Numerical modelling and evaluation of laboratory tests with impact loaded young concrete prisms

Results from laboratory tests with impact loaded young concrete prisms are evaluated using a finite element model. The application of the dynamic load from an impacting hammer is used as with previously tested models, but here are 3D solid elements used. A non-linear material model is also implemented, capable of describing cracking during stress wave propagation. The position and width of cracks and measured particle vibration velocities are calculated and compared with the laboratory test results. Alternative geometry for the test prisms, with a notched section, is tested. This results in one wider crack at the centre of the prisms instead of two or three cracks distributed over its length. The geometry has been recommended for future laboratory test specimens since the appearance of cracks will become easier to detect, thus facilitating a more precise determination of critical vibration velocities. Finally, recommended damage limits for early age concrete are given, based on numerical calculations for two types of normal strength concrete.

The paper demonstrates the use of non-linear material representation together with the previously suggested finite element model. It also shows the implementation for modelling of cast concrete specimens, also using a 3D modelling approach.