Construction Project Management
Fourth Edition

Project Planning and Scheduling

Chapter 10

The organization and content of this presentation is based on a scheduling seminar one of the authors teaches for the R.S. Means Company. David Pierce, Southern Polytechnic University and a consultant to R.S. Means, was the principal author of this seminar.

Construction Schedule

- Series of tasks or activities
  - Arranged in a logical order
  - Depicting a start time
  - Showing activity durations
  - Indicating a completion time

Schedule Objectives

- Determine Project Completion Time
- Determine Critical Activities
- Identify which activities can be delayed
- Use as a tool to manage a project

Scheduling Uses

- Owner program planning
- "What if" Analysis
- Project Coordination
- Analyze and document project changes
- Resource Management
- Project Reporting and Monitoring

The Critical Path Method

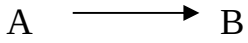
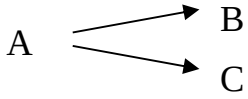
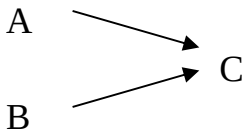
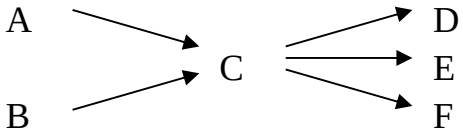
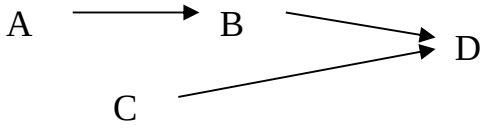
- Break a job down into manageable/small parts
- Analyze each part for time and resources
- String them together in sequence

Diagramming formats

- How to indicate logic/ sequence/order of the work

Logic Problems

Demo Diagrams

Activity B cannot start until activity A is completed	
Activity A must be complete before B and C can start	
C cannot start until A and B are completed.	
C cannot start until A and B are completed, and D, E, and F cannot start until C is completed.	
B follows A C runs concurrent with A and B D follows B and C	

Key questions to ask when establishing sequence

- What must go before the activity?
- What must go after the activity?
- What can go on at the same time as the activity?

CPM job calculations

- Goals of the calculation procedure
  - To find starting times for all activities
  - To find overall job duration
  - To find critical activities

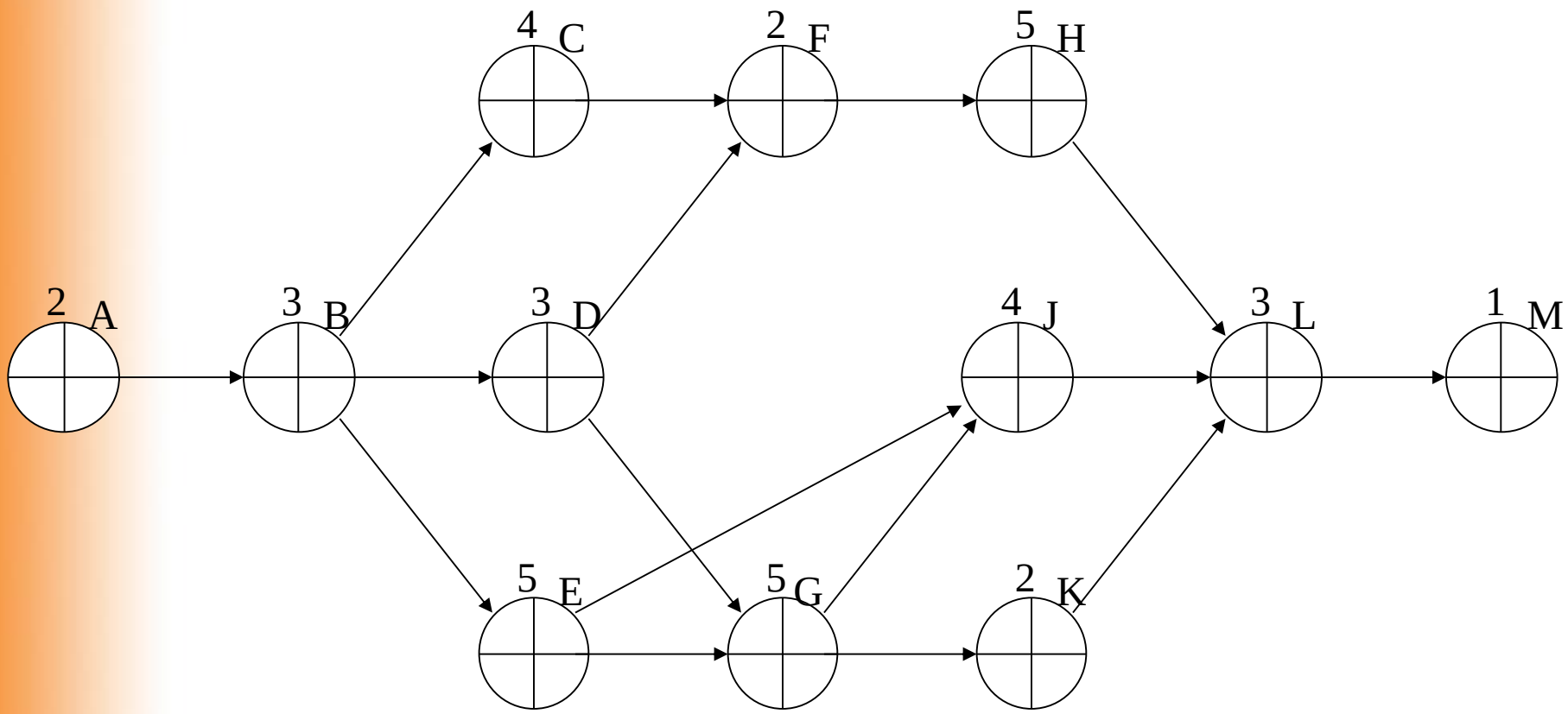
Definitions

- Early Start (ES)
- Early Finish (EF)
- Late Start (LS)
- Late Finish (LF)
- Total Float

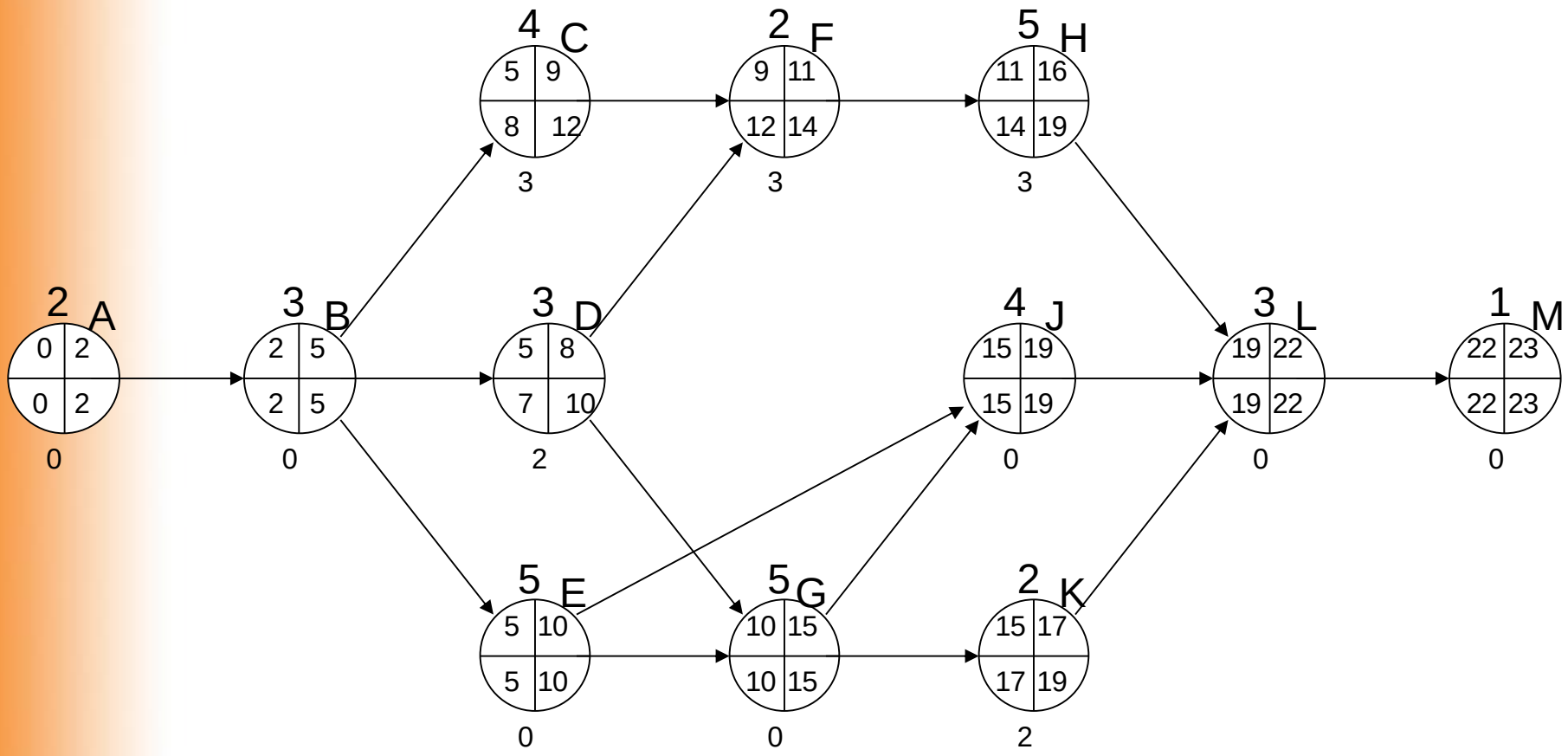
Calculation Steps

- Forward Pass
  - Early Times
- Backward Pass
  - Late Times
- Find Float Times

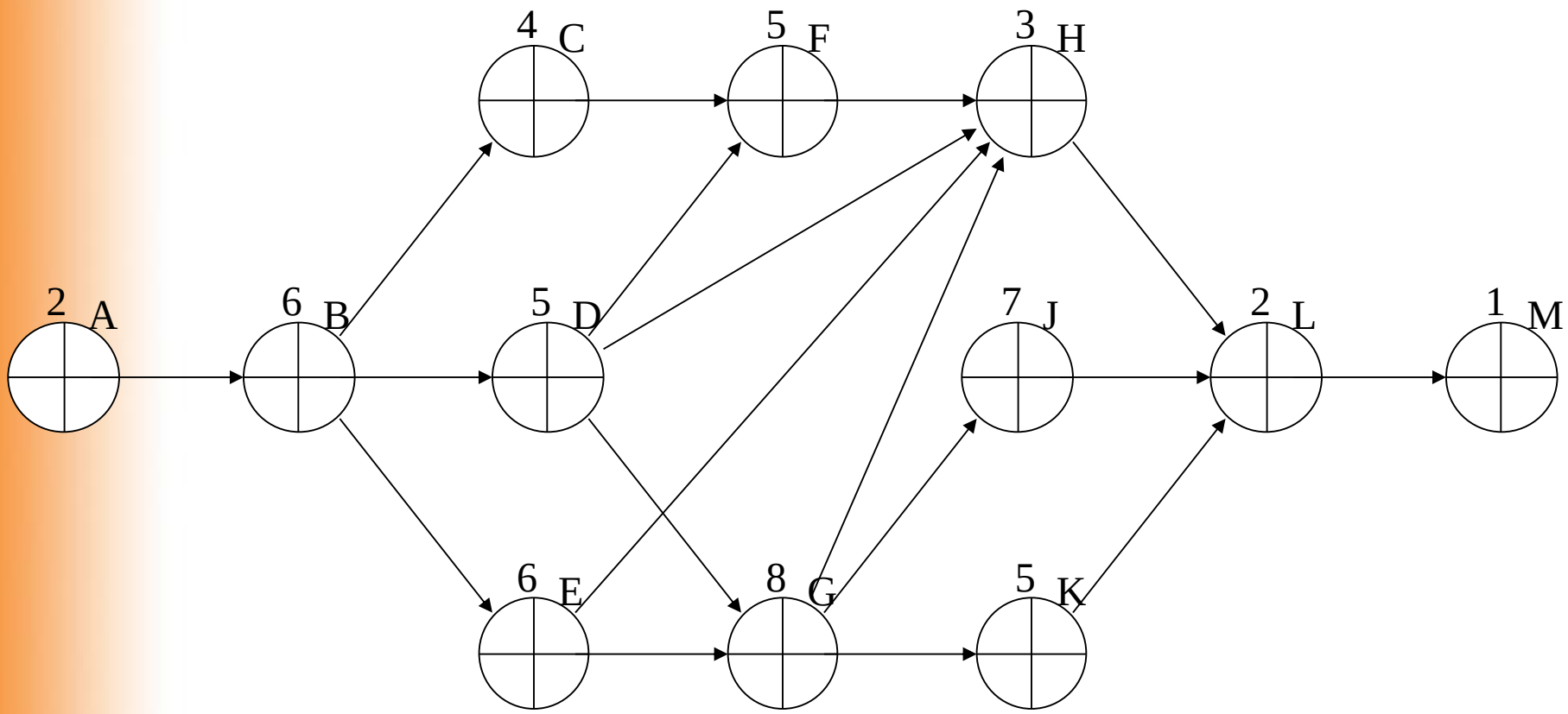
Network Problem 1



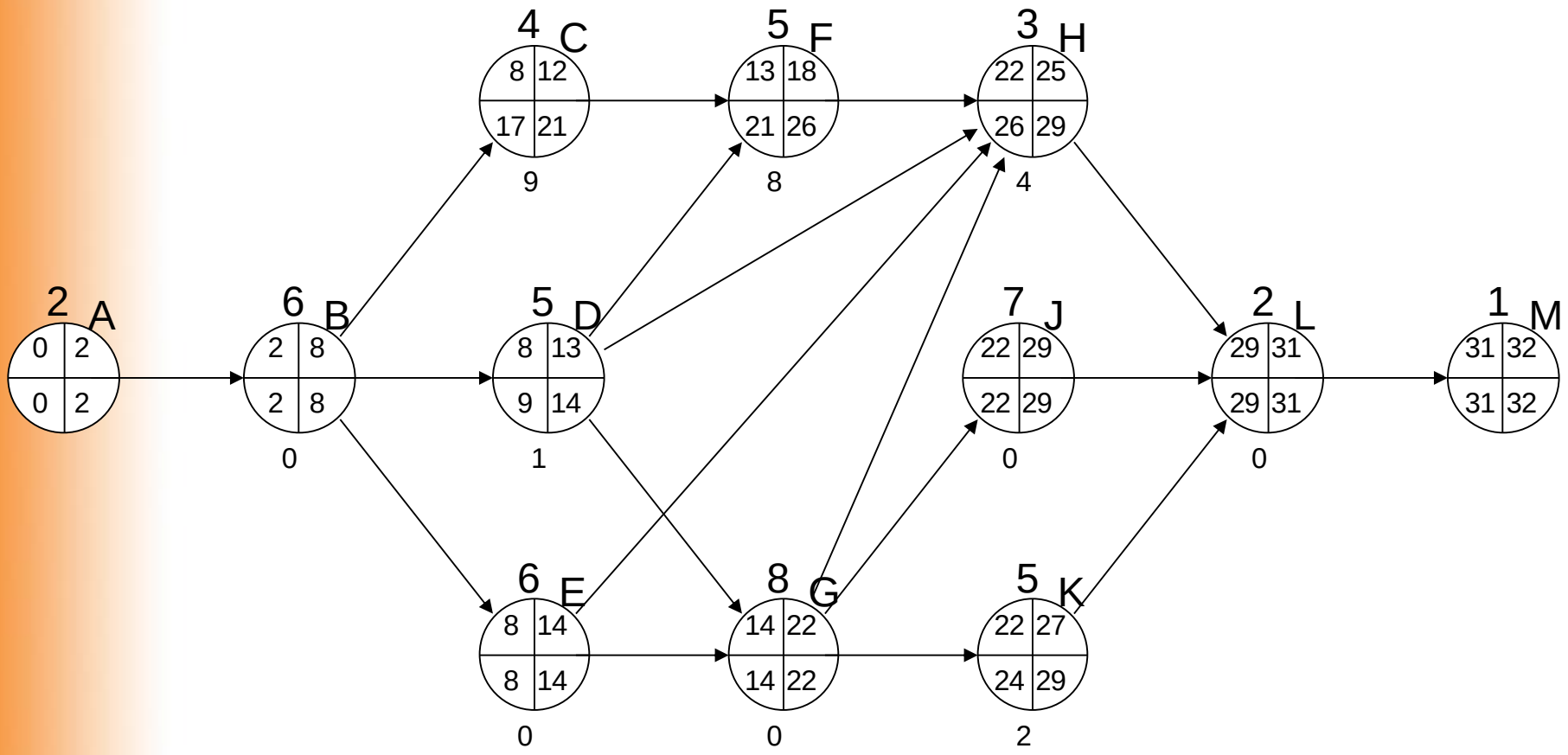
Network Solution 1



Network Problem 2



Network Solution 2



How to Plan a Project?

- Review historical data
- Review Contract
- Review Drawings and Specs
- Communicate

Basic Idea

- Break the job down into its component parts
- Figure out how long each part should take
- Decide the sequence of construction
- Figure out how long the job as a whole should take

Breaking The Job Down Into Activities

- Small/manageable parts
- Individual tasks must add up to the whole
- 20/80 rule

Activity types

- General types
  - Construction
  - Procurement
  - Administrative and support

Activity Types

- Specific types
  - Physical elements
  - Trade, skill or crew (also called task)
  - Contractual division
  - Organizational responsibility
  - Physical or geographic area

System for Description

- Action
- Building element
- Location

Separating the Activities

- Separating actions
- Separating the work items
- Separating areas

The Concept of Level of Detail

- General phase list
- Specific physical element list
- Detailed task list

Tips on Activity List Development

- Brainstorming helps
- Make a large list first, then cull
- Use all sources of information
- Do a preliminary list, then refine

Planning the Sequence of Work

- Establish the Logic/Sequence of all tasks necessary to complete the project

Priority of Relationships

- Physical
- Managerial
- Administrative

Development of the Overall Logic Diagram

- Go from the general to the specific
- Go from large to small
- Go from phase to structure to task

Tips for Establishing Work Sequences

- Consider the perspective of the on site superintendent
- Never let "the computer" dictate sequence
- Remember that scheduling is a creative process

Estimating Duration Times

Rules for Estimating Durations

- Assume each activity will be done normally
- Evaluate each activity independently
- Use consistent time units
- Keep good records as the schedule is developed

Adjustment of Calculated Times (cont.)

- Labor hour productivity does not govern activity time
- Take learning curves into account
- Determine subcontractor activity times
- Apply experience to the final result

Adjustment of Calculated Times

- Round up all times
- Ensure productivity data is used correctly
- More than one type of work in the activity
- Not all scheduled work time is production time

Calculations of Activity Durations

- Labor hour productivity method
- Daily production rate method

Derivation Typical Means Line

- BCCD line 03 30 53.40 3920

Durations Using the BCCD

1. Install 2770 feet reinf conc strip ftg, 36”w x 12”dp
2. Install 760 feet, 3’dp x 12” thk solid CMU fndn wall, parged 1/2” thk
3. Install 620 feet 12’ hi part wall, 2x4 wd stud@16”cc,1/2” std gyp board, tape/fin
4. Install 585 feet 6” dia PVC Sch 40 pipe, cplgs@10’, hangars 3@10’
5. Paint 390 feet x 12’6” hi alum siding, primer + 2 coats ext latex by brush

Goals of the Project Calculation Procedure

- To find starting times for all activities
- To find overall job duration
- To find critical activities
- To determine where we have flexibility

Calculating Overall Job Duration

- Forward Pass
- Backward Pass
- Total Float

Advanced Calculations

- Lagged relationships
  - Start to start
  - Finish to finish
- Constrained dates
  - Start no earlier than
  - Finish no later than
- Calendars
  - Basic calendars
  - Dealing with the effect of weather on project calendars

How to Communicate Schedule Info?

- Use Barcharts
- Don’t Overload People With Information
- Meet Regularly to Review Results and Plan Action

Questions

- Who will use the information?
- What will they need to know?
- How can we design the schedule to provide the proper information at the right time

Monitoring And Controlling The Project

- Good initial plan essential but not enough
- Events occur to alter the plan
- PM must be able to deal with these changes

The Monitoring Process

- Monitor progress
- Compare progress to goals
- Take corrective action

Monitoring Progress

- Determine present status
- Behind? On-time? Ahead?
- How does Present affect Future?

Steps in Updating

- Measure progress of each task individually
- Measure impact of the tasks on the project as a whole

How Often to Update??

- Quarterly?
- Monthly?
- Weekly?
- Daily?

Updating the Individual Activities

- Cases
- Concepts
  - DD
  - PC
  - RD
  - ExF
- Problems with the various update methods

Where to Find Progress Information

- Measure actual work done
- Daily job logs
- Interviewing field personnel
- Job records
- Other areas to check
- Measuring progress on the entire job

Comparing Progress to Goals

- Setting the target schedule
- Displaying the results
- Preventing information overload

Analyzing Job Status

- Baseline/Target schedule
- Do not display Float
- PM considers all legitimate reasons for changing dates

What to look for in project reports

- Status of critical activities
- Activities with low production rates
- Delays in resources delivery
- Activities with more downstream
- Changes in outside factors

Taking corrective action

- The necessity for follow-up
- Types of corrective action
  - Apply more resources
  - Re-examine the logic

The Key Element of Communication

- Consult with all personnel
- Display the information in the clearest possible way
- Communicate regularly