



MINING AND MINERAL PROCESSING ENGINEERING SYLLABUS OF EXAMINATIONS 1998 EDITION

For textbook information please refer to the **Textbooks** section on page 3 of the document entitled **Information for Students and Examinations Candidates**.

GROUP A COMPULSORY EXAMINATIONS (SIX REQUIRED)

98-Mmp-A1 General Geology and Exploration

Mineralogy, determination and identification of minerals, with emphasis on ore minerals. Petrology. Structural geology. Internal and external geologic processes. Techniques used to find and delineate ore bodies, airborne methods, geophysical, geochemical, sampling and drilling.

The Use of Stereographic Projection in Structural Geology Phillips, F.C. (3rd edition) Edward Arnold Publishers 1993

98-Mmp-A2 Mining Methods and Design

Description and usage of the following underground mining methods: room and pillar, long-hole, longwall, open stoping, shrinkage stoping, cut and fill sub-level stoping, timbered stoping, top slicing, underhand and overhand stoping, block caving, sublevel caving, and VCR mining techniques. Underground design — stope development, haulage systems, shafts, hoists, ramp design and multi-level access. Surface mining methods including strip mining, open pit mining, terrace and contour mining, placer mining, hydraulic mining dredging and quarrying. Design criteria for surface mines including scheduling, materials handling, waste dump and pit dewatering.

98-Mmp-A3 Mineral Processing

Material balances. Measures of efficiency of mineral separations. Sampling systems and sampling errors, use of Gy's equation. Particle size measurement and presentation of results. Mineral liberation by crushing, grinding, screening, and classification. Mineral concentration using gravity, dense medium, magnetic and high tension separators. Froth flotation and flotation circuits. Use of reagents — collectors, frothers, depressants, and activators. Precious metals recovery methods — cyanidation, Merrill Crowe, carbon-in-pulp, carbon-in-leach, metal recovery methods. Heap leaching technology for precious metals and base metals. Dewatering techniques — thickening, filtering, drying, flocculants, and filter aids. Flowsheet analysis emphasizing Canadian mineral processing plants.

98-Mmp-A4 Mine Valuation and Mineral Resource Estimation

Aspects of geological conditions and geological control that relate to mineral resource estimates. Mineral resource estimation using conventional and geostatistical techniques. Mine valuation and

preliminary feasibility studies. Marketing and smelter contracts. Financial models, capital and operating cost estimations, and control.

98-Mmp-A5 Mine Management and Systems Analysis

Mine organization and mine management. Budgeting and management accounting. Industrial engineering — work design and scheduling, work study and sampling, development of standard practices. Organizational structure of business in the mining industry. Contracting procedures. Labour/management relations. Operations Research methods — control networks (CPM, PERT), linear programming and simulation techniques. Optimization and experimental design.

98-Mmp-A6 Environmental Protection

Tailings disposal systems: impoundment on surface, treatment of recycle or decant water, sub-aqueous discharge to fresh and marine waters. Construction, maintenance and stability of embankments, waste piles, dams, and dikes. Prediction, prevention and control of acid rock drainage from exposed faces or waste dumps. Control of dust, noise, and gas emissions. Reclamation and revegetation. Government regulations concerning environmental protection in the design, operation and closure of mines and mills.

GROUP B

ELECTIVE EXAMINATIONS (THREE REQUIRED)

98-Mmp-B1 Applied Rock Mechanics

Determination of rock properties. Field instrumentation. Structural surveys, rock mass classification. In situ stress determination. Modelling stress fields around openings, including finite element and boundary element techniques. Mine support systems. Mine subsidence. Monitoring and control techniques, including seismic events, ground waters.

98-Mmp-B2 Rock Fragmentation

Principles and technologies of cutting, drilling, boring, and blasting, including vibrational and shock effects. Explosives, including properties and classification, selection of chemical explosives and explosive mixtures, regulations and approved procedures for handling, storing, loading, and detonating. Blasting design, including detonators, delay systems, control blasting methods.

98-Mmp-B3 Mine Equipment Selection and Maintenance

Selection, sizing and matching of mining equipment: shovels, excavators (BW and hydraulic), draglines, loaders, tramming equipment (trucks, LHD, trains, etc.). Conveyors, feeders, stackers, bins, pipelines and hoists. Automation and robotic control of mining equipment. Applications of GPS. Maintenance principles and practices — preventative and predictive maintenance.

98-Mmp-B4 Occupational Health, Safety and Loss Management

Control and detection of hazards in mines: rock falls, slope failure, radiation, heat, noise, dust and gas. Ventilation — air flow through mine openings, air quality and control. Health, safety and industrial hygiene. Risk analysis, risk management, and loss control.

98-Mmp-B5 Mill Design, and Operations

Flowsheet synthesis and circuit design. Selection and sizing of milling equipment: comminution, classification, size separations, froth flotation, dewatering, solids and slurry storage and transport. Modelling and new developments in mill design: Tower, AG and SAG mills, column flotation, coal preparation practices, pre-concentration techniques. Sampling, data logging and material balances. Capital, and operating cost estimations.

98-Mmp-B6 Mill Process Control

Basic process control and analysis: PID loops, feedback, feed forward, cascade and interacting control systems. Controller settings — analytical and loop-tuning techniques. Computer control: modelling, adaptive, and supervisory. On-stream analysis and sampling for control; strategies for control of crushing, grinding, flotation, and dewatering circuits. Instrumentation for bin and sump level sensing, solids and slurry flowrates, pulp density, power draw, reagent addition, pH measurement. Alarm and interlock systems, sequencing problems. Benefits and justification of automatic control.

98-MMP-B7 Extractive Metallurgy

Thermodynamics of pyro- and hydro-metallurgical extraction processes. Kinetics of extraction processes. Slag and mattes. Pyrometallurgical processes including calcining, roasting, and smelting. Hydrometallurgical processes, including leaching (autoclave, agitation, and heap), purification and concentration via ion exchange, and solvent extraction, metal recovery via electrowinning, electrolysis or precipitation. Refining processes. Flowsheet studies.

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