

Award-winning paper in 2013

Papers published in *Construction Materials* are eligible for awards from the Institution of Civil Engineers. Papers from any of the ICE journals can be nominated for several awards. In addition, each journal has awards dedicated to their specific subject area.

On Friday 17 October 2014, ICE president Geoff French presented an award to the following paper published in *Construction Materials* in 2013. The editorial panel nominated their best papers and an awards committee chaired by Quentin Leiper allocated the awards.

Howard Medal

The Howard Medal, presented for the best paper on any of the uses or properties of iron, steel or material development, was awarded to Gengnagel *et al.* (2013).

Abstract

This joint venture research brings together three different fields of research which have led to novel findings: these relate to single-motion erection of irregular lattice gridshells using geometric optimisation techniques for the application of natural fibre-reinforced composites within the context of actively bent elements for curved load-bearing structures. Fabrication tests are carried out for pultruded flat test specimens and tubular sections made from environmentally advantageous composites with flax or sisal fibres and a partially bio-based resin. The flat test specimens with flax fibres exhibit excellent tensile and bending strength properties but the sisal yarns prove more successful for pultrusion. Fibre-reinforced composites (including natural fibre-reinforced plastics) compare favourably to timber and steel for application in actively bent structures where low weight, bending-stress reserves and large curvatures are required. The pultrusion tests also identify serious manufacturing challenges (such as the twisting of sisal fibres), which lead to inconsistent properties and subsequently highlight the need for further investigation. The experimental realisation of a 10 m span irregular lattice gridshell using glass fibre-reinforced plastic was completed as a proof of concept for the suitability of active bending for pultruded fibre-reinforced profiles and also to validate newly developed computational optimisation and construction procedures for irregular gridshell lattices.

REFERENCE

Gengnagel C, Lafuente Hernández E and Bäumer R (2013)
Natural-fibre-reinforced plastics in actively bent structures.
*Proceedings of the Institution of Civil Engineers –
Construction Materials* **166**(6): 365–377, <http://dx.doi.org/10.1680/coma.12.00026>.



ICE President Geoff French with Christoph Gengnagel, winner of the Howard Medal