Engineering/Architectural Graphics – Part 1 Orthographic Projection

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Lecture – 20
Projection of a Point and Line on Auxiliary Plane

Welcome to the last lecture of this week for the ongoing online course on architectural or engineering graphics. And today we are going to learn about how to draw the projections on auxiliary planes. By this time, I have already explained to you how to draw orthographic projections of points and lines. Now points were simple. So, in case of points we just had to locate the point with references to the two reference planes.

The vertical reference plane and the horizontal reference plane. Now, in case of lines the lines were being inclined to at times one of the references planes or at times two both the reference planes. Now, we arrived at the true length or rather we started from the true length of the line by drawing it in simple positions and then inclining it. Now, what happens if you actually see just a projection of one of these lines which is inclined and you want to draw the true length of that line.

And then further plane and then as part of the solid. So, actually the auxiliary planes will really be needed when we are looking at some of the surfaces and solids, but the fundamentals we have to learn here so that is what I am going to do here. I will just introduce to you the concept of auxiliary planes and how to draw orthographic projections using auxiliary planes.

However, the real use of auxiliary planes will come when we start looking at the solids and sections of solids where we will have to draw the true shape of these sections of solids or part of the solids where we will actually see how to draw it on auxiliary planes. So, let us start with our discussion on auxiliary planes today. Now, what is an auxiliary plane? Now an auxiliary plane is a hypothetical plane which is either inclined to horizontal plane or it is inclined to vertical plane.

Now, how will we take it whether we will take it inclined to horizontal plane or inclined to vertical plane will depend upon the object which is going to be viewed, but it could be any case.

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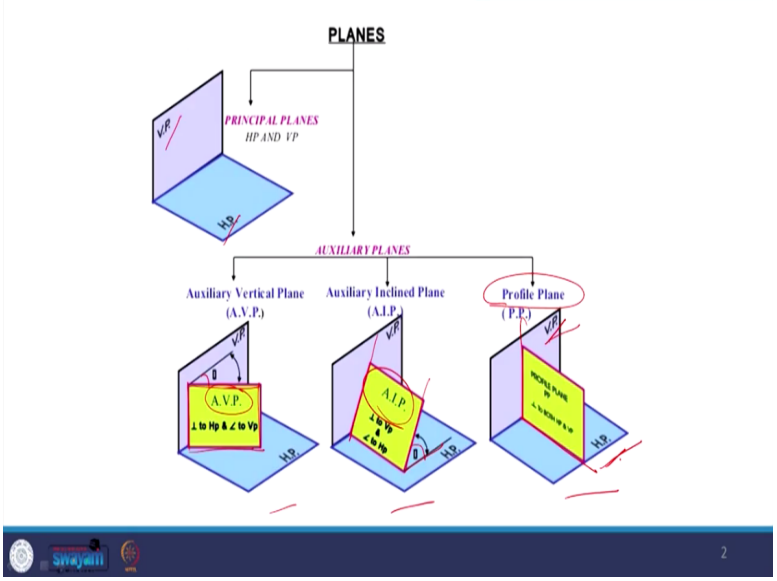

So, what we basically have is we have two reference planes which we have been seeing so far these are the principal reference planes. Now the auxiliary vertical plane is a plane which is perpendicular to HP and it is making an angle of certain degrees with the vertical plane. So, that is called an auxiliary vertical plane. In case the auxiliary plane which we are considering is making an angle with the horizontal plane, but it is perpendicular to the vertical plane it is called an auxiliary inclined plane.

So, this is also an auxiliary plane. The third plane which we have been seeing as the side plane or a plane which is perpendicular to both the reference planes is called a profile plane. So, this plane is perpendicular to both VP and HP. These are the three conditions, these are the three different types of auxiliary planes that we need in orthographic projections.

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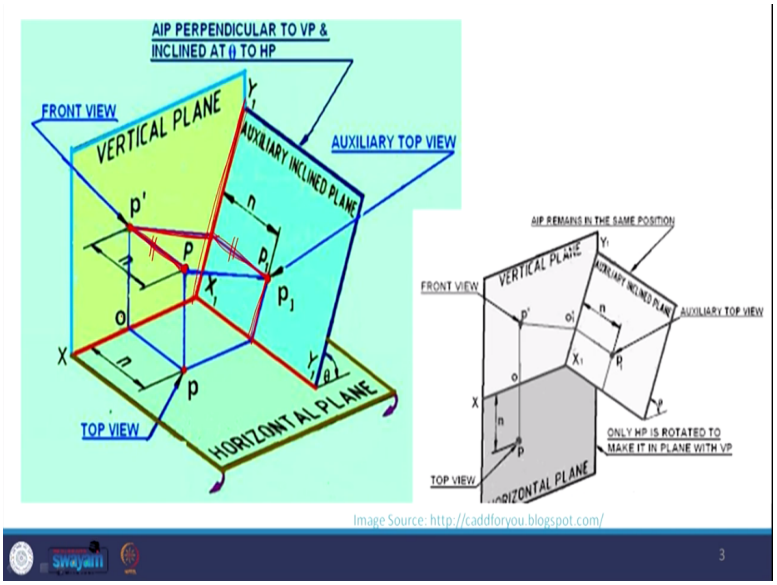

Now, how do we really draw the projections of these auxiliary planes. Let us look at our reference planes. So, just imagine that this is our vertical plane and this is our horizontal plane and then we have an auxiliary vertical plane. So, what is an auxiliary vertical plane? So, let us take the example of this reference plane with the help of which we understand. So, this is our vertical plane, this is our horizontal plane.

Now just imagine we have an auxiliary plane which is inclined to HP and it is making an angle with HP and it perpendicular to VP. Now, suppose we have this condition like this. So, this is our auxiliary plane, this is the auxiliary inclined plane like this. Now, if I have a line which is like this. Now what do you see in the front view? We see a straight line which is of the same length and in the top view we see a point.

What happens if we have to project it on this auxiliary plane. So, what happens is that this distance if I see this distance which we have in the horizontal plane remains the same as what we see in the top view. So, what we have here is for example this is one of the points of the line. So, if we are seeing this line the horizontal distance if we look at this auxiliary inclined plane this horizontal distance of this point remains the same.

So, if this was n this remains n and the trace which is coming from the front view perpendicular to this auxiliary plane will give us this relative height. So, what we will

actually be seeing is that this distance remains the same which is the distance from this and the height will actually come from the front view.

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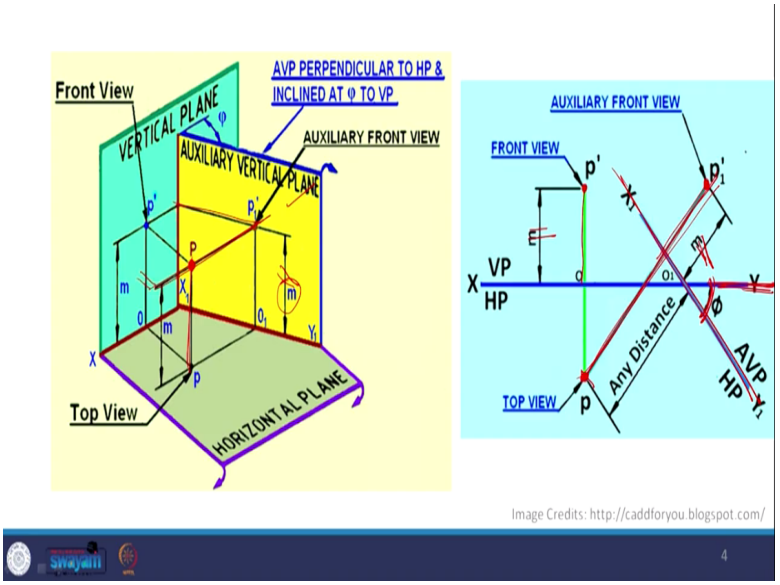

Now, the other case is when this auxiliary plane is perpendicular to HP. In that case what happens? The height remains the same. So, the height will be exactly the same as we see in the front view while the horizontal distance is just arrived at by drawing the projections. So, what we do in this case is we will draw the auxiliary plane at whatever angle. This distance will be equal to the distance which is the height of the point.

And the horizontal projection is directly in line with the top view of the object. So, here it is just a point so we will just draw a straight line which is perpendicular to the auxiliary plane, drawn at certain angle to the XY which is what is the representative of the vertical plane and we just draw taking the height from the front view.

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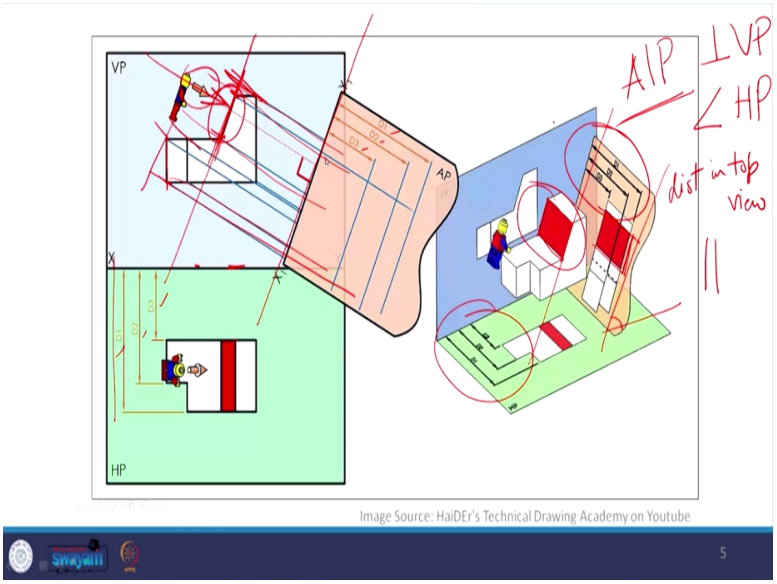

Now, I will take up an example and explain to you what happens and why at all would we need this auxiliary plane and the concept. So, what happens here just imagine that we have a solid like this. So, just look at this in 3D and then we will see how to draw it in the orthographic projection. So, this was a solid which was being seen. Now, if we have to know what is the true shape of this plane which is highlighted in red?

So, what happens we will start to draw a plane an auxiliary plane which is parallel to this plane. So, if you look at this, this is the plane which we wanted to see as a true shape. So, we draw a plane which is parallel to this plane. Now, this plane is inclined to HP and it is perpendicular to VP. So, what we have is auxiliary inclined plane. In this case the projections will directly come from the VP.

And the distance that this object has from the reference line which is XY will be measured. So, this D 1, D 2, D 3 is the distance which we will take from the top view here and rest of the projections will directly come from the front view. So, what we have is finally when we see we will be seeing we are actually seeing it here perpendicular to this plane. So, when we see anything perpendicular to that plane we will actually be seeing the total true dimension which is what we are seeing here.

So, this dimension is the true dimension. Now, the rest of the planes will not be seen as true dimensions because we are not having a plane which is perpendicular to the viewing plane.

So, auxiliary planes are actually needed when we want to see the true shape of a desired part of the solid. The important thing to note is that when we are talking about auxiliary inclined plane and auxiliary inclined plane is perpendicular to VP and it is inclined to HP.

In that case the distance in top view or plan will remain the same. It will be the same. So, we will just measure it from the top view and transfer it on to the auxiliary plane.

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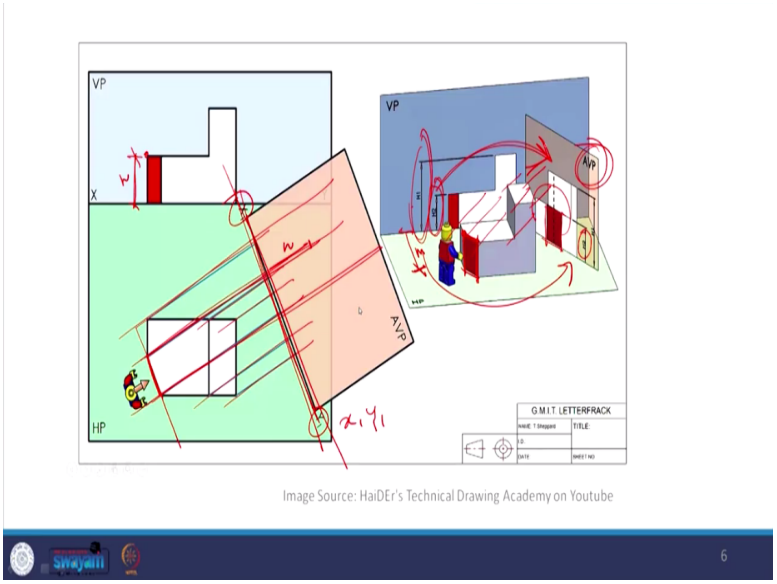

However, if we have the other case. So, suppose we have a surface like this so this was the surface which was inclined to VP. So, we will draw an auxiliary vertical plane. In the previous case it was an auxiliary inclined plane now it is an auxiliary vertical plane. In that case what happens the traces from the top view will come directly we will not measure them. So, the surface which is parallel to the auxiliary plane will be seen in its true shape and size here.

Rest of the surfaces around it they are slightly skewed, but the heights will remain the same. So, heights will be the same if you look at this object here the heights are going to be the same. So, only the horizontal distances will be taken from this top view and the heights will actually be derived from the front view on to this auxiliary vertical plane that is how we will derive the true shape of the surface here.

Now, if I split this up if it is only a point now what happens in case of a point let us go back to auxiliary inclined plane. Just assume that this is one of the points which we are considering on an auxiliary inclined plane. If we want to consider this point projection of just this point we will take its horizontal distance from the reference line, the original reference line and we will mark the same distance from the reference line, the new reference line that we would have taken.

So, if we draw it here we are drawing. So, if this plane makes an angle of say x degrees here if we make an make an angle of x degrees here, we will not get a line which is straight. So, what we will do is we will just make a line here and make it in such a manner that it is perpendicular to the projections coming from this inclined plane. So, if we look at this point what we have? It will have the same distance as in the top view.

And the height is directly being projected from the projection in the front. So, this was the point that we were taking. We just have it projected directly here and this distance D 3 is taken from the reference line which is here that is how we draw the projections orthographic projections in auxiliary inclined plane. For drawing it in auxiliary vertical plane what we have?

We just take the projections and draw a line perpendicular to this, this is the new reference line x 1, y 1 which is here. So, the horizontal projections are directly coming from the true shape and the height of this point say this was the point of concern. So, this height will actually come from the front view. So, in auxiliary vertical plane the heights will be measured and then transferred from the front view.

In auxiliary inclined plane the horizontal distance from the reference line will be measured and transferred on to the auxiliary inclined plane. So, these are the two ways in which projections on auxiliary planes will be drawn and we will be needing it, we will be seeing how to draw it when we draw the true shape of the section of solids in subsequent upcoming lectures and weeks.

So, with this, I will stop my lecture here. I hope you have slightly understood the concept of auxiliary plane. It will be further strengthened when we look at the drawing of orthographic projections of sections of solids. So, thank you very much for being with me here today. And see you again next week till then bye-bye.