

The Effect of Angle of Web Opening for Prediction of Ultimate Failure Load of Castellated Beams by Experimental Investigation

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Abstract

A beam which has openings in its web portion is called castellated beam. For the preparation of castellated beams, fabrication of I section is done by cutting web portion and subsequently re-joining it one above the other. The popularity of castellated beams measures its advantageous structural applications. It expands the lives of millions every day combined with our pioneering business facilities. The objective of this research paper is to investigate new angle of web opening of the diamond shape in comparison with hexagonal and rectangular web opening to determine the ultimate load-carrying capacity and to avoid shear stress concentration at the corner of the rectangular and hexagonal opening which is responsible for failure of castellated beam. This paper studies the deflection performance and ultimate load-carrying capacity of castellated beams with a diamond, hexagonal and rectangular opening. To identify experimental results of this research, 24 beams were fabricated, tested and results are validated using ANSYS software. The variable considered in this research is the angle of opening 30° , 45° and 60° for diamond. The length of the opening for diamond and rectangle of castellated beams is equal. It is concluded that the ultimate load-carrying capacity of diamond web opening with 30° angle of opening is 47.86% more and has 47.5% less deflection compared to the hexagonal opening. The average load-carrying capacity of diamond web opening is 44.21% more and deflection 44.00% less than rectangular web opening.

Keywords


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