Construction Waste Management

National / California Statistics

Waste
- On new commercial projects, the waste to square foot ratio may be as high as one ton for each 100 square foot of building floor space.
- Buildings and infrastructure generate about 30% of the state’s solid waste materials according to the California Integrated Waste Management Board.

Recycling
According to the California Integrated Waste Management Board, in 2000 approximately 28 million tons of waste was recycled in California. Tipping fees have reached as high as $85.00 a ton in some regions of the state.

CA Regulations
Assembly Bill AB 939, California Integrated Waste Management Act of 1989, requires local jurisdictions to reduce the amount of waste they are sending to landfills by 50% in the year 2000. Local jurisdictions who fail to comply can be fined up to $10,000 /day for non-compliance.

Assembly Bill 75 requires state agencies to reduce the amount of material they are sending to the landfill by 25% in 2002 and 50% in 2004. Again, it is anticipated that non-compliance could have negative budgetary impact on a state agency.

CA/DGS Construction Waste Management (CWM) Requirements

The current DGS A/E Agreement includes requirements for construction waste management based on the Tier Lists.

Tier 1 List. Projects are required to incorporate these solutions. For construction waste this requires the development of a recycling plan/program that diverts 50% or better of demolition and construction materials from landfills.

Tier 2 List. If economically feasible, project teams are encouraged to divert 75% or better.

Benefits of Construction Waste Management
- Increases longevity of existing landfills
- Prevents costly process of siting new landfills
- Prevents emissions of air/water pollutants
- Conserves energy
- Preserves resources
- Creates jobs
- Decreases green house emissions
- Stimulates development of greener technologies
Cost savings from lower disposal fees, avoided labor and implementation expenses.

Notes:

A study called the Environmental and Economic Benefits of Increased Recycling was sponsored by U.S. EPA and developed by the Tellus Institute. The Tellus Institute performed an analysis of the economic and environmental benefits if the State of Iowa increased its recycling rate to 50% in 2000 relative to 25% in 1990. Four categories of benefits were examined:

Energy. The energy benefit is the energy saved by manufacturing a product from recycled materials as opposed to virgin materials.

Greenhouse gas (GHG) emissions. The GHG emission benefits are the net emissions per ton due to the recycling of a given material minus the net emissions from storing it in a landfill.

Value of materials recovered. The materials benefit is the value of the additional material recycled. It is based primarily on the price of recycled feedstock purchased by end users and mills.

Amount of landfill space saved. The landfill benefit is the landfill space saved by recycling. A per-ton multiplier was developed for each of the four categories. These multipliers were applied to each ton of waste recovered to determine the benefit of recycling that material.

Environmental benefits noted in the study. 1,307,220 tons diverted from landfill.
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- 96,981,741 cubic feet of landfill space avoided
- 210,997 acres of forests not harvested
- 11,094,003 lbs of carbon monoxide eliminated
- 2,763 lbs of lead burden to environment eliminated
- 5,261,384 lbs of nitrogen oxide eliminated
- 455,190 MTCE greenhouse gasses eliminated

**Economic benefits noted in the study.**
- 650 jobs created processing recyclables
- 1,290 additional “piggybacked” jobs
- $100.3 million in industrial sales statewide
- State revenue: $2,400,000
- Local government revenue: $3,900,000
- End use value of recycling to 50% rate: $359,000,000
- End use jobs created/enhanced; 8,800

Who is Responsible for CWM?

DGS Staff, the Architect, and the Contractor all have a role to play in developing a plan for Construction Waste Management. As noted in the RFP and the DGS Standard A/E agreement, it is a requirement that CWM be included in every DGS project.

Typically, the Architect is responsible for developing the CWM Plan. If the Contractor has experience in writing and/or implementing a CWM plan, the Contractor may assist in developing the plan.

Refer to page 7.8-7.10 for a flowchart that outlines the steps to develop a successful construction waste management plan.

Additional information that will be helpful in developing the plan is included below:

**Identifying Materials for CWM Plan**

Consider the following materials for **reuse or salvage**
- Doors/windows
- Fixtures
- Appliances
- Wood/lumber
- Brick
- Soil
- Plants
- Cabinets/Millwork
- Architectural finishes
- HVAC equipment

Consider the following materials for **recycling in a new construction project**
- Brick
- Metal
- Cardboard
- Drywall
- Asphalt Pavement
- Concrete
- Paint
- Insulation
- Wood
- Glass
- Tile and masonry
- Gypsum
- Beverage containers

The following may be recycled in **renovation projects**
- Ceiling tile
- Carpet and pad
- Plumbing fixtures
- Electronic fixtures and wire
On-site / vs. Off-site Separation

One of the key steps in developing the CWM Plan is determining if construction waste will be sorted on-site or off-site. Some of the key issues and considerations of each option are listed below.

**Site Separation**
On-site separation refers to the sorting of construction waste on-site for delivery to a recycler. On-site separation spreads the cost and benefits of collection, and provides a clean waste stream. This concept of was first formalized by the document WasteSpec which was generated by the Triangle J Council of Governments in North Carolina.

WasteSpec requires that separate material bins be located at the site for recyclables. The general contractor is responsible for verifying that all subcontractors are sorting construction waste from their own activities. It is the general contractor’s responsibility to provide bins or containers and maintain them as part of daily cleaning.

Implementing and enforcing a plan involves careful planning as well as continuing education of all trades in weekly meetings and "tool box" talks.

**Remote Separation**
In this scenario, an independent recycler owns a materials recovery facility (MRF). Typically, an independent recycler underbids a garbage hauler. The independent recycler takes containers of construction waste from the site to recycler’s own plant where separation takes place.
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Many independent recyclers use sophisticated equipment and have access to large sites for the storage of materials until the markets for various materials are more lucrative. Waste haulers may also offer a recycling service. However, the owner and architect must be satisfied that such a firm has a proven track record of recycling in this manner and has the resources required to satisfy the contract requirements. This is a serious issue that often justifies an audit. All participants should be aware of the increased possibility of contamination.

CWM Reporting

A CWM specification should identify CWM expectations, set diversion goals, and define how CWM will be audited. This is the only means by which the owner can be satisfied that construction and demolition waste is being properly recycled.

Site Separation

For site-separation projects, the contractor would be required to generate a form with weight tickets, signatures and other forms of validation that reflect the kind and amounts of materials that have been recycled.

Remote Separation

For remote-separation projects, the recycler should be able to define general percentages of materials as well as their weight. To better facilitate future programs, it is important to quantify and qualify recycling efforts, thereby reinforcing successes and defining failures.

A sample weigh ticket is included on page 7.11.

City Ordinances

Several municipalities have established ordinances to control construction and demolition waste. Some of these cities tie the ordinances to general permits. The City of Dublin requires that each project over $100,000.00 submit a waste management plan detailing how that project will divert 50% of it’s materials from the landfill. Applicants for building or demolition permits involving any Covered Project shall complete and submit a Waste Management Plan (*WMP*), on a WMP form approved by the City for this purpose as part of the application packet for the building or demolition permit. The completed WMP shall indicate all of the following:

1. the estimated volume or weight of project C&D debris, by materials type, to be generated;
2. the maximum volume or weight of such materials that can feasibly be diverted via reuse or recycling;
3. the vendor or facility that the Applicant proposes to use to collect or receive that material; and
4. the estimated volume or weight of C&D materials that will be landfilled.

http://www.stopwaste.org/pr-dublin.html

The California Integrated Waste Management Board (CIWMB) web site links to local government programs, ordinances, contract language, and permit conditions.

There is a sample ordinance from the City of Oakland located at the back of this section.
Project Team Coordination
The single most effective way to ensure success with a construction and/or demolition waste management program is through communication. Experience shows the most effective Project Team coordination includes the following communication components:

On-Site CWM Manager - An on-site CWM operations manager should be appointed. Their responsibility should include verifying conformance with the CWM plan, coordinating proper emptying of containers, and resolving any related issues.

Plan Distribution – Since the CWM plan may effect any department during its’ implementation, the CWM plan should be distributed to all levels of management. People who are informed about a policy early in its deployment are far more likely to become invested in its successful outcome.

Education – Because different groups of people will be working at the site throughout the project duration, it is important that a formal educational presentation of the CWM program be given to all contractors – including subs - prior to their admittance to the job site. The On-Site CWM Manager should review the container locations and relevant sorting procedures with all workers.

Signage – Signage throughout the job site will help increase recovery rates of waste materials. Signs can be used to direct worker’s attention to the appropriate C & D policies, the location and use of the collection receptacles, and the recovery progress to date.
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Monitoring – The On-Site CWM
Operations manager should verify that all team members are sorting their recyclables properly. The success of any recycling program depends on usable recovered materials.

Overcoming Obstacles
The Owner and the Architect or Engineer must take a proactive approach to ensuring success of CWM for the following reasons:
- Monetary savings.
- The construction team will be more likely to fully comply if they witness sponsorship of the CWM plan from management.
- One CWM plan successfully implemented encourages further successful CMW plans.
- It is State law
- It’s good public relations for all involved.

Obstacles will vary depending on the strategies employed during each project:

Logistics – Great effort is often required to determine exactly what should or can be recycled for a project in any given geographical area. Before a CWM plan can be formed, some initial investigation will need to be done for each project.

Infrastructure Constraints - Several issues may hinder a CMW plan. Can the materials be stored on-site until collection? Is there a market for the recyclables nearby? One option to overcome these is to have an on-site public sale of the materials. Another option is vertical integration of materials, whereby the building or demolition company operates a construction company or salvage yard to handle material themselves. Ideally, the material is reclaimed on-site and prepared for re-use in another local building project.

Tracking - It is more difficult to track the quantities of specific recyclables that have not been site- sorted. Since sorting at the time of deposit requires little additional time, it is the most cost-effective way to sort construction waste. Salvage companies pay more for carefully sorted materials, and can more easily provide documentation of what, and how much, is being collected.

Community Benefits
While the benefit to recycling is primarily environmental, it is vital to understand that recycling efforts also reflect commitment to the total economic well-being of a community. Financial returns from recycling continue to increase as supporting industry infrastructures grow. Increased recycling volumes make the process more cost-effective for both supplier and receiver. By providing full, sustained support to recycling enterprises, communities throughout California are realizing enhanced economic returns.

There are also subtle economic returns from recycling. Avoided are the costs of collecting and burying “trash”. The burden of future environmental cleanup and associated public health liabilities is reduced. Recycling also provide new jobs and affiliated industries. Furthermore, communities that are viewed as being environmentally responsible are more likely to attract progressive industries and the workforce to run them.
It is important to look at the whole chain of economic benefits from Construction Waste Management. What may appear to be a break-even venture, in fact has more return for a community than is initially apparent.

Notes:

Resources

http://www.ciwmb.ca.gov/CalMAX

*King County, WA Solid Waste Division*
King County, Washington’s Department of Natural Resources’ Solid Waste Division web site has extensive information on sustainable design and construction waste management.
http://dnr.metrokc.gov/swd/bizprog/sus_build/how_others.htm

*Used Building Materials Association*
The Used Building Materials Association is a non-profit organization which helps companies gather and redistribute building materials. http://www.ubma.org

*California Division of General Services – Energy Management*
WasteSpec a publication with the specification language required to insure CWM compliance, is available from David Weightman, DGS Energy Management Division.
David.Weightman@dgs.ca.gov
This manual is being developed as part of a ten-point plan to implement the Governor's sustainable building goal as outlined in Executive Order D-16-00 and the report Building Better Buildings: A Blueprint for Sustainable State Facilities (Blueprint). Task 7 of the Blueprint calls for developing sustainable building technical assistance and outreach tools, including a training program for state departments, as well as local government and private sector partners. This manual was developed by DGS, the Sustainable building task force, and CIWMB as one component of the sustainable building training program for state departments. This document will be undergoing constant revision as other deliverables outlined in the Blueprint are completed and technological and process breakthroughs advance the rapidly emerging field of sustainable design.