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**SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)**

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Standards Generating Body (SGB) for

Manufacturing and Assembly Processes

registered by Organising Field 06 – Manufacturing, Engineering and Technology, publishes the following qualification and unit standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the qualification and unit standards. The full qualification and unit standards can be accessed via the SAQA web-site at www.saqa.org.za. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the qualification and unit standards should reach SAQA at the address below and **no later than 30 March 2007**. All correspondence should be marked **Standards Setting – Manufacturing and Assembly Processes** and addressed to

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SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:**Further Education and Training Certificate: Cable Jointing and Termination**

SAQA QUAL ID	QUALIFICATION TITLE		
58204	Further Education and Training Certificate: Cable Jointing and Termination		
SGB	PROVIDER		
SGB Manufacturing and Assembly Processes			
ETQA			
QUALIFICATION TYPE	FIELD	SUBFIELD	
Further Ed and Training Cert	6 - Manufacturing, Engineering and Technology	Manufacturing and Assembly	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	231	Level 4	Regular-Unit Stds Based
REGISTRATION STATUS	SAQA DECISION NUMBER	REGISTRATION START DATE	REGISTRATION END DATE
Draft - Prep for P Comment			

PURPOSE AND RATIONALE OF THE QUALIFICATION

Purpose:

The purpose of this qualification is to recognise the skills and knowledge required to:

- o Terminate, joint, upgrade and install medium voltage cables.
- o Work effectively and efficiently, optimising the use of resources.
- e Observe all applicable regulations and legislative requirements.

For the purposes of this qualification, medium voltage is defined as not exceeding 33 kV.

These capabilities require an understanding of:

- e Factors which affect the quality of cable joints and terminations.
- e Work practices which promote and maintain safety and quality, while minimising risks, by identifying and eliminating hazards and potentially dangerous situations.
- Controlling environmental impacts and working in adverse climatic conditions.
- o The relevant standards, statutory requirements and jointing or terminating procedures.
- Managing resources, time and the jointing team.
- Liaising with sub-contractors.

The skills and understanding acquired by learners will contribute to the development of the economy, the supply of essential services, the expansion of services to those who previously did not have electricity, and the maintenance of current services to industry and private citizens.

Rationale:

Although electrical power cable jointers perform a critically important role in the economy, there has to date been no formal recognition of their skills. Cable jointing and termination as an activity is captured within electrical qualifications but specialist cable jointers have had to rely on

informal training acquired over a period of many years. It has become important to recognise this occupation and the related skills and knowledge for the following reasons:

- The complexity of cables and cable jointing systems, especially for medium and high voltage cables, has increased.
- The renewal of South Africa's aging electrical infrastructure requires formally qualified people if the cable jointing and termination failures are not to persist.
- Infrastructural development projects will require the services of formally qualified cable jointers.
- Electrical service providers, such as municipalities, find it difficult to identify contractors who have the required knowledge and skills.
- In keeping with the principles of the National Qualifications Framework, this qualification will provide recognition to those who are deemed competent in the occupation by their peers and their employers.

The outcomes of this qualification combine skills and knowledge in the technical, inter-personal and business spheres, enabling the learner to perform the operational aspects of the work, function within a team context and contribute to value-adding processes within the organisation, for the benefit of customers and thus for the economy and society at large.

RECOGNIZE PREVIOUS LEARNING?

Y

LEARNING ASSUMED TO BE IN PLACE

The following competencies are assumed for a learner embarking on this qualification:

- Communication and Literacy, NQF Level 3.
- Mathematical Literacy, NQF Level 3.
- Hand skills with a variety of hand and power tools.

These skills form the basis for determining the credit allocation in this qualification. These skills may be acquired through a National Certificate at **NQF** Level 2 or 3. If a learner **does** not have such experience, the learning time will be increased. The allocation of credits is **also** based on the assumption that the learner will be working towards this qualification as part of a learning programme which integrates the unit standards.

Recognition of Prior Learning:

This qualification may be obtained through a process of RPL. The learner should be thoroughly briefed prior to the assessment and support should be provided to assist the learner in the process of developing a portfolio. The guidelines for integrated assessment should be used to develop the RPL assessment process. As with integrated assessment, while this is primarily workplace-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the Exit Level Outcomes.

Access to the qualification:

There is open access to this qualification. Employers or training institutions may however require the learner to have had experience in another occupation such as fitter or electrician. A workplace and learner support in the workplace is, however, a prerequisite to obtaining the relevant work experience and evidence required for the assessment of the Exit Level Outcomes.

QUALIFICATION RULES

The rules of combination for this qualification are reflected in the matrix.

The total number of credits for this qualification *is* 231.

- o The total number of credits in the Fundamental component is 56.
- o The total number of credits in the Core component is 163.
- o The minimum number of Elective credits is 12. The elective credits should be chosen in accordance with the requirements of the selected context and the interests of the learner.

EXIT LEVEL OUTCOMES

The Exit Level Outcomes for this qualification reflect a combination of Specific Outcomes and Critical Cross-field Education and Training Outcomes. The way in which the Critical Outcomes have been advanced through the learning required for this qualification is embedded in the way in which the unit standards have been constructed. Critical Outcomes form the basis for acquiring the skills and knowledge and values. The application of these in a specific context results in the achievement of Specific Outcomes. The integration of Specific Outcomes from a variety of unit standards results in the ability to achieve the Exit Level Outcomes.

1. Terminate, joint, upgrade and install medium voltage cables.
2. Plan and prepare for cable jointing operations.
3. Develop the skills and performance of team members.
4. Manage the quality and safety of cable jointing and termination.

Critical Cross Field Outcomes:

The Critical Cross-Field Outcomes are embedded in the unit standards which make up the qualification and are thus also reflected in the Exit Level Outcomes of the qualification. While performing cable jointing and termination functions and related activities qualifying learners will exhibit the following in relation to the Exit Level Outcomes.

- o Identifying and solving problems in which responses display that responsible decisions using critical thinking have been made (Exit Level Outcomes 1, 2, 3, 4).
- o Working effectively with others as a member of a team, group, organization and community (Exit Level Outcomes 1, 2, 3, 4).
- o Organising and managing oneself and one's activities responsibly and effectively (Exit Level Outcomes 1, 2, 3, 4).
- o Collecting, analyzing, organizing and critically evaluating information (Exit Level Outcomes 1, 2, 3, 4).
- o Communicating effectively using visual, mathematical and/or language skills (Exit Level Outcomes 1, 2, 3, 4).
- o Using science and technology effectively and critically, showing responsibility toward the environment and the health of others (Exit Level Outcomes 1, 2, 4).
- Demonstrating an understanding of the world as a set of related systems by recognizing that problem contexts do not exist in isolation (Exit Level Outcomes 1, 2, 3, 4).

ASSOCIATED ASSESSMENT CRITERIA

1.
 - o A comprehensive range of cable types, joints and terminations, and conductor jointing methods has been mastered.
 - A range of repairs, upgrades and new installations has been completed.
 - All applicable safety authorisation procedures have been followed and documented.
 - A jointing team is informed and managed effectively.
 - o Jointing instructions and procedures are interpreted and applied correctly, specifically in respect of the latest versions of South African National Standard 10198.
 - The capability to operate independently and to show initiative in the face of challenges is demonstrated.
2.
 - Correct materials are ordered, received and checked for each specific task.

- Subcontractors' work is co-ordinated and managed.
 - Risk assessment processes are communicated and completed.
 - Planning processes contribute to on-time completion.
- 3.
- Team members participate actively and contribute to on-time completion, quality and safety.
 - Team members participate actively in the risk assessment process.
 - Team members' performance and skills are improved.
- 4.
- All joints and terminations conform to the quality criteria set out in the jointing instruction.
 - All relevant conditions are recorded and documented to ensure traceability.
 - All safety checks are documented and complete.
 - All work is done according to standard operating procedures.

Integrated Assessment:

The integrated assessment should be based on a summative assessment guide. The guide will specify how the assessor will assess different aspects of the performance and will include:

- Evaluating evidence in a portfolio of evidence, particularly projects which integrate various aspects of the qualification and which demonstrate the integration of all aspects of learning: fundamental and core; knowledge, skills and values; the development of the critical outcomes.
- **Observing** and listening to the learner at work, both in primary activities as well as in other interactions, or in relevant simulations.
- Asking questions and initiating short discussions to test understanding and to verify other evidence.
- Looking at records and reports.
- Formative and summative assessment of unit standards.

Assessment of competence for this qualification is based on experience acquired by the learner in the workplace, within the particular cable jointing and termination context. The assessment process should cover the explicit tasks required for the qualification as well as the understanding of the underlying concepts and principles. The assessment process should also establish how the learning process has advanced the Critical Cross-Field Outcomes.

The learner may choose in which language ~~he/she~~ wants to be assessed. This should be established as part of a process of preparing the learner for assessment and familiarising the learner with the approach being taken.

While this is primarily a workplace-based qualification, evidence from other areas of endeavour may be presented if pertinent to any of the Exit Level Outcomes.

Assessors should also evaluate evidence that the learner is able to perform consistently over a period of time.

INTERNATIONAL COMPARABILITY

Comparison with cable jointing qualifications was carried out in two stages:

- Comparison of the occupational profile.
- Comparison of course and/or standards for specific cable jointing and termination processes.

Occupational profile

A cable jointer is a recognised **trade/occupation** in a wide range of countries ranging across Europe, Asia, Africa and the Antipodes. The International Standard Classification of

Occupations (ISCO, 1988) classifies it as **72451** Cable worker, electric power, underground cables.

The occupational profile is described by the Australian Standard Classification of Occupations (Second Edition) as:

- 4313-13 Cable Jointer: Joins insulated electric power cables installed in underground conduits and trenches and prepares cable terminations for connection to electrical equipment and overhead lines.
- Skill Level: The entry requirement for this occupation is an AQF Certificate III or higher qualification. Registration or licensing may be required.

Tasks Include:

- Repairs, maintains and joins cables.
- Splices conductors, insulates splices and connects cable sheathing.
- Checks insulation and performance of installed cables.
- Maintains location diagrams.
- Ensures that electrical conductors are correctly connected between sub-stations and customers' premises.
- May dig trenches and service pits or tunnels for cables.
- May test for the presence of gas.
- May encase cables in armoured or other protective covers.

An Australian AQF Certificate III is equivalent to the South African NQF level 4 which is a standard for engineering trades and occupations. Energex, a private Australian company which distributes and retails electricity, amongst other sources of energy, describes the responsibility of the cable jointer as follows:

- Cable Jointers are responsible, both individually and as a member of a team, for the installation and maintenance of a wide range of cables, accessories and auxiliary equipment associated with underground electricity cable systems to ensure the safety, quality assurance and reliability of services.

This occupational profile has been quoted to emphasise that:

- The cable jointer works as part of a team. Implicit in the occupational profile is the ability to direct the activities of a team, and particularly those of the jointer's mate (see the section on courses below).
- The occupation has to deal with 'a wide range of cables, accessories and auxiliary equipment'.

These broad occupational descriptors accord, explicitly and implicitly, with those in other countries, eg New Zealand, United Kingdom, Germany and Hong Kong.

In the United States of America and other countries in the new world, the occupation is classified as Electrical Line installer and Repairer and the profile includes other duties such as installing overhead cables. This component of the qualification is not included in the usual role descriptions of cable jointers.

The occupational profiles, in general, do not specify voltages or cable types and the definitions of low, medium and high voltage vary quite widely. Voltage is an indication of complexity and determines specific jointing and quality requirements. The exception is New Zealand, where cable jointing qualifications are described in some detail:

- They demonstrate a progression in terms of complexity across three levels.
- They are more explicit in terms of voltages and complexity.

The New Zealand cable jointing qualifications describe three stages:

Stage 1: National Certificate in Electricity Supply (Cable Jointer- Low Voltage) (Level 3).

- o Jointing and terminating low voltage paper cables.
- o Jointing and terminating low voltage live polymeric and paper cables.
- o Polarity and phasing.

Stage 2: National Certificate in Electricity Supply (Cable Jointer - High Voltage) (Level 4) with an optional strand in Cable Jointer Advanced

The qualification covers the jointing and terminating of high voltage cables in the following cable categories:

- o Joint HV polymeric insulated power cables up to 11kV.
- o Joint HV paper insulated power cables up to 11kV.
- o Install pad mounted electrical equipment.
- o Terminate HV polymeric insulated power cables up to 11kV.
- o Terminate HV paper insulated power cables up to 11kV.

Optional Strand

The optional strand allows the trainee to further develop these skills for working on the following cable categories:

- o Joint HV polymeric insulated power cables from 22kV to 33kV.
- o Joint HV paper insulated power cables from 22kV to 33kV.
- o Terminate HV polymeric insulated power cables from 22kV to 33kV.
- o Terminate HV paper insulated power cables from 22kV to 33kV.

Joint electricity supply power cables up to and including 11kV using transition jointing methods.

Stage 3: National Certificate in Electricity Supply (Cable Jointer - Specialist) (Level 5).

The qualification covers the specialist jointing and terminating of high voltage cables in the following cable categories:

- o Oil or gas pressured paper cables.
- Oil or gas filled polymeric cables.
- o Paper insulated cables up to 33kV.
- o Polymeric cables up to 66kV.
- o Other specialist HV cable types.

Occupational Profile Compared to Qualification

The exit level outcomes and the unit standards included in the South African qualification can be compared satisfactorily to the occupational profile in general and the requirements of the level 4 New Zealand qualification in particular.

Courses and Standards

Education and training for cable jointers is generally described in the following forms:

- o A person acquires the skills and knowledge as part of an apprenticeship, eg Hong Kong, India, Australia, New Zealand, Malaysia.
- A person qualified in a related engineering trade acquires the skills and knowledge in a combination of short courses and on-the-job training, eg USA, UK, Germany.

Typical courses include the following from a private training company in the United Kingdom:

- o Course Name: 33 kV Jointing, Days: 10.
- o Course Name: HV Overhead Terminations, Days: 1.
- o Course Name: Padmount Jointing, Days: 1.
- o Course Name: 11kV XLPE (Triplex) Jointing, Days: 5.
- Course Name: 33kV Single Core XLPE Jointing, Days: 2.
- o Course Name: Jointing Appreciation Course, Days: 1.
- o Course Name: LV Single Phase Jointing Course, Days: 2.
- o Course Name: Full 11kV (LV-HV) Cable Jointing Course, Days: 10.
- Course Name: Jointers Mates Duties, Days: 5.
- o Course Name: Full Low Voltage Jointing, Days: 20.
- Course Name: Plastic Jointing Course, Days: 4.
- o Total course days: 61.

The courses essentially only cover jointing and termination techniques but also include low voltage jointing and termination. The courses do not cover welding techniques, the management of sites and resources, or team management and development skills. Note the course detailing the duties of jointer's mate. This implies:

- o The team-nature of the process.
- e That the jointer's mate has a particular role in the process.

Another example, from Africa, illustrates a slightly different approach. The Kafue Gorge Regional Training Centre in Zambia, which focuses largely on developing skills for hydroelectric power generation, offers a 3 week training course for cable jointers.

Learning Objectives (sic)

At the end of the course, the participant shall be able to:

- Apply skills in the use of various types of hand, power and special tools in cable jointing and termination.
- Identify and utilize various types of materials used in cable jointing and termination.
- Apply standard safety rules and regulations.
- Apply skills pertaining to installation and maintenance of LV, MV and HV cable joining.

Course Outline

- o Electricity General Rules and Regulations.
- o Communication Skills.
- Basic Electricity Theory and Practice.
- Engineering Drawing.
- o Mechanical Principles.
- Main cable types.
- Application of cable to various voltages.
- Configurations and situations.
- Cable Jointing Theory and Jointing Practice.
- o Cable Termination Theory and Termination Practice.
- Tools and Materials.

This course illustrates the broad framework of knowledge and skills required by a cable jointer. However, given that the 11 modules are spread over 15 days, a considerable degree of depth is unlikely to be achieved, and, at best, this course serves as an introduction. A deepening of knowledge and understanding through application in context would be needed to develop the level of competence expected in the occupational profile.

Course Comparison to Qualification and Unit Standards

The difficulty in comparing training modules and courses to a competency-based qualification is that they only describe one part of the learning process. The workplace epistemologies or epistemologies of practice (ways of acquiring knowledge) are not explicit. All that can be stated is that the titles of the courses or modules are embedded in the qualification as:

- Specific outcomes.
- Essential embedded knowledge.
- Assessment criteria.

The contents of the courses would be embedded in the unit standards and assessed as that part which probes the learner's understanding.

Summary of the comparison

Comparison was done in two stages:

- Comparison of the occupational profile.
- Comparison of course and/or standards for specific cable jointing and termination processes.

The occupational profile is reflected in the exit level outcomes and the choice of unit standards and the course titles and content are embedded in the unit standards.

References

Australia

- www.milcom.com.au/files/List%20of%20courses%20under%20contract%20to%20Telstra.pdf
- <http://www.ee-oz.com.au>
- http://www.energex.com.au/careers/distribution_ugroundjointer.html
- http://www.westernpower.com.au/mainContent/ourServices/PowerTrainingServices/coursesAvailable/UndergroundCableTrainingCourses/Underground_Cable_Training-Courses.html
- <http://www.myfuture.edu.au/services/default.asp?FunctionID=5050&ASCO=431313A>
- McLennan, W. Statistician General, 1997 Australian Standard Classification of Occupations, Second Edition Canberra: Australian Bureau of Statistics

Germany

- <http://infobub.arbeitsagentur.de/berufe/start?dest=profession&prof-id=Z80I>
- http://www.bibb.de/dokumente/pdf/ft-elektrotagung_borch_folien.pdf
- http://www.swb-gruppe.de/download/24_47.pdf

Malaysia

- <http://www.sesco.com.my/sesco/english/tccourseelec.html>

New Zealand

- <http://www.esito.org.nz/main.cfm>

Philippines

- <http://www.oshc.dole.gov.ph/policy.htm>

Scotland

<http://www.planitplus.net/careerzone/areas/default.aspx?PID=nf&TOPL=10&SECL=10EE&ID=2>

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United Kingdom

- http://www.empower-training.com/Training/Cable_Jointing/Courses/?id=50
- www.connexions-direct.com/_library/publications/Electrical%20%20Electronic%20Engineering.doc

USA

- <http://www.bls.gov/oco/ocos195.htm>
- <http://www.idc-online.com/pdf/training/electrical/Cable%20Jointing.pdf>

Zambia

- <http://www.kgrtc.org.zm/coursedetails.php?id=15>

ARTICULATION OPTIONS

This qualification has been designed and structured so that qualifying learners can move from one context within the cable jointing and termination environment to another. They would have to acquire the specific knowledge related to the new context and adjust their skills and values accordingly.

Employers or institutions should be able to evaluate the outcomes of this qualification against the needs of their context and structure top-up learning appropriately. Holders of other qualifications may be evaluated against this qualification for the purpose of **RPL** and placement in learning programmes.

- This qualification articulates vertically with a planned National Certificate in Cable Jointing for high and very high voltage cables, nominally at NQF level 5.
- This qualification articulates horizontally with other engineering qualifications at this level.

MODERATION OPTIONS

Moderators for the qualification should be qualified and accredited with an appropriate ETQA.

To assure the quality of the assessment process, the moderation should cover the following:

- Assessor credentials.
- The assessment instrument.
- The assessment process.

Moderators should be qualified assessors in their own right.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

The following criteria should be applied by the relevant ETQA:

- o Appropriate qualification with a minimum of 2 years' experience of medium voltage (11-33 kV) cable jointing and termination operations. The subject matter expertise of the assessor can also be established by recognition of prior learning.
- Be active in the industry and be familiar with the particular aspects of the jointing and termination technologies which the learner has been required to use.
- Appropriate experience and understanding of assessment theory, processes and practices.
- Good interpersonal skills and ability to balance the conflicting requirements of:
 - o Maintaining national standards.
 - o The interests of the learner.
 - o The need for transformation and redressing the legacies of the past.
 - o The cultural background and language of the learner.

- Registration as an assessor with a relevant ETQA.
- Any other criteria required by a relevant ETQA.

NOTES

N/A

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	243668	Joint and terminate a range of 11-33kV cables in a range of settings	Level 4	72
Core	243667	Co-ordinate activities and manage the cable jointing site	Level 4	6
Core	13224	Monitor the application of safety, health and environmental protection procedures	Level 4	4
Core	9885	Read and interpret engineering drawings	Level 3	12
Core	13235	Maintain the quality assurance system	Level 4	5
Core	10981	Supervise work unit to achieve work unit objectives (individuals and teams)	Level 4	12
Core	242810	Manage Expenditure against a budget	Level 4	6
Core	119915	Manage personal expenditure	Level 3	3
Core	119913	Use a personal budget to manage own money	Level 2	3
Core	11775	Test, diagnose and locate a fault on a high voltage electrical cable	Level 3	9
Core	113862	Install and terminate Medium/High Voltage cables	Level 4	6
Core	10621	Identify the correct phase sequence on high voltage transformers and cables	Level 3	3
Core	13254	Contribute to the implementation and maintenance of business processes	Level 4	10
Core	243669	Manage cable jointing resources	Level 4	8
Core	116714	Lead a team, plan, allocate and assess their work	Level 3	4
Elective	116692	Plan, organise and control the erection, alteration/repositioning and dismantling of access scaffolding	Level 4	12
Elective	10810	Join metals by means of Tungsten Inert Gas (TIG) welding	Level 3	6
Elective	119257	Produce and maintain work activity reports	Level 4	8
Elective	114877	Formulate and implement an action plan to improve productivity within an organisational unit	Level 4	8
Elective	12455	Perform the role of a safety, health and environmental protection representative	Level 3	4
Elective	116292	Demonstrate an understanding of the principles of manufacturing and assembly logistics planning	Level 4	12
Fundamental	12153	Use the writing process to compose texts required in the business environment	Level 4	5
Fundamental	119462	Engage in sustained oral/sign communication and evaluate spoken/sign texts	Level 4	5
Fundamental	12155	Apply comprehension skills to engage written texts in a business environment	Level 4	5
Fundamental	119472	Accommodate audience and context needs in oral/sign communication	Level 3	5
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5
Fundamental	119467	Use language and communication in occupational learning programmes	Level 3	5
Fundamental	7468	Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues	Level 4	6
Fundamental	9015	Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems	Level 4	6
Fundamental	9016	Represent/analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	Level 4	4
Fundamental	119471	Use language and communication in occupational learning programmes	Level 4	5