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Spotlight on *Structures*

Volume 43

Volume 43 of *Structures* (September 2022) is now available to read at **www.sciencedirect.com/journal/structures/vol/43**.

Associate Editor, Pedro Silva, has chosen an article focused on the use of reclaimed concrete blocks for a 10m-long arch footbridge, and how a lifecycle assessment of the structure showed that the process reduced its global warming potential by 71% compared with a recycled concrete alternative.

The article will be available free of charge for six months.

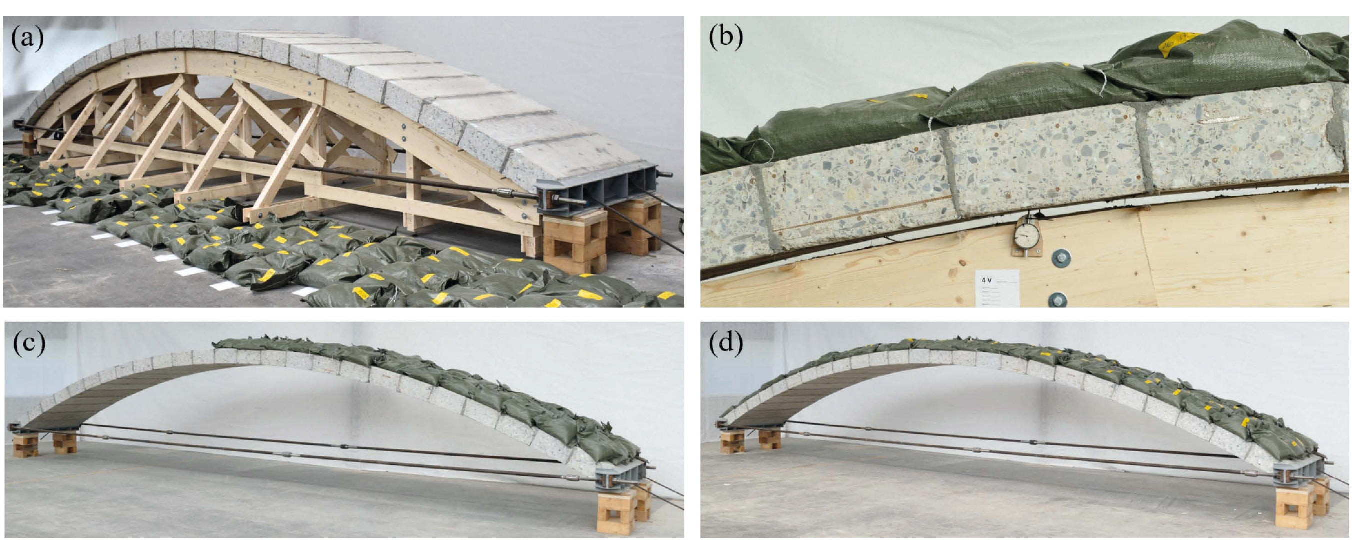
Editor's Featured Article

Re:Crete – Reuse of concrete blocks from cast-in-place building to arch footbridge

Julie Devènes, Jan Brütting, Célia Küpfer, Maléna Bastien-Masse and Corentin Fivet
Ecole Polytechnique Fédérale de Lausanne (EPFL), Structural Xploration Lab (SXL), Fribourg, Switzerland

About 9% of anthropogenic greenhouse gas emissions worldwide are due to the production of cement, a key constituent of concrete. Concrete also contributes to a large share of demolition waste, usually coming from building structures that are discarded because of functional obsolescence rather than of technical deficiency. Current practice for treating end-of-life concrete is to landfill it or crush it into aggregates used in new concrete mixes. Instead, a little-explored strategy consists in extending the service life of concrete elements by reusing them in new constructions. Following this paradigm, this paper presents a proof-of-concept prototype that reuses blocks cut out of obsolete cast-in-place concrete walls for a new structural application: a 10m-long post-tensioned segmented arch footbridge. The paper details the design, material sourcing, and construction processes while highlighting the unusual features of the approach. The structural behaviour is verified with a finite element analysis model and validated by load testing. A comparative life cycle assessment shows that the arch construction presents a significantly lower global warming potential then recycled concrete (–71%) or steel (–74%) alternatives and is very competitive to a timber one (+9%). In conclusion, the project proves the feasibility of a new circular economy application for the construction industry, in which new and reliable concrete structures are built with little to no cement inputs.

→| Read the full paper at **https://doi.org/10.1016/j.istruc.2022.07.012**

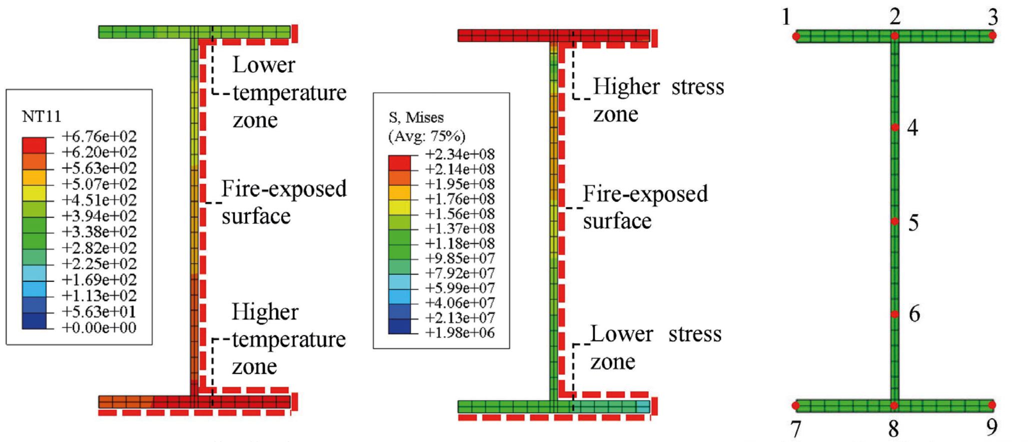


Volume 44

Volume 44 of *Structures* (October 2022) is now available to read at **www.sciencedirect.com/journal/structures/vol/44**.

Associate Editor, Hua Yang, has selected an article based on the critical temperature method (CTM) used in Eurocode 3 and Chinese standard GB 51249-2017 and how this can be used as the basis for an advanced CTM for H-shaped steel beams under different fire scenarios.

The article will be available free of charge for six months.



Temperature distribution — Mises stress distribution — Positions of preliminary CTPs

Editor's Featured Article

Advanced critical temperature method for steel beams exposed to different fire scenarios

Tian-Yi Song[a], Xing-Yu Qu[a], Hongyuan Zhou[a], Kai Xiang[b]
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The early-warning of fire-induced failure of structural members is becoming more and more attractive to the fire department since it can provide warning signal to the firefighters at the scene of a building fire. Temperature is a type of easily measured parameter in fire condition, and can reflect the ultimate state of structural members to some extent, therefore it has the application potential to indicate the failure of structural members in fire. The traditional critical temperature method (CTM) in *Eurocode 3* or *Chinese standard GB 51249-2017* has been widely used in the fire safety design of steel members, but it cannot be extended to the early-warning of fire-induced failure directly. Based on the traditional CTM, this paper presents an advanced CTM for simply supported H-shaped steel beams under different fire scenarios. Finite element analysis models were established and validated to investigate the critical temperatures of H-shaped steel beams. Based on the numerical analysis, guidelines for confirming the positions of characteristic temperature points (CTP) and values of refined critical temperatures (RCT) on H-shaped steel beams were proposed, and parametric analysis results indicated that the longitudinal fire scenario, perimeter of beam section and beam load ratio were the key influencing parameters. Finally, a design table was proposed to determine the positions of CTPs and values of RCTs of simply supported H-shaped steel beams with two-hour fire rating time, which can be used in the early warning of fire-induced failure directly.

→| Read the full paper at **https://doi.org/10.1016/j.istruc.2022.08.019**

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The Drawing Board

TheStructuralEngineer

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Sketches must be:

- hand drawn (no CAD, except for 'guided free-hand')
- from a real project or assignment
- at a suitable scale for publication (i.e. not too intricate/detailed).

Please also submit a short description (150 words) to put the sketch into context.

To take part, submit your entries to: tse@istructe.org

Each published entry will receive a free single e-book from the Institution's current list of titles.