Material Reuse Overview & LEED BD+C v4.1

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USGBC LEED Social Equity Working Group
Past-Chair, LEED Materials and Resources TAG
Founder, Past-President, BMRA
Current USA deconstruction / reuse foundations

• HfH ReStores and non-cash charitable contribution Federal tax deduction.
• Starbucks-effect (corporate) and the Robert Redford-effect (personal).
• **Emergent properties**
  • Circular economy, environmental justice, public health, embodied carbon.
Demolition trend

2002 – 2012 change in employment
• Building construction = -35%
• Site preparation = +17%
2002 – 2012 change in employment
- All retail = +0.4%
- Used merchandise = +46.3%
Geography of reused building materials 2018

Reclaimed lumber firms per 100,000 pop

All-types building materials reuse firms per 100,000 pop
Trend of reused building materials USA 2005-2018

Year 2005 Total = 779
Year 2018 Total = 1820

Year 2018 lumber-focus = 26%
• NonProfit sector dominated by HfH ReStores.
• HfH ReStore and Profit sector each added ~640 firms 2005-2018.
• NonProfit sector growth 433%.
• Profit sector growth 51%.
• ~98% of lumber-focus are Profit firms.
Trend of reused building materials California 2005-2018

Year 2005 Total = 99
Year 2018 Total = 152

Year 2018 lumber-focus = 36%
• NonProfit sector dominated by HfH ReStores.
• NonProfit sector growth 260%.
• Profit sector growth 67%.
• 100% of lumber-focus are Profit firms.
• Arlington County Green Building Incentive Policy
  • LEED certification for County buildings
  • Bonus densities via increased F.A.R. for green building and priority credits including:
    • Building reuse and materials reuse
• Montgomery County Adoption of 2012 IGCC and Green Building
  • Minimum 50% C&D diversion rate
• Montgomery County Property Tax Credit – green buildings
  • Higher LEED Certification level for higher credit
• DC Green Building Act of 2006 and Adoption of 2012 IGCC
  • LEED Certification requirement public and private buildings
• Exempt <10,000 SF unless otherwise required.
• Commercial buildings >50,000 SF LEED certification or DC GCC electives.
• Applies to raze, demolition, and alteration projects as applicable.
• Materials Resource Conservation and Efficiency Electives
  • Construction and Demolition Waste Management.
  • Materials Selection: including reuse / indigenous materials.
  • Design for Deconstruction and Building Reuse.
  • Existing or Historic Building Reuse.

https://up.codes/viewer/district-of-columbia/igcc-2012/chapter/A/project-electives#A105.5
Facilitate local reuse and recovery of materials to capture their economic and social value.

Target 2: reuse 20% of all waste produced in the District.

WS2.1: reuse or recycle 50% of all commercial construction waste.

WS2.2: reuse 5% of all non-hazardous residential building materials.

DC Raze and demolition permits

- **Raze permit** - complete removal of entire building from site, including carriage houses and garages.
- **Demolition permit** – partial removal of a building from site.
DC 2017 Alteration, demolition & raze permits (1509)
DC 2017 Alteration, demolition & raze permits by type

- Commercial: 800
- Residential: 700
- Garage/shed: 100
- Church: 0
Demolition permits Montgomery County 1 year (341)
• Each requirement identifies a specific action that fits into the larger context of a life-cycle approach to embodied impact reduction.

• **Scope and phases;** climate change, cradle-to-..., etc.

• **and a hierarchical** approach (reduce, reuse, recycle).

• ...associated with the extraction, processing, transport, maintenance, and disposal of building materials.
LEED System Impact weightings

Climate Change: 35%
Human Health: 20%
Water Resources: 15%
Natural Resources: 10%
Biodiversity: 10%
Community: 5%
Green Economy: 5%
### LEED Credit Categories / points

<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and Atmosphere</td>
<td>33</td>
<td>30.0%</td>
</tr>
<tr>
<td>Indoor Environmental Quality</td>
<td>16</td>
<td>14.5%</td>
</tr>
<tr>
<td>Location and Transportation</td>
<td>16</td>
<td>14.5%</td>
</tr>
<tr>
<td><strong>Materials and Resources</strong></td>
<td><strong>13</strong></td>
<td><strong>11.8%</strong></td>
</tr>
<tr>
<td>Water Efficiency</td>
<td>11</td>
<td>10.0%</td>
</tr>
<tr>
<td>Sustainable Sites</td>
<td>10</td>
<td>9.1%</td>
</tr>
<tr>
<td>Innovation</td>
<td>6</td>
<td>5.5%</td>
</tr>
<tr>
<td>Regional Priority</td>
<td>4</td>
<td>3.6%</td>
</tr>
<tr>
<td>Integrative Process</td>
<td>1</td>
<td>0.9%</td>
</tr>
</tbody>
</table>
• **Option 1: Historic Building Reuse;** no threshold for compliance (5 pts).

• **Option 2: Renovation of Abandoned or Blighted Building;** reuse at least 50% of surface area, and if more than 25% of building is to-be-demolished, project is ineligible for this option, must use **Option #3** (5 pts).
Option 3: Building and Material Reuse; reuse or salvage building materials from on or off-site.

Path 1: Combination of reuse or salvage structural and non-structural elements from on or off-site (25% - 2 pts: 50% - 3 pts: 75% - 4 pts).

Path 2 a/b: a. Maintain only structure and envelope of walls, floors and roofs (25% - 1 pt: 50% - 2 pts: 75% - 3 pts); b. Maintain interior non-structural elements at least 33% by area of completed building, including additions (1 pt).
### Structure or envelope element

<table>
<thead>
<tr>
<th>Structure or envelope element</th>
<th>Existing area (m²)</th>
<th>Reused area (m²)</th>
<th>Percentage reused</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On-grade floor assembly</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundation, slab on grade</td>
<td>3120</td>
<td>2740</td>
<td>87.8%</td>
</tr>
<tr>
<td>Subfloor</td>
<td>3000</td>
<td>2000</td>
<td>66.7%</td>
</tr>
<tr>
<td>Hardwood flooring</td>
<td>3000</td>
<td>1500</td>
<td>50.0%</td>
</tr>
<tr>
<td><strong>2nd-floor assembly</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural deck</td>
<td>3120</td>
<td>1050</td>
<td>33.7%</td>
</tr>
<tr>
<td>Hardwood flooring</td>
<td>3000</td>
<td>2500</td>
<td>83.3%</td>
</tr>
<tr>
<td>Ceiling tiles</td>
<td>2225</td>
<td>1300</td>
<td>58.4%</td>
</tr>
<tr>
<td><strong>Roof deck</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reused roof deck</td>
<td>1905</td>
<td>985</td>
<td>51.7%</td>
</tr>
<tr>
<td>Roof deck (structurally unsound and removed)</td>
<td>920</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Asbestos ceiling tiles (hazardous material removed)</td>
<td>1905</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>1st-floor wall assemblies (excluding windows)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brick enclosure</td>
<td>1525</td>
<td>1525</td>
<td>100.0%</td>
</tr>
<tr>
<td>Insulation</td>
<td>1525</td>
<td>765</td>
<td>50.2%</td>
</tr>
<tr>
<td>Drywall</td>
<td>1525</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>2nd-floor wall assemblies (excluding windows)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brick enclosure</td>
<td>1525</td>
<td>1525</td>
<td>100.0%</td>
</tr>
<tr>
<td>Insulation</td>
<td>1525</td>
<td>380</td>
<td>24.9%</td>
</tr>
<tr>
<td>Drywall</td>
<td>1525</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>26,995</td>
<td>16,270</td>
<td>60.3%</td>
</tr>
</tbody>
</table>

**Note:** All materials included in credit calculations.
• **Option 4: Whole-building Life-Cycle Assessment;**
  • Path 1 - life-cycle assessment of the project’s structure and envelope (1 pt).

• Path 2 – life-cycle assessment of the project’s structure and... a minimum 5% reduction in 3 of the 6 environmental impacts including global warming potential (GWP) (2 pts).

• **Path 3** - life-cycle assessment of the project’s structure and envelope... a minimum 10% reduction in 3 of the 6 environmental impacts including GWP (3 pts).

• Path 4 – meet Path 3 and incorporate building reuse and/or salvage materials into the structure and envelope for the proposed design. Demonstrate a minimum 20% reduction in GWP and 10% reduction in an additional 2 environmental impact categories (4 pts).
Responsible Sourcing of Raw Materials (1 to 2 pts)

• Use permanently installed products from at least 3 manufacturers that meet at least one of the criteria, for at least 20% by cost, of total materials value (1 pt).

• Use permanently installed products from at least 5 manufacturers that meet at least one of the criteria, for at least 40% by cost, of total materials value (2 pts).
• **Materials reuse**, including salvaged and refurbished products, **valued at 200% of cost for credit**.

• **Recycled-content** as sum of post-consumer recycled content + ½ of pre-consumer recycled content, based on cost, valued at 100% of cost for credit.

• Products sourced **within 100 miles** of the project valued at 200% of base cost or two (2) products for credit achievement maximum.

• No double-counting except FSC with recycled-content and bio-based.
Material Reuse – Calculation for value

- **Cost paid or replacement value whichever is higher.**
- **If actual cost below equivalent new item cost, use higher value.**
- Source location distance is 0 for reuse of materials from project site.
- May use salvage from same Owner from another site.
- Furniture from same Owner and another site, must have been purchased at least 2-years prior to “reuse”.
- Salvage directly from other sites or third-party reuse store, source location is last location before reuse, either another site or the reuse store.
Low Emitting Material (1 to 3 pts based on number of products)

• Flooring and Ceilings
  • At least 90% of all flooring, by cost or surface area, meets the VOC emissions evaluation OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria.

• Wall Panels and Composite Wood
  • At least 75% of all wall panels, by cost or surface area, meet the VOC emissions evaluation, OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria.

• Furniture
  • At least 75% of all furniture in the project scope of work, by cost, meets the VOC emissions evaluation, OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria.
Option 1: Diversion (1 to 2 pts)

• Path 1a - Divert 50% and three (3) Materials Streams (1 pt).

• Path 1b – Divert 50% using certified commingled recycling facility and one (1) more material stream (i.e. two (2) materials streams) (1 pt).

• Path 2a - Divert 75% and four (4) Materials Streams (2 pts).

• Path 2b – Divert 75% using certified commingled recycling facility and two (2) more material stream (i.e. three (3) materials streams) (2 pts).
Option 2: Reduction of total waste material (2 pts)

• Do not generate more than 7.5 lbs/SF of new construction waste, and for renovation and demolition waste, salvage or recycle at least 75%, not including ADC (required).
• **Environmentally Preferable Products (1 to 6 pts)**
  • Product contains at least 25% reclaimed materials, including salvage, refurbished or reused. For renovation, existing components are considered reclaimed. Includes urban forestry, deadfall, landfill or river recovery.

• **Construction Waste Management (1 to 3 pts)**
  • Reduction from a baseline scale of waste relative to number of bedrooms and home size. Allowable Project Construction Waste = total waste - (recycled waste *0.25):
  • 20% reduction = 1 pt up to 60% reduction = 3 pts.
LEED Commercial interiors (122) % reused material type

$4.6 million reuse value = ~$37,000 per project
Mass of average new US single family dwelling (2,085 SF)

65 lbs/SF; 180 CY as waste = 9 @ 20 CY roll-offs
Salvage value per Non-Structure and Structure

- NS cabinets
- NS carpet
- NS windows
- NS appliances/equip
- NS vinyl siding
- NS doors
- NS bathroom accessories
- NS sinks
- S lumber
- S plywood
- S fiberglass insulation
- S concrete
- S asphalt shingles
- S drywall

[value $/1,000lbs] [total $/house]
Resources

http://lifecyclebuilding.org/

https://issuu.com/publicarchitecture/docs/design_for_reuse_primer_issuu

https://www.deconstructionproject.com/
Q & A Thank you! Brad Guy materialreuse@gmail.com