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Design and Fabrication of Composite I-Beams for Bending Load Applications

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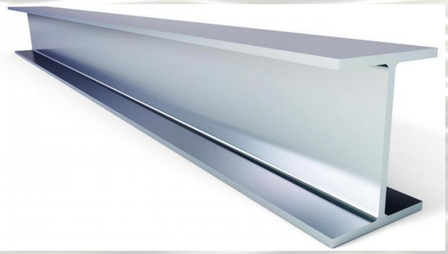


Objective

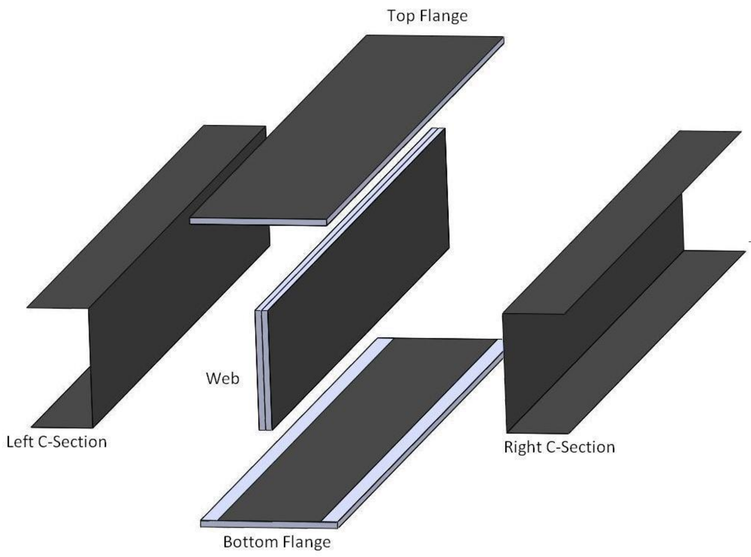
To establish a basic understanding of how to design and fabricate composite I-beams.

Introduction

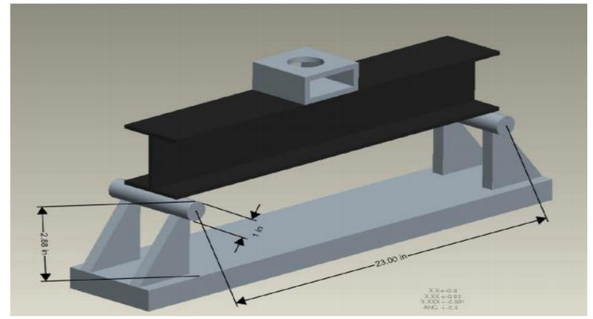
Composite is a special type of material that combines the properties of two different constituents thereby, enhancing its mechanical properties. These constituents are generally a fiber and matrix.

Design and Fabrication

- Composite I-beam fabricated from 5 separate sub-sections, layed up by hand and co-cured in a vacuum bag at room temperature for about 5 hours.
- *Material composition:* 12carbon fabric layers (per sub section) and EPON 828 / Epikure 3274 resin system (100:40 weight ratio)
- A wooden block mold (24 in. x 1.75 in. x 3.5 in.) was used to maintain shape during lay-up and cure.



Three Point Bending Test



Instron machine with roller supports spaced 23 inches apart and a metal plate (4 in. x 4 in.) with max. load of 25000 lbs

Results and Conclusion

- Web stability was the driving failure mode →increase cross - sectional area
- Use of metal molds and autoclave
- Future improvements to design

Reference

- *Composite I- Beam Fabrication and Testing in Response to 14th Annual SAMPE bridge competition*