France Is Helping Wood Make a Comeback as a Commercial Building Material

BY PHILIPPE DONNAES

There can be no doubt that monuments bear witness to their times, reflecting both the technologies and the aesthetic feeling of the society that created them. For France, the Eiffel Tower is an emblem of the late 19th century, the crowning glory of the industrial era and the age of metal. As we approach the end of the millennium, France has found a work that will reflect the global awareness of the need to preserve our natural heritage.

The Tour de la Terre (Earth Tower) consists of eight wooden pillars, each 509 feet high, supporting a metal flower sculpture that has a surface area of 37,675 square feet. The structure is designed to withstand wind gusts of up to 143 miles per hour. Work started this autumn on the 656 foot high structure, which is the dram of the French architect Nicolas Nomier, of the architectural firm of Hennin-Normier Lelievre. Due to be completed by the end of 1999, it will be made mainly from wood.

“It is the only material understood by six billion people and that is capable of reflecting the objectives stated and global ecological awareness,” explains Normier. This is also an opportunity to restore the image of wood, says Normier, “by giving it back the status of a high-tech modern building material and the only one that is renewable,” he adds, with a project that will demonstrate the materials remarkable technical features.

Supporting 2,500 Tons

Each of the eight wooden supports will withstand 500 metric tons of vertical load and 2,000 metric tons of wind force, with the structure being designed to withstand gusts of up to 143 mph, according to Gabriel Gossner, the technical manager of Sechaud & Bossuyt, one of the major French engineering offices responsible for carrying out structural studies on the project. In other words, 2,500 metric tons of compression load and 1,500 metric tons of traction at the base of the tower, with both of these figures being non-weighted.

In comparison, the truss frame of the Eiffel Tower, which is subject to the most strain, will not endure more than 1,000 metric tons of force. “The Tour de la Terre is characterized by its exceptionally slender shape, 656 feet high with a diameter of 59 feet at the base, compared to 984 feet and 410 feet respectively for the Eiffel Tower,” observes Dominique Calvi, a French structural engineer who specializes in wooden structures.

In practical terms the structure, which will be constructed in the eastern part of Paris near the National Library (Tres Grande Bibliotheque), will consist of four habitable floors, each with an area of 6,459 square feet suspended from an overhang between 262 and 328 feet high and a 37,675 square foot metal flower structure that measures 147 feet high. This will be made up of five stainless steel or titanium petals, forming a metal corolla measuring 197 feet in diameter, at the top of the 508 feet high stem.

This central support, the pivotal point of the whole design that consists of eight wooden pillars measuring 6.2 feet in diameter and forming four sections, will be made from LVL (Lumber Veneer Laminated) up to the 108 foot mark. Says Normier, this is “a perfect timber, with no weak points and it is 50 percent stronger than traditional wood-core plywood.” From there the tower will be Douglas fir wood-core plywood up to the 344 foot mark, followed by a composite material up to the 506-foot top made of maritime pine wood-core plywood reinforced with steel or carbon rods.
The wooden pillars will be protected by 2-inch-thick oak shells, positioned 2 inches away from the surface to create a well ventilated cavity that will ensure the long life of the structure.

THAT’S A BIG CRANE

In terms of foundations, the 4,000 metric ton tower, cross-braced with metal frames measuring 9.8 to 11.8 inches diameter, will be supported by eight H-section battens under the wooden pillars, anchored to a depth of 82 feet, all linked together by a molded circular wall with a diameter of 93 feet. The tower will be built with the help of one of the world’s largest pieces of lifting equipment, a CC12600 or 4800 twin-ring crane used in the petrochemical industry, which is capable of lifting 300 ton loads to heights of more than 490 feet. A convoy of 30 trucks will be needed simply to carry the crane to Paris in pieces.

The tower will be pre-assembled on the ground and will consist of five main sections: four pieces of stem plus the metal flower, plus the steel reduction piece to alter the diameter above the habitable section. This will obviously be costly, but it will avoid the risks entailed by traditional construction methods using scaffolding, which would require the creation of a high altitude construction site in a space no more than 26 feet in diameter and more than 500 feet above the ground.”

The various elements will be assembled using a system of steel connectors attached to plates at each end of the stem sections. The plates themselves will be fixed using 3.3 foot-long sunk keys, fastened in place with a resin mortar.

Legal aspects of the assembly are being finalized, and the structure has been approved by the safety authorities. The estimated cost of the project is $41.7 million, but this may come down, since several companies have expressed interest in sponsorship operations. When finished, the Tour de la Terre will serve as both a reminder of the technical feats that can be achieved with wood and also as a sign of the continued redevelopment of the East side of Paris.

About the Author
Philippe Donnaes is a technical free-lance writer in Paris.