



## **Underground Construction (Tunnels, shafts, chambers, passageways, etc.)**

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### ➤ **Access and egress**

- Protected from excavators, haulage machines, trains, and other equipment.
- Prevent unauthorized entry with barricades and “Keep Out” signs

- Check in/check out procedure for head count
- Record of employee location kept on the surface
- Workers aware of emergency procedures
- Power communication system if voice communication ineffective

### ➤ **Emergency**

- Hoist can work during power failure
- Self-rescuers provided where workers might be trapped by smoke or gas
- One above-ground employee to get help and keep head count
- Hand lamp or cap lamp for each employee
- Rescue teams available
- When dangerous gasses present, post notices at all entrances.
- Keep record of air quality

### ➤ **Ventilation**

- Reversible air flow
- Ventilation doors closed when in use
- Dust control measures for drilling rock or concrete (wet drilling, vacuum collectors, water mix spray systems)
- No internal combustion engines underground

➤ **Fire**

- No open flames except for welding, cutting, and other hot work
- “No Smoking” signs in explosive hazard areas
- Store no more than 24-hour supply of diesel fuel underground
- Piping diesel fuel from surface only if surface tank has max capacity of 24 hour supply
- storing oil, grease, and diesel fuel
  - tightly sealed containers 300 feet from explosive magazines
  - dike or position so that overturned containers will not flow from storage area

➤ No flammables stored on surface within 100 feet of opening

➤ Fire extinguisher at head pulley and tail pulley of underground conveyors.

➤ **Welding, cutting, and other hot work**

- No more than a 24-hour supply of fuel and oxygen allowed underground
- Non-combustible barrier installed below if working in or over a shaft

➤ **Ground Support**

- Portal areas guarded by shoring, fencing, head walls, or short-creting
- In hazardous subsidence areas, create stability by shoring, filling in, or erecting barricades.
- Underground areas
  - Inspect roof, face, and walls for ground stability
  - Loose ground must be scaled, taken down, or supported
- Shafts—if worker will enter shaft deeper than 5 feet, then support shaft with steel casing or other material

➤ **Blasting:** Wires kept clear of conductive material

➤ **Drilling**

- Receptacles or racks provided for storing drill steel located on the jumbos
- Drills on columns anchored, retightened as necessary
- Stairs for jumbo decks higher than 10 feet high
- No blasting holes drilled through muck or water
- Caution sign posted where air lines are buried or hidden

➤ **Haulage**

- Audible warning device and warning lights
- No endless belt-type man lifts
- Precautions to prevent rolling of unattended equipment
- Safety chains in addition to couplers when grade exceeds one percent
- Parked rail equipment chocked, blocked, or braked
- Berms, bumper blocks, safety hooks to prevent over-travel and overturning at dumping locations
- Only small hand tools or lunch pails transported with employees in man cars

➤ **Electrical Safety:** Power lines insulated or away from water lines or other conductive materials

➤ **Underground Hoisting**

- Warning light at bottom and at subsurface shaft entrances below load
- Spin-type connections kept clean
- Cage, skip, and load connections to the hoist rope made so that connection will not be undone—moused or latched open throat hooks do not meet this requirement
- For wire rope wedge sockets, wedge escapement prevented
- Cranes equipped with limit switch to prevent over travel at the boom tip.
- Enclosed metal cages used to raise and lower persons in shaft

➤ **Hoists**

- brakes automatically applied on power release or failure
- control levers of the “dead man” type that return to neutral position upon release
- fire extinguisher mounted at each hoist house
- landing level indicators at operator’s station (marking of hoist rope does not meet this requirement)
- hoist operators equipped with closed-circuit voice communication system to talk to landing station

➤ **Cofferdams:** Warnings posted for emergency evacuation of workers.

➤ **Compressed Air:** Employer-designated representative present to ensure compliance with compressed air requirements

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