LOW ENERGY MATERIALS FOR INTERIORS

EVENT  The 8th Regional GRIHA Summit
THEME  Choosing sustainable, building sustainable
5 action-ables

Tools / Standards
- Are green materials really green?
- Performance Matrix
- Existing Standards, Labelling and Tools.

Why Interior Materials & why “GREEN” interior materials?
- Environmental & Human Impact.
- Embodied Energy

Adapted from Simon Sinek
WHY?
We spend 90% of our time indoors. Interior spaces have an effect on our health & wellbeing.

90% of the operating costs over a lifetime of a building are related to human resources.

Interior woks are carried out in approx. every 7-10 years. Sometimes even in shorter periods of time, resulting in high recurring embodied energy.
INTERIOR MATERIAL CYCLE

DRIVER
= Comfort

DRIVEN
= Env. Resources

- Pollution → emissions
- Depletion of natural resources

IMPACT
“Sick Building Syndrome”

Raw Materials
Material Processing
Distribution
Use
Recycle
Disposal

Use & Maintenance

Psychological
Visual
Acoustic
Air Quality
Thermal
Ergonomics

= Comfort
= Env. Resources
Energy is embodied in everything we use and depend on. Often Embodied Energy is ignored because it is not “visible” or as easy to track as operational energy.

Embodied energy = the sum of energy inputs to make a product.
WHY EMBODIED ENERGY?

At beginning of building life, embodied energy = 100% of building’s energy

At end of life-cycle (yr 50), operational energy = 75% and embodied energy = 25%


Source: 2030, Inc. / Architecture 2030.
WHY EMBODIED ENERGY

As operational energy reduces, the impact of embodied energy increases.

Source: Cannon Design, Presentation on Material Life
LCA FOR EE: CRADLE TO GATE (TO GRAVE)

Embodied energy = the sum of energy inputs to make a product.

For the full cradle to grave cycle, energy inputs from:

• Extraction of raw materials
• Transportation to factory
• Manufacture of product/ components
• Assembly of product / system
• Transportation to site / point of sale
• Installation / construction
• Maintenance
• Replacement
• Disposal / re-purposing / recycling
**EMBODIED ENERGY**

**INTERIOR APPLICATIONS**

- **WALL**
  - Partitions
  - Paints
  - Wallpaper
  - Acoustic Panels

- **CEILING**
  - False ceiling

- **FLOOR**
  - False flooring
  - Carpeting
  - Stone / Tiles

- **FURNITURE**
  - Workstations
  - Seating
  - Storage

**Breakdown of initial embodied energy for typical office building**

- **Envelope**, 26%
- **Structure**, 24%
- **Services**, 24%
- **Constructi on**, 7%
- **Finishes**, 13%
- **Site work**, 6%

**TOTAL** 447.8 MJ/ft²

Source: Cole and Kernan, 1996
EMBODIED ENERGY (1000 FT² OFFICE)

Initial Cost Breakup

- Floors: 13%
- Walls: 9%
- Partitions: 17%
- Ceilings: 5%
- Furniture: 57%

Surface Areas of Material Applications

- Floors: 22%
- Ceilings: 22%
- Partitions: 38%
- Doors: 3%
- Wall finishes: 5%

Materials:
- Carpet
- Wet partition walls
- Vitrified tiles
- Gypsum board partitions
MATERIAL EVALUATION (SAMPLE)

Wall Finishes

- Mechanically attached
- Applied with adhesive/cement
- Direct application

Flooring

- Resilient Flooring
- Hard flooring

Source: Cannon Design, Presentation on Material Life
Initial Embodied Energy (%)

- Furniture, 30%
- Ceiling Finishes, 20%
- Partitions, 12%
- Glass Doors, 4%
- Painting, 8%
- Carpet, 9%
- [CATEGORY NAME] & Stone, [VALUE]

- The Embodied energy in items like furniture & natural stone is more due to the transportation energy.
- Paints have lesser embodied energy than carpets, but comparatively much more surface area.
- Reducing False ceiling can bring the Embodied energy down by at-least 10-15%.
- Life expectancy & durability of the material plays an important role in overall embodied energy.
  - Paint = 5-7 years
  - Carpets = 10 years OR stone/tile = 20 years
  - Gypsum boards/ceiling = 8 years
  - Glass = 10 years
HOW?
ARE “GREEN MATERIALS” REALLY “GREEN”?

ISSUES:

• Plethora of options.
• Reliability of self declarations.
• “Greenwash” → What determines green?

COMMON TERMINOLOGIES:

• Recycled versus recyclable
• Biodegradable
• Low VOC
• Rapidly Renewable
• Sustainable Forestry
• Free of Urea Formaldehyde
SINGLE ATTRIBUTE CERTIFICATIONS

- FSC
- cradle to cradle
- Health Product Declaration Collaborative
- Greenguard Gold
- EPD Verified
- WaterSense
- CRI Green Label
GRIHA CRITERIA 21

Use of low-environmental impact materials in building interiors.

- At least **25%** of all materials meets the criterion – **1 point**
- At least **50%** of all materials meets the criterion – **2 points**
- At least **75%** of all materials meets the criterion – **4 points**

Following materials will be accepted as low-environmental impact:

- Stones from India
- Composite wood based products
- FSC Chain of Custody certified products
- Manufactured products with at least **5%** recycled content
- Products with EPD (cradle to gate) analyzed and published as per ISO 14025 / ISO 21930
- Products with water footprint (cradle to gate) analyzed and published as per ISO 14046

false ceilings/internal partitions/panelling/in-built furniture/flooring/internal door & window panels & frames
GRIHA CRITERIA 13

Use of low-VOC paints and other compounds in building interiors.

- Ensure that all interior paints are low-VOC and lead-free – 1 point
- Ensure that all adhesives and sealants used shall be low-VOC & that interior composite wood products do not use urea-formaldehyde as a bonding resin – 1 point
MATERIAL DOUGHNUT

Safe space between the overshoot limit / ceiling of the environmental impacts and the shortfall in human comfort.
**Example: Paints**

Surface Area application in an interior project = 40-45%

**Embodied Energy:**
- Solvent based paint 98.1 MJ/kg
- Water based paint 88.5 MJ/kg

**VOC content:**
- Solvent-based coatings contain between 30 and 70% VOC’s by weight
- Most water-based coatings contain approximately 6% VOC.

Source: Dulux Paints, R. Reddy Embodied Energy Coefficients
TOP 5 POINTS FOR “GREEN INTERIORS”
USE ONLY FURNITURE THAT IS SOURCED REGIONALLY & WITH HIGH RECYCLED CONTENT.

“The details are not the details. They make the design.”
– Charles Eames
USE LOCAL, NATURAL & RESILIENT FLOORING. USE CARPET SPARINGLY. (REGIONALLY SOURCED, WITH HIGH RECYCLED CONTENT)

“There is no better designer than nature.”
– Alexander McQueen
3.

AVOID FALSE CEILINGS

“Less is More.”
– Ludwig Mies van der Rohe
4. USE WATER BASED PAINTS

“Be water, my friend.”
– Bruce Lee
“Instead of thinking out the box, get rid of the box.”
– Deepak Chopra
THANK YOU

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