Application of Soil Mechanics
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Lecture – 25

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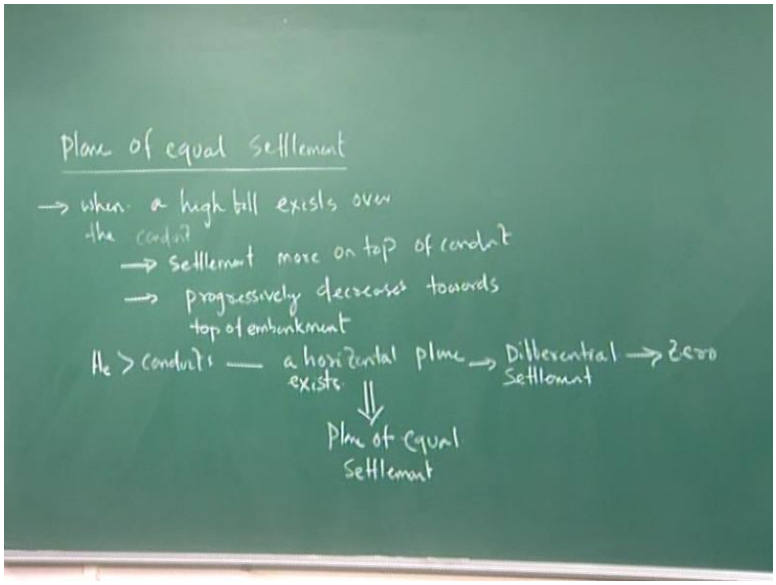

So, we are finished last class (( )) projecting conduits, in these case one thing will continue that is a plane of equal settlement plane of equal settlement when a high fill exist over a conduits right means that you mean by plane of equal settlement (( )); that means, when a high fill exists Over the conduit conduits, then the settlements are more in the top it is more on top, and progressively decreases we can say that progressively decreases top of top of conduits we can say that progressively decreases towards top of the embankment at certain height h e above the conduit. You can say that at certain height h e above the conduits if horizontal plane exist an horizontal plane exists at which differential (( )) settlement is zero at which differential settlement is zero differential settlement is zero these plane called plane of equal settlement this plane is called plane of equal settlement, plane of equal settlement above the plane of equal settlements central zone the side zones settles equally, if I draw it.

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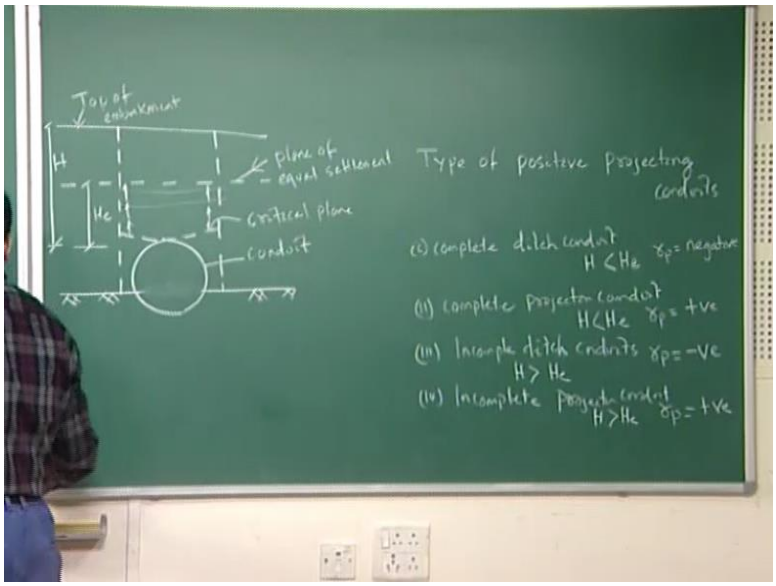

If I draw it diagramicaly (( )) trigger a positive conduits (( )), d is this plane is called plane of plane of equal settlement, this is a top of embankment top of embankment of this side is known as h e. And total height is your capital h, and this is called this is called your critical (( )) plane. If you look at the definition plane of equal settlement; that means, when a high fill exits over the conduits; that means, the fill of height of the fill is very high. So, that overburden (( )) will be more this is called a when a high fill exist over the conduits, and in these case what will happening exactly the settlement is more on top of the conduits look at here this the settlement in this (( )) on top of the conduits, and what will happen?

This settlement will be progressively decreased the settlement will progressively decreased as you proceed from top of the conduits, this is your conduits top of the conduit to your top of the embankment condition one, there is a high fill there is a high fill. So, once there is a high fill, what will happen? This settlement above the top of the conduits will be very high, and these settlement will be slowly slowly it will decreased slowly slowly it will decreased, it will decreased what happen at certain point at certain point? There is a horizontal plane exist there is a horizontal plane exist at which the differential settlement is zero differential settlement is zero this plane is called plane of equal settlement; that means, plane of equal settlement will be settlement here here here here everywhere else around top of the conduits will be equal what about it settle will be equal this is called plane of settlement.

So that means, h is your height below your equal plane of equal settlement to a conduit of surface h is a total height below, which the top of the embankment, where the conduits is there. So, while were interested for this plane of this plane of equal settlement or plane of equal settlement line, if you see type of projecting projecting conduits, if I write it type of positive projecting conduits for a complete ditch conduit complete ditch conduits h is less than equal to h c h is less than equal to h e h is less than equal to h e. So, r p is equal to negative, then complete projection conduit complete projection conduit in these case in these case sorry for complete ditch conduit h is less than equal to h c for complete projecting conduits h is less than h e in these case r p is equal to positive, then incomplete ditch conduits incomplete ditch conduits incomplete ditch conduits in these case h is greater than h e, where r p is equal to negative, then incomplete projection conduits incomplete projection conduits in these case h is again greater than h e where r p is equal to r p is equal to positive.

So, these are the all classifications based on your plane of equal settlement from these triggers. Once the moment you identify a plane of equal settlement, then you note your h height above the conduit that is your h e that is called plane of equal settlement, and depending upon h e is greater than h or h is greater than h e it should be classified as it should be classified as complete ditch conduits h is less than h e complete projection conduit h is less than h e r p is negative or r p is positive, then incomplete ditch d I t c h incomplete ditch conduit r p is negative, then incomplete projecting projection conduit r p is positive it depends upon that how h, and h e are (( )). So, some relationships has been given by some relationship has been given by for this positive conduits plane of equal settlements by this method.

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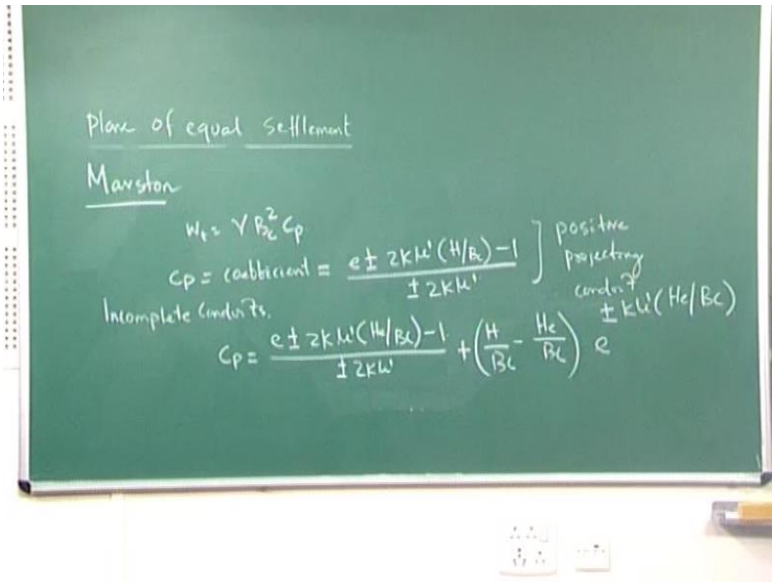

This is m a r s t on marston has given the following expression for quality projecting conduits, in these case gamma b c square c p, where c p is your c p is equal to coefficient coefficient this is equal to e plus minus two k mu. Prime h by b c minus one divided by plus minus two k mu prime this is for your positive conduit this is for your expression for positive projecting conduits similarly for incomplete conduits similarly for incomplete conduits your c p comes out to be c p is your e plus minus two k mu prime H e by b c minus one divided by plus minus two k mu prime plus h by b c minus h e by b c into e to the power plus minus two k mu prime h e by b c. So, these are the two relations based on a plane of equal settlement marston has given for quality projecting conduits, and incomplete conduits now next part of this we are going to start that is your negative projecting conduits of a complete derivation as well as the theory behind it.

So, negative as I said earlier ditch positive conduits negative (( )) conduits as well as the imperfect conduits definition has been explained by diagrammatically. So, will start this negative projecting conduits case now h case is over for the (( )) projecting conduits.

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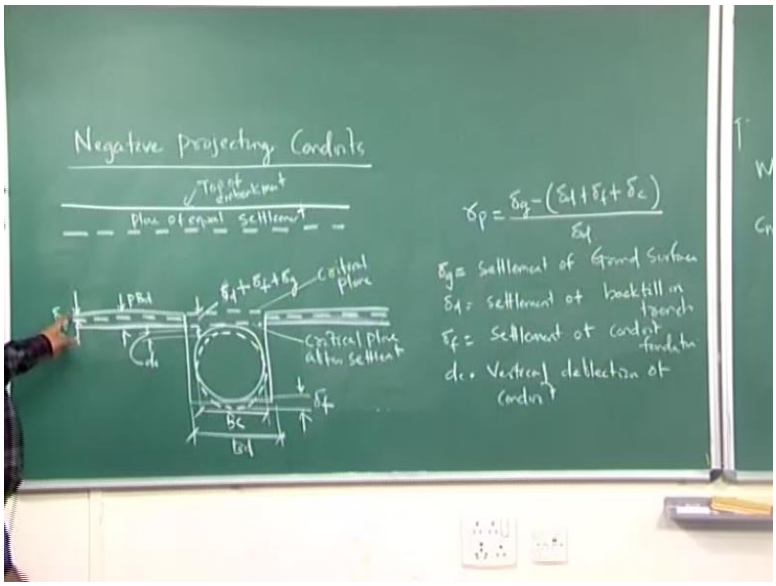

Now, second one is your negative projecting conduits, if I draw a diagrammatically how it looks it has been used for pivots (( )). Example for (( )). So, this is your top of embankment this is a plane of equal settlement plane of equal settlement, then if I start with this negative projecting conduits below this top of the embankment there is culvert (()) and drawing this how it works slightly increasing diagrammatically (()) this way this is your delta g p b d, and this part will be rho d plus sorry delta d plus delta f plus delta g, and this is your critical plane critical plane, and this is your critical plane after settlement, and if I take it this two.

This is your kind of d c b c b d, and these part will be over coming delta f. So, as I said in case of negative projecting conduits r p comes out to be delta g minus delta d plus delta f plus delta c by delta d. So, where delta g is equal to settlement of ground surface delta d is equal to settlement of back fill in trench delta f is equal to settlement of conduit foundation d c is equal to vertical deflection vertical deflection of conduit.

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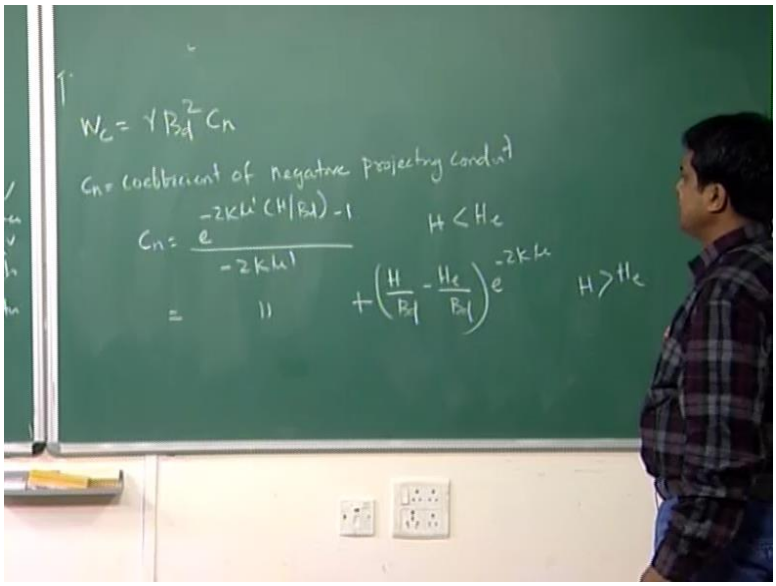

So, as (( )) width w c is equal to gamma for negative case b d square into c n c n is your c n is your coefficient of negative projecting conduits c n is equal to coefficient of negative projecting conduits, and c n Comes out to be e to the power minus two k mu prime h by b d minus one divided by minus two k mu prime, and h is equal to less than h e, and this will be with the set of set of plus h by b d minus h e by b d e to the power minus two k mu h is greater than h e.

If you look at this negative projecting conduits, where it has been used negative projecting conduits example is a (( )). So, there is a (()) convert here I have drawn the (()) there is a (( )) here in these for (( )) this conduits is there above these is your top of the embankment top of the embankment; that means, filling part is there. So, if I draw this if you look at here one is your plane of equal settlement one is called plane of equal settlement it will be below your top of embankment. So that means, up to from plane of equal settlement to top of the embankment whatever the settlement is going to happen it should be equal it should be equal now the settlement below these if you look at here there are things like critical plane this is your critical plane, then this is your critical plane after settlement there are particularly four type of settlement of zone (( )) Delta g.

If you look at here delta g settlement of ground surface the ground surface in this particularly conduit at this label. So, this has been settled with this your dottend line, because what will happen once there is a conduit try to understand once there is a

conduit above this there is a filling material what will happen the conduit also settled, then the material above the conduit also it will also settled along with side by soil also (( )) settled. So, in these case delta g is your settlement of ground surface; that means, it is nothing to this (( )) it is only the ground surface have much amount it settled it is your delta g, then delta d is your settlement of back fill in trench, where is your delta d if you come back here delta d delta d is your settlement of back fill in the trench; that means, whatever back fill you are done particularly above the trench, because this is a trench this is your trench above the trench.

So, that is your delta d settlement of back fill in the trench, and delta n is your settlement of conduit foundation if you look at here a conduit is resting over the pressure of the soil what will happen the conduit also settled the conduit settled where below this there is also a soil. So, conduit settlement of conduit foundation this is called below this called conduit foundation. So, this part is from here to here it is called delta f; that means, this is (( )) conduits settlement b c is your vertical deflection of conduit it will contact your b c at the top part how much it will, because once the conduit is settled at the top conduit is settled at the bottom at the top what will happen? This is will called a vertical deflection of conduit the conduit will be deflected some part of vertical deflection.

Then at the bottom conduit will settled at the bottom will settled, because here there is a soil here below the conduit, there is no soil this is a water pipes or may be something it is a (( )) this is called deflection here, we are trying calling it as a settlement. So, there are four type of settlements; one is your settlements due to a ground surface, because of a ground surface, then second is your settlement of back fill in the trench third is your settlement of conduit foundation this is your conduit foundation fourth is your vertical deflection of conduit fourth is your vertical deflection of this conduits this is a vertical deflection of conduits, and now with this, this is this is complete how the settlement of conduit how the settlement of foundation soil, how the settlement of particularly your kind of ground surface all. If you look at here conduit settles above the conduit soil settle below the conduit what will happen ground surface settle, and below the conduit also foundation (( )). So, everything has been taken into the situation based on that as I said r p r p is your delta g minus delta d plus delta f plus delta c by delta d.

So, based on that based on that the w c is coming about gamma b d into square c n c n is your coefficient of negative projecting conduits c n is your coefficient of negative

projecting conduits in these case c n comes out to be these doc (( )). Once h is less than equal to h e where is your h e as I said h e is your distance of the conduit distance of the conduit above the conduit to a plane of equal settlement (( )) plane of equal settlement these part is your, this is your h e. Now what is your h h is your from here to top of the embankment this is your h as I said when this plane of equal settlement you are going to observe if this height above the conduit is more high; that means, filling material is more high. So, it will be in that case you are going to get (( )) plane of equal settlement that is the definition (( )) may not get a plane of equal settlement.

So, these two terms depending upon that you can say that if h is less than a h e what is the c n coefficient of negative projecting conduits, if h is greater than h e what is the coefficient of negative projecting conduits. So, these are all about this how how it settled how the (( )) will settled what will happen? What will happen in these case, what will happen? This settlement will be a kind of this kind of settlement this kind of settlement it will go all of certain it became a plane plane of equal settlement plane of equal settlement means the settlement at the ground surface settlement above the conduit settlement of conduit settlement of foundation surface settlement of ground surface all will be equal all will be equal all will be suppose it is suppose somebody say if it is (( )) settlement are the plane of equal settlement; that means, delta g is equal to ten m m delta d is equal to ten m m delta f is equal to f m m delta c is equal to (( )). So, this is called plane of equal settlement.

So, how this in these case negative projecting conduits what are the what are the effect how the effect has come it has been completely drawn in a figure where b c is equal to b c is equal to diameter of conduit b d is equal to width of a trench width of a trench, because this is a (( )) this is a (( )) width of trench, where trench has been made, then (( )) has to be eracted. So, this is your b d is equal to this. So, this is all about your negative projecting conduits may be next class will start about some special conduit cases of the complete derivations.

Thanks a lot