Principles of Construction Management

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Lecture – 07
Description of items

[FL]. And welcome once again to this series of lectures on the Principles of Construction Management. And today we are at lecture 7, where we will be talking about description of the items. So, in the last class we had talked about finding out the quantities of different items. In fact previous to that we had identified the quantities and then we talked about how to find out the quantities involved in the construction of a simple boundary wall. It involved excavation, it involved a little bit of PCC then brickwork some amount of concrete shuttering the enforcement work and so on.

So, we had said that in order to be able to estimate the cost of the boundary wall which the primary objective we should know the items the quantities and the rates of those items. For example a cubic meter of earthwork how much it is going to cost, a cubic meter brickwork what is going to cost and so on. Now in order to determine the cost involved we should know a little bit more about the actual description of the item and the finer details therein. And those finer details are what we are going to talk about today. With that is what is called the description of items.

So, when we describe an item then we actually tell the contractor or a bidder as to well there is earthwork involved and these are the conditions under which the earthwork is to be carried out. So that is something which we are going to do today.

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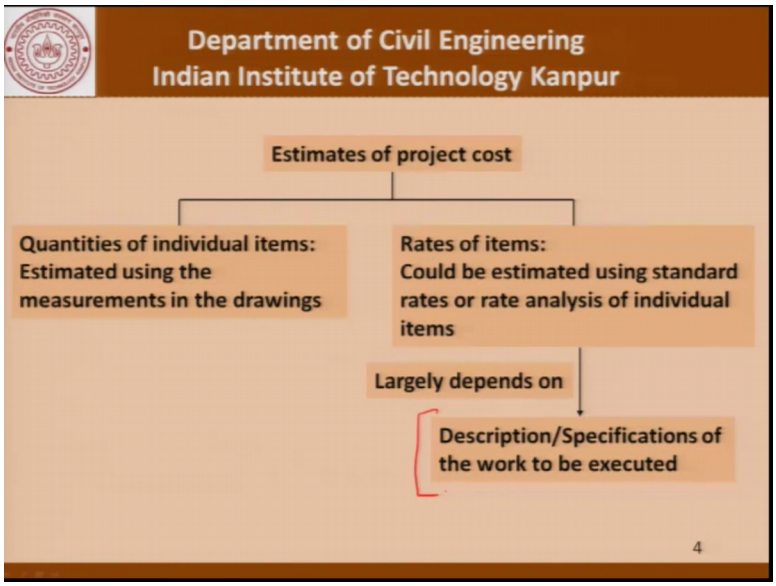

And coming back to these estimates there is the quantity of individual items that is what we have done last time. There are the rates of these items; the quantities are estimated using the measurements as given in the drawing. And then as far as rates are concerned they could be estimated using standard rates or the rate analysis of individual items. We are going to talk about it a little later perhaps in the next discussion. And it largely depends on the description or specifications of the work to be carried out. This is what the thrust of our discussion today.

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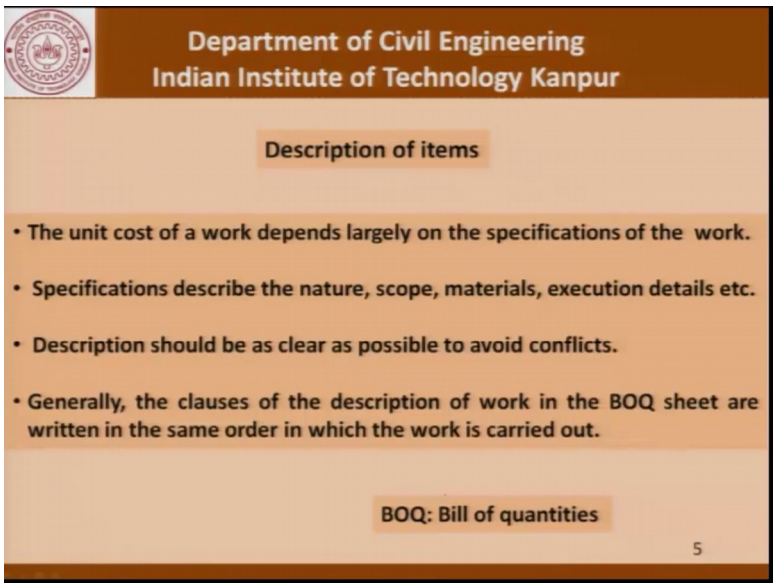

The description of the items comes to the unit cost of an item largely depends on the specifications of the work. The specifications describe the nature, scope, materials, execution details and so on. The description should be as clear as possible to avoid conflicts and we will see in the discussion today, where we need to be careful when describing an item. Generally the clauses of the description of item are included in the BOQ- that is a bill of quantity sheet and that should be written more or less in the order in which the work is to be carried out.

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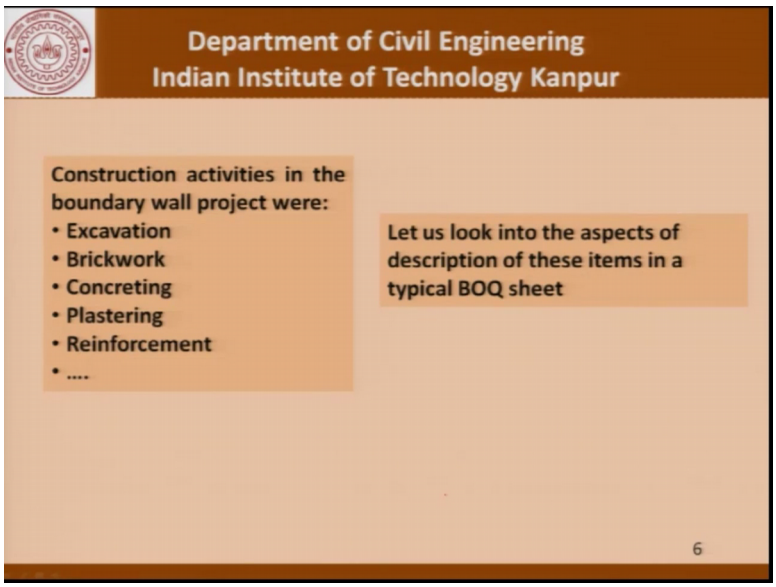

So, now let us go back to the example that we were working on. The construction activities in the boundary wall project work, excavation, brickwork, concreting including PCC and RCC, plastering, reinforcement, and there was a small item of structural steel, and so on shuttering was included and all that kind of stuff. So, now let us look at some of the aspects relating to description of these items as it should appear in a typical bill of quantities sheet.

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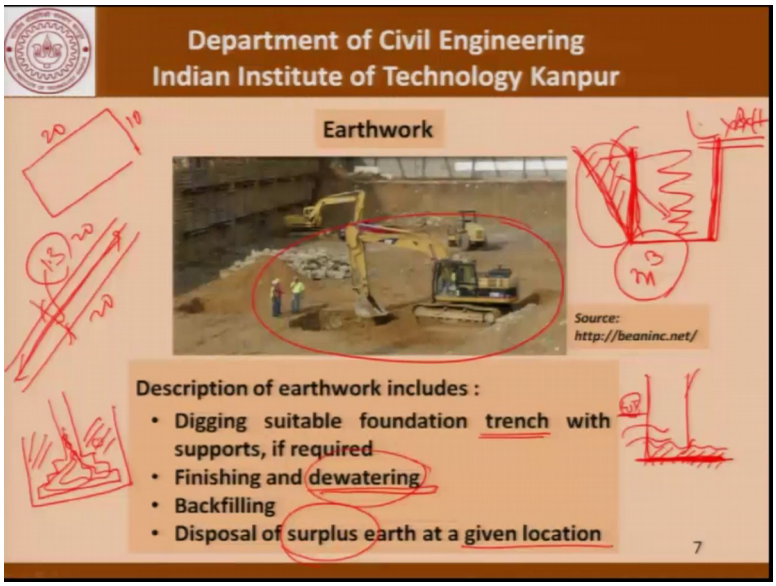

Now the first thing is earthworks. So, now this picture here shows the earthwork being carried out at a technical site- that is not necessarily the kind of site that we will work with when you are doing a boundary wall. But this is illustrative to the extent that we come to see what are the things involved in the earthwork.

So, there is a certain height which is involved, there is a certain area which has to be available, the surplus earth which is generated here will have to be removed, and it will have to be dumped somewhere. So how far is the dumping ground from, the site where the earthwork is being carried out, sometimes when we carry out an excavation it is required that this part here the sites should be properly supported in order to ensure that they do not cave in. Either we support the sites like this or we allow for a slope here. So what we must remember is that for every cubic meter of earthwork involved there is a certain cost associated with it.

So, now the drawing will tell you only the minimum amount of earthwork that is required to be carried out. What from a construction point of view we have to understand is how much is the earthwork that is payable, how much should we pay for. So, if this is the earthwork which is required and the client agrees to that then this becomes payable. If not the contractor has to keep this earthwork in mind when bidding for this quantity of earthwork alone. So, in either case one has to be aware of the issues involved. Under

what conditions what kind of a slope is required; if it is a hard strata or a soft strata and so on and so forth.

Now typically therefore the item description for earthwork should include digging suitable foundation trench which supports if required. So whether it is a trench or not is a issue. So, in our kind of a construction of a boundary wall; yes there is a trench that is the earthwork is largely linear. So there is a boundary wall which is like going to go like this and whether it is 1.3 meters or whatever the width is. So, this will be a 1.3 meter wide earthwork or trench will be dug for 20 meters, because if you recall we have our boundary wall is like 20 meters and 10 meters in these sides. So, there will be a large 20 meter trench which will turn here and so on and so forth.

So, now it should include the trench, the earthwork really involves removal of that earth from the portion which has been excavated. Finishing and dewatering. So finishing really means that depending on the kind of equipment. That you use for the earthwork it may not be possible to maintain this ground at a certain level across the entire length. So, how earthwork is typically carried out is that in a crude form you come to about this depth and then do this final let us say 100 mm or 150 mm through a more precise kind of earthwork. So that is what you do to get this bottom fixed. And then we need to make sure that the earth is properly ramped or it is properly compacted before the PCC is laid on the ground.

Then there is this issue of dewatering. Depending on how deep the excavation is and where is the water table there can be an issue of some amount of water seeping into our earthwork. And now whether this dewatering is to be included as part of the description of earthwork or not is something which we have to decide. If we do not include it and there is dewatering that comes in the contractor would be free to say that- well, the cost of dewatering is not included in the description and therefore that becomes an extra item. If it is included then we do not have to pay for dewatering because that is part of the earthwork itself.

Moving forward there will be a certain amount of back filling. It is not necessary for example that all the earth that is removed will be taken away. See for example in our case what we did was we are going to excavate something like this and create a wall which will look something like this. So, what happens to this part? This part will have to be

backfilled. So, only this amount of earth which is generated will need to be carted away. So, that is why we have this term called disposal of surplus earth at a given location. Very often the surplus earth may need to be disposed of at a distance which may be 100 meters or a kilometer away from the site. So, the cost of carting this earth to that dump location has also to be specified and accounted for in the description or the cost of the earthwork.

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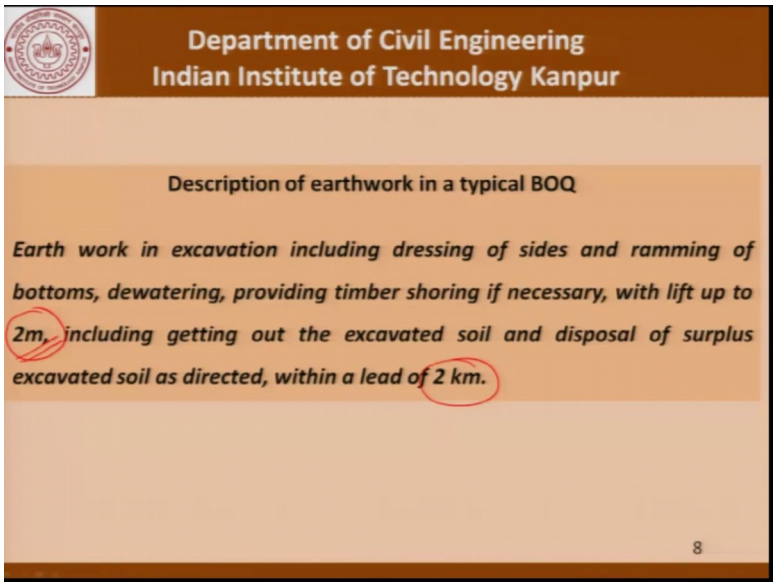

So, that is what is earthwork all about. And therefore the description of an earthwork item could typically be earthwork in excavation including dressing of sides and ramming of the bottoms, dewatering providing timber shoring if necessary, with lift up to 2 meter, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 2 kilo meter.

So, we are talking of a depth and we are talking of a lead among other things. So this depth can also be different. So obviously if the depth of excavation increases or changes then the unit cost of worth work will also change.

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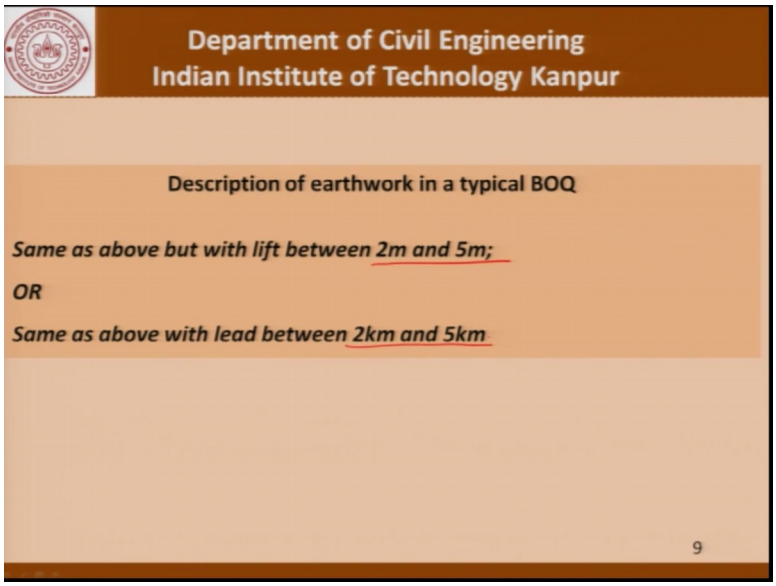

So, we can have a situation where; so we can always have another item of worth work in a typical BOQ which would say same as above but with a lift between 2 and 5 meters. So, what we are declaring is that if the lift is between 2 meters and 5 meters what the cost. Or, we can have a situation where same as above with a lead between 2 kilometers and 5 kilometers. So the contractor knows and he bids for the earthwork item depending on what are the kinds of conditions that are given in the BOQ.

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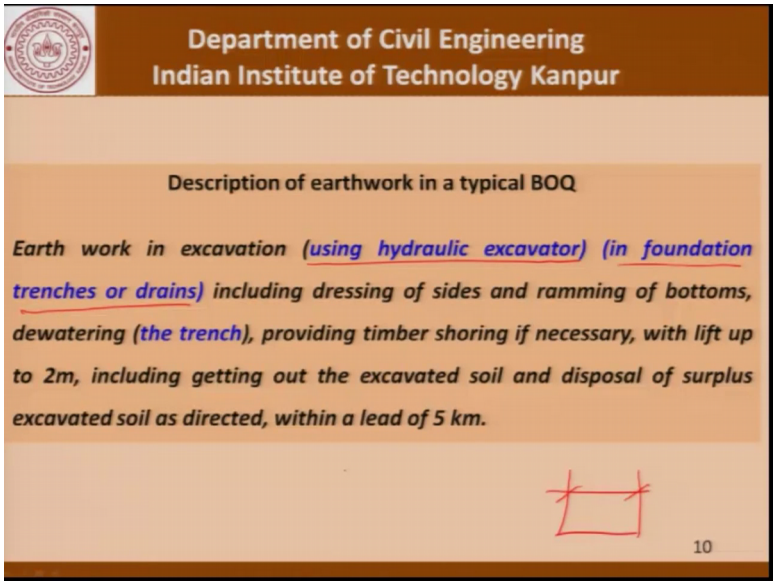

Let me also add a few other things which are highlighted in blue here. Using hydraulic excavator we do not need to specify equipment when we are writing a BOQ, but sometimes we may do it. When we say foundations in trenches; now what we are saying here is that the excavation is being carried out in a trench or in a drain where the width involved is not necessarily very large.

The picture that was given to you right in the beginning let me go back to that picture. If we are excavating something like this, so the calculation of length versus breadth more into height will give you a certain amount of excavation as far as quantities is concerned. But if the area was not this large and the same amount of excavation was to be carried out in a trench or a drain kind of a configuration then the situation will be quite different.

So, that is something which again we can include in the description. And that is what is being done here that in foundations or drains. So if it was a rough foundation we can say that it is a rough foundation or it is a foundation which measures so much area and plan and so on. And of course we have already talked about the issues relating to dewatering.

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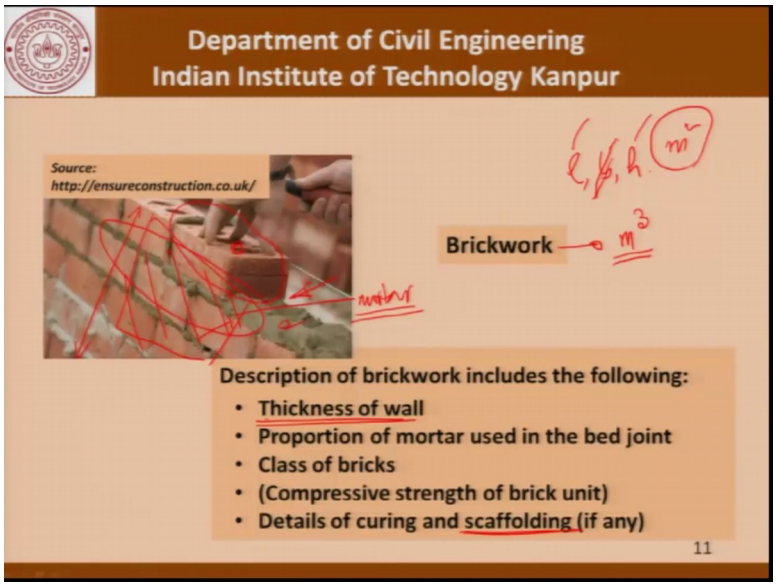

So, now moving forward what about brickwork; so this picture here shows brickwork being carried out, we can see that it involves placing of bricks in layers and we have what is called a bed joint and this joint is typically filled with mortar. So we need to specify what the composition of this mortar, what is the thickness of this brick wall, and sometimes we also may specify the strength of the masonry unit. Or we may just specify

the quality of the bricks and the composition of the mortar and assume that the strength of the masonry unit will be automatically met.

So, now the brickwork description could include items such as the thickness of the wall, proportion of the mortar to be used in the bed joint, the class of bricks to be used, compressive strength of the brick unit, and details of curing and scaffolding if necessary. Obviously, once we have a brick wall being made there is the issue of what is the height of the wall. If the wall is let us say more than 2 meters or 2.5 meters then it is not possible for a mason to reach the top here and be able to do the brickwork. For that we will need to erect a scaffolding- up to let us say about 1 1 and a half meter the brickwork can be done without scaffoldings.

So, whether scaffolding is to be included not included would depend on the nature of the job that we are talking about. So long as let us say we are talking about 1.5 1.7 meters it is not necessary perhaps to make elaborate scaffolding, and we can just make do with a stool or something like that. For an item of that nature we need not include the cost of scaffolding. And that is what we can do with our boundary wall.

You will recall that the brickwork that we calculated in the last lecture was in cubic meters and we used the length breadth and height of the brickwork. Now please remember that if we specify the thickness of the wall; we say that the wall is 115 thick or 230 thick in that case the breadth dimensioned need not be given. Then we are only talking in terms of a square meter representation of the masonry unit or the brickwork.

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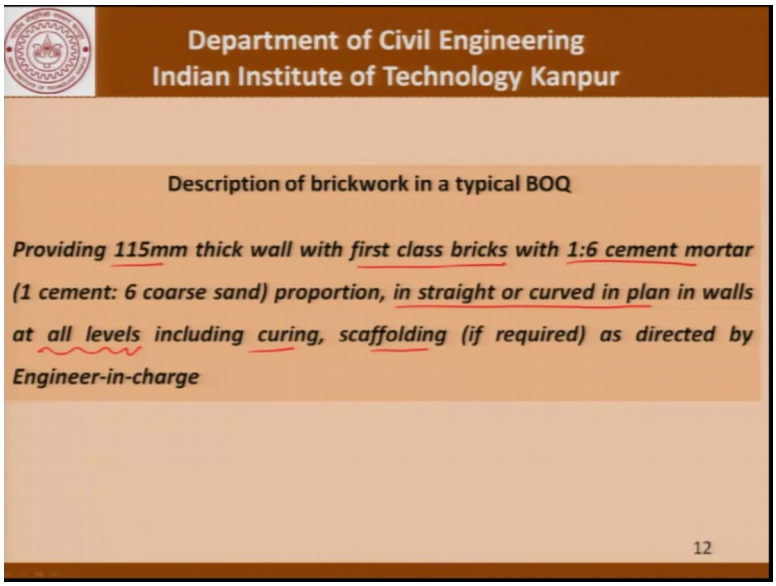

So, more formally the description of brickwork in a typical BOQ would be something like providing 115 mm thick wall with first class bricks with 1 is to 6 cement mortar in straight or curved in plan walls at all levels including curing scaffolding if required as directed by engineer in charge. So in this case we have given the wall thickness, the class of bricks, the composition of the mortar is specified that it could be straight or curved in plan including curing scaffolding all levels as directed by the engineer.

So, from a contractual point of view if we write all levels and there is indeed a huge variation in the height, then it becomes difficult for the bidder to understand how much brickwork is being done at 1 1 and a half meter and how much of it will require scaffolding. And that is why it becomes important for us to have the drawings ready at the time of tendering so that the bidder is able to look at the drawings and look for himself in what portion of the brickwork scaffolding will really be required. That will help him bid more realistically.

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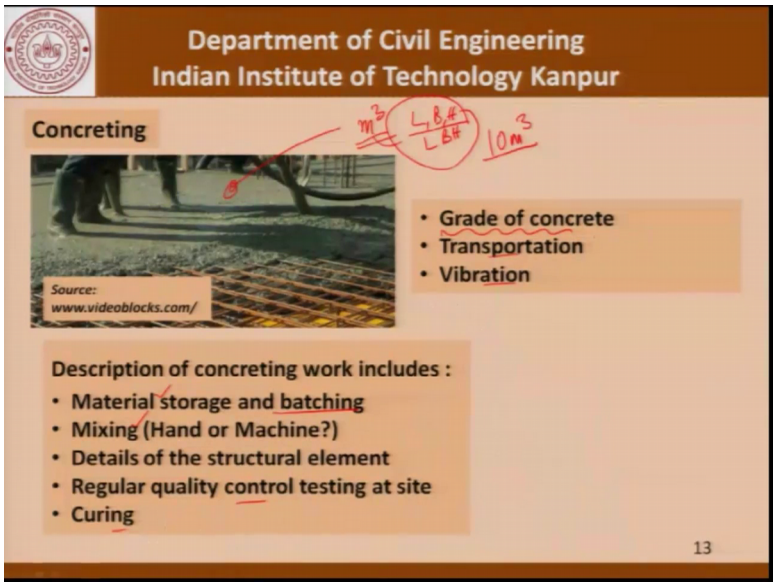

So, now coming to the concrete in work, let us see this is what the concreting is. This picture here shows concreting being carried out. Trying to find out what will be the cost of this concrete being poured. What is the most logical unit in which it can be measured and paid? The most logical unit as we did in the estimation exercise last class was in cubic meters, where we try to find out that for the footing what is the length breadth and height, for the pillars what is the length breadth and height, and we find the total volume of concrete involved.

So, now in order to be able to do that we should specify other details such as the material storage and batching, so the contractors or the bidder will have to get all the ingredients store them safely so that they are not contaminated with leaves or any other extra material. Wear them batch them in a mixing plant. It should include mixing, whether it is by hand or machine or it could be the details of the structural element, much as the same discussion that we had for excavation to get a cubic meter of concrete in a open area which is like a slab or a raft is quite different than getting the same cubic meter of concrete into a beam or a column. We should specify the details of the structural element where the concrete is being placed, a regular quality control testing at site, and curing and also the grade of concrete; the transportation of concrete from the mixing plant to the site of placing and vibration.

So, all this has to be part of the concreting work. Then we know that in order to do 10 cubic meters of concrete which involves the material, the mixing, the quality control, the curing, transportation and vibration what is going to be the cost. And obviously that is also related to the grade of concrete whether its m 25 or its m 30 possibly there will be differences in cement content there could be differences in admixtures and so on and so forth. So once all these things are known then we can submit a realistic cost for the cubic meter of concrete and that is the unit cost that we are talking about.

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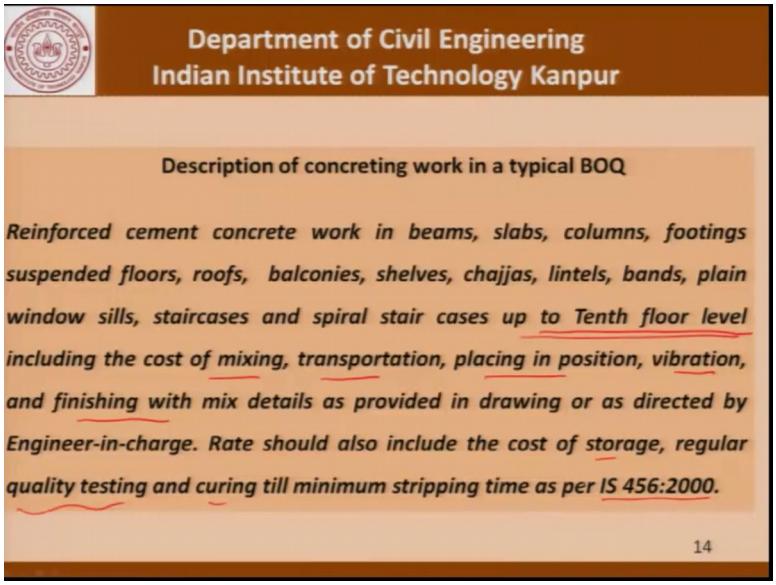

So, a formal description of the concreting work would be reinforced cement concrete work in beams, slabs columns and so on up to Tenth floor level or specify a certain height that obviously once the height increases different equipments will come into play.

So, the contractor or the bidder should know whether pumps have to be mobilized or not what is the kind of placing method that is going to be used, including the cost of mixing, transportation, placing in position, vibration, and finishing with the mixed details as provided in drawings or as directed by the engineer in charge. The rate should also include cost of storage and regular quality testing and curing till the minimum stripping time as per any standard; it could be IS 456 or any other standard that we are doing the construction with. So that is how we go to the description of concreting works.

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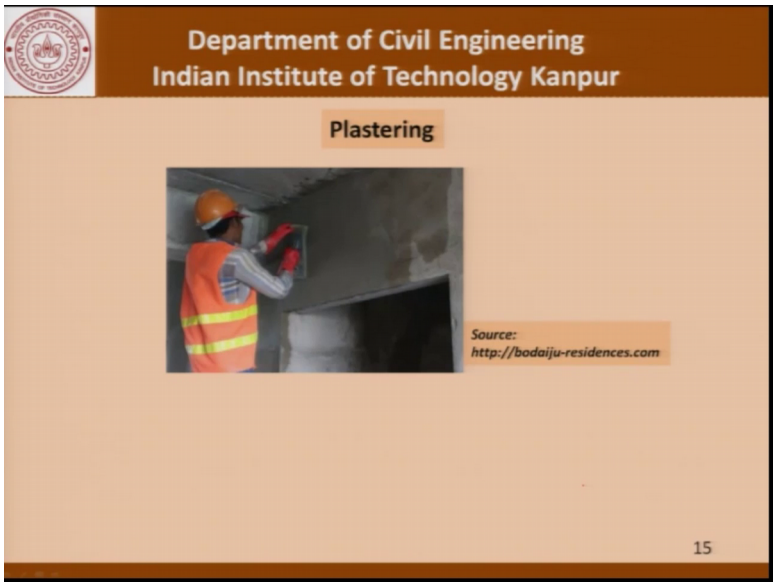

And coming to plastering this is the picture of plastering being carried out.

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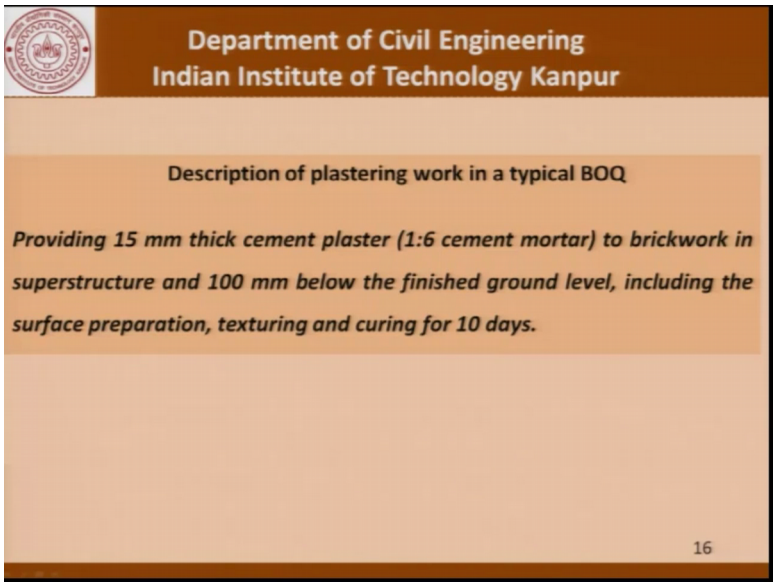

And there the description would be providing 15 mm thick cement plaster in 1 is to 6 mortar to brickwork in superstructure including surface preparation texturing and curing for 10 days.

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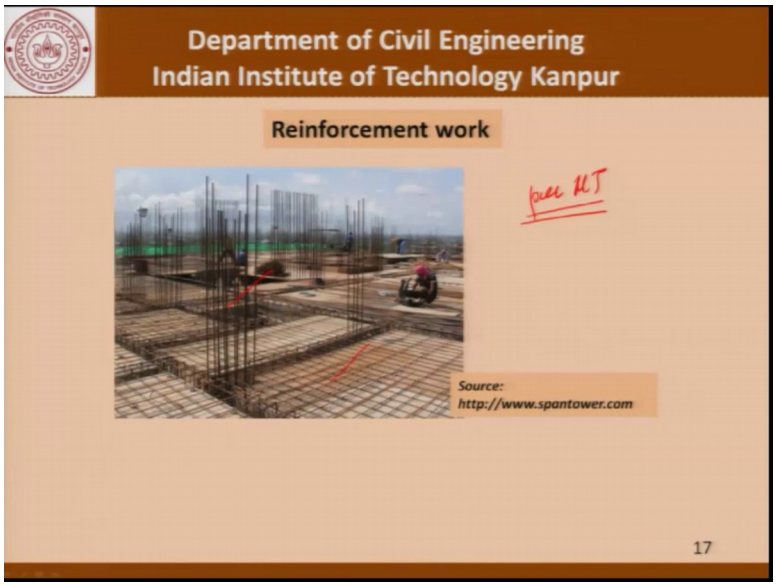

So, that is how the plastering item goes. And now coming to the reinforcing steel, we have seen some pictures in the last lecture and this is another picture which shows that what we are talking about is to find out what should be the cost per let us say metric ton for putting these kind of reinforcements in position.

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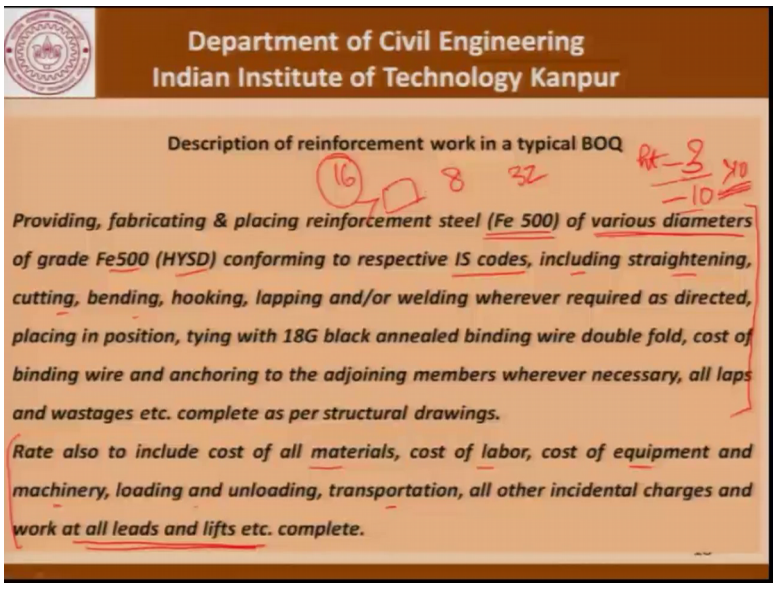

For that the description would really be: providing fabricating and placing reinforcement steel Fe 500 or any grade of steel of various diameters. So what we are saying is that we are putting in all the diameters together and submitting a quotation in terms of tons alone

of grade Fe500 HYSD bars conforming to respective IS codes or any other codes that we are talking about which would include is straightening, cutting, bending, hooking, lapping and or welding wherever required as directed placing in position tying with 18G black annealed binding wire double fold, cost of binding wire and anchoring to the adjoining members wherever necessary, all laps and waste is complete as per structural drawings.

So, this really is the complete description of the reinforcing work, because it also includes the rate will include cost of all materials, cost of labor, cost of equipment, machinery loading and unloading transportation all incidental charges at work at all leads and lifts. So, once we say this we are also declaring that regardless of the height of placing the reinforcement the rate will be the same. So, much as we did with the earthwork we could again here also have a situation, we can divide this item into heights. At the same reinforcement item up to a height of say 3 meters, beyond 3 meters up to say 10 meters, greater than 10 meters. So, if we are able to do that the contractor or the bidder knows that in certain cases the reinforcement will be placed up to 3 meters in certain cases it will be up to 10 meters and beyond 10 meters. So depending on how much is the reinforcement being placed in these 3 heights or at these 3 heights the rates applicable would be different.

Similar is the situation with handling diameters. You can imagine that handling an 8 mm diameter bar or a 32 mm diameter bar is not really the same thing as far as the ease of operations is concerned. Bending the bar, cutting the bar, jointing the bar all these things are different when it comes to different diameters. So of course, it becomes very difficult to say that for each diameter we have a different rate, but yes engineering judgment can be exercised and one can say that we will apply a rate up to 16 mm bars, and then for bars greater than 16 mm there will be a certain other rate applied.

So these are the kind of refinements that we need to do in preparing a very precise description in the bill of quantities. And please remember that the more precise we are in our description the easier it becomes for the bidder to bid and the more accurate is your estimate.

And with this we come to an end to the discussion today.

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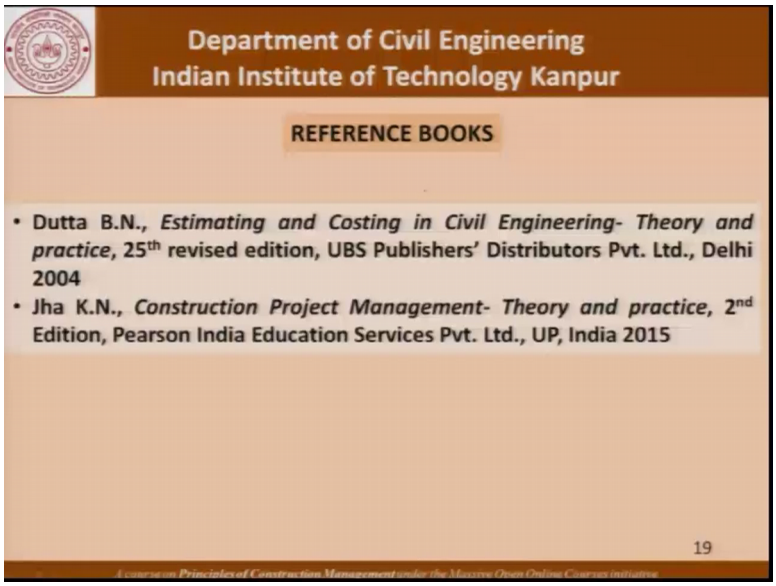

These are some of the references which you could use to understand the topic further. And I look forward to seeing you in another lecture next time.

Thank you.