Introduction to Lean Construction
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Module 1 – Lecture 53
CPS Process, Overall Schedules (Master Schedule, Phase Schedule, LAP, Weekly Plan), Constraint Analysis

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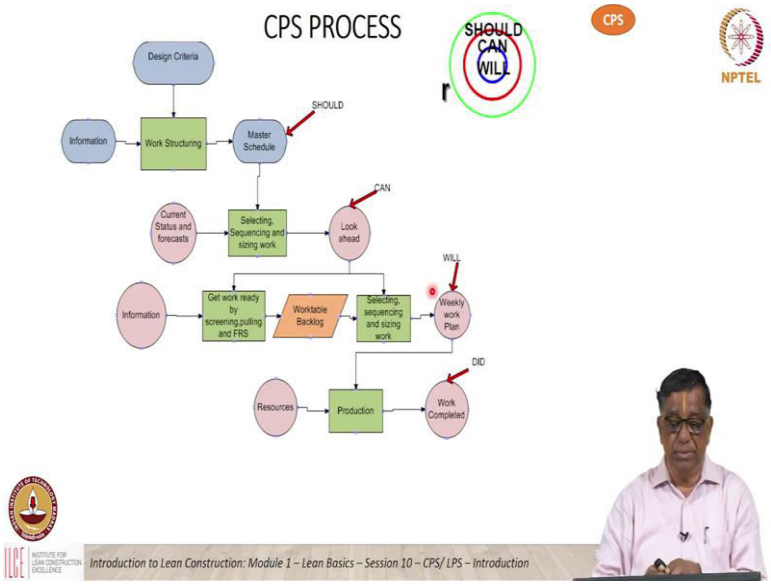

This is a very very famous chart which we have in the CPS Process. So, initially we are starting with the design criteria. I have not talked to you about something called work structuring, that is actually the starting point for CPS, where we actually work with the construction methods and the overall systems. At the time, we make the master schedule, the master schedule, we have the milestones and the major commitments.

At the time the client says you should do this by a date, we should do that by a date, the emphasis is on the word should. Then when we come down to the sequencing work and the looking at understanding the work better, we come to the Look Ahead planning. In the look at planning, if you are able to look at the constraints, and remove the constraints, we say you know the stage we can possibly do the work.

So, the client has told us we should do the work and we say yes, we can probably do that. Then we come down to the weekly planning, weekly planning, we have more understanding, better understanding, we have looked at the constraints removed them, we have looked at the resources and people have given the promises and taken the promises at that stage all the constraints have been removed.

Remember that at the end of say the 6 week look ahead planning, you come to the current week, theoretically all the constraints have been removed. And all the resources which a person the production man requires, they are being promised by the people who are in this very same room.

So, at that stage, the production people, the frontline people, they cannot but say that they will do the work, why should they not do the work? They have all the constraints removed, they have all the resources, the method spelled out, everything is well laid out. So, they will gladly say yes, I will do the work as per the planning. And then every day you come back and do a process check, ask him have you done the work? And he will say yes, I did.

So, there is a progression of should, to can, to will, to did over the time will come down the cascading from the for you know, narrowed down focus that is a great beauty of the collaborative planning system. We are narrowing down our focus at every stage we cover our backs. We identify the constraints, remove them, we have inter promises and inter coordination between the very people who are doing the work and who are able to supply the resources, to finally at the end of the day, the man says each day. Yes, I did. I did I did. And your, PPC that you know I told you earlier that keeps on improving all the time.

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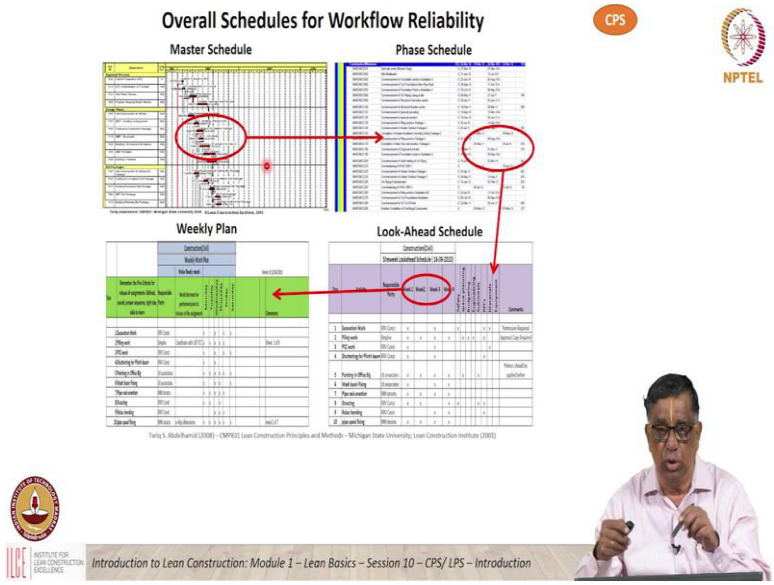

So, if you look at the broad progression, we have the master schedule, which is you know, very broad. And then we come to the phase schedules, and then we come down to the Look ahead schedule, and then we come down to the weekly planning. So, each time there is a narrowing down of focus, and having better and better control on what is happening.

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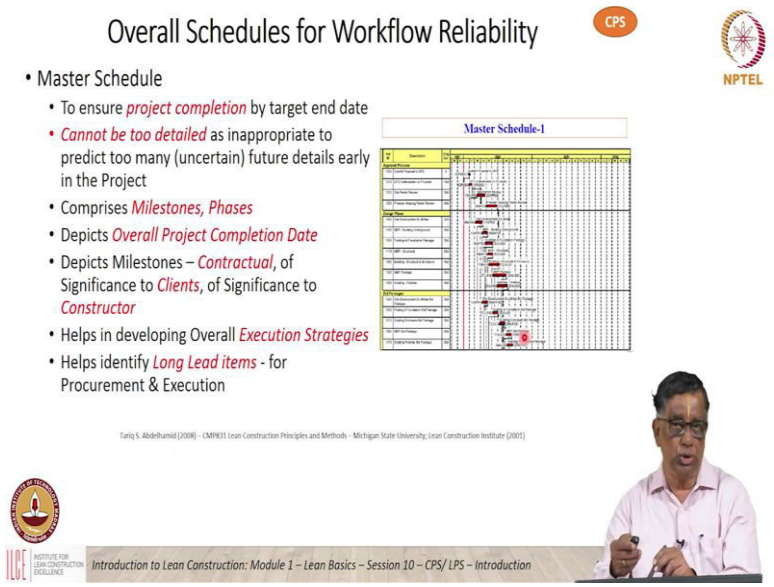

Now, to look at the various schedules in more detail, the master schedule ensures the completion of the entire project by a given date, going through various milestones. At this stage, obviously, it cannot be too much in detail. Look at a three year or 4 year long project, you cannot plan the project, you know in minute detail for the entire 3 or 4 year period.

So, we look at the broad milestones and make a schedule like this. And then from this, we carve out the various phases, phase one, phase two, phase three, and so on. And we this Master schedule, it contains all the contractual commitments, in terms of completion date, in terms of milestones, and so on. So, this is actually a sacrosanct document.

And this is what says, what we should do? And from this, we derived the broad execution strategies at the various phases. And this also helps us to identify the long lead items. For example, there could be many items, you know, which take a long time for production, maybe take 3 months, 4 months, 6 months, and so on. They all get identified when you are doing the master schedule, and those orders need to be placed well in advance. We cannot wait till the last minute we do that.

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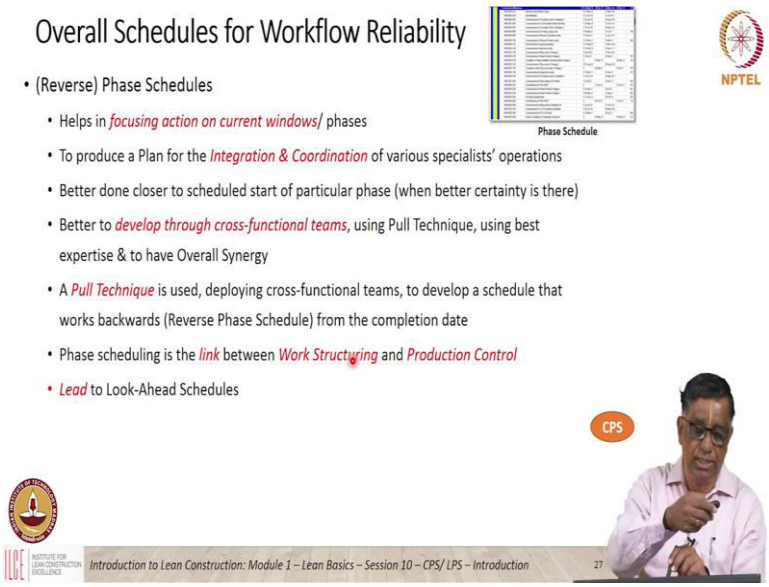

And then when it comes to the phase schedules, oftentimes we call them reverse phase schedules. Because again, we start from a particular milestone, and work backwards on a pull basis in a reverse manner. And then again what we do, we engage a multidisciplinary team for example, you know the all the all these suppliers of resources and then the you know electrical man, the mechanical people, MEP people, they all get together and then we work out the reverse phase schedules.

And this planning is done just before sometime before the actual phase is going to start, there is no point in doing planning much earlier in advance and then not being able to understand what happened, whether we have taken the feedback into account, what are the conditions of the site and so, on. So, we start the phase schedule near about the time when the actual face is going to start, so, we have a better understanding, we have better understanding of the previous execution and the and have taken the counter feedback. So, again we use a pull technique and then you know, this actually the link between work structuring when we had the broad planning and the production control with the look at schedules.

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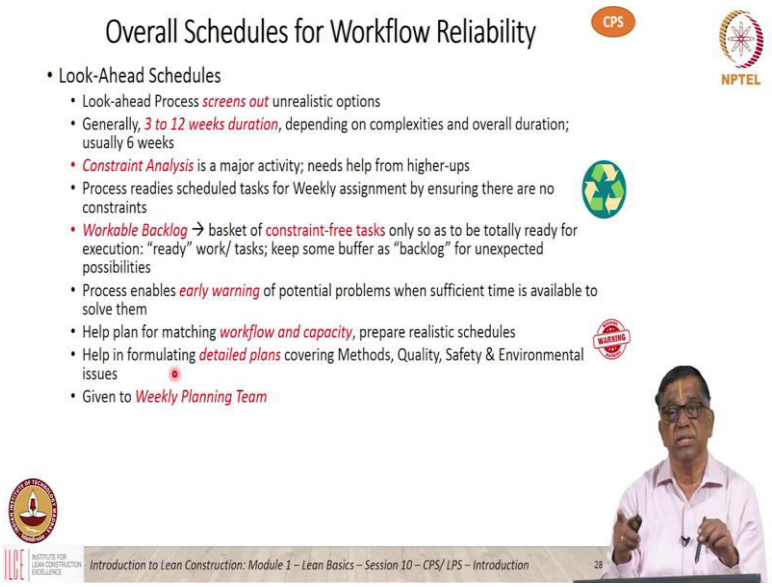

So, cascading down from master schedule to phase schedule, and then we go down to the Look Ahead planning. Like I said the look ahead plan can be anything from 3 to 12 or even 16 weeks, depending on the size of the project. And every week, you know, you have a rolling plan, one week, 2, 3, 4 say for example, up to 6 weeks. Corresponding to each week, I also identify what are the potential constraints for example, I need to have particular crane a 300-ton crane on the fifth month, I do not start looking for the crane at the end of fourth month, I started looking for it from that particular Look ahead window.

Similarly, there could be some other difficult to procure items, there may be some difficult you know, different kinds of labor skills required, precessing people may be required, waterproofing people may be required conduiting people may be required. So, I identify all these requirements in advance. And then every week you know, I look at what is going to happen in the first week, second week, third week up to the sixth week, I put down my potential problems and I also I will come to the constraint analysis later.

So, right now, we will look at the sorting out the activities to be done in the various weeks of the look ahead planning. And I also build up a backlog, suppose I plan so much work, you know, in a particular week, and that week something goes wrong, you know, say for example, suddenly it starts raining, I am not able to do the underground activities. So, the labour cannot sit idle. So, I must also have some contingency items or items planned, which you can execute in the particular week, that is called a workable backlog.

So, in this planning, I also create a workable backlog for the various weeks. And then we have detailed plans developed over you know, the look ahead window, and then finally, we come down to the weekly planning. So, when that by the time we come to weekly planning, remember, we have identified the sequence, we have broadly identified the batch size, what we mean by batch size? How much quantity you can take up in a given period of time daily or weekly or you know, in the look ahead window, we identify so much work to be done in a batch on a particular day or a particular week.

So, we have done the sequencing, we have done the batch size, the broad methods are identified, the resources are you know taken care of in the constraint planning, then we come to the weekly planning. So, when it comes to the sixth week, for example, the sixth week work, I have analyzed it in the previous 5 weeks, I have been looking down, I will have to do these works on the end of the sixth week. So, I have removed all the constraints, I have made sure that all the resources are available.

So, when it comes to the sixth week say for example, the Saturday before that, in the big room, the entire team assembles, I am going to plan the sixth week work and the concerned frontline people they see, so much work to be done. and we work backward from Saturday, the sixth week, Saturday, Friday, Thursday and go on up to Monday. So, whatever the frontline man requires, he asked the corresponding people in the same room. Can you give me the formwork? Can you give me the rebar? Can you give me the crane, the concrete pump? Whatever it is.

So, he gets all the promises across the table. Based on those promises. He gives his own promise. He says okay, I will do 300 cubic meters of concrete on Saturday. I will do 250 cubic meter on Friday, and so on. He puts all his figures on these, but he also puts a caveat. He says I will do this if I get these kind of resources, and the resource man comes and says, I will give you a batching plant on this date, a transit mixer on this date, concrete pump on this date, you know, boom placer on this date, and so on. So, all the resources, everything gets properly tied up for the given week, on the Saturday planning so that is how we come to the weekly planning.

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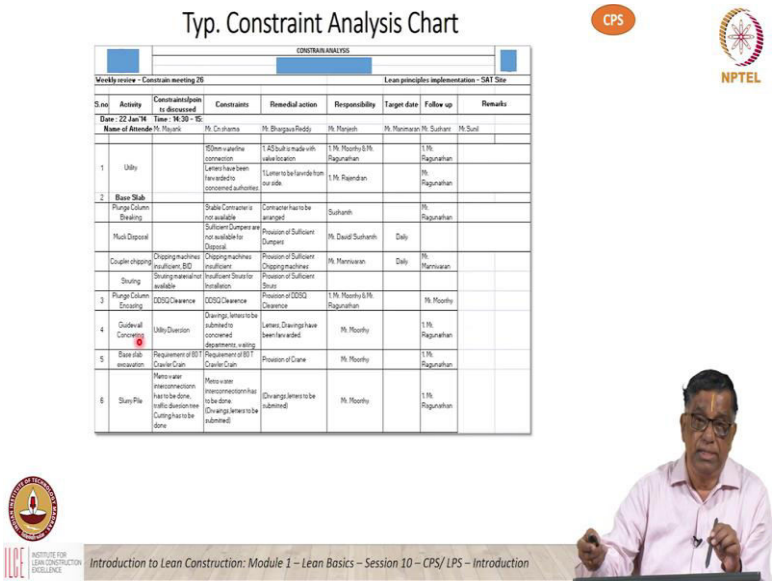

This is a typical constraint chart, if you look at the various columns, we have the activity, then we have the actual constraint. And you know, what kind of remedial action is required for solving that particular constraint. And whose responsibility, we identify the person well in advance, I remember this constraint for a given week, he is being analyzed 5 times or 6 times before the actual work, and then what is a target date, and then we keep following up in every week, and then writing the remarks are done or not done.

So, with the constrained analysis being done 5 times before my sixth week to, I have every chance of removing all the constraints, and coming down to what is called a totally constrained free basket of work. So, every single activity I have listed here, or in the, you know, weekly planning, that is all been removed of all the constraints, that is the real thing.

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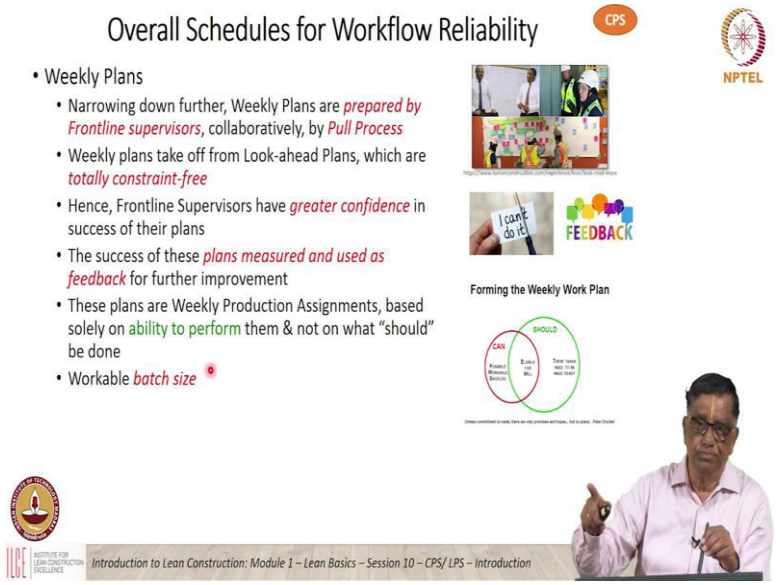

So, when it comes to the weekly plans, they take off from the look ahead plans, totally constrained free. And all the frontline people can have great confidence, yes, you know, they can do that without any problem. And then we have to look at the workability and workable and the batch size.

That means on the particular week, I will do so much of concreting, for example for the entire week, and that I split up between Friday, Saturday, Friday, Thursday, and up to Monday, like that. So, that is how the weekly plan gets done. And remember, this week plan has derived been derived from the Look ahead window. So, that means the overall workflow has been properly looked at and properly assigned.

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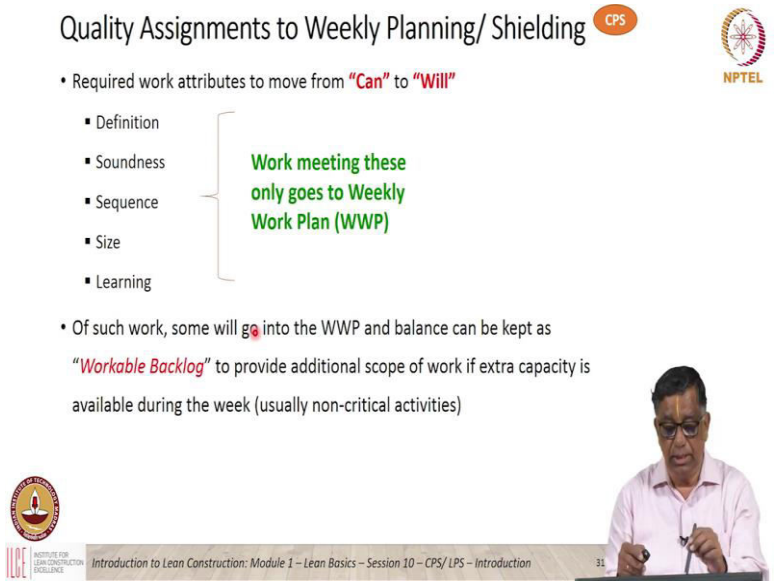

So, when it comes to weekly planning, what kind of activities can we take up in a particular week, there is something called quality assignment, we see whether the work is properly defined that means is there a drawing for that given work, when I say I want the concreting to be done on the sixth floor, what is the area to be done, what is the concrete thickness, rebar, everything whatever the conduits, embedment, so the work has to be properly defined.

Soundness, that means, you know, whether the method is clear whether I have the access properly, under the sequence wise, the previous rebar, formwork, and you know, the subsequent activity of conduits, embedment, and so on. All the sequences are properly defined, and size, how much work quantity I am going to take up in the next week, we cannot be unrealistic, nor can it be under size underestimated. It has to be the right size called the batch size.

And then Learning, whatever problems they encountered in the previous weeks or months, I take into account all those and then a factor in these problems. And then make sure that this current week, I do not have any plan, I do not have any problem. And then we also have this workable backlog I say, in case on a given day in the week, I am unable to do a particular kind of work, a particular type of work, whatever it is, I have a back I have something to fall back upon, so from this workable backlog which I have identified on the previous Saturday, I can take up some other work and do that and make sure that your labor or equipment they are not going idle.

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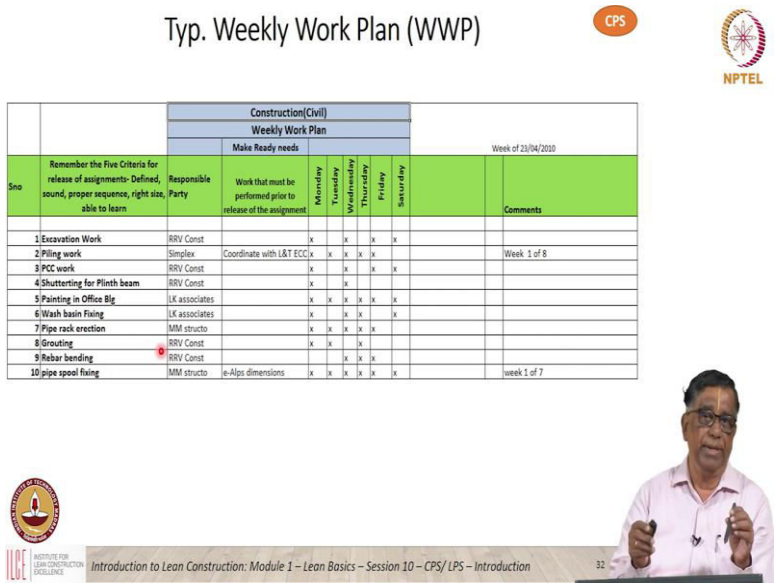

So, this is the scheduling or quality assignment for the weekly planning. The weekly planning is a very simple chart, you have the various activities and then you know we say who the responsible party then from Monday to Saturday, we have the various quantities are written there and then any remark what require particular resource or require or what are the problems that need to be solved? So, this is my, what do you call a planning for the current week coming for the coming week.

So, with that I go with great confidence because I know that all the constraints have been removed. I have the promises from all the concerned people. For all my resources. I know the method, the size, batch size, everything is properly done. So, that is the advantage of coming up to the weekly plan

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