



**Faulty of Engineering and Technology**

**Civil Engineering Department**

**Construction Materials Laboratory**

**ENCE215**

**Experiment :**

**" Non destructive test : The Ultrasonic Test "**

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## **Introduction :**

The ultrasonic test or pulse velocity is a family of non-destructive testing techniques based on the propagation of ultrasonic waves in the object or material tested .

Ultrasonic Pulse Velocity (UPV) is based on the technique of measuring the speed of sound through materials in order to predict the material strength, having the distance crossed, and the reading of pulse time, the calculated velocity is correlated with the compressive strength of concrete .

In this test , we take a specific place with a certain distance and we pass waves through this distance .



It is assumed that when I move to a second area that the device gives me the same reading or a reading close to it, otherwise I discover that I have a ( break, voids or nesting) in the sample .

This test gives me an indication about the concrete , so the test is not a certified test .

## **Purpose :**

- To measure the time required for a pulse to cross a length of cubical, cylindrical specimens and beam in order to make an expectation on their material or structural behavior .
- This test is also used to measure the strength of the sample without break it .
- Learning the new way to get the indication about samples' strength and take an idea about the amount of cracks and voids taking place in the hardened concrete without crushing them.
- Learning how to use the ultrasonic device.

## Materials and Equipment's :

Equipment	The name of it :	Equipment	The name of it :
 <p>Figure 1</p>	<p><b>Ultrasonic pulse velocity tool</b></p>	 <p>Figure 2</p>	<p><b>Tallow</b></p>

## Procedure :

- In the beginning , We put the tallow to the end of each piece of the device, then lend it using a piece called the caliber .
- We bring in the concrete piece, then there are three ways to place the device poles :
  1. Face to face .. The best way
  2. Square angle
  3. Parallel
- Record the read of the time from the device .
- Find the plus velocity by the equation :
 
$$\{ \text{Plus velocity (KM / S)} = \text{Distance ( between the poles )} / \text{time} \}$$
- Find the strength of the sample by the curve of ( Strength VS Plus velocity ) .

## Result and Conclusion :

### Results :

**For large cube ( 15 \* 15 \* 15 ) :**

time = 42 micro second

distance ( between the poles ) = 15 cm

Plus velocity = distance (KM) / time ( second )

$$= ( 15 * 10^{-5} ) / ( 42 * 10^{-6} )$$

$$= 3.57 \text{ KM / S}$$

**( Not accepted , because the value is out of the curve )**

**For small cube ( 10 \* 10 \* 10 ) :**

time = 22 micro second

distance ( between the poles ) = 10 cm

Plus velocity = distance (KM) / time ( second )

$$= ( 10 * 10^{-5} ) / ( 22 * 10^{-6} )$$

$$= 4.545 \text{ KM / S}$$

Strength = 28.5 MPa ( Approximately )

**For small cube " Immersed in water " ( 10 \* 10 \* 10 ) :**

time = 21 micro second

distance ( between the poles ) = 10 cm

Plus velocity = distance (KM) / time ( second )

$$= ( 10 * 10^{-5} ) / ( 21 * 10^{-6} )$$

$$= 4.76 \text{ KM / S}$$

Strength = 50 MPa ( Approximately )

### **Conclusion :**

As a conclusion for this test, the results taken can't be accurate enough; because many factors affect the accuracy of the test such as : amount of tallow, right placement of the transmitter and receiver. However, the results are generally accepted because the same specimen was tested many times and the average strength was calculated .