

# CB 510

# Project Management

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# Repetitive Activities Projects

- Repetitive activities projects are ones where the construction crew repeats the same sets of activities throughout the units of the projects.
- Repetitive activities are divided into:
  - Linear: railways, pipelines, highways, etc.
  - Non-linear: high rise buildings, multi-housing complexes, etc.

# Representing Repetitive Activities

- Draw an AON, and perform CPM calculations for the following project repeated throughout 4 identical units

Activity	Dependencies	Durations
A	-	2
B	A	3
C	A	5
D	B,C	1

# Drawbacks of AON and CPM

- AON representation of repetitive activities projects is inappropriate.
- CPM calculations does not account for the resources (duration oriented approach).

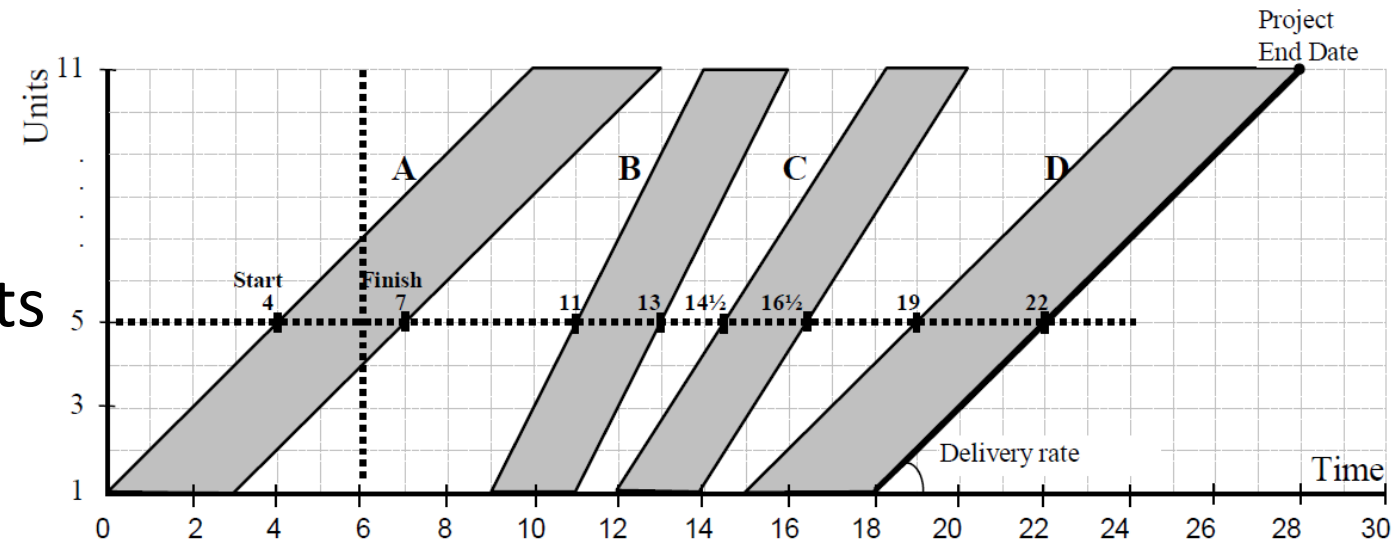
# Repetitive Activities Projects Scheduling

Different resource driven scheduling techniques were developed for repetitive activities

- Line of Balance (LOB)
- Linear Scheduling Method (LSM)
- Repetitive Scheduling Method (RSM)

# Line of Balance

- Line of Balance (LOB) is represented through two axis, vertical for units; and horizontal for time
- The width of each activity is its duration
- Slope of each activity is the rate of the activity



# Line of Balance – More Details

- Each activity is undertaken by multiple crews
- Each activity is separated by a buffer
- Rate of progress of each activity should be respected to avoid work interruptions

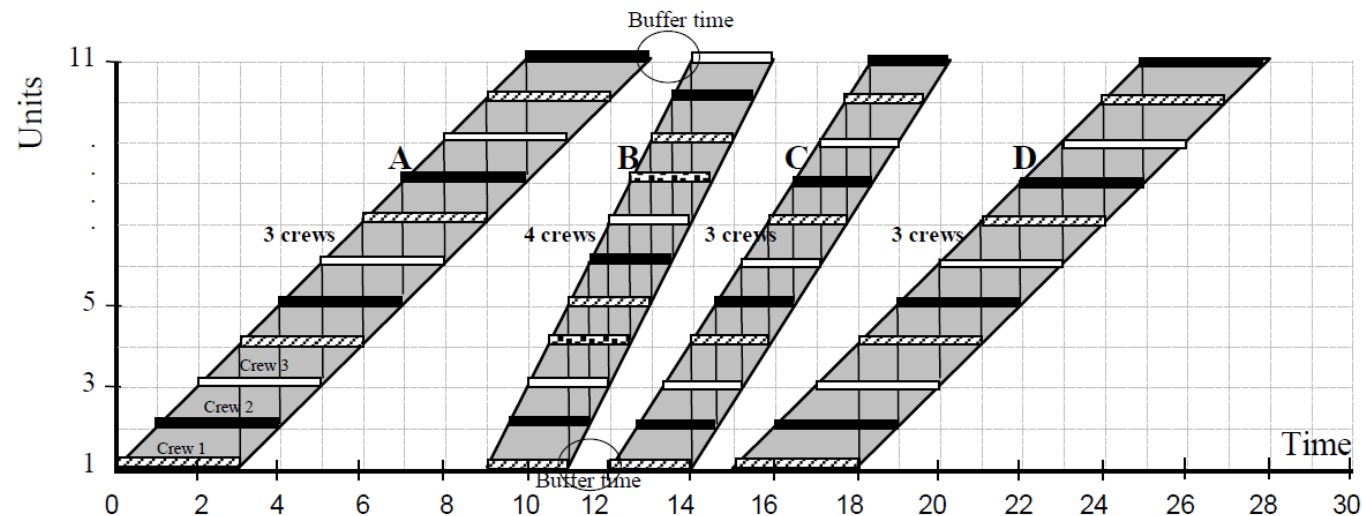


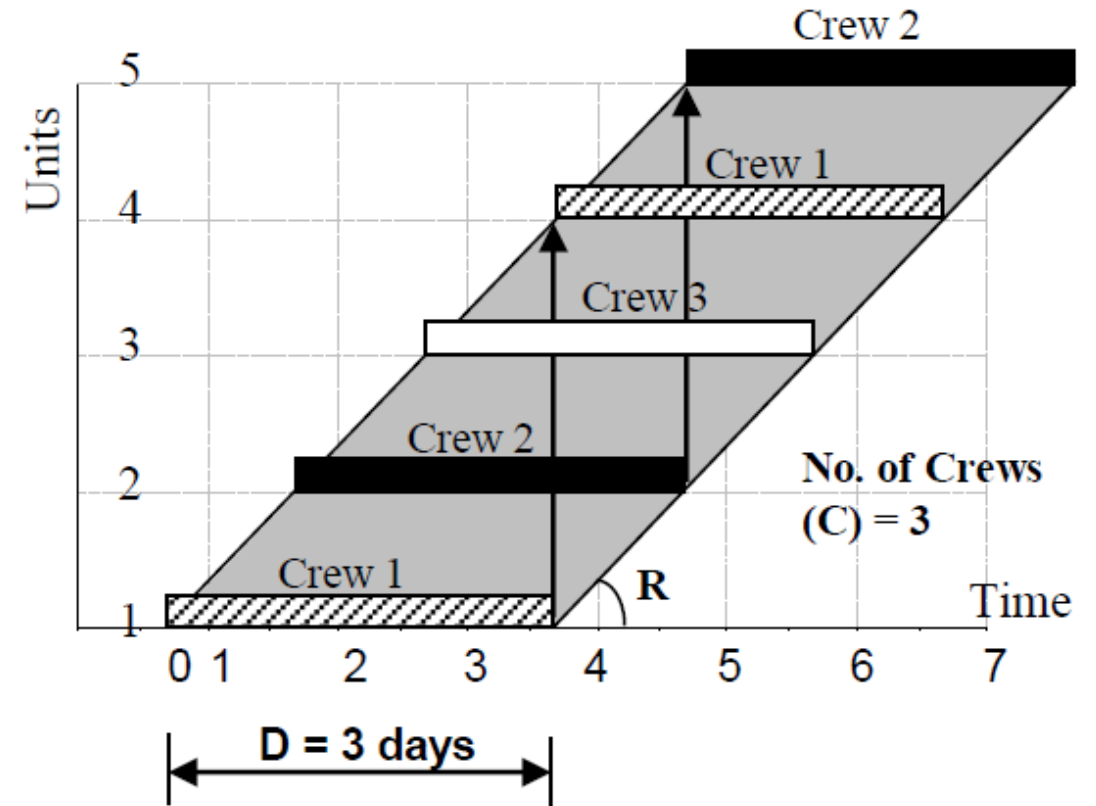
Photo credit: Prof. Emad Elbeltagi

# Crew Synchronization

- This approach allows for smoother transition of resources through the units.
- Number of crews needed

$$C = D \times R$$

C = number of crews, D = duration of activity, R = Rate of Activity.



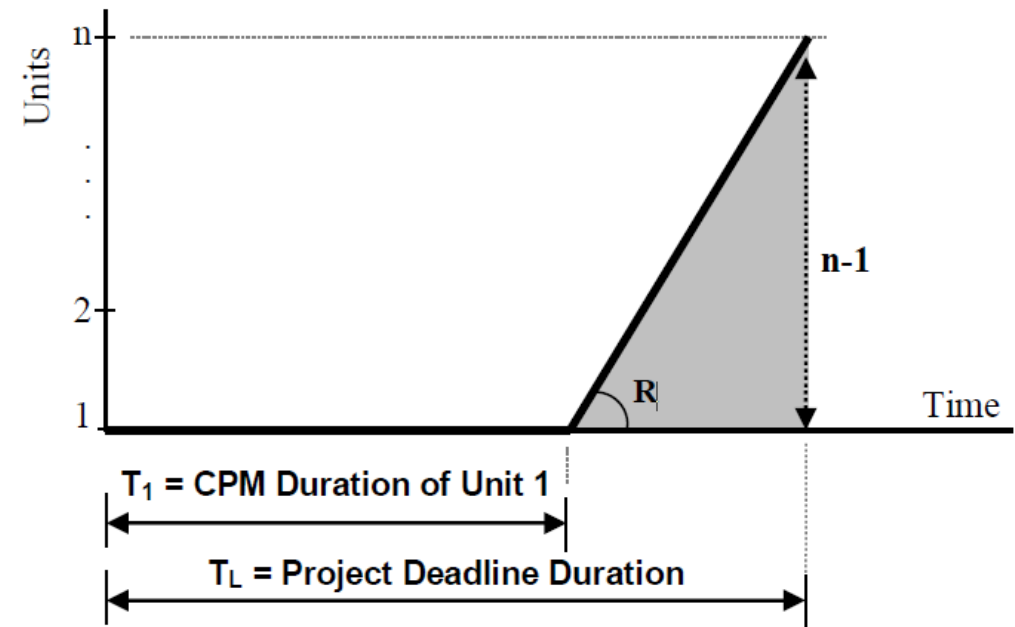


# Meeting Deadline with LOB

- If we have a given deadline, we can find the minimum required rate through the following equation

$$R_d = \frac{(n - 1)}{(T_L - T_1)}$$

Where,  $R_d$  is the required rate,  $n$  is the number of units,  $T_L$  is the deadline of the project, and  $T_1$  is the finish date of the first unit through CPM



# Steps for LOB

1. CPM for the 1<sup>st</sup> unit with a buffer
2. Determine  $R_d$
3. Calculate crew per activity
4. Adjust actual Rate per activity
5. Draw LOB
6. Respect rate of crews to avoid interruptions

# Example

The following is the activities of a 1 unit of a 10 identical units. Draw LOB if the project is due after 40 days. Assume 1 day buffer.

Activity No.	Activity Name	Duration (days)	Predecessors
1	Locate and Clear	1	-
2	Excavate	3	1
3	String pipe	1	1
4	Lay pipe	4	2,3
5	Pressure test	1	4
6	Backfill	2	5