The Globe at CERN, Geneva

A relocatable exhibition pavilion made entirely of wood

Project information

Completion date:	2002 & 2006
Building type:	Spherical pavilion
Location:	Geneva, Switzerland
Client:	CERN
Architect:	Groupe-H: Hervé Dessimoz
Structural engineer:	Timber specialist Charpente-Concept
Main contractor:	CIB and the Swiss Army
Timber supplier:	Ducret Orges
Timber element(s):	Glulam cylindrical arcs, glulam and solid beams, oriented strand board floors, solid cladding boards
Timber specie(s):	Scots pine, Douglas fir, spruce, larch and Canadian maple – all from Swiss forests

Introduction

The Globe is the tallest timber domed structure in the world, about the size of the dome of Saint Peter's Basilica in Rome. Yet despite its great size, this timber structure was always intended to be relocated.

The Globe was originally conceived as a pavilion known as Le Palais de l'Equilibre (The Palace of Equilibrium) for the Swiss Expo 2002 at Neuchâtel, held 10 years after the United Nations Conference on Environment and Development (The Earth Summit) at Rio de Janeiro. The competition brief was to plant the idea of sustainability in the minds of visitors. The original team included the architect Hervé Dessimoz and the structural engineer Thomas Büchi, as well as artists from the alChemistudio. Designed to be dismantled, it was the only building reused from Expo 2002.

Much of the timber was used originally in Switzerland's pavilion at the Hanover Expo 2000, and then recycled in Le Palais de l'Equilibre. After the Expo, engineers carefully dismantled the structure and labelled all the parts. In 2004, CERN had it taken from storage and transported some 120km to its site in Geneva where it was reconstructed and opened in 2006 as The Globe of Science and Innovation.

The European Organization for Nuclear Research (CERN, in Geneva) is the world's largest particle physics laboratory. A focal point for welcoming the public, The Globe is a venue for film showings, conferences, exhibitions and debates, and it is the departure point for more than 25,000 visitors visiting CERN each year.

Building description

The Globe is a sphere, 40m in diameter, 27m tall and made primarily of wood; it represents the Earth's future by combining science with innovation. Its structure is reminiscent of the shape of the planet, while it is made of the most ecological of all building materials, wood. The outer shell, resembling a finely spun cocoon, is designed to protect the building from the sun and the elements, just like the Earth's atmosphere.

When entering the Globe, one is immediately impressed by its vast volume, strength and the sweet aroma of a pine forest. The timber is emphasised during the day, while at night the Globe is a ball of light. A showcase of the talents of Swiss carpenters, the Globe has taken timber construction to a new level.

The inner and outer shells each comprise 18 glue-laminated cylindrical arcs of 600mm diameter. The inner shell is clad in curved glulam panels and covered with a weather-proof membrane. The outer shell, which

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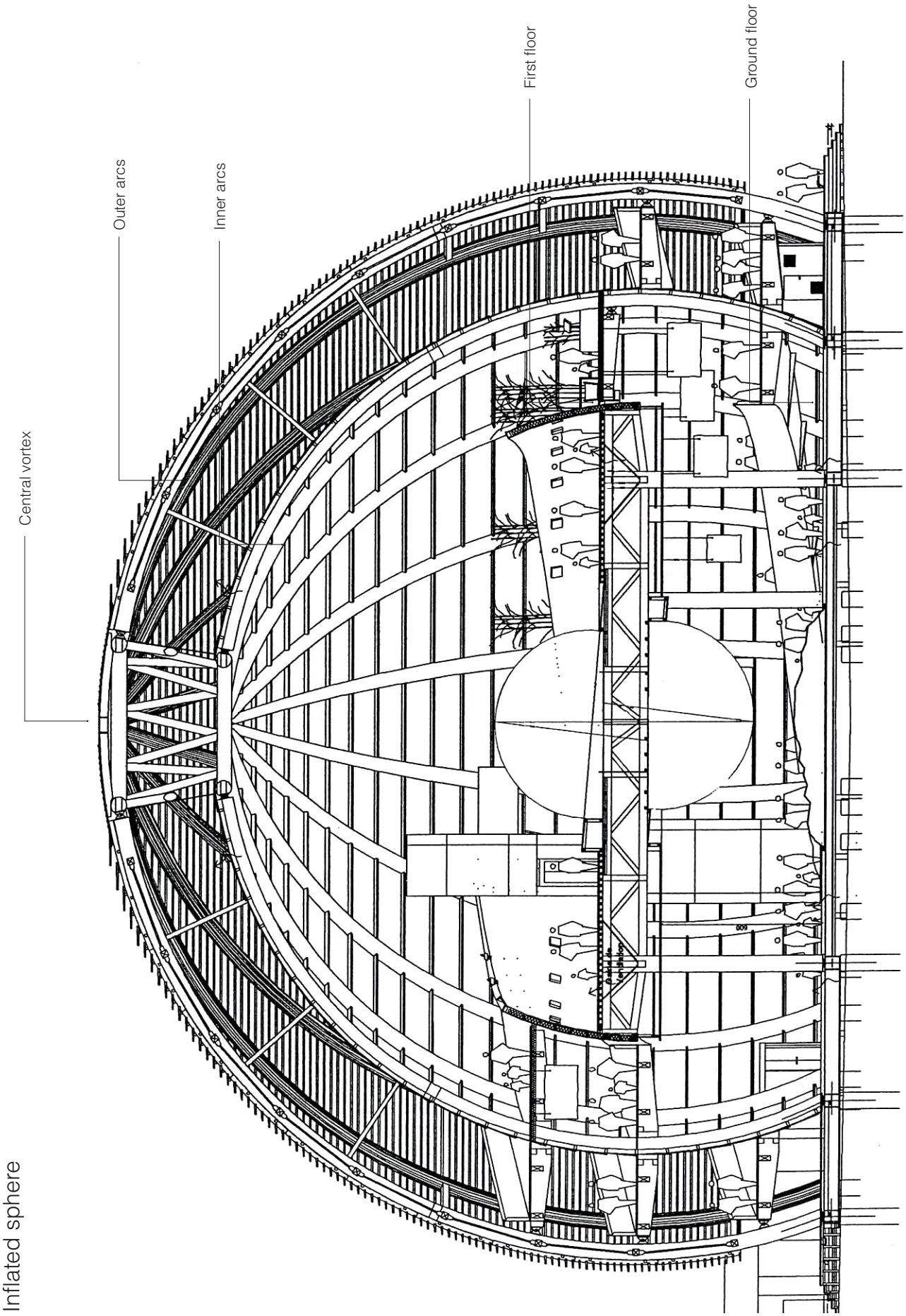
Ground floor
First floor
Outer arcs
Inner arcs
Central vortex
Inflated sphere

Building description (cont.)

includes glulam compression braces and steel rod tension braces, supports louvre panels. Two spiral pedestrian ramps wind their way up between the outer and inner shells.

When relocated to CERN, engineers reassembled the entire building in its original form. Additional work included thermal insulation, sound proofing and electrical services. The top quarter of the larch louvres had a polyethylene membrane added to enhance the durability of the wood. The architect intends to replace it with wood shingle cladding, when funds permit.

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Structure

The sequence of erection was (also see photos on page 4):

1. Install the concrete foundations and steel substructure.
2. Erect a temporary central tower and platform to support the vortex.
3. Raise the vortex into position.
4. Install the inner arcs and cladding.
5. Install the outer arcs and bracing.
6. Remove the central tower.
7. Install the first floor and ramps.
8. Install the pre-assembled larch cladding panels.

Each arc was made of two elements bolted together on site and then bolted to the base and the gigantic central vortex.

The bracing has a particular function. Without it, the top of the globe could rotate and cause collapse in a torsion mechanism.

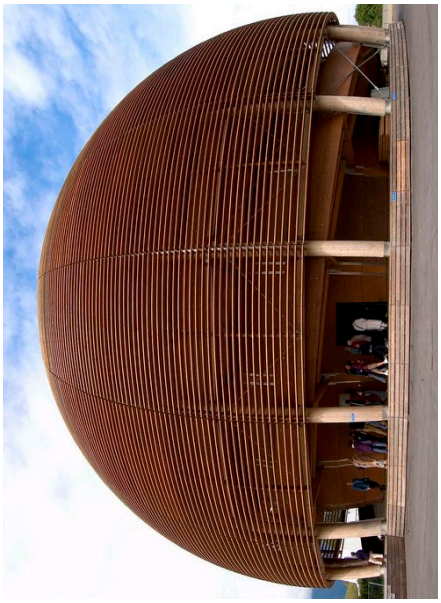
When the engineers removed the temporary tower, the top of the building lowered slightly as the arcs flexed to take the load.

All timber connections (timber-timber and timber-steel bracing) employ a revolutionary system devised by Ferwood, an Italian company that specialises in woodworking machinery and systems. In the factory, carpenters embed dowels (steel reinforcing bars) into holes drilled in the wood. A resin bonds the dowels to the wood. Elements assembled in the factory simply butt together around the dowels. For site connections, the dowels have threaded ends for connection via steel sections. The technology is now so advanced that 3D trusses, normally made of steel tubes, can be made of wood.

Le Palais de l'Equilibre at Nenchâtel for Swiss Expo 2002.

The Globe at night.









Central vortex and skylight.

Hexagonal beam at centre of first floor.

Weatherproof membrane over inner shell.

The Wood

Five species of timber were used in the Globe's construction – Scots pine, Douglas pine, spruce, larch and Canadian maple – all grown locally. The Swiss forests produce about 700m^3 of timber per hour; hence, the 2,500 m^3 of timber in the structure represents only about three-hour's production.

This timber is a significant carbon sink for as long as the timber is preserved. The trees absorbed 2,500 tonnes of CO^2 and released 1825 tonnes of oxygen (O^2) during their lifetime. Therefore, the timber of the Globe is now a repository for 675 tonnes of carbon.

Bracing elements connected via steel brackets with Ferwood® anchored bolts.

Steel sections with Ferwood® anchored bolts splice massive glulam arcs.

Structure supporting the first floor.


Georges Charpak
Au fil de sa vie ...

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