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Spotlight on Structures



Editor's Featured Article

The Featured Article for Volume 67 of *Structures* is now available. Jason Ingham, Associate Editor, has selected a paper on tubular sandwich cross-sections made with metal additive manufacturing components.

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Tubular sandwich cross-sections fabricated with Wire Arc Additive Manufacturing for jumbo structural members

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Innovations in the field of robotics and production processes have led to the exploration of new manufacturing techniques, offering greater freedom in size and shape of metal additively manufactured (AM) components. This has opened the doors

to the design of customised complex-shaped elements. Among these metal AM processes, wire arc additive manufacturing (WAAM) stands out, enabling the fabrication of complex large-scale structural elements, which are essential for applications in the construction sector. Within offshore engineering applications, submerged steel members of offshore jacket structures, exposed to significant compressive radial pressure, are typically made by circular hollow section (CHS) tubular members. In this regard, the present work focuses on the initial investigations of new geometrical shapes for jumbo tubular cross-sections of steel members, referred to as tubular sandwich sections (TSS), for structural

engineering applications requiring high resistance against buckling failure. In detail, the engineered geometrical shape of TSSs offers higher freedom to structural designers able to optimise the design based on different target structural performances. However, to properly account for the specific manufacturing constraints, computational design approaches and advanced numerical simulations should assist the designer towards a feasible structural solution. The present study aims at exploring the potential capabilities of TSSs. First, the geometrical properties and potential structural performances of TSSs are investigated. Then, two different case studies are presented to illustrate different target structural performances. The first one illustrates the application of a parametric approach to design efficient TSSs of uniform thickness leading to the creation of a first catalogue of uniform TSSs. The first proof of concept of uniform TSS is provided by the manufacturing of two samples realised with WAAM technology. The second case study investigates the structural behaviour of non-uniform TSS member specifically designed to resist high radial compressions. For this aim, linear and non-linear finite element buckling analyses are carried out also considering the effect of initial geometrical irregularities. The structural performances of the TSS member are compared with those of an equivalent CHS member, demonstrating a significant increase in the critical pressure of TSS, even when considering geometrical irregularities.



→ Read the full paper at <https://doi.org/10.1016/j.istruc.2024.106689>



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