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

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

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

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- **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 choked, 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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