Foundation Design
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Lecture – 14B
Design of Foundation – Part 5

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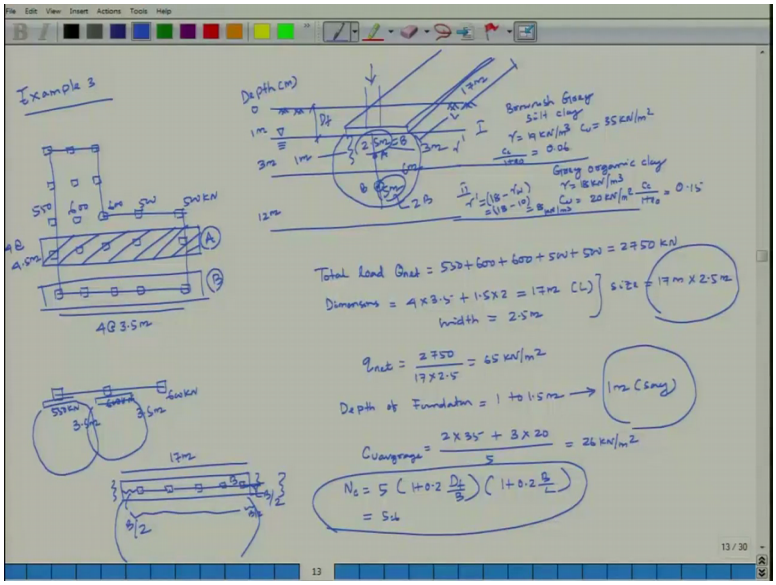

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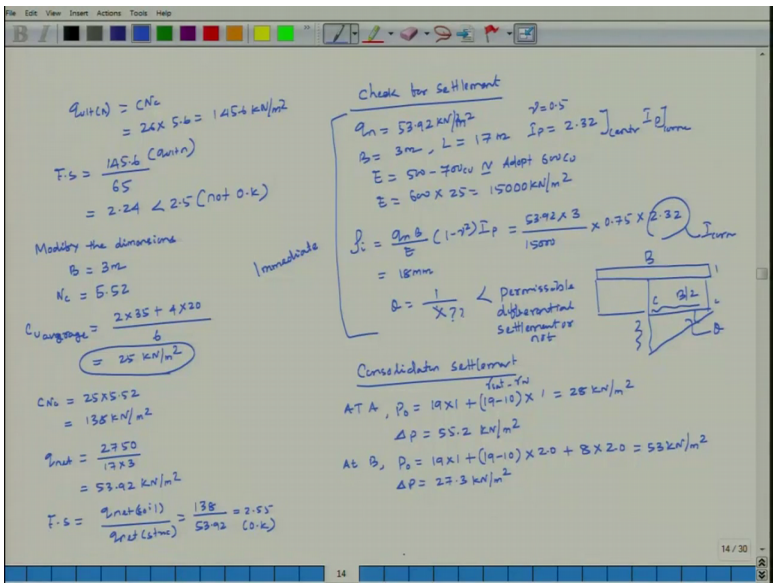

Now, one part was over that was the dimensions, then bearing capacity factor of safety we got it, then we have to check the settlement profile. For settlement profile, what are

the values has been given means it is well know net load intensity is your 65 not 65. It is coming out to be q net is equal to 53.92; 53.92 Kilo Newton per meter square; B is equal to 3 meter, L is equal to 17 meter.

Now, Poisson's ratio mu is equal to given 0.5 IP has been given 2.32 that is your influence factor at the centre; you can take it E modulus of elasticity of clay between 500 to 700 c u. So, adopt 600 c u; you can take 500; you can take 700; this is the range. So, with this E is equal to 600 into c is your weighted average this value I am taking it which is your 25 which is equal to 15000 Kilo Newton per meter square. Now find it out immediate settlement.

So, immediate settlement rho I is equal to q n into B by E into 1 minus mu square IP. This I have discussed very beginning in the settlement classes; you can recall you can check. So, this comes out to be q n into B q n is equal to 5392 Kilo Newton per meter square. So, 53.92 into B is equal to 3 E is equal to 15000 into 1 minus mu square is equal to 0.75 into IP is equal to 2.32 this is a IP you can say at this centre.

Similarly, IP at the corner also given based on that you can find it out; what is the 18 mm also multiplying with this not IP at the centre; you can multiply with also IP at corner, then you can find it out; is there any differential settlement or not if there is an differential settlement whether it is it will be within permissible limit or not. So, for this is my B this is my B. So, this will be settlement at the centre and this will be at the corner.

So, differentiation this and this will be your B by 2 and this is your theta then find it out theta in terms of one is to X means something then check as per B's code whether it is less than your permissible; permissible differential settlement or not. So, once it is over then you go for consolidation settlement then you go for consolidation settlement.

So, in consolidation settlement check for settlement first one is your immediate this part is your immediate then go for consolidation settlement check. So, at A; where is your A? This is your A that this is your total 3; 3 into 2 6 and this to this is your; Now if I take it; this has been modified into 3 meter and this total will be modified into 6 meter and this is your 2 meter. This is your 4 meter at the middle of the 2 meter this is your A at the middle of the 4 meter; this is your B.

Now, at A P 0 is equal to 19 into 1; 19 into 1; 19 above the water table; 19 into 1 plus 19 minus 10; that is your below the water table. Water table is at located at 1 meter then into 1; why into 1? It is at the middle; this; your 2 meter; that means, from here to here this will be 1 meter. Now it comes out to be 28 Kilo Newton per meter square.

Now, we can find it out delta p also increase in stress because it is a rectangular loaded area B is equal to 3 meter l is equal to l is equal to your 17 meter that also you can find it out increase in stress also I have discussed. So, delta p which is equal to 55.2 Kilo Newton per meter square.

Now, find it out at B; at point B where is your B? This is your B; what is your P 0? So, P 0 is equal to 19 into 1 plus 19 minus 10. This is your sub massed unit weight. This is your gamma saturated minus gamma W into 2.0. Why it is 2.0 because this soil layer has to be covered 19 somewhere here you have to find it out some merge united because water table is at here; that means, 19 minus 10; 9 into 2 meter.

So, it is your 2 meter plus 8 into 2; how come it is 8 into 2 gamma is equal to 18. So, gamma submerge is equal to 18 gamma saturated minus your gamma W approximately. We have taken either gamma W is 9.81 or 10 and it comes out to be 8 Kilo Newton per meter cube, then it comes out to be P 0 which is equal to 53 Kilo Newton per meter square, then similarly you find it out delta P increase in stress first you have calculated increase in stress at point a increase in stress at point B because of this foundations 17 meter by 3 meter. Here it is delta P is equal to 27.3 Kilo Newton per meter square.

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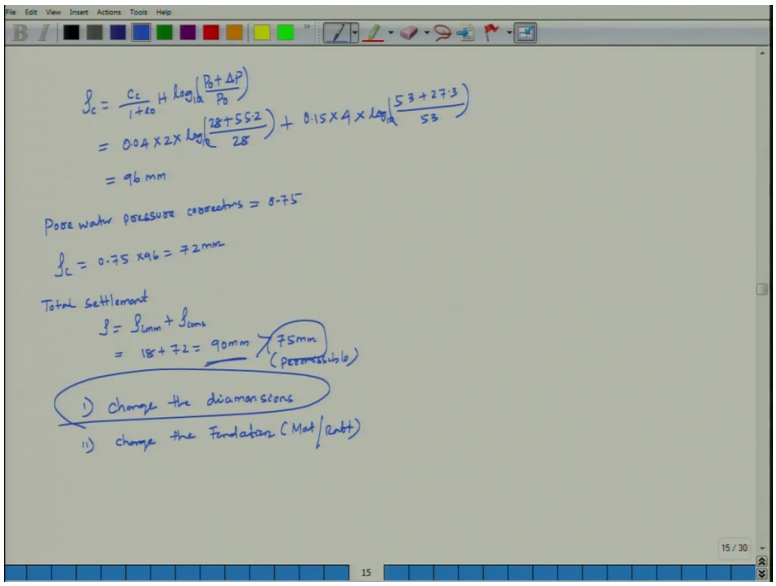

Now, you got it go for your consolidation settlement; consolidation settlement is C c by 1 plus E 0 H log 10 P 0 plus delta P by P 0. C c by 1 plus E 0 layer 1. It is 0.06 layer 2. It is 0.15; that is what it is there. So, layer 1 is your 0.04, sorry, it is not 0.06; it is 0.04; I am changing; sorry typo error.

So, it will be 0.04. So, it will be 0.04. H is equal to 2 into log 10 then 28 plus 55.2 divided by 28; 28 is your P 0 delta P 0 55 plus 0.15 into 4 this is your 4 meter 0.15 into 4 into log 10; 49 plus 27.3 divide by log 49; 49 then which comes out to be; it is not 49; rather it is 53. This part I am putting it here. It is your P 0 is your 53 and your 27.3. So, here it is your 53 plus 27.3 divided by 53.

So, it comes out to be 96 mm. You can check yourself doing this calculation you can check yourself. So, then because this is a clay soil then you have to apply also pore water pressure corrections pore water pressure corrections which is equal to 0.75. So, rho consolidation is equal to 0.75 into 96 which is equal to 72 mm. So, total settlement; total settlement rho is equal to immediate settlement plus consolidation settlement which comes out to be 18 plus 72 which is equal to 90 mm which is greater than 75 mm that is your permissible.

What is it mean? That means, whatever you have taken the dimensions these are not for a strip foundations of 3 meter by 17 meter, it is not because the total settlement. I am getting 90 mm which is much higher than your permissible settlement 75 mm. So, what

are what are the options left with you first option change the dimensions if it is not feasible change the foundation change foundation how do how you are going to change the foundations instead of strip you have to go for mat or raft foundations. So, first one you try for changing dimensions check whether it is happening or not then we will see then change in foundations whether if it is change the dimensions are not then we will go for change in foundations.

So, either you change the dimensions; first one you try this is for your homework and check whether the settlement criteria has been satisfy or not if it is satisfy well good we can always recommended instead of raft foundation I can take a strip foundations here and here and which will be fine if it is not satisfied then you have not other options because you have tried for isolated footing strip footing then you have to go for raft foundations.

There is your another long problem. So, that I am plan t o do it in the next class also. So, just in brief what I am going to do it.

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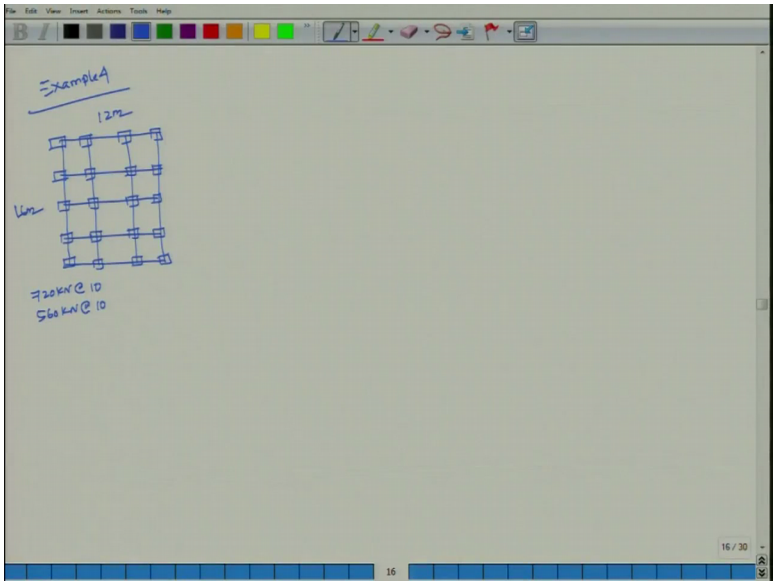

it is your example 4; look at the dimensions what is given I just give a brief outline then I will stop it because it is not possible it will take long time here 1, 2 then 3, 2, 1, 2, 3, 1, 2, 3, this total dimensions is your 12 meter. Here it is your 16 meter; total load coming in 720 Kilo Newton 10 columns and another column of 10 column if you look at 1, 2, 3, 4,

then 5 So, there are 20. So, here it is seven to 20; 10 columns then 560 Kilo Newton 10 columns; total is there and there are also sub soil profile.

So, go for a design. So, here again you have start with isolated footing if isolated footing is not satisfied then go for a strip footing; if it is not satisfied, go for a raft foundations. Basically, these kind of things will go for raft foundation designs and this raft foundation designs; I will discuss in the next class. Remember, I have not started at this structural part. Out of the 3 cases, all cases whatever I am doing right now only soil part only. One example I will pick it. I will give it; how this structural design as to be carried out and based on that you can do it. You should have also adequate knowledge of structural design because days as been changed once you go for any design form you have to sub soil explorations; You have to report then you will go for a foundation design once you design the foundation then you go for structural design also you have to provide details reinforcements these examples; I will discuss in the next class.

Thank you.