Basic construction materials
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Lecture 30
Cement and Concrete 3 - Part 2

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So now, next aspect is mixing. You have batched the ingredients whether by volume or by weight and then you need to mix it. Mixing, if you go to the construction sites in India or abroad, in many instances you will find the kind of mixing that people do varies significantly. This is a common site that you see in locations where there is absolutely no control on the quality of the material.

You have people who are pouring the cement and aggregate together on the ground making a heap and then they use these shovels to essentially mix it well together, make a good dry mix. After that what they typically do is, they make a crater on top and pour water into it and then they take the material from the side and put it in the center so that the water and the dry material gets mixed up intimately.

Of course, a seasoned hand can actually do a good job at this and make good quality concrete even with simple shovel based mixing. But this is not something that you want at a proper construction site where you need to make a good control on the quality of the concrete that you get. In most cases of volume batching that people are doing, these are the kinds of

facilities that will be there or slightly more advanced, what this guy is doing here is he is got all the materials stacked up here.

He is taking a shovel, taking the material and directly putting into this mixer. That is a tilting drum mixer, same thing that you see here also. So what this person is doing is, simply taking shovelfuls of one material putting it in shovelfuls of the second material, putting it in and so on. Again, there is no control on the quantity that is added, this is more or less like volume batching. Or he is actually mixed up, in this case of course he has mixed up the sand, cement and stone together and he is going to put that in the mixer and add the water to ensure that it mixes quite well.

This is a more controlled site as you can see from picture, the proper protective equipment that this person wearing reflective jacket, helmet, steel-toed shoes and so on and so forth. And the mixer is mixing the concrete that is getting dispensed into this wheel barrow. And that is what the person is using to take the concrete and deliver it to where it supposed to be going. Wheel barrow is used for delivering.

In such cases what will happen is, these guys after mixing the concrete they will put it in these small containers. And you might have seen in our construction sites the labourers carrying these containers on their heads and then going in passing it around to the next person and that person will finally dump it into the form work.

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Now when we want to get more sophisticated we need to invest in what are called centralized mixing plants. I am not saying you cannot do this on site also. Sometimes in such sites also you can actually provide good quality mixes which can actually take care of weigh batching as well as very good mixing of the concrete before it is delivered to the site. But in most cases for good quality, we rely on the centralized batching plants.

So this is a picture of a centralized batching plant. You have here a control room which is usually controlling the operations of batching and mixing using computerized equipment. They batch the exact quantities of material required using controlled computerized equipment and this material goes into the mixer and gets mixed for a certain period of time and then gets discharged.

What are the other things that you see here? You see here some storage facilities for aggregates and these aggregates after they are measured adequately are conveyed using these conveyor belts into the mixing equipment. You do not see it very clearly but the mixer is located here in the picture. What about the cement? The cement and other types of additives that are typically added like fly ash or slag are stored in these silos.

So these are called cement silos and then again they are connected, you can see these tubes that are carrying this material to the mixing equipment. They are connected well and with this computerized control you can actually get exactly the amount of quantity that required to come through this and commit the mixing equipment. In most cases in such ready-mix concrete plants you will have a mixer that is looking like a cylinder.

A mixer that looks like a cylinder and it is got a shaft in the center and there will be blades which are there for mixing. That is called a pan mixer because it is shaped like a pan. Some modern concrete equipment which mix much better are based on what is called as twin shaft mixer. That improves the mixing efficiency. So here what happens is, after all the materials come into this mixer they are mixed properly and then they are discharged into this concrete truck.

So that is a concrete truck or we sometimes call it RMC truck or sometimes it is even called as a miller. These are the trucks that are carrying the concrete from the central mixing plant to the job site. Now of course, it does not mean that the mixing plant is very far away from the

job site in very large job sites. For example, when you are constructing airports for instance you may want to set up a plant very close to the site itself depending upon the availability of plant.

In such cases the trucks will only be carrying it over a distance of let us say a few hundred meters but still a truck is a good way to carry a large volume of concrete to the site. Most conventional trucks will have volume that they can carry up to about six cubic meters. The truck can get filled up with six cubic meters of concrete. But mind you this mixer that is here may not have the capacity to produce all that concrete in one single mix.

In most cases the mixers will be of a size of 0.5 to 1 cubic meter. So if it is 0.5 cubic meters, it has to mix 12 times or 12 batches together and then each batch is then dispensed into the truck. The truck has this barrel which can rotate. So the barrel basically can be rotated to continue to mix this concrete which is getting dumped from the centralized plant. And you may have seen that when these trucks go from the plant to the job site, they have a very slow rotational movement.

Why do they do that? Because they do not want the concrete that is inside to get set or to start getting separated. You want the concrete to be intimately mixed and when this truck reaches a job site you will find that they rotate the drum at a faster speed. When it is travelling to the job site it is only slightly maintaining an agitation to ensure that the concrete does not sit. When it reaches the job site, it is mixed again homogenized at a much higher speed and then discharged into the form work.

So, overall when you use a ready mix concrete or concrete from a centralized mixing plant you get a better quality and much more optimal concrete designs. You can control the quantity of water, you can control the quantity of your cement and all others to optimal levels. And in most cases most of these ready-mix concrete systems will have your mineral and chemical additives invariably always in your concrete mix.

Of course, all these processes are going to make it more expensive and secondly if your travel time is unpredictable, for example in Indian cities travelling from one location to another can be highly variable depending upon the time of the day that you go. In such cases the transportation time could be a minus that is associated with ready-mix concrete. So you need

to be careful that the concrete when it arrives at the job site should still be checked or assessed for its quality.

So what happens when this truck arrives at the job site is, it delivers the concrete to do some testing. So what test is typically done? One is the slump test. You need to ensure that the slump is properly done or you have enough workability for the construction process to happen. The other is that they make some specimens to test the strength of the concrete at a later date. At a later date, they will test the strength of the concrete. I will come back to that in a little bit of time.

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Again, as I said in large projects, the centralized mixing plants can be set up on site itself. You see, this is one such plant which is of a much smaller size as compared to the plant that I showed you for the ready-mix concrete plant. So here you see the aggregate storage is like this and you have this bucket that picks up the aggregate and then discharges it into the way batching equipment.

Now, after the concrete has been mixed in large sites, you can actually convey the concrete using different systems. In some cases you can convey it using conveyor belts. For example if you have your construction site where the concrete needs to be delivered over long distances, but they are not so far that you need to send the truck away. So you can usually use this conveyor belt and then you have these called buckets or hoppers.

So you fill up the concrete in the bucket. The crane basically pulls it up, the crane lifts it up takes it to the required location and then you have people who are opening the bottom gate of the bucket of the hopper and allowing the concrete to fall into place. This again is a conveyor, so you have this concrete mixer on site and the conveyor basically takes the concrete and puts it in the location that is needed.

So there are several ways of actually conveying the concrete to different locations on a job site. Another common thing that you see in most construction site today is the use of boom placers. A boom placer has an extended arm which is connected to a pipe and you discharge the concrete into a pump at one end and the boom placer basically carries it across that pipe and is able to access very large areas. A boom placer is a major equipment that is used in most construction sites where large quantity of contrary need to be done today.

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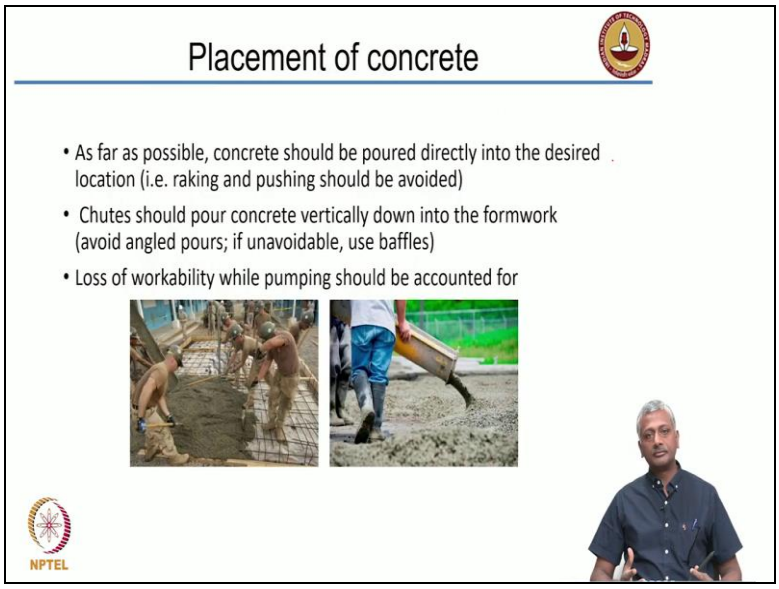

So, after you have conveyed the concrete you are going to be putting it in the form work or placing it. So, as far as possible concrete should be poured directly into the desired location. You do not want to pour it at one end and then start raking it. So here, for example, you see a picture of these workmen, so concrete is getting discharged here and these people are actually pulling it.

Now the problem is, this raking process, this is called raking. When you are raking the concrete and pulling it to the different locations, there is a tendency, if the concrete is highly workable for segregation to happen. So that is why, what you need to do is, you need to move this chute around and place it directly where it is required. In some cases it is difficult, so you

see this person controlling the chute and then he is able to move the chute to wherever they want to pour the concrete.

So as far as possible concrete should be poured directly into the desired location. Raking and pushing should be avoided as much as possible. The chutes which are the pouring devices for the concrete, should pour concrete usually vertically down into the form work. So if this is your formwork, the chute should pour the concrete down vertically. Now, in some cases it is unavoidable that you do a slanted sort of a chute.

In this case in the picture, of course it is directly coming from the truck. So the truck has a dispensing equipment that comes directly down or the tube that comes directly down and the concrete is poured. But when you have conveyed through a pipe, the pipe can be made vertical and the concrete discharged vertically. What will happen if it is not done this way and you have the pipe at an angle is, you may tend to reflect off the bottom and then separate the material into different sizes.

Your coarse aggregate will rebound more, your finer material will settle to the center and you will get some separation. So it is better to actually put it down vertically. Loss of workability may happen while pumping. Now pumping is one thing which we are not talking about in much detail here. But imagine the scenario of a high rise building, you have concrete truck that reaches the bottom of this building. You are in the 15th floor for instance.

So you have created a pipe system that carries the concrete from the ground floor to the 15th floor by applying pressure. So you have a pump that applies the pressure, pushes it through the pipe that takes it to the top. Now the concrete is flowing through this pipe and there is bound to be some friction while it is flowing and that friction can reduce the consistency or workability of the concrete.

So that amount of pressure needs to be applied for the concrete to go through the pipe and come out on the 15th floor but with still the required amount of workability. So we need to design the concrete at the ground floor for sufficient workability so that any losses because of the pipe travel can still be compensated at the point of time of the pouring. For example at the point of time of pouring if you want a slump of 100 millimetres.

You need to design the concrete for conveyance of the ground floor for nearly 150 millimetres to ensure that any losses in slump during the flow in the pipe can be avoided. Now I do not know how many of you are aware of this, for Burj Khalifa which is the tallest building in the world, concrete was pumped over a vertical distance of 600 meters, from the ground to a level of 600 meters concrete was pumped and that is the world record in pumping concrete to a vertical distance, 600 meters.

And that concrete was such that it could actually compact on its own. I will show you the example of that. And you had to maintain that workability at the point of discharge of the concrete on the 600 meter level. That is not an easy job to do so you need to plan that quite well design the concrete appropriately and so on.

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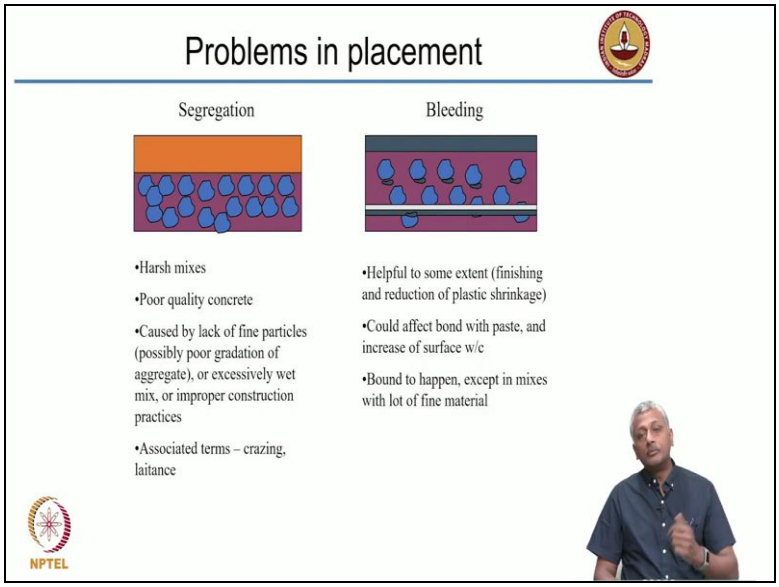

So you can have problems while placement if the concrete has not been designed properly, you can get problems like segregation and bleeding. What is segregation? Essentially it is caused by settling of the coarser particles down and the lighter or finer particles float on top. So usually you have the cement paste floating on top and you get aggregate settle at the bottom. This happens when you have insufficient fines in your mix.

That means, either the fine aggregate content is low or you may have less amount of cement in the mix and that will cause this problem of segregation. If you have too much water, you will cause what is called bleeding. This water basically is the lightest ingredient of the concrete, so because of gravity the water rises to the surface and forms a layer on the surface that is basically called bleeding.

Now while this bleed water on the surface helps to some extent in finishing and reduction of any shrinkage cracking on the surface, the problem is, it is going to locally increase the water to cement ratio because more water is there, and less cement is there. So water to cement ratio of the local zone at the top of the concrete slabs will be higher and if you have a higher water cement ratio, you automatically get a lower strength.

So, this is not a desirable situation. You do not want segregation and bleeding to happen on the site. Very often, when you get this cement paste on the surface, I told you before that cement paste shrinks, if you form this layer of cement paste on the surface, it will shrink and then start getting cracked. That cracking is called crazing. You get these crazing cracks and sometimes the cement paste will dry off as a powder and comes out and that is called laitance.

The cement paste dries off as a powder and basically gets removed from the top surface that is called laitance. Crazing and laitance are a major problem, crazing is basically random cracking of the top surface. So if you lack fines in your mix, either fine aggregate or enough cementitious materials, if you lack them in the mix you are going to be causing these problems of segregation and bleeding.

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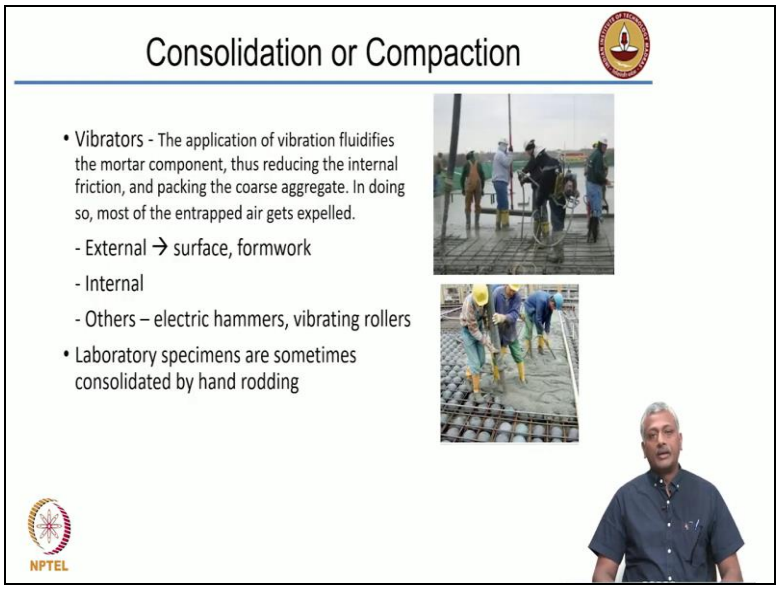

So you place the concrete down, next step is to compact it. Because you have a reinforced concrete structure, when you are pouring the concrete, this concrete may not properly go around the reinforcement and properly encapsulate it. To ensure that happens properly, you

need to compact it or consolidate it. Compaction or consolidation is done with the help of vibrators and vibrators can be of different types. You can have external vibrator, which is basically some devices attached to the surface of the concrete or to the formwork itself which causes the entire formwork to shake, which is called an external vibrator.

Or you can have an internal vibrator, like what these people are doing. You see that this guy is holding a needle, which is a needle vibrator. It is a vibrating needle again here. So needle vibrator basically is a rod of steel which is being made to vibrate at a very high frequency. We are talking about 4000 to 5000 hertz, this vibrates at a very high frequency. So what it does is, it loosens up the concrete so that it starts flowing.

Concrete which is very stiff also, if it is dumped into the form work will not go anywhere. But as soon as you put your vibrator inside which is vibrating at such high frequencies, it loosens up the aggregate and then starts the concrete to flow and that creates the compaction. So external vibrators are placed on the formwork or on the surface and cause the concrete to vibrate and compact.

Internal vibrators are the needle vibrators which are poked into the concrete. They are also called needle vibrators, also called pokers. What these people are doing with this vibrating equipment may seem like a lot of fun, but any of you who chance to visit the site and are able to see one of these vibrators or vibrating devices, try to lift this needle in your hand and see for yourself. The amount of weight that this material has and imagine at that weight you are lifting it and putting into the concrete and it is going to be vibrating at a frequency of 4000 to 5000 hertz, you will be in a bad shape by the end of the whole process.

So the people who are actually doing are handling the vibrating equipment are doing quite badly in terms of their health especially the health of their hands. Because of the extremely high frequency of vibration they can have loss of blood from their hands causing numbness and that could be quite a bit of a problem. Secondly, this vibration is a process that generates tremendous amount of noise.

So if you are not protected properly by wearing ear muffs, you can have hearing damage. So vibration in a construction site is an extremely polluting, noise pollution is very high from vibration. So you need to ensure that you keep vibration to a minimum or try to use concretes

which may not need vibration. Now when you come to the laboratory, you do not always use vibrators to make your specimens.

Laboratory, we do not make very large concrete sections. We all only make specimens either cubes or cylinders. In such cases, if the workability is good enough, you can use this rod that I showed you that for slump cone, the tamping rod and that can be used to simply consolidate and make up the entire concrete specimen. Of course, all these processes are well described in the standards as to how you should prepare specimens whether by rodding or by vibration and so on.

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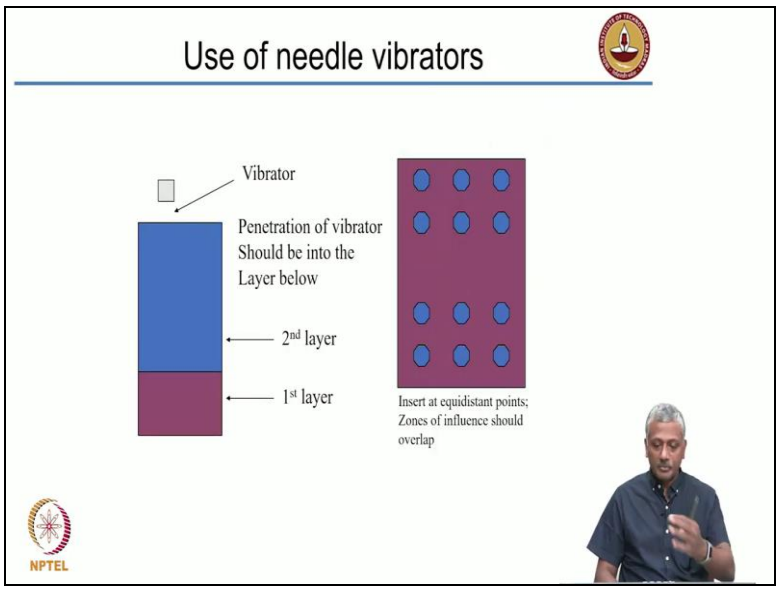

So, I was saying that you need to establish ways of putting concrete with minimal vibration. Before I go to that, I am just showing you a scenario of how this needle vibrator basically is used. So if I vibrate, this vibrator basically pushes into the concrete. So if you have first layer of concrete here and the second layer that is coming on top of it, the vibrator should go all through the depth of the second layer and just into the first layer to ensure that there is good jointing between the layers.

Otherwise you will have a problem of creation of cold joint. Second is, the vibrator needle should be placed at equidistant intervals into the concrete and that ensures that you have a proper compaction all through. Depending upon the area that you want, you can have a zone of influence around the vibrator that ensures that the concrete around that zone gets compacted properly. So you need to calculate properly as to where you need to put the next poke of the vibrator.

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So, as I was saying, you need to design structures with concretes that have high flow ability. So, that they need very little vibration or almost no vibration as in the case of self-compacting concrete. So here this is a slump test that has been done with self-compacting concrete. As you can see the concrete is simply flowing out. There is no slumping here, it is actually totally flowing out almost like water.

So with self-compacting concrete imagine constructing a helical staircase like this or constructing a structure like this with so many gaps inside and constructing the swimming pool diving board with such excellent finish on the surface. This cannot be possible with normal concrete which needs to be vibrated for compaction. A self compacting concrete basically compacts under its own self weight.

It does not need additional vibration for compaction. So this use of self-compacting concrete can bring down the number of vibration related injuries on a job site. So it is highly preferred now in many construction sites to use self-compacting concrete.

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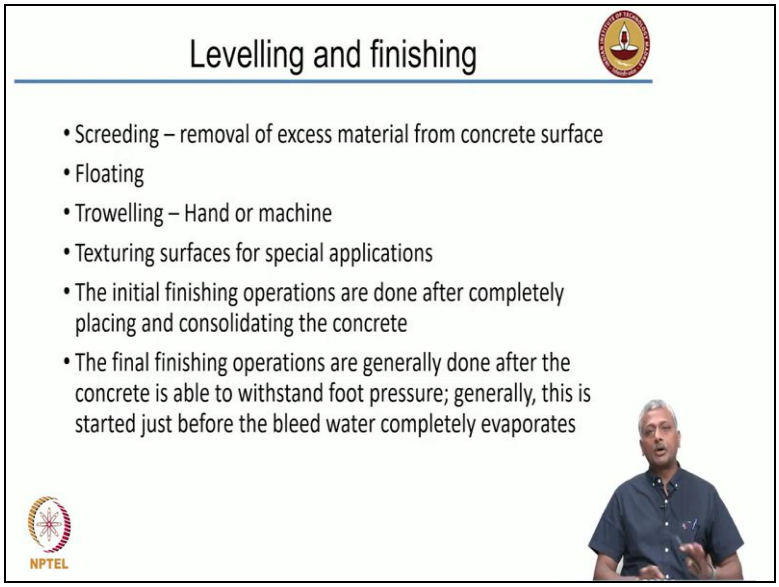

So, after the concrete has been poured, compacted, it needs to be then levelled to ensure that it gets the top surface exactly where you want it and then finished. So levelling process can be done with the help of screeding. Screeding basically is removal of excess material from the concrete surface. So you basically fill up more than what you want and remove the part that is not necessary. Finishing can be done using several methods, one is called floating. I will show you an example of this in just next couple of slides.

You have trowelling, you can use these trowels which you see a mason handling in a typical masonry job also, and that same trowel can be used to finish the surface of the concrete. Now in some cases you may want to texture the surfaces. Texturing is very interesting, I will come to applications of texturing in just a minute. So the initial finishing operations, after you level the concrete, the initial finishing operations are done immediately after completely placing and consolidating the concrete.

So initial finishing and this is followed by a final finishing. Final finishing is done and when the concrete is able to withstand foot pressure. So the workman should be able to stand on the top of the concrete slab or structure that has been laid. For example this is only valid in the case of slabs, in the case of beams and columns you do not have to stand on it to compact it or finish it. But in the case of slabs, very large area structures, you may want to stand on it to do the final finishing operations.

So the concrete should be somewhat stiff to resist the pressure of the foot on the surface. Because the workman has to stand on it to do the final finishing operation. Now this is

generally started just before the water that comes up to the surface that is called the bleed water completely evaporates. Before it evaporates you need to do the final finishing because some level of water on the surface, the sheen of water, helps in the final finishing operation.

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So I will show you these pictures here. So you see this example of the people striking of the excess material, this is called screeding. Now trowelling and floating are shown here, this is a handheld float. And again another example of a float, this here for instance what this person is holding, that is called a bull float. Again, you see here these people making the slab here.

This person using handheld float and this is again the bull float that is being used. Basically it is a flat piece of metal which is rubbed on the surface of the concrete to ensure that you get a nice smooth finish. So this is initial finishing operation, they are not standing on the concrete. But here you see, this person is standing on the concrete which has been newly laid and he is doing again floating. And this person here is carrying an instrument which is shown here, which is called a power trowel or a machine trowel.

It is a machine trowel or power float, it has these paddles at the bottom. So this is basically rubbed on the surface, the paddles rotate with the power of this machine, there is a motor that is attached to it and then they finish the top surface. This is the final finishing operation and after the finishing is done, during the time of final finishing, you may want to do some texturing.

Sometimes we may do texturing like drawing lines on the surface. You may have seen this in concrete pavement slabs. On the top surface, they may have these lines separated by a fixed interval, I will come I will come to that in the next slide. Sometimes you may want to have a slightly rougher surface which has a broom finish. So you take this broom which has these sharp bristles at the edge and you rub it on the concrete surface and give a broom finish.

In most cases, this is done for pavements and for parking areas. So again, the texturing is usually done to provide certain characteristics to the top surface to make it possible for use in specific applications. So in concrete pavements you may see the top of the payments like this that you have these lines that have been cut into the concrete or grooved into the concrete that is basically called a tining.

And what happens is as your vehicle passes on top of the road surface, this tining or the grooves that are provided by the tining which are made with this sort of a grooving tool, those ensure that you get the required frictional resistance and you also get a way to reduce the amount of hydroplaning. That means when water gets in or when it is a wet condition, your vehicles can skid off.

The provision of this tining or these grooves ensures that the effect of the hydroplaning reduces significantly and this also reduces the tire pavement interaction noise. You may have seen on highway, a lot of noise is generated when the vehicles move on the surface. When you provide these air pockets or grooves on the road surface, they absorb a lot of this noise and reduce the amount of noise that gets generated from highways.

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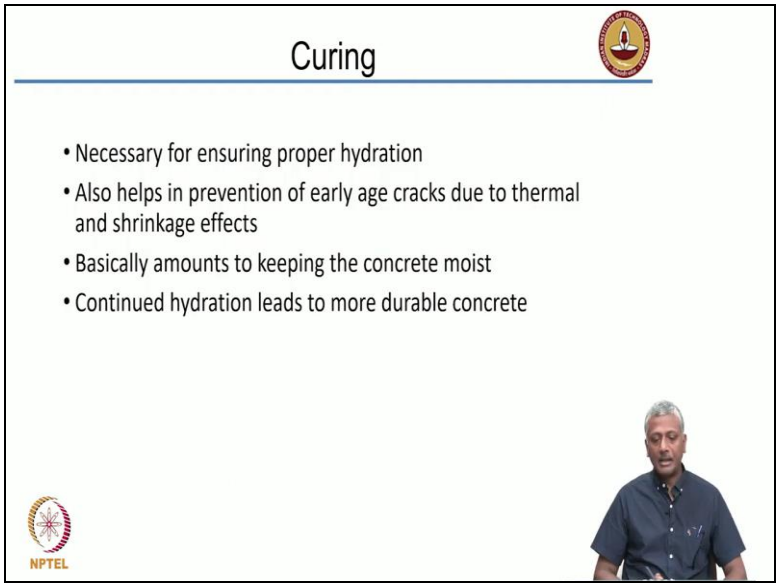

After finishing is done, the next step is curing. Curing is absolutely necessary for ensuring a proper hydration of the cement. So you put in cement, water, stone and sand into the concrete, the cement and water is having a certain level of proportion that is in such a way that the water is required for reacting with the cement and producing this hardened concrete structure. If this water starts evaporating even before the cement fully reacts, then it is not going to be good for your concrete.

So to ensure that cement hydrates properly you need to cure it. Curing also helps in preventing shrinkage cracking and also thermal cracking. So at the early ages, a lot of heat is getting involved, concrete needs to come down to ambient conditions. It starts shrinking also as a result of the hydration. Curing ensures that there is sufficient supply of moisture given from the external environment that reduces the effects of thermal and shrinkage cracking.

So in simple terms; concrete curing simply means, keeping the surface of the concrete moist. During the hardening process of the cement, you keep the surface of concrete moist, which is basically curing. Continued hydration, the more the cement hydrates, the more it reacts, the more durable the concrete that you get. So that is very important. So curing is absolutely essential for strength and durability.

If you do not cure, you will not get a concrete structure that gains required strength and more importantly you will not get the required durability. So continued curing or keeping the concrete surface moist while it is hardening is very important.

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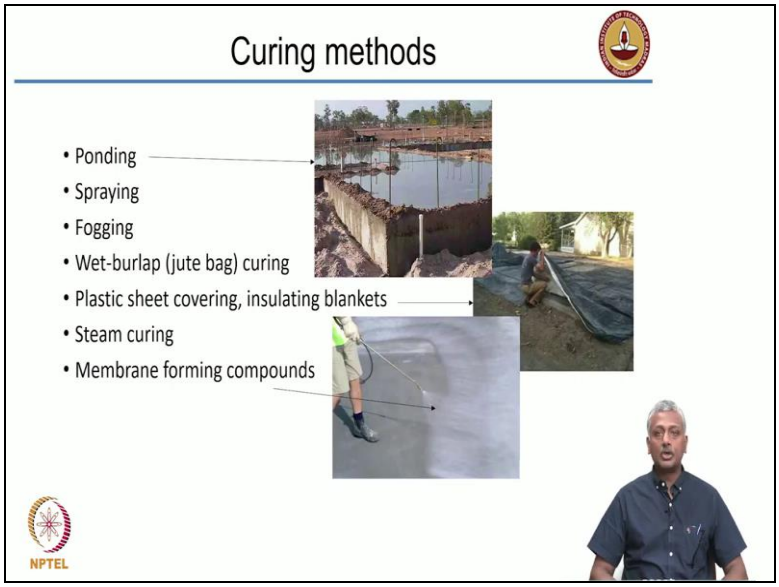

Now there are different ways in which you can do this. For horizontal members like this, you can simply create an embankment and store water on top, which is called ponding. Sometimes you may just spray water using a water spray or a pipe. Sometimes you can fog the environment by using very fine sprays of the water which creates more or less like a mist around the concrete.

This is typically done in many laboratory conditions, you do fogging. In some cases, you may want to do a wet burlap or jute bag curing, that is also called hessian cloth. So you have wet jute cloth which is kept on the surface of concrete. But you have to take care to ensure that this cloth is always wet, otherwise what will happen is the cloth dries out, the concrete also will eventually dry. In many instances you will find that columns especially are covered by wet jute cloth type curing, but you need to ensure that the jute cloth is wetted from time to time to maintain the wetness properly.

In some conditions it is just enough to even put some covering on the top surface to restrict the evaporation. For example, plastic sheet covering that reduces evaporation or insulating blankets like these. Now why do you need insulating blankets? Insulating blankets not only cover the surface and prevent water evaporation, they also ensure that the heat that is generated because of the hydration is kept inside.

And why is that important? Because when the heat is maintained inside, it will lead to a faster hydration of the concrete and it will lead to speeding up of the reaction rate which will cause the attainment of strength much faster. So insulating blanks are used blankets are used very

often in cold weather concreting. Now when you go to job sites today, you will find that increasingly the use of water for curing has reduced significantly.

Because all these processes use water. All these four processes use water and they are the most commonly adopted practices on construction sites. But today, as I said earlier use of good quality water because you need to use potable water, which is excellent quality for all concreting operations but use of good quality water, the availability of good quality water can be quite questionable at many job sites.

So in such cases, you may want to start using what are called membrane forming compounds like what is being sprayed here on the surface of the concrete. So before the concrete surface becomes totally dry, you spray this membrane forming compound that ensures that there is a less evaporation of water from within the concrete. So it maintains that humid condition inside the concrete.

So that is also another way of curing and increasingly today, because of shortage of good quality water on construction sites, you see that many sites have adopted practices of membrane forming curing compounds. They are also called curing compounds.

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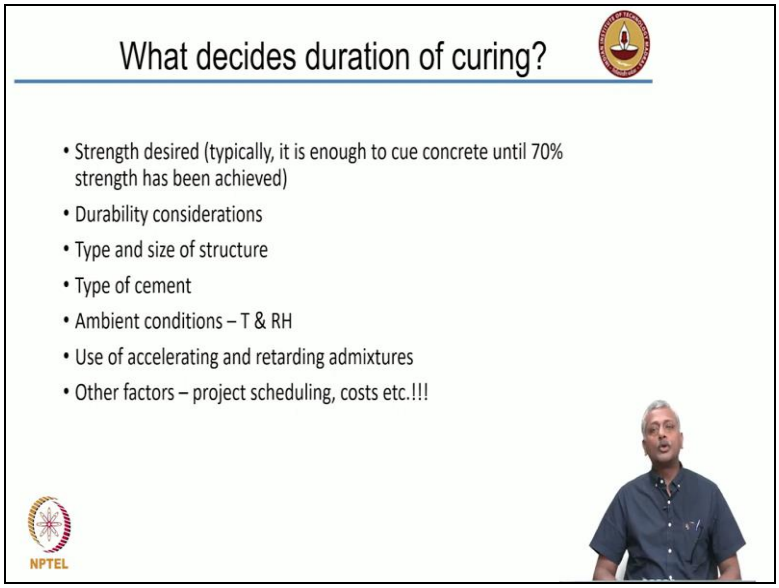

Now how long do you cure? That depends on what you really require. One is of course you need to have certain strength level maintained in the concrete. So typically it is enough to cure concrete until 70% of the design strength has been obtained. Now how do you know when that is obtained you cannot obviously be testing concrete so often. So in most cases

what happens is curing is done until 7 days. Again in most cases the design strength of the concrete is at 28 days.

So at 7 days you have already attained nearly 70% of the design strength. So most cases with just plain OPC concrete, you may want to cure for 7 days. But when you are using PPC or PSC, the curing duration increase to 10 to 14 days because these cements will be slower to reach the strength level of OPC. So please remember the use of blended cements like PPC and PSC leads to more stronger and durable concrete in the long run.

But to get there, you need to ensure that the curing duration is increased as compared to OPC. So you need to cure for longer to attain the same level of performance at the early ages but that will guarantee you a much better performance in the long term. Curing also needs to be based on durability considerations. In some situations, if you have to protect the structure for a much longer period of time you need to be prepared to cure for that period of time.

The type and size of the structure, the type of cement as I said, the ambient conditions, temperature and relative humidity will also determine the degree of curing to be provided. For instance; if you are in an environment where the external temperatures are very low, then the concrete strength gain is going to be severely restricted. As I said again, in such cases use of insulating blankets is a good way to keep the heat inside so that the concrete gains strength much faster.

If you are using an accelerating admixture which speeds up the strength gain of the concrete, you do not have to cure for a longer time. If you are using a retarding admixture which slows down the process of setting and strength, obviously you need to cure for longer. Very often what happens is availability of water ends up determining the length of curing. In some cases the project scheduling, the amount of money involved to actually do the curing operations and the workmen necessary for curing.

All these aspects need to be considered also apart from the technical aspects that I have laid out in the beginning parts of this slide.

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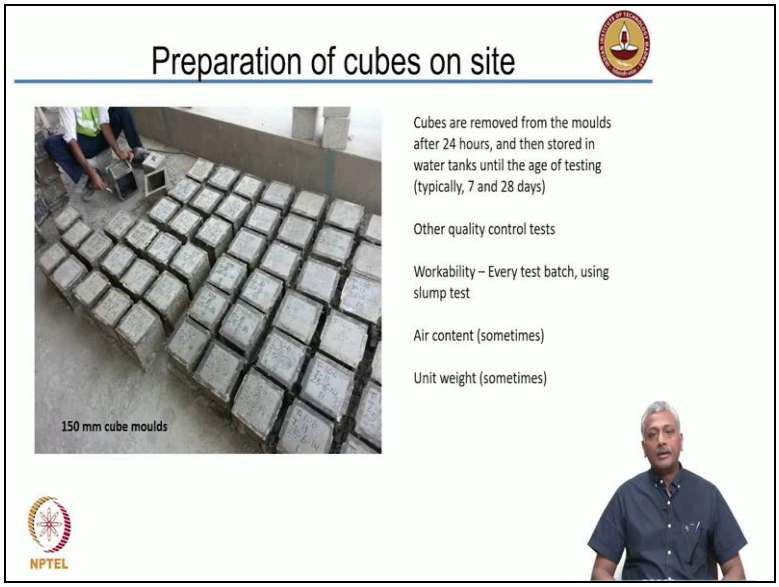

Now on the job site as I said there has to be some quality control done to ensure that the concrete that is supplied is meeting the demands of what the design has been done for. As I said one of the common tests that is done the job site is the slump test, to determine the workability. But apart from the slump test, you also need to ensure that you determine the strength somehow.

For that purpose, when the concrete is supplied to the job site, you prepare these specimens, 150 millimetre cube specimens, at least in India we use cube specimens to determine the strength of the concrete after a certain period of time. So you have the concrete truck that reaches the job site, you do the slump test, then you take material to prepare these cubes, so you prepare the 150 millimetre cubes. You can see this person is actually removing the moulds to extract the concrete cube from inside.

Typically the removal of the concrete from the mould is done at one day, which means the day after the concrete has been placed, it is removed from the moulds and then it is cured under water most cases. In most construction sites the curing is done under water and they are cured until the age of testing, usually 7 days or 28 days. Apart from strength based tests, you may actually do other kinds of quality control tests like workability as I said every test batch you do the slump test.

Sometimes you may also want to determine the air content in the concrete for the fresh concrete and the unit weight of the fresh concrete to ensure that they are within the required

limits for your construction site. But strength is always done, slump and strength are always done in all construction sites.