

# **THE ARCHING MECHANISM IN GRANULAR MATERIAL AND ITS APPLICATION TO SOIL-STRUCTURE INTERACTION**

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If a portion of an otherwise rigid support of a granular mass (e.g. sand) yields, the adjoining particles move with respect to the remainder of the granular mass. This movement is resisted by shearing stresses which reduce the pressure on the yielding portion of the support while increasing the pressure on the adjacent rigid zones. This phenomenon is called the "Arching Effect". The arching effect can be found widely in natural terrain as well as in man-made construction.

A study and analysis are carried out focusing on the fundamental mechanism of arching in granular material and the interaction between granular material and a solid body along an interface. Two approaches are being used:

1. Experimental study, concentrating on the development of a new trap door testing apparatus, and a high accuracy physical model. The model consists of two dimensional photoelastic particles with high resolution image acquisition and analysis system capable of monitoring the motion and contact forces of all particles.
2. Theoretical study, concentrating on mechanical and numerical modeling of the phenomenon, utilizing the experimental test results. The numerical methods used include the Finite Element Analysis for a study based on a continuum approach and the Discrete Element Method (DEM) analyzing the interaction of individual particles.