Course on Integrated Waste for a Smart City
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Module 10
Lecture No 48
C & D Waste Management

Okay so welcome back so now we have covered if you remember from the course syllabus we were if you we said that towards the end of the course which actually we are kind of reaching towards the end of the course now we have another I think 3 more weeks slightly around three weeks of material left.

So here towards the end I said in the beginning that we will focus on 2 other aspect, so in terms of regular future MSW management we have covered the material that we wanted to cover, so there will still be some problems solving which will be done by the TA's, they are working on that and they will those videos will be up and you will be able to see that, that will be specially will be useful for the ones useful for everyone but especially the students who wants to take the exams, for them it will be useful to go over those problems so will have those videos up there as well.

But in terms of the 2, MSW was the major focus of this course, so we covered MSW management all the way from generation, transportation, different types of treatment system, disposal system, waste we talked about waste to energy, we talked about composting anaerobic digestion and all that and then also waste management rules, smart city, Swacch bharat mission all those things we covered.

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Now this for the remaining part of the course we will look at two big topics which is kind of very popular, very relevant from the Indian context. So today we will start from this video will start talking about construction and demolition waste management. In short form we call it C & D waste management, so this C & D waste which is construction and demolition and I will explain that to you in a as part of this particular video.

So we will focus on C & D waste and then in next few videos will do that and then after that we will go into electronic waste management, e-waste which is also the popular and very relevant, we have lot of e-waste issues in the country. Every one of us is using different type of electronic gadget and producing contributing to towards the production of electronic waste.

Construction demolition as the name suggest construction so we have lot of boom in the country in terms of the different types of constructions going on roads, infrastructure, buildings, you go to any new any big-city now, you will see several high-risers are being is being constructed. So when these constructions are done, lot of waste is also produced, so how to manage that, what is that waste really is, what are the what are the components of that waste and can they recover material from that waste to be used as a construction at material.

So as part of this 2016 waste management rules that the government came up with this is the first time that the government had come up with a separate rule for construction and demolition waste, which is there in many countries in the world, but it was never there in India. So C & D waste was always a neglected area, C & D waste is considered mostly inert.

Construction waste as long as you keep it separate you do not mix things with each other, it is actually very easy to recycle, can be managed easily. The problem comes in the demolition waste and also and demolition as well as slash you can call it disaster waste.

When we say demolition, demolition means you are building down the building for some reason the building has gone bad or you want to build a new building in that particular location you cannot put new more floors on that because of the foundation was not done properly, it was designed only for 2 storeyed or 3 storeyed, it might be an old brick building and you want to make now a big high-rise there, so you need to go for those beam, columns may have to go for piling as well depending for which where you are for the foundation.

Say for example in Kolkata in New town Rajarhat most of those area which is there lot of construction happening, lot of piling activities, so we those of you are civil engineers you know what I am talking about, these are the pile foundation. So you have too lots of piles and then top of that you have this structure coming on, so the load is getting transferred through those piled for to the subsurface where you have like a rock bottom or something in there.

So that is in terms of construction things are much easier, in terms of demolition, if you are doing a controlled demolition again you can control the things you can because any building you look at after constructions of the basic skeleton of the building we have the electrical fittings, we have AC nowadays, we have lots of other things coming into the building and those AC's has lot of chemicals in there.

Say God forbid if something happens and in a right now say if there is a rainy season this year we add so much like Bombay had issue and there are lot of problems are happening in those context if some building gets collapsed for some reason and then when the building collapses it is not only the brick and mortar and concrete and steel it is steel rebar it has lot of other things and it, it has the electrical fittings and these electrical fittings may have some heavy metals, may have some other chemicals, we have you have like a refrigerator sorry could be a refrigerator as well in the houses but then you have AC's, AC's have different type of chemicals, so all this becomes gets mixed up.

So this disaster debris, especially disaster debris it is a very nasty material, it is not easy to handle those, so it is good that but if done properly there is a chance of recovering a lot of good amount of material which can be used as a construction material. And as we are talking

about housing for all then housing for all requires lot of construction material and so if you have to build all these infrastructure, so we need lot of construction material.

So the goal of this MSW, goal of this C & D waste management rule is to how to promote use of this construction use like a recovery of this material from this construction waste as well as the demolition waste and disaster waste and use it in a use it back into the economy. So first in this particular like a series of videos, few videos that we will talk about C & D waste, let us look at the rule first, since the rule just came out and just like a year ago, so let us look at the rule. So we will talk about the C & D waste treatment rules 2016 , what is it is?

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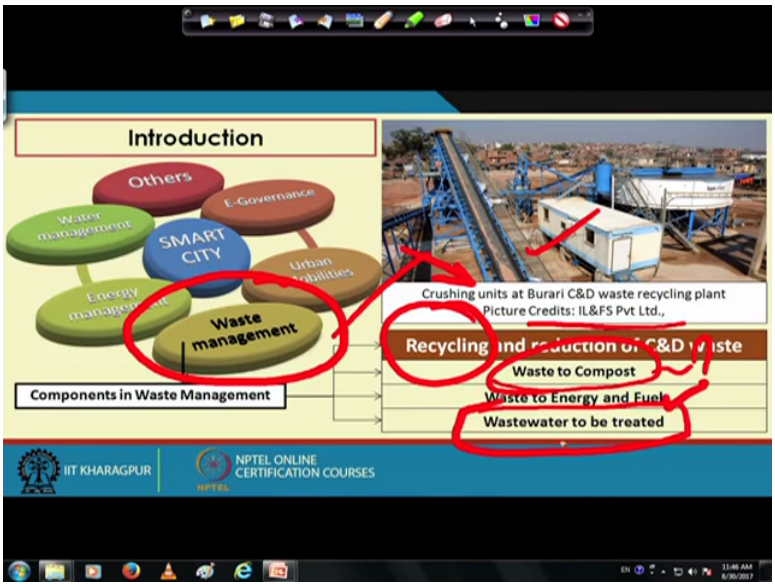

So in terms of if you look at the components of the like any waste management components, we have different things happening in terms of waste management which we talked about that as well and the newer concept of this smart cities is also coming in. Where the smart cities has lot of other things like, water management, energy management, but one of the important components of smart cities is also waste management, which we talked about earlier in this particular class as well, in this particular like a particular video not in this video but in the earlier video.

But C & D waste recycling, as part of the waste management. Construction and demolition is also getting popularity, so as part of this construction and demolition you see a picture of C & D waste recycling plant which is in Burari in Delhi and this is done by IL and FS. So this picture actually came from their website and although like you can if you are in Delhi you should try to go and visit this facility, I think this is the only this is at least the biggest C & D

waste facility in the country, maybe the only one unless if I am wrong correct me, but I think that is the only operating C & D waste recycling facility which is just working on C & D, just like a dedicated construction and demolition waste recycling facility in the country right now.

So recycling and reduction of C & D waste, of this construction and demolition if you have some wood material, if you have certain material you may want to use it for composed but not that much, so it is it can be used at not that much will be there. So what it can be used is? It can be use waste to energy and fuel, you can do the waste to energy you can burn it and make some fuel out of that and you can recycle, the thing is that you can recycle, you can do a lot of recycle of construction and demolition waste and then you can produce certain like a bio char and those kind of stuff with different types of material out there you can also try to do some waste treatment and all those kind of stuff. But in general the most predominant way of handling C & D waste is the recycling of C & D waste, and we will talk about specifically about that.

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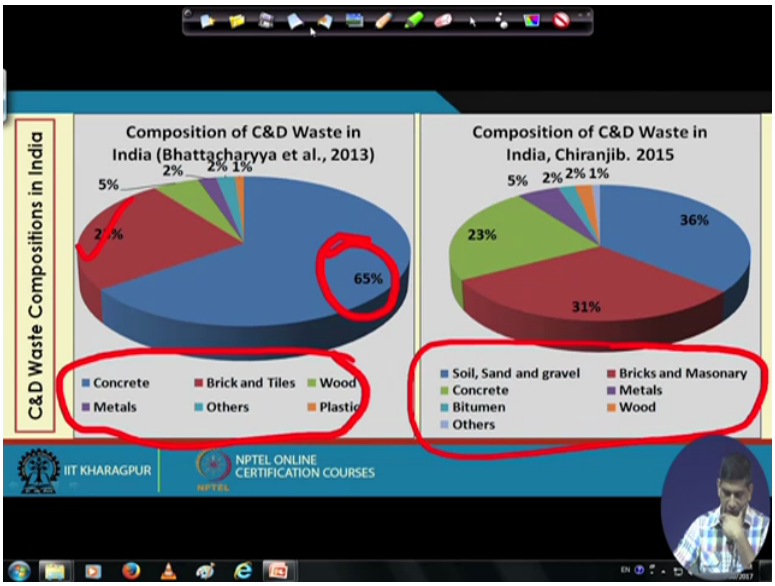

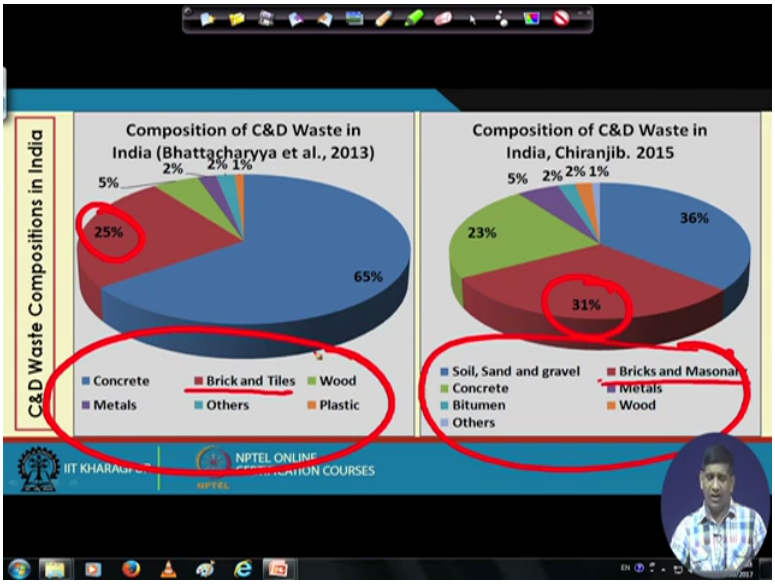

So composition of C & D waste in terms of in India not much data is out there, these are a couple of papers which you see, so this one is Bhattacharya et al which was done at I think CBRI which is central building research Institute and I think it is same as our present deputy director of IIT Kharagpur, he had he was the author of this paper, Prof Shriman Bhattacharya, so he is the lead author and the other authors out there.

So as you can see in Indian context from 2013 and this is in 2015, so we see that nearly 65 percent is concrete, then 25 percent is brick and tiles, then wood, some metals, some other materials, some plastic, 1 percent plastic and then 2 percent some other material. Another study in 2015 which is since this categories are not the same, it is very difficult to kind of compare this 2, but just if you look at some of the material for example brick and masonry, brick and masonry over here we found if we just take it off for a minute we found around 25 percent so around 25 percent was the brick and masonry in the study and he this gentle found bricks and masonry is 31 percent, but here we call it bricks and tiles, that is also not exactly the same, so that is why the number are usually will not match that much.

So for metals like metals actually 2 percent, here also it is around 2 percent, 2 plastic do we have plastic separately here? No. Wood is there? Wood is 2 percent and here the wood was around 5 percent. So again depends on place where how the construction and how where the sample was collected how the sample was collected so there will be some variability.

For big picture kind of looks more or less the same but since the categories here is not the same as this, so that is why many times we want to standardise, it is always better to have a standard protocol, isn't it? That is why I was trying to you explain earlier in one of the video

that is if you have this kind of protocol, so if we can use the same type of categories in each one of the study then it is easier to compare and it is also depends on what you called tile, whether we calling the same things tiles into different studies and so those things are also sometimes gets into like different kind of results.

But in big picture, what is the concrete? Is the major component, we see a good amount of concrete, we see bricks those are bricks masonry concrete, so those are kind of major component that you will see in a composition of construction and demolition waste, which is not surprising.

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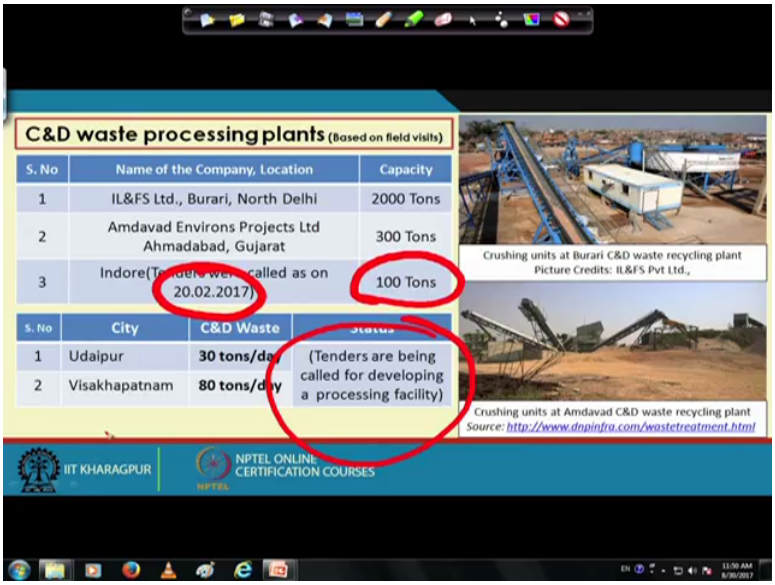

So bricks and concrete, they can be recycled, they can be easily recycled in here. So there are some facilities which are trying to do some processing and there are so IL & FS is a set that is biggest one that is the recycling plant which they have. Then there are there is another projects which are coming up which is it is like based on field visits which was done I think early this year.

We found out that in IL & FS in Burari, north Delhi they have the 2000 tons capacity, Ahemdabad Environs project limited, so they are building a facility of 300 tons of recycling facility there. Indore they again had in pipeline where tenders calling on 20th February, I we do not know what happened after that maybe it is already things around the pipeline, but this was around the time we had the site visit over there, so on 100 tons and there are tenders are being called for developing a processing facility in the Udaipur and Visakhapatnam as well.

So Delhi basically led the pack and this and this is much-much bigger facility and it is already operational I visited that I think last year early 2016, so it is almost a year and half ago and that facility was operational. Other facility are also coming up and as solid waste management sorry as the C & D waste management rules is focusing on the C & D recycling, more and more facility will come up the governments are government is promoting and more and more facility for construction and demolition waste.

See if you remember from the waste to energy chapter, waste to energy module or the set of video there, one thing we talked about in waste to energy module is that, this concrete, bricks they are actually nuisance at that waste to energy thermal treatment plant. So if we can collect

it separately, so again going back to the basic like separation is the key which you are talking about in this course, that either you do source separation or you do a separation at a facility, but if you can separate the garbage and keep the different fraction separate and that really helps in terms of like a doing it doing management in much proper way, so you can if you have the C & D waste separate we can do a C & D waste recycling facility we can make new material out of that and use it for construction and other purpose.

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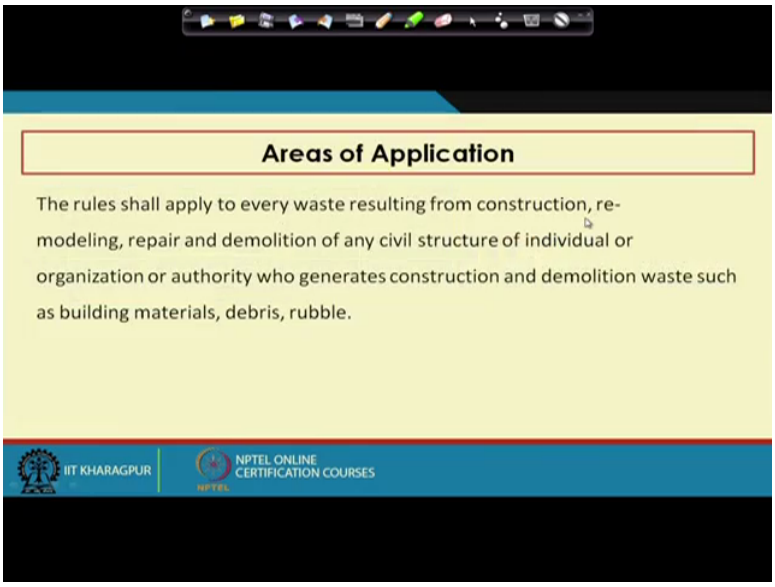

So the rule applies for every waste resulting from construction, remodelling, repair and demolition of any civil structure of individual or organisation or authority which generates construction and demolition waste such as building materials, debris, rubble, so that is where the rule is apply.

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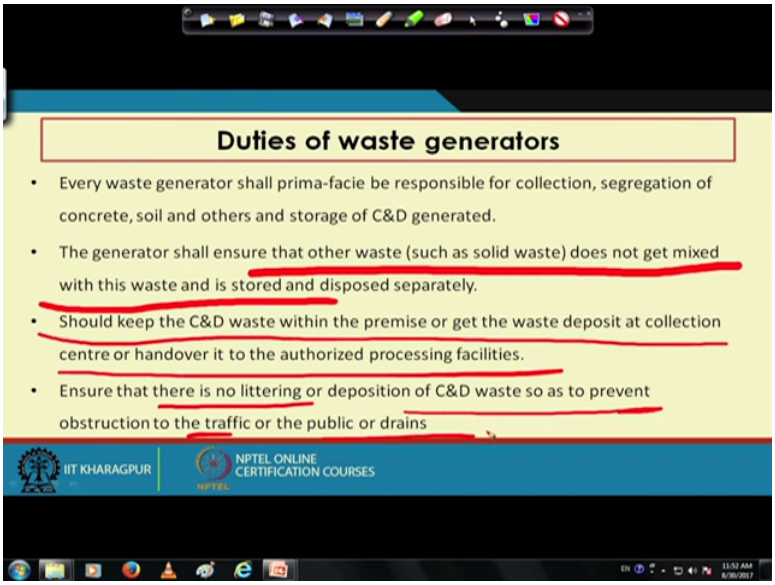

So that is the and there are certain duties as you have seen in the MSW management rules, the duties have been given. The waste generator shall be responsible for collection, segregation and all that concrete, soil other storage of C & D generated. Generator shall ensure that other waste does not get mixed up, so this is very good, does not get mixed up with this waste and stored and disposed separately.

So they do not want MSW to get mixed with this C & D material that is a really good thing that this rule talks about. If that really gets done that will really it will solve a problem on both sides, C & D waste can be recycled easily, MSW incinerators will not have that problem of big-big rubble showing up on their if on their conveyor belt and if that goes into the with that grates, they will damage the grates and that will actually cost lot of money to repair those grates as well.

So and then should keep the C & D waste within the premise that is and get the waste deposit at the collection centre or handover to the authorised processing facilities. Ensure there is no lettering or **(())(15:23)** of C & D waste, obstruction of traffic or public or drain, so not dropping it into the drain and all that which was very common that you can see the drain totally choked up by the construction waste coming from a particular construction work.

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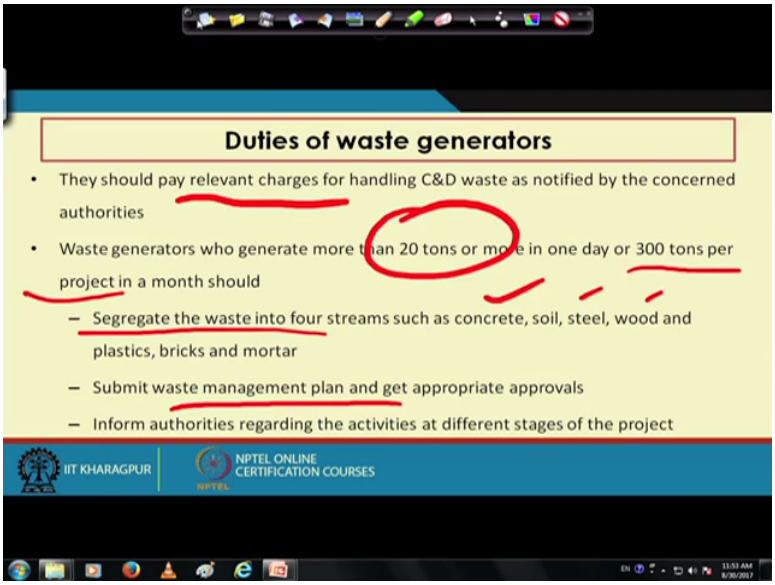

So they pay certain relevant charge, again pay as you throw concept, like you pays relevant charge of handling C & D waste as notified by the concerned authorities. If you generate more than 20 tons or more than in a 20 tons or more in a day or 300 tons per month, so you become you segregate the waste into 4 streams concrete, soil, steel, wood and plastics, so concrete, soil and steel, wood and plastic and brick and mortar. So that is then submit the waste management plan and get appropriate approval, inform authorities regarding the activity at different stages of project, so that is again typical as you see in any rule are coming those things are there.

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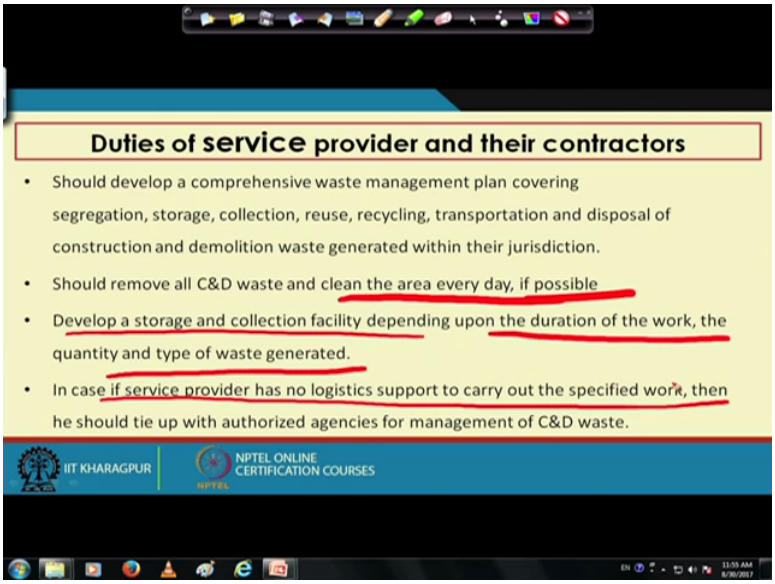

And then should develop a comprehensive, so as if you are a provider and any contractor associated with that they should have a comprehensive waste management plan, covering the segregation, storage, collection, reuse, recycling, transportation, disposal of all construction waste, construction and demolition waste. Should remove all the C & D waste and clean the area every day, if possible. Sometimes it may not be possible, because again C & D waste as you remember from the collection chapter we talked about that these are the haul container system, we use the haul container not the stationary container, because these are the bulky material.

So if you have a big container, you dropping C & D waste, it may not get filled up in one day, so it may take a few 4, 5, 6, 7 days to fill-up, so there is no point taking this empty container to the disposal site or to the recycling facility, because you are using so much of money, energy, everything but transporting that. So it is better let it filled up and then you transport, it may take few days to do it. So that is why it says, if possible then you do it you do not have to do it but if you try to do it every day if possible that is what it talks about here.

Develop a storage and collection facility depending upon the duration of the work, the quantity and type of waste generated, so that is so that you can recycle it. In case the service provider has no logistic support then he should tie up with the authorised agencies, so with a and the authorised agencies needs also needs to come up in to can help in terms of implementation.

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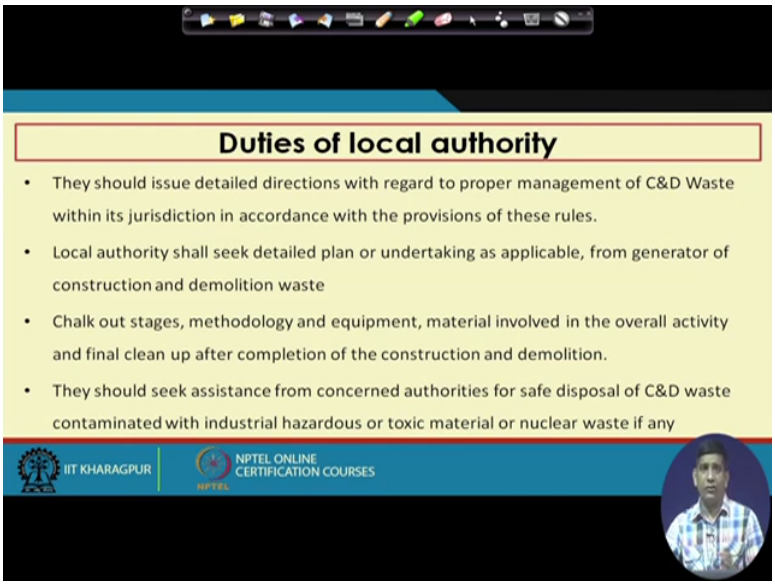

Then we have the duties of local authorities, which will the ULB's they should issue detailed directions with regard to proper management of C & D waste within its jurisdiction in provision of rule. Local authorities should seek detailed plan, undertaking from the generator. Chalk out stages, methodology and equipment, material involved, they should seek assistant from concern authority, safe disposal of C & D waste contaminated with industrial hazardous or toxic material or nuclear waste if it is there. So those are typical responsibilities to make sure the C & D waste is managed properly.

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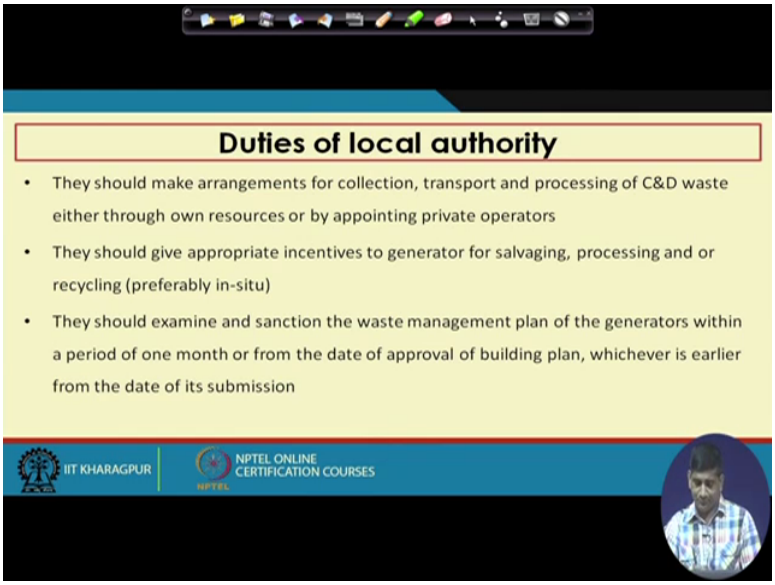

Make arrangement for collection, transport and processing, give appropriate incentive to generator for if they salvage process or recycle. They should examine sanction of the waste management plan within one period date of approval of building plan whichever is earlier, so with the waste now with the building plan you should also have a C & D waste management plan**,** you should have a construction waste management plan with the building plan which is out there.

So these are all kind of typical regulatory language and for all this will require lot of capacity building of the ULB itself, so the ULB's needs to be really they should understand what they are what we are talking about here, so they should be able to like a we should then they should be able to help if they do not themselves know, they will not be able to help. Specifically ULB's needs lot of training programme in terms of construction and demolition waste, what it is, what are the ways it can be managed, what are the environmental implications of which we will talk about.

So when you try to go for this beneficial reuse of construction and demolition waste, there is always if there is always chances of that you will contaminate something, you make lead to safer use of construction and demolition waste especially disaster waste material for road construction, there may be some heavy metals there which may leach off and it will go and contaminate your surface water, to the pond, lakes nearby.

So you need to be really careful, in terms of make sure that there is nothing harmful substances in there, for that there are already protocols, there are global standards. So we need to basically understand those standards and use it properly in Indian context not like a blank it, but we should try to use it in Indian context.

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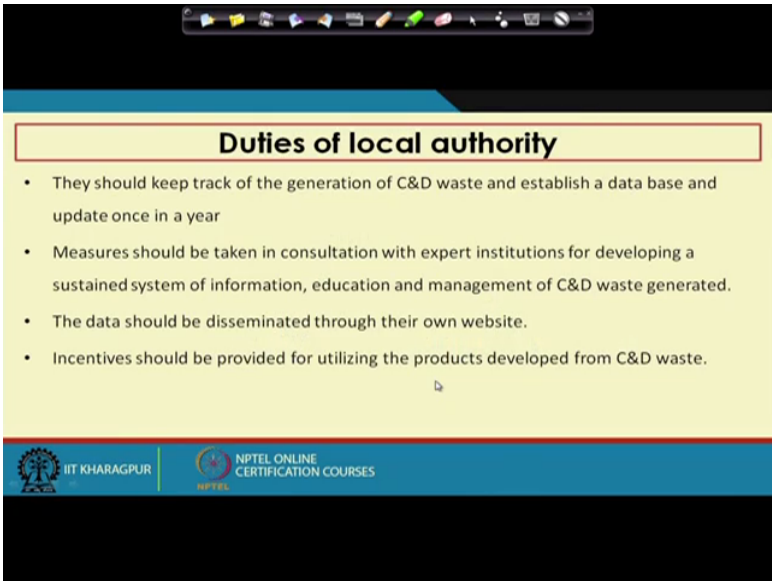

So there should examine and all those we talked about, they should can keep track of generation C & D waste, establish a database, and upgrade once a year. Then they should try to have they should take measure in consultation with expert institution for developing a sustained system of information, education and management, that is what I was talking about, and then people like institutions as ours, so it can always help.

So there are resources available and in fact there are resources available within the country who understands it, the thing is that the correct people should be there at the correct place that is where it is so that correct type of information good information is transferred. So data should be decimated through their own website, incentives should be provided, so those things by utilising products develops on C & D waste so those things are out there.

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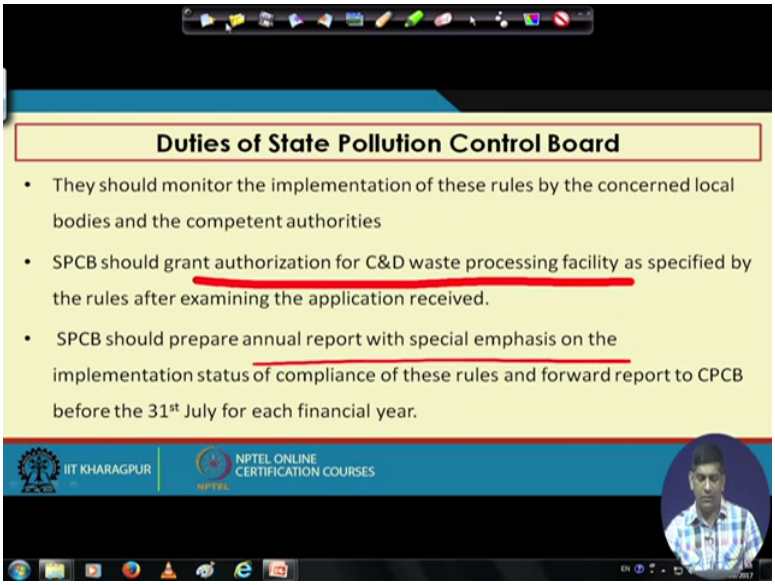

So that is on you are the local body then you have duties of State pollution control board, similarly as you can they should monitor implement these rules. SPCB should grant the authorisation for C & D waste processing facility, it should prepare annual reports, so those authorities for each financial year they have to give it to the CPCB, so those things are done for that.

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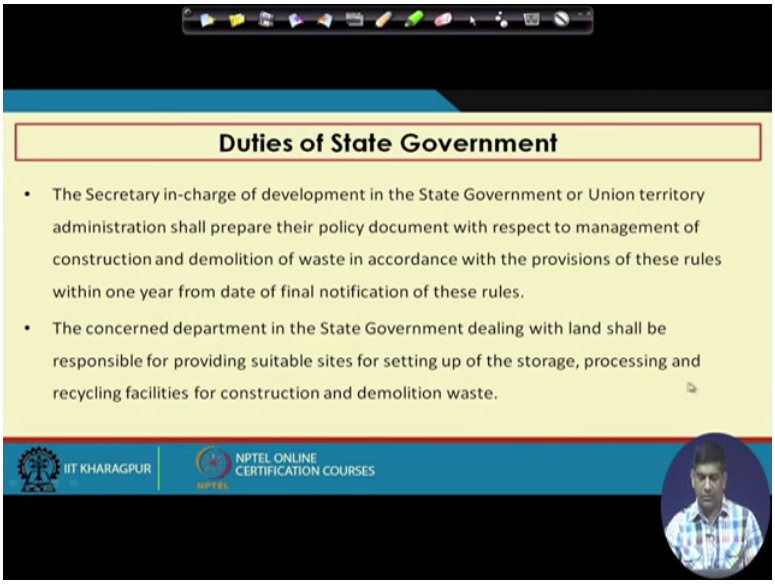

Then there are duties State government, so the secretary in charge of the State government or Union Territory shall prepare the policy document with respect to management. The concerned department with deal with responsible for suitable site development, setting of the

storage, processing facilities, so those is very similar to what we saw in the MSW management rules.

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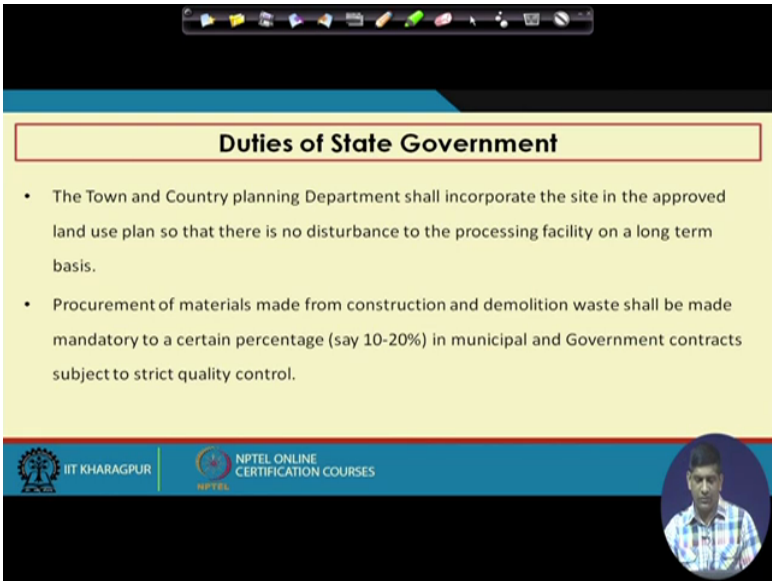

Then you have the Town & Country planning department, so that will do they will shall approved, shall incorporate the site in approved land use so there is no disturbance on the future use of that facility. Procurement of material say procurement material made from C & D waste shall be made mandatory by the certain percentage in municipal and government contracts subject to strict quality control that also we need to look at.

Say if you are trying to recycle construction waste or demolition waste; there are 2 things we need to look at, one is of course the structural. If you want to for construction as a construction engineer if you are just if you are a civil engineer or any engineer or even say any site let us say if you are using a material, material has to do certain function and if the virgin material like a new material is has certain properties now we have these recycle material, they should also have the similar properties, otherwise you it cannot compete with the virgin material and your design specifications will like you need to look at the design it has to meet whatever is the material specification.

So what in terms of material quality that you require for that particular construction, so that is one aspect, so that is the structural aspect and the other aspect is on the environmental side. Is there anything in the recycle aggregate or recycle material which I am using at a construction material, is there anything present which could be environmental harmful? We need to know that, if it is there, can we contain it? What sort of treatment we need to require and so we

need to do that? That is called the beneficial reuse risk assessment of waste material and that is very standard protocol for that and I myself has done some project on that when I was abroad.

So it is very recently we have student right now a M.Tech student who is working on something similar where we are looking at potential reuse of certain industrial waste, it is not a construction waste but if you use of certain industrial waste as a substitute for material for certain construction, making bricks and those kind of stuff and what will be what is there is there any environmental harm, there is no environmental harm in great.

Say negative information is also a information, so many times people say that we did the leaching test and we did not find anything, they tend to convey the message that we wasted the time, no it is if you did some leaching test, you did not find anything that is very good that is a piece of information that this is not harmful. So it does not leach out or it leeches out at very low concentration, great. We can use this material as for construction at area, but that does not mean that that every time you need to have some sensation information like we do have like a breaking news on TV, that does not happen, many of those breaking news are not actually breaking news.

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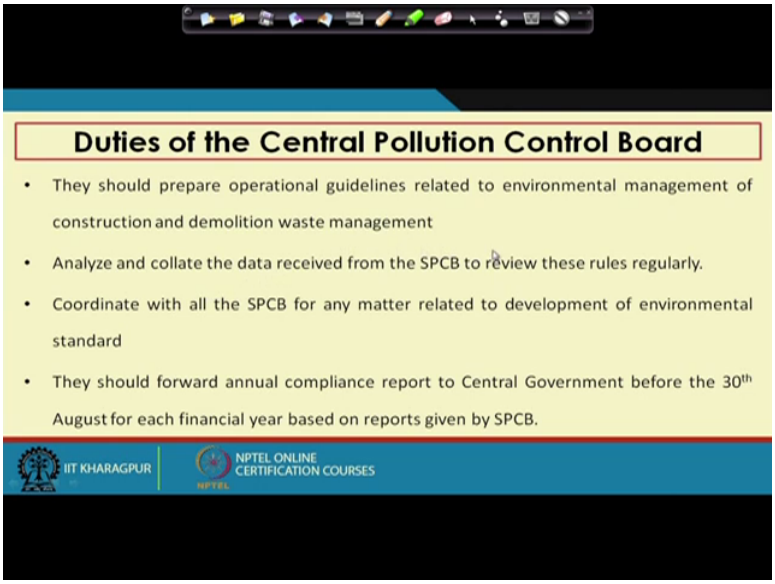

So anyway so and there are duties of central pollution control board where central pollution control board should prepare operational guideline related to environmental management, analyse the data provided by SPCB and they also coordinate with all the State pollution control board or any matter related to development of environmental standard, so any if you

look at the beneficial reuse standard that is what we need, we need a development of environmental standard for recycled construction recycled waste material.

So that is essentially the same thing that I was talking about the beneficial reuse risk beneficial reuse standard, so we do need a standard in the country in terms of having a for environmental standard for that. And they should forward annual compliance report to the Central government and each financial year based on reports given by State pollution control board.

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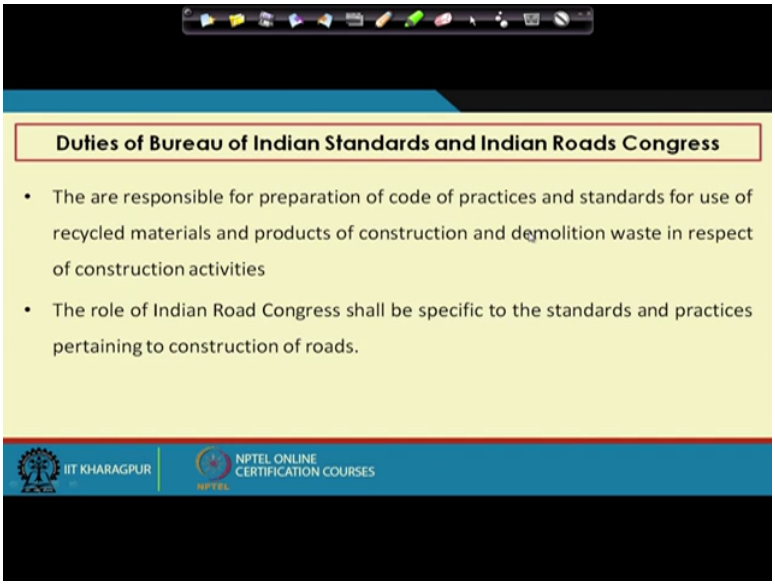

So that is then there are bureau of Indian standard and Indian Road Congress, since many of this construction material is supposed to go in a road construction or those kind of construction. So they are responsible preparation of code of practice standard recycle material and product of construction and demolition waste in respect to construction activities. The role of Indian Road Congress shall be specific to the practice of the construction of roads. So both bureau of Indian standard and the Indian Road Congress they are kind of needed for those construction waste recycling like what kind of rule what kind of of like a rules or the standards of practices needs to be there.

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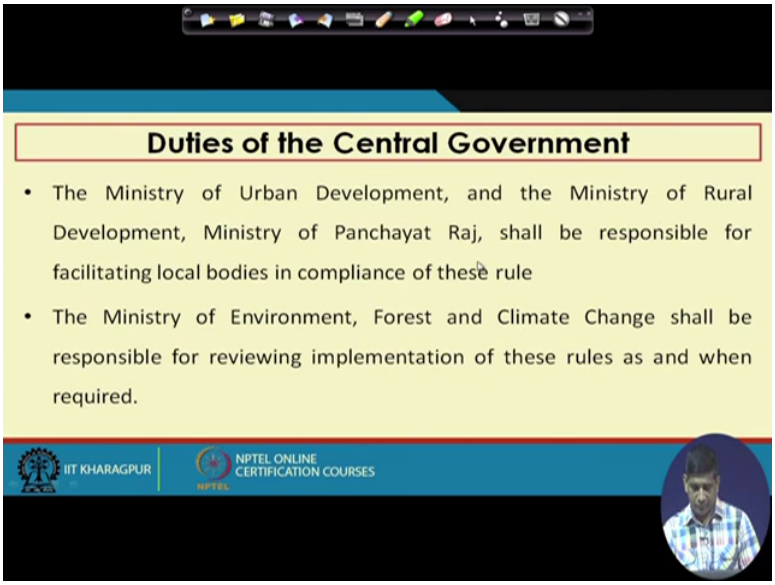

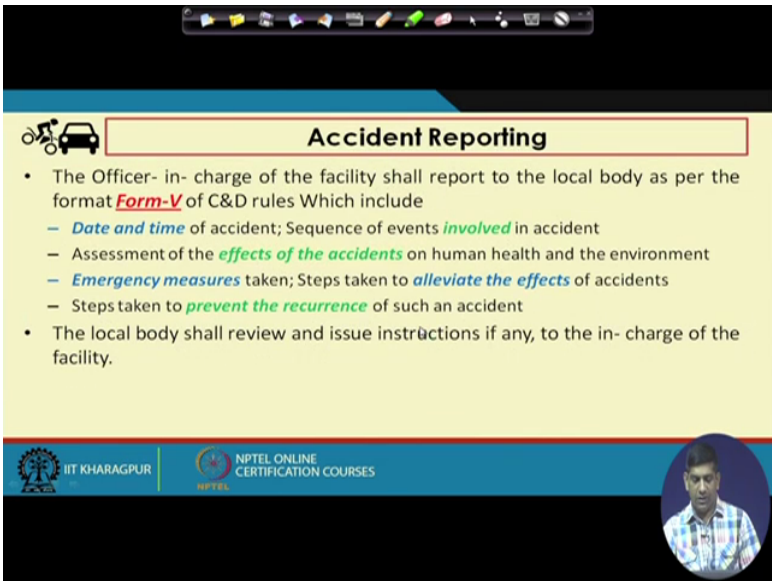

Duty of Central comment, the Ministry of urban development, rural development, Panchayat Raj they will responsible for facilitating local bodies. Minister of environment and climate change for a living implementation of these rules as and when needed. So then there are accident reporting, very similar to the MSW management rules, if you there is any accident you have to report, date and time of the accident, effect of the accident, it is basically to show that the accident does not happen again, at a construction site as well as the demolition site as well as during this is mostly looking at accident at a construction and demolition recycling facility.

This accident is not the accident we are talking about, accident happening at a construction site as a activity for construction, this we are looking at C & D waste processing facility or C

& D waste recycling facility any accident at that particular facility. So it is not a construction site it is basically a waste treatment site, C & D waste treatment site that we are talking about.

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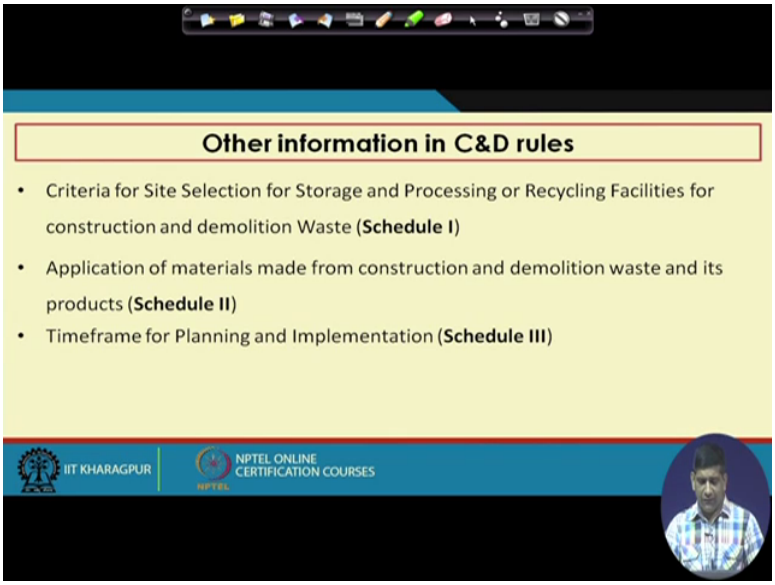

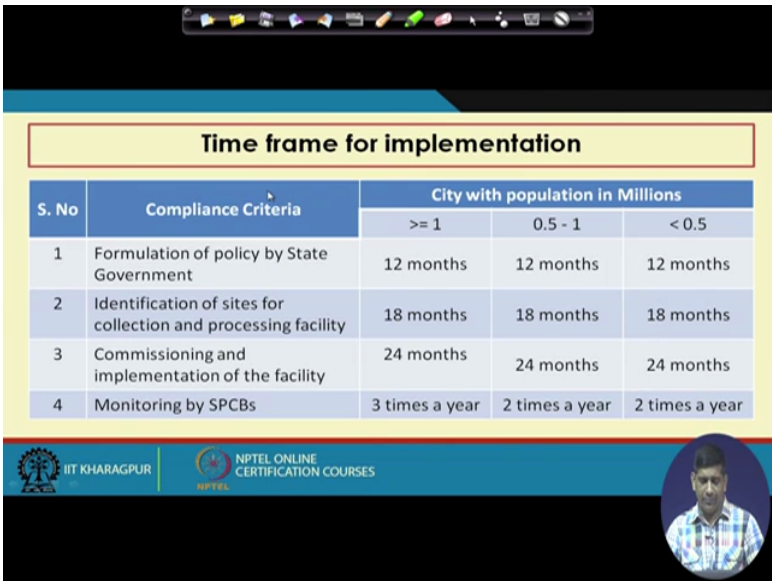

And there are other information, how to do the site selection for storage and processing of these recycling facilities. Application of materials made from construction demolition waste, timeframe for planning and implementation, so they have given certain timeframe that you have to make the policy city with more than 1 million, point 5 to 1 million, less than point 1 million, formulation of policies is the same, identification of site is also the same, commissioning and implementation is also pretty much the same, but monitoring by SPCB is actually goes down when it is less than 1 lakh, if it is more than 1 lakh 1 million sorry 10 lakhs it is 3 times a year for other it is 2 times a year.

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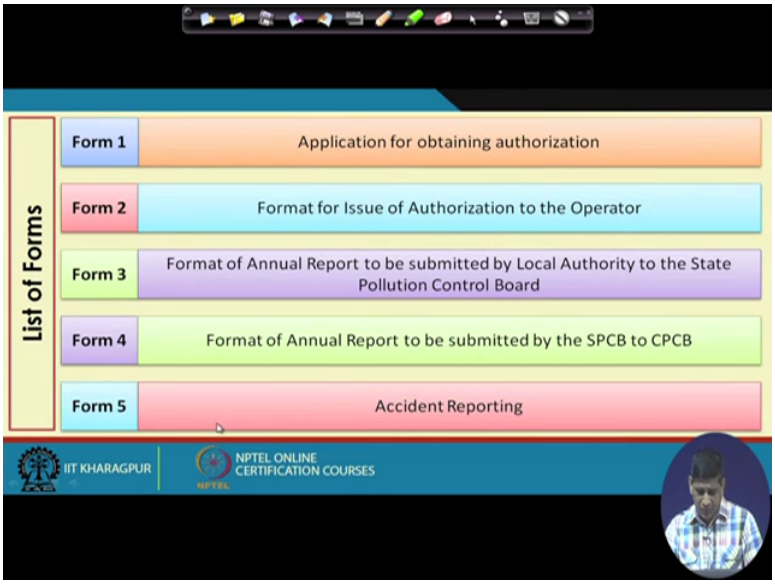

So there are different forms, application for obtaining authorisation, issue of authorisation, annual report to the state pollution control board from by local authority to SPCB and this is then from form 4 SPCB to CPCB, form 5 is for the accident reporting. So that is basically the big picture overview of construction and demolition waste management rules, so I would encourage you to look at that rule that rule go on Google should be able to download it not I think it is a much thinner version of what is there in MSW management rules, just flip through the pages we already and then listen to this video.

So if you have already like if you have gone through the video look at the rules again and come back to the video one more time to revise and that will help you understand the rules and if questions for the questions you have, feel free to put it on the discussion board and we will be happy to answer it from there and with that I think we should close this particular module and then we will go into more basic of what is C & D waste and all those kind of stuff and then I will show you some examples like from different project examples related to C & D waste recycling.

Okay so with that thank you best of luck keep working hard and those of you have registered for exams start preparing for your exam it will not be difficult as if you have done if you have gone through all the video careful if you have done all assignment fine you will be fine, thank you.