Engineering/Architectural Graphics – Part 1 Orthographic Projection

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Lecture – 17
Projection of Line Parallel to One and Perpendicular to Another Plane

Good morning. Welcome to the lecture number 17 and we are in the week 4 of this ongoing course on architectural graphics or engineering graphics and we are learning orthographic projections of lines here. In the previous lecture, we saw how to draw lines which are parallel to both the planes. In today's lecture, we will learn about drawing projections for lines which are parallel to one plane and perpendicular to the other.

So, before we go on to learn about how to draw the projections. Let us quickly visualize how this line would look like. Suppose, we have this line which is perpendicular to vertical plane so it is perpendicular to vertical plane and parallel to the horizontal plane. This is the line which is perpendicular to vertical plane and parallel to horizontal plane. So, as the rule goes we will be seeing the true length of this line in horizontal plane.

And in vertical plane we will only be seeing a point because we are seeing from the front and all we see when we see it from the front is a point. Another possibility could be this is when the line is in the air. Another possibility could be that the line is resting in HP and it is perpendicular to VP. In this case also, we would be seeing the true length of the line in HP which is in the top view the plan view.

And in the elevation we will be just seeing a point. Another possibility for this set of lines is when the line is perpendicular to HP and parallel to VP. Here, we would be seeing the true length of the line in VP and a point in HP and for the same line it could be in VP and it would be perpendicular to HP. So, we would be seeing a line the true length in VP and a point in the XY line which is for the top view.

So, let us see how to draw these various conditions for a line parallel to one plane and perpendicular to another plane on sheet.

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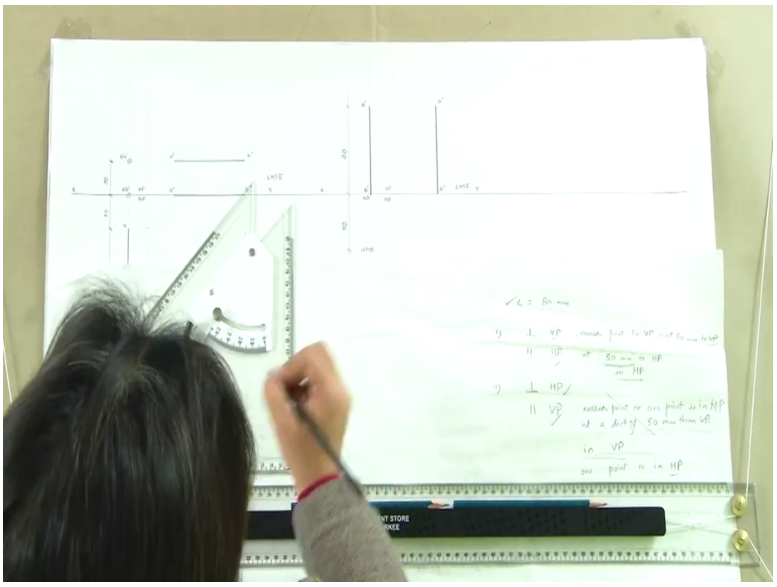

Just like the previous case let us draw reference line an XY line. This is the XY line that we are considering here. Now, let us write the conditions. So, there is a line of length 80 mm. The first set of condition is that the line is perpendicular to VP, parallel to HP and the nearer point to VP is at 30 mm to VP and here the line is at 30 mm to HP. So, just imagine that the line is perpendicular to VP and the nearer point to VP is at 30 mm to VP.

And the line is 30 mm to HP. So, just imagine what are you seeing? You are seeing a line in the plan, you are seeing a line which is having its nearer end to VP at 30. And in elevation since it is perpendicular to HP we would only be seeing a point. So, since the line is perpendicular to VP and parallel to HP we would be seeing the true length of the line in plan. Now this line is at starting the nearer point is at 30 mm to VP. So, which means that the line will start at 30 mm to VP and the line is 80 mm long.

So, this is the projection of the line that we are seeing here. We darken this line. This is the plan view of this line which is represented by this condition here. And in the elevation we see a point, but where will we see it? It is at 30 mm to HP it is at distance of 30 mm to HP. So, we will measure a distance of 30 mm from XY. So, we take it at 30 mm to XY and this is one single point so what do we see here?

We just see a point here which is like this and if we have to draw the side elevation now. Let us draw the side elevation on a side plane say the side plane is starting slightly away from this. So, what do we do? We first take the projections up to the side plane. So, we take the projections to the side plane and then keeping our compass in XY or we could also draw it with a 45 set square we can draw the projections.

So, instead of taking a compass we could also draw it using a 45 set square. Now, let us write the nomenclature here. Suppose, this was the line a b. What do you see in the elevation is b dash a dash. These are both the points so a is behind b so we will see b ‘ a ‘. Now, take the projections and you would know how to mark the or how to visualize the line which is in side elevation. So, what do we do?

We first take the projections horizontally up because these are orthographic projections. So, all the lines will either remain parallel or perpendicular to each other and here we draw another projection line coming from the elevation. Now match the point this is a the projection of the point is going here. So this is point a here, b the projection is going like this so from here and then it is meeting the projection of point b here.

So this is the point b in side elevation. So, what do we have here? This one point which is a double dash and this point which is b double dash and we can darken the side elevation of this line here. So, here we fulfill the condition which is given here that the line is of length 80 mm. So, we have to now dimension this line. So, the length of the line which is seen in its true length in HP because it is parallel to HP is 80.

It is at a distance of 30 mm to VP the nearer point is 30 mm to VP. So, that is what we will mention here and it is at a distance of 30 mm to HP which is seen here. And the true length of the line is also seen inside elevation because when the line is perpendicular to VP it is also parallel to the side projections screen. So, here we will now mention the reference line which is XY here.

We have VP here, HP here and this is the left hand side elevation LHS elevation. This is what you would be seeing when you draw a line which is perpendicular to VP, parallel to HP, but at

a distance of both the planes and this is what we would see as one of its side elevations. So, let us take another case where the second case is the line remains 80 mm, but it is perpendicular to HP and parallel to VP.

So, it is perpendicular to HP and parallel to VP The nearer point or one point of the line is in HP. So, since this line is perpendicular to HP let us assume that one of the points is in HP and it is at a distance of 50 mm from VP. So, it is at a distance of 50 mm from VP. Let us start drawing this condition. So, since the line is parallel to VP we will be seeing the true length of the line in VP. Now it is at a distance of 50 mm from VP and one of the point is in HP.

So, what we are seeing here is that this perpendicular line which is seen here. So, we will draw this line perpendicular. Now, this is a line perpendicular to HP. So, what do we have and then one of its points is in HP. So, we have an 8 centimeter line like this. This is how we will be seeing it when it is perpendicular to HP with its one point in HP and it is at a distance of 50 mm from VP.

So, we will draw, we will measure a distance of 50 from VP and this is the point that we get because in plan it is seen as perpendicular so only one point will be seen and now if we have to draw the side elevation of it. Again, we will do the same thing we will take the projections up to the side screen first. We will take the projections from the plan into the elevation and project it to get the elevation of the projections of both the points.

So, what is happening now let us do the nomenclature. This line say this was a b here. Now since it is in elevation we will be writing a dash b dash. This line that we are seeing as a point here is actually a b because a is on the top so we will be seeing the point a first and then b.Now take the projection. So, this is the projection line for a where it meets this is one point a this is the same projection line for b where it meets b is the point b.

So, this is the side elevation of the same line and we draw this as a double dash b double dash. This is what the projection of a line which is perpendicular to HP and parallel to VP would look like when one of the points is in HP. So, what now we will quickly dimension it

and check if we have clearly represented all the conditions here. So, what we have here is this is the true length of the line as 80 mm which is given here.

Now the distance that this line has from VP is represented in the top view which is 50. One of the point is in HP so b is an HP which is also given. So, what we have clearly done is we have represented all the conditions. We will mention the XY the VP and HP and this one is left hand side elevation. This way we have represented all the conditions which are given in this problem statement.

Every time we draw we have to draw in such a manner that all the conditions are not just fulfilled, but they are also clearly represented through the dimension line, through the nomenclature and it is clear for anybody. So, if I look at this diagram this picture here I should be able to derive the conditions which were given that is what is the language of graphics. It is unambiguous we should only be able to decipher one thing out of it.

In this case, I should clearly be able to say that this line is parallel to VP because its true length is seen here in VP and another thing that we have to understand is that we only mention the true lengths of the objects which are being projected. Suppose, this line was inclined and instead of 80 mm we were seeing just a 60 mm in its projections as a trace. We will not dimension that.

Anything which is not seen in the true length or the true dimension will not be labeled, it will not be dimensioned that is what the rule of graphics is that is another rule. So, that is one condition. We can also have a line which is in one of the planes. It is perpendicular to one plane and it is contained in one of the planes. So, for example, there is a line which is parallel to HP and perpendicular to VP and it is resting in HP.

So, just imagine the first condition where it is perpendicular to VP, parallel to HP it is in HP. So, instead of 30 mm to HP we will say it is in HP and the nearer point to VP is I would say 30 mm to VP. Now what difference will be made from this diagram? So, condition 1 and there is a condition 3 where the line is in HP. The only difference being that this distance 30 becomes 0.

So, what would we see? We would see almost the same diagram just that this point b dash a dash will now be here. There will be no 30 mm given here. So, we will have a point here and this line a double dash b double dash will come here and merge with the XY. So, that is what we will be seeing for the condition 3 this is where the point b dash a dash will be. This is the line a double dash b double dash and we will darken this point.

Everything else remains the same because all other conditions are the same. This is the beauty of graphics that the only thing that will be represented is what is actually there. So, here we changed only 30 mm and brought it to 0 this is the only change which will be represented here. The dimensions remained the same, the other dimensions remain the same and this is what we see.

So, this is for the lines which are perpendicular to one plane and parallel to another plane. They could be in the plane, they could be out of the plane, they could be partially in the plane. So, that one of the points is resting in the plane as in this case. In this case if we had the line which is in one plane. For example this line which we are seeing here is perpendicular to HP and it is in VP.

And one of the points of the line is in HP then what difference would it make? So, what difference are we making to the second condition let us quickly see this. So, what we are saying it is perpendicular to HP, parallel to VP and instead of these two we say that it is in VP and one point is in HP. Now, let us see what difference would this condition make to this particular diagram, this particular picture.

So, what we are saying it is perpendicular to HP and parallel to VP, true length seen here, perpendicular to HP a point, but it is in VP and one point is in HP. So, all that we will do is this point which is here will be b dash and it will also be ab because this is the same point that we are seeing here. So, this is ab and it is also a dash b dash and here in the side elevation we would be seeing a double dash b double dash as the same.

But this projection will not be there, this distance will not be there because it has become 0 and everything else remains the same. So, I hope with this you have been able to understand how to draw the projections for lines which are perpendicular to one plane and parallel to the other plane. In the next lecture, we would move on to understand the projections of lines inclined to one of the planes and parallel to another plane that is the next lecture.

So, I hope you are following whatever is being discussed regarding orthographic projections here and I am hoping that you are practicing all that we are seeing being done here on sheet and you are becoming more familiar with the usage of tools, the pencils and erasers and everything. So, in the next lecture we will be looking at inclined lines till then stay safe and see you again in the next lecture bye-bye.