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NATIONAL PROGRAMME ON
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Geotechnical Engineering Laboratory

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Lecture No - 03
Field Density

Welcome, I am Prof. Jnanendra Nath Mandal Department of Civil Engineering, Indian Institute of Technology Bombay. Today I will discuss the field density test using the wood cutter method, how you can determine the field density and this field density is very important this is maximum realistic test and I will talk about more detail about the procedure and how you will perform the test in the field.

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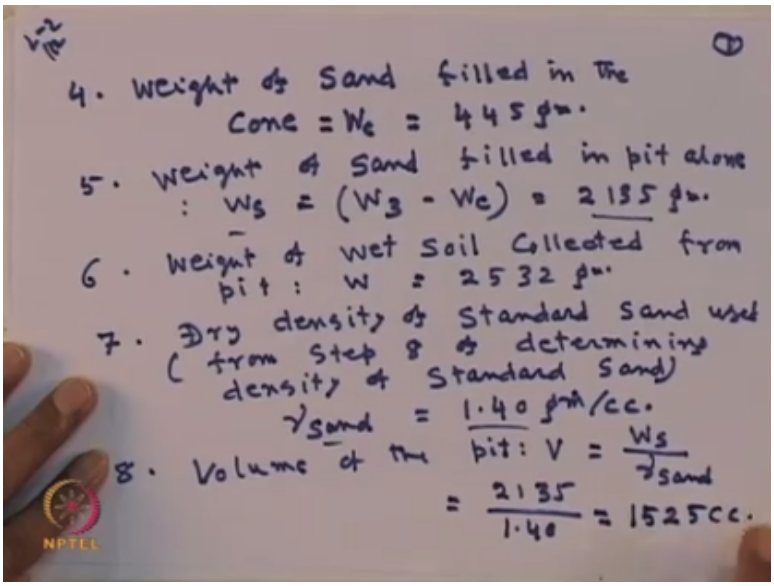

So four number that what is the weight of sand filled in the cone, so this is weight of the sand filled in the cone is derivative the W_c=445 gram. Then weight of sand filled in pit alone that is W_s will be equal to W_3-W_c so this will be 2135 gram. Then weight of wet soil collect it from pit

that is W=2532 gram. Then dry density of standard sand used this is from step 8 of determining density of standard sand, that is γ_{sand}=1.40 gm/cc.

Now you know that what should be the volume of the pit that is $V=W_s/\gamma_{sand}$ there is W_s=2135 this is W_s=2135 this divided by γ_{sand} and γ_{sand} is 1.40, so 1.40 so this will give the volume of the pit okay, about 1525cc.

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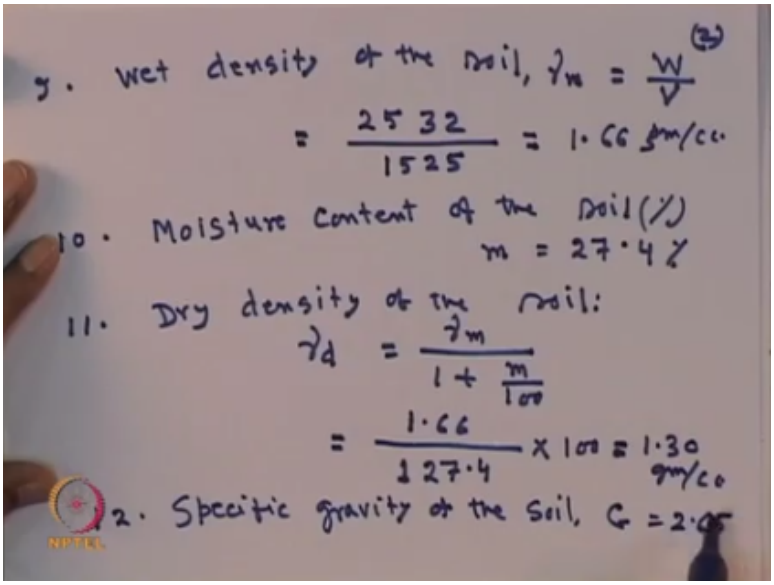

Then 9 wet density of the soil okay, that is γ_m=W/V so you know that W is 2532 this weight of the wet soil collected from the pit 2532, so we can write 2532 this divided by the volume, so volume of the pit we determine that V=1525 so you can write 1525 so this will give the density about 1.66gm/cc. and then you can calculate the moisture content of the soil and that is in percentage let us say m=27.4%.

So you can calculate it also this moisture content. Now we can calculate the dry density of the soil okay, which is designated at γ_d γ_d= γ_m this divided by 1+m/100, so this γ_m we just calculated 1.66 this divided by 1+m/100 that means if you calculate this it will be the 127.4 and this into 100 okay, so this will give you that density of the dry soil is about 1.30gm/cc, okay because your moisture content 27.5% so you can calculate the dry density of the soil. And then you know that specific gravity of the soil that is G=2.65 okay.

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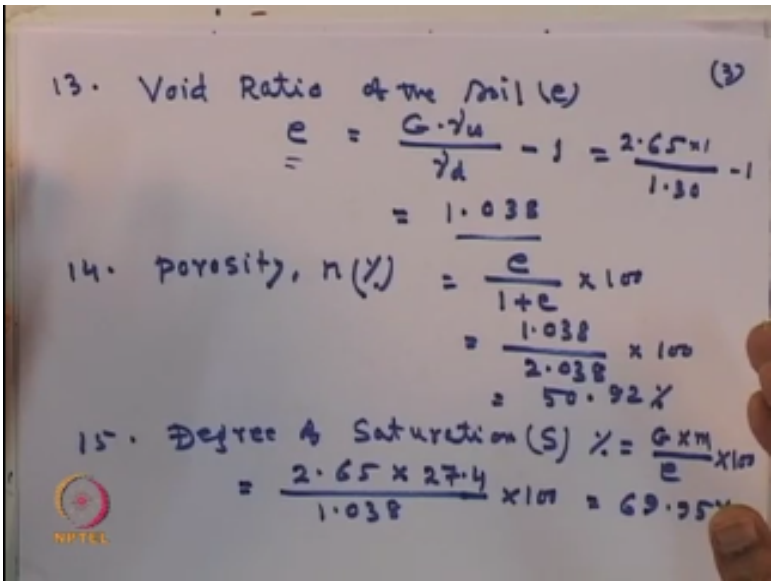

Now you can calculate void ratio of the soil that is (e), so $e=G.\gamma_w/ \gamma_d - 1$ so g is I mention that 2.65 so this 2.65 that in to 1 okay and that divided by γd we have already calculated 1.30 okay -1 so will give you 1.038 okay. This is the void ratio 1.038, then we calculate the porosity and that is reignited n and unit percentage that is e/1+e x 100. So e value you know 1.038/ 2.038 x 100.

So this will be above 50.92% then degree of saturation and that is defined as (s) % that will be equal to g x m / e x 100. So we know g is 2.56 and m already we have earlier the calculated that is 27.4 this is m is 27.4 so you can write 27.4 / e okay e is 1.038 x 100. So this will give you 69.95%, so you can calculate the degree of saturation. So knowing this how to calculate the void ratio porosity degree of saturation and the dry density and the moisture content from this test.

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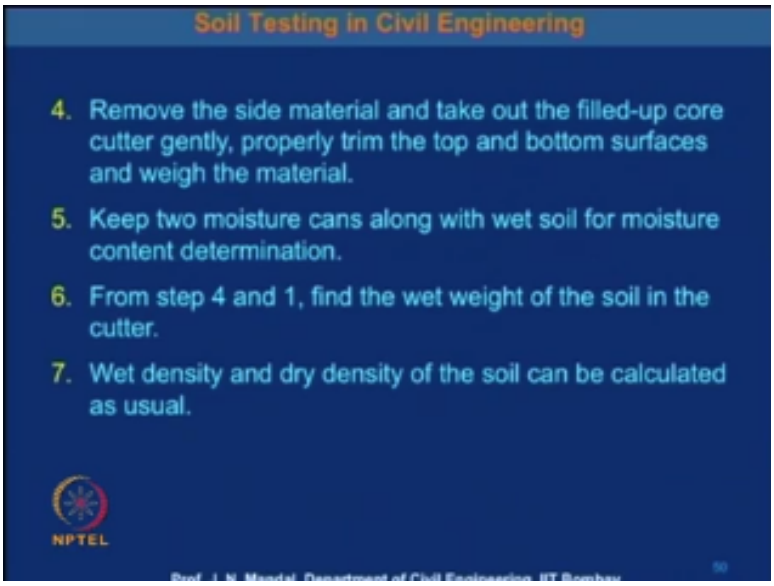

Remove the side material and take out the filled-up core cutter gently, openly trim the top and the bottom surfaces and weigh the material. Next keep two moisture can along with the wet soil for moisture content determination of the step 4 and 1 find out the wet weight of the soil in the cutter. Then wet density and the dry density of the soil in the cutter, then wet density and the dry density of the soil can be calculated as usual, I am show you that equipment.

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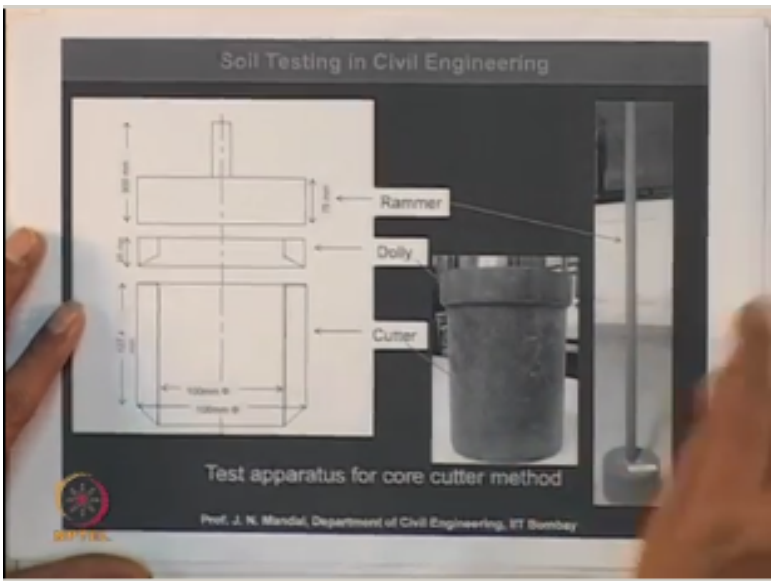

What we use for this test. So this is the test operators for core cutter method, so here this is the cutter this part and this 106mm diameter and this is 100mm diameter inside and this height is 127.4mm this is the cutter, and the top of the cutter there is a Dolly this is the Dolly and both is from here to here is 25mm. and then this is the Rammer so rammer is 75mm from here to here and we have to draw this is about 900mm. So this is the rammer we have to insert in to the soil.

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Next again I will show you some more about this avocado or the core cutter method and this is for determination of the field density by core cutter, so this is the core cutter and then this is the what I showed you that is the rammer and then you have to insert this core cutter in to the intuitive soil by the edge of this rammer you can see here rammer is inserting this core cutter is here and then it can take out the soil around this core cutter and then it take out this cutter.

And then you trim it the top and the bottom okay so this way you can collect the specimen or soil sample okay for the determination of field density by core cutter method.

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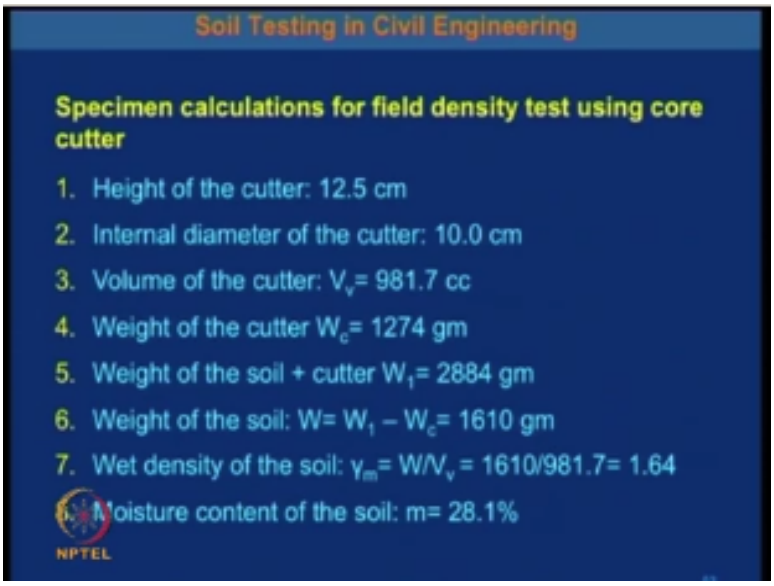

So this I now show you some specimen calculation.

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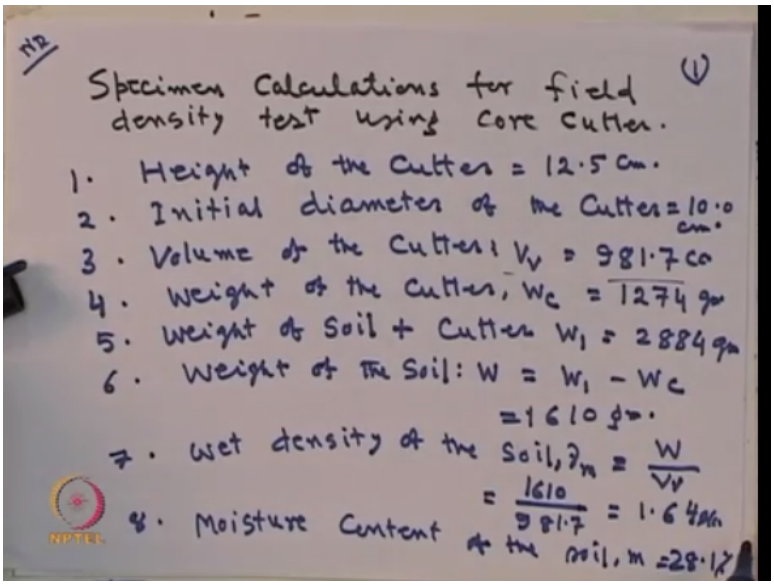

So this is the specimen calculation for field density test using core cutter. So what you can write first of all that you measure the height of the cutter and that is 12.5 cm then initial diameter of the cutter is 10.0cm, now know volume of the cutter and that is Vv = 981.7Cc. Now weight of the cuter now you take the weight of the soi9l =1274 gm +cutter here you say w1 +2884gm weight of the soil w =w1_wc and this the volume of the one number then you can you calculate the soil and 1610/98.17 =1.64 gm moisture content of the soil

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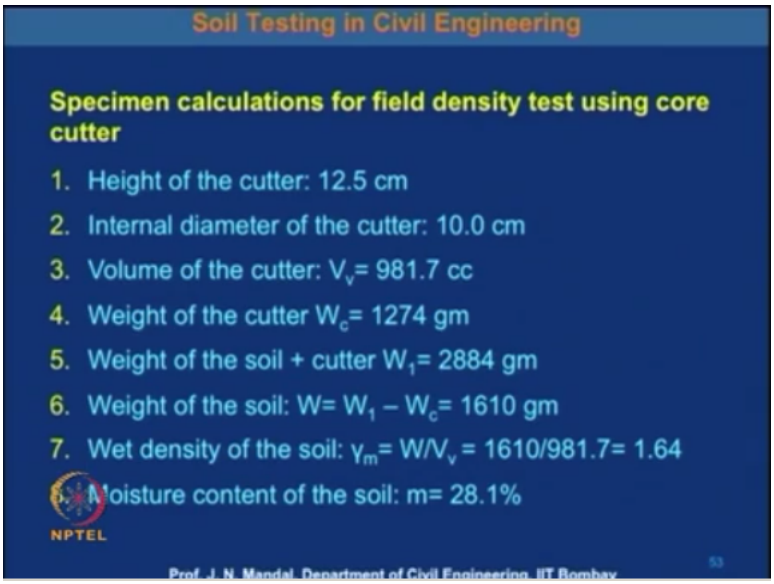

We can calculate dry density of the soil 8d = 8m this will divot *100 and this will 28, that is the Wight and that is e 800/8d =2.65/1.28andf this will be equal to the porosity that is in that is in percentage that is density of the e/1+e*100=1.07/2.07*100 this will be the porosity of the .69 percentage next we can calculate e the degree of saturation.

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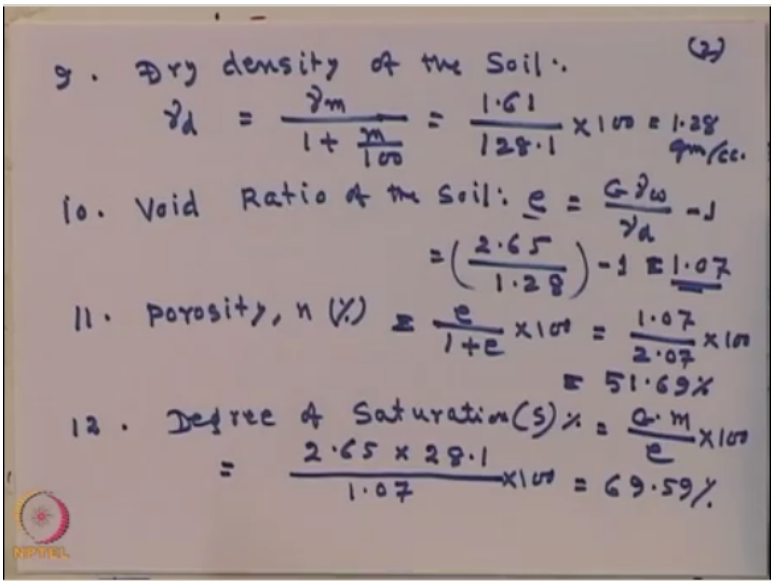

(s)=g.m/e*8100 and this is 2. 65 and m must content I shown you 2.65 *2.56 /1.07 *100 and this degree 69.59 so from this cutter you can determine that is what should be the density of the soil and what should be the body ratio an that is very important you can calculate the porosity and calculate the degree the saturation and these are the important t parameter and this the real estimate.

So from this we will density the whole cutter method so you can determine what should be the clean density of the soil erosion apart from the fetid density you can also determine that what should be the moisture content of the soil what should be the specific gravity and what should be that porosity and the dry density moisture density and the body ratio and the equal saturation and this is the density is important you are having some realistic value on the soil and these generally the plat form on the thing so you can determine all other thank you.

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