SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)
COIMBATORE-35

II YEAR / III SEMESTER

19CET201-ENGINEERING GEOLOGY

Classification of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Engineering properties of rocks. Description, occurrence, engineering properties, distribution and uses of Granite, Dolerite, Sandstone, Limestone, Shale, Quartzite

ENGINEERING PROPERTIES OF ROCKS

Common engineering properties typically obtained from laboratory tests include,

- Compressive strength
- Transverse strength
- Porosity
- Density
- Abrasive resistance
- Frost and fire resistance
- Specific gravity
- Permeability
- Tensile strength
- Shear strength
- Absorption Value
- Durability

ENGINEERING PROPERTIES OF ROCKS

Rock mass properties are determined by visual examination and description of discontinuities within the rock mass. Rock features that influence the strength of rocks construction material are as follows

COMPRESSIVE STRENGTH

➢ It is also called crushing strength.

➢ It is defined as the maximum force expressed per unit area, which a stone can withstand without rupturing. Any force applied beyond the compressive strength will cause a failure or rupture of the stone.

➢ Compressive strength = P/A

P=Load at failure,

A=Area of cross-section of the stone

➢ Compressive load at failure is determined using UTM (Universal Testing Machine

TRANSVERSE STRENGTH

➢ It is defined as the capacity of stone to withstand bending loads.

➢ When a stone is intended for use as a beam or as a lintel, its transverse strength is determined as Modulus of Rupture, R

➢ R= 3wl/2bd2

Where, W=load at which sample breaks

l= length,

b=width,

d=thickness of test specimen.

➢ Transverse strength is generally 1/10th to 1/20th of their compressive strength

ENGINEERING PROPERTIES OF ROCKS

POROSITY

➢ Porosity is an important engineering property of rocks. It accounts for the fluid absorption value of the stones in most cases and that a higher porosity signifies a lesser density which generally means a lesser compressive strength.

➢ The size, shape, and degree of packing of the component grains in a rock gives rise to its porosity.

➢ It is the ratio between total volume of pore spaces and total volume of the rock sample expressed as percentage.

➢ If the grains are angular in shape, then porosity will be low and if the grains are spherical or rounded in shape then the porosity will be high.

➢ Porosity values for a few common building stones are Granite-0.1 to 0.5%, Basalt- 0.1 to 1%, Sandstone- 5 to 25%, Limestone- 5 to 20%, Marble- 0.5 to 2%, Quartzite- 0.1 to 0.5%.

ABSORPTION VALUE

➢ It is defined as the capacity of a stone to absorb moisture when immersed in water for 72 hrs.

Absorption value =(S-W)/W X 100

Where, S=Saturated weight of specimen

W=Dry weight of specimen

DENSITY

It is defined as the weight per unit volume of a substance.

Types are,

1. Dry density:

Dry weight of stone per unit volume

2. Bulk density:

Density of rock mass with natural moisture content. Here all pore spaces are not filled with water

3. Saturated density:

Density of rock fully saturated with water. Here pore spaces are completely filled with water

ABRASIVE RESISTANCE

➢ It is defined as the resistance of stone against rubbing action.

➢ This property has vital importance in situations where the stone is to be used is subjected to rubbing action.

➢ Mineralogical composition of a stone plays a great role in resistance to abrasion.

➢ This resistance is tested using Dorry's abrasion testing machine.

Standard sand is used as abrasive charge. The stone and abrasive charge is immersed in the machine, and it is subjected to about 1000 revolutions by the machine.

➢ The abrasive charge wears the stone and thereby loss the weight of stone.

Hence,

Coefficient of Wear = 40/% Loss in weight

Safe value of coefficient of wear is 20, when the loss in weight of stone after 1000 revolutions is 2%.

ENGINEERING PROPERTIES OF ROCKS

FROST AND FIRE RESISTANCE

- ➢ Porous rocks show poor frost resistance.
- ➢ Granites and other coarse grained igneous rocks are poor in fire resistance.
- ➢ Poor fire resistance is due to their multi- mineral composition.
- ➢ Different minerals expand at different rates on heating.

SHEAR STRENGTH:

➢ Shear strength is the resistance offered by a stone to shear stresses, which tends to move one part of a specimen with respect to the other. It is obtained by using the relationship.

➢ Shear strength of a stone is also not commonly determined except when the stone is to be used as a column

$S = P/(2A)$

Where, S = shear strength

P = load at failure

A = area of cross section of the specimen

ENSILE STRENGTH:

➢ Tensile strength of a rock is related to its ability to withstand breakage. It

happens after some level. That level is its strength.

➢ It may be determined directly or indirectly. The tensile strength that must

be applied to a material to break it.

➢ It is measured as a force per unit area

ENGINEERING PROPERTIES OF ROCKS

PERMEABILITY:

➢ It is the capacity of a rock to transmit water. Sand stones and limestones may show high values for absorption or 10% or even more.

➢ Selection of such highly porous verities of these stones for use in building construction, especially in most situations, would be greatly objectionable.

➢ Presence of water within the pores not only decreases the strength of the rock but also makes the stones very vulnerable to frost action, in cold and humid climatic conditions.

THANK YOU…