

CertainTeed Corporation Trim Product

CertainTeed Corporation manufactures building materials that include roofing, vinyl and fiber cement siding, trim, fence, railing, decking, foundations, insulation, gypsum, ceilings, and pipe products. CertainTeed has approximately 70 facilities throughout the United States and Canada. CertainTeed's Restoration Millwork Trimboard is evaluated in BEES for the Exterior Trim category. The Trimboard is modeled as an average of CertainTeed's Trimboard embossed finishes manufactured at its Social Circle, GA, Restoration Millwork Plant. The product in BEES is 2.54 cm (1 in) thick by 15.24 cm (6 in) wide, with a mass of approximately 0.454 kg (1 lb) per 0.30 m (1 ft). The functional unit is 1 linear foot of trim used for 50 years. It is installed using four galvanized finishing nails per foot of product.

Flow Diagrams

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

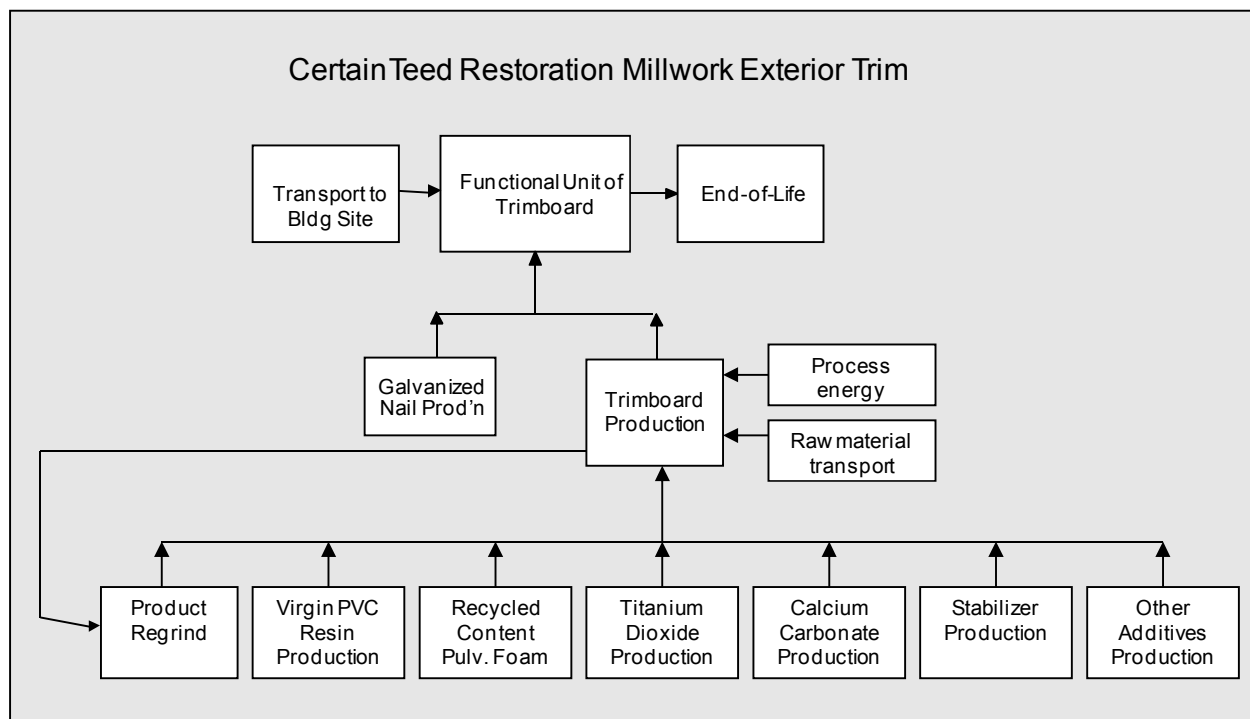


Figure 1: CertainTeed Trimboard System Boundaries

Raw Materials

Trimboard is made up of the following materials:

Table 1: Trimboard Constituents

Constituent	% in the Siding
PVC resin	1 % - 65 %
Internal regrind	1 % - 25 %
External regrind	1 % - 25 %

Recycled Content PVC	1 % - 50 %
Calcium carbonate	1 % - 20 %
Acrylic-based additives	1 % - 5 %
Titanium dioxide	1 % - 5 %
Other additives	1 % - 5 %
Total	100 %

The PVC resin data come from the U.S. LCI database. Internal regrind is finished product scrap that is sent to a regrind silo within the Social Circle, GA facility, where it is introduced back into the product. The energy consumption for this is included in the manufacturing energy described below. External regrind is the same material but is instead sent off-site to be reground. The round-trip transportation of this product – 1 122 km (697 mi) – has been accounted for in addition to the grinding energy which was provided by the processing facility, specifically: 0.0015 kg natural gas per kg regrind and 0.123 kWh electricity per kg regrind.

CertainTeed purchases a pulverized recycled PVC foam material consisting of pre- and post-consumer waste. Because this is a recovered waste product, it is modeled as free of upstream production, with the exception of transportation pertaining to the collection of the foam, pulverization of the recycled materials into useful form, and transportation of the material to CertainTeed. The same energy used for the external regrind has been assumed due to lack of precise data on the pulverization energy. This assumption is conservative, as the pulverization energy may be less due to the softness of the recycled foam.

Production data for the other materials in the table above are based on the U.S. LCI, EcoInvent, and SimaPro databases. “Other additives” include pigment, stabilizer, blowing agent, process aid, and lubricants. Data for the supplier-specific materials were provided in Material Safety Data Sheets (MSDS); their production data are included in the LCA model but are excluded from this documentation to protect company confidential data.

Manufacturing

Manufacturing energy for Trimboard is presented in the table below.

Table 2: Energy Requirements for Trimboard

<i>Energy source</i>	<i>Quantity per functional unit</i>
Electricity (kWh)	0.385
Natural Gas (MJ)	0.192
Propane (MJ)	0.037

The electricity is used for raw materials mixing, extrusion, machining, lighting, air compressors, cooling water pumps, grinding operations, and other miscellaneous equipment. The natural gas usage is only for space heating, and the propane is used in the forklifts. Electricity production fuels, natural gas, and propane production and combustion come from the U.S. LCI Database. The following table summarizes other manufacturing-related data:

Table 3: Other Process Data for Trimboard

<i>Process Flow</i>	<i>Quantity per functional unit</i>
Input: Water use (L)	0.156
Output: Wastewater (L)	0.096
Output: Solid waste (kg)	0.008
Output: Waste oil (kg)	1.0 E-5

The water is used to run the cooling towers and for overhead/domestic and other miscellaneous uses. The wastewater, discharged to the sewer, comes mainly from overhead/domestic and other miscellaneous uses; the discrepancy between the reported water in and out is mainly due to evaporation losses in the closed loop cooling water system. This water is assumed to be uncontaminated.

There is no product loss during manufacturing; CertainTeed collects any scrap product and regrinds it to make new product. A small amount of off-spec product is collected and sent to an off-site recycler to be integrated into other products. The solid waste is non-hazardous miscellaneous plant waste that is landfilled. The waste oil goes to a nearby hazardous waste operation where it is incinerated.

Combustion-related air emissions are accounted for in upstream energy use data sets (e.g., natural gas use in a boiler). Particulate matter is generated during the process (in the sawing operations, for example), but these are immediately suctioned into a vacuum system and sent back to the regrind silo where it is introduced back into the product formulation. The facility uses a closed pneumatic transfer system for all of their raw materials (silo to mixer to hopper to extruder) which minimizes material loss. The facility is exempt from reporting air emissions so other potential emissions are not available.

Transportation of Trimboard material constituents. Transportation of the raw materials in the Trimboard has been accounted for. The PVC resin is transported by rail a distance of 1 117 km (694 mi). The remaining materials are transported by heavy-duty diesel truck, and transportation distances range from 724 km (450 mi) to 5 150 km (3 200 mi). All transportation modes are modeled based on the U.S. LCI Database.

Transportation of Product to Installation

The finished product is transported an average of 1497 km (930 mi) by diesel truck to the building site. The nails used at installation are assumed to be transported 241 km (150 mi) by diesel truck. The BEES user is free to change the assumed transport distances for the main product.

Installation

Installation is done primarily by manual labor. The most common fastener for this product is an 8d finishing nail (6.35 cm (2.5 in) long) with a weight of 0.0024 kg (0.005 lb). Four nails are used per functional unit of installed product, for a total weight of 0.0096 kg (0.02 lb). The nails

are modeled as galvanized steel. While the purchased product does not need to be painted, it can be if desired. This model does not include painting of the product.

The model assumes an average installation waste of 6.5 %, and this waste is assumed to go to a landfill.

Use Phase

This product is modeled as having a useful life 25 years. Thus, one initial installation and one replacement are modeled for the BEES functional lifetime. No routine maintenance is required to prolong the lifetime of the product, although cleaning is recommended to maintain appearance. Cleaning would normally be done with water and household cleaners. Information on typical cleaning practices (e.g., frequency of cleaning, types and quantities of cleaning solutions used) was not available.

End-of-Life

At the end of life, this product is assumed to be disposed of in a landfill.

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 7.0 LCA Software*. 2005. The Netherlands.
- Ecoinvent Centre, *Ecoinvent data v2.0* (Dübendorf: Swiss Centre for Life Cycle Inventories, 2007), retrieved from: www.ecoinvent.org.

Industry Contact

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