

# AMMI-16 UNDERGROUND METALLIFEROUS MINING

## UNIT-1 INTRODUCTION

- 1.1 Present status of Indian metal mining industry;
- 1.2 Scope and limitations of underground mining.

## UNIT-2 DEVELOPMENT

- 2.1 Choice of level interval and back/block length; Shape, size, position, excavation and equipping of shaft station/plat, grizzly, ore/waste bin, main orepass system,
- 2.2 Underground crushing and loading stations, underground chambers, sump and other subsidiary excavations;
- 2.3 Arrangements for dumping into main orepass; Underground crushing, loading and hoisting Cross-cuts and drifts their shape, size and position;
- 2.4 Review of excavation process ground breaking, mucking, ventilation and support;
- 2.5 Track extension and car switching;
- 2.6 Use of modern drilling and loading equipment in drifting;
- 2.7 Raises and winzes their shape, size and position; Excavation process ground breaking, mucking, ventilation and support; Modern methods of raising
- 2.8 Alimak and Jora-lift raising, longhole method including vertical crater retreat method of raising;
- 2.9 Raise boring systems and their details; Modern methods of winzing;
- 2.10 Secondary breaking at grizzley conventional and mechanised methods.

## UNIT-3 STOPING

- 3.1 Selection of stoping methods; Classification of stoping methods; Stopping of narrow ore bodies by underhand, overhand, breast, longhole and raise mining methods;
- 3.2 Resuing; Mining of parallel veins; Room & pillar, sublevel, large diameter blast hole/DTH, cascade, shrinkage and vertical crater retreat methods their applicability,
- 3.3 Stope layouts, stope preparation, ground breaking, mucking, ventilation and supporting;
- 3.4 Haulage and dumping; Supported methods- horizontal overhand and underhand cutand
- 3.5 Fill methods, square-set method and its variations, details of stope layouts,
- 3.6 Ground breaking, supporting, mucking, ventilation, haulage and dumping.

## UNIT-4 MINE SUPPORTS

- 4.1 Timber support: Post, drift-set of various types, square-set, crib-set, cog, stull and chock / chock mat supports; fore poling/piling; load bearing capacity of timber supports; bulkheads.
- 4.2 Steel support: Steel set rigid and yielding types; tubbing, wire mesh, steel lining,
- 4.3 Screw jacks and ratchet jacks; Improved steel props, friction props, hydraulic props; link bars and chocks, powered supports;

## UNIT-5 CEMENT SUPPORT

- 5.1 Poured monolithic and reinforced concrete lining; monolithic pump packing, concrete blocks,
- 5.2 Concrete slabs, guniting and shotcreting.

5.3 Rock support: Pillars of ore and waste, pack walls, masonry walls and arches building materials and construction.

#### **UNIT-6 FILL SUPPORT**

6.1 Materials of backfill and their procurement; theoretical aspects of slurry transportation; preparation, transport and placement of hydraulic backfill with and without cement;

6.2 Paste fills; rock and concrete fills; surface arrangement for storage and mixing;

6.3 Pneumatic and mechanical methods of backfilling.)

#### **UNIT-7 REINFORCEMENT SYSTEMS**

7.1 Materials and techniques; rock bolts and dowels - different types and uses; mechanics of bolting; point anchored rockbolts- Slot and wedge type, expansion shell type,

7.2 Grouted point anchor type; full column anchors

7.3 Wooden and fiberglass dowels, mechanical full column anchors,

7.4 Split sets/friction rock stabilizers, swellex, full column grouted rockbolts;

7.5 Installation and testing of rock bolts; cable bolting its installation and applications.

7.6 Innovations in support and reinforcement systems for hard rock mines.

#### **Reference Books:**

1. "Introductory Mining Engineering" by Hartman
2. "Elements Of Mining Technology" by D J Deshmukh.

