Tensile and shear strength

Ability to resist elongation is called tensile strength of concrete. In order to test the tensile strength of concrete Split cylinder method is performed.

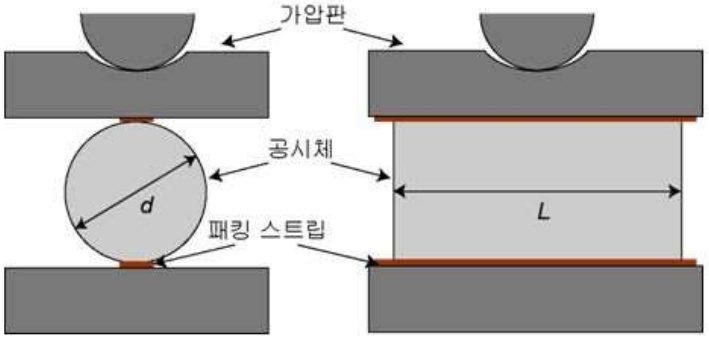
As we know that, concrete is weak in tension.

Tensile strength of concrete = 1/10 times of compressive strength

Tensile and shear strength

Tensile strength of concrete

Splitting tensile strength test

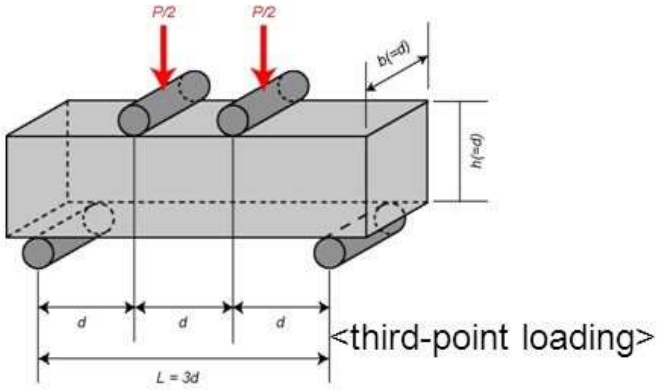


✓ Calculation of splitting tensile strength

$$f_{sp} = \frac{2P}{\pi d L}$$

where, P : maximum load
d : diameter of specimen
L : length of specimen

Flexural tensile strength test



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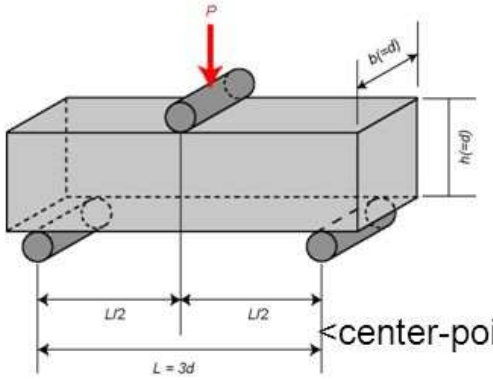

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Splitting Tensile Test

Procedure of Splitting Tensile Test

- Initially, take the wet specimen from water after 7, 28 of curing; or any desired age at which tensile strength to be estimated.
- Then, wipe out water from the surface of specimen
- After that, draw diametrical lines on the two ends of the specimen to ensure that they are on the same axial place.
- Next, record the weight and dimension of the specimen.
- Set the compression testing machine for the required range.
- Place plywood strip on the lower plate and place the specimen.
- Align the specimen so that the lines marked on the ends are vertical and centered over the bottom plate.
- Place the other plywood strip above the specimen.
- Bring down the upper plate so that it just touch the plywood strip.
- Apply the load continuously without shock at a rate within the range 0.7 to 1.4 MPa/min (1.2 to 2.4 MPa/min based on IS 5816 1999)
- Finally, note down the breaking load(P)

Flexural test

Flexural test evaluates the tensile strength of concrete indirectly. It tests the ability of unreinforced concrete beam or slab to withstand failure in bending.

Procedure of Flexural Test on Concrete

- The test should be conducted on the specimen immediately after taken out of the curing condition so as to prevent surface drying which decline flexural strength.
- Place the specimen on the loading points. The hand finished surface of the specimen should not be in contact with loading points. This will ensure an acceptable contact between the specimen and loading points.
- Center the loading system in relation to the applied force.
- Bring the block applying force in contact with the specimen surface at the loading points.
- Applying loads between 2 to 6 percent of the computed ultimate load.
- Employing 0.10 mm and 0.38 mm leaf-type feeler gages, specify whether any space between the specimen and the load-applying or support blocks is greater or less than each of the gages over a length of 25 mm or more.

Flexural test

- Eliminate any gap greater than 0.10mm using leather shims (6.4mm thick and 25 to 50mm long) and it should extend the full width of the specimen.
- Capping or grinding should be considered to remove gaps in excess of 0.38mm.
- Load the specimen continuously without shock till the point of failure at a constant rate (Indian standard specified loading rate of 400 Kg/min for 150mm specimen and 180kg/min for 100mm specimen, stress increase rate 0.06+/-0.04N/mm^2.s according to British standard).
- The loading rate as per ASTM standard can be computed based on the following equation

r: loading rate

S: rate of increase of extreme fiber

b: average specimen width

d: average specimen depth

L: span length

$$r = \frac{Sbd^2}{L} \quad \rightarrow \text{Equation-2}$$