

King Fahd University of Petroleum & Minerals
College of Environmental Design
Construction Engineering & Management Department
CEM 510
Construction Planning & Scheduling
Fall 2005/2006



Resource management



Resource management

- Resources include material, labor, equipment, and subcontractor.
- The original assumption in CPM was that material, labor, equipment, and other needs will be available when required.
- Since resources are looked upon as scare, this assumption is not practical.
- Thus, resource management comes in order.



Resource management

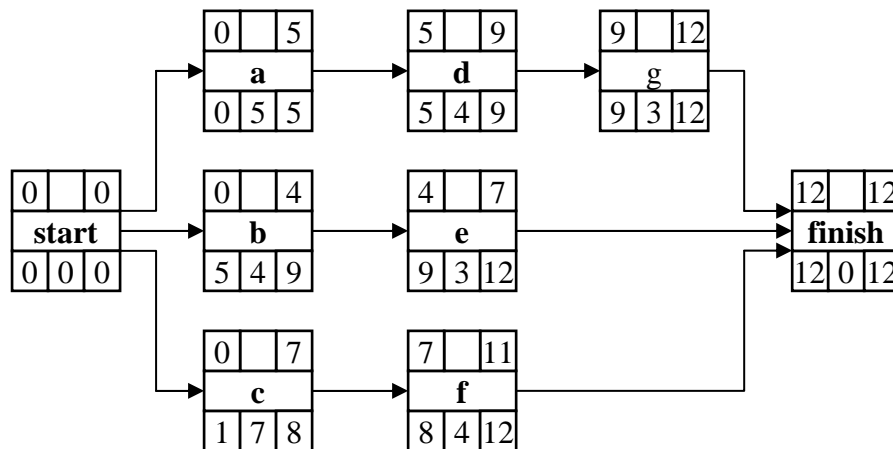
- **Supply and support of field operations so that:**
 - **The established time objectives can be met.**
 - **The costs can be kept within the construction budget.**
- **Resource management involves:**
 - **Planning.**
 - **Follow up**



Resource planning

- Detailed compilation of daily resource requirements:

1- Tabulation of resource requirements.

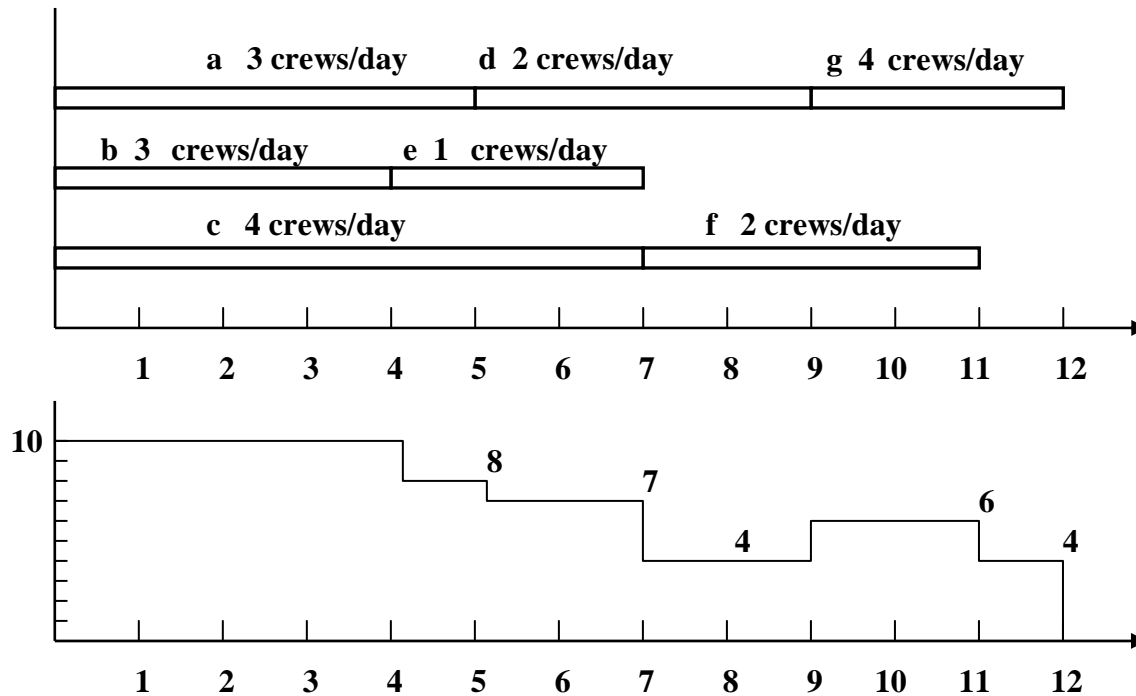


Act.	# of crews required
a	3
b	3
c	4
d	2
e	1
f	2
g	4



Resource planning

2- Project resource summary (Tabulation & time-scaled diagram).



Daily demand of crews based on early times



Resource planning

- Check required against available resources:
- Given: Resource requirements, resource availability, project duration.
- Required: Is it possible to finish with the time limitation specified?
- Answer:

Yes:

Reschedule the activities with floats to achieve smoother resource requirements (resource leveling).



Resource planning

No:

If there is a localized shortage in resources try to work out utilizing activities' floats, working additional shifts, or subcontracting part of the work.

Otherwise, seek out an activity schedule that:

- Keep resource requirements within the defined level.
- Maintain job logic at a minimum extension of job duration.

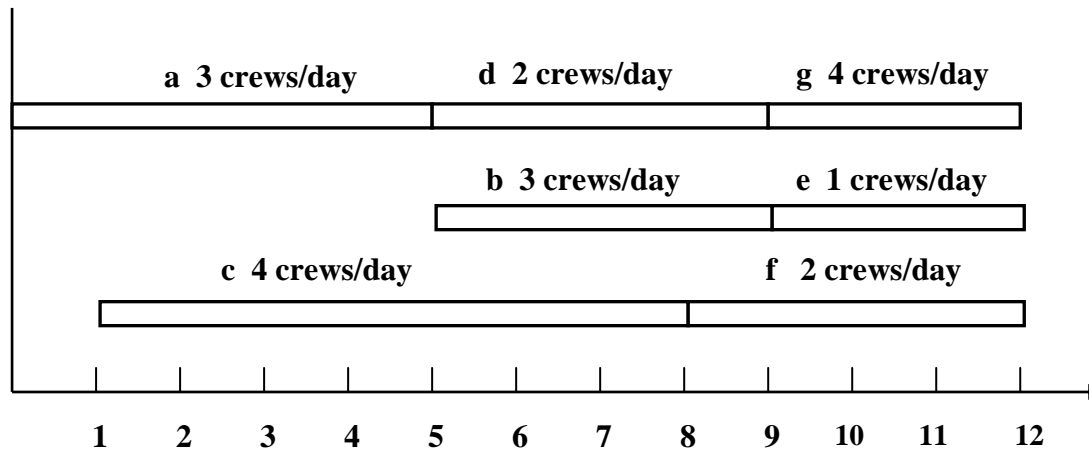


Resource Leveling

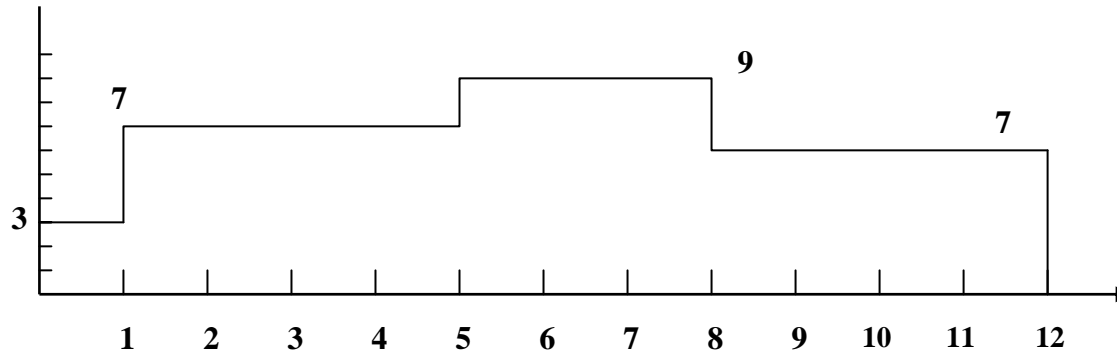
- This is the process of smoothing out daily resource demand.
- Variation in demand, recurrent hiring and laying off of personnel on a short-time basis are:
 - Troublesome.
 - Inefficient.
 - More expensive.



Resource Leveling (desirable)



Late-times schedule

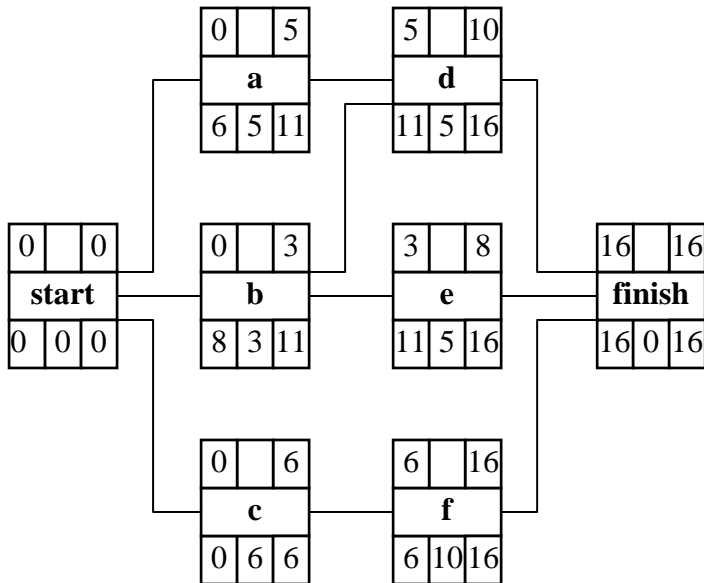


Daily demand of crews based on late times



Resource Allocation

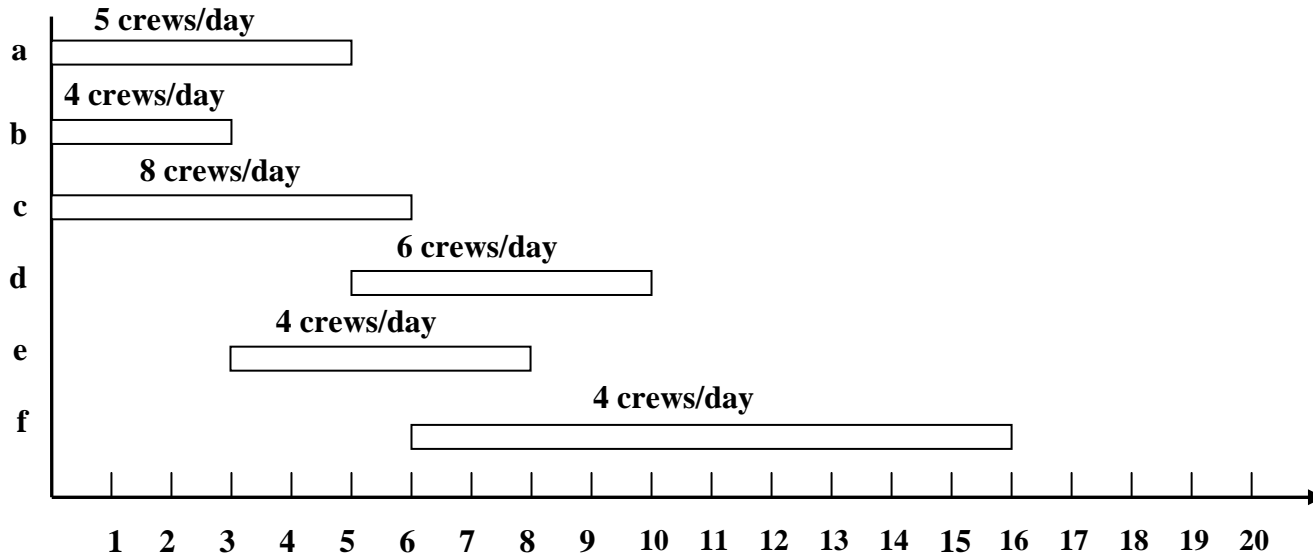
- **Example:**



Act.	ES	LS	TF	Daily Req. Crews
a	0	6	6	5
b	0	8	8	4
c	0	0	0	8
d	5	11	6	6
e	3	11	8	4
f	6	6	0	4



Daily Resource Requirements



Note: The duration is 16 days and the daily resource requirement in some days exceeds the level of 13 crews.



Resource Allocation

Required:

Re-schedule the activities such that:

- 1. Maximum available crews per day is 13 crew.**
- 2. Priority is given to the activity with the least late start.**
- 3. In case of two activities with the same late start, priority is given to that of less total float.**



First Step (At day 0)

1. Eligible Activity Set (EAS)

A B C

2. Resource requirements

5 4 8

3. Late start of EAS

6 8 0

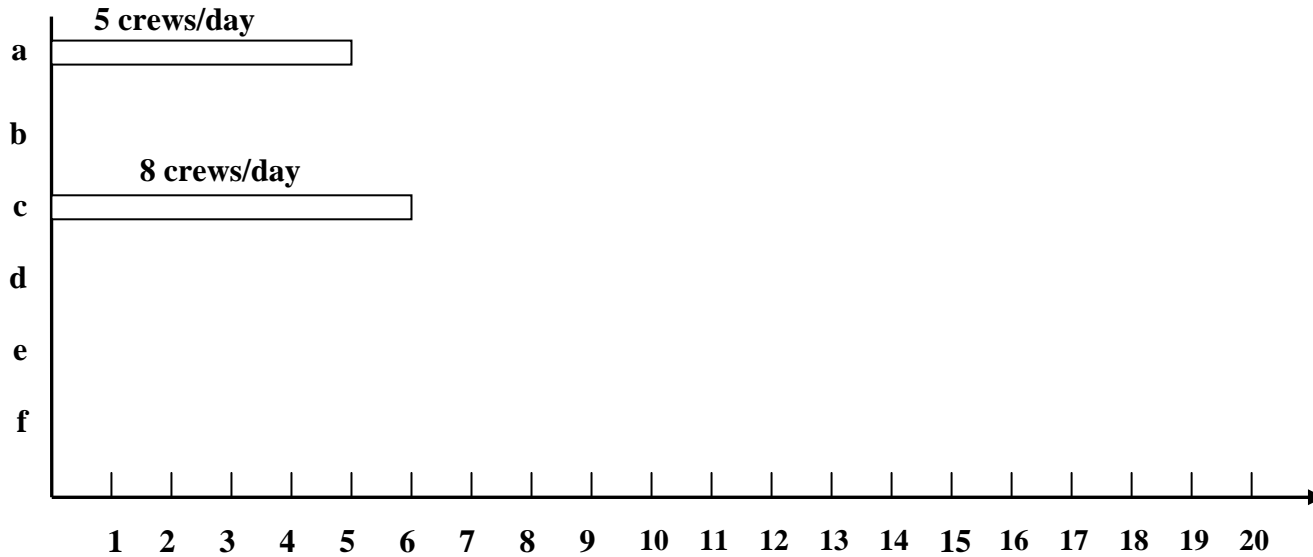
4. Ordered Scheduled Set (OSS)

C → A → B

Activities C and A are scheduled. Resources are inadequate to schedule activity B.



Output of the First Step



Second Step (At day 5)

1. Eligible Activity Set (EAS)

B D E

2. Resource requirements

4 6 4

3. Late start of EAS

8 11 11

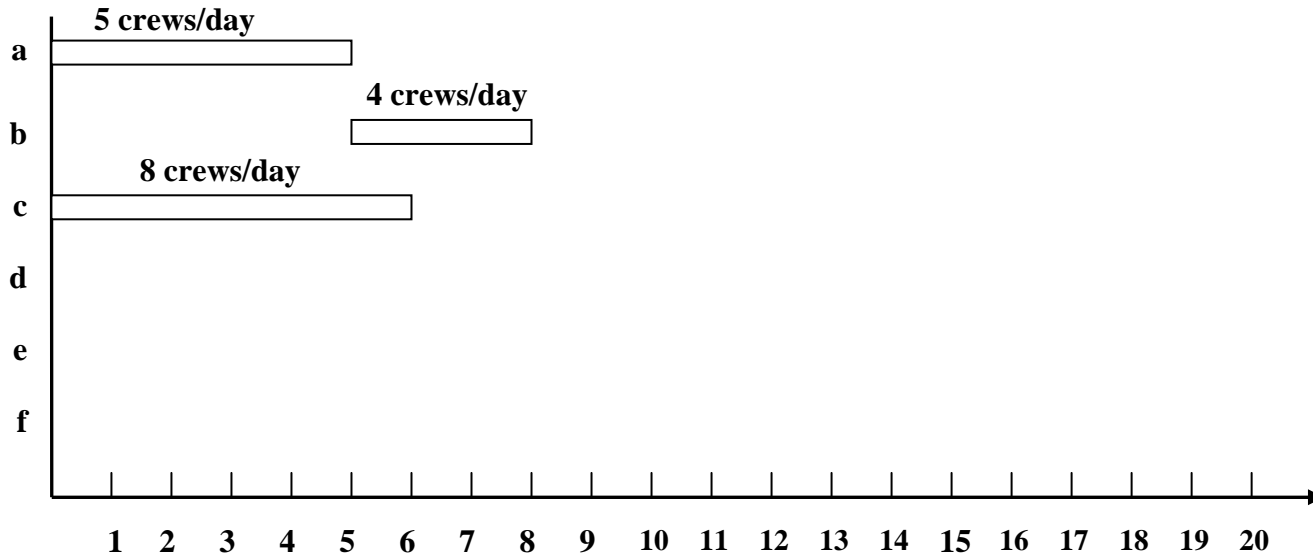
4. Ordered Scheduled Set (OSS)

B → D → E

Activity B is scheduled. Resources are inadequate to schedule activities D and E.



Output of the Second Step



Third Step (At day 6)

1. Eligible Activity Set (EAS)

D E F

2. Resource requirements

6 4 4

3. Late start of EAS

11 11 6

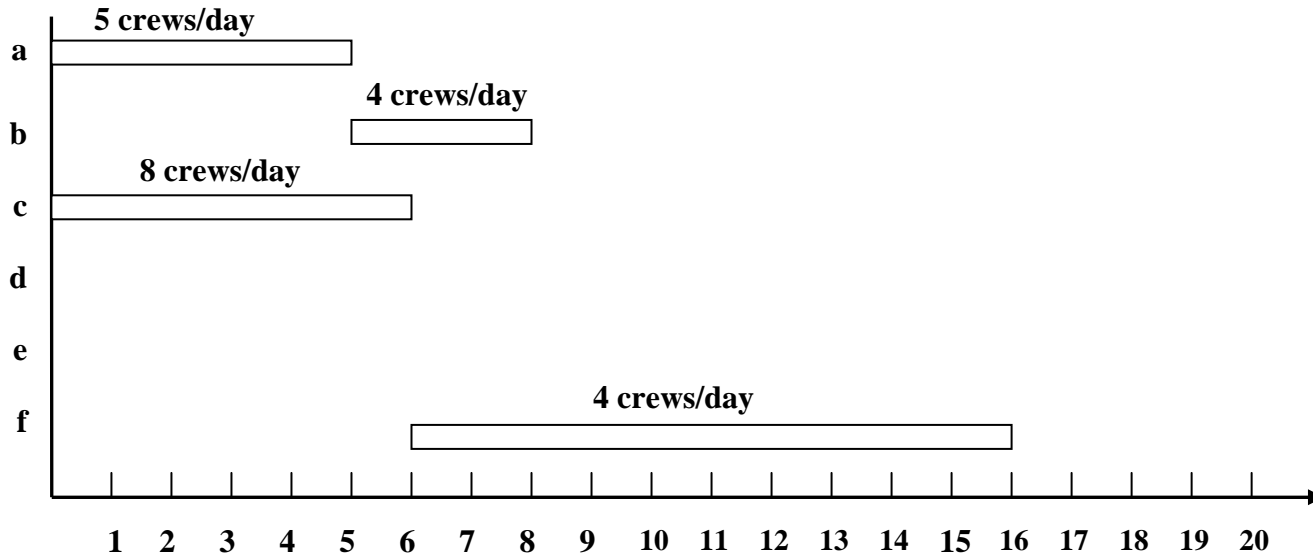
4. Ordered Scheduled Set (OSS)

F D E

Activity F is scheduled. Activities D and E can't be scheduled for inadequate resources needed for D and since activity B isn't finished yet to schedule E.



Output of the Third Step



Fourth Step (At day 8)

1. Eligible Activity Set (EAS)

D E

2. Resource requirements

6 4

3. Late start of EAS

11 11

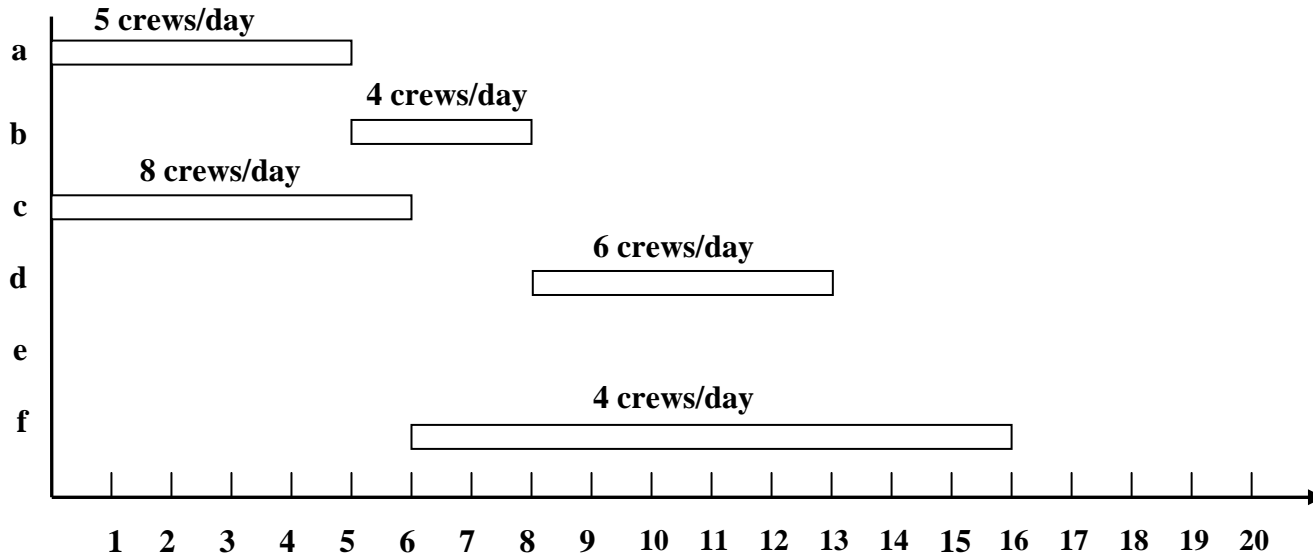
4. Ordered Scheduled Set (OSS)

D E

Activity D is scheduled. Activity E can't be scheduled for resources inadequacy.



Output of the fourth Step



Fifth Step (At day 13)

1. Eligible Activity Set (EAS)

E

2. Resource requirements

4

3. Late start of EAS

11

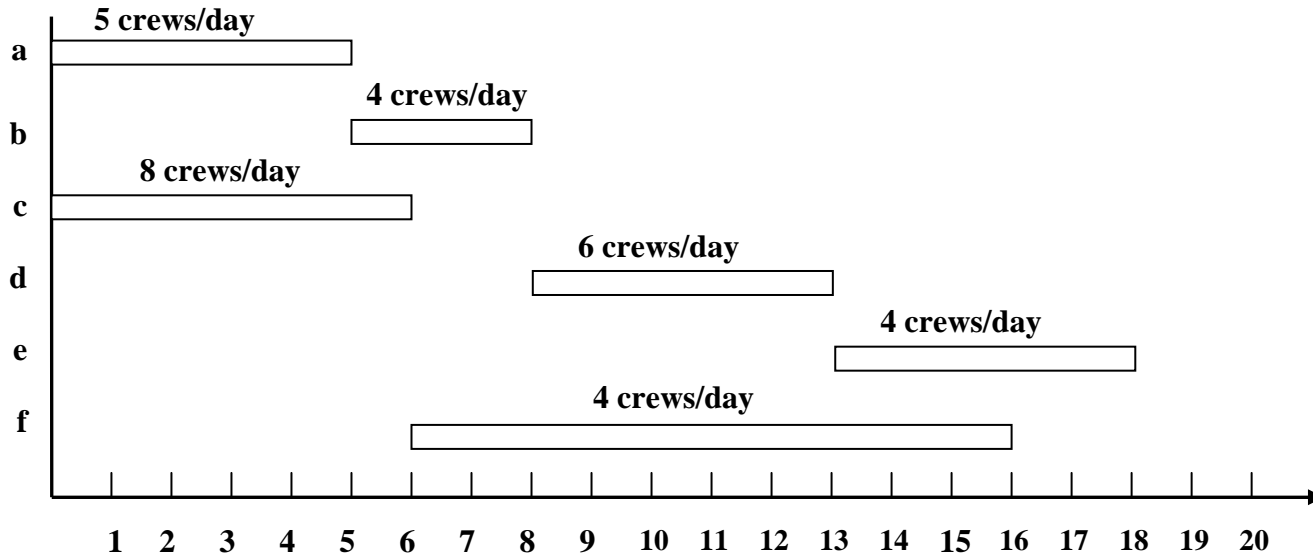
4. Ordered Scheduled Set (OSS)

E

Activity E is scheduled.



Output of the fifth Step



Note: The duration is extended to 18 days and the daily resource requirement is at the level of 13 crews.

