4.6 MODULUS OF ELASTICITY

Modulus of elasticity of concrete can be defined as the slope of the line drawn from a stress of zero to a compressive stress of $0.45f'_c$. As concrete is a heterogeneous material, the strength of concrete is dependent on the relative proportion and modulus of elasticity of the aggregate. One can easily obtain an approximate value of modulus of elasticity of concrete using 28 days concrete strength (f'_c) with its formulas. These formulas are based on the relationship between modulus of elasticity and concrete compressive strength.

Testing procedure

- Assemble the top and bottom frame by adjusting the screws.
- Keep the pivot rod on the screws and lock them in position.
- Keep the compressometer centrally on the specimen so that the tightening screw of the bottom and top frame are at equal distance from the two ends.
- Place the specimen with compressometer in the compression testing machine and center it.
- Apply load continuously without shock at a rate of 140 kg /cm²/minute
- Maintain the load at this stress for at least one minute and reduce gradually to an average stress of 1.5 kg/ cm²(a load of 0.3 Ton)
- Note the compressometer reading at this load.
- Reduce the load gradually and take readings at an interval of 1Ton
- Plot the graph using stress (y-axis) and strain (x-axis)
- Then the Young's modulus (Initial / Secant / Tangent) may be calculated by corresponding stress to strain.

Graph

A graph is plotted between load and deflection, for loading and unloading conditions. The tangents at the initial portion of the loading curve and at the load corresponding to the working stress of the mix, is drawn. The initial point and the point on the loading curve corresponding to working stress are joined.

Calculation

Modulus of Elasticity = Stress/Strain (Load and deflection from the line joining initial point and the point at working stresses is considered)