UTM
UNIVERSITI TEKNOLOGI MALAYSIA

RESEARCH UNIVERSITY

CIVIL ENGINEERING LABORATORY

CONCRETE LABORATORY

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Assessment *(please see overleaf for assessment rubrics)*

Scores :

TEST 1: DETERMINATION OF ULTRASONIC PULSE VELOCITY

References:

EN 12504-4

Objectives:

To Determine the Ultrasonic Pulse Velocity on Material

Apparatus:

a) Electrical Pulse Generator
b) Transducer – One Pair
c) An Amplifier
d) Electronics Timing Device for measuring the transit time
e) Reference bar for calibration
f) Coupling agent (contact paste)

General Discussion:

Ultrasonic Pulse Velocity is a Non-Destructive test of concrete PUNDIT (Portable Ultrasonic Non – Destructive Digital Indicating Tester) is the instrument that used in ultrasonic pulse velocity test. The method is based on the propagation of a high frequency sound wave which passes through the material. The speed of the wave varies in function of the density of the material, allowing the estimation of the porosity and the detection of discontinuities. The idea is to project the sound inside a material and measure the time necessary for the wave to propagate through it. Once the distance is known, it is possible to determine the average pulse velocity, which will depend on several factors such as the nature of the material and the presence of water in the pores, among others. The test is performed by positioning the source and receiver on either side of the area in question, then the source sends a compressional wave through the region, and the receiver records the full waveform on the other side. After receiving the pulse, the instrument can amplify the pulse and also can measure the time taken by the pulse to travel through the concrete. This test often used to monitor the uniformity of concrete, degree of compaction, the estimation of in-site strength, the quality and homogeneity of concrete in relation to specified standard requirement. UPV methods can play an important role in this area, since they allow us to monitor the density and homogeneity of the material, providing information about the strength evolution and about the existence of internal flaws and defects.

Procedure:

Calibration Test (before and after)

1) Place a coupling agent on a pair of transducer and a calibration reference bar on a both side
2) Do a calibration before and after testing

Specimen

1. Clean and smooth the surface of the specimen
2. Weighing and measure the specimen
3. Mark out the test point on specimen area
4. Place a coupling agent on a pair of transducer and specimen test point
5. Select the method of pulse transmission (Direct and Semi-direct) for the particular test point
6. Transmit test pulse and record the transmit time. Take three readings at each point and calculate the average value

Table of Data:

Specimens ID:		
Location:		
Date:		
Description of the Specimens:		
Age of Specimens:		
Temperature of Specimens:		
Type and make of Apparatus used including:	a) Dimensions of Contact Area Transducers:	
	b) Natural Pulse Frequency of Transducers:	
Transmission Method:		

Transducer Arrangements:	
Surface Conditions:	

Data Record:

Length of Measurement (mm)	Pulse rate (Hz)	Data 1 (μs)	Data 2 (μs)	Data 3 (μs)	Average (μs)	Pulse Velocity (km/s)

Expression Result:

For direct and semi-direct transmissions the pulse velocity shall be calculated from the formula:

$$V = \frac{L}{T} 1$$

Where:

V is the pulse velocity, in km/s;

L is the path length, in mm;

T is the time taken by the pulse to transverse the length, in μs.