Further Dynamic Testing of Masonry by the Longitudinal Vibration and Ultrasonic Pulse Velocity Methods.

Y.Z.Totoev,M.Eng.,Ph.D(Kiev)¹ and J.M.Nichols,BE(Hons).,MIE(Aust).,Ph.D Student²

ABSTRACT

Two dynamic test methods developed originally for measurement of the elastic properties of concrete are the Longitudinal Vibration Test Method (LVTM) and the Ultrasonic Pulse Velocity Method (UPVM). These methods have been previously adopted by us for the testing of the elastic properties of bricks and masonry.

The LVT Method uses a modified version of the Electrodynamis Materials Tester Emefco SCT/5. This instrument is noted as complying with the British Standard 1881:52 - Longitudonal Vibrations. The test protocol is based on measuring the fundamental natural frequency of a regularly shaped brick or masonry sample. An accurate oscillator excites a vibrator, secured to an end face of the test sample. The test sample is clamped about its centre with a jaw clamp. A piezoelectric crystal pickup senses the oscillations, that are then amplified and displayed on an oscilloscope.

The UPV Method uses the standard CNS Portable Ultrasonic nondestructive Digital Indicating Tester(PUNDIT). This protocol is based on the measurement of the velocity of ultrasonic pulses in a solid media. The PUNDIT measures the travel time of the pulses between two transducers in this case located on opposing faces of the media. Measurement of the length of material between the transducers then trivially reveals the velocity.

Results for these test can then be compared to the results from a conventional uniaxial quasi-static test. The advantage of these two dynamic procedures is that the same samples can be used in the quasi-static testing and one of the dynamic test procedures. Research thus far has concentrated on five brick types and masonry constructed from one consistent 1C:1L:6S with no additives mortar. The dynamic test methods to determine the elastic properties have provided good agreement with the quasi-static test procedures.

This further research will look at two further aspects of the test program. The first aspect is to look at extending our program to a variety of mortars, from a low grade commercial mortar to a high grade structural mortar using two common brick types for the tests. The second aspect is to undertake further specific work on the influence of homogenity of the media, isotrophicity & anisotrophicity exhibited by some bricks in the initial test program and the influence of load frequency that was clearly evident in the calcium silicate and concrete masonry units.

¹ Associate Lecturer, Department of Civil, Surveying and Environmental Engineering, The University of Newcastle,Callaghan, NSW,2308,Australia. Telephone(+61 49) 215 290, Facsimile (+61 49) 216 991, Email : ceyuri@civeng.newcastle.edu.au
² Postgraduate Student, Department of Civil, Surveying and Environmental Engineering, The University of Newcastle,Callaghan, NSW,2308,Australia. Telephone(+61 49) 216 073, Facsimile (+61 49) 216 991, Email : cejn@engmail.newcastle.edu.au