

## عنوان مقاله:

Strength and Serviceability of Reinforced Concrete Deep Beams with Large Web Openings Created in Shear Spans

## محل انتشار:

ژورنال مهندسی عمران، دوره 4، شماره 11 (سال: 1397)

تعداد صفحات اصل مقاله: 15

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## خلاصه مقاله:

Deep beams are used in wide construction fields such as water tanks, foundations, and girders in multi-story buildings to provide certain areas free of columns. In practice it is quite often occurring to create web opening in deep beams to supply convenient passage of ventilation ducts, cable channels, gas and water pipes. Experimental studies of ten 10 deep beams were carried out, where two of them are control specimens without openings and eight with large web openings in the shear spans. The variables that have been adopted are the ratio of the shear span to the overall depth of the member cross-section, location and dimensions of the opening. Test results showed that there was a decrease in the load carrying capacity of deep beams with openings compared to the control deep beams. This reduction may reach 66% in particular cases. It is clear that, the position of opening in shear span has less effect on the performance of structural concrete deep beams at different serviceability stages. Only 11% increase in load capacity at failure was observed in specimens with openings adjacent to the interior edges of shear spans in comparison with specimens with openings at the center of shear span because the discontinuity of the load path is less. Also the midspan deflection at service load level of the reference beam in specimens with openings adjacent to interior edge of shear spans was less than the midspan deflection of reference specimens by 10% - 33%. Evaluating all these advantages facilitates to recommend, if it is very required, the creation of openings at the interior edges of shear spans of the structural concrete deep beams.

## کلمات کلیدی:

Deep Beam; Large Web Openings; Shear Span; Load Carrying Capacity

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