Finite element analysis and structural design of pretensioned inverted T-beams with web openings

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ABSTRACT

This paper presents the results of a research project aimed at providing standard circular web openings to the popular precast pretensioned inverted T-beam. Opening size and placement and required materials strengths were investigated. In this paper the nonlinear analysis and design of simply supported pretensioned inverted T-beam with circular web openings are presented. Two design parameters are varied: opening location and number of openings. The results from nonlinear finite element analysis were substantiated by test results from five pretensioned inverted T-beams with web opening and one solid beam. Good agreement is shown between the theoretical and the experimental results. The test results obtained from this investigation show that the performance of the specimens with web openings is almost identical to that of the specimen without web openings. A simple design method for pretensioned inverted T-beam with circular web openings is proposed.

KEYWORDS

Prestressed concrete; Inverted T-beams; Web openings

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