

## Studying the Structural Behaviour of RC Beams with Circular Openings of Different Sizes and Locations Using FE Method

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**Abstract :** This paper aims to investigate the structural behaviour of RC beams with circular openings of different sizes and locations modelled using ABAQUS FEM software. Seven RC beams with the dimensions of 1200 mm×150 mm×150 mm were tested under three-point loading. Group A consists of three RC beams incorporating circular openings with diameters of 40 mm, 55 mm and 65 mm in the shear zone. However, Group B consists of three RC beams incorporating circular openings with diameters of 40 mm, 55 mm and 65 mm in the flexural zone. The final RC beam did not have any openings, to provide a control beam for comparison. The results show that increasing the diameter of the openings increases the maximum deflection and the ultimate failure load decreases relative to the control beam. In the shear zone, the presence of the openings caused an increase in the maximum deflection ranging between 4% and 22% and a decrease in the ultimate failure load of between 26% and 36% compared to the control beam. However, the presence of the openings in the flexural zone caused an increase in the maximum deflection of between 1.5% and 19.7% and a decrease in the ultimate failure load of between 6% and 13% relative to the control beam. In this study, the optimum location for placing circular openings was found to be in the flexural zone of the beam with a diameter of less than 30% of the depth of the beam.

**Keywords :** ultimate failure load, maximum deflection, shear zone and flexural zone

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