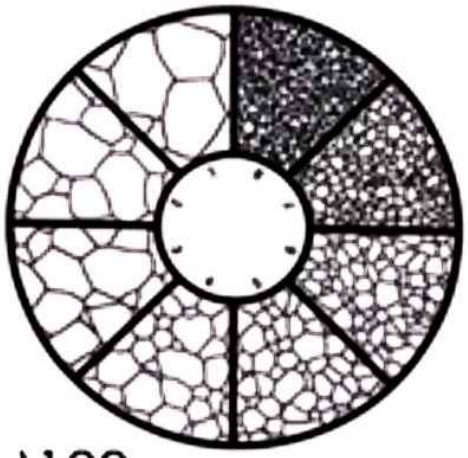
Grain size analysis

- Grain size is determined by shaking a known amount of clean, dry sand downward through a set of 11 standard sieves of decreasing mesh size.

- After shaking for 15 minutes, the amount remaining on each sieve is weighed, and the weights are converted into an AFS (American Foundrymen's Society) Grain Fineness Number (GFN).

Sand Grain Shape:

- Rounded Sand Grains
- Angular Grains
- Sub-angular Grains
- Compound Grains



% Retained in a Sieve = $(W_{sieve}/W_{total})100$

Every sieve is having a multiplying factor and % retained on each sieve is multipled with multiplying factors (of individual sieves) and finally added.

GFN = Summation of product/Total % retained grains

Moisture Content

- Moisture content affects the other properties of the mixture such as strength and permeability. Too much moisture can cause steam bubbles to be entrapped in the metal casting.

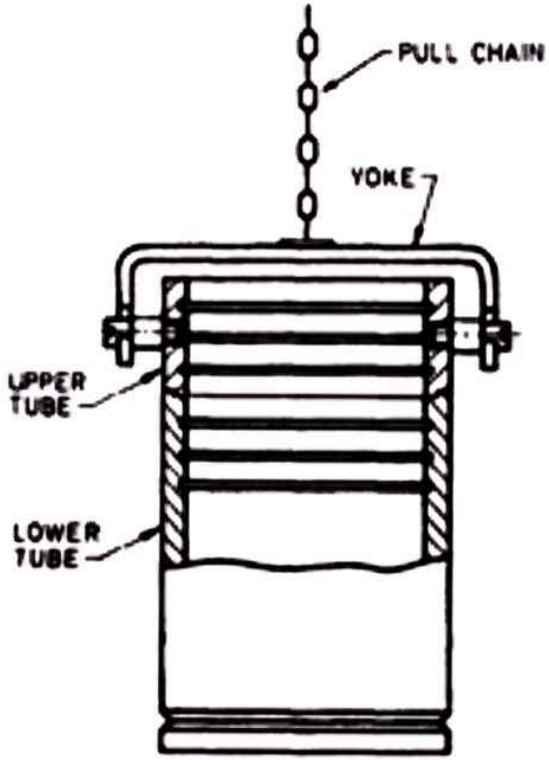
- Moisture content is usually determined by a device called moisture teller that measures the pressure of acetylene gas released because of reaction between Calcium carbide and moisture and accordingly finds the moisture content.

- Another method is to measure the weight lost from a 50 g sample after it has been subjected to a temperature of about 110°C for sufficient time to drive off all the water and finally finding the moisture content.

Strength Test

The strength of a molding sand mixture is the maximum stress which the sand mixture is capable of sustaining when prepared, rammed and tested according to standard procedures.

- **Classification on the basis of sand:**
  - Green strength
  - Dry strength
- **Classification on the basis of load:**
  - Tensile strength
  - Compressive strength
  - Shear strength



Setup for green and tensile strength test

Permeability Test

$$AFS\ Permeability\ Number = \frac{V\,H}{P\,A\,T}$$

V = Volume of Air

H = Height of Specimen

P = Air Pressure (g/cm^2)

A = Cross Section Area of Sand Specimen

T = Time in minutes

Hardness Test

- Hardness of the compacted sand can provide a quick indication of mold strength and give additional insight into the strength-permeability characteristics.
- This test is performed by a mold hardness tester.
- The working of the tester is based on the principle of Brinell hardness testing machine.
- In an A.F.S. standard hardness tester a half inch diameter steel hemispherical ball is loaded with a spring load of 980 gm. This ball is made to penetrate into the mold sand or core sand surface.
- The penetration of the ball into the mold surface is indicated on a dial.

Compactability / Flowability Test

- The compactability test is widely accepted as both simple to perform and directly related to the behavior of sand in molding, particularly when involving squeeze compaction.

- A fixed volume of loose sand is compacted under standard conditions and the percentage reduction in volume represents the compactability.
  - Percent compactability is the change in height divided by the original height times 100%.
  - A low compactability correlates with too little moisture.