

MECHANICAL BEHAVIORS OF GFRP BOX BEAMS WITH LOW SPAN-TO-DEPTH RATIOS SUBJECTED TO THREE-POINT LOADING

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Abstract

This research paper presents the mechanical behaviors and mode of failure of box beams with low span-to-depth ratio subjected to three-point loading. The variables studied were the span-to-depth ratio of 6.0 and 10.0 and the wall-thickness of the beams of 3.2 mm and 6.4 mm. It was found that the behaviors of the GFRP box beam used in this study are in general similar to each other. The first portion of the load-displacement curve is linear up to 35% to 75% of the ultimate load, where the larger span-to-depth ratio and the thicker wall thickness gives the longer linear behavior. Then, the curve is nonlinear to the ultimate load due to series of crack initiated by the stress concentration under the loading point. The mode of failure of the beams was in a form of progressive failure. But, it is not one of the six distinct modes of failures of the structural plastic beam proposed by ASCE. Thus, the ASCE design equations may be inappropriate for the design of GFRP box beam with the span-to-depth ratio below 10 subjected to concentrated load such as in guard rail and bridge rail.

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