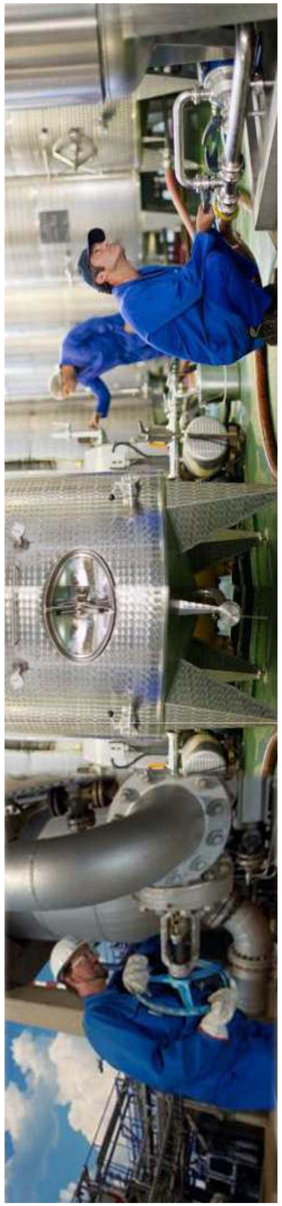
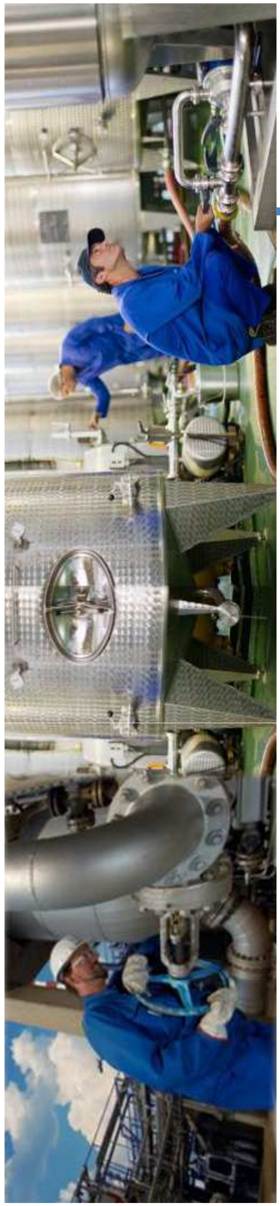
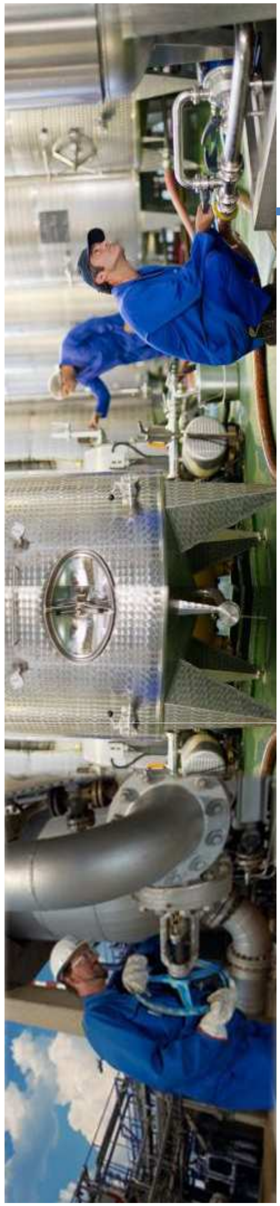


Critical Path Method



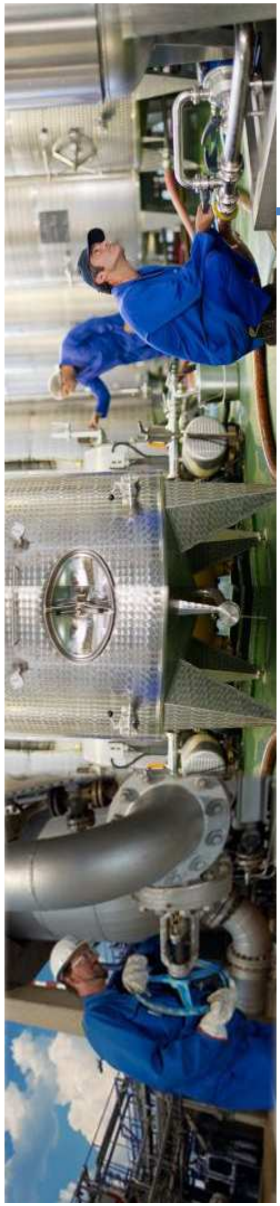
History

- The critical path method (CPM) is a project modeling technique developed in the late 1950s by
  - Morgan R. Walker of DuPont and
  - James E. Kelley, Jr. of Remington Rand.



Application

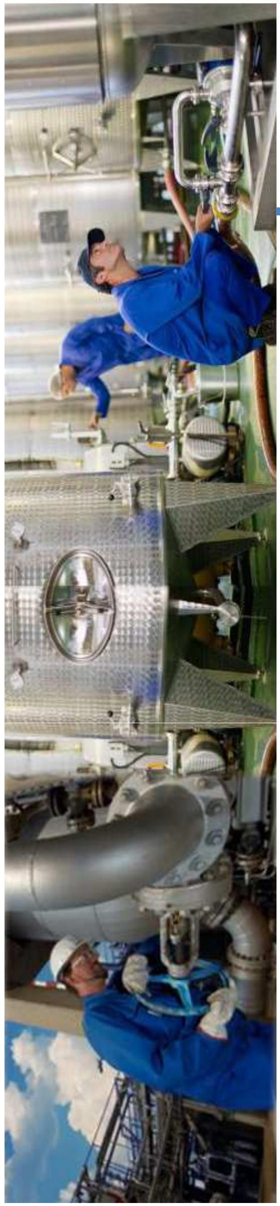
- CPM is commonly used with all forms of projects, including
  - Construction
  - Aerospace and defense
  - Software Development
  - Research Projects
  - Product Development
  - Engineering, and Plant maintenance, among others.
- Any project with interdependent activities can apply this method of mathematical analysis.



Basic Technique

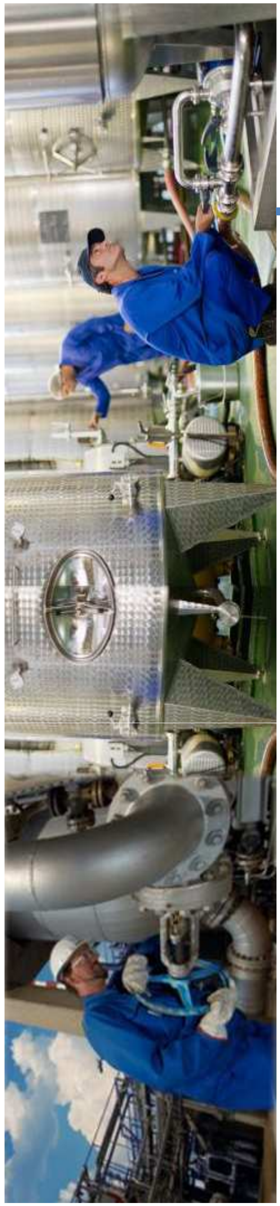
The essential technique for using CPM is to construct a model of the project that includes the following:

- A list of all activities required to complete the project (typically categorized within a Work Breakdown Structure),
- The time (duration) that each activity will take to completion, and
- The dependencies between the activities.



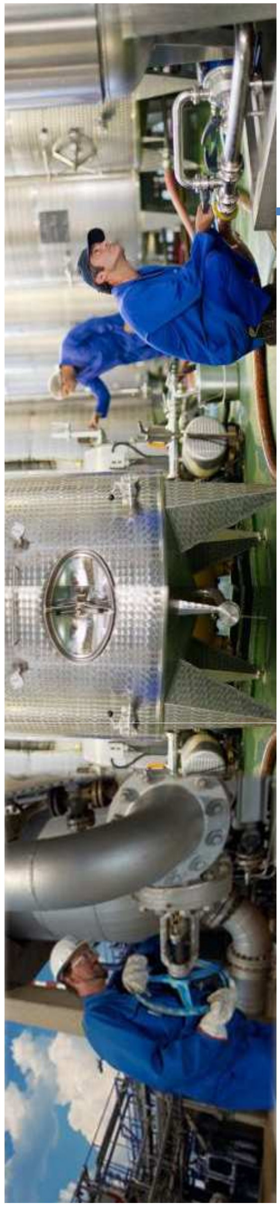
Basic Technique

- Using these values, CPM calculates
  - The longest path of planned activities to the end of the project
  - The earliest and latest that each activity can start and finish without making the project longer.
  - This process determines which activities are "critical" (i.e., on the longest path) and which have "total float" (i.e., can be delayed without making the project longer).



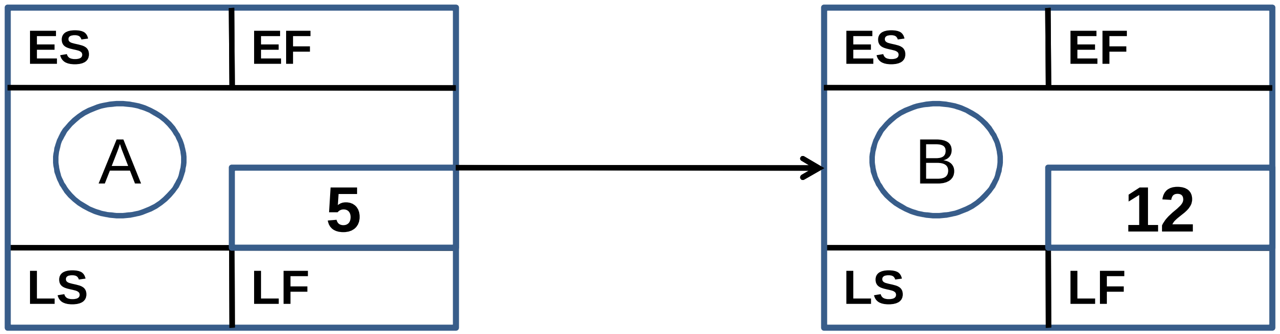
Basic Technique

- In project management, a critical path is the sequence of project network activities which add up to the **longest** overall duration.
- This determines the shortest time possible to complete the project.
- Any delay of an activity on the critical path directly impacts the planned project completion date (i.e. there is no float on the critical path).
- A project can have several, parallel, near critical paths.
- An additional parallel path through the network with the total durations shorter than the critical path is called a sub-critical or non-critical path.

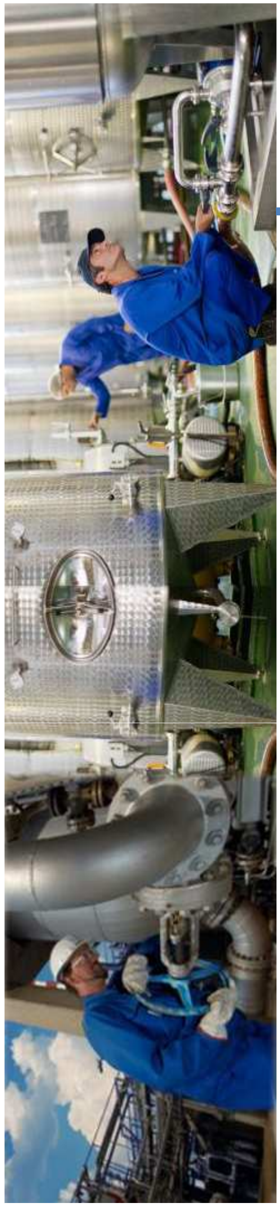


PERT Chart

- Activity-on-arrow diagram ("PERT Chart") is where each activity is shown as a box or node and the arrows represent the logical relationships going from predecessor to successor as shown here in the "Activity-on-node diagram".



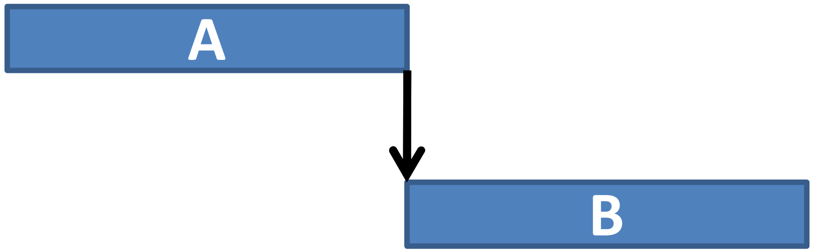
Project baseline CONSULTANTS



Activity Relationships

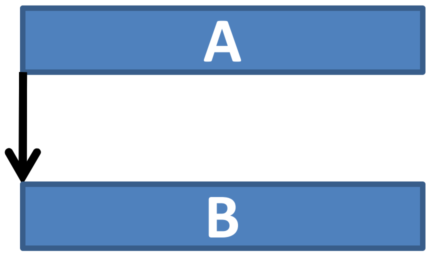
Finish-to-Start (FS):

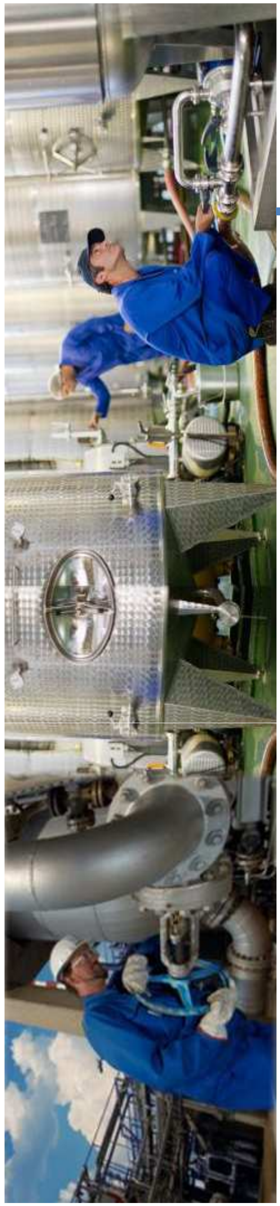
A relationship between activities in which the start of a successor activity depends on the finish of its predecessor activity.



Start-to-Start (SS)

A relationship between activities in which the start of a successor activity depends on the start of its predecessor.

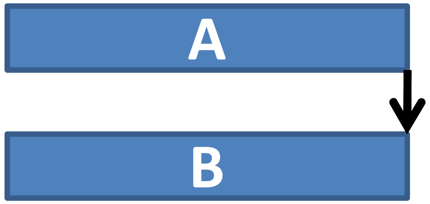




Activity Relationships

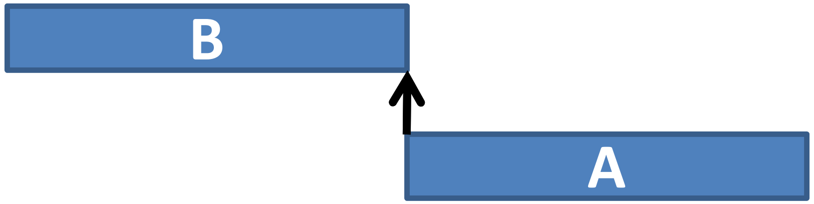
Finish-to-Finish (FF):

A relationship between activities in which the finish of a successor activity depends on the finish of its predecessor.



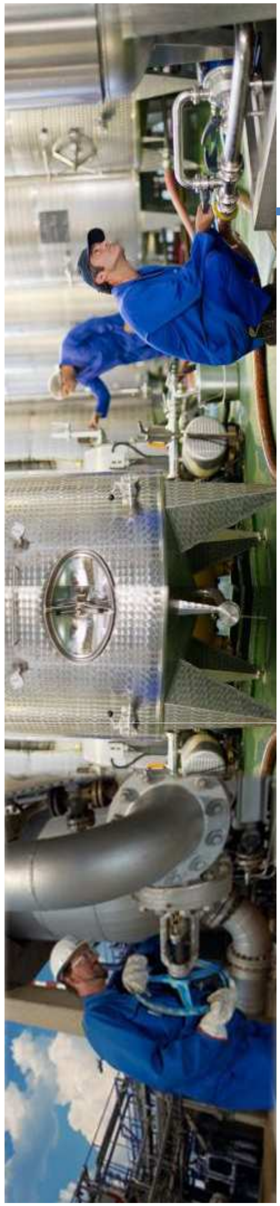
Start-to-Finish (SF):

A relationship between activities in which a successor activity cannot complete until its predecessor starts.

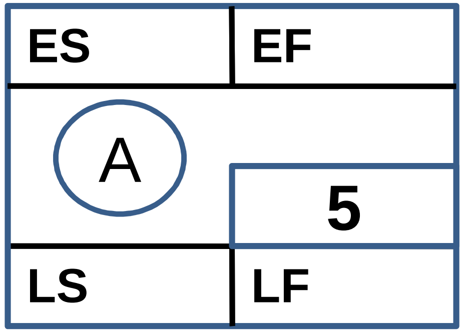


Lags (or Leads):

An offset or delay from an activity to its successor. A Lag can be positive or negative

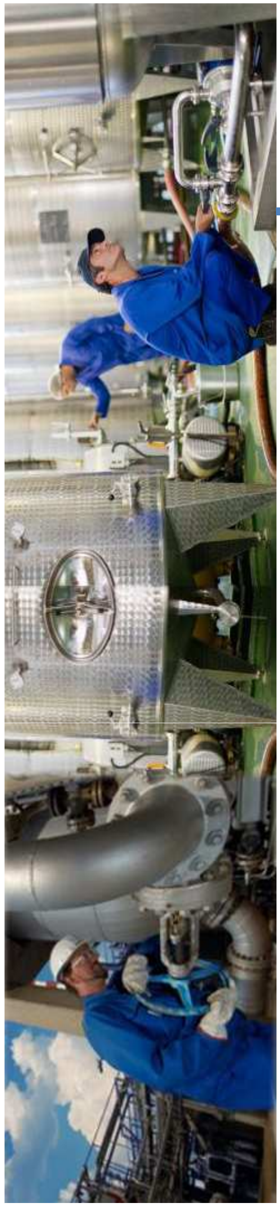


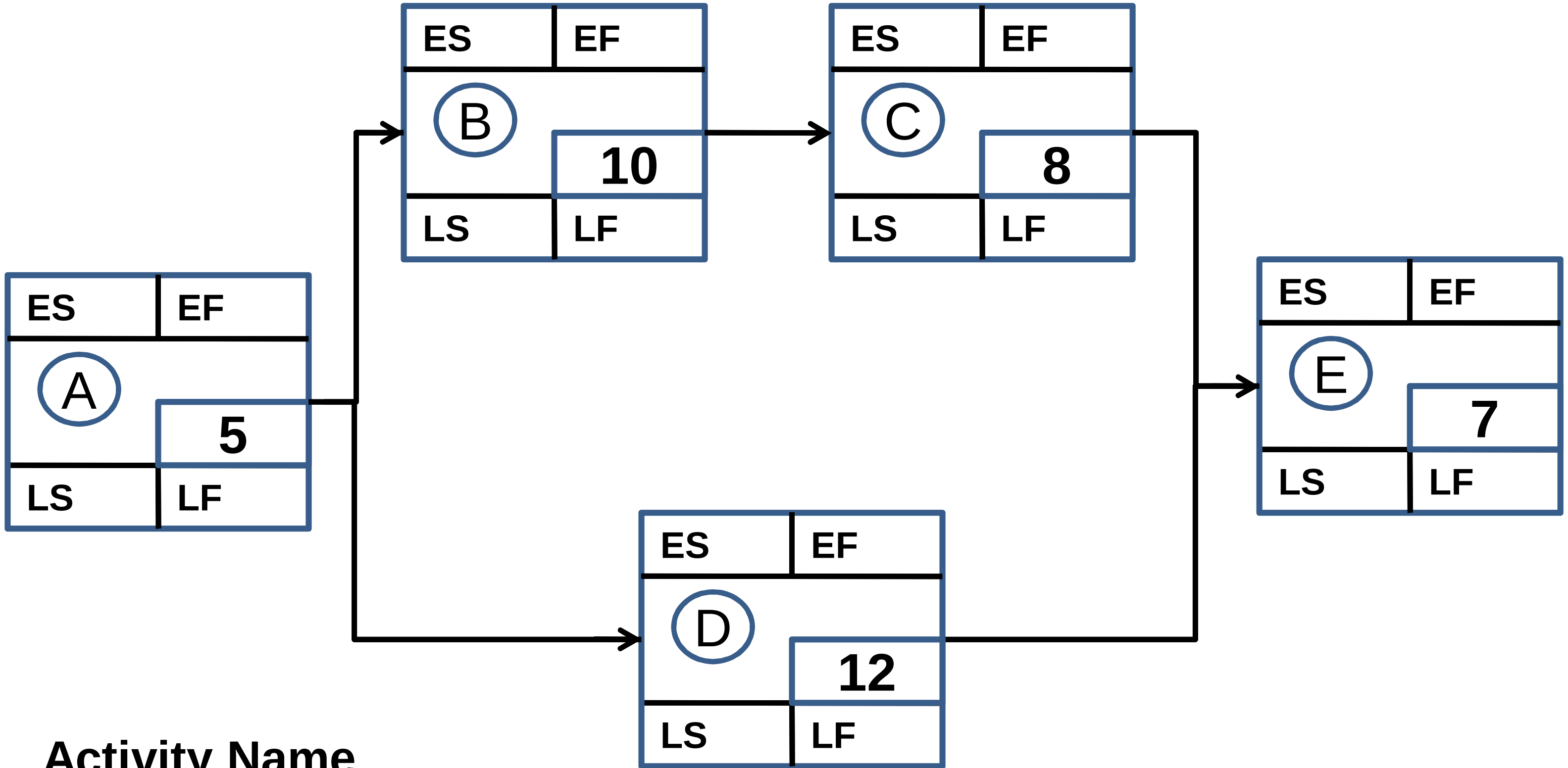
Activity Box



ES = Early Start
EF = Early Finish
LS = Late Start
LF = Late Finish
A = Activity Name
5 = Duration Of Activity

Activity Network Diagram



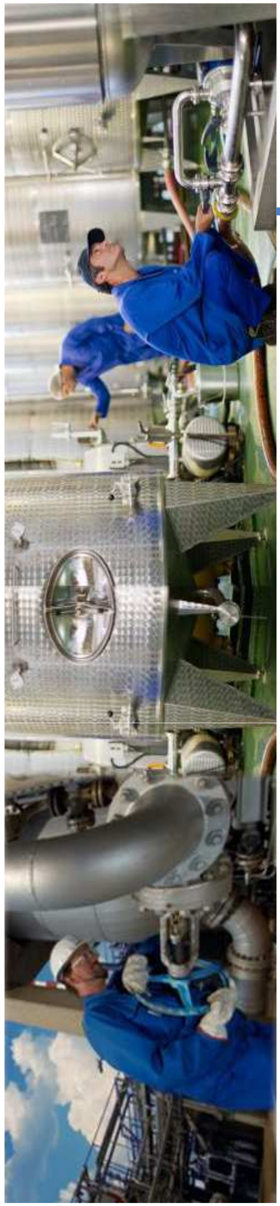


Activity Name

A. Ordering of Pump
B. Pump Manufacturing
C. Pump Transportation
D. Pump Foundation
E. Pump Erection

Assumptions

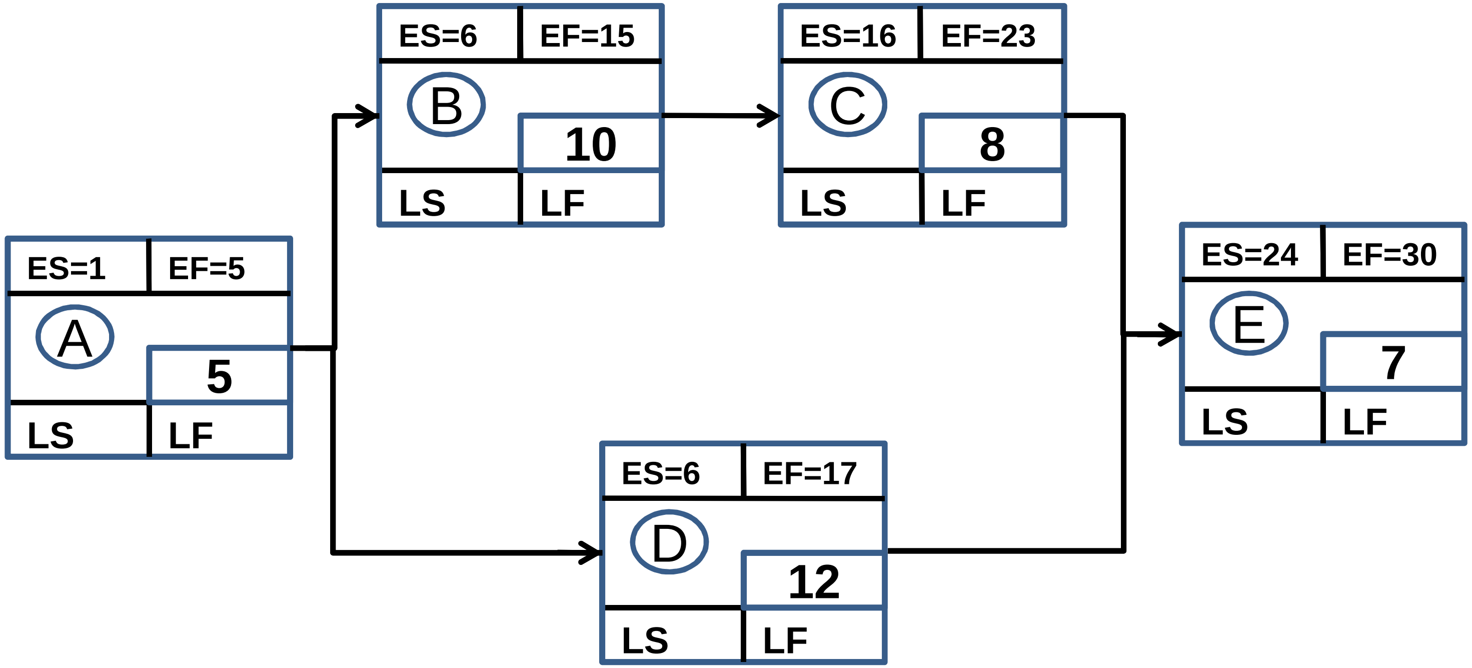
- 7 day work week
- FS – Relationships
- No Lag or Leads



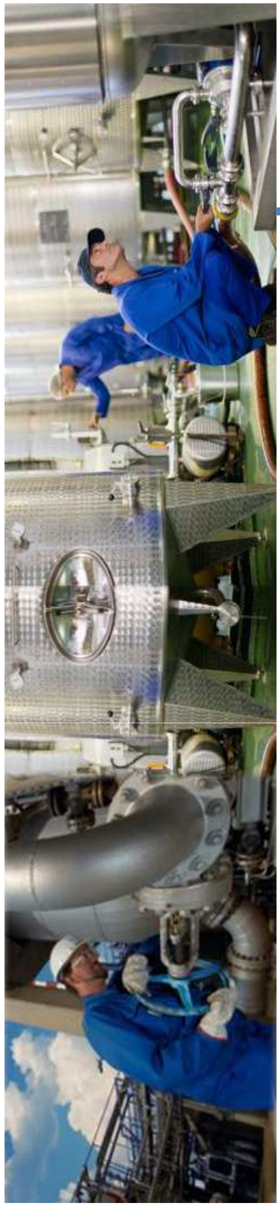
Forward Pass

In Forward Pass Early Dates are calculated

Forward Pass

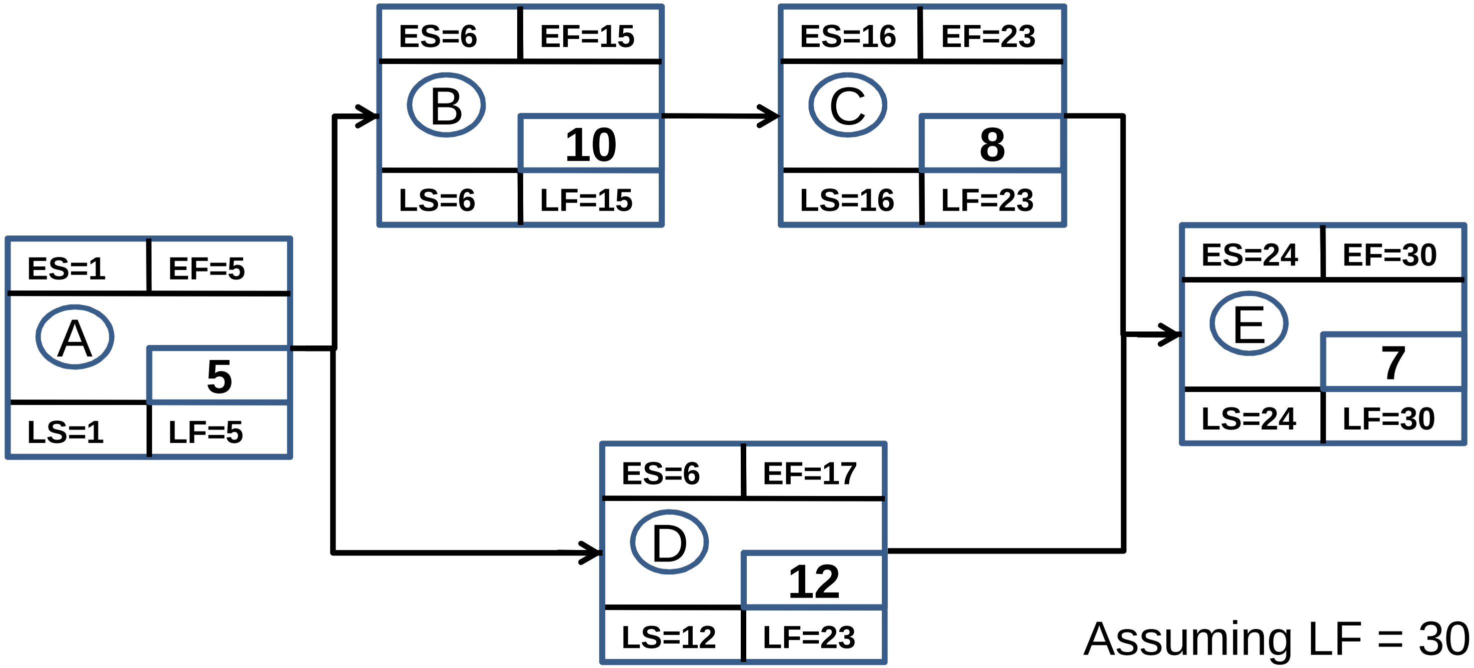


Early Finish = Early Start + Duration - 1



Backward Pass

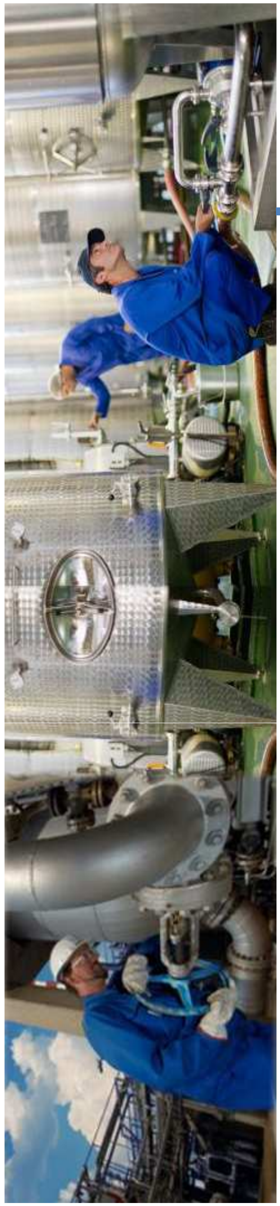
In Backward Pass Late Dates are calculated



Assuming LF = 30

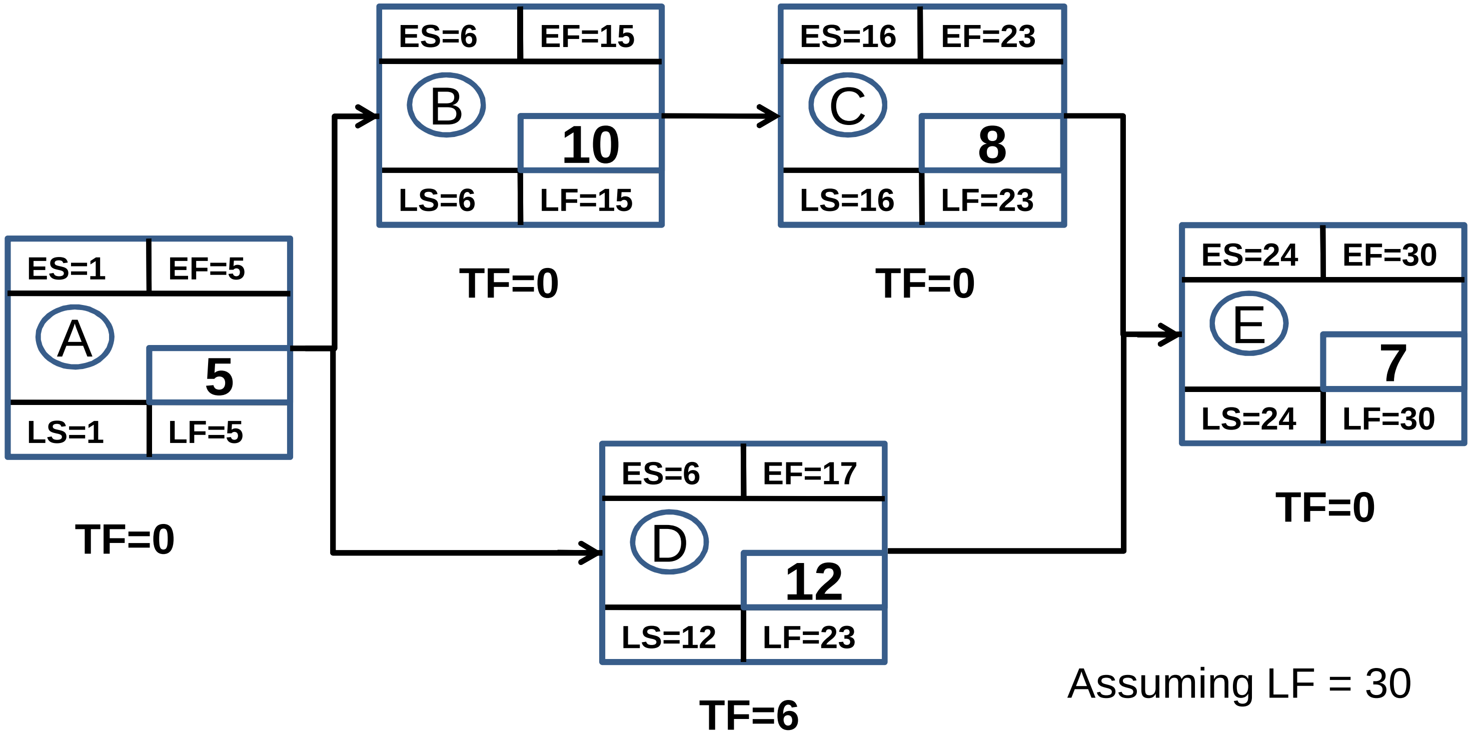
Backward Pass

Late Start = Late Finish - Duration + 1



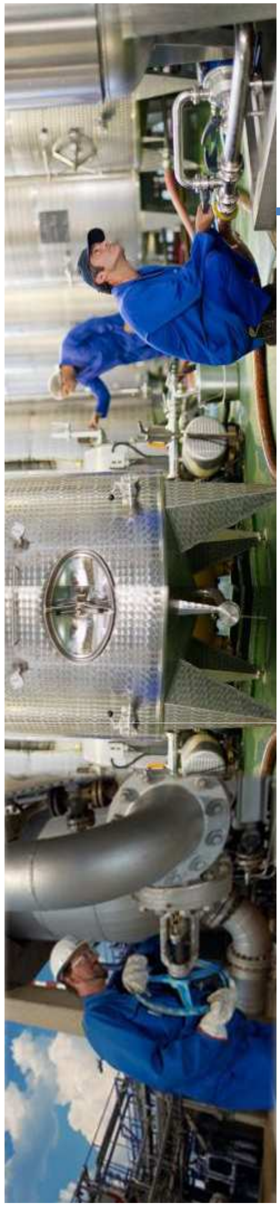
Total Float

Total Float = The amount of time the activity can be delayed before delaying the Project Finish Date



Assuming LF = 30

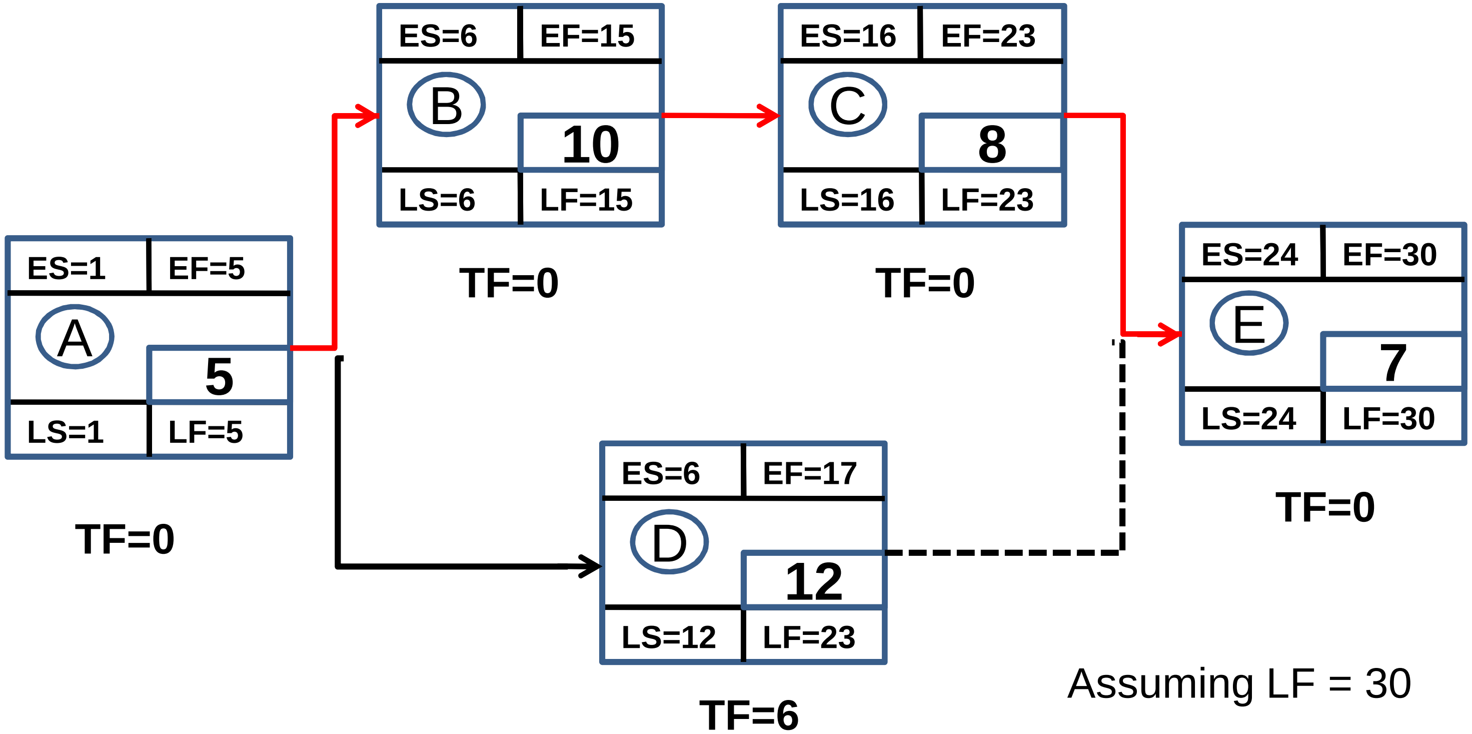
Total Float = Late Finish – Early Finish
or Late Start – Early Start



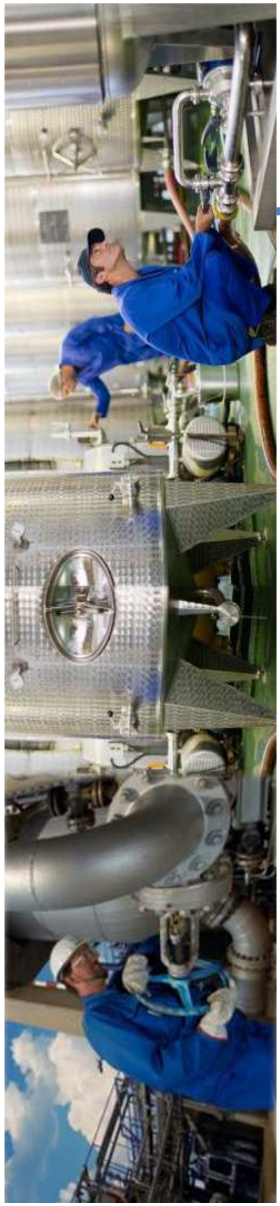
Critical Path – Scenario-I

Scenario – I Late Finish of the project = 30

Activities with Total Float =< 0 are on the Critical Path



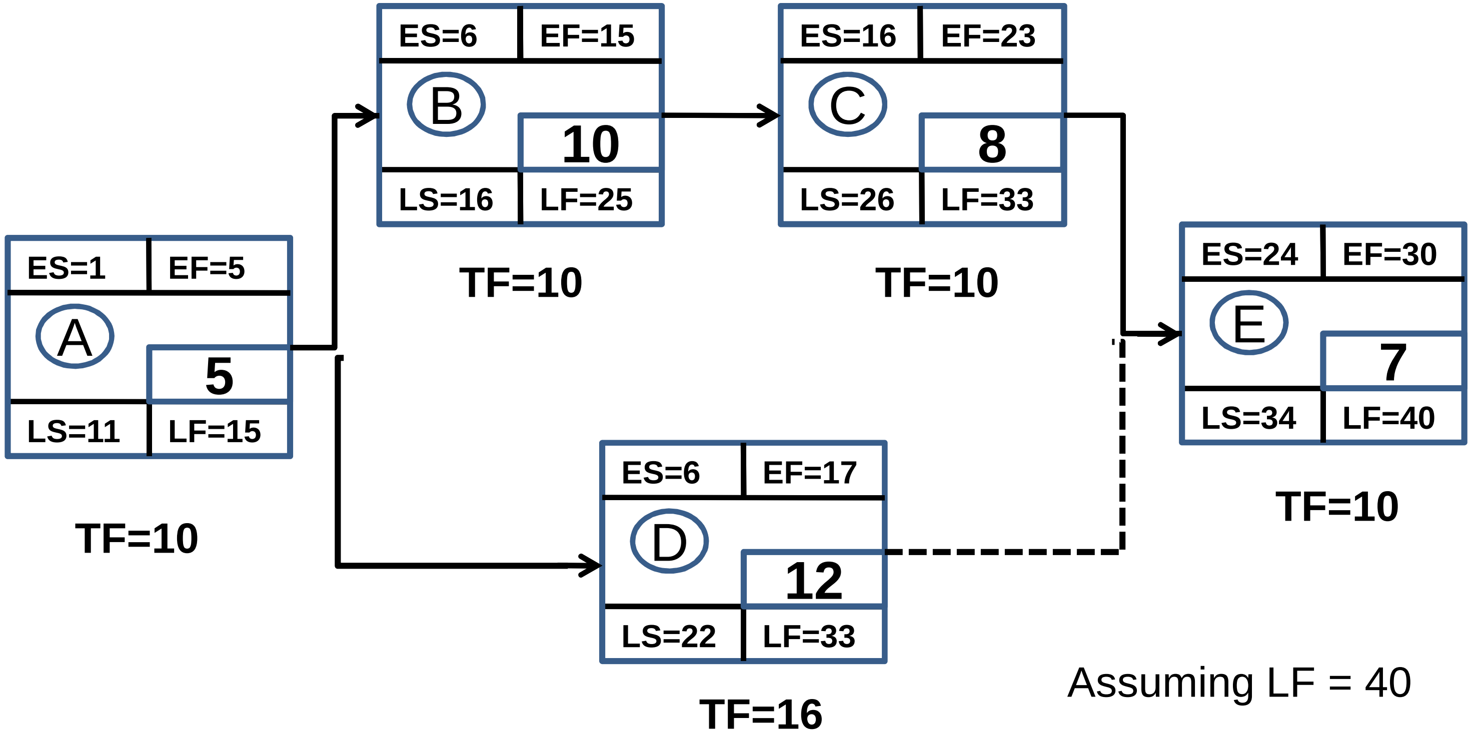
Activities A, B, C and E are on the Critical Path (Longest Path)
Activity D can be delayed by 6 days before delaying the finish date of the Project



Critical Path – Scenario-II

Scenario – II Late Finish of the Project is greater than 30 i.e. 40

Activities with Total Float =< 0 are on the Critical Path



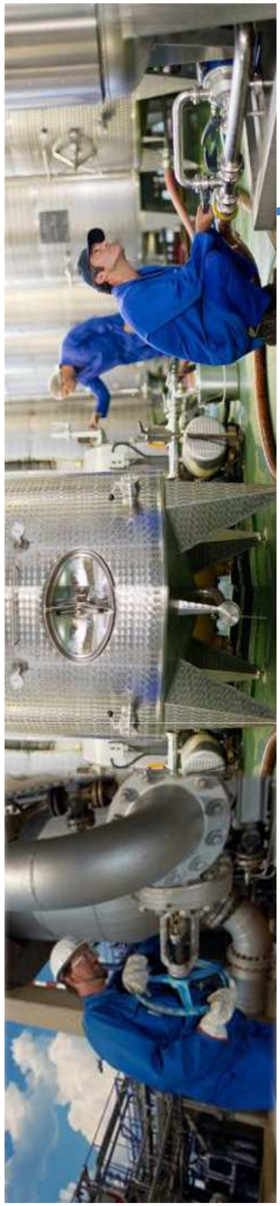
Assuming LF = 40

There is no critical activittes

But the Longest path is Activities A, B, C and E

For Activity E, C is a driving activity as Finish Date of C determines the Start Date of E

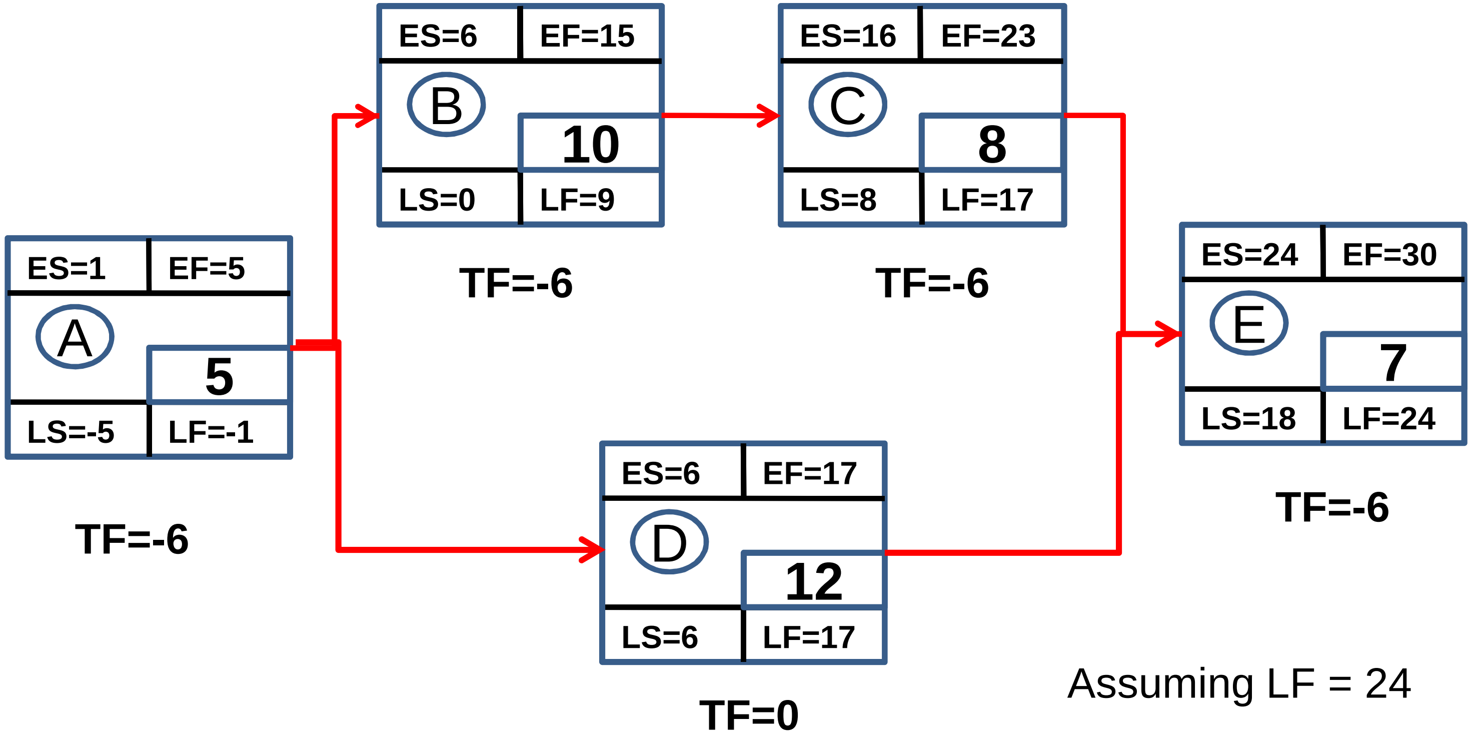
And D is Non Driving



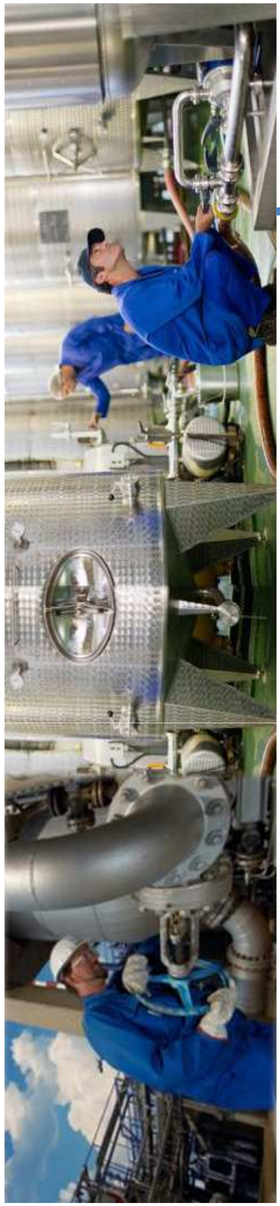
Critical Path – Scenario-III

Scenario – III Late Finish of the Project is Less than 30 i.e. 24

Activities with Total Float =< 0 are on the Critical Path

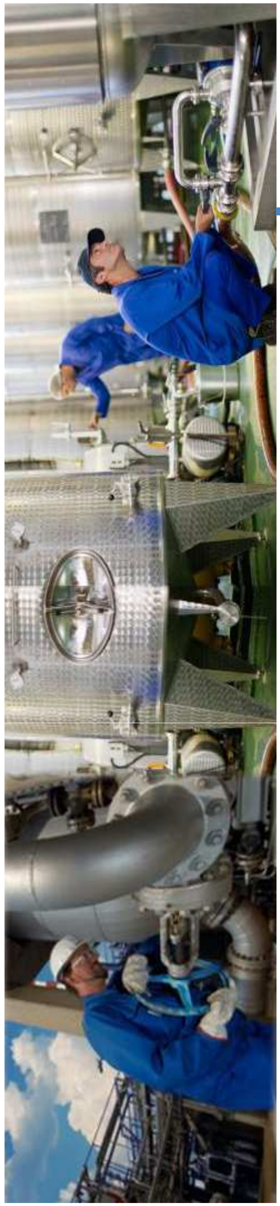


All the activities are critical



Total Float

- Positive Total Float
  - We can delay the activity
- Zero Total Float
  - We cannot delay the activity
- Negative Total Float
  - The activity is already delayed



Crashing Of Project

It is a project Schedule Compression, which is performed for the purpose of decreasing total Period of the project.

Different Methods of Crashing of the Activities:

- First Crash Activities on the Critical (Longest) path.
- Change the Relationships : FS to SS
- Change the lags between activities
- Reduce the Duration of activities
- Increase the Resources
- Change the Working time : 5 day workweek to 6/7 day workweek

Project baseline CONSULTANTS