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The effect of mix proportions and method of testing on Poisson's ratio for mortars and concretes*

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The authors are to be congratulated on their comprehensive review of the research work carried out to determine the value of Poisson's ratio for concrete, and for their timely pointer, in their Conclusion, that further work in this field is necessary for a better understanding of the internal mechanisms of concrete deformation.

With regard to the disparity of values obtained, from tests on the same specimens, for the various values of dynamic ν (pp. 118, 119), do the authors consider that the linking of E_D by equations 1 and 2 is fully justified? It is realized that this is common practice but, just as differences in static and dynamic moduli are explained on the basis of a zero stress criterion, is it not possible that the electrodynamic and ultrasonic excitations produce different responses as far as modulus is concerned?

A typical use of these linked equations has been the determination of ν_D on laboratory specimens, for the determination of the site E_D . The authors point out (p. 127) that "the moisture condition and temperature of the test specimen are important, although, as yet, there is little information on these parameters". It would be interesting to hear their views on the determination of the site E_D by the laboratory-site method bearing in mind that the laboratory specimens have either (a) been continuously water cured or (b) been left to dry out.

As the specimens are small, in relation to the site concrete, the results obtained in both cases would appear anomalous. The determination of ν_D for use in equation 1 is very important, as reference to Figure 1 indicates. The Figure shows how the calculated value of E_D changes with changes in the assumed ν_D . Could the authors suggest a method of obtaining the varia-

Figure 1: Theoretical variation of E_D with ν_D (weight: 149.3 lb/ft³; length of pulse path: 30 in.; pulse time: 175×10^{-6} s).

tion of moisture content in a laboratory specimen in order that the relationship with ν_D could be tested?

Reply by the authors

We would like to thank Dr Mayfield for raising some interesting points in connexion with our paper. The calculation of dynamic Poisson's ratio ν_D using equations 1 and 2 is considered justifiable to the extent that both the pulse velocity and the resonance frequency tests involve measurements in the longitudinal or compressive mode. Whether concrete responds in the same way to the different frequency levels of these tests, however, has yet to be established.

The value of the dynamic elastic modulus E_D for concrete in situ can be assessed by taking measurements of the pulse velocity V and then using equation 1 together with a value of ν_D which may either be assumed or determined from laboratory tests. In his Figure 1, Dr Mayfield has drawn attention to the considerable influence which variations in ν_D can have on the value of E_D computed in this way. It would certainly be useful to establish the extent to which the dynamic Poisson's ratio ν_D is dependent upon such parameters as moisture content, temperature and degree of hydration. To do this, comparisons would have to be made between saturated and air-dried laboratory specimens and prismatic sections sawn from a large block or beam of concrete at regular intervals as it was allowed to dry out. The moisture content through the large block would be strongly dependent upon the rate of drying which, in turn, would be affected by the chosen specimen size and the pore structure of the hardened concrete.

*Pages 115 to 130 of *Magazine* No. 56.