

Engineering/Architectural Graphics – Part 1 Orthographic Projection
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Lecture – 06
Dimensioning

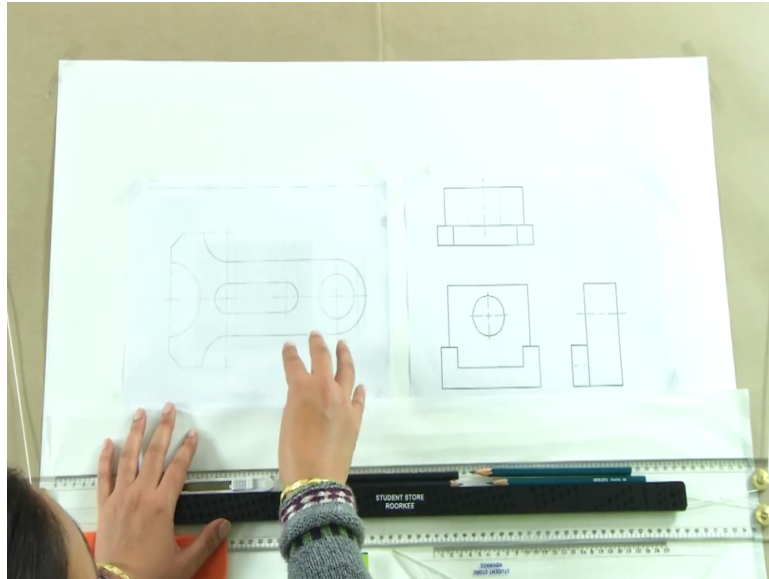
Good morning. Welcome to the week 2 of this course on architectural graphics or engineering graphics and I am your course instructor Dr. Avlokita Agrawal from department of architecture and planning, IIT, Roorkee. So, in the week 1 of this course on architectural graphics we understood the basic fundamentals of architecture graphics to start with. So, we saw what are the different types of lines that we use in engineering graphics.

What are the different type of graphic symbols that we use in architectural graphics in engineering graphics and how do we do the lettering for the drawings. Besides that, we also understood about the different tools and the pencils, erasers, the different tools how to take care of them, how to ready your board, how to put up your sheet. So, all that basic things we have learned.

One thing which is left as part of the basic understanding of drawing process is how to dimension the drawings which is what we are going to pickup in today's lecture which is lecture 1 of week 2. So, today we are going to understand the rules for dimensioning, how to carry out the dimensions and then we will see how do we really do it for these two sample drawings which I have put up here on this sheet.

So, our intent is not to start drawing today, but just to understand how the dimension would be done so that is what we are going to be seeing.

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So, for you I have put up two drawings one which has a lot of curves in it so that we can make the curvilinear dimensions, we can dimension the curve and the second one is more or less straight lines. So, let us see first we should understand the rules of dimensioning which is what I will demonstrate through this drawing here. Now the first rule for dimensioning is that when we are going to read the drawing afterwards.

We should be able to read it from the right bottom corner of the sheet. So, the dimension ideally should be either on the left hand of the side of this drawing or it should be in the bottom of the drawing. So, either the dimensions would come here or here. However, sometimes when the dimensions cannot be represented here they can be represented on the right side and top as well.

But our intent our initial aim should be to place the dimensions on the left hand side and on the bottom of the sheet that is what we would try that is the first rule. The second rule which is most important is that no two dimension lines should crossover each other, they should not intersect. Now what would that mean how does it manifest when we dimension we will see in this drawing.

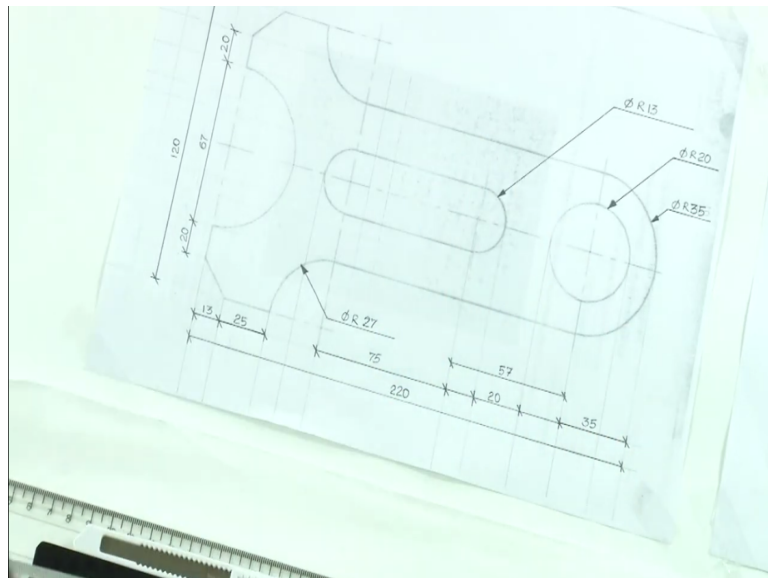
But no two dimension lines should intersect because it will become very confusing that which dimension line or which dimension is representing which side or which dimension of the drawing. So, the intersection is absolutely prohibited while dimensioning a drawing. Another

rule which is very important is that we often it is very rare, but often we do not dimension inside the drawing.

It is very rare either when the drawing is too large that we can clearly read the dimension inside without interfering with the construction lines all the lines that are depicting the drawings. So, in that case we might put the dimensions inside the object, but in all other cases we would try to have our dimensions outside of the object. So, I will start drawing the dimensions. And then we will see.

And then how do we really dimension what is the thickness of the line that we take and all those things.

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So, we start dimensioning this drawing. Now here in this particular drawing let us first draw the extension lines to understand that what all do we need to dimension. So, what we need to dimension? We need to dimension this bigger dimension with full dimension, let us take only the vertical dimensions initially. So, let me draw in very thin line so I am using a 2 H pencil here and I am just drawing the extension lines initially.

So these extension lines will always be drawn in very thin lines and these thin lines should be drawn almost faint enough not to be seen. So, if we are making these lines using a 2 H pencil they would hardly be seen afterwards. So, if we look at all the vertical dimensions with which

will be shown on the left hand side of the drawing we can see that there are too many dimensions which are coming together especially these smaller ones.

So, a smaller dimension is in the front while a slightly bigger dimension is coming from the back and then the bigger dimensions are to the front. So, the ideal way would be that we take out these curvilinear dimensions and put them to the right of the drawing so that is what we are going to do and on the left hand side we would rather dimension the remaining ones. So, let me draw few of these dimension lines and then we will see that what is the dimension which is going to be shown here.

So, always as a rule the smaller dimension will be closest to the drawing. So, if we look at this we can see that the smallest dimension in this particular part of the drawing is that of the circle this semicircle and then the next one is the dimension these two flat ends and then we have an overall dimension which is this. So, what we can see here is the next one we can go on to use the H B pencil.

So, the first thing the first line which we have here and kindly remember that for the dimension line we have to use a very thin sharp pencil. Now when we draw these dimension line the extension lines are anyways coming in very thin faint lines and then these are the markers which will be drawn to mark the end of the dimension line. So, these are small lines which are marking the ends of this.

As an angle to these lines say an angle of 45 degree we will mark another line this is the dimension line. Now, whatever the dimension of this semicircle is so let us measure and suppose it is approximately 6.7 centimeters and if we are dimensioning this drawing in mm it depends upon what is the unit that you are following, but whatever unit be it will be followed uniformly depending upon the scale.

So, this drawing is being drawn to a 1 is to 1 scale so in actual size and this is 67 mm all the dimensions are in mm here. So, on top of this since we are going to be reading it from this side we will be writing the dimensions on top of the dimension line. So, we will be writing 67

mm and mm units will not be mentioned 67. So, if you look at this the dimension is going to be read from this side.

This is the shortest dimension 67 mm the unit will be mentioned separately. The next we could either take the flat ends the next set of dimensions to the other side, but then there will be no dimension in the center. So, what we would do is we would only continue extending the same line. So, we could have continued extending the same line initially only or we could do it later, but it is just an extension a continuation for the same and we mark further the ends.

So, we mark the vertical markers, we mark the horizontal markers and then we write the dimension on top of it. So, approximately let us say this is 20 mm each. So, we write on top of these lines so the dimension which is mentioned here is for this part of the dimension line, the dimension mentioned here is for this part of the dimension line is what it is implying. This is one way of dimensioning.

We will also see the second other way of dimensioning, but for now this is what it is. So, we have already dimensioned this part and we have dimensioned the two flat parts here and then we will take the bigger dimension which is the complete dimension similar to how we did it. We will mark the bigger dimension away from the drawing. So, it will always be the last dimension to be read.

If we are marking to the left of it this will be the biggest and say it is 120 mm so we write it like this. So, the horizontal dimensions of this side have almost been covered on the left hand side. Now we will mark the extension lines for the horizontal dimensions and let us see how do we mark them here. So, let us start drawing the bottom of the drawing. We will also be needing to mark the center for the curves.

So, it is not just the object but also from where the centers will be taken. So, I am marking the extension lines which will determine how the dimensions will be given. These are all very thin faint lines as I repeatedly say and we have to be very careful that initially only light lines I will be drawing. So, to start with we may be dimensioning this part which is in the center we might be requiring to dimension this part.

We might be requiring to dimension what is the overall dimension of this object from end to end. We might be needing to know where is the center for these two curves which is circular coming. So, from the end what is the dimension for this and then this what is the distance between these two curves or what is the distance between these two centers? So this is what we will mention here.

So, I start by mentioning the dimension for the straight parts first. So, we have these dimensions which we will be mentioning now here and then we are writing when we are marking the dimensions in the bottom of the sheet, the dimension will be read above it. So, what I intend by this is and by the way the end markers will all remain parallel throughout. So, if we have taken it in one particular orientation throughout the drawing, entire drawing the markers will come in the same orientation they cannot change.

So, now what we have is how much is the distance from this end of the object to the center of this curve say 35 mm we write it on the top of this dimension. Since it will be read from this corner so either we write towards this side or towards the top. So, we know that the center of this object is at 35 mm from the end which is easier to mark. Now the two centers so this is at say 75 mm this rectangular part is 75 mm which is what we have written here.

We will also write what is the distance between these two curves or we could also write what is the distance between these two centers. So, we may write another dimension here which is the distance between these two centers. So, the intent is to actually mention the dimension which is required to draw or construct an object. So, maybe this is required if you feel that another dimension is required to actually draw that is what will be drawn.

If we see this is another say 20 mm which is what we have mentioned here the flat surface of it say 25 here this is say 13 so I mention it 13 here. Now, what is required to draw this is the radius for all these curves. So, how do we draw the radius of these curves? What we do for curves is we will mark the leader. So, as I told the leader is almost as dark as the dimension line itself.

And what we do at the end of the leader is that we draw this horizontal line which is like the dimension line. So, what we do here is we make an arrow head like this so the thickness of the arrow is one-third its length approximately. So, this is the curve and we mentioned that this curve whatever radius it has so this curve has a radius of say 13 mm so we write circle with radius 13 that is how we mention this curve.

And similarly we will mention the other curves. The arrows have to be symmetrical they should not be like more on one side and less on other side we have to be careful about that. So, say this is 20 so a circle with radius 20 mm it is all in mm and all the arrows should be same sized. So, this is with a radius at a radius of say 13.5 circle with a radius of 13.5 mm. So, that is what we are writing so, this is actually 35 mm at a radius of 35 mm.

So, this is how we have marked where the center of the circle is coming so we know where the center of this circle is coming. So we can mark this circle and another one then we know that from this center the next center is coming at 57 and if you realize you can very clearly see the center line being marked so there is a big dash and a small dash like that. So, along this center line we now know that the first center is at 35 mm and the next center is at 57 mm and the next center is at 75 mm from that and the radius of this is 13.

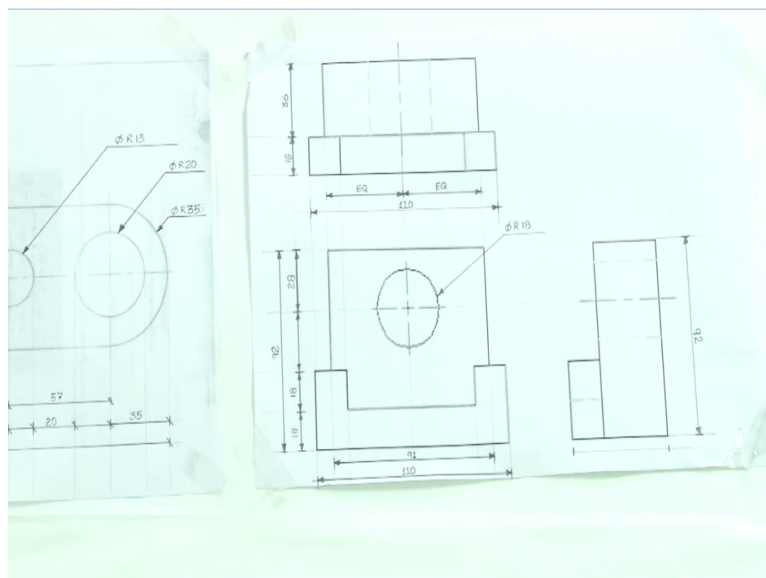
We can again mark the radius for this circle as well semicircle we already know this or we could also mark the radius for that. We also need to know the radius for these two curves. So, we will again draw another one with the radius mentioned. So, for example, if the radius is say 27 so the radius for this curve is 27 and we would mention another radius for the curve there and that is how we would have mentioned all the dimensions here.

So one more dimension which is left is the overall dimension of this particular drawing which is always necessary. So, we should always mention the overall dimension of any drawing the final dimension, outer dimensions and in all cases the total dimension should match up to the sum of these smaller dimensions. So say 220 here we have not mentioned this dimension, this dimension and this dimension.

So, it does not matter, but in case we were doing that all these dimensions should have added up to 220. For now it does not matter we cannot reduce the dimensions in between. So, this is R 27 so we know that this is 27 we would know that okay this is R 13 so this is 13 and we know this is R 20 so this is 20. So, overall all these dimensions should add up to this one that is what our aim is.

So, this is how we would dimension the curves and drawing which has a lot of curves and straight lines. Another way of dimensioning which I am going to show on this drawing is if instead of these marker heads the inclined marker heads we use the arrows. So, to start with we will again start with drawing the extension lines.

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Another thing when we are drawing the plan elevation and the side elevation of it. This is the plan, this is the front elevation and this is the side elevation of it. So, when we are dimensioning we would be dimensioning separately for plan, separately for elevation, separately for the side elevation. However, when the drawing is going to be read a dimension which is already mentioned in plan may not necessarily be repeated again in the elevation or the side elevation.

So, we may omit certain dimensions. So, let us quickly draw the extension lines, so we would first quickly draw the horizontal and vertical both extension lines which is what I have done to start with this drawing. So, if you can read these drawing it is basically a shape where what

we have is we have a sheet like of structure a vertical sheet which is in the side elevation seen like this.

In front of it we have another structure like this which is like a U and it has some thickness and it is depressed from the center that is why you see this hidden line. So, when you see it from the side there is one entire rectangular phase which is this, but then at the back of it we know that it is being cut so that is what the drawing is. Now what you need to know? You need to know the radius of this.

So here we can mention the radius of this circle which will be mentioned here then we need to know the center of the circle from the top. So, this is the elevation drawing we can see the dimensions in elevation, we would need to know how much at what distance from top is this circle, the center of the circle which is what we will mention here then we would know what is the depth of this one from the bottom.

So, we know this on the same line then we have the remaining depth of the bottom part which is here and then we would know that at what height is this center. So, that is what I have drawn here and again just like we have done for the previous drawing style the dimensioning style we would draw the horizontal markers which will always be there whether we use arrows or not does not matter we will have to use the horizontal markers.

But then instead of this diagonal markers sometimes we can actually use the arrows. So, when we are printing it is easier to use arrows when we drawing with hand sometimes it becomes smudgy because the arrows are usually filled up they are filled and we need to be very particular that all the arrows have to be the same length and width then the drawings looks good.

If you cannot make those arrow heads you better stick to these inclined marker heads. So, we would dimension at what distance from the top is the center being placed vertically and then from bottom what is this distance? So, I keep writing down that so say 18 say another 18 and from top it is say 28 whatever is coming that is what we have mentioned. We have mentioned the thickness of this one, the height of this one and the center from the top.

And we can then also write the overall height of this object. So, we have the overall height of the object and the dimension style will remain the same, same arrows and they do not increase or decrease in size. So, this one is approximately 9.2 so 92 that is what in elevation we get. I do not think we need anything more than that. Here, we need to know the radius of this if you know the location of the center all we need to know is the radius of it.

So, say the radius of it is 18 so we know that the circle with center here has a radius of 18 and we should be able to draw that now. Now what else do we need to know about it. In elevation, we may be interested to know about say two dimensions one the inner dimension the outer dimensions of the sheet on top and the outer dimension of the bottom part. So, we will again mark these.

So, this is the dimension for the top part which is coming down like this. So, the extension lines have to be very clear if they have to communicate where this dimension is coming from. So, we will mention the dimension so say 91 and then the outer dimension say 110 like this. So, this is how we are reading this now one more thing which is still left is where is the horizontally where is the center placed.

So, that is what we can get in this drawing as well. So, in the plan may be we can get to know that okay so maybe that the center is placed at the midpoint of this line. So, we draw another extension line and what we can also write. So, we already know that this is 91 so we can also write equal. So, sometimes we may not be able to divide or give the dimension for it, we could just write EQ which means that both these dimensions are equal to each other.

This is what we write and we can just bisect this particular drawing and say these two parts are equal so this part is equal to this part. We do not need to give the dimension sometimes or you could also give the dimension if you feel it is necessary and then in the top one also we would give the final dimension. So, this is what we will write and always the outer dimensions of the drawings should always be the same.

So if it is 110 here it has to be 110 here the outer dimension must remain the same. So, now this particular dimension will not be seen anywhere so we need to mention and preferably try to maintain the same dimension. So that is what it is seen from the top. So, we will mark this dimension whatever this dimension is use the same dimension style. So, this is what is seen from the top so for this one this dimension is also seen here.

So, it is say approximately 18 again 18 is the thickness of this one and for the other plate it is 36 for this one is 36 so we know the thickness. Now this 36 is equal to this 18 is equal to this and this height is equal to this, this width is equal to this. So, that is what more or less we have already given the dimensions we may or may not dimension this one, but at least we will dimension the outer ones.

Now since there is not enough space between these two we would prefer to dimension towards the right unlike in the previous drawing. So that is what we will do. Now without even looking at or measuring it I should know that this is 92, but which side of the dimension unit the number will be written, it will be written away from the drawing that is the rule. So, when we mark the dimension it is always towards the outside of the drawing.

We never write it in between the drawing and the dimension line. So, that is what we are doing here again we will draw the extension lines and we will make the arrows and all and without even seeing I can write that this is 36 and this is 18 the same dimension as is coming from this. So, I hope with this you are reasonably clear about how to dimension a drawing making drawing is important, but dimensioning it is equally important.

We have to know how to dimension this entire drawing otherwise the drawing will be of no use. So, that is the end of my lecture 1 for week 2 today and we will be starting with the fundamentals of basic geometrical construction in the week 2 lecture 2. So, see you again for the next lecture. Thank you.