Design of Offshore Structures
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Module - 4
Lecture - 12
Tubular Joint Design for Static and Cycling Loads XII

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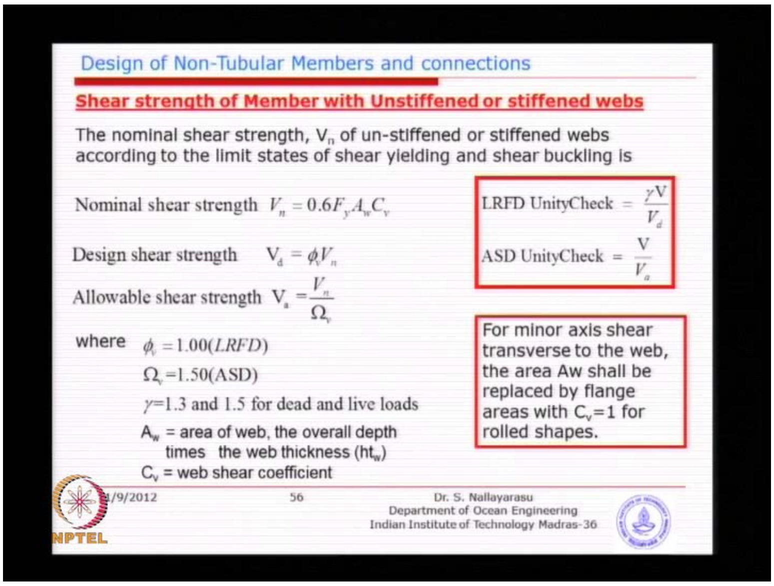

We will say this shear effects on the members today. So, this basically similar to what we have been locking at for actual and bending. So, you can see here the shear effect is taken into account by sixty percent of yield this is in contradiction to tubular members or a p i code we were looking at sixty percent not sixty percent is forty percent only. So, that is one major difference, but of course, it will be adjusted by means of other load factors. So, you see hear sixty percent of yield multiplied by the area of web that is allowable or nominal sheer strength of the web or members in question if it is a horizontal then you'll be replacing this a w by the area of the flange.

Because it is a vertical shear you will take the capacity of the web that is horizontal shear you will take the two flanges top and bottom flanges area for the a w that is what i have just written here in in there and multiple by a coefficient called c v which is basically share buckling coefficient which needs to be calculated depending on the parameters such as depth and the thickness of the web and from the nominal capacity you can either calculate the design capacity or allowable capacity by by doing same dividing by a factor of safety are material factor if it is a h l r of the design multiplied by five which is your material factor or you divide by the factor of safety which is conventionally one point six seven for almost all of the cases remember we were having actual compression in bending two point six seven here you have one point five. So, if you divide point six by one point five will become how much point six divided by automatically. So, that is how the adjustment as being there if you look at a p i we were having allowable sheer capacities point four times five y.

So, here the loads factor how been adjusted accordingly. So, the unity check is again similar shear load divided by shear capacity will give you the unity check for shear and load factors multiplied by shear load divided by the design shear strength will give you the unity check. So, the adjustment is only on the multiplication factors for l r b division factor for allowable strength and i will repeat again for miner axis bending a w will be replaced by the area of the flanges.

So, vertical shear is only taken by the web horizontal shear taken by flanges this is similar explanation what we were having for surplus sessions you know the area for shear is taken as fifty percent by simply if you just make it as a squire. So, there will be two flanges to webs. So, fifty percent for vertical and fifty percent for shear of course, it can integrate and greed. So, the shear strength is very easy to calculate basically what you need to know is the area of shear whether its horizontal or vertical.

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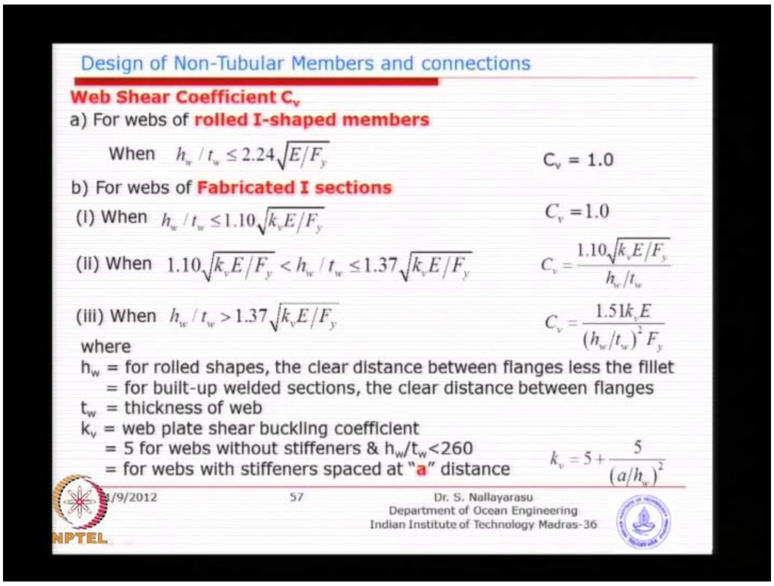

Now, this shear buckling coefficient c v needs to be calculated here we have got two cases webs of i shape members or webs of fabricated sections i think we have seen earlier you know how the the fabricated sections are made by taking flat plates and then making a fillet it weld or full penetration weld. So, there is a slight modification to the c v as long as you buy a a hi shaped members c v value is one point zero whereas, fabricated sections where you make it cylinder you know the idea is the height of the web to the thickness of the web is becoming higher then you have a cylinder less effects. So, local buckling may govern instead of sixty percent of yield which is basically taken a s c i capacity. So, that is why we have got three cases when h by t w which is simply the cylinderness of the web is less than one point one times this parameter which is basically the new one is coming inhere is the k v times e divided by f i k is defined as a coefficient associated with the space think of stiffness.

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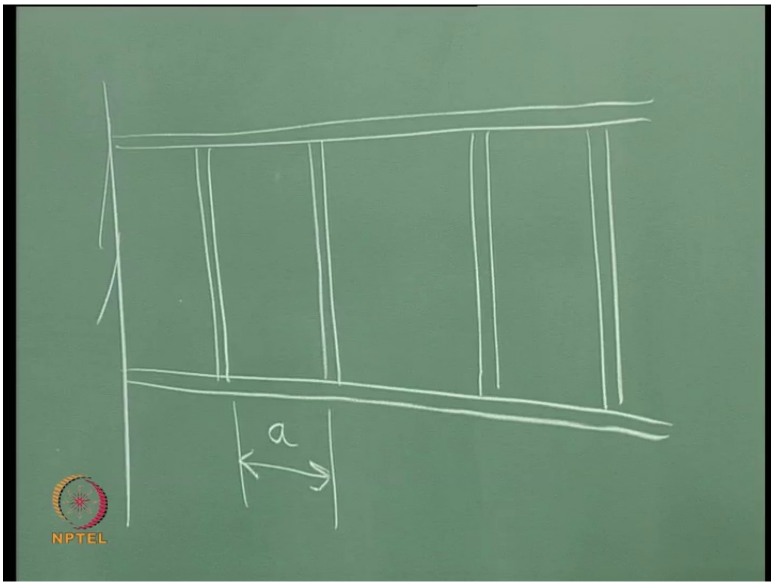

So, remember if I draw one plate girder will just and that is your support when you're web is stiffen by stiffness in this section. So, that is your. So, periodically you provide stiffness. So, what it means we made this the web two cylinders; that means, thickness is too small. So, we have two choices either to increase this thickness of the web to make a it stronger enough. So, that buckling does not happen or we go and provide perpendicular. So, many stiffness that the web will not wobble around so but you're spending some amount of extra steel without which you are not going to get because as soon as you do not have the stiffness k v value will change and corresponding c v value will be less than one makes the allowable stress smaller. So, either way you are not going to get the shear strength freely by just making cylinder making.

Bigger and bigger we are not going to get the capacity. So, that is the exactly idea. So, h by t w is less than one point one times this para meters c v is one; that means, it will treated same as the the load shifts because the load shifts remember yesterday I was talking about all the load shifts of american code or from indian course we purposely made it as compact members with compact flanges and compact web. So, only the fabricated we try to manipulate the movement of energy by simply making the web higher and that is their problem. So, the second case will be between one point one and one point three c v value is calculated is using this and if it is greater than one point three seven then the c v value is calculated using this empirical formula these are empirical formulas relating the shear capacity and the cylinderness now a is basically the webs with stiffness space at distance a which I have marked on the drawing here. So, the spacing is denoted as a as long as a is higher.

Then the k v value will be smaller once the k v value is small less c v value will be also smaller. So, basically the larger the spacing is no good closer the spacing we are going to get the better stiffening. So, that is the idea behind how shear can be enhanced by providing additional stiffener effect or you just make it thicker you know if you make it thicker you will anyway come under category of one which will automatically make the c v s one and then automatically you will go back and you calculate the then nominal share capacity with the area times point six f is c v is equal to one. So, shear capacity calculation is quite simple in a way is not complicated as bending and once you know the the loading you can go back and calculate the unity check the load divided by capacity here load multiplied by the load factor divided by design capacity.

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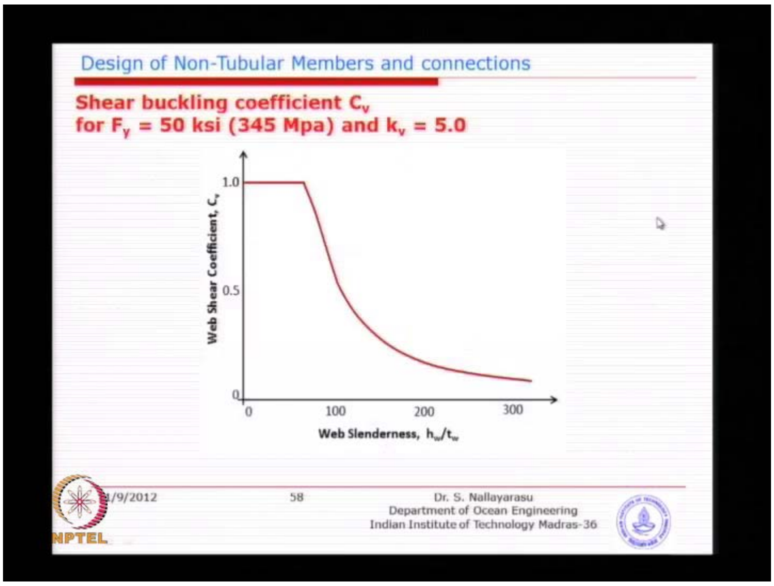

A simple diagram i have just plotted these three equations part one part two part three just to understand how the web cylinder less effects you know the c v coefficient c v is one the web cylinderness is very low I think around eighty and then after it become drastically reducing as you can see here almost with hundred we are able to reduce the capacity will go capacity a not very good you know.

So, that is the exactly the idea. So, we need to keep this cylinderness less than sixty seventy. So, that yesterday we were seeing web cylinderness the limit was ninety you know if you look at the compression elements is ninety is the web slenderness otherwise it will start buckling basically it will be wobbling around. So, this idea behind the next one we we are already calculated the actual capacity. And then tension and compression and bending capacity in minor axis and major access bending and also share now there will be load cases were you'll have concurrent existence of all the loads together in any b mar column.

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So, what we need to see is similar like a p i codes we need to see the possibility of combining them. So, that the the beam is safe in coexistence of all the loads.

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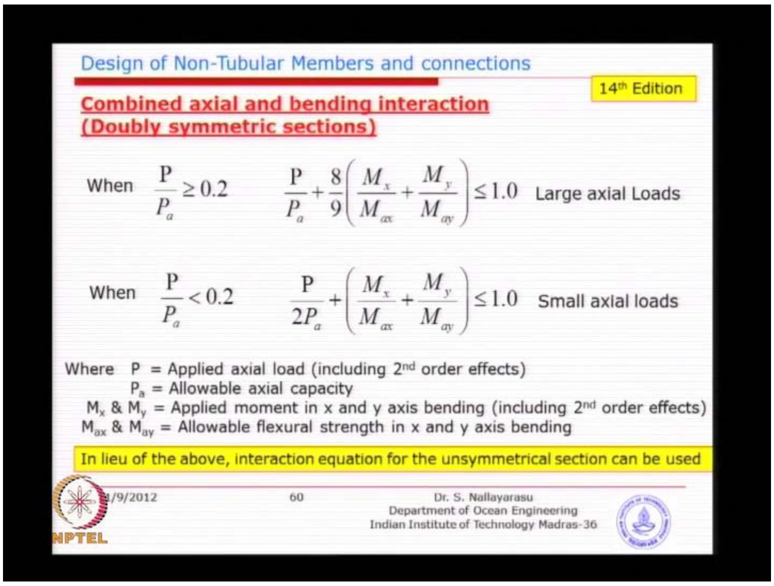

Until the ninth edition the the unity check or the interaction equation is very similar to a p i. In fact, from a a c the was developed, but in the recent times due to changing you know several data s obtained from experiments a s c as come up with that slightly modified equation, but of course, fundamental principle of linear superposition still not changed you can see here is almost similar except instead of stress you see here is the capacities very similar what we have learned from our joint design in a p i isn’t it a p will also be very similar, but of course, a p i does use the non-linear interaction instead of linear, but in here is typically you will see a leaner here.

Is you will see a typical linear summation of the actual and bending effects, but what difference it makes one think we have made in fourteenth edition that the t delta p delta effects have been taken into account by a slightly different means there are three options given to you one was trying to do the correct second order analysis incorporating p delta effects and t delta effects second option was to use just use only the effective length factor in place of second-order analysis which is difficult to do the third option was to calculate the effects of p delta by means of empirical coefficient from the derived moments and the displacement obtained from first-order analysis love anyone of them at that can use but fourteenth edition see if you use this method one and three not the effective length method then you will be using the movements modified by this effects; that means, already incorporating those two effects the movements and actual courses are recalculated I think yesterday we spent some time by looking at the movement of obtained from first-order and multiplied by the beta one and beta two you get a value which incorporates those effects. So, that is why you see here if you just re collect the equations that we have ah used for tubular members.

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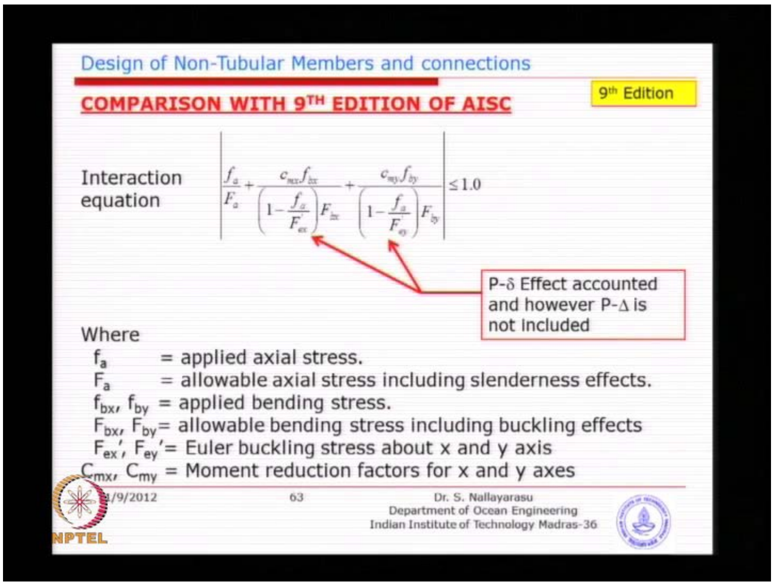

You will be seeing something like this if you just go quickly here i think you might this effects. So, what is that bottom term. In fact, if you look at this is actual stress by actual allowable stress which is nothing, but actual load divided by actual allowable load and the second term is bending stress divided by bending allowable stresses is here, but what is the extra term hear is basically that delta effect as long as long as you have a larger deformation effects you'll see that the actual stresses is more automatically corresponding buckling stress will be less are more depending on the loads on this parameter in bracket you will always be reducing the allowable stress for bending. So, this is basically take as an indirect means you can derive this is the interaction whatever we are having is can be derived and this parameter will always be more the actual stress; that means, the the reduction factor will be you know the smaller ones that factor is smaller it is indirectly reducing the amount of allowable bending stress that you can allow that the idea behind. So, that is taken into account in a p i whereas, instead of taking into account.

It in here we remove this, but automatically we have already taken the additional movement because of the p delta effects in the nominator instead of denominator. So, that is slightly different form, but of course, the fact is the movements are magnified here whereas, the allowable stresses are reduced here is going to produce the exactly the same result. So, that is the different that we wanted to highlight that we should be using slightly different form of checking instead of a p i you will be using here as simple form and again here we got two two subclasses one is when the load is actual predominant then you got this formula when actually slightly smaller less than twenty percent then you can use the second statement similarly like we had in a p i when the f a by f a is less than point one five you got set up the formula which is a slightly modified and when the predominantly actual stress then you have a interaction formula something like this this is for the the buckling case.

So, basically this will give you an idea that why this form is different because we have incorporated the magnified movements and magnified forces from second-order effects in the nominator.

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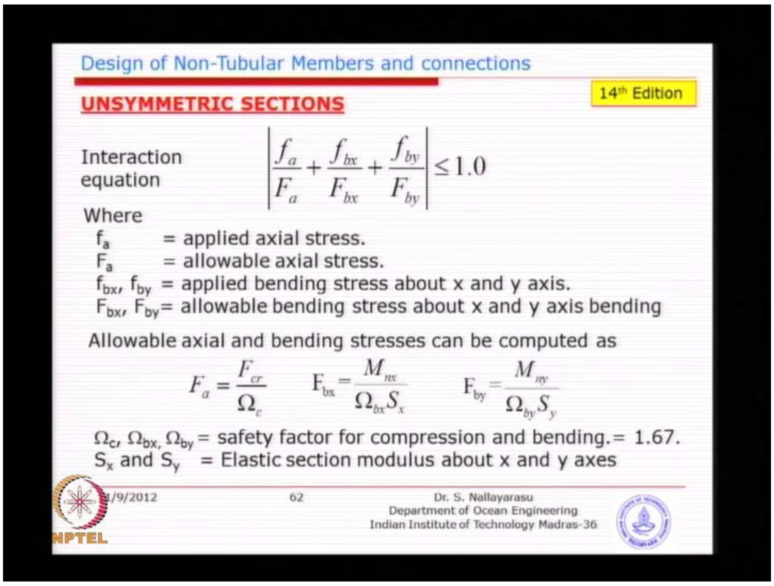

So, there is no downgrade effects on the allowable bending movements. So, that is the idea behind of course, this is doubly symmetric sections, but then for the un symmetric sections a is the does ask us to use this type of equations similarly to what we have been having in a p i one of the equation is like this of the four one of them is this way, but of course,, but of goes in here we are going to use f b x after magnifying the movement of the second-order effects that is the only difference whereas, in a p i you do not do that you actually use the nominal stress applied and basically that difference and the stresses are calculated in the following manner f b and f a are applied stresses which will be calculated from your movements obtained from the second order or the first-order analysis with factors multiplied by b one and b two and the allowable stresses are obtained by the the capacity is that you derived. So, far divided by the either the fact the safety or in case of movement you divide by the either the factor safety in case of movement you divide by the section modelers with you have already derived. So, if you substituted back you'll get back this equation the first equation you know. So, that is the different that we are trying to make only the eight by nine is missing. So, un symmetric sections you can use this for symmetric sections.

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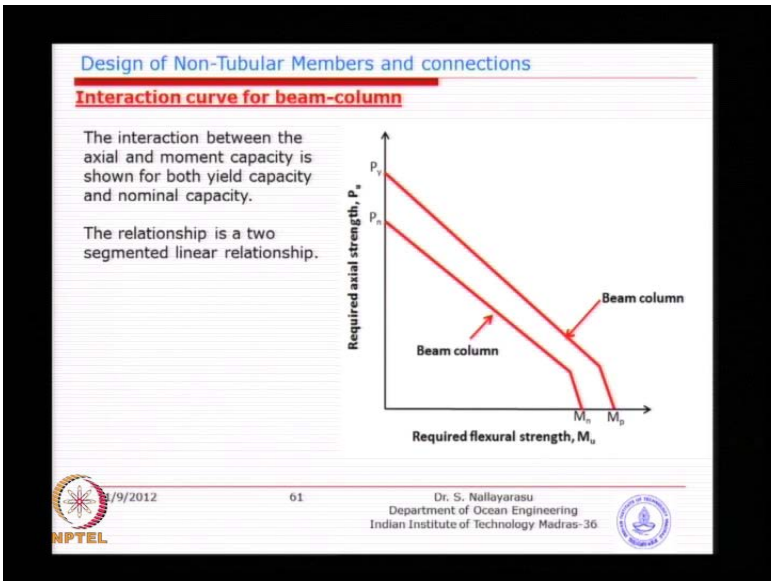

You can use this i have just is plotted typical graph of interaction diagram between the actual and. So, instead of non-linear we used to seeing the tubular connections it is a linear two segment curve you know the denoting segment one and segment two. So, that the idea behind you can plot this one of them is the ultimate other one is allowable the second one is nominal this is the ultimate just divided by the factor. So, un-symmetric sections as as you can see here the factor of safety against compression and bending is one point six seven s x s y is the elastic modulus which I think you should know how to calculate.

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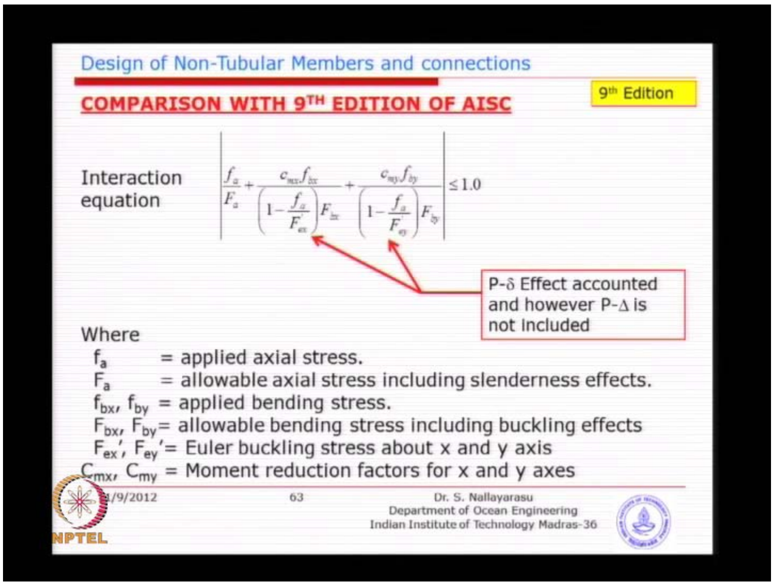

So, having done all these why i wanted to highlight here this was what actually originally proposed in the ninth edition you will even see now a p i and this a is this old edition is matching. In fact, the same equation is copied in a pr p to a for tubular sections and the difference is only the p delta effect is taken whereas, the p delta effect of the swerve frame has not been taken that is because most of the offshore structures especially jackets we always have braces that is why it has been taken indirectly.

So, if you have weunbraced frame then you will have way as wave whereas, most of the jacket structures what we are designing will actually put considerable amount of brazing and that was why if you read a p i carefully everywhere you will see that photo frames the indirect means of taking into account this p delta effect is by applying larger effective length factor if we just read carefully the tabling the a p i you’ll see that the photo frame effects are taken by increasing the effective length factor by one point two one point four something like this. So, that allowable stresses are automatically comes down. So, there are several indirect ways of dealing with it, but the best way of doing is simply doing a proper brazing. So, that the sway effects are reduced to considerable extent.

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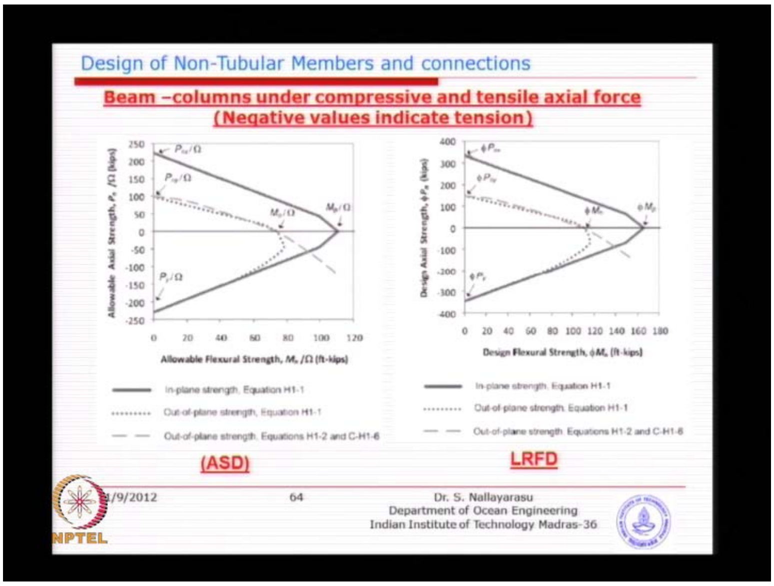

This is the diagram that have just taken from as s c for both l r m a s t just to give you an idea that you know you may have the actual force either tension or compression. So, that the idea behind. So, you see here this is the compression the negative value means is tension just a mirror image of the graph what i have just shown here this you will see on the other side. So, mostly you might have seen such an interaction diagram for concrete design in in concrete design either ac on British cods or highest four five six i again a difference is hear you divide by the factor of safety factor which is one point six seven here you multiplied by the the material factor five. So, with that i think the design of open sections which is specifically for i sections we have covered actual compression tension bending minor axis major axis shear.

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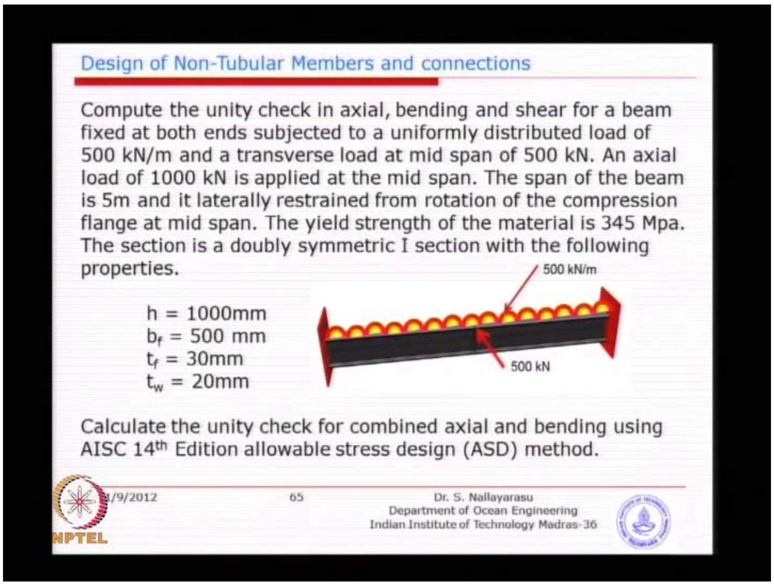

And the combination will just take a typical example problem for you to just practice in case. So, in this example i have just picked up simple plate girder fabricated girder of these dimensions the height of the beam is one thousand flanges five hundred and web is twenty m m thick flanges is thirty m m thick and just ask you to design in according with the fourteenth edition using allowable stress method in a we

have now the the idea of how the l r of the also works in parallel we have workout most of the equations are given to you you know the basically the difference is only in the capacity calculation in unity check reaming whether buckling calculations or the allowable stress calculations are allowable capacity calculations every one of them is almost similar. So, that makes you to a feel comfortable that if you are asked to design by l r f d also can be designed without any trouble because ultimately you’re going to come back after calculating the then nominal capacity either you will multiplied by material factor or divided by the allowable stress factor which will give you the design capacity or will be giving you the allowable capacity the reminder is the procedure is same. So, that is the idea behind.

So, you could expect you know the problems in both in terms l r of the or in terms of a s d. So, because we also have been introduced that the differences in the previous sessions what difference it makes with respect to l r f d and a s d by doing this exercise by this time i think we should be having enough knowledge on the idea to solve any problem given to l r of the side. So, in here we have got u d l distributer load of five hundred and lateral load applied perpendicular beam web of another five hundred point load. So, you can see here we are going to get in plane bending bending for sure these u d l will create a the major axis bending this five hundred kilo neutral is going to create a minor axis bending of course, there is no actual load. So, you could substitute the equation from what we have learned and what i have asked you to find out is the combined effect of the in major axis minor axis is bending.

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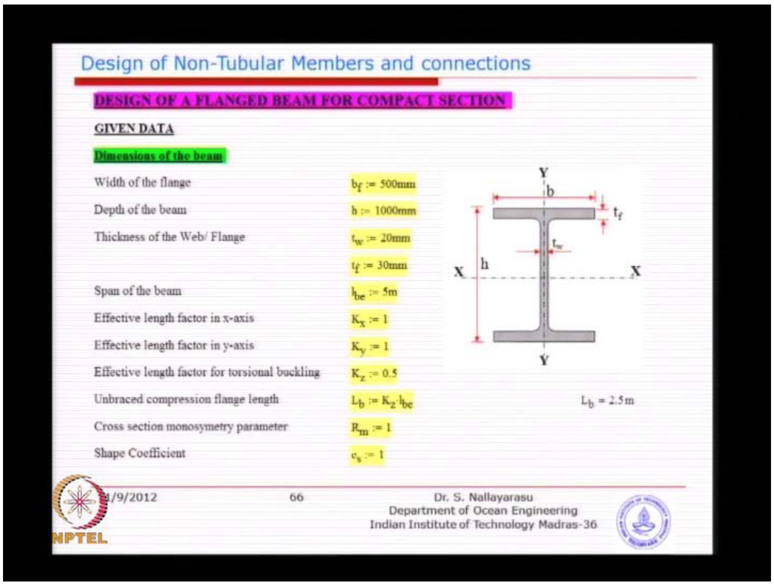

So, simply going through the parameters of course, k factors is given asone for you already and un brazed length as been given as half the beam length some where i was specified from rotation the span of beam is five meter its latterly restrained at the mid span. So, just like what i have shown you picture yesterday that along the mid span here another member is coming and joining perpendicular to the length of the members. So, that it does not allow you to rotate about its axis. So, that the idea behind.

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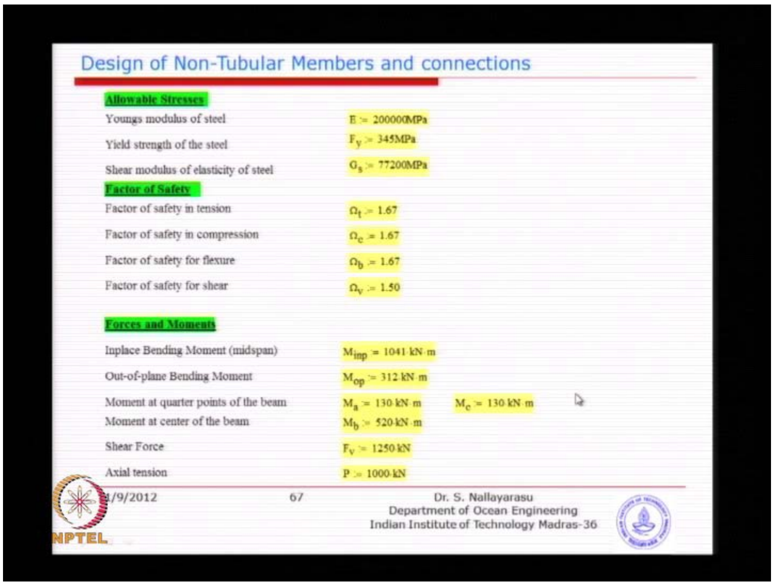

So, just substitute the parameters and right and try to calculate the all other factors which we must be knowing e value g value and basically the yield strength value is also given safety factors for actual bending and share and the applied movements you have to calculate. So, basically use this loading and you can calculate the bending movement diagram which you should be knowing which is a fixed beam.

So, simply supported beam you should be able to calculate the bending moments corresponding to and that i have done here. In fact, the tension value actual tension value is also given an extra load of one thousand kilo neutral is applied at the mid span. So, that you can also have a interaction how it is working .

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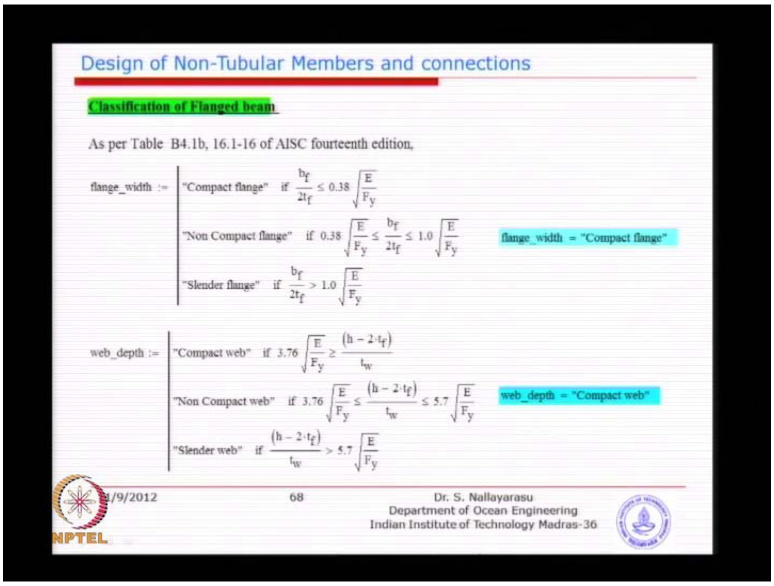

And here we are just checking the compactness of the web and the flanges and. So, you can see here both the flange as well as the web is compact just for convenience, but you do not think you'll get the same thing because in any case all the complicated formulas will be given to you as the reference for exam purpose.

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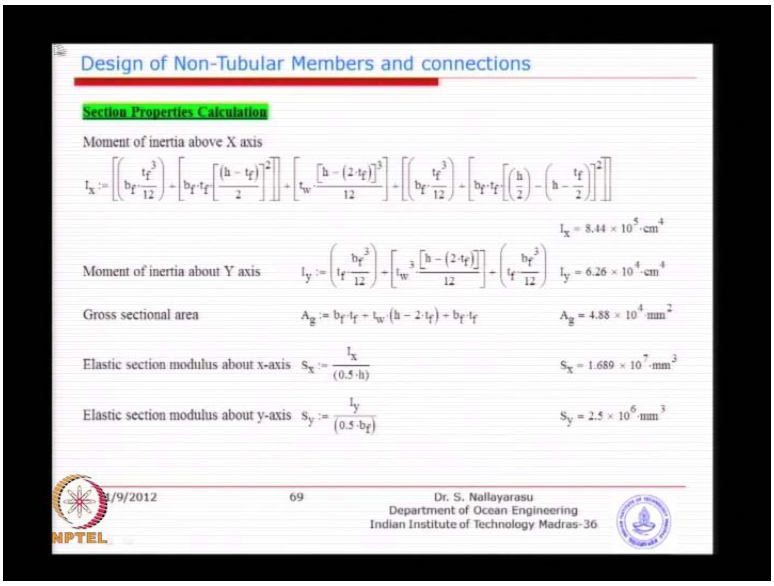

This is the movement of inertia and section modulus calculations which easy to remember, but you can also not remember this large formula.

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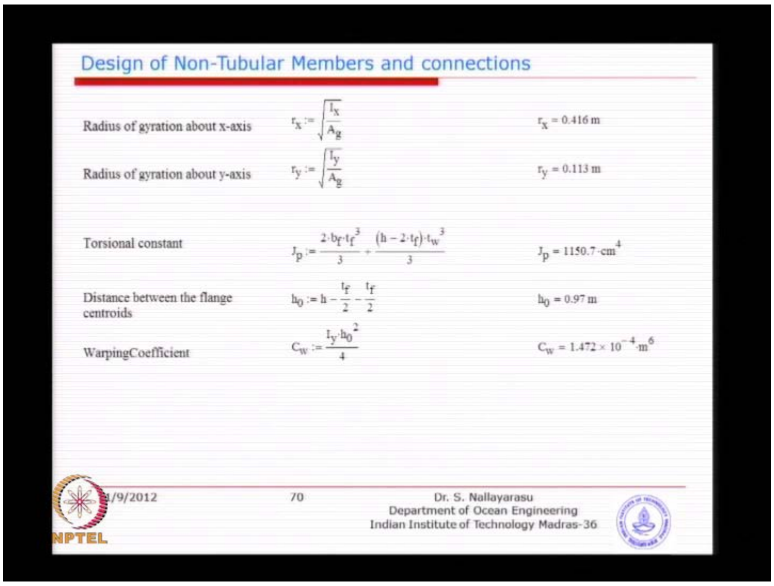

You can just do it from the basics, which is that is a gyration polar movement of inertia or torsional constant we call it we should also remember how do we do it basically width time the thickness cube divided by three and stimulating of all the segments suppose if you have two flanges one web. So, you see how we are done polar constant is basically the t cube by three plus the web is the other way h t web t cube by three point cumulatively add that will give you torsional constant and the distance between. So, all these are geometric parameters then we have reviewed yesterday this actual stress calculations and in this case is tension and basically the unity check ratio p divided by p a similarly for factor influence bending and yesterday we reviewed the the buckling parameter is l b lb is two and half meter.

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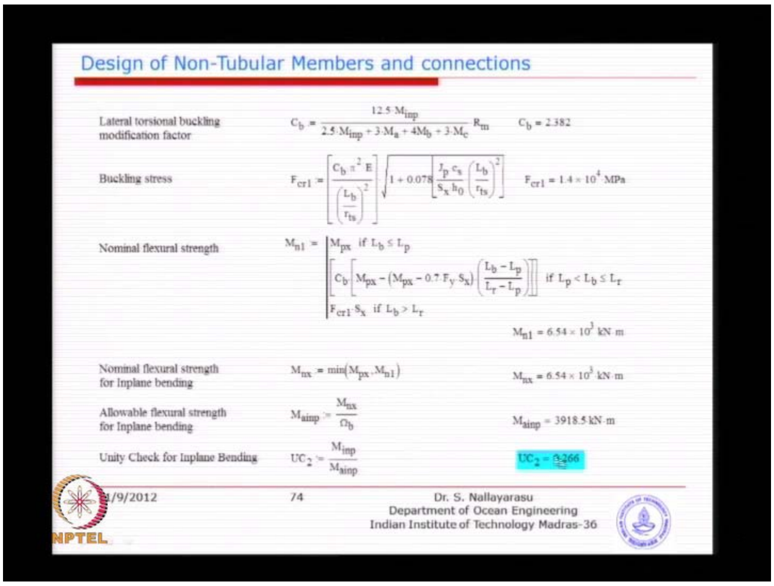

So, you calculate l r and then l p and find out, which para beach category of allowable stress is automatically calculate the f c value calculate the movement capacity and then the unity check is how much similarly the out of plain bending we have got the movement acting perpendicular that to the web and you have got yielding or later torsional buckling and similar you will find out the capacity then you will just decide which formula to use this is being symmetric sections we tried to use this formula which we learned about today and basically is seventy percent utilization of the total b. So, you got actual tension and also you having influent bending you also have out of plain bending.

So, i think it is a simple procedure exactly similar like tubular members only the equations and the idea behind and the parameters involved slightly different shear capacity weeks we just did in the morning basic idea is the calculation of c v corresponding to the stiffener effect and otherwise you'll get this c v equal to one and basically find out the capacity nominal capacity allowable and shear capacity unity check is the ratio of the applied load. So, shear also you should calculate from the applied load. So, what we have done is the of in somebody able to understand the differences because even though procedure is similar only the difference between the tubular and non-tubular now we will just quickly look at before we finish the class today the connections what are the differences, so that you could possibly designing without much difficulty.

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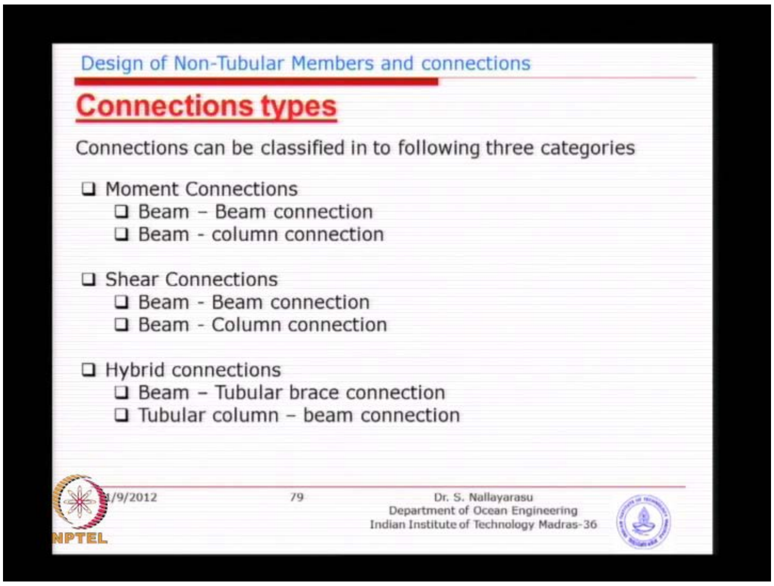

So, there are several types of connections one is the beam beam connections the next one is beam call connections and then the hybrid connections because since the superstructure the we may have beams girders or pipes because sometimes we do use pipe sections for columns. So, when the beam is coming and trying to connect with to the column which can be i beam which also can be a tubular sections. So, we just need to just see how it can be connected and how the calculations can be made that is the idea behind you can connected by drawing, but then the resolution of forces and how we make a design unfortunately none of these available in any of the course because they leave it to the professional engineering to design what type of load distribution you want to make. So, none of the course neither a p i or the a s e will give you the idea how you will renewed the forces to design it like the procedure for tubular connections we have way a elaborate procedure in a p i isn't it something like that you will not be available.

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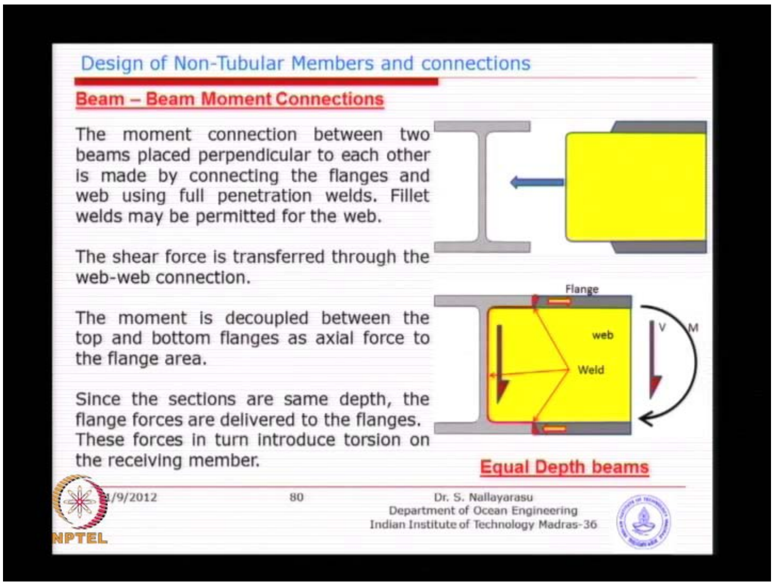

So, we need to justify ourselves how we want to deal with it. So, let us quickly look at the configuration first basically a beam beam connection one beam is going and perpendicular and another beam is trying to connect like this. So, you could see here there are two flanges the flange to flange connection and web to web connection. So, normally what we do is we just you have to remove this portion of the flange and just come and insert and you will have a welding all along the interface between the web and the flange and web and web and something like this and then also there will be a connection between two flanges of the winds now when you apply a vertical load which is coming as a sheer and also a movement. So, you can see here how it will actually develop shear will go as a perpendicular member to the web as a sheer of course, we have agreement.

Welding here that will not be too effective because most of the the load will be taken by the vertical weld which is very stiff compared to the top and bottom weld whereas, when you look at the bending movement you will be able to decouple which is basically the fundamental idea of the decoupling the moments between the strong points seethe top and bottom you have large web flange area. So, that is where it will get decoupled. So, you will convert has a actual load at the top and bottom tension and compression couple. So, this is where you’ll find that the welding between flanges have to be stronger enough to take this couple load otherwise what will happen will just come away. So, that the basically the idea behind how you can decouple a force when you are applied has a movement from a incoming member. So, this basically called movement connection because we are able to decouple this movement into actual force on the top and bottom flange and transmit to the the parent girder now what really happens with this i b m which is receiving these two couple forces is too small then it will introduces a larger tarsantant which will make them into fail unless you have some other connection going here and the backside to keep this one from balancing. So, you need to make sure that such loads are designed such loads are taken and designed. So, that the beam is receiving these loads are able to survive otherwise it will fail by torsion and normally this type of torsion supposed to be avoided.

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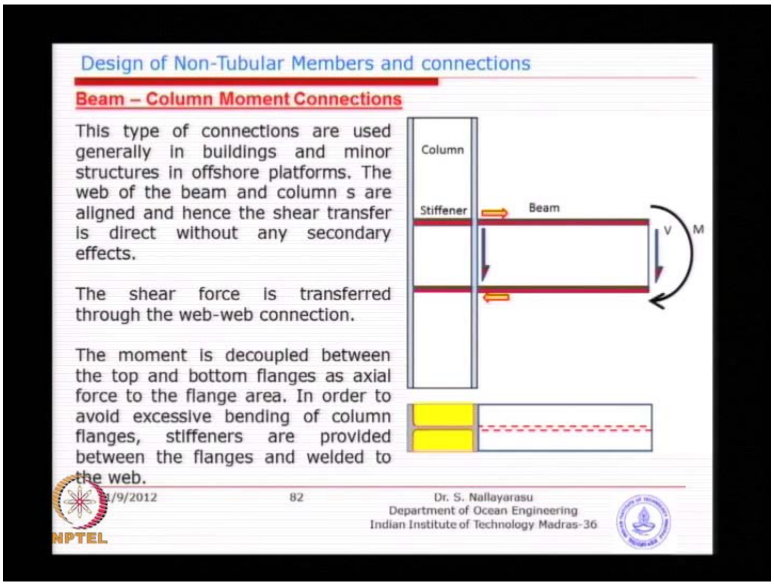

So, how do we avoid this simple idea is you go here were is that by taking this connection connection i think sketch is missing instead of doing this connection you just remove this welding and remove this welding. So, what will happen you know there will not be any decoupling happening because there is no receiving flange here. So, only shear will be able to take say cannot apply the movement here. That means, the beam the beam shown in yellow colour needs to be design using a simply supported boundary conditions like you will be using w l squire by four instead of w l squire by eight instead of a fixed beam which is w l squire by twelve or twenty four something like this. So, basically either you design this that is going to come or you just do not do this welding to avoid this couple forces, but then you design this beam for an increased bending movement because once you are assuming once you have a simply.

Supported condition your bending movement for this member will be larger. So, you will make the beam stronger enough. So, that may be called simple share connections which is slightly different form i have given. So, this is beam beam connection is just purposely made movement connections.

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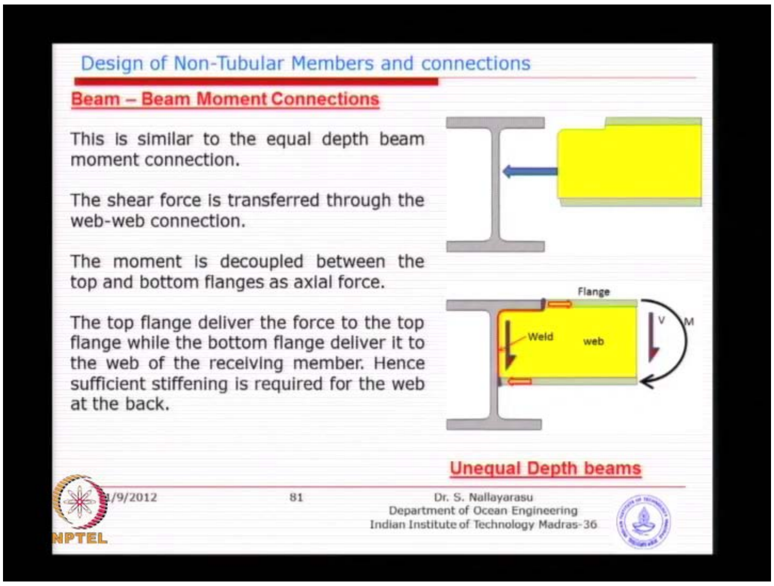

You can also have a unequalled depth, but of course, then it does bigger enough damage at some location along the web. So, you may actually have to stiffen this side. So, that this web is a able to take this force coming from decoupling effect otherwise you will see a the larger bending here and by that web will fail. So, the equal and un equal. So, only the difference is the web local buckling is to be taken into account the next i s the beam column instead of beam beam you have a beam column very commonly used in industrial buildings in d on shore structures also buildings.

Sometimes free fabricated buildings people use this type of connections very often and basically you can see here the web of this and web of this is aligned in the similar lines. So, that you do not get buckling number one and the bending effects is transported to the parent column by means of a decoupling effect which needs to be taken and transported the web. So, ultimately the web as to take; that means, this stiffness shown in red colour is going to prevent flange from the buckling and bending otherwise what will happen when the forces transferred this flange will start rotating. So, unless you connect the two flanges by this stiffener and make sure that the load is transferred to the web because of sheer. So, that is the idea behind you need to design this stiffness which you can make a simple basic mechanics calculation by transferring sheer. So, you can take the fifty or forty percent of the stress each stiffener will able to take simple connection how do we make a simple connection is very simple you know the basically the movement is not taken. So; that means, you will not bring the flange to welded towards here only shear can be transferred because you would not be able to decouple because there is absolutely no flange to decouple flanges are removed.

So, what we normally do is you remove a flange in the near vicinity of the connection. So, that only can transferred sheer in this what will happen the design of this beam have to be taken into account and corresponding boundary condition which is basically a simply supported condition and; that means, this beam will become slightly bigger instead of w l squire eight you w l squire by twelve you will w l squire eight because it is supposed to be a boundary condition corresponding to simply supported.

So, that is the price that you are paying for, but then you do not need to really stiffen anything here because there is no bending transferred has a coupled reaction which; that means, i do not need to really stiffen here. So, which is alternatively easier for fabrication many times people prefer this, but of course, there is a price to be paid for…

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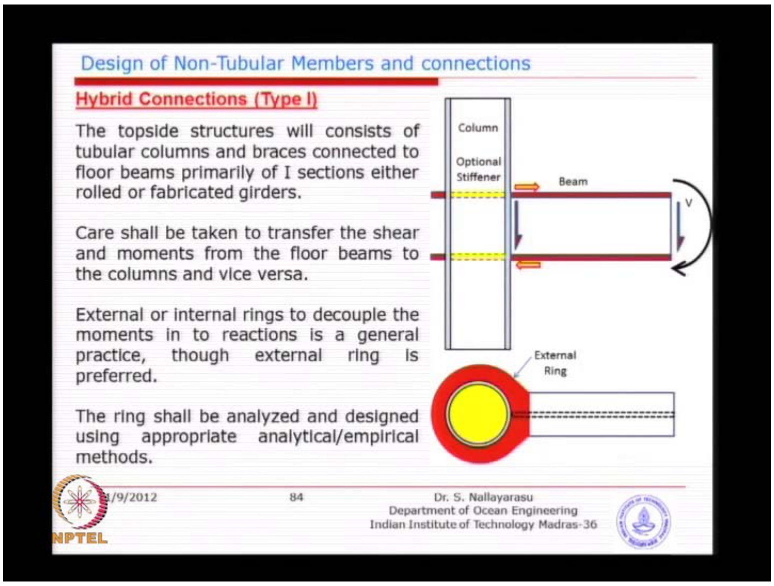

So, the next connections is basically the hybrid connections three types one is circular column do, but incoming i beam how do we do this connection?

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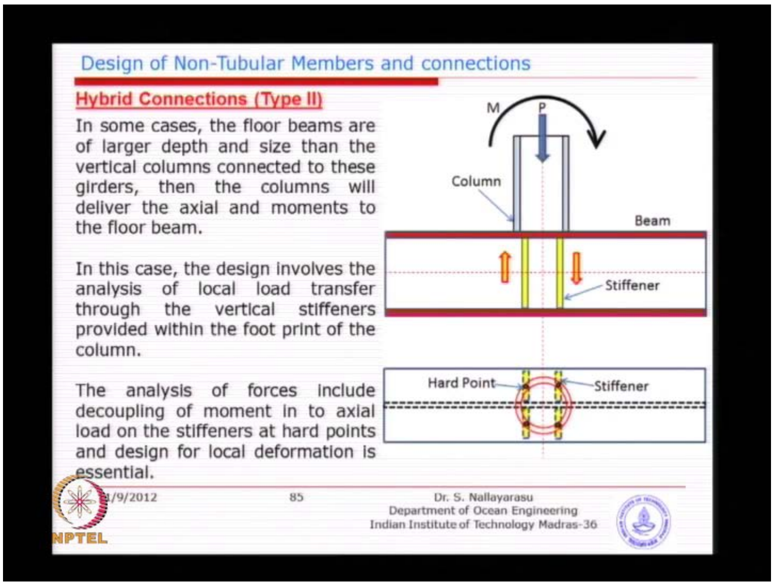

Second one i think beam is a i b section, but the incoming brace is a circular circular section which is also very combatant of the third one is inclined braze.

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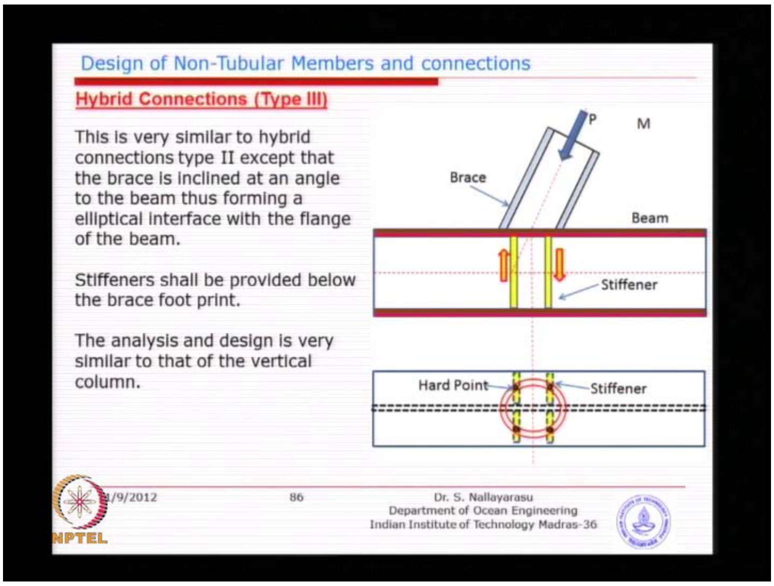

So, you will see that all three of them have little bit difficulty in designing especially when you take first one you see here you have a column and we have an i b m coming game is not easy to connect what we need is basically to avoid local buckling of the pipe because the loads are going to come. So, much concentrated when you apply a movement what happens you know such an axial force will make pulling up the that tube across the section which i think we where looking at during our tubular connection design such a stress is not good because it is going to create local stresses which will make the the pipe to fail by buckling and that is why we need to distribute the load all around by making a horizontal stiffening rink. So, the load will go has a shear transfer between the pipe and the stiffener by doing this kind of stiffening we avoid the local effects, but of course, sometimes we also do inside stiffening because that will make sure that there is no local effects, but then all depends on the the diameter of the pipe diameter is too small we would not be able to go inside and do this stiffening effect normally we tried to do it outside, but if it is larger diameter you could also do a internal stiffening which could look very neat because nothing is presenting in the outside.

So, sometimes people that. So, in any case how do we do this design that is the main thing the shear transfer is very easy because we can find out the what is the height of the web and multiplied by point six times your thickness will give you the shear four transferred whereas, the movement transfer you need to decouple the forces into such type of point loads and design this ring this ring can be design using close from solutions i think if you look at some of the textbooks you will be able to get the beams covered in nature i think you might also have studied in your applied mechanics covered beams. So, you can just take the load and apply and find out like very similar to arch only here is a double arch closes section.

So, you can design the ring and then allowable scan be taken as sixty per center seventy percent and then these ring needs to transferred the forces by means of a c circumference shear along the pipe section. So, that is you will have two make this design and this is very commonly adapted in offshore topside structures very very common without which we cannot design any connection because most of the site side structures columns are pipes beams are i sections and you will see that many many times you will encounter this that is why i just call them hybrid connections the second type is exactly opposite the receiving member is i section which is also common because in flow may be requiring middle support. So, at the time you’ll have a column coming and supporting it in hear is exactly the reverse problem the the member coming and connecting is pipe section carrying actual load or bending movement needs to transfer this load to the web of this section. So, that it can go to the neighboring support.

So, in here we have a slightly complicated problem. So, you can see here in the plant view you have a circular sections shown in red colour delivering forces on the flange of the the beam unless you have this flanges are stiffen supported sufficient enough the flange will fail by local buckling which is what supposed to be prevented otherwise the beam will also fail once the plants fails will not have a adequate capacity to even receive this actual forces. So, what we need to do is decouple the forces into actual loads on the yellow colour stiffening effects given their and design them as a short column as per the procedure what we have studied just now the third one is also you similar effect, but only thing is braze is slightly inclined.

Of course, some component horizontal component will go along the actual loadon this member in actual an this member the vertical component of the p will come and act as a point load on these stiffening effects only thing is the position of stiffening needs to be allied properly do not put the stiffener outside you need to keep the stiffener within the ferry ferry of the intersection the idea of this the dot points or the hot points what i have given because that is where the load will just start jumping because that is the stiffener location crossing the type location that is where the stiffness is higher. So, if you imagine you take about this point there is no stiffener at the point below. So, load will not transfer because there relatively relative this point. So, this point is weaker this point is stronger. So, that is the point of intersection.

So, you keep the stiffener outside is no use still it as to travel through the flange by making the flange to bend then only it will go to the stiffeners. So, if you keep the stiffener inside the hot point will take the loads sufficiently directly. So, the last one is the similar only thing is the braces inclined, but here there actually load will be taken as a horizontal load on vertical load depending on the angle you can resolute this forces the horizontal load will go on the horizontal shear to the beam and the vertical load will go through the the stiffeners ultimately the stiffeners will carry the load to where it as to go back to the web only because the web carries the shear and take to the supports.