ARC 226 CONSTRUCTION SCHEDULING

Chapter 6 Creating the Network Logic Diagram

Introduction

- First step in CPM scheduling
  - Develop the logic diagram
    - Durations can then be assigned
  - Also the most important step of the CPM process
  - If the logic diagram is not accurate, the schedule will not be accurate

Project Familiarity

- Study the plans and specs thoroughly
  - General conditions, submittal sections may have specific requirements regarding the schedule
    - http://www.lechase.com/projectcenter/projectfiles/Misc/01311.doc
- Consider the project requirements and constraints
  - Site access
  - Methods of construction
  - Equipment needs
  - Where will the project start, what will the progression be?

Project Execution

- There will be a variety of ways to complete the project, which is best?
  - Management team must be familiar with the drawings
  - Determine how the team will move through the project
    - What is the best sequence?
  - Are there unusual or unique aspects of the project?
- How will completion of one portion of the project affect the other activities?
  - Access often an issue

Management Interviews

- Talk with the estimators about problem areas of the project
- Get input from the superintendents and project managers
  - Owner may also have some input
- In general, consult all the members of the project team
- Consulting the subcontractors is a key item

Project Activities

- How detailed should the activities be?
  - Must be small enough to have direction and control
  - Must be large enough to avoid unnecessary detail and confusion
    - Force detailed thinking and communication
- Don't make it too complex, but give it enough detail
- Who is the schedule designed for?
  - What is their level of experience?

Scheduling Subs

- Don't schedule the subs as one single activity
  - Do not make an activity "Electrical" for the duration of the project
  - At least break down the electrical into categories such as the area of the building, the floor, or the phase
    - East wing, 2nd floor, below slab electrical, etc.
- The sup may schedule the details on a weekly basis
  - The PM schedule the summary activities

Procurement Activities

- Should the procurement activities be included on the schedule?
  - Submittals, manufacturing materials, shipping, etc.
  - Shop drawings, samples testing
- If the activity can or has caused problems in the past, include it in the schedule
- Including items in the schedule may help avoid overlooking that item

Work Breakdown Structure

- Defining activities so each activity can be identified by a WBS number
  - Numbering systems are project or company specific
  - Breakdown according to PM, firm, sub, area of work, CSI, phases
- Phases are a common format for the WBS
  - Foundation
    - Footings
      - Layout
      - Excavate
      - Form…
    - Foundation walls

Activity Level Logic Diagram

- Instead of using a WBS, creating a logic diagram and thinking directly on the activity level
  - Action, object, location method
    - Form, footings, north end
    - Provides the necessary communication and control
      - Who, where, what, when are all answered
- The level of detail will be evident from experience
  - Is a summary level schedule enough?
    - Project can be broken down later into 3 or 4 week look-ahead schedules

Creating the Logic Diagram

- Node or activity box
  - One box for each activity
  - Each activity box contains a shortened name
    - Also ES, Dur, EF, LS, TF, LF
- Start with the first activity
  - Stamp or draw the activity on a large sheet of paper
- Identify the 2nd activity and establish the relationship
  - Proceed on with activities and logical relationships
    - Establish predecessors, successors, and concurrent activities
  - If the logical relationships are wrong all dates and reports will be incorrect
  - Requires detailed thinking about the construction procedure

Redundant Arrows

- Redundant arrows are not necessary
  - Helps eliminate confusion
- Given activities A, B, and C
  - If A must be done to start on B, and B must be done to start C, then A must be done to start C
    - If there is an arrow from A to B, and B to C, no arrow is needed from A to C
  - Eliminate logic loops
    - Arrow from A to B to C and back to A
- See examples pg. 59-60

Logic Diagram, cont.

- The logic diagram is completed so as to represent the procedure of construction for the project
  - Careful thought must be given to sequencing
- Creating the schedule should be a team process
  - Consult the field managers
- The logic diagram construction will be more involved than the bar chart diagram
  - CPM forces detailed thinking about the project

Other Names for the Logic Diagram

- Pure logic diagram
- Project Evaluation Review Technique (PERT)
- Network view
- Logic diagram is probably the most accurate description

Other Methods for Creating the Logic Diagram

- Can be created on a computer
  - Difficult to see all of the activities and predecessors and successors
- There will be many revisions to the logic diagram
  - Input from other parties will cause changes
- The logic diagram can also be created from end to beginning
  - What do we need to do before activity X can be completed?
    - Helpful to look at the project both ways
- Rubber stamp, Pos-it notes, mailing labels

Planning

- The logic diagram is primarily a planning process
  - The logic diagram is the result
  - The final schedule will communicate that result to others
    - The scheduling phase starts after the durations and dates are entered
- Start and end with only one activity
  - Only one activity with no predecessors, one with no successors
    - Helps check the logic

Ensuring Accurate Logic

- Establishing the logic diagram is the most important part of the scheduling process
  - The schedule dates are developed from the logic diagram
  - If the logic diagram does not represent the project sequence, none of the dates will be valid
- At each activity, ask two questions:
  - Does this activity really need to be done before the next activity can start?
  - What other activities need to be done before this activity can start?
- Double check the network diagram

Conclusion

- Logic diagram is the most important scheduling step
- A primary reason schedules are abandoned during construction is because the logic diagram was insufficient or incorrect
- Familiarize yourself with the project
- Involve all management members
- Break down the project into activities (WBS)
- Create a hand drawn network diagram
- If you do not know the proper sequencing or construction process, consult someone who does