Course on Integrated Waste for a Smart City
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Module 09
Lecture No 45
Landfill Disposal (Contd.)

Okay so welcome back and so we will continue our discussion on the landfill site selection that we were doing it yesterday, we have looked at some of the regulatory requirement, some economic requirement and also we have talked about some of the political compulsions many times you have in terms of selecting a site. And these are all realistic issues, so it is rather then saying that we do not have that problem it is always better to identify the problem and address the problem, rather than pretending problem does not exist.

Because wherever you go around the world like as I have mentioned earlier in my discussions that I had an opportunity to be at several countries and worked on waste management in several countries and everywhere there will be some political interference will be there, it is there it is everywhere there but somewhere it is too much somewhere it is too less and some and many and basically we have to identify we have to acknowledge that issues is there and then work within the constraints that we have rather than pretending that the problem does not exist because if you pretend that the problem does not exceed you will not come up with the solution of that problem.

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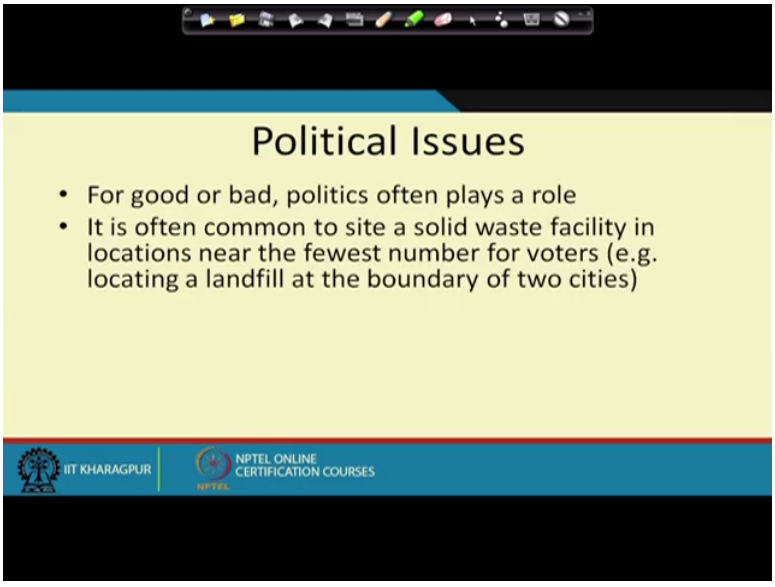

So we were looking at now these political issues, social issues before that economic issue, environmental issues so we covered this in the earlier video. So today we will start talking about how you actually go about doing that siting process, like what is the method in terms of how we go about scientifically or technically selecting the site.

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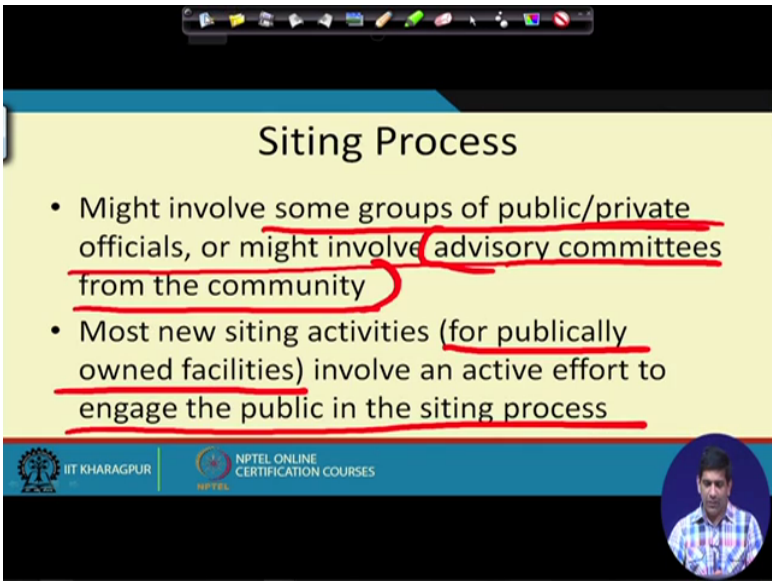

So we what we do is we have a it does involves a group of public and private official. So ideally in many parts in many cities around the world what they do is they involved advisory committee and I think I mentioned to you that city that I was living in Canada very close to Toronto I was actually co-chair of there solid waste management master plan committee because I was a local professor at the University, teaching in waste management so off course they thought that the expertise is there why not make use of that expertise.

So I served as a this is the same advisory committee that they talk about, it involves some certain advisory committee from the communities. So you try to involve people from the community who knows about the waste management, just do not involve people who just happens to be part like a members of a particular political party in the power or somehow play influential for some reason but does not understand anything on the waste management does not have any background expertise on waste management.

So you do we do need it is a public representative but always try to identify person who can really contribute something to it that is how things can improve. So there are groups of public and private officials they get-together and then they go over this new siting activity and it is all for the publicly owned. So where I am talking about publicly owned facilities most of the

environmental facilities are publicly owned and even if it is a private owned it is on kind of on the public land it is on like build, operate, lease and transfer kind of BOLT or PPP model, whatever model you go for ultimately it is the public money which is going into the construction of these facilities.

So we do engage public in the siting process, then it is an important aspect, so if you do not engage the public later on will have more problems, so it is always better to engage the public in siting process. And so we it used to happen in ancient India, like if you look at all the ancient histories and when you start reading about different kingdoms we had over last say several thousand years, whatever history we have available in the history books you see that there used to be a public consultation there was a people from community will come and they share their opinion and then based on whatever is the best decided by elected representative as well as the technical expertise and community workers and those names are changed today so those names becomes earlier what it used to be in terms of happen in a court of Kings.

Nowadays we have ministers, we have a federal, we have a bureaucracy, we have executive, we have a judiciary, we have NGO's, so we need all these people on board and then only we will so that (())(04:49) the project will prosper otherwise you start something and there would be somebody will go and do a PIL in the court and then things keep on hanging, so it is always better to keep people in one board and all the stakeholders has to understand that this needs to be done, so let us try to come up with a way to get this done rather than delaying it.

Because when you delay a project as we are very much well known as the citizen of our country that many of our projects gots delayed and over last several decades and delaying the project increases the cost, many times the objective of the project it is also lost because we want it to build it for something but the thing the situation has changed or maybe the situation the problem has become too big now so the solutions to small, so those things comes into picture.

So coming back here, so in terms of siting process for the landfill we try to have advisory committee from the community especially people who are knowledgeable in this area, get public on board and then they engage the public in the siting process. But what we do in the siting process, let us look at that.

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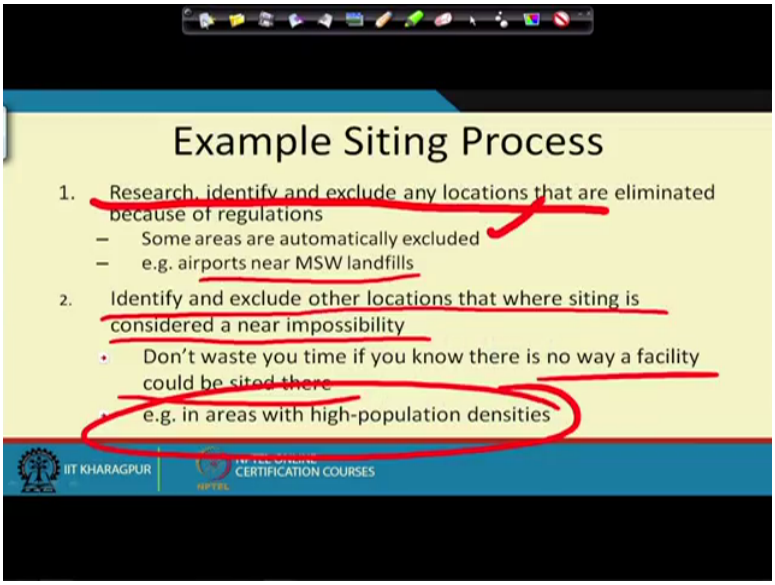

So in siting process we start first by researching, identifying and excluding any location that are eliminated because of regulations, earlier we talked about the regulation requirement in the previous video. So whatever those that first of all we will, say for the city for the town of Kharagpur if we have 5 or 6 locations in mind, so based on town since I am the engineer, I am the solid waste engineer of town or if I am the public health person or the BDO or whatever position I am not that. So whoever is in charge and they people who are in charge they know what other sites potentially can be used. So they said okay that we have site A, site B, site C, site D so although site A, B, C, D they go over the regulatory requirement if some these sites does not meet the requirements, that site is strike off right now straightaway.

So you research, you identifying and you research, identify and exclude any location. So research, identify and exclude any location that are eliminated because of regulations, because some will be automatically excluded. For example the airports near MSW landfills, we cannot have a MSW landfill near the airport, so that is already excluded, we already know that. Then if you have if you know identify and exclude other locations where siting is nearly impossibility, impossibility for example areas with high population density.

So if you know that although it is may be a good it meets the requirement but there is no way a facility could be sited there. So rather than wasting your time and pretending that problem is not there, let us face the problem and okay will not go to this site, let us try to choose from whatever is left, so we go to the next step.

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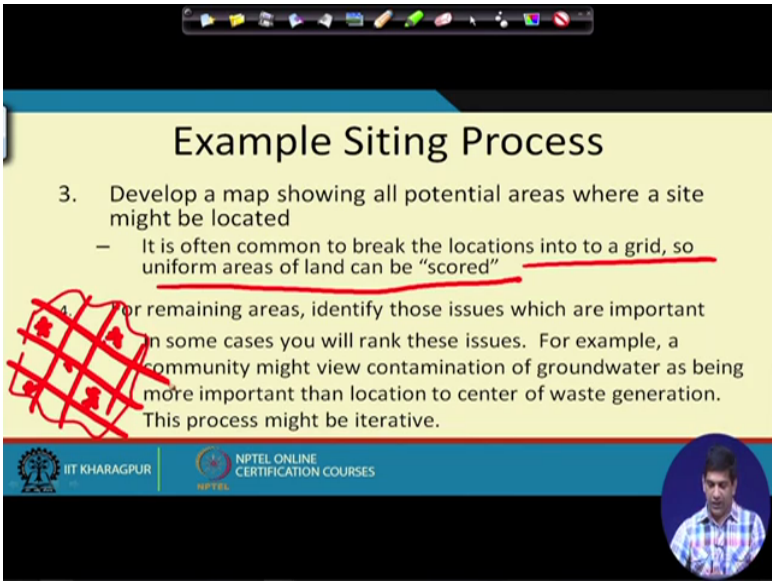

In terms of next step, what we do is, we develop a map. We have to develop the maps so all the potential areas where the site could be located. So we come up with this town map of Kharagpur and then so we have a let us so if it is I will just draw a hypothetical map. So say if this is the map of Kharagpur and then we have some sites identified, so these are our site which is identified so we just map to this site's. Then what is next, so what we try to do is we break the locations into a grid, so uniform areas of land can be scored. So we put a certain like a grids system here and on base on that grid we will come up with certain scores and I will explain what those scores we are talking about.

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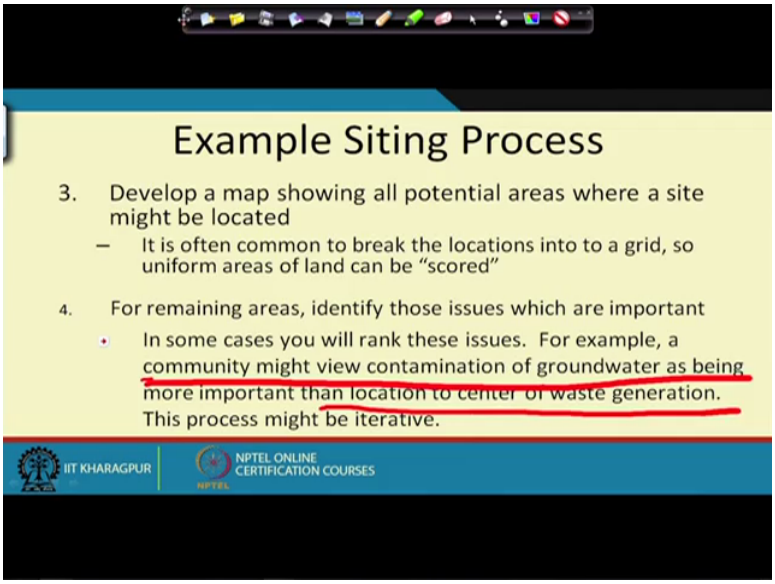

Then we identified the issues which are important. The issues could be community might view a groundwater contamination issue more important for them. They rely on groundwater; they do not have water supply system coming from a publicly owned water treatment plant yet, so they rely on their groundwater wells, their tube wells. So they may if you that it is a very critical so that is one of the will be a which we have to rank, when the ranking of the site we have to give more weightage to that.

And so the as groundwater is more important than the location to centre of waste generation, so rather than whatever critical point we have been talking in this class is that collection is very expensive in terms of municipal solid waste, but the collection is because the collection cost is very high. But at the same time for some reason, say if this one particular community for them the groundwater protection is much is very critical. So in that case that takes higher precedence higher weightage is given to that as a post to the collection cost that we may incur more collection by having a site which is further away. So that is because if the so then we have to rank different items and then we give weightage to the different items I will walk you through an example which will help you to make it clear.

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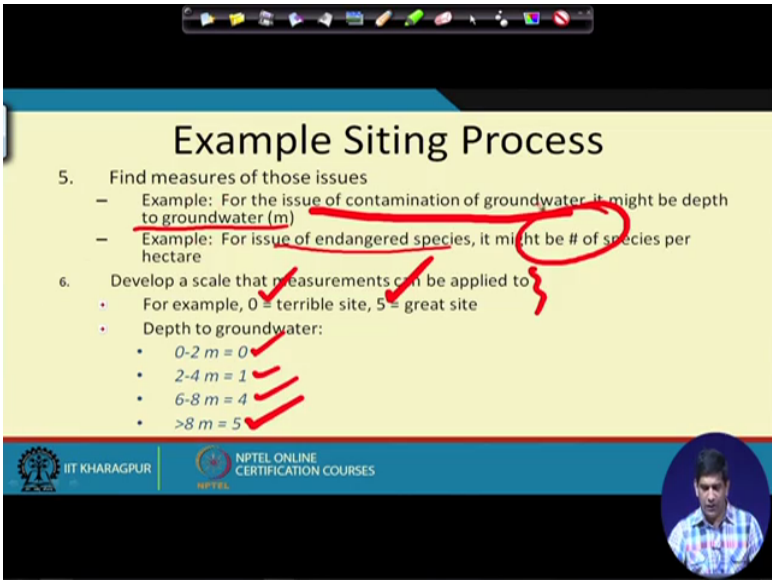

So find numbers, find those issues, so we have to first find those issues. For example issues of contaminations of groundwater, it might how we will do it? We can do it by the depth of groundwater and then there could be a issue of endangered species, it might be number of species per hectare in that area so those are important. So then you put a scale on the site which where we have 0 score is for the terrible site, 5 is a great site. For example for the depth of the groundwater we can say 0 to 2 meter if that is the depth of the groundwater, then

the score is 0, if 2 to 4 is 1, 6 to 8 is 4, and then anything greater than 8 is 5 because it is a good site.

So similarly for each and every parameters that we are interested in what the local communities is also interested in that their mind, what they think is important for them, because ultimately they have to live in the community. So they will be leaving in the community for several years, so we have to in terms of getting that siting so we score them, we score all these different like based on different criteria we do this scoring and after this scoring is done we come up with a total score.

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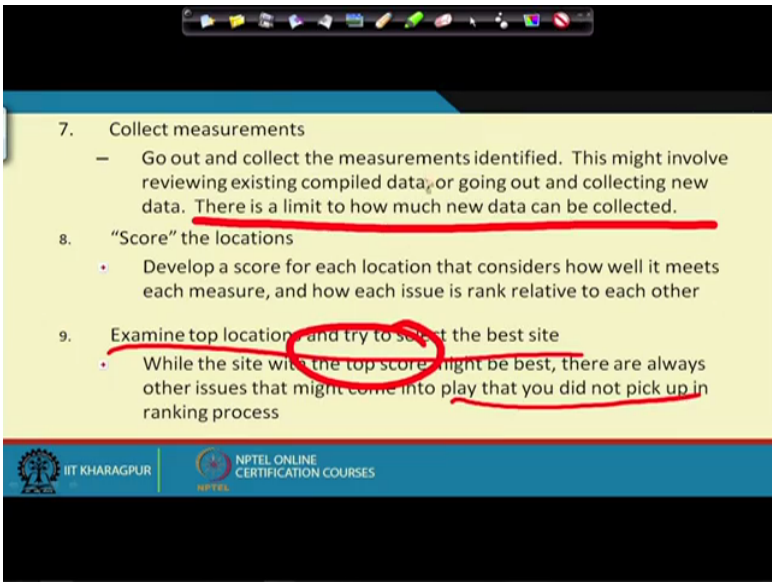

So we collect the measurement, so we have to go out and collect the data, so data will be groundwater depth data, there could be hydrogeology data, so based on all different parameters that we are trying to find values for which is important for that location we go and collect measurement, so that is actually become part of the DPR as well. When you do the site selection you have to do a DPR for that site selection with as site selection is also a part of the DPR.

So you have to go and collect the measurement in terms of groundwater depth, in terms of soil profile, looking at the soil bearing capacity, looking at what is the what is the flora and fauna around it, we have some surface water, how far is the surface water and so all those different parameters which is important we need collect those data and we compile that data and off course there is always a limit on how much new data can be collected.

So there could be some existing data that we can use that. But many times you try to collect new data, because new that is the primary data and there is a difference between primary data and secondary data, if you have collected the data which has been compiled earlier and then that is your secondary data. Many times a secondary data is not you do not cannot rely on those secondary data, so we something is more critical you go for primary data and then you score the locations.

So when we say scoring the location you are for the each location you come up with, how well it meets the criteria you have those 0, 1, 2, 5 ranking so and then you rank them and to all what you do add them up. So you get for the different parameters that you had, you had 3 sites or 4 sites A, B, C, D you add all these score and then you will come up with a total score and then you try to examine the top locations and try to select the best sites from there.

So while so it is you may you have this score many times it may happen while you have this top scorer, this site might be the best but they are not all there could be some other issues that come into play when you are not pick the top one or you may pick the second one or maybe so that is depends on how things will be things are at the local level. So this is how the essentially the process works in terms of doing this site selection.

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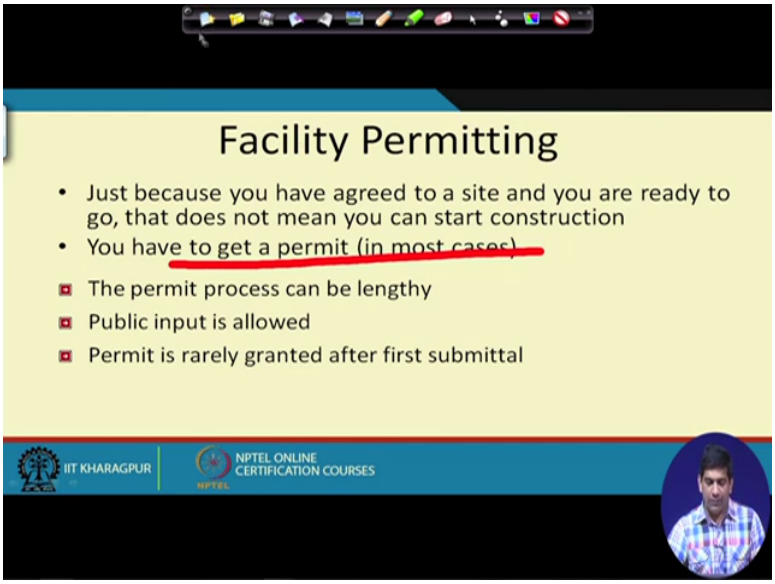

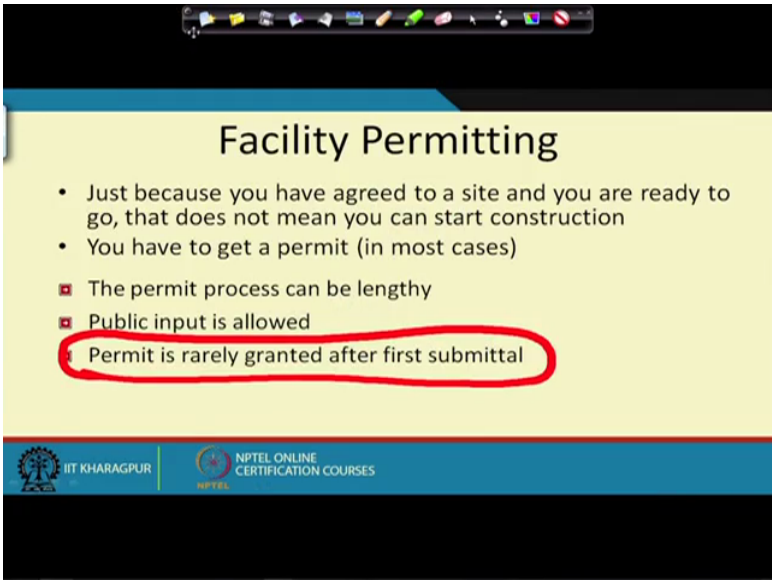

Then once you have selected the site, once the site has been selected the next thing is we have to have the facility permitted. We have to have some so we have to you go for building anything you need to get the permit, so the next step is to collect the permit. So just it does not matter that if you have agreed to a site that means you are ready to go. You have a right to a site and you are ready to go does not mean that you can start the construction; you have to get a permit.

So there is a permitting process, so that is what the permit as engineer you will go through some of this permit process when you work with any firm any consulting firms you have to get a permit for construction firm in most cases you have to get the permit. The permit process can be lengthy; many times it takes it is a lengthy process public input is allowed so once you submit. So during the permit process before you submit this permit document or I can say I should say in other way as the part of the permit document when you submit a permit document you do have to submit at least preliminary design of that facility. So the preliminary design of the facility has to be there as part of the permit document that is important and so that is it is very much it is needed for that and the permit.

So when you do for this permit process once you submit the permit you may be asked certain questions, you have to reply to that question, the permit is open to the public, public can view it, they can raise some objection, they can raise some concerns and then as a engineer of the consulting firm who is hired to do this permit process all as a engineer like whatever role you are if you are involved in the permit process you will have may have to answer the certain questions of that. So after most of the time permit takes few iteration, so it is permit is rarely

granted after first submission submittal. So you have you go through certain iterative process as part of the permit document permit approval.

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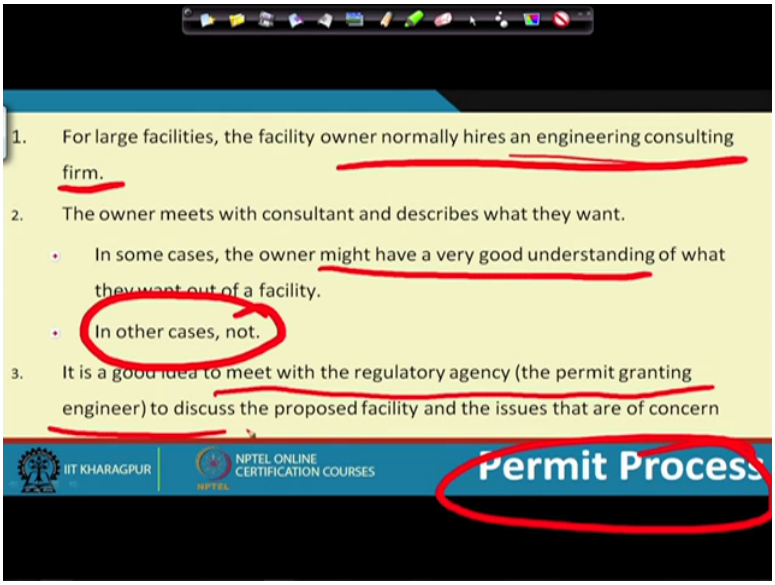

So for large facilities what happened is the normally the owners will hire a consulting firm, there will hire engineering consulting firm who will do the permit for them . The owner will meet with the consultant and describe what they want so they will this is the part of the permit process that we are talking about.

So owner will meet the consultant and they will explain to them that what they want as part of that facility. In some cases owner may have a good understanding and what they want in many cases they do not actually have good understanding. So as a consultant, as a environmental engineer, as a trained environmental engineer or environmental professional you will have to explain to them that this facilities can what basically can be extracted from a facility like that. So that is there is a kind of like a meeting and other things has to take place.

So it is a good idea to meet with the regulatory agencies, so like when you working on your permit it is always good idea rather than I do not know it is in terms of how it works in terms of the SPCB and CPBC areas if somebody of you know please post that on the discussion forum but some of you may be aware to have done this kind of exercise, but it is usually it is impact it is a good idea to meet the regulatory agencies.

So you meet the permitting permit granting engineer or permit granting professional to ask them what is their expectation, many times the expectations listed on a piece of paper which comes out it is not that clear. So it is subject to different interpretation by different engineer

as well, so the engineer who will be working on that permit granting site it is a good idea to go and meet that person, schedule an appointment go and meet, present like a very overview of what as a consulting company what you try to propose and then get their feedback.

So that when you submit the permit documents it is more in line with what they are expecting rather than if there are too many surprises for them it is a waste of time for them it is a waste of time on your part it is waste of time on permit engineering part as well. So that is it would be a good practice if the SPCB and CPCB does not do it they should I would rather think that they should do those kind of exercise to help expedite the process.

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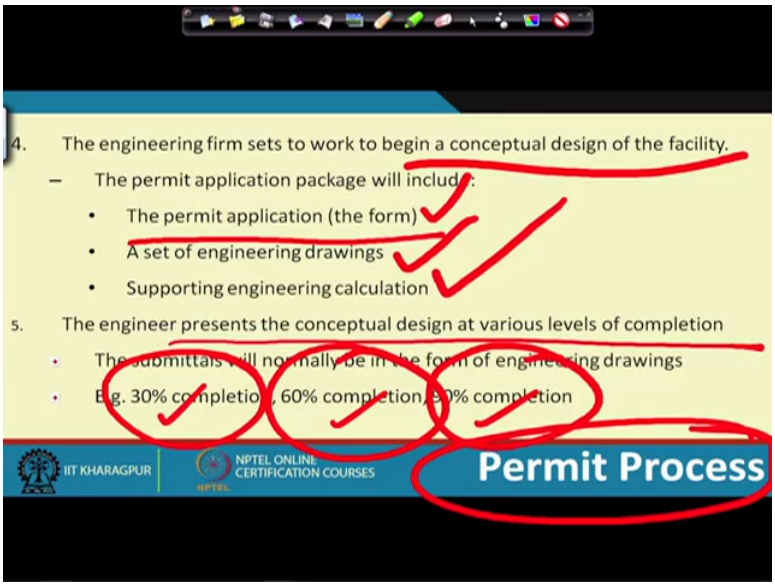

So the engineering firm then they will so they set to work again with conceptual design. So that is they have to do a conceptual design of the facility like a basic design, so the conceptual design of the facility has to be there. The permit application package usually includes, permit application form, set of engineering drawings and supporting engineering calculations. So we have to submit as part of the permit application there is a standard form which you will get, so this is as part of the permit process.

So there is a standard form which need to be filled in with all the detail and then we have a set of engineering drawings which needs to go with that because if you are showing some basic engineering design and then you show some basic support, basic engineering calculations which goes with that. So and the engineer also presents the conceptual design at the various levels of completions.

So submittal will normally be in the form of engineering drawings, in terms of 30 percent completion how the drawings will look like, 60 percent completion, 90 percent completion so there lot there is the variety of drawings, there is overall plot plan and there is would-be overall plot plan would be the big drawing which has all details of the site, all the different facilities, major services will be shown and all that, then for each of the unit you can have the individual drawing going in the detail.

So that is and that how at 30 percent, 60 percent, 70 percent that you will have more details, more services added or more at the different level of completion for that particular unit. So I have worked in the petrochemical refinery areas, so I can write know I can like totally visualise all the drawings that we use to prepare which use to go in the technical bid documents and all those kind of stuff that we used to make for different petrochemicals refineries in India and abroad as well.

So that is how this drawings are done and as a engineer as you know engineering drawing is very-very important component. Basically for engineers like us our engineering drawing is the language, so I am talking to you in English right now, but as a engineer when we talk from our design office to the construction office or the vice a versa we actually talk to through drawings, so drawing is our language.

So we have to most of the drawings these days are made using computers, AutoCAD and all different software's are there people doing it on board you do not see that much for very small work probably may be, but most of works are done through the AutoCAD, but still the AutoCAD drawings have to be printed out or and has to be sent on-site and the site people will do the construction.

So at site you cannot have drawing on the computer and trying to use it, maybe these days with the hi-tech automatic construction but most of the manual construction that we are we have and I think 99 percent of the construction is manual construction where you see that you need to have that physical drawing, so can check each and every aspect of the drawing while the construction is going on. So for the construction engineers these drawings are very-very important. And to understand how the plant will look like also so the drawings are important that is why at 30 percent, 60 percent, 90 percent at different levels drawings are made.

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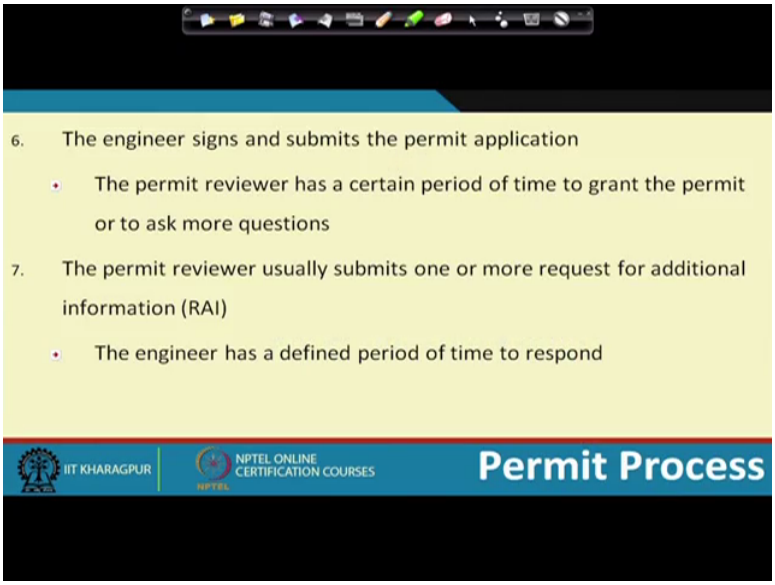

So once the engineer will sign and sign that submit the application in many countries the signature of the permit application can be done only by professional engineers. So you can go for professional engineering license, in India we have something called chartered engineers, so I am a chartered engineer myself which is a where situation in India they do provide the chartered engineering certificate based on your credentials and off course I think most of us are members of Institution of engineers of India and there are different level of membership. But chartered engineers are kind of Indian equivalent of professional engineers of PE or P-Engg that you see in US, Canada and other places.

So the permit reviewers once it submitted, the permit the reviewer will spend some time to grant the permit or to ask more questions. So they raise request for additional information, so many times you have RAI coming in which is called request for additional information. So the permit engineer will ask for more information so that this permit process, permit document can be evaluated.

So the engineer has a defined period of time so within that so then you have a defined period within that time we need to respond back to the permit granting authority. So and that is like a this is how the process continues, so once you have that once the permit reviewer is satisfied so those RAI could be multiple times.

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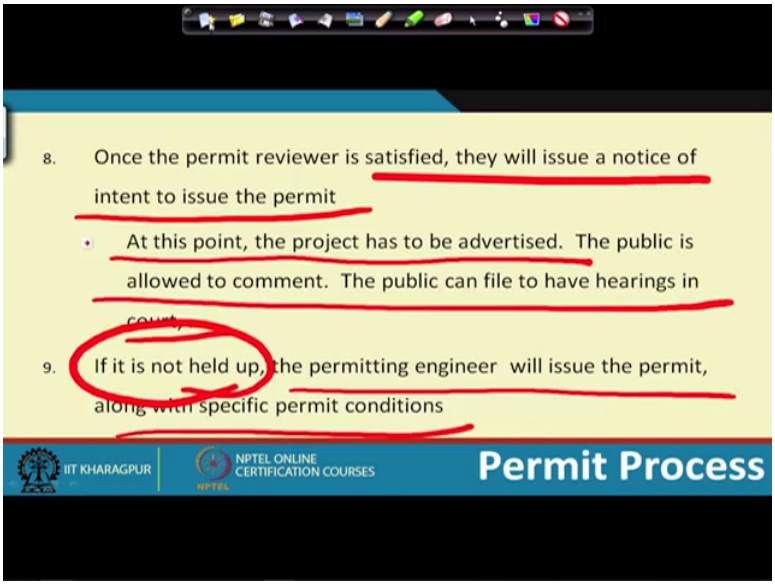

So that request for additional information may come multiple times, so once this permit reviewer is satisfied after it has excuse me so once this permit reviewer is satisfied with your general issue a notice of intent to issue the permit. So you will get a permit intent to issue the permit, this time the project has to be advertised. So that is the typical procedure and I am talking about global best practice that is happening.

So at this point you the project has to be advertised. The public is allowed to comment, so public can file a hearing in the court. So they can look at the project they can know what is the proposal and then they can go on court or if they have some issue they can raise that issue through any public forum or coming directly to the agency which trying to implement this project. So if it does not get held up so which always the in a democratic country this is all it code it can get held up due to some law issue or the other but if it does not get held up the permit engineer will issue the permit along with site-specific permit conditions.

So it issues the permit along with what are the condition that goes along with the terms and conditions, like you get anything today like a cell phone, Sim card or anything you have those terms and condition, credit card terms and conditions for everything there are terms and conditions, you looked at the back there are terms and condition. So similarly here when the permit document is given, permit is approved but with certain terms and condition to maintain the uniformity of activity throughout the country.

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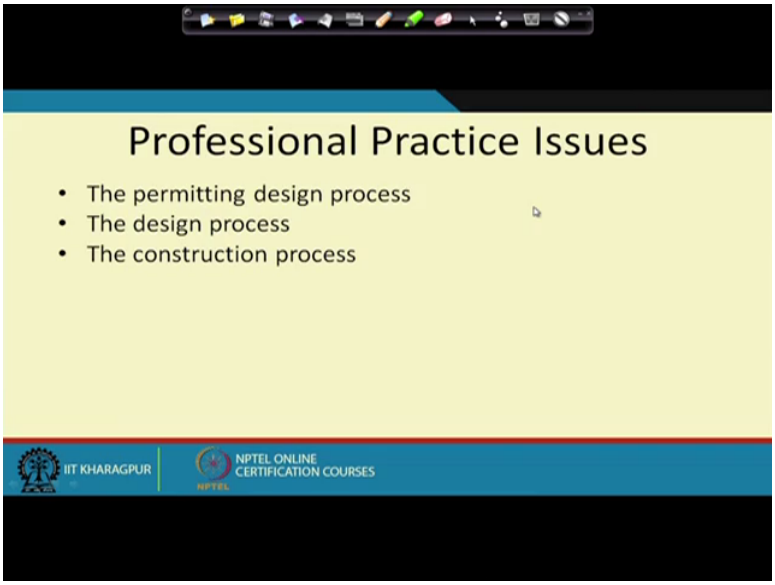

So in terms of the professional public practice issue what we are talking now is actually professional practice issues. So as engineer what we do, as a professional engineer what are the what things we work on. So in terms of the professional practice issue, the permit design process we talked about the permitting process and then there is a we will talk about the design process, so once the permit we have to do the design then we also talk about little bit about the construction process, so these three are the big areas of professional practice issues.

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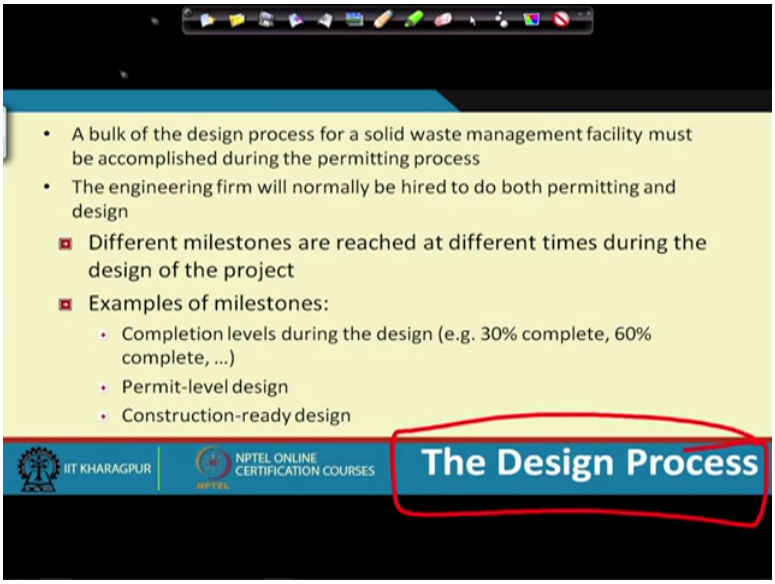

So in terms of the design process the bulk of the in design is for the solid waste management facility must be accomplished during the permitting process at least the basic design. So because as part of the permit document you need to submit all these design drawings at

different level of completion, so at least the basic design and some extent even the detailed design gets completed as part of the permitting process.

The engineering firm will normally be hired, so typically the firm which is hired to do the permit application is hired to do the design as well, so because that becomes easier for them for both the parties actually, for the client as well as the consulting company to have to do to both so that they it is become they understand the problem, they have communicated with the permit granting authority so they have a very clear understanding of the project. So they can give the permission to the project to go further and since they had they already some of the drawing as part of the permit application package they can just use some additional resources and create more detailed drawing for the construction purpose.

So the engineer firm will be hired for both permitting and design and there are different milestones are reached at different times of the design. So it is there are different milestones we have a completion levels during the design for 30 percent completion, 60 percent completion, permit level design, construction ready design, so there are different levels of design which we goes through there are different milestones for that.

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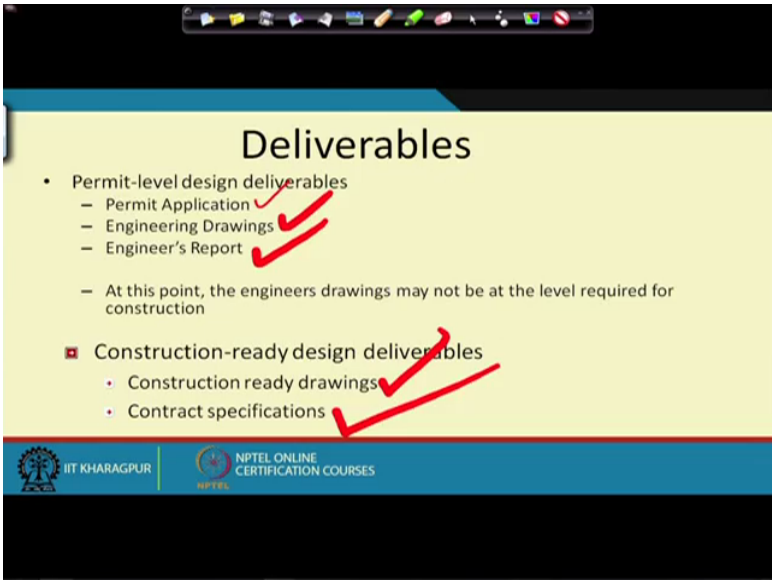

And then there are deliverables, so there is a permit level design deliverables, as a permit level you have to do this permit application, you have engineering drawings, your permit application, your engineering drawings and there is engineers report at so basically you have some report about the site condition what your observation is, how this construction should

be done, your suggestions for improvement of the different aspects of the project so that goes into the engineer's report.

So at this point the engineering drawing may not at the level required for construction yet but it has some details and then we have to make a construction ready design deliverables, which is the second level. So in construction ready design deliverables you make the construction ready drawings and then you have to have contract specification because all the material that you are proposing to buy all the different stuff that will come in, what is the specification of those materials, so that is also very-very important in terms of project management.

And this one of the most these things are true for many of the project's in environmental and non-environmental projects it is not only for the solid waste but it most the basic concepts of these whatever we have been talking about in this video is kind of general can be applied to water-base, water-air, solid waste and other fields as well.

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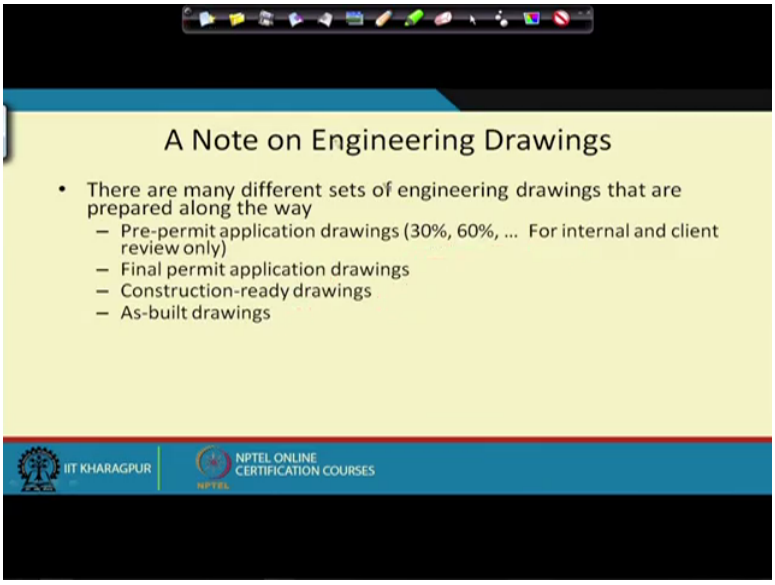

So terms of the engineering drawing there are many sets of engineering drawings are made, so there are pre-construction, pre-permit application drawing for internal and client reference. So you make some drawings which is mostly internal between the different offices because you will having mechanical engineers, civil engineers, instrumentation, chemical there are electrical, so all this different people will be working on so they share at least the basic drawings and most of this basic drawing is actually done by the civil engineering department of that consulting firm, the civil people they do the basic big picture layout.

And then the electrical and other things will come into their area and then they will develop more detailed drawing for the electrical components, mechanical will do it for the mechanical components and that those details will actually again has to immerged into this overall plug over all drawing which is done by civil people.

So there many different engineering drawings, pre-permit application drawing 30 percent, 60 percent we talked about that. Final permit application there is one, then construction ready drawings and then As-built drawings. As-built drawings is the one which we have not talked about yet, As-built drawing is the one which you make at the completion of the project. So once as built that means the construction is stop now, so this drawing depicts what is the condition what are details of as-built structure, the structure is already built.

Why this drawing is important? why this as-built drawings after construction ready we know that we need to take there construction drawing to make the construction done and once we have checked everything is okay we do this QA, QC check we put this like a we put some of in terms of construction, quality assurance, quality control and all those things we do, but even after that the people have already moved in and they are trying to use the stuff but the we stress on having a good as-built drawings.

The reason for that is that say if you go for an expansion later on, you go for any expansion later on you need to really know where are your services, where are the pipes going in which direction and which by pipe is what. So because after 10-15 years nobody will most of the people working in the consulting may not be there or they will be old to remember and then you have this you go to a site where you do not have a good as-built drawings made and then it becomes a nightmare.

My first project as a after I graduated from B-Tech degree from this institute in late ninety's my first project was on MRPL expansion which is Mangalore refinery petrochemical Limited phase 2 at we worked at MRPL phase 2 which is very close to the Mangalore. So it is there we have some issues with as- built drawings. So since we were working on phase 2 phase 1 facilities are already there but the phase 1 as-built drawings were not done very well

So there was although it was okay for most part but there was days when we will actually scratch our head because we will see that we suggest certain new professialities and then from the site we will get a notice saying that cannot be done we already have lot of fall-in going on, because there is already lot of pipes going there, so those but those information is

not depicted very clearly in the as-built drawing and that creates a lot of problem for people working on in expansion of these kind of project.

So with that let us with that note let us try to stop this video we will stop here and then we will continue with some of the more discussion in terms of design process and other stuff in the next video. I hope to complete this discussion regarding this landfill disposal in the next video. So with this I think we are almost towards the end of ninth week, so we will get into the tenth week from next.

So keep posting your questions on discussion boards so we will be happy to respond, if you have any queries we will try to answer and take the quiz and those who are preparing for the exam do the do it well and then we will also help you that help is for everyone actually whether you are preparing for exams not. There will be certain example problems coming up towards the end of this set of lectures where you can have we will have some example problems we have several example problems as part of the course content as well but that would be some more to help you for the exam. So with that thank you and look forward to see you again in the next video.