Mercury (Hg) - tested for 1, found 1

Polyaromatic hydrocarbons (PAHs) - tested for 18, found 9
Pollutants from burning gasoline and garbage. Linked to cancer. Accumulates in food chain.

Polybrominated dibenzodioxins and furans (PBDD/F) - tested for 12, found 7
Contaminants in brominated flame retardants. Pollutants and byproducts from plastic production and incineration. Accumulate in food chain. Toxic to developing endocrine (hormone) system.

Perfluorinated chemicals (PFCs) - tested for 12, found 9
Active ingredients or breakdown products of Teflon, Scotchgard, fabric and carpet protectors, food wrap coatings. Global contaminants. Accumulate in the environment and the food chain. Linked to cancer, birth defects, and more.

Polyaromatic dibenzodioxins and furans (PCDD/F) - tested for 17, found 11
Pollutants, by-products of PVC production, industrial bleaching, and incineration. Cause cancer in humans. Persist for decades in the environment. Very toxic to developing endocrine (hormone) system.

Organochlorine pesticides (OCs) - tested for 28, found 21
DDT, chlordane and other pesticides. Largely banned in the U.S. Persist for decades in the environment. Accumulate up the food chain, to man. Cause cancer and numerous reproductive effects.

Polybrominated diphenyl ethers (PBDEs) - tested for 46, found 32
Flame retardant in furniture foam, computers, and televisions. Accumulates in the food chain and human tissues. Adversely affects brain development and the thyroid.

Polychlorinated Naphthalenes (PCNs) - tested for 70, found 50

Polychlorinated biphenyls (PCBs) - tested for 209, found 147

Source: Chemical analyses of 10 umbilical cord blood samples were conducted by AXYS Analytical Services (Sydney, BC) and Flett Research Ltd. (Winnipeg, MB).

House Passes Sweeping Chemical Safety Bill

Bipartisan support comes after states, retailers began to address consumer concerns.

Dow Chemical and other industrial giants welcomed federal legislation to improve chemical safety. Above, a Dow chemical plant in Plaquemine.

By ALEXANDRA BERZON and AMY...
The AIA recognizes that **building materials impact the environment and human health before, during, and after their use**. Knowledge of the life cycle impacts of building materials is integral to improving the craft, science, and art of architecture. The AIA encourages architects to promote transparency in materials’ contents and in their environmental and human health impacts.

**Directory of Public Policies + Position Statements**

-AIA Board of Directors, December 2014
Source: Courtesy of Sustainable Construction Solutions
Transparent Lifecycle and Health Data

Product Name by Manufacturer Name
CLASSIFICATION: 00 00 00

Product Description:
This space describes the product briefly. It indicates if the product is part of a system or assembly and describes what is covered in this HPD, as well as any special use considerations. Extended descriptions should be continued in Section 5: General Notes.

Section 1: Summary

Content Inventory
Threshold (per material) Residues and impurities considered in 03 of 04 materials
- 100 ppm
- 1,000 ppm
- Per GHS SDS
- Per OSHA MSDS
- Other

Based on the selected Content Inventory Threshold:
Characterized……………………………….. ● Yes ○ No
Are the Percent Weight and Role provided for all substances?
Screened……………………………….. ● Yes ○ No
Are all substances screened using Priority Hazard Lists with results disclosed?
Identified……………………………….. ○ Yes ● No
Are all substances disclosed by Name (Specific or Generic) and Identifier?

Content in Descending Order of Quantity
Summary of product contents and results from screening individual chemical substances against HPD Priority Hazard Lists and the GreenScreen for Safer Chemicals®. The HPD does not assess whether using or handling this product will expose individuals to its chemical substances or any health risk. Refer to Section 2 for further details.

Material | Substance | Residual or Impurity GreenScreen Score | Hazard Endpoint View Key
---------|-----------|-----------------------------|-----------------------------

Material | Substance | Hazard | Hazard | Substance | Hazard | Substance | Hazard | Substance | Hazard | Material
---------|-----------|--------|--------|-----------|--------|-----------|--------|-----------|--------|---------

Number of GreenScreen BM-4/IBM-3 contents (towards ‘green chemistry’) …… 01
Contents highest concern GreenScreen Benchmark or List Translator Score: ……… LT-1

Nanomaterial: One or more contents are characterized as a nanomaterial.

Inventory and Screening Notes
Refer to Section 2 for detailed content information and explanatory notes, and to the last page for HPD scope.
This space explains any “No” answers from above and provides any further information.
Ingredient Inventory → Hazard Screening → Assessment → Product Certification → Project Certification
Pharos subscribers have access to a wealth of resources for material selection:

**Building Product Library**

The Pharos Building Product Library (BPL) combines manufacturer transparency and independent research to provide in-depth health and environmental information about a wide range of building products. Browse dozens of product categories, or use our search filters to specify your product criteria.

**Chemical and Material Library**

The Pharos Chemical and Material Library (CML) is an online catalog of chemicals, polymers, metals, and other substances. It identifies key health and environmental information using authoritative scientific lists for specific human and environmental health hazards, restricted substance lists, and GreenScreen List Translator scores. The CML also characterizes the process chemistry used to produce substances and screens woods against endangered species lists.

**Certifications and Standards Library**

The Pharos Certifications and Standards Library provides a wealth of information on certifications and standards used to measure the environmental and health impacts of building materials, including VOC content and emissions, recycled and biobased content, and more.

Companies using Pharos to inform their building product selection include:

[Logos of Google, HKS, Perkins+Will, HDR, Dignity Health]
Portico is Google’s Healthy Materials Tool. It is an online resource for architects and designers as well as contractors and project teams to find the latest, innovative healthy materials and products to specify for Google projects. Portico’s transparent product information is useful right at the start of a project, during the design and planning stages, and all the way through to opening day.

Portico enables project teams to:
- **Respond** to the Google’s Healthy Materials requirements, demand for healthy materials, transparency, LEED certification, and industry standards.
- **Access** product and materials information in a simple, easy-to-understand format.
- **Understand** material properties and potential impacts on human health.
- **Make** informed selections of products and materials based on reliable and transparent data.

**Designer & Manufacturer Collaboration**
Bring products into Portico

**REWS Team**
Manage Portico database & Work with project teams

**Designers/Specifiers & Contractors/Project Managers**
Use Portico to spec healthy materials

**Healthy Buildings**
Everyone enjoys healthier buildings

---

Building Product Ecosystems
A Collaborative for Optimizing Health
10 26 00 - InPro Corporation - 1455iWG
The 1455i Wall Guard is 4” high and is used to protect walls from carts, wheelchairs and other equipment. The wall guard is comprised of an extruded aluminum retainer supports, extruded vinyl cover and an internal recycled extruded bumper.

10 26 00 - InPro Corporation - 1500WG
The 1500 Wall guard is 5” high and is used to protect walls from carts, wheelchairs and other equipment. The wall guard is comprised of an extruded aluminum retainer and extruded vinyl cover. Accessories include molded returns, corners and brackets.

10 26 00 - InPro Corporation - 1500iWG
The 1500i Wall Guard is 5” high and is used to protect walls from carts, wheelchairs and other equipment. The wall guard is comprised of an extruded aluminum retainer supports, extruded vinyl cover and an internal recycled extruded bumper.

10 26 00 - InPro Corporation - 1600WG
The 1600 Wall Guard is 6” high and is used to protect walls from carts, wheelchairs and other equipment. The wall guard is comprised of an extruded aluminum retainer, extruded vinyl cover and an internal recycled extruded bumper.

10 26 00 - 1600iWG
The 1600i Wall Guard is 6” high and is used to protect walls from carts, wheelchairs and other equipment. The wall guard is comprised of an extruded aluminum retainer supports, extruded vinyl cover and an internal recycled extruded bumper.
SM Material Health Overview™
Leverage your investments in material assessment and turn disclosure into brand value

The SM Material Health Overview (MHO) is a cloud-based marketing tool for manufacturers to inform safer and healthier purchase decisions. It combines product sustainability efforts into one integrated story and standardizes the presentation of results from ANY program in one comprehensive report.

Sustainable Minds partnered with the leading material evaluation organizations to create MHOs tailored for each program.

An innovative and user-friendly way to report material health
The MHO makes disclosure data understandable and meaningful by distilling essential technical information, describing what it means and what the manufacturer is doing to improve.

Enables readers to easily get answers to these questions:
• Are there any hazardous ingredients in this product?
• If yes, how bad are they?
• Are there any exposure concerns?
• What is the company doing about improving product material health?

The Material Health Overview has five sections:
1. Program and scope – A description of the program used and the scope of the assessment
2. Assessment results – Design of this section is tailored to each program to include the material contents and/or the screening and hazard assessment results
3. Health concerns/how rating was achieved – Interpretation of the results, manufacturers can answer questions readers might ask and explain and contextualize the results.
### Division 1 Specifications

**Product Content Transparency**

**Definition:**

Provision of the following data:
1. Safety Data Sheet (SDS) or Material Safety Data Sheet (MSDS). SDS is preferred.
2. EC REACH Reporting (if applicable).
3. Completed Manufacturer's Transparency Reporting Form (Appendix F), and at least one of the following documents (listed in order of preference):
   a. Health Product Declaration (HPD).
   b. GreenScreen Full Assessment.
   c. GreenScreen List Translator Assessment.
   d. CI

**Standards:**

**SDS:** Safety Data Sheet (formerly called ‘Material Data Safety Sheet’ or ‘MSDS’): US Department of Labor, OSHA Standard 29 CFR 1910.1200 Appendix D, Safety Data Sheets (Mandatory). Chemical manufacturers, distributors, or importers provide Safety Data Sheets (SDSs) for each hazardous chemical to downstream users to communicate information on these hazards.

**Manufacturer's Transparency Reporting Form:** See Section 018113 Appendix F.

**HPD:** Health Product Declaration Open Standard, developed by the Health Product Declaration Collaborative; HPDC Foundation 401 Edgewater Place, Wakefield, MA, 01880. The HPD is a standard format for reporting building Product content and associated health data.

**GreenScreen Full Assessment/GreenScreen List Translator Assessment**, developed by Clean Production Action, 1310 Broadway, Suite 101, Somerville, MA 02144. GreenScreen is a comparative chemical hazards assessment method and benchmark system.

**EC REACH:** European Commission Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) most recent “Candidate List of Substances of Very High Concern for Authorization” published in accordance with Article 59(10) of the REACH Regulation. EC REACH applies to Products imported from, or exported to, the European Community.
Building Product Ecosystems [LLC]
Multi-disciplinary Open Innovation
Objective: Optimize health of wallboard manufacture/install/use/reuse cycles, establishing source separation and closed-loop wallboard post-consumer recycling process and infrastructure.

Systemic Material Health Optimization: Wallboard
① Reutilize much of the 10 Million tons drywall debris generated/year. Only 5% is currently recycled; remainder is landfilled.
② Avoid hydrogen sulfide (an asthmagen) and methane (a greenhouse gas) generated from landfilled wallboard.
③ Source separate gypsum debris to minimize cross-contamination with other material liquids and fines.
④ Reduce impacts of Natural Gypsum Mining.
⑤ Minimize potential for elevated Mercury (Hg) - Content, Emissions, Effluent from coal-fired power plants and the Synthetic Gypsum produced.
⑥ Regionalize supply chains, reducing transport, supporting local economies.

Evolving Wallboard Systems | Why Source-Separated, Closed Loop GWB Recycling
Objective: Pilot cast-in-place concrete Portland cement replacement with city post-consumer recycled glass pozzolan for 1) reduced carbon impact, 2) no heavy metals, 3) consistent end use for glass otherwise landfilled.

Systemic Material Health Optimization: Concrete
① Reutilize the 11 Million Tons post-consumer glass waste generated/year. Only 30% is currently recycled; remainder is landfilled.
② Reduce the 90 Million Tons Portland cement/year that results in 90 Million tons CO2.
③ Minimize Heavy Metal content in concrete - renovation considerations.
④ Localize supply chain, limiting transportation emissions, supporting local economy.
⑤ Avoid increasingly inconsistent availability of Flyash, domestic Slag.
⑥ High performance demonstrated in strength testing and pilots performed in NYC and CA to-date.

Glass in Concrete | Why Post-Consumer Recycled Glass Pozzolan Replacement of Cement
80% [emissions] by 2050
90% [waste] by 2030

Source: NYC Mayor’s Management Report, Citywide Performance Reporting.
Notes: YTD is Year to Date through Nov. 2015
195 countries adopted the Paris Agreement at the 21st Conference of the Parties in December.

At the core of the Agreement:

- We must keep global temperature rise this century to well below 2°C Celsius (that's 3.6°F Fahrenheit).
- 189 countries representing more than 99% of global emissions have submitted their Intended Nationally Determined Contributions. These INDCs make up the heart of the Paris Agreement.
- Countries must review and re-assess these pledges every 5 years, with “global stocktaking” starting in 2023. Countries can't lower their targets - in fact, they are encouraged to raise their ambition and level of commitment with time.
Inconsistent Fly Ash + Synthetic Gypsum Supply

Scheduled electricity generation capacity additions and retirements in 2015 megawatts

annual net change:
- wind (9,811 MW)
- natural gas (4,318 MW)
- solar (2,235 MW)
- nuclear (1,122 MW)
- other renewables (471 MW)
- petroleum and other (-800 MW)
- coal (-12,922 MW)

Source: U.S. Energy Information Administration, Electric Power Monthly
Note: Other renewables include hydroelectric, biomass/wood, and geothermal.
Fly Ash Health, Safety

Coal Ash Spill Revives Issue of Its Hazards

Fifteen homes like this one in Harriman, Tenn., were flooded with fly ash sludge on Monday after a storage pond wall broke.

By SHAILA DEWAN
Published: December 24, 2008
Inconsistent Regional Blast Furnace Slag Supply

**Iron and Steel Slag**

*Events, Trends, and Issues:* The availability of blast furnace slag is becoming problematic in the United States because of the closure and (or) continued idling of a number of active U.S. blast furnaces in recent years, the lack of construction of new furnaces, and the depletion of old slag piles. At year-end 2014, granulation cooling was available at only three active U.S. blast furnaces and was unlikely to increase at any other sites. Pelletized blast furnace slag was in very limited supply (one facility), while the supply of basic oxygen furnace slags from integrated iron and steel companies has also declined. Basic oxygen furnace steel slags have become less available recently because of the closure of several integrated iron and steel companies. Basic oxygen furnaces now produce the majority of blast furnace slags. Basic oxygen furnaces have sometimes been less volatile than those of natural occurrences. Demand and imports will likely restrict availability in the near-term. The present situation, with only increases that have characterized the overall U.S. cement market since 2010, Long-term demand for GGBFS likely will increase because its use in concrete reduces the unit carbon dioxide (CO₂) emissions footprint of the concrete related to the Portland cement content. Recent draft regulations to restrict emissions of CO₂ and mercury (Hg) from cement production will likely cause many such plants to low-cost materials and lower energy use. Many only have some slag material of material for use as cementitious additive for concrete. This has the potential to increase future demand for GGBFS. Long-term growth in the supply of cement, which has been approached by the use of unground material. Imports may be constrained by increasing international demand for the same material and because not all granulated slag produced overseas is of high quality. New restrictions on mercury emissions by cement plants will likely reduce demand for fly ash as a raw material for clinker manufacture, and this could lead to use of air-cooled and steel slags as replacement raw materials.


NYC Glass in Concrete Value Chain

- NYC Residential Curbside Recycling
- Material Recovery Facilities (MRFs)
  - Un-Recycled Glass 4,500 tons/month
  - Recycled Glass Aggregate (RGA)
    - Roadbed Aggregate
    - Storm Water Filtration
    - Drainage Pipe Bedding
    - Clean Fill/Blends
- Landfill
- Mixed Colored Glass 5,000 tons/month
- Glass Processing Facility
  - Clean, Ground Glass Pozzolan
  - Glass Pozzolan
  - Portland Cement
  - Fly ash
  - Slag
  - Silica Fume
- Ready Mix Concrete
- Concrete Batch Plant
- Concrete Depot / Distributor
- Mixed Colored Glass 5,000 tons/month
- Sorted Clear Glass to new glass production ~1,200 tons/month
- NYC Residential Curbside Recycling

- Mixed Colored Glass 5,000 tons/month
- Mixed Colored Glass 5,000 tons/month
All full 1/2 cy mini containers are taken down to loading dock and immediately deposited in large 30 cy container, which has just been delivered. After all scrap is deposited, 30 cy container leaves...
### Gypsum Source

<table>
<thead>
<tr>
<th>Study</th>
<th>Natural-Mined</th>
<th>Synthetic</th>
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</thead>
<tbody>
<tr>
<td>This Study  (2015)</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Yost (2007)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sanderson (2008)</td>
<td>10</td>
<td>12</td>
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<tr>
<td>This Study  (2015)</td>
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<td>20</td>
</tr>
<tr>
<td>Yost (2007)</td>
<td>-</td>
<td>3.1</td>
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<tr>
<td>Sanderson (2008)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EPA* (2009)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Sample Size**

- **Average Mercury (ppm)**
  - This Study (2015): 0.04
  - Yost (2007): 0.024
  - Sanderson (2008): -
  - This Study (2015): 0.07
  - Yost (2007): 0.38
  - Sanderson (2008): -
  - EPA* (2009): -

**Maximum Mercury (ppm)**

- This Study (2015): 0.1
- Yost (2007): 0.03
- Sanderson (2008): 0.95
- EPA* (2009): 3.1

---

*Gypsum tested is pre-wallboard production. Other studies use post-wallboard production gypsum.*
Technical Performance Testing

<table>
<thead>
<tr>
<th>Mix</th>
<th>Source</th>
<th>6000psi w/ Pozzo</th>
<th>8000psi w/ Pozzo</th>
<th>10000psi w/ Pozzo</th>
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<tbody>
<tr>
<td>Date Batched</td>
<td>7/1/2015</td>
<td>7/1/2015</td>
<td>7/1/2015</td>
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<tr>
<td>Cement (lbs.)</td>
<td>Essex Cement - Type II</td>
<td>423</td>
<td>505</td>
<td>553</td>
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<tr>
<td>Glass pozzolana</td>
<td>Pozzoite</td>
<td>227</td>
<td>270</td>
<td>297</td>
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<tr>
<td>Sand (lbs.)</td>
<td>Roanoke Sand &amp; Gravel</td>
<td>1250</td>
<td>1300</td>
<td>1240</td>
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<tr>
<td>Stone # 1 (lbs.)</td>
<td>Tilcon, Clinton Point #67</td>
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<td>Stone # 2 (lbs.)</td>
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<td>Water (gal.)</td>
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<td>29.8</td>
<td>29.8</td>
<td>29.7</td>
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<td>Admixture 1 (oz.)</td>
<td>Euclid / Air</td>
<td>9.8</td>
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<td>Admixture 2 (oz.)</td>
<td>Euclid / Plastol 5000</td>
<td>58.5</td>
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<td>W/C</td>
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<td>0.38</td>
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<td>Slump (in.)</td>
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<td>8.5</td>
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<tr>
<td>Spread (in.)</td>
<td></td>
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<td>26.0</td>
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</tr>
<tr>
<td>Air (%)</td>
<td></td>
<td>5.5</td>
<td>0.9</td>
<td>1.4</td>
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<tr>
<td>Theor. Unit Wt. (pcf.)</td>
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<td>145.78</td>
<td>152.7</td>
<td>153.0</td>
</tr>
<tr>
<td>Actual Unit Weight (pcf.)</td>
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<td>147.3</td>
<td>153.0</td>
<td>154.5</td>
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<tr>
<td>1 day results</td>
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<td>3740</td>
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</tbody>
</table>
Include Ballot Rationale Here (Required for all Ballots)

Standard Practice for
The Selection of Post-Consumer Gypsum Board for Closed-Loop Recycling ¹

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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This standard includes the physical condition and compositional criteria for selecting post-consumer gypsum board for use in manufacturing new board product.

1.2 This standard only applies to recycled material for use in interior gypsum board and not in exterior use panel products nor in any specialty product such as type X, type C, impact
Ground Glass as a Supplementary Cementitious Material

Code Review:
ACI 318 Building Code Requirements, Chapter 3 allows use of SCMs that conform to the following ASTMs:

- **ASTM C989 (AASHTO M302)** - Ground granulated iron blast-furnace slags; Grade 80, 100, 120

- **ASTM C618 (AASHTO M295)** - Fly ash and natural pozzolans
  - Class N – Natural pozzolans
  - Class F – Fly ash with pozzolanic properties
  - Class C – Fly ash with pozzolanic and cementitious properties
Targeting Cast in Place Concrete Specification

2.4 CONCRETE MATERIALS

A. Portland cement: ASTM C 150, Type I or II, ASTM C 1157, Type GU or LH. Concrete of 8,000 psi @ 28 days or higher strength requires the use of one brand of cement as approved by the Engineer.

B. Supplementary Cementitious Materials:

1. Slag: ASTM C989, Grade 100 or 120, may be used up to a maximum of 35% of the total cement content.

2. Pozzolans: ASTM C 618 –08 Class N, may be used up to a maximum of 35% of the total cement content

3. At no point shall the sum of the Slag and Pozzolan quantities exceed 35% of the total cement content

4. The exact percentages used shall be based on a successful test placement onsite.

This project is being used as a prototype to introduce the use of Post-Consumer Powdered Glass Pozzolans as a replacement to the above-specified Slag. All things being equal, physical properties, chemical properties and economics, the use of powdered glass pozzolans in lieu of Slag will be given preferential treatment.
Summary

Issue:
While most waste from construction sites can be collected in dumpsters and then separated and recycled off-site, certain materials become damaged when comingled. They cannot be reused or recycled unless they are separated at the construction site.

Recommendation:
Require ceiling tiles, carpeting, new gypsum wallboard scrap, and large-dimension lumber to be sorted on-site and reused or recycled. Also, require construction-waste management plans for large projects.

Proposed Legislation, Rule, or Study

Amendments to the New York City Building Code:

1. Add the following definitions to Section 3302.1:

CONSTRUCTION WASTE MANAGEMENT PLAN. A plan outlining procedures for the reuse, including resale, or recycling of recoverable waste materials generated during construction and demolition.
Field Tests, Mock-ups
Coal-fired retirements due to EPA MATS
Thank you!

Amanda Kaminsky
*Founder, Building Product Ecosystems LLC*
*Board Chair, Health Product Declaration Collaborative*
*Board Secretary, Healthy Building Network*
Amanda@BuildingProductEcosystems.org