

LIFE-CYCLE STUDIES

Plywood

Overview

Plywood may be the most prosaic building material ever. Even concrete, polished to a mirror finish, can be made into high-end kitchen counters; there's no equivalent glory for softwood-based plywood. (Hardwood laminates are another tale.) But when toughness is required, plywood gets the call, as Hurricane Katrina and all that television footage of people racing to board up their windows remind us.

Laminated woods were known to the ancient Egyptians and Chinese, but it wasn't until the early 1900s that anything like mass production began. Even then, plywood didn't blossom until the invention of a waterproof adhesive for bonding the plies. That was achieved in 1934 (by an American chemist, according to U.S. sources; the Canadians say it was one of theirs). Suddenly there was hardly anything plywood couldn't do. During World War II it was declared an essential war material and made into crates, buildings, various watercraft (including fast PT boats), gliders, and even the famous de Havilland Mosquito fighter-bomber. In the United States, the postwar building boom fueled soaring demand. Today, global annual output of plywood and veneer sheets is roughly 70 million cubic meters and rising. The top five producers are the United States (about 30 percent of the total), Indonesia, China, Japan, and Canada.



A barge of crated plywood leaving Kalimantan, Indonesia

Manufacture

Though the logs grow out of the ground, the plywood made from them is an industrial product. The logs are stripped of bark and limbs and cut into lengths called blocks. Using hot water or steam, the blocks are heated to about 93°C before moving on to a veneer lathe or slicer, which cuts the logs into layers generally about 3 millimeters thick. These in turn are trimmed and blasted with hot air to reduce the moisture content. The cooled veneers are coated with heat-cured resins and laid up symmetrically on a core with the grain of each ply at right angles to the one below. The lay-ups are sent to a hot press, where the resin is cured at over 100°C, and then move on to be trimmed and possibly sanded.

This process consumes a lot of energy, thus releasing notable emissions of carbon dioxide, carbon monoxide, sulfur dioxide, and nitrogen oxides. But plywood manufacture also releases particulate matter smaller than 10 micrometers in diameter (PM₁₀)—which are inhalable and thus unhealthy—as well as volatile organic compounds, including formaldehyde and other hazardous air pollutants. Some of these escape into the atmosphere.

Global plywood demand also contributes heavily to the unsustainable logging of tropical rainforests, especially in Malaysia and Indonesia.

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Reconstruction in Dili, East Timor

Disposal

Where does all that plywood go at the end of its useful life? Like other wood scrap, a lot of it is burned for energy, although combusting plywood without proper emission controls can release hazardous substances. Some of it lives on as particleboard after being ground up into suitable flakes. Some is salvaged and reused; this seems to be a favored option among "green" builders, and they benefit from a budding network of architectural salvage companies and Internet sites that function as exchanges. Used plywood can even be

composted, despite the glues. (In a pilot study, some plucky Mississippi researchers mixed plywood sawdust with various animal manures, also a major waste problem, and left the compost cans outside for six months, reporting at the end both "reduced toxicity and weight.") In the end, though, most plywood returns to the Earth from which it came, but in landfills.

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Preparing for Hurricane Ivan in Florida, U.S.