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Concrete Compression and NDT

(Essai d’écrasement sur béton + Essais non destructifs)

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1 Concrete Compression and NDT

1.1 Introduction

This study investigates the compressive strength of concrete using a combination of methods. Non-destructive techniques, including the Schmidt hammer and ultrasonic pulse velocity tests, were performed alongside destructive compressive testing.

1.2 Objective of the Test

The objective of this experiment is to evaluate the compressive strength of concrete using both destructive and non-destructive testing methods. These tests are essential for ensuring the quality and durability of concrete structures.

1.3 Equipment used

- Schmidt Hammer (Rebound Hammer)
- Ultrasonic Pulse Generator (with transmitter, receiver, and timer)
- Compression Testing Machine
- Concrete specimens:
  - Cylindrical
  - Cubical

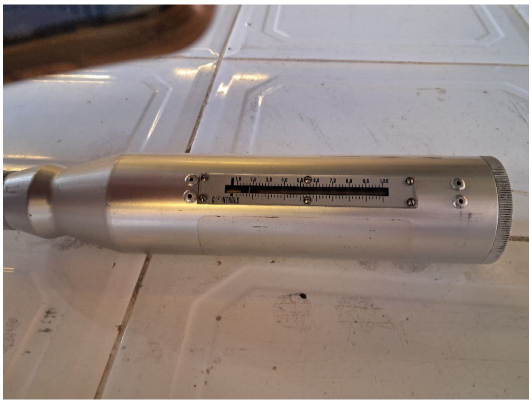

FIGURE 1.1: Schmidt Hammer

FIGURE 1.2: Concrete specimens

FIGURE 1.3: Ultrasonic Pulse Generator

FIGURE 1.4: Compression Testing Machine

1.4 Equipment used

1.5 Operating Procedure

1. Non-Destructive Testing

1.1 Schmidt Hammer Test

1. Place the Schmidt hammer vertically on the test surface.
2. Apply pressure to slide the plunger inward.
3. Before the plunger fully retracts, the hammer strikes the surface, producing a rebound.
4. Record the rebound value displayed on the scale of the device.

FIGURE 1.5: Schmidt Hammer Test procedure.

1.2 Ultrasonic Test

1. Position the transmitter and receiver on opposite sides of the concrete specimen.
2. Emit an ultrasonic pulse from the transmitter.
3. Measure the time it takes for the pulse to travel through the specimen using the timer.
4. Calculate the pulse velocity (V) for each sample using the formula:

$$V = \frac{\text{Distance}}{\text{Time}}$$

FIGURE 1.6: Ultrasonic Pulse Generator setup for testing.

2. Destructive Testing

2.1 Compression Test

1. Prepare concrete specimens (cylindrical, cubical, or core samples).
2. Place the specimen on the platform of the compression testing machine.
3. Apply a steadily increasing compressive force until the specimen fails.
4. Record the compressive strength of the specimen at the point of failure.

FIGURE 1.7: Compression Testing Machine used for destructive testing.

1.6 Expression of results

2. Destructive Tests

Results:

from the ultrasonic test :

Sample	Velocity (V) (m/s)	Time (T) (s)
Sample 1	4650	21.5
Sample 2	4670	21.4
Sample 3	4700	21.3
Cylindrical	4080	78.5
Mean	**4673.33**	**21.4**

from the Schmidt Hammer test:

Test	1	2	3
Result	35	30	25

from the compression test:

Sample	Sample 1	Sample 2	Sample 3	Cylindrical
Compressive Strength (MPa)	21.93	19.98	17.66	13.84

By comparing the crushing test results with the assumed values (From the curve):
The concrete resistance is verified.

Discussion

While the results from the destructive and non-destructive tests were consistent with the expected standards, they did not align with the assumed values obtained using the **Dreux-Gorisse method**. This discrepancy is attributed to the concrete exceeding its shelf life, which impacted its performance and strength.

1.7 Conclusion

In this experiment, both non-destructive (Schmidt hammer and ultrasonic) and destructive (compression test) methods were used to assess concrete strength. The results were consistent with expected standards but did not align with the assumed values from the **Dreux-Gorisse method**. The discrepancy is likely due to the concrete being past its optimal curing period, affecting its mechanical properties.