Surface Mining Technology
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Lecture No. 05
Stripping Ratios and Pit Layouts - III

Welcome you to the fifth lecture of Surface Mining Technology.

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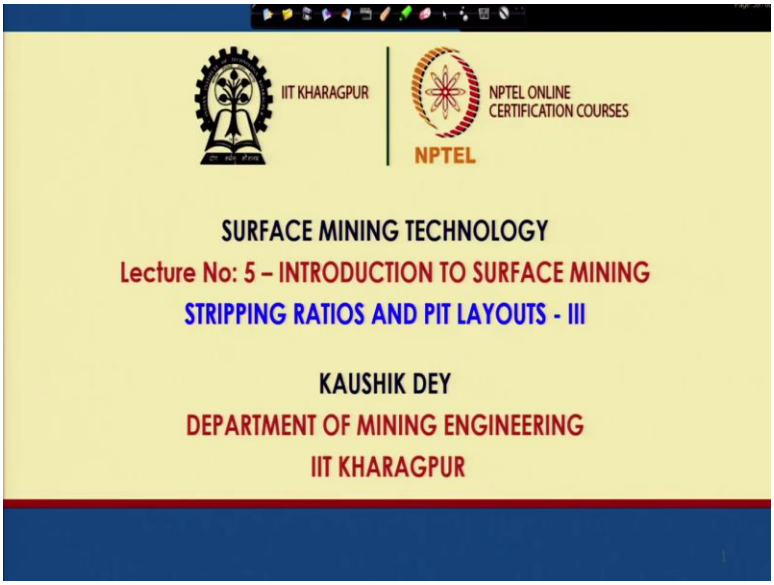

This is the last and fifth lecture in the Introduction to Surface Mining and the third lecture on the Stripping Ratios and Pit Layouts.

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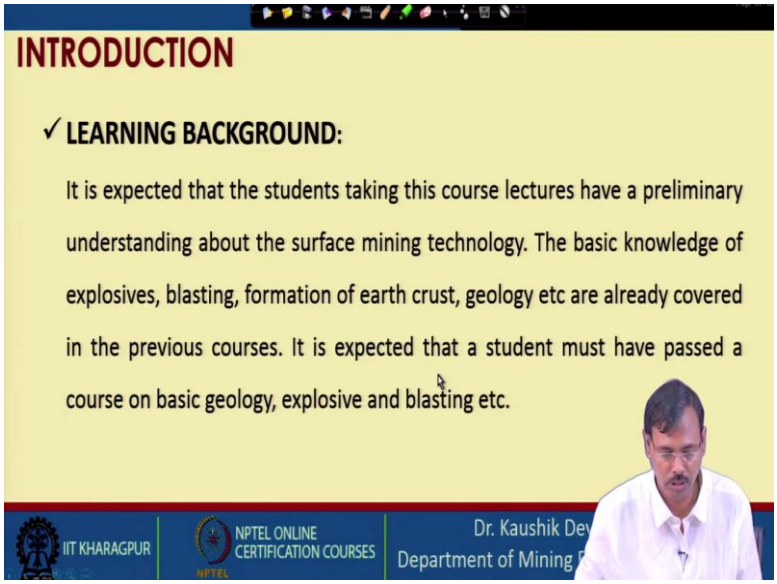

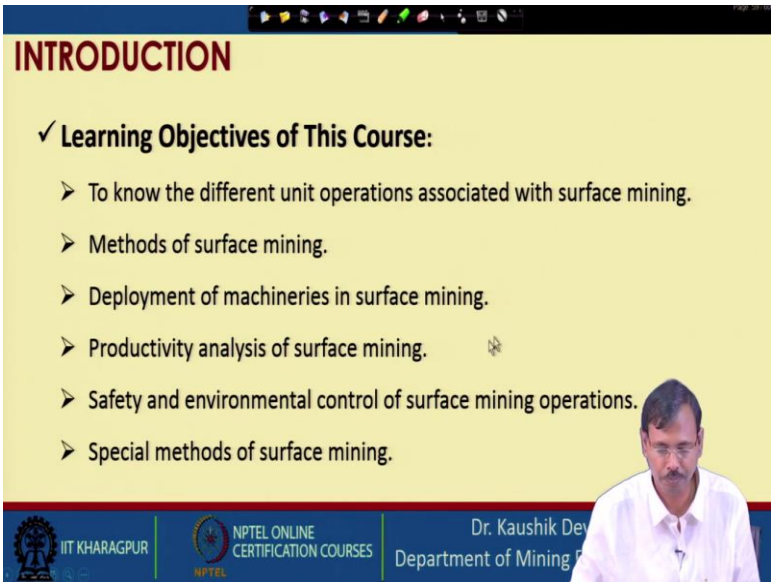

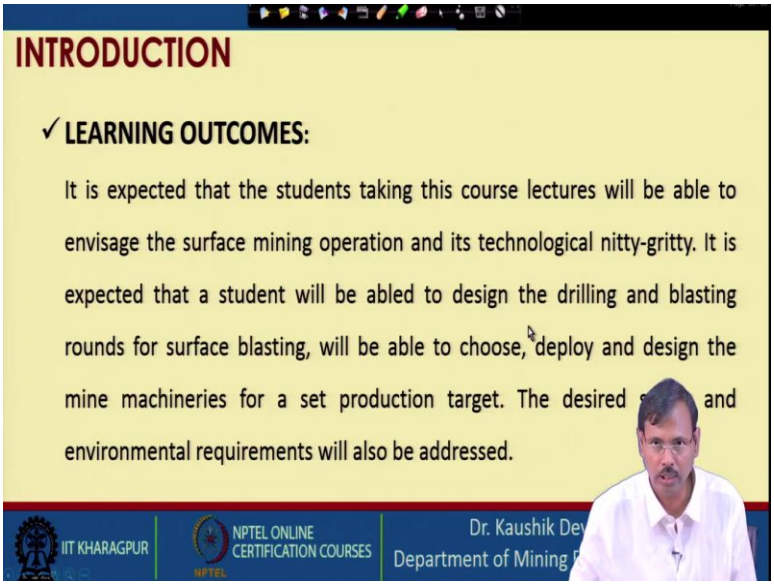

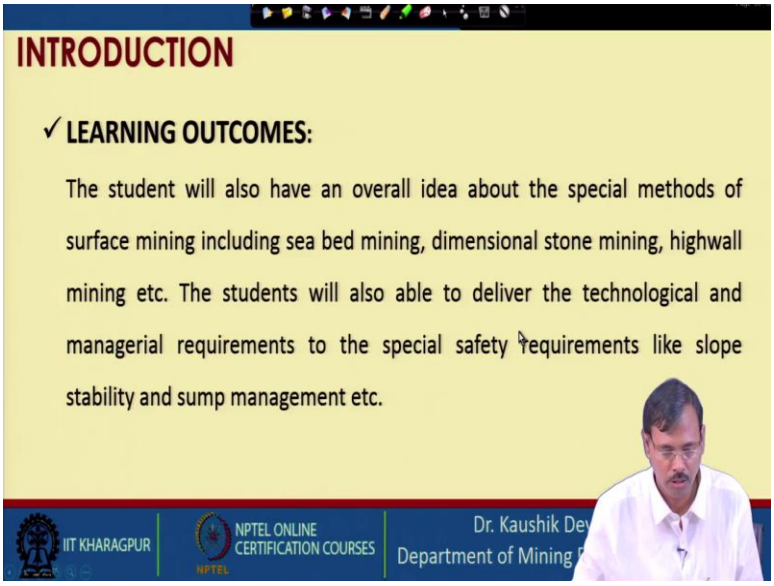

We have already discussed these learning backgrounds for surface mining. We have also discussed the learning objective of the course, surface mining technology. And we have also discussed the learning outcomes of surface mining technology.

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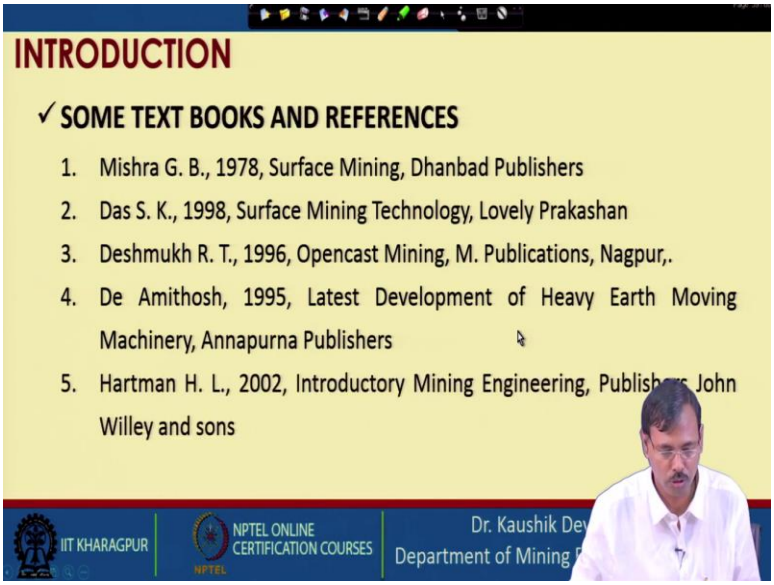

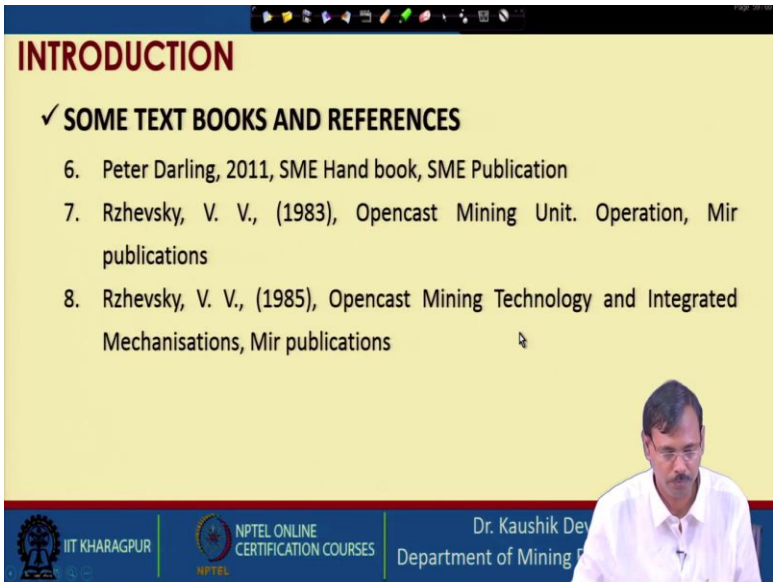

Now, these are the textbooks and reference books.

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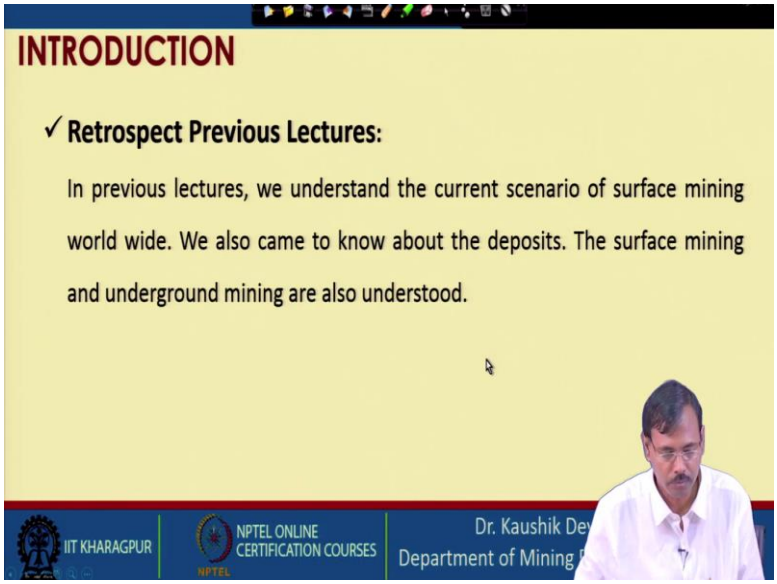

Now, let us retrospect the previous lectures. In the previous lecture, we have understood the surface mining scenario. We also covered the different types of stripping ratios, and based on that; we have to decide whether we will go for surface mining or we will go for underground mining. So, these are the strategic decision, economic decisions, technical decisions; based on that, one has to decide whether they will go for surface mining or they will go for underground mining.

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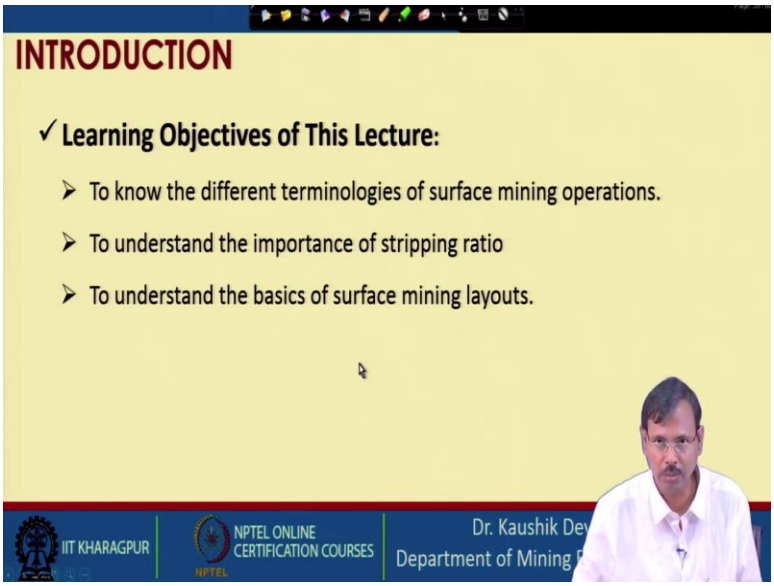

So, the objective of this lecture is basically the same as we have discussed understanding the different terminologies. We will also understand the importance of the stripping ratio that is discussed. The stripping ratio is basically giving us the idea about how much overburden rock has to be handled for taking out the ore. And we will also understand the surface mining layouts, how the mine plans are made, and that can be shown.

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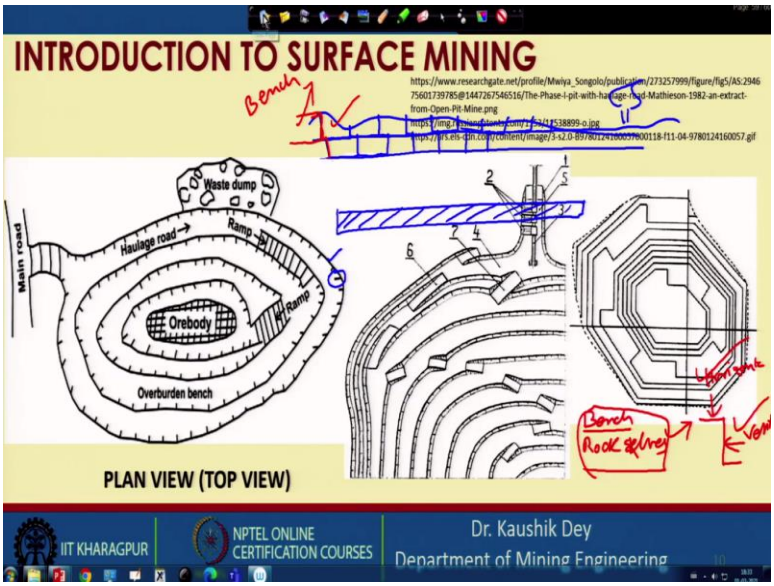

So, as we have covered the stripping ratio, we will directly start with the mining layout in this lecture. This is the most common layout which is practised in mining. So, this view is basically the plan view or top view. Now, let us understand the way we go for swaying the layout. You see, there is a line having some dotted line towards the insight. This is basically showing us the phases of the phase of mining working. How is it described? Let me show you the plan and sectional view.

Surface mining is nothing but the excavation of the horizontal slices. What is the meaning of that? That means if this is your surface and you are having to say it ore body is lying here, like this. Now to excavate this, what we will do, we will first take out the horizontal slices like this. And to do this, what we have to do, we have to take out this slice first. Then we have to take out this slice, and then we have to take out this slice, then this one, like this way we have to excavate the slices and, in the bottom, also will start excavating like this.

Now, this part you can see is shown like this, and this place is basically kept so that this portion should not topple down to the bottom. So, basically, we are taking out the slices, and for these, whenever we have taken out this one, this is creating a remaining rock portion like this. So, basically, this remaining rock portion that is available here is called a bench. So, what is a bench in surface mines?

A bench is basically a rock self which is having an almost horizontal surface, almost horizontal surface and almost vertical surface. So, the bench is a rock self which is having a horizontal surface and also has a near-vertical surface. So, basically, in surface mining, what do we do?

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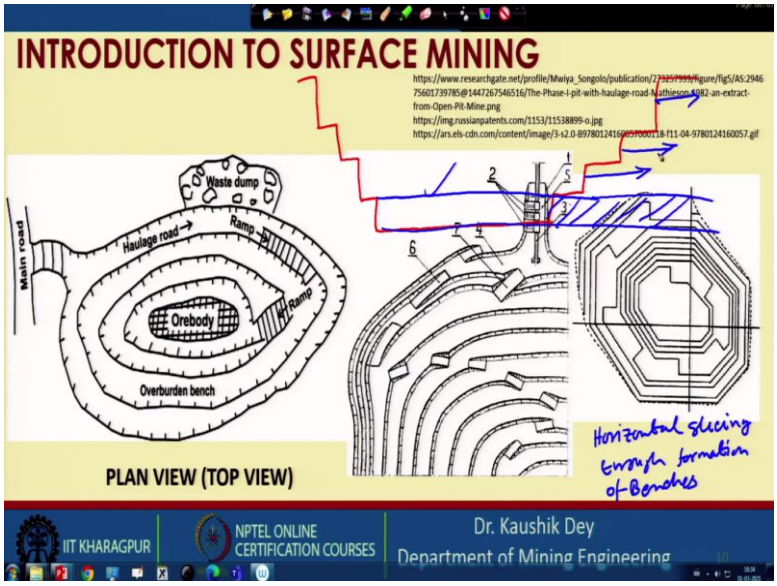

In surface mining, we first formed the bench, and by this way, we formed the bench, and here we had, and here we have our valuable products, here we have our valuable products, this part is already excavated, and this part is the remaining there. So, we have to take out this one. So, we will move this one on this side, move this one on this side, move this one in this site and gradually take out this one.

So, surface mining is nothing but the horizontal slicing, horizontal slicing through the formation of, formation of benches. So, it is the horizontal slicing through the formation of benches. So, we are forming bench and we are slicing the rock. So, this is the surface mining technology in nutshell.

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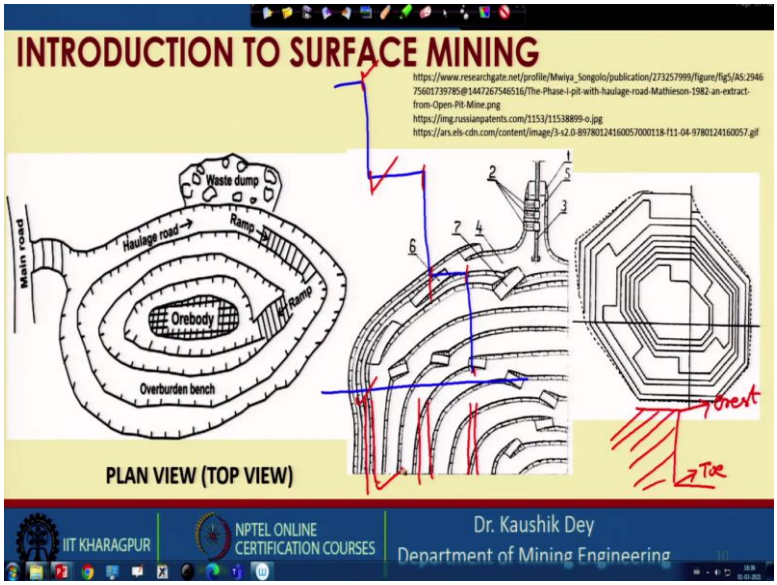

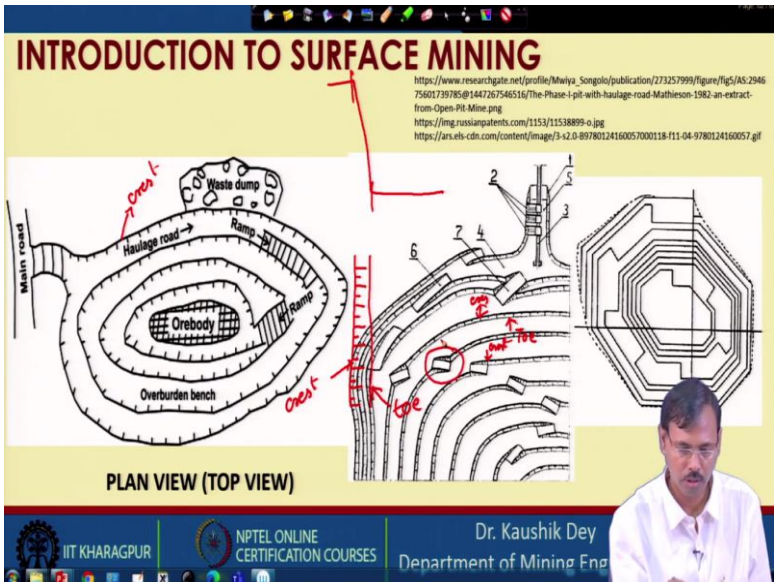

Now, if you are looking at one bench part, if we are looking at this and say we are, this is the sectional view, and we have to go for drawing the plan view. Then what will happen if we draw this plan view this part, this part is this one, this part is this one, and this part is this one, but in this close to in this, this is another part. So, this is the next part, this is another part and this, this is the next part and here is another one so, this is the so, it is basically showing this one.

This is the first part, and let me draw the bench once again. If you look into the bench, this is the bench. This is called the crest of the bench; this is called the toe of the bench. So, this is the crest line. So, this is the crest line and this is the toe line, this is the toe line. So, whenever we are

basically drawing the layout or showing the plan of a mine, in that case, we are keeping this in our mind.

So, let us see once again if this is the bench, then this is the crest line. This is the toe line. So, this is the crest, this is the toe, but how you will understand which one is a crest which one is toe? So for this, we show it like this. So, these lines join the mainline, which basically indicates the crest. So, this is the crest line through which these small lines are coming out that is crest line, and the line which is free is, and the line which is free is showing the toe line. So, this is crest line, and this is to line.

So, now you can see you understand in a plan the way it is showing so, this is the crest line, here toe line is not shown, but here you can see this is the crest line, this is the toe line, this is a crest, so, this is a crest. Now, this is clearly understood, but what about this one?

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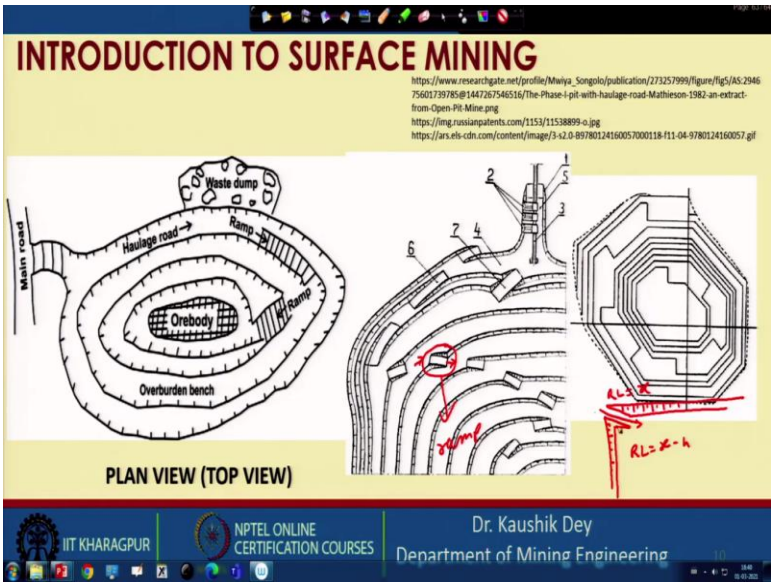

This is called ramp, which means you are coming through this ramp from this level to this level. So, similar way, you can draw it like this. So, this is crest line, this is also crest line, and this is showing the ramp because it is elevation here elevation is less. So, this is called a ramp, and you can clearly understand this ramp is going from here to here. You can see in this case,

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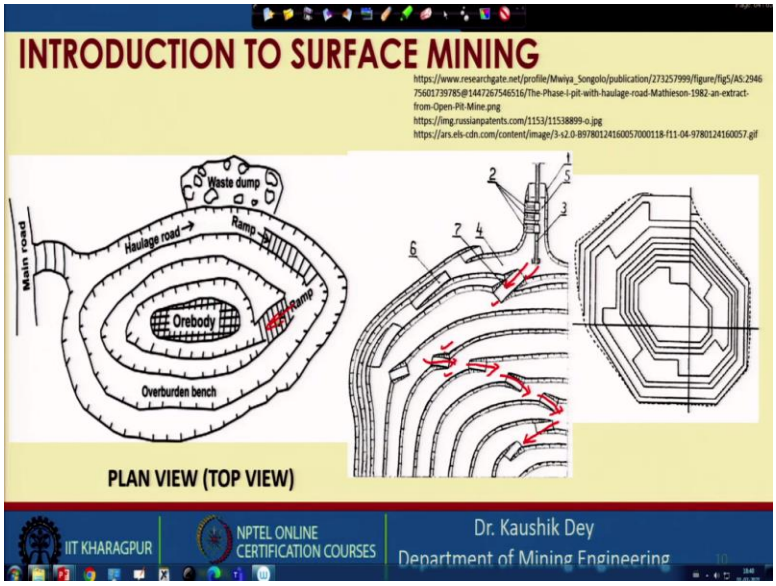

Let me clear it once again you see, in this case, this elevation is higher. So, this elevation is higher. This elevation is lower. So that means your ramp is on this side. Here, this is upper elevation. This is lower elevation so this is like this again, this is moving like this. So, this is the general technique to construct the layout of a mine, and you see, in this case, this is this one.

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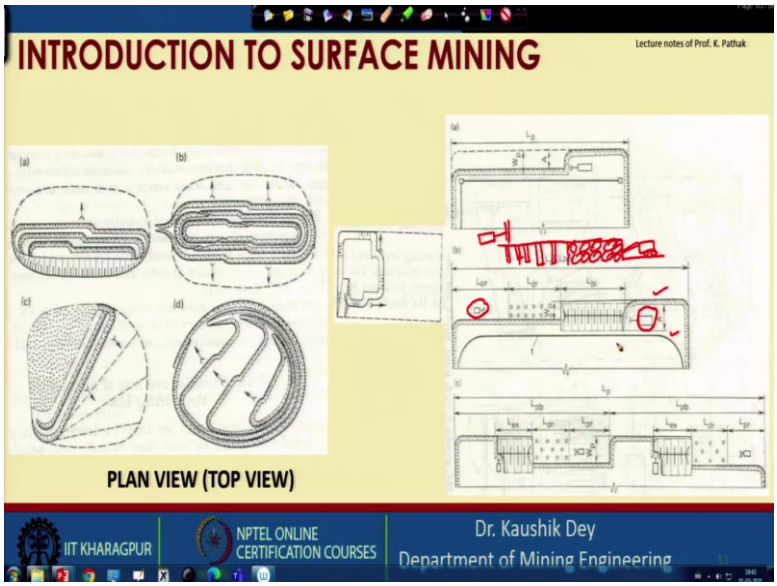

Now, this is this layout is basically showing us how the different machines are operating we will discuss this layout when this machines will be a showing. Say suppose if you are considering this one, if you can see one machine is operating here and this is the upper elevation, this is the lower

elevation. So, the bench is basically you can consider here the bench is like this in this place, the bench is like this and your this machine is working at this position.

So, this is showing and here it is showing that in future this part from here to here, this part is now fragmented rocks. So, this machine is basically taking out this fragmented rock and this place, you can see the small holes are showing. So, up to this, you are carrying out drilling of holes for your blasting purpose, so, that in future this will be blasted and then your excavation will be there this machine is that upper or higher elevation.

So, this is probably the drill machine or some other machine that is working at this position. So, this is the general layouts of different machine operations shown in these different diagrams. So, a similar way you, you can have different layouts for different machines.

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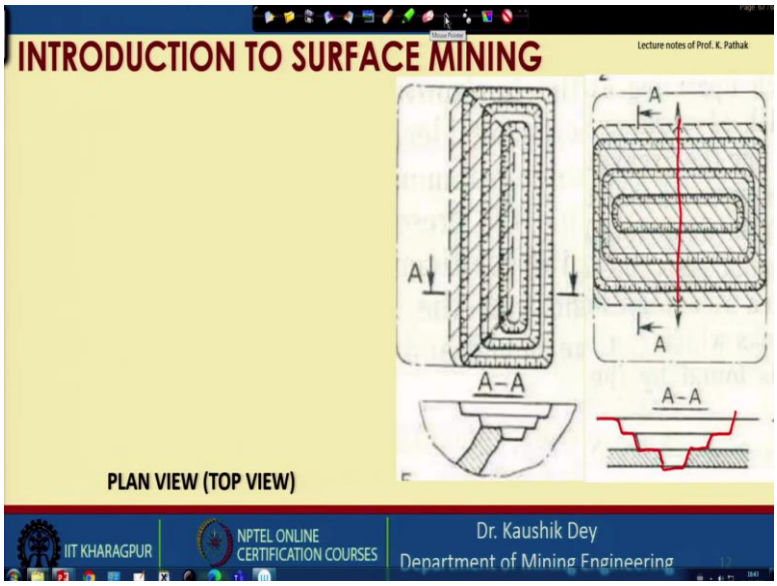

So, this is also another one, this is the section and if you are taking, if you are taking the section along this line, then you will see what the pit layout is looking like. This is clearly indicated at this point.

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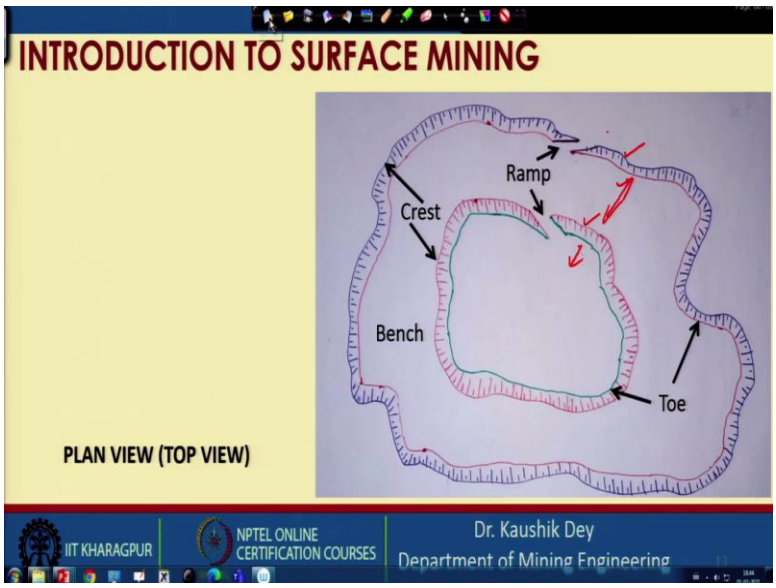

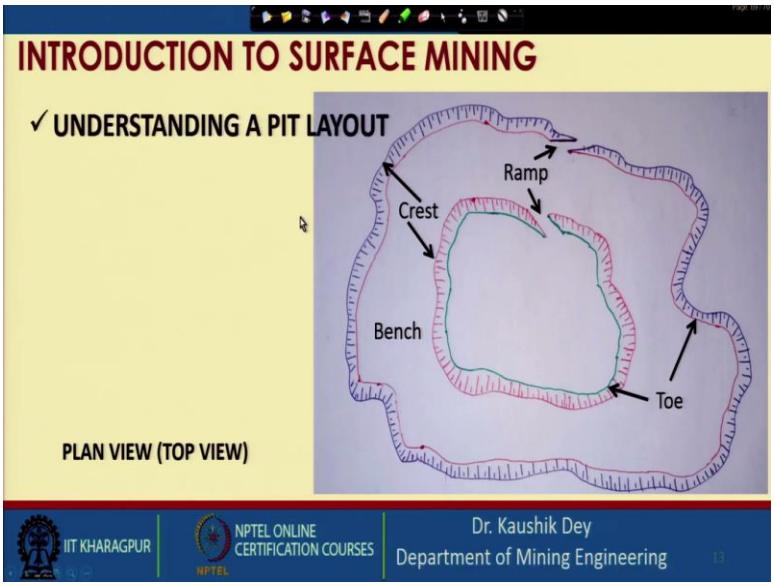

So, now, we can see in this layout also this is a simple hand sketch, which is showing a circular pit of portion, here you can see this is the ramp, this is the higher elevation, this is the lower elevation, this is the higher elevation, these elevations are the same elevation. So, this is the bench width, this is bench height, and you can have this as the lower bench. So, this is the bench, this is the crest line, this is the ramp, and this is the toe.

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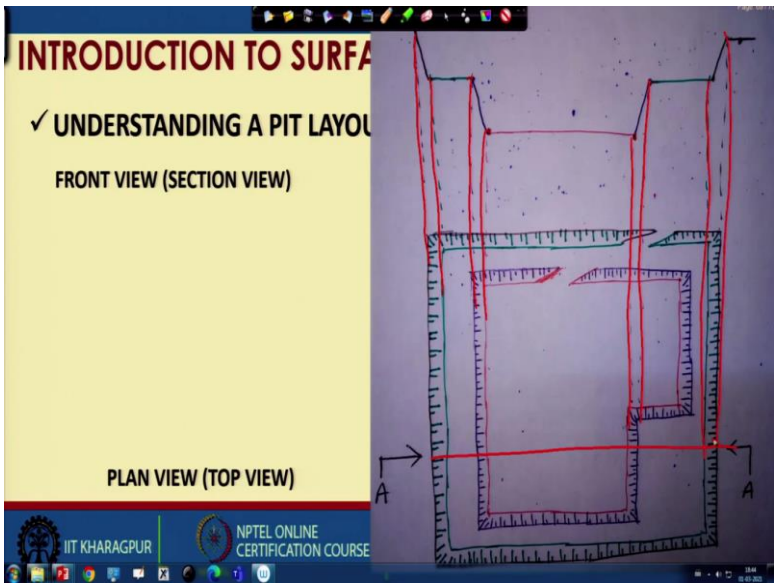

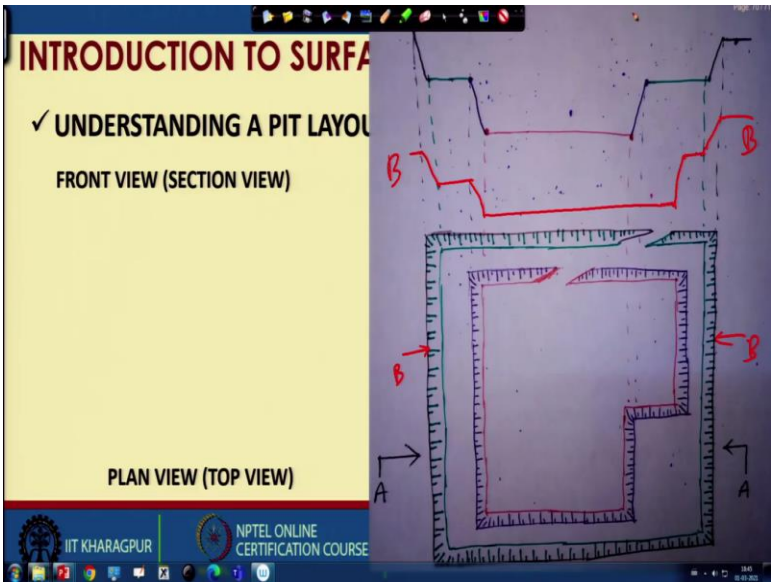

And you can see if you are taking the section along, the section along this line you can directly project this one. So, it is projecting this, see this one is projected, this one is projected, and this one is projected. Now, instead of this, if you are trying to take a section along this line, then what will happen? You will find out this one will remain the same. Instead of this, you will go up to this point here, and now, this is top one on this position and then this one so, this will become a section like this so, this is let us mark BB, so, this is BB.

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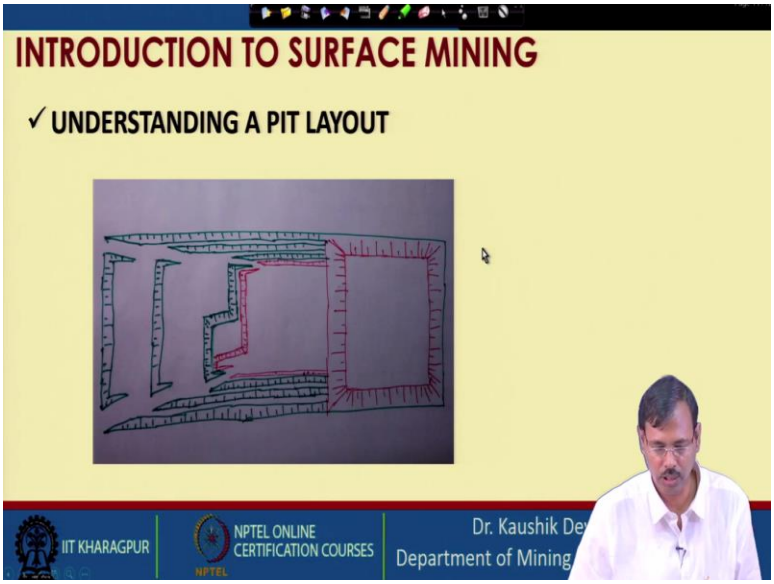

So, this is another layout.

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And if you look into this, you can see these are the circular pits you can see these are the benches you can see this is the bench. This is the crest line, this is the toe line, so toe, crest. So, similarly, you can see, and these are the ramps. You can see these are the ramps showing in the mine layout.

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Next is very, very important is that how the facilities are provided in your mine? How are the machines being deployed? In this particular figure, this machine deployment shows how the machines, etcetera, are working. You can see this is the portion where currently the drilling is carried out, and likely to be the blasting is to be taken. Similarly, this is probably overburdened. This is the ore material on which also the drilling is carried out, and probably the blasting will be taken at the end of the sift.

Here, the material is already blasted. The shovel is working. It is taking the material onto the dumper. The dumper is taking this material outside the pit and loading it. This is the loaded material going to the mining stockpile. This is the empty truck returning back to the mine. So, you can see this is the bench walls. This is the berms, and this is the haul road. This is the external dump. So, this external dump overburden material is taken from this place, this material is taken out, and by this way, it is going, and finally, it is dumping at this place.

So, this overburdened material which will be blasted here will be taken like this way and it will be dumped here and you see this dumping is not affecting the operation of the mine after the mining operation this will be, after the mining operation this may be taken to dump it back to the filling the void. Sometimes we can then return back the filling of the void area in especially in case of coal mine etc where you take out the coal, you take out the coal and you dump back the overburden rock into the D-cold area where the coal is already taken out.

So, these are the typical layouts of different mines. Circular pits are carried out in case of massive deposits. Circular pits are carried out in case of vein deposits, but in bedded deposits, mostly we go for the backfilling of the void area using the overburden.

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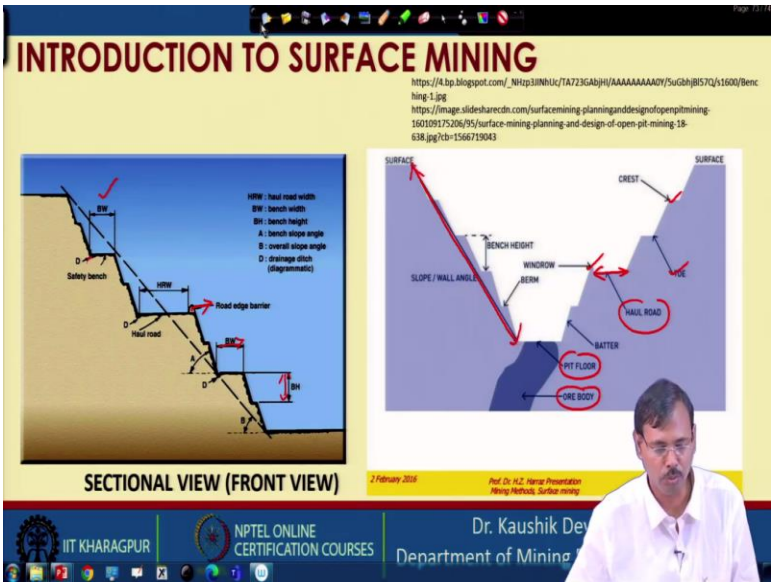

So, this is the typical terminology for a bench. So, this is called bench width, this is drainage provided or ditch provided. This is the safety bond provided so that the trucks, etcetera, will not topple down to the lower bench and this is the bench height, this is the bench width. This is the general terminology. This is called pit floor. This is orebody, this is haul road you can see the wider bench width is provided, this is the berm, this is a crest, this toe and this is bench height.

From this point to the bottom point, this is called the overall slope angle and should be maintained as safe as possible.

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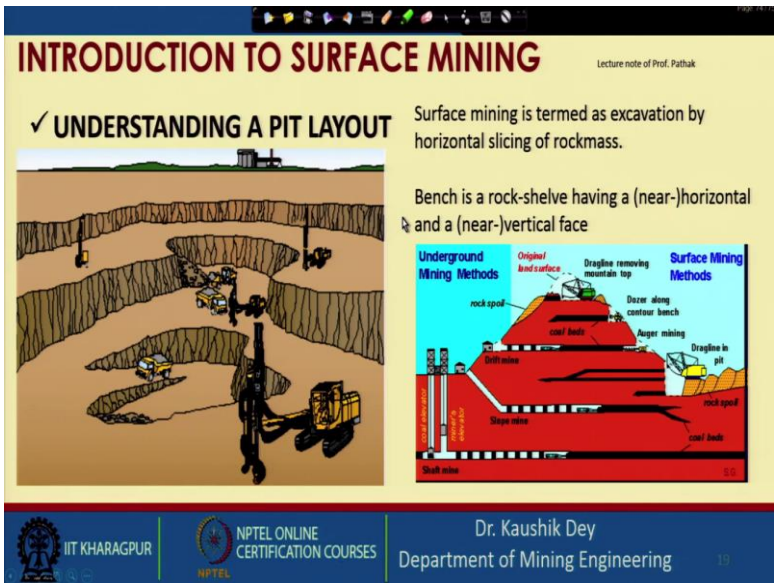

This is a typical figure, this is underground mining and surface mining showing together.

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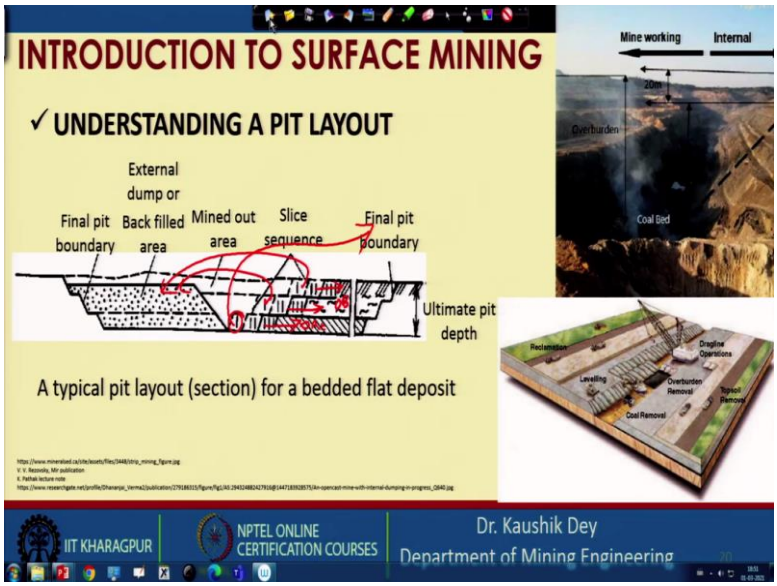

This is in this figure. You can see the sequencing excavation procedure. This is the mine out area is filled back with the overburden said this is the ore, this is overburden so that you see the sequence of operation this is excavated showing at this, this is also as excavated throwing at this, this is an excavate and take out as the as it is ore. So, this is the sequence of operations 1, 2, 3, 1, 2, 3 and in this sequence, your benches are being moved in this direction, and overburdened rocks are backfield in the mined-out area.

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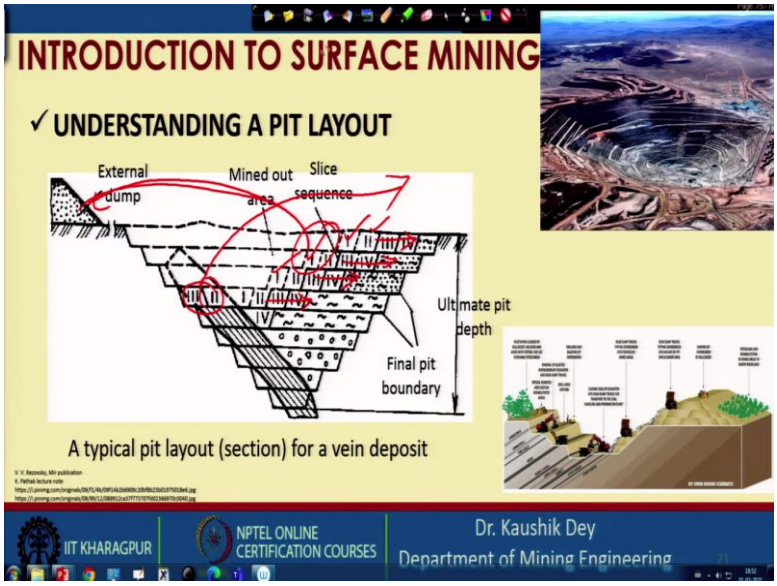

This is also that is for bedded deposit and this is for the vein deposit. You can see in the vein deposit. You have to go for outside dumping. You have to go for outside dumping, because you cannot dump here any material you will dump here we will come down to the pit. So, the sequence of operation you can see this is 1111222. So, more or less, the horizontal slicing is carried out, but the overburden materials are taken out, and ore materials are taken out and dumped outside, and ore materials are taken out and sold in the market. So, this is a typical layout of vein surface mine.

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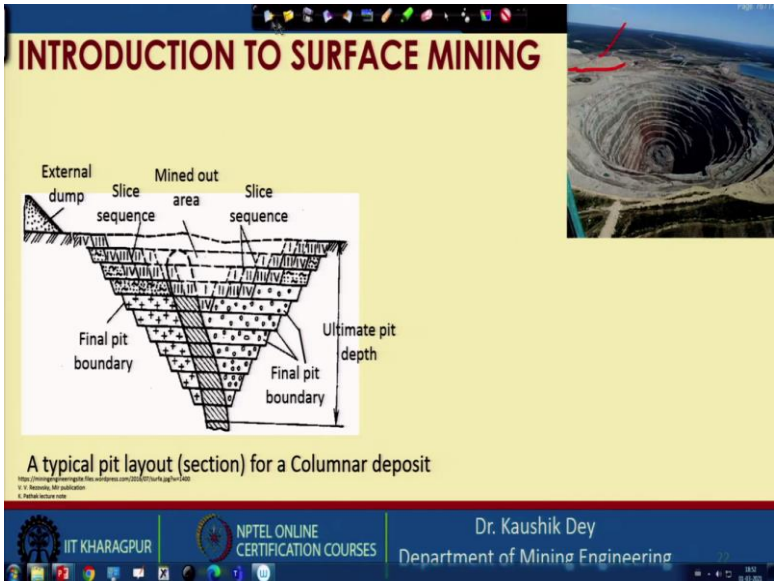

This is for the Columnar deposit, how it can be carried out this is a simple example of this one you can see the outside dumping is carried out in this case also this is the outside dumps placed at this position.

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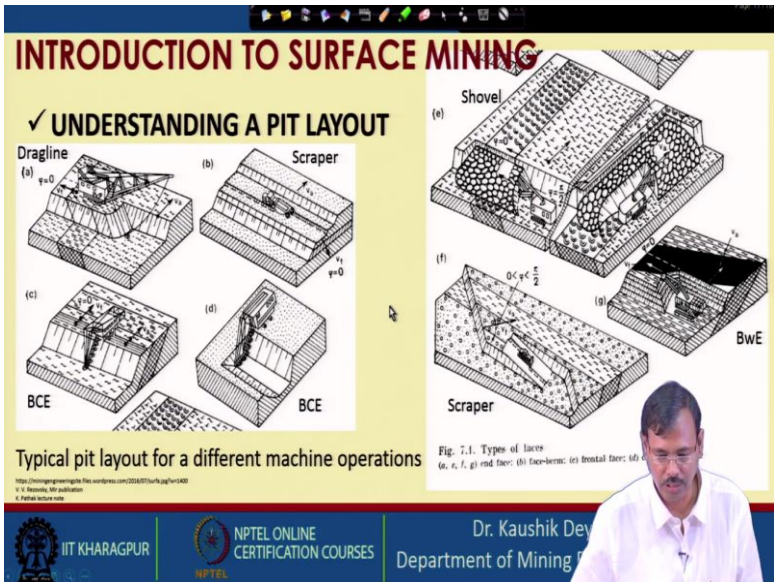

This is the layout for the operation of different machines, draglines, scrapper, bucket chain excavator, shovel, so these are the different layouts. So, this is more or less about the layout of the surface mines, how we will position, how we will position the machines, how the different terminologies are expressed, and how the mine plan is how it is sewing is shown in this lecture. So, let us stop this lecture at this position, will discuss the phases of mining in the next class. Thank you.