

Materials Testing Repair And Maintenance

Course Code: CT-224

Credit hours: 02 (Theory)

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20

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sessional

Mid
term

Final
term

Materials Testing Repair And Maintenance

- Objective:

1. To know about the failure of building structures and their measures

2. To understand the rules and regulations of maintenance.

- Basically the subject is divided into two major parts First part is different type of testing (destructive and non-destructive) and 2nd part consist of remedial measure of different defects present in the structure and there possible solution (repair).

Materials Testing Repair And Maintenance

- Material Testing: Destructive and Non-destructive test, Mechanical properties, Method of testing of Fatigue test, impact and hardness test, tensile test and mild steel specimen.
- Repair and Maintenance of Civil Works: Introduction to different types of failures in building structures and their causes, Assessment of damage by different methods including non-destructive methods, Introduction to Rules and Regulations of Maintenance, Repair and Maintenance Measures.

Non-destructive test

- Non- destructive test.

The use of noninvasive techniques to determine the integrity of a material, component or structure

or

quantitatively measure some characteristic of an object.

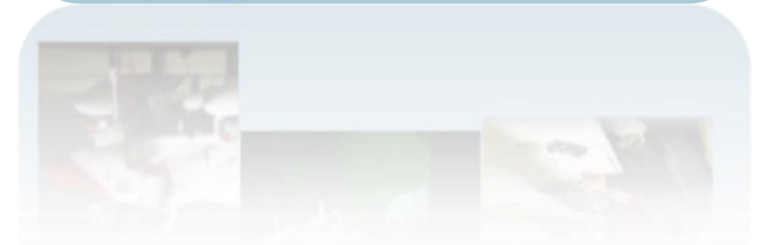
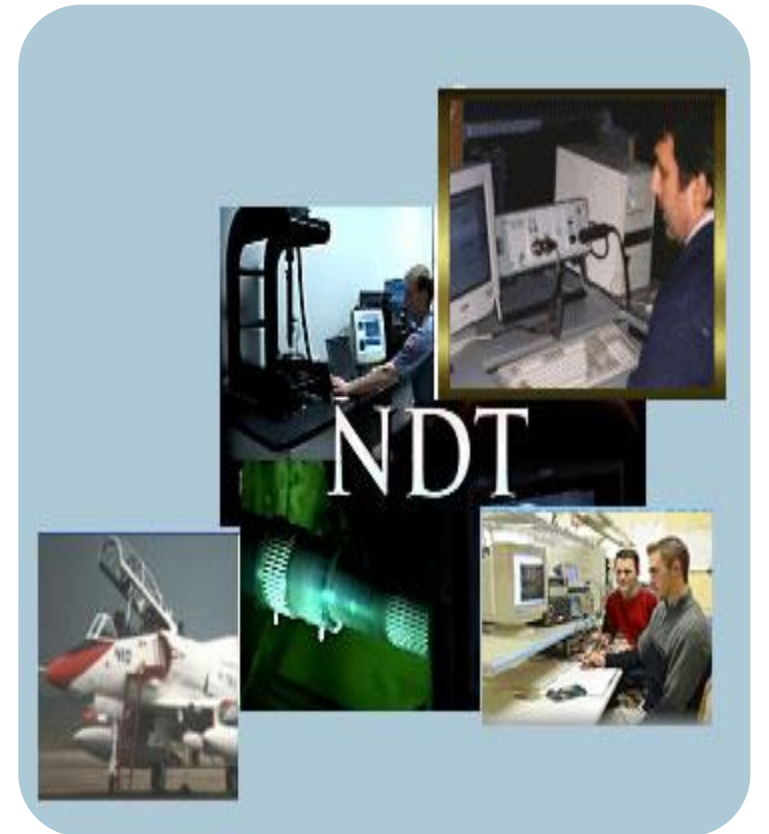
i.e. Inspect or measure without doing harm.

Introduction:

- For inspecting the defects on surface.
- Wide group of analysis techniques used in science & industry.
- Saves both the time & money.
- Use of this N.D.T in specialist high risk areas such as nuclear & sea shore structures , gas & oil pipelines.

Why we are using N.D.T?

- It's an assessment without doing harm, destroying the test.
- Plays crucial role in ensuring cost effective operation, safety and reliability of plant.
- Cost saving technique in quality assurance process.



N.D.T METHODS

- Ultrasonic Testing (UT)
- Ultrasonic pulse velocity method
- Rebound hammer test
- Radiographic Testing (RT)
- Liquid penetrate Testing
- Magnetic particle Testing
- Electromagnetic Testing (ET)

N.D.T TESTS

- Ultrasonic Pulse Velocity test.
- Rebound Hammer test.



ULTRA SONIC PULSE VELOCITY TEST

Ultrasonic Pulse Velocity Test

- It measures the time of travel of an ultrasonic pulse passing through the concrete.
- The apparatus for ultrasonic pulse velocity measurement consists of the following:
 - (a) Electrical pulse generator
 - (b) Transducer – one pair
 - (c) Amplifier
 - (d) Electronic timing device



Ultrasonic Pulse Velocity Meter

How it works?

- In ultrasonic testing, an ultrasound transducer connected to a diagnostic machine is passed over the object being inspected.
- There are two methods of receiving the ultrasound waveform, reflection and attenuation.



Reflection mode:

- The transducer performs both the sending and the receiving of the pulsed waves as the "sound" is reflected back to the device.

Attenuation mode:

- In attenuation mode, a transmitter sends ultrasound through one surface, and a separate receiver detects the amount that has reached it on another surface after traveling through the medium.

Applications & Limitations

- The pulse velocity method is an ideal tool for establishing whether concrete is uniform.
- Applied to both existing structures and those under construction.
- High pulse velocity readings are generally indicative of good quality concrete.

INTERPRETATION

- To determine the quality & homogeneity of the concrete structures.
- To determine the existence of the flaws ,cracks & voids in concrete structures.
- ✓ Table: Velocity Criterion for concrete Quality Grading

S.No	Pulse velocity in cross probing (km/sec)	Concrete Quality Grading
1.	Above 4.5	Excellent
2.	3.5 to 4.5	Good
3.	3.0 to 3.5	Medium
4.	Below 3.0	Doubtful

Advantages:

- High penetrating power.
- High sensitivity.
- Greater accuracy
- Some capability in estimating the size , shape , nature of the flaws.
- portability

Disadvantages:

- Manual operation requires careful attention by experienced technicians
- Difficulty in inspecting the parts which are irregular.
- Test objects should be water resistant.

REBOUND HAMMER TEST

- This is a simple, handy tool, which can be used to provide a convenient and rapid indication of the compressive strength of concrete.



REBOUND HAMMER TEST

- The schematic diagram showing various parts of a rebound hammer were

1. Concrete surface

2. Impact spring

3. Rider on guide rod

4. Window and scale

5. Hammer guide

6. Release catch

7. Compressive spring

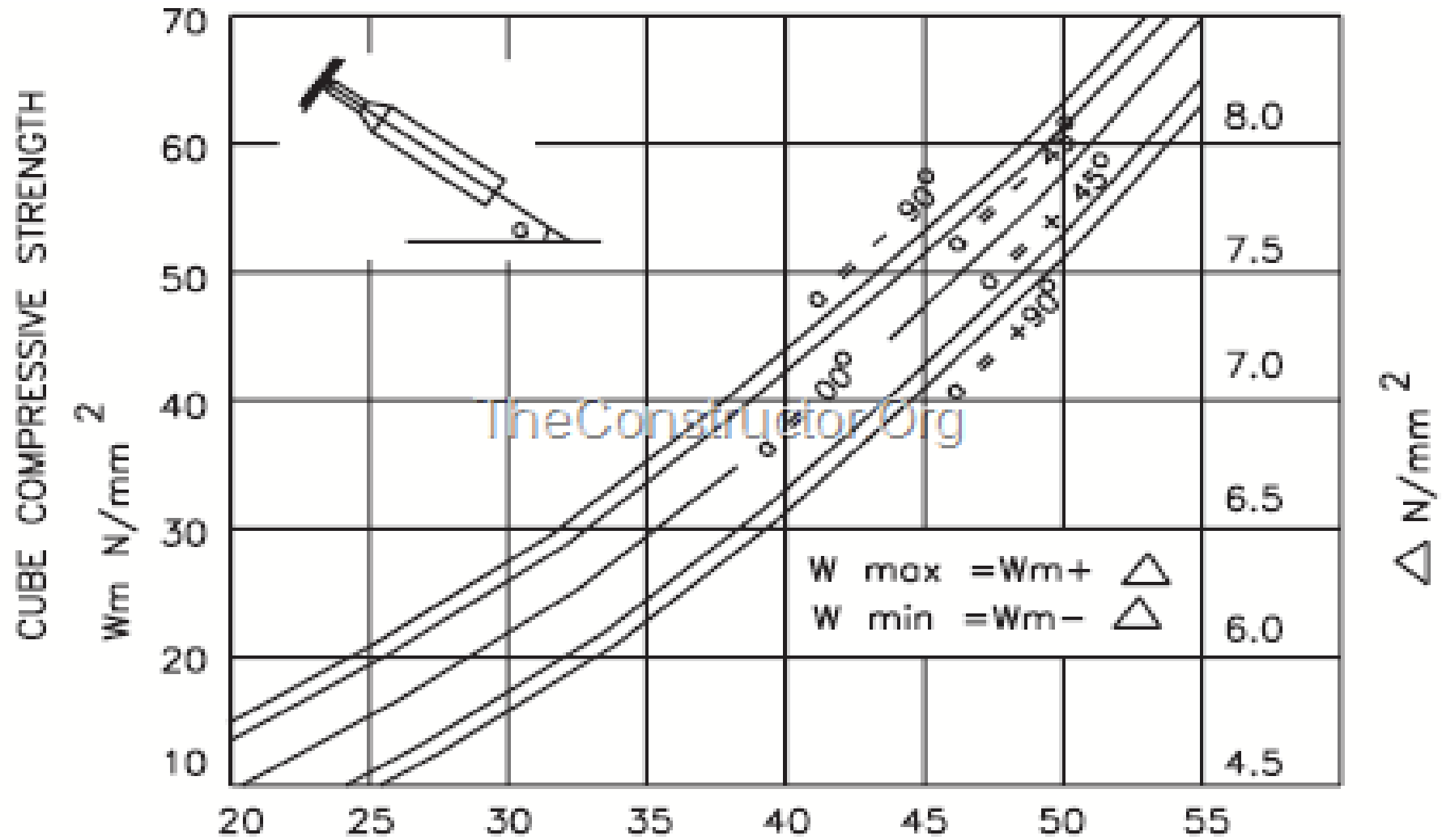
8. Locking button

9. Housing

10. Hammer mass

Principle

- The elastic mass depends on the hardness of the surface.
- It is related to the compressive strength of the concrete.
- The rebound value is designated as the rebound number or rebound index.
- The results are significantly affected by :
 - Mix characteristics.
 - Angle of inclination of direction of hammer.
 - Member characteristics.



cube compressive strength is N/sq.mm plotted against rebound number

Procedure

- Should be tested against the test anvil.
- Apply light pressure on the plunger and allow it to extend to the ready position for the test.
- Apply a gradual increase in pressure until the hammer impacts.
- Take the average of about 15 readings.

REBOUND HAMMER TEST

Advantages:

- Assessing the likely compressive strength of concrete .
- Assessing the quality of concrete in relation to standard requirements.



Interpretation of Results:

The rebound reading on the indicator scale has been calibrated by the manufacturer of the rebound hammer for horizontal impact.

Average Rebound Number	Quality of Concrete
>40	Very good hard layer
30 to 40	Good layer
20 to 30	Fair
< 20	Poor concrete
0	Delaminated

conclusion

for better maintenance of existing concrete structures, there are still more tests have to be done.