

No. 597

13 July 2007

**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

Generic Manufacturing, Engineering and Technology

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.saqg.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 13 August 2007**. All correspondence should be marked **Standards Setting – Generic Manufacturing, Engineering and Technology** and addressed to

The Director: Standards Setting and Development
SAQA

Attention: Mr. D. Mphuthing

Postnet Suite 248

Private Bag X06

Waterkloof

0145

or faxed to 012 – 431-5144

e-mail: dmphuthing@saqa.org.za

DR. S. BHIKHA

DIRECTOR: STANDARDS SETTING AND DEVELOPMENT



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:**National Certificate: Engineering Fabrication**

SAQA QUAL ID		QUALIFICATION TITLE	
58720		National Certificate: Engineering Fabrication	
ORIGINATOR		PROVIDER	
SGB Generic Manufacturing, Engineering & Technolog			
QUALIFICATION TYPE	FIELD	SUBFIELD	
National Certificate	6 - Manufacturing, Engineering and Technology	Engineering and Related Design	
ABET BAND	MINIMUM CREDITS	NQF LEVEL	QUAL CLASS
Undefined	138	Level 3	Regular-Unit Stds Based

PURPOSE OF THE QUALIFICATION**Purpose:**

This qualification is designed to meet the needs of the Learner in a variety of engineering related sectors. Engineering Fabrication is a generic engineering and trade related qualification that builds on the fundamentals of fabrication. This qualification will provide learners, education and training providers and employers with the standards and the range of learning required to work effectively in various industries making use of engineering fabrication.

The main skill that is recognised in this qualification is the ability to produce components of some complexity using a variety of fabrication methods. This capability requires an understanding of, and the ability to, lay out and mark off shapes; set up and use powered machinery; develop and fabricate from drawings and sketches and cut and join components using welding and other mechanical methods.

The metal components that the qualified person fabricates will be vital for the construction, maintenance and reliable operation of equipment and machinery in a variety of industries.

The qualification adds value to the qualifying learner in terms of enrichment of the person, recognition, and contributes towards the achievement of "artisan" status or other accepted progression route.

The qualification is structured in such a way that it exposes learners to generic and specific competencies required in the Engineering Fabrication industries. This qualification makes provision for engineering fabrication to be applied within the following sectors:

- Mining and Minerals sector.
- Chemical sector.
- Transport sector.
- Manufacturing sector.
- Other engineering related sectors.

Qualifying learners will be able to do the following:

- Demonstrate an understanding of a variety of engineering fabrication methods.
- Interpret structural and engineering drawings.

- Develop and lay out metal work pieces for fabrication.
- Produce metal components of some complexity.
- Use and maintain engineering hand and power tools.
- Adhere to Occupational Health, Safety and Environmental requirements.
- Communicate with peers and members of supervisory levels.

Qualifying learners will also understand:

- The basics of how a business functions, and the role of the qualified learner in the business, i.e. fabrication and related activities.
- How the learning achieved whilst obtaining this qualification relates to the learning required in other similar qualifications.
- The importance of communication in achieving goals.
- How they are affected by legislation, regulations, agreements and policies related to their particular work environment.

With this understanding, learners will be able to participate effectively in workplace activities.

Rationale:

Engineering Fabrication, in the context of this qualification is the designing and fabrication of metal components with certain complexity. These components are usually required for initial or replacement structural purposes, as opposed to merely for maintenance reasons, as required within various industry sectors. The main focus is on interpreting drawings, the lay out and development of metal components, and manipulation of metal (sheet metal, plate and pipe) to produce usable components, as per design requirements.

This qualification is intended for learners who want to follow or further a career in the field of engineering fabrication in any of various industries, such as the Mining and Minerals Industry; Chemical; Petro-chemical; Metal, Engineering and related industries. This qualification is for learners who wish to further their learning and to possibly specialise in fabrication, within the context of boiler making, plating, welding, sheet metal working or auto vehicle body building.

It enables learners who have gained relevant experience in the workplace to gain credits through the RPL process. The qualification also forms the basis for further learning in the field of engineering fabrication where the learner will be able to specialise in one of the Fabrication or Welding skills areas at NQF Level 4.

Most industries rely on the design and fabrication of metal components, of some complexity. Examples of this may be the chemical industry where a wide variety of pipes are utilised. Invariably these pipes are exclusive to a particular plant and need to be specifically fabricated to be fit for purpose. The mining and minerals industry typically has a need for designing and fabrication of components that require special welding processes to cater for high pressure pumping systems. It is evident that each peculiar industry will have a specific requirement.

The design of this qualification stems from the collaborative approach to achieve generic type qualifications, that allows (promotes) access, progression, transferability of competence and mobility of the learner within and between sectors. Certain components of learning within this qualification may have pertinence within other learning fields such as fitting, electro-mechanical, automotive etc. This will predominantly be in the area of welding and oxy-fuel equipment cutting and welding.

The qualifying learner will be more employable within a broad industry context, and will thus be a contributing factor to the economy of the relevant organisation and the country. The learner will benefit from obtaining this qualification due to the fact that industry has a need for persons

with design, development and fabrication competencies. Competent persons will be responsible for designing, developing and fabricating industry related equipment.

This qualification focuses on developing skills and knowledge necessary to perform at the level of competence required. This qualification replaces the (currently de-registered) National Certificate: Fabrication NQF Level 3 and the interim registered National Certificate: Plater Welder and Plater Boilermaker NQF Level 3.

As this qualification forms the basis for further learning in the field of engineering fabrication, where the learner will be able to specialise in one of the Fabrication or Welding skills areas, it is accepted that the learner may exit (and be employed at this level (Level 3)), or continue further learning toward obtaining the next level qualification.

The learner may also choose to learn towards achievement in other fields, as the learning in the fundamental and core component of this qualification lends itself to lateral as well as vertical exploitation. This qualification enables learners who have gained relevant experience in the workplace to gain credits through the RPL process.

This qualification is the result of various Standards Generating Bodies collaborating in a common or generic approach to develop Fabrication Qualifications. All the participating SGB bodies recognize the fact that a generic approach, with opportunity for peculiar specialisations, is a solution to avoiding duplication of registering qualifications on the NQF.

RECOGNIZE PREVIOUS LEARNING?

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LEARNING ASSUMED IN PLACE

In order that the learner may progress at a desired rate whilst learning towards this qualification, it is assumed that learners are already competent in Communication and Mathematical Literacy at NQF Level 2.

Recognition of Prior Learning:

If the learner does not have an equivalent qualification or combination of competencies and assessment of prior learning in relation to the relevant learning guidelines at NQF Level 2 and NQF Level 3 may be undertaken.

The learner should be thoroughly briefed on the mechanism to be used and support and guidance should be provided. Care should be taken that the mechanism used provides the learner with an opportunity to demonstrate competence and is not so onerous as to prevent learners from taking up the RPL option towards gaining a qualification.

Access to the qualification:

Access to this qualification is open. However, it is preferable that learners have completed a relevant industry related National Certificate at NQF Level 2. An example of this may be the National Certificate: Engineering Fabrication NQF Level 2.

QUALIFICATION RULES

To achieve this qualification the learner must achieve a minimum of 138 Credits.

The learner must achieve the Fundamental, Core and Elective learning components of this qualification as follows:

Fundamental Unit Standards:

- Learners wishing to achieve this qualification must successfully complete all the listed fundamental unit standards with a total credit value of 37 credits.

Core Unit Standards:

- Learners wishing to achieve this qualification must successfully complete all the listed core unit standards with a total credit value of 76 credits.

Elective Unit Standards:

- The elective unit standards from all sectors/industries are listed. However certain unit standards are fit for purpose to a peculiar specialisation area. These peculiar specialisation areas may be the Mining and Minerals Industry, The Chemical Industry, Transport industry, etc.

Learners wishing to achieve this qualification must successfully obtain a minimum of 25 credits from the list of elective unit standards, and preferably from those that reflect their specific industry needs.

EXIT LEVEL OUTCOMES

1. Demonstrate the ability to produce components of some complexity using a variety of fabrication methods and operations.
2. Demonstrate the ability to select and apply appropriate methods to determine component compliance with specifications and select appropriate procedures to solve familiar problems within a fabrication environment.
3. Contribute to workgroup efforts and support the maintenance of a safe, effective and efficient workplace through effective communication.
4. Maintain organisational relationships through effective communication with peers and members of supervisory/management levels.

Critical Cross-Field Outcomes:

In accordance with SAQA guidelines, all unit standards include the assessment of relevant critical cross-field outcomes. Consequently, Exit Level Outcomes are consistent with critical cross-field outcome requirements.

The following CCFO's have been addressed in this qualification as per the unit standards outlined in the Annexures.

Identifying and solving problems in which responses display that responsible decisions using critical thinking have been made.

- Evident in Exit Level Outcome/s 1, 2, 3, 4.

Working effectively with others as a member of a team, group, organisation and community.

- Evident in Exit Level Outcome/s 2, 3, 4.

Organising and managing oneself and one's activities responsibly and effectively.

- Evident in Exit Level Outcome/s 1, 2, 3, 4.

Collecting, analysing, organising and critically evaluating information.

- Evident in Exit Level Outcome/s 1, 2, 3, 4.

Communicating effectively using visual, mathematical and/or language skills.

- Evident in Exit Level Outcome/s 1, 2, 3, 4.

Using science and technology effectively and critically, showing responsibility toward the environment and health of others.

- Evident in Exit Level Outcome/s 1, 2.

Demonstrating an understanding of the world as a set of related systems by recognising that problem contexts do not exist in isolation.

- Evident in Exit Level Outcome/s 3, 4.

Contributing to the full personal development of each learner and the social and economic development of society at large, by making it an underlying intention of the programme of learning to make an individual aware of:

- Reflecting on and exploring a variety of strategies to learn more effectively.
 - Participating as responsible citizens in the life of local, national and global communities.
 - Being culturally and aesthetically sensitive across a range of contexts.
 - Exploring education and career opportunities.
 - Developing entrepreneurial opportunities.
- (Evident in Exit Level Outcome/s 1, 2, 3, 4).

ASSOCIATED ASSESSMENT CRITERIA

Associated Assessment Criteria for Exit Level Outcome 1:

- Plating and structural metal drawings of some complexity are read and interpreted.
- Detailed plating and structural metal drawings are produced according to specified requirements.
- Component fabrication methods are explained in context to complexity of fabrication.
- Materials that are appropriate are identified for the fabrication of components of some complexity.
- Equipment is selected and utilized in a safe working manner.
- Components with some complexity are produced to the required specifications.

Associated Assessment Criteria for Exit Level Outcome 2:

- Components' specification compliance is determined in accordance with accepted best practice.
- Components are fabricated whilst displaying the ability to function within clearly defined contexts, with some scope for personal decision-making and responsibility.
- Appropriate problem solving techniques are applied and/or communicated in a timely manner.

Associated Assessment Criteria for Exit Level Outcome 3:

- The purpose and importance of communication in the workplace is explained in terms of achieving specific objectives.
- Occupational health, safety and environmental legislation is understood in order to apply specific safety practices and procedures relevant to the engineering fabrication industry.
- The correct channels of effective, regular and on-going communication are explained and demonstrated.
- Correct information is gathered and communicated through written reports.
- Problems are identified in a timely manner, reported and discussed and the agreed corrective action is implemented.

Associated Assessment Criteria for Exit Level Outcome 4:

- Communication techniques within the engineering fabrication discipline are explained and demonstrated in accordance with specified requirements.

- Range: Communication Techniques include verbal and written instructions and reports.
- Relationships with peers, supervisory and management levels are established and maintained to promote effective communication within the workplace.
- Engineering Fabrication related information is interpreted and communicated to peers and management in accordance with organisational work requirements.

Integrated Assessment:

Integrated assessment at the level of the qualification provides an opportunity for learners to show they are able to integrate concepts, actions and ideas achieved across a range of unit standards and contexts.

Integrated assessment must evaluate the quality of observable performance as well as the thinking behind the performance, and must be based on a summative assessment guide. The guide will spell out how the assessor will assess different aspects of the performance and will include:

- Observing the learner at work (both in the primary activity as well as other interactions).
- Asking questions and initiating short discussions to test understanding.
- Looking at records and reports in the portfolio and reviewing previous assessments.

In some cases inference will be necessary to determine competence depending on the nature and context within which performance takes place.

It is necessary to ensure that the fundamental part of the qualification is also targeted to ensure that while the competence may have been achieved in a particular context, learners are able to apply it in a range of other contexts and for further learning. The assessment should also ensure that all the critical cross-field outcomes have been achieved.

The learner may choose in which language s/he 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 introduced if pertinent to any of the exit-level outcomes. The assessment process should cover both the explicit tasks required for the qualification as well as the understanding of the concepts and principles that underpin the activities associated with the engineering fabrication process.

INTERNATIONAL COMPARABILITY

It must be stated from the outset of this statement that reference to international benchmarking for this qualification series, applies only to the education and training content at specific levels between NQF Levels 2, 3 and 4 and its measure of "appropriateness" when compared with fabrication training programs internationally. It was not possible to assimilate operational applicability as contexts are too various and wide.

South Africa (SAQA) has embarked on a rationalisation of engineering qualification on the National Qualifications Framework. The traditional qualifications (from the Apprenticeship route) such as Plater Welder, Plater Boilermaker, Boilermaker, etc. were mostly similar in content and intent. In order to arrive at a meaningful and acceptable nomenclature for the qualification, it was decided to use "Fabrication" as a description of the type of activity for this qualification.

This presented a problem when attempting to do a comparison of qualifications, nationally and internationally. The problem is that the understanding of the term "Fabrication" is very broad. Many qualifications and outcomes are available but not many in the context of what we (South African Industry) require. The plastic forming industries, as well as the wood and furniture type

industries also use "fabrication" as their activity description. This made the International Comparability research more complex. An attempt to concentrate on contextually relevant qualifications during the research process was thought to be prudent.

African countries with manufacturing and engineering infrastructure (including SADC countries) were scanned for applicable qualifications or training programs, but no relevant (equivalence) qualifications is offered in any of these countries.

Despite exhaustive information searches for information regarding fabrication qualification in Germany and Korea. It was apparent that a similar problem of specialisation as opposed to generalisation existed.

International comparability, including similar qualification structures and progressions from Level 2 to Level 3 were found in the following countries:

United Kingdom:

Fabrication & Welding Engineering Level 3 (NVQ 100/2949/7 SVQ G75023).

http://www.tsw.co.uk/tsw/uploaded_files/Fabrication%20&%20Welding%20Engineering%20Level%203.pdf

The competencies listed in this qualification are as below:

Assess Route; Unit Title:

- FWE3/001; Complying with Statutory Regulations and Organisational Safety Requirements.
- FWE3/002; Using and Interpreting Engineering Drawings and Documents.
- FWE3/003; Working Efficiently and Effectively in Engineering.
- FWE3/004; Welding Materials by the Manual Metal-Arc Process.
- FWE3/005; Welding Materials by the Manual MIG/MAG and the other Continuous Wire Processes.
- FWE3/006; Welding Materials by the Manual TIG and Plasma-Arc Welding Process.
- FWE3/007; Welding Materials by the Manual Gas Welding Process.
- FWE3/008; Welding Pipe/Tube Using Multiple Manual Arc Welding Processes.
- FWE3/009; Welding Plate Using Multiple Manual Arc Welding Processes.
- FWE3/010; Preparing Mechanised Arc Welding Equipment for Production.
- FWE3/011; Preparing Resistance Spot, Seam and Projection Welding Machines for Production.
- FWE3/012; Preparing Laser Welding Machines for Production.
- FWE3/013; Preparing Electron Beam Welding Machines for Production.
- FWE3/014; Preparing Friction Welding Machines for Production.
- FWE3/015; Preparing Brazing Machines for Production.
- FWE3/016; Welding Materials with Mechanised Arc Welding Equipment.
- FWE3/017; Welding Materials Using Resistance Spot, Seam and Projection Welding Machines.
- FWE3/018; Welding Materials using Laser Welding Machines.
- FWE3/019; Welding Materials Using Electron Beam Machines.
- FWE3/020; Welding Materials Using Friction Welding Machines.
- FWE3/021; Joining Materials Using Brazing Machines.
- FWE3/022; Marking Out Components for Metalwork.
- FWE3/023; Cutting Sheet metal to Shape Using Hand and Machine Tools.
- FWE3/024; Forming Sheet metal Using Hand and Machine Tools.
- FWE3/025; Producing Sheet metal Assemblies.
- FWE3/026; Heat Treating Materials for Fabrication Activities.

- FWE3/027; Developing and Marking Out Templates for Metalwork.
- FWE3/028; Joining Fabricated Components Using Mechanical Fasteners.
- FWE3/029; Bonding Engineering Materials Using Adhesives.
- FWE3/030; Joining Materials by Resistance Spot Welding.
- FWE3/031; Producing Fillet Welded Joints Using a Manual Welding Process.
- FWE3/032; Cutting Plate and Sections Using Shearing Machines.
- FWE3/033; Cutting and Shaping Materials Using Portable Thermal Cutting Equipment.
- FWE3/034; Cutting Materials Using Saws and Abrasive Discs.
- FWE3/035; Bending and Forming Plate Using Press Brakes or Bending Machines.
- FWE3/036; Forming Plate Work Using Power Rolling Machines.
- FWE3/037; Producing and Finishing Holes Using Drilling Machines.
- FWE3/038; Producing Plate Work Assemblies.
- FWE3/039; Slings, Lifting and Moving Materials and Components.
- FWE3/040; Forming Structural Sections Using Machines.
- FWE3/041; Producing Structural Metal Ancillary Components.
- FWE3/042; Producing Major Structural Components/Sub- assemblies.
- FWE3/043; Erecting Structural Metalwork.
- FWE3/044; Forming Pipe work by Machine Bending.
- FWE3/045; Producing Pipe Fabrications.
- FWE3/046; Producing Socket and Flange Fillet Welded Joints in Pipe Using a Manual Welding Process.
- FWE3/047; Producing Components by Fibre Reinforced Plastic (FRP) Moulding.
- FWE3/048; Producing Components by Acrylic Moulding.
- FWE3/049; Producing Components from Carbon Fibre.
- FWE3/050; Producing Components from Glass Fibre.
- FWE3/051; Producing Composite Assemblies.
- FWE3/052; Producing Components by Vacuum Forming.
- FWE3/053; Trimming Composite Mouldings Using Hand Tools.
- FWE3/054; Joining Plastics Using Manual Welding Processes.
- FWE3/055; Bonding Composite Mouldings.
- FWE3/056; Welding Rails Using the Aluminothermy Welding Process.
- FWE3/057; Restore Rails to Operational Condition Using on Arc Welding Process.
- FWE3/058; Preparing Flash Welding Machines for Operation.
- FWE3/059; Joining Rails Using Flash Welding Equipment.

All National Vocational Qualifications in the United Kingdom are achieved through training and assessment. Assessment is normally through on-the-job observation and questioning. Candidates produce evidence to prove they have the competence to meet the NVQ standards. Assessors 'sign-off' units when the candidates are ready - the assessor tests candidates' underpinning knowledge, understanding and work-based performance to make sure they can demonstrate competence in the workplace. This process is fully compatible and comparable with the South African process.

Many of the units of learning are not applicable as they are largely outside the peculiar specialisation areas as required in South Africa. It is not evident what the credit value for this qualification is.

New Zealand:

No relevant qualifications at Level 3 were found. However the Level 4 Qualification National Certificate in Engineering - Fabrication (Level 4) with Sectoral strands in Heavy Fabrication, Light Fabrication, and Welding was used as comparison. There is some similarity in the content of the qualifications with the New Zealand qualification being more specific in terms of unit standard titles.

National Certificates in New Zealand are achieved through training and assessment. Assessment is normally through on-the-job observation and other evidence gathering techniques. Candidates provide evidence to prove they have the competence to meet the NZQA standards. Assessors test candidates' underpinning knowledge, understanding and work-based performance to make sure they can demonstrate competence in the workplace.

This process is fully compatible and comparable with the South African process with the exception that New Zealand has some unit standards with the requirement of being performed "under supervision". This is contrary to outcomes based learning and development principles.

The qualification compares well with the one in New Zealand and also appears to satisfy the comparison in terms of a combined (non-specialist) qualification attainment. This is due to the availability of a choice of strands being available to the industry and the learner.

The minimum credit value for this qualification is listed as 269 credits which indicates that it would compare well with the apprenticeship type qualifications.

The competencies listed in this qualification are as below:

<http://www.nzqa.govt.nz/nqfdocs/quals/doc/0122.doc>

ID; Title; Level; Credit:

- 101; Develop and use keyboarding skills to enter text; Level 1; 3 credits.
- 2353; Pre-treat work for subsequent metal surface finishing operations; Level 3; 5 credits.
- 2363; Polish ferrous and non-ferrous metal parts to produce a decorative finish; Level 3; 10 credits.
- 2387; Assemble mechanical components under supervision; Level 2; 2 credits.
- 2395; Select, use, and care for engineering hand tools; Level 1; 4 credits.
- 2396; Select, use, and maintain portable hand held engineering power tools; Level 2; 4 credits.
- 2414; Lay out and mark off regular fabrication shapes under supervision; Level 2; 15 credits.
- 2415; Form and shape fabrication materials under supervision; Level 2; 10 credits.
- 2416; Assemble and mechanically join plate and sheet under supervision; Level 2; 10 credits.
- 2417; Mechanically cut fabrication materials under supervision; Level 2; 8 credits.
- 2418; Lay out and mark off irregular fabrication shapes under supervision; Level 3; 15 credits.
- 2419; Form and shape, sheet, plate, pipe and structural sections using power machines under supervision; Level 3; 15 credits.
- 2420; Assemble and mechanically join tube, pipe and sections under supervision; Level 3; 15 credits.
- 2421; Mechanically cut fabrication materials using powered machinery under supervision; Level 3; 10 credits.
- 2422; Lay out and mark off complex fabrication shapes; Level 4; 15 credits.
- 2423; Form and shape fabrication materials; Level 4; 15 credits.
- 2424; Assemble and mechanically join sheet, plate, tube, pipe and structural sections; Level 4; 20 credits.
- 2425; Mechanically cut sheet, plate, tube, pipe and structural sections; Level 4; 10 credits.
- 2430; Draw and interpret engineering sketches under supervision; Level 2; 4 credits.
- 2431; Draw and interpret engineering drawings under supervision; Level 2; 8 credits.
- 2432; Construct engineering plane geometric shapes; Level 2; 3 credits.
- 2433; Create two dimensional engineering drawings using computer aided design system; Level 2; 6 credits.
- 2434; Produce detailed engineering drawings under supervision; Level 3; 15 credits.
- 2438; Produce fabrication drawings; Level 4; 20 credits.
- 2670; Avoid welding hazards with safe work practices; Level 2; 1 credit.

- 2671; Weld metal structures with the manual metal arc welding process in down hand positions; Level 3; 6 credits.
- 2672; Weld metal to a general purpose industry standard with the gas metal arc welding process; Level 3; 6 credits.
- 2673; Weld metal structures with the gas metal arc welding process in down hand positions; Level 3; 6 credits.
- 2674; Weld stainless metal plate with the gas metal arc welding processes in the down hand positions; Level 3; 6 credits.
- 2675; Weld aluminium with the gas metal arc welding process in the down hand positions; Level 3; 6 credits.
- 2676; Weld stainless metal sheet with the gas tungsten arc welding process; Level 3; 6 credits.
- 2677; Weld aluminium with the gas tungsten arc welding process in the down hand positions; Level 3; 6 credits.
- 2678; Join metals with the oxyacetylene welding process; Level 3; 6 credits.
- 2679; Join metals using torch brazing and soldering; Level 3; 6 credits.
- 2680; Join metals with the resistance welding process; Level 3; 4 credits.
- 2681; Weld metal structures with the submerged arc welding process; Level 3; 4 credits.
- 2682; Weld metal to a general purpose industry standard with the manual metal arc welding process; Level 3; 6 credits.
- 2683; Cut metals using manual thermal processes; Level 3; 4 credits.
- 2684; Weld metal structures with the gas metal arc welding processes in all positions; Level 4; 10 credits.
- 2685; Weld metal structures with the manual metal arc welding process in all positions; Level 4; 10 credits.
- 2686; Weld aluminium with the gas metal arc welding process in all positions; Level 4; 10 credits.
- 2687; Weld stainless metal sheet and plate with the gas metal arc welding processes in all positions; Level 4; 10 credits.
- 2688; Weld stainless metal tube with the gas tungsten arc welding process; Level 4; 10 credits.
- 2689; Weld aluminium with the gas tungsten arc welding process in all positions; Level 4; 10 credits.
- 2690; Weld metal pipe with the oxyacetylene process; Level 4; 10 credits.
- 2691; Cut metals using mechanised thermal processes; Level 4; 4 credits.
- 2692; Repair non-ferrous metal components by welding; Level 4; 10 credits.
- 2693; Repair ferrous metal components by welding; Level 4; 10 credits.
- 2694; Weld metal pipe with the manual metal arc welding process using cellulosic electrodes; Level 4; 20 credits.
- 2695; Weld metal pipe with the manual metal arc welding process using hydrogen controlled electrodes; Level 4; 20 credits.
- 2696; Weld pipe in all positions with the gas tungsten arc welding process; Level 4; 12 credits.
- 2697; Weld aluminium pipe in all positions with the gas tungsten arc welding process; Level 4; 10 credits.
- 2824; Follow safe working practices on an engineering worksite; Level 2; 3 credits.
- 3234; Install metal pipe work according to plans and specifications under supervision; Level 3; 12 credits.
- 3236; Install stainless metal pipe work according to plans and specification under supervision; Level 3; 12 credits.
- 3238; Manufacture duct work to plans and specifications; Level 3; 20 credits.
- 4432; Identify and convert basic units of measure used in engineering; Level 1; 1 credit.
- 4433; Measure with non-complex devices used in engineering; Level 1; 2 credits.
- 4436; Select, use and care for engineering marking-out equipment; Level 2; 4 credits.
- 4795; Distinguish the characteristics of engineering materials; Level 1; 2 credits.
- 4796; Distinguish the characteristics of engineering metals; Level 2; 3 credits.
- 9184; Erect non-notifiable prefabricated scaffolding; Level 3; 3 credits.

- 12299; Shift loads in the performance of machinery and equipment installation and maintenance; Level 2; 3 credits.
- 16954; Calculate lengths, areas and mass of engineering fabrication materials; Level 2; 4 credits.
- 16955; Calculate sizes, mass, volumes, and quantities for engineering fabrication; Level 3; 4 credits.
- 16956; Demonstrate knowledge of force and stress in engineering fabrications; Level 4; 4 credits.
- 18106; Gouge metals using manual thermal processes; Level 3; 2 credits.
- 18107; Lay out and mark off complex heavy fabrication shapes; Level 4; 15 credits.

Australia:

Following the Australian Prime Minister's announcement, the responsibilities and functions of the Australian National Training Authority (ANTA) have been transferred to the Department of Education, Science and Training (DEST).

Certificates in Australia are achieved through training and assessment. Assessment is through training provider and on-the-job observation and other evidence gathering techniques. Candidates provide evidence to prove they have the competence to meet the DEST standards. Assessors test candidates' underpinning knowledge, understanding and work-based performance confirm they can demonstrate competence in the workplace. This process is fully compatible and comparable with the South African process.

The trade of Boiler-making is utilised in Australia. However, the process of achieving the qualification is from various options. These options have various specialisations with a set of core components. The lists of unit standards shown below are those that make up the entire qualification requirements.

The relevant (for comparison purposes) specialisation areas are listed as:

- General Heavy Fabrication.
- Sheet metal.
- Welding.

The qualification Certificate III in Engineering - Fabrication Trade replaces the following qualifications:

- Boiler-making.
- Boiler making and/or Structural Metal work.
- Boiler-making/Welding.
- Welding.
- Sheet metal.
- Working.
- Blacksmithing.
- Tin-smithing.

This comparison indicates that there are synergies between this SAQA qualification and the qualification listed in Australia (MEM30398). The Certificate III in Engineering - Fabrication Trade (Apprenticeship) also appears to satisfy the comparison in terms of a combined (non-specialist) qualification attainment.

Certificate III in Engineering -Fabrication Trade MEM30398.

<http://apprenticeship.det.nsw.edu.au/html/trades/fabrication.htm>

Unit code; Unit title:

- MEM1.1FA; Undertake interactive workplace communication.
- MEM1.2FA; Apply principles of Occupational Health and Safety (O H & S) in work environment.
- MEM1.3FA; Apply quality procedures.
- MEM1.4FA; Plan to undertake a routine task.
- MEM2.1C12A; Apply quality systems.
- MEM2.2C11A; Organise and analyse information.
- MEM2.3C11B; Operate in a work based team environment.
- MEM2.4C11A; Assist in the provision of on-the-job training.
- MEM2.5C11A; Measure with graduated devices.
- MEM2.6C10A; Plan a complete activity.
- MEM2.7C10A; Perform computations - basic.
- MEM2.8C10A; Perform computations.
- MEM2.9C10A; Performs computer operations.
- MEM5.5AA; Carry out mechanical cutting.
- MEM5.7AB; Manual heating and thermal cutting.
- MEM5.8AA; Advanced manual heating, thermal cutting, gouging and shaping.
- MEM5.9AB; Automated thermal cutting.
- MEM5.10AA; Undertake fabrication, forming, bending and shaping.
- MEM5.11AB; Assemble fabricated components.
- MEM5.12AB; Perform routine manual metal arc welding.
- MEM5.15AB; Weld using manual metal arc welding process.
- MEM5.16AB; Perform advanced welding using manual metal arc welding process.
- MEM5.17AB; Weld using gas metal arc welding process.
- MEM5.19AB; Weld using gas tungsten arc welding process.
- MEM5.36AB; Repair/replace/modify fabrications.
- MEM5.37AA; Geometric Development.
- MEM5.47AA; Weld using flux core arc welding process.
- MEM5.49AA; Perform routine gas tungsten welding.
- MEM5.50AA; Perform routine gas metal arc welding.
- MEM9.1AA; Draw and interpret sketch.
- MEM9.2AA; Interpret technical drawing.
- MEM11.11AA; Manual handling.
- MEM12.7AA; Mark off/out structural fabrications and shapes.
- MEM18.1AB; Use hand tools.
- MEM18.2AA; Use power tools/hand held operations.
- MEM2.13C5A; Perform mathematical computations.
- MEM5.20AB; Perform advanced welding using gas tungsten arc welding process.
- MEM5.38AA; Advanced Geometric Development - Cylindrical/Rectangular.
- MEM5.39AA; Advanced Geometric Development - Conical.
- MEM5.40AA; Advanced Geometric Development /R- Transitions.
- MEM5.49AA; Perform routine gas tungsten arc welding.
- MEM7.15AA; Set NC/CNC machines/processes (basic).
- MEM7.16AA; Set and edit NC/CNC machine/process.
- MEM5.18AB; Perform advanced welding using gas metal arc welding process.
- MEM5.20AB; Perform advanced welding using gas tungsten arc welding process.
- MEM5.48AA; Perform advanced welding using flux core arc welding process.

It is also apparent that different outcomes are utilised for various qualification titles. The comparison of the Level 2 qualifications indicated that there is a different qualification (MEM30305) that may also be utilised when wishing to embark on further learning in this field.

- A direct comparison with these international qualifications indicates that the education and training focus of all the qualifications is basically the same. However, the basic construct differs in that the nomenclature is dissimilar to that used in South Africa.

- This SAQA Qualification compares well with the international qualifications and training programs offered. The specific operational content (elective component) incorporated in the qualification will serve to enable qualifying learners to make better informed decisions within an expansive context that compares well with international learners. One difference is the fact that the SAQA qualification caters for a broader category of industries. This is mainly due to the fact that the South African Qualification is very explicit in the way elective competencies play a role in contextual competence.

It is not evident what the credit value for this qualification. The discussion documents do however make mention of periods in the region of 36 months duration.

ARTICULATION OPTIONS

The qualification has been designed and structured so that qualifying learners may move from one engineering context to certain other engineering contexts (within same industry sector or to new industry sectors). This can be achieved by the selection of appropriate credits in the elective category. Equally, holders of other similar qualifications may be evaluated against this qualification for the purpose of RPL.

Vertical articulation:

- ID 58721: Further Education and Training Certificate: Engineering Fabrication, NQF Level 4.

Horizontal articulation:

Other contextually relevant engineering qualifications may be:

- ID 57886: National Certificate: Welding Application and Practice, NQF Level 3.
- ID 23274: National Certificate: Mechanical Engineering: Fitting, NQF Level 3.

Fundamental learning at this level applies to equivalent credit accrual for most engineering qualifications at NQF Level 3.

Core learning at this level may lead to credit accrual for some unit standards in the following qualifications at NQF Level 3:

- National Certificates in Mechanical Engineering (Welding), (Fitting), (Machining).
- Vehicle Servicing.
- Automotive Component Manufacturing.

MODERATION OPTIONS

- Anyone assessing a learner or moderating the assessment of a learner against the qualification must be registered as an assessor with the relevant Education, Training, Quality, Assurance (ETQA) Body, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

- Any institution offering learning that will enable the achievement of this qualification must be accredited as a provider with the relevant Education, Training, Quality, Assurance (ETQA) Body, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

- Assessment and moderation of assessment will be overseen by the relevant Education, Training, Quality, Assurance (ETQA) Body, or by an ETQA that has a Memorandum of

Understanding with the relevant ETQA, according to the ETQA's policies and guidelines for assessment and moderation.

- Moderation must include both internal and external moderation of assessments, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described in the associated unit standards.

- Anyone wishing to be assessed against this qualification may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

Assessors should be in possession of:

- An appropriate qualification at or above the level of the qualification and preferably relevant workplace practical experience.
- Registration as an assessor with the relevant ETQA.

NOTES

N/A

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Core	116520	Apply safety, health and environmental principles and procedures in a workplace	Level 2	2
Core	243075	Draw and interpret simple plate, pipe and structural steel plate, pipe and structural steel drawings	Level 2	6
Core	14713	Use welding definitions and symbols	Level 2	5
Core	13234	Apply quality procedures	Level 3	8
Core	243077	Cut material using the oxy-fuel pipe cutting device	Level 3	3
Core	243080	Cut material using the oxy-fuel profile cutting machine	Level 3	5
Core	243081	Cut material using the oxy-fuel straight-line cutting machine	Level 3	3
Core	115568	Fabricate components by means of the parallel line method	Level 3	4
Core	115571	Fabricate components by means of the radial line method	Level 3	4
Core	115565	Fabricate components by means of the triangulation method	Level 3	4
Core	12244	Form and shape sheet, plate, pipe and structural section using power machinery	Level 3	15
Core	244339	Mark off and fabricate sections using the contour marker method	Level 3	9
Core	12245	Mechanically cut, drill, punch and assemble fabrication materials using powered machinery	Level 3	8
Elective	243061	Assemble work pieces in jigs (minor amendments include the use of manipulators)	Level 2	3
Elective	243069	Braze metals using the oxy-fuel brazing process	Level 2	6
Elective	10780	Cut mild steel by means of an Oxy-acetylene profile cutter	Level 2	4
Elective	10842	Join cast iron by means of arc welding	Level 2	3
Elective	12482	Join metals using the resistance welding process	Level 2	4
Elective	12481	Sling loads	Level 2	4
Elective	243076	Weld carbon steel workpieces using the cored-wire welding process in the downhand position	Level 2	8
Elective	243066	Weld carbon steel workpieces using the gas metal arc welding process in the down-hand position	Level 2	8
Elective	243056	Weld carbon steel workpieces using the shielded metal arc welding process in all positions	Level 2	16
Elective	244343	Align a steel structure using a dumpy level	Level 3	2
Elective	12246	Assemble and mechanically join sheet, plate, tube, pipe and steel sections	Level 3	4
Elective	12457	Develop learning strategies and techniques	Level 3	3
Elective	12456	Explain and use organisational procedures	Level 3	6
Elective	115740	Fabricate a launder	Level 3	5

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	115744	Fabricate a spiral by means of triangulation	Level 3	5
Elective	115699	Fabricate rolled sections	Level 3	6
Elective	14700	Lay out and mark off regular and irregular shapes for thermoplastic fabrication	Level 3	25
Elective	244346	Layout and fabricate a metal structure	Level 3	5
Elective	9526	Manage basic business finance	Level 3	6
Elective	9530	Manage work time effectively	Level 3	3
Elective	8039	Operating cranes	Level 3	10
Elective	8038	Operating lift trucks	Level 3	6
Elective	14695	Remove material with the shields metal arc gouging process	Level 3	8
Elective	10790	Silver solder metals by means of Oxy-acetylene equipment	Level 3	3
Elective	243068	Weld carbon steel workpieces using the gas tungsten arc welding process in the downhand position	Level 3	15
Elective	10789	Weld mild steel by means of Oxy-acetylene equipment	Level 3	4
Elective	14698	Cut materials using plasma cutting	Level 4	4
Elective	243065	Weld carbon steel pipe using the gas metal arc welding process in all positions	Level 4	20
Elective	243062	Weld carbon steel pipe, using the shielded metal arc welding process in all positions	Level 4	20
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	9528	Communicate with clients	Level 3	3
Fundamental	12488	Complete feasibility and commissioning reports	Level 3	3
Fundamental	9010	Demonstrate an understanding of the use of different number bases and measurement units and an awareness of error in the context of relevant calculations	Level 3	2
Fundamental	9013	Describe, apply, analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	Level 3	4
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	9012	Investigate life and work related problems using data and probabilities	Level 3	5
Fundamental	7456	Use mathematics to investigate and monitor the financial aspects of personal, business and national issues	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Align a steel structure using a dumpy level***

SAQA US ID	UNIT STANDARD TITLE		
244343	Align a steel structure using a dumpy level		
ORIGINATOR		PROVIDER	
SGB Generic Manufacturing, Engineering & Technolog			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	2

SPECIFIC OUTCOME 1

Explain the factors critical to aligning a steel structure using a dumpy level.

SPECIFIC OUTCOME 2

Prepare to align the steel structure using a dumpy level.

SPECIFIC OUTCOME 3

Align the steel structure using a dumpy level.

SPECIFIC OUTCOME 4

Complete the aligning process.



SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:***Layout and fabricate a metal structure***

SAQA US ID		UNIT STANDARD TITLE	
244346		Layout and fabricate a metal structure	
ORIGINATOR		PROVIDER	
SGB Generic Manufacturing, Engineering & Technolog			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 3	5

SPECIFIC OUTCOME 1

Explain the factors critical to layout and fabricate a metal structure.

SPECIFIC OUTCOME 2

Prepare to layout and fabricate the metal structure.

SPECIFIC OUTCOME 3

Layout and fabricate the metal structure.

SPECIFIC OUTCOME 4

Complete the layout and fabrication process.