

## A Brief Analysis of Various Building Materials

Recycled, non-toxic building materials should be used wherever possible. Some alternatives to conventional materials include:

- Recycled cotton insulation
- Blown-in Cellulose Fiber insulation
- Hydra-stop roofing systems (simulate metal roof)
- Recycled decking
- Crushed glass (used in foundations)
- Recycled plastic pop bottles (used to make carpet)
- Recycled paint
- Cellulose Wallpaper and the list goes on....

### **Aluminum**

- Bauxite strip mining causes destruction of tropical forests
- Reclaiming the forest may reduce long-term effects, but the loss of species is inevitable
- Bauxite comprises about 8% of the earth's crust, but is a finite resource
- The aluminum industry accounts for 1.4% of the annual world energy consumption [1]
- Using recycled aluminum, rather than bauxite ore, saves approximately 80% of the total energy consumed [2]
- The majority of airborne emissions are recovered, but a small amount of carcinogenic hydro carbons escape into the atmosphere
- The fabrication and finishing of aluminum may produce heavy metal sludges and a large amount of wastewater that will require treatment

### **Concrete**

- Environmental concerns arise from all phases of concrete's life cycle including: land and habitat losses from mining, air and water quality degradation from material acquisition and manufacture, and disposal of waste materials
- Water quality deterioration results when rinse water from mining, manufacturing, and fabrication is not properly disposed of, or treated

- One of the main environmental concerns is the amount of debris that is generated and the disposal techniques that are employed when a building is demolished, renovated, etc.
- Concrete is used extensively as a thermal mass in walls and floors for passive solar design

### **Blown-in Cellulose Fiber**

- Made from 100% recycled cellulose fiber (wood, paper, cardboard, etc.), borax (a fire retardant) and latex (a binding agent)
- Adheres to wood with almost no shrinking
- For 9.5", cellulose achieves R37 and an air infiltration rate of 2.3 cfm compared to 7.2 cfm for standard fiberglass
- Can be blown in around plumbing and electrical fixtures
- Is more complex to install than batt insulation
- Moisture added to the spray is quickly dissipated after installation, avoiding wood rot concerns
- Requires a trained installer

### **Manufacturers/Suppliers:**

Climatizer Wall Insulation System Ltd.  
120 Clairville Drive  
Etobicoke, ON  
M9W 5Y3  
Canada  
(416) 798-1235

### **Expanded Polystyrene (EPS)**

- It is a closed cell polystyrene foam that has a high degree of dimensional stability under moisture exposure
- Provides superior fire protection, igniting at 600-650 °F versus 500 °F for Douglas fir
- The panels contain no CFCs or HCFCs
- Contains no formaldehyde or related chemicals
- Is made with pentane, a greenhouse gas, as a blowing agent
- Has an R value of 4.35 per inch at 25 °F and 3.85 per inch at 75 °F
- Is a petroleum based product

### **Particleboard**

- Approximately 90% of the wood component of particle board is sawmill waste [3]
- Specifying particleboard rather than solid lumber, saves a significant amount of trees
- Most solid waste from particleboard manufacturing is easily recovered and used for numerous other applications (fuel, wood chips, wooden stakes, etc.)
- On the downside, when particle board is bound into an assembly with other materials, it becomes very difficult to recycle it

### **Sealant**

- Most sealants are based on petroleum derivatives
- Many of the chemicals used in the manufacture of sealants are classified as hazardous and disposing of such wastes must be handled with extreme care
- Some sealants are preferable for indoor use (indoor air quality), due to their low emissions rating. Some of these include oleoresinous, acrylic emulsion latex, polysulfide, polyurethane, silicone sealants, and water based sealants.

### **Carpet**

- The amount of water consumed in carpet manufacture is very large - about 15 gal/yd<sup>2</sup> of carpet
- Carpet dyes remain in the wastewater stream after treatment, thereby posing a serious threat to water quality
- Chlorofluorocarbons (CFC's) were conventionally used as blowing agents for cushion foams. Today many foams are made with other blowing agents. Remember to pay special attention to this when purchasing carpet.
- Some carpet adhesives, both organic solvent based and water based, have been found to have high initial emissions of volatile organic compounds (VOC's). These compounds have an enormous effect on indoor air quality. To reduce the harmful effects of VOC's, let the carpet air-out for a couple of days before installation and have your ventilation system running (so that fresh air is continually entering the building).

### **Glass**

- The mining of glass sand, limestone, and soda ash result in particulate emissions, soil erosion, habitat loss, pollutant runoff, and air pollution. These alterations in the environment are a product of mining activities, processing, and the transporting of materials
- Glass building products removed during remodeling are generally disposed of in landfills, with little regard to recycling
- Glass sand, limestone, and soda ash are finite resources
- Glass manufacturing can release air pollutants and water pollutants that contribute to numerous environmental problems
- Scrap glass can be recycled back into the glassmaking process during manufacture, or after demolition/renovation

### **Linoleum**

- Linoleum is made from natural ingredients that are based on renewable resources
- Linoleum scrap can be recovered from the process and reused in the manufacture of plain linoleum
- Consider linoleum as an alternative to vinyl flooring, ceramic tile, and other products where a very durable, hard, waterproof surface is desired
- Specify low VOC-emitting adhesives to glue down the linoleum (this will improve the indoor air quality)
- Some traditional adhesives and floor maintenance products, such as waxes and cleaning products, may emit high levels of VOC's

### **Plaster**

- Mining of gypsum, limestone, clay, silica, and cement rock for plaster and the mining of coal, iron ore, and zinc for steel lath result in particulate emissions, soil erosion, loss of habitat, etc.
- Cement production generates dust, sulfur oxides and other air pollutants as well as water pollutants

### **Steel**

- Main environmental concerns include embodied energy, resource use, land and

habitat loss from mining activities, and air and water quality

- Risks to air quality include dust and combustion emission from ore refinement, combustion emissions from blast furnaces operation, etc.
- Risks to water quality result from improper disposal of water from mining and milling operations
- Considered to be the most recyclable material since it is easily separated from the waste stream
- Recycled steel accounts for approximately 2/3 of new steel shipped in U.S. [4]

### ***Ceiling Tiles***

- Major environmental concerns associated with mining the raw materials include energy and resource use, soil erosion, pollutant runoff, land and habitat loss, etc.
- Few wastes are generated during the manufacture of ceiling tiles. The wastes that are generated can be recycled back into the manufacturing process
- The major risks to water quality result from mine runoff and polluted wastewater generated during coking, steelmaking, galvanizing, and manufacture of aluminum

### ***Gypsum Board***

- Significant amounts of water are consumed in the manufacture of paper used in gypsum board
- Most of the paper used in the board is made from recycled stock
- Gypsum, limestone, clay, talc, and mica are finite resources, but they are in plentiful supply
- Large amounts of energy are consumed in calcining gypsum and drying gypsum board

### ***Paint***

- Most paints are produced primarily from finite resources such as petroleum-derived substances, however a few of the alternative paints are produced from renewable resources
- Most waste that is generated during the manufacturing process can be recovered and reworked into marketable products

- Conventional paints, both organic solvent-based and water-based, emit substances that may be hazardous. Alternative paints, including hypo-allergenic and low-biocide paints have now been developed. Paints are now being manufactured out of 100% recycled material

### ***Plywood***

- Softwood is manufactured with waterproof phenol formaldehyde adhesives, used primarily for structural purposes such as sheathing, siding, and concrete forms
- Hardwood is manufactured with urea formaldehyde adhesives and used mainly for decorative purposes such as cabinets and paneling
- Wood is a renewable resource if following sound management practices
- Waste can be recycled into chips for composite wood products, incinerated to generate energy, etc.
- The embodied energy is less than the embodied energy of any comparable building material

### ***Green Building Materials Virtual Sample Room***

What can you find in the sample room?

The Virtual Sample Room contains a wide array of products for commercial construction and home construction and renovation. It allows you to search by product category, such as paint, carpet, or ceiling tiles, and provides you with a list of product matches. The Database Search Return provides basic information and a picture of the product, as well as links to more detailed information.

If you need more detailed information on a particular product, you can access it through links found on the Database Search Return page. The Detailed Product Profile contains all of the environmental information provided by the supplier on the product, and the “Supplier Contact Information” button links you to the list of sales and technical contacts for the product supplier.

If you wish to see what this site has to offer,  
please follow the link below:

<http://www.sampleroom.buygreen.com/english/index.htm>

**References:**

1. Solstice: Your on-line source for sustainable energy information from CREST  
<http://solstice.crest.org/environment/gotwh/general/materials/html/alum.html>
2. Solstice: Your on-line source for sustainable energy information from CREST  
<http://solstice.crest.org/environment/gotwh/general/materials/html/alum.html>
3. Solstice: Your on-line source for sustainable energy information from CREST  
<http://solstice.crest.org/environment/gotwh/general/materials/html/particle.html>
4. Solstice: Your on-line source for sustainable energy information from CREST  
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