

ARTIFICIAL TWO DIMENSIONAL SANDS, SHOCK TUBE, CENTRIFUGE, AS EXPERIMENTAL TOOLS IN MODEL TESTS OF CAVITIES SUBJECT TO EXPLOSIONS

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The paper describes scale model tests carried out on underground cavities subject to explosive loads. The material in-situ was sand and gravity forces were to be correctly represented, as well as the Elastoplastic behavior.

When structural details of reinforced concrete are reproduced (micro-concrete) the limiting scale of length is about 1:10. Two dimensional "sand" made of steel rods of special forms had a density of 17 g/cm³, which gave a length scale 1:11, while stresses were 1:1. The mechanical properties of this "sand" are shown to be suitable. Measurements of the 3 components of the stress tensor by rosettes of dynamometers are described, as well as the large possibilities of movement measurements according to the special geometry.

The scale of length was reduced by a factor of 10-20 in models where g was represented by centrifugal acceleration, utilizing the CESTA centrifuge (Le Barp, France) which has a radius of 10m. Model tests used Fontainebleau sand and artificial steel-balls sand. Shocks were generated either by a shock tube fixed at the end of the centrifuge arms, or by explosives and the results are compared.