

## Impact of falling blocks

The aim of the study is the establishment of a general guideline to assist practising engineers during the design of rock sheds covered with damping materials which protect against rock impacts. The research programme includes a bibliographic study, tests permitting the measurement of dissipated kinetic energy in the cover materials and the forces in the bearing elements, the interpretation of the measurements as well as a theoretical justification. Approximately 80 test series were carried out in a hall equipped with a pit in which a slab covered with damping material was placed at the bottom. The slab was instrumented to permit the measurement of dynamic solicitations and the deformations of the system formed of the rock, the slab and the covering material. The various parameters were: the mass of the impacting block, its falling height, the nature of the covering material and its thickness (Figs. 1 and 2).

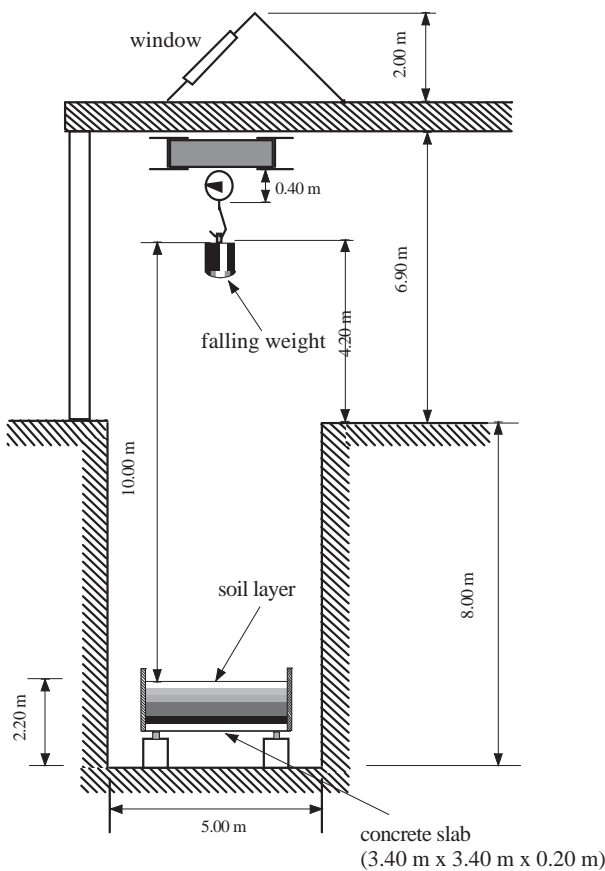


Fig. 1: Vertical section of the test set-up

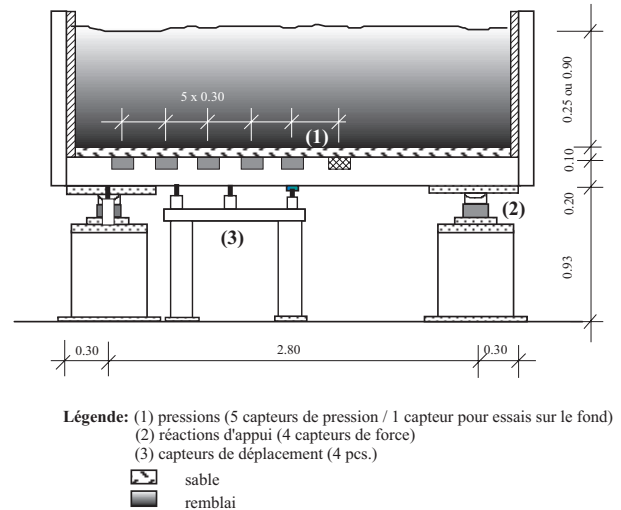


Fig. 2 Testing device

- (1) pressure gauges (5 pressure transducers)  
 (2) support reaction (4 force transducers)  
 (3) 4 deformation transducers D1 to D4

Additional test series were carried directly on the pit bottom, in order to check the influence of the rigidity of the system, the effect of the compacting of the material as well as the impact angle. For these tests, an apparatus permitting the rotation of the block had to be put into place.

Semi-empirical laws linking the impact energy and the dynamic force acting on the slab have been established. A one dimensional dynamic model will be developed which will permit the identification of the critical parameters for the system response.

## Publications

- Montani S., Descoedres F. Etude expérimentale de la chute de blocs impactant une dalle en béton armé recouverte par des matériaux amortissants, Mandat 98/92 Publ. OFR N° 524 (Ecole Polytechnique Fédérale, 1996).
- Labieuse V., Descoedres F. and Montani S., Experimental Study of Rock Sheds Impacted by Rock Blocks. *Structural Engineering International IABSE*, (3), pp. 171-176 (1996).
- Montani Stoffel S., Labieuse V. and Descoedres F., Essais d'impacts de blocs sur un modèle de toit de galerie de protection. Publ. SSMSR N° 134 (1997).