Outline

1. Carbon impacts of building materials
2. Short term – carbon reduction opportunities
3. Long term – moving towards circular building material sector
Carbon impacts of building materials
Product lifecycle – embodied carbon focus areas
CO2 emissions

Global

- Industry: 30%
- Transportation: 22%
- Building Materials and Construction: 11%
- Building Operations: 28%
- Other: 9%

39%

Oregon consumption-based

- Building Operations: 22%
- Embodied Carbon of Building Materials: 8%
- Other emissions: 71%

30%

Source: Architecture 2030, DEQ 2018
Embodied vs. Operational Carbon

Source: AIA / CLF Embodied Carbon Toolkit
Strategies to reduce embodied carbon

• Build less
• Reuse existing buildings
• Build smaller
  — occupancy matters
• Reuse materials
• Optimize building
  — whole building LCA
• Optimize materials
  — EPDs
  — other certifications
• Minimize waste
• Recover waste
Reduction strategies – short term
City of Portland - Zoning Code

Example: 5,000 square foot lots

City of Portland Residential Infill Project: https://www.portlandoregon.gov/bps/article/657675
Policy

- Requires reporting of embodied emissions for all rezoned buildings
- Equivalent annual embodied emissions values must be reported alongside operational emissions in kgCO2e/m2/year
- Data collected by city to understand scale of embodied emissions
City of Portland – Deconstruction requirement
Environmental Product Declarations (EPDs) for public purchasing

Other State Efforts:
• Oregon
• New York
• Washington
• Minnesota

Federal Efforts:
• Buy clean Procurement Requirements
What is an Environmental Product Declarations (EPD)?

- Disclosure label that reports the environmental impacts of products

- Typically include impacts of raw material extraction, transportation, and manufacturing

- Third party certified against ISO standards
Oregon Concrete EPDs

Program stats:
• 10 companies
• 21 central batch plants
• 4 mobile mix plants
• Over 1500 EPDs produced
City of Portland Concrete Procurement Policy

- **Jan 1, 2020**
  - EPDs required on all City projects
- **Jan 1, 2022**
  - City publishes GWP threshold
- **~ June 1, 2022**
  - All EPDs must be below threshold

Policy: [https://www.portlandoregon.gov/brfs/article/731696](https://www.portlandoregon.gov/brfs/article/731696)
Concrete – policy + pilots

Published EPDs in the Portland Area

2020 Low Carbon Concrete Sidewalk Pilot

This case study provides information on the City of Portland’s first round of low-carbon concrete pilot projects, featuring sidewalk ramps within the City’s Bureau of Transportation.

October 2020
Additional City of Portland Pilot Projects

Traffic signal pole footing  Driveways  Pavement and ADA ramps  Stormwater + Playground
## Table 19.07.050 Cement and Embodied Carbon Limit Pathways

<table>
<thead>
<tr>
<th>Cement limits</th>
<th>Embodied Carbon limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>for use with any compliance method 19.07.050.2 through 19.07.050.5</td>
<td>for use with any compliance method 19.07.050.2 through 19.07.050.5</td>
</tr>
<tr>
<td>Minimum specified compressive strength $f'_c$, psi (1)</td>
<td>Maximum ordinary Portland cement content, lbs/yd$^3$ (2)</td>
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<tr>
<td>up to 2500</td>
<td>362</td>
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<tr>
<td>3000</td>
<td>410</td>
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<tr>
<td>4000</td>
<td>456</td>
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<td>6000</td>
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<tr>
<td>7000</td>
<td>594</td>
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<tr>
<td>7001 and higher</td>
<td>657</td>
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<tr>
<td>up to 3000 light weight</td>
<td>512</td>
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<tr>
<td>4000 light weight</td>
<td>571</td>
</tr>
<tr>
<td>5000 light weight</td>
<td>629</td>
</tr>
</tbody>
</table>

**Notes**

(1) For concrete strengths between the stated values, use linear interpolation to determine cement and/or embodied carbon limits.

(2) Portland cement of any type per ASTM C150.
Long term – moving towards circular building material sector
materials management

conserving resources · protecting the environment · living well

Jordan Palmeri | jordan.palmeri@deq.state.or.us
503-229-6766