Engineering/Architectural Graphics – Part 1 Orthographic Projection

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Lecture – 02
Drawing Instruments

Good morning. I am Dr. Avlokita Agrawal and this is the course on architectural graphics or engineering graphics where we are going to learn about orthographic projections. So, in the second lecture of this course we are going to learn about the different tools and instruments that we are going to be using for making these drawings by hand. So, though most of us have already shifted to computers, but before we move on to computers.

We have to understand the basics of how the drawing would be done on sheet and by hand. So, that is what we are going to learn and in this lecture I am going to show you what are the different tools and stationary items that you need to procure. So, now I am going to tell you what are the different instruments and tools that you will be needing for architectural drawing or engineering drawing.

Not necessary that you would need all these instruments at all the times, but at some point of time you might just need it. **(Video Starts: 01:30)** So to start with, we will first start with the very basic tools that you would be needing. So, these are these pencils you must have these hard wooden pencils that we have and why do we have so many different pencils? So, we have pencils from grade 4 H to 8 B.

So, if you ever pickup a pencil you can see that there is a grade written in the bottom which is this one says 4 H and then you can find the pencils with the grade of 3 H and 2 H and then we have an HB and from HB then the grade starts increasing towards the B so we have 2 B, 3 B, 4 B, 5 B, 6 B and 8 B. Now, what does this H and B mean that you have to understand? So, the pencils which have an H means they have a hard lead.

So, they will be very light when you draw with them. So, you can apply a lot of pressure, but it will still give you a very light colored line so it is a hard pencil. While if you look at this 8

B pencil it is a very soft pencil and it is black. So, B stands for black. So, the darker is the grade 8 B is darkest, but it also the softest. So we use it very rarely in engineering graphics H B which is the one which is most commonly used is a balance of hardness and black.

So, it is quite convenient, comfortable to use and we would have when we are drawing we would have the grades starting from this 4 H to 8 B. Though, some of the pencils we would use less often and some we would use more often, but we would have this entire range of pencils with us as a stationary kit then we would need an eraser because we are working with pencils. Though, when we are drawing we should ideally use the eraser least.

We should not be using the eraser. So you should be drawing very carefully because more we erase using the eraser the dirty or messier your sheets would become and the sheets though they are not fancy they do not have colors and rendering and painting, but still the graphics itself should be very balanced and composed and we should be needing this eraser much lesser.

What you would need along with that is not a sharpener not the regular sharpener that most of us would have used in the school, but we would actually use a paper cutter to sharpen our pencil and that is what we would be using I would show you how you actually sharpen the pencil. So, we do not sharpen using the sharpener because when we sharpen using the sharpener it also moves along with this lead.

And the lead becomes little soft and powdery. So, it leaves those powdery marks and that is what we do not want. So, we would always sharpen our pencils using a paper cutter that is the best. So, we have these pencils, eraser and sharpener then along with that you would always be needing these two different types of tapes. So one is a sellotape is commonly known as a sellotape it is a transparent tape and we also have a magic translucent tape.

So, we would be having so we would be having one roll of each one of these then along with that you should always have at least a duster to dust your sheet and keep your instruments clean. You would be needing a simple scale foot long scale 30 the centimeter scale and when

you select a scale you should be checking if it has an inking edge or not. So, scales sometime would come with an inking edge.

Now, I should tell you what an inking edge is with some other. So, this is the set square you have used the set squares this one in schools definitely for your Math Mensuration and geometry these are the bigger ones which we use. Now as far as we are going with pencils on architectural traffic sheets you would not need an inking edge, but the moment you are working with point and ink pen and ink you would need an inking edge.

So, what inking edge is if you move your nails along the edge like this. So, you would see that there is an edge inside you cannot really see it, but you can feel it. So, every time the ink blots. The inking edge which is slightly depressed will hold that ink and the ink would not spread on your sheet, it will not blot the entire sheet. So, besides scales you would have two set square one is the 45-45 and other one is this 30-60 set square which we would be needing.

And we also have a protractor so this one is used for making the angular lines. So we would need a protractor also. We also have this adjustable set square which is an interesting combination of both set squares and protractor. So, if you look at it in a closed way it is actually a 45-45 set square this is the protractor that I am talking about. So, you can actually fix it to some angles.

So, I have just fix it to 30-60 that you can see so it is 30-60 here so if you keep it like this so this is actually the 60 edge and this is the 30 edge. So, this adjustable set square can be adjusted to any angle, you can adjust it to any angle, but in its closed form it will remain to be a 45-45 set square and this one is quite handy because you can use it for any angle unlike these ones which are fixed.

So, we have this adjustable set square. You have the scissors which you will need anyway besides this we have this French curves. So, most of the times when we are talking about the engineering graphics you go for curves like circles and ellipses, but when you are designing building sometime the fancy building I am sure you must have seen a lot of building. For

example, the Sydney Opera House and many others where different shapes of curves have bee used and we will be talking about different curves.

For such curves sometimes it is not possible to make them with the help of a compass or they are not fixed, they cannot be determined especially when you are making them by hand. In such cases, we would need these French curves. So, this is a set of 12 curves so there are 12 curves in that they are numbered and then what you have to do it is basically hit and trial. So, you have any three points that you have to be joined with the help of a curve.

So, you just put these curves and it could be any one of these which will be used and as you practice more you understand that which curve would fit in the given circumstances in the give points. So, you put these curves French curves any one of these and then you make the curve as desired. So, this is French curve that you would be needing. Now these are all the supporting ones.

Another thing that you would be needing is the scale. So, it is not the ruler as I said which I wrongly used the word scale it is actually the ruler, this is the scale. So, basically when we talk about scaling or dimensioning the drawing so when we start talking about the scaling or dimensioning of drawings that is when we would need the scale. So, this one if you see reads 1 is to 25 or 1 is to 250.

So, instead of calculating that what would a 10 meter mean on a 1 is to 25 scale we could simply look at this and we can actually select the scale and make the drawing directly. So, it is to help you scale the drawing and you would need it quite often when you are doing the architectural drawing. So, this scale comes handy and it has multiple scale I think it has 6 in total and the most frequently used ones are 1 is to 50 and 1 is to 100.

So, that is what you would be needing most often. In addition to that, you would actually be using the main drafting equipment. We use two drafting equipments commonly. So, if you are working with a smaller board the half size board this one is an A 0 board the one which is in view is an A 0 board with a stand. So, you might be having a board with the stand this is a full size board.

For a full size board you would always be needing a T pulley. So T pulley I will show you how you work with a T pulley, but a T pulley actually has these four or two pulley. So in case it is 4 you have 2 pulley on each side in case it is two pulley so you will basically have one pulley on each side and you pass thread over it. So, on the board the T pulley actually moves in parallel, it continues to remain parallel and it moves.

I will show you how to fix that. So, for bigger drawing especially for architectural drawings we use this or if you are using the smaller board you may also be needing and some of you who already studied the subjects might be familiar with this, this is a mini drafters. There are bigger drafters so which are exactly the same shape, same fundamental, but they are bigger. So, we could use this mini drafter if we are working on smaller boards.

And smaller size sheets, half size sheets or we could be using the T-pulley. I would show you using the T pulley you could also see there are lot of tutorials available on how to use the mini drafters as well, but the fundamentals remains the same. You would also be needing board pins especially when we are working the pulleys to fix up the sheet. So, we would be using the board pins. These are the flat head board pins which are made up of brass.

So, you can use these ones instead of the very small lifted headed pins board pins so buy a pack of these board pins as well and the most important thing of all of these is these sheets. So, we will be using the cartridge sheet. Now, if you look at the cartridge sheet if you have handled the cartridge sheet you would know that cartridge sheet has two sides to it. One is a rough side and the other one is a fine side.

So, on the fine side if you want to draw thinner drawing especially engineering drawing where a fine line is required and finesse is required you would go for the thin side and for sketching and painting the free hand things you would use the rough side. So, for all this entire course I would suggest that you prefer to use the smooth side of the sheet. Though, you can always try making drawings on both the sides and see which one works for you.

Some people make little bold drawings which are thicker and some people prefer to use thinner lines whatever we are using thicker lines or thinner lines consistently other lines will have to be shifting. We would always keep a butter sheet along and that is to save our sheet from dirty and messing. So, that is what we are going to be using. Now before we start understanding how to use T pulley or mini drafter, I would first show you how do you actually sharpen your pencils which is essential.

So, I am going to show you sharpening an H B pencil. So, just keep a rough piece of paper where you do it and approximately one inch you mark on your pencil. So, if you can see I have already marked this and then with a very light hand you start to chisel off the pencil especially towards the head of it and if you see we are not doing it like in one go it has to be done simply thin pieces of wood should come out,

And as we go continuously we have to reduce the length of this wood chiseling and restrict it only to the top of the pencil where as you can this lead is gradually coming out. So, what we have to attempt doing is we have to make this wooden part absolutely smooth. So, if you look at this part it is absolutely smooth and this is what we require so that that pressure when you are using the pencil the pressure from your hand on the pencil is uniform.

So, there is no deviation of pressure when you are moving the pencil and when we actually draw we actually move the pencil, we rotate the pencil like this. So, that we get a uniform thickness. Once we have done this much, we will start to chisel the pencil and if you see closely I am continuously rotating the pencil as I start to chisel it and if you continuously do this you will actually be reaching a very fine point pencil.

And always we should make a habit when we are drawing using these hard wood pencils to be drawing using a fine pencil and not a thick pencil that should be like a rule of drawing. So, if you see this and you should try not holding your pencil with your hands so that it does not dirty your hands and your sheet remain clean. So, if you see this, this is far better and it stays longer if you have a point like this unlike these ones which have been done.

So, these come from the market if I have to suggest you if I have to use it I will chisel it with the help of this paper cutter and I will actually chisel it to give it this shape so that my pencil, my point is actually very fine and every time so one more thing which I have actually missed out is a sandpaper. So, you have to get a very fine grade sandpaper the zero grade sandpaper and every time assuming this is the sandpaper every time your pencil becomes little thick.

So, you just have to rub it to on the sandpaper like this, keep rotating it, rubbing it and then you have to clean the pencil using this so that there is no lead which deposits on this wooden part because if it is there then once you hold it your hands will become dirty so that is one habit that you should have the other habit that you should always have is that you should keep cleaning your hands.

You should never have lead in your hands otherwise all that lead that dirt will get transferred on to your sheet and you will not be able to maintain a clean sheet. So that is another thing. So, I hope you will be able to procure these pencils and you will be able to chisel it, you will be required to chisel all of these pencils and keep them ready before you start. Another thing that you can do because pens come with a cap pencils do not.

So, for keeping your pencils in shape when you go to the class if you go to the college in the times of Corona maybe it is little unlikely if you start going to the colleges you will actually have to be prepared before your class and for that what you can actually do is you can actually prepare the pencil caps like this and all that you have to do is to keep your pencils in these caps. So, prepare them at home in advance and keep these pencils ready.

So, whenever you go to the class you just have to pull them out and it stays much safer and it is quite handy so you keep them back that is what you should be doing. Another thing another practice that you should inculcate when you are going to become an engineer or an architect and you are going to draw is to keep your stationary, keeps your tools clean and that is why I always say that I insist upon that you should have these dusters.

And in addition to these dusters, you should have spirit which is like nail polish remover or some little spirits. So, a small bottle of spirit you should keep just dip your cloth in the spirit

and after every use it does not take much time, it just takes 2 minutes, 3 minutes dip your cloth in spirit and clean the edges of the equipment the instrument that you are using.

So, whatever instrument you are using just clean the edges because these instruments they pick up the lead dust. So, if you can see there is a lot of lead dust which is already there and if you do not clean your instruments frequently you will actually be dirting your entire sheet and that is what you should not do. So, these dusters should be maintained, should be cleaned and you should actually not be messing, dirting your sheets.

Your sheets are like a treasure which you should maintain for yourself as a portfolio and for that you have to inculcate. Another thing that you will be doing when we are drawing using these sheets is we are not touching the sheet often. So, since it is a huge board since it is a big board and the sheet is also going to be big so every time I have to draw my hand should actually be resting on this butter paper.

So, this butter paper should be the one where my hand should rest. If I am drawing on the top the butter paper will be pulled up, if I am drawing in the middle or bottom the butter paper will be pulled down and then I draw and once you have completed the drawing the butter paper will be pulled up to the entire sheet. So that there is no smudging which is happening on this sheet and you just roll these sheets.

And do you stack and store your sheets that is another thing. So, there are sheet holders which are available you can procure a sheet holder or you could also keep your sheets absolutely flat. So, you can place them between sheets of newspapers, place the sheets flat and store it may be under the bed or somewhere where they remain flat, but they do not get smudged by anything.

One more tape which I forgot to mention is this thick tape, brown tape which we will need to cover the board. So, the board if you see and this is the brown sheet by the way, this is not the surface of board. So, we will also be needing a thick brown paper. So, if you look at the board the board will actually have a texture a wooden texture so there are scales which are coming and if you move your head.

So, if we do not cover our board with the help of some cushioning which is made of newspaper and covered with this brown board. If you move your pencil horizontally because of the scales coming your pencil will move. It will not be a straight line to avoid that we actually add a lot of cushioning on the board which is of newspaper and then on top of that we place this board, this brown paper.

And then we packet properly before actually going on and starting to draw. **(Video Ends: 24:18)**. So, this was all about your different stationary material and instruments that I had to tell you about. I hope for the next lecture you would have procured all the stationary materials and all these instruments and tools and you will be ready to start with your drawing exercises.

If you are planning to buy a board depending upon what is the requirement you can also buy a small board and work with a mini drafter instead of buying a huge big board and with the help of T pulley depends upon which course you are enrolled in and what is the requirements of your course, but either one of these works equally good, there is no limitation. The only thing is with a small board and a small sheet you cannot make very big drawings.

While if you want to make bigger drawings if you want to use full sheets you will have to go for a big board and T pulley and related instruments. So, now we have seen what all instruments, tools and stationary items will be needed and I am hoping that you will try your hands at each of these instruments and tools before we come for the next class. So, please procure all these stationary items and these instruments and tools before you actually work by yourself on a sheet and a board starting with lecture 3.

So, the list of all these instruments and stationary items has already been shared in the script for the lecture and that is available on the website. Kindly have a look at that list and procure all the stationary items. So, you should be able to draw simultaneously as you hear the lecture as this lecture is seen by you. So, with that hope we will meet for the next lecture, lecture 3 till then have a good day, bye-bye.