Mechanics of Material
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Pressure vessels and failure theories
Lecture - 95
Mohr - Columb condition

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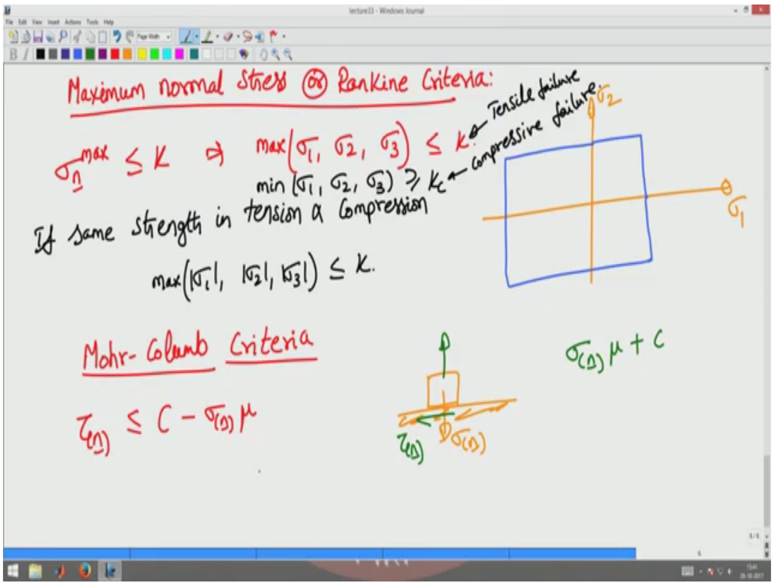

Let us look at the next criteria which is Mohr-Columb criteria. What this says is it says basically that the shear stress at any plane should be shear stress in any plane must be lesser than or equal to the cohesive friction or the wet friction or the gluing strength of the planes minus the normal stress in that plane times the coefficient of friction mu ok. That is what this says is if a block is moving on a surface, you have frictional forces coming you know difference upon the normal stress on that surface right between the block and the surface.

That normal stress is sigma n and the shear stress that resists this motion is taus of n ok. So, the resistance to this shear stress depends upon that the dry friction between the surfaces, which will give me resistive force of sigma n times the coefficient of friction mu plus a wet friction term, which is c which is like if I glue the surfaces there be glue centroid which will resist there as withdraw of other there is a compressive normal stress or tensile normal stress. On the other hand if I add a tensile normal stress which is positive, the glues and reducers that is what this equation tells you ok.

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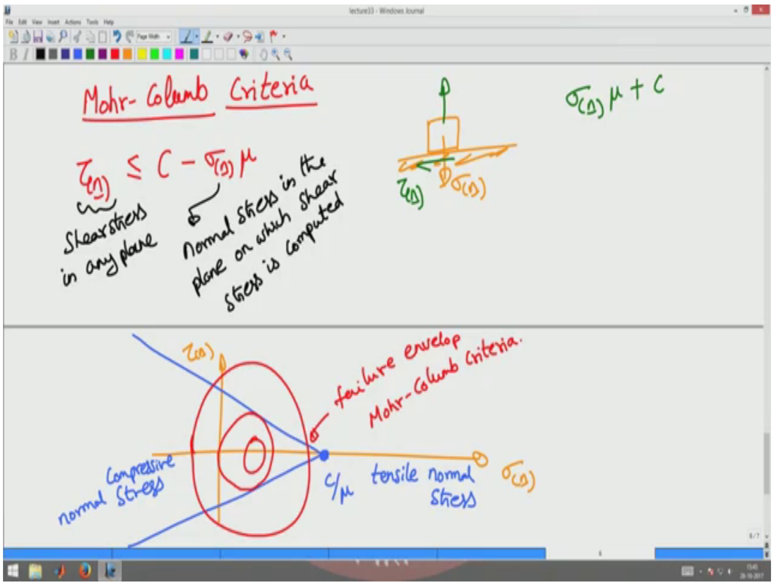

Now, let us interpret these equation terms of the Mohr circle. In terms of the Mohr circle I have taus of n this axis represent sigma of n ok. So, in this small circle axis what this tells you is the relationship in taus of n and sigma or n is given by c minus tan phi or coefficient of friction times the normal stress ok.

So, basically if it as a tensile stress the shear stress goes to 0 at a particular point. So, basically I have a line I have this line do not have anything beyond that, this is a point this point is given by C by mu that is a limiting tensile strength. Note we have plotting the tensile normal stress along this axis, this is positive normal stress and this side represents compressive stresses normal stress. This is tensile normal stress this is a tensile normal stress and that side is compressive normal stress ok.

So, if a tensile normal stress exceeds a particular value it will fail, but what are be the compressive normal stress if it is a hydrostatic set of stress in our fail that is what this theory tells us ok. And if you draw Mohr circle which is contained within these two failure envelopes if a circle is the Mohr circle is like this it will wont fail, the Mohr circle is like this it is on the verge of failure, the Mohr circle is like that is on the verge of failure a Mohr circle which does this it is not possible ok. That Mohr circle is not possible because it cuts the failure envelope. So, such a stress state is not possible ok.

So, this blue lines represents the failure envelop for Mohr columb criteria. Note till now we have been writing the criteria's in terms of the principal values or the principal invariants, but Mohr-Columb criteria can be written in terms of the principal invariants, but it is a complicated expression for this course we will would not do that whereas, we leave it at a intitule level variant we write it in terms of the Mohr circle diagram ok. Where you have to understand that this taus of n is the shear stress in any plane this is a shear stress in any plane and this is a corresponding normal stress in the plane on which shear stress is computed.

So, it is possible that there exist phase where there are zero shear stress, but it is not possible to our planes, where the shear stress exceeds exists, but there is no normal stress at all ok.