Lesson 2
Factors influencing Productivity, Example for Ideal Productivity, Factored Productivity and Working Time Factor

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Factors Influencing Productivity

Factors affecting activity productivity:
- Skill/Experience of work crew
- Construction Method
- Local practices
- Site Characteristics

Total Productivity

Productivity = Production / Day/ Crew (or Person)

Quantity of Work

Activity Duration
Duration Driven Estimates

- Activity Duration
  - Total Quantity of Work
  - Number of Crew
- Activity Productivity
  - Factored Productivity
- Construction methods
- Site Characteristics
- Local Practices
Duration Driven Estimates

• Excavation of soft soil on a site has to be completed in 2 days. The total quantity of excavation is 1000 cum.

• Based on the previous flowchart the factored productivity and crew size can be estimated.

• The flowchart shows steps to determine the crew size for both methods
Duration Driven Estimates

1000 cum

8 hrs/day

500 cum/day
62.5 cum/hr

35 cum/hr

2 Crew

2 cum/hr

32 Crew

Use of Backhoe loader
Soft Soil
Mechanized Working

Manual Labour 4 per crew
Soft Soil
Manual Working

2 Days

Duration: 2 Days

Volume: 1000 cum

Production Rate: 500 cum/day

Hourly Rate: 62.5 cum/hr

Crew: 32

Use of Backhoe loader and Soft Soil indicates mechanized working.

Manual Labour with Soft Soil suggests manual working at a lower rate.
Resource Driven Estimates

- Construction methods
- Site Characteristics
- Local Practices

Factored Productivity

- Number of Crew
- Total Quantity of Work

Activity Productivity

Activity Duration
Resource Driven Estimates

• Consider the same excavation example without a duration constraint but with a quantity and a resource constraint
Examples
Example 1 – Ideal Productivity

• Calculate the duration required for the construction of a solid block masonry wall without finishing.

• 2 crews each of 1 mason + 1 helper
  – Total Quantity of Work to be done – 600 Sqm
  – Productivity – 20 Sqm/day/crew
  – Working Time – 10hrs/day
Ideal Productivity – Solution

\[
\text{Duration} = \frac{\text{Quantity}}{\text{Production}}
\]

\[
\text{Production} = \text{Productivity} \times \text{No. Crew}
\]

Production = 20*2 = 40 sqm/day

Duration = 600 / 40 = 15 days
Example 2 – Factored Productivity

- Block work is now being done at a height between 8m~15m by same crew.
  - Quantity – 600 Sqm in each area

  - Productivity at ground floor– 20 Sqm/day/crew

  - For working at height we have consider the following factors that reduce the efficiency of the crew
    - Scaffolding and other equipment - 0.9
    - Movement of materials – 0.9
    - Safety precautions for working at height – 0.95

  - Working time for the crew is 10 hours a day

- Calculate the duration
Example 2 - Solution

- Factored productivity for Working at height

\[ 20 - \left[ (1 - 0.9) \times 20 \right] - \left[ (1 - 0.9) \times 20 \right] - \left[ (1 - 0.95) \times 20 \right] \]

\[ = 15 \text{ Sqm/Day} \]

\[
\frac{\text{QuantityOfWork}}{\text{FactoredProductivity} \times \text{NoOfCrew}}
\]

\[
\text{Duration} = \frac{600}{15 \times 2} = 20 \text{ Days}
\]
Example 2a – Working Time Factor

• 10 hr workday – productive time? 9am-7pm

• Breaks 11-11:15am 1-1:45pm 4-4:15pm etc. the effective working time is only 8.5 hours.

• Calculate the modified duration for block work considering this.
Example 2a - Solution

• Factor for working time
  Actual Working hours/Ideal Working hours
  8.5/10 = 0.85

• Actual Duration = Ideal Duration/Working time Factor
  – For Block work on ground
    =15/0.85 ~ 18 days
  – For Block work on scaffold
    =20/0.85 ~ 24 days