

Gypsum Drywall Recycling

In the North East



Construction & Demolition Materials Source Construction & Demolition Recycling Association (CDRA)

- ▶ 583 Million tons generated
- ▶ 430 million tons recycled
- ▶ Diversion success story
- ▶ Local markets
- ▶ Natural resource savings
- ▶ Reducing carbon foot print
- ▶ Job creation
- ▶ \$23.4 Billion economic benefits

Mixed Construction & Demolition Materials

After subtracting aggregates - source CDRA

- ▶ 63.4 Million Tons Mixed C&D recycled annually
- ▶ C&D process fines 21.5 million tons (**Recycling?**
Diversion? or?)
- ▶ Process fines contain 5-10% sulfate (1-2 m tons)
- ▶ Gypsum is 17% Sulfate
- ▶ 5.8-11.8 million tons gypsum contained in fines



Source CDRA

U.S. Generates 13.5 Million
Tons of Drywall Scraps
NEWMOA States 2.8 million?



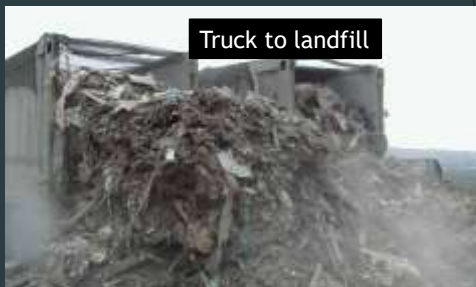
Current Disposal Options



Process fines (ADC?)



Process residuals



Truck to landfill



Rail to landfill

Gypsum & Disposal Challenges



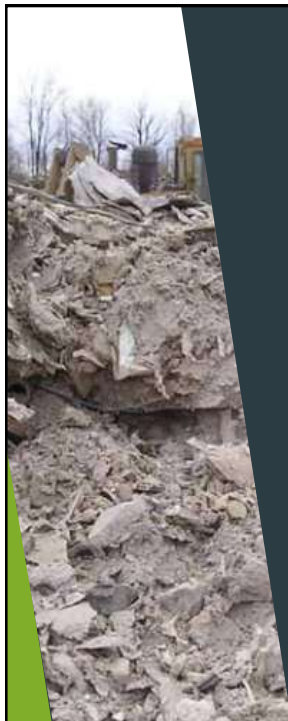
- ▶ 8 years landfill capacity in NE
- ▶ Gypsum generates H₂S (odors)
- ▶ H₂S Suppresses methane generation
- ▶ H₂S contaminates methane
- ▶ Sulfide contaminates leachate
- ▶ Waste to energy ash + SO₂ emissions

H₂S Issues - Business as usual?

- ▶ 12+ North East landfills currently fighting H₂S odor problems
- ▶ Class action lawsuits



SC Supreme Court rules nuisance odor is trespassing - tangible invasion \$2m award 2013

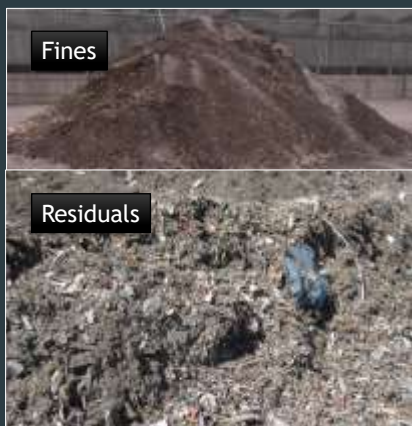


Exporting the Problem?

- ▶ “It is likely that significant quantities of gypsum will be recycled only if gypsum is not allowed in landfills due to H₂S issues” *MA 2007 C&D Debris study*
- ▶ “All of the NEWMOA states have experienced public health and/or nuisance problems with hydrogen sulfide gas at landfills that use C&D residuals” *NEWMOA 2010*
- ▶ **Hazardous waste definition 40 CFR § 261.23**
 “..When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment”



Five Steps Outlined by NEWMOA 2010



1. Ban the disposal of gypsum wallboard waste in landfills
2. Require recycling of wallboard wastes produced by state-financed projects
3. Require waste management planning
4. Develop common terminology and reporting requirements
5. Develop and implement extended producer responsibility approaches

Strategies to Increase Recycling of Waste Gypsum Wallboard in the Northeast



Still Talking About This?

- ▶ 1973 Asbestos ban
- ▶ 1978 Lead paint ban
- ▶ 1978 H2S landfill odor linked to gypsum
- ▶ 1985 Drywall recycling began due to H2s
- ▶ 1990 National Gypsum bankruptcy - asbestos
- ▶ 2001 USG bankruptcy -asbestos
- ▶ 2005 Drywall Recycling in MA
- ▶ 2007 "Gypsum removal should occur prior to processing"... *Control of Odorous Gas at MA Landfills MASS DEP*
- ▶ 2010 MA new drywall waste ban
- ▶ 2015 MA recovered drywall 811 tons (DSM)
- ▶ 2019 Landfills continue to battle H2S

Gypsum Supply

USGS 2018

- ▶ 21 million MT mined FOB Mine \$7.80 / ton
- ▶ 22 Million Metric Ton FGD FOB power plant \$5 / ton?
- ▶ Price is all about freight

Flue Gas desulfurization (FGD) gypsum is produced by scrubbing sulfur from coal fired power plants.



Gypsum Supply Drivers Technology, Gas & Trains!



Coal power
2006-2016

Bloomberg

		ME -78.2
		NH -89.1
NY -91.6	MA -83.0	RI
NJ -87.9	CT -95.9	

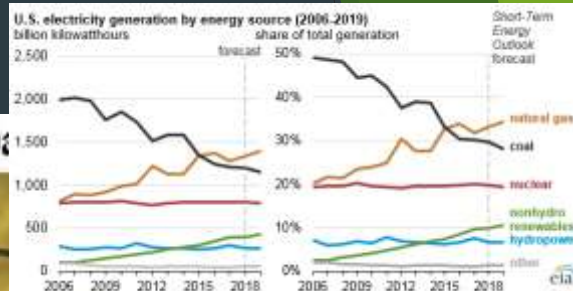


Gypsum Supply disruption

OCT 29, 2018

Pittsburgh Post-Gazette

When the Bruce Mansfield power plant closes, what happens to the Beaver County drywall plant using its coal ash?



Gypsum Market Changes 2014 vs 2018

Demand Up 23%

- Consumption 37-48 million mt
- Mined 50% - FGD 50%
- FGD +30%
- Mining +13%
- Imports +31% (5.4 million mt)



Source: USGS



Why Doesn't It Go There?

It is only Money! (Allocation?)

- **Cheap Gypsum?**
 - New mines built & reopened
 - Stranded FGD wallboard plants
 - New transport facilities built
- **Cheap Disposal?**
 - New transport facilities built
 - H₂S odor abatement
 - Suppressed methane generation
 - H₂S gas treatment systems
 - Leachate contamination
 - **Legal risk & costs**

Who Has The Money?

Drywall Economics

- ▶ \$0.02 Billion drywall recyclers?
- ▶ \$3.4 Billion mixed C&D waste
- ▶ \$60 Billion solid waste
- ▶ \$10 Billion board products
- ▶ \$748 Billion building industry
- ▶ \$0.675 Billion Solves The Problem?
(13.5m tons x \$50? =0.09% building)



25.5 Billion Sq.Ft. Board 2018

Sources; Me, CDRA, Statista, Gypsum Assn, Statistic-brain

Change is Hard

- ▶ Timing is right?
 - ▶ Landfill issues & cost
 - ▶ Gypsum supply & transportation
 - ▶ Public opinion

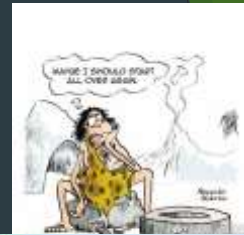


Gypsum Drywall Recycling Proven Since 1985

Proven in Canada - EU - NW U.S. Including Demolition

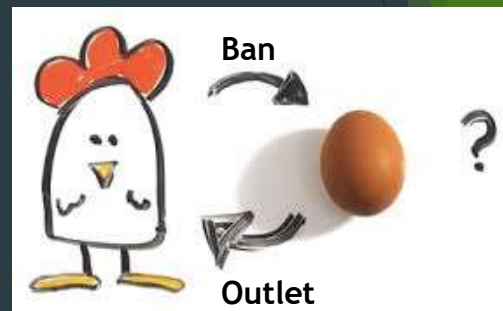
- ▶ Ban landfilling
- ▶ Drywall abated (source separated)
- ▶ Recycling protocol
- ▶ Manufacturers take back

(Ceiling Tile Example in U.S.)



Successful Programs Ban Gypsum from Landfills and Manufacturers take back

- ▶ BC - Bans all gypsum from landfills
- ▶ EU - Ban from MSW & CD landfills no mixing with biodegradable waste. Separate "dry" cell
- ▶ Seattle - Ban + permit = 85% of new scrap - 29,000 tons 2013



Classify as Reactive hazardous waste to provide outlet?

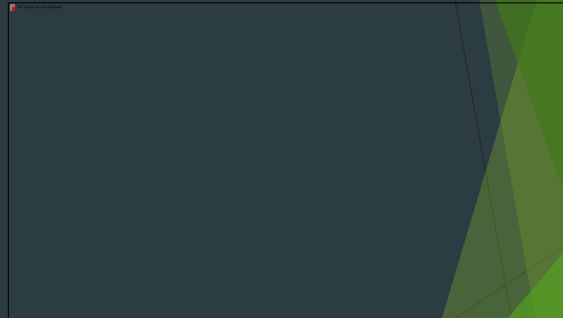
- ▶ Drywall manufacturer
- ▶ Distributor
- ▶ Developer or owner
- ▶ Contractor (waste generator)
- ▶ Waste Hauler
- ▶ C&D Processor / transfer
- ▶ Landfill owner



Recycle Planning

Using Construction Documents

- ▶ LEED 4.1 waste management plans
- ▶ ASTM standard in process
- ▶ Life Cycle Analysis (LCA) for waste in process (CDRA)
- ▶ Needed - standard construction document examples
- ▶ Ordering correct sizes & types
- ▶ Permit requirements for recycling
- ▶ Certified Process facility certification Recycling Certification Institute (RCI) extra LEED point



Plan & Verify

LEED v4.1 BD+C beta

MR CREDIT: CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

Intent

To reduce construction and demolition waste disposed of in landfills and incineration facilities by reusing, reusing, and recycling materials.

Requirements

Recycle and/or salvage nonhazardous construction and demolition materials. Calculations can be by weight or volume but must be consistent throughout.

Exclude excavated soil, land-clearing debris from calculations. Include materials destined for alternative daily cover (ADC) in the calculations as waste (not diversion). Include wood waste converted to fuel (biofuel) in the calculations; other types of waste-to-energy are not considered diversion for this credit.

Option 1: Diversion (1-3 points)

Path 1a: Divert 50% and Three Material Streams (1 point)

Divert at least 50% of the total construction and demolition material; diverted materials must include at least three material streams.

OR

Path 1b: Divert 85% using Certified Commercial Recycling Facility and One More Material Stream (1 point)

Divert at least 85% of the total construction and demolition material; diverted materials must include at least two material streams. All commercial recycling is required to be one of the streams and must be sent to a facility certified by the Recycling Certification Institute or approved equivalent.

OR

Path 1c: Divert 75% and Four Material Streams (2 points)

Divert at least 75% of the total construction and demolition material; diverted materials must include at least four material streams.

OR

Path 1d: Divert 75% using Certified Commercial Recycling Facility and Two More Material Streams (2 points)

Divert at least 75% of the total construction and demolition material; diverted materials must include at least three material streams. All commercial recycling is required to be one of the streams and must be sent to a facility certified by the Recycling Certification Institute or approved equivalent.



RECYCLING CERTIFICATION INSTITUTE

Cooper Tank Recycling - Cooper Tank Recy

Facility Profile & Report

Facility:

Cooper Tank Recycling

123 Varick Ave.

Brooklyn, NY 11237

Main: 7183847727

Web: cooperativerecycling.com

Contact: Ray Rivedas

Email: rrivedas@cooper-tank.com

Facility Type: C&D Recycling Facility

View Detailed Report

Current Facility 12-Month Recycling Rate:

Recycling Rate with ADC

69.87%

Recycling Rate without ADC

41.39%



Construction Bid Documents

PART 1 - GENERAL

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Prior to any waste removal, the Contractor shall submit to the owner a Waste Management Plan. The Plan shall contain the following:
 - h. Include a narrative and cost estimate for diverting scrap gypsum during construction, not inclusive of scrap gypsum during demolition. Consider a processes that minimize labor and loading dock access, such as collecting scrap gypsum in minis that would be tipped into a dedicated packer truck when there is a full load, crushed, and then transported to USA Gypsum.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Reclamation Programs: Research and prepare a plan to work with manufacturers who have programs to receive used materials. Known reclamation programs are available from, but not limited to, the following manufacturers:

CONSTRUCTION WASTE MANAGEMENT AND
DISPOSAL 017419 - 3

ASTM Standard in Process



Designation: X XXXX-XX

Ballot Rationale

Recycling is currently practiced in the gypsum industry today but is not yet a standardized process. There are many forms of gypsum recycle including scrap gypsum board from construction processes, scrap gypsum board from a manufacturing facility and post-use material that is often the result of building de-construction. The recovery and reuse of all such forms of gypsum is possible and details for such processing are described herein.

Standard Practice for Recycling Gypsum Panel Products¹

This standard is issued under the fixed designation X XXXX; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last approval. A superscript epsilon (ε) indicates an editorial change since the last revision or approval.

1. Scope



Types of Gypsum Drywall



100% Recyclable

- Recovered gypsum core
- Fiber facing

Demolition concerns

- Asbestos pre 1980
- Lead paint
- Wall covering - paint
- Contamination levels
- Landfill facing 10-20%







New Gypsum Drywall Types

- ▶ New gypsum drywall with standard core including type X fire rated (89%)
- ▶ Specialty, green, purple or gold board (11%)?
- ▶ Painted or coated
- ▶ Anything with color on Facing?
- ▶ Research continues

Mixed C&D Processing & Transfer

- ▶ Drywall gets crushed & cannot be picked on sort belts
- ▶ Requires Positive Sort before processing
- ▶ Need space & labor
- ▶ Safety Issues

Source Separation of Gypsum Drywall

Increases Recovery Rates

- ▶ Space on Jobsite
- ▶ Labor management
- ▶ Extra transportation?



Source Separation *Options*



Source Separation Management (trash Control)



Source Separations in Urban Areas



Transportation to Collection Point



Transportation To Collection Point

Consolidation Considerations



Chittenden VT (Ideal)

- Quality Control
- Expected Volume
- Storage Capacity
- Outside / Inside
- Moisture Cost
- Loading Equipment

Consolidation Options

Stage containers



Rutland VT 2008

Outdoor bunk (moisture)



Shipping to Recycler

- ▶ Large Dumps
- ▶ Walking Floors



Trust but verify!

Receiving at Recycler

Dump Trailers



Flatbeds



Walking floors

Processing for Quality Products

USA Gypsum today



USA Gypsum 1998



Raw Material & Process Enclosed

moisture and dust control

Gypsum drywall stockpile



Process machinery



USA Gypsum Markets

Economics require upcycling

- ▶ Farm
- ▶ Home
- ▶ Industrial
- ▶ Package options
- ▶ Several grades
- ▶ Custom Blending
- ▶ Buy on line



Gypsum Drywall Recycling Resources

Standards the industry can agree upon?



- ▶ EU PAS 109 Specification 2009 updated 2013
- ▶ NEWMOA 2010 "Strategies to Increase Recycling of Waste Gypsum Wallboard in the Northeast"
- ▶ CDRA 2018 "Standard Specification for the Production of Recycled Gypsum from Scrap Gypsum Drywall"

Stakeholders - All of Us

“The years just **pass** like **trains**, I wave but they don't slow down”
....Steve Wilson on twitter



Reading Captain Envirotrotron to my granddaughters

