



الأكاديمية العربية للعلوم والتكنولوجيا والنقل البحري
Arab Academy for Science, Technology & Maritime Transport

CB251 Testing of materials

Compression Test

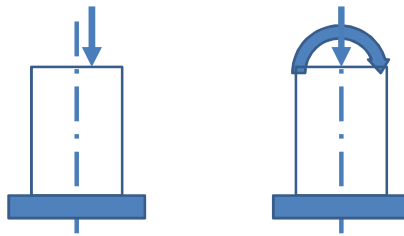
Dr. Karim Helmy

Compression Test

- Tension test is normally conducted to obtain the mechanical properties of Metals. It is the primary test used for quality control and the basis for acceptance and refusal of metallic products used in construction and other uses.
- Compression test is used to obtain the mechanical properties and is the basis acceptance and refusal of brittle non metallic and other materials that have very low strength in tension like concrete, wood, masonry, etc.

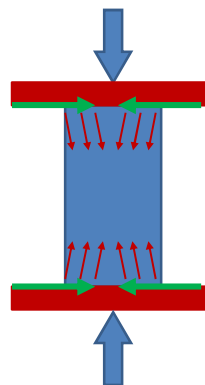
Compression Test

- Compression test could be used to obtain the mechanical properties of metals however it is not preferred due to the following;
 - It is difficult to apply a truly axial load in compression which leading to non uniform stresses



Compression Test

- Friction between the machine head and the sample effects the results causing stresses to have a small inclination



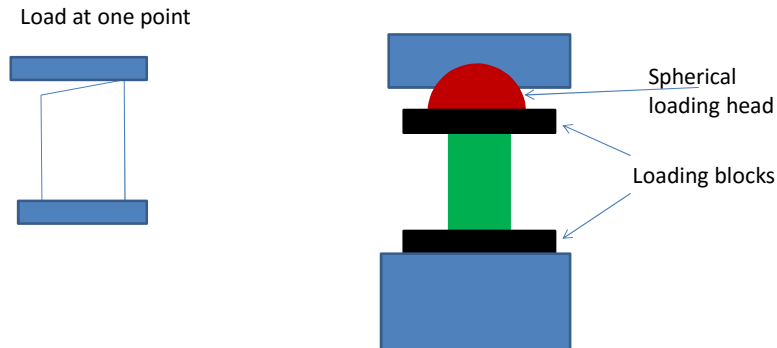
Compression Test

- Eccentricity may cause instability
- Long samples are prone to buckling therefore the length of the specimen must be limited
- Using small samples results in inaccuracies in results and using large samples requires testing machines with large capacities

Compression Test Setup

- Bearing blocks are used to ensure the load is applied to the specimen
- Spherical loading heads are used to avoid applying the load at a single point if the loading surfaces are at a small angle

Compression Test Setup



Compression Test Specimens (Metals)

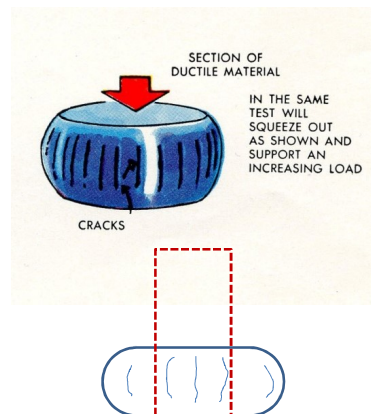
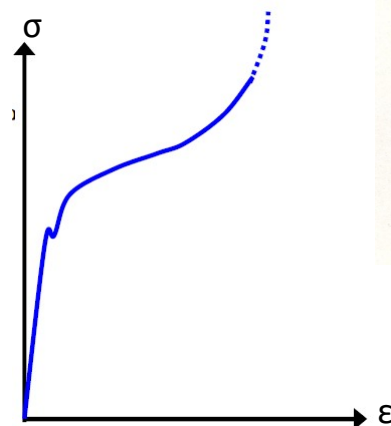
- Cylindrical specimens are preferred to ensure uniform distribution of stresses, three types of specimens are used
- $L \leq 10 d$ to avoid buckling
- Long specimens $L=8-10 d$ to install deformation measurement devices for obtaining the stress strain curves and other mechanical properties like the Modulus of Elasticity, Resilience, Toughness, etc.

Compression Test Specimens (Metals)

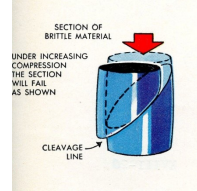
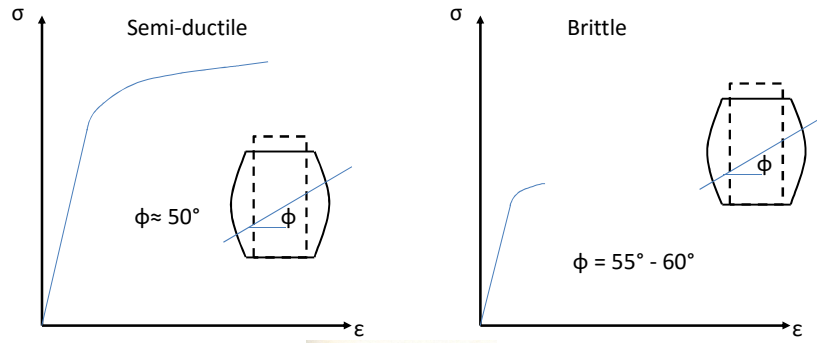
- Medium specimens $L = 3d$ to obtain compression strength of metals
- Short specimens $L = 0.9d$ to test metals used as bearings since the friction induced in testing will resemble bearing conditions

Behavior of Metals in Compression

- Ductile metals

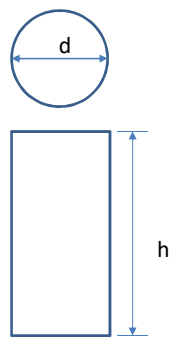


Behavior of Metals in Compression



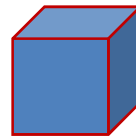
Compression Test Specimens (Concrete)

Cylinder (American Standards)



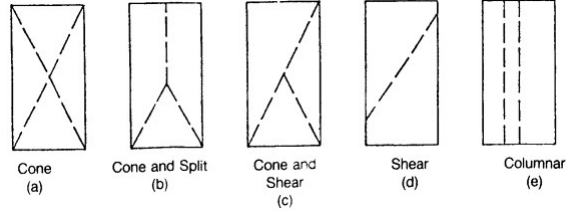
Large $d=150$ mm (6 inch)
 $h=300$ mm (12 inch)
 Small $d=100$ mm (4 inch)
 $h=200$ mm (8 inch)

Cube (Egyptian Standards)



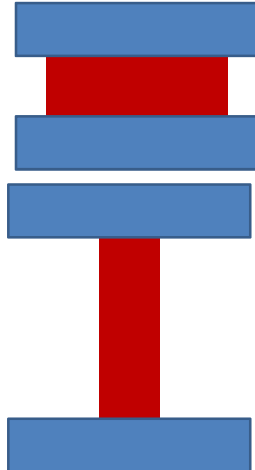
Large (150 x 150 x 150 mm)
 Small (100 x 100 x 100 mm)

Concrete Failure Shapes

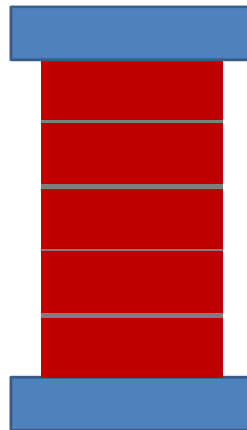


Masonry

1 Block
To obtain brick properties



5 Block
To obtain brick-mortar assembly properties



Column

