# INFLUENCE OF THE TRIAXIAL LOADING PATH ON THE ULTIMATE STRENGTH OF PLAIN CONCRETE

T. GABET[†*], Y. MALECOT[*] AND L. DAUDEVILLE[*]

[*] Sols Solids Structure Laboratory
B.P. 53, 38041 Grenoble cedex 9, FRANCE
[†] gabet@geo.hmg.inpg.fr

Concrete is a building material used for sensitive infrastructures like dams or nuclear reactors; however its behavior remains poorly known under extreme dynamic loading like rock falls, explosions or ballistic impacts. This is due both to the difficulty of reproducing experimentally such a loading which generates transient high triaxial stresses and to the intrinsic complexity of concrete. Predicting its dynamic response needs first an experimental characterization of its behavior under extreme triaxial stresses and various controlled loading paths. Some authors [1] argue that inertia, producing an effective confining stress, plays a major role in the apparent rate dependence in compression. The influence of defects may explain the important rate effect in tension [2]. According to the previous references, identifying the constitutive behavior of concrete under high dynamic loading by means of quasi-static tests is then possible.
An experimental study performed on a standard low strength concrete with a maximum aggregate size of 10 mm is presented. The specimens are cylinders of 140 mm length and 70 mm diameter, dried in an oven until weight stabilization. The experimental device consists of a large capacity triaxial press. The experiment originality is due to the level of stresses (of the order of one GigaPascal) regarding the specimen size. “Real” concrete specimens (centimetric aggregate dimension) can then be tested. The use of gauges to measure strains at very high confinement is another original feature of that experimental study. Different loading paths can be followed by means of independent controls of the axial stress and the confining pressure. Several testing programs (hydrostatic, triaxial, proportional, œdometric and extension) have been performed. The influence of moisture content on the triaxial behavior of concrete is presented in another paper [3]. The first results of tests performed on dried specimens presented in this paper highlight different features of the concrete triaxial behavior. They show an influence of the loading path on compaction; we observe both a brittle-to-ductile transition and an evolution of the failure patterns with the confining pressure. A relative independence of the yield surface from the loading path can also be noticed. The extension tests allow us to show the influence of the Lode Angle on the triaxial behavior of concrete.

**References**

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