies are searching for new ways to reduce the environmental impacts of their facilities. As part of E.O. implementation, agencies must ensure that at least 50 percent of the construction, demolition, and land-clearing materials generated from the construction and major renovation of their facilities are recycled or salvaged. Therefore, improving resource management through the reduction, reuse, and recycling of construction and demolition (C&D) materials will become a priority for many agencies.

C&D materials are items left over at a construction, renovation, or demolition site. The most common materials are concrete, asphalt pavement, asphalt shingles, wood, drywall, metal, and corrugated cardboard. Often disposed of as waste, these materials are valuable commodities that can be recycled into new products or used in many innovative ways. This article presents tools and information to help federal agencies comply with the C&D materials diversion requirements of E.O. 13423.

## Benefits of Recycling C&D Materials

The construction, operation, and disposal of buildings consumes a significant amount of natural resources and energy. Mining, extracting, or refining virgin resources are energy-intensive processes that result in greenhouse gas emissions. Reducing, reusing, and recycling C&D materials decreases the need for virgin resources and reduces the environmental impacts associated with processing those resources. In addition to environmental benefits, diverting C&D materials from landfills can save money by decreasing disposal costs for the generator of the materials and decreasing the cost of materials for end users. Table 1 presents common recycling and reuse options for C&D materials.

## E.O. 13423 C&D Materials Diversion Requirements

Section 2(f) of E.O. 13423 states that the head of each agency shall “ensure that new construction and major renovation of agency buildings comply with the Guiding Principles for Federal Leadership in High Performance and

Sustainable Buildings set forth in the Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding (2006).” Agencies must also ensure that, as of the end of fiscal year 2015, 15 percent of their existing federal capital asset building inventory incorporates the sustainable practices in the Guiding Principles.

The technical guidance for E.O. 13423 and the Guiding Principles outlines key ways that agencies can reduce the environmental impact of materials, including recycling and salvaging construction waste. More specifically:

“During a project’s planning stage, identify local recycling and salvage operations that could process site related waste. Program the design to recycle or salvage at least 50 percent construction, demolition and land clearing waste, excluding soil, where markets or onsite recycling opportunities exist.”

[http://www.wbdg.org/references/mou\\_cw.php](http://www.wbdg.org/references/mou_cw.php)

The next two sections of this article contain information and resources to help agencies identify local recycling and salvage operations and ensure that at least 50 percent of the C&D materials generated from their projects are recycled or salvaged. >>>

**Table 1: C & D Materials and Markets**

Material	How is it processed for use?	Reuse/Recycling/ Waste-to-Energy Markets
Concrete	The material is crushed, the reinforcement bar is removed, and the material is screened for size. More information can be found at <a href="http://www.concreterecycling.org">www.concreterecycling.org</a>	Road base General fill Drainage media Pavement aggregate

Material	How is it processed for use?	Reuse/Recycling/Waste-to-Energy Markets
Asphalt Pavement	The pavement is crushed and recycled back into asphalt, either in-place or at a hot-mix asphalt plant.	Aggregate for new asphalt hot mixes Sub-base for paved road
Brick	Bricks are reconditioned and mortar is removed	Reuse as brick in new structures
	Bricks are crushed and screened	Decorative landscaping materials
Asphalt Shingles	After removal of nails, asphalt shingles are ground and added to hot-mix asphalt. More information can be found at: <a href="http://www.shinglerecycling.org">www.shinglerecycling.org</a>	Asphalt binder and fine aggregate for new asphalt pavement mixes
	After removal of nails, asphalt shingles are ground.	Temporary roads Dust control
	Shingles can be split into aggregates and asphalt backing	Asphalt backing for energy in cement kilns, aggregate for use in cement manufacture
Wood	Clean, untreated wood can be re-milled, chipped or ground.	Recovered lumber re-milled into flooring and other interior wood applications Feed stock for engineered particle board Mulch and compost Animal bedding Boiler fuel
Drywall	Drywall is typically ground or broken up, and the paper is removed. For more information, visit <a href="http://www.drywallrecycling.org">www.drywallrecycling.org</a>	Gypsum wallboard manufacture Cement manufacture Agriculture (land application)
Steel, Copper, and Other Metal	Melted down and reformed	Metal products

Material	How is it processed for use?	Reuse/Recycling/Waste-to-Energy Markets
Carpet	Carpet is collected then sorted into four key fiber types: nylon 66, nylon 6, polypropylene and polyester. The sorted carpet is then either baled and shipped to end users or it is further processed to separate the thermoplastic face fiber and shipped to end users.	Manufacture of new products, such as composite lumber (both decking and sheets), tile backer board, roofing shingles, railroad ties, automotive parts, carpet cushion, stepping stones, and other products.
Cardboard	Ground and used in new pulp stock	Paper products
Interior fixtures, such as cabinets, mantles, sinks, toilets, lights, and doors	These fixtures can be removed and directly reused. They are sometimes reconditioned before reuse.	As fixtures or decorations in new structures.

## Identifying Local Reuse and Recycling Opportunities

The easiest way to find local opportunities is to contact local waste haulers to find out if they provide recycling or reuse services. Agencies can also contact state or local environmental agencies; many have lists of facilities that reuse or recycle C&D materials. Below are additional resources to help agencies identify local C&D materials reuse and recycling opportunities:

- The Construction Industry Compliance Assistance (CICA) Center's Web site** ([www.cicacenter.org](http://www.cicacenter.org)) contains a C&D materials State Resource Locator, where contractors can find state environmental agency Web sites.
- The Whole Building Design Guide's Construction Waste Management Database** ([www.wbdg.org/tools/cwm.php](http://www.wbdg.org/tools/cwm.php)) contains a listing of companies that haul, collect, and process recyclable materials from construction projects.
- The Building Materials Reuse Association's (BMRA) Web site** ([www.buildingreuse.org](http://www.buildingreuse.org)) contains a directory of members that operate reuse stores. The BMRA is a non-profit educational organization whose mission is to facilitate building deconstruction and the reuse/recycling of recovered building materials.
- Habitat for Humanity (Hfh)** operates many Re-Stores throughout the country ([www.habitat.org/cd/env/restore.aspx](http://www.habitat.org/cd/env/restore.aspx)). Hfh Re-Stores are retail outlets where used and surplus building materials are sold. Proceeds from ReStores help fund the construction of Habitat houses.
- The Construction Materials Recycling Association's (CMRA) Web site** ([www.cdrecycling.org](http://www.cdrecycling.org)), under the Find a Recycler section, provides a list of member C&D materials recyclers. CMRA is a 501(c)(3) organization that promotes the recycling of C&D materials.
- The National Demolition Association's (NDA) Web site** lists buyers of various C&D materials ([www.demolitionassociation.com/find\\_a\\_product.php](http://www.demolitionassociation.com/find_a_product.php)). The NDA is a non-profit trade organization representing more than 1,000 U.S. and Canadian companies.
- The Steel Recycling Institute (SRI)** promotes and sustains the recycling of all steel products and can help find locations for recycling steel ([www.recycle-steel.org](http://www.recycle-steel.org)).

Once local reuse and recycling operations have been identified, contact the facilities to determine which materials they accept and whether they require them to be separated (separation at the jobsite can increase the value of C&D materials, though some recyclers do accept mixed loads of materials if separation at the jobsite is not feasible). If the recycler requires materials to be separated, this will need to be factored into C&D materials management plans (also known as construction waste management plans). Incorporating reuse and recycling into C&D >>>

> > > materials management plans prior to construction will make reuse or recycling programs more successful.

## Including C&D Materials Reduction, Recycling, and Reuse Requirements in Design Specifications and Plans

Agencies can include reduction, recycling, and reuse requirements in design specifications, solicitations for offers, and C&D materials management plans. Reducing the amount of C&D materials generated should always be a priority. Agencies can reduce the amount of C&D materials generated from their projects by ensuring the design of the building considers reduction, reuse, and recycling in the construction phase as well as in future renovation and demolition phases of the building. Agencies can ensure facilities are designed to minimize cut-offs of excess materials and optimize purchasing to prevent excess materials from arriving at the job site. To further minimize waste generation, agencies can select durable materials that do not have to be replaced frequently, such as environmentally-preferable products containing recycled content, and purchase materials that contain the least amount of packaging as possible.

Federal agencies should include specific language addressing waste reduction, reuse, and recycling in solicitations for offers (SFO). For example, in the SFO for the new construction of EPA Region 8 headquarters, EPA Region 8 and the General Services Administration included language addressing C&D materials management and recycled content product requirements. Their SFO is a useful model for other federal agencies looking to construct a green building and may be found at:

[www.epa.gov/greeningepa/documents/denver\\_sfo\\_environ\\_508.pdf](http://www.epa.gov/greeningepa/documents/denver_sfo_environ_508.pdf).

C&D materials management plans should be developed in the project's planning stage to ensure optimal recycling rates. These plans should include recycling or reuse goals, an analysis of the project waste, collection methods, and instructions for the crew and subcontractors. Plans should also consider onsite separation of C&D materials, particularly since some recyclers require materials to be separated prior to delivery. Separating the materials onsite may result in decreased waste management fees as well. Clear signage should be located throughout the jobsite to ensure successful separation of the C&D materials.

C&D materials management plans should also consider how C&D materials can be recycled onsite into the facility design. For example, concrete can be ground and used as fill, and clean wood, drywall, and cardboard can be ground and used onsite as a soil amendment. Many recyclers and equipment manufacturers can accommodate onsite recycling, but be sure to contact local and state waste regulators to learn which materials are permissible to recycle.

The following resources for model design specifications and sample language for C&D materials management plans are available online:

- ***The Federal Green Construction Guide for Specifiers*** is a comprehensive guide for procuring green building products and construction services. It contains a section on C&D materials management that provides sample specification language that can be inserted into project specifications as appropriate to your agency's goals. Certain provisions, where indicated, are required for U.S. federal agency projects: [www.wbdg.org/design/greenspec\\_msl.php?s=017419](http://www.wbdg.org/design/greenspec_msl.php?s=017419).

- **King County's Solid Waste Division in Seattle, WA** developed a Green Tools Program that provides model design specifications and sample language for C&D materials management plans. These samples may be found at: [www.metrokc.gov/dnrrp/swd/greenbuilding/construction-recycling/index.asp](http://www.metrokc.gov/dnrrp/swd/greenbuilding/construction-recycling/index.asp).
- You can also check out **WasteCap Wisconsin, Inc.'s** C&D specifications at [www.wastecapwi.org/canddguidelines.htm](http://www.wastecapwi.org/canddguidelines.htm) and California Integrated Waste Management Board C&D Recycling Specifications at: [www.ciwmb.ca.gov/ConDemo/Specs](http://www.ciwmb.ca.gov/ConDemo/Specs)

## Key Points

With the proper amount of upfront planning, federal construction and renovation project managers can easily achieve C&D materials diversion. Federal agencies are poised to help meet the material needs of the nation's construction industry by ensuring C&D materials are salvaged or recycled from the construction or major renovation of agency facilities. Agencies can play a critical role in saving energy and reducing greenhouse gas emissions from using fewer virgin materials.

Additional information can be found at the EPA's C&D Materials Web site ([www.epa.gov/cdmaterials](http://www.epa.gov/cdmaterials)) and the EPA's Industrial Materials Recycling Program homepage ([www.epa.gov/industrialmaterials](http://www.epa.gov/industrialmaterials)). ■

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# Recycling Information Resources

The following list identifies a variety of recycling information sources. It is not intended to be an exhaustive list.

## General Recycling Information and Sources

### Environmental Protection Agency

<http://epa.gov/epaoswer/non-hw/muncpl/recycle.htm>

Offers an overview of the recycling process, facts and figures, and opportunities to recycle in communities across the country.

### National Recycling Coalition

<http://www.nrc-recycle.org/consumers.aspx>

Identifies the public works departments that oversee recycling for each city, county, and state in the United States. This website also discusses the benefits of recycling and includes the “Conversionator,” a stimulated model that shows how different items are recycled.

### Earth 911

<http://earth911.org/recycling/>

Provides information about how to recycle, why to recycle, and what to recycle. There is a locator function that allows individuals to search for recycling locations based on zip code, city, or state.

### National Institutes of Health/Department of Health and Human Services (For Kids)

<http://kids.niehs.nih.gov/recycle.htm>

Geared toward educating children on recycling and recommending activities to encourage a sustainable environment.

### Container Recycling Institute

<http://www.container-recycling.org/links.htm>

Provides multiple links to websites that focus on specific items for recycling including electronics, light bulbs, batteries, hazardous waste, and mobile phones.

### Recycle Plus

<http://www.recycleplus.com/what-can-be-recycled.shtml>

Identifies what items are acceptable for recycling and the category that items fall in for recycling (i.e., Mixed Paper, Glass, Aluminum, etc).

### Recycler's World

<http://www.recycle.net/>

Provides multiple links to websites that focus on specific items for recycling.

### GrassRoots Recycling Network

<http://www.grrn.org/>

Offers information for children and information on a variety of campaigns to encourage recycling and sustainability.

## Paper

### Paper Recycling Coalition

<http://www.paperrecyclingcoalition.com/>

Provides information on recycled paperboard, why to recycle paper, actions the public can take with respect to paper recycling, and issues currently facing the paper recycling world.

### American Forest & Paper Association

[http://www.afandpa.org/Template.cfm?section=Environment\\_and\\_Recycling](http://www.afandpa.org/Template.cfm?section=Environment_and_Recycling)

Provides statistics regarding paper recycling in the U.S. and provides a guide for offices, schools and communities on how to establish a sustainable recycling program. A locator function allows individuals to search for recycling locations based on the state in which they are located.

### PaperRecycles.Org

<http://www.paperrecycles.org/>

Provides yearly statistics for different categories of paper recycling, benefits of paper recycling, and trends throughout the years.

### Newspaper Association of America

<http://www.naa.org/Resources/Articles/Public-Policy-Facts-About-Newspaper-Recycling/Public-Policy-Facts-About-Newspaper-Recycling.aspx>

Identifies newspaper recycling success stories and background information concerning newspaper recycling.

### Magazine Publishers of America

[http://www.magazine.org/government\\_action/environment/21345.cfm](http://www.magazine.org/government_action/environment/21345.cfm)

Encourages magazine recycling through the Please Recycle This Magazine campaign, which is designed to encourage and educate the public to recycle magazines. >>>

## Plastic and Glass

### Glass Packaging Institute

<http://www.gpi.org/recycling/>

Provides educational materials, a locator function, recycling news, and an explanation about the benefits of recycling glass.

### National Association for PET Container Resources (NAPCOR)

<http://www.napcor.com/index.html>

Provides facts and ways to recycle PET containers and answers common questions about recycling PET containers.

### Plastic Loose Fill Council

<http://www.loosefillpackaging.com/>

Provides information on recycling polystyrene, commonly known as “packing peanuts.” A locator function allows individuals to search for recycling locations based on zip code, city, or state.

## Steel

### Steel Recycling Institute

<http://www.recycle-steel.org/>

Educational material on the benefits of recycling steel and the infinite recycling cycle that steel offers. Provides a steel recycling locator based on zip code, city, or state.

## Construction and Demolition Debris

### Environmental Protection Agency

<http://www.epa.gov/epaoswer/non-hw/debris-new/index.htm>

Provides information on what construction and demolition materials can be recycled, how to recycle them, and where to recycle them

### Construction Materials Recycling Association

<http://www.cdrecycling.org/>

Educates individuals in the C&D community about how to recycle materials. Includes construction material recycling success stories.

### Asphalt Shingle Recycling

[http://shinglerecycling.org/index.php?option=com\\_content&task=view&id=54&Itemid=78](http://shinglerecycling.org/index.php?option=com_content&task=view&id=54&Itemid=78)

Provides information on how to recycle asphalt shingles, and the environmental regulations surrounding recycled shingles. This organization also hosts conventions for individuals in the construction and demolition field.

## Hard to Manage Materials

### Compact Fluorescent Light Bulbs (CFLs)

[http://www.energystar.gov/ia/partners/promotions/change\\_light/downloads/Fact\\_Sheet\\_Mercury.pdf](http://www.energystar.gov/ia/partners/promotions/change_light/downloads/Fact_Sheet_Mercury.pdf)

Provides information on why to use CFLs, how to recycle CFLs and how to clean up broken CFLs.

### Light Bulb Recycling

<http://www.epa.gov/bulbrecycling/>

A locator function allows individuals to search for CFL recycling locations based on zip code, city, or state.

### Rechargeable Battery Recycling Corporation

<http://www.rbrc.org/call2recycle/>

Provides information about how to recycle rechargeable batteries and old cell phones and recognizes retailers that partake in the Call2Recycle program.

### Rubber Manufacturers Association

[http://www.rma.org/scrap\\_tires/scrap\\_tires\\_and\\_the\\_environment/](http://www.rma.org/scrap_tires/scrap_tires_and_the_environment/)

Encourages the recycling of used tires and identifies the environmental costs and benefits of recycling rubber materials.

### American Petroleum Institute

<http://www.recycleoil.org/>

Provides information on how to recycle, where to recycle, the benefits of recycling and the process of recycling used oil.

### Electronics Recycling

<http://www.electronicrecycling.org/Pages/ContentPage.aspx?ContentCategoryId=533>

Identifies ways to recycle electronics, the process of recycling electronics, and upcoming events related to recycling electronics.

### Cell Phone Recycling

<http://www.collectivegood.com/>

Explains how to recycle cell phones and the benefits of recycling. ■

# Checking Out of the Hotel San Diego

The old Hotel San Diego was a designated city landmark in San Diego, so its destruction to make room for a new courthouse was inherently sensitive. Unfortunately for historic preservation groups who had fought the demolition in courts, the 92 year old hotel did not meet post-Oklahoma City security guidelines and failed government tests for earthquake safety. The U.S. General Services Administration (GSA), Pacific Rim Region, wanted to expand an existing courthouse in San Diego located directly across from the Hotel San Diego. When the Hotel was condemned, GSA saw its chance to redevelop a near-by site and purchased the property.

GSA mandated that the implosion and ensuing construction meet the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED™) criteria for green buildings. This combination of green criteria for both the destruction of the old building and creation of the new led to an extensive recycling operation, which would result in both environmental and economic benefits.

GSA awarded the demolition and construction to Clauss Construction and charged the company with diverting as much demolition debris as possible from landfill. Patrick Clauss, president of Clauss Construction, decided not to go with multiple groups of specialists, commonly utilized in such endeavors, but instead to stick with one team with multiple skills. Decades worth of experience taught him that this single team method was more efficient because it does not require intense coordination between groups, but allows one team to design and implement all parts of the process,

keeping the big-picture in mind throughout. This meant that all decisions about waste management and recycling of materials during the demolition were made by the same people who would be involved in the construction of the new courthouse, allowing the team to make resource efficient choices.

Working with the GSA, Clauss Construction created a Comprehensive Construction Waste Management Plan that required source separation of materials. The company believed this method was most efficient because it separates waste during the demolition process rather than after. Because he went with one crew, all were knowledgeable about the abatement process, thus reducing errors involving management of hazardous materials such as asbestos. Through this process, GSA encouraged diverting as much waste from the

landfill as possible, and the company delivered on this goal.

Clauss Construction diverted 15 tons of furniture; 55 tons of paper, electronics, wood, light bulbs, and ballasts; and 3,561 tons of terra-cotta tiles from landfill disposal. Dozens of artifacts were saved and donated to local organizations such as the Save Our Heritage Organization and the San Diego Historical Society. The company also diverted much of the actual structure of the building, including 100 percent of the 26,831 tons of crushed concrete which were reused directly into the base of the parking structure of the new courthouse, as well as salvaging 628.5 tons of asphalt, steel, and copper. All accounted for, Clauss Construction was able to salvage 90 percent of the demolition debris, exceeding the LEED goal by 15 percent.

The company also exceeded >>>



>>> goals financially. Its contract was \$3.1 million, nearly halving the GSA's projected costs of \$5.9 million. It is also estimated that avoided disposal fees and recycling receipts outweighed all additional costs resulting from the intensive Construction Waste Management plan

**U**nder LEED, a project can attain points based on the amount of materials that are diverted from landfills during demolition. A building is awarded one point for diverting 50 percent of construction debris from a landfill and two points for diverting 75 percent of debris from landfills. This makes a good Construction Waste Management plan, including methods to recycle the demolition debris, vital for a contractor or agency seeking LEED certification for a project. ■



and recycling procedures. By diverting 31,090 tons of waste from landfill, at \$105 per ton in San Diego, the government saved \$3,264,450. This project was recognized by the GSA with the 2007 Reclaim to Fame Award for New Construction.

By utilizing a single team throughout the process, Clauss Construction was able to greatly improve upon the GSA's goals incorporating C&D recycling into sustainable design in buildings. The C&D recycling efforts undertaken in the demolition of the Hotel San Diego resulted in significant resource conservation during the construction of a 471,369 square foot San Diego courthouse meeting USGBC standards for green buildings. For further information, please contact Steve Clark of GSA at (415)522-3372, or by email at [steve.clark@gsa.gov](mailto:steve.clark@gsa.gov). ■

## Office of the Federal Environmental Executive

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*Footprint graphic created by, and several articles written by, Eric O'Shaughnessy.*

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