Ultrasonic Pulse Velocity Method

ULTRASONIC PULSE VELOCITY

This test is done to assess the quality of concrete by ultrasonic pulse velocity method as per IS: 13311 (Part 1) – 1992. The underlying principle of this test is -

The method consists of measuring the time of travel of an ultrasonic pulse passing through the concrete being tested. Comparatively higher velocity is obtained when concrete quality is good in terms of density, uniformity, homogeneity etc.

Procedure to determine strength of hardened concrete by Ultrasonic Pulse Velocity.

i) Preparing for use: Before switching on the 'V' meter, the transducers should be connected to the sockets marked "TRAN" and " REC".

The 'V' meter may be operated with either:

a) the internal battery,

b) an external battery or

c) the A.C line.

ii) Set reference: A reference bar is provided to check the instrument zero. The pulse time for the bar is engraved on it. Apply a smear of grease to the transducer faces before placing it on the opposite ends of the bar. Adjust the 'SET REF' control until the reference bar transit time is obtained on the instrument read-out.

iii) Range selection: For maximum accuracy, it is recommended that the 0.1 microsecond range be selected for path length upto 400mm.

iv) Pulse velocity: Having determined the most suitable test points on the material to be tested, make careful measurement of the path length 'L'. Apply couplant to the surfaces of the transducers and press it hard onto the surface of the material. Do not move the transducers while a reading is being taken, as this can generate noise signals and errors in measurements. Continue holding the transducers onto the surface of the material until a consistent reading appears on the display, which is the time in microsecond for the ultrasonic pulse to travel the distance 'L'. The mean value of the display readings should be taken when the units digit hunts between two values.

Pulse velocity=(Path length/Travel time)

v) Separation of transducer leads: It is advisable to prevent the two transducer leads from coming into close contact with each other when the transit time measurements are being

taken. If this is not done, the receiver lead might pick-up unwanted signals from the transmitter lead and this would result in an incorrect display of the transit time.

Interpretation of Results

The quality of concrete in terms of uniformity, incidence or absence of internal flaws, cracks and segregation, etc,indicative of the level of workmanship employed, can thus be assessed using the guidelines given below, which have been evolved for characterizing the quality of concrete in structures in terms of the ultrasonic pulse velocity.

Pulse Velocity (km/second)	Concrete Quality (Grading)
Above 4.5	Excellent
3.5 to 4.5	Good
3.0 to 3.5	Medium
Below 3.0	Doubtful

Source: http://www.engineeringcivil.com/ultrasonic-pulse-velocity-method.html