Timber engineering

Carpenter Oak & Woodland

www.carpenteroakandwoodland.com

About us

Carpenter Oak & Woodland are award winning timber engineering experts and have taken on some of the biggest timber engineering projects in the UK.

History

Since its establishment in 1987, Carpenter Oak & Woodland have been leading the field in innovative contemporary design and construction. Over the years our team have become widely recognised as experts in the properties and capabilities of solid and engineered timbers, and more importantly what can be achieved by building with this remarkable material.

Today we are renowned experts in the resolution of difficult and challenging timber structures, and our involvement in many major award winning projects stands testimony to our success.

Philosophy

The Carpenter Oak & Woodland philosophy is that by being involved in the design of the structure right from the earliest stages, the client receives the best possible solution; better design equates to a solution that is more cost effective, better performing in service, and critically, aesthetically superior.

Experience

Substantial experience in the design, fabrication and erection of unusual timber structures has given us a knowledge base and practical capabilities that we believe to be unrivalled in the industry. While we proudly boast that we can build anything; it is probably more accurate to say that we believe that we can find a cost effective solution to any timber building challenge.

Our particular areas of specialism include: hybrid green timber and glulam structures, innovative steel jointing methods, glulam portals, ribs and frameworks, gridshells (high precision or free-form) and geometrically challenging structures.

Structural solutions: Chiddingston Castle Orangery

An innovative solution for a new roof to an existing Grade I listed building of questionable structural integrity.

Design

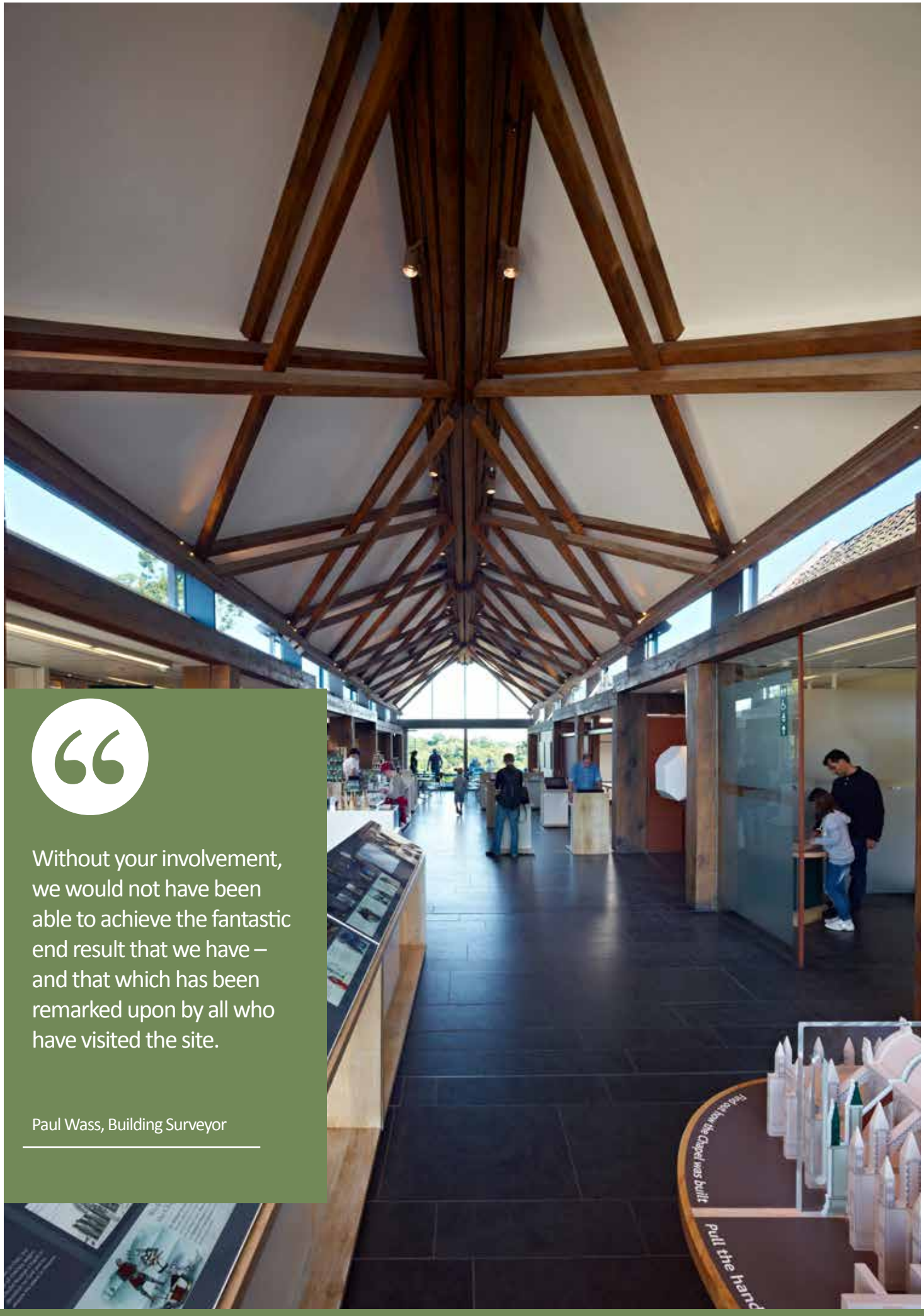
• The roof sits within the existing structure transferring load to the new foundation
• The Chiddingstone gridshell is unique in having to support a frameless glass roof and being built to precise tolerances
• Tests on the cable, clamps and lath provided the data that dictated the roof curvature
• Collaboration with the glass manufacturer resulted in a node to clamp the chestnut lath, the cabling and support the toughened glass panels

Engineering

The structure comprises of an elliptical ring beam of ply and steel plate supporting a lattice of chestnut lath. Cables anchored to the ring beam and running through the node clamps provide triangulation to the structure. The grid is constructed from four layers of lath sandwiched together and crossing at the nodes. Each lath is 40mm wide by 35mm deep and up to 12 metres long.

Erection

The ring beam was constructed on stools, the laths then laid out as a flat lattice with loose connecting nodes. The lattice was lifted allowing the laths to slide through the nodes and acquire the required form. Once the form had been achieved, the nodes were tightened and the cables secured around the apron. The roof structure was then lowered onto the steel stanchions that transfer the load to the new raft foundation under the stone floor.



Without your involvement, we would not have been able to achieve the fantastic end result that we have – and that which has been remarked upon by all who have visited the site.

Paul Wass, Building Surveyor

Project management: Earth Centre, Solar Canopy

Europe's largest flat-foot photovoltaic spans 1,300 square metres, containing 250 photovoltaic panels which generates 80,000 kilowatts of electricity per year.

Design

The concept for the canopy was an 'abstracted' tree. It is trapezoidal in form; it is this irregularity which adds to its beauty. While it was commented that a regular space frame would have been significantly less interesting, if more economic, the cost for the frame was £225K, only marginally more than a steel equivalent.

Fabrication

The irregular form meant that each of the 800 larch poles had unique measurements, as did the 221 galvanised steel nodes. Each node was fabricated on specially constructed jigs because of the very high accuracy needed for the canopy's triangulation to work. A high degree of three dimensional tolerance was required, a mere 20mm over the entire structure, and since each of the poles had its individual features drilling to a tolerance of 2mm over individual connections was needed.

Erection

The greater challenge was to erect this top heavy structure while ensuring traceability of 1021 unique components. Since access to the structure would always be problematic, requiring complex rope access and working while being suspended in mid-air, the focus was on doing as much of the assembly on the deck as possible. The architects had envisaged the canopy going up as an obvious series of five trusses, however our eventual solution was to sub-erect three much larger sections resting on a scaffold cradle, which we then lifted by two large cranes. Such rationalisation of the erection methodology cut this section of the work schedule by half, to one month, whilst the total erection took six weeks.

Collaboration: Loch Lomond and Trossachs National Park HQ

The Loch Lomond and Trossach's National Park Headquarters is the largest green timber frame building in the UK.

Design

While superficially a beautifully simple structure, the cleanliness of its lines belies the technology beneath. The primary structural frame of green oak, Douglas fir and glulam beams combines post and beam construction with a cutting edge pre-fabricated floor and roof panels and a site built skin. Because of the large open plan spaces this highly engineered hybrid structure needed to take loadings way beyond the norm. Post and beam structures readily withstand dead loading but they require bracing to resist imposed loading such as the force of wind. However the architect was keen to avoid the use of diagonal bracing found in most post and beam buildings.

Fabrication

Initially consultant engineers tried to use a conventional studded wall system but this proved impractical because of the high forces. Carpenter Oak & Woodland in collaboration with a number of specialist companies, developed a solution, unique in the UK, using pre-fabricated wall panels with a central vertical ply sheet with top and bottom flanges (essentially a very tall I beam) with vertical ribs at regular intervals to provide rigidity. A final diaphragm skin was applied on site. These panels were used intermittently down the length of the building and across it to provide 'buttressing'. Further bracing was achieved with the unique floor beams which comprised of two vertical panels with top and bottom flanges creating an I box section rather than the conventional I beam.

The success of this building at a budget previously considered unachievable, was in no small part due to the functioning of the design team – the architect, engineer, client and ourselves – working from the earliest days to design and cost engineer the structure.

Architect	Page/Park
Project value	£7m

Award winning

We are very proud to have many awards for our timber engineering work including the coveted RIBA awards and Wood Awards.

Key projects and awards

Accordia Brooklands – Stirling Prize, Wood Awards Commended
Aspire Centre – Wood Awards Commended
Bedales Performing Arts Centre – RIBA Award, Wood Award
The Maggies Centre – Wood Award, RIAS Andrew Doolan Award
The Orangery Gridshell – Winner Best Use of British Timber, Wood Awards
The Solar Canopy – RIBA Award, Wood Award

Your next steps

Whether you have a project you'd like to discuss or even a set of drawings you would like us to price, then we'd really love to hear from you.

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