Hello learners!!

Welcome to this lecture

series in T.Y.B.Sc Geology program semester 5. The paper code is GED-101. The paper title is Engineering Geology. The title of the unit is Engineering Geology Unit 1. Module name is

engineering properties of rocks

rocks as materials for construction-4. I am Vinita Mayenkar Assistant Professor in Geology from Dhempe College of Arts and Science, Miramar-Goa.

For the present session i'll be talking about rocks as material

for construction wherein i'll be dealing with test for rocks

used as aggregates in which

there is hardness test and toughness test.

After completing this module, students, you will be able to understand, what is a rock aggregate? understand

the properties to be investigated before using any rock aggregate for construction purpose.

now let us understand what

exactly we mean by a rock aggregate. Rock aggregate is nothing but small fragments of crushed rocks which are used

for concrete making or as a road

material and railway blast can be termed as a rock aggregate. properties which we need to take into consideration before

using any rock as a rock aggregate,

they should be unreactive with the cement used, rock aggregate should possess the

necessary hardness so that they are durable, they should be

tough enough and should have high crushing strength similarly they should have satisfactory hydrophobic properties.

let us talk about the hardness test now.

aggregates are used as road material and they undergo shaking movements because of the dynamic load of vehicular traffic which causes mutual attrition of the aggregate grains, therefore if the rock pieces are not resistant

to attrition they will cause rapid wear and tear of the road metal.

rubbing action of wheels of vehicle over the aggregate causes abrasion of the rock material and the aggregate should withstand such an abrasive effect therefore resistance to attrition and abrasion is tested in hardness test. attrition means mutual rubbing of the aggregates against each other whereas abrasion is rubbing action of the wheels over the aggregates and both these causes wear and tear of this aggregate. So, attrition and abrasion test is a must before using any aggregate as a road metal. Hardness tests are carried out using Devil's attrition testing machine.

let us talk about the attrition test and how it is done using Devil's attention testing machine.

Firstly, the rocks are broken into pieces of 60 millimeter size, oven dried at 100 degree celsius to 110 degree celsius and 5 kg of the sample is put in both the cylinders of the Devil's attrition testing machine and closed and this cylinders are inclined in position and allowed to rotate at the speed of 30 rotations per minute for 5 hours after which the rock fragments are taken out and seived using a 5 micro millimeter mesh. The material retained on the sieve is weighed. The loss in weight gives the measure of resistance to attrition. The percentage of wear is given by the following formula: loss of weight

upon the initial weight of the specimen or the sample \* 100.

If the percentage of wear is less than 3% then that aggregate is considered as good and can be readily used for construction purpose but if the wear is 3% is considered to be a tolerable limit and can be used but if the wear is more than three percent that means the rock aggregate is not resistant enough to the rubbing action. That is it is not satisfactory

and such aggregates cannot be used in for construction.

Now let us move on to the next test which is abrasion test. abrasion test is done using Dorry's abrasion testing machine.

Now this test is the same of what is done for building stone. The presence of sand acts as an abrasive abrading material and causes wear same as traffic wheels would do on the surface of the aggregates. Coefficient of wear is then calculated by using the following formula

coefficient of wear is equal to 20 minus loss of weight in grams divided by 3.

coefficient of hardness should be more than 17 to be used as an aggregate if it is between 14 to 17 it is said to have medium hardness while if the harness is less than 14

the rock is said to have very poor

hardness and should not be used for road work otherwise that particular construction would be a failure after some time. After understanding how we are supposed to do hardness test let us move on to the next test which is our toughness test.

The aggregates which are used as road metal are subjected to transient load of frequent nature which causes crumpling of the aggregates into smaller pieces therefore it is necessary to test the road metal for that resistant to fracturing under the influence of impacts and it is done by using two tests. first test is impact test for a single stone and the second is impact test for aggregates.

Let's see the impact test for single

stone. A cylindrical test specimen of 2.5 centimeter diameter and 2.5 centimeter height is taken and it is placed on cast iron anveel of a testing machine which consists of a 2 kg steel hammer which falls freely between the two vertical guides. A steel plunger is kept resting all the time on the specimen on which the hammer is blown the height of the fall of hammer is increased from one centimeter till the rock breaks. impact value is taken as height in

centimeters at which the specimen breaks. If the toughness index is less than 13 centimeter the rock is not tough. If the value falls between 13 to 19 centimeter the rock is moderately tough and if it exceeds 19 the rock is said to be high in toughness. From this what we can understand is the height at which from which the hammer falls is important and that is noted to understand the toughness of the rock if the height from which the hammer falls on the rock is less than 13 it indicates that the

rock is not tough whereas if it is between 13 to 19 that means that the rock is moderately tough and if it exceeds 19 it means that a rock

is highly tough and can be easily used for construction purpose.

That was toughness test for a single stone.

now let us see how we can do toughness test for aggregates so let's talk about impact test for aggregates.

5 kg of aggregate sample of 1 to 2 centimeter size is taken and subjected to 15 blows from a 15 kg hammer falling from a height of 40 centimeters once the blows are given the sample is sieved using bss 7 seive and the samples passing through the sieve are weighed and the weight is expressed in terms of percentage of the original weight more the fines, less is the resistance of aggregates to pounding.

For the present module I have referred to these books.

That's it in this module

See you all for the next session Thank you.