CHAPTER5
PRECEDENCE DIAGRAM

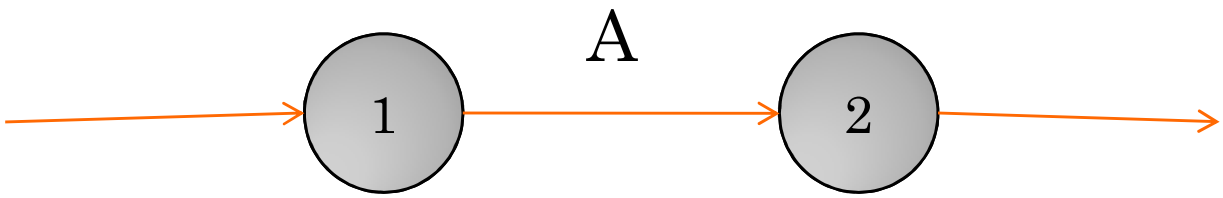
DEFINITION AND INTRODUCTION

Precedence networks are node networks that allow for the use of four types of relationships: finish to start (FS), start to start (SS), finish to finish

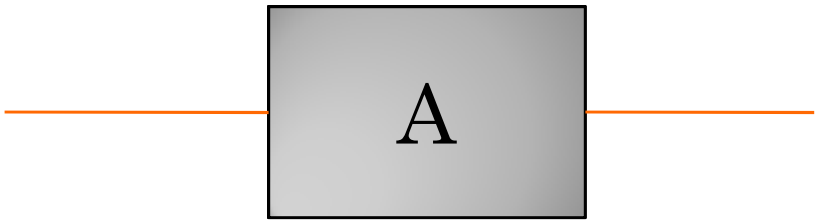
Advantages of using Precedence Diagram:

1. No dummy activities are required.
2. A single number can be assigned to identify each activity.
3. Analytical solution is simpler

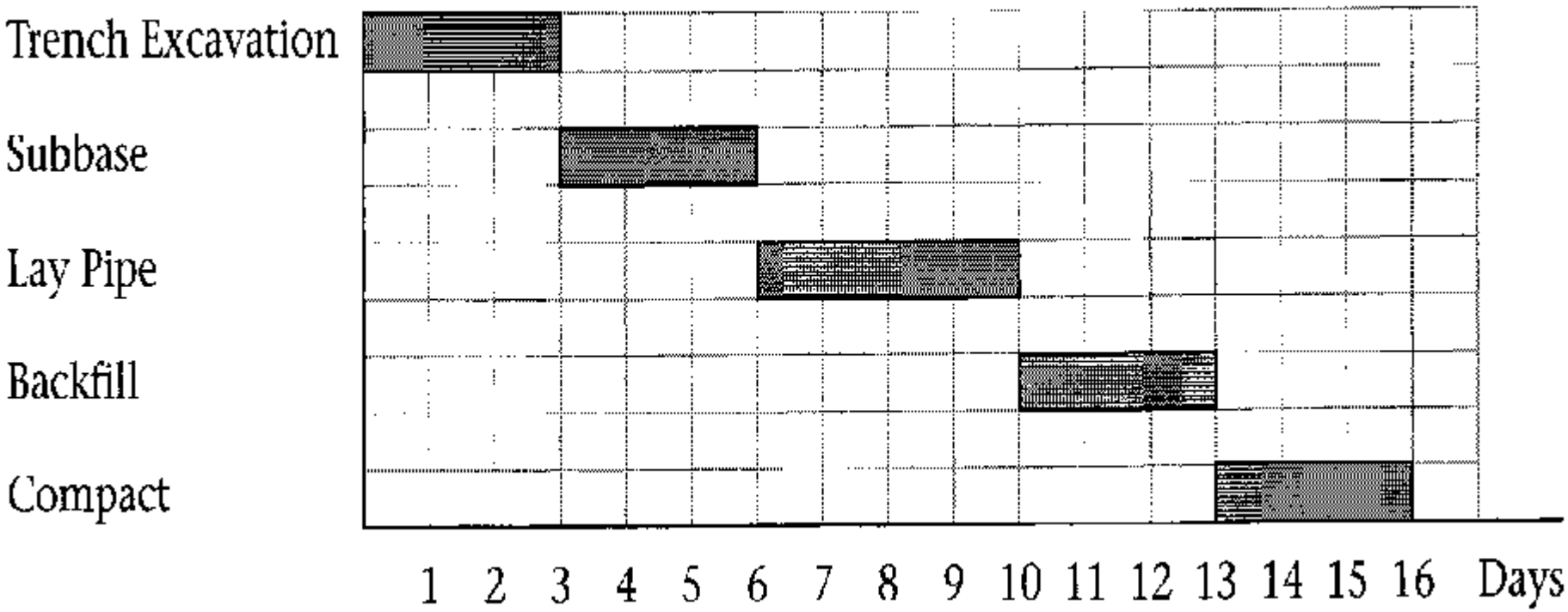
Difference between Arrow diagram and precedence diagram

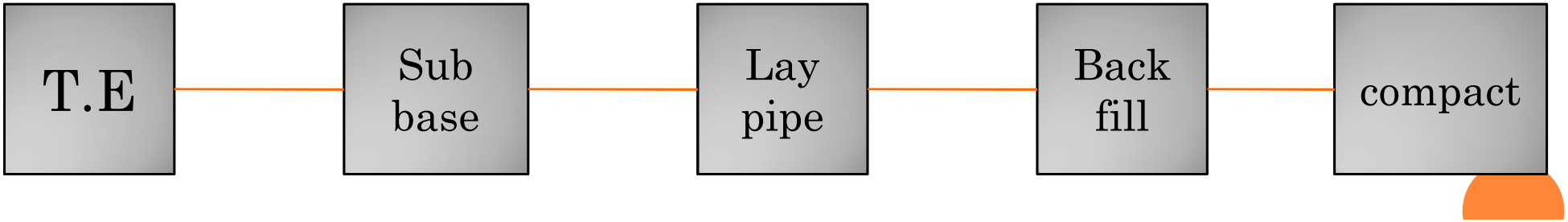


Arrow diagram



Precedence Diagram

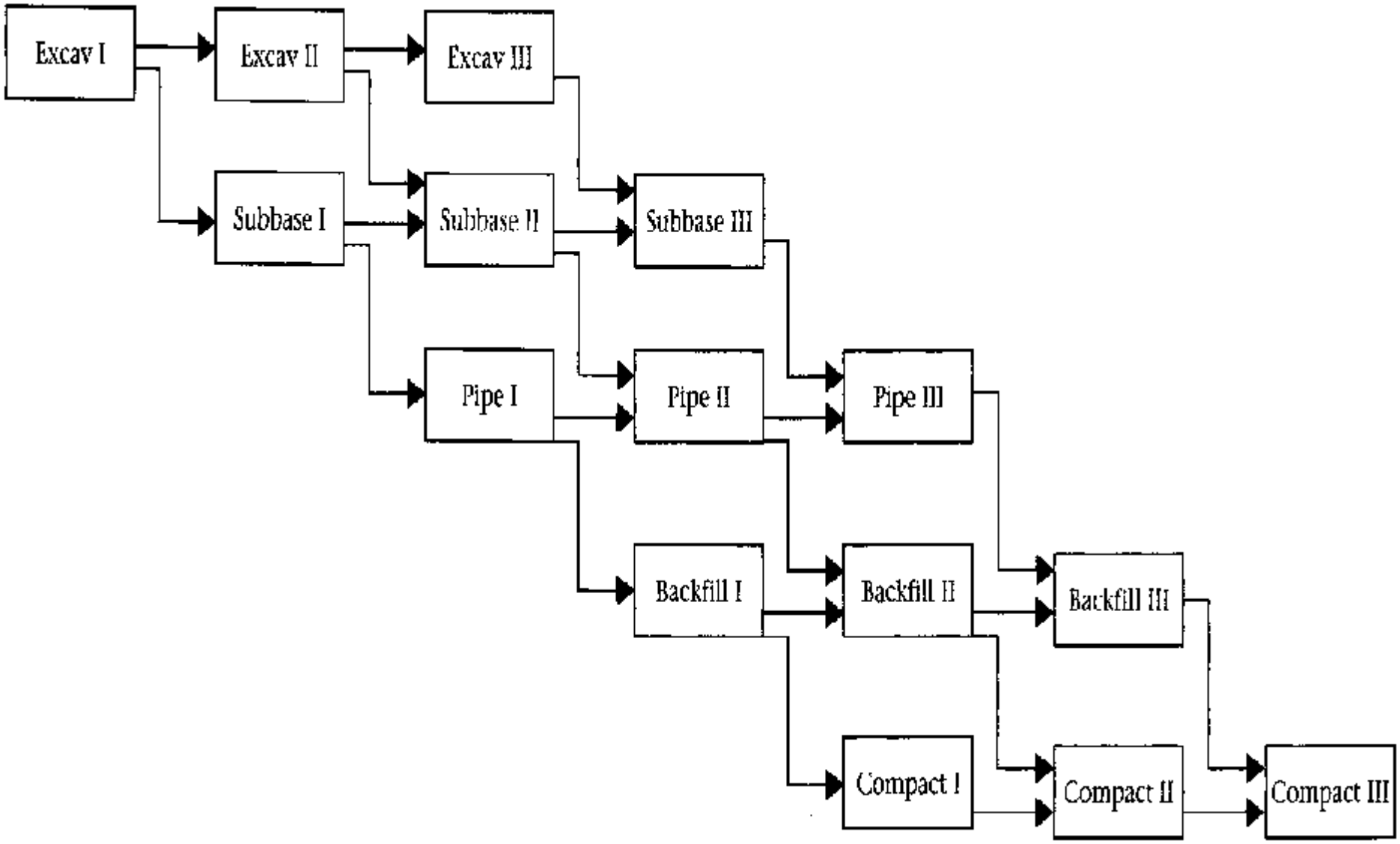




Precedence diagram

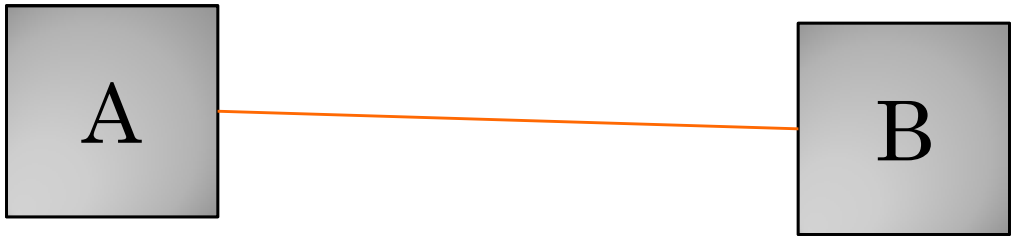
CON.

- The project can be represented in Other way which called ***<u>The stair type relationship.</u>***
- In this method each activity divided into many parts as shown below



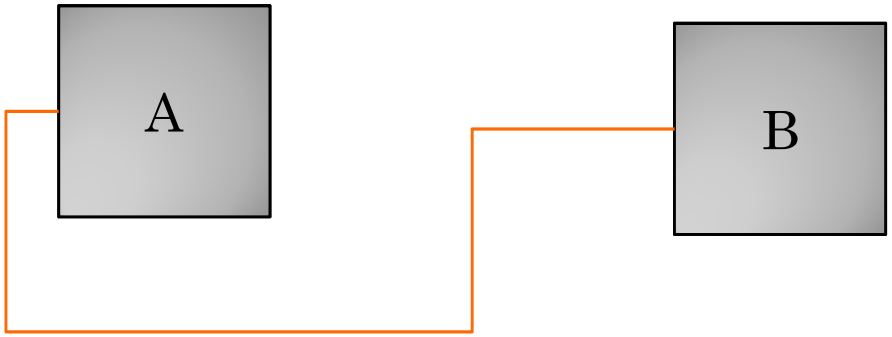
THE FOUR TYPES OF RELATIONSHIPS

1. ***Finish-to-start (FS) relationship.*** The most common type of relationship is the FS relationship. Many project managers still insist on using only this type. Many examples of this type exist, such as the following:
   - The concrete cannot be placed (poured) until the formwork has been built.



2. ***Start-to-start (SS) relationship.*** The SS relationship is common and extremely useful. Examples of this type are as follows:

- Excavation for the foundation cannot start until clearing and grubbing begins (usually with a certain lag; i.e., a certain percentage is finished).



3. ***Finish-to-finish (FF) relationship.*** The FF relationship is also common and useful. Examples of this type are as follows:

- Backfilling a trench cannot finish until the pipe in the trench has been laid.

4. ***Start-to-finish (SF) relationship.*** The SF relationship is uncommon and almost nonexistent in construction projects.

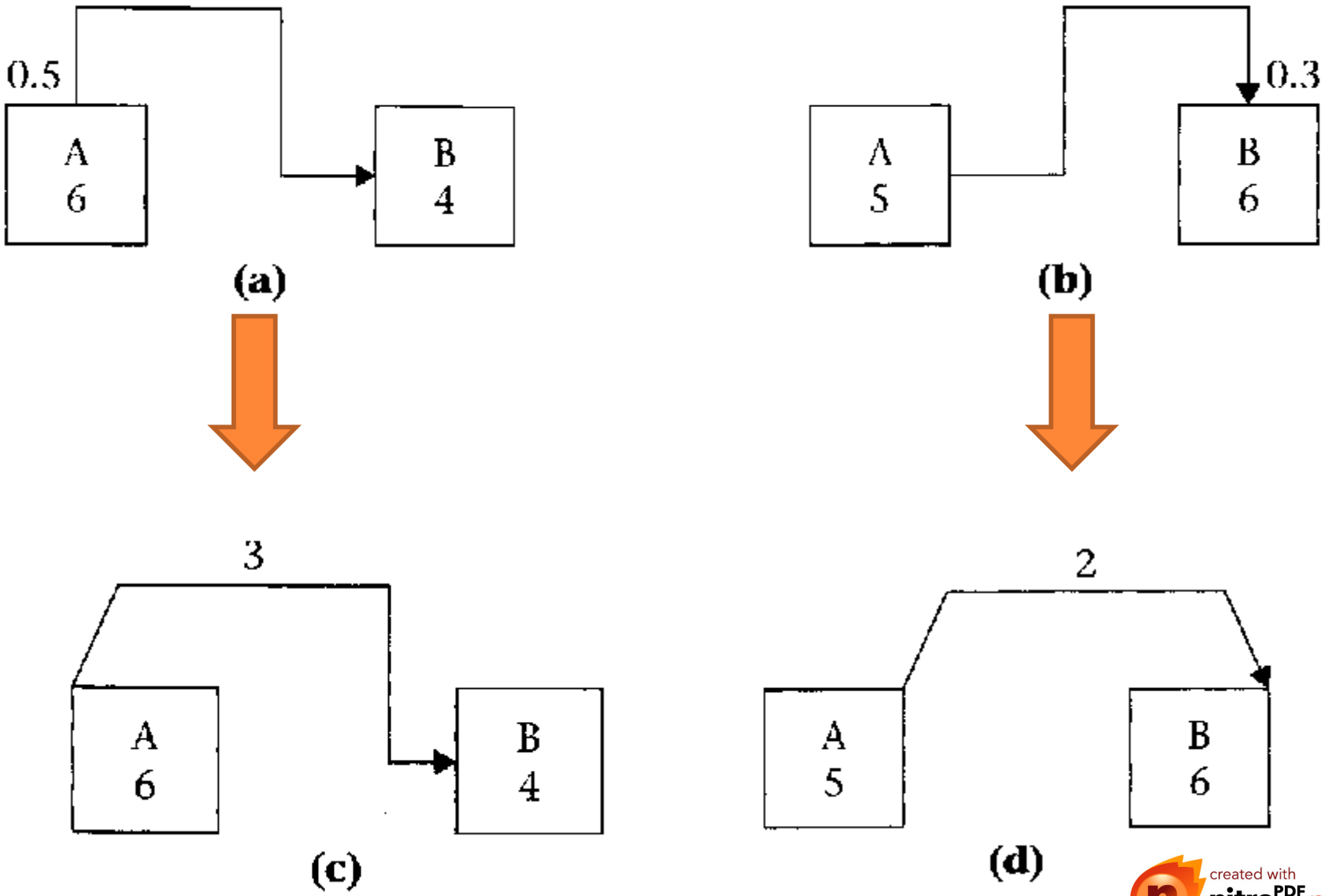
Important Comments About the Four Types of Relationships

1. Practically, the only two types of relationships that can be combined are SS and FF.

2. You can always use lags and leads with the four relationships. In fact, you will have more need to use lags with SS and FF relationships than with the traditional FS relationship.

3. With regard to critical path method (CPM) calculations (discussed later in this chapter), when you are using a combination relationship (SS and FF), usually only one of the two relationships becomes binding (driving). This situation may change if some criterion—such as duration, lag, or logic—changes.

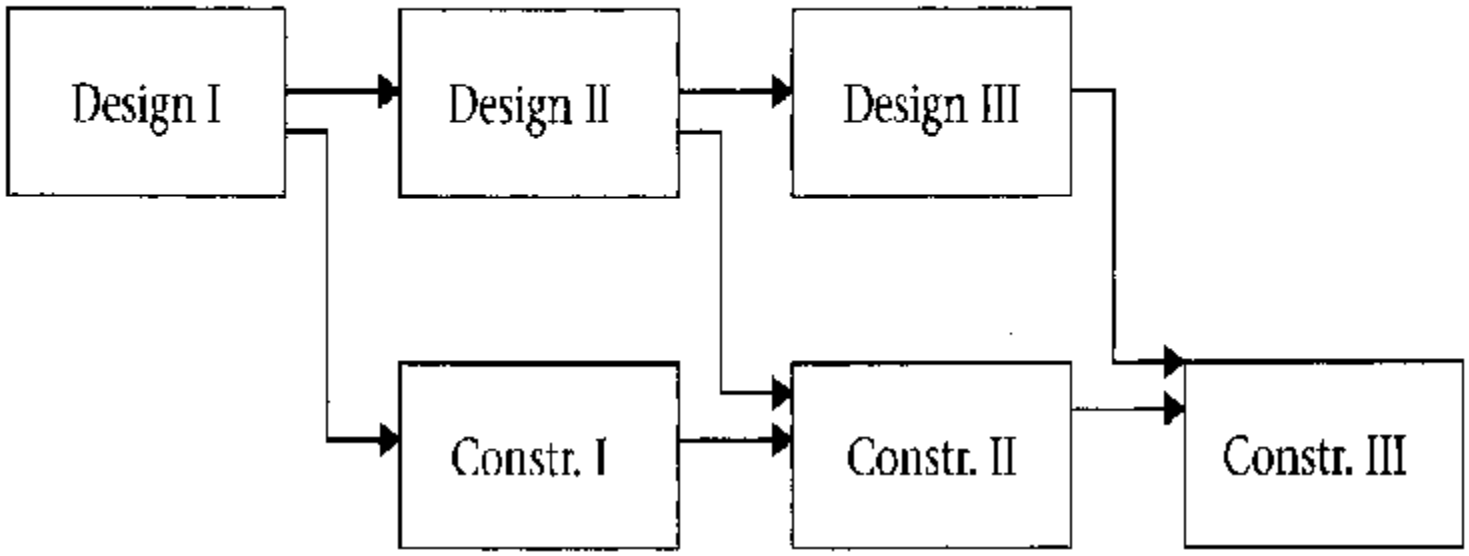
THE PERCENT COMPLETE APPROACH



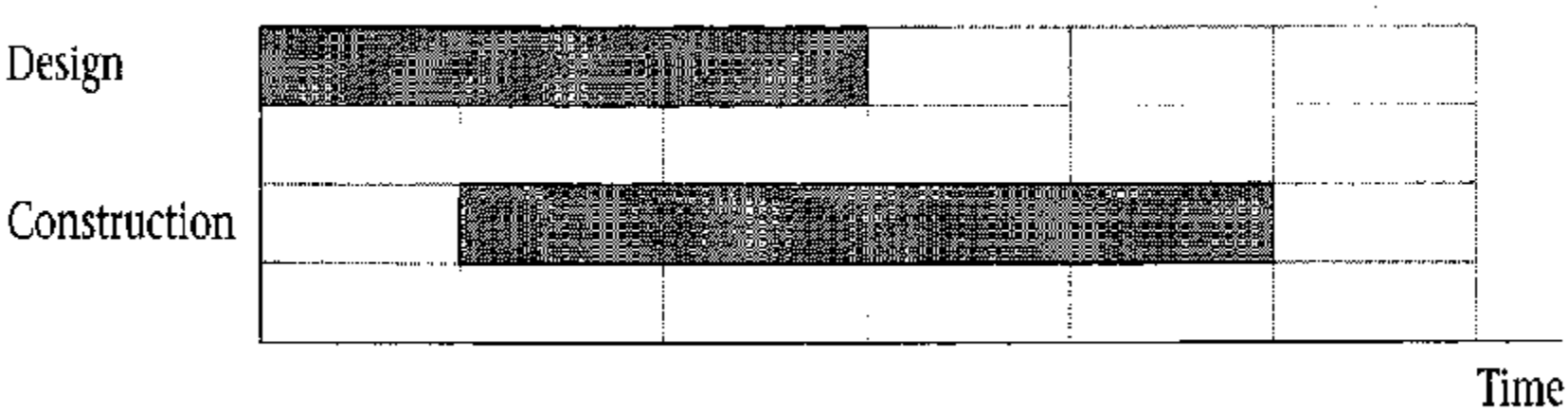
FAST-TRACK PROJECTS

What it does mean?

fast track in the construction world means starting the construction process while the design is still under development. Under normal circumstances (i.e., the traditional way), the design must be complete before construction can start. In some situations, time may be so tight that the owner or project management team decides to "fast track" the project. In this case, the design portion is divided into several phases, and it proceeds along with construction, as shown in Figures 5.9a and 5.9b.



(a)



(b)

The Simplistic Approach

1. In chapter 4 (arrow and node diagrams), we had only the FS type of relationship. Activities were always connected in only one way: from the end of an activity's predecessor to its start, and from its end to the start of its successor. In precedence diagrams, we use four types of relationships. Thus, you must be careful about the type of relationship chosen. An activity can be controlled (driven) not only from its start, but from its end as well.
2. In precedence diagrams, we may use combination relationships (mainly SS and FF). Doing so creates a condition in which each relationship yields a different set of dates, but one set prevails. Let us go

3. Note that unlike in chapter 4, the durations may not be equal to $EF - ES$ or $LF - LS$. Furthermore, all or some of the total float may be restricted. This will be elaborated in the detailed approach (discussed subsequently). Total float is always calculated by using this simple equation:

General Notes About the Simplistic Approach

Two points about the simplistic approach should be noted

1. The position of the relationships (i.e., from top or bottom) is left to the user's discretion and has nothing to do with the choice of early or late dates.

2. We may have **dangling activities** in precedence diagrams. Dangling activities are tied from one end only. In other words, dangling activities have either no predecessors or no successors. As mentioned previously, we like to always start the network with one activity (e.g., Notice to Proceed) and end it with one activity (e.g., Final Completion).

Four time values associated with each activity:

1.ESD (Early Start Date)
is the earliest point in time that any activity bursting from its beginning node can start.

2.EFD (Early Finish Date)

is the earliest point in time that any activity can be finshed

3.LSD (Late Start Date)
Is the latest point of time that any activity can be start.

4.LFD Late (Finish Date)

is the latest point in time that any activity which merges at the activity's ending node can finish.

Forward Pass Rules

Rule 1

The initial project event is assumed to occur at time zero

Rule 2

All activities are assumed to start as soon as possible, that is , as soon as all the predecessor activities are completed.

Rule 3

The early finish time of an activity is merely the sum of its early start date and the estimated activity duration.

EFD = ESD + T

Rule 4

The late start date LSD is found by subtracting the activity duration T from the late finish date LFD

$$LSD = LFD - T$$

1. Total Float

Total float may be defined as that time span in which the completion of an activity may occur and not delay the termination of the project.

TF = LFDij - EFD

= LSD - ESD

2. Free Float

 Free float may be defined as the time span in which the completion of an activity may occur and not delay the finish of the project nor delay the start of any following activity.

FF = ESDB - EFDA

3. Interfering Float

That part of the total float which remains after free float has been deducted is the interfering float.

It may be defined as: the time span in which the completion of an activity may occur and not delay the termination of the project but within which completion will delay the start of some other following activity.

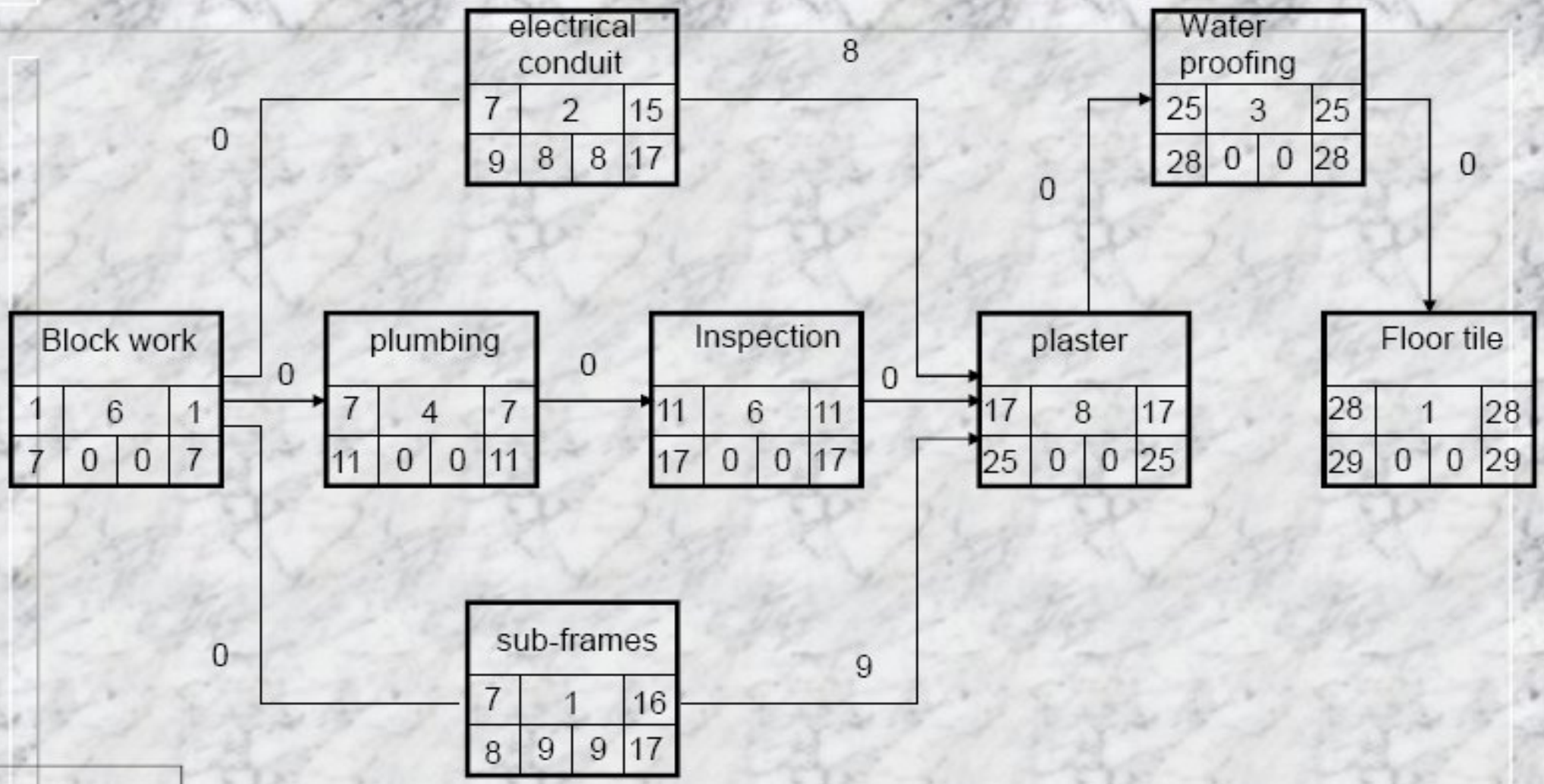
INTF= TF - FF

Precedence Network Calculations

Exercise

1) Forward pass calculations

4) Backward pass calculations



ES	Dur.		LS
EF	FF	TF	LF

2) Calculate the Lag ($LAG_{AB} = ES_B - EF_A$

3) Calculate the Free Float (FF) FF = min. LAG

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