



CONSTRUCTION & DEMOLITION WASTE MANAGEMENT BEST PRACTICES MANUAL

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Waste Reduction, Reuse and Recycling Grant #2015001

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Beginning in January 2015, EcoStores Nebraska, with the help of a grant from the Public Works Department of the City of Lincoln, embarked upon a project to study construction and demolition waste in the Lincoln area. The project envisioned a 12 month feasibility/demonstration study for the establishment of public policy and practices for a Lincoln based Construction & Demolition Waste Management System. The study was performed and directed by EcoStores Nebraska with the new "Lincoln/Lancaster County Coalition for Construction Waste Management." The following construction/demolition companies participated in the Coalition: Ayars & Ayars Construction; Kingery Construction; Sampson Construction, Speedway Properties/ NGC Construction and special advisor, Dale Gubbels with First Star Fiber. Each coalition member provided a project for the purpose of this study as detailed below:

COALITION MEMBER:	C & D MANAGEMENT SITE NAME:
Ayars & Ayars	Bison Sports Project
Kingery Construction	St. Patrick's Church Demo (subcontractor-Gana)
Sampson Construction	Sandhills Publishing Project
Speedway Properties	Nebraska State Historical Society (sub-NGC)

The following pages will take a closer look at recycling, specifically for the construction and demolition industry, as well as current trends and environmental benefits associated with construction site recycling and waste management. A step by step best practices guide for construction and demolition waste management, some cost analysis of recycling versus not recycling, and diversion numbers from the above listed projects are also included. As a nation, municipal solid waste accounts for 59% or 243 million tons of waste deposited in our landfills annually, the other 41% or 170 million tons of waste in our landfills is generated from building related C & D waste. (source-EPA, WasteCap Resource Solutions, Inc.) Five of the top ten components in landfills are generated by the building industry. They are, in order; wood (8.9%); roofing shingles (5.8%); metals (4.9%); cardboard (3.9%); Rock/concrete/brick (1.7%), throw in recyclable paper (6.9%) and plastic (5.7%) and you can bump that figure to 7 out of the top 10 from C & D waste. (source-WasteCap Resource Solutions, Inc.) Using the following chart you can calculate estimated amounts of debris that a project will generate.

Estimating Amounts of Debris Generated		
	<i>EPA Estimate</i>	<i>WasteCap Resource Solutions and National Association of Home Builders Estimates</i>
Commercial Construction Debris	3.89	5.44
Commercial Demolition Debris	155	---
Residential Construction Debris	4.38	4
Residential Demolition Debris	61	---

measured in pounds per square foot of construction (WasteCap Resource Solutions, Inc.)

Looking at these figures alone it is easy to answer the question "why recycle?" C & D recycling will greatly reduce the burdens on our landfills and it is good for the environment. Recycling promotes sustainable building, saves natural resources and is "the right thing to do." Companies that routinely recycle on their job sites find it easy and not time consuming, they realize savings in reduced disposal costs and find that recycling sites tend to be safer and more efficient work sites.

Currently more and more cities, counties and states are requiring recycling and documentation of recycling for their C & D projects. More contractors are realizing the benefits to project recycling and are setting company-wide goals to do so. Architects and developers are beginning to specify recycling on their projects and contractors say that sustainable construction waste management is the most important green building practice behind energy efficiency. (source-McGraw Hill/WM 2009, WasteCap Resource Solutions, Inc.)

It is obvious from the above statistics and statements that reducing, reusing and recycling helps save valuable natural resources, energy and raw materials. So why aren't more construction companies better managing their waste? As we found out in our study, there are many misconceptions about C & D waste management. Mainly, companies are apprehensive about change and don't want to alter the way they have always done things. They think that implementing a viable recycling program would be costly and time consuming. It would be too hard to coordinate all the sub-contractors and get everyone on the same page. These are just a few of the misconceptions/excuses that we heard as we assembled the coalition for this study, however, as the study progressed all of the companies seemed to embrace the idea of recycling and when presented with a plan and a recycling goal they found it to be quite easy.

During our yearlong study of the four projects provided by the coalition members, were able to divert 676.97 tons of C & D waste from our landfill. This chart shows the breakdown of materials diverted.	Material Diverted (Tons)	
	Brick/Concrete	635.98
	Cardboard	1.19
	Drywall	2.27
	Metal	15.49
	Plastic	1.10
	Wood	20.94
	GRAND TOTAL	676.97

The average landfill tipping fee per ton across the United States is \$49.78 and the average in Nebraska is \$31.13 (Green Power Inc. 2013). According to the Solid Waste Management Division the current tipping fee for the Lincoln/Lancaster County Landfill is \$28.75 (as of March 2016). Looking at some simple economics these four companies combined saved \$19,462.89 in tipping fees alone by NOT taking the above items to the landfill (676.97 X \$28.75 = \$19,462.89). We can also add in another \$1,316.65 for the return gained on scrap metal at \$85.00 per ton (as of March 2016) and our total rises to \$20,776.54. If we divide this number by our four

coalition members we get an average savings/income per member of \$5,194.88. While this number may seem small, keep in mind that the savings realized is proportional to the project size and the percentage of materials diverted, as illustrated in the following analysis of the Weston 4 Power Plant in Rothschild, WI, October 2004 - August 2009. (source-WasteCap Resource Solutions, Inc.)

CASE STUDY

CONSTRUCTION

Weston 4 Power Plant

Rothschild, WI, Oct. 2004 – Aug. 2009

Wisconsin Public Service Corporation

Material	August 2008 Volume (yd ³)	To Date Volume (yd ³) October 2004 – August 2008	August 2008 Weight (tons)	To Date Weight (tons) October 2004 – August 2008
Scrap Metal	600.2	22,344	72.57	2,756
Untreated Wood	298.9	21,649	36.58	1,748
Concrete	0	4,153	0	2,371
Asphalt	0	996	0	697
Clean Fill	0	3,570	0	1,883
Cardboard	0	3,960	0	100
Drywall	0	61	0	15
Plastic	1163	1,193	13.95	17
Total Recycled	2,091.5	57,954.7	124.8	9,587.8
Trash	120	23,536	14.96	2,044.3
% of debris recycled:	94.57%	71.12%	89.3%	82.43%

Income/savings by recycling: \$721,765.51

Construction Phase

9,587 TONS REUSED AND RECYCLED



During its construction, the Weston 4 project recycled more than 80% of its waste. That means that for every 5 pounds of waste generated at W4, 4 pounds of it were recycled. The project goal was to recycle 60% of its waste.

Included in the total tons of recycled material are:

2,291 tons of metal – enough metal to build more than 1,200 automobiles

1,566 tons of wood – enough wood to build more than 100 average homes

91 tons of cardboard – enough to save more than 1,500 trees

The Weston 4 project is one of the largest and most successful construction waste recycling projects ever undertaken in Wisconsin.



Steps to Setting up a Construction or Demolition Debris Reuse and Recycling Program

Setting up a successful C & D waste management program starts with commitment and ends by celebrating your successes.

I. Commit

- A. Commit to reuse and recycle. Someone with overall-project authority (owner, construction manager, general contractor) must commit to recycling. He/she can issue a statement explaining that construction waste recycling is important to the project and why. (This statement can be used many ways-in worker training materials, in news releases and other communications).
- B. Put recycling specifications into all contracts.
- C. Establish who will control the debris. Establish one project authority, usually the construction manager or general contractor, to control all project waste. Provide dumpsters and waste services for the project. Enforce recycling rules with all contractors.
- D. Include waste reduction, reuse and recycling from the start.
 - 1. Order materials just in time, send back extra inventory, utilize reused building materials, and consider ways you can reduce and reuse waste during construction and put these methods into contracts.
 - 2. Ask suppliers to reduce packaging, send you recyclable packaging or take packaging back.
 - 3. Discuss and encourage reduction, reuse and recycling at pre-construction meetings.
- E. Select a coordinator - designate a staff member (typically construction project manager with the cooperation of the site superintendent) to promote and monitor the recycling program. The coordinator will educate staff and subcontractors

II. Identify Target Materials

- A. Identify target materials at the job site that can be recovered from the waste stream during construction/demolition and during site preparation. What are you using whose waste could be recycled? What packaging do you expect on site? Identify materials that may be able to be recycled, including:

- | | |
|-------------------|--|
| 1. Asphalt | 8. Metal |
| 2. Bricks | 9. Office paper |
| 3. Cans & Bottles | 10. Paper |
| 4. Cardboard | 11. Reusable (<i>wood, bricks, counters, sinks, toilets, fixtures, etc.</i>) |
| 5. Carpet and Pad | 12. Shingles |
| 6. Concrete | 13. Wood |
| 7. Gypsum Drywall | |

III. Select Markets

- A. Write request for proposal for waste hauling and recycling and select hauler(s). Decide what will happen to targeted materials--who will haul what material to what market?
- B. Develop vendor list for your area. Consider allowing more than one hauler to service your site. (For example, many projects send out a separate request for proposal and have a separate hauler for scrap metal)
- C. Write request for proposal. Ask:
 1. What materials they accept and how they must be prepared
 2. What happens to materials after they are collected (ask for specifics on location of markets and what your recyclables will get made into)
 3. For documentation of recycling and trash quantities and weights provided monthly to be part of the service
 4. For education of crews and dumpster signs to be part of the service
- D. Allow for haulers to bid on (and not bid on) specific materials. For example, not all haulers have access to markets for wood recycling. You can include it as an option in your request for proposals.
- E. Select haulers and make arrangements for dumpster sizes and collection.

IV. Write Waste Management Plan (to include)

- A. Description of the project and identification of the construction waste plan manager
- B. Goal for the percentage of waste to reuse and recycle
- C. Analysis of the projected types of job site waste to be generated, including types and quantities
- D. Targeted materials for reuse and recycling
- E. Responsible parties for various recycling operations (calling in dumpsters, monitoring, educating, documenting)

- F. Trash and recycling service provider(s)
- G. End markets for all targeted materials, such as EcoStores Nebraska for materials that would normally go to the landfill, but still have years of useful life remaining.
- H. Educational and motivation plan
- I. Waste auditing procedures
- J. Documentation procedures

V. Make Decisions on Site Logistics

- A. Determine where to place dumpsters on site, how many what type are needed, and when they will be needed. ***Make sure to put a trash container near recycling containers or the recycling containers will be contaminated with trash.*** If it is a very crowded site, you may only be able to fit dumpsters for those materials being generated in the largest quantity. Throughout the project, consider what scrap materials will be generated and order dumpsters accordingly.
- B. Determine how to move recyclables and trash around the site. How will the trash and recyclables get into the correct containers? Who is responsible?

VI. Monitor

- A. Periodically check the containers to ensure that the proper materials are going into them. If problems exist, find the person or people responsible and instruct them on how to properly participate.

VII. Educate and Train

- A. Make sure that every new person that comes onto the site is educated about the recycling program. Include waste into your training program. Educate them before or right as they come onto the site. Provide a one page handout to crews as a reminder of separation requirements.
- B. Set aside time to explain the program to all subcontractors at the site, and instill in them that it is their responsibility to ensure that their laborers participate.
- C. Bring up waste management at every job site meeting. Reminders are important. Provide feedback to workers.
- D. Post clear signs. It is essential to the success of the recycling program that each dumpster is clearly marked. Your hauler may help provide signs.

E. You can create a sign for the fence which promotes success in the program to the public and reminds crews every time they come onto the site that yours is a recycling site. Tracking month-by-month progress can help to motivate crews to reach your recycling goals.

VIII. Document

- A. Track all materials taken off site for reuse, recycling or solid waste.
- B. Ask haulers to provide you with records, at least monthly of how much material is being removed, by weight and volume, at what cost.
- C. Provide these numbers to the owner, architect, contractors and others on an ongoing basis throughout the project.

IX. Make Adjustments

- A. Obtain contamination reports from haulers and communicate regularly with the haulers to find out how your crews are doing. Provide this information to your crews.
- B. Do a final analysis which tells you whether you saved money or spent extra in disposal costs by recycling and tells you exactly how many tons and cubic yards of resources you saved
- C. Evaluate the program and make it even better next time!

X. Celebrate Success

- A. Promote success in the program to managers, subcontractors, clients and the public. For example, one contractor took his employees on a company sponsored fishing trip with the funds from recycling steel.

(Source-WasteCap Resource Solutions, Inc.)

Currently, Nebraska has no state wide, county, or city ordinances that mandate C & D recycling. This is not the case in other parts of the country. The state of California has mandates in place for C & D recycling and cities across that state have embraced these mandates. The city of Brawley, CA is a rural town with a population of approximately 20,000 people. Their ordinance establishes a mandatory construction and demolition debris recycling program. The C & D diversion program is administered by the city's public works department and is applicable to all construction projects with a value greater than \$50,000, or demolition projects greater than 1000 square feet. The ordinance requires both a deposit and an administration fee, the submission of a project site recycling plan, and self-reports based on the recycling plan. Although this ordinance was created specifically to comply with the California state diversion

requirements, the program goals and language is transferable to a variety of localities. It is a good example of how to establish a C & D waste diversion program in smaller, rural communities. On a larger scale, the city of Chicago also mandates C & D recycling. Their program is three fold; keep track of C&D debris that is generated on project sites, recycle at least 50% of recyclable debris that is generated and submit a recycling compliance form to the department of public health at the end of each project, along with an affidavit from the waste hauler or recycler. These statewide mandates and city ordinances are quickly becoming the norm rather than the exception.

We would like to thank all of the coalition members for their willingness to embrace this study as a grass roots effort for the establishment of public policy and practices for a Lincoln based construction and demolition waste management system.

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Helpful Links:

<http://ecostoresne.org/>

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

WasteCap Nebraska Recycling Guide - <http://www.wastecapne.org/recycling-guide/>

References:

Construction and Demolition Debris Recycling Training and Accreditation Toolkit
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