Engineering/Architectural Graphics – Part 1
Orthographic Projection
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Lecture – 25
Orthographic Projections
Projection of a Plane Inclined to both the Reference Planes - II

Good morning, welcome to this last lecture of this week 5 of the ongoing online course and we are continuing this lecture today from the previous lecture yesterday, which was on orthographic projections of planes, which are inclined to both the reference planes or the oblique planes. If you followed what I explained yesterday, we were looking at a plane, which was inclined to both HP and VP.

And how we went about drawing the orthographic projections was looking at one of the diagonals of this given plane and then assuming that this diagonal is now making the entire angles and then drawing that diagonal first and drawing the entire rest of the shape about it. So, that is what we are going to do even today. And I will explain it to you by taking a different example, a slightly different example.

And then we will start to see how to repeat those steps, so, that you become more familiar with those steps. So, today, yesterday, we had taken the example of a square. Today, I am going to take the example of a circle. Now, the circle becomes slightly difficult, because there are no defined points in a circle.

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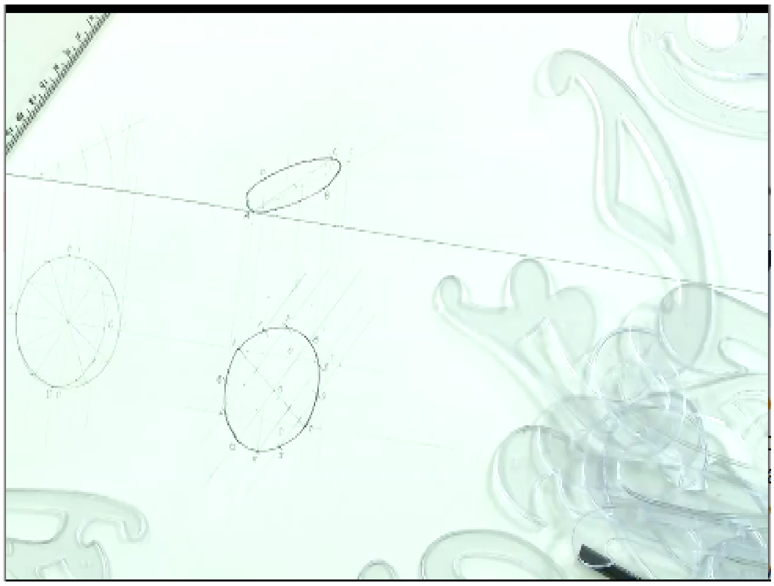

So, there are no defined points in a circle and we will follow the same process as we have followed. So, I assume similar conditions exactly the same conditions as we had taken for square. We will take it for square for the circle and what we will have is again 2 conditions. One where one of its diagonals makes an angle with both HP as well as VP that is the first condition and the second condition being, we will assume that this diagonal is making an angle of certain degrees with HP.

But, the diagonal which is perpendicular has certain other angle which it is making with the VP. So, we will draw the same 2 conditions here and let us see how do we draw. So, here again one of the points is in HP. So, let us assume that one of the points is going to be stationed in HP. So, we have a circle. We will draw a circle of say radius 3 centimetres. And to begin with, we will assume that this circle is parallel to HP and it makes a certain degree of angle with VP.

So, this is the starting of this is to draw the circle and take its projection onto the VP. And now, we will draw. We will divide the circle into 12 equal parts as we always do to simplify the projections of circles. So, now, we have these 12 equidistant points. The circle divided into 12 equal parts and we have the projection here. Now, this circle has 2 diagonals. Let us lightly number them AC and BD. These are the 2 diagonals which we are considering.

Now, let us assume that this point A is stationed in HP and this diagonal AC makes an angle of 30 degree with the HP. So, we are going to be seeing it here. So, before we take the projections, let us take all of these points up. So, they will be projected. So, these are the projections and now, we will take all these projected onto this line which represents a 30 degree inclination for the same circle.

So, what we would still see in this case is that the circle still is seen as a line in VP. So, this is the projection of the same circle onto this line in VP and what we will get back here is an ellipse. So, what we get here is an ellipse just as we drew the projections for a circle which is inclined to one of the planes. Follow exactly the same process and you will arrive at the right shapes and the right projections.

So, what are we expecting to get from this projection is an ellipse. So, this revised one is an ellipse that we are going to get here. Let us join this ellipse and joining it freehand here because, we still have to modify this ellipse once we take the projections further. However, when you draw the sheets, please make the ellipse using French curves. Ideally, in orthographic sheets, we should not be doing it freehand because it is a very scientific drawing alright.

So, this is the ellipse that we get when this circle is inclined at 30 degrees to the HP and here what we are seeing is that this point C has shifted. So, we now have this point C, B and D. Now, BD is still intact because it is still parallel to this HP. Now, what we have to do next is we have to incline. We have to incline this ellipse in such a manner that is AC now makes an angle of 30 degree with VP also.

Now, I will bring this ellipse here first and then we will start to incline it. So, what we have here is; we have a line which is inclined at 30 degrees to the HP. I will bring these points which are the horizontal projection. So, all we are doing; we are doing nothing new. But what I am doing is since there are so many points here. I am just bringing this entire picture this entire drawing as fresh so, that we do not have the original circle seen here.

So, I will get these points onto this line and we will bring the same points from this ellipse, which we got here, since it was a circle, the projection of this ellipse is also symmetrical. It is regular. So, what we get here is this ellipse. So, this is the ellipse that we have got here, now, you can see this is AC and BD. Our task is not yet over. We still have to incline this AC by 30 degrees. So, what we have now?

We have this as the horizontal trace of this line. Now, we have to take it onto so, if it was the original AC here and we had to incline it by 30 degrees onto this. In that case, what we would have done? We would have taken a line equal to the original diameter here and passed a line through that, which is the locus for this new AC and then got this new AC onto this. So, this would become our final projection of the diagonal AC, which is inclined at 30 degrees to VP and also 30 degrees to HP.

And the same thing, we are going to be doing here. So, what we get here is that the original projection of this diagonal AC, which was this will now be projected onto this line. So, the trace of this is now going to be projected onto this line. So, this is the new AC in elevation. So, what we have is: this is the new AC and what we get here is that each one of this is going to be transferred onto these horizontal lines, which is what we will get here.

And the same thing is going to happen here, we now have this AC and each of the points. So, each of the points for example, all these distances, which we got onto this line, so, this is the trace which we got here. So, we will translate all of them here horizontally. So, what we are getting is: we are shifting the trace of all these points onto this line, which is inclined to both HP and VP by 30 degrees. This is the new line.

And now, in this case also what remains is that BD remains parallel to HP and it is making certain angle with VP. So, now what we are doing, we are just drawing these lines perpendicular to this diagonal AC because all we had was the projections of this diagonal AC and also this diagonal AC which is this. We will now cut the points. The distances which are equal so this is the point O and now this is the new point O.

So, we will be marking the distance from all O, this diagonal AC to these different points which are represented here. So, we have now BD and being a symmetrical ellipse, we will have the same distances here of these 12 divisions, which we have already marked. So, this is the final shape of the ellipse that we have got. Now, we have to transfer the same points back up.

So, if you see, we already matched the projection of this diagonal AC. Now, what we have is all these points, which were here, because, if you see, we got this horizontal trace of C transferred onto this. So, what we have to do? We will transfer the horizontal trace of each of these points here and what we will get is these lines passing through the horizontal lines. So, we have the horizontal trace and from here we will take back the vertical trace.

So, what if I mark these here starting from this, so, this is 1, 2, this is B; 3, 4, C; 5, 6, B and 7, 8. And let us now take these points back up. A and C is fixed. Let us start with B. So, this is where the B is going and if you look at this original one, this is the point B and if you look at D, so, D is going from here and it is coming on the same line where we had this B. So, what we have here is, this is D. So, this is D; this is B.

And now, we will take the other points, this is 2 originally towards here. So, we have to mark to somewhere on this line. This is 2 and this is 1. Originally, one was here, so, this is 1, so, A, 1, 2, B, if you look at 3, so, this was the original 3, and now, the 3 goes up there. So, this was the original 3 and this is the new 4 which we taking here. So, this is where we will get 4 and then this is the new C. This is the new B. Then you have this 5.

Then we have this 6. D, this is 7 and this is 8. So, now, we will see that we do not see the true angles of this line, this diagonal AC anywhere and now I will quickly finish up this ellipse using the French curves. So, I have these French curves now. I will try to fit in the curves so, that you are able to see a good fitting ellipse here. Since it is a regular ellipse, that is why I am able to rotate the same French curve and still get the perfect fitting curve here.

Otherwise, it would become very difficult for you to manage sometimes. So, this is the ellipse, which we will get as a projection. And here if you see, this is the ellipse that we are going to get. We might have to draw this by splitting it in multiple parts. This is the projection of the circle where the given condition is that this diagonal AC makes an angle of 30 degree with VP and 30 degree with HP and you have to remember that we will not be seeing the true angle anywhere.

So, if you see this AC is slightly off from this line which we had drawn a 30 degrees and here also, this AC; this is A; this AC is slightly off in terms of angle from the line which we had drawn as 30 degrees. This is exactly the same procedure, which we had followed for doubly inclined lines. The only thing we are doing here is we are building up the rest of the points by taking their distances from either this diagonal or from one of the points or from the centre and then developing the entire plane around it. So, this is one condition.

Now, the other one was shift if we have to make, this they are in such a manner that AC makes an angle of 30 degrees with HP, but, the BD makes an angle of 60 degrees. In that case, what we are going to do is; since AC is not changing its angle, the only thing it is doing is the BD now makes an angle of 60 degrees. So, it will still remain the same the only thing happens is; BD will now so instead of this BD being parallel, we will now inclined this BD in such a manner that BD makes an angle of 60 degrees.

So, if we were to start from the previous point, instead of inclining this AC and taking it on this locus the straight line which is on the locus of this line, AC inclined at 30 degrees, we will just incline this BD by 60 degrees. And in that case, the BD and AC would still make a right angle, because BD still remains parallel to the HP and we will be seeing the true shape or and true angle of BD in HP. So, that is the step that we are going to follow.

And I am just hoping that you will be able to follow this entire procedure up whatever be the given condition for an oblique plane. You have to look at the diagonal, understand the angles and perceive the entire plane as if it is being generated from this diagonal and then draw it. Never get confused when you are looking at this plane that from where to start or what to do. Identify the diagonal and take the angle measurements for that diagonal. So, that you are able to move around and develop the entire surface.

So, I hope with this, you have fairly understood how to draw the orthographic projections of planes. From the next week onwards, we will be starting with orthographic projections of solids, regular solids. Gradually, we will move onto orthographic projections of intersection of solids and also truncated solids. So, thank you very much for being with me here today. See you again next week. Till then bye, bye.