SOME ENVIRONMENTAL EFFECTS OF USING WOOD COMPARED TO OTHER RAW MATERIALS

A dramatic Increase in the use of structural wood substitutes, including steel studs and plastic lumber, shows few signs of letting up in the United States, in contrast to reported trends in Australia and New Zealand. Some 1.5 billion board feet of substitute material was used in 1992, equivalent to 3% of total U.S. lumber consumption. However, by 2003, the U.S. demand for structural substitutes could exceed 5.5 billion board feet, and some estimates predict that steel-framed homes will make up 25% of the new housing market in the next decade.

The question is: ***"How, in terms of energy required for production and the amount of emissions or effluents produced , do these alternative materials compare to their wood counterparts?"***

Relative Energy Consumption To Produce A Ton Of	
Material	**Energy**
Aluminum	70
Steel	17
Brick	3.1
Concrete Blocks	3.0
Dry Lumber	1.0
Source: CORRIM I, National Research Council, 1976.	

Net Carbon Emissions In Producing A Ton Of	
Material	**kg C/metric ton**
Framing lumber	-460
Concrete	45
Concrete block	49
Brick	148
Glass	630
Steel	1,090
Aluminum	2,400
Plastic	2,810
Source: Honey and Buchanan, Department of Civil Engineering, University of Canterbury, Christchurch, NZ, 1992.	

Comparative Energy Consumed in Manufacturing Wood vs. Steel-Framed Interior Wall (GJ)

Process	Wood Stud Wall	Steel Stud Wall
Extraction	0.7	1.2
Manufacturing	2.1	9.7
Construction	0.6	0.6
Total	3.4	11.5

Source: Athena Sustainable Materials Institute, 1993.

Comparative Emissions in Manufacturing Wood vs. Steel-Framed Interior Wall		
Emission	**Wood Wall**	**Steel Wall**
CO2 (kg)	305	965
CO (g)	2,450	11,800
SOX (g)	400	3,700
NOX (g)	1,150	1,800
Particulates (g)	100	335
VOCs (g)	390	1,800
Methane (g)	4	45

Source: Athena Sustainable Materials Institute, 1993.

Comparative Emissions in Manufacturing Wood vs. Steel-Framed Interior Wall		
Effluent	**Wood Wall**	**Steel Wall**
Suspended solids (g)	12,180	495,640
Non-ferrous metals (mg)	62	2,532
Cyanide (mg)	99	4,051
Phenols (mg)	17,715	725,994
Ammonia (mg)	1,310	53,665
Halogenated organics (mg)	507	20,758
Oil and grease (mg)	1,421	58,222
Sulphides (mg)	13	507

Source: Athena Sustainable Materials Institute, 1993.

The energy relationships for different building materials are being updated in the CORRIM II project. A complete life-cycle energy accounting (including energy in transportation, recycling, glues, etc.) over the lifetimes of the various materials is a somewhat daunting task.

Athena (Forintek) in Canada and New Zealand have more recent numbers than the original CORRIM work, or Peter Koch's CINTRAFOR update in the early '90s. Jim Bowyer's slide presentation includes the more recent data.

Slides compliments of Jim Bowyer, April 19,2000
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ADDITIONAL INFORMATION SOURCES

"Wood versus nonwood materials in US residential construction." 1992. Forest Products Journal 42(5): 31-42. (considers wood, steel, aluminum, brick, concrete, carpet and pad.)
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"Comparing the enviro effects of building systems." 1997? Wood the Renewable Resource N0. 4 (case study). Canadian Wood Council and Forintek Canada Corp. 11 pages. (considers wood, steel, and concrete in 3-story office buildings with underground parking)

Susan Alexander and Brian Greber. October 1991. *"Environmental Ramifications of Various Materials Used in Construction and Manufacture in the United States."* USDA Forest Service. Pacific NW Research Station. General Technical Report PNW-GTR-277.

Internet sites with "life-cycle" information

Canadian Wood Council
http://www.cwc.ca/english/publications/technical_bulletins/index

Environmental Properties of Timber from the Forest Wood & Products Research & Development Corporation http://oak.arch.utas.edu.au/environment/env_prop/env_prop.html

Alternative materials (general properties and +/- from a builders viewpoint), Rainforest Information Centre "Good Wood Project" http://forests.org/ric/good_wood/nont_bld.htm

The New South Wales (Australia) Rainforest Information Centre "Good Wood Guide"
http://forests.org/ric/good_wood/env_imp.htm