

CHAPTER 7

ARROW DIAGRAMING SYSTEM

7-1. Arrow Diagraming.

a. Activities. The activities from the project breakdown are shown as arrows. An arrow on the diagram represents an activity requiring time flowing from the tail to the head of the arrow (Figure 7-1). The description of the activity is usually shown above the arrow. The arrow can be drawn in any direction; however, the conventional flow is from left to right. Durations are estimated just as in the Precedence system and are usually shown below the arrow.

b. Events. Any time period must begin at some point in time and end at some point in time. These points in time are called "events" or nodes and are shown as circles on the diagram. There must be an event, or node, at each end of an arrow (Figure 7-2). Each activity can start at only one event and end at one other event.

c. Logic Diagraming. Activities recorded on the diagram are interrelated through the events using the same considerations as in the Precedence system. An event can be the end point for one or more activities as well as the start point for others. Figure 7-3 indicates that "B" cannot be started until "A" is finished. Any two or more activities which can be started at the same point in time (Figure 7-4) or finished at the same point in time, (Figure 7-5), are said to be concurrent or parallel. In Figures 7-4 and 7-5, "C", and "D" are concurrent or parallel activities and "E" and "F" are concurrent or parallel. If "C" and "E" are in sequence and "D" and "F" are also in sequence, the path "CE" is parallel or concurrent with "DF" as shown in Figure 7-6.

d. Restraints/Dummy Activities. When two or more activities must be finished before another activity can be started, the restraining activities must terminate together at the event from which the succeeding activity begins. Figure 7-7 shows that "P" cannot start until both "M" and "N" are finished. If another activity "R" is introduced and is restrained by "N" only, "R" could not be shown starting from the common event without indicating a false restraint by "M". A restraint or dummy activity, shown as a dashed arrow, is used which indicates flow of dependency but not time or work. A restraint is quite similar to the arrows

used in Precedence. In Figure 7-8 the start of activity P continues to depend on the completion of both activities M and N while the start of activity R is restrained only by the completion of activity N. A restraint normally has 0 duration.

e. Activities are identified which will reveal the logic developed on the diagram. This is easily done by assigning numbers to the events on the arrow diagram. An activity then can be identified by the combination of the initial (i) event number at the tail of the arrow and the terminal juncture (j) node at the head, the i-j number serving to identify the activity. Unlike the Precedence system, this numbering should be done sequentially with the (j) event number always higher than the (i) number. Such numbering avoids logic errors called loops. Also the i-j number for each activity should be unique to that activity. At times a numbering dummy is inserted to accomplish this, when two activities would otherwise have the same i and j event numbers (See Figures 7-10 & 7-11). It is a good idea to skip numbers in a network to allow for adding logic without violating the numbering system.

7-2. Analysis. The breakdown of a project, development of logic, and estimates of duration times for individual activities can be done manually or using a computer. Analysis is normally accomplished by computer once the logic and durations are entered. The management data which results from the analysis in the Arrow diagramming system is very similar to that obtained in the Precedence system. There are some differences such as the logic can be understood from the (i) (j) listing and no predecessor-successor report is needed. There are Early Event Times and Late Event Times distinct from the Early and Late Starts and Finishes. Some of these are identical and some are not. The Arrow system does not have the Start-to-Start and Finish-to-Finish features of the Precedence system so, to duplicate this logic, activities must be broken into more detail. Dummies, used in logic development, should be erased from working reports where they serve no purpose but they should be retained in the i-j and the total float reports. The Critical Path consists of a chain of activities with 0 float. It may contain dummies.

DESCRIPTION →



Figure 7-1
Activity

Figure 7-2
Events or Nodes



Figure 7-3
Activities in Sequence

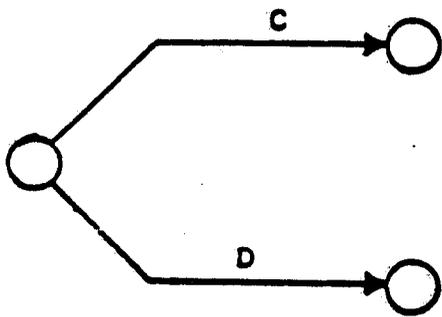


Figure 7-4
Concurrent or Parallel Activities

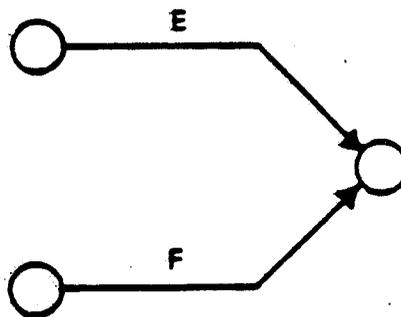


Figure 7-5

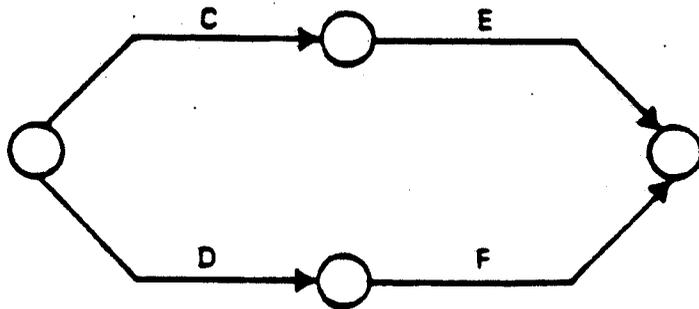


Figure 7-6
Concurrent or Parallel Paths

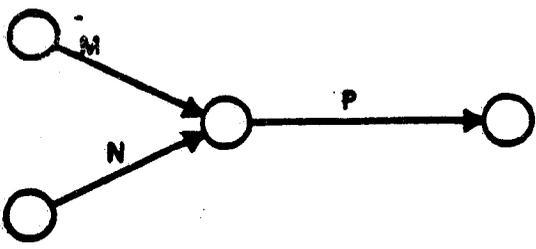


Figure 7-7
Two Activities Restraining One Activity

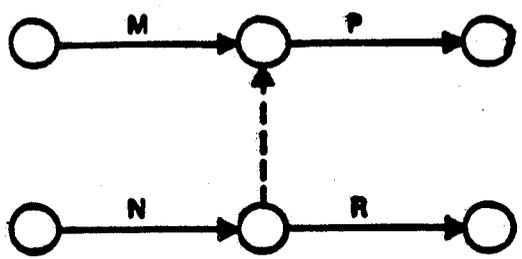


Figure 7-8
The Logic Dummy

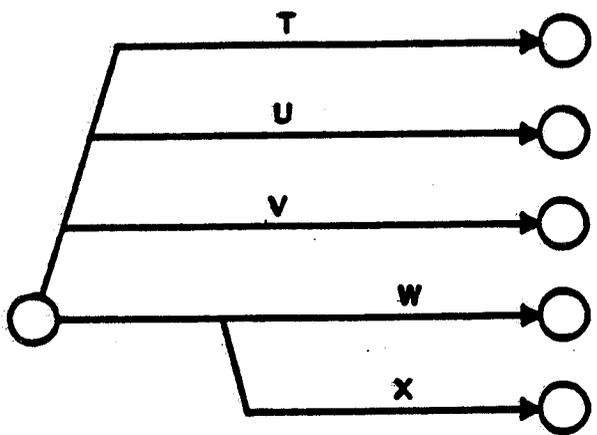


Figure 7-9
Common Lines - Separate Activities

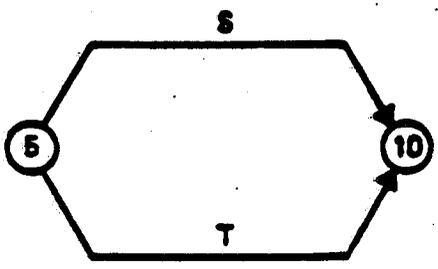


Figure 7-10
The Numbering Dummy

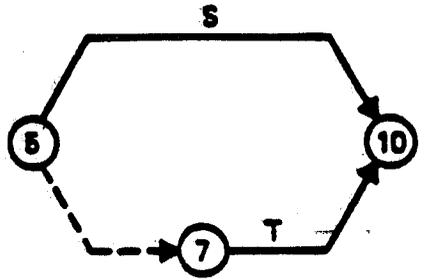


Figure 7-11