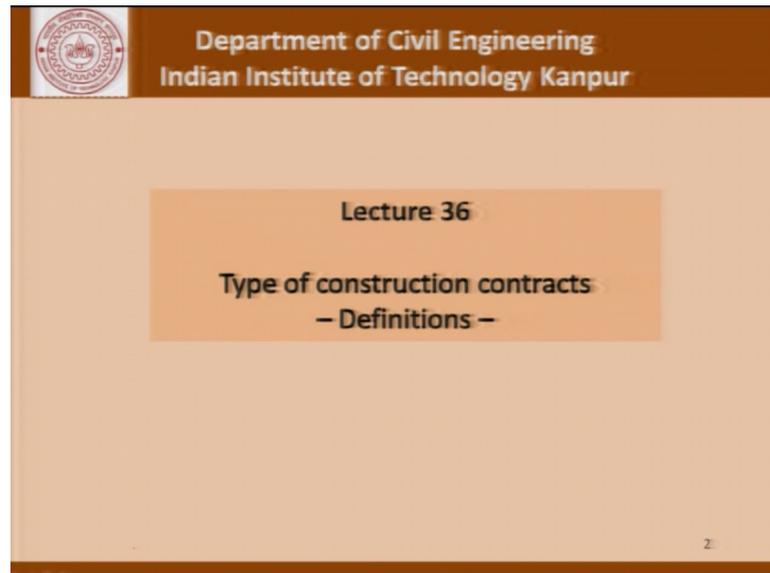


Principles of Construction Management
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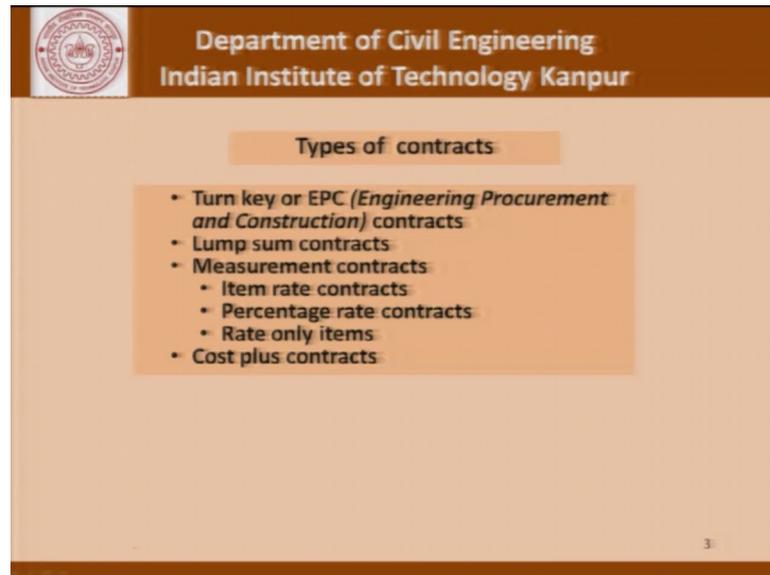
Lecture – 36
Type of construction contracts – Definitions

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And welcome once gain to this series of lectures on principles of construction management and we are talking about legal issues or legal aspects of construction. And in this lecture we will talk about the different kinds of contracts. Basically we will just stick to definitions not get into details, but yes we will go through the definitions of some of the different kinds of contract which are commonly used as far as the construction industries concerned. Now the types of contracts that we use are turn key or epc which is engineering procurement at construction contracts. Lump sum contracts measurement contracts which have 3 variations item rate contracts, percentage rate contracts, rate only contracts and cost plus contracts.

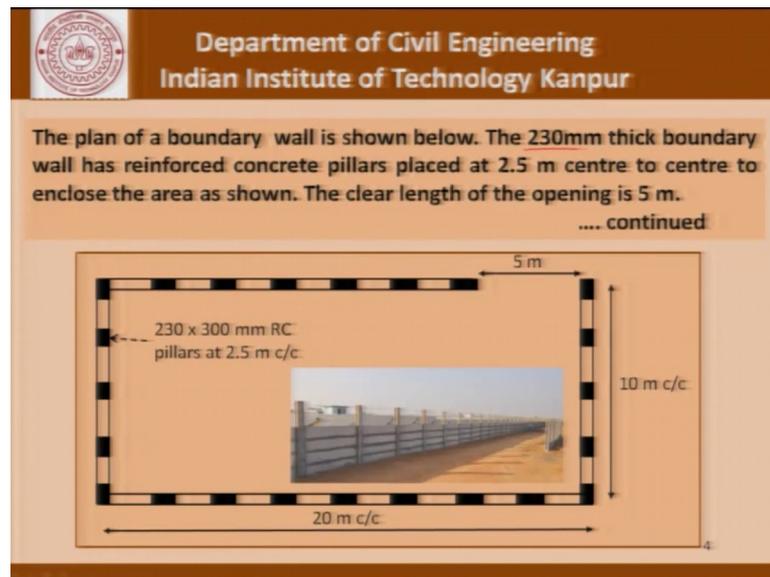
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So, these are some of the different types of contracts that we work with. Basically the idea is that there is a project to be completed, the contractor will do the project and the contractor has to be pay the certain amount of money for completing that project. That project is made up of certain number of activities, each of those activities have a certain quantity associated with it or those activities have a certain rate associated with it. We arrive at the total contract value, by adding the rates and the corresponding quantities and so on that we have done all through as far as this course is concerned.

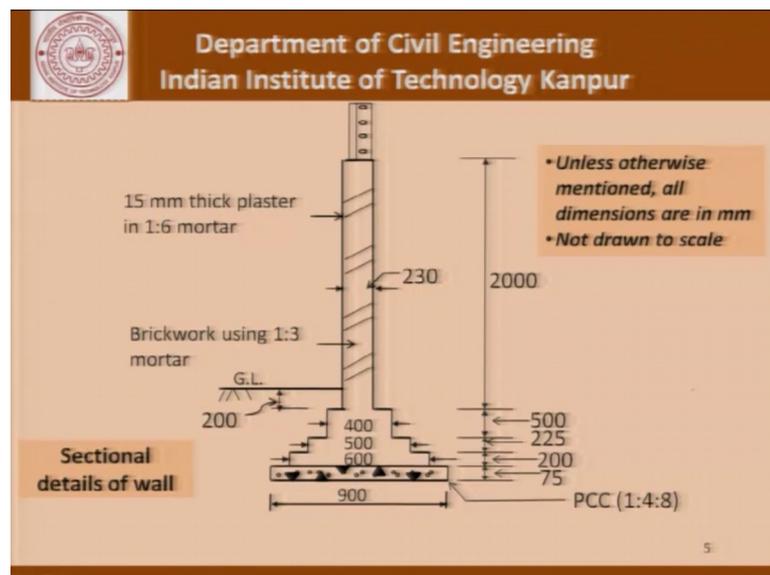
Now, the issue is there a variation to that. So, before we get into the details of how these different kinds of contracts look like as far as evolving or deciding upon a mode of payment for the contractor.

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I would like to recall the discussion that we had for the boundary wall, we have a 230 thick brick work boundary wall with 230 by 300 mm RC pillars placed at 2.5 meters' center to center. So, this distance between the pillars is 2.5 meters and there is a 5 meter opening the boundary wall itself measuring 20 meters here center to center and 10 meters here center to center.

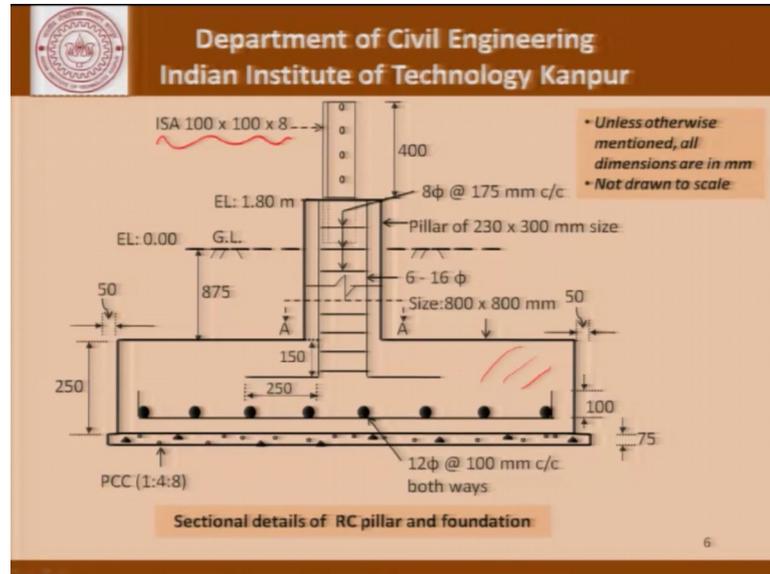
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Now if we look at the details of this boundary wall this was the section, which was given that there is a ground level there is a certain amount of excavation which has to be done,

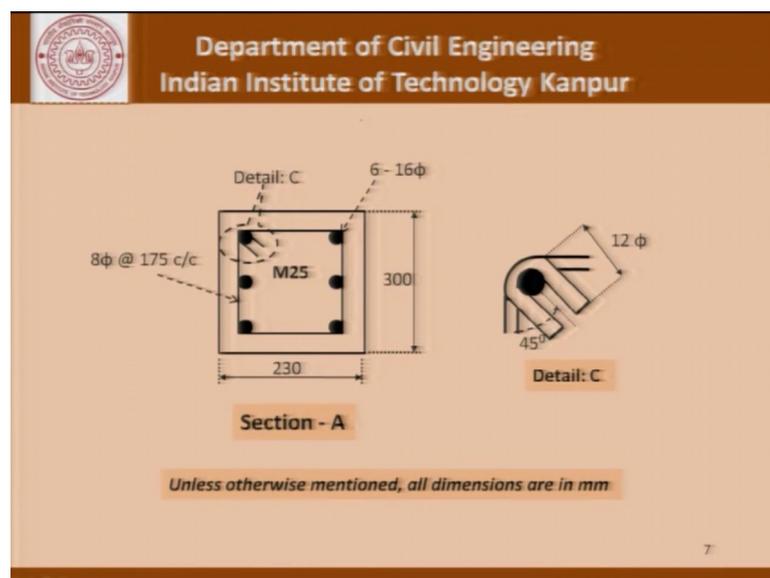
there will be brick work using one is to 3 mortar here. There will be a 15 mm thick plaster on both sides the wall there will be PCC, one is to 4 is to 8 at the bottom.

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And as far as the RC pillars are concerned this is the details of the drawing that the reinforce concrete will be in the foundation and in the columns. And there will be an angle which will be fixed at each of these RC pillars. These are the places where the barbed wire will run.

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This picture here was used to explain what is the details of the a stirrups involved.

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Additional notes

- Excavation is to be calculated allowing 200 mm on both sides beyond minimum width required.
- All concrete work is in M25 grade concrete. Concrete pillars are also to be plastered.
- RC pillars are supported on isolated footings measuring 800mm x 800mm.
- Assume the clear cover as 40 mm, wherever required.



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And then there were additional notes which were told to you which said that excavation is to be calculated allowing 200 mm on both sides beyond the minimum width required all concrete work is in M25 grade concrete RC pillars or supported an isolated footing. Clear cover is forty mm original and final ground levels are the same, the plaster on both sides of the boundary wall extends 100 millimeters.

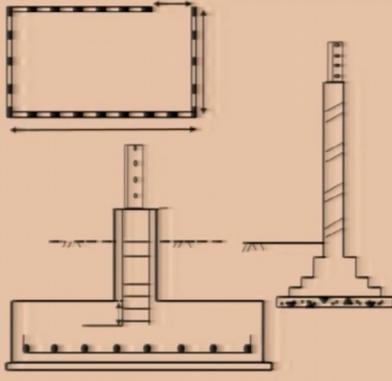
Below the ground level and angles are embedded 50 mm in the center of the RC pillar extending 400 mm the top of the pillar to allow placing of barbed wires and barbed wires are placed at 100 mm center in the angle in 4 layers.

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Identifying the Items Involved

- Excavation
- PCC
- Brickwork
- Concrete work
- Plastering work
- Shuttering
- Length of barbed wires
- Reinforcement work
- Structural steel (angles)



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With this description of the boundary wall we went about identifying the items for this particular project. We have excavation pcc brickwork concrete work plastering work, shuttering work, length of the barbed wires, reinforcement work and finally, it structural steel angles. So, this we are identified as the different items.

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Quantity

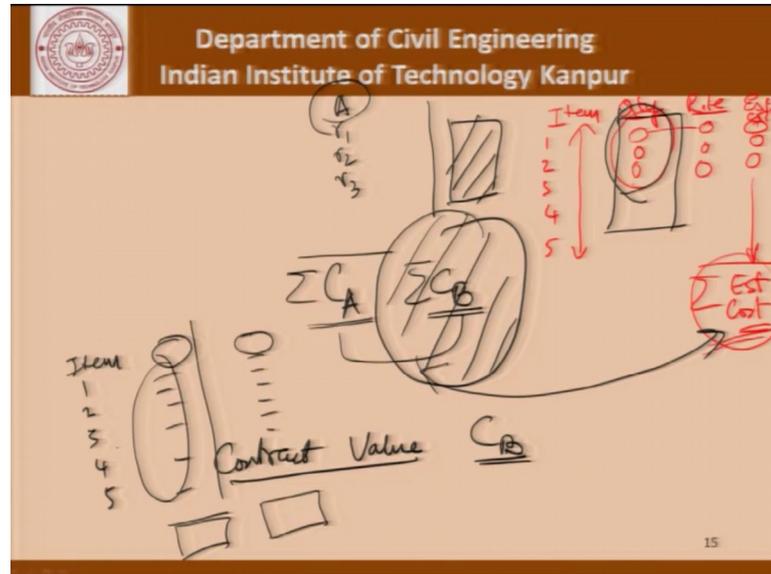
Item	No	L (m)	B (m)	H (m)	Quantity	Unit	Remarks
8		○	○	○	□		

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And then we went into a detailed exercise to calculate the quantity of the different items by using the concept of length breadth height and finally, arriving at the quantity sometimes it is length and breadth there is no height whatever the units. And as an example we calculated the total quantity of earth work involved as 87.83 cubic meters. The quantity

of reinforced concrete to be 7.9 the total quantity of pcc, to be there 0.78 cubic meters and so on. Brickwork similarly was calculated as 41.59.

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Once we have completed this exercise what happens is that we have a description of the items 1, 2, 3, 4. Whatever they are in this case excavation pcc brickwork and so on. We find then the rates from a standard source it could be the (Refer Time: 05:09) or any such known set of rates or our own numbers that we may have. And based on this the rate for each of this items we get the estimated cost for each of this items. And once we have this if we add up his number here in this column, we will get what we will call as the estimated cost of this project. Once this is completed then we declare to the contractor and that is what we did this time in our example we said that these are the items of work these are the quantities involved this is the estimate cost of the project, now you please let us know at to what rate will you be willing to execute this project.

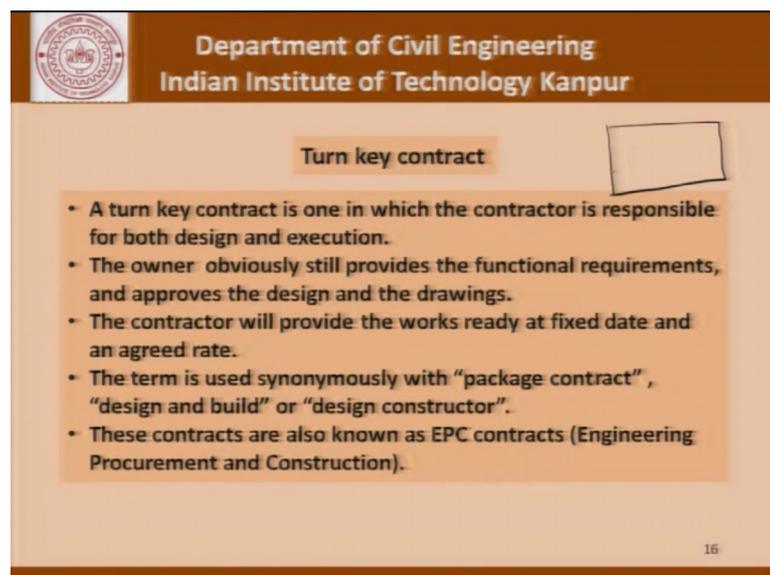
Now when this exercise goes to the next step the contractors know this number and contractor a will say that my rate which is r_1 for this item r_2 for this item r_3 for this item and the total rate that the contractor a codes the total amount that the contractor a codes let say becomes C_A . So, this is the cost at which contractor a is willing do the work, similarly we can have an exercise here and we will come up with the cost that contractor b wants to do it these costs; obviously, need not be the same as the estimated cost because each of this contractors will have different rates and so on. The quantities

remain fixed because these are something we have already estimated from our drawings having carried out this exercise. Now we can decide which contractor do you want to give it to let us say we give it to the contractor B? So, now, we have an estimated value which was earlier, we have a contract value, which is the cost at which this contract has been awarded let us say C B.

Then we went through examples of running a count bills where the different quantities of work that is we have items 1 2 3 and 4 (Refer Time: 07:11) whatever they are. We have date one we have another date at this date what are the different items that have been completed to what extent and at the next date what are the items which have been completed till that day, we went through the exercise of calculating the value of the work done at this point and time value of the work done at this point and time.

And decided and found out how much is the money payable to the contractors at different points and time based on these rates which were quoted by the contractor and accepted by us as clients. And the quantities of work which have been done at different points and time. So, with this background which is just a recapitulation of what we have already done. We will now try to examine what are the different other options that we had as far as executing thus contract is concerned from the point of view payments.

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Turn key contract

- A turn key contract is one in which the contractor is responsible for both design and execution.
- The owner obviously still provides the functional requirements, and approves the design and the drawings.
- The contractor will provide the works ready at fixed date and an agreed rate.
- The term is used synonymously with "package contract", "design and build" or "design constructor".
- These contracts are also known as EPC contracts (Engineering Procurement and Construction).

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The first thing that we want to do is to discuss the turn key contract. A turn key contract is one in which the contractor is responsible for both design and execution. That is the

client does not do the design. The owner or the client; obviously, still provides the functional requirement and approves the design and the drawings. So, in our example a small example of course, the client will say that well I want to fence this area, which may measure some x by y. And it is left to the contractor to come up with the drawings those drawings and the design are approved by the client.

And then we move on to decide the payments. The contractor will provide works ready at a fixed date ready at a fixed date at an agreed rate the term is used synonymously with the package contract design and built or design constructor and is also known as epc contract which is engineering procurement and construction. So, the contractor does the entire design gets the approvals from the client and proceeds to execute the project. And it is agreed upon between the client and the contractor that well this is the total cost of the project as far as the client is concerned there is no cost incurred in designing there is no cost incurred in determining the different quantities the different rates none of that is involved and it is all left to the contractor, would does the drawings who calculates it is own quantities comes up with the rates comes up with the total cost.

Of course, the client has to be very clear in his mind that how they will evaluate different proposals different contractors will; obviously, come up with different kinds of boundary walls perhaps and the client should know how to evaluate it, but having said that the turn keep project has it is own advantages because it says the client of a lot of detailed engineering, which they may or may not have the capability to do sometimes coming to what is called the lump sum contract.

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Lump sum contract

- A lump sum contract (or Fixed Price Contract) is a type of contract in which a single lump sum amount is paid for all of the works performed.
- In this contract, the contractor is responsible for completing the project within the agreed fixed cost stated in the contract.
- This contract is normally used in the construction industry to reduce design and contract administration costs.
- This contract is simple to administer, and most suited for simple and small projects, where the project is already well defined, and changes are unlikely.

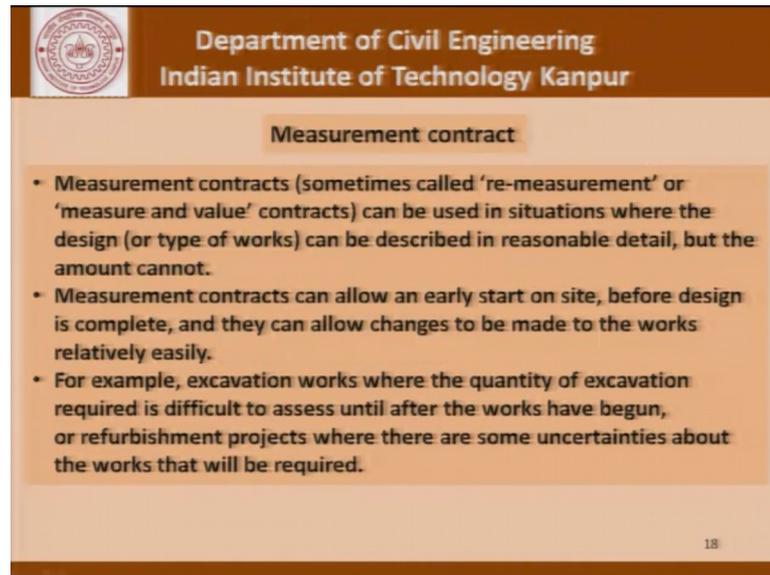
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This is a type of contract in which a single lump sum amount is paid for all the works performed. All the works performed may or may not include the design and the preparation of drawings in the detailing. So, for example, in our case we can still give the drawings and say that well there are no items and the rates (Refer Time: 10:24) and the contractor works out a total value itself and submits the contract. And therefore, even at the time of running a count bills we do not have to measure the quantities of the different items. In this contract the contractor is responsible for completing the project within the agreed fixed cost is stated in the contract.

This contract is normally used in the construction industry to reduce the design and contract administration. And is simple to administer most suited for simple and small projects, where the project is already well defined and changes are unlikely. So, if the boundary walls for example, what we are talking about is clearly known it s a simple example where anybody can calculate the quantities, you just have to give the drawings and any contractor can work out the details can submit a fixed cost at which that contractor is willing to execute the job.

So, for small projects where the situation is fairly clear and not likely to change. At the word go even before the work has to be started these contracts can be recommended for adoption.

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Measurement contract

- Measurement contracts (sometimes called 're-measurement' or 'measure and value' contracts) can be used in situations where the design (or type of works) can be described in reasonable detail, but the amount cannot.
- Measurement contracts can allow an early start on site, before design is complete, and they can allow changes to be made to the works relatively easily.
- For example, excavation works where the quantity of excavation required is difficult to assess until after the works have begun, or refurbishment projects where there are some uncertainties about the works that will be required.

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As far as measurement contracts are concerned they are also sometimes called re measurement or measure and value contracts. And can be used in situations where the design or the type of work can be described in reasonable detail, but the amount cannot be and measurement contracts can allow an early start on the site before the design is complete and they can allow changes to be made to the works relatively easily. So, for example, even in the case of the boundary wall. We may not have worked out the final details of the depth of the angle embedment or the length of the angle projection above the boundary wall. We can still allow the contractor to proceed with the excavation and the pcc work. And that is what is being said here that the work can be started even before the complete design has been carried out that is what stated here.

The excavation work where the quantity of excavation required is difficult to access until after the works have begun or refurbishment projects where there can be some uncertainties about the work that will be required these contracts are recommended. Because what we have to do is to take the measurements and pay the contractor for the actual work carried out now.

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Item rate contract

- Item rate contract is also known as unit price contract or schedule contract. A contractor undertakes the execution of work on an item rate basis.
- The contractor is required to quote rate for individual item of work on the basis of schedule of quantities (i.e., bill of quantities) furnished by the owner or the client, and the amount to be received by the contractor, depends upon the quantities of work actually performed.
- The payment to the contractor is made on the basis of the detailed measurements of different items of work actually executed by him

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As we said there are 3 variations of this measurement contracts the stock of the item rate contract and that is. In fact, the contract that we have discussed in detail the item rate contract is also known as the unit price contract or schedule contract a contractor undertakes the execution of work on an item rate basis. So, the items are known and the rates are quoted and that becomes the basis to determine the contract value. The contractors required to quote the rate for individual items of work on the basis of the schedule of quantities or the bill of quantities that is what we talked about. Furnished by the owner or the client and the amount to be received by the contractor depends on the quantities of the work actually performed.

So, therefore, if you recall the quantities of work actually performed may or may not be exactly the quantities of the work that were planned or estimated. You would recall from an example that when we calculated the plasters and have addressed this before also we talked of the quantities of plaster on the walls and we had not calculated the quantity of plaster on the top of the wall. So, there will be a division as far as quantities are concerned this kind of contract allows us to handle that kind of deviation without any trouble except. That of course, we must remember that these deviations should not be large in magnitude.

Payment to the contractors made on the basis of the detailed measurements of different items of work actually executed by him.

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Item no	Qty	Rate
1	0	0
2	0	0
3	0	0
4	0	0

Percentage rate contract

- In this form of contract, the client or the owner draws up 'item rate tender' i.e bill of quality and total amount.
- Contractors are required to offer to carry out the work as per with the rates shown in the specific price schedule or some percentage above or some percentage below the rates indicated in the schedule of work attached with the tender.

Est. Value - 100

Contractor A → +10% → 110

Contractor B → -2% → 98

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Then we come to percentage rate contracts. In this case the client or the owner draws up the item rate tender the bill of quantities in the total amount. So, what you have done is that for the different items 1, 2, 3, 4 we know the quantities of these items. The owner draws this up and also the rates. So, we have these rates. And we have therefore, an estimated cost. Once we have this estimated cost we ask the contractors or bidders to submit a bid as to whether they are willing to do the work at rate at an amount which is higher or lower than this estimated cost in terms of percentages.

That is contractors are required to offer or to carry out the work as per the rate shown in this specific price schedule or some percentage above or some percentage below the rates indicated in the schedule of work attached with the tender. So, what the contractor submit is a number which is maybe plus 10 percent or minus 5 percent of the estimated value. So, if the estimated value is let say a hundred contractor. A submits plus 10 percent of this value contractor B submits minus 2 percent of this value. Basically what is being said is that this guy is willing to do the work at 98 and this company is going to charge a 110 to carry out the work.

The difference between now in this case if you compare this discussion, with the item rate contract. The contractors or the bidders had the freedom in that case in the item rate contract the bidders had the freedom to choose the rates. So, company a could come up with a total of 110 by varying the rates of the different items. Company B could come up

with ninety 8 by varying the rates, but in this case the rate means fixed. And the total amount that they have quoted here which is plus 10 percent or minus 2 percent that is distributed across the board.

This has implications in terms of understanding of front loading of contracts. And that is something which I am leaving to you to think and understand how front loading can be avoided through percentage rate contracts. We must also remember that as far as large projects are concerned, when you are talking of civil contracts or the single large contract electrical works in the same project is another large contract. In both cases also we could operate percentage rate contracts and this also does not require with this discussion on the percentage rate contract as contrast it to the item rate contract.

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Rate only contract *Measurement RATE*

These contracts call for tenderers to quote only their rates per unit of work of different kinds. They are used for work whose quantity cannot be defined in advance, such as for site investigations, grouting work or the sinking of boreholes.

Any quantities entered in such contracts will be for indicating the amount of work expected and do not form a basis of the contract.

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The third variety here is the rate only contract. Now in this case the contracts call for tenderers to quote only the rates per unit quantity of the different works involved. They are used for work whose quantity cannot be defined in advanced such as for site investigations grouting work or sinking of boreholes.

So, in this case it is a measurement contract that is the payment will be made based on the measurement of work carried out for different items whether it is excavation or plaster or whatever it is, but the quantity is not given. So, the contractors submit only the rate and depending on the actual measurement of the work carried out the payment is made; obviously, if the quantities were known the contractor would have a better ideas to

what they are getting into as far as a particular project is concerned, but at times such as those given here grouting works sinking of boreholes site investigations, it is very difficult to access the kind of quantity of work which will be involved. And therefore, sometimes the clients are forced to go for a rate only contract.

They know the type of work involved, but they do not know the quantity in that case they ask only for the rates and the contractors told that the payment will be made based on the measured quantity of the work executed. Any quantity entered into such contracts will be for indicating the amount of work expected and does not form a basis for the contract.

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Cost Plus Contract

- A cost-plus contract, also termed a cost reimbursement contract, is a contract where a contractor is paid for all of its allowed expenses, *plus* additional payment to allow for a profit.
- Cost-reimbursement contracts contrast with fixed-price contract, in which the contractor is paid a negotiated amount regardless of incurred expenses. } Lump Sum

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Now moving on from there. We go to what can be called the cost plus contract. And in this case a cost plus contract is also called a cost reimbursement contract. And that is a contract where the contractor is paid for all of its allowed expenses plus an additional payment to allow for a profit.

So, the cost that is actually incurred in carrying out the work plus a certain percentage as profit is admissible to the contractor in the cost plus contract. The cost reimbursement contracts contrast with fixed price contract, in which the contractor is paid a negotiated amount regardless of the expenses incurred. So, if we look at for example, the lump sum contract. So, in the lump sum contract the contractor is paid a certain amount of money which is arrived at by some negotiation through some kind of means. And does not take

into account the actual expenditure incurred by the contractor, but in a cost plus contract the payment is made based on the actual cost incurred in different items plus a certain profit rate plus a certain profit margin which is also indicated in the contract.

So, with this we come to an end to our discussion of the different types of contracts. And I hope you will be able to relate this discussion to the example that we have talked about in case of the boundary wall. And of course, that is a very simple example you can think about it or try to expand your understanding of the different types of contracts to a more complicated construction project. And this the list of references which may help you understand the different types of contracts better. And I look forward to seeing you again in a subsequent lecture.

Thank you.