DEPARTMENT OF MINERALS AND ENERGY

MINE HEALTH AND SAFETY INSPECTORATE

RULES AND SYLLABI FOR THE MECHANICAL AND ELECTRICAL ENGINEER'S CERTIFICATES FOR MINES AND WORKS FRAMED UNDER MINERALS ACT REGULATION 28.6, IN FORCE IN TERMS OF SCHEDULE 4 OF THE MINE HEALTH AND SAFETY ACT 1996 (ACT 29 OF 1996)

CONTENTS

EXAMINATIONS FOR THE MECHANICAL AND ELECTRICAL ENGINEER'S GOVERNMENT CERTIFICATE OF COMPETENCY (GCC) FOR MINES AND WORKS

(Revised: 2 January 2003)

1. CERTIFICATES OF COMPETENCY

The following instructions, rules and syllabi for the examinations are framed in terms of Minerals Act Regulation 28.6 in force in terms of the Mine Health and Safety Act, (Act No.29 of 1996) regulation 28.6.

1.1 The following Certificates of Competency are issued by the Department of Minerals and Energy:

(a) Certificate of Competency as Mechanical Engineer for Mines and Works.

(b) Certificate of Competency as Electrical Engineer for Mines and Works.

1.2 Written examinations for each of these certificates are conducted in June and November by the Department of National Education in collaboration with the Commission of Examiners of the Department and the Department of Labour.

1.3 The procedure required to be followed to acquire a certificate of competency is summarised in paragraph 6.

2. QUALIFYING EXAMINATIONS

2.1 To qualify for a Certificate of Competency as Mechanical or Electrical Engineer for Mines and Works, the following subjects must be passed by persons accepted as candidates:

(a) **Plant Engineering; and**

(b) **Legal Knowledge (Health and Safety Act and Regulations).**

2.2 To qualify for a Certificate of Competency, candidates must obtain at least 50% in each subject stipulated in 2.1. Candidates need not pass both subjects at the same examination sitting, but the second subject must be passed within two years or four consecutive examination sittings after passing the first, otherwise both subjects must be re-written. However, if a candidate obtains 75% or more of the full marks in a subject he/she will be permanently exempted from re-writing that subject. An appropriate Certificate of Competency will be forwarded to candidates who have passed the subjects required to qualify for such a certificate.

3. ACCEPTANCE OF CANDIDATES FOR A GCC FOR MINES AND WORKS AS MECHANICAL OR ELECTRICAL ENGINEER

3.1 No person will be allowed to enter for the qualifying examination, unless he/she has been accepted as a candidate by the Commission of Examiners, and no credit will be given for a pass in the subjects mentioned in 2.1, prior to such acceptance. An applicant shall not be accepted as a candidate by the Commission of Examiners, unless he/she has submitted proof that he/she has reached the age of 23 years, of sobriety and general good conduct and that he/she is in possession of qualifications and experience in engineering as follows:-

3.2.1 A B.Sc. degree in mechanical or electrical engineering recognised by the Commission of Examiners and at least two years post graduate appropriate practical experience in the maintenance and operations of mechanical and electrical machinery, satisfactory to the Commission of Examiners and of which at least one year has been at a mine in the RSA; or

3.2.2 A course (Technikon route) in engineering (mechanical or electrical as the case may be), a National Diploma (S4) plus at least two years experience subsequent to the issue of such diploma in the maintenance and operations of mechanical or electrical machinery as the case may be, which is satisfactory to the Commission of Examiners, and of which at least one year has been at a mine in the RSA. The completion of such course shall include passing all the subjects with a mark of at least 50%.
Individual Technikons may structure a curriculum to cover the electrical and mechanical course according to the requirements of the Plant Engineering syllabus (Annexure II). The Technikon must subsequently certify that a candidate for the Government Certificate of Competency, having followed the Technikon route, has -

(i) Completed a curriculum, which covers the syllabus for Plant Engineering;

(ii) Acquired a National Diploma with a mark per subject of at least 50%; and

(iii) Received the required experiential training; or

3.2.3 Enrolled for the B.Tech. Degree, at a Technikon granted permission by the Commission of Examiners with the undertaking from such Technikon to monitor and control the required experiential training after completion of such degree.

3.2.4 A course (Technical College route) in engineering (mechanical or electrical as the case may be). The completion of such course shall include passing all the subjects with a mark of at least 50%. Such person shall also have served an apprenticeship in an appropriate trade and has gained experience in the maintenance and operations of mechanical or electrical machinery, as the case may be, as listed in Annexure I. Such experience, of which at least one year has been at a mine in the RSA, shall be satisfactory to the Commission of Examiners.

The Department of National Education will structure a curriculum to cover the electrical and mechanical course according to the requirements of the Plant Engineering Syllabus Annexure II. After completion of the prescribed course, the Department of National Education will be required to certify that a candidate for the Government Certificate of Competency, having followed the Technical College route, has -

(i) Completed a curriculum, which covers the syllabus for Plant Engineering; and

(ii) Acquired a National Certificate on the N6 level, with a mark of at least 50% in all subjects.

3.3 The Commission of Examiners will consider other qualifications and experience on merit.

3.4 A maximum of 50% of the period for appropriate practical experience obtained during military training may be recognised by the Commission if substantial proof of the appropriate experience is submitted by a candidate.

3.5 When an applicant follows an approved practical training program, such an applicant may be accepted as a candidate to write the qualifying examination, before the applicant has completed the required practical experience as stipulated in paragraph 3.2.1,3.2.2,and 3.2.4, provided that the applicant can provide proof that not more than four months of the approved practical training program is still outstanding at the closing date for acceptance as a candidate to write the qualifying examination. Upon successful passing of the qualifying examination, a certificate will only be issued if proof of completion of the full-approved practical training program has been submitted.

3.6 Persons who wish to be accepted as candidates and who are in possession of a foreign degree, diploma or certificate in engineering, or who are in possession of engineering qualifications other than those mentioned in 3.2.1, 3.2.2 and 3.2.4 must have such degree, diploma or certificate evaluated by the Department of National Education, Examination Section, Private Bag X110, Pretoria, 0001, to check what additional subjects, if any, must be passed in order to comply with the requirements for acceptance. A request for valuation must indicate that it is for the Engineer's Certificate of Competency and must include a list of the subjects, including marks obtained, which led to the obtaining of the degree, diploma or certificate. A copy of the evaluation and a certified copy of the degree, diploma or certificate must accompany the application for acceptance as a candidate.

3.7 A person who has been accepted by the Commission of examiners as a candidate and has not obtained a Certificate of Competency in seven years from date of acceptance must re-apply to the Commission for acceptance.

NOTE: An evaluation by the Human Sciences Research Council on its own is <u>not</u> sufficient.

4. SYLLABI AND EXAMINATION RULES

4.1 The syllabi for the legal Knowledge subject mentioned in 2.1 is given in Annexure C.

4.2 Plant Engineering (Mining) is a "closed book" examination. It will consist of both mechanical and electrical questions, with a limited choice of questions. The time allowed for the examination is three hours.

Candidates may not use alphanumerical or programmable calculators in the examination room.

4.3 The question paper on the Mine Health and Safety Act and Regulations is also a closed book examination. There is no choice of questions and all questions must be answered. The time allowed for the examination is three hours.

It should be noted that the syllabus includes the practical application of the Act and Regulations. This implies an understanding of the Act and Regulations rather than committing the wording to memory only.

5. ALTERNATE CERTIFICATES AND EXEMPTIONS

5.1 A candidate with a B.Sc. degree in electrical or mechanical engineering or equivalent qualifications, reconised by the Commission of Examiners, who has had at least three years post-graduate experience satisfactory to the Commission of Examiners and accepted as a Professional Engineer (appropriate qualified) by the Engineering Council of South Africa (ECSA), may be exempted from the subject "Plant Engineering".

This ruling shall expire on 31 December 2003 after which exemption for Plant Engineering will no longer be granted.

5.2 The holder of a Certificate of Competency for "Factories" who wishes to qualify for the equivalent certificate for "Mines and Works" shall re-apply for acceptance as a candidate together with proof of at least one year's experience in the maintenance and operation of appropriate machinery at a mine satisfactory to the Commission of Examiners and after acceptance will be required to pass the subjects mentioned in 2.1.

5.3 The holder of a Certificate of Competency as Mechanical Engineer who wishes to qualify for a certificate, as Electrical Engineer shall re-apply for acceptance as candidate together with proof of appropriate experience (appointment letter(s) as an engineer in charge of machinery). Such experience shall be satisfactory to the Commission of Examiners and shall consist of at least two years experience in the maintenance and operation of electrical machinery or at least four years "mixed" experience in the maintenance and operation of both electrical and mechanical machinery, which was gained after the acquisition of the mechanical certificate. The applicant will also be required to produce proof obtained from a Technikon or

Technical College of passing the subjects required to cover the Syllabus for the Certificate of Competency as Mechanical Engineer, with a mark of at least 50%.

5.4 The holder of a Certificate of Competency as Electrical Engineer who wishes to qualify for a certificate, as Mechanical Engineer shall re-apply for acceptance as a candidate together with proof of appropriate experience (appointment letter (s) as an engineer in charge of machinery).
Such experience shall be satisfactory to the Commission of Examiners and shall consist of at least two years experience in the maintenance and operation of mechanical machinery or at least four years "mixed" experience in the maintenance and operation of both mechanical and electrical machinery, which was gained after the acquisition of the electrical certificate. The applicant will also be required to produce proof obtained from a Technikon or Technical College of passing the subjects required to cover the syllabus for the Certificate of Competency as Mechanical Engineer, with a mark of at least 50%.

6. SUMMARISED PROCEDURE

6.1 Obtain application forms for acceptance from:

The Secretary
Commission of Examiners
Department of Minerals and Energy
Private Bag X59
PRETORIA
0001 Tel.: (012) 317-9079.

For further information see the DME website: www.dme.gov.za

6.2 Return the completed forms where applicable to the above-mentioned address together with:

(a) A R50.00 uncancelled revenue stamp (s) (stuck on form); and

(b) Certified copies of degrees, diplomas or certificates (see paragraph 3); and

(c) A certified letter of evaluation from the Department of National Education stated that the syllabus of the subject Plant Engineering has been covered (N 6 route); or

(d) A certified letter from a approved Technikon, stated that the syllabus for Plant Engineering has been covered. (S4 and B-Tech route); and

(e) Certified proof of appropriate practical experience (see annexure D) and record of service signed by time keeper/ payroll manager; and

(f) A testimonial letter of sobriety and good conduct from the Resident Engineer (original letter); and

(g) A certified copy of candidates ID Number

6.3 If the application is successful, the Commission of Examiners will send a letter of acceptance to the candidate to enrol for the examination.

6.4.1 The candidate must take the letter of acceptance to enter for the qualifying subjects (par.2.1) to any Technical College or to any Local Secretary of the Department of National Education, to whom the examination fees must be paid. The examinations are in June and November and the closing dates for entry are **20 March** and **25 September** respectively.

6.5 The Commission of Examiners will only consider applications for the GCC examination **30 working days** prior to the closing date set by the Department of Education (see paragraph 6.4). The results obtained by a candidate in any examination **will not** be recognised by the Commission of Examiners, if such candidate entered for the examination without having obtained a letter of acceptance from the Commission of Examiners.

6.6 A candidate, who has passed the qualifying subjects (par 3.2) must forward certified proof of having passed the prescribe subjects to the Commission of Examiners to the above-mentioned address.

6.7 A candidate who has passed a subject (s) (par.6) by means of a remark must notify the Commission of Examiners accordingly.

6.8 The appropriate GCC will only be issued by the Department on receipt of a letter together with the following information by a candidate-

a) Proof of Examination results from Department of National Education
b) Proof of Identity Number
c) Postal address
d) A letter requesting the issuing of the appropriate GCC i.e. Mechanical or Electrical.

7. "FACTORIES" CERTIFICATES

Persons who wish to qualify for a certificate of competency for "Factories" must apply to:

The Secretary
Commission of Examiners
Department of Labour
Private Bag X117
PRETORIA
0001 Tel.: (012) 309-4378

ANNEXURE A

ACCEPTABLE TRADES AND EXPERIENCE

Trade in which the apprenticeship has been served	Minimum appropriate post-apprenticeship experience in the general maintenance and operation of machinery
	YEARS
Aero engine fitter, ground engineer or equivalent	2
Armature winder	3 on general electrical maintenance
Blacksmith	3 not as a blacksmith
Boilermaker	3 not as a boilermaker
Diesel Mechanic	2 not as a diesel mechanic
Electrician	2
Engine-room fitter	2
Fitter	2
Fitter and armourer	3
Fitter and rigger (Air Force)	2
Fitter and turner	2
Instrument mechanican or instrument maker	4 not as an instrument mechanic
Instrument technician	2 not as an instrument technician
Lift mechanic	2
Millwright	2
Motor mechanic	3 not as a motor mechanic
Refrigeration mechanic	3
Tool and die maker	2
Welder	4 not as a welder

ANNEXURE B

SYLLABUS FOR PLANT ENGINEERING

THE THEORETICAL SECTION OF THE SUBJECT PLANT ENGINEERING TO BE INCLUDING IN THE SYLLABI OF TECHNIKONS AND TECHNICAL COLLEDGES

Questions will be framed on all aspects of the theory and the practical application of such theory in its widest sense as would be expected of a certificate engineer while performing his normal duties. Accent is placed on his competency in the exercise, control and supervision over the safe installation, maintenance and operation of machinery.

SYLLABUS FOR PLANT ENGINEERING

1. SAFETY AND MANAGEMENT

MECHANICAL	ELECTRICAL
Accident prevention	Accident prevention
Fire protection	Fire protection
Risk control	Risk control
Project management	Project management
Financial management	Financial management
Loss control	Loss control

2. ELECTRICAL TECHNOLOGY

MECHANICAL	ELECTRICAL
Direct - current machines	Direct - current machines
Direct - current generators	Direct - current generators
Direct - current motors	Direct - current motors
Efficiency of D C. machines	Efficiency of D C motors
Alternating voltage and current	Alternating voltage and current
Single and three phase circuits	Single and three phase circuits
Transformers	Transformers
	Alternator windings
Production of a rotating magnetic field	Production of a rotating magnetic field
Characteristics of synchronous	Characteristics of Synchronous
Generators and motors	Generators and motors
Three phase induction motors	Three phase induction motors
Semi conductor devices	Semi conductor devices
Electric lamps and illumination	Electric lamps and illumination
Electric power transmission & distribution	Electric power transmission & distribution

ANNEXURE B CONTINUED

MECHANICAL	ELECTRICAL
Circuit breakers	Circuit breakers
Underground cables	Underground cables
Insulators	Insulators
Overhead lines	Overhead lines
Economics of power supply maximum demand	Economics of power supply Maximum demand
	Circuit breakers
Power factor correction	Power factor correction
	High frequency transients
	Methods of earthling
	Protection
	Storage of energy
	Rectification
Fault discrimination (basics) (Symmetrical faults only)	Fault discrimination
Illumination	Illumination
	Communication
Explosion proof equipment	Explosion protected apparatus
Lightning protection	Lightning protection
	Basics of data transmission

3. APPLIED THERMODYNAMICS

MECHANICAL	ELECTRICAL
Air- and gas compressors and blowers	Air- and gas compressors and blowers (rotary compressors only)
Air motor (applications)	
Compressed air columns	Compressed air columns
Compressed air receivers	
Refrigeration and properties of refrigerants	Refrigeration and properties of refrigerants
Air conditioning	Air conditioning
Psychometric tables and charts	
Steam generators (boilers & ancillary equipment)	Steam generators (boilers & ancillary equipment)
Properties of steam	Properties of steam
Heat balancing	
Condensers	
Steam and gas turbines	
Fans	Fans (classification)
Internal combustion engines	Internal combustion engines
Heat transfer	
Fuels and combustion	

ANNEXURE B CONTINUED

4. STRUCTURES AND STRENGTH OF MATERIALS

MECHANICAL	ELECTRICAL
Simple stresses	Simple stresses
Simple stress and strain	Simple stress and strain
Thin-walled pressure vessels	Thin-walled pressure vessels
Torsion of circular shafts	Torsion of circular shafts
Close coiled helical springs	Shear force and bending moments
Shear force and bending moments	
Temperature stresses	Temperature stresses
Strain energy due to direct Stresses	
Second moment of area	Second moment of area
Bending stresses	Bending stresses
Shear Stress in beams	
Struts & buckling	
Catenaries	Catenaries
Foundations	
Fatigue failure	
Mechanical and chemical properties of metals	Mechanical and chemical properties of metals
Testing of materials	Testing of materials
Twisting of shafts	
Ropes	Ropes
Properties of different	
Types of ropes	
Reinforced concrete	
Retaining walls	
Fastenings	Fastenings

5. THEORY OF MACHINES

MECHANICAL	ELECTRICAL
Conveyors	Conveyors
Winding plant (Double drum, Single drum, Koepe, Blair Multi-rope and multi-drum) (Degree of protection)	Winding plant (Double drum, Single drum, Koepe, Blair Multi-rope and multi-drum) (degree of protection)
Elevators	Elevators
Traction	Traction
Motion and inertia	Motion and inertia
Displacement, velocity and acceleration	Displacement, Velocity and acceleration
Static and dynamic balancing	Static and dynamic balancing
Belt and chain drives	Belt and chain drives
Brakes and dynamometers	Brakes and dynamometers
Toothed gearing	
Gear trains	

ANNEXURE C

SYLLABUS FOR MINE HEALTH AND SAFETY ACT AND REGULATIONS

1. **MINE HEALTH AND SAFETY ACT (ACT NO. 29 OF 1996)**

2. **The following Mine Health and Safety Act and Minerals Act Regulations (As amended):**

Chapter 1	1.1(1) 1.2.1(1)
Chapter 6	6.3, 6.4, 6.5, 6.6, 6.7 and 6.9
Chapter 10	10.1, 10.2 to 10.5, 10.6.1, 10.6.4, 10.6.6, 10.11.2, 10.13, 10.14, 10.15, 10.20.1, 10.20.2, 10.21.4(a), 10.23, 10.24.1, 10.24.2 and 10.25
Chapter 16	All regulations
Chapter 20	All definitions
Chapter 21	All regulations
Chapter 23	All regulations

3. Minerals Act Regulations (as amended)

Chapter 1	Definitions
Chapter 2	2.5.2.1, 2.5.2.2, 2.5.4, 2.6.1, 2.6.2, 2.6.4, 2.9, 2.10.2, 2.10.4, 2.10.5, 2.10.14 to 2.10.19, 2.13.1 to 2.13.12, 2.17.1 to 2.17.7, 2.18.1 to 2.18.2, 2.19.1 to 2.19.7
Chapter 4	All Regulations
Chapter 5	5.1.1, 5.1.2, 5.2, 5.3.5, 5.5, 5,6.1 to 5.6.3 5.7, 5.8.1 to 5.8.3, 5.9.1 to 5.9.2, 5.11, 5.13.1 to 5.13.4, 5.14 to 5.14.4, and 5.15
Chapter 6	6.1.1, 6.1.2, 6.2.2.2, 6.3.2.3, 6.4, 6.5.1 to 6.5.2.2 6.6 to 6.6.6, 6.7, and 6.9
Chapter 7	7.1, 7.3.1 to 7.3.4, 7.5.1, to 7.5.3, 7.7,1 to 7.7.3, 7.8.1 to 7.8.3, and 7.9.1 to 7.9.2
Chapter 8	8.4.6, 8.4.7, 8.6.1 to 8.6.3
Chapter 9	9.15.1, 9.30.1, 9.30.2.1 to 9.30.22, 9.30.3.1, 9.38.6 and 9.38.7

Chapter 11	All Regulations
Chapter 14	All Regulations except 14.3
Chapter 16	All Regulations
Chapter 17	All Regulations
Chapter 18	All Regulations
Chapter 19	All Regulations
Chapter 20	All Regulations
Chapter 21	All Regulations
Chapter 22	All Regulations
Chapter 23	All Regulations
Chapter 24	All Regulations
Chapter 26	All Regulations
Chapter 27	All regulations
Chapter 28	28.1.1 to 28.6, 28.9 to 28.12, 28.22.1 to 28.31, 28.47.1 to 28.47.7, 28.48.1, to 28.48.2
Chapter 29	All Regulations
Chapter 30	30.1,to 30.4.4, 30.7 and 30.8
Chapter 31	31.1 to 31.10
Chapter 35	All Regulations

4. The practical application of the Act and Regulations.

5. Machinery guidelines issued in terms of Section 9 (3) of the Mine Health and Safety Act.

6. SANS referenced in Regulations and Guidelines.

ANNEXURE D

PRACTICAL KNOWLEDGE TO BE COMPLETED BY MENTOR/ENGINEER AND CANDIDATE, TO BE SUBMITTED WITH APPLICATION

PRACTICAL KNOWLEDGE (MINES)

Candidates must be conversant with the following plant, equipment, practices and processes on surface and underground at mines with emphasis on the general design, lay out, reticulation, production capacity, energy requirements, motion characteristics, economic, operation, efficiency testing, commissioning, maintenance, safety precautions and devices. This section is complimentary to and additional to the theoretical curriculum obtained at Universities, Technikons or Technical Colleges. Certain experience is required- Please indicate on the attached form the experience gained under each section.

- **Certain Experience is required – Please indicate on attached Annexure E experience gained under each item. Return the completed Annexure E (original signature of Mentor) with your application.**

- **Please note: ACTUAL EXPERIENCE GAINED AFTER ACADEMICAL QUALIFICATIONS HAVE BEEN COMPLETED**

ANNEXURE E

NAME: …… **MINE: ……**

ID NO: …… **GROUP: ……**

Description	Start Dates No Working Days	Completion Dates No Working Days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of Mine where experience gained
WINDING PLANT (60 days)					
1.Various winding systems					
1.1 Double drum					
1.2 Single drum					
1.3 Multi Rope					
1.4 Automatic					
1.5 Stage winders					
2. Control Systems					
2.1 A C					
2.2 D C closed loop					
2.3 Variable speed					
3. Signalling and safety devices					
4. Wire ropes and attachments					
5. Front and back end rope cuts					
6. Sheaves, shafts and shaft bearings including sheave profile					

Description	Start Dates No Working Days	Completion Dates No Working Days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of Mine where experience gained
7. Cages, skips and other types of conveyances					
8. Rope, steel, timber, and timber and rail guides					
9. Loading and unloading arrangements for persons, material and minerals					
10. Headgear's, bins and loading chutes					
11. Shaft sinking					
12. Signalling systems 12.1 Safety devices					
LIFTING EQUIPMENT (10 days)					
1. Lifting Machines 2. Lifting tackle					
LIFTS (ELEVATORS) (10 days)					
1. Type of Lifts 1.1 AC 1.2 DC 1.3 Rack and Pinion Lift					
2. Safety devices					
3. Ropes and Chains					
4. Hatchway and cars					

Description	Start Dates No Working Days	Completion Dates No of Working Days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of Mine where experience gained
5. Motor room and controls					
6. Inspections and tests					
CHAIRLIFTS (10 days)					
1. Safety devices					
2. Ropes and Splices					
3. Chains					
4. Chairs and attachments					
5. Brakes					
6. Boarding/Alighting station					
7. Travelling learances					
COMPRESSED AIR AND RETICULATION (10 days)					
1. Air compressors					
1.1 Rotary 1.2 Screw 1.3 Piston					
2. Ancillary equipment					
3. Control of safety devices					
4. Transmission					
5. Distribution					

Description	Start Dates No Working Days	Completion Dates No Working Days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of Mine where experience gained
6. Measurement of compressed					
7. Compressed air motors					
8. Testing of air compressor systems					
DRILLS (20 days)					
1. Rotary and percussion machine for drilling					
2. Machine cutting rock					
3. Rock drill machine					
4. Raiser bore					
5. Diamond and shot drills					
6. Drills and drill bite machine					
7. Drill sharpening					
ENVIROMENTAL ENGINEERING (25 days)					
1. Ventilating and cooling including main and aux fans					
2. Air conditioning					
3. Refrigeration including balance					

Description	Start dates No Working Days	Completion Dates No working days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of Mine where experience gained
4. Dust and fumes: cause and prevention					
5. Noise: cause and prevention					
6. Hearing protection					
7. Illumination of working places					
MATERIAL/ORE HANDLING EQUIPMENT (50 days)					
1. Conveyors					
2. Scraper winches					
3. Endless rope and mono-winch installation					
4. Rocker-arm loaders					
5. Underground rail bound transport					
6. Underground trackless transport					
7. Use of flame proof diesel engines in fiery mines and hazardous locations					
8. Man-riding conveyors					
9. Mono-rail systems					

Description	Start dates No Working Days	Completion Dates No working days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of Mine where experience gained
FLUID HANDLING (30 days)					
1. Stope drainage					
2. Haulage water drainage					
3. Mine de-watering pump station					
4. Underground settlers					
5. Underground dams/ plugs					
6. Multi-stage pumps					
7. Sludge pumps					
8. Water treatment					
9. Measurement of flow					
10.U/G water system					
11.Pelton wheels					
12.Water balance					
ELECTRIAL (50 days)					
1. Electrical power transmission					
2. Transformers					
3. Switchgear					
3.1 Oil 3.2 Mineral oil 3.3 Vacuum circuit breaker 3.4 SF6					

Description	Start Dates No Working Days	Completion Dates No of Working Days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of Mine where experience gained
4. Underground and surface electrical distribution					
5. Electrical power control and measurements					
6. All type of electrical motors 6.1 AC 6.2 DC 6.3 Synchronous motors					
7. Emergency power generating installations					
8. Heating equipment					
9. Lightning equipment					
10.Protection against lightning surges					
11.Earth leakage and overload protection including discrimination and testing of equipment					
12. Fault current calculations					
13. Power factor and power factor corrections					

Description	Start Dates No Working Days	Completion Dates No of Working Days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of Mine where experience gained
14. Power costs and tariff calculations					
15. Explosion protected apparatus					
16. Classification of hazardous locations					
17. Repair and manufacturing of electrical equipment					
ORE PLANT (20 days)					
1. Crushing plant and equipment					
2. Storing, screening, washing plant					
3. Grinding plant (mills)					
4. Mill product thickening					
5. Filtering					
6. Vacuum systems					
7.Recovery 7.1 Flotation					
8. Residue handling and storage					
STEAM GENERATING (15 days)					
1. All type of boilers					

Description	Start date No working days	Completion dates No of working days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of shaft Where experience gained
2. Boiler fuels					
2.1 Gas 2.2 Coal 2.3 Electrical 2.4 Oil					
3. Safety devices					
4. Ancillary equipment					
5. Steam piping systems					
6. Autoclaves					
7. Super heaters					
8. Condensers					
9. Water treatment					
10 Boiler inspections and tests					
WORKSHOPS (30 days)					
1. Electrical workshop					
2. Fitting shop					
3. Boiler shop					
4. Carpenter shop					
5. Mine store					
6. Workshop organisation					
7. Cable repair shop					
8. Garage workshop					
STRUCTURES (20 days)					
1. Buildings erected to house machinery					

Description	Start Dates No Working Days	Completion Dates No of Working Days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of Mine where experience gained
2. Provision for cranes and lifting gear					
3. Underground chambers support of excavation					
4. Lifting arrangements					
CONCRETE WORK (10 days)					
1. Reinforced concrete					
2. Composite beams					
3. Shuttering and concrete hardening					
4. Protection against chemical wear					
STEEL AND ALLOYS (5 days)					
1. Mechanical properties of various type of steel and alloys					
2. Stress in structures					
3. Composite beams					
4. Corrosion and abrasion protection of steel					
5. Effects of fluctuating temperatures					

Description	Start date No working days	Completion dates No of working days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of shaft Where experience gained
LUBRICATION (10 days)					
1. Elementary theory of lubrication					
2. General properties of oil and greases					
3. Modification of properties by additives such as detergents					
4. Extreme pressure additives and antioxidants					
5. Condition monitoring					
FIRE PREVENTION AND CONTROL (5 days)					
1. Fire prevention and control					
2. Use of different types of fire extinguishers					
3. Maintenance and repair of fire prevention systems					

Description	Start dates No working days	Completion dates No of working days	Mentor Signature (Engineer)	Engineer in Training Signature	Name of shaft Where experience gained
OPERATION AND MAINTENANCE OF PLANT (30 days)					
1. Care					
2. Operations					
3. Planned maintenance					
4. Supervision and inspection/audits					
5. Safety precautions					
6. Safety devices					
7. Automation in operating or production processes					
8. Financial control					
9. Commissioning of projects					
PROJECT MANAGEMENT (20 days)					
1. Planning methods					
2. Control and implementation of projects					
3. Critical route scheduling					
4. Gantt-chart					

Description	**Start dates No working days**	**Completion dates No of working days**	**Mentor Signature** (Engineer)	**Engineer in Training Signature**	**Name of shaft Where experience gained**
5. Nett present values					
6. Retention payments					

Name of Engineer: ……..…… **Date: ……**

Cert No: …….. **Name of shaft: ……**