

The effect of failure mechanism on the capacity of masonry arch under vertical loading*

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Abstract

Masonry arches are very old because of the advantages of the structural-behavior of their shape. For many reasons, rehabilitation of these arches is required where the method of strengthening is structurally related to failure mechanism. Therefore, this research is focused on the failure mode of masonry arch under a vertical concentrated load.

Finite Element Method (FEM) and Materially Non-linear Analysis (MNA) are performed. On the other hand, the clay brick unit and mortar were modeled separately where other researchers have simulated them as one material which affects the failure mechanism to be clearly explored. Moreover, the effect of both loading position and boundary conditions has been taken into account.

This work has shown that changing the loading position does not influence the carrying-capacity of the arch. Whereas, different boundary conditions may cause a drop in resistance. Also, it has demonstrated that the maximum arch-capacity occurs at the forming of first hinge. Therefore, it is so important to distinguish this hinge to delay its formation through local support at its presumed location, thus, elevating bearing ability of the masonry arch. .

Key words: Masonry arches- Vertical loading- Finite Element Method- Non-Linear Analysis.

* For the paper in Arabic see pages (107-115)

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