Principles of Construction Management
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Lecture – 03
Overview of steps in execution of a project

[FL]. And welcome to this lecture on Principles of Construction Management.

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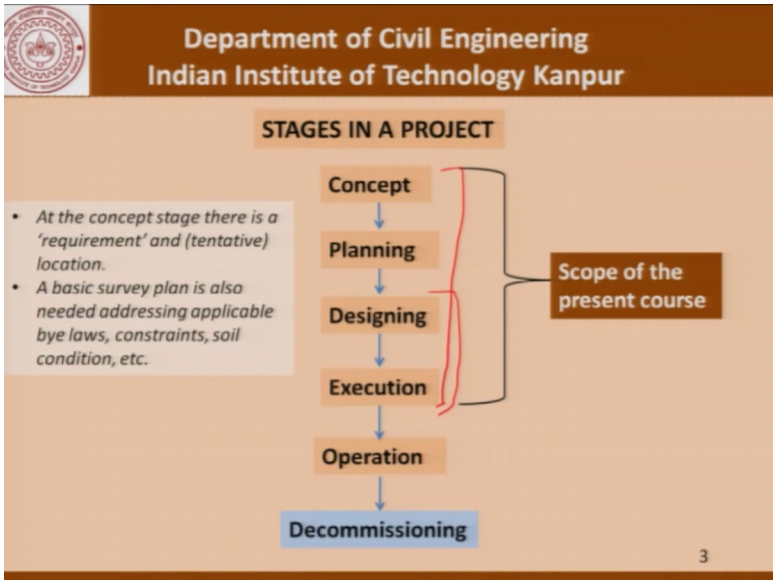

Now in the last discussion that we had we had gone through the stages in a project comprising of the concept which would essentially also have a requirement; that means, there is already a requirement and the client knows the tentative location of that project. A basic survey has been carried out to address the applicable bye laws, constraints, soil conditions and so on. So, if these things have been carried out at the concept stage itself it makes things a lot easier as far as the project is concerned.

So, from the concept we move to a more detailed plan followed by a structural and other design steps. These design steps are followed by an execution phase where a contractor or another agency actually carries out that project followed by the operation of that project during which we are mostly concerned with the maintenance and operation of that. And finally, the decommissioning. So, as far as this particular course is concerned I have already emphasized that we are primarily dealing with these aspects from concept

to planning to design and execution more is specifically we will deal with design and execution as we go along.

Now before we get into that discussion.

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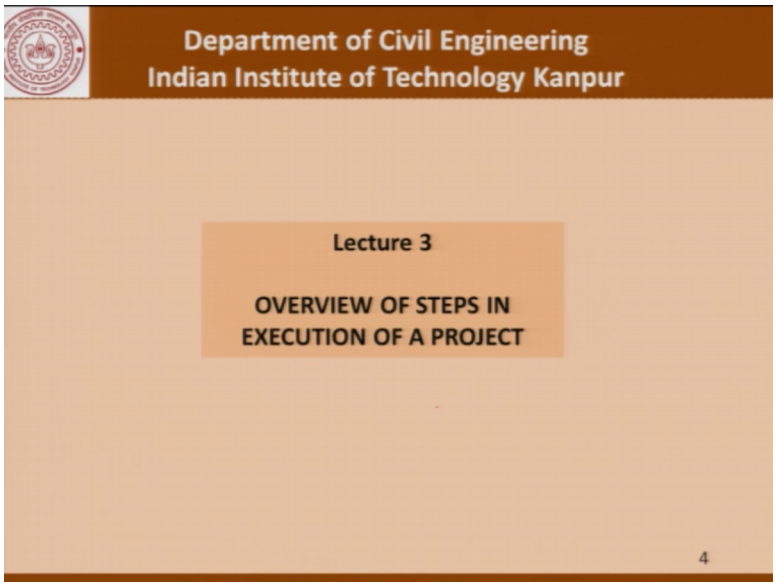

In this lecture today, we will go through some of the major steps in the execution of a project and also cover some of the basic definitions that we will use as we go along in this course.

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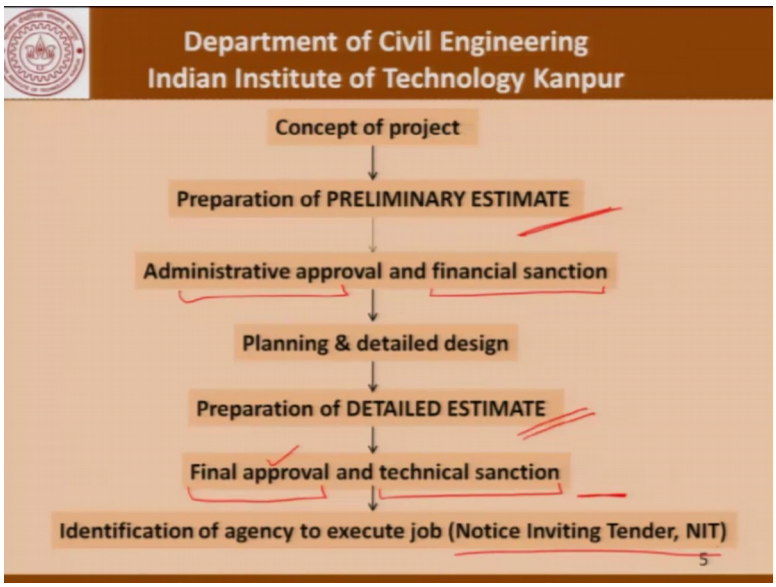

Now coming to the first step which is the concept, from there we move on to the preliminary estimate of the project. These exercise the client or the owner carries out to have some understanding of how much as a ballpark figure, how much would the project cost? Whether, it is going to cost 1 million or 10 million or a 100 million and so on. We must remember that we are not dealing with individual finances. We are dealing with institutional finances which require approvals, which require the proper kind of paperwork which has to be supporting a particular expenditure.

So, here is a preliminary estimate which need not be very accurate, but if it is accurate its good, but it need not be very accurate. Please also remember that even to prepare a preliminary estimate the client has to invest a certain amount of manpower. There is a certain amount of investment in terms of manpower, in terms of resources to prepare the preliminary estimate and that is what we talked about earlier in this discussion today. That is the investment that is required to do the very rough layout plan, figure out the need and so on.

So, once the preliminary estimate is ready, we take an administrative approval and financial sanction. So, we go to whatever the authority or the body be, that this is the project that we would like to execute kindly approve this project. So, depending on the kind of discussion that happens at that stage the project is let us say approved.

Now, once that approval is obtained, additional investment is carried out by the client in more detailed planning and more detailed design which could include the structural design, the functional design, good for construction drawings and so on and so forth. We have not covered or we do not really need to go into the details as to whether an architect will be involved or an architect will not be involved, as to which is the agency, which will actually carry out the preliminary estimate or the detailed estimate and so on. Leaving those things apart once we have the detailed design, we go ahead and calculate or carry out the detailed estimate; that gives us the actual amount of funds that are likely to be involved as far as the construction of that project is concerned.

Then we go back and obtain a final approval and technical sanction, please remember that it is a matter of terminology. We are calling it financial sanction here, we are calling a technical sanction, here we are calling it to final approval, here we are calling it an administrative approval here, and so on. But those are matters of detail and we really do

not have to bother so much about what terminology is used and so on. The idea basically is that initially there is a preliminary estimate then, there is a detailed estimate and before we go to the site we need to have a final approval from someone who says yes we can go ahead and execute the project.

Till such time as we have reach this stage, the project is still on the drawing board alone. This does not mean that all the details of the project have been worked out before the execution starts. There may be some details which are left out, but the detailing should have already reached a stage where in a very accurate estimate can still be made. So, having come this far we finally, go to the stage where we try to say now let us try to look for an agency to execute the job and this exercise is carried out through what is called or what I have called here a notice inviting tender and NIT. Now before we proceed further I would like to make some comments.

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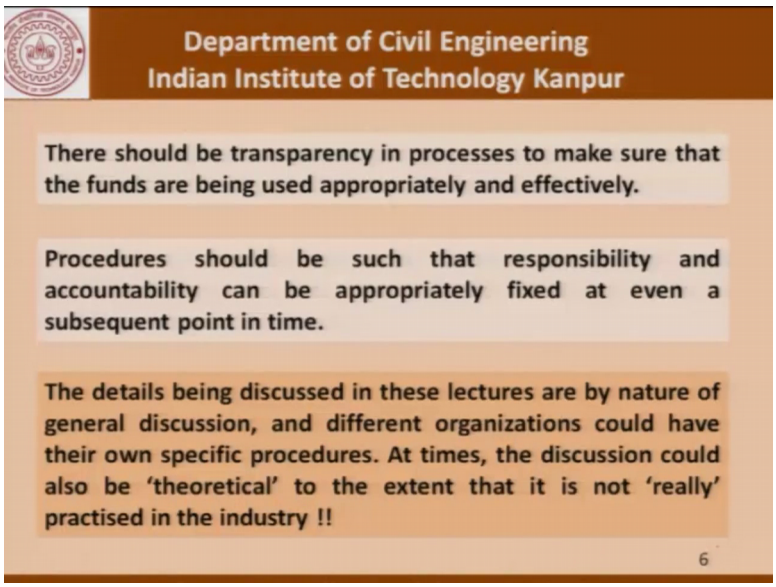

One of them is that we must remember that these procedures have been designed or they are being discussed because we need to have transparency in processes to make sure that the funds are being used appropriately and effectively. Like I said at the beginning of the discussion today, we are dealing with institutional funds. If it is a government project, we are dealing with public funds.

So, there is an accountability and there is a responsibility which is very important and the processes have to ensure transparency. The procedure should also be such that the

responsibility and accountability can be appropriately fixed at even a subsequent point in time. What this means is that even after the project has been executed should there be a doubt as to whether the right kind of procedures are followed or not there should be a trail of documents, approvals and so on which would be able to establish as to what were the different steps that were taken. I must also share with you the fact that the details being discussed in these lectures are by nature of a general discussion and different organizations could have their own specific procedures and their terminologies.

At times the discussion here could be largely theoretical to the extent that it is not really practiced in the industry. We will talk of processes, which could be ideal. We may allude to them in that form or not, but we must remember that it is not a single process which is practiced across the construction industry. Different organizations whether it is the railways or whether it is the roads, they have their own processes. Different countries have their own processes by which these projects are executed.

Now having said that let us look at a few simple definitions, what exactly is a tender in the construction industry?

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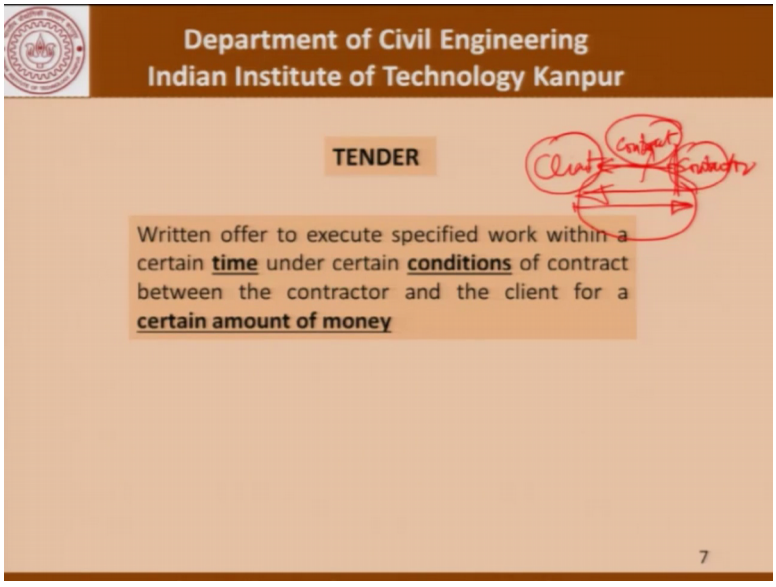

This really is a written offer to execute a specified work within a certain time under certain conditions of contract between the contractor and the client for a certain amount of money. So, we have a client and we have a contractor and what binds them together is a contract and this contract basically says that the contractor agrees to create a certain

service or a certain structure or whatever it is and the client agrees to compensate the contractor with a certain amount of money.

So, now this pair is what is given in the contract. So, the tender is basically a written document, which is not a contract of course, it is a written statement submitted by the bidder as such saying that ok, for this work under these conditions this is what it is going to cost. So, we will see these details more closely later on.

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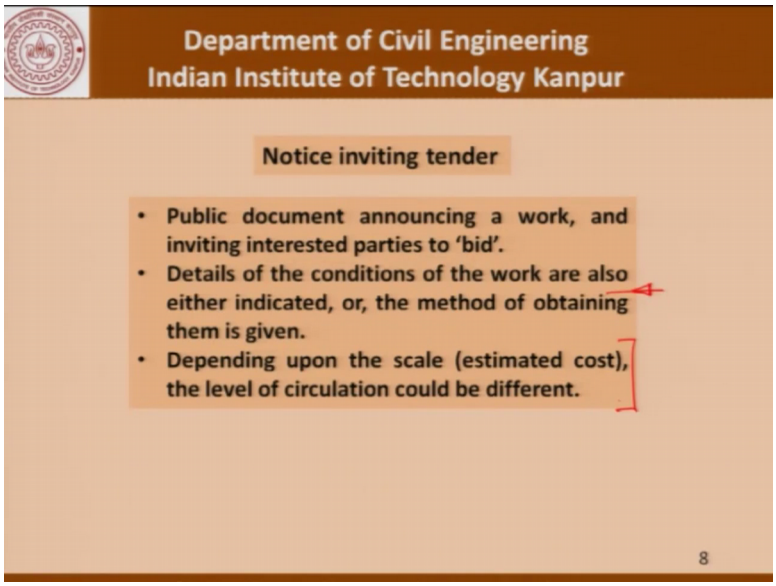

Now let us try to look, at what is a notice inviting tender? As we saw in a previous slide, this is the stage when the client is ready to go public with an announcement that well this is a project which we would like to see executed. So, a notice inviting tender is a public document announcing a work and inviting interested parties to submit their bids. The details of the condition of the work are also either indicated or the method of obtaining them is given.

So, this is where we really need to have completed all our detailed design and everything. So, that any interested bidder can either look at that document or there is a place it could be a website, it could be a link or whatever it is, he could go there and obtain the details of the work and the conditions under which it has to be carried out. Then depending upon the scale or the estimated cost, the level of circulation could be different. Now what this means is that depending on the estimated cost of the tender or

estimated cost of the work and that estimated cost is not the preliminary estimate, it is basically based on the detailed estimate.

That is the final estimate that we worked out at the end of our planning and design exercise based on that cost, what should be the level of circulation? The level of circulation means that whether we should publish it locally, at the clients website and leave it at that or we should make extra efforts to publicize the fact that there is a work available. The lowest form of execution is word of mouth. We just inform some people and let it be the most public form of circulation is a global tender where, we try to invite people from across the world to bid for a project. We must remember that circulation also involves funds and therefore, one has to decide that for a 1 million project this is the level of circulation that we will do, for a 10 million project this is what we will do and of 100 million this is what we will do and so on.

So, that is where different departments, different institutions, different organizations may have their own standards and methods of circulation.

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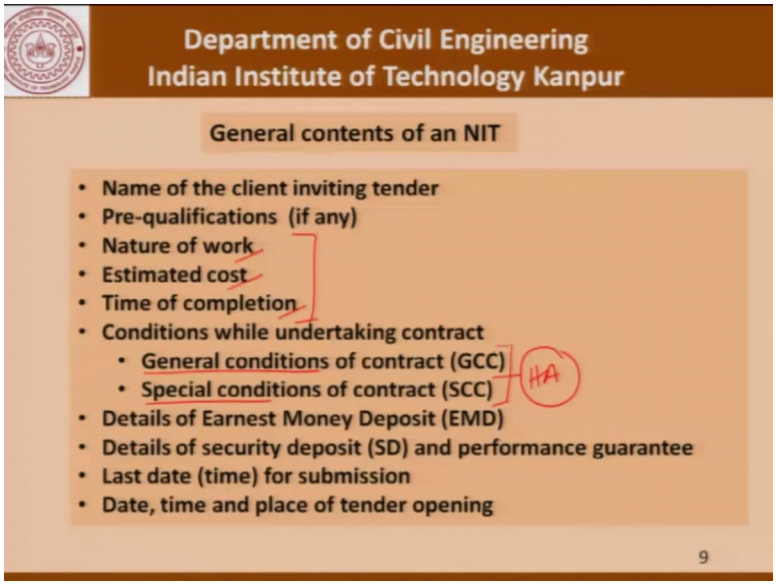

Now what does the notice inviting tender or the NIT contain? It contains the name of the client inviting tender, it also contains pre qualifications if any, it might say that well for this job we are looking for a contractor who is already registered with us. So, there is a procedure by which different organizations have pre registered contractors and we have to declare that in this, what is the nature of the work? Whether it primarily involves

construction of a house or it involves primarily civil work or electrical work or whatever it is.

What is the estimated cost? What is the likely or the desired time of completion? What are the conditions while undertaking the contract or the job? This typically is given in two volumes; one is a general conditions of contract which is called the GCC and the other is the a special conditions of contract which is the SCC. Then there are details of the earnest money deposit the EMD and the details of the security deposit in the performance guarantee. It also contains the last date. In fact, it specifically the time for submission of a tender document and finally, it gives the date time and place for opening of the tender.

Once we look at these details it becomes obvious that the nature of the work and the estimated cost, the time of completion these details are important for a bidder to decide whether or not they are interested in submitting a bid for that project or not. For example, certain large contractors may not be very interested in very small jobs. Maybe, gather way around very small contractors who has not handled a large project before would not like to bid for a certain job.

So, this nature of jobs estimated cost in the time of completion gives an idea to the bidder whether or not they should bid for a job or not. As an assignment I would like you to read the general conditions of contracting, the special conditions of contract which will probably try to share with you, but please do read them on your own and that will give you an idea as to what is contained therein and why they are called general conditions and special conditions

So, this is an home assignment which I am leaving for you. It is more like a food for thought; obviously, there is no answer or there is no solution to it possibly at some point in time in the course we will discuss it.

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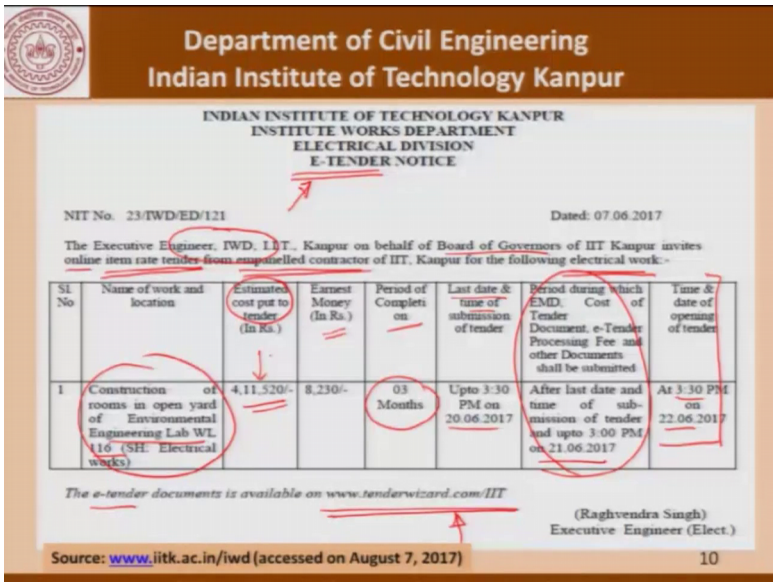

Now, here is an example of a notice inviting tender except that as you can see here it is an E tender notice. It is not a notice which has been published in newspapers and so on. it is for E tendering. Now let me read this. So, that we see as to how this particular example covers the kind of things that we talked about in the last slide.

It says that the executive engineer IWD, IIT Kanpur on behalf the Board of Governors of IIT Kanpur invites online item rate tenders from empanelled contractors of IIT Kanpur for the following electrical work. So, it says that; who is the agency which is calling the tender? It is the works department of the institute. The fact that they are doing it on behalf of the Board of Governor of IIT Kanpur is a administrative input. We do not have to really take so much of cognizance of it. It is an online item rate tender.

Now, there are different types of tenders and this is one of them. In fact, as far as this course is concerned we will stick to this type of tenders because I would think that if we understand this model of tenders the others are easier to follow. From empanelled contractors, now here is where the pre qualification is that the contractor who bids for this project should already be an empanelled contractor.

They institute in this case, IIT Kanpur, the organization they have an exercise or they carry out an exercise periodically of impaneling contractors and that exercise precedes this. So, once the contractors have been empanelled they are free to bid for projects as they come along the electrical work. So, there is the nature of work which is declared

here, but more specifically it is given here. It says construction of rooms in open yard of environmental engineering lab western lab and so on. So, this is the exact location of the work.

So, that it makes it easier for any prospective bidder to go to the site if they need to or if they want to and see where exactly it will be located. This helps the contractors or the bidders at this stage decide what will be the nature of difficulties in executing the work at that location and so on. Whether it is accessible? How far is it from the road? How will the material be taken there? Because all these things have a cost implication, it gives the estimated cost in this case, it is 4,11,520 rupees and so on.

Then it talks of an earnest money which we will talk about later the period of completion is given here as 3 months. The last date and time for submission of the tender is given as some date and time and period during which the EMD cost of tender document, E tender reprocessing fees and other documents shall be submitted is given here.

So, remember that this is an E tender, which means that the tender will have to be submitted online, but the client which in this case is IIT Kanpur needs to have certain physical documents which have to be submitted to the institute by the regular post and this is the deadline for those documents to be received. The time and date for opening of tender is given here, this is the date and this is the time. And it says that the E tender document is available at this particular site.

So, once a bidder goes to this site this gives us or gives the bidder all the details relating to this particular project which is going to cost 4,11,520 rupees as an estimate as prepared by the institute. This estimate is; obviously, not the same as what the bidder may agree to do it or not agree to do it and so on and so forth.

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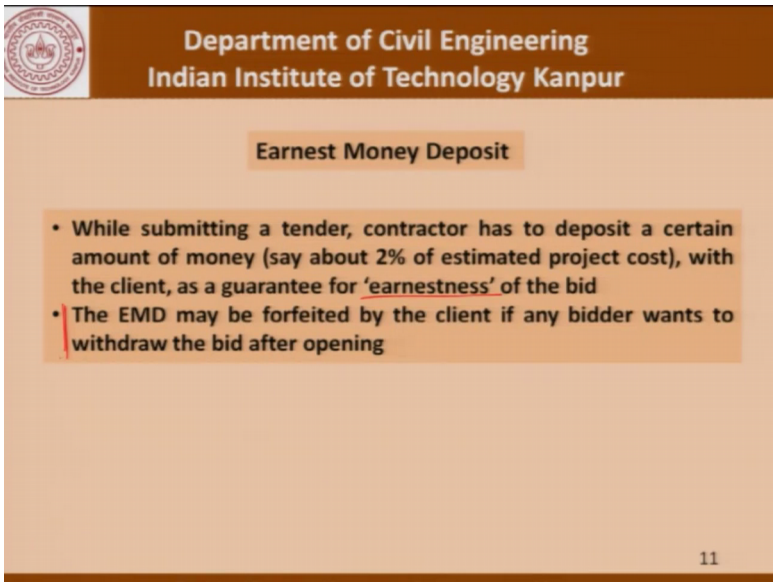

Moving forward let us try to look at a few definitions first of all earnest money deposit.

Now, while submitting a tender the contractor has to deposit a certain amount of money say about 2 percent of the estimated project cost with the client as a guarantee for the earnestness of the bid. Just to prevent frivolous bidding, this kind of a provision is made. At the time of submitting a bid, the bidder also submits a certain amount of funds. Those funds are not cash they could be in the form of a bank guarantee or a term deposit and so on and that is an expression of earnestness, a seriousness in the bid. The earnest money may be forfeited by the client if the bidder wants to withdraw after the bid has been opened.

Please note that the EMD can be forfeited by the client, if the bidder wants to withdraw the bid after the opening. Till such time as the bids have not been opened, that even if the documents have been submitted to the client somebody can say that well please do not open my bid, I want to withdraw from the tendering process. And most of the time the EMD is not forfeited, but once the bids have been opened then, there is all likelihood that the EMD is forfeited by the client.

So, this is again a feature which is built into most of our contracting practices to make sure that there is no frivolous bidding because we must remember that in processing the bids and so on there is a certain amount of resources which the client spends and; obviously, the client would not like to incur an expenditure on resources, for processing a

bid and the bidder just withdraws. So, this is a kind of a penalty which will be imposed in those conditions. Now what is a security deposit?

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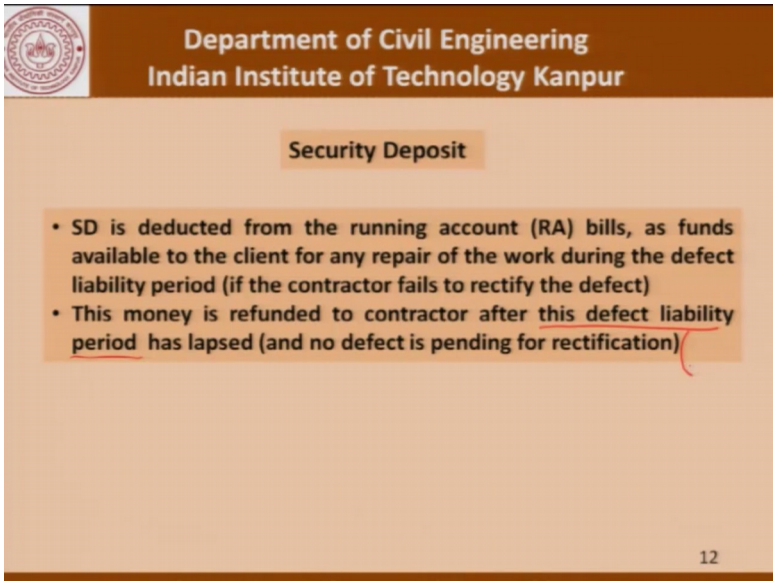

A security deposit is deducted from running account bills; we will talk about running account bills later on as funds available to the client for any repair of the work during the defect liability period.

Now, we will talk about this also later on if the contractor fails to rectify the defect. See basically what is happening is this as the project is getting executed the project should be able to perform the way it is designed to perform. The contractor is responsible for ensuring the quality of the project and ensuring that any defect that appears in the project during construction or during this defect liability period should be rectified by the contractor; without any extra cost. In order to ensure that the contractor does it and if the contractor does not do it the client should be able to do it, but the cost should be recoverable from the contractor, the security deposit is the route. A part of the payment due to the contractors recovered a security deposit and is parked with the client. Of course the money or the security deposit is refunded to the contractor at the end of this defect liability period and making sure that there is no defect pending to be rectified.

Now, one question that comes to mind is, what is the length of this defect liability period? This is another food for thought for you to try to look at different projects. There is enough information available about projects and the different conditions on the

internet and you can find out what is the defect liability period for different projects. In a manner of speaking this defect liability period is similar to a guarantee period. When we buy a refrigerator or a car or any other device like this or any other machine of that nature, there is a period during which we would like the manufacturer to make good any problem that arises in that machine.

Now, for a construction project also whether it is a bridge or a road or whatever it is, we would like to have a period during which the project or that particular structure is defect free is able to perform the way it is supposed to perform. If we buy a car it should be able to run, if you are living in a house there should be no leakage, there should be no seepage and so on. So, now, how much should the defect liability period be is an open question and different projects may have different liability periods. Also a question is when does the defect liability period start? For example, if the project starts at time T is equal to 0, it takes 3 years to complete and then we are talking about a defect liability period.

So obviously, even those parts of the structure which were built in the initial phase of project cannot have their defect liability period starting from when they were completed. Most of the time we would say that after the project has been completed only then the defect liability period comes into play. So, these are small things which one must remember one must be very careful because these are all things which are likely to be the causes for any dispute that may arise with the contractors at any point in time. So, moving forward let us talk of a letter of intent and a performance guarantee.

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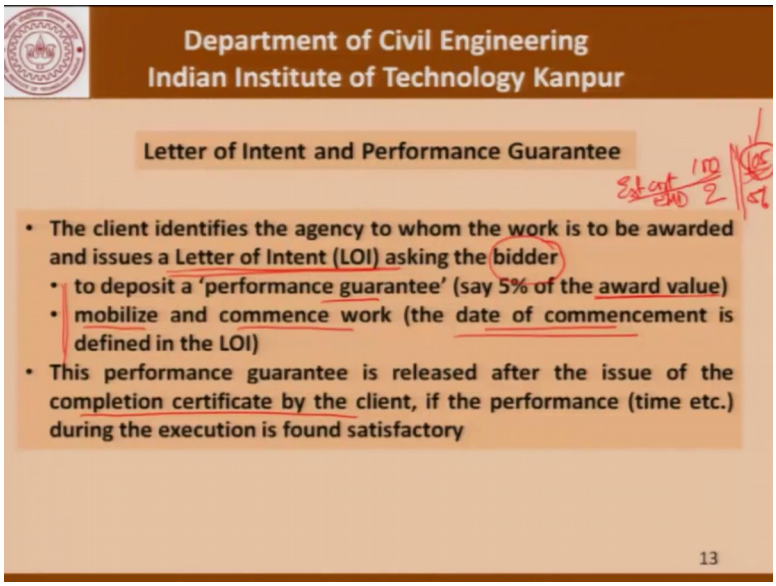

Now at the end of the process of handling, the bids that have come from the notice inviting tender; the client identifies the agency to whom the works to be awarded, how it is done? We will take it up later and issues what is called a letter of intent. Now that letter of intent is essentially a formal invitation to one of the bidders that yes we are intending to award this job to you. So, till that time the person or that agency is still a bidder. It has not become the contractor and that is a semantics part of it. Now what does the letter of intent contain? It invites the bidder to deposit a performance guarantees let us say 5 percent of the award value.

Now, please see we are now talking about the award value; earlier we were talking about the estimated value. So, the estimated value was prepared by the client and the EMD was based on that estimate. Now when we have issued the LOI, we are talking about the award value. So, if the estimated cost was let us say 100, the EMD at 2 percent of this would be 2, but if the award is being given at let us say 105 then, the performance guarantee will be 5 percent of 105 and not 100. So, that is a small point that I would like you to take note of the letter of intent also calls upon the bidder to mobilize get started with their preparations and commence work.

Now, since that time of the project is precisely defined in the contract or given in the notice inviting tender also. The date of commencement is a very important date, now what should be the date of commencement? That usually is given in the letter of intent

typically it could be 15 days from the issue of the letter of intent or one month from the issue of the letter of intent and so on. So, all these details in fact, are part of the conditions of the contract which the bidder already knows from the details of the document available on the website of the client.

Now this performance guarantee is; obviously, released after the issue of the completion certificate by the client if the performance, time, safety and so on during the execution is found to be satisfactory. So, basically what is happening is that if a job has been awarded for 105 with an estimated cost of 100 there will be a certain amount of money which will be withheld and the payment will not be made to the tune of 105 immediately after the completion of the project. Some of it will be paid only after the completion of the defect liability period and so on and so forth.

So, all these things are already known to the bidders when they submit their bids and they make their bids keeping these kinds of things in mind.

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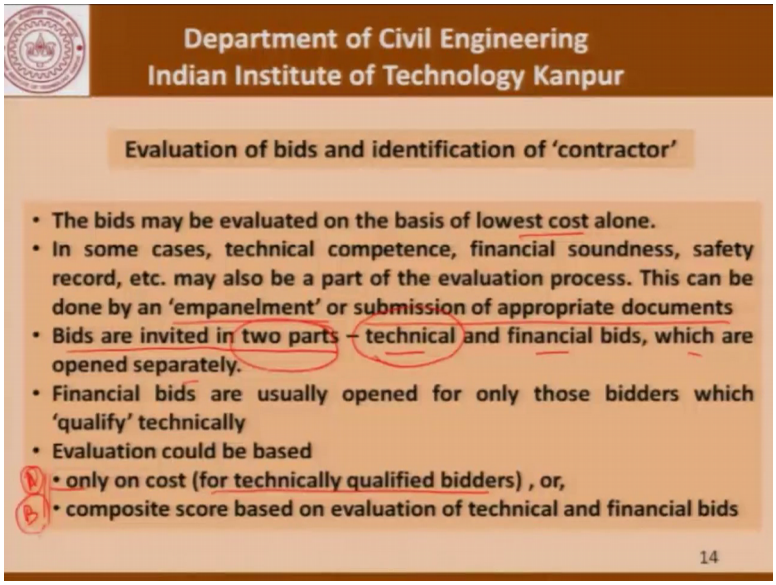

Now let me talk a little bit about the evaluation of bids and identifications of a contractor. Now the bids may be evaluated on the basis of lowest cost alone. So, at the end of it we can say that here is a project five people bid for it and depending on whosoever is the lowest bidder we award the job to that person and issue him what is called the letter of intent. That is what you are talking about in the last slide; having said that though we can

award the job to the person or the bidder with the lowest bid, we must make sure that the bidder is technically competent, financially sound and so on.

So, this has to be insured through an examination of technical competence, financial soundness, safety record, and so on. So, all this is part of the evaluation process that goes on. Of course, we can award the job to the bidder with the lowest bid, but we must make sure that the person is technically competent, financially sound, has the right kind of a safety record and so on. So, all this has to be a part of the evaluation process. So, now, either we do that on a case to case basis for each of the contracts that we award or it can be done through a process of empanelment.

So, this empanelment exactly is the kind of thing which we refer to earlier that the client invites people or invites bidders to submit their documents. So, that for a period of time that is the validity of them empanelment, for that period different bidders they submit documents which establishes their competence. Now once that is done then, we can indeed go for the lowest bid; else it has to be submission of appropriate documents with each bid the people have to submit their proofs of technical competence, financial soundness and so on. Now apart from the lowest cost system, we can have a system where bids are invited in two parts; technical and financial which are opened separately.

Now the technical bid does not contain any financial details and obviously, that gives only information about the technical competence, it could include financial soundness and so on everything other than how much it is going to cost for that particular project? Or how much is the money which the bidder is going to take from the client for that particular project? So, once we have this so called two bid system, initially we carry out what is called the technical evaluation and then having carried out the technical evaluation we open the financial bids. So, typically technical bids are opened first and after certain amount of time then the financial bids are opened. Financial bids are usually opened for only those bidders which qualify technically. It makes no sense for us to even know what was the bid of a bidder, who does not have the technical competence?

So, those bids are summarily returned and rejected. So, only those bidders whose technical bids are found in order, their financial bits are opened. Now in this process now the evaluation can be based on only the cost for the technically qualified bidders or it could be based on a composite score based on evaluation of technical and financial bits.

In the next class, we will go through an example where this concept is going to be more clearly explained, but right now it suffices to say that what I am calling A here basically says that for all bidders who qualify technically it is only the cost that is going to decide the winner or it is the cost alone that is going to decide to whom the project would be awarded. Whereas, in B that is not the case and the score on the technical competence will also have a certain weightage when we carry out the final evaluation.

So, this is going to become clearer once we do an example next time.

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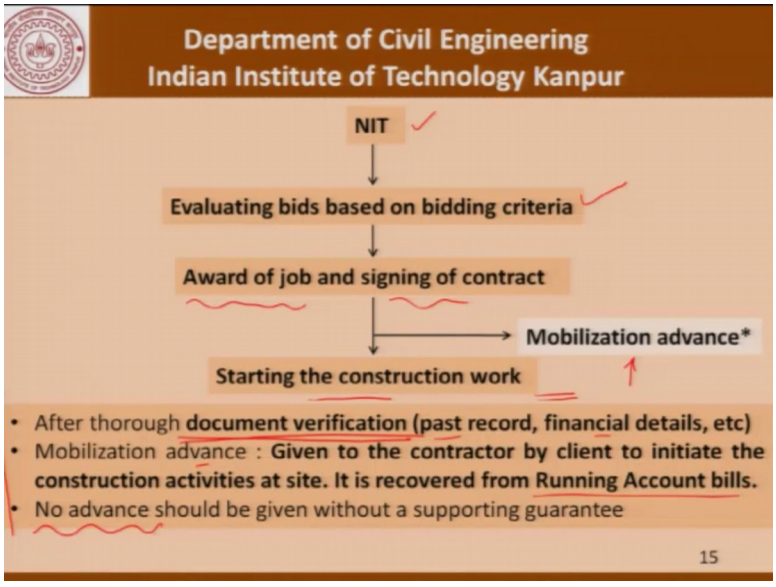

So, to recapitulate what we have done today is we have gone through the notice inviting tender, whatever the details it should contain and so on. We have gone and studied the evaluation of bids based on the bidding criteria. We have gone on the award of job, signing of contracts, the issue of the LOI and so on and starting the construction work. Now before the construction starts, once we ask the contractor to mobilize; we also have the provision of a mobilization advance which the contractor can ask in order to be able to mobilize or in order to facilitate his mobilization.

Now let me quickly explain what I have written here. We must be very careful with document verification in terms of past record, financial details and so on before we sign the contract or issue the letter of intent. Similarly the mobilization advance is given to the contractor by the client to initiate construction activities at site; it is recovered from running account bills. And we must make sure that no advance is given without a

supporting guarantee. The guarantee could be informal for bank guarantee or whatever it is, but it should not be unsecured. And before we close the discussion for today let me also go through.

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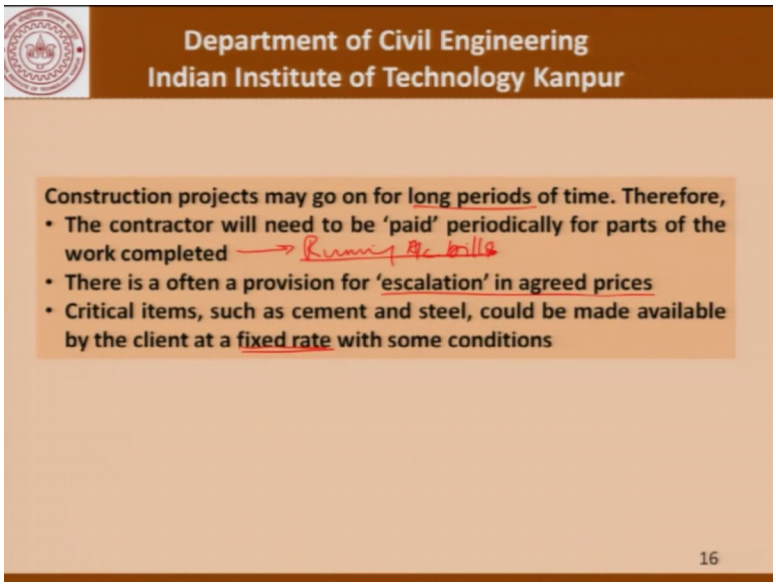

Another very important aspect that is construction projects may go on for long periods of time and involve substantial commitment of resources. Therefore, the contractor will need to be paid periodically for the parts of the work that are completed.

Now, this is ensured by what is called running account bills and that is something which we had talked about earlier in the discussion today; also because of this long duration of construction projects there is often a provision for escalation in agreed prices and also critical items such as steel or cement could be made available by the client at a fixed rate with some conditions. Now what this kind of a provision does is to protect the contractor from fluctuations in cost of critical items. That is why the client takes that risk and says that well that part of the risk in fluctuation of prices and steel or cement also perhaps to ensure a certain quality, that material supply is included as part of the client supply and finally there are different types of contracts.

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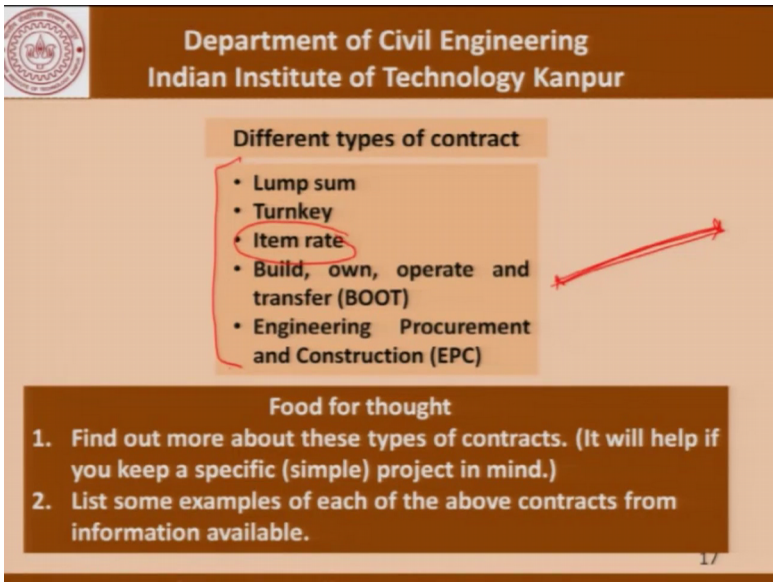

It could be a lump sum contract or a turnkey contract, an item rate contract or a build, own, operate and transfer contract or an engineering procurement and construction contract and as far as we are concerned we would largely concentrate on the item rate contract as far as our discussion in this module is concerned. But having said that I would like you to find out more about these types of contracts and it will help if you have a specific simple project in mind if you just think that let us talk off a road from point A to point B.

If this is the project that is being tendered for and people are bidding for it, how will these different models or how will these different types of contracts be applied to that project? That is a food for thought for you and also lists some examples of each of the above contracts from information available to you on the internet and so on. With this we come to an end of our discussion today.

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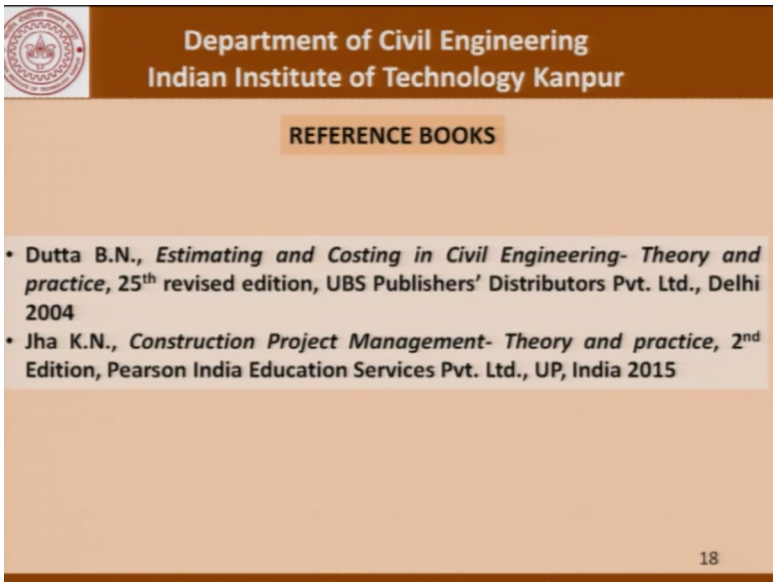

These are some of the books which will help you better understand the material that we have covered today.

Thank you.