Spatial structure of excavating

Structure

Spatial

Technologic

Element of structure

Excavation

Digging

Space of excavator moving

Space of transport

Storage

Extraction of soil

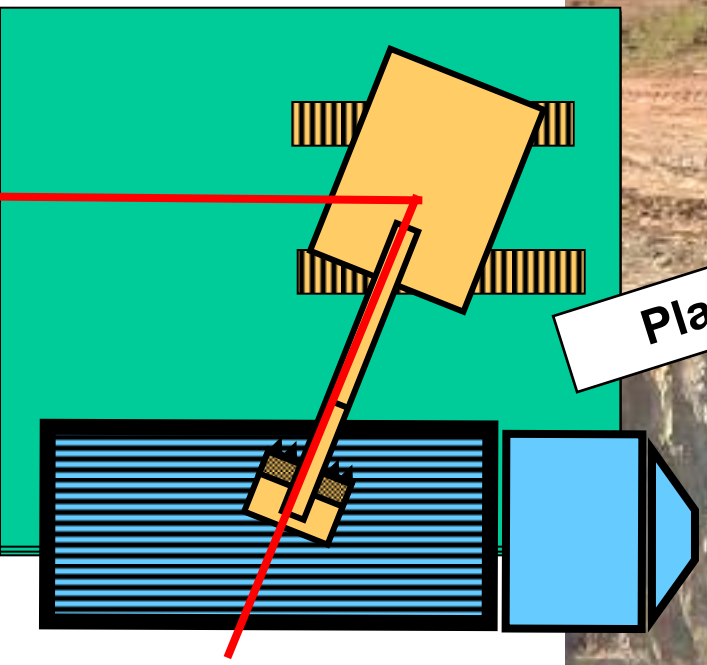
Transport tools

Tools for spoil storage

Features of elements

Liaison among them

Spatial structure & set of machines



Spatial liaisons among machines: **Unload elevation**

Angle of rotation

Working cycle of excavator

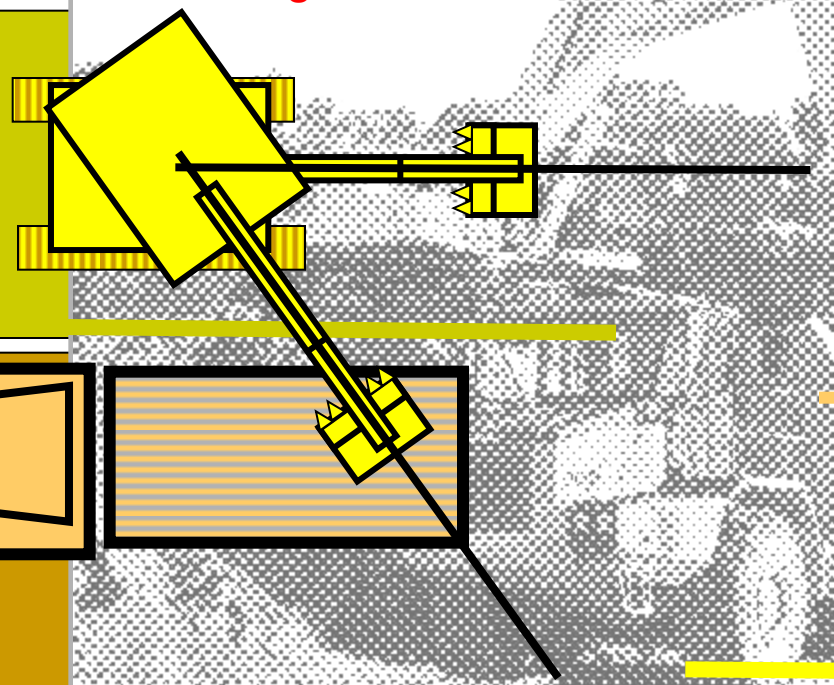
t_c - duration of cycle [S] is function of

1. Spatial liaison among machines

Plain of excavator moving

Spatial structure

Bottom of take



Technologic linkage

Working cycle of excavator

t_c - duration of cycle [s] is function

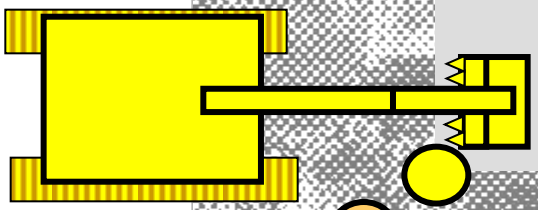
1. Spatial linkage among elements
2. Technologic linkage

Extracted soil

Class of excavated soil

Ripping force

Extracting tool



output of engine

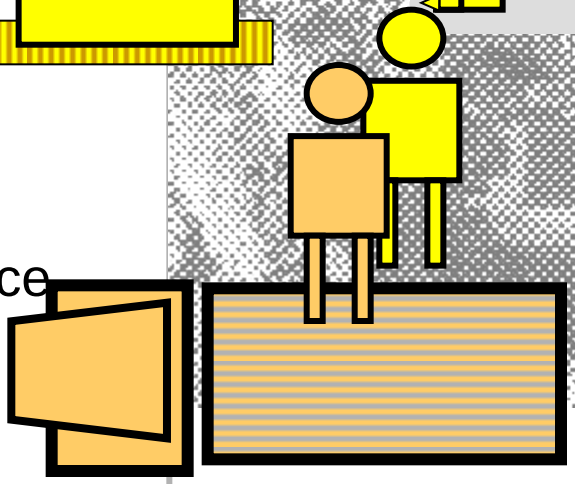
volume of bucket

Operators

Qualification, experiences

cooperation

transport device



Volume of dump load-bearing capacity, output of engine

Earthwork Technology

Choice of digging technology

Properties of digging place

Technologic properties of soils & rocks

Spatial properties of excavation

Position & shape of excavation

complete machine

Operations needed

Ripping, disintegration

Transport

Available time

Output required

Output of excavator

Excavator is **cyclic working machine**

Q - output of excavator [$m^3.hod^{-1}$]

$$Q = \frac{3600}{t_c \cdot k_i \cdot k_P} \cdot V \cdot k_o \cdot k_l \cdot k_m$$

Number of cycles per hour x **volume of bucket**

t_c - time of theoretical working cycle [**s**]

k_i - influence of operator – qualification - **1,02 - 1,60**

k_P - coefficient of geometry of moving **1,05 - 1,4**

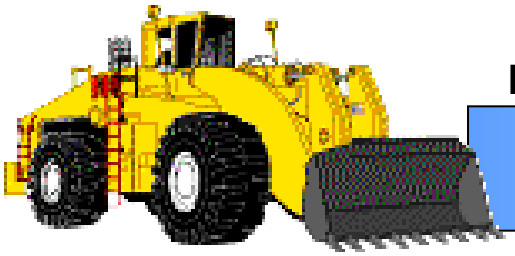
V - volume of bucket - [m^3]

k_o - coef. of count according to natural state = **1/** k_n

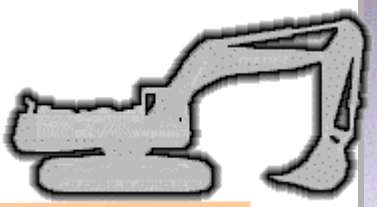
k_l - coef. of filling – type of shovel **1,1 - 0,65**

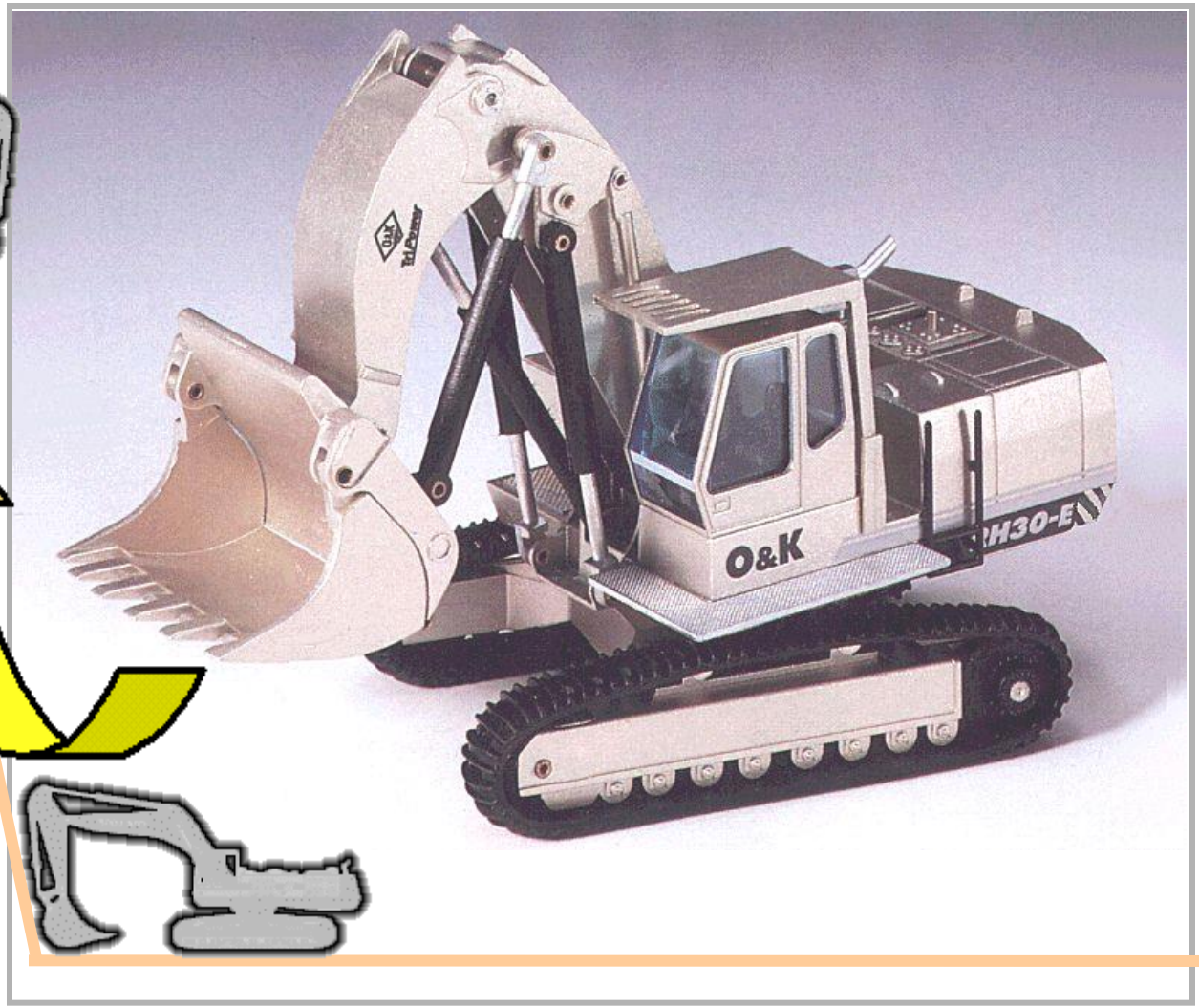
k_m - level of management, barriers - **0,4 - 0,9**

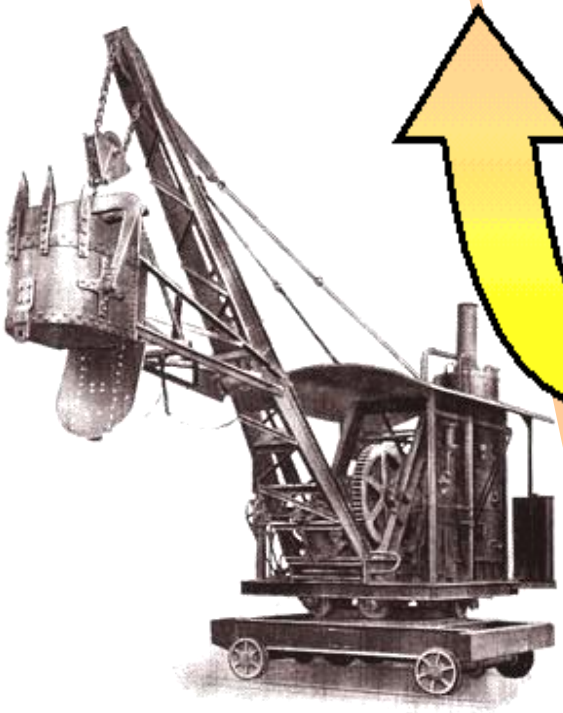
Cyclic working machines: excavators, loaders, dozers, dumpers etc.

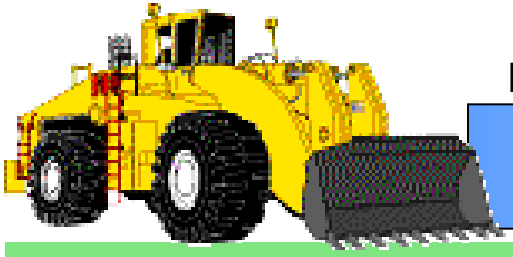


Face shovel









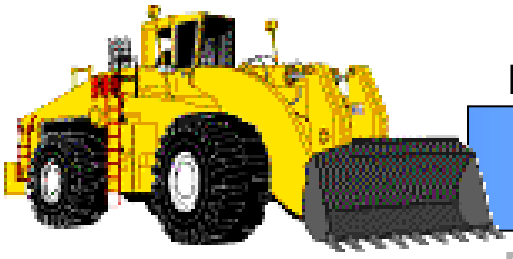
The biggest excavator

RH 400

2984 kW

788 t

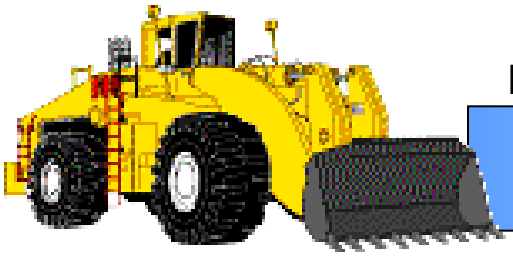
46 m³



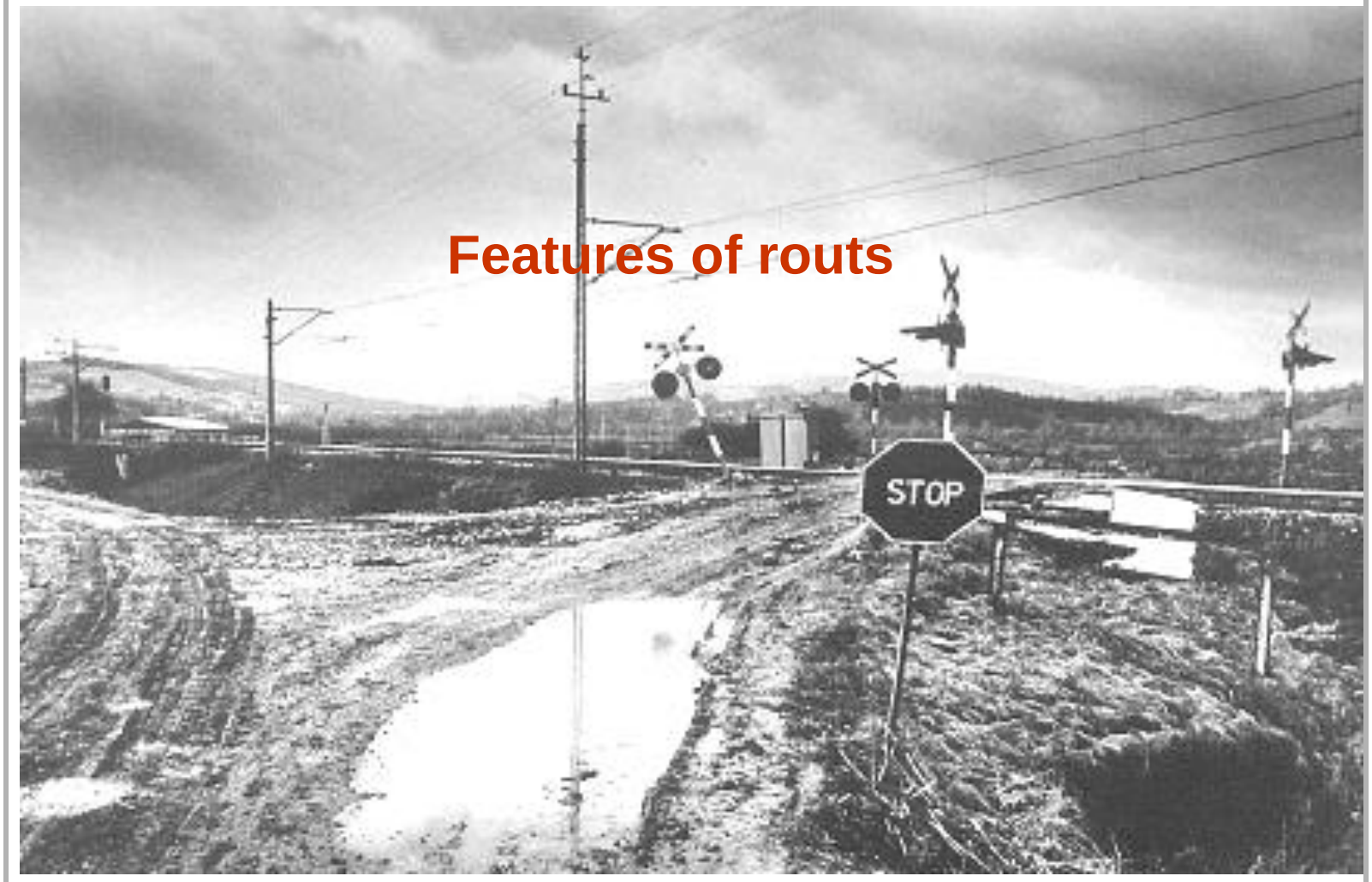
Transport

- **Transport**
  - **Manually**
  - **Tracked**
  - **By railway**
  - **Auto transport**
    - Routs
    - Terrain

Cycles of transport



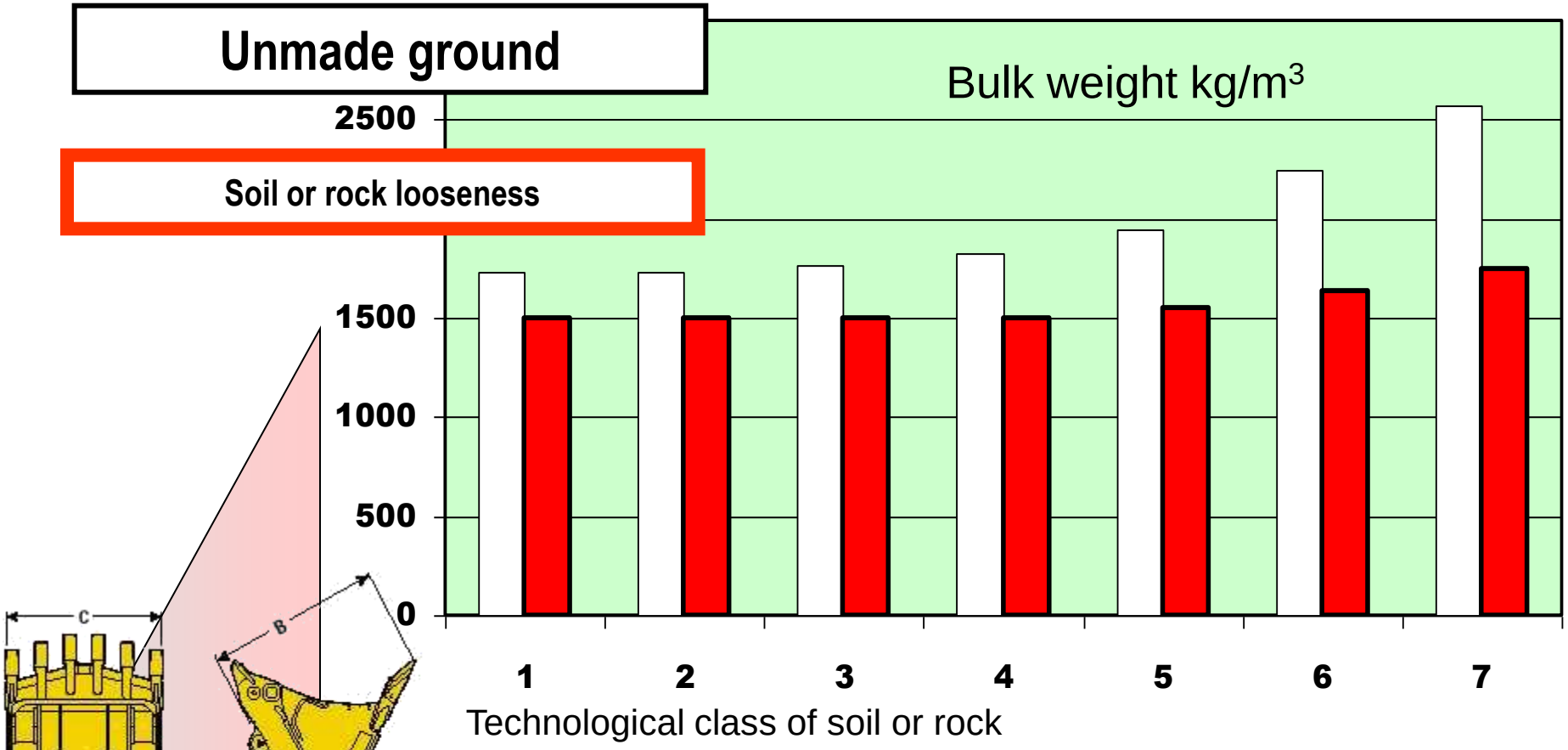
Transport



Fluffiness of soil or rock

Unmade ground

Soil or rock looseness



Coefficient fluffiness of excavation

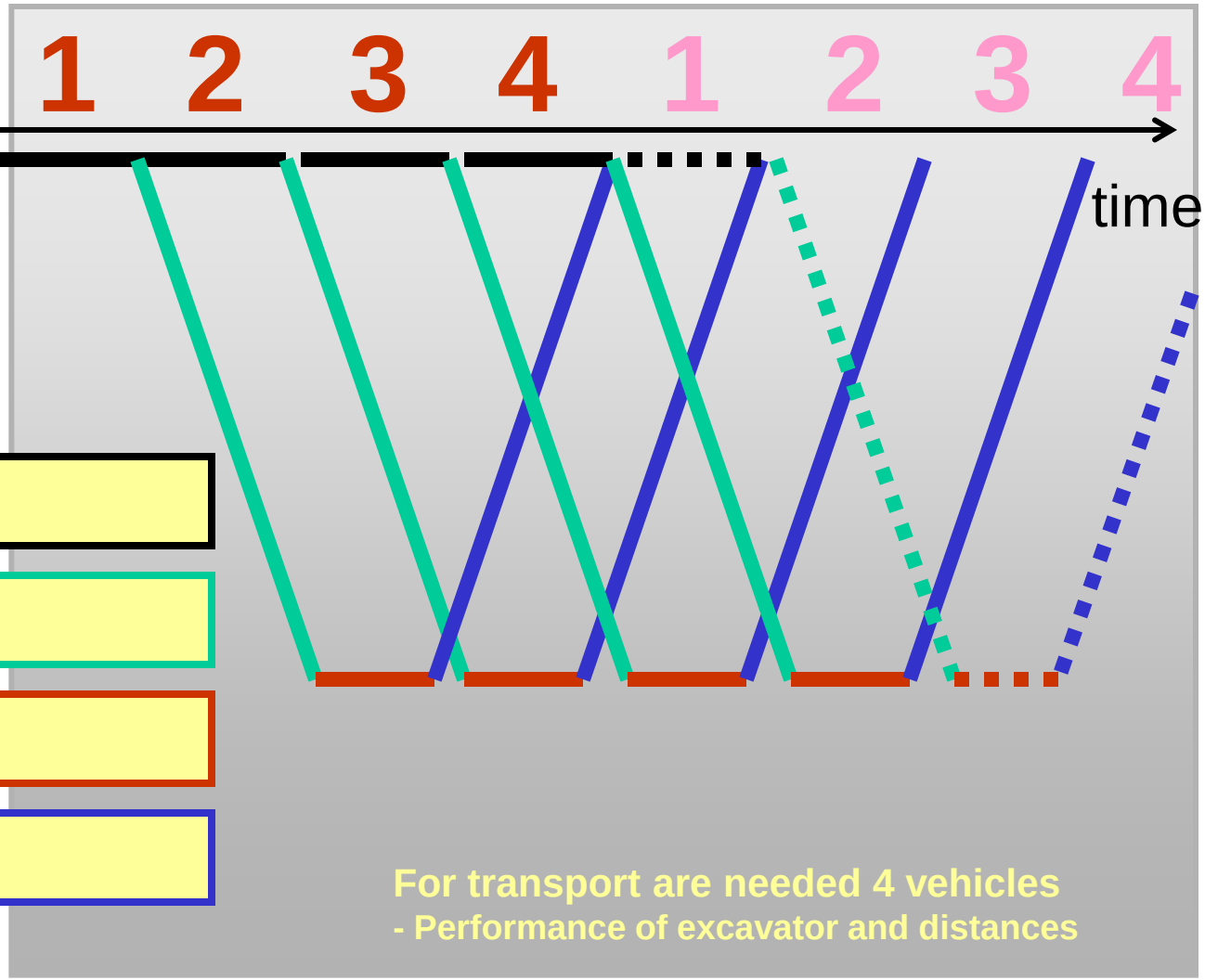
Transport of excavation

Type of transport

- **Manual**
- **Belt transport**
- **Rail transport**
- **Lorry transport**
  - Route
  - Terrain

Number of lorries needed

Graphical solution



operation

Loading

Trip with spoil

Unloading

Trip back

For transport are needed 4 vehicles
- Performance of excavator and distances