Hello learners!!
Welcome to the lecture series in Engineering Geology. This course is for TYBSc students in the semester 5. The paper code for this paper is GED 101.
Today we'll be talking about Engineering Geology unit 2 wherein we'll be talking about tunnels and stress conditions in tunnel.
I am professor Vinita Mayenkar from Dhempe College of Arts and Science.
For the present session what we'll be discussing is definition of a tunnel, different tunnel terminologies, parts of tunnel, types of tunnels and what are the stress conditions acting in a tunnel.
After completing this session students will be able to define what is a tunnel, understand the
different parts and terminologies
used for tunnels, understand the
different types of tunnels and what are the different stress conditions acting in tunnel.
Now this image is of nothing but a tunnel
let us try to define what is a tunnel. Tunnel by definition is an underground route or passage driven through the ground without disturbing the overlying soil or rock cover or we can also define a tunnel as a horizontal or nearly horizontal excavation that is open to the ground surface at each end that is it is open from both the end.
Now that we have seen the definition of tunnel let us move on and define some terminologies which are related to a tunnel design. This image shows us the different terms which are related to tunnels. Now in the image you can see that this part which is shown as a straight line is nothing but a tunnel because it is open from both the end this what is marked over here is nothing but a hill and this excavation which is open from both the end is the tunnel.
Now let us see what is a shaft this vertical or nearly vertical excavation which is open at the top on the surface is called as the shaft
let's define what is a drift or adit. Drift is nothing but a horizontal excavation which is similar to tunnel the only difference between a drift and a tunnel is that drift is open only at one end it is closed at another end but tunnels they are open on both the ends and both are horizontal excavations whereas shaft differs in a way that it is vertical or nearly vertical excavation.
let us define what is a raise or a stop. Whenever an excavation is
inclined and it is driven from the main tunnel or drift in the upward direction.
You can see it in the image shown over here from this drift or edit it is in upward direction that is called as a raize exactly opposite to raize is winze. winze is an inclined excavation which is driven from
the main tunnel in the downward direction now winze is not marked in this figure but it is exactly opposite to a raise. raise is from the main edit or drift in the upward direction whereas winze is in the downward direction.
Now let us see what are the different parts of a tunnel.
Now this is a schematic sketch which is drawn which shows us the different parts of a tunnel.
Top part which is marked over here is called as the back /crown or roof of the tunnel.
It is nothing but the top roof of the
tunnel. This the sides of the tunnel which are also called as the walls of tunnel. Spring line is that point where the crown is coming in contact with the walls of the tunnel so that is what is called as a spring line and the base of the tunnel is nothing but the floor or the invert of the tunnel. So when we define the different parts of tunnel we are supposed to define what is back or crown of the tunnel, spring line, walls and floor or invert of the tunnel. Now this is an image of a tunnel wherein you can see all these parts which i have marked in

the schematic diagram this is this portion is called as the crown or the roof of the tunnel this are the walls of the tunnel and this is the floor or invert of the tunnel now where this crown is coming in contact with the wall that is this place that is this place is called as the spring line of the tunnel

I hope the different parts of tunnel are very clear to you all.

So now let us discuss the different types of tunnels. This types are dependent upon the different uses for what they are constructed.

Now when we talk about traffic tunnel the primary purpose of this tunnels are for the movement of vehicular traffic. Hydropower tunnels are for generation of hydroelectricity. Public utility tunnels are for different public utilities like for example for transportation of oil or for supplements for creating subways are also a type of public utility tunnel. Diversion tunnel is a special type wherein suppose there is for there is construction of dam going on a river channel then the area where the dam is to be constructed needs to be dry and for that purpose the river water is diverted in some other direction by making use of diversion tunnels and lastly discharge tunnels this are specifically used for discharging water from one point to another.

So depending upon the use there are these different types of tunnels. Now whenever we do tunneling work there are different stresses which are active in tunnels.

Now let us see what are the different stress conditions which are active in a tunnel.

whenever we excavate or do an underground excavation the rocks

are under tremendous pressure because firstly they are lying at a very deep depth and because of the load of the overlying rocks and sediments they are under stress the outcome of this stress is strain provided there is a space for movement and whenever we do tunneling work there is this space which is given for rocks so that it will rebound back in the in the form of strain.

let us see what is this residual stress which is active in tunnel. stresses which could not produce any displacement only because of one reason that is confinement of the rock mass is called as residual stresses now whenever there is confinement the stresses are present in the rock in the form of residual stresses but if there is no confinement rock particles are displaced and this movement depends upon how much is the magnitude of the residual stresses. there may be only a small displacement with insignificant rupture of rocks or there may be very large displacement involving very violent movement

and this phenomena is nothing but pressure relief phenomena so whatever residual stresses were present in the rock they are released in the form of movement violent movement and that phenomena is called as pressure relief phenomena. In nature there obtain a system of self-balancing shear stresses which makes material draw inwards and this phenomena is known as arching that is there is neither generation nor release of pressure and because of arching even though we are doing tunneling work

all the material which is lying on top does not collapse into the tunnel. Arching involves radial stresses acting normal to the wall of tunnel and circumferential stresses acting parallel to the circumference. The radial stresses which are present at the wall is zero but progressively increases inward as long as shear strength of the material of the tunnel opening is more than the corresponding shearing stresses. the result resulting from the overburden there will be no failure that's why even though we do tunneling work the overlying burden will not fall into the tunnel plus there can be lining which can be done in order to

give more support to the tunnel so that there is no rockfall.

I hope this module is clear to you all.

For the present module I have referred to these books.

Thank you and see you for the next session.