

Innovative Fabricated Steel Beams with Cold-Formed Steel: Pioneering Cost-Effective and Sustainable Building Solutions

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Abstract

Integrating advanced structural elements is pivotal in seeking cost-effective and efficient building designs. This research delves into the innovative use of steel I-beams with corrugated webs and fabricated cold-formed steel I-joists, highlighting their potential to revolutionize building construction. The study focuses on the dual benefits of these structural components: cost reduction and design efficiency. Steel I-beams with corrugated webs offer enhanced load-bearing capacity while reducing material usage, leading to significant cost savings. Additionally, the corrugated design improves the beam's resistance to buckling, ensuring structural integrity under various load conditions. Fabricated cold-formed steel I-joists complement this by providing lightweight yet robust support for floors and roofs. Their fabrication process allows for precise customization, optimizing material use, and reducing costs. A key feature of these joists is the inclusion of strategically placed web openings. These openings facilitate the passage of plumbing, electrical, and HVAC systems, eliminating the need for additional floor height and enabling false ceilings. This design innovation conserves vertical space and simplifies the installation of building services, contributing to overall project efficiency. Beyond cost and efficiency, this research underscores the sustainability of the developed beams and joists. Using high-strength steel and efficient fabrication processes minimizes waste and reduces the carbon footprint of construction projects. Moreover, these structural elements support green building initiatives by enhancing energy efficiency and promoting using recyclable materials. In conclusion, adopting steel-I-beams with corrugated webs and fabricated cold-formed steel I-joists represents a significant advancement in building construction. Their ability to reduce costs, improve design efficiency, and support sustainability makes them valuable for modern construction practices. This research aims to inspire further innovation and adoption of these technologies in the industry.