**Underground Mining of Metalliferous Deposits**

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**Lecture No. 24**
**Raising and Winzing – III**

## RAISING/WINZING METHOD IN METAL MINES

### Alimak Raising:

Alimak raising is a mechanised blind raising method. It was introduced in mines way back in 1957 and over the time it has proved to be economical, flexible, and a safe method of raising for as long as 900 m. It can be used for vertical and inclined raises.

The machine along with a cage runs up and down on a guide rail that incorporates rack and pinion gear mechanism. The guide rails are in segments and fastened to the rock by rock bolts. They are extended as the raise advances.

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The drilling operation is carried out standing on the platform after charging the holes the cage is taken down at to a safe place for blasting the face.

After the fumes clearance the cage goes up again and guide rail extension is done. The blasted muck is removed.

Figure 1. Rack and pinion gear mechanism

Alimak raising provides the safest of all entry methods involving the least risk to the miner and can excavate safely through all types of ground conditions supporting the face after each blast is taken ensuring the integrity of the excavation during all stages of development.

The Alimak raising system ensures fast mobilisation, minimal preparation, is flexible, accurate, economical and very cost effective even over short distances.

Even multiple raises with directional changes in the raise of up to 90° can be carried out easily making this method the ideal choice for ore passes, crusher chambers, split level ventilation raises or any difficult excavation profile.

Alimak raise climbers are widely being used to drive shafts and raises in Mount Isa mine Australia. Importantly the longest Alimak raise developed to date in these mines is more than 1000 m in length.

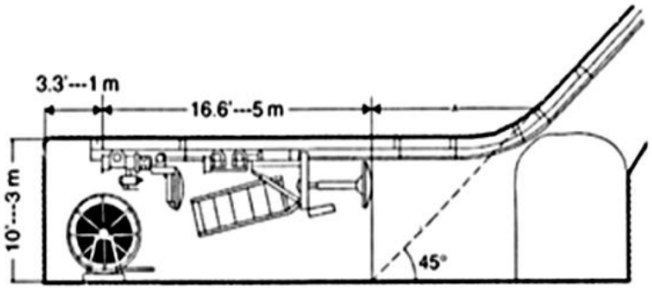


Figure 2. Equipment for an inclined raise.

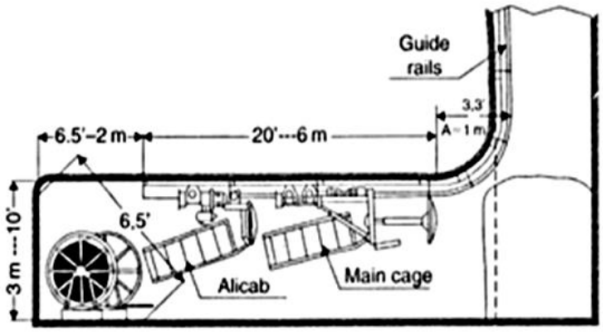


Figure 3. Equipment for a vertical raise.

**Alimak Raising - Cycle operation**

Step 1 – Drilling: Drilling is undertaken from the drill deck on top of the raise climber, which is sized to suit the size, shape and angle of the raise. Drill machine is jack hammer for drilling a 34 mm diameter and 2 m long blast holes. Burn-cut parallel blasting patter in the common pattern used for raise blasting.

**Step 2 - Loading:** When drilling is completed the face is charged with explosives along with MSD & HSD delay detonators. Of all the rounds, perimeter round is very important in raise blasting, and smooth blasting techniques are followed to contain over-break.

**Step 3 -** The Alimak climber is then lowered to the bottom of the raise and into a station for protection before the blast is triggered from a safe location.

**Step-4: Ventilation:** The Alimak system provides for efficient post blast ventilation and a powerful air/water blast effectively dislodging loose rock from the freshly blasted face making ready for re-entry.

**Advantages**

permits driving of long raises.

personal are well protected in a cage under the platform.

the miners work from the platform that can be easily adjusted for convenient height.

timbering is avoided and stability can be increased by rock bolting if necessary

no danger from falling of rock pieces

**Features**

**Drive Units:**

The raise climber is developed with three kinds of drive units: air driven, electrically driven, and diesel/hydraulically driven.

Of the different types of Alimak raise climbers, compressed air driven raising is very common in the country, followed by diesel operated raise climbers are popular.

1. **Air Driven:**

In the air driven raise climbers, compressed air comes through a hose. An automatic winch or reel winds the hose up and down as per the movement of the alimak in the raise construction. The air motors are effective for raising up to 200m length.

2. **Electrical drive:**

Electric are not common in mines, however they have a capacity of driving about 1000m long raises. The longest vertical raise for ventilation shaft at the Densison mines, Ontario, Canada, in 1974 [SME-UMM Hand book].

3. **Diesel / Hydraulic drive::**

Diesel operated Alimak raises climbers are also common after the compressed air driven machines. However there is a risk of excess air pollution due to diesel operated machines underground. The diesel/hydraulic driven raise climber can drive more than 1000 m long raises in one step.

**Safety features**

For the types of Alimak raise climbers the following safety features make them more adoptable in mines;

- Over speed control system; the permitted speed limits on descent are 0.9m/s, if the climber exceeds this speed limit the automatic braking system stops the climber to further descend.
- The rack-and-pinion gear plates are wielded to the guide rails thus ensure a guided maneuvering of the climber up and down the raise.
- The air, water supply is provided through the ports within the guide rail, approximately 25m3/min air supply is provided continuously at the face point. This facilitates the operators with fresh air at the working face. There is a provision to increase the air quantity as per the requirement.
- Telephone communication between the face crew and the bottom crew is provided by an insulated wire passing through one of the ports in the rail.
- Blasting cable also runs through the port within the rail.
- A canopy is also provided for the safety of the face workers while scaling down the loose material from the roof.