

Generic Steel Framing

Product Selection and Description

Steel is an important construction framing material. Cold-formed steel studs for framing are manufactured from blanks sheared from sheets cut from coils or plates, or by roll-forming coils or sheets. Both these forming operations are done at ambient temperatures. Cold-formed steel shapes are made from flat-rolled 0.46 mm to 2.46 mm) (18 mil to 97 mil) carbon steel as either single bent shapes or bent shapes welded together. Two basic types of steel framing, nailable and nonnailable, are available in both punched and solid forms. Zinc chromate primer, galvanized, and painted finishes are available. Steel stud and joist systems have been adopted as an alternative to wood and masonry systems in most types of construction. Steel framing is also used extensively for interior partitions because it is fire-resistant, easy to erect, and makes installation of utilities more convenient. Cold-formed steel framing can be installed directly at the construction site or it can be prefabricated off- or on-site for quicker installation. The assembly process relies on a number of accessories usually made of steel, such as bridging, bolts, nuts, screws, and anchors, as well as devices for fastening units together, such as clips and nails.

The functional unit of comparison for BEES framing alternatives is 0.09 m² (1 ft²). The steel framed exterior wall has 33 mil galvanized steel studs placed 61 cm (24 in) on center, and has a service life of 75 years. Self-tapping steel screws, used as fasteners for the steel studs, are included. While the exterior wall is constructed as an assembly with sheathing components and insulation, for the BEES framing category, only the framing material is accounted for, not the full assembly.

Flow Diagram

The flow diagram below shows the major elements of the production of this product, as it is currently modeled for BEES.

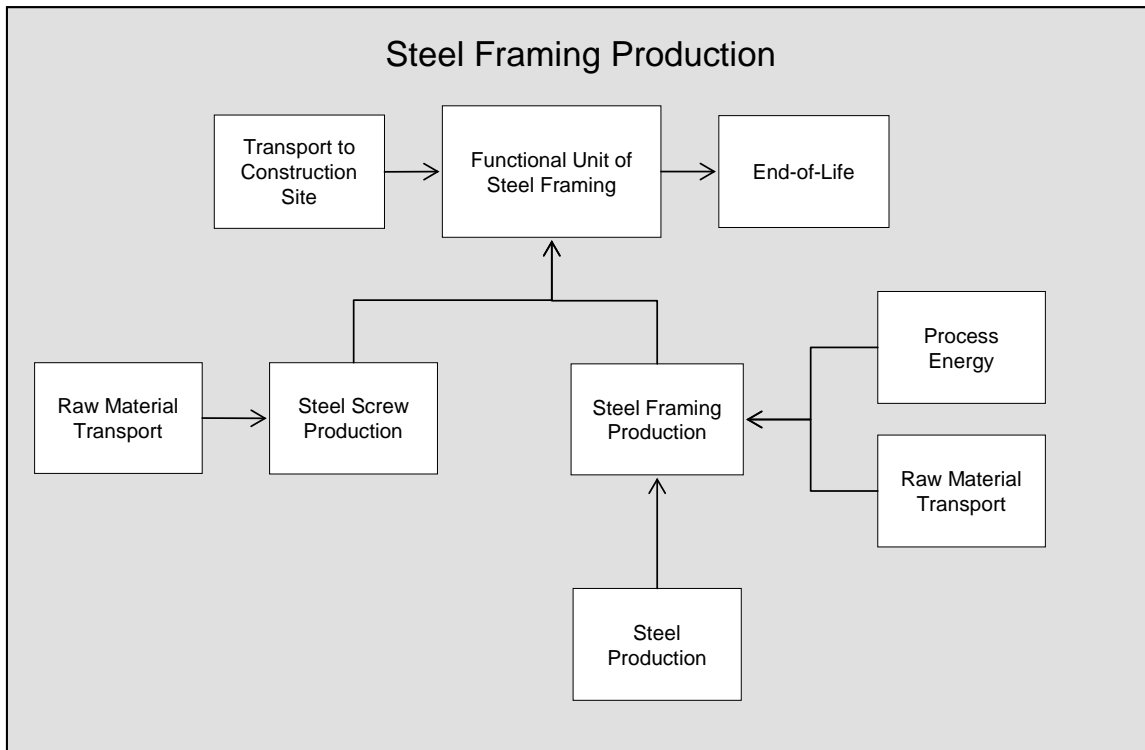


Figure 1: Steel Framing System Boundaries

Raw Materials and Manufacturing

BEES modeling of the production of raw materials necessary for steel stud and fastener manufacture is based on

data from the American Iron and Steel Institute (AISI) and the International Iron and Steel Institute (IISI), which represent late 1990s world-wide production of steel and account for recycling loops. Energy requirements and emissions from manufacturing cannot be itemized, since the industry data are in fully-aggregated form.

Secondary data were obtained from LCA databases and published literature.

Transportation

Transportation of the steel framing by heavy-duty truck to the building site is modeled as a variable of the BEES system.

Installation

During installation of the steel stud framing, 1 % of the installation materials are assumed to be lost as waste, which is recycled by contractors following “green building” practices. Approximately 0.0056 kg (0.0123 lb) of galvanized steel screws are assumed to be used per ft² of steel framing. The installation of the framing is assumed to be a manual process, so no energy inputs or emissions are included in the model.

Use

Steel framing is assumed to have a useful life of 75 years. This is a conservative value; steel studs have a very long life due to their galvanized treatment.

End of Life

All the steel framing and its components are assumed to be recycled at end of life.

References

Life Cycle Data

- National Renewable Energy Laboratory (NREL): *U.S. Life-Cycle Inventory Database*. 2005. Golden, CO.
Found at: <http://www.nrel.gov/lci/database>.
PRé Consultants: *SimaPro 6.0 LCA Software*. 2005. The Netherlands.

Industry Contacts

- Bill Heenan, President, Steel Recycling Institute (January 2006)
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