materials use

introduction

The materials used to build our homes, can have significant health and environmental effects. these often extend far beyond the specific context of their end-use. Usually the impact of materials used is dictated by the processes adopted to extract, process and transport them to the site.

The cumulative effect of seemingly small, local impacts over the lifecycle of a material can have substantial or even catastrophic consequences on a global scale.

The Impact of a given material can occur at all stages of the material's lifecycle, from extraction and processing through the useful operating life to end use (disposal or recycling). These are not always apparent.

Careful analysis and selection of the materials used and the way they are combined can yield significant improvements in the comfort, cost effectiveness and energy efficiency of a home.

James Hardie / Burgess House

This well insulated home clad in lightweight fibre cement sheeting has low embodied energy and requires little heating or cooling energy to maintain thermal comfort in a warm, temperate climate.

THE KEY ISSUES

The Materials Use group of fact sheets:

> Examine the economic and environmental cost of various commonly used materials.

> Identify and explain various tools available for measuring these costs over total lifecycle.

> Outline principles for choosing materials and systems to reduce or eliminate these impacts.

> Demonstrate the application of these principles with case studies and examples.

Informed decisions about materials and construction systems can reduce the environmental impact of a home without adding to the cost.

To reduce the total amount of materials consumed and their environmental impact:

Make more efficient use of existing materials.

Minimise the amount of waste.

Use materials with least environmental impact.

Consider both operational and whole lifecycle performance of materials and designs.

Use fully recycled materials or materials with recycled content.

Re-use whole buildings or parts thereof to reduce consumption of new materials.

Choose materials with a lifespan equivalent to the projected life of the building.

Design to extend building lifespan (current average 50 years – aim for 100+).

Design and build for de-construction, re-use, adaptation, modification and recycling.

Encourage development of new, efficient, low impact materials and applications by creating demand.

Consider how and where the materials are sourced and the impacts this causes.

Minimise the energy used to transport materials by using locally produced material. Use of lightweight material where appropriate also reduces transportation energy.

Minimise the energy used to heat and cool the building by using materials that effectively modify climate extremes.

Understand how chemicals used in the manufacture of some materials might affect your health.

Minimise or eliminate emissions during use and manufacture.

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OVERVIEW OF MATERIALS USE FACT SHEETS

EMBODIED ENERGY AND LIFE CYCLE ASSESSMENT

Consequences (or impacts) of particular materials and construction systems are often not apparent because they occur long distances from where the product is consumed or are part of the manufacturing and transportation phase and simply not considered by the end user.

Life Cycle Assessment (LCA) is the method used to measure these environmental impacts over the total life span of the materials. This includes extraction, manufacture, transportation, use or operation and eventual disposal or re-use. LCA can be applied to a whole product (house or unit) or to an individual element or process included in that product.

Practical, cost effective ways exist to reduce entire life or "cradle to grave" impact. These are often as simple as using construction systems appropriate for climate or substituting materials with high recycled content for those made from new or non-renewable material. This is particularly true of the energy component.

Embodied energy is the total energy used to create, use and dispose of a product including all the processes involved in harvesting, production, transportation, construction, use and disposal or re-use. It can represent a significant proportion of the total energy used during the lifecycle of a home.

WASTE MINIMISATION

Examines methods for lowering costs and reducing consumption of materials by minimising waste and recycling or re-using materials.

The sheet focuses on the design and construction phases as these are the stages of lifecycle where the greatest inefficiencies exist and the greatest gains can be made.

INDOOR AIR QUALITY

Examines the effect of various materials, and the chemicals they emit, on health and comfort within the home. It identifies options for reducing the number of "outgassing" materials and minimising the effects of those that remain.

The four factors considered in addressing the health affects of materials are:

> Emissions: where they come from and what they are.

> Toxicity: who do emissions affect and what are the symptoms.

> Quantity: volume of emissions and how long they last.

> Proximity: length of exposure, volume of room and ventilation levels.

CONSTRUCTION SYSTEMS

Guides the selection of systems of construction with lowest economic and environmental cost by comparing "entire life" performance with "operational" performance for common house building envelope systems.

Examines the performance of various roof, wall and floor systems in a range of climates and compares their operational cost/benefits to their lifecycle cost benefits in economic and environmental terms.

LIFECYCLE BIODIVERSITY IMPACTS

Biodiversity is the variety of all life forms - the different plants, animals and micro-organisms, the genes they contain and the ecosystems of which they form a part. Biodiversity is an essential human life support system.

The harvesting of many materials used in building a home may causes many adverse impacts on biodiversity including:

> Extinction of species.

> Destruction of natural systems and habitat.

> Degradation of life support systems.

> Fragmentation of habitat and populations.

These impacts are rarely apparent at the point of purchase or use. As a result, we continue to specify and use materials that destroy our life support systems, even where alternatives exist.

Use this fact sheet to identify significant off-site impacts, guide your design and material choices, and influence your suppliers to provide biodiversity-friendly products.

ECOSPECIFIER

EcoSpecifier is a guide to selection of individual materials on an "environmentally preferred" basis. It has been developed by the Centre for Design at RMIT University in conjunction with EcoRecycle Victoria and is reproduced in the "Your Home" CD-Rom in complete form by kind permission of the authors.

The format of EcoSpecifier is different to other fact sheets because it is an independent publication. It has been included because it is the most comprehensive guide to selecting environmentally preferred materials.

EcoSpecifier explains how materials are assessed as being environmentally preferred based on lifecycle assessment and a range of other factors. It includes a comprehensive list of environmentally preferred generic materials commonly used in Australia.

Use this valuable tool to either select materials with least environmental cost, or to gain an understanding of the principles of selection in order to identify or develop alternative materials.

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