CHAPTER 18
OTHER SCHEDULING TECHNIQUES
Introduction

- Alternate scheduling methods (vs. CPM)
- Some are other CPM related techniques
- Some are separate stand-alone techniques
- Offer a different format
  - May be more suitable depending on the project or circumstances
Many projects start with a master project
- A detailed schedule is then produced to cover the next several weeks or months
  - A common interval is 3 weeks
  - Also called a Short Interval Production Schedule or Construction Activity Plan

It often takes too much time to produce an entire schedule at the beginning of the project with the level of detail as the 3-week look ahead
- Also allows for another check on planning the project
  - What do we have to do in the next three weeks?
Schedule Format

- **Short interval schedule is often created by the site management**
  - Often takes the form of a bar chart
- **Allows for greater detail**
  - Manpower, equipment, tools, etc. can all be accurately forecast for the upcoming time period
  - May only deal with a specific portion or part of the project
  - The 3-week schedule must still agree with the master schedule
    - The schedule is still created every week
  - May also be resource loaded
Included Details

- Short interval schedules may include
  - # of workers
  - Material requirements
  - Equipment to be installed or needed for construction
  - Maintenance
  - Owner visits
  - Inspections
  - Safety and progress meetings
  - Production rates
  - Special material tests

- The format can be modified to reflect the needs of the project
  - Excel, Project, etc.
Hammock Activities

- Hammock activity - spans other activities
  - An activity that takes place in conjunction with other activities
  - Example:
    - Dewatering done during an excavation and pouring of caissons
      - Dewatering continues until the permanent drainage system is in place
    - Haul roads that need to be maintained during an excavation
Constraints

- Constraint - restriction or boundary on finish of an activity
  - Used when an activity must meet a certain deadline or when an activity must happen before or after a certain date
    - Deadlines - (no-later-than constraint)
    - Potential delays - (no-earlier-than constraints)
  - Attached to the start or finish of an activity
    - Deadline on the start or finish of an activity, potential delay stating an activity can not start or finish before a certain date

- The project is typically scheduled first without constraints
  - Constraints are then added one at a time
Constraints cont.

- **Constraints override the CPM logic**
  - If a mandatory start is implemented the activity will start regardless of predecessors finishing
  - If the project is ahead of schedule the constrained date will not change

- **Most often used for deadlines and delivery dates**
Start Constraints

- Specify that an activity can start no earlier or later than a specified date
  - An activity cannot begin until a certain piece of equipment is delivered
- If an activity must start by a certain date a late start date constraint is attached
Finish Constraints

- Specify that an activity must finish no earlier or later than a specified date
- Early finish constraint
  - Activity can not finish before a specified date
## Mandatory and Start-on Constraints

<table>
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<tr>
<th><strong>Mandatory</strong></th>
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<td>- Force an activity to establish a definite date for its start or finish</td>
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<td>- Activity takes place no matter what on that particular date</td>
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<td>- Will override any associated CPM logic</td>
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<th><strong>Start-on</strong></th>
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<td>- Set the early and late start dates as the same day</td>
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<td>- Protects the schedule logic</td>
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Expected Finish Constraints

- Force the duration of an activity to depend on its scheduled finish date
  - Duration is calculated from its ES date to the specified expected finish date
    - A calculated duration may be marked with an asterisk
Float Constraints

- Affect the scheduling of an activity but do not override schedule logic
- Zero total float constraint
  - Causes an activity to be scheduled as soon as possible
    - Eliminates the float, makes the activity critical
- As late as possible float constraint
  - Schedules an activity to start as late as possible without delaying any successors
  - Eliminates any float from the activity
    - Used for payments and deliveries
Fenced Bar Charts

- Bar chart developed from a CPM network showing logical relationships
  - Bars and arrows are used instead of boxes and nodes
  - Gives a balance between a bar chart and a logic diagram
  - May become complex and difficult to read on large projects due to overlapping arrows
Graphic Schedules

- Marked or color coded set of drawings showing the general sequencing of a project
  - Dates can be added for the associated work
  - Arrows can show the general progression through the building
- Simple method, but can still force detailed thinking about the project
  - In general, the graphic schedule shows where and when work is to take place
Matrix Schedules

- Show desired summary information about when certain activities will happen
  - May consist of area rows and activity columns
  - Each cell is then filled with desired info concerning Start, Actual Start, Duration, Actual Duration, etc.

- Not a CPM method, so it is not generated by CPM software
  - Simple Excel format
  - Dates are not automatically updated
    - May be good for summary purposes
Activity on Arrow Method

- Used alternatively to activity on node
  - Not supported by most software
  - Initially easier to draw by hand than AON

- Activity description is located on the arrow
  - Nodes represent the beginning and end of an activity
  - All activities coming into the node before and activity coming out of the node can start

- Dummy - shows a relationship but is not an activity
  - Allows for an activity to be a predecessor to more than one string of successors

- Other aspects of AOA are similar to AON, but AOA is not commonly used
Project Evaluation and Review Technique
- Similar method to CPM, but durations are figured as optimistic, most likely, and pessimistic
- Actual duration = \( \frac{O + 4L + P}{6} \)
  - Gives the most likely time a weighted average
  - Accounts for some uncertainty with respect to durations
  - The most likely duration is then calculated using statistical methods
    - A probability for not finishing on time can be calculated

Not commonly used in the construction industry
- Monte Carlo Simulation software is the most common
Conclusion

- CPM is the most common method for construction scheduling
- Different projects may have other requirements that make another method or technique useful
- The short interval schedule can help to analyze the upcoming requirements for a project
  - Manpower, materials, equipment
- Hammock activities give a more accurate representation of a project