Technical Arts 101
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Lecture - 31
Lab – 03

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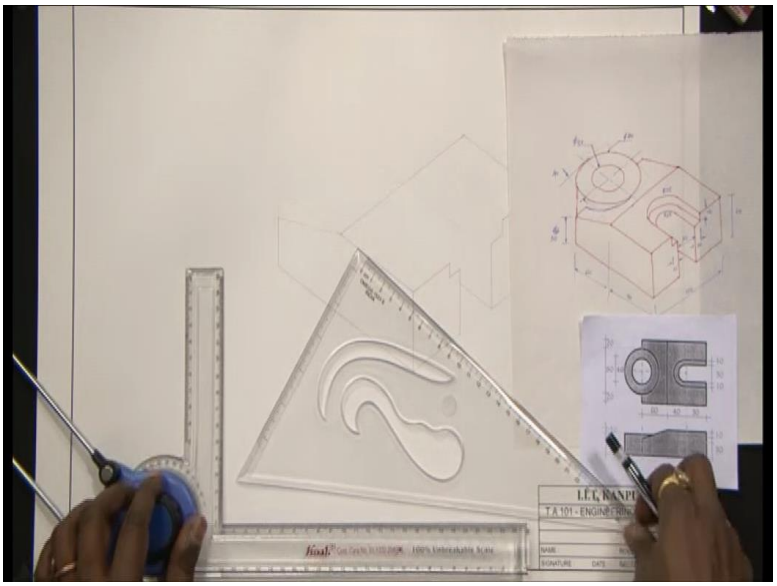

It is always a nice idea for me to not to overlap a line, but anyhow. And then must be trace this vertical edge first, and then trace this edge, and then this vertical line, this vertical line here; this one here, and this one here. I just want to make sure I get the lengths of this right. So, this is about 10, which is kind of ok, and this is also about 10 this is kind of ok, maybe a little more than 10, but let me not worry about the accuracy, in this sample. Well I should be worrying about the accuracy. So, maybe I really I should be erasing this, and I should be redrawing or again if you notice I have a little (( )). So, I cannot see it is 10 or 11, but that is ok, and then of course, these two edges. I hope I get this right. And then let me worry about these three edges. Let me move my sketch a little bit on to the right. It probably would not be visible to you, but that is ok. I will get back. These are the lines which are little difficult to draw, but it looks like a habit, and now for this 1. We have got overshot while little while, but that is ok.

As I said I have little disadvantage reaching this region of the drawing. Here is my sketch back, and here is the picture of the autographic drawing. So, what I have done is, I have covered this edge, and covered this edge; this 1, this part here, this part here. I will worry

about these parts little later. Of course, these three are straight lines, and there would be a line which is parallel to the y axis over here. So, let me sketch that first or draw that first; otherwise I will forget. Here I am. I will have to keep flipping, so maybe I will just fix this part of the edge right, again will be a little more.

So, I will keep flipping these two pictures little right, because I am going to be accessing different parts of my drawing here. I hope we have a better view of the sketch and the drawing both all right. So, I have this 70 covered up, I have to worry about this 60 now. I have already gotten the 60 length of marked here; looks like. So, let me draw this feature of the object. So, if I look at this length, this is about 30, maybe I can use the solid pencil directly, because this is a solid line; my h pencil and draw this directly. And perhaps I can even go ahead and draw this line, using the h pencil, to make my figure look little better, great; looks good.

So, you know this height is about 50, this height is about 30, and maybe I can go ahead and draw this line directly. I hope I have this, looks like I have. So, take care of this, this, and this line, and at the back. Well although I have drawn this as if this set of features going to be letting this part of the object visible, I would not be quite sure, but anyhow. Well it will be a good idea for me to draw the bounding rhombus for this circle. Well give me an idea whether these parts of the object, will be visible or not, and it will also help me prepare to draw the circle.

Of course, the center of the smaller one the large 1, they are the same. You know in second third. well I would need to be little careful when, drawing this bounding rhombus for the circle, because you know this height, it is this height, this height about 30 millimeters, and this height is about 40 millimeters, and rather whereas, this height from here to here, is about 40 millimeters. So, the plane of this rhombus, will definitely be below the plane of this feature of the object, by 10 millimeters. And of course, that plane will be 10 millimeters above this plane, or this height of the object. So, I need to be a little careful, and I need to draw this accurately.

Let us now draw the bounding box for this outer circle, and the bounding box which is going to be rhombus in both cases for the inner circle. I need to be a little careful. Look at this height, this is about 30, this is about 50, and this height here, is about 40. So, this plane with this circle and this circle rely. This plane is midway between this plane and

this plane. So, that is the first point I need to keep in mind. The second point I need to keep in mind, is look at this centerline. This centerline is coinciding with this edge in the front view; imply that this distance is something that I will keep in mind, when drawing this center line. So, this corresponding centerline will probably be here, but at distance of 10 below these vertices for this edge.

So, having said that, let me take my set square away, plot 10 down, plot 10 down from here, and perhaps plot 10 down from here. I am using my set square I get this line. So, this is where this centerline will be. So, let me go ahead and mark that centerline, using my h pencil; once again long dash short dash long dash short dash long short long. And I want to be careful, because this horizontal centerline will not be at this level, but at 10 below this line. So, switching back my pencil. I go 10 down, and then using my set square, I make a line along the y axis or parallel to the y axis. This one, make sure that these lines are very parallel. Just want to make sure that these lines are very parallel.

So, this center is this center here. So, let me make this centerline. Once again long dash short long short long short long. I cannot see this line, but looks like I got it right. So, once I have gotten this center, all I need to do is, to make a rhombus around this. So, what I will do is, this rhombus is of side 80 by 80. So, I will mark 40 on both sides of the center, along this line where I go, and I will use my set square, and make sure I have 40 on the other two sides, along this direction, and here. And then I will join these two vertices, may be use a slightly thicker or darker line; not thicker, but darker line all right. So, I got this rhombus, and what I would need to do, is draw an ellipse, touching the four sides of the rhombus, and for that I will be using the 4 center method. Of course, that 4 center method does not give me the exact ellipse, but approximate. So, let me find the 4 centers first. So, I will draw the longest diagonal, which is going to be horizontal in this case, and then I take this vertex and join that with the midpoint of this edge of the rhombus, right here, and then I will take this vertex, join that with this midpoint; all the side of the rhombus.

So, you realize that now we have 4 centers; center 1 center 2, center 3, and center 4. Of course, I can think about using the circles in the tensor here, but it looks like the diameter of this circle will be bigger than the bigger circle I have in my tensor. So, probably I have to use my compass. So, with this center, let me adjust this compass. Let me see if I touch both these points looks like I do. So, I draw an arc, this would be dark arc in the

same center, rather with the same radius and with the new center here. So, if my construction is correct, I should be able to draw this arc with same radius. See if I touch both these points. Let me I will have to adjust my compass a little bit. I will have to adjust my compass a little bit, and then I draw this arc, probably not touching that, but that is ok. For demonstration purposes I can always correct that later. So, looks like there was an error on my part here, and then with this big radius, with this point of center, and with this big radius, soon make sure I got it right; looks like I draw this arc, and with this at center and with the same radius I draw the final arc. Well let me draw thicker this time.

And then there is little bit of touching I would need to do, which I would do free hand. So, looks like I have gotten this outer rhombus now, rather the outer ellipse. Now let me work with the inner ellipse. So, the same center, now this inner circle is of diameter 40. So, I will have to draw the rhombus each of side 40. Well I do not think I would need to do much, except for the fact that I need to measure 20 on both sides, perhaps here and here. I am using these two points. I just draw dim lines not so dark 20 from here and till here, and 20 again from here up till here perhaps, and then rotate this, and get the lines parallel to be x axis, slightly darker not very dark, and here. So, again we are going to be using the 4 center method. I already have the longest diagonal in there. So, this vertex of the rhombus, and the midpoint of this hyper rhombus, I join them, and I join these two vertices. Once again I get 4 centers, and let me mark this, these centers. So, center 1 center 2 center 3 and center 4.

If I measure this, this is about 11 millimeters from here to here. I expect the same, for this radius, for this arc that I would be drawing in a short while. So, maybe I can cover these arcs, through my tensor, with a circle of diameter 22. So, let me not worry about the center very much, just to ensure that the arc that I am going to draw, touches these two edges of the rhombus; looks like I got this right, maybe I will switch my pencil, and straightaway from this arc; the same radius, and let me make sure that these edges are tangent to the arc that I am going to draw just now; looks like it is, and I go and draw the arc. For the bigger arcs I recon I would need to use my compass, with this is center, this is radius, I just start a little, and let me draw this arc gently. May be I just little touch up, and then with this as a center series I will draw this arc. We got a little bit touchup here. So, looks like I have my 2 rhombi, and the two ellipses that I needed; one of rather one

representing a circle of diameter 80, and the second one representing a circle of diameter 40. Now, if I look at this sketch of mine. So, this is going to go in a little bit, and this is also going to go in a little bit, and of course, there would be a vertical edge, corresponding to this. So, let me using light lines, extend a line from this vertex. And I am going to be using construction line for that, so 2 h pencil.

Well let me have this line extended throughout, and then let me have vertical coming down, from this part of the cylinder, from the circular frame in to the cylinder. I am going to using solid line for that, because I know that this would be visible very much. And of course, this line will be intersecting the line that I just drew, so maybe this part would be solid line as well. So, from here let me draw vertical solid line. Well let me draw a vertical dim line, because this edge is not there all right, do have a reference. So, this point is the corresponding point, or the point corresponding to this on this side. Once I have that let me join these two vertices, using the solid edge line which is going to be visible, there I go and then let me (( )) line. So, notice that my dim lines are not so dim after all, because I need to show the construction of these ellipses very clearly; otherwise my grader will try to figure how I actually got these ellipses, and he will be confused or she will be confused. So, anyhow I got this part done. Notice that I have made this curve in blue while I made the rest of the sketch in red.

This is a particular reason for that. I will come back to that just to let you know that, this actually is the curve that is a result of the intersection between this cylinder and this slant surface. So, this slant surface and this cylinder, and this curve have nothing to do with the ellipses that I have drawn here. So, it will be separate curve and I try to figure, how to get this curve. This curve may or may not be an ellipse. Anyhow, so let us try to focus on this part of the object. Let me transfer my sketch on to the left and also the figure on to the left, and get my drafter here, maybe I have my figure here. No it is not visible perhaps here, because I am going to working on only this part of the object for now all right. So, we already got that this was 30 this was 10 this was 10, so this is 30 10 10. Now let me focus on this point of the object this point, or this point perhaps. And from here up till the center of this arc; this arc is also going to be or these sets of arc rather they, are also going to be looking like ellipses in the asymmetric view, but for now let me focus on these horizontal line that I need to draw. So, these horizontal lines they will

be parallel to the y axis in my sketch and each of these horizontal lines they will be of length 30.

So, I take my friend here the 30 60 set square and start drawing lines along this direction, the direction parallel to y axis in my sketch, let me shift this slightly and start drawing these 30 degree lines each of length 30. So, if I look at my sketch this line will be visible, and these three lines will all be visible. So, I met as well views the h pencil directly, and make sure that I draw visible lines.

Now this line and this line will probably be coincident. So, maybe I will go ahead and draw this. Now, to draw these three lines each of length 30 from here, draw this as 30, go down draw this as 30, and come down further over here and draw this as 30. Let me use my mini drafter; the vertical scale of that, and see if I got it right. So, looks like I got this part right. Would be just little vertical for my reference, and remember that this length is going to be 10. So, I just measure, I told you that I had a little error of 10 10th of 5 here, I measure the same, pretty much there, pretty much right. Now, the final thing that I would need to do is, to draw these semicircular arcs or in isometric drawing, the ellipses or half ellipses corresponding the semicircular arcs.

Let me bring my orthographic views back, and focus on this outer circular arc this is of parameter 50, so this rhombus will be of 50 by 50. The center of this rhombus will be along this edge. Let me draw this. So, this would be the corresponding center for that rhombus, and then using my 30 60 friend, I am going to plot 25 millimeters on both sides, on this edge. So, this is about 2 5 and of course, this is about 205.

So, let me extend this edge, and I will go over there this is about 25, and I will rotate this I am done here, and complete my rhombus not so dot lines, but dark enough for us to see how the construction was done and then of course, we use the 4 center method for that; 4 center method to draw this ellipse. So, this longest diagonals going to be horizontal. So, this longest diagonal is going to be horizontal. Well let me use my mini drafter for this, and let me give the 4 centers, joining this vertex of the rhombus to the midpoint of that side, and line parallel to this using that vertex, and joining the midpoint of this side of the rhombus. And I have the 4 centers as this one, this one, this one, and this one. I am going to be interested in only the semicircular part of the ellipse.

So, only these 2 arcs they need to be drawn, so let me measure this. This is about 15, looks like I have a circle of diameter 13 in my tensor here, and perhaps I can use this tensor, and get the circular arc here. Make sure it is tangent to both edges; looks like there I go, and of course, this seems longer, so I am going to be using my compass for this. Seems like this rhombus was not accurately made, but not to worry, I will just do a little touchup here, and little touchup here. Well technically I am not supposed to that, but for demonstrations.

Now, how about the semicircular arc, that would start from here, and perhaps go down here, back to my sketch this 1. So, this would be on the same dimensions as this arc, just that it would be 10 millimeters down from inside. I do not have to draw this rhombus all over again, I need to be a little smart, and what I can do, I already have the centers for this ellipse. So, I can, maybe shift these centers down by 10, perhaps here, and perhaps here, and may be shift this point also downward. And then I already have the radius set, this figure is set in my compass, maybe I can use that, and draw this ellipse; little touchup here.

And then this was about 15, so I am going to be using my tensor, and may be shift this thing over here, or ideally I should be drawing these two edges, or should be shifting these two edges also downward. So, let me do that just to get it right. So, this edge is down, and let me also shift this edge down already have this over here. So, maybe I will just draw that. So, with my 30 degree, or rather 30 mm, is about 50 all right, so with my 30 mm circle. And perhaps I should have drawn this part of the rhombus, would be I just draw that, just to get an idea whether these edges are really tangent or not, to the arc. Now, I think I am just about ready. So, this arc would be just up to this point, and then all right. Now finally, for this arc, so we will have to work out a rhombus of side 30. Of course, the center for that rhombus would come down over here by 10 mm. So, looks like I already have the edges. So, this dimension is about 15 is bigger, and this dimension is about 15 also, this is about 15 I view. So, I take my set square my mini drafter extends 15 here, and 15 here down.

And I believe I have 15 here, and perhaps 15 there. I locate that, get another rhombus, this time of side 30 millimeters each. Let me double check; of course, this is the center, this is about 15 and 15 all right, this should be about 30. This should be about 30, and this should be about 30. So, I probably need to extend this a little bit, and then extend

this edge and get the fourth vertex of the rhombus. So, this is my rhombus, where I need to draw the semicircular arc of diameter 30. Once again 4 center method; get the longest diagonal, this could be m s or I will try to be little careful. So, I am focusing on this rhombus now. So, the midpoint of this edge is somewhere here, extend this edge and the midpoint of this edge over here. So, I join this vertex or the rhombus.

So, this is the final thing, I join this, midpoint of the edge, where this vertex, and this one of this, get 4 centers; first 1, second 1. I just need these two to get this part of the semi-circle. So, I measure this, this is about 9 pretty much. So, get back to my tensor, switch to my h pencil quickly, use a circle of diameter 18, make sure that it touches both edges, its tangent to both edges, and quickly draw this arc. And I measure this length, this is about 25, again I need to use my compass for that.

So, I get my compass, and draw this circle of arc, perhaps little darker. a little bit of touchup, and perhaps I will see this edge, perhaps. So, maybe I will give raise this 4 now. I must admit that this not the first time I have use the eraser, but still, to make sure I am accurate. These two vertices will be joining together, and it looks like I am finally finished, except for the fact that I still do not have this arc. Let me scratch my head think about that and get back to you. So, this is what we have as of now, so looking at the orthographic views, in third angle projection that we have. So, we covered the circular feature, we covered the internal void, and then we covered this slant surface, and then we covered this path surface here, and then we covered the features over here.

So, looks like we have that pretty much except for that, we still have not been, or rather we still have not addressed the curve of intersection, between this cylindrical feature, and the slant surface. So, this was the blue curve on my sketch; this one here. So, what I did was I took a long break, I folded my sketch place it in my pocket, came out and start thinking has to how I would be getting this curve, and it looks like may be if I focus on this region of the orthographic projection. May be there is chance that I might be able to find the points of intersection between this slant surface, and this arc of the cylinder.

In fact, this curve is nothing, but a set of point of intersections between these two surfaces. So, let us try to find that out, but before we do that, let me put this sketch and the figure away for a while. Well let me get this figure back, let me place it here. Look at this distance, how much is this, how much is this distance. This is about 20, do I have 20

here, probably not. So, what I will do is I will mark this distance, and may be coming back to my sketch extend this line. So, that this distance is 20, and then I will start worrying about the point of intersection, between this cylinder and the slant surface. I get back to my friend the 30 60 set square, mark this as 20, and then extend this line, make this as a solid line, this pretty much what I have here. And then before I start with the intersection points, let me draw the magnified view or the orthographic view, pertaining to this part of the solid. So, let me have my sketch here, and let me first draw this trapeze here, may be somewhere over here, or may be a little on the side, just to make sure that this figure does not interfere with this figure.

So, this distance is 60, I am using my 2 h pencil. So, I draw horizontal of 60, this height is 40, this height is 30. So, what I will do, is I will draw 30 from here, whereas, this height is 50. So, I will get 50 here, and then I will join these two points, using my drafter, I project these vertical edges upward. So, I am only interested in the intersection points in this region. So, in the orthographic view I will just be drawing this part of the cylinder. Notice that this center is just above this vertical edge, which is this edge here. So, the radius of this is 40.

So, I will make sure I have enough clearance, which I do. So, maybe I will mark this here, I will give the centerline. Let me also give the bounding square, that bounce; this outer circle, will actually it would not be a square, but it will be have a square. This is about 40, so I just draw this; horizontal line, and then using this as center. Let me also draw this centerline over here, using this as center. So, with this as radius, let me draw an arc. I should have drawn it lighter, because the construction arc, but that is now notice that this is 60 here, and this is 40. So, there was going to be a gap of 20 between these two fits, for this is gap of 20, just about 20, and then I project this part downwards.

Now, the points of intersection are going to be in this region, how do I get that. Well they have to be lying in the top view they have to be lying, on the circumference of the circle, and in the front view, they have to be lying on this slant surface. So, that is something that we need to keep in mind. Once again the point of intersection in the top view will be here on this arc, and the front view they have to be lying on this slant surface. So, what I do is I draw horizontal from here, extended, and then I partition it into, let us say four parts, and then I take these projections upward. Now, corresponding to this horizontal line, let me draw a line here. So, this is of length 40, and of course, this line in the

isometric view, or drawing is going to be along the direction of the y axis, as going to start from here. So, let me start from this point; measure 40, and then draw little construction line, right there. Now these points, these five points are going to be lying on this line. So, let me mark these lines, or these points rather.

So, once I have these points marked, you know if I look at the front view, these distances are nothing, but the vertical distances from this points; that is something that I need to keep in mind. So, at this point the vertical distance is 0, at this point the vertical distance is something here. And the vertical distance is reduced as I go from here to here. So, maybe it will be nice idea for me to measure these distances, and mark them on this picture here, on this diagram, on this figure. So, this would be about 12. So, I go over here and mark 12. From here this is about 10 just about, so I mark 10. Here this is about close to 7, so from here I mark 7. Here this is about 3 millimeters, so I mark 3 millimeter, and then this is 0, this is 0. Now, how about these distances. Now these distances would correspond to the distances, of assuming this line to have been projected up there. And then these distance, rather these distances would be from here up to the point of the circle, let us try to measure them. So, if I go here this distance is 0, if I go here, this is about 2 millimeters. So, I will have to measure 2 millimeters from here.

So, it will be a nice idea for me to draw, lines parallel to the x axis, from each of these. Now I know that this distance is just about this distance. There would be some error over here. Well I do not need to worry about that, because I know the point of intersection will be here, and corresponding to this the point of intersection will be here. Now, if I measure this, this is about 2 millimeters, so this thing should be about 2 millimeters. So, I take my set square measure 2 from here. So, I get the first point of intersection, this height is close to 5. Again this is not accurate, close to 55.5 perhaps. So, I will mark 5.5 here, and then this is about 15. I will possibly mark 15 from here. So, it is about 14. So, I will probably have to shift one point back, may be very close to the circle. So, I have got this point as one point of intersection; this is the second, this is the third, this probably the fourth, and this right over here has the fifth point of intersection.

So, once I have the points of intersection, I would just draw them or join them, using say a French curve. So, this may not be very accurate, but this is close to what we might expect to get. So, I have to get up and come to the other side of table, to get my French curve right not quite. So, this point is kind of a little off, but I can perhaps take care of

the other points, and get this curve intersection. Let me see if I got this right, getting back to my figure here. So, I got these points right. This would be 0 of course, and this would be 0 over here sorry. And this is close to about 3, would be close to about 3 perhaps. This would be close to about 6 perhaps 6, and this would be about 9 or 10. So, this should have been, it is about 9 or 10. So, in a way I think it is ok, just to get the idea. So, these distances would be these distances, and these distances in the top view would be these distances. So, this is what the idea is. And having said that, I think I may have covered pretty much everything that I have on my sketch, and therefore, the isometric view of this solid; the orthographic third angle projections which I have given, pretty much looks like what we have on our sheet right here.

Thank you for joining me.