

## **A SYSTEMATIC APPROACH TO MANAGING CONSTRUCTION AND DEMOLITION WASTE ON A UNIVERSITY CAMPUS**

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### **ABSTRACT:**

Institutions across the country are experiencing the largest construction boom since the late 1950's and 1960's. Recently, there have been significant changes in the construction industry with the goal of creating "green buildings". A key, but sometimes overlooked, element of the green building process is the management of construction and demolition waste (C&D waste). The EPA estimates that up to 30% of the solid waste load in the U.S. is C&D waste. This session provides participants with an overview of our systematic approach to managing UVM's C&D waste reduction program. This program grew out of university staff's experience with LEED<sup>TM</sup> standards and Environmental Management Systems. This experience led them to systematize the C&D management practices of LEED<sup>TM</sup> new construction projects in order to extend those practices to other campus projects. This model, developed and tested at the University of Vermont with support from an EPA grant, includes templates intended to be adapted to fit the needs of other campuses

**Keywords:** construction and demolition waste reduction, environmental management systems

### **Introduction**

The construction and demolition waste management program at the University of Vermont was established by a partnership of several campus departments including Capital Planning, Architectural and Engineering Services, and the Physical Plant Department's Recycling and Solid Waste program. This group applied for and received a Regional Resource Challenge Conservation Grant from the Environmental Protection Agency (EPA). The grant was used to improve C&D waste management in order to reduce, reuse and recycle this waste whenever the opportunity presents itself. Before this program was developed, budgetary and deadline stresses often led to the trashing of materials for which recycling options were available. This paper includes a variety of links to information about aspects of C&D waste management at UVM. The goal of an EMS and the C&D waste program at UVM is to show accountability while continuously improving the management system.

## **C&D Waste Program Overview**

### ***History and Context***

UVM's Green Building Program began with a Presidential signature of the policy statement at the 2005 University Convocation. This policy commits the University to using the LEED<sup>TM</sup> guidelines in all of its building projects. Under the LEED silver guidelines at least 75% of material must be diverted from the landfill to gain credit. More recently, program staff realized that including C&D waste management as a standard component of campus projects would further this object. In order to hire consulting help to move this project forward, the program received a grant from the Environmental Protection Agency (EPA) in September of 2006 to develop an Environmental Management System approach to the issue.

### ***Activities***

A data collection/training website has been established to communicate with employees, students, and the general public. The site will contain a tracking tool for waste where weights can be entered in order to track our waste generation efficiently. It will also analyze the Environmental Management System for C&D waste that has just been organized. This will be a way for anyone to learn more information about the program. Lists of materials recyclers and haulers as well as links to important construction and demolition waste websites in Burlington and surrounding areas will help in establishing best management practices for each project. The website will serve as a central place to find any information regarding C&D Waste practices at UVM.

The training PowerPoint is another aspect of the "toolkit" developed to aid UVM project managers and construction managers on the ways UVM manages C&D waste. It can be used by anyone to better understand the C&D waste management program but the intended audience will be project and construction managers. It outlines on-site practices such as proper waste separation and specifications from UVM including a waste management plan for all large projects and a description of how to track the waste generated.

The justification of the use of an EMS and the development of a C&D waste management system outlines the motivations for UVM in implementing these new policies and procedures. It supports the Campus Master Plan and UVM's mission to become a "premier environmental university" including promotion of campus sustainability. This provides a better understanding of why UVM demands certain waste management practices and justifies the use of an EMS.

## C&D Waste Environmental Management System

### *Plan*

- Green Building Policy
- Draft Construction and Demolition Waste Policy
- Training content developed
- Greening UVM

### *Do*

- Money Spent on Disposal
- Material diverted from landfill

### *Check*

- Achievement of LEED credits
- Percentage of Diverted Material

### *Act*

- Pilot Study in the summer to assess tracking tool
- Waste Management Plans
- Waste tracking tool
- C&D waste management specifications written for all projects

## C&D Waste Program Dashboard

Program Indicators	Goals
<u>Number of People Trained</u>	<u>Train at least 75% of employees</u> involved in construction and demolition waste management at UVM in 5 years
<u>Percentage of Material Diverted From Landfill</u>	<u>Divert 75% of all material</u> from the landfill for all large projects in 2 years
<u>Waste Streams Recycled</u>	<u>Increase number beyond current</u> to include all alternative waste disposal options identified by the state and Chittenden
<u>LEED Credits Achieved</u>	Within the next 3 years, all projects must receive all C&D <u>LEED</u> points, for all LEED <u>versions</u>

## C&D Data Entry Page

The C&D data entry page is designed for use by construction managers and UVM project managers to track the amount of waste generated on any construction, demolition, or renovation project. The data gathered from the waste hauled away from the project (i.e. tonnage, cubic yards, etc.) is entered into the web page and recorded. This data is then used to assess the effectiveness of the waste management practices currently used at the university. The progress is quantified on the [C&D Waste Program Dashboard](#).

To aid in recycling and accompany the tracking tool a spreadsheet of local C&D waste vendors was created. As of May 2007 UVM has contacted a number of different vendors, but the list should not be considered comprehensive. Information will be added to the spreadsheet as more is gathered. It contains information regarding location, material specifications, collection procedures, and end use of materials. This spreadsheet should be used in collaboration with other C&D waste hauler databases such as:

[Vermont Agency of Natural Resources database](#)  
the [Chittenden Solid Waste District](#) webpage,  
and/or the [Vermont Green Building Network](#) webpage.

## Environmental Management System Assessment

In the spring semester of 2007 UVM offered an EMS class which taught the workings of the EMS/EcoCampus\* Model as well as reviewing different programs that manage the universities impacts and sustainability. A group of students working with facilitators came up with a baseline environmental assessment of the current C&D waste management practices at the university. The [final report](#) contains different aspects and impacts of C&D waste at UVM, how they are managed, and how the current management fits into the EMS/EcoCampus framework.

To see the report follow this link: [final report](#)

\*The EcoCampus model for higher education uses the EMS framework to assess the performance of any program at the university. It provides incremental steps to improve the program in conjunction with a rating system to recognize successes. To see more about the EcoCampus model follow this link the the [home page](#).

## Project Planning Checklist

### *Project Planning Checklist*

UVM has set a goal to recycle at least 50% of construction and demolition waste. To meet this goal, planning should begin at the earliest stages of project development. Nearly everything in a building can be diverted from the landfill- projects in Vermont have surpassed 90% diversion rates.

Note: All items in bold are available online at this website: <http://www.uvm.edu/~gbc/wiki>

### *1. Determine Scope and Scale of Project*

Projects at UVM can be divided into three tiers, each of which has slightly different procedures for managing Construction and Demolition Waste:

- a) **LARGE PROJECTS** typically have external design consultants, an external Construction Manager/ GC, and include major renovations and new buildings.
  - 1) The RFP for design services shall include information on the Waste Management Plan.
  - 2) The architect or lead design consultant shall use the [Long Form Specification](#) in the bid documents.
  - 3) All material that leaves the site shall be entered into the [tracking database](#) by the UVM project Manager or a designated member of the Construction Management team.
- b) **MID-SIZE PROJECTS** may or may not have design consultants or external construction managers, but there will be subcontracts involved— such as mechanical, electrical, or abatement contractors.
  - 1) If design consultants are to be involved, the RFP for design services shall include information on the Waste Management Plan.
  - 2) Anyone bidding on the project shall receive the [Short Form specification](#) in the bid documents.

- 3) The UVM Project Manager shall develop the waste management plan with the appropriate subcontractors and/or designers, and will be responsible for making sure waste is separated and for entering data into the tracking database.
- c) SMALL PROJECTS are maintenance projects or minor renovations that are handled entirely in house. These projects will follow the short form specifications and the UVM project leader will be responsible for separating and tracking waste and entering data into the [tracking database](#).

## ***2. Project Design Standards***

Prevent waste through the design of the project:

- encourage use of “c2c” (cradle to cradle certified) materials
- minimize finishes
- consider demountable partitions
- consider materials “servicizing”- e.g. leasing furnishings such as carpet, systems furniture, etc.
- Require reclamation of scrap drywall in specs
- Require material suppliers to take back products at end of life cycle
  - Carpet
  - others
- Avoid products and assemblies that are difficult to recycle:
  - Wallpaper
  - Use wood blocking rather than plywood or OSB behind casework
- Avoid hazardous materials
  - Some hydraulic equipment can use canola oil or mineral oil instead of hazardous petroleum based oils.
- Where portions of the building can be considered 'permanent'-such as exterior walls-use durable materials such as masonry, metals, etc. Avoid finishes with short life spans such as EIFS.

## ***3. Determine extent of Demolition***

Most UVM projects are renovation projects, but most new construction projects will involve some demolition, if only buried utilities and/or site clearing. Where there are historical moldings/details, wood trim, moldings, or flooring, or extensive demolition of plumbing or electrical fixtures, an architectural salvage company should be involved. Look for areas where existing infrastructure can remain. It is particularly expensive to demolish load bearing walls, structural elements, and electrical or mechanical infrastructure, especially when that infrastructure serves areas that will remain occupied.

- a) WHOLE BUILDING DEMOLITION/ INTERIOR GUTTING. When an entire structure is to be removed or extensive demolition is expected, a building deconstruction company should probably be engaged.
- b) PARTIAL INTERIOR AND EXTERIOR DEMOLITION. This includes renovation projects that involve an addition or re-work of exterior elements. Depending on size, the project may include a deconstruction company or demolition subcontractor.
- c) PARTIAL INTERIOR DEMOLITION. If a large number of walls are to be removed, a demolition contractor should be engaged. If the demolition involves only finishes and/or equipment, a demolition contractor may not be required.

## ***4. Site Walkthroughs***

For all projects, The UVM project manager, as well as the designer where applicable, should walk through the site as early in the process as possible to identify waste management issues, including:

- i. Site clearing issues
- ii. Location for dumpsters, staging areas, location for storing reusable materials
- iii. Salvageable/ reusable materials. Salvage or re-use is almost always more resource-efficient than recycling or disposal. Salvageable/ reusable materials include lighting and plumbing fixtures, working mechanical equipment, windows/doors and hardware, plumbing fixtures, furniture, cabinetry/ casework, etc.
  - The highest priority should be given to preserving assets that will be useful to the University.

- The next priority should be given to items of value which may be sold, or at least removed at no cost to UVM by an architectural salvage or building deconstruction firm.
- The third priority should be given to items sent to Excess Property for sale.

### **5. Waste Management Plan**

All large and mid-size projects (see #1, above) will need a Waste Management Plan approved by the Green Building Coordinator and the Recycling, Solid Waste & Surplus Manager. The plan shall include:

- i. Target for percentage, by weight, of material to be recycled.
- ii. Abatement requirements and abatement schedule
- iii. Staging areas, scheduling, and other planning for re-usable and salvageable items. If extensive salvage and re-use is anticipated, there should be a plan to tag salvage/reuse items.
- iv. Number and types of dumpsters required. Consider multi-compartment dumpsters. Dumpsters shall use signage available on the green building coordinator website referenced at the top of this document.
- v. Anticipated use of Centennial facility for items which can be recycled but where there is not enough material in the scope to warrant a dumpster.
- vi. Plans for specialty recycling, such as carpet or asphalt shingles, which cannot be recycled locally.
- vii. Training dates for all contractor and subcontractor staff.
- viii. The person responsible for tracking demolition waste.

### **References**

Carrigan Deconstructed to Make Way for New Student Center  
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Building - Related C & D Waste Characteristics  
<http://peakstoprairies.org/p2bande/Construction/C&DWaste/whatsC&D.cfm>