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NPTEL ONLINE CERTIFICATION COURSE

Course
On
Reinforced Concrete Road Bridges

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Lecture 18: Design of RCC T Beam Bridge (Part III)

Hello everybody today we shall continue with the design of RCC T beam bridges, and this is our lecture number 18.

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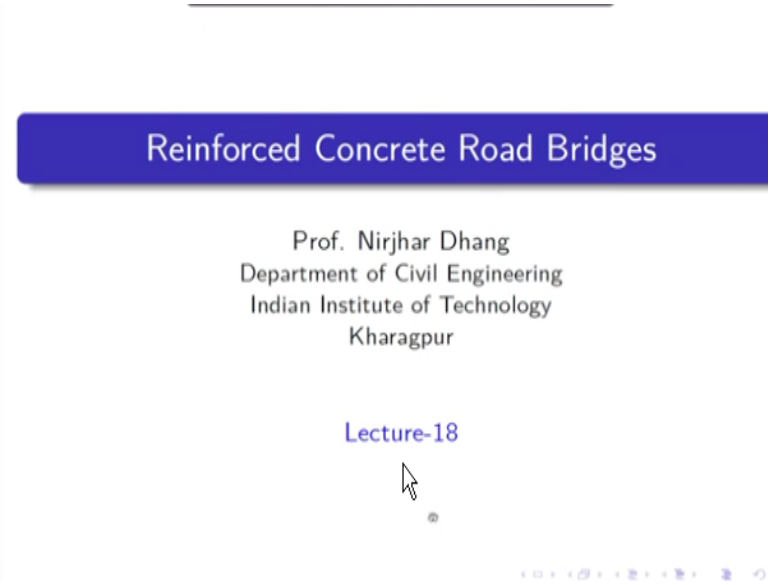

So reinforced concrete road bridge lecture number 18.

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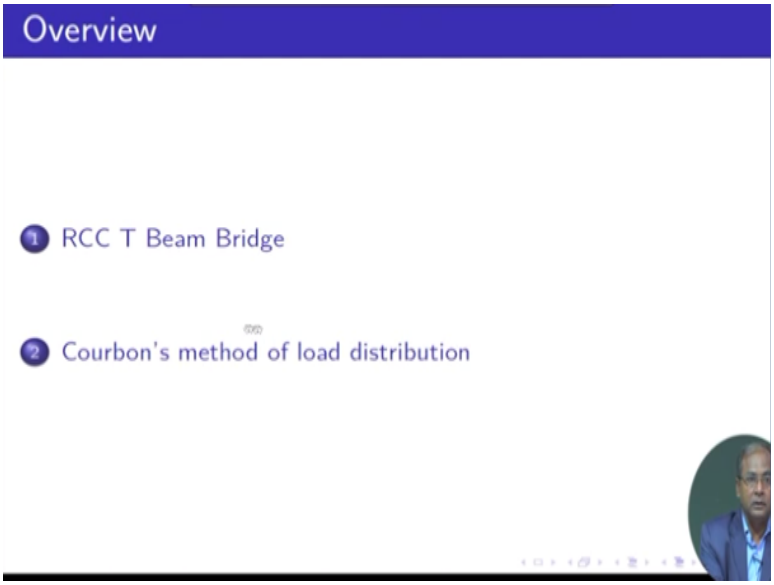

We shall start with two things RCC T beam bridge and Courbon’s method of load distribution.

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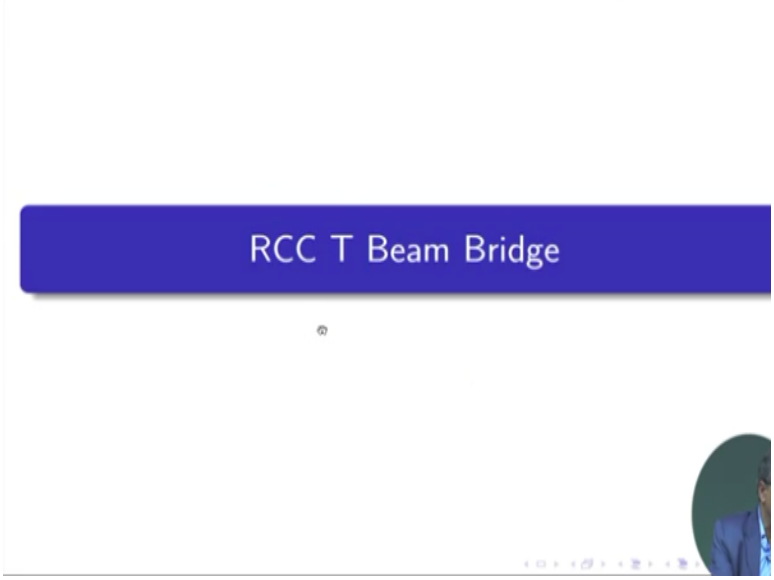

Let me tell you that let me show the thing here.

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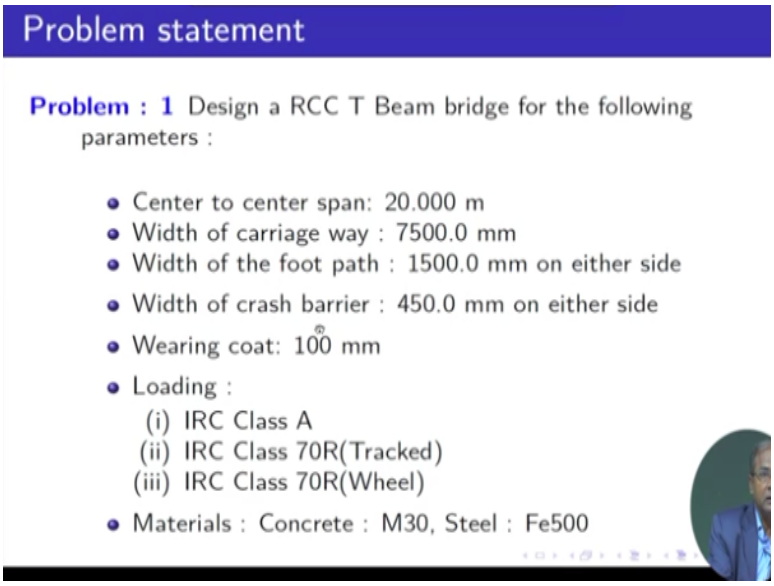

We started with something that your problem statement that we would like to continue and within this limited time it may be difficult to complete the whole problem, we shall give the basic principle and then we shall upload the pdf file of the whole solution, so that you can go through it. But our objective with this time we shall give the basic principle how to approach the problem, how to attend the problem you can say, that we would like to find out here.

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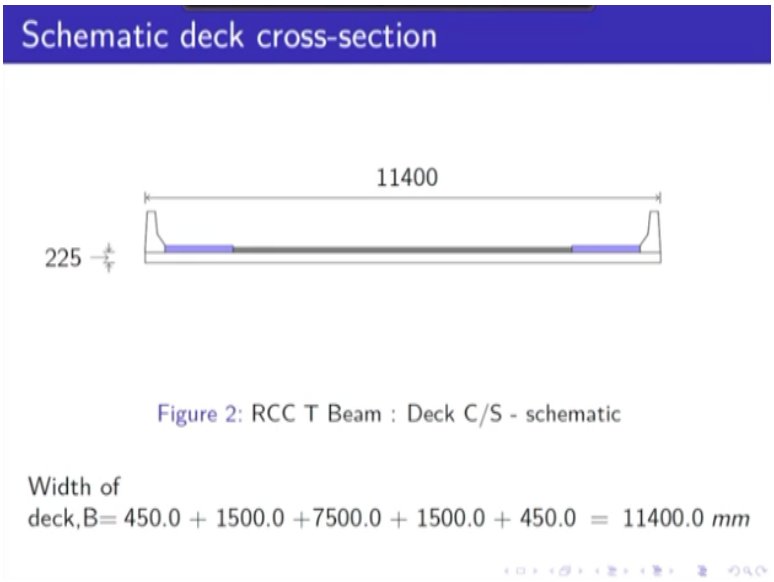

Figure 2: RCC T Beam : Deck C/S - schematic

Coming to this one here as we can see that we are having here the crash barrier, then we are having footpath, and then middle portion we are having that first deck and your wearing coat. And then we have given a uniform one though at check that is now uniform that one will get the different dimensions we shall get it. So coming to this one considering our requirement as we noted that one, this is 450, this is 1500, and this is 7500 the carriage way.

And then we are having this portion, again another 1500 like that, so if it comes like 11400. As we have told you last class also that 225, 200, 215, so that way they come that maximum we can go to 250, 275 also at selected places, this is not uniform, that we give it. And this is very much nowadays, it is very much competitive that your thickness they give it even sometimes they give you 210 also 215 that as much as possible they can save it.

So this is the one they do it, but I have told repeatedly that whenever you consider that your reinforced concrete section it is always better to have such section more, because the concrete can take that more moment of resistance. And still we shall save as much as possible.

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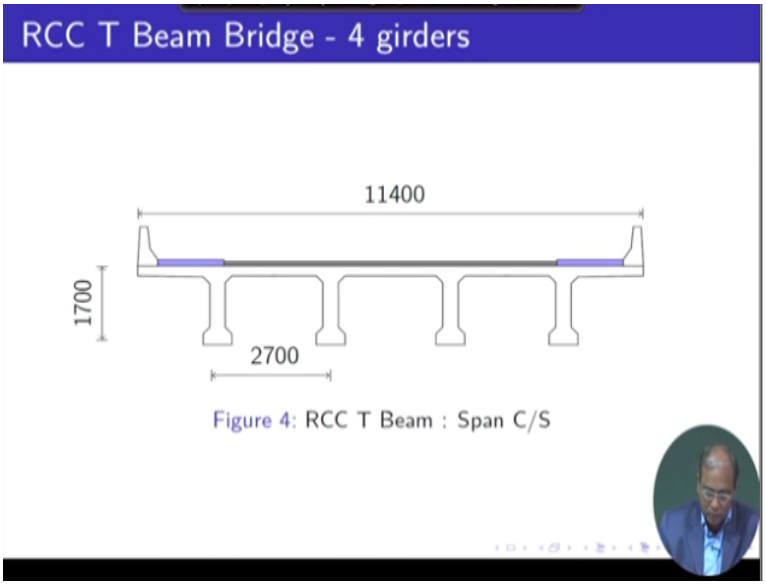

So coming to this one here this is the section that we have to provide. Our objective is that we have to provide this section. That you would say spacing and your overall depth B, and then your B whatever you have got it. So that means here we can say that we are giving the particular one say 2700 and this section we are giving here.

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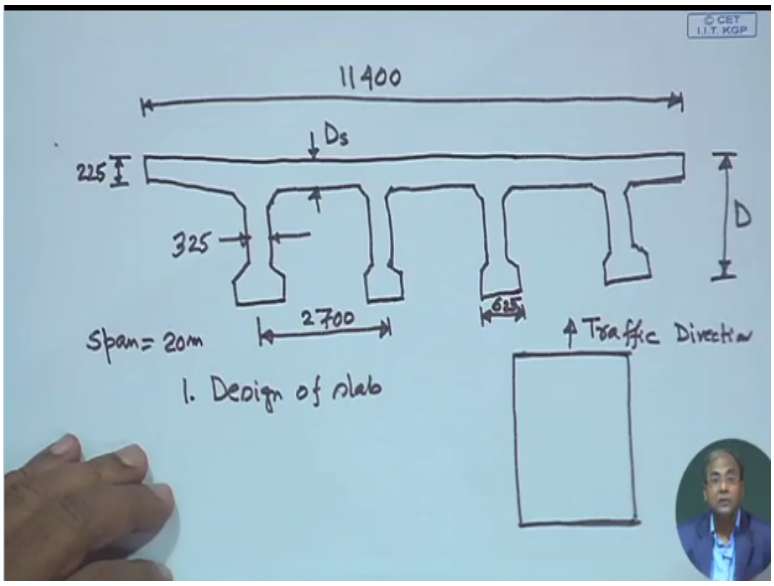

As we have noted down that one here just to give you idea, and we have discussed also. So this is our section and we are providing the haunch like this it will come. So another, since we are considering three griders, sorry not three griders, four griders. So this is sorry, this one it will go little more it suppose to, but anyway so our objective is that we are giving this particular spacing 2700 and this one 11400 our objective is that we have to provide this section.

And one objective of this way that we have to provide this section that one same considered as a overall depth D then we are having this section and including inside also we can consider 225 then we can once here there are many more things we can give 250 or 200 horizontal 150 vertical like that we can give this thickness generally it comes in the range of 300 to 325 350 also.

Let us say we are give here 325 these dimension we are giving here 600 say 25 that one we are giving that means here we can give that one is say 150, 150 both side we can give that is one if you give 650 then you can provide 350 so like that we can make it here now what is our objective is that we have to design of slab so whenever you are going to design slab that means we have find out these thickness, let us consider that one as say Ds depth of slab now when we have to find out design of slab then what we are doing basically here this particular one.

Then we are making it as a panel, so these panel this is the one traffic direction we are taking this is one I said traffic direction, so when we have this traffic direction and this is your one side that cross grider this is your another cross girder or there from whatever you see there from means at

the end we call that from intermediate cross grider we call it that we can have since we are talking say 20m span.

So our objective here let me write down this here somewhere a span 20m now it is there is tendency that they use this one of certain kind of say your that less number of say I shall come back to this before that let me tell you.

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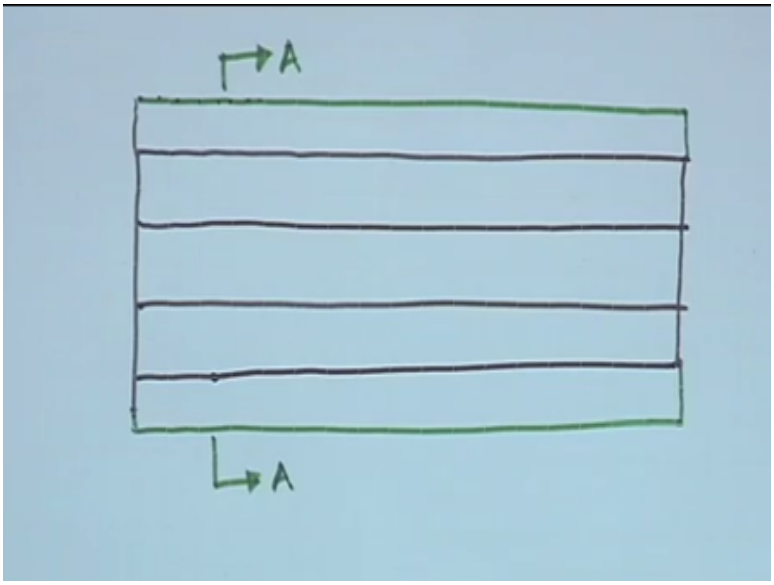

Because so if we consider this one and then we are having certain portion over here let me consider that one here over a different color so if you take loop from this side A and A then let me show you that actual screen of drawing again.

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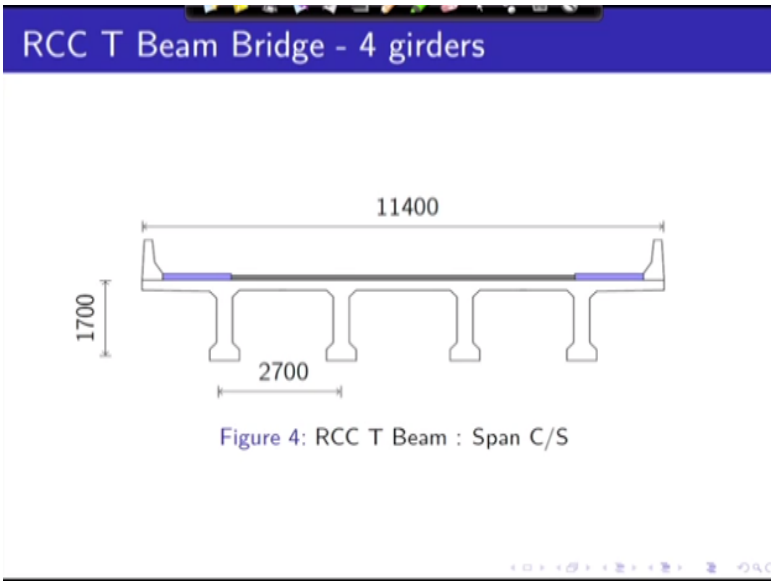

Figure 4: RCC T Beam : Span C/S

Then you will get this type of configuration this is the configuration you get that if you take a cross section of the bridge that then you will get this that means the way I am going through the bridge along the traffic the direction then I shall get this cross section here now what I am trying to say in this particular figure.

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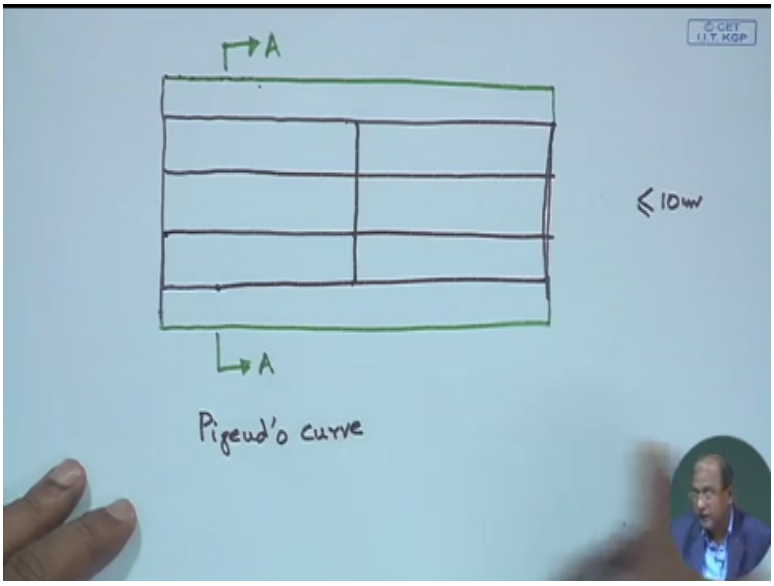

What am I trying to say that particular one that how many cross grider we shall provide as I told you now a days that people actually giving less number of cross griders here that in that from only they are giving but in earlier book all those things we will find out that they are having more number of cross griders so what we suggest that at least it should be at least say less than equal to 10m.

That is the one at least this particular one because from later stability point of if we find that one we are that let us at least it cost now more than 10m specimen that we can so when we shall come that one then it will become a different philosophy what is that one that if we provide the Cos grider here, then what will happen this length is more and this one then in that case what will happen actually here that we are that this one will be almost like we say 1slab that we could not hear, but if we provide one more then can we get that.

Now these design of slab either I have told you earlier we use it by that piegue curve, that what I have told earlier that particular one so just once more actually let it once more this is type of curve.

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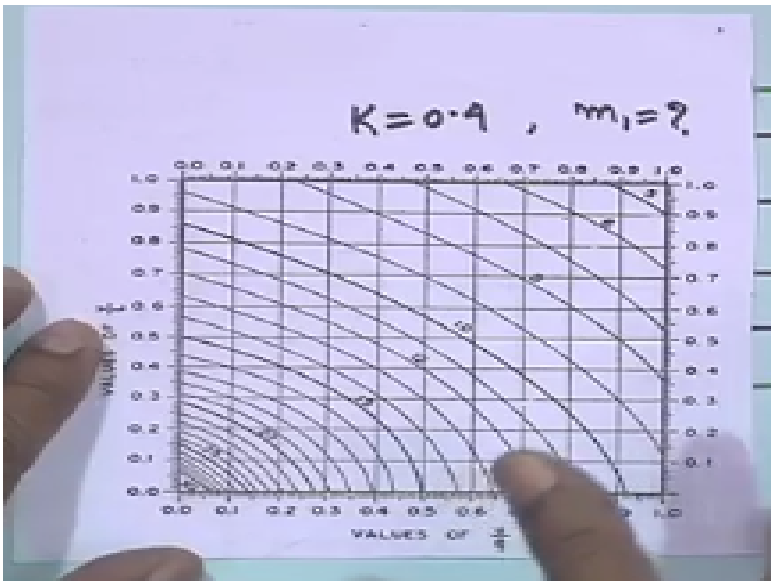

This type of curve we get it here one that is here, that we have discussed all those things like this that we find out with depending on u / e that impression p/l with here that is the one we do it now coming to this one here that means we are solving this problem first step that design of slab, that is the one we are doing it here.

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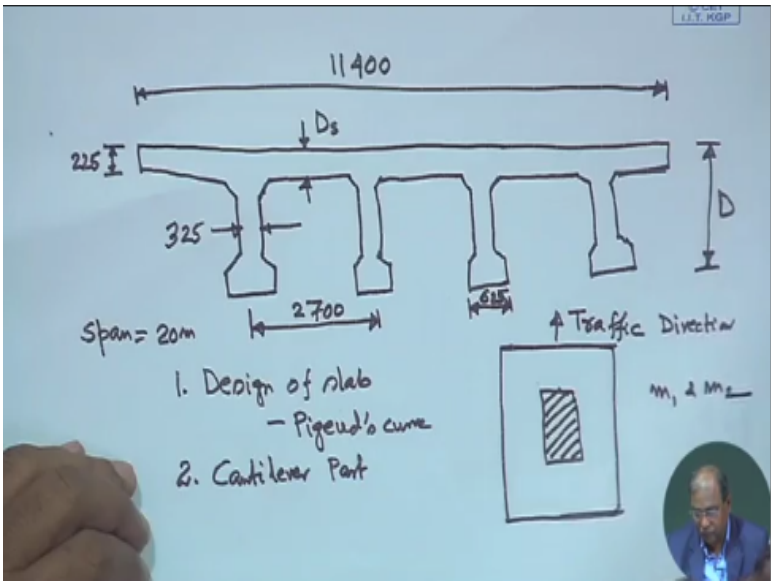

So and that one for that for earlier have been solid slab we are used that effective width effective length that we have calculated here we use by Ego curve that is the first thing we do it that means depending on the impression whatever we are having this impression, impression of tire or track whatever the load whether l or 7 Tr tracked or we or class and then we will get the dispersion on the basis of that we will find out and then we know the length and width and from there you can find out the value of m1 and m2.

And from there we can find out the value of that moment that we can find out whatever force we are getting that particular one can get it here the way we have done it in IS profile see that two way slab that we have done it, that is for uniformly distributed load that is available in IS profile 6 similar impression that it is concentrated load with the dispersion other thing that we can use it this is the one so this is your that step and on the basis of that we generally most of the cases what we do we check the section that most of the cases the business were standard.

Now it is we can find out that one 20m as I have told you RCC t beam means 20m span that is the one it can go from 8m to 22m like that so we make the configuration and on the basis of this configuration we made the configuration and on the basis on the configuration we check whether this section so whatever we provided that is alright or not this is the one we do it, it is rather we can analysis of section rather than design of section that is the one I could say so we use to say that one analysis of section we can say next one we have the loading given here that your said to

beam or cantilever part so next one is the cantilever part that we have to find out for that case what we do we can find out the load let us say.

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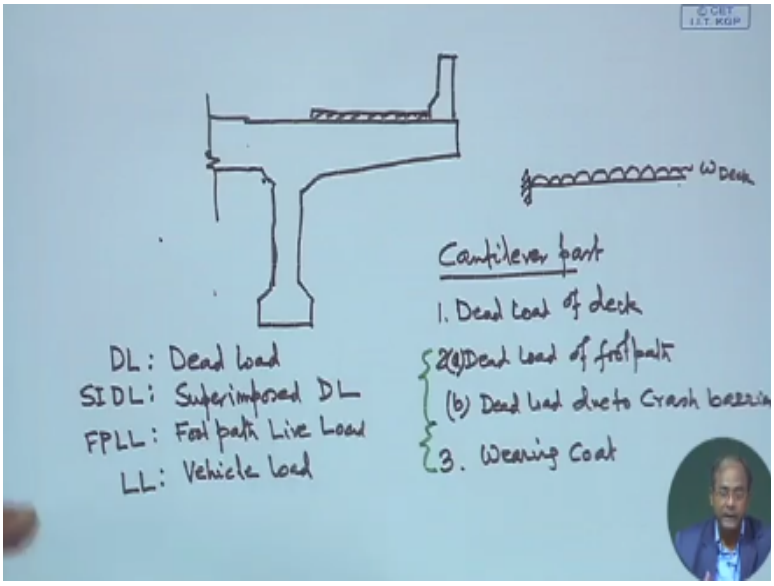

So this is the one cantilever section now we have to find out the bending moment and shear force and this one we terminate what we have here we have this section of class barrier. So like this and then we had foot path so whatever we are having the foot path that we can find out here that foot path so we have to consider this load we have to consider that means we can say it is like this may be you are having this load this is the load of the deck then we can have let us say whatever we are having this one that position that is almost to this coming over all that.

We can see and you can actually take the sectional that your vehicle will not come this side that also we can take you when I put in such a way that your foot path will come within that so that means no partially certain position vehicle will come certain position in that way instead of that you can make you in such a way so that it will be there the full foot path load will comes.

So first one you are having dead load of deck second one dead load of footpath we can consider this one has a and this one as b dead load due to crash barrier now these one we have a very something the name that we should tell you actually here one who called it actually DL that means dead load another one we call it SIDL super in forced dead load then we call it say FPLL footpath live load we can sometimes we call it LL let us consider that one LL is a primary one we can say which is we can say vehicle load.

So these are all you can call it gravity load because all coming down that towards that one we can say under this SIDL whatever you are having that means you are having that not here applicable for cantilever part this one it is not a applicable here but wearing coat actually it should come here number 2 and this should be number 3 wearing coat that one also will be your say super inforced dead load so we can find out dead load means only you are talking deck and your beam.

That we can consider that one dead load and whatever you are know that is the one we have constructing over that you are putting all of them that foot path foot path live load like that way so this one we consider and we for each of them actually you can actually that find out that beam our objective sis that to find out that live load now it is whatever we do actually here.

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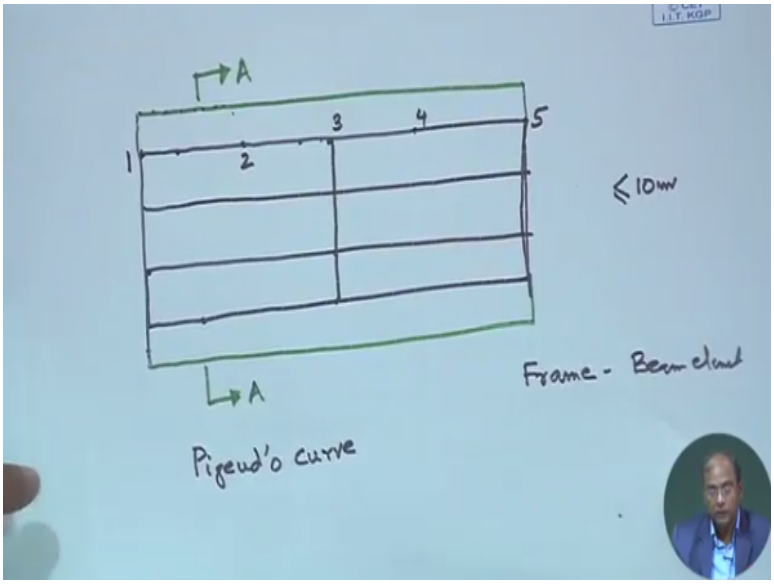

Nowadays in using different actually software popular software actually level that one you can say you are having now stared very, very popular one stared then stared core or your having say CSI bridge and then you are having say medias, there is different kind of software available and you can use it and that particular one whatever you can do? You can actually make it has a frame or beam element. Frame or beam element as you can say that we can use it and we can make this frame and we can apply that means you can consider this one here, we can say from here.

Let us say this is 1 is mode number 2, mode number 3, mode number 4 say let us say mode number 5 like that we can get, this way we can make it. If we want to make it further then you can make it here also here 1 mode, quarter point also we can make it and this fashion actually we can make that frame on that your bridge and that also you can analyze but our object here that we shall go to the problem that in a classical way, the way they do it, how to distribute that which girder will take how much load? That we would like to find out, that is our objective here.

So this particular way, if you look at your binding moments you can find out and then obviously you can go for standard design whatever we are having, either you go for IRC 6 or IRC 112 or any other code that particular one the limiting values whatever they have you can find out and solve it. I shall give you this particular one

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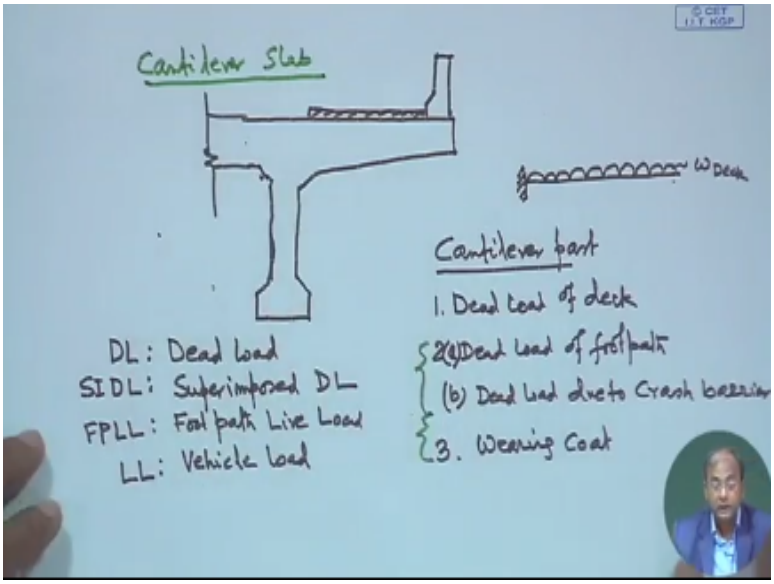

You're in the previous file that we will give with the concrete detail because if the basic principle if you know then you can solve it. So cantilever being, this is your one we will design it, say slab here that we have to design. Next part is coming that is one called girder.

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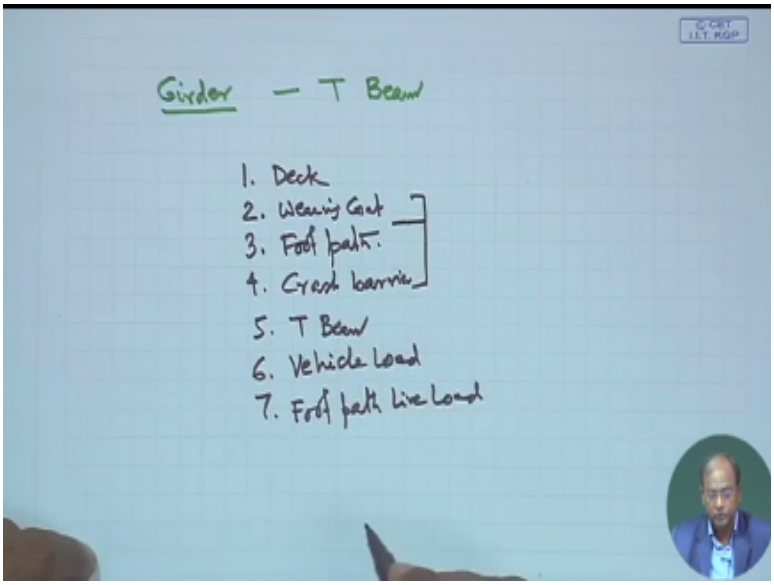

All the other in our case that say your TB in this case, so the question is that one here it has its own self weight no doubt about it has its own self weight and then whatever the loads are coming that particular one that you can consider. Now under these you can say that your, how shall we actually go ahead or how should we distributed the load, so we are having the deck, wearing coat, foot path, crest barrier. This part one way we can think of it, and then you are having say T beam that vehicle load.

So you are having different components that foot path live load that also I can add. One thing I always recommend that you also try to find out what is the contribution of each thing, and then it

will give you an idea, that which is giving more loads that particular one you can find out. That particular one here what we can do wearing coat that is distributed, foot path, crest barrier are highly consider. One alter could be that if you consider just coming to the screen.

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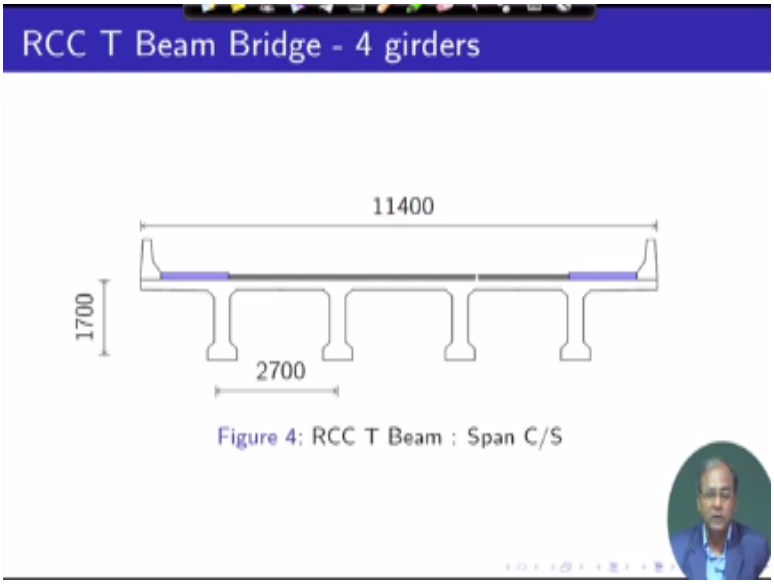

We can say that if you come to this particular one, I can say one preposition could be that these load will be taken by this outer girder. Similarly these load will be taken by this outer girder that is one alternative, other alter we have is distrusted among all the girder, that is also another one, that means whenever you are bringing that assumption you should have the knowledge that how much you actually differences is there, the most important in our design.

And would have the knowledge that how much actually you difference is there that is most important in our design that how mush actually deference that the particular we should know, so coming to this particular one here our main objective here because directly you can find out this one if you really say that the intermediated if you consider.

So obviously if I take the imperial force function to the medial force which one has been taken these gadded and whatever load will be have in the particular one bur the regarding vehicle loading you shall have the certain problem because we have to follow that I R C loading we have

to follow that we have to see in the next question is coming that as I has have told you have in the certain ,so the weather the 700 is al5right not that we have not to check that means we have all depth the particular one is alright or not that we have to check coming to these one but we can say .

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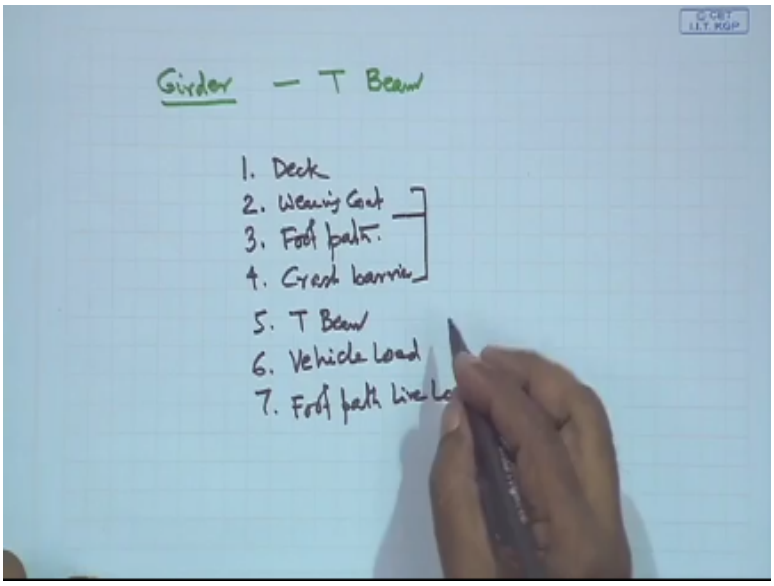

That our objective is that we have to design that design that girder for that we have the different loads take we can find in that I have told you that we can take certain in the portion from here to here ,and then again other portion will go that means that we are having certain portions ,we are having these one and B W, so like that we are having these one said DS and then we are having these one is a overall depth now coming to these one here very interesting thing I like to say that generally it happens.

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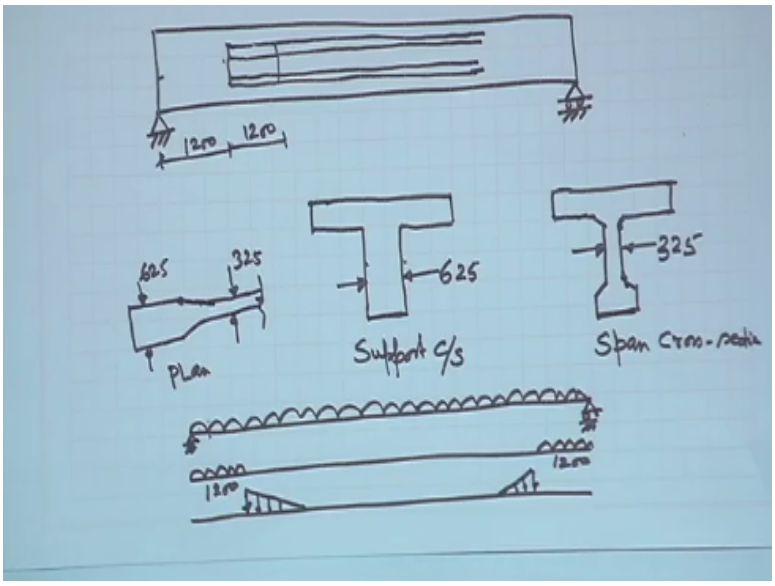

Whenever we are considering that the beam then certain portion that if you see this one here you will actually get the two lines you note up to the scale but you will get here two lines what are the two lines those two lines gusted me draw the figure here.

So one line you are getting here these portion another one if you cut it another one you are getting here these portion here that the particular one we are getting here similarly we shall get it here also you shall get it here you shall get one here and here one line required here now as I have told you these one is your support that we get it here sorry span this is the one getting span co section span cross section and the square as this is support cross section.

So these with these with same for the example these one it come in the range of 625 this one say 625 one bridge we will find out 350 and 650 like that and now it is find actually these one we are getting in the particular value you are getting, so that means from support we are starting from here then we are coming these level and that one you shall find out how much you shall get it here that we have to find out here. And so it will go up to second level and that generally we can keeps here something in the range of set will 100. Sometimes people use to be 900 also, so 1200 also something like that. In between your having another 1200 you will have that period that means if you see from the top and then it will go.

This one you are looking that plain. Then this one 625 and this one 325, so these portion you are having the from this 625, this one fourth one investigated of 1200. So if we now draw the figure very interest thing we have find out. This is the one I am getting here, that particular one is

getting then what we shall do here this the you do L for this section. For there I can herb another load you do L 1200. For that I can herb.

For each of then we can find out bendy medium here like that you can find out, you can see what the difference you are getting at here is. So that you can find out here, that is the thing we can solve the particular one here. Then the next part I shall tell you that you regarding that you say that guard or load to the live load how much it will come then we shall discuss, the remaining part we shall discuss.

So this is the thing that I would like to say that particular. We shall give you that complete solution for; each and every one we shall give you can both go through it and which will be helpful for your say your assignment also. So that we can find out step by step we can give that particular one here. Because the process will end the land within the particular time we shall not able to but the basic principle is that how to actually move forward with this problem that I am trying to say first. Thank you very much.