Project Planning & Control

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Lecture – 23

Lesson – 05

Two–Span Bridge: Activity-Duration-Predecessors

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Two Span Bridge – Activity-Duration-Predecessors

No.	Activity	Duration (days)	Predecessor
1.	Order & Deliver Piles	15	Start
2.	Cast Beams	a.16 & b.20	Start
3.	Drive Piles East	12	1
4.	Const East Pile Cap	08	3
5.	Const E. Abutment	36	4
6.	Drive Piles Centre	6	1
7.	Const Centre Pile Cap	07	6
8.	Const Centre Pier	27	7
9.	Drive Piles West	12	1
10.	Const West Pile Cap	08	9
11.	Const W. Abutment	36	10
12.	Place Beams E. Span	07	2(a),5,8
13.	Place Beams W. Span	07	2(b),8,11
14.	Deck Slab East	15	12
15.	Deck Slab West	15	13
16.	Lay Roads	25	14,15

Draw Network. Do Network Analysis - Any Changes suggested ?

We came here, now what we needed to do is to actually look at the… I have given the durations which we have discussed here. So, in the beam casting for example, I given you a and b, which is for the first set of 3 and the second set of 3. Now, I wanted to take this also for a discussion after we take a little bit here or take a little bit of discussion on this issue, let us look at the predecessors. Just we have started discussing this in the earlier lecture, but we will take it up now, we have order deliver piles is start, cast beams is start, there is no predecessor as such.

Driving piles is after my delivery, I can construct the pile cap only after driving…, east abutment after pile cap, pile centre after delivery, pile cap, after that the centre pier after the pile cap is done, piles west.

Student: Like how it drive one.

Yes one, it drive construct west pile cap. Now, E.span ?…

Student: It depends on the centre and the beam.

So, pile and beam should be available. The beam should be available and the east abutment should be ready and the centre pier should be ready. Now, west my beam should be available , centre pier west apartment. Deck slab east is based on the east, west is west on the beams on the west and then lay roads after the east and west deck slabs and all. So, this is the finish start relationship predecessor. So, one thing I would like, you to check is does breaking the cast beam into two activities make an influence here?. Now, so you can answer yes only if the duration makes a difference. If I took it as one activity, what would be my duration,… 20 which means I could start placing E.span only after 20 days, but physically ..16. So, the the abstraction level of an activity can really control the way you can execute a project,

So, the network need not represent the reality on the project, we talked about level of detail of activities, remember. So, here the more level of detail I go, I might be able to represent the project better, this particular case it will depend on. See, this is 20 days here, you know it is very likely to take more than 20 days, only a calculation can say that. So, what does early start of place beam E.span. If the early start is anywhere close to 17, 18, then this makes difference; if it does not then this split does not make a difference.

So, there are issues like that which will come up again on networks. Should I break a network into, break an activity into smaller activity, so that I can get relationships better or we talked a little bit about start, start relationships or should I use start, start relationships in a precedence diagramming kind of an approach. So, these are really the tricky issues or what you can call, moving away from the science the art of planning.

How do I represent, what activities do I represent in the network, so that I do not blow up into thousands of activities, many of which do not need to be represented. How do I make the network Appropriately represent the project I am doing, if I change in the network should be reflected in the project, and change in the project should be easily capturable in the network. Network to project should have a good, they should be representative by each other and these are issues that make it likelihood.

So, as an exercise, I want you to draw the network, do the network analysis and come up with suggestions. You know on either the way the duration was estimated or the predecessor relationships or anything else.

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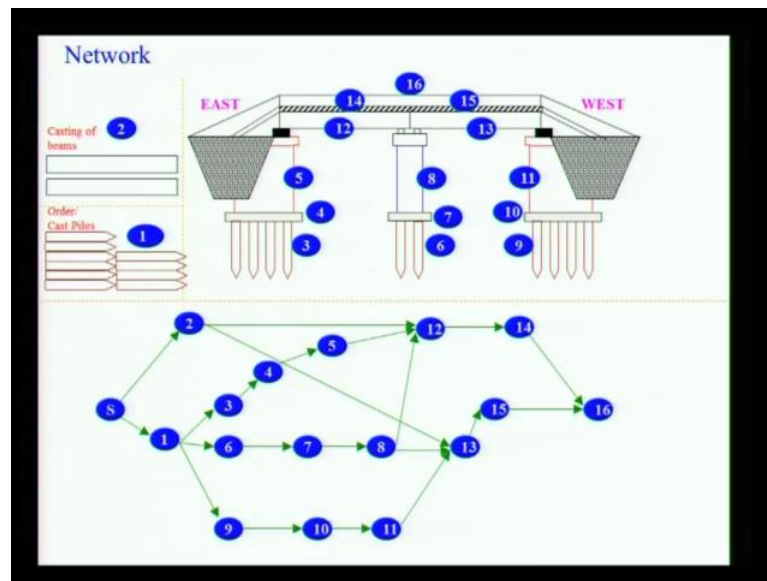
So, you can use this as a base, this shows the basic network, I want to end with one question. You can see here that we have, based on the relationships we have predecessors, we have done; we have you know we have activity piles, piles are delivered and then we have 3, 6 and 9 which is driving the piles. So, as per this network, it looks like we can do 3, 6 and 9 together.

Student: parallel

Does this mean it can be a… So, I mean, so let say I only have one piling rig, should I change the network.

Student: Yes………

So, this is something we will take up more when we talk about resource allocation, because piling rig is a resource and there is a danger of changing the network to match your resource.

Student: sir, everything down stream gets changed.

not only everything down stream gets changed, that let say now I get a second piling rig, what will happen. I have to again go back and change my network. So, the network logic should ideally not be dictated by your resource availability and you know, if you are using, if you are not going to resource load your network, then yes you have to put resource constraint as a part of your network logic. But, the minute you include resources into your network planning or you know scope, then if you put, if you constrain a

network with the resource availability logic, we will find it is a very, very difficult way thing to manage, you are not making the full use of the resource allocation capabilities of a network procedure.

We will certainly take this up in much more detail later, but I just wanted to introduce it to you here, because we are still talking about predecessor relationship and it is always tempting to constrain predecessor relationship with the resource constrains here. Any questions?

Student: Why not then just all the scheduling process, once you really aware of all the resources, then you go ahead with the scheduling.

No, but why would you do that?

Student: Because to avoid all this kind of…

No, but do you want to make a resource, you know network resource. No, did you want to include resource constrain in a precedence relationship?

Student: No, I want to make it independent of…

So, you make it then just it depends, so then we come to the question, what should the precedence relationship be based on. In this case, what is it done by?

Student: We assume that there are three pile rigs

No, we are not assumed that there are three pile rigs

Student: But, then that is only reason why 3, 6 and 9 are running parallely.

Right now 3, 6 and 9 are running parallel, because we are not planning the resource load at this stage; that is why you see think they are running parallely, but if the minute we have resource loaded, it will adjust itself. So, this is something to keep in mind. Basic CPM does not take about resource and this is where concepts like critical chain planning and everything has come in, because ultimately without resources you are not going to be able to achieve whatever duration you want to achieve, whatever productivity you want, you know all of that.

So, resources and even your large level sequences govern the resources. So, actually come back to the basic question, what in the way we are discussing what should your network logic be driven by,….. what you know activity, yes; what should the logic be driven by. In the case what is our logic driven by? What is the fact that we say, you know

that 3, 6 and 9 should follow one.

Student: Physical constrain

Physical constrain, that unless I have one ready I cannot do, that is one; second is construction method. If I prefab, so you know if I did from prefab versus this versus that, the method makes a big difference. So, for example, here we have said an earth work will get done at a different sequence or the roads will get done at difference sequence, the method makes a big difference and when we say that, for example activity 12 can be done only if 2, 5 and 8 are done. What does 5 and 8, why are 5 and 8 predecessor should write?

Student: Because if there is no support.

It is a physical constrain. So, ideally network logic should be based on such constrains, resource constrains should not be brought into the network logic. Then especially when we start loading our network with resources, it will take care of it. When we do a calculation on this right now with what we have covered so far, yes with resource and without. We do not put the resource logic in a, there will be a different answer from when you actually put resource driven logic into the network. But, this is only for hand calculation, we have to look at the larger picture.

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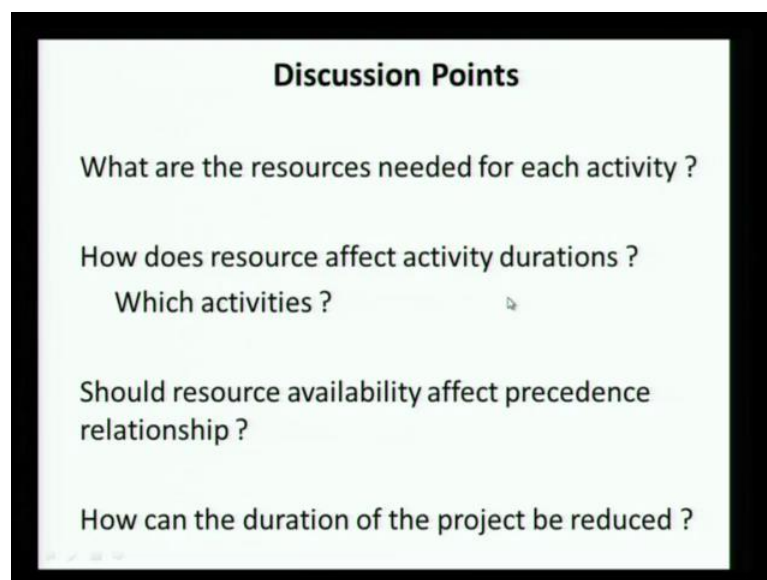
So, these are the points, I would also like you to think about before the next lecture, what are the resources needed for each activity, how does resource affect duration, we discuss this a little bit. So, in which activity does resource affect duration? Should resource

availability affect precedence relationship? We have just had a discussion on this and how can duration of a project be reduced.

So, this is we will take this in a lot more detail, we have a specialized method for this called crashing, we will take this in more detail later, but I think this point should be discussed at this stage itself and then, we get into detail as we go through the different issues. We will be concluding this discussion on this bridge case and raise more issues with respect to this.