A New Dilemma:
Wood, Steel or Plastic Lumber

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So there you are, planning to build an addition on your home, a shed out back or a smaller project around the house You go to your local building materials supplier and find your choices are lumber, treated lumber, aluminum studs, steel studs, wood/plastic composite lumber or plastic lumber. What will you choose? The cheapest? The lightest? The easiest to cut and nail? The material most friendly to the environment? Whoa - now you've done it. Which of these *is* the most environmentally friendly?

This is a question asked every day by people wanting to "do right". The problem is that it is not a question always easily answered. Most commonly one thinks about saving the rainforest or using recycled materials - and if we have done that we are "environmentally conscious". But it turns out to be a more complicated proposition.

Questions need to be asked not only about the raw material we are using (which is very important), but also how is it extracted, manufactured, used in service, life of the product and what will happen when its service life is over and it needs to be torn down and/or discarded. These questions begin to approach the real environmental consequences facing our world today. They are the basis of new studies which are called life cycle analyses or "cradle to grave" studies.

Everything we use goes though a cycling process, just like the air we breathe. We take in air, our bodies extract and use the oxygen component and we breathe out nitrogen, carbon dioxide and a few other elements. The carbon dioxide we discard is then extracted by plants and trees which in turn discards oxygen which starts the cycle over again. This is a very simplistic look at a very complicated process, but one we can use to better understand our use of materials - those we are borrowing from our children and grandchildren.

Each step of a material's "life" will influence our environment. By understanding the influence for more than just a single part of that cycle, we can begin to understand how specific materials will enhance or degrade our grandchildren's world.

To get the *full* environmental story the following areas need to be understood.

Resource Extraction. This is usually thought of as the initial stage or "cradle" stage when we first extract our raw materials. This stage includes understanding the impacts on the land, wildlife, air and water when cutting timber, mining underground minerals, strip mining or extraction of oil. It must also include the amount of energy required to extract and transport this raw material. Have you stopped to consider the amount of energy it takes to mine

underground minerals or transport heavy ore to the processing plant? Use of heavy equipment for extraction and transportation all use oil and gas, which are non renewable.

They also emit carbon dioxide to the atmosphere which may be adding to our global warming concerns. In addition, after extraction, timber substitutes are non renewable and have taken millions of years to develop, whereas timber is renewable and will be replaced.

Manufacturing or Processing the Resource. Impacts on the air and water during processing are of great importance, and both are directly affected by the amount and type of energy required to transform the raw material into useful products. As a material, wood is relatively light, can be easily cut and transported and the residues can be used as an energy source.

Steel, aluminum and plastics require large amounts of energy to be transformed into useful products - energy which requires emitting tons of carbon dioxide to the air. For example, in a study done for the National Research Council in Washington D.C., the energy required to produce 100 square feet of wall was calculated for different materials. The amounts, including extraction of raw materials, production and construction techniques varied greatly between building materials.

For convenience, British Thermal Units (BTU's) were the measurement tool. A BTU is the amount of energy required to raise one pound of water one degree Fahrenheit. It was found that a wall of plywood siding over a 2X4 frame will require less than a total of 2 million BTU's of energy to produce and construct. This compares with over 17 million BTU's for concrete block with no insulation and almost 17.9 million BTU's for brick veneer over sheathing. Using steel studs, plywood sheathing and medium density fiberboard (MDF) for the wall required over 5 million BTU's.

On-Site Use or Construction. Building with wood products and materials has been preferable, especially in residential construction due to its lightweight characteristics and ease in handling. Steel and concrete require the use of large equipment to handle and construct, again increasing the amount of energy required. In addition, cutting to size and fabricating joints can require additional amounts of energy consumption.

Occupancy and Maintenance during service. Providing the correct type and amount of maintenance, any of our building materials can last for a hundred years or more. For wood this primarily means keeping

it dry. One very positive influence wood has over other materials during use is that in effect it is storing carbon dioxide. So as we enjoy our wooden furniture, cabinets and shelter made of wood components, we are increasing our storage capacity of CO_2.

Demolition. In reality, most buildings are not demolished due to their condition but to their lack of usefulness. This includes change of styles, living preferences or zoning. The environmental effects incurred during this stage include the use of heavy demolition equipment and transport from the site.

Recycling/Reuse/Disposal. It is more common today to recover as many of the materials as possible before it reaches the landfill. Products which can be salvaged and resold such as quality windows and doors, flooring and interior components such as fireplace mantels and built-in cabinets are finding their way back in newer construction.

Metals and glass head toward the recycling industries. Currently the majority of wood can be used as fuel or else it goes to a landfill. Work is currently being done to better utilize the wood component. Some of this work includes combining wood fiber and plastic, which make up the majority of materials in our landfills. Recycling of metals from construction, junk cars, etc. still requires a large amount of energy to be transported and transformed to useful new products.

Wood, steel, aluminum or plastic? What should you use? When you consider all of the stages materials must go through, wood looks very good. It requires much less energy to obtain and manufacture into the numerous products we use, it is renewable so we can plan on it for future generations, and it certainly is an enjoyable material to feel and utilize. If wood is not used, other materials will be - but at what environmental cost?

There is still much to be learned about the total use of materials, from cradle to grave. The two major study groups currently examining building materials and designing studies for the future are the Athena Sustainable Materials Institute in Ontario, Canada and the Consortium for Research on Renewable Industrial Materials (CORRIM Inc.) based at the University of Washington, Seattle, WA. CORRIM is comprised of 12 universities, including LSU, five forest products companies, two industry associations, and two government agencies.

The more we know of the total influences of the materials we use, the better we can plan for an environmentally sound future.