Chapter -7
Materials & Resources

Learning Objectives

- Storage of recyclable materials
- Construction Waste Management Planning & Implementation
- Building life cycle impact reduction
- Building product disclosure and optimization
  - Environmental product declarations
  - Sourcing Raw Materials
  - Material Ingredients
Useful Terminologies

Embodied Energy

• The embodied energy of a product is the total primary energy consumed in extracting, processing, manufacturing, transporting and using a product
**Embodied Energy: Cradle to Gate**

- Cradle to Gate: Calculated up to Manufacturing

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<table>
<thead>
<tr>
<th>Cradle to gate</th>
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<tbody>
<tr>
<td>Primary Resource Extraction</td>
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<tr>
<td>Transport unfinished product</td>
</tr>
<tr>
<td>Processing and Manufacturing</td>
</tr>
<tr>
<td>Transport Final Product</td>
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<tr>
<td>Assembly</td>
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<tr>
<td>Maintenance (Recurring)</td>
</tr>
<tr>
<td>Demolition / Recycling</td>
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**Embodied Energy: Cradle to Site**

- Cradle to site: Calculated till the product reaches site

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<table>
<thead>
<tr>
<th>Cradle to site</th>
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Embodied Energy: Cradle to grave

- Cradle to grave: Calculated till the end of life of the product

Cradle to Cradle approach

- Conventional products have cradle to grave approach.
- Cradle to cradle products are environmentally preferred.
- Cradle to Cradle maintains materials in closed loops reducing waste disposal and landfill.
Lifecycle Assessment

Life cycle assessment determines the environmental impacts of products, processes or services, through production, usage, and disposal.

LCA Impact categories
- Global warming potential
- Depletion of the stratospheric ozone
- Acidification of land and water sources
- Eutrophication
- Formation of tropospheric ozone
- Depletion of nonrenewable energy resources

Materials & Resources

Waste reduction

Environmentally Preferable Materials
- Less life cycle impact
Storage of Recyclable Materials

Intent

• Facilitate recycling for the occupant.
• Reduce the amount of waste going to landfill when the building is occupied
Strategies & Implementation

• Provide dedicated storage facility for recycling minimum paper, cardboard, glass, plastics and metals
• Decide on type of recycling Comingled or segregated
• Take appropriate measures for the safe collection, storage, and disposal of two of the following: batteries, mercury-containing lamps, and electronic waste
• Proper signage to indicate storage place of recyclable materials
• Contaminated materials such as e-waste, batteries, lead, asbestos, mercury etc should not be mixed with general recycling

Construction & Demolition
Waste Management
Planning and Implementation
• Divert Construction waste from landfill and incineration.
• Consider reducing waste generation on site by using modular construction, prefabricated materials, reduced packaging and by using industry standard constructions
• Prepare a construction waste management plan in order to divert construction waste from landfill.

Construction Waste Management Plan

• Identify convenient storage place for recyclable material
• Consider recycling, reusing, donating etc.,
• Sign a contract with haulers for recycling
• Consider Waste-to-energy
• Waste to Energy is the conversion of non recyclable waste materials into usable heat, electricity, or fuel through a variety of processes, including combustion, gasification, pyrolyization, anaerobic digestion, and landfill gas (LFG) recovery
Construction Waste Management Plan

• Excavated soil, land clearing debris and Alternate daily covers are not considered in construction waste calculation
• Construction Waste Management Plan shall address how hazardous or contaminated materials will be handled in the project but hazardous or contaminated waste shall not be included in the calculation
Intent

• To encourage adaptive reuse and optimize the environmental performance of products and materials.

LCA Reduction Options

- Building Reuse
- Material Reuse
- Conduct LCA to demonstrate reduction in Environmental Impact
Building Reuse

Historic building Reuse

Blighted Building Reuse

Preserve/Retain historic nature of the building

Blighted: defined as neglected, rundown or deteriorated condition sufficient to constitute a threat to human health, safety, and public welfare
Building Reuse

- Maintain existing building structure (roof, floor and envelope)
- Retain existing interior nonstructural elements (e.g., interior walls, doors, floor coverings and ceiling systems)

**Not to Reuse:**
- Hazardous, contaminated and damaged parts of building
- Window glazing and MEP equipments

Material Reuse

Use refurbished or salvaged materials.
Building Reuse
- Same location, same purpose

Material Reuse
- Different location, different purpose
- Reused materials can be sourced onsite or offsite

Demonstrate reduced environmental impact by Life cycle assessment

- **Life Cycle Assessment (LCA)** is the investigation and valuation of environmental impact of building throughout its life span

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Building product disclosure and optimization

Intent

• To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts.
Understanding Disclosure

• To procure environmentally preferable materials first the project should identify products and manufacturers who have disclosed the environmental impact, Health Impact, Raw materials used etc.
• Disclosure part of credit encourages projects to identify products with disclosures
• Disclosures addressed in LEED
  – EPD: Environmental Product Declaration
  – HPD: Health Product Declaration
  – CSR: Corporate Sustainability Report
• Disclosure part is assessed based on number of products with disclosure from different manufacturers

Environmental Product Declarations

• Environmental Product Declaration (EPD), is a standardized way of quantifying the environmental impact of a product or system. Typically, an EPD will include information about a product’s impact on global warming, ozone depletion, water pollution, ozone creation, and greenhouse gas
• Download a sample EPD http://www.armstrong.com/common/c2002/content/files/72237.pdf
• Credit awarded based on number of products from different manufacturers having EPDs
Sourcing of Raw Materials-Disclosure

- Use materials from manufacturers who publish Corporate Sustainability Report
- Corporate sustainability reports (CSRs) disclose source and extraction of raw materials and thereby help to identify products/manufacturer’s that have been verified to be extracted or sourced in a responsible manner.

Health Product Declaration/Material Ingredient reporting

Health Product Declarations (HPDs): HPDs are a standard format for transparent disclosure of building product ingredients and associated hazards.
Optimization: Use Environmentally Preferable Products

- Use products that demonstrate impact reduction below industry average.
- Credit awarded based on cost of products which has lesser impact compared to industry standard.
- Third party certifications like Green Screen, Cradle to Cradle may help achieve the sourcing of raw materials credit

Environmental preferable products based on raw materials include
  - Products with recycled content
  - Biobased materials
  - Products that are harvested or extracted, processed and manufactured with 100 miles from project location
  - FSC Certified wood

Recycled Content

Post Consumer recycled content

- The recycled material generated from materials that and can no longer be used for its intended purpose
- Example: used milk gallons, bottles, construction waste etc.,

Pre consumer recycled content

- The recycled material generated from industrial by products and unused materials.
- Example: sawdust, fly ash etc.,
- Unsold news papers, unsold magazines
Recycled content is the measured as proportion, by mass, of pre-consumer or post-consumer recycled material. 

Reference Standards: ISO 14021

Bio based Materials

Bio based Materials are composed of biological products, renewable agricultural materials.

Examples:
- Bamboo
- Cork
- Linoleum
- Wheat board
- Strawboard
- Coir, jute
FSC Certified Wood

Forest Stewardship Council (FSC) is a seal of approval awarded to forest managers who adopt environmentally and socially responsible forest management practices.

Chain of Custody (COC)

Chain-of-custody (COC) is a tracking procedure for a product from the point of harvest or extraction to its end use, including all successive stages of processing, transformation, manufacturing, and distribution.
Points to be remembered

• For all credits Materials and Resources credit MEP materials are excluded from the calculation

• Furniture may be included for credit calculations but if included should be included consistently in all credit calculations. For interior projects furniture must be included for calculations.

• Only permanently installed materials are included in calculation. Scaffolding and other temporary construction materials are excluded

Summary

▪ Storage of recyclable materials
▪ Construction Waste Management Planning & Implementation
▪ Building life cycle impact reduction
▪ Building product disclosure and optimization
  ✓ Environmental product declarations
  ✓ Sourcing Raw Materials
  ✓ Material Ingredients
Questions?
Put your questions in the forum