Mechanics of Material
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Pressure vessels and failure theories
Lecture - 96
Drucker-Prager Condition

So you have to map it in a pure shear there is no normal stress and pure shear only the wet friction governs.

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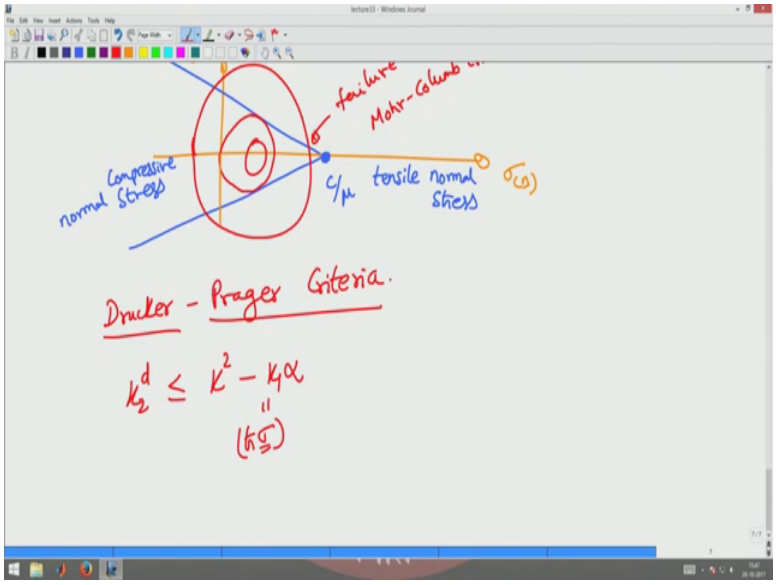

So, that is some of the observations you have to make in here ok. The final criteria that we want to look up, is the Drucker-Prager criteria, what this tells us is this similar to Mohr-Columbs criteria except that it places in terms of the invariance directly ok. We saw that k to d is nothing, but the octahedral shear stress you want that to be lesser than some kappa square this like a wet friction similar to the C, that played a role in Mohr-Columb criteria minus k 1 this is a first principle invariant of the stress that is this is nothing, but trace of sigma, which we saw is related to the hydrostatic pressure trace of sigma by 3 is a hydrostatic pressure.

So, it is minus k 1 times some factor alpha is what the Drucker-Prager criteria tells us this alpha is like a dry friction coefficient, it comes in the Mohr-Columb criteria ok. We

will would not go into more details of these failure criteria's which will go in more detail in either soil mechanics course or in advance course in mechanics of materials ok.

So, before finishing couple of more points first point is it understand that this failure criteria's there are many of them because there is not one failure criteria that governs the failure of all materials. So, depending upon the material first you have to choose a failure criteria and then you have to find the parameters in the failure criteria based on particular test that we do on that material.

Second point is possible for materials to have strength greater than the uniaxial strength of the material; Example pressure insensitive material like exhibiting Von Mises pressure criteria.

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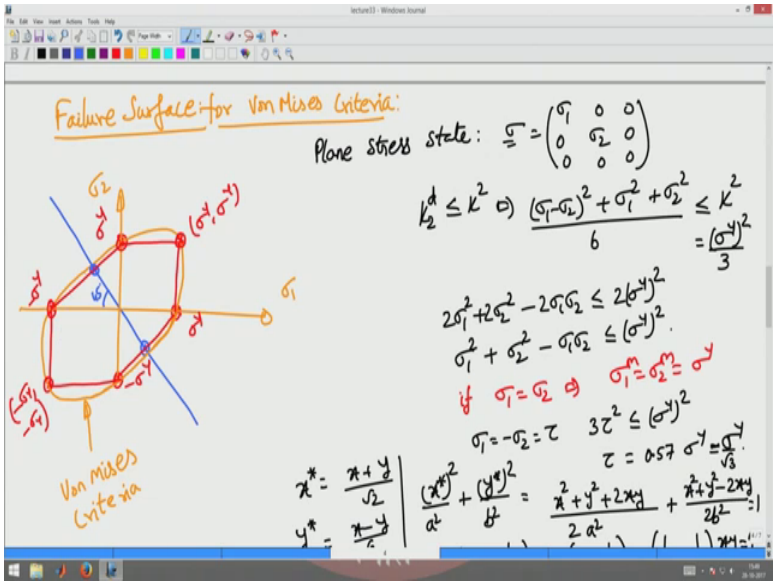

If you see here the ellipse will be such that. So, you joint this line, you joint this line in tension tension or compression compression extent the axis the uniaxial strength of the material. So, it is possible that the strength can exceed the uniaxial strength probably you applied some small tension the other direction ok.

And by the way what is this red envelop here? It is a Tresca envelop which is inscribe inside the Von Mises envelop only if I match with uniaxial yield stress and the other hand if I match with the shear stress, the Von Mises curve would be inscribe between the Tresca criteria.

So, it is not that one failure criteria is always conservative and the other is unconservative, it depends upon where your matching the failure criterias and you have to be able to articulate where the maximum difference occurs in each of these failure criterias Tresca and Von Mises, Rankin and Mohr Columb Rankin and Drucker Prager in all these cases we you can compute analytically, but in the maximum difference occurs even though they agree upon in the uniaxial yield stress condition ok.

So, these are some of the pointers on what you can be tested upon in failure criteria or what you should be aware of in descending structures, where you want to prevent failure ok.

Thank you.