



Technical BULLETIN

► Report on: Life Cycle Assessment of Steel Framed Homes

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SUSTAINABILITY - A GLOBAL VIEW

A growing world population and the desire to improve the quality of life of the planet's inhabitants is driving increasing consumer demand for products and services. Intensifying demand is putting a greater burden on the planet's natural resource base and the global eco-system. The recognition that the planet has finite resources and a limited ecological carrying capacity has resulted in increased concern over how we carry out our activities, and the effectiveness with which we utilize our limited resources. From this recognition, the notions of sustainability and sustainable development have arisen. Although **sustainability has yet to be defined** in substantive terms, the implications are clear. We must become less wasteful in our use of natural and human resources and take the appropriate steps necessary to maintain the planet in a healthy state, today, and for the future.

Sustainable development requires a change in thinking from short term economic benefit to a more thoughtful long term viewpoint, balancing environmental and economic factors. Well developed methods and criteria already exist to measure productivity and economic performance. In the context of sustainable development, there is an apparent necessity for comparable methods and criteria to incorporate sustainable thinking into the decision-making process. Life cycle assessment is a tool, which can be used to direct sustainable thinking.

LIFE CYCLE ASSESSMENT

Life cycle assessment, or LCA, is a tool for comprehensively measuring and accounting for the resource consumption and environmental burdens associated with a product over its life.

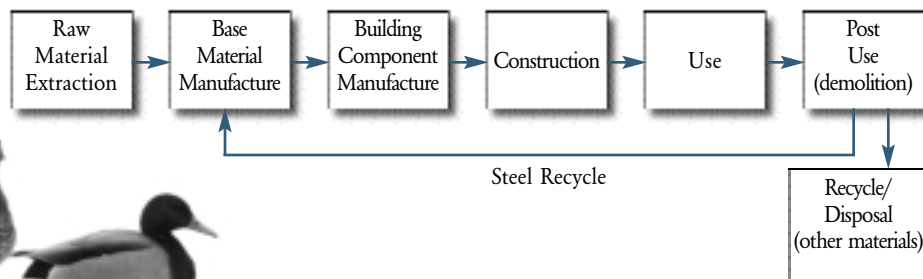
The life cycle of a product typically represents a number of distinct phases. In the construction context a condensation of the major phases includes:

- **Raw Material Extraction and Manufacture** - the resource consumption and burdens associated with the conversion of raw materials from the earth to finished building components;
- **Construction** - the resource consumption and burdens associated with the fabrication of the home;
- **Use** - the utilization of the home for its intended purpose;
- **Post Use** - the demolition, recycling/disposal of base materials.

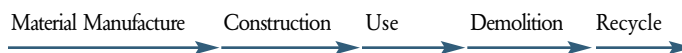
LCA is methodologically rigorous, requiring the completion of four steps. The steps are :

1. **Goal and Scope Definition** - the demarcation of the physical boundaries round the product system which is to be examined;
2. **Life Cycle Inventory, LCI** - the data collection phase, consisting of the measurement and accounting of all material and energy inputs, outputs, and emissions;

Figure 1.0 - Life Cycle Phases for a Steel Framed Home



Summary of Major Construction Life Cycle Phases:



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3. **Life Cycle Impact Assessment, LCIA** - the categorization of the various emission types into common environmental themes expressed in a uniform metric;
4. **Interpretation** - the evaluation of each environmental theme as a potential environmental impact.

LCA AND STEEL

The International Iron and Steel Institute, IISI, and its member companies have recently completed a Global Life Cycle Inventory for 14 steel products. Over 50 companies, representing 40 % of world steel production have contributed to the independent study, making it the largest Life Cycle Inventory ever undertaken. The steel LCI methodology was developed in conformance with the ISO 14000 series of environmental standards for life cycle assessment making it the first study in world to be ISO 14040/41 compliant.

fuels is considered one of most significant environmental issues with the greatest potential environmental impact for the earth.

In light of this, construction professionals are becoming increasingly aware of the significance and influence, which the building sector has on global environmental performance. To improve environmental building performance, the building industry has begun to explore how energy is invested over the life cycle of buildings and not just in one of the phases such as manufacturing energy. This has spurred considerable debate regarding the environmental profiles of various building materials. LCA can be used to assist in resolution of the debate as well as putting the contribution of the building material into the context of the building's life cycle. Equipped with this information building professionals are better armed as they weigh benefits and shortcomings of the various construction materials.

The energy profile assumes the steel framing used is first generation, not taking into account the benefits of a multiple recycling scenario. Therefore, the profile represents a conservative analysis. The most striking feature, which is revealed, is that the Use Phase of the home represents over 95 % of the total life cycle energy. The significant use phase energy contribution is typical for any home, regardless of material of construction, and arises from heating, lighting, and using appliances over a projected life of 50 years. The construction materials energy contribution represents a **minor 2.7 % of the total life cycle.** (see figure 2.0)

The analyses of steel as a construction material, indicates that the energy burden associated with steel or other framing materials represents a small contribution to the home's overall life cycle energy profile. In addition, the unique properties of steel allow for that initial energy investment to be re-used in future generations of recycled steel products. This inherent property represents a significant advantage for steel as a sustainable construction material over other construction products.

THE MULTIPLE LIVES OF STEEL

One of the key sustainable attributes of steel is its ability to be recycled without the loss or degradation of its inherent material properties. The recyclability of steel allows for it to exist for potentially an infinite number of product life cycles.

Steel benefits from the most comprehensive and accessible collection infrastructure of any material, and not just in North America, but around the world. Steelmaking practice ensures that there is a minimum of 28 % recycled steel content in every ton of steel produced. Economic and environmental considerations have driven technological advances in electric arc furnace (EAF) steelmaking technology. EAF technology utilizes a **100 % recycled steel charge.** Presently, steel made from EAFs accounts for 45 % of all steel produced in North America and is used in the manufacture of steel framing components. The traditional integrated steelmaking route and EAF routes ensure that 60 % of all steel produced in North America is recycled to become new steel.

EMBODIED ENERGY - A LIFE CYCLE PERSPECTIVE

The use of energy and creation of greenhouse gases generated by the combustion of fossil

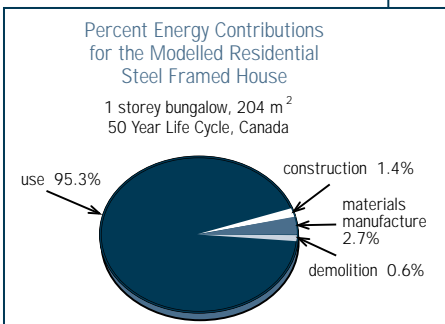


Figure 2.0

