

Compression Test

1. OBJECTIVE

To conduct compression test on a specimen using a universal testing machine (UTM) to determine ultimate compressive strength of the material.

2. THEORY

When a material is subjected to compressive loading, the relationship between stress and strain is similar to that obtained for a tensile loading. Upto a certain value of stress, the material behaves elastically, i.e. stress is in proportion to strain. Beyond this value, plastic flow starts, i.e. more strain starts than happening in elastic limit for any increment value of loading. It is seen that a compression test is more difficult to be conducted than standard tensile test due to (i) specimen must have larger cross-sectional area to resist any buckling due to bending, (ii) the specimen undergoing strain hardening as deformation proceeds, and (iii) cross-section of the specimen increases with deformation, thereby requiring substantial increase in the required load. The lateral instability due to buckling action can be avoided by keeping the ratio of height (h) to diameter (d) of the specimen less than 2. The compressive strength essentially depends upon ' h ' to ' d ' ratio. Hence, higher is ' h ' to ' d ' ratio, lower is the compressive strength.

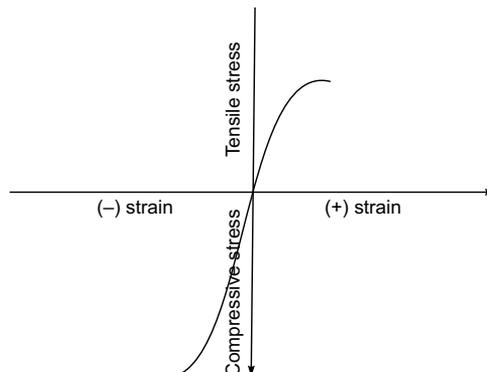


Fig. 1 Compressive strength.

5. STANDARD DATA SHEET

- (a) Material of the specimen =
- (b) Size of cubical or cylindrical specimen =
- (c) Ultimate load =
- (d) Ultimate compressive strength = $\frac{\text{Ultimate load}}{\text{Cross-sectional area}}$

6. RESULT AND DISCUSSION

Compression tests are performed on brittle materials as these materials fail in shear. It is seen that the shear develops along a diagonal plane which is maximum on a plane inclined at 45° from the direction of compression load.

In compression loading, the fracture of the specimen takes place due to bulging action. The property of a material to bulge under compressive loading is called malleability. It is the ductility that is associated with tensile loading while it is malleability that is associated with compressive loading.

The modulus of elasticity in tensile loading and compressive loading should be equal except for bi-modulus materials such as wood.

7. PRECAUTIONS

- (a) The specimen must be kept at the centre of cross-head so that a uniform compressive loading can be assured on the specimen.
- (b) The loading is to be increased gradually.
- (c) The size of the specimen is to be measured accurately.