3.1 GEOMECHANICAL PROPERTIES OF ROCKS

The engineering properties of rocks to be tested in laboratory, to find their suitability tobe used as building stones, road metal or concrete aggregate are listed by below:

1. Uniaxial compressive strength
2. Tensile strength
3. Hardness
4. Water absorption capacity
5. Porosity
6. Abrasion coefficient
7. Toughness index
8. Specific gravity
9. Weathering resistance index, etc.

1. Compressive strength:

Uniaxial compressive strength is defined as the maximum load per unit area, which a stone can withstand without failure. It is expressed as C_0.

C_0 = load at failure / load bearing surface area = P/A

Where,

P = load at failure

A = area of cross section of sample.

Eg

Rock name : compressive strength

Granite : 1000-2500 kg / cm^2

Sand stone : 200-2000 kg / cm^2

Gneiss : 500-2500 kg / cm^2

2. Tensile strength:

The resistance offered by a rock specimen to tension is called its tensile strength. Tensile strength is indirectly determined by Brazilian test.

Tensile strength = 2 x load at failure / π x diameter of the specimen x length of the specimen

(or)

$T_s = 2P/\pi DL$

Eg:

Rock name : Tensile strength

Granite : 7-25 MPa

Sand stone : 4-25 MPa

Marble : 15 MPa

Quartzite : 10-30 MPa

3. Hardness:

Hardness is defined as the resistance offered by a stone specimen to any external force that tries to scratch it.

MOH'S SCALE OF HARDNESS	
Mineral Name	**Hardness No.**
TALC	1
GYPSUM	2
CALCITE	3
FLOURITE	4
APATITE	5
FELDSPAR (ORTHOCLASE)	6
QUARTZ	7
TOPAZ	8
CORUNDUM	9
DIAMOND	10

In this scale, higher hardness minerals will scratch lower hardness minerals, but the lower hardness minerals will not scratch higher hardness one.

4. Water absorption capacity:

Water absorption capacity of a rock specimen refers the ability of that rock to absorb water at a given time and temperature.

Eg

Rock sample	**:**	**water absorption capacity**
Sand stone & limestone	:	10%
I class Brick	:	20% (max)

5. Porosity:

Porosity of soil or rock is defined as the ratio of volume of pore spaces to the total volume of the rock or soil.

It is given by, $\alpha = (v/V) \times 100$

Where, α = porosity of specimen

v = volume of pore spaces present in specimen

V = total volume of specimen

Eg

Building stones	**:**	**porosity**
Granite	:	0.1-0.5%
Sand stone	:	5-25%
Marble	:	0.5-2%

6. Abrasion coefficient:

Abrasion coefficient is defined as the resistance offered by a stone against rubbing action. The sand loaded winds blown will produce rubbing action upon the stones used in pacing along roads, buildings, tunnels, dams, etc. hence, abrasion coefficient is a significant property to be studied and tested by an equipment called Dorry's abrasion testing machine.

The safe value of abrasion coefficient = 2%

7. Toughness index:

Toughness index refers the resistance offered to No. of blows of load from a constant height, applied to the stone specimen, without undergoing failure.

8. Specific gravity:

Specific gravity of a material is defined as the ratio of weight of the sample in air to that of an equal volume of water.

Specific gravity = (weight of stone sample in air/ weight of equal volume of water) x density of the water

Where, density of water = 1

Specific gravity of any material can be obtained, using pycnometer.

9. Weathering resistance index:

It is the resistance offered by the stone sample to weathering impact. It is indirectly known by doing acid test.