WOOD!

Anybody who wants to work in this country in the construction industry needs to understand that the use of WOOD is folded deep into the cultural DNA of professional practice. Even when one is working with concrete, and ESPECIALLY when one is working with steel, the patterns of thought which accompany wood manufacture and assembly will affect the way in which you are guided to work. In one sense, this is an outrageous statement, since it is hard to imagine that a concrete beam has anything in common with a couple of two by twelves. But the relationship remains, historically; and the subsequent interaction among all the building systems is, in the United States, defined by the requirements and traditions of stick-built construction, which itself first emerged here in wood.

The reading in *Technics and Architecture* should have laid it out fairly clearly for you. The forests of Europe were a plentiful and inexpensive source of both building material and fuel until, in each society in almost every phase of history, that source had been exploited to extinction. Greece, Rome, France, England... although all these societies have parallel traditions in masonry, depending on their wealth at any one time, each of them began as wood-based building cultures and only later adapted themselves to building in other materials.

In the United States, of course, it is the English tradition that dominates. What crossed the Atlantic in the 17th and

18th century as a post-and-beam technology continued as such into the 19th century. But what transformed wood construction in the US was the advent of... what?

Power.

As the power of wind and water and coal was harnessed for the propelling of ships and land vehicles, that same "mechanization took command," to allude to Sigried Gideon's book of the same title, of the processing of lumber thoughout the US *and* Europe. But it was only in the US and in some parts of Scandanavia, which had retained a large store of unforested land, where the rationalization of lumber fabrication affected society in a more profound way; and it was primarily in the US, in which the economic rationale is usually the only acceptable one, in which these changes effected a real revolution in building technology: Balloon Framing and Platform Framing. And these innovations were due to the application of power to wood.

Although cheaper and easier to handle than masonry, traditional wood -- based on the post-and-beam -- was relatively coarse, hard-finished, and required an experienced team to handle. With "stick" framing, on the other hand, a single person could handle individual pieces without aid, and a small team of relatively uneducated laborers could build an entire structure in much less time than the previous, traditional carpenters could. Who can deny the incredible advantages of platform framing, which remains the primary form of construction for low-rise construction in the US to this day?

Back to wood itself, as a material... Wow, you must have learned lots of trivia about wood. But you probably know in general terms about Hardwoods and Softwoods. In fact, most construction is done with softwoods, such as the differnt forms of fir, pine, and hemlock. Furniture and decorative items are often built from the hardwoods, such as Ash, Beech, Cherry, Oak, etc. Floors, too, are mostly built from hardwoods -- if you can afford it.

Your reading also alludes to some important characteristics of wood which affect Sustainability. Can anyone tell me what they are?

Renewable Resource (Forestry, Conservation)
Usable by-products (Mill practices)
Distance to installation...
Low Embodied Energy
On-site practices (wastage and collection)
Indoor Air Quality
Combustibility & Life Cycle Characteristics.

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As for the wood itself, you saw that the way boards and wood pieces are extracted from the original lumber can determine their strength and structural behavior. You read about the differences between plain sawing and quartersawing, you read how the wood is dryed either by air or in a kiln to encourage uniform shrinkage before its delivery to a job site. Naturally, all these different methods combine with the characteristic of the individual species to

determine their performance, which may be expressed by standard grades. Of course, you've memorized all these categories by heart...

In fact, the most interesting part of your reading about wood is to me the miscellaneous wood products which have developed to both enhance the structural behavior of wood but to make use of wood byproducts which would otherwise be wasted. This is almost a dialectical proposition: In the United States, we live in garbage. Literally. Most of our building materials are composites formed downstream in the consumption flow, making use of industrial by-products and advanced organic chemicals.

What are some examples? plywood, glue-lams, OSB, wafer-board, (that cool looking flake board), particle board, MDF, even bamboo flooring: It's all somebody else's junk which is all glued together.

(Not that there's anything wrong with that...)

Laminated Wood, which includes glue-lams, mirco-lams, lam-chops, parallel strand lumber... all these significanlty enhance the capacitys of wood-based products, but they share the ease of use that characterizes stick-built wood construction. The same guy who frame your house will hang the glue-lam; if you had used a steel beam, a different trade would have to have been called in.

Wood Panel Products, such as plywood and OSB, are most often used as sheathing either vertically in walls or hori-

zontally, for use as sub-floor decks. But where the boards have notable tensile properties, as with plywood, the possibility of shell-like behavior is also possible. There's very little not to like about plywood.

Unless you smoke in bed.

As you read, some chemical technology is available to address wood's undesireable characteristics, such as suseptibility to combustion and to water damage. Treatments for fire-resistance and for moisture resistance add some level of dependability, but this improved perforance is notiable mostly during one's code anaylsis, where the introduction of treated wood might allow a larger floor area per floor. In general, wood is wood -- and you better protect it or assume that it's going to burn.

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Now, all this wood would do us little good without the bits and pieces that hold it together. Fasteners, such as nails, bolts, gang-nails, and glues, comprise a technology unto itself. From the architectural perspective, the possibility of putting the fasteners to use for decorative purposes is enticing, and the history of architecture is filled with wonderful examples of ornamental joinery. The contrast between fine metal objects and coarser, more elemental wood members is usually quite appealing. From a technological perspective, however, the reality is more prosaic: We have nails, which might be galvanized, zinc-coated or stainless

steel; we have bolts, which are usually stainless, and we the metal equivalent of a throw-everything-but-the-kitchen-sink approch, the toothed-plate connector.

In short, although we may feel that often the specification of connectors in wood is out of our hands as Architects, the more awareness you have of what/where/when will allow you to choose the locations for which a decent bolted detail will highlight your design intention.

As you saw, the chapter ended with a review of wood-based manufactured systems, such as pre-fab trusses, Wood joists, and composite panels. I love this stuff, since it is the future, and we've been living it for 50 years.

And nobody notices because all the best efforts of US technology is brought in to create essentially antique-looking architecture. All the high-tech resins, all the cool new vapor-permeable weather barriers, and all the laminated wood members are there to recreate in Owings Mills a house which would have looked ugly two hundred years ago in Colonial Williamsburg.

But I digress...<g>

The continuing systemization to which wood construction has been pushed is one of the more interesting and potentially useful trends for us architects. I challenge each of you to think of new uses for these manufactured components, so that you can explore in truth the nature of a material which has little nature about it anymore...

In-class exercise: Exercise 3.1 & 3.2.

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WOOD LIGHT FRAME CONSTRUCTION

EXTERIOR FINISHES FOR LIGHT-FRAME CONSTRUCTION