Engineering/Architectural Graphics – Part 1 Orthographic Projection

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Lecture – 13
Orthographic Projections: Projection of Points

Good morning. Welcome to the 3rd lecture of week 3 where we have already started discussing about the orthographic projections. Today, we are going to start with orthographic projections of points just simple points, but we have to understand how a point would be viewed if placed in different quadrants. However, after that probably we would limit ourselves to the first quadrant only, but today we will understand how a projection of the point would look like.

So, if you remember again this is how we understood the quadrants first quadrant, second quadrant, third quadrant and fourth quadrant. Now just imagine that I have this pencil and this the tip of this pencil is actually the point which we are considering. So, what would happen? Suppose I place this point at some distance from VP say 5 centimeters from VP and 7 centimeters from HP which is the horizontal plane.

I will start to draw the projections on a flat sheet of paper like this. So, let us see how it look like when we draw it on the sheet and how do we draw?

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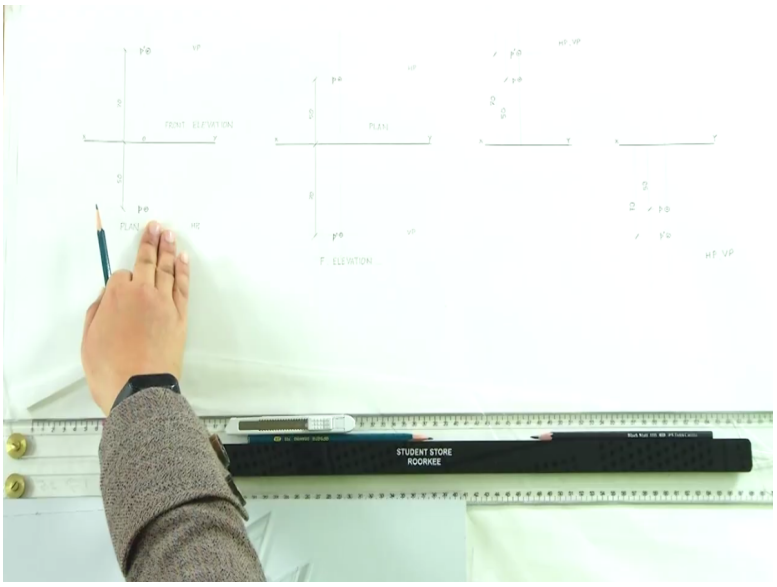

So, the first thing that we have to draw is a reference line. This is the reference line the XY line. Now when we are drawing the projections in first quadrant we know very clearly that the top view or the plan is going to be seen below the reference line and the elevation is going to be seen above the reference line. Now, visualize it again we have this point here which is at 5 centimeters from the VP.

So, when we see it from the plan we will see that the point is at 5 centimeter from this reference line because this plane will appear to be a single line. So, we will see 5 centimeter in front of the VP. So, we will measure 5 centimeters and we will draw a thin line, a thin straight line where we measure this 5 centimeter here and it was 7 centimeters above the horizontal plane.

So, we mark the point 7 centimeters above. We simply mark it, we make it little bold such that the point is seen. Sometimes we could also circle it because it is a single point this is the top view or plan of the point which we are discussing and this is the elevation front elevation of the point in discussion. The nomenclature is the projection and this line this line which is passing through these top view and the front view is the projection line where the projection line is meeting in this case we will just mark it as say O.

And this one say the point was P so the top view will be marked as small alphabet p and the elevation will be marked as small alphabet p' that is the nomenclature. Now, what else do we need to do in this particular drawing is. We have to mark the dimensions lines. So, we will draw these horizontal leaders and mark this dimension line. If you remember we always have to mark the dimension towards the left preferably and to the bottom.

Now, there is no horizontal dimension which has to be shown towards the bottom of the drawing so we just have this now. The distance you always have to remember the distance from VP is shown in the top view and the distance from HP is shown in the front elevation often we mistake about that. So, what we have to keep in mind is and always visualize this very simply you can pick up any notebooks of yours and imagine that this is the quadrant.

If you open your notebook suppose this was your notebook just open your notebook and you will get a quadrant like this. Imagine the given question so if you have the 0.5 centimeter in front of VP and 7 centimeters above HP this is what you should be getting. So, since if possible majority of the time we would dimension in mm millimeters. So, we would dimension 70 and 50 here.

This is showing the dimension we will also mention the reference line XY. So, everything that we draw is with reference to this XY line and one more thing we will write is we will mention the vertical plane VP and HP. So, now when we have this VP and HP it is evident that when VP is above and HP is below this is a drawing which we are seeing in the first quadrant because if it was third quadrant we would have HP in the top and VP below because it folds otherwise.

So, this is evident that we are having this drawing or the point seen in first quadrant. These are the different things in case we have a bigger solid sometimes we may also be required to write front elevation and plan here. So, we would write VP, HP and here we could also write plan or top view preferably we will use the term plan, we could also write top view though and we will write front elevation.

This makes the entire drawing for the given point complete. This is in first quadrant. Now just imagine that the same point instead of being in the first quadrant was in the third quadrant. So, I am just flipping it over, but please keep in mind this is the first quadrant and this is third quadrant. So, what if I have a point here which is at 50 mm from VP and 70 mm from HP.

Now what happens the moment we have it like this it is going to fold like that only. So, whatever we will be seeing in HP is going to go up. So, if I turn it over again this was our first quadrant, this is our third quadrant we have the point here and you fold it the same way. So HP goes above and VP comes below. Now, if we have to make the projection of the given point in third quadrant.

What is the difference? There is not much difference except that the top view and the front view are reversed. So now what would we see? We would actually be seeing HP in the top and the moment we have HP in the top we will actually be seeing the distance which the point makes from the front view. So, we have 50 mm seen from the top and we have 70 mm as seen in the bottom.

This is actually the top view and this is actually the front elevation everything else remains the same. We mark the point. Now the plan will always be mentioned with the letter first. So, here this would become p and this would become p' which is the nomenclature for the elevation. So, we have p in top and p dash in the bottom. We will again dimension the same way as we did for the first quadrant.

So, now the distance from the VP which was 50 will actually be seen above the reference line. So, we have the reference line XY which remains the same it is just that the vertical plane and the horizontal plane they are reversed. So, now here we are seeing HP in the top and VP in the bottom and this is the front elevation. So, we have the front elevation in the bottom and we have the plan in the top.

The moment we have a drawing like this we can very clearly see that this is a third quadrant projection because we have a plan in the top and front elevation in the bottom. The dimensions of the point remained the same, it is still at 50 mm from VP and 70 mm from HP. The only difference being that the point in this case was located in first quadrant and in this case it was located in the third quadrant.

You can very clearly see that while we kept the reference line as the same at the same level we can see that there is this difference. Now, let us move on to second and fourth quadrant. So, assume that this same point which was at 50 mm from VP and 70 mm from HP is now located in the second quadrant. So, if the point is here somewhere what happens if we fold it both HP and VP have gone to the same place.

So, now in this case we will have nothing below the XY line the reference line. Both the planes the HP as well as VP have merged together to go to the top. So, what happens if we

start drawing it now? Now, what would we see? We would see that both HP and VP have gone towards the top. So, we will draw a single line of projection and we will be seeing the projection of the same point both in plan as well as in elevation on the top of the XY line reference line.

So, we will have the reference line here and we will be seeing the projections on the same line. So, what do we see here? We see both the plan as well as the elevation. Now visualize it again. What is the plan? It is at 50 mm from VP so at 50 mm from VP we will be seeing the top view. So, this is the p and 70 mm from HP which is what we are going to be seeing in elevation.

So, on the same line we will be having both the plan and elevation of the same point and in this case we will have the dimensions mentioned in such a way that they do not intersect each other. So, we will have the shorter dimension mentioned first and the bigger dimension mentioned later. This is how we will show and here it is both HP, VP above the reference line which means that this particular drawing the object is placed in the second quadrant that is why we will see nothing in the lower part of the drawing below the reference line everything is above there.

Now, if the same point was located in the fourth quadrant so visualize it again. If the point is located somewhere same dimensions it is located here in the fourth quadrant. Now what happens we fold it like this and what goes both HP and VP that have flattened together below the XY line. So, in this 4th quadrant it will be a reverse of this. We will be seeing exactly the same thing as we are seeing in the second quadrant.

But below the reference line because now you see that it has flattened in such a way that HP which is the horizontal plane goes and merges with the VP below the XY line. So, if we have to draw this we repeat the process exactly the same way as we have done here. This is p and this is p dash and we mark the dimensions just like we did for the second quadrant. This is our reference line XY.

And here in this drawing we have both HP and VP coming below the XY line. If you look at these four drawings here it is for the same point a point which is at a distance of 50 mm from VP and 70 mm from HP. In all these four cases it is the same distance that we have followed the only difference being that this is first quadrant, third quadrant, second quadrant and fourth quadrant drawing.

It is very simply seen from here just by looking at where the position of VP and HP is. Now, one thing which becomes very clear from this drawing is that second quadrant and fourth quadrant are not very convenient to read because the projections will intersect. They will not overlap that is why we do not use second and fourth quadrant drawings. We preferably go for the first quadrant or the third quadrant.

In India as I said earlier also, we use first quadrant while in several countries including United States of America they follow the third quadrant. Both are equally readable, both are equally convenient, unambiguous to use for graphics, for engineering drawing. And we could use either, it is just the nomenclature that we have to use. The only thing being here in third quadrant the plan comes in the top, elevation in the bottom.

And in our case we draw plan in the bottom and elevation in the top that is the only difference everything else would remain the same and other difference is just to understand the difference between first angle projection, first quadrant projection and third quadrant projection I have already explained. Now, since it was a point one single point we could still see clearly that how the projections are coming.

Just imagine if it was a complicated solid we would not be able to apprehend how the projections are coming in case of second and fourth that is why we are going ahead with first and third and from next class onwards when we start with the projection of lines, parallel lines to start with we would be looking at in the first quadrant only. So, I hope you have clearly understood how to draw the projections of point placed in any of the quadrants.

With this, I am requesting you to constantly follow it up with drawing. So, you could draw at your home using whatever tools you have available and learn the fundamentals of these

projections because if we are not convenient, comfortable with projections of points at the stage it will become more and more difficult for you to pick up the projection of lines and planes and solid subsequently.

So, I hope you have been following up till now and thank you very much for joining me in this lecture. In the next lecture, we are going to talk about projection of straight parallel lines. Thank you.