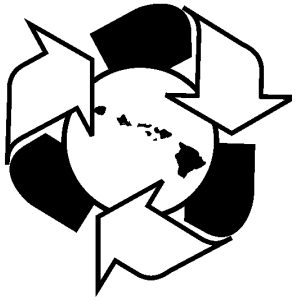
# A Contractor's Waste Management Guide

## Best Management Practices and Tools for Job Site Recycling and Waste Reduction in Hawaii



Prepared by O'Brien & Company

for

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**Program Administrator**: Energy, Resource and Technology Division, DBEDT

**Prepared by**: Kathleen O'Brien, O'Brien & Company, LLC, Bainbridge Island, Washington

**Industry Consultants**: Don Ainsworth, Maui Community College
Doyle Betsill, Betsill Brothers Construction, Inc., Maui
Bill Chase, On Center Construction, Kauai
Alan Ewell, Integrated Architecture, Oahu
John Harder, DOH, Office of Solid Waste Management
Randy Lau, Designer Built Systems, Inc., Oahu
Mike Leary, Island Demo
Virginia MacDonald, AIA, Hawaii
Steve Meder, UH School of Architecture, Environmental Building Coalition of Hawaii, Oahu
Colleen Romano, AIA, Kauai
James Severson, Jr., AIA, Oahu
Gail Suzuki-Jones, Clean Hawaii Center, DBEDT; Green House Hawaii, Oahu
Anthony D. Vidana, Vidana Construction/Big Island Building Education Center, Hawaii
Tim Waite, T.J. Waite & Associates; Building Industry Association; Steel Alliance, Oahu

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# Introduction

When we build, we do well when we are guided by the State motto:

**"UA MAU KE EA O KA AINA I KA PONO"**

(The life of the land is perpetuated in righteousness.)

*A Contractor's Waste Management Guide* provides practical methods contractors can use to practice responsible construction waste management in Hawaii. It contains checklists, tips, and tools for use in residential, commercial, and remodeling projects. While its primary focus is on job site construction practices, the *Guide* identifies opportunities to reduce waste through design, such as through material selection and specification. In particular the *Guide* provides specific ways to help you:

- Reduce the amount of construction waste generated.
- Divert waste from disposal
- Use recycled-content or salvaged building materials
- Use least-toxic buiding materials (to minimize hazardous waste)

The primary goal of the practices in this *Guide* is to protect against environmental degradation by reducing the amount of C&D waste disposed in Hawaii. However, many of the practices recommended in this *Guide* have the added benefit of saving you or your client money. Incorporating material efficiencies in design and operation can reduce the overall cost of materials. Job site recycling or reuse can save on disposal fees. In addition, waste reduction techniques can protect you from long term liability or other long-term costs.

## Building With Vision

Worldwide, buildings are responsible for 12 percent of freshwater withdrawals, 25 percent of wood harvest, and 40 percent of material and energy flows. In Hawaii, we can help protect the water we drink, the air we breathe, and the natural beauty of our islands by using resource-efficient construction methods, including job site waste reduction and recycling.

In particular, responsible construction waste management can more effectively utilize limited resources, help preserve a unique and fragile environment, and help protect a tourist economy that thrives on an aesthetically pleasing built and natural environment. By reducing the amount of construction and demolition C&D waste disposed in Hawaii, we work together to foster a sustainable environment and economy.

This *Guide* is a part of Clean Hawaii Center's efforts, in partnership with the construction industry, to promote resource-efficient construction. It focuses on one facet of resource-efficient construction. For more information about how to build with the environment in mind, we refer you to the *Guide to Resource-Efficient Building in Hawaii*, a publication of the Hawaii Advanced Building Technologies (HABiT) program.

## Not Just for Contractors

Although this *Guide* is primarily for use by contractors, it is also useful for:

- Design Professionals—As a design professional, you play a key role in waste management. The *Guide* will help further your overall understanding of job site production processes, and Appendix G will provide guidance in using design specifications to reduce construction waste.

- Solid Waste Planners—As a solid waste planner, you will find this document useful to increase your understanding of current practices and as a tool in shaping future policies and programs.

## How to Use The Guide

This *Guide* is organized as follows:

***Fundamentals—***The *Introduction, Start With A Plan,* the *Strategies* and *Developing Your Own Specifications* sections of *Appendix G, Appendix H (Resource List),* and the *Glossary* cover the basics. You may want to take a look at these before you get into the "tools" provided in the guide, which include:

***Checklists—***The checklists provide specific actions for putting waste management practices in place. The body of the *Guide* provides three checklists for use by contractors in the field—one each for general practices, solid waste management, and hazardous waste management. Other checklists include *Appendix E,* a contractor's checklist for job site training, and the *Specification Options* design checklist of *Appendix G.*

***Tips—***You'll find these quick "pointers" in bordered boxes in the margin of the *Guide*. They provide additional helpful information related to specific topics, such as how to estimate the amount of waste you will generate for a project and how to make recycling convenient and efficient.

***Case Studies—***These illustrate successes and lessons learned with several "real-life" job site recycling and waste reduction programs in Hawaii and on the mainland. You'll find them throughout the Guide, in shaded boxes at the bottom of the page.

***Forms—***These are forms you can use to carry out checklist items such as performing a pre-project walk-thru (*Appendix A*), developing a job site waste management plans (*Appendix B*), performing a waste audit (*Appendix C*), and assessing the effectiveness of your waste management program (*Appendix F*).

***Samples—***These provide ideas for job site signage you can use to inform your field personnel and to market your program.

# Start With A Plan

## The Job Site Action Plan

### Tips for a Cost-Effective Job-Site Action Plan

- Keep it simple.
- Target only high-potential materials for recycling and reuse.
- Collect and recycle a specific material when the volume justifies it. This may vary with different phases of construction.
- Specify methods for storing and collecting recycled materials. Methods should be as convenient as disposal, protect materials from damage, and require no additional expense (such as container rental) if avoidable. For example, you may want to stockpile cardboard in a garage, use a roped-off area for metal, and use containers for wood

The purpose of the Job Site Action Plan is to help you incorporate the Three "R's" of effective construction waste management:

- ***Reduce*** (or "source reduction") means to prevent waste before it happens. It is highest on the construction waste management hierarchy because it has the most positive environmental impact. Many design and job site practices can significantly reduce waste and cost of materials on a construction project while requiring only slight modifications of standard procedures. One example is the use of efficient framing techniques that can reduce up to 20 percent of your wood framing material costs. Effective source reduction begins during design.

- ***Reuse*** means to reuse materials as much as possible in your construction project. This includes materials removed during demolition, scrap generated on site, and used materials or scraps from other jobs.

- ***Recycling*** means to separate recyclable materials from non-recyclable materials and supply them to a hauler or business so they can be processed and used to make new products. Another aspect of recycling is to "Buy Recycled." Buying building materials with recycled-content helps develop a market for the waste materials you recycle from your job site and "closes the loop."

Appendix B provides sample Job Site Action Plans (one for larger jobs and one for smaller jobs).

# General Practices Checklist

## Materials Selection & Purchase Options

### *Sourcing*

- ❑ Choose suppliers who use reusable, recyclable, or recycled-content packaging. Let your suppliers know what you are looking for.
- ❑ As much as possible, arrange for "just-in-time" deliveries

### *Selection*

- ❑ When possible, make sure recycled-content or resource-efficient building and landscaping materials are specified and installed.
- ❑ Substitute recycled-content or resource-efficient building and landscaping products as equivalents when cost-effective. See Appendix H for resources providing specific information on recycled-content materials available.
- ❑ Install recycled or reused materials and equipment.
- ❑ Select low-toxic alternatives to conventional materials whenever possible. Examples include organic fertilizers, low-toxic solvents, paints, sealants, and wood preservatives, rot-resistant woods, and pest- and water-proof plastic lumber. Other examples include formaldehyde-free sheathing, fiberglass, and low-mercury lighting fixtures.

### A Tip on High Potential Recyclables

Demolition and re-modeling activities generate many materials that have high recycling potential. These materials include:

- χ Concrete
- χ Asphalt
- χ Concrete/asphalt rubble
- χ Drywall
- χ Metal (ferrous and non-ferrous)
- χ Wood
- χ Building components and specialty items
- χ Other (See Appendix A)

## Waste Reduction Options

### *Pre-Project Walk-Thru (Demolition and Remodels Only)*

- ❑ Prior to start of demolition or re-model, perform a walk-thru of the site with an experienced recycler/demolition or remodel contractor to identify high-potential recyclable materials. Appendix A provides a sample form to use for this walk-thru. (See "*Sourcing*" below for information on recyclers.)
- ❑ Use results of the walk-thru to develop your waste management plan. (Appendix B)

### *Signage*

- ❑ Clearly mark material storage areas and post storage recommendations.
- ❑ Clearly mark areas for cutting, recycling and other waste management operations. See Appendix D for sample signage.
- ❑ Post the job site waste reduction plan (with waste reduction goals) in material storage area and other central locations, such as the job site trailer. Provide specific examples of ways to reduce or reuse waste materials generated on the job.

### *Training*

- ❑ Use a meeting to inform on-site contractors, subcontractors, and laborers about the important of waste reduction (including reuse) and techniques that reduce waste. This meeting can be combined with other training meetings on recycling and site protection. Be sure to ask for ideas from participants. See Appendix E for a suggested checklist to use during the meeting.
- ❑ Provide positive incentives to crews to encourage waste reduction. Incentives. (For example: hats, T-shirts, pizza)
- ❑ Direct crews to make use of scraps and use less materials overall.

**Good waste management goes hand in hand with an effective safety program.**

With slight modifications, a clean, safe site can become a "waste-busting" site. The effective use of signage, education at weekly meetings, and incentives is a common thread throughout this *Guide* and is based on the safety program model.

### *Storage*

- ❑ Store materials in a dry, protected place.
- ❑ Use manufacturers' recommendations for storage.

### *Operations*

- ❑ Set up specific areas for cutting, recycling, and other waste management operations.
- ❑ Estimate as accurately as possible. Suppliers can often provide tips on estimating specific materials to help you avoid over-ordering.
- ❑ Prepare and use detailed take-offs and provide as a reference for crews.

#### A Tip on Incentives

Train forklift operators to help educate people in the proper way to handle recyclable materials.

Require people who mis-sort or mishandle recyclable materials to resort the materials themselves.

Charge a fee to individuals who continually contaminate loads.

## A Case Study: The Kauai Resource Exchange & BuyBack Center

The Kauai Resource Exchange and BuyBack Center diverts used consumer goods from Kauai's public landfills and gives them new life through reconditioning, repair, and recycling. The Center itself was constructed as a waste management project. The complex was constructed with a combination of locally recycled materials, locally manufactured materials, and conventional building materials. Examples of this blending of "green" and conventional materials include:

- χ Retaining wall constructed from used tires, stacked and backfilled with crushed glass. (Over 1000 tires were used, saving the County an estimated $5000 in transport and disposal costs.)
- χ Ground cover made from crushed glass in lieu of gravel.
- χ Exterior walls of concrete masonry units manufactured on Kauai using local materials.
- χ Roof framing system made from galvanized steel made from recycled scrap.

(Contact: William Bess, AIA, Architects Kauai, phone 838-2880.)

- ❑ Use quality tools and clean thoroughly between uses.
- ❑ Reuse materials whenever possible.
- ❑ Donate or sell reusable materials from your job.
- ❑ Use reusable form-work, such as steel and aluminum forms.
- ❑ Balance cut and fill.
- ❑ Reuse excavated soils and vegetation and grind landclearing wood and stumps for reuse on-site as fill or mulch.
- ❑ Preserve existing native vegetation and reuse as landscaping.
- ❑ Donate unused existing vegetation for use as landscaping.
- ❑ Use transplanted native vegetation if available.
- ❑ If you must use hazardous products, keep their wastes separate from C&D waste, and dispose of them properly.

### A Tip on Residential Waste Generation Rates

Use the following ballpark figures to get a sense of how much construction waste may be generated on your jobs:

| **Material** | **Lbs./sq.ft.** |
|---|---|
| Wood* | 1.3-2.1 |
| Drywall | 1.0-1.2 |
| Cardboard** | 0.1-0.5 |
| Metals | 0.02-0.13 |
| Other waste (plastic, shingles, etc.) | 0.5-1.3 |
| **Total** | **3.0-5.2** |

*Range for wood waste depends on material used for wall sheathing, siding, trim, and roofing

**Range for cardboard depends on type of siding and whether windows, doors, and cabinetry are locally manufactured.

Source—*Residential Construction Waste Management, A Builder's Field Guide*

## Job Site Recycling Options

### *Signage*

- ❑ Post waste reduction goals in material storage areas and other central locations, such as the job site trailer. Provide specific examples of significant ways to reduce or reuse waste materials generated on-site.
- ❑ Prominently display your progress in meeting recycling goals, both for both public visibility and to keep site crews updated. See Appendix D for sample signage.

### *Training*

- ❑ For demolition only—Conduct a pre-demolition briefing to inform demolition contractors of salvage/recycling goals identified by the pre-project walk-thru. Emphasize the importance of sorting and avoiding mixing of demolition waste.
- ❑ Use a meeting to inform on-site contractors, subcontractors, and laborers about the importance of recycling, the types of materials that can be recycled, potentially hazardous materials, and any restrictions. This meeting can be combined with other training meetings on waste reduction and site protection. Be sure to ask for ideas from participants. See Appendix E for a suggested checklist to use during the meeting.
- ❑ Provide positive incentives to crews to encourage recycling. (For example: hats, T-shirts, pizza)

### A Tip on Volume to Weight Conversions

**Material**
**Conversion Rate**

Wood
300 lbs./cu.yd.
5.7 cu.yd./ton

Cardboard (loose)
30-100 lbs./cu.yd.
20-50 cu.yd./ton

Drywall
400 lbs./cu.yd.
5 cu.yd./ton

Mixed waste
350 lbs./cu.yd.
5.7 cu.yd./ton

Source—*Residential Construction Waste Management, A Builder's Field Guide*

### *Sourcing*

- ❑ Refer to *Minimizing Construction & Demolition Waste* (available from the Department of Business, Economic Development, and Tourism, Clean Hawaii Center, phone 587-3802, to identify recycling services on Oahu. For facilities on neighboring islands, see Appendix H.

## Cleanup & Disposal Options

### *Sourcing*

- ❑ Reduce your liability by using only responsible haulers who deliver the materials generated at your site to properly permitted facilities. Verify this by requiring receipts.

### *Site Maintenance & Cleanup*

- ❑ Regularly clean around storage and recycling bins.
- ❑ Manage bins to minimize leakage or spillage.
- ❑ Use only storage bins that are watertight, rodent-proof, and easily cleaned.
- ❑ Do not burn, bury or otherwise dispose of rubbish and waste materials on project site.
- ❑ Ensure *all* wastes are removed from the site upon completion of the project.
- ❑ Restrict the use of water for cleanup where sweeping is sufficient.
- ❑ Properly dispose of treated wood waste through a certified landfill or municipal solid waste incinerator. Do not burn scraps of treated wood on-site or as kindling in a wood stove or fireplace.

### A Case Study: The Liholani Golf Village Job Site-Recycling Program

The Liholani Golf Village development in Pukalani, Maui comprises 26 housing units on a condominiumized property of 3.5 acres. A project of the Smith Development Company and Dilloway Construction Company, construction began in early September 1998. At the time of this writing, the Maui Recycling Group is midway through a pilot program to investigate the feasibility of on-site, source-separation recycling for residential construction sites.

Preliminary data indicate that the project is exceeding its goals—approximately 25 percent of the total weight of waste generated is being diverted, and actual hauling costs are well under budget. The project is also experiencing unanticipated efficiencies in construction process, attributed to the convenient placement of the recycling tipsters.

Based on projected totals, savings for tipping costs for drywall alone (at $37.00 per ton) are $1,110. This is approximately equivalent to the original bid for recycling services. This savings alone offsets the cost of recycling. (Contact: Jeff Stark, Maui Recycling Group, phone 579-9109.)

# Solid Waste Management Checklist

## Materials Selection & Purchase Options

### Tips to Reduce

- χ **Avoid damage**. Train crews to handle and store materials properly.
- χ **Avoid contamination**. Train site crews to separate materials properly and avoid mixing recyclable and non-recyclable materials.
- χ **Use materials efficiently.** Encourage site crews to make use of scraps and use less materials overall.
- χ **Estimate as accurately as possible.** The more accurate, the less waste. Suppliers can often provide tips on estimating specific materials.
- χ **Purchase precut and prefab components.**
- χ **Choose strong materials and exploit structural advantages.**
- χ **Purchase high-grade materials.** These will get more use and generate less waste.
- χ **Reduce packaging waste.** Use suppliers who take back packaging.
- χ **Coordinate just in time deliveries.**

Source—The *Recycling Plus* Program manual.

*Selection*

- ❑ Consider used building materials. Most used building materials can be installed provided they do not act as structural components or otherwise compromise safety. Materials purchased at salvage yards usually cost only 10 percent to 50 percent of the cost of new materials. For best results, the use of salvaged materials should be incorporated during design.
- ❑ If you are involved in building design, use standard dimensions to reduce wasted lumber, drywall, and other materials.
- ❑ Use recycled concrete as aggregate for fill or to make new concrete.
- ❑ Use recycled aggregate containing crushed brick, concrete block, or glass cullet.
- ❑ Use compost and mulch in landscaping.
- ❑ Use crushed/ground gypboard as a soil amendment.
- ❑ Use cold-formed steel framing. Select steel framing with a minimum of 25 percent recycled-content. (Caution: Use galvanized steel and assemble with good quality connectors to prevent corrosion.)
- ❑ Use engineered lumber products.
- ❑ Use concrete in the foundation with flyash content up to 30 percent.
- ❑ Use lightweight concrete in the foundation made with pumice and perlite from expanded volcanic materials.
- ❑ Use insulation with recycled-content. Examples include cellulose, fiberglass, expanded polystyrene (EPS or rigid foam), and mineral wool.
- ❑ Install materials that can be recycled, such as low-mercury lighting fixtures.
- ❑ Use locally-produced, recycled-content finishes, where available. Examples include cabinet pulls, glass blocks, and tiles manufactured from recycled glass.
- ❑ Use durable finishes.
- ❑ Use recycled gypsum board.
- ❑ Use plastic lumber for exterior applications such as fences, benches, decking, docks, retaining walls, picnic tables, and landscape borders.
- ❑ Use counter tops and cabinets constructed from recycled material.
- ❑ Use recycled-content or recyclable carpet and carpet pads.
- ❑ Use recycled-content ceramic tile.
- ❑ Use recycled-content ceiling tiles.

### *Sourcing*

- ❑ Use suppliers who use less packaging, such as cardboard, plastic shrink wrap, Kraft paper, wood pallets or frames, and metal bands.
- ❑ Use suppliers who take their packaging back after delivery.
- ❑ If the building design calls for a non-standard dimensions (try to avoid), and you have sufficient dry storage, order in bulk from a supplier who will produce the dimension for you.

## Waste Reduction

### *Training and Enforcement*

- ❑ Require or encourage solid waste reduction in subcontractor agreements.
- ❑ Provide reminders at safety or other regular meetings of the project's waste reduction goals. Use these meetings to report progress, discuss problems, and discuss specific actions that can be taken. See Appendix E for a suggested checklist to use during the meeting.

### *Operations*

- ❑ Set up a central area for cutting and storage of scraps for reuse. Studies of construction sites with a centralized cutting area show total waste from the sites were reduced by as much as 15 percent.
- ❑ Avoid throw-away equipment. Clean and maintain properly to get the full life out of the equipment. Examples of reusable equipment include construction fences, tarps, and refillable propane tanks.
- ❑ Set up labeled bins for different sized nails, screws, and other fasteners to reduce wasted hardware. Provide weather protection for bins.
- ❑ Maintain a dedicated area for recycling metals, cardboard, drywall, wood, and other recyclable waste.
- ❑ Sell or give away any untreated wood scraps.
- ❑ Divert other untreated wood scrap to a composting facility.
- ❑ Keep treated wood scraps separate from other C&D waste.
- ❑ Save larger treated wood scraps and re-use on a future project. Be sure to protect from the weather.
- ❑ Create a board-by-board take-off from your order list and provide as cut list to framer.
- ❑ Reuse materials used to build temporary structures. To make reuse easier, use assembly methods that make dismantling convenient (for example, fasten with screws instead of nails).
- ❑ Reuse small or warped pieces of dimensional lumber as blocking, bracing, shims, back framing, or form stakes. (Store in a central cutting and storage area.)

#### Tips to Reuse

- χ Use salvaged materials from other jobs.
- χ Reuse job-site materials such as concrete forms and site fencing.
- χ For temporary construction, use methods that allow for reuse, such as screws rather than nails.
- χ Reuse scrap on site.
- χ In demolition and renovation jobs, plan to salvage. Donate or sell salvaged materials.
- χ Allow for local scavenging, if it is not a site safety issue.

Source—The *Recycling Plus* Program manual.

- ❑ Donate or sell reusable items from your job. Contact HIMEX (Hawaii Materials Exchange, phone 808-586-4240 or web site www.himex.org) or other non-profit organizations regarding donated materials.
- ❑ Move materials leftover from job to job.

### *Application—Termite Control*

Termite control is an issue key to waste reduction because termites represent a significant threat to the integrity of the building structure. Repairs are not only expensive, but often generate large amounts of waste that cannot be recycled or reused. Methods of termite control include ground treatment, both chemical and non-chemical, wood treatment, preventive design and construction strategies, and regular maintenance measures. Here are some specific, environmentally-preferred actions for termite-prevention:

- ❑ Thoroughly remove all roots when clearing vegetation.
- ❑ Inspect lot for termites when clear.
- ❑ Keep the site and work area clear of all organic debris, wood scraps, cardboard, and paper.
- ❑ Frequently inspect site for signs of termite activity.
- ❑ Use materials that are impervious or unattractive to termites such as concrete, masonry, steel, and plastic lumber. (Caution: When using steel, use galvanized steel and assemble with good quality connectors to prevent corrosion.)
- ❑ If wood is used, use only wood with adequate chemical treatment. Use the least toxic method suitable for the application. (If possible, use borate-treated or other non-toxic treated lumber, which has higher recycling potential.)
- ❑ Keep drainage flow routed away from building by using appropriate grading and root and site drainage systems. Use french drains or mini-dry wells when appropriate.
- ❑ Provide easy access for termite inspection by the owner.
- ❑ Install a 4-inch basalt termite barrier (BTB) around, and in some cases, below footings and beneath all slab on grade construction.
- ❑ Protect the BTB protective layer during construction. Dirt and wood dust can mix with the basalt and diminish its effectiveness as a termite barrier.
- ❑ Install a non-chemical termite control system. An example uses marine grade stainless steel screen as a physical termite barrier around the building perimeter.
- ❑ Use concrete in place of wood or concrete masonry units (CMUs) for building foundations.
- ❑ Fill all cracks in concrete foundations that are larger than 1/32-inch in foundations to eliminate avenues for termites.
- ❑ If CMUs are used, fill shrinkage cracks in the grout to eliminate termite entry points, especially around slab pipe penetrations. If

unsealed, these points provide termites with entry opportunities.

- ❑ Use copper or galvanized metal termite pans to separate foundations from wooden structures.
- ❑ Treat field cuts and drill holes with a brush-on wood treatment such as copper naphthenate. (CCA treated wood only.)
- ❑ Keep plantings at least 24 inches from the building perimeter.

### *Application—Advanced Framing*

- ❑ Use wood-saving advanced framing techniques, including one or more of the following:
  - ♦ Drywall stops or clips for backing eliminate the need for extra studs, for example, where one wall abuts another, or where two walls intersect at corners. A box of clips cost about $160 and supplies three average homes.
  - ♦ Two-stud corners. With two-stud corners, drywall clips spaced two feet apart can provide back-up for interior finish materials.
  - ♦ Insulated headers. Insulated headers reduce thermal transfer (bridging) found in standard construction using solid wood headers for exterior window and door openings.
  - ♦ 24-inch on-center framing. (Because there's more room for insulation, your customer will also benefit from greater energy-efficiency.) Refer to the Uniform Building Code for stud sizing requirements. When using this method, apply plywood on a horizontal axis (making the system similar to roof assembly) to eliminate "wavy" walls. This has been shown to provide structural integrity while reducing wood use by 15 percent.

(For more information on advanced framing, see *Advanced Framing: Techniques, Troubleshooting and Structural Design*, Journal of Light Construction, Richmond, VT: Phone 1-800-375-5981.)

## A Case Study: The Moanalua Terrace Demolition Project

On a recent military housing upgrade project, Transcend, Inc., subcontractor to Harper Construction, removed 516 homes, complete with concrete slabs, floors, roofs, masonry block walls, and existing trees and vegetation. The $90 million demolition took approximately six months to complete. Nearly 80,000 tons of material was diverted, saving approximately $800,000 in landfill fees. The material recycled comprised:

- χ 45,000 tons of concrete, crusted on site and used as aggregate for utilities
- χ 2,700 tons of scrap iron, rebar, and 300 tons of non-ferrous copper aluminum
- χ 3,500 tons of trees and vegetation, ground and converted into fuel
- χ 7,500 tons of cold plain and A/C for use as road base
- χ 20,000 tons of fill material used to grade and improve agricultural land.

Also salvaged were electrical switches, panels, and breakers (shipped to Los Angeles, CA), power poles, doors, and water heaters.

The new design housing features termite-resistant steel construction using waste-saving, prefabricated walls. (Contact: Jeff Harper, Harper Construction Company, phone 422-1931.)

# Job Site Recycling Options

**In Hawaii , you can recycle concrete, asphalt, wood (clean lumber and green waste), cardboard, and metals.**

Some companies, such as scrap metal dealers, will pay for recyclable material. Others charge fees to accept or pick up recyclables, but still generally less than fees for landfill disposal. Be aware that recyclers have specifications for the types and grades of materials they accept. To avoid wasted effort, call first to find about their requirements. See the directory in *Minimizing Construction & Demolition Waste* for a list of haulers and recycling businesses.

## Tips on Recycling

- Look for a member of your staff/crew who has high interest in recycling. Most recycling plans succeed if someone in the company takes responsibility for the program.
- Work through your trade association. A job-site recycling committee can provide the forum for information/options you might otherwise miss.
- You may feel that any cost savings recycling tipping will not cover the extra time required for separation. Keep in mind that extra time spent on recycling normally decreases as the crews and subcontractors get used to a new system of waste management.
- Avoiding contamination is the key to successful recycling. Be sure that your idea of a "clean" load is the same as your recyclers'.

Source—The *Recycling Plus* Program manual.

### *Planning*

- ❑ Identify materials that can be recycled cost-effectively in your area, and target them in your plan.
- ❑ Prepare a job site recycling plan and post it on-site.
- ❑ Set a measurable goal for recycling. For example, "We will attempt to recycle 50 percent of the waste generated on this job."

### *Signage*

- ❑ Clearly mark recycling areas and containers (interior and exterior) to prevent contamination. Make sure the signage provides information on what is acceptable. (For example, "No, wood with paint," "Yes, wood with nails.") See Appendix D for sample signage.

### *Training and Enforcement*

- ❑ Include a requirement to recycle as much as possible in all subcontractor agreements. Identify target materials, those that are cost-effectively recycled in the project area.
- ❑ Inform new personnel where the recycling containers are located and which materials are recyclable.
- ❑ Periodically check recycling and garbage bins for mis-sorted materials. Provide training to people who are mis-sorting recyclable materials or ask your superintendent or safety manager to inform them.
- ❑ Provide reminders at safety or other regular meetings of the project's waste reduction goals. Use these meetings to review where, when, and how materials will be source separated and collected, report progress, discuss problems, and discuss specific actions to take. Also use these meetings to exchange ideas as to how to accomplish this with highest efficiency. See Appendix E for a suggested checklist to use during the meeting.
- ❑ Track and promote recycling results. See Appendix D for sample signage to use to advertise your success.

### Tips for Making Recycling Convenient and Efficient

- χ Provide clear, easy-to-read signs on bins. (Bilingual or pictorial, if appropriate)
- χ Provide signs for bins that are also sturdy and removable so that they can be quickly removed and re-attached as bins are changed out.
- χ Avoid contamination of recyclables by making sure there's a convenient trash receptacle near recycling bins.
- χ Avoid unnecessary pickups (and charges) by making sure containers are full and packed down before starting to use empty or half-full ones.

Source—The *Recycling Plus* Program manual.

### *Sourcing*

- ❑ Evaluate your options for transporting recycled materials to appropriate facilities. Local options are provided in the *Minimizing Construction & Demolition Waste* directory. Options include:
  - ♦ Garbage Hauler—Your hauler may provide bins and pick-up for certain materials.
  - ♦ In-House Recycling—You work with individual recyclers, arrange bins and pick-up and/or self-haul
  - ♦ Subs Recycling—Sub-contractors work with individual recycler, arrange bins, pick-up, or self-haul.
- ❑ Maintain regular contact with your haulers or recycling service providers to make sure you benefit from cost savings and buy-back opportunities.

### *Operations*

- ❑ Locate trash and recycling containers close to each other, making it convenient to recycle.
- ❑ Use your waste disposal bills and recycling receipts to determine your progress towards your recycling goals. Your hauler should be able to provide you with a summary of the results. Advertise your success!
- ❑ Divert untreated wood waste to a composting facility. On average, about 25 percent of discarded construction material is dimensional lumber and another 10 percent is waste from manufactured wood products.
- ❑ Keep treated wood scraps separate from other C&D waste.

## A Case Study: Using Waste Audits to Improve Your Recycling Program

Fletcher Wright Construction saved $70,000 through recycling and waste reduction during the construction of two new Microsoft Campus office buildings in Redmond, Washington. The general contractor used periodic waste audits to check and "tweak" recycling operations.

Using an audit form similar to Appendix C, project managers were able to identify problems, including instances where recyclables were being thrown in the dumpster instead of the recycling bin, and trash was thrown into the recycling bin. The project's safety manager conducted the audits on a weekly basis as part of his regular routine. The audit helped raise awareness and demonstrated that the general contractor was serious about recycling.

A more in-depth waste audit on one dumpster by an environmental building consultant hired for the project revealed that *nearly 70 percent* of its contents were recyclable! Slides of the materials, shown at a job site pizza meeting, motivated the crew to "do better." Later that week, the crew set up areas for metals and cardboard. The recycling contractor estimates that after this audit, recycling increased between 5 and 10 percent.

(Contact: Kathleen O'Brien, O'Brien & Company, phone 206-842-8995.)

### A Tip for Job Site Recycling

You will want to target only high potential materials in your Job Site Action Plan. These are the materials you generate the most volume of, that have the most market value (and as a result can be successfuly recycled in the job site area), and can be most easily source-separated.

- ❑ Save larger treated wood scraps and reuse on a future project. Be sure to protect from the weather.
- ❑ Properly dispose of treated wood waste through a certified landfill or municipal solid waste incinerator. Do not burn scraps of treated wood on-site or as kindling in a wood stove or fireplace.
- ❑ Recycle cardboard. Most volume occurs during the finish phase of the project, when electrical and mechanical fixtures are being installed. Depending on the market, cardboard can represent a buy-back opportunity.
- ❑ Recycle metal scraps. In addition to high-value copper, other metals are now being recycled, some representing buy-back opportunities. Separated metals have a higher value than mixed metals.
- ❑ Recycle drywall. Recycling fees for drywall are slightly less than disposal fees at local landfill facilities. Items that could be considered contaminants include paint, joint compound, screws, lath and plaster, or moisture. If your drywall subcontractor handles his or her own waste, work with the sub to develop a recycling program.
- ❑ Reuse site-generated concrete/asphalt rubble.
- ❑ Divert reusable waste materials, such as fixtures, to a salvage exchange facility, such as HIMEX (Hawaii Materials Exchange), phone 808-586-4240 or web site www.himex.org. The directory in *Minimizing Construction & Demolition Waste* also lists other agencies that accept donations of used building materials.

## Cleanup & Disposal Options

- ❑ See General Practices

### A Case Study: Island Demo, Inc., Honolulu's C&D Transfer Station

At the this time, Island Demo Inc. is Oahu's only City- and County-permitted C&D debris facility transfer station. Disposal of C&D at Island Demo undergoes 27 percent reduction by weight from low technology segregation and recycling methods, reducing the amount of material destined for the landfill. Materials recovered/diverted comprise:

- χ Cement aggregated (16%)
- χ Metal (7%)
- χ Miscellaneous hardware, fittings, fixtures (3%)
- χ Paper (1%)

(Contact: John Mike Leary, phone 839-5522,)

# Hazardous Waste Management Checklist

Contractors and subcontractors are responsible for knowing whether materials or items they use are hazardous and or may be considered hazardous waste when disposed. Common job site materials that can become hazardous waste include paints and other finishes, solvents, adhesives, and oils. Other hazardous waste items might include vehicle batteries and other petroleum products such as gasoline, diesel, or kerosene. Hazardous materials must be treated with special care to avoid contamination of other non-hazardous materials as well as the site itself.

**To determine if a material or item is potentially hazardous waste:**

- Check label and shipping papers.
- Look for words such as hazardous, danger, caustic or corrosive (dissolves skin, metal or other materials); flammable or ignitable (catches fire easily) carcinogenic (causes cancer); and toxic or poisonous (harms people and animals). A list of hazardous waste and criteria are found in Hawaii Administrative Rules (HAR) Title 11 Chapter 26.
- Check the material safety data sheet (MSDS) the manufacturer must prepare for the product. Ask your supplier for a copy.
- For questions and additional information including fact sheets and flyers, call the Hazardous Waste Program Office at 586-4225.

### A Tip on Generator Classifications

Most builders meet the State's definition of a Conditionally Exempt Small Quantity Generator (CESQG). A CESQG generates no more than 220 pounds of hazardous waste per month (about half of a 55-gallon drum) and never accumulates more than 2,200 pounds. CESQGs must send their waste to a site permitted to manage hazardous waste. There are fewer regulations and less paperwork required for CESQGs.

If you generate more than 220 pounds, you are classified as a Small or Large Quantity Generator (SQG or LQG) and must contract to have your hazardous waste sent to a site permitted to manage hazardous waste. There are more regulations that SQGs and LQGs must follow, including obtaining an EPA ID number and tracking of the waste from "cradle to grave."

## Material Selection and Purchase Options

### *Selection*

- ❑ Substitute less or non-toxic materials for toxic products when cost-effective. Examples include formaldehyde-free sheathing and fiberglass, and low-mercury fluorescent tubes, which are not classified as hazardous waste. Other examples are organic fertilizers, low-toxic wood preservatives, rot-resistant woods, and pest- and water-proof plastic lumber.
- ❑ Avoid toxic wood treatment with arsenic compounds such as CCA (copper chromium arsenic compound) and ACZA (ammoniac copper zinc arsenate). Select less toxic treatments such as borate (Hi-Bor) and ACQ (alkaline copper quartenary). These less toxic treatment may also render the products more recyclable.
- ❑ Use less pesticides and fertilizers and install a landscaping scheme that will require less of these polluting substances. A low-maintenance landscaping scheme uses less of these toxic substances *and* uses less water for maintenance.
- ❑ Use water-based instead of oil-based solvents, paints, and sealants.
- ❑ Purchase and use low-toxic or non-toxic cleaners for the job.
- ❑ Purchase and use less toxic form releasers.
- ❑ Avoid chlorinated solvents. Consider using citrus-based solvents.

### *Sourcing*

- ❑ Ask suppliers for MSDS as a routine part of purchasing materials that have been identified as potentially hazardous. Inform your suppliers that you prefer cost-effective least-toxic alternatives.

- ❑ Check with your local supplier for low or non-toxic alternatives.

**To determine your status as a regulated hazardous waste generator:**

- At the start of the project, work with your owner and any subcontractors to determine the types and amounts of hazardous waste likely to be generated during the project. Will any of the potentially responsible parties (owner, general contractor, sub-contractors) be a regulated generator (CESQG or SQG)?
- If so, determine who should accept the responsibility for the designation as the generator. This designee is often the person who pays for hauling—normally the general contractor. However, other factors such as the number and nature of other ongoing projects, may make indicate that designating the owner or a sub-contractor(s) is more prudent and cost-effective.
- Once the designation is agreed upon, the general contractor should contact both the MSW landfill and the C&D landfill to discuss the landfill's waste screening requirements. This will identify any additional requirements of the landfill that must be met.
- For assistance, contact the Hazardous Waste Program Office at 586-4225.

# Waste Reduction Options

### *Signage*

- ❑ Post signage to remind field personnel of the goal to reduce hazardous waste on the project. See Appendix D for sample signage.

### *Training*

- ❑ Provide reminders at safety or other regular meetings of the project's waste reduction goals. Use these meetings to report progress, discuss problems, and discuss specific actions. See Appendix E for a suggested checklist to use during the meeting.

**A Tip on Liability**

Builders can reduce their liability exposure by requiring their painting subcontractor to show proof of proper disposal or to switch to more benign paints, stains, caulks, and solvents.

### *Operations*

- ❑ Label hazardous waste containers properly to avoid mixing incompatible wastes or contaminating clean materials.
- ❑ Avoid overstocking hazardous materials.
- ❑ Adopt a "first-in, first-out" policy to prevent raw materials from becoming out-dated.
- ❑ Store wastes separately to avoid contamination.
- ❑ Reject vendor samples you don't need.
- ❑ Reuse spent solvent for cleaning.
- ❑ Donate extra paint to someone who can use it. List large quantities with the HIMEX (Hawaii Materials Exchange), phone 808-586-4240 or web site www.himex.org. The directory in *Minimizing Construction & Demolition Waste* also lists other agencies that accept donations of used building materials.
- ❑ Dispose of non-recyclable hazardous waste at legally permitted facilities.
- ❑ Require and retain receipts to document proper disposal/recycling of all hazardous materials.

### Tips for Reducing Hazardous Waste

- χ Use cleaners wisely—use heavy duty, more toxic) cleaners only for heavy duty jobs.
- χ Buy only the amount of product that you need. Use up the products or give leftovers to someone who will.
- χ Inspect containers upon receipt, and reject leaking or damaged containers.
- χ Adopt a "first-in, first-out" policy to prevent raw materials from becoming obsolete.
- χ Label hazardous waste containers properly to avoid mixing incompatible wastes or contaminating clean materials.
- χ Control access to storage areas and routinely inspect containers.
- χ Be prepared to respond promptly to spills
- χ Reuse solvents. Allow solids to settle, then pour off the clear top layer and reuse it. Solids can also be strained from spent solvents using many different types of paper or cloth filters. Note: The solids so removed (settled or strained) are often hazardous waste.
- χ Recycle all recyclable hazardous wastes, such as used motor oil.

# Job Site Recycling Options

### *Training*

- ❑ Provide reminders at safety or other regular meetings of the potential to recycle hazardous waste. Use these meetings to report progress, discuss problems, and suggest specific actions. See Appendix E for a suggested checklist to use during the meeting.

### *Operations*

- ❑ Recycle as much as possible. Consult the *Minimizing Construction & Demolition Waste* directory for businesses and facilities that accept hazardous waste for recycling.
- ❑ Recycle fluids, such as oil or antifreeze and vehicles removed from vehicles at approved facilities.
- ❑ Recycle solvents from paint gun washers.

# Cleanup and Disposal Options

### *Operations*

- ❑ Follow manufacturers' recommendations for the disposal of paints, stains, and other controlled materials.
- ❑ Dry latex paint in the can, and remove the lid before discarding in covered dumpsters.
- ❑ After reusing solvents, dispose of them as hazardous waste.
- ❑ Keep hazardous waste separate. Do not mix different wastes.
- ❑ Promptly dispose of hazardous items and waste materials not identified for recycling or reuse.

### *Sourcing*

- ❑ Dispose hazardous waste through a permitted facility (as required).

# Safety & Control

### *Storage*

- ❑ Control access to hazardous material storage areas, and routinely inspect containers for signs of deterioration. Store hazardous waste left on site in waste containers that are in good condition and suitable for the waste (as required by law).
- ❑ Clearly label hazardous waste containers.
- ❑ Store volatile liquids, including fuels and solvents, in closed containers.

### A Tip on Penalties for Improper Disposal

Contractors, beware of low disposal bids! Haulers who are convicted of improper disposal of solid waste face fines from the State of up to $1000 per day. If the waste included hazardous waste, the potential liability is even more severe and far-reaching.

Unpermitted landfills that accept hazardous waste for dumping are in violation of EPA hazardous waste regulations *and* solid waste regulations. These regulations encompass the "cradle-to-grave" process of the material, making the project owner and general contractor vulnerable to EPA liability actions, including fines exceeding $500,000 and costs for clean-up and remediation.

*Operations*

- ❑ Do not clean rollers and brushes in sinks, lawns, catch basins. Painting companies should comply with Department of Health regulations. See *Reducing & Managing Painting Contractor Wastes*. (See Appendix H).
- ❑ All vehicles and equipment used during construction should be fueled off-site or at a designated fueling pad. Any on-site fueling area must be constructed with proper containment and safety features.
- ❑ Properly maintain vehicles and equipment to reduce gaseous pollutant emissions and fluid leakage.
- ❑ Inspect containers upon delivery. Reject leaking or damaged containers.

# Appendix A—Pre-Project Walk-Thru (Demolitions and Re-Models)

Use this form to identify materials and estimated quantities for salvage and recycling for demolition and re-modeling projects.

| Material | Est. Qty. | S, R, D (Note 1) | Salvage/ Recycling or Disposal Co. | Est. Tons (Note 2) | Comments |
|---|---|---|---|---|---|
| Drywall | | | | | |
| Concrete | | | | | |
| Wood | | | | | |
| Ferrous Metal | | | | | |
| Non-ferrous Metal | | | | | |
| Glass | | | | | |
| Asphalt | | | | | |
| C/A Rubble | | | | | |
| Mixed loads (trash, plastic, packaging) | | | | | |
| Landclearing debris | | | | | |
| Cardboard | | | | | |
| **Building Components/Specialty Items (list):** | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Note 1—Indicate S (Salvage), R (Recycle), or D (Dispose)

Note 2—Average volume-to-weight conversions are:

| | |
|---|---|
| Mixed Waste | 5.7 yds/ton |
| Wood | 6.7 yds/ton |
| Cardboard | 20 yds/ton |
| Drywall | 4 yds/ton |
| Rubble | 1.4 yds/ton |

# Appendix B—Job Site Waste Management Action Plans

Includes:

1. Job Site Waste Management Action Plan for Large Jobs
2. Job Site Recycling Plan for Smaller Jobs

# Job-Site Waste Management Action Plan Form for Large Jobs

**Project Name:** _____ **City and County:** _____

**Recycling Site Coordinator:** _____ **Date:** _____

**REDUCE, REUSE AND BUY RECYCLED ACTION ITEMS**

1. _____
2. _____
3. _____
4. _____
5. _____

**RECYCLING GOAL - To recycle ____% of waste generated on the site.**

**RECYCLING SERVICE PROVIDERS AND TARGETED MATERIALS.**

**Action Items** ❑ Evaluate Cost and Services Offered ❑ Service Provider Agreements in Place

**Company #1** _____
_____
_____

| Materials | Peak Generation * | Mtls. Recipient ** |
|---|---|---|
| ❑ Wood | _____ | _____ |
| ❑ Metal | _____ | _____ |
| ❑ Cardboard | _____ | _____ |
| ❑ Drywall | _____ | _____ |
| ❑ _____ | _____ | _____ |
| ❑ _____ | _____ | _____ |

**Company #2** _____
_____
_____

| Materials | Peak Generation * | Mtls. Recipient ** |
|---|---|---|
| ❑ Wood | _____ | _____ |
| ❑ Metal | _____ | _____ |
| ❑ Cardboard | _____ | _____ |
| ❑ Drywall | _____ | _____ |
| ❑ _____ | _____ | _____ |
| ❑ _____ | _____ | _____ |

* Point in project (week, phase, dates) when most volume will be generated in material category.
** Only applicable if you are handling all recycling activities with in-house staff.

**RECYCLING OPERATIONS - Consult Planning Sections for more information.**

| Action *** | Who/What/When |
|---|---|
| ❑ Choose bins/collection methods | _____ |
| ❑ Order bins - oversee delivery | _____ |
| ❑ Site bins/collection sites for optimum convenience | _____ |
| ❑ Label/sign bins/collection sites | _____ |
| ❑ Sort or process wood | _____ |
| ❑ Sort or process metal | _____ |
| ❑ Sort or process drywall | _____ |
| ❑ Sort or process cardboard | _____ |
| ❑ Sort or process _____ (material) | _____ |
| ❑ Sort or process _____ (material) | _____ |
| ❑ Schedule material pickups/dropoffs | _____ |
| ❑ Document material pickups/dropoffs | _____ |

*** Depending on the service option you choose, action items may be the responsibility of your field personnel, your hauler, a full-service recycling contractor, or your subcontractors.

**COMMUNICATION ACTION ITEMS - Check only items you plan to use.**

| Action | Who/What/When | Completed |
|---|---|---|
| ❑ Complete Job Site Action Plan | _____ | ❑ |
| ❑ Hold Orientation/Kick-off Meeting | _____ | ❑ |
| ❑ Mention Program & Progress in Weekly Job Site Meetings | _____ | ❑ |
| ❑ Use Implementation Checklist | _____ | ❑ |
| ❑ Post Goals/Progress (Signage) | _____ | ❑ |
| ❑ Post Targeted Materials (Signage) | _____ | ❑ |
| ❑ Distribute Tip Sheets for Job Site Personnel | _____ | ❑ |
| ❑ Distribute Subcontractor Kit with Tip Sheets | _____ | ❑ |
| ❑ _____ | _____ | ❑ |

**MOTIVATION ACTION ITEMS - Check only items you plan to use.**

| Action | Who/What/When | Completed |
|---|---|---|
| ❑ Use Formal Agreements Committing Subs to Program | _____ | ❑ |
| ❑ Fork-Lift Operations Police Site | _____ | ❑ |
| ❑ Require Mis-Sorters to Re-Sort Bin | _____ | ❑ |
| ❑ Charge Individuals Contaminating Bins | _____ | ❑ |
| ❑ Provide Stickers, T-shirts, or Hats | _____ | ❑ |
| ❑ Public Recognition of Participating Subs | _____ | ❑ |
| ❑ Serve Refreshments at Meetings | _____ | ❑ |
| ❑ Award T-shirts (if not used as incentives) | _____ | ❑ |
| ❑ Letters of Recognition | _____ | ❑ |
| ❑ Awards Luncheon | _____ | ❑ |
| ❑ _____ | _____ | ❑ |

**EVALUATION ACTION ITEMS - Check only items you plan to use.**

| Action | Who/What/When | Completed |
|---|---|---|
| ❑ Perform Short Form Waste Audit ("Know What's in Your Dumpster", Appendix C) | _____ | ❑ |
| ❑ Perform Mid-Course Assessment | _____ | ❑ |
| ❑ Perform Monthly Cost and Materials Tracking | _____ | ❑ |
| ❑ Perform Final Evaluation | _____ | ❑ |
| ❑ _____ | _____ | ❑ |

**PROGRAM BENCHMARKS - 10 STEPS**

| Action | Who/What/When | Completed |
|---|---|---|
| ❑ Develop Job Site Action Plan | _____ | ❑ |
| ❑ Ensure Buy-In of Field Personnel and Subs | _____ | ❑ |
| ❑ Implement Your Plan On-Site | _____ | ❑ |
| ❑ Implement Communication Action Items | _____ | ❑ |
| ❑ Implement Motivational Action Items | _____ | ❑ |
| ❑ Evaluate/Track Progress | _____ | ❑ |
| ❑ Reward Successes | _____ | ❑ |
| ❑ Incorporate Improvements in Company Program | _____ | ❑ |
| ❑ Develop a Plan for Your Next Project | _____ | ❑ |

# Recyclable Materials

| What material will you target? | Condition of material* | How will it be handled on site? | Who will haul it? | Where will it be taken? |
|---|---|---|---|---|
| ❑ Wood | | | | |
| ❑ Cardboard | | | | |
| ❑ Ferrous metal | | | | |
| ❑ Non-ferrous metal | | | | |
| ❑ Drywall | | | | |
| ❑ Concrete / Asphalt Rubble | | | | |
| ❑ Other | | | | |

**Check with your recycler or hauler to see if any specifications or conditions exist regarding the material being recycled. Examples include size restrictions and non-acceptable materials (for example, treatments, finishes, or fasteners).*

## Action Items

- ❑ Complete this Job Site Recycling Plan and post on site.
- ❑ Commit subcontractors to recycle in Subcontractor Agreement.
- ❑ Keep subcontractors and workers aware and informed of Recycling Program.
- ❑ Require individuals to properly sort recyclables and hold them responsible for mis-sorted loads.
- ❑ Track and promote recycling results.

*Follow these procedures to maximize recycling at your job site.*

- ❑ Separate and recycle wood, cardboard, metal, drywall and other recyclable materials.
- ❑ Make sure both interior containers and exterior recycling dumpsters are convenient and clearly labeled.
- ❑ Train new personnel where the recycling containers are located and which materials are recyclable.
- ❑ Move trash and recycling containers close to each other, making it convenient to recycle.
- ❑ Store materials to prevent loss from damage.
- ❑ Check recycling and garbage bins daily for mis-sorted materials.
- ❑ Provide training to people who are mis-sorting recyclable materials or ask your superintendent or safety manager to inform them.
- ❑ Identify large quantities of waste that are not being recycled, and ask your superintendent if they can be recycled.

# Appendix C—Know What's in Your Dumpster

The most effective waste reduction programs will include some method of monitoring the program while the project is in progress. This appendix provides a waste audit form that you can use to get feedback about how well the program is working. It will help you know whether you are recycling all you can or whether appreciable amounts of recyclables are ending up in the dumpster.

# Know What's in Your Dumpster

Project Name _____ Date _____

On-Site Recycling Coordinator _____

Major Subcontractors On site: _____ _____

_____ _____ _____

_____ _____ _____

1. Indicate the volume of each garbage and recycling container on site and indicate the percent full in the following chart. Then indicate the three bins to be used for the audit.

| Container | Cubic Yds | Percent Full | Audit |
|---|---|---|---|
| Garbage Receptable # 1 | | | |
| Garbage Receptable # 2 | | | |
| Garbage Receptable # 3 | | | |
| Garbage Receptable # 4 | | | |
| Wood Recycling Container | | | |
| Metal Recycling Container | | | |
| Cardboard Recycling Container | | | |
| Other Recycling Container ( ) | | | |
| Other Recycling Container ( ) | | | |
| TOTAL WASTE (CY) | | | |

2. Estimate the percentage and amount of recyclables ending up in one garbage receptacle and the percentage and amount of mis-sorted materials in two recycling bins.

| Material Types | Garbage Receptacle | | Recycling Container | | Recycling Container | |
|---|---|---|---|---|---|---|
| | Show % &CY of recyclable materials | | Show % &CY of mis-sorted materials | | Show % &CY of mis-sorted materials | |
| | % of total | CY (approx) | % of total | CY (approx) | % of total | CY (approx) |
| Wood | | | | | | |
| OCC cardboard | | | | | | |
| Gypsum | | | | | | |
| Metal | | | | | | |
| Asphalt paving | | | | | | |
| Concrete (includes block) | | | | | | |
| Bricks | | | | | | |
| Composition shingles | | | | | | |
| Plastic (#1 and #2) | | | | | | |
| Other recyclable | | | | | | |
| Other recyclable | | | | | | |
| Garbage (waste not targeted) | | | | | | |
| Total | 100% | CY | 100% | CY | 100% | CY |

3. Mark the areas you feel need attention to help you meet the project's recycling goals.

- ❑ Lack of space to place containers
- ❑ Lack of close-by work containers
- ❑ Lack of toters to carry materials to bins
- ❑ Materials not recyclable
- ❑ Recycling bins are not available (list material types):
  _____
  _____
  _____
- ❑ Pick-ups not frequent enough
- ❑ Pick-ups too frequent
- ❑ Recycler not responsive
- ❑ Costs prohibitive:
  _____ Hauler
  _____ Labor
  _____ Space
  _____ Bin
- ❑ Job schedule is prohibitive
- ❑ In-house crew not knowledgeable
- ❑ In-house crew not responsive
- ❑ Subs not knowledgeable
- ❑ Subs not cooperative
- ❑ Other _____

4. Waste Reduction—Below is a list of actions you can take to prevent waste generation on site. Mark the practices currently being used with a (C) and those you plan to implement on this project with a (P).

_____ Use less material
_____ Prevent materials damage during handling
_____ Store materials properly
_____ Make use of scraps
_____ Avoid contaminating waste with toxic materials
_____ Plan to salvage
_____ Reuse salvaged materials
_____ Sell or donate salvaged materials
_____ Reduce packaging waste
_____ Order in bulk
_____ Coordinate just-in-time deliveries
_____ Use products with recycled-content
_____ Use accurate materials estimating procedures
_____ Use precut and prefab components
_____ Reduce toxic materials use
_____ Choose strong materials and exploit structural advantage
_____ Use high grade materials
_____ Other: _____

Other Comments:

_____

_____

_____

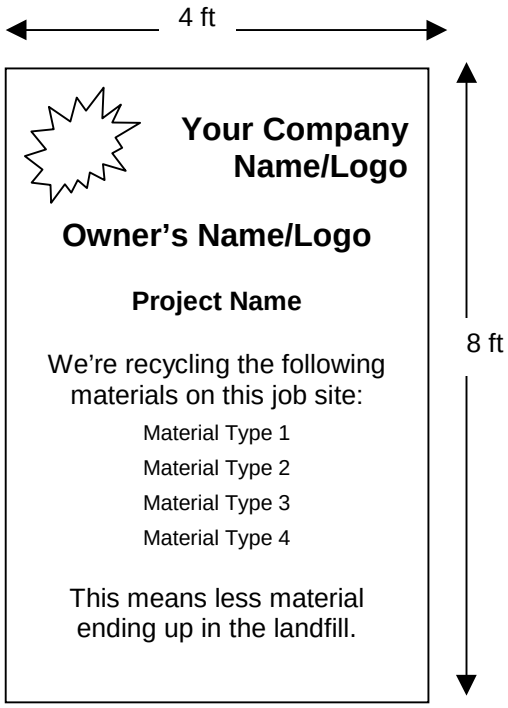
_____

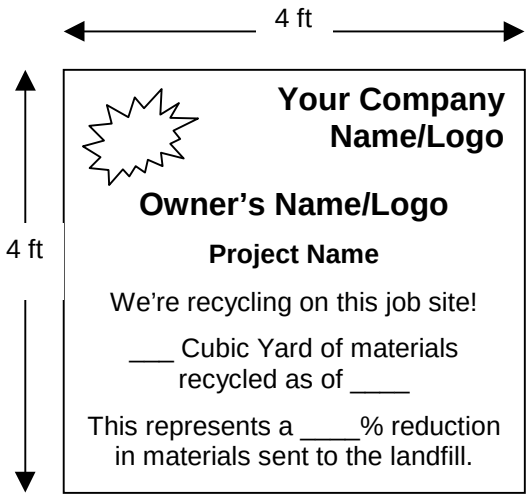
_____

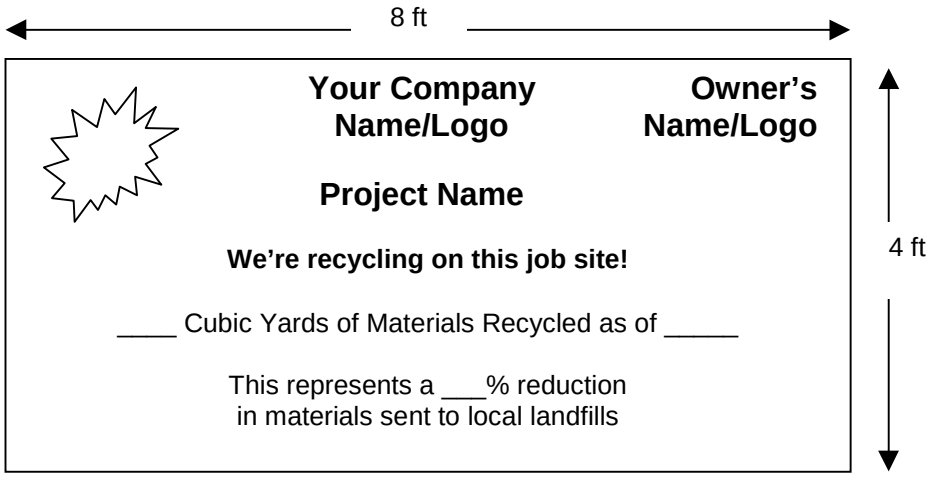
_____

_____

# Appendix D—Sample Job Site Signage



Here are some ideas for "Targeted Materials Definitions" signage. Check all categories that apply and post prominently on the job site trailer or on/near recycling bins. These signs should be large enough to be visible from a distance.

**OK to Recycle WOOD that is:**

- ❑ Painted or Stained
- ❑ Pressure Treated
- ❑ Laminated
- ❑ Engineered (contains glue or other non-wood materials.)
- ❑ Contaminated with nails or screws.
- ❑ No longer useful for any purpose on the job site.
- ❑ _____

✓ **Only Checked Categories Apply.**

**OK to Recycle DRYWALL that is:**

- ❑ Painted
- ❑ Contaminated with joint compound
- ❑ Contaminated with nails or screws
- ❑ Contaminated with lath and plaster
- ❑ Wet
- ❑ No longer useful for any purpose on the job site.
- ❑ _____

✓ **Only Checked Categories Apply.**

**OK to Recycle CARDBOARD that is:**

- ❑ Waxed
- ❑ Broken down (flat)
- ❑ Wet
- ❑ Contaminated with metal banding or strapping
- ❑ No longer useful for any purpose on the job site.
- ❑ _____

✓ **Only Checked Categories Apply.**

**OK to Recycle METAL that is:**

- ❑ Ferrous (iron and steel) such as rebar, misc. iron
- ❑ Non-ferrous, such as aluminum siding, gutters, brass, copper, nickel, and stainless steel
- ❑ No longer useful for any purpose on the job site.
- ❑ _____

✓ **Only Checked Categories Apply.**

# Appendix E—Job Site Training Checklist

Here are some items to cover during job site training sessions to get a quick assessment of your recycling progress.

- ❑ As of _____ (date), what percentage of our "waste" are we recycling?
- ❑ Does everyone know what materials are being recycled on this job?
- ❑ Does everyone know what materials are acceptable for recycling? (Refer to posted definitions for targeted materials.)
- ❑ What's in the garbage and shouldn't be? (Refer to waste audits, including slides if you have them).
- ❑ Does everyone know where different materials go? (Refer to signs, color codes, or other means of determining collection sites.)
- ❑ How can we reduce waste in the first place? (Refer to job personnel and subcontractor tip sheets.)
- ❑ Does anyone have any suggestions for improving our operations?

## Tips for Site Crews

- ❑ Make sure recycling containers are full before using empty or half-full ones.
- ❑ Make sure bins are as close as possible to where material is being generated.
- ❑ Use bins that suit the site. For example:
  - ♦ **cranable**: for multi-story buildings
  - ♦ **smaller or mobile**: for quick-moving or hard-to-get-at projects
  - ♦ **sectioned with dividers**: for smaller quantities or hard-to-get-at projects

# Appendix F—How Well Did You Do?

Here are two worksheets that you can use to see how much money you are saving through your recycling efforts, one for small jobs and one for large jobs. You can also purchase software that will perform these calculations for you. One software package, the *Business Recycling Cost Model,* automatically calculates your savings, provides a cost-benefit analysis for waste-prevention activities, and evaluates the effect of substituting materials, using data that you enter. (For more information, see Appendix H—Resources.)

You will notice that the *estimated* cost savings will be fairly modest in terms of your overall budget. This is because current C&D disposal fees in Hawaii ($25 per ton) are relatively inexpensive. In addition, the cost differential between disposal and recycling in Hawaii is not significant. This situation is not one you can count on, however. Builders in other parts of the U.S. have experienced "sticker shock" when faced with sharp increases in tipping fees that occurred almost overnight. You can prevent this by making waste reduction a part of your everyday practice.

For small jobs especially, the *actual* cost savings are likely to be primarily the result of source reduction strategies such as efficient framing design, careful take-offs, and centralized cutting. You can estimate material cost savings by comparing material purchase receipts to those from similar projects you completed using conventional methods. For example, you may see a drop of 10% or more in your budget for framing materials by using an efficient framing design. Since most building materials are imported to Hawaii, this could represent substantial savings, and increased profit margin.

# How Well Did You Do?—Small Jobs

The formula below is a guide for determining how well you did overall in reducing the amount of material used as well as wasted. Based on research conducted around the country, it is estimated that the amount of waste coming off conventionally built single-family homes in the U.S. can be as much as 5 pounds per square foot. Any source reduction strategies you incorporate, in addition to job site recycling, will reduce the amount of waste you must dispose.

The formula helps you determine roughly *how much material you saved* from the landfill by comparing your actual disposal costs to your disposal costs if you were generating waste at the rate of 5 pounds per square foot.

For small jobs, *actual* cost savings are likely to be primarily the result of source reduction strategies such as efficient framing design, careful take-offs, and centralized cutting.

| | | |
|---|---|---|
| _____<br>Your project square footage | Multiplied by 5/2000<br>(avg. weight of waste, in tons, generated per sq.ft.) | =_____tons<br>avg. waste typically generated for projects this size |
| _____ Tons<br>Avg. waste typically generated (from row above) | Multiplied by $25<br>(cost per ton to dump waste in your county) | = $ _____<br>avg. disposal cost for projects this size |
| $ _____<br>avg. disposal cost (from row above) | Minus _____<br>Your *actual* disposal costs | = $ _____<br>your savings |
| $ _____<br>your savings (from row above) | Divided by $25_____ | = _____tons<br>tons of material you saved through recycling and waste reduction |

## 1. Determine how much you would have paid if you had not recycled:

How much material did you dispose *and* recycle? _____ Tons
(weight will be on bills and receipts, (See conversion tips on page 7 to convert from volume to weight for recycled materials.)

Multiply this amount by the tipping fee per ton X $ _____ per ton

*Cost if you had disposed entire amount, with no recycling* = $ _____

## 2. Determine how much it cost you for waste management, including recycling:

Total fees for disposal and recycling $_____
(Check vendor bills and receipts)

Add estimate for any *extra* labor costs due to recycling (may not be applicable) + $ _____
(Estimate 1 to 2 extra hours per project week times the labor rate. Will vary depending on phase of job. Some weeks will be minimal.)

Add estimate for any *extra* rental costs for recycling containers or equipment + $ _____
(May be included in bills)

Add estimate for any *extra* trucking costs for recycling + $ _____
(May not be applicable)

Subtract any revenues for recycling - $ _____
(May be applicable for some materials, such as metals)

*Cost for waste management, including recycling* = $ _____

## 3. Compare cost of disposal vs. a waste management program, including recycling:

Cost without recycling $ _____

Minus cost with recycling - $ _____

***That's Your Savings!*** **= $** _____

[1] You can estimate your savings beforehand by:

- estimating the amounts of waste you typically generate (see your previous disposal bills)
- estimating how much material you will be recycling (by type)
- calculating the cost (fees) of recycling those materials
- estimating other recycling costs (labor, containers/equipment, trucking)
- estimating revenues from recycling
- and using the same method above for calculating the savings

# Appendix G—Using Specifications to Reduce Construction Waste

## Introduction

Increasingly, architects preparing project specifications are including provisions waste reduction, reuse, recycling, and use of recycled-content building materials. Between 50 and 80 percent of construction waste is reusable or recyclable, and specifications for waste management can help ensure project managers will efficiently manage these resources.

This appendix provides information about ways that project specifications can be used to reduce construction waste. Although project specifications are developed by design professionals during the design phase, contractors frequently have input in their development. Contractors may also want to include some of these ideas in requests for changes and substitution. You can also include some of these in your subcontractor agreements.

## Strategies

Proven strategies in developing effective specifications for construction waste management are:

1. *Using bid alternates*—Requiring submission of bid alternates for undertaking specific reduction/recycling/reuse measures as an alternative to landfilling waste. This option allows the owner to determine whether these alternative measures are economically feasible.

2. *Requiring waste reduction/recycling/reuse/use of recycled-content to the extent practical*—This option uses language that requires waste reduction, reuse, recycling, and use of recycled-content materials to the fullest extent possible. The effectiveness of this approach can be strengthened with additional requirements for tracking and reporting and verbal encouragement at pre-project and project progress meetings.

3. *Requiring a construction waste management plan*—This option requires the successful bidder to submit a construction waste management plan for approval by the owner. The specifier can choose which items must be included in the draft, and the parties can negotiate prior to agreeing upon a final plan.

4. *Requiring recycling/reuse/use of specific items*—Another option foregoes the waste management plan and instead directly specifies that certain items will be recycled, reused, and certain resource efficient (including recycled-content) materials will be used.

5. *Subtracting waste costs and substituting a waste manager*—With this approach, each subcontractor is required to include a line item in their bid for disposal costs. This amount is subtracted from the final bid, and an independent waste manager is hired to handle all waste management.

Strategies 2 through 5 have been used in published case studies that demonstrate the waste minimization effectiveness of the approach used at reduced or unchanged costs.[1] Numerous case studies document the successful use of recycled-content and other resource efficient building materials.

[1] For more information and case studies, contact Triangle J Council of Governments, phone (919) 549-0551, fax (919) 549-9390.

# Specification Options

Here are some ways to use your bid documents to get results:

## *Source Reduction*

- ❑ **Take-Offs**: Require detailed take-offs. In addition to acting as an order list for building materials, a detailed take-off will identify the intended location and use in the structure. This reduces the risk of unplanned and potentially wasteful cuts.
- ❑ **Tools, Equipment, Supplies**: Include a goal to use good quality (durable) and/or reusable tools equipment, and supplies. For example, concrete forms can be reused, as can durable site fencing, tarp, and temporary barriers and controls.
- ❑ **Supplier Packaging**: Minimize packaging waste by requiring provisions for returnable or reduced packaging in supply agreements, particularly for items purchased in large quantities. Seek bulk packaging.
- ❑ **Waste Management Plan**: Require provision of a waste management plan that incorporates source reduction during build-out. It would describe:
    - Waste audit (required for remodels and demolition).
    - Source reduction goals.
    - The means to be used to track progress towards those goals.
    - The method to be used for communicating those goals to field personnel and subcontractors (such as inclusion in subcontractor agreements and training at safety meetings).
- ❑ **Materials Storage**: Require proper storage of materials (including hazardous materials) to avoid damage and outdating.
- ❑ **Termite Control**. Require specific, environmentally-preferred actions for termite-prevention.

## *Recycling*

- ❑ **Waste Audit**. For remodels and demolitions, provision for performance of a waste audit to identify high potential recyclable materials.
- ❑ **Waste Management Plan**: Require provision of a waste management plan that incorporates recycling during build-out. It would describe:
    - The types of materials that will be generated during construction in significant amounts, and that can be recycled cost-effectively.
    - Recycling goals. Reasonable recycling goals based on current field research include:
        - 20% for remodeling waste
        - 40% for new construction waste
        - 50% for demolition waste
    - The means to be used to track progress towards those goals, including providing tonnage of materials disposed/recycled and associated savings
    - The method to be used for communicating goals to field personnel and subcontractors (such as inclusion in subcontractor agreements and training at safety meetings).

## *Recycled-Content and Salvaged Building Materials*

- ❑ **Recycled-Content Materials**: Set a goal for the use of recycled-content in the building, such as: "Use at least five materials that have x% of post-consumer or recycled-content." Alternatively or in addition, specify particular building materials with recycled-content. Examples of building material options that meet industry standards and include recycled-content are:
  - Expansion Joint Filler—available with 100% post-consumer content (newspaper).
  - Concrete Aggregate—locally produced to specifications from concrete waste.
  - Compost—locally produced from processed yard, food, and other organic waste.
  - Carpet and Pad—commercial grades available with up to 100% recycled plastic; also available with recovered fibers from recycled textiles.
  - Steel Framing—all steel framing includes a minimum of 25% recycled-content. Some framing systems are targeting much higher levels of recycled-content.
  - Plastic lumber—manufactured in Hawaii from recycled milk jugs and soda bottles.
  - Insulation—cellulose, polystyrene, fiberglass, and mineral wool insulation include varying amounts of recycled-content.
  - Ceramic Tile—available in various recycled-contents (up to 70 percent).
  - Ceiling Tiles—typically include significant amounts of recycled fiber and/or mineral waste.
  - Drywall—available with recycled gypsum.
  - Floor Tile—ceramic tiles, rubber, and vinyl tiles are available with recycled-content.
  - Cabinet pulls, glass blocks, and glass tiles—manufactured in Hawaii from recycled glass.
  - Paint—available with recycled or reworked (from mis-tints) content for both primer and finish coat.
  - Glass Cullet—use as fill or filter medium; see DOT specifications.
  - Playground Surfacing—available with 100% recycled rubber.
  - Parking Stops—available with 100% recycled plastic.
  - Roofing—shingles, tiles, and panels are available with a variety of recycled materials, including plastic, rubber, metal, fiber, and flyash slag.
- ❑ **Salvaged Materials**: These materials may be available from the existing structure (if applicable) or an outlet for used building materials or architectural salvage. Some commonly salvaged materials are:
  - Landscaping materials
  - Concrete, brick, masonry (as site furnishings)
  - Finishes, such as tile, carpet, millwork (trim and flooring), and cabinets
  - Dimensional lumber, timbers
  - Windows, doors, and associated hardware
  - Electrical fixtures and lamps (subject to code approval)
  - Sinks, bathtubs, and accessories
  - Broken concrete and asphalt from demolition (can be used as fill per DOT specifications) or for retaining walls at project site or other building sites)
  - Insulation
  - Appliances

## *Resource-Efficient Materials*

- ❑ **Steel framing**. Specify cold-formed steel framing with a minimum of 25 percent recycled-content.
- ❑ **Wood-Efficient Materials:** Set a goal for the use of wood-efficient materials in the building. Examples include:
  - ♦ Engineered wood products, such as I-beams, LVL, finger-jointed studs and trims.
  - ♦ Wood products produced from fast-growing species or particle board, produced from shavings.
- ❑ **Certified Wood Products:** Wood products produced from sustainably harvested timber. (Certified sustainably harvested timber is locally available.)
- ❑ **Durable Materials:** Set a goal for the use of durable materials in the building. Examples include:
  - ♦ Metal roofing
  - ♦ Linoleum sheet flooring
- ❑ **Standard Dimension Materials:** Set a goal for the use of materials available in standard sizes and/or provide modular dimensioning. Both structural and non-structural options (including finishes) are available. Design to accommodate these standard dimensions.
- ❑ **Locally-Produced Materials:** Set a goal for the use of locally produced materials. This will save on the energy used to transport the material from manufacturing site to building site.
- ❑ **Low Maintenance and Easily Replaced Materials:** Set a goal for the use of materials that require less maintenance or are easily replaced or repaired. For example, carpet tiles, which can be selectively replaced in high-wear areas, are an option that saves money and resources. A durable finish that requires no coating is another option.
- ❑ **Other Emerging Product Selection Criteria:** As technology develops, there may be other criteria that can be used in your design and specifications to determine environmental preferability. For example, the issue of recyclability is one area being investigated. The additional resources listed are updated from time to time and should include information about additional criteria you may use.
- ❑ **Post-Occupancy Purchases:** For building materials selected for resource-efficient criteria, require the provision of information (including MSDSs and other product literature) to owner's representatives for post-occupancy replacements.

# Developing Your Own Specifications

Several resources are available for use in developing your own project waste management specifications, including generic specifications such as WasteSpec[2] and Green Spec.[3] In practice, waste management specifications are often derived from a number of sources. You will likely find the best approach is to develop a set of generic specifications suited to your types of projects and location, which you can then adapt for individual project use.

Two sample waste management specifications follow: a the Job Site Waste Reduction Specification section of waste management specifications developed by the Natural Resources Defense Council (NRDC) and a Department of the Navy Guide Specification for waste management.

[2] To order WasteSpec ($28.00), contact the Triangle J Council of Governments, PO Box 12276, Research Triangle Park, NC 27709. Phone (919) 549-0551, fax (919) 549-9390.

[3] To order Green Spec, contact Siegel & Strain Architects, 1295 59th Street, Emeryville, California, Phone (510) 547-8092; email info@siegelstrain.com.

# WASTE MANAGEMENT SPECIFICATIONS --

# GENERAL PROVISIONS

The sample specification that follows is adapted from *Solid Resources Management Specification: Contractor Guidelines and Requirements for Reuse, Salvage, and Recycling of Construction, Demolition and Landclearing Materials,* courtesy of the City of Los Angeles Integrated Solid Waste Management Office (213-847-4321). Additional provisions were adapted from *Waste Reduction and Recycling Demonstration Project Final Report,* submitted to Seattle Solid Waste Utility by O'Brien & Company. To order this specification on disk, call NRDC at *415-777-0220* and ask for the Wood-Use Efficiency Department.

## Job-Site Waste Reduction Specification

**1. DESCRIPTION**

1.1 This section includes procedures for ensuring optimal diversion of solid resources generated by the Work within the limits of the Construction Schedule, Contract Sum, and available materials, equipment, and products.

1.1.1 Assembly Bill 939, California Solid Waste Management Act, requires that localities throughout the state develop source reduction, reuse, recycling, and cornposting programs to reduce the tonnage of solid waste disposed of in landfills by 50 percent by the year 2000. Construction, demolition, and landclearing debris generated by the development are among the materials targeted by [city] to achieve these diversion rates, and the Developer supports these initiatives.

1.1.2 The Contractor shall participate in promoting efforts of the Developer or its representative to create a resource-efficient and environmentally sensitive Project and to effect optimum control of solid waste and recoverable resources generated in the Work.

1.1.3 The Developer has adopted recycled product procurement policies and the Contractor shall use products with post-consumer recycled content to the greatest extent feasible. Refer to the most recent issue at the date of bid of *A* Resource *Guide to Recycled-Content Construction* Products published by the Los Angeles Integrated Solid Waste Management Office (call 213-847-1444 to obtain a copy).

1.2 Related Sections: Documents affecting work of this Section include, but are not necessarily limited to, the following Contract Specifications:

- Site Clearing, 02230
- Demolition, 02220
- Asbestos Removal, 13280
- Earthwork, 02300

**2. DEFINITIONS**

2.1 Class III landfill: A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste resulting from construction, remodeling, repair, and demolition operations. A Class Ill landfill must have a solid waste facilities permit from the California Integrated Waste Management Board (CIWMB) and is regulated by the Local Enforcement Agency (LEA).

2.2 Construction and demolition waste: Includes all non-hazardous solid resources resulting from construction, remodeling, alterations, repair, and demolition operations.

2.3 Disposal. Acceptance of solid wastes at a legally operating facility for the purpose of landfilling. Includes Class III landfills and inert fills.

2.4 Inert backfill site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring, or other soils engineering operation.

2.5 Inert fill: A facility that can legally accept inert waste such as asphalt and concrete exclusively for the purpose of disposal.

2.6 Inert solids/inert waste: Non-liquid solid resources including, but not limited to, soil and concrete, that do not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional Water Board pursuant to Division 7 (Section 13000 et seq.) of the California Water Code and do not contain significant quantities of decomposable solid resources.

2.7 Mixed debris: Commingled recyclable and non-recyclable materials generated at the construction site.

2.8 Mixed debris recycling facility: A solid resources processing facility that accepts commingled construction and demolition debris for the purpose of recovering reusable and recyclable materials and disposing of the non-recyclable residual materials.

2.9 Permitted waste hauler: A company that possesses a valid and current permit from the [name] County Department of Public Health to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal in the [name] County.

2.10 Recycling: The process of sorting, cleansing, treating, and recon-stituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating, or thermally destroying solid waste.

2.10.1 On-site recycling: Sorting and processing materials for use in an altered form in the Work (e.g., concrete is crushed for use as base for a parking lot on the site).

2.10.2 Off-site recycling: Hauling materials to a location off the Project site for use in an altered form in the manufacture of a new product.

2.11 Recycling facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a Solid Waste Facilities permit from the CIWMB or be regulated by the LEA.

2.12 Reuse: Making new use of a material without altering its form.

2.13 Salvage: Recovery of materials for on-site reuse or to sell or donate to a third party.

2.14 Source-separated materials: Materials that are sorted at the site of generation by individual material type for the purpose of reuse or recycling, e.g., demolished concrete that is separated at the Project site for delivery to a base course recycling facility.

2.15 Solid waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.

2.16 Transfer station: A facility that can legally accept solid wastes for the purpose of temporarily storing the materials for reloading onto other trucks and transporting to a landfill for disposal, or recovering some materials for reuse or recycling. Transfer stations must be permitted by the CIWMB and regulated by the LEA.

**3. SUBSTITUTIONS**

Should the Contractor desire to use procedures, materials, equipment, or products which meet the requirements of these specifications but are more environmentally sensitive, the Contractor shall submit these substitutions in accordance with Substitutions and “Or Equal” Submittal of the General Requirements.

**4. SOLID RESOURCES MANAGEMENT PLAN**

4.1 Contractor shall conduct a site assessment and estimate the types and quantities of materials under the Work that are anticipated to be feasible for source separation for recycling or reuse, either on-site or off-site, and shall note the procedures

intended for a recycling, reuse, and salvage program. Refer to the most recent issue of *Construction and Demolition Waste Recycling Guide,* and *Wood You Recycle?,* published by the Los Angeles Integrated Solid Waste Management Office, for a partial list of facilities that accept these materials for recycling.

4.2 After award of Contract and prior to the commencement of the Work, the Developer or its representative shall schedule and attend a meeting with the Contractor to discuss the Contractor's proposed Solid Resources Management Plan. Not more than 20 working days after the meeting, the Contractor shall draft and submit to the Developer or its representative a written Solid Resources Management Plan, formatted as shown in Attachment A. This Plan shall be submitted to allow the Developer or its representative and the Contractor an opportunity to develop a mutual understanding regarding the recycling, reuse, and recycled-content procurement programs and shall include, but not be limited to, the following:

- Contractor and project identification information
- Types of solid resource materials and wastes that will be produced
- Materials to be salvaged, reused, and recycled, both on-site
- and off-site
- Procedures to be used
- Estimated quantities of materials
- Names and locations of salvage, reuse, and recycling facilities/sites
- Names and locations of waste disposal facilities/sites
-

4.3 Incorporating the review and comments of the Developer or its rep-resentative, Contractor shall revise and resubmit the Solid Resources Management Plan. The Developer/representative's review and comment on the Solid Resources Management Plan will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.

**5. RECYCLJNG, REUSE, AND SALVAGE PROCEDURES**

**5.1 Recycling, Reuse, and Salvage Facilities**

The most recent issues of *Construction and Demolition Waste Recycling Guide* and *Wood* You *Recycle?,* published by the Los Angeles Integrated Solid Waste Management Office, are incorporated herein by reference. For more information, contact the LA. Integrated Solid Waste Management Office, Room 1450 City Hall East, 200 N. Main St, Los Angeles, CA 90012, 213-847-1444; fax 213-847-3054. These guides are updated regularly.

**5.2 Development and Implementation of Procedures**

Based upon the Contract Documents, the Contractor's Solid Resources Management Plan, estimated quantities of materials, and availability of salvage, reuse, and recycling facilities, Contractor shall develop and implement procedures to reuse, salvage, and recycle materials to the greatest extent feasible. Procedures shall include source-separated recycling as well as mixed recycling efforts. On-site recycling shail be considered.

**5.3 Salvage and Reuse**

5.3.1 Contractor shall perform a site pre-assessment, identify materials that are feasible for salvage, and determine requirements for site storage and transportation to salvage facilities. A salvage/reuse program shall be implemented to the greatest extent feasible. A partial list of facilities is included in the most recent issue of *Construction and Demolition Waste Recycling Guide,* published by the Los Angeles Integrated Solid Waste Management Office.

5.3.2 Where practicable and cost-effective, wood shall be carefully dismantled and sold to a reuser, salvage dealer, or wood recycler Fixtures, furnishings, and equipment shall be removed from the facility intact and sold or donated to an appropriate organization. Any additional items (e.g., windows and doors), when feasible, shall be salvaged, source-separated, and taken to a recycling company, materials exchange, or similar facility.

5.3.3 The following salvage options shall be considered at a minimum:

- California Materials Exchange (CALMax) -- a free program sponsored by the CIWMB designed to help businesses find markets for materials that traditionally would be discarded. To obtain a current listing, call 916-255-2369 or 800-553-2962.

- LA Shares -- a non-profit materials exchange that accepts excess reusable materials from private donors and distributes them to various non-profit organizations throughout the City. 213-485-1097.

- Habitat for Humanity Los Angeles (HFH-LA) -- a non-profit housing organization that rehabilitates and builds housing for low income families. 213-975-9757. HFH-LA sites requiring donated materials vary.

**5.4 Source-Separated Recycling**

5.4.1 The Contractor shall develop and implement a program to include on-site separation, to the greatest extent feasible, of the following materials:

- Asphalt
- Brick
- Cardboard
- Concrete, concrete block, masonry, rocks, and rubble
- Dirt (clean dirt will be taken to a clean fill site)
- Drywall (source-separated and recycled or ground and used as soil amendment on-site)
- Metal, ferrous and non-ferrous (including HVAC equipment, fasteners, piping, chillers, generators, boilers, doors, aluminum paneling)
- Wood
- Green materials (e.g., tree trimmings)

5.4.2 Recycling plans shall estimate the amount of recyclable materials to be used on-site in the Work and include a program for off-site recycling of any excess material that cannot be used in the Work.

5.4.3 Each recycling facility or waste processor has requirements as to the way materials must be prepared to be accepted and to what degree materials can be contaminated. The Contractor shall provide separate containers or enclosures to facilitate its own recycling efforts and those of Subcontractors in order to meet those requirements and to meet specifications identified in the Contract Documents. A separate container shall be provided for non-recyclable, non-reusable trash.

5.4.4 Subcontractors shall be required to recycle the above materials, follow source separation requirements for each material, and use the appropriate on-site container/enclosure for each material.

5.4.5 Separation arrangem ents are subject to approval of the Developer or its representative.

**5.5 Mixed Debris Recycling**

Contractor shall develop and implement a program for commingled recycling of construction and demolition materials that cannot be feasibly source-separated. Such materials shall be legally transported to a mixed recycling facility. These facilities are listed in the most recent issue of *Construction and Demolition Waste Recycling* Guide, published by the Los Angeles Integrated Solid Waste Management Office.

**5.6 Waste Disposal**

5.6.1 Using a permitted waste hauler or its own trucking services, the Contractor shall legally transport non-recyclable, non-reusable materials to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal.

5.6.2 The Contractor shall not burn, bury, or otherwise dispose of solid waste on the project job site.

**5.7 Hauling**

5.7.1 Contractor shall arrange for delivery of materials, by a permitted waste hauler or using its own trucks, to facilities that can legally accept construction and demolition materials for purpose of reuse, recycling, or disposal.

5.7.2 Prior to delivering materials, Contractor shall familiarize itself with the specifications for acceptance of construction and demolition materials at recycling facilities. The most recent issue of *Construction and Demolition*

*Waste Recycling Guide,* published by the Los Angeles Integrated Solid Waste Management Office, includes a partial list of these facilities.

**6. MATERIALS TRACKING FORM**

6.1 To each application for progress payment submitted to the Developer or its representative, the Contractor shall attach a Materials Tracking Form; a sample is shown as Attachment B. The Materials Tracking Form shall quantify all materials generated in the Work and document their disposition (salvage, reuse, recycling, or disposal) as specified herein.

6.2 The Materials Tracking Form shall identify materials sent to:

- Source-separated recycling facilities
- Mixed debris recycling facilities
- Class III landfills (including inert materials accepted as daily cover)
- Inert fills
- Inert backfill sites other than inert fills
- Other diversion sites (specify)

6.3 Contractor shall complete each Materials Tracking Form as described below.

6.3.1 Fill in the project title; project work order number; progress payment number; name of company submitting the Materials Tracking Form; the printed name, signature, and daytime phone number of the person completing the form; the beginning and ending dates of the period covered; and the date that the form is completed.

6.3.2 Report disposal/recycling either in tons or in cubic yards: if scales are available at facility, report in tons; otherwise, report in cubic yards. Indicate zero (0) if there is no quantity to report for a type of material.

6.3.3 Indicate locations to which materials are delivered.

6.3.4 Attach to the form legible copies of weigh tickets, receipts, invoices, or other documents that specifically identify the Project generating the materials. Said documents must be from sites and/or facilities that can legally accept the materials for purposes of reuse, recycling, or disposal.

6.4 Failure to submit the Materials Tracking Form and supporting documentation may render the application for progress payment incomplete and delay progress payments.

**7. REVENUE**

Revenues or other savings obtained from recycled, reused, or salvaged materials shall accrue to Contractor unless otherwise noted in the Contract Documents.

**********
**DEPARTMENT OF THE NAV**
**NAVAL FACILITIES**
**ENGINEERING COMMAND**
**GUIDE SPECIFICATION**

**NFGS-01572A**
**30 September 1998**
**----------**
**Superseding NFSG-01572 (06/97)**
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**09/98**



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**DEPARTMENT OF THE NAV**
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**NFGS-01572A**
**30 September 1998**
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**Superseding NFSG-01572 (06/97)**

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NFGS-01572A

# WASTE MANAGEMENT

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Preparing Activity: SOUTHNAVFACENGCOM

| | Typed Name & Reg. | Signature | Date |
|---|---|---|---|
| Prepared by: | R. E. Bostain, P.E. | /s/ | 08/01/98 |
| Prepared by: | R. E. Bostain, P.E.<br>Division Director | /s/ | 08/01/98 |
| Prepared by: | E. H. Stehxneyer, P.E.<br>Planning & Design<br>Department Head | /s/ | 08/01/98 |
| Approved for NAVFAC: | /s/<br>Carl E. Kersten, R.A. | | 09/30/98 |

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**DEPARTMENT OF THE NAV**
**NAVAL FACILITIES**
**ENGINEERING COMMAND**
**GUIDE SPECIFICATION**

**NFGS-01572A**
**30 September 1998**
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**Superseding NFSG-01572 (06/97)**
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SECTION 01572

WASTE MANAGEMENT
**09/98**

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**NOTE : This guide specification requires implementation of a waste management program for recycling non-hazardous construction and demolition debris. It is intended to reduce the amount of waste requiring landfill disposal and to promote more efficient use of construction materials.**
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**NOTE : This revision "A" to NFGS-01572 revalidates the issue dated 30 June 1997.**
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PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Construction and Demolition Waste

Solid wastes such as building materials, packaging and rubble resulting from construction, remodeling, demolition and repair of buildings /facilities, paving and infrastructure.

1.1.2 Recyclable Materials

Products and materials that can be recovered and remanufactured into a new product. Recyclable materials include, but are not limited to, the following:

a. Metals (ferrous and non-ferrous), including banding, metal studs, ductwork, piping

b. Asphaltic concrete paving

c. Portland cement concrete

d. Land clearing debris including trees and plant materials

e. Native rock and granular fill

f. Gypsum products

g. Paper and cardboard

h. Wood products, including structural, finish, crates and pallets

i. Brick and masonry

j. Carpet and padding

k. Plastics

1. Copper wiring

m. Mechanical and electrical products and equipment

1.1.3 Recycling Facility

A business that specializes in collecting, handling, processing, distributing, or remanufacturing waste materials generated by demolition and new construction projects, into products or materials that can be used for this project or by others.

1.1.4 Salvage and Reuse

Existing usable product or material that can be saved and reused in some manner on the project site. Materials that can be salvaged and reused must comply with the applicable technical specifications and include, but are not limited to, the following:

a. Dimensional lumber and other wood products

b. Structural steel

c. Soil

d. Masonry products

1.1.5 Salvage for Resale

Existing usable product or material that can be saved and removed intact (as is) from the project site to another site for resale to others without remanufacturing.

1.1.6 Trash

Product or material unable to be salvaged for resale, salvaged and reused, returned, or recycled.

1.1.7 Waste Materials

Product or material that can be salvaged for resale, salvaged and reused, returned to vendors, or recycled.

1.2 SUBMITTALS

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**NOTE : Where a"G" in submittal tags follows a submittal item, it indicates Government approval for that item. Add "G" in submittal tags for items deemed sufficiently critical, complex, or aesthetically significant to merit approval by the Government. Submittal items not designated with a "G" will be approved by the QC organization.**

Submit the following in accordance with Section 01330, "Submittal Procedures."

1.2.1 SD-08 Statements

a. Waste Management Plan G

1.3 CONSTRUCTION WASTE MANAGEMENT

1.3.1 General Intent

The Contractor shall use all means available to divert to the greatest extent practical and economically feasible, construction and demolition waste from landfills and incinerators.

1.3.2 Construction Waste Management Operations

Take a pro-active, responsible role in management of construction waste and require all subcontractors, vendors, and suppliers to participate in the effort. Establish a construction waste management program that includes the following categories:

a. Minimizing Packaging Waste

b. Salvage and reuse

c. Salvage for resale or donation

d. Recycling

e. Disposal

Salvage and reuse is a better waste management method than recycling because little or no reprocessing is necessary, thus less pollution is created when items are reused in their original form. Therefore, a diligent effort shall be made to salvage and reuse products and materials. Waste materials that cannot be salvaged and reused, and have value as being recyclable, shall be recycled. Only trash shall be transported to a landfill or incinerator. The Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling construction waste for this project. Revenues or other savings obtained for recycling or returns shall accrue to the Contractor.

1.3.3 Construction Waste Management Plan

Perform a waste analysis to determine the types and quantity of construction waste anticipated and identify salvage for resale, salvage and reuse, recycling and disposal options available. Within 30 days after contract award and prior to performing any demolition work, submit a Waste Management Plan for review and approval. The Waste Management Plan shall include the following:

a. Project waste analysis.

b. Projected cost of disposing of all trash and waste materials as if there would be no salvage or recycling on this project.

c. Name, address and phone number for each landfill or incinerator facility to be utilized.

d. Tipping fee for each landfill or incinerator.

e. A list of waste materials that will be salvaged for resale, salvaged and reused, and recycled.

f. Identification of each recycling facility to be utilized.

g. Anticipated net cost savings determined by subtracting the cost of separating and recycling from the following:

   1. Savings due to reuse of demolished materials.

   2. Revenue from the sale of salvaged and recycled materials.

   3. Landfill or incinerator tipping fees saved due to diversion of materials to recycling.

h. Description of the method to be employed in recycling waste materials and description of the method that will be used to protect recycled materials from contamination.

i. Description of the means of transportation of recyclable materials and the destination of the materials.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PROGRAM IMPLEMENTATION AND MONITORING

Implement and maintain, for the duration of the project, the construction waste management program. Establish a method of monitoring and documenting the program, and submit a periodic report with each application for payment that includes the following:

a. Amount (by weight) and type of waste materials disposed of in a landfill or incinerator, the tip fee per ton, and the total cost of disposal including transportation costs, container rental costs, etc.

b. Amount (by weight) and type of materials salvaged for sale, salvaged for reuse, and recycled. Provide destination, means of transportation, cost of transportation and handling, tipping fee savings and revenue generated for each material.

c. Cost savings due to salvaging, reusing, and recycling materials.

3.1.1 Hazardous Materials/Hazardous Wastes

If any non-acceptable materials such as hazardous materials or hazardous wastes are encountered, notify the Contracting Officer.

3.2 SALVAGE AND REUSE

Encourage the practice of efficient waste management when sizing, cutting, and installing products and materials.

3.3 SEPARATION OF RECYCLABLE WASTE MATERIALS

Provide the necessary containers and bins, to facilitate the waste management program, that are clearly and appropriately marked. Prevent contamination of recyclable materials from incompatible products and materials. Separate construction waste at the project site by one of the following methods:

a. Source Separated Method: Waste products and materials, that are recyclable, are separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Trash is transported to a landfill or incinerator.

b. Co-Mingled Method: All construction waste is placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed and the remaining trash is transported to a landfill or incinerator.

c. Other methods proposed by the Contractor and approved by the Contracting Officer.

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NOTE : Suggestions for improvement of this specification will be welcomed using the Navy "Change Request Forms" subdirectory located in SPECSINTACT in Jobs or Masters under "Forms/Documents" directory or DD Form 1426.

Suggestions should be forwarded to:

Officer In Charge
Seabee Logistics Center
NAVFAC 15G/SLC 15E
4111 San Pedro Street
Port Hueneme, CA 93043-4410

FAX: (805) 985-6465/982-5196 or DSN 551-5196

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-- End of Section --

# Appendix H—Resource List

## General References

*Business Recycling Cost Model*, software that can help you evaluate what to recycle, what it means to the "bottom line," cost-benefit analysis for waste-prevention activities, and evaluate effect of substituting materials. The software includes: software, manual, technical assistance through an 800 phone number, and case studies. The cost is $99.00 plus $5.00 shipping up to three copies. (A free demo is available). To order, call 360-897-9533.

*Guide to Resource-Efficient Building in Hawaii*, A publication of Hawaii Advanced Building Technologies Program. Available from the State Department of Business, Economic Development & Tourism, Clean Hawaii Center, call 587-3802.

## Buy Recycled and Resource-Efficient Building Materials

*Business Guide to Waste Prevention, Recycling, and Buying Recycled-Content Products.* City and County of Honolulu, Department of Environmental Services, Refuse Division, Recycling Office. 527-5335.

*Earth-friendly Products and Materials*—A list of materials available through the Green House Hawaii Project. Call Clean Hawaii Center, phone 587-3802, to obtain the current list.

*The Green House Hawaii Project.* An exhibit of building materials and systems designed to promote an awareness of the resource-efficient, water-conserving, and waste-reducing products and systems currently available. A partnership of the A.I.A.-Honolulu and the University of Hawaii School of Architecture with support from the State Office of Solid Waste Management, Clean Hawaii Center, American Lung Association, the Honolulu City and County Recycling Office, and others. For more information, call Gail Suzuki-Jones at 524-0620.

*Where to Buy Recycled Products and Recycling Services in Hawaii Guide*. State Department of Business, Economic Development & Tourism, Clean Hawaii Center, phone 587-3802.

## Recycling and Waste Reduction

*Business Guide to Waste Prevention, Recycling, and Buying Recycled-Content Products.* City and County of Honolulu, Department of Environmental Services, Refuse Division, Recycling Office. 527-5335.

*Environmental Services in Hawaii 1997 Directory*. Hawaii State Department of Health, Solid and Hazardous Waste Branch, phone 586-4226.

*Hazardous Waste Minimization News* Vol. 6, No. 1, Spring 1997 (Construction). Hawaii State Department of Health, Solid and Hazardous Waste Branch, phone 586-4226.

*Hazardous Waste Minimization News* Vol. .5, No.1, Spring 1996 (Fluorescent Light Disposal). Hawaii State Department of Health, Solid and Hazardous Waste Branch, phone 586-4226.

*Minimizing Construction & Demolition Waste*. February 1998. Published jointly by the State of Hawaii, Department of Health, Office of Solid Waste Management; State of Hawaii, Department of Business, Economic Development and Tourism (DBEDT), Clean Hawaii Center; Environmental Building Coalition of Hawaii; Building Industry Association of Hawaii; and the General Contractors Association of Hawaii. Contains a directory of C&D Waste Management Facilities on Oahu. Call DBEDT for a copy, 586-4240.

*Recycling Plus Program Manual.* Produced by Clean Washington Center with O'Brien & Company and Fletcher Wright Construction (for commercial or other large-scale projects). Manual includes Field Guide and Subcontractors Kit, camera-ready art and forms for customizing your own recycling program. Based on a traditional safety program approach. Available through DBEDT, call 586-4240.

*Reducing & Managing Painting Contractor Wastes*. Hawaii State Department of Health, Solid & Hazardous Waste Branch, phone 586-4226.

*Residential Construction Waste Management, A Builder's Field Guide—How to Save Money and Landfill Space*, published by the National Association of Home Builders (NAHB) Research Center, 400 Prince George's Boulevard, Upper Marlboro, Maryland 220774. (301) 249-4000. www.nahbrc.com.

*The Hawaii Guide to Alternatives and Disposal of Household Hazardous Waste.* Hawaii State Department of Health, Solid & Hazardous Waste Branch, phone 586-4226.

*Waste Minimization in Action #12: Construction Industry.* Hawaii State Department of Health, Solid and Hazardous Waste Branch, phone 586-4226.

*Waste Minimization in Action #2a: Painting Contractor's Bulletin.* Hawaii State Department of Health, Solid and Hazardous Waste Branch, phone 586-4226.

## Neighbor Island C&D Recyclers and Landfills

(Note: for facilities on Oahu, see the Clean Hawaii Center publication *Minimizing Construction & Demolition Waste).* Also contact HIMEX (Hawaii Materials Exchange, phone 808-586-4240 or web site www.himex.org.

**KAUAI**

| Facility | Phone | Services |
|---|---|---|
| Kauai Nursery and Landscaping<br>Puhi | Lelan Nishek<br>808-245-7747 | Green waste, clean lumber, new drywall, some scrap metal |
| Garden Island Disposal<br>Nawiliwili | Dean Kawasaki<br>808-245-2372<br><br>Genevieve Salmonson<br>808-842-3602 | Cardboard |
| Puhi Auto Recycling<br>Puhi (under construction) | Troy Tanigawa<br>808-241-6880 | Scrap metal |

**MAUI**

| Facility | Phone | Services |
|---|---|---|
| Maui Scrap Metal<br>Waikapu | Roger Apana<br>808-244-0305 | Scrap metal and cardboard |
| Maui Composting<br>Puunene | Tim Gunter<br>808-877-0403 | Green waste and new drywall |
| Eko Systems<br>Central Maui Landfill | Rubens Da Fonseca<br>808-283-5019 | Green waste (at Central Maui Landfill) and clean lumber |
| Campaign Recycle<br>Waikapu | Charles Davidson<br>808-244-0722 | Green waste and clean lumber |
| De Coite C&D Landfill<br>Maalaea | Richard De Coite<br>808-871-7496 | C&D waste |

**HAWAII**

| Facility | Phone | Services |
|---|---|---|
| Hawaii Metals Recycling<br>Hilo Landfill | Jim Bannigan III<br>808-682-5810 | Scrap metal |
| Renew Hawaii<br>Hilo Landfill | Andrea Alonzo<br>808-963-6850 | Green waste |
| Hilo Business Service<br>Hilo | Margaret Pahio<br>808-959-1436 | Cardboard |
| Environmental Recycling<br>Kono | Michael Allen<br>808-935-9328 | Cardboard |

# Glossary

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| Best Management Practices (BMPs) | Defined by the U.S. Environmental Protection Agency as "the use of materials, processes or practices that reduce or eliminate the creation of pollutants or wastes at the source. It includes practices that reduce the use of hazardous materials, energy, water, or other resources, and practices that protect natural resources through conservation or more efficient use. |
| Construction and Demolition (C&D) waste | For the purposes of this guide, C&D waste includes all non-hazardous solid wastes resulting from construction, remodeling, renovation, and demolition activities.<br><br>The regulatory definition of construction waste includes concrete, drywall, masonry, roofing, siding, structural metal, wire, insulation, and other building material; and plastics, Styrofoam, twine, baling and strapping materials, can buckets, and other packaging materials and containers. It also includes sand, rocks, and dirt that are used in construction. In no event shall construction waste include dangerous or extremely hazardous waste or any kind of garbage, sewerage waste, animal carcasses, or asbestos. |
| Hazardous Waste | A waste that is solid or liquid material with certain properties that could pose dangers to human heal, property, or the environment. |
| Landfill | Disposal facility at which solid waste is permanently placed in or on land as permitted by the jurisdictional health department and other appropriate agencies, accepting non-hazardous waste including non-recycled construction, remodeling, repair, and demolition debris. |
| Recycling | Either source separation or the processing of solid waste mechanically or by hand to segregate materials for sale or reuse. Materials that can be removed through recycling include, but are not limited to, mixed paper, newsprint, cardboard, aluminum, glass, plastics, chemicals, oil, wood, compostable organics (food and yard/land clearing debris), ferrous metal, and inorganics (rubble and inert material). Recycling does not include combustion of solid waste or preparation of fuel from solid waste. |
| Recycling Facility | An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product. Recycling facilities have their own specifications for accepting materials. |
| Reuse | Making use of a material without altering its form |
| Salvage | Recovery of materials for on-site reuse or donation to a third party |
| Source-separated materials | Materials that are sorted at the site by material for the purpose of reuse or recycling. |