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Theory and Practice of Non Destructive Testing

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Ultrasonic Testing – 7

Hello everybody so we have been on this topic of ultrasonic testing and in last few lectures we have seen different aspects of this particular technique and if you remember in the last class I emphasized on the importance of calibrating the instrument before you do the test, and I have also shown you some of the standard blocks which are used for calibrating the instrument for ultrasonic testing.

So in today's class we will see what kind of blocks are used and how exactly the calibration is done okay. If you remember I have also told you before that when you use a standard block for calibrating an instrument you need to follow certain specifications okay, in the sense that the block that you are using it has to be made following some specifications some particular dimensions and so on okay.

So in this case also we need to follow certain specifications and as for those specifications these blocks are made and we can use these blocks to calibrate the instrument okay.

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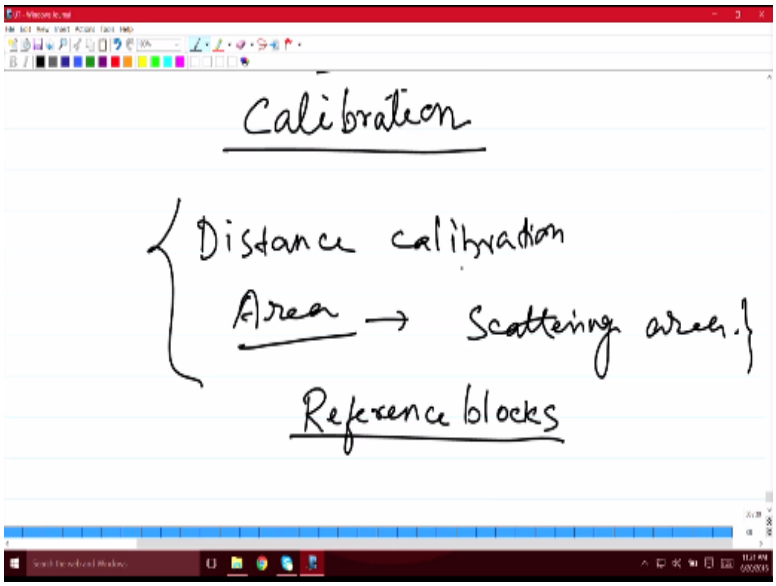

So today in this class let us see what these blocks are, how these blocks are and how they are used to do this two kinds of calibrations as I told you before one is distance calibration and another is area, so these are known as distance amplitude calibration or distance amplitude correction and area amplitude calibrations okay. So these are the two primary types of calibrations that you do for normal probes.

And then I will show you later also if you use an angle probe then what kind of block you can use and how the calibration is done for the angle probes okay. So today let us go ahead and see how they said distance amplitude the calibration and area amplitude calibrations are done okay.

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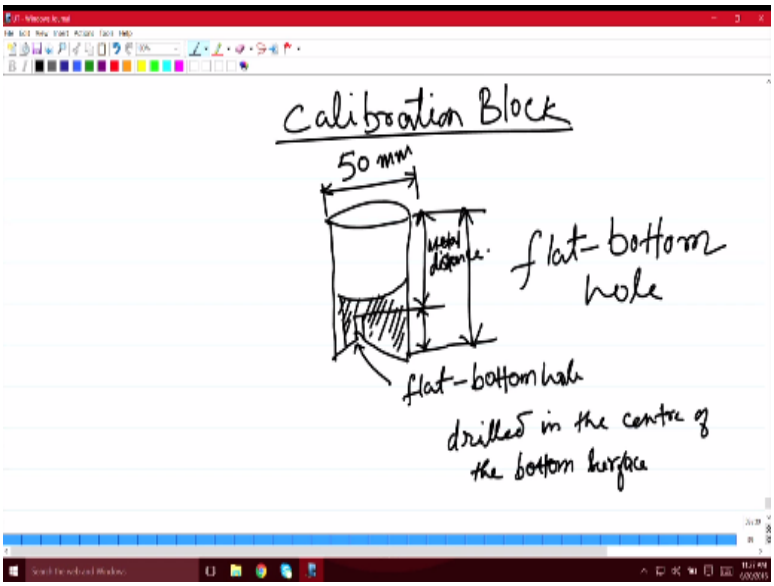

So if you follow the specifications in this case the block that you have it looks like this, that is primarily a cylinder we has an artificial flow cut at the bottom in terms of a flat bottom hole okay. So the defect or the artificial flaw that we are going to use in this case is a flat bottom hole okay which is cut at the bottom of the cylinder okay. So this cylinder has to have a particular dimension as for the specification and this flat bottom hole also has to have a particular dimension okay.

So if you take a section of this cylinder at the bottom so this is where you have this flat bottom hole okay, and this will have a particular diameter and a particular depth. So this is the depth of the hole and the cylinder also will have a particular height and a particular diameter okay. For example, in most of the cases a diameter of 50mm is used and now using this kind of blocks you would be able to calibrate not only the distance, but the area also okay.

So when you calibrate distance you need to vary the height of this block keeping the size of the plot bottom hole same so when you vary the height then you could vary these metal distance which is this one, so in case of distance amplitude calibration this metal distance is varied and

the size of the hole is kept constant on the other hand when you calibrate the area in that case the metal distance is kept constant and the size or the area of the hole is varied okay.

So this is how by varying the metal distance and varying the size of the hole you can calibrate the distance and the area respectively okay. So this hole is drilled precisely in the center of the bottom surface of the cylinder okay. So you need to vary this metal distance as I said that means you need a number of these cylinders which will provide you different metal distances that means you need a set in order to do the calibration. So let us see what kind of assets are available that that we can use and calibrate.

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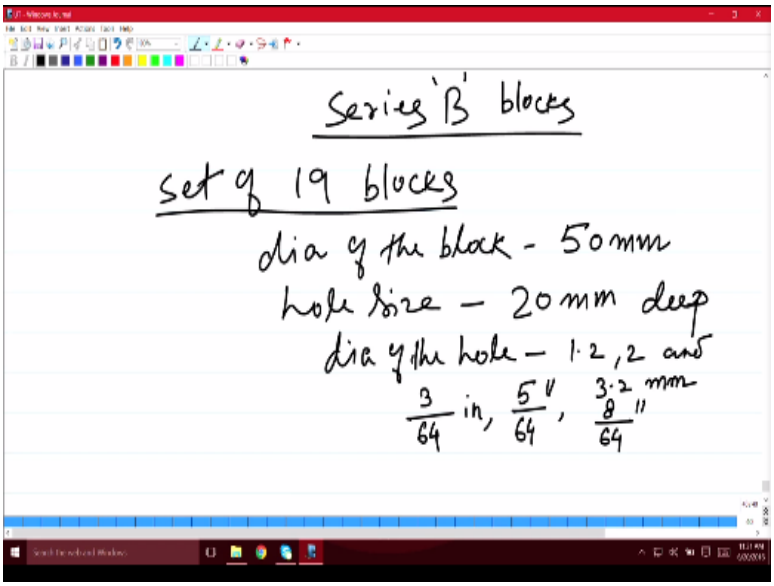

So there is a series called series B blocks and in this case this is a set of 19 blocks okay, and this is how the cylinders are in this case the blocks are diameter of the block is 15mm, the flat bottom hole that you have the size of that hole is it is 20 mm deep. So that depth that I had shown you in the diagram that is 20 mm and the diameter of the hole is kept same in all the blocks as I said when you do the distance calibration.

So you can choose a diameter from this range and keep it constant 1.22 and 3.2 millimeter. So from this range you can choose the diameter okay, and in terms of inches if you see these are written in terms of 164th of an inch and why it is written in that fashion I will come to that there is a reason behind that. So the first one which is 1.2 mm it is 3/64th inch the second one which is 2mm it is 5 x 64 inch and the third one which is 3.2 mm that is 8 x 64 inch okay.

So these are the three diameters that you have in this case so you select one of them and keep it constant keep it fixed then you vary the metal distances okay because you are going to calibrate the distance.

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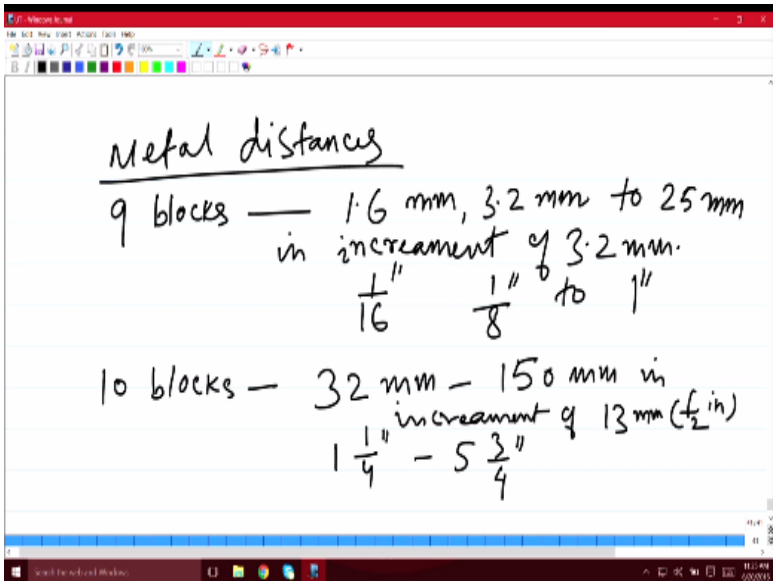

So in these 19 blocks these are the metal distances you have you have 9 blocks with these metal distances 1.6 mm 3.2 mm through all the way to 25 mm in increment of 3.2 mm okay. So in this with this distances you have 9 blocks in terms of inches you have 1/16th of an inch then for 3.2mm to 25mm that is 1/8th of an inch to 1 inch. And then you have 10 other blocks with the metal distances of 32mm to 150mm in increment of 13mm or half an inch.

So in terms of inches this is one, one inch 25 three-quarter inches with an increment of half an inch so this is how this set is so using these metal distances that you have okay ,you can have a broad range as you could see and keeping that hole size constant you can calibrate the distance okay ,now let me come back to this and tell you why it is kept in this fashion .

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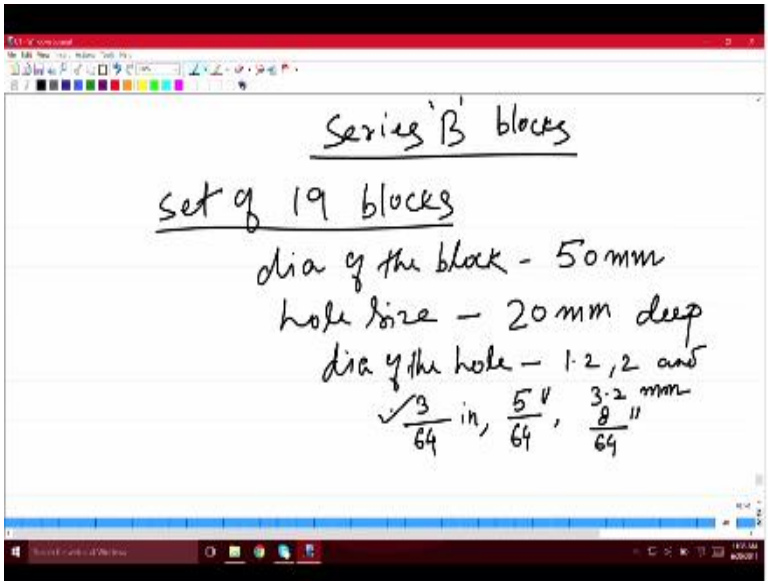

This hole diameter in terms of 640 of an inch ok this is to give nomenclature to this blocks to give some kind of designation so that you would be able to identify a particular block by a particular number okay, so in order to create that number in order to create that Norman classes this kind of dimensions are given in terms of 64^{th} one 64^{th} of an inch so let me tell you how this is used to create that through which you can identify a particular block first of all the number is like.

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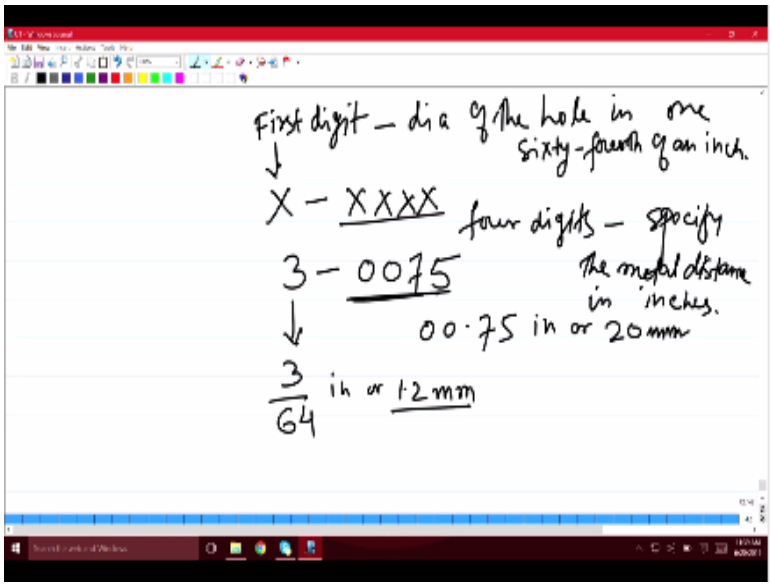

This one number first followed by a - and then four more numbers so this is the format one number -and then followed by four numbers so let's say you have a block which is given a number like this okay, as I am going to show you now this is according to that one by 64th that we have given to the size of the holes okay this first number that you have the first digit is the diameter of the hole in terms of sixty fourth of an inch okay so that means if it is 3 then you immediately know that the diameter of the hole is three x 64 inches or 1.2mm okay.

And the last four digits that you have these specify the metal the distance in inches okay for example in this case these are the four digits okay, so the metal distance in this case is point7,5 inch that is three quarter of an inch or 20 mm okay so these numbers are given first of all to identify a particular block but through these numbers as you saw it just now you could also get the dimensions of the block both in terms of the size of the hole okay and in terms of the metal distance .

And that is why to get the size of the hole we had written he size in terms of one by sixty fourth of an inch so that the number itself will tell you 1,2,3 whatever it is that it is 164th of an inch like in this case the number is 3 so the diameter of the hole the flat bottom hole that you have is three

x 64th of an inch okay so this is how the numbers are created and a number is given to each block there is one more set .

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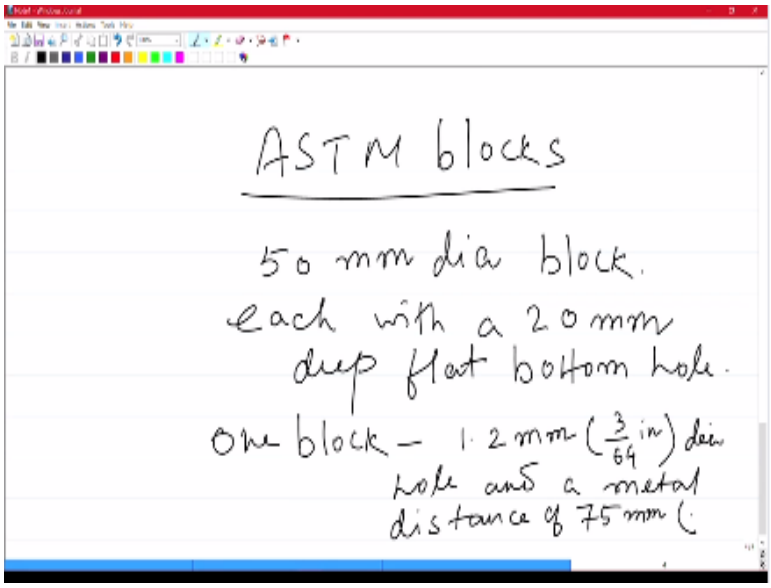

which is the STM blocks and like the series be blocks these STM blocks can also be used for calibrating both distance and area so this set of blocks consists of a 50 mm diameter cylinder and each of these 50 mm block will have a 20 mm deep flat bottom hole and then you can have different metal distances and different a hole diameter in order to get either different distances for calibrating the distance or different areas for calibrating the area okay so this is primarily a set often blocks which can be combined into different distances and different areas to calibrate either distance or area and out of this ten blocks.

One block is like this it has a 20 mm deep flat bottom hole with a diameter of 1.2 mm or 3 by 64 inches and this one has a metal distance of 75mm or three inches.

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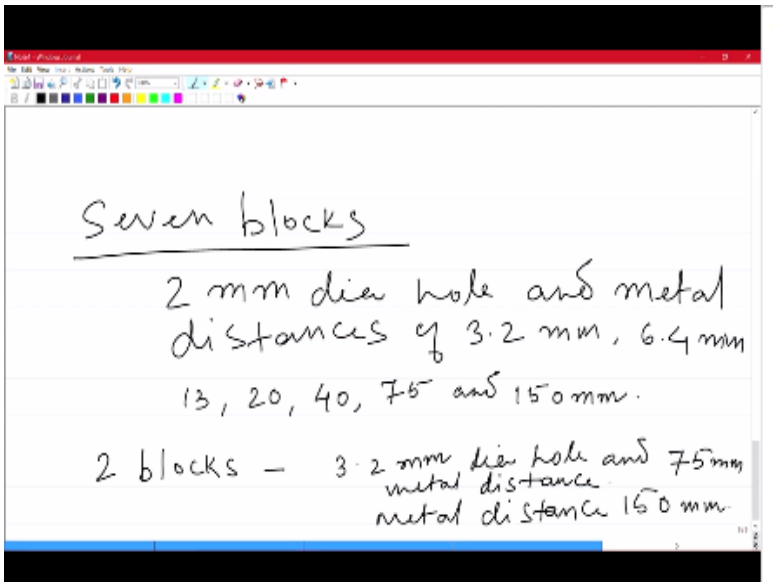

Then you have seven blocks which are as follows all the blocks have a 2 mm diameter hole and the metal distance is varied in this case so this will give you seven different metal distances in this seven blocks and these are the metal distances 3.2 mm ,6.4 ,13 ,20,40 75 and 150 mm okay so these are the seven metal distances that these seven blocks provide you and there are 2 more blocks one is having 3.2 mm diameter hole and a metal distance of 75 mm okay and the second one is having the same hole that is 3.2 mm diameter hole but metal distance.

In that case in these second block is 150 mm okay so this is how this ten blocks that you have it has a different combinations of metal distances and whole sizes also and this blocks can therefore be used for both distance calibration as well as area calibration okay now if you have an angle probe then in that case this kind of cylindrical blocks cannot be used because for an angle probe you need to calibrate the angle i as well apart from the distances okay so when you have angle probe the block.

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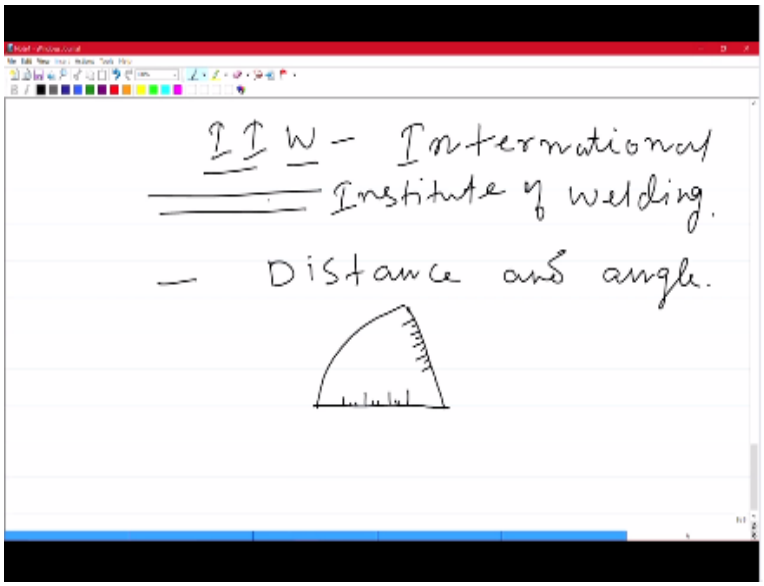

which is used is known as IIW block which stands for International Institute of welding so this IIW block can calibrate both the distance as well as angle okay so this is a one block that we are going to take up separately because you know we have to discuss in little more detail as to how exactly the angle is calibrated but for the time being I just wanted to let you know that apart from those cylindrical blocks which are used for calibrating the distance and the area you have another block which is primarily used for the angle probes to calibrate.

The angle but this can also be used for calibrating the distance as well and if you only want to calibrate the angle then there are this kind of small blocks available just for the purpose of calibrating the angle only so this is a small triangular block like this which will have the angles graduated on the surface okay.

So on this phase for example you could have this kind of angle scales and with the help of this you would be able to read the angle of the beam which is coming out from the probe from an angle probe similarly on this surface also you would have this angle scales so depending on what is the angle that you have either this surface and this surface can be chosen when you are calibrating the transducer for the angle right so this is so these are the two types of blocks that

you have available for calibrating the angle for a particular ultrasonic transducer and as I said this one we are going to take up separately later on and we will see how this is used to first calibrate the angle and as I am going to show you that time this can also be used for you know getting some other information particularly about some of the important parameters like resolution and things like that this IIW you block can also be used for that as well ok so for today this is all I will have so for today I will stop here thank you for your attention.

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