AFTER RECYCLED CONTENT

HOW PRODUCT TRANSPARENCY IS CHANGING THE WAY BUILDINGS ARE DESIGNED AND CONSTRUCTED

DANIEL OVERBEY AIA, WELL AP, LEED AP (BD+C, ID+C, O+M)
DIRECTOR OF SUSTAINABILITY
1 BILLION
SQUARE FEET OF BUILDING DEMOLISHED PER YEAR

82 BILLION
SQUARE FEET WILL BE REPLACED GLOBALLY FROM 2005 – 2030c
82 BILLION SF
ENERGY NEEDED TO DEMOLISH / REBUILD

= 10 YEARS
25% 

MATERIAL IN LANDFILL IS DEMOLITION AND CONSTRUCTION WASTE
OBsolescence

Physical

Functional

Economic

Locational

Lack of research into lifecycle impacts of building materials
LIFECYCLE ASSESSMENT
1960’s
ENERGY CRISIS
LCA FOR FUELS, ENERGY SYSTEMS

1970’s
CONSUMER PRODUCTS
COCA-COLA & MRI

1980’s
WASTE
LCA FOR CONSUMER PRODUCTS; ESP.
CONTAINERS, AND WASTE MANAGEMENT

1990’s
POLLUTION
LCA FOR INDUSTRIAL PROCESSES; CHANGES
...AND DIAPER WARS...

2000’s
BUILT ENVIRONMENT
LCA FOR MATERIALS, BUILDINGS;
CLIMATE CHANGE; CARBON FOOTPRINT
DIAPER WARS

1990
THE AMERICAN PAPER INSTITUTE FINDS DISPOSABLE DIAPERS TO BE PREFERABLE. (STUDY BY FRANKLIN ASSOCIATES)

1991
THE NATIONAL ASSOCIATION OF DIAPER SERVICES CONCLUDES CLOTH IS BETTER. (STUDY BY LEHRBERGER & JONES)

1992
PROCTER & GAMBLE REVERSES THE CONCLUSION ONCE MORE: DISPOSABLE IS BETTER. (STUDY BY A. D. LITTLE)

1992
NEW FRANKLIN ASSOCIATES STUDY CONCLUDES: IT DEPENDS... (ENERGY, WATER, OR SOLID WASTE).
4 THINGS YOU NEED
FOR ANY LIFECYCLE ASSESSMENT

GOALS AND SCOPE
ACCORDING TO THE ISO STANDARDS

LCI – LIFECYCLE INVENTORY
INVENTORY FLOWS OF WATER, ENERGY, RAW MATERIALS, AND RELEASES TO ENVIRONMENT

LCIA – LIFECYCLE IMPACT ASSESSMENT
GAUGE POTENTIAL IMPACTS TO ENVIRONMENT

TOOLS
BEES, SIMAPRO, TALLY, ATHENA
WASTE = FOOD
IN 1996, 136 MILLION TONS OF CONSTRUCTION AND DEMOLITION DEBRIS WAS GENERATED – 57% BY NON-RESIDENTIAL CONSTRUCTION

IN 2000: 75%
OF U.S. LANDFILLS WERE FULL OF CONSTRUCTION DEBRIS

IN 2014: 40%
OF U.S. LANDFILLS WERE FULL OF CONSTRUCTION DEBRIS, AFTER WIDESPREAD ADOPTION OF GREEN BUILDING STANDARDS
MAKING PROGRESS...

REUSING BUILDINGS
PRIORITY NUMBER 1

THE BUILDING YOU DON’T BUILD
SMALLER BUILDINGS; ADAPTABILITY

MODULAR CONSTRUCTION
REDUCES WASTE AND INCREASES EFFICIENCY

HIGH RECYCLED CONTENT
BUT NEED TO DESIGN MATERIALS TO RECYCLE THE RECYCLED CONTENT
THINK HOLISTICALLY.

PRODUCTS
BUILDINGS
INDUSTRY
### Impurities

Residuals from processing and contaminants from raw materials identified by Life Cycle Research in the Pharos CML. Solvents, catalysts, monomers, and other reactants involved in processing are also listed here.

<table>
<thead>
<tr>
<th>Component</th>
<th>CASRN</th>
<th>Function</th>
<th>Health Hazards</th>
<th>% Wt. Part</th>
<th>% Wt. Whole</th>
<th>LCA?</th>
</tr>
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<tbody>
<tr>
<td>Manganese</td>
<td>7439-96-5</td>
<td>gravel residual</td>
<td>Orange Red</td>
<td>Unknown</td>
<td>0.09%</td>
<td>No</td>
</tr>
<tr>
<td>Quartz</td>
<td>14808-60-7</td>
<td>clinker residual</td>
<td>Orange Red</td>
<td>Unknown</td>
<td>0.07%</td>
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<tr>
<td>Vanadium</td>
<td>7440-62-2</td>
<td>gravel residual</td>
<td>Orange Red</td>
<td>Unknown</td>
<td>0.01%</td>
<td>No</td>
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<tr>
<td>Nickel</td>
<td>7440-02-0</td>
<td>gravel residual</td>
<td>Orange Red</td>
<td>Unknown</td>
<td>0.01%</td>
<td>No</td>
</tr>
<tr>
<td>Chromium Compounds</td>
<td></td>
<td>clinker residual</td>
<td>Orange</td>
<td>Unknown</td>
<td>Less than 0.01%</td>
<td>No</td>
</tr>
<tr>
<td>Cobalt</td>
<td>7440-48-4</td>
<td>gravel residual</td>
<td>Orange Red</td>
<td>Unknown</td>
<td>Less than 0.01%</td>
<td>No</td>
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<tr>
<td>Lead</td>
<td>7439-92-1</td>
<td>gravel residual</td>
<td>Purple Orange Red</td>
<td>Unknown</td>
<td>Less than 0.01%</td>
<td>No</td>
</tr>
<tr>
<td>Arsenic</td>
<td>7440-38-2</td>
<td>gravel residual</td>
<td>Purple Orange Red</td>
<td>Unknown</td>
<td>Less than 0.01%</td>
<td>No</td>
</tr>
<tr>
<td>Selenium</td>
<td>7782-49-2</td>
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<td>Purple Orange</td>
<td>Unknown</td>
<td>Less than 0.01%</td>
<td>No</td>
</tr>
<tr>
<td>Beryllium</td>
<td>7440-41-7</td>
<td>gravel residual</td>
<td>Orange Red</td>
<td>Unknown</td>
<td>Less than 0.01%</td>
<td>No</td>
</tr>
<tr>
<td>Cadmium</td>
<td>7440-43-9</td>
<td>gravel residual</td>
<td>Purple Orange Red</td>
<td>Unknown</td>
<td>Less than 0.01%</td>
<td>No</td>
</tr>
</tbody>
</table>

Source: The Quartz Project
## EPD: Environmental Product Declarations

### Atmosphere
- **Global Warming Potential** refers to long-term changes in global weather patterns—including temperature and precipitation—that are caused by increased concentrations of greenhouse gases in the atmosphere.
- **Ozone Depletion Potential** is the destruction of the stratospheric ozone layer, which shields the earth from ultraviolet radiation that's harmful to life, caused by human-made air pollution.
- **Photochemical Ozone Creation Potential** happens when sunlight reacts with hydrocarbons, nitrogen oxides, and volatile organic compounds, to produce a type of air pollution known as smog.

### Water
- **Acidification Potential** is the result of human-made emissions and refers to the decrease in pH and increase in acidity of oceans, lakes, rivers, and streams—a phenomenon that pollutes groundwater and harms aquatic life.
- **Eutrophication Potential** occurs when excessive nutrients cause increased algae growth in lakes, blocking the underwater penetration of sunlight needed to produce oxygen and resulting in the loss of aquatic life.

### Earth
- **Depletion of Abiotic Resources (Elements)** refers to the reduction of available non-renewable resources, such as metals and gases, that are found on the periodic table of elements, due to human activity.
- **Depletion of Abiotic Resources (Fossil Fuels)** refers to the decreasing availability of non-renewable carbon-based compounds, such as oil and coal, due to human activity.

Source: Interface
<table>
<thead>
<tr>
<th>Health</th>
<th>Health Product Declarations (HPD)</th>
</tr>
</thead>
</table>

**Ecotoxicity** refers to the potential for biological, chemical or physical stressors to adversely affect ecosystems.

**Human Toxicity** is the likelihood of an environmental toxicant to have an adverse effect on human health.

**This open standard was developed to provide a consistent reporting format that increases the quality and availability of product content and health information.**
TRANSPARENCY.
WITH PURPOSE

1ST: DISCLOSURE
MORE PRODUCT TRANSPARENCY.
INTERNATIONAL STANDARDS.
CONSISTENT FORMATTING.

2ND: BE BETTER INFORMED
EASILY ACCESSIBLE INFORMATION.
“APPLES TO APPLES” COMPARISONS.

3RD: OPTIMIZATION
HOLISTIC APPROACH TO MATERIALS AND PRODUCTS.

4TH: SCALE IT UP
AGGREGATE DATA ON MATERIALS AND RESOURCES.
TOWARD ASSESSING LCA FOR ENTIRE STRUCTURES.
EVENTUALLY: INDUSTRIAL AND COMMUNITY SCALE.
TYPICAL WORKFLOW

SCHEMATIC DESIGN → DESIGN DEVELOPMENT → CONSTRUCTION DOCUMENTS

LCA WORKFLOW

SCHEMATIC DESIGN → LCA MODELING → DESIGN DEVELOPMENT → LCA MODELING → CONSTRUCTION DOCUMENTS
SINGLE-ATTRIBUTE DECISION-MAKING IS DEAD.
AFTER RECYCLED CONTENT

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