**Underground Mining of Metalliferous Deposits**
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**Lecture No. 21**
**Horizontal Drivages - 4**

## HORIZONTAL DRIVAGE - Mechanical cutting technique

ROADHEADER

The roadheader (RH) is the most widely used underground partial face mechanical excavator.

Roadheaders were first developed to mechanically excavate coal in the early 1950s.

Later, their use was extended for excavating railway tunnels, roadways, sewers, and diversion tunnels in soft and moderately hard ground conditions.

Since 1970, roadheaders are used to excavate haulage drifts, roadways, cross-cuts etc. in underground metaliferrous mines.

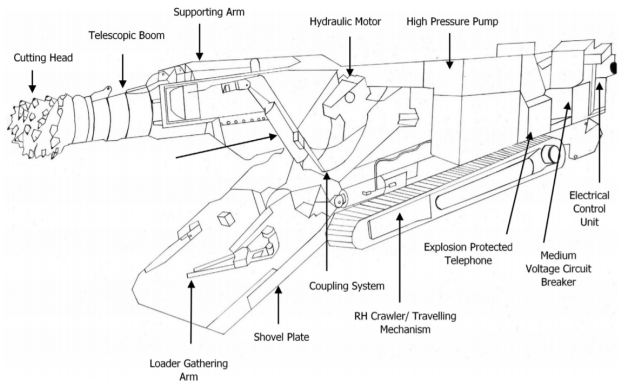


Figure 1. Schematic representation of a roadheader

### Construction

The roadheader is a hybrid mechanical excavator and consists of a boom-mounted rotating cutting head with a conveyor for broken rocks.

A crawler travelling track moves the entire machine forward into the rock face.

High mobility, advance rates, reliability, low strata disturbance, safety and low labour deployment are some of the advantages of the RH.

**Machine Classifications**

Roadheaders can be divided into two types:

Milling (axial) with the cutterhead rotating around the boom axis,

Ripping (transverse) with the head rotating perpendicular to the boom axis.

Seven roadheader manufacturers worldwide presently offer small (30 ton), midsize (70 ton) and large (up to 120 ton) roadheaders.

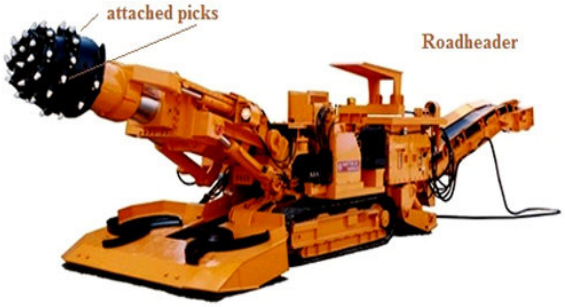


Figure 2. Roadheader

**Performance**

Performance of a roadheader depends on

Rock parameters – strength, discontinuities, abrasivity etc.

Machine parameters – weight, cutting power, cutting system, pick configuration etc.

Site parameters – cutting direction, cooling arrangements, operator's skill etc.

$$RMCI = \sigma_c \left(\frac{RQD}{100}\right)^{2/3}$$

$$ICR = 0.28 \times P \times 0.974^{RMCI}$$

$$RPI = (P \times W)/UCS$$

$$ICR = 27.511 \times e^{0.0023 \times RPI}$$

**PROBLEM**

The rock properties of an underground drift and the specifications of the proposed roadheader to be deployed are given below –

UCS = 120 MPa.

BTS = 10 MPa.

Weight of Roadheader = 80 tonne

Power of roadheader = 400 kW.

Determine the cutting rate of roadheader as per Copur et al 1997.

Solution:

| | | |
|---|---|---|
| RPI = P*W/UCS | RPI = | 266.67 |
| ICR =27.511*exp(0.0023*RPI) | Cutting rate ($m^3$/hr) = | 50.80 |

**PROBLEM**

A mine has two lodes (Vein - A and B) of strike length 700 m and 1.8 km respectively. Vein-A has width of 5m and vein-B is 8m wide. conventional ore drives are driven exploitation of both the lodes. A crosscut of 200m from shaft to vein-A and another of 350 m from vein-A to vein-B is required of 4m width. The deployed road header has an average production capacity of 25 $m^3$/hr with an average utilised monthly cutting hour of 250 hr. The planned largest machine required an excavation height of 3.5m. Determine the time required to complete development work of the level.

Solution:

| GIVEN | |
|---|---|
| | |
| Strike length of lode-A (m) = | 700 |
| Strike length of lode-B (m) = | 1800 |
| Drive width of lode-A (m) = | 5 |
| Drive width of lode-B (m) = | 8 |
| Crosscut length (shaft - lode-A (m) = | 200 |
| Crosscut length (lode -A - lode-B (m) = | 350 |
| Width of cross cut (m) = | 4 |
| Height of all drives (m) = | 3.5 |
| Roadheader production ($m^3$/hr) = | 25 |
| Utilised hour/month (hr) = | 250 |

| CALCULATION | |
|---|---|
| | |
| Volume of rock in cross cut ($m^3$) = | 7700 |
| Volume of rock in Drive of Lode-A ($m^3$) = | 12250 |
| Volume of rock in Drive of Lode-B ($m^3$) = | 50400 |
| Total Volume to excavate in level ($m^3$) = | 70350 |
| Hour required (hr) = | 2814 |
| Months required (month) = | 11.256 |