Project Planning & Control

Prof. Koshy Varghese

Department of Civil Engineering

Indian Institute of Technology, Madras

Lecture - 45

Defining Relationship (Based on Construction Method) – Simple Shed

Now, what we want to do is move on to putting some kind of real activities to what we are looking and kind of discuss, , how do we define these in cases like this.

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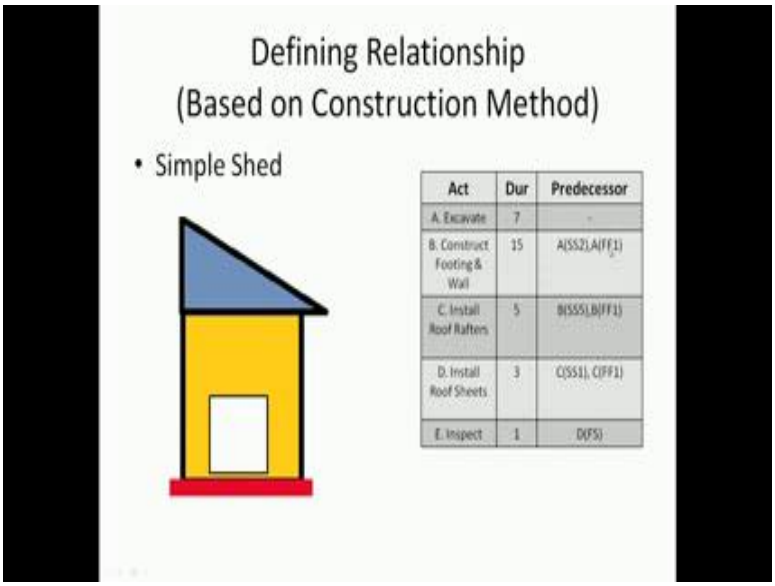

So, I have actually given what I am calling as a simple shed. And, basically, what we have are the following activities. We have an excavation; we have construct wall and footing – construct actually footing and wall. So, we have some kind of a foundation for this. There is a footing made and then there is a wall made for the shed; and then, there is roof rafters, which are installed. And then, we are installing the roof sheets and then pass inspection and then the job is done. So, this is the basic five activities for constructing a simple shed, where we are defining.

And now, the question is how can we do this; how do we represent these activities in a precedence diagram, so that we will be able to represent what is actually happening on the construction method? So, like I have said here, the construction method becomes extremely important. If you are for example, using prefab, the relationships might be totally different. There can be a lot of variation on what the relationships are based on the

construction method. And, it is extremely important that you look at the method and understand the method properly before you start putting relationships, which are representing of what is going to happen onsite. So, we have gone about and said "okay we are going to start". So, here you can see a start-start relationship and a finish-finish relationship. So, I will start excavation. After two days of excavation, I can start constructing the wall and footing. So, this is the relationship I am defining. And, wall and footing can finish only after one day after excavation is complete. That is how the finish-finish 1 is defined.

Similarly, the installing roof rafters; we are saying that it will start only five days after the wall and footing has started; only five days after this activity has started and can finish only after one day after this activity has finished; that is, FF1. And, installing roof sheets; we are saying after the rafters are installed, I have been started; one day after the rafters have started, I can start installing roof sheets and it will finish one – after the rafters activities have completed – after one day after the rafter activity is completed. And, inspection – we basically say after all – after the installation of root sheets is done– only after that inspection can start and it will take one day. So, this is the representation, which we have discussed. And, if you actually look as to how the shed is constructed; for example, I might say I do not want to overlap; I will do all my excavation, all my construction of footing and then do the wall and then install. But, obviously, that would take a lot of time if we did every activities serially. And, that is why we want to start this in a parallel way.

Now, if we were going to do the same setup using activity on a node with just the finish-start relationship, we would land up with this serial set of activities. Now, the alternative as we discussed last time in the last class is to break it up into pieces and in many ways that is a good alternative. If I am going to take excavation and break into excavation A 1, A 2, A 2 and then B 1, B 2, B 3 and C 1, C 2, C 3. And, based on how I am going to do this and then represent it in an activity on node with several activities. You have to certainly handle more activities; but, that is an option which is possible.

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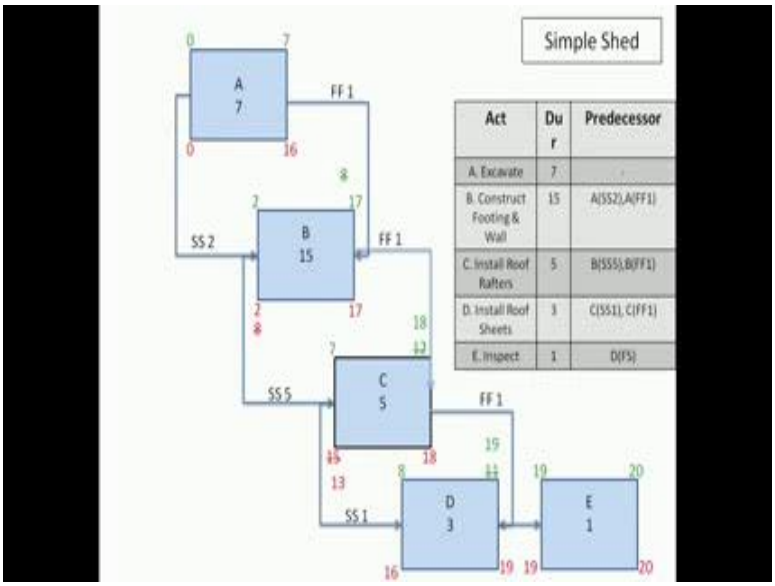

But, if we are going to do it with precedence diagramming method, this is how it works out, where you have A, B, C, D, E. And, all other relationships, which we discussed are defined here. So, we have the start-start, the finish-finish with all the lags as we have specified in this. And, we can now do the basic analysis, which is shown here. So, you have 2, again 17. From the start-start relationship, we get 2 go to 15; we get the 17. From finish-finish, what we got was the 8. So, obviously, 17 controls. So, I am not again going through the details of this; but, let us see how do we then represent and analyze this. So, you will find that, once we do the analysis, the critical issue – the critical aspects are one – this start-start relationship at start of A becomes critical; the start of B becomes critical; end of B is critical; finish of A is not critical; start of C is not critical; start of D is not critical; but, end of C and end of D become critical; and, the start and end of E becomes critical.

So, what does this mean in terms of these activities? How does this translate into an actual implementation on the fields? So, for example, if I say I am going to start excavating and then end of excavation is not critical, it means that, it does not mean that I can start excavation and stop, because I have to keep excavation ahead of constructing the footing. So, if I do not keep excavation ahead of constructing the footing, somewhere B is going to stop. So, here you can see B is fully critical, but A - only the start is critical. But, it just does not mean that I start and then I stop A because I have got things started. From the network perspective, it might show that, just start A and then everything can take care of itself. But, that is not how it is going to work. And, you will have to really

know the physical layout and how the progress of A – you have the work front for A. Doing A has to come to B, so that work front progress has to be planned and that detail has to be taken care off. Just because we have done this relationship, we cannot assume that the event here will take care of all of the networks. So, this is very important.

I cannot emphasize it enough; what we have represented here is just a very abstract way of what the project is going to go through. Ideally, I should have more relationships here; which if you had done on the AON, where splitting activities, you have these relationships. And so, lot of times, from a very basic sense, that is easier and more intuitive to understand and control. So, that is between A and B. Similarly, you can see that activity C – the start of C is not critical, but the end of C is critical. So, while the start of B is critical, I can then start delaying or I have flexibility with the start of C; but, I have to end it on 18. So, this is somewhat realistic as far as a sub-contract of C want this kind of information rather than saying my whole of C is constrained within a particular range or things like that.

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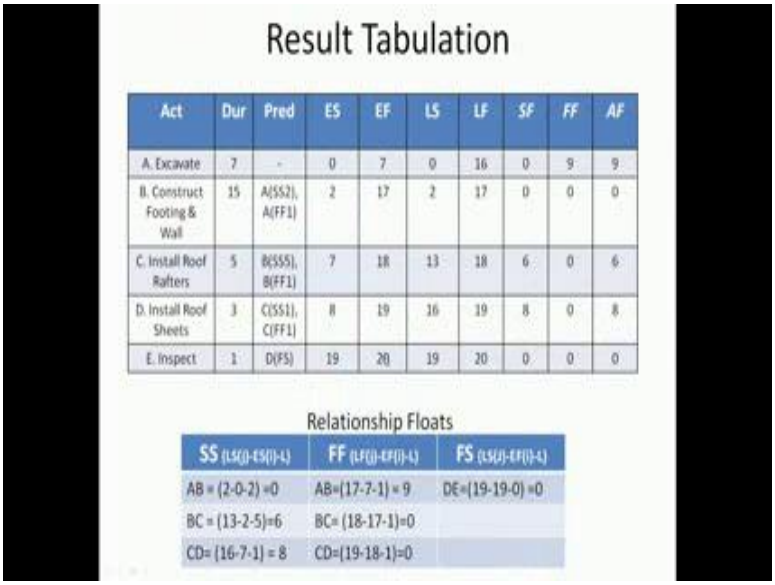

And so, one way of expressing all of these results, I have shown in a tabulation here. So, what we have is activity; we have the duration; we have the predecessors; we have here the early start, early finish, the late start, late finish. We have start float, finish float. And, what we are calling as total float or activity float. So, all of these values are listed here. Again you can see this from the network. We have taken the relevant values for early start, early finish, late start, late finish as well as based on these values, we have calculated the start float, finish float and the activity of total float. So, you should be able

to go through this tabulation and check with your calculations what answers you get and if they tally with this.

Now, at the second table here, we have the relationship floats. So, if I can go back and forth; so, we have a relationship for example, AB relationship here; we have a start-start AB relationship. Basically, we are calculating it here with 2 being the value of the late start and 0 being the early start of A minus 2. So, 2 minus 2 is 0. If I take a finish-finish relationship, I have AB; again this is a finish-finish with the finish-finish with the lag of 1. We have finish-finish. So, we are going with 17 minus 7 minus 1. And, that is coming from 17 minus 7 minus 1 gives you the float in this finish-finish relationship. And, you can see that is of value of 9.

An additional 9 before it starts impacting the project; that can be seen. And obviously, this is also shared with the finish float of A. So, just as we had total float in the AON and it is shared along the chain of activities, these floats here are also shared based on how they are along the activities. Again it is not like a free float; it belongs only to the activity – only to that part of the activity. It is again shared along the path. And so, similarly, we have all the finish-finish floats represented here. And then, we have this finish start, which is the only finish-start relationship here was this one. And, the finish-start float is also now represented through this calculation. And obviously, when we get here it is pretty straightforward; we do not have a lag; it gets to 0. So, ideally, we would take network representation like this, do the analysis and show it in tabulation like this. In a larger project, this would might be easier to read rather than do this; but, from a conceptual standpoint, I think this is fairly illustrative; that is why I have used more of a network for the result discussion rather than just the tabulation.

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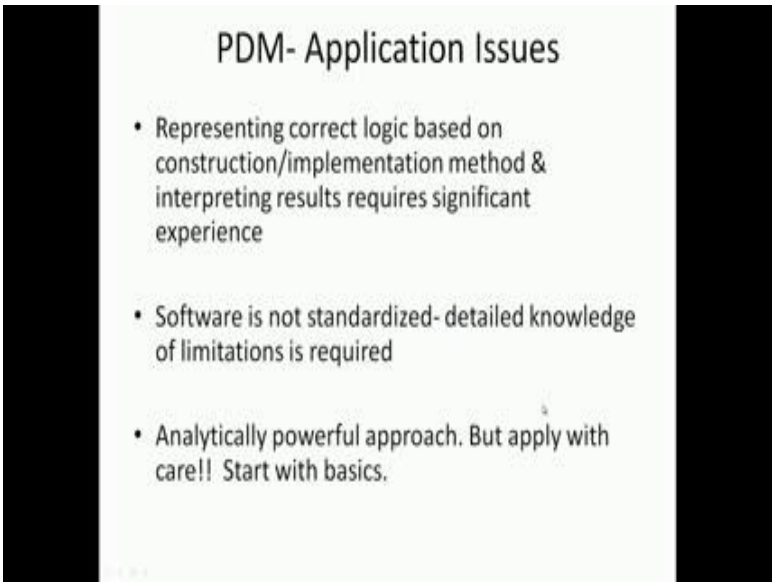

Now, we come to the application issues. So, I think I have been repeating this from the beginning that, we have seen a lot of PDM being used especially through the software that is available. The software that is available today is quite powerful. And, we have seen a lot of planning groups, use the start-start, finish-finish with leads and lags quite liberally. But, once they do that, nobody is able to interpret what is happening to the project. So, unless you have really a lot of experience and you are able to represent the logic of what the construction method that is going to be used very accurately in the PDM, it is not advisable to use these complex relationships when you are starting out in your planning exercises.

Once you have experimented, tried, understood how the software behaves, how the logical relationships behave; then, by all means, start scaling up the use of PDM, because it is certainly powerful. And, the more we are able to use the power, the more representative will the plans be of the project in a much more compact way. But, like we discussed, AON, given that, we cannot use AOA in software today. Most of the software will use an AON representative; you can use finish-start relationships; and, through that, we should be able to actually model most of what we can do. The number of activities will certainly be more; but, I think basically, what our experience, interacting with many of the companies have shown that it is still a reasonable place to start. Again repeating once, you have experimented and you understood how these other things behave; and then, you move on to PDM from practising point of view.

In fact, I would encourage you to use any other standard software and enter PDM and

enter some of these..what we call as negative lags, leads; you see the software itself does not give you reasonable answers. So, there is no standardization in the software. In addition to knowing the concepts in detail, you need to know detailed knowledge of the limitations of the software itself. How the software computes what. And, you will find that, in addition to some of these constraints, you have constraints like must start on, must finish on, must finish before, can start, must start after – all of these constraints make the software again very much more involved and complex to use. So, I would like to end of this. While we have really analytically powerful approach in the PDM, you should apply it with care and do start with the basics of PDM, if you are implementing it onsite and then scale it up.

Thank you.