Decision Support System for Managers
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Module – 04
Lecture – 21
Space Calculation in a Warehouse: Space Calculation for Racks

Hello and welcome to "Decision Support Systems for Managers". We are into module 4, 'decision support systems for materials managers'. And as we mentioned the purpose of the materials manager is not only to estimate or the safety and upkeep of the materials but also the entire warehousing plus the materials management function; ok; how much to store, where to store, what are the safety equipments required in the warehouse, etc.; ok.

Now, so today now in the previous lecture what we learnt was the space required space calculation required for the warehouse and there we learnt that warehouse space calculation is primarily one is staging area.

What is the staging area? Where the goods will be dumped from the trucks. Remember we had drawn a warehouse layout diagram and in that warehouse layout diagram we have shown the area where the goods will be dumped from the trucks they will be counted and then they will be taken back to the storing area.

So, staging area is basically it is like a stage where things are kept and then they will be taken to the storing area. So, in the previous module in the sorry in the previous lecture we have calculated the space required for the staging area means where the products are dumped and counted; ok.

Now, today we will carry on and we will move ahead to find out how much space you require for the storing area ok. So, first was staging area where there will be first dumped then they are taken into storing area. Today, we will calculate the area required for storing. So, staging plus storing plus some space for the keeping of forklifts etcetera and office is my total area required for the warehouse; clear.

Now, then you will ask me that ah, but we learnt EOQ where is Economical Order Quantity materials coming in where is that reflected. Yes, it is reflected. How reflected?

Remember in the staging area problem we calculated number of trucks per day multiplied by number of that formula number of vehicles per day and multiplied by number of pallets in every truck. So, what is it giving you? Number of trucks multiplied by pallets per truck that is giving you the total material coming in a day. How is the total material coming in a day calculated?

That is calculated by calculating Economic Order Quantity ok. So, it is all coming in from there right ok. So, let us move. So, today we will calculate as I said space calculation for racks right; ok.

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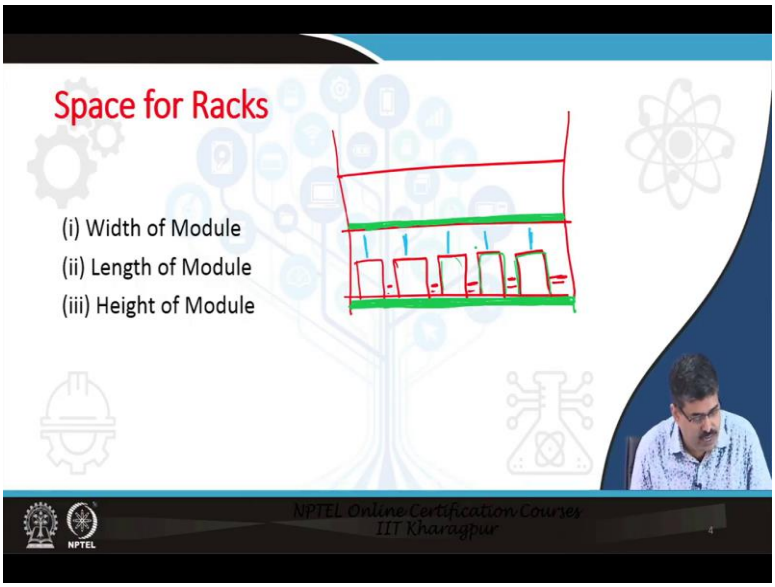

Now, space calculation for racks has this dimension one is width of module, length of module and height of module. Now, what does this mean actually; let us see. It is very-very simple; it is very-very simple.

Now, you see this is you know in our homes or our offices or our offices we have racks. In our homes we keep books in our offices we keep office files right. Same thing for our kitchen also we keep kitchen items there right agreed. Now, so you see your products are here right. There is a gap between each product. Why is that gap? So, that you can pull your hand and bring it out.

For books, and all in our homes that is not required because they are very thin in dimension as well as very light in weight so you can pull them out, but in a warehouse

products are big big cartons and when there are cartons you have to put your hand from both sides and pull it out. So, that is why this gap is there; right.

The second gap that is coming in here is on top also there is some gap ok. On top also there is some gap, why? Because it should not get stuck and if required we can put a hand from the top also and pull it ok. So, this is these are the gaps that are required in warehouse setting; right.

Second thing if you notice very carefully have you been to a library or office you will see there are racks and aisles. So, you can go into a library and go in you, look at the books from one side, pull it. You go to the other side again you can pull books from the other side.

So, the racks are back to back racks; are back to back. You go this way; you bring out; you go this way; you pull it out; ok. So, racks are back to back; ok. Now, so that is, one keep in mind, second third thing that you keep in mind is the, these are iron racks; right. Iron racks; and that iron rack also has a, has something called a thickness; right.

An iron rack also has a thickness agreed. Iron rack also has a thickness which we call as the width of the iron beam right. We call it as a width of the iron beam right. We call it as the width of the iron beam right ok. So, width of the iron beam agreed. So, this is what just keep in mind ok. So, there will be gaps between 2 pieces of cartons gap on top and the width of the iron beam right ok. So, let us move.

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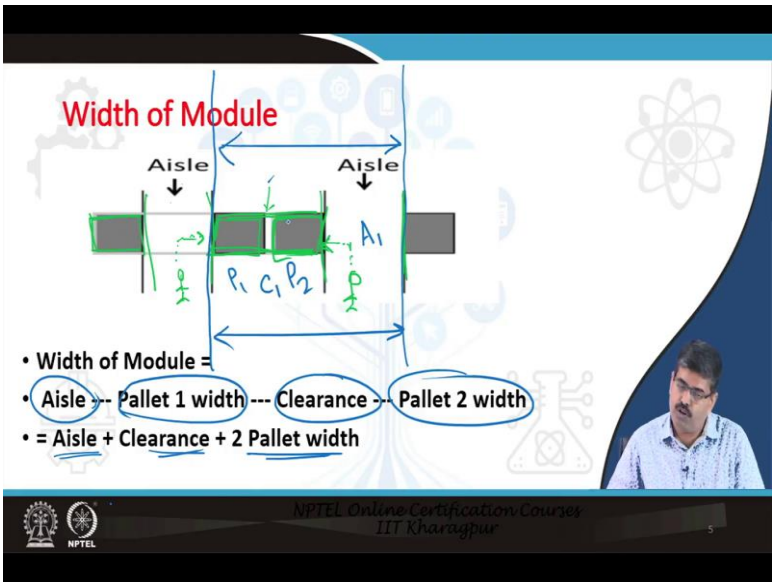

So, this is this thing is width of the module first thing width of the module width of the module ok. Width of the module basically means that listen very carefully. Here is one carton or one pallet; ok. Here is the passage which we call as aisle. Now, here is a rack here is a rack just like we have book shelves in our houses and here is another aisle; right.

So, what it says is I will put 1 carton or 1 pallet here leave a little bit of a gap leave a little bit of a gap and another pallet on this side so that tomorrow when I require a worker can go this way and pull out the carton from this aisle. Similarly, a worker can go this way can go this way and pull out the carton from this side right and there is a gap in between so that there is no friction or no damage nothing like that; clear; right.

So, what is the width of a module? The width of a module is basically the width of a module is basically this. Pallet 1 clearance 1 clearance means the gap pallet 2 aisle 1 ok. This is my width of the module pallet 1 width clearance pallet 2 width aisle width. This is the sequence or you can look at it from this angle also; aisle pallet 1 clearance pallet 2, aisle pallet 1 clearance pallet 2.

This is the sequence it goes or you can say pallet 1 clearance pallet 2 aisle ok. So, basically it means that aisle plus clearance 2 into pallet width because there are 2 pallets. So, 2 into pallet width is it clear and stay on this slide for some time and understand then you move on to the next slide. So, basically you pause on this and then you move on.

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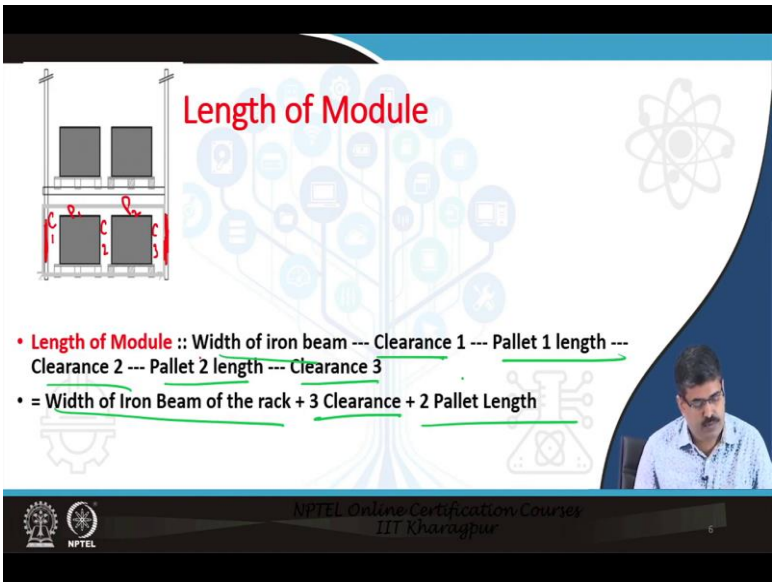

What is the length? Length of the module is like this length of the module is the width of the iron beam. Remember the first diagram that we drew width of the iron beam the width of this iron beam clearance here.

Pallet 1 length I think we will use a different color if required yeah. So, width of this; iron beam clearance pallet 1 length. This was clearance 1, clearance 2, pallet 2 length, clearance 3 right. This width of this iron beam will not be taken, why? Because, it will be considered for the next one; ok.

So, what is it width of the iron beam this red color width of the iron beam width of the iron beam this red color plus clearance 1 this blank area plus pallet 1 length plus clearance 2 this blank area pallet 2 length and clearance 3; that means, width of the iron beam plus 3 into clearance. There are 3 clearances and 2 into pallet length there are 2 pallets right. So, again I request you pause here and then you move.

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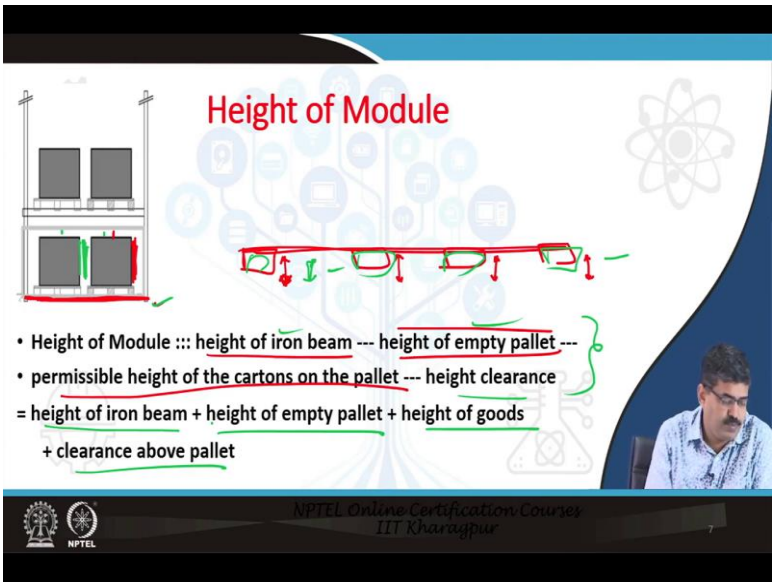

Height same thing just remember the first diagram that we drew height is same thing. Height of the iron beam again here let us go. Height of the iron beam height of the empty pallet ok. Now, this pallets are like this. Remember you have a refrigerator at home. Refrigerator has a stand right has legs right that is some that is an example of a pallet ok. It has a refrigerator has a stand right it has a stand; ok.

So, that is an example of a pallet. So, that it is away it is away from the floor. It is away from the floor right. So, what is the height of this? Um what is the height of this the stand that that stand has a height right that that stand has a height; right.

So, height of the empty pallet, permissible height of the cartons on the pallet so this height permissible height of the cartons on the pallet. Height clearance; this clearance between the carton and the rack above it so that clearance to pull it out right as simple as that. So, height of the iron beam height of the iron beam let us take a different color, height of that iron beam height of the iron beam plus height of that empty pallet.

Remember the fridge or the refrigerator stand height of that empty pallet, permissible height of the cartons on the pallet, permissible height of the cartons on the pallet height clearance this clearance height; ok.

So, this is basically my height of the module. So, that is equal to height of the iron, beam height of empty pallet, height of goods plus clearance of a pallet; very simple same equation. Again I request you to pause here for some time and look at the formula.

Next we come to storage space calculation; ok.

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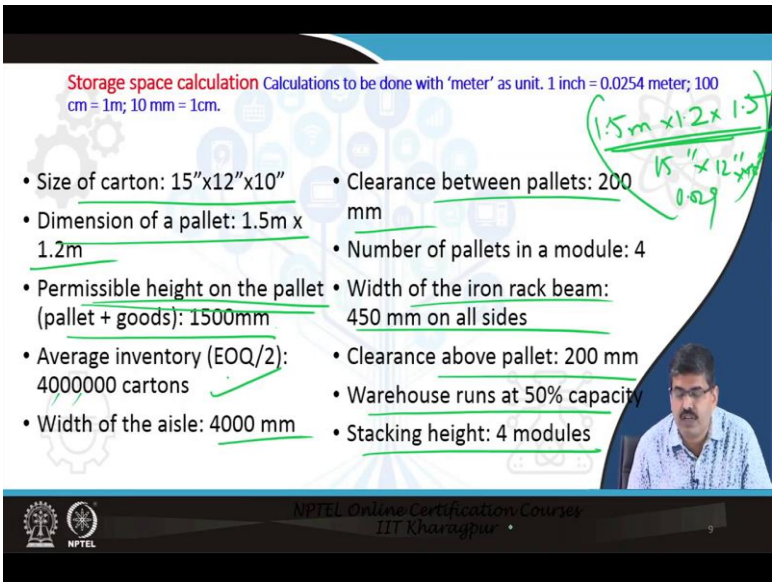

This is I would say, this is self-explanatory but you can definitely pause, read, go through again; pause and check-up, it is self-explanatory problem but we will go through it; ok. Storage space calculation calculations to be done with meter per unit as 1 inch is equal to 0.0254 meters or the 100 centimeter 1 meter 10 millimeter 1 centimeter given it for easy calculation.

Look at it. Size of the carton that is pallet carton is on top of this size of the carton you know in your local shops you they bring cartons in cardboard sizes size of carton is 15 inch 12 inch 10 inch dimension of a pallet is 1.5 into 1.2. What is the first thing that is coming into your mind? Number of cartons that can be put on a pallet; right.

So, the number of cartons should be the area or the volume whatever that should be yeah permissible yeah sorry permissible height on the pallet plus goods is 1500 mm right. Yeah. So, the volume of the pallet.

So, number of cartons that can go in that volume very simple now. So, you can easily calculate 1.5 meter into 1.2 meter into again 1.5 meter right ok. Am I correct? 100

centimeter is equal to 1 meter. So, divided by yeah; so this is the volume that can that a carton can hold right divided by 1 inch is equal to 0.024; so divided by psi. This I am putting an inch you have to calculate into meter 10 ok so this divide.

So, this is the total number of cartons that can go in one pallet ok. If it is in decimals what will you do? Reduce it not increase because dimension has to be straight. You cannot have a bulging out number of cartons in a pallet ok, then it will hit while it is moving. Now, average inventory is 40 lakhs right 40 lakh cartons. So, how much space should you have in the warehouse?

80 lakh worth of space minimum because that is average it will reach a maximum right it will reach a maximum. So, average is EOQ by 2. So, 40 lakhs we will have to move to 80 lakhs width of the aisle 4,000 millimeters. All this we will have to convert into a common unit.

Clearance between the pallets 200 millimeter, where will you need it? You need it while you are calculating width of the module and length of the module right. Width of the iron beam 450. Where will you need it? When you are calculating the width of the module and height etcetera clearance of a pallet for height of the module warehouse runs at 50 percent capacity. So, this 40 lakhs full stock is 80 lakhs that is 50 percent capacity. So, we will have to keep provision for 16 lakhs 40, 80, 160 lakhs and stacking height is 4 modules.

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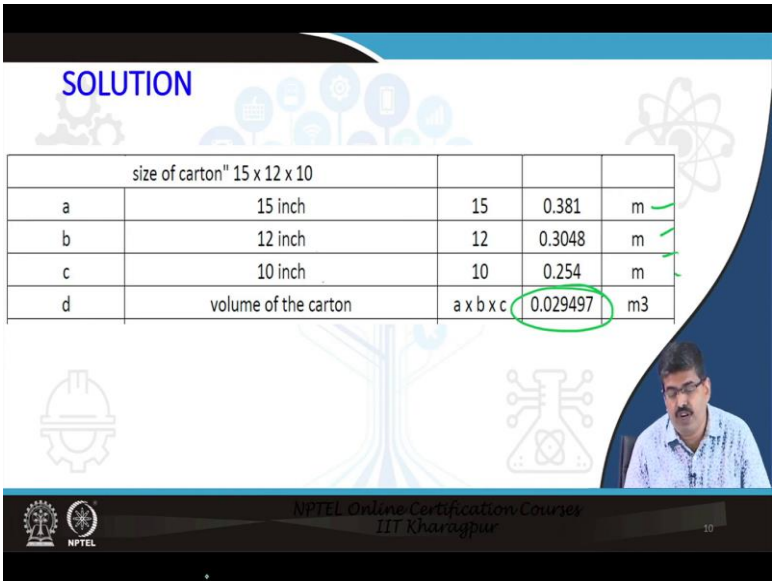

So, solution we have just mentioned we just telling it 15 inch, 12 inch, 10 inch you multiply it and convert it into meters. So, your volume of the carton is this. So, how many carton 0.29497 so 0.029. So, this is basically 0.029 ok. So, divide so that will get you.

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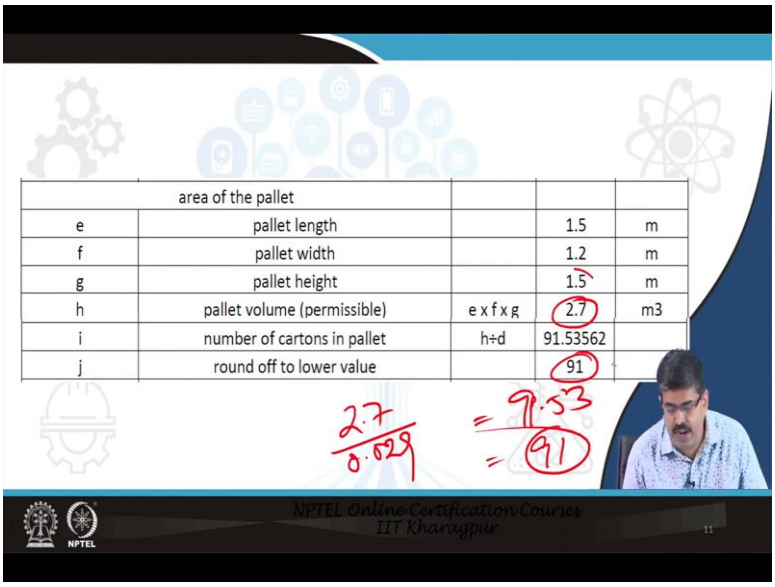

Now, then area of the pallet, pallet length, pallet width, pallet height. So, pallet volume is 2.7 ok. So, what we said was that the number of pallets number of cartons in a pallet will be 91.53 because this was the pallet volume ok. This was the pallet volume and pallet volume and this 2.7 has to be divided by 0.029 and we get 91.53 now as we said it cannot bulge out. So, it should be 91; ok.

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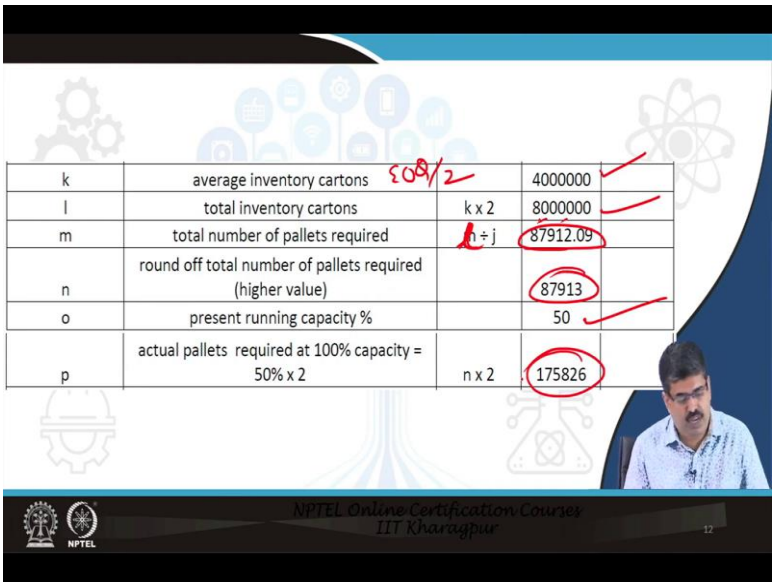

So, 91 cartons can hold in this pallet right ok. Now, as we mentioned that average inventory is 4 lakhs EOQ by 2 EOQ by 2. So, total inventory will be just multiplied by that 8 lakhs sorry 80 lakhs ok. So, when your inventory is this, so total number of pallets required will be yeah 91 and this 8 this sorry m divided by j.

This is sorry this is not this will be the l divided by j l divided by j 80 lakhs divided by your 91 pallets ok. So, 80 87,000 pallets we will require basically 87,913 pallets we will require present running capacity is 50 percent. So, actual pallets will required will be exactly double.

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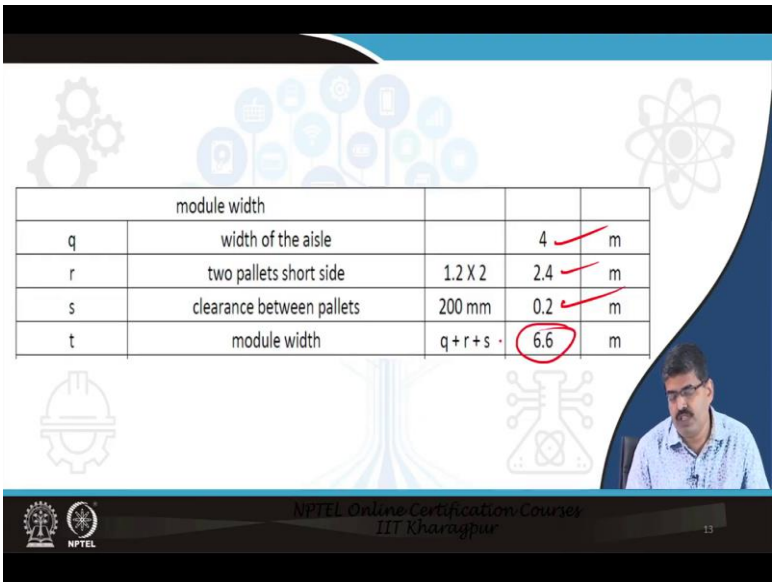

Now, having said that let us go to module width we have run we have done this formula of module width was what. Module width formula was this one aisle plus clearance plus 2 pallet width; ok. So, let us go to module width calculation. Width 2 pallets aisle that is clearance between pallets. So, module width is 6.6.

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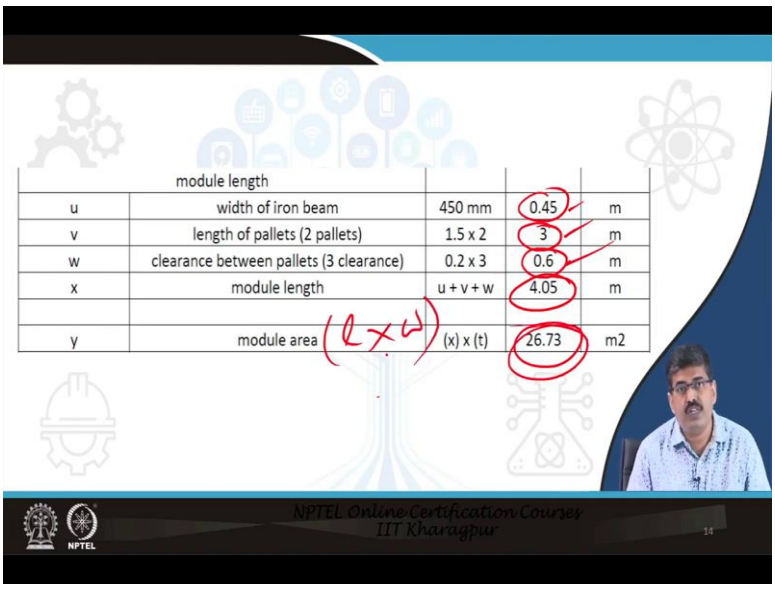

Similarly, for module length width of the iron beam, length of the pallets 2 pallets and distance between pallets was 3 clearance. Remember what we did we had this length of width of iron beam.

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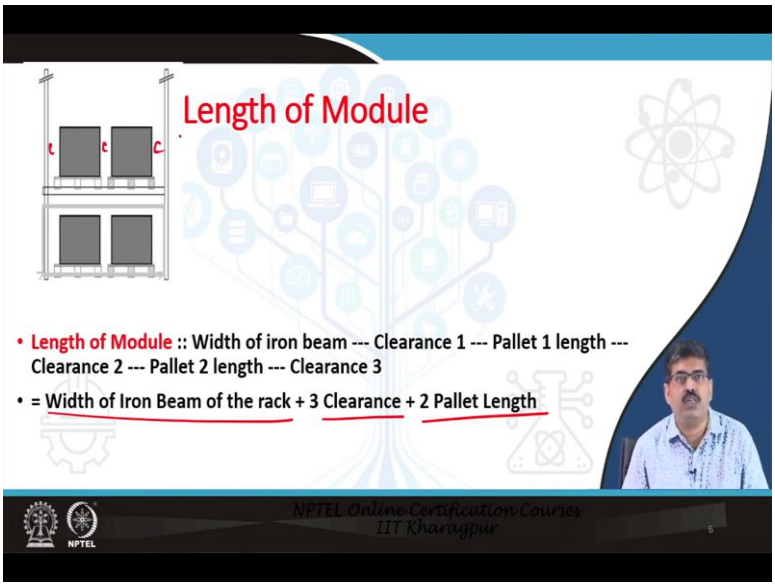

3 clearance, 2 pallets; what was clearance? Clearance 1, clearance 2, clearance 3 ok. So, same thing here yeah. Module length width of iron beam, length of pallet that is 2 pallets and 3 clearances. So, module length is 4.05. So, module area is this um. So, module width module area is module length into width 26.73.

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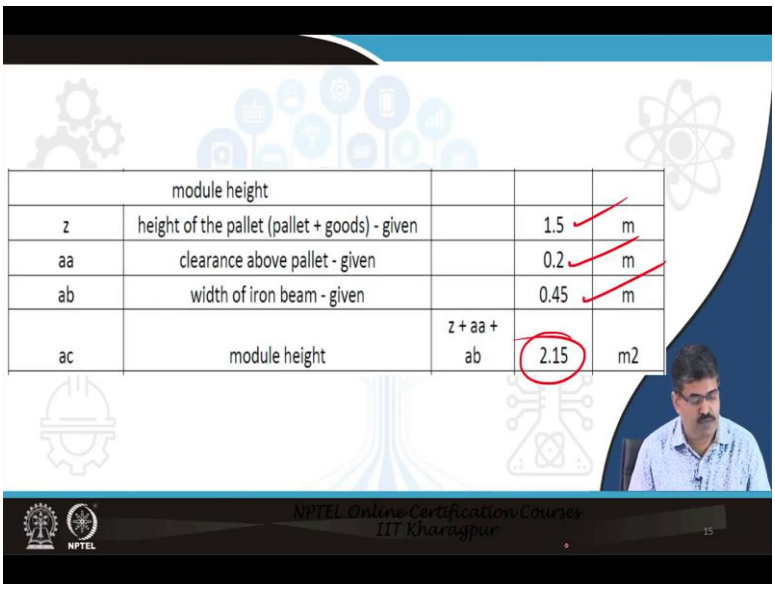

What is the height of the module? Again we have the formulas here. We have the height of the module. Formula height of iron beam, height of empty pallet, height of goods,

clearance of a pallet 4 dimensions ok. So, height of iron beam, height of pallets given, clearance width of iron beam; all are given. So, module height is 2.15.

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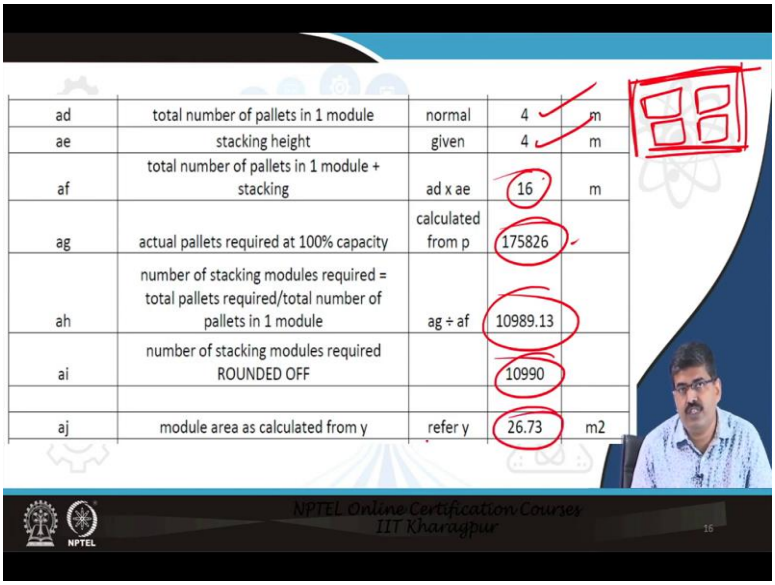

So, we have got everything now. Total number of pallets in one module is 4. We have got a stacking height that is given to us is 4 stacking heights. So, basically how many pallets can go in one module? 4 into 4 16 ok. In one total number of pallets in one module is this.

So, total number of pallets in one module is this and stacking height is 4. So, basically you have 16 pallets in one module. Actual pallets required is this. So, number of stacking modules required will be divided this divided by 16 is this a number. So, let us round it off 10,990 and so module area calculated is 26.73.

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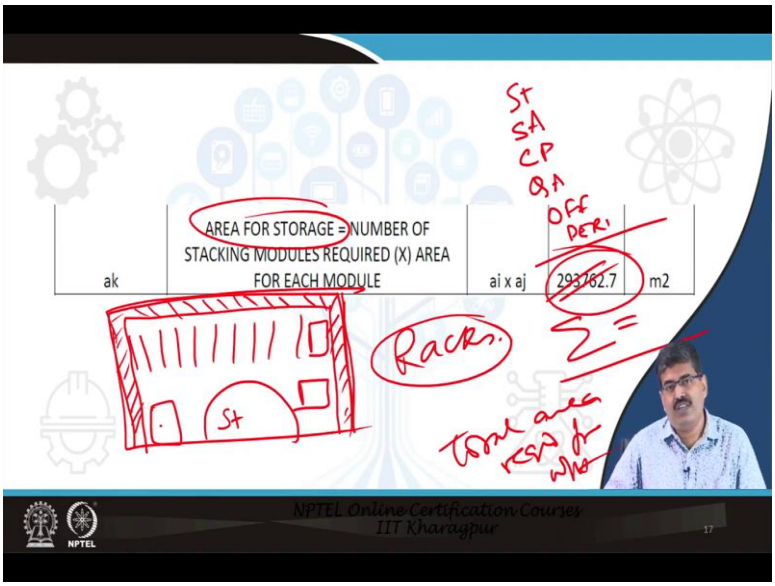

So, area for storage is area for storage is number of stacking mode is required into area for each module. So, what did we get up to now? Up to now we have got staging area and racks that is area for storage. So, we have got staging area and storing area. What we have not got remember we are calculating module and we have kept aisle is there.

So, the last aisle is not included. Last aisle is not included and a road or a basically another aisle will move around the entire warehouse. So, this area also needs to be calculated. This area also needs to be calculated ok. This is very simple. Add to it office area add to it your area for charging and add to it the quarantine area.

So, staging area, storing area, charging points, quarantine area, office and perimeter summation of all this is your is your total area required for warehouse total area required for warehouse is this clear. Now, this part calculations part what you need to do is this is very simple arithmetic class 6 7 problem ok, but only thing is you will have to pause the video go through the calculations very nicely and if you have access to excel if you have access to computer just type these numbers in excel and calculate.

Use formulas and calculate it will be very easy ok. Then reason why I am telling excel is then what you can do is you can put your offices actual data in this. Formula is already there you have put in excel. Now, you can put actual data of your office and you will see the exact number of square feet or square meter of space that you require in the warehouse how much you have.

So, how much you can save and I am telling you that no warehouse runs at runs with lesser space. You have scope for improvement; clear.

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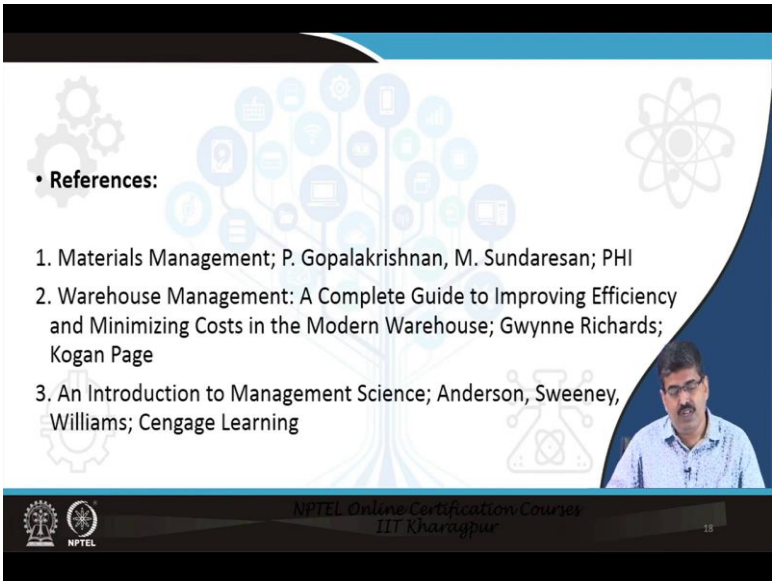

So, we will end this module here; sorry, we will end this lecture here. These are the references as we have mentioned so.

Thank you! Ok.