

# Construction & Demolition Materials Research Project



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## Introduction

# Challenging Materials for Recycling and Reuse

In research conducted during a previous project funded by the St. Louis-Jefferson Solid Waste Management District and the Missouri Department of Natural Resources, USGBC-Missouri Gateway and its partners found that some C&D materials are more difficult to reuse or recycle than others. This research project explores solutions for those as well as opportunities for putting C&D materials to a higher use.

St. Louis currently has effective and profitable processes in place for recycling several types of C&D waste:

- Carpet
- Ceiling tiles
- Clean concrete
- Clean wood
- Co-mingled “traditional” – paper, aluminum, plastics, cardboard
- Roof shingles
- Scrap metal
- Yard waste

However, there are still large quantities of C&D materials going to the landfills that are not being recycled or reused, as they are either contaminated or difficult to process. Based on a series of two focus groups with local members of St. Louis’ construction and demolition community in 2011 as well a follow up survey in Fall 2012, the materials identified as the most difficult to recycle in this region are:

- Drywall
- Concrete
- Wood
- Brick (Crushed or 3-hole)
- Paint
- Plastic Wrap - LDPE #4 (stretchy, soft) or PP #5 (crinkly)
- Plastic Fencing - PVC #3
- Plastic Banding - PET #1
- Plastic Buckets - PET #1 , HDPE #2 , or PVC #3

# Contaminated Drywall, Concrete and Wood

Contaminated C&D materials present a largely insurmountable challenge towards recycling due to concerns with air, soil and groundwater contamination. There are currently very few viable local or national options for recycling contaminated drywall, concrete or wood.

## **Drywall**

In older buildings lead or asbestos contaminated drywall is common. A general rule of thumb is that drywall from buildings constructed before 1979 is likely contaminated with asbestos or lead-contaminated paint. Currently, there is no known process to remove paint or other substances from the drywall in an efficient and cost-effective way. Grinding of the drywall creates dust, which, if contaminated with asbestos or lead, can pose serious health risks.

## **Concrete**

Concrete is not always coated, allowing for several opportunities for reuse and recycling. However, when painted or otherwise coated, concrete is generally rendered useless for recycling due to potential contamination.

Also, when recovered from buildings, concrete often has rebar or other structural elements embedded within it, which eliminates recycling as a cost effective option.

## **Wood**

Wood is often treated with paint, stain and/or with heavy-metal-laden chemicals, such as CCA (Chromated Copper Arsenate), which add water and mold resistant properties. Wood often contains nails or other fasteners. Although lead has been banned from household paints in the United States since 1978. If a structure was built before 1978 and hasn't been renovated, it's likely the paint contains lead.

Painted or treated wood is generally not recyclable. If burned, toxic fumes would be emitted to atmosphere. If added to the soil, it can pollute ground or surface waters or plants in soil. The best current solution is to bury wood in a permitted landfill according to the Resource Conservation and Recovery Act (RCRA).

There is, however, great promise in new research in *Wood to Liquid*, a liquefaction process that recycles all woods, treated and painted, being studied at the LSU Agricultural Center's Calhoun Research Station.<sup>1</sup> The end products are the chemicals originally used to treat the wood as well as nontoxic liquefied wood that can be used for resins, molded wood products, foams and plastics.

## Local C&D Recycling Resources - Summary

	Brick - Crushed	Brick - 3 Hole	Concrete - Clean	Drywall - Clean	Wood - Clean	Paint Cans - Full	Paint Cans - Partial	Plastic Banding - PET #1	Plastic Buckets - PET#1, HDPE#2, PVC#3	Plastic Fencing - PVC #3	Plastic Wrap - LDPE #4	Plastic Wrap PP #5
Baden, Inc.										X		
Earthbound Recycling						X	X		#1			
Eco Recycling, Inc.			X	X	X				X	X	X	
Habitat for Humanity-St. Louis ReStore		X		X	X	X			X			
Hansen's Tree Service				X	X							
PLM, Inc					X			X	X		X	X
Republic Services										X	X	
St. Louis Composting				X	X							

For a comprehensive list of C&D recycling resources, please visit ReSource St. Louis' Local Recycling Resources page.<sup>ii</sup>

# 1. Drywall

Drywall (also known as plasterboard, wallboard or gypsum board) is a panel made of gypsum plaster pressed between two thick sheets of paper. It is used to make interior walls and ceilings. Drywall contains gypsum, quartz), dolomite, anhydrite, portlandite, and calcite.<sup>iii</sup>

## REUSE

- **Reused Drywall** - If dismantled with care, drywall can be reused in its entirety for a new wall.

## RECYCLING

- **Animal bedding** – Gypsum has been found to be more absorbent than sawdust or shavings; and also has bacterial suppressant qualities.<sup>iv</sup>
- **Compost** - After being ground, scrap gypsum drywall can be used as a bulking agent for compost.
- **Crop Nutrients** - Gypsum may provide a source of sulfur, calcium, and other nutrients to crops and reduce acidity. Only regular ½” drywall, Type X drywall, and Plaster Base (standard blue board) may be used for a soil amendment.<sup>v</sup>
- **New drywall** - After being ground and mixed with virgin gypsum, recycled content can be once again be re-manufactured into new drywall indistinguishable in performance from virgin-manufactured drywall.
- **Portland cement** - Gypsum is a raw ingredient in Portland cement manufacturing.
- **Water treatment** - After being ground and worked into the land, gypsum can help improve workability, water penetration, and texture of clayey soils; increasing the shear strength of the soil.

## LOCAL RECYCLERS

Company	Condition	Drop-off Fee	Pick-up Fee	Re-sale Product	Re-Sale Pricing	Website
Eco Recycling, Inc.	Clean only	\$75/ton	Will bid	Base material	Call for pricing	<a href="http://ecorecyclinginc.com">http://ecorecyclinginc.com</a>
Habitat for Humanity-St. Louis ReStore	Clean, whole sheets only	Free	N/A	Used drywall	Varies	<a href="http://www.habitatstl.org/supportus/restore/">http://www.habitatstl.org/supportus/restore/</a>
Hansen's Tree Service	Clean only	\$7/yard	Will bid	Compost ingredient	\$23/yard (compost)	<a href="http://www.hansenstree.com/">http://www.hansenstree.com/</a>
St. Louis Composting	Clean only	\$35-45/load	Will bid	Compost ingredient	\$18-39/yard (compost)	<a href="http://www.stlcompost.com/">http://www.stlcompost.com/</a>

## NATIONAL BEST PRACTICES

**Lafarge<sup>vi</sup> gypsum plant** in Buchanan, NY, is completing an upgrade that will allow their drywall product to exceed 99% recycled content by weight and contribute to Materials and Resource credits in the LEED Green Building Rating System. The Lafarge facility also accepts synthetic gypsum from **Mirant Corporation<sup>vii</sup>**, which provides a reliable supplier agreement for a cost-effective feedstock.

## RESOURCES

- **DrywallRecycling.org<sup>viii</sup>** provides a general online resource for gypsum-based sheet board.
- **Earth 911<sup>ix</sup>** has more tips on reusing gypsum drywall.
- **Gypsum Association<sup>x</sup>** provides full life-cycle info<sup>xi</sup>, including reuse.
- **State of Vermont<sup>xii</sup>** has published a report on regional wallboard recyclers.

## 2. Concrete

Concrete is a mixture of cement, fine aggregate, coarse aggregate, water and air. Concrete is used in a variety of construction applications, such as architecture, pipes, pavement, and masonry, and is considered an integral component in today's infrastructure.<sup>xiii</sup> Cement is composed of calcium, silicon, aluminum, and iron and serves as the binding material for concrete.

### REUSE

Due to its necessary destruction during dismantling, it is not possible to reuse concrete as-is.

### RECYCLING

When recovered from buildings, concrete often has rebar or other structural elements embedded within it, which can limit recycling as a cost effective option. Local markets for recycled concrete depend on the presence of local construction and road building markets<sup>xiv</sup> and on the availability of substitutes such as lime rock.<sup>xv</sup>

- **Building Foundation** – Concrete can be crushed and reused as foundation. This is a primary market for recycled concrete.
- **Drainage** – Crushed and combined with brick.
- **Portland cement** – Crushed and combined with a virgin aggregate in new concrete or used as aggregate in a sub-base layer
- **Road base** – Crushed concrete is often combined with asphalt or brick to create road base.
- **Structural fill** – Crushed concrete combined with brick may cost 20% - 30% less than natural aggregate fill<sup>xvi</sup>. This is a primary market for recycled concrete.

### LOCAL RECYCLERS

Company	Condition	Drop-off Fee	Pick-up Fee	Re-sale Product	Re-Sale Pricing	Website
Eco Recycling	Clean only	\$75/ton	Will bid	Base material	Call for pricing	<a href="http://ecorecyclinginc.com">http://ecorecyclinginc.com</a>

### NATIONAL BEST PRACTICES

- **Recycled Material Company** has recycled over 25 million tons of concrete and asphalt into various aggregate products.<sup>xvii</sup> RMC is based in Colorado and California, but has achieved an international market presence. Recycled aggregate products include road base, pipe bedding, structural backfill, landscape stone, drainage rock, and soil amendment.
- **Stapleton International Airport**<sup>xviii</sup> in Denver, CO recycled 6.5 M tons and created an “urban quarry” for public construction projects.<sup>xix</sup>

### RESOURCES

- **ConcreteRecycling.org**<sup>xx</sup> is a website hosted by the Construction Materials Recycling Association and presents information and case studies on concrete recycling.
- **Environmental Council of Concrete Organizations**<sup>xxi</sup> (ECCO)'s catalog includes several publications on concrete recycling issues
- **Portland Cement Association**<sup>xxii</sup> (PCA) is actively working to promote beneficial uses of CKD through its ongoing research efforts and continuous improvement program.<sup>xxiii</sup>
- **University of New Hampshire Recycled Materials Resource Center**<sup>xxiv</sup> is a national center that promotes the wise use of recycled materials (pavements, secondary, waste, byproduct materials) in the highway environment.

### 3. Wood

Clean wood in construction is most often found in wall and product framing and shipping pallets. Wood waste by almost all account constitutes 40-50% of the volume of the residential new construction waste stream. The most common reuse option for C&D wood is as fuel in industrial boilers or co-generation plants.<sup>xxv</sup>

#### REUSE

- **Lumber** – General lumber, but also specialty wood species or vintages recovered from deconstruction projects.

#### RECYCLING

- **Animal bedding** – Shavings, chips, sawdust, and shredded wood waste can be used as an absorbent in litter.
- **Compost or mulch** – after being chipped or ground.
- **Down-cycled wood products** –plywood, oriented strand board, and wood I-beams.
- **Industrial fuel source** – Lower grade wood waste can be utilized as a fuel source in boilers or co-generation plants.
- **Landfill cover** – Chipped or ground wood waste from contaminated or painted board can be reused as alternative daily landfill cover.

#### LOCAL RECYCLERS

Company	Condition	Drop-off Fee	Pick-up Fee	Re-sale Product	Re-Sale Pricing	Website
Eco Recycling	Clean only	\$75/ton	Will bid	Base material	Call for pricing	<a href="http://ecorecyclinginc.com">http://ecorecyclinginc.com</a>
Habitat for Humanity- St, Louis ReStore	Clean lumber only	Free	N/A	Used drywall	Varies	<a href="http://www.habitatstl.org/supportus/restore/">http://www.habitatstl.org/supportus/restore/</a>
Hansen's Tree Service	Clean only	\$7/yard	Will bid	Compost ingredient	\$23/yard (compost)	<a href="http://www.hansenstree.com/">http://www.hansenstree.com/</a>
PLM, Inc.	Pallets only	WILL PAY \$0.50-\$4.50 per pallet	Will bid	Refurbished pallets	\$37.50 and up	<a href="http://www.plmgt.com/">http://www.plmgt.com/</a>
St. Louis Composting	Clean only	\$35-45/load	Will bid	Compost ingredient	\$18-39/yard (compost)	<a href="http://www.stlcompost.com/">http://www.stlcompost.com/</a>

#### NATIONAL BEST PRACTICES

Wood is commonly diverted from landfills today as there is profit to be made on the part of a contractor or municipality to sell wood waste to mulch processors and pocket the savings from landfill tipping fees.<sup>xxvi</sup>

#### RESOURCES

- **General Reports<sup>xxvii</sup> on Best Practices for Wood Waste** – Clean Washington Center.
- **Quality Specifications<sup>xxviii</sup> for Animal Bedding Wood Waste Reuse** – Clean Washington Center.
- **Successful Approaches to Recycling Urban Wood Waste<sup>xxix</sup>** - USDA

## 4. Brick (crushed and 3-hole)

Locally made clay bricks have been an important commodity in St. Louis for centuries, fetching high profits locally and nationally. There are lesser forms of bricks, however, which are not as useful in today's market and are generally discarded – whole bricks that have been broken or 3-hole bricks.

### REUSE

- **Whole bricks** – intact 3-hole bricks can be reused

### RECYCLING

- **Asphalt Concrete** – Crushed brick of various grades can be recycled into concrete or hot asphalt mix for roadway construction projects.
- **Exterior Fill** - Crushed for backfilling garages and retaining walls.
- **Mulch** - Crushed bricks can be recycled into weed control and outdoor improvement products; including garden bed mulch, gravel for pathways and driveways, and well as surfacing red porous tennis courts.
- **Outdoor Pavers** – Crushed brick can easily be reformed into new pavers of various size and shape.
- **Roadway Sub-Base** – When used as sub-base for roadways, crushed brick is highly resilient and capable of absorbing road impact.

### LOCAL RECYCLERS

Company	Condition	Drop-off Fee	Pick-up Fee	Re-sale Product	Re-Sale Pricing	Website
Habitat for Humanity-St. Louis ReStore	Whole 3-hole bricks only, depending on need	Free	N/A	Used bricks	Varies	<a href="http://www.habitatstl.org/supportus/restore/">http://www.habitatstl.org/supportus/restore/</a>

### NATIONAL BEST PRACTICES

**Interstate Brick<sup>xxx</sup>** boasts several varieties of custom-sized bricks, including bricks made from 100% post- and pre-consumer brick. Interstate Brick is based in Utah, and has a complete Eco-Friendly Brick Line composed of both structural and paving bricks.

## 5. Paint

Paint remains one of the most common finishing treatments used to protect indoor and outdoor surfaces and provide color.

### REUSE

- **Paint** – Reusable paints of the same color can be mixed, tested, adjusted, and resold.

### RECYCLING

- **Cement additive** – an ingredient in the manufacture of cement

### LOCAL RECYCLERS

Company	Condition	Drop-off Fee	Pick-up Fee	Re-sale Product	Re-Sale Pricing	Website
Earthbound Recycling	Full or partial cans	\$0.25/lb	N/A	Used paint	Free (for global charities)	<a href="http://www.earthboundrecycling.com/">http://www.earthboundrecycling.com/</a>
Habitat for Humanity-St. Louis ReStore	Full cans only	Free	N/A	Used paint	Varies	<a href="http://www.habitatstl.org/supportus/restore/">http://www.habitatstl.org/supportus/restore/</a>

### NATIONAL BEST PRACTICES

- **Global Paint for Charity** collects leftover paint from both residential households and commercial businesses nationwide and uses it for global housing rehabilitation projects such as homes, schools, hospitals, jails and churches.<sup>xxxi</sup>

## 6. Job Site Plastics

### 6.1 Plastic Wrap - LDPE #4 (stretchy, soft) or PP #5 (crinkly)

**#4 LDPE** (Low Density Polyethylene) is typically used in plastic bags, and products such as outdoor furniture, siding, floor tiles, shower curtains, shipping totes, waste and storage containers, clamshell packaging and for wrapping pallets.

**#5 PP** (Polypropylene) has good resistance to heat and is used to create flexible and rigid packaging, film, textiles, and custom containers and for wrapping building products.

#### REUSE

- **Plastic wrap** - can be reused as long as structural integrity is maintained.

#### RECYCLING

- **Polyethylene modified asphalt concrete<sup>xxxii</sup>** - Processed and powdered LDPE has been tested for use as a binder in asphalt concrete.

#### LOCAL RECYCLERS

Company	Condition	Drop-off Fee	Pick-up Fee	Re-sale Product	Re-Sale Pricing	Website
Eco Recycling	#4 only	\$75/ton	Will bid	N/A	Varies	<a href="http://ecorecyclinginc.com">http://ecorecyclinginc.com</a>
PLM, Inc.	#4 and #5		Will bid			<a href="http://www.plmgt.com/">http://www.plmgt.com/</a>

#### NATIONAL BEST PRACTICES

Baled LDPE and PP should not be stored outdoors in weather and sunlight for over a month to prevent damaging the commodity.

## 6.2 Plastic Fencing - PVC #3

**Polyvinyl Chloride (PVC)** - A family of co-polymers, also known as vinyl. PVC is used to make products such as pipes, bottles, upholstery, and automotive parts. Industrial sources, agricultural applications and demolition of buildings will generate most PVC waste.

### REUSE

- **PVC fencing** - can be reused almost infinitely as long as structural integrity is maintained.

### RECYCLING

- Any fencing with a #3 stamp can be recycled at participating recycling facilities.

### LOCAL RECYCLERS

Company	Condition	Drop-off Fee	Pick-up Fee	Re-sale Product	Re-Sale Pricing	Website
Eco Recycling		\$75/ton	Will bid	N/A	Varies	<a href="http://ecorecyclinginc.com">http://ecorecyclinginc.com</a>

### 6.3 Plastic Banding - PET #1

**#1 PET (or PETE, Polyethylene Teraphthalate)** is a thermoplastic material used to manufacture plastic soft drink containers and other rigid containers and materials.

#### REUSE

- **Plastic banding** – can be reused as long as structural integrity is maintained.

#### RECYCLING

Unless contaminated by metal clips and/or staples, plastic banding is easily recyclable. In some cases, it requires special recycling equipment to prevent it from getting caught in conveyors. There are different grades of plastic banding, so when marketing for resale, it is best to be as descriptive as possible on color and any markings or writing. In general, green/transparent banding is most likely PET. If there are other colors present, it is probably a PP/PET mix. Some plastic banding may be marked “AAR” (railroad approved).

- **Carpet**
- **Clothing, such as fleece**
- **Polyester fiber fill**

#### LOCAL RECYCLERS

<b>Company</b>	<b>Condition</b>	<b>Drop-off Fee</b>	<b>Pick-up Fee</b>	<b>Re-sale Product</b>	<b>Re-Sale Pricing</b>	<b>Website</b>
PLM, Inc.	Truckload only, chopped or baled	varies	Will bid	Sold to recyclers	Market price	<a href="http://www.plmgt.com/">http://www.plmgt.com/</a>

## 6.4 Plastic Buckets - PET #1, HDPE #2, or PVC #3

**High Density Polyethylene (HDPE)** is a plastic resin material used in the manufacturer of milk jugs, butter and yogurt containers, detergent bottles, plastic lumber and construction buckets.

### REUSE

- **Plastic Buckets** - reused

### RECYCLING

It is currently most cost effective to ship plastic buckets to China for recycling there.

### LOCAL RECYCLERS

Company	Condition	Drop-off Fee	Pick-up Fee	Re-sale Product	Re-Sale Pricing	Website
Earthbound Recycling		\$0.25/lb	N/A	Used buckets	Free	<a href="http://www.earthboundrecycling.com/">http://www.earthboundrecycling.com/</a>
Eco Recycling	Mostly clean	\$75/ton	Will bid	Broker sells out of country	~\$30/ton	<a href="http://ecorecyclinginc.com">http://ecorecyclinginc.com</a>
Habitat for Humanity-STL ReStore		Free	N/A			<a href="http://www.habitatstl.org/supportus/restore/">http://www.habitatstl.org/supportus/restore/</a>
PLM, Inc.			Will bid			<a href="http://www.plmgt.com/">http://www.plmgt.com/</a>

## 7. Other Locally Recycled Materials

	Asphalt (incl. millings)	Asphalt Roof Shingles	Batteries	Brick (whole, crushed)	Carpet	Chemical Containers	Dirt	Electronics - All	Electronics - Portable	Furniture	Lighting	Lumber	Metal	Organic Fill	Pallets	Refrigerators	Salvageable Materials	Window Glass
Ameren Missouri																X		
Batteries Plus			X						X		X							
Earthbound Recycling													X					
EcoRecycling	X	X		X			X											
eCycle								X	X									
Flooring Systems, Inc.					X													
Furniture and Metal to Food										X			X				X	
Green Earth Waste Recovery													X					
Habitat for Humanity-St. Louis ReStore										X							X	
Midwest Recycling & Shredding Inc.		X																
National Recycling													X					
Perhat Lumber	X			X								X					X	
PLM															X			
Route 66 Organics														X				
Strategic Materials																		X
Tri-Rinse						X												
Veolia Environmental Services								X			X							
World Metal Buyers			X										X					

For a more comprehensive list of construction & demolition waste resources in Missouri, please see: <http://goo.gl/maps/Eck24>

## 8. Appendix

### **Conclusion**

There were several important conclusions reached as a result of this study.

First, even though St. Louis lacks in abundant formal commercial construction recycling options, there is a lot being done now that is economically viable and effective in our fast-paced and competitive commercial markets.

Also, Eco Recycling clearly stands out as a significant resource in this region that should be promoted as a model for others.

Finally, there is clearly monetary value for even the most challenging commercial construction materials in our region – the subject of this study. Even though it is still cheap and easy to simply send materials to our landfills, recycling and reuse is now being managed at a truly competitive rate.

Therefore, we propose a next step for this study – to invite all those currently active in commercial construction waste recycling and reuse (identified in this study), current landfill waste haulers, and current residential recyclers to a round-table discussion. We believe there might be important process lessons to share, critical financial models to examine and the potential for discussion about partnerships and other efforts supporting the development of even more facilities in our region to handle a growing demand for construction waste management.

### **Study Methodology**

1. Identification of the most challenging C&D materials to reuse or recycle in the St. Louis region based on feedback from previous focus group organized in 2011 by the USGBC-Missouri Gateway Chapter (Regional Construction & Demolition Waste Research & Education Project)
2. Introductory survey announcing study and seeking to identify all local recyclers sent to:
  - a. Participants in Focus Group
  - b. Local recyclers and haulers
  - c. Local sustainable leaders
3. Survey follow-up sent to identified recyclers requesting additional information:
  - a. Clarification on accepted materials
  - b. Fees for drop off and pick up
  - c. Identification of resulting materials for resale and prices
  - d. Estimate of annual quantities processed
4. Identification of national best practices for economically viable and successful recycling or reuse programs for identified materials
5. Compilation of useful C&D recycling resources

## Recommended C&D Resources

- [C&D Research/Funding](#) – links to organizations conducting research on, or providing grants for, C&D materials reuse and recycling
- [Construction Initiative](#) – EPA’s public-private collaboration to reuse industrial wastes and materials
- [Disaster Debris](#) –guidance on deconstruction, reuse, recycling and overall management of disaster debris
- GSA’s Construction Waste Management Database<sup>xxxiii</sup> - companies that haul, collect, and process recyclable debris from construction projects.
- [The Building Deconstruction Consortium \(BDC\)](#) - best practices for the “deconstruction” of Army buildings
- The Construction Industry Compliance Assistance Center<sup>xxxiv</sup> - provides explanations of environmental rules for the construction industry and links to detailed information, including state regulations and other resources
- [US Air Force Center for Environmental Excellence](#) - resources for C&D debris management and planning including [References and Resources for C&D Waste Management](#)
- [US Army Corps of Engineers Construction Engineering Research Laboratory](#) - how to reduce C&D at Army installations
- US Department of Transportation, Federal Highway Administration<sup>xxxv</sup> - information about recycling concrete and asphalt in highway construction
- [Using Recycled Industrial Materials in Buildings](#)
- [Using Recycled Industrial Materials in Roadways](#)
- [WasteWise Building Challenge](#) - helps US organizations reduce their solid waste, benefiting both their bottom line and the environment
- [What You Can Do](#) – advice on reducing and preventing C&D materials when planning a construction/remodeling project

## Endnotes

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- <sup>i</sup> [http://www.lsuagcenter.com/en/our\\_offices/research\\_stations/Calhoun/Features/multimedia/About-Calhoun-Research-Station.htm](http://www.lsuagcenter.com/en/our_offices/research_stations/Calhoun/Features/multimedia/About-Calhoun-Research-Station.htm)
- <sup>ii</sup> <http://resourcestlouis.org/resources/local-recycling-resources>
- <sup>iii</sup> Uses of Ground Sheetrock (Gypsum) As A Soil Amendment, Soil Science Notes, No. 1, NC State Univ. 1995
- <sup>iv</sup> <http://www.usagypsum.com/animalbedding.aspx>
- <sup>v</sup> [http://www.wastecap.org/wp/wp-content/uploads/2009/03/BMP\\_drywall\\_on\\_home\\_sites\\_final.pdf](http://www.wastecap.org/wp/wp-content/uploads/2009/03/BMP_drywall_on_home_sites_final.pdf)
- <sup>vi</sup> [http://www.lafarge-na.com/wps/portal/na/en/6\\_3\\_7-Recycle\\_and\\_Reuse](http://www.lafarge-na.com/wps/portal/na/en/6_3_7-Recycle_and_Reuse)
- <sup>vii</sup> <http://www.genon.com/>
- <sup>viii</sup> <http://www.drywallrecycling.org/>
- <sup>ix</sup> <http://earth911.com/recycling/construction/gypsum-drywall/tips-for-recycling-and-reusing-gypsum-drywall/>
- <sup>x</sup> <http://www.gypsumsustainability.org/recycled.html>
- <sup>xi</sup> <http://www.gypsumbuilds.org/gypsum-and-the-environment/gypsum-from-production-to-recycling-an-overview-of-the-gypsum-lifecycle/>
- <sup>xii</sup> <http://www.anr.state.vt.us/dec/wastediv/recycling/gypsum.pdf>
- <sup>xiii</sup> <http://www.portcement.org/index.asp>, 2003
- <sup>xiv</sup> Turley, 2002
- <sup>xv</sup> FDEP, 2001:24
- <sup>xvi</sup> <http://www.cwc.org/wood/wd975fs.PDF>
- <sup>xvii</sup> <http://www.industrialmaterialssummit.com/2008/presentations/RickGivan.pdf>
- <sup>xviii</sup> [http://en.wikipedia.org/wiki/Stapleton\\_International\\_Airport](http://en.wikipedia.org/wiki/Stapleton_International_Airport)
- <sup>xix</sup> <http://www.concreterecycling.org/histories.html>
- <sup>xx</sup> <http://www.concreterecycling.org/>
- <sup>xxi</sup> <http://www.ecco.org/>
- <sup>xxii</sup> <http://www.cement.org/>
- <sup>xxiii</sup> [http://www.industrialmaterialssummit.com/midwest/summit/rmt\\_rpt.pdf](http://www.industrialmaterialssummit.com/midwest/summit/rmt_rpt.pdf)
- <sup>xxiv</sup> <http://www.rmrc.unh.edu/>
- <sup>xxv</sup> <http://constructionwaste.wordpress.com/materials/>
- <sup>xxvi</sup> <http://www.recyclecddebris.com/rCDd/Resources/WasteStudy/Chapter04.aspx>
- <sup>xxvii</sup> <http://www.cwc.org/wood.htm>
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