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<tr><td>651202-02</td><td colspan="3">Coded Welder</td></tr>
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SECTION 1: CURRICULUM SUMMARY

1.1 Occupational Information

1.1.1 Associated Occupation

651202: Welder

1.1.2 Skill Addressed by this Curriculum

Coded Welder Qualification

1.1.3 Alternative Titles Used Industry

- A Class Welder

1.1.4 Related Occupational Qualification Curriculum

Welder

1.2 Curriculum Information

1.2.1 Curriculum Structure

This Skills Programme is at NQF Level 04 with a total value of **96 credits = 960 hours= 120 days= 6 Months training value that culminate into a SOR (Statement Of Results)**

1.2.2 Rules of Combination

This Skills Programme is made up of the following compulsory Knowledge and Application Skills Modules:

1.2.2.1 Knowledge Modules

- KM-01: Introduction to the Welding Trade NQF Level 2, Credits 1
- KM-02: General health, safety and environmental protection concepts, NQF Level 2, Credits 1
- KM-03: Welding codes, standards and parameters, NQF Level 04, Credits 2
- KM-04: SMAW/MMA Process, NQF Level 3, Credits 2
- KM-05: GTAW/TIG Process, NQF Level 3, Credits 3
- KM-06: Safely use, care and store engineering hand tools, NQF Level 2, Credits 4
- KM-07: Safely use, care and store engineering power tools, NQF Level 2, Credits 2
- KM-08: Safely use, care and store engineering measuring equipments, NQF Level 2, Credits3

Total number of credits for Knowledge Modules: 18; 180 hours; 22.5 days

1.2.2.2 Application Modules

- AM-01: Safely use, care and store engineering hand tools, NQF Level 2, Credits 4
- AM-02: Safely use, care and store engineering power tools, NQF Level 2, Credits 2
- AM-03: Safely use, care and store engineering measuring equipments, NQF Level 2, Credits2
- AM-04: Produce fillet welds on carbon steel material using the Shielded Metal Arc Welding process, NQF Level 03, Credits 8
- AM-05: Produce fillet welds on carbon steel material using the Gas Tungsten Arc Welding process, NQF Level 03, Credits 04
- AM-06: Produce plate butt welds on carbon steel material using the Shielded Metal Arc Welding process, NQF Level 04, Credits 06
- AM-07: Produce plate butt welds on carbon steel material using the Gas Tungsten Arc Welding process, NQF Level 04, Credits 08
- AM-08: Produce plate butt welds on carbon steel material using the Gas Tungsten Arc Welding and Shielded Arc Welding process combination, NQF Level 04, Credits 04
- AM-09: Produce pipe welds on schedule 40, ½ inch Ǿ, 2-inch Ǿ and 6-inch Ǿ carbon steel material using the Gas Tungsten Arc Welding process, with carbon steel and carbon steel welding consumables in the 2G, 5G and 6G positions, NQF Level 04, Credits 20 credits
- AM-10: Produce pipe welds on Schedule 40, 6-inch Ø carbon steel material using the Gas

Tungsten Arc Welding (GTAW / TIG) and Shielded Metal Arc (SMAW/MMA) Welding processes combination, with carbon steel and carbon steel welding consumables NQF Level 04, Credits 20

Total number of credits for Application Modules: 78 credits, 780 hours, 97.5 days

1.3 Entry Requirements

- NQF Level 1 with Mathematics and Science **OR**
- Recognition of Prior Learning (RPL) shall administer an entry Level predominately by utilizing learning instruments, learning methodology aligned with the Coded Welder Qualification matrix alignment

1.4 Quality Assurance

QCTO

1.5 Employability Opportunities

Upon completion of the Coded Welder qualification, the learner shall access a Non-destructive X Ray Testing (X Radiographic Testing) that will enable the learner to be employed as the following tradesmen:

1.5.1 Welder Double Coded / "A" Class Welder
1.5.2 Welder Single Coded / "A" Class Welder
1.5.3 Welder Structural / "B" Class Welder

1.6 Further learning opportunities available

Skills Programme / Part Qualifications

1.6.1 Fillet Welder

1.6.1.1 Gas Metal Arc Welding (MIG & MAG)

1.6.1.2 Flux Cored Arc Welding (FCAW)

1.6.1.3 Gas Tungsten Arc Welding (GTAW) aluminium material group

1.6.1.4 Gas Tungsten Arc Welding (GTAW) stainless steel material group

1.6.1.4 Oxyacetylene (OAW) carbon steel material group

1.6.2 Plate/Butt Welder

1.6.2.1 Gas Tungsten Arc Welding (GTAW) stainless steel material group

1.6.2.2 Gas Tungsten Arc Welding (GTAW) stainless steel material group

1.6.2.3 Gas Tungsten Arc Welding (GTAW) aluminium material group

1.6.2.4 Gas Tungsten Arc Welding and Gas Metal Arc Welding (GTAW & GMAW) combination carbon steel material group

1.6.2.5 Gas Tungsten Arc Welding and Gas Metal Arc Welding (GTAW & GMAW) combination stainless steel material group

1.6.1.4 Oxyacetylene (OAW) carbon steel material group

1.6.1.4 Oxyacetylene Brazing (OAB) carbon steel material group

1.6.3 Pipe Welder

1.6.3.1 Gas Metal Arc Welding (MIG & MAG)

1.6.2.5 Gas Tungsten Arc Welding and Gas Metal Arc Welding (GTAW & GMAW) combination carbon steel material group

1.6.2.5 Gas Tungsten Arc Welding and Gas Metal Arc Welding (GTAW & GMAW) combination stainless steel material group

ARPL Artisan Recognition of Prior learning

After which a double coded welder has acquired 3 years of employment experience, capabilities and know how, the opportunity to become a qualified Artisan shall arise through an Artisan Recognition of Prior Learning conducted by an accredited Trade Test Centre across the country. The ARPL process shall include the interview, knowledge assessment and skills practical assessment. Should the ARPL Candidate be deemed competent, the candidate shall be recommended to attempt Trade Testing under section 26D

National Trade Testing

The candidate will be offered 3 conservative attempts to be deemed competent to become a qualified Welder under Section 26D of the Skills Development Act, act of 1998

SECTION 2: SKILLS PROGRAMME PROFILE

2.1 Skills Programme Purpose

The purpose of this skills programme is to prepare a learner to produce welded test coupon/s in accordance with the parameters specified in a qualified welding procedure specification (WPS). The individual will be able to produce welds that meets the required visual, non-destructive and if applicable, destructive evaluation acceptance criteria as defined by the relevant welding codes within a short space of time.

2.2 Skills Programme Tasks

- Apply generic welding specific health, safety and environmental protection, concepts and principles
- Safely use, care and store engineering hand tools
- Safely use, care and store engineering power tools
- Safely use, care and store engineering measuring equipments
- Produce fillet welds using SMAW / MMA and GTAW / TIG combination processes
- Produce plate welds using SMAW / MMA and GTAW / TIG combination welding processes
- Produce pipe welds using the GTAW / TIG and SMAW / MMA combination welding processes

2.3 Skills Programme Task Details

Apply generic and process specific health and safety principles and practices to produce positional welds using the following processes and materials~~:~~

SMAW/MMA Process – material to be used is carbon steel with carbon steel welding consumables (E6013 and E7018)

- Fillets: 1F, 2F, 3F, 4F
- Plate butts: 1G,2G,3G,4G
- No Pipe included in this process

GTAW/TIG Process on carbon steel material, using~~,~~ carbon steel and carbon steel consumables (ER-70-S-6)

- Fillets: 1F, 2F, 3F
- Plates butts: 1G, 2G, 3G
- Pipes: 2G, 5G, 6G

GTAW/TIG and SMAW Process combination on carbon steel material, using carbon steel and carbon steel consumables (ER-70-S-6) and (E-6013 and E-7018)

- Plates butts: 1G, 2G, 3G
- Pipes: 2G, 5G, 6G

2.3.1.1 Unique Product or Service

- Weld specimens produced in accordance with approved Welding Procedure Specifications (WPS) that meet the required visual, non-destructive and destructive evaluation acceptance criteria as defined by the relevant welding code.

2.3.1.2 Skills Programme Responsibilities

- Practice and apply all applicable health and safety principles and requirements
- Identification, inspection, safely use, care and store hand and power tools as well as engineering measuring equipments
- Produce weld specimens in different positions using the dedicated two welding processes and materials as outlined under “task detail”
- Interpret, use and adhere to the welding codes and standards as applicable

SECTION 3: CURRICULUM COMPONENT SPECIFICATIONS

3.1 KNOWLEDGE MODULE SPECIFICATIONS

List of Knowledge Modules for which Specifications are included:

- KM-01: Introduction to the Welding Trade NQF Level 2, Credits 1
- KM-02: General health, safety and environmental protection concepts, NQF Level 2, Credits 1
- KM-03: Welding codes, standards and parameters, NQF Level 04, Credits 2
- KM-04: SMAW/MMA Process, NQF Level 3, Credits 2
- KM-05: GTAW/TIG Process, NQF Level 3, Credits 3
- KM-06: Safely use, care and store engineering hand tools, NQF Level 2, Credits 4
- KM-07: Safely use, care and store engineering power tools, NQF Level 2, Credits 2
- KM-08: Safely use, care and store engineering measuring equipments, NQF Level 2, Credits3

- **Total number of credits for Knowledge Modules: 18; 180 hours; 22.5 days**

3.1.1 KM-01: Introduction to the welding trade, NQF Level 2 (1 Credit)

3.1.1.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to introduce the learner to the welding trade, employment opportunities, career opportunities and requirements to be deemed a certified Coded Welder.

The learning will enable learners to demonstrate an understanding of:

- KM-01-KT01: Occupational profiles of welders (60%)
- KM-01-KT02: Specialized welding related positions (10%)
- KM-01-KT03: The welding ARPL trade test procedures and processes (5%)
- KM-01-KT04: The work environment of a welder (25%)

3.1.1.2 Guidelines for Topics

3.1.1.2.1 KM-01-KT01: Occupational profiles of welders

Topic elements to be covered include

- KT0101 The occupational profile and employment opportunities for the certified coded Fillet welder
- KT0102 The occupational profile and employment opportunities for the certified coded Plate welder
- KT0103 The occupational profile and employment opportunities for the certified coded Pipe welder

Internal Assessment Criteria

- IAC0101 Describe and explain the occupational environment and roles of a welder

3.1.1.2.2 KM-01-KT02: Specialized welding related positions

Topic elements to be covered include

- KT0201 The International Welding Practitioner
- KT0202 The Occupational Trainer: Welding
- KT0203 The International Welding Specialist
- KT0204 The Welding Inspector
- KT0205 The Welding Technologist and Engineer

Internal Assessment Criteria

- IAC0201 Describe and explain the occupational environment and roles of a welder accurately

3.1.1.2.3 KM-01-KT03: The welding trade test

Topic elements to be covered include

- KT0301 The welding trade test and eligibility requirements

Internal Assessment Criteria

- IAC0301 Describe and explain the occupational environment and roles of a welder accurately
- IAC0302 Explain the eligibility requirements for an ARPL welding trade test.

3.1.1.2.4 KM-01-KT04: The work environment of a welder

Topic elements to be covered include

- KT0401 Career opportunities in different sectors of the economy
- KT0402 Work ethics
- KT0403 Collective agreements that applies to the welding trade

Internal Assessment Criteria

- IAC0401 Describe and explain the occupational environment and roles of a welder accurately

3.1.1.3 Provider Programme Accreditation Criteria

Physical Requirements

- QCTO approved learning resources

Human Resource Requirements

- Qualified welder with 3 years operational welding experience,
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,

The following requirements would be an added advantage:

- Completed Moderator qualification

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.1.1.4 Exemptions

- None

3.1.2 KM-02: General health, safety and environmental protection, NQF Level 2 (1 Credit)

3.1.2.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to introduce the learner to general and welding specific safe work practices in an industrial environment

The learning will enable learners to demonstrate an understanding of:

- KM-02-KT01: General health, safety and environmental protection concepts (30%)

- KM-02-KT02: Welding specific health, safety and environmental protection concepts (70%)

3.1.2.2 Guidelines for Topics

3.1.2.2.1 KM-02-KT01: General health, safety and environmental protection concepts

Topic elements to be covered include

- KT0101 General overview of occupational health and safety legislation
- KT0102 General workshop safety rules and practices
- KT0103 Environmental protection and pollution
- KT0104 Hazard identification and risk assessment principles
- KT0105 Safety signs and color coding
- KT0106 Personal protective equipment
- KT0107 Fundamentals of securing worksites
- KT0107 Behavioural based safety
- KT0108 Potential Deviation Analysis
- KT0109 Permit to work

Internal Assessment Criteria

- IAC0101 Describe and explain general safe work practices
- IAC0102 Explain fundamental occupational health, safety and environmental protection concepts.
- IAC0103 Identify and interpret safety signs and describe the associated risk and safe conduct
- IAC0104 Respond to questions that demonstrates understanding of the inter relationship between workplace safety and a productive work environment
- IAC0105 Explain the general hazards in an industrial environment

3.1.2.2.2 KM-02-KT02: Welding specific health, safety and environmental protection concepts

Topic elements to be covered include

- KT0201 Welding specific safety risks such as the working environment; fumes, heavy and hot material, electrical cables, working at heights for example gantries and fixed staging; poor ground conditions; extremes of heat and cold; wind and rain effects
- KT0202 Protection of other workers from welding hazards,
- KT0203 Welding in confined spaces such as build-up of pollutants; risk of explosion; displacement of oxygen by gases like argon, nitrogen
- KT0204 Properties, handling and storage of compressed gases
- KT0205 Earthing arrangements of welding machines
- KT0206 Extinguishing substances and fire fighting

Internal Assessment Criteria

- IAC0201 Explain the general hazards in a welding fabrication shop
- IAC0202 Explain the need for ventilation, risks of explosion and handling of compressed gases
- IAC0203 Explain basic safety precautions to be taken before and during welding (PPE, shielding, equipment, materials)

3.1.2.3 Provider Programme Accreditation Criteria

Physical Requirements

- QCTO approved learning resources

Human Resource Requirements

- Qualified welder with 3 years operational welding experience,
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor and facilitator qualification

The following requirements would be an added advantage:

  - Completed a Moderator qualification

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.1.2.4 Exemptions

- None

3.1.3 KM-03 Welding codes, standards and parameters, NQF Level 04 (2 Credits)

3.1.3.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to build an understanding of welding codes, standards and parameters as applied in the welding trade.

The learning will enable learners to demonstrate an understanding of:

- KM-03-KT01: Codes and standards for welding (40%)
- KM-03-KT02: Concepts related to welding parameters (60%)

3.1.3.2 Guidelines for Topics

3.1.3.2.1 KM-03-KT01: Codes and standards for welding

Topic elements to be covered include:

- KT0101 Codes and standards used nationally and internationally
- KT0102 Standards for welding equipment and welding consumables
- KT0103 Standards for welding practice
- KT0104 Product Standards that contain welding requirements
- KT0105 Standards for Quality and Co-ordination in welding
- KT0106 Abbreviations, terminology and definitions

Internal Assessment Criteria and Weight

- IAC0101 Name the most important international and national standards for welding
- IAC0102 Explain abbreviations and terminology
- IAC0103 Provide definitions of key concepts

3.1.3.2.2 KM-06-KT02: Concepts related to welding parameters

Topic elements to be covered include:

- KT0201 Welding Procedure Specifications
- KT0202 Welding parameters, welding positions
- KT0203 Welding symbols
- KT0204 The effect of welding parameters on performance and their influence on the weld surface
- KT0205 Introduction to welding defects.
- KT0206 The control of welding parameters
- KT0207 Visual inspection practices and methods

Internal Assessment Criteria and Weight

- IAC0201 Read and interpret welding details and welding symbols
- IAC0202 Explain welding positions
- IAC0203 Explain the use of a Welding Procedure Specification in production
- IAC0204 Describe the influence of the welding parameters on the weld
- IAC0205 Describe the effect of incorrect welding parameters
- IAC0206 Describe the common different types of weld defects.
- IAC0207 Explain visual inspection practices and methods

3.1.3.3 Provider Programme Accreditation Criteria

Physical Requirements

- QCTO approved learning resources

Human Resource Requirements

- Qualified welder with 3 years operational welding experience,
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,

The following requirements would be an added advantage:

  - Completed a Moderator qualification

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.1.3.4 Exemptions

- None

3.1.4 KM-04 Shielded Metal Arc Welding (SMAW)/MMA Process NQF Level 3, (2 Credits)

3.1.4.1 Purpose of knowledge module

The main focus of the learning in this knowledge module is to build an understanding of the **SMAW welding process** as applied in the welding trade

The learning will enable learners to demonstrate an understanding of:

- KM-04-KT01: SMAW general health, safety and environmental protection concepts (20%)
- KM-04-KT02: SMAW Welding Equipment and Typical Parameters (50%)
- KM-04-KT03: SMAW covered electrodes: 30%

3.1.4.2 Guidelines for Topics

3.1.4.2.1 KM-04-KT01: SMAW general health, safety and environmental protection concepts

Topic elements to be covered include:

- KT0101: Adherence to appropriate SMAW welding PPE
- KT0201: Electric shock, harmful fumes and gases

Internal Assessment Criteria and Weight

- IAC0101: List the PPE to be worn when welding SMAW process
- IAC0201: Explain precautionary measures and recommended safe practices to avoid burns, fumes inhalation and electric shock

3.1.4.2.2. KM-04-KT02: SMAW Welding Equipment and Typical Parameters

Topic elements to be covered include:

- KT0201: SMAW welding process
- KT0202: SMAW equipment
- KT0203: SMAW process applications and limitations
- KT0204: SMAW process variables

Internal Assessment Criteria and Weight

- IAC0201: Explain SMAW welding process
- IAC0202: Identify SMAW equipment and explain the types and application characteristics of the different power sources used for the process.
- IAC0203: Explain the advantages and disadvantages of the SMAW welding process
- IAC0204: Explain SMAW essential and non-essential variables

3.1.4.2.3 KM-04-KT03: SMAW covered electrodes

Topic elements to be covered include

- KT0101: Types of SMAW process electrodes
- KT0102: Function of flux covering in mild steel electrodes
- KT0103: Composition of mild steel Electrode fluxes

Internal Assessment Criteria and Weight

- IAC0101: Explain the difference between cellulosic, basic and rutile covering in electrodes
- IAC0201: Describe the requirements of an electrode coating
- IAC0301: Explain the reaction taking place between flux ingredients, the arc and the weld metal
- IAC0401: benefits derived from slag formation during SMAW welding

3.1.4.3 Provider Programme Accreditation Criteria

Physical Requirements

- QCTO approved learning resources

Human Resource Requirements

- Qualified welder with 3 years operational welding experience,
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,

The following requirements would be an added advantage:

  - Completed a Moderator qualification

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,

- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.1.4.4 Exemptions

- None

3.1.5 KM-05: Gas Tungsten Arc Welding (GTAW) /TIG Process, NQF Level 3 (3 Credits)

3.1.5.1 Purpose of the Knowledge Module

The main focus of the learning in this knowledge module is to build an understanding of **GTAW welding processes** as applied in the welding trade

The learning will enable learners to demonstrate an understanding of:

- KM-05-KT01: General health, safety and environmental protection concepts GTAW (10 %)
- KM-05-KT02: Principles of GTAW operation (30%)
- KM-05-KT03: GTAW process variables (20%)
- KM-05-KT04: GTAW process equipment and consumables (20%)
- KM-05-KT05: GTAW electrodes classification and tip configuration (20%)

3.1.5.2 Guidelines for Topics

3.1.5.2.1 KM-05-KT01: General health, safety and environmental protection concepts GTAW

Topic elements to be covered include

- KT0101: Adherence to appropriate GTAW welding PPE
- KT0201: Electric shock, harmful fumes and gases

Internal Assessment Criteria and Weight

- IAC0101: Describe or list appropriate GTAW PPE
- IAC 0201Explain the dangers associated with shock, harmful fumes and gases

3.1.5.2.2 KM-05-KT02: Principles of GTAW operation

Topic elements to be covered include

- KT0201: Shielding gas feeding and protection of GTAW electrode
- KT0202: Producing electric arc and arc stabilization
- KT0203: Melting of the base metal and filler wire feeding

Internal Assessment Criteria and Weight

- IAC0201: Describe different GTAW shielding gases and their characteristics
- IAC0202: Explain how arc stability is achieved when welding GTAW process
- IAC0203: Explain how the base metal and filler are melted when welding GTAW process

3.1.5.2.3 KM-05-KT03: GTAW process variables

Topic elements to be covered include

- KT0301: GTAW process primary variables i.e. arc length, welding current, travel speed and shielding gas

Internal Assessment Criteria and Weight

- IAC0301: Explain GTAW essential variables

3.1.5.2.4 KM-05-KT04: GTAW process equipment

Topic elements to be covered include

- KT0401: GTAW welding torches
- KT0402: Parts of GTAW welding torch

Internal Assessment Criteria and Weight

- IAC 0401: Explain different types of GTAW torches
- IAC 0401: Identify GTAW torch components

3.1.5.2.5 KM-05-KT05: GTAW electrodes classification and tip configuration

Topic elements to be covered include

- KT0501: AWS classification of electrodes
- KT0502: Consumable and none consumable GTAW electrodes
- KT0503: GTAW electrode geometry

Internal Assessment Criteria and Weight

- IAC0501: Explain GTAW electrodes in line AWS standard
- IAC0502: Describe the difference between a consumable and non-consumable electrode
- IAC0503: Explain the GTAW non consumable electrode sharpening geometry.

3.1.5.3 Provider Programme Accreditation Criteria

Physical Requirements

- QCTO approved learning resources

Human Resource Requirements

- Qualified welder with 3 years operational welding experience,
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,

The following requirements would be an added advantage:

  - Completed a Moderator qualification

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.1.5.4 Exemptions

- None

- 3.1.6 **KM-06 Safely use, care and store engineering hand tools, NQF Level 2, Credits 4**

3.1.6.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to safely use, care and store for a range of engineering hand tools used for forming, cutting, marking, fastening tools, tooling aids and storing of hand tools in a safe lock up designated area

The learning will enable learners to demonstrate an understanding of:

- KM-06-KT01: Safely use engineering hand tools. (60%)
- KM-06-KT02: Apply care and maintenance of engineering hand tools. (30%)
- KM-06-KT03: Store engineering hand tools in a safely designated area (10%)

3.1.6.2 Guidelines for Topics

3.1.6.2.1 KM-07-KT01: Safely use engineering hand tools

Topic elements to be covered include:

- KT0101 Demonstrate safe working practices, apply worksite practice and generic health, safety and environmental protection concepts while using engineering hand tools
- KT0102 Identified, select, and safely use for all related engineering hand tools.
- KT0103 Demonstrate the ability to use the different engineering hand tools in their different applications and practice
- T0104 Recognize and report problems, changes and/or malfunctions while working with engineering hand tools

Internal Assessment Criteria and Weight

- IAC0101 Read and interpret engineering related drawing
- IAC0102 Demonstrate an ability to mark-off work pieces accurately
- IAC0103 Cut and prepare work pieces to meet specific size
- IAC0104 Work pieces are filed correctly to meet related specifications

3.1.6.2.2 KM-07-KT02: Apply care and maintenance of engineering hand tools.

Topic elements to be covered include:

- KT0201 Apply care and maintenance of engineering hand tools.

- KT0202 The understanding of the maintenance processes to accurately respond to the engineering hand tools task related questions
- KT0203 Procedures and technique for cleaning different engineering hand tools
- ***Internal Assessment Criteria and Weight***
- IAC0201 Read and interpret safety risk assessment when performing related maintenance of engineering handtools
- IAC0202 Describe implications of causes of injury and damage to materials and the Implications of incorrect use of engineering hand tools
- IAC0203 Apply procedures and techniques of safety, cleaning and maintenance of engineering hand tools

3.1.6.3.2 KM-07-KT03: Store engineering hand tools in a safely designated area

Topic elements to be covered include:

- KT0201 Engineering hand tools are stored as per storage management specifications
- KT0202 Safely store different hand tools according to their classifications
- KT0203 Store engineering hand tools in a lock up safely designated area
- KT0204 Procedures for storing different hand tools
- KT0205 Safety inspection and records of stored engineering hand tools are administered
- KT0206 Recognize and report problems, changes and/or malfunctions while storing engineering hand tools

Internal Assessment Criteria and Weight

- IAC0201 Engineering handtools are stored accordingly to conform to apply worksite practices.
- IAC0202 The understanding of the storing processes are confirmed by responding accurately to storage management
- IAC0203 Identify the defected engineering hand tools prior to storing processes
- IAC0204 Discard defected engineering hand tools prior to storing processes

3.1.6.3 Provider Programme Accreditation Criteria

Physical Requirements

- QCTO learning resources

Human Resource Requirements

- Qualified welder with 3 years operational welding experience,

- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,

The following requirements would be an added advantage:

  - Completed a Moderator qualification

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.1.6.4 Exemptions

- None

- **3.1.7 KM-07 Safely use, care and store engineering power tools, NQF Level 2, Credits 2**

3.1.7.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to safely use, care and store a range of engineering power tools used for cutting, grinding, drilling and storing of power tools in a safe lock up designated area

The learning will enable learners to demonstrate an understanding of:

- KM-07-KT01: Safely use engineering power tools. (60%)
- KM-07-KT02: Apply care and maintenance of engineering power tools. (30%)
- KM-07-KT03: Store engineering power tools in a safely designated area (10%)

3.1.7.2 Guidelines for Topics

3.1.7.2.1 KM-07-KT01: Safely use engineering power tools

Topic elements to be covered include:

- KT0101 Demonstrate safe working practices, apply worksite practice and generic health, safety and environmental protection concepts prior to commencement using of engineering power tools
- KT0102 Identify, select and safely use power tools as recommended by the manufacturer specifications to meet the task descriptions.
- KT0103 Read and interpret the name plate on the power tools to identify the task related specifications
- KT0104 Use the correct consumables as recommended by the manufacturers specification

Internal Assessment Criteria and Weight

- IAC0101 Demonstrate the ability to use the different engineering power tools in their different applications and practice
- IAC0102 Recognize and report problems, changes and/or malfunctions while working with engineering power tools
- IAC0103 Cut and prepare work pieces to meet the task descriptions.
- IAC0104 Bevel workpiece to meet the task descriptions.

3.1.7.2.2 KM-07-KT02: Apply care and maintenance of engineering power tools.

Topic elements to be covered include:

- KT0201 Apply care and maintenance of engineering power tools.
- KT0202 Service Power tools prior to commencement of the task descriptions
- KT0203 Faulty power tools identified and corrective action recommended prior to the commencement of the task descriptions
- KT0204 The understanding of the maintenance processes to accurately respond to the engineering power tools task related questions
- ***Internal Assessment Criteria and Weight***
- IAC0201 Read and interpret safety risk assessment when performing related maintenance of engineering power tools
- IAC0202 Describe implications of causes of injury and damage to materials and the Implications of incorrect use of engineering power tools
- IAC0203 Apply procedures and techniques of safety, cleaning and maintenance of engineering power tools

3.1.7.3.2 KM-07-KT03: Store engineering power tools in a safely designated area

Topic elements to be covered include:

- KT0201 Engineering power tools are stored as per storage management specifications
- KT0202 Safely store different engineering power tools orderly according to their classifications
- KT0203 Store engineering power tools in a lock up safely designated area
- KT0204 Procedures for storing different engineering power tools must be maintained
- KT0205 Safety inspection and records of stored engineering power tools are administered
- KT0206 Recognize and report problems, changes and/or malfunctions while storing engineering power tools

Internal Assessment Criteria and Weight

- IAC0201 Engineering power tools are stored accordingly to conform to apply worksite practices.
- IAC0202 The understanding of the storing processes are confirmed by responding accurately to storage management
- IAC0203 Identify the defected engineering power tools prior to storing processes
- IAC0204 Discard defected engineering power tools prior to storing processes

3.1.7.3 Provider Programme Accreditation Criteria

Physical Requirements

- QCTO learning resources

Human Resource Requirements

- Qualified welder with 3 years operational welding experience,
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,

The following requirements would be an added advantage:

- Completed a Moderator qualification

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.1.7.4 Exemptions

- None

- **3.1.8 KM-08 Safely use, care and store engineering measuring equipments, NQF Level 2, Credits 3**

3.1.8.1 Purpose of the Knowledge Modules

The main focus of the learning in this knowledge module is to safely use, care and store a range of engineering measuring equipments used for measuring such as measuring tape verniers, callipers, rules, combination set, spirit level, plumb bob, micrometers, dial gauges, feeler gauges, thermometers, scales, go/no go gauges, thread gauges, pressure gauges in a safe lock up designated area

The learning will enable learners to demonstrate an understanding of:

- KM-08-KT01: Safely use engineering measuring equipments (60%)
- KM-08-KT02: Apply care and maintenance of engineering measuring equipments (30%)

- KM-08-KT03: Store engineering measuring equipments in a safely designated area (10%)

3.1.8.2 Guidelines for Topics

3.1.8.2.1 KM-08-KT01: Safely use engineering measuring equipments

Topic elements to be covered include:

- KT0101 Demonstrate safe working practices, apply worksite practice and generic health, safety and environmental protection concepts prior to commencement using of engineering measuring equipments
- KT0102 Identify, select and safely use engineering measuring equipments as recommended by the manufacturer to meet the task descriptions.
- KT0103 Explain and discuss basic units of measure and symbols
- KT0104 Explain Basic units of measure, symbols and derived units of measure
- KT0105 Faulty measuring equipment identified and corrective action taken

Internal Assessment Criteria and Weight

- IAC0101 Demonstrate the ability to use the different engineering measuring equipments in their different applications and practice
- IAC0102 Recognize and report problems, changes and/or malfunctions while working with engineering measuring equipments
- IAC0103 Measurements are taken and recorded

3.1.8.2.2 KM-08-KT02: Apply care and maintenance of engineering measuring equipments.

Topic elements to be covered include:

- KT0201 Identify and report unsafe or faulty measuring equipment
- KT0202 Clean, service and maintain measuring equipment
- KT0203 Damaged or faulty measuring equipment includes deformities, breakages, stickiness, not zeroing, missing parts, expired calibration.
- KT0204 Maintenance of measuring equipment includes oiling, setting and calibration.
- KT0205 Problems are reported timeously to appropriate personnel
- ***Internal Assessment Criteria and Weight***
- IAC0201 Read and interpret safety risk assessment when performing related maintenance of engineering measuring equipments
- IAC0202 Describe implications of causes of injury and damage to materials and the Implications of incorrect use of engineering measuring equipments
- IAC0203 Apply procedures and techniques of safety, cleaning and maintenance of engineering measuring equipments

3.1.8.3.2 KM-08-KT03: Store engineering measuring equipments in a safely designated area

Topic elements to be covered include:

- KT0201 engineering measuring equipments are stored as per storage management specifications
- KT0202 Safely store different measuring equipments orderly according to their classifications
- KT0203 Store engineering measuring equipments in a lock up safely designated area
- KT0204 Procedures for storing different engineering measuring equipments must be maintained
- KT0205 Safety inspection and records of stored engineering measuring equipments tools are administered
- KT0206 Recognize and report problems, changes and/or malfunctions while storing engineering measuring equipments

Internal Assessment Criteria and Weight

- IAC0201 engineering measuring equipments are stored accordingly to conform to apply worksite practices.
- IAC0202 The understanding of the storing processes are confirmed by responding accurately to storage management
- IAC0203 Identify the defected engineering measuring equipments prior to storing processes
- IAC0204 Discard defected engineering measuring equipments prior to storing processes

3.1.8.3 Provider Programme Accreditation Criteria

Physical Requirements

- QCTO learning resources

Human Resource Requirements

- Qualified welder with 3 years operational welding experience,
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,

The following requirements would be an added advantage:

  - Completed a Moderator qualification

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,

- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.1.8.4 Exemptions

- None

3.2 APPLICATION MODULE SPECIFICATIONS

List of Application Modules for which specifications are included

- AM-01: Safely use, care and store engineering hand tools, NQF Level 2, Credits 4
- AM-02: Safely use, care and store engineering power tools, NQF Level 2, Credits 2
- AM-03: Safely use, care and store engineering measuring equipments, NQF Level 2, Credits2
- AM-04: Produce fillet welds on carbon steel material using the Shielded Metal Arc Welding process, NQF Level 03, Credits 8
- AM-05: Produce fillet welds on carbon steel material using the Gas Tungsten Arc Welding process, NQF Level 03, Credits 04
- AM-06: Produce plate butt welds on carbon steel material using the Shielded Metal Arc Welding process, NQF Level 04, Credits 06
- AM-07: Produce plate butt welds on carbon steel material using the Gas Tungsten Arc Welding process, NQF Level 04, Credits 08
- AM-08: Produce plate butt welds on carbon steel material using the Gas Tungsten Arc Welding and Shielded Arc Welding process combination, NQF Level 04, Credits 04
- AM-09: Produce pipe welds on schedule 40, ½ inch Ǿ, 2-inch Ǿ and 6-inch Ǿ carbon steel material using the Gas Tungsten Arc Welding process, with carbon steel and carbon steel welding consumables in the 2G, 5G and 6G positions, NQF Level 04, Credits 20
- AM-10: Produce pipe welds on Schedule 40, 6-inch Ǿ carbon steel material using the Gas Tungsten Arc Welding (GTAW / TIG) and Shielded Metal Arc (SMAW/MMA) Welding processes combination, with carbon steel and carbon steel welding consumables NQF Level 04, Credits 20

Total number of credits for Application Modules: 78 credits, 780 hours, 97.5 days

- 3.2.1. **AM-01: Safely use, care and store engineering hand tools, NQF Level 2, Credits 4**

3.2.1.1 Purpose of the Application Modules

The focus of the learning in this module is to providing the learner with an opportunity to develop basic engineering hand skills

The learner will be required to:

- AM-01-AT01: Safely use, care and store engineering hand tools

3.2.1.2 Guidelines for Practical Skills

- **3.2.1.2.1.** AM-01-AT01: Safely use, care and store engineering hand tools

Scope of Practical Skill

Given a schematic drawing, material, hand tools the learner must be able to:

- PA001 Select, use and care for engineering hand tools
- PA0102 Read, interpret and produce basic engineering drawings
- PA0103 Mark-off various simple components
- PA0104 File a work piece
- PA0105 Saw a work piece

Applied Knowledge

- AK0101 Practices related to quality, health, safety, and protection of the environment when using hand tools
- AK0102 Identification, function and use of hand tools
- AK0103 Procedures for care, cleaning and storing different hand tools
- AK0104 Terms and definitions pertaining to engineering drawings
- AK0105 Limits, tolerances and fits
- AK0106 Engineering drawings
- AK0107 Procedures and techniques/methods for marking-off
- AK0108 Procedures and techniques/methods to file work pieces
- AK0109 Procedures and techniques/methods to saw work pieces

Internal Assessment Criteria

- IAC0101 Different hand tools required are identified and used correctly
- IAC0102 Work pieces are marked-off accurately

- IAC0103 Work pieces are cut to specific size specifications
- IAC0104 Work pieces are filed correctly to specifications
- IAC0105 Health, quality, safety and environmental protection practices are adhered to

3.2.1.3 Provider Programme Accreditation Criteria

Physical Requirements:

Demonstrate access to:

- Hand tools equipment
- Consumables
- Material
- Welder equipment and welding cubicle per learner.

Human Resource Requirements:

- Qualified welder with 3 years operational welding experience, **and**
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,
- Completed Moderator qualification would be added advantage

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.2.1.4 Exemptions

- As required

- **3.2.2. AM-02: Safely use, care and store engineering power tools, NQF Level 2, Credits 2**

3.2.2.1 Purpose of the Application Modules

The focus of the learning in this module is to providing the learner with an opportunity to develop basic engineering power tools operating skills

The learner will be required to:

- AM-01-AT01: Safely use, care and store engineering hand tools

3.2.2.2 Guidelines for Practical Skills

3.2.2.2.1. AM-01-AT01: Safely use, care and store engineering hand tools

Scope of Practical Skill

Given a schematic drawing, material and power tools the learner must be able to:

- PA0201 Select and care for engineering power tools
- PA0202 Grind material with a bench grinder
- PA0203 Drill material using a portable drilling machine
- PA0204 Drill material using a pedestal drilling machine
- PA0205 Grind material with an angle grinder
- PA0206 Cut material with a power saw

Applied Knowledge

- AK0201 Practices related to quality, health, safety, and protection of the environment when using power tools
- AK0202 Identification, function and safely use of engineering power tools
- AK0203 Procedures for care, cleaning and storing different engineering power tools
- AK0204 Limits, tolerances and fits
- AK0205 Types and uses of drill bits
- AK0206 Types and uses of grinding disks and wheels

Internal Assessment Criteria

- IAC0201 Health, quality, safety and environmental protection practices are adhered to
- IAC0202 Different engineering power tools are identified and used correctly
- IAC0203 Cleaning and storage procedures are adhered to
- IAC0204 Cutting, drilling and grinding is done to requirements

3.2.2.3 Provider Programme Accreditation Criteria

Physical Requirements:

Demonstrate access to:

- Power tools equipment
- Consumables
- Material

- Welder equipment and welding cubicle per learner.

Human Resource Requirements:

- Qualified welder with 3 years operational welding experience, **and**
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,
- Completed Moderator qualification would be added advantage

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.2.2.4 Exemptions

- As required

- **3.2.3 AM-03: Safely use, care and store engineering measuring equipments, NQF Level 2, Credits 2**

3.2.3.1 Purpose of the Application Modules

The focus of the learning in this module is on providing the learner an opportunity to develop basic engineering measuring equipment operating skills

The learner will be required to:

- AM-01-AT01: Safely use, care and store engineering hand tools

3.2.3.2 Guidelines for Practical Skills

3.2.3.2.1. AM-01-AT01: Safely use, care and store engineering hand tools

Scope of Practical Skill

Given a schematic drawing, material and engineering measuring equipments the learner must be able to:

- PA0201 Select and care for engineering measuring equipments
- PA0202 Basic units of measure, symbols and derived units of measure are explained
- PA0203 Explain Basic units of measure, symbols and derived units of measure
- PA0204 Explain and discuss basic units of measure and symbols
- PA0205 Basic units of measure include length, mass, temperature, angle, pressure

- PA0206 Measuring equipment cleaned, serviced, maintained and stored.
- PA0207 Faulty measuring equipment identified and corrective action taken.

Applied Knowledge

- AK0201 Practices related to quality, health, safety, and protection of the environment when using engineering measuring equipments
- AK0202 Identification, selection and safely use of engineering measuring equipments
- AK0203 Procedures for care, cleaning and storing different engineering measuring equipments
- AK0204 Limits, tolerances and fits
- AK0205 Types and uses of measuring tape verniers, callipers, rules, combination set, spirit level, plumb bob, micrometers, dial gauges, feeler gauges, thermometers, scales, go/no go gauges, thread gauges, pressure gauges
- AK0206 Types and uses of engineering measuring equipments

Internal Assessment Criteria

- IAC0201 Health, quality, safety and environmental protection practices are adhered to
- IAC0202 Different engineering measuring equipments are identified and used correctly
- IAC0203 Explain and discuss basic units of measure and symbols
- IAC0204 Measurements taken are appropriate to scale of measuring device

3.2.3.3 Provider Programme Accreditation Criteria

Physical Requirements:

Demonstrate access to:

- Power tools equipment
- Consumables
- Material
- Welder equipment and welding cubicle per learner.

Human Resource Requirements:

- Qualified welder with 3 years operational welding experience, **and**
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,
- Completed Moderator qualification would be added advantage

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation

- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety

Hazard Identification Risk Assessment

3.2.3.4 Exemptions

- As required

3.2.4 AM-04: Produce fillet welds on carbon steel material using the Shielded Metal Arc Welding process, NQF Level 03 (7 Credits)

3.2.4.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to develop fillet-welding skills to the minimum requirements of internationally accepted welding standards (AWS D1.1 and ISO9606) in a controlled learning environment using the Shielded Metal Arc Welding process.

The learner will be required to:

- PM-02-PS01: Produce a single pass fillet welds using the Shielded Metal Arc Welding process
- PM-02-PS02: Produce a multi pass fillet welds using the Shielded Metal Arc Welding process

3.2.4.2 Guidelines for Practical Skills

3.2.4.2.1. PM-04-PS01: Produce a single pass fillet weld using the Shielded Metal Arc Welding process

Scope of Practical Skill

Given an approved Welding Procedure Specification (WPS), welding equipment, carbon steel material and welding consumables (E-6013 and E-7018-1)

The learner must be able to:

- PA0101 Produce a fillet weld in the flat position (1F) including fitting and tacking
- PA0102 Produce a fillet weld in the horizontal position (2F), including fitting and tacking
- PA0103 Produce a fillet weld in the vertical up position (3F), including fitting and tacking
- PA0104 Produce a fillet weld in the overhead position (4F), including fitting and tacking

Applied Knowledge

- AK0101 Material preparation for Shielded Metal Arc Welding
- AK0102 Fit up and tack welding techniques and practices
- AK0103 Welding techniques using Shielded Metal Arc Welding
- AK0104 Work piece cleaning and dressing practices
- AK0105 Visual inspection procedures and quality indicators

- AK0106 Practices related to quality, health, safety, and protection of the environment when using Shielded Metal Arc Welding

Internal Assessment Criteria

- IAC0101 The minimum requirements of current accepted international standards are met e.g. AWS D1.1 and ISO9606 standards
- IAC0102 Health, quality, safety and environmental protection practices are adhered to
- IAC0103 Welding equipment setup and settings/parameters are correct and can be explained for different applications
- IAC0104 Welding imperfection and defects are recognized through visual inspection, causes and prevention thereof is explained, and defects are rectified

3.2.4.2.2. PM-04-PS02: Produce a multi pass fillet weld using the Shielded Metal Arc Welding process

Scope of Practical Skill

Given an approved Shielded Metal Arc Welding procedure, welding equipment, material and consumables the learner must be able to:

- PA0201 Produce a fillet weld in the flat position (1F), including fit up and tack
- PA0202 Produce a fillet weld in the horizontal position (2F), including fit up and tack
- PA0202 Produce a fillet weld in the vertical up position (3F), including fit up and tack
- PA0202 Produce a fillet weld in the overhead position (4F), including fit up and tack

Applied Knowledge

- AK0201 Material preparation for Shielded Metal Arc Welding
- AK0202 Fit up and tack welding techniques and practices
- AK0203 Welding techniques using Shielded Metal Arc Welding
- AK0204 Work piece cleaning, dressing and inter-pass cleaning practices
- AK0205 Visual inspection procedures and quality indicators
- AK0206 Practices related to quality, health, safety, and protection of the environment when using Shielded Metal Arc Welding
- AK0207 Root, filler and cap welding techniques

Internal Assessment Criteria

- IAC0201 The minimum requirements of current accepted international standards are met. e.g. AWS D1.1 and ISO9606 standards
- IAC0202 Health, quality, safety and environmental protection practices are adhered to
- IAC0203 Welding equipment setup and settings/parameters are correct and can be explained for different applications
- IAC0204 Welding imperfection and defects are recognized through visual inspection, the causes and prevention are explained, and defects are rectified

3.2.4.3 Provider Programme Accreditation Criteria

Physical Requirements:

Demonstrate access to:

- Shielded Metal Arc Welding equipment
- Consumables
- Material
- Welder equipment and welding cubicle per learner.

Human Resource Requirements:

- Qualified welder with 3 years operational welding experience, **and**
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,
- Completed Moderator qualification would be added advantage

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.2.4.4 Exemptions

- As required

3.2.5. AM-05: Produce fillet welds on carbon steel using the Gas Tungsten Arc Welding process, NQF Level 03 (4 Credits)

3.2.5.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to develop fillet-welding skills to the minimum requirements of internationally accepted welding standards (AWS D1.1 and ISO9606) in a controlled learning environment using the Gas Tungsten Arc Welding process.
The learner will be required to:

- PM-05-PS01: Produce a single and multi-pass fillet welds using the Gas Tungsten Arc Welding process

3.2.5.2 Guidelines for Practical Skills

3.2.5.2.1. PM-05-PS01: Produce ~~a~~ single and multi-pass fillet welds using the Gas Tungsten Arc Welding process

Scope of Practical Skill

Given an approved Gas Tungsten Arc Welding procedure, welding equipment, carbon steel material and consumables, the learner must be able to:

- PA0101 Produce ~~a~~ single and multi-pass fillet welds in the flat position (1F), including fit up and tack

- PA0102 Produce ~~a~~ single and multi-pass fillet welds in the horizontal position (2F), including fit up and tack

- PA0103 Produce ~~a~~ single and multi-pass fillet welds in the vertical up position (3F), including fit up and tack

- PA0104 Produce ~~a~~ single and multi-pass fillet welds in the overhead position (4F), including fit up and tack

Applied Knowledge

- AK0101 Material preparation for Gas Tungsten Arc Welding

- AK0102 Fit up and tack welding techniques and practices

- AK0103 Welding techniques using Gas Tungsten Arc Welding

- AK0104 Work piece cleaning, dressing and inter-pass cleaning practices

- AK0105 Visual inspection procedures and quality indicators

- AK0106 Practices related to quality, health, safety, and protection of the environment when using Gas Tungsten Arc Welding

- AK0107 Root, filler and cap welding techniques

Internal Assessment Criteria

- IAC0101 The minimum requirements of current accepted international standards are met. e.g. (AWS D1.1 and ISO9606) standards

- IAC0102 Health, quality, safety and environmental protection practices are adhered to

- IAC0103 Welding equipment setup and settings/parameters are correct and can be explained for different applications

- IAC0104 Welding imperfection and defects are recognized through visual inspection, the causes and prevention thereof is explained, and defects are rectified

Applied Knowledge

- AK0201 Material preparation for Gas Tungsten Arc Welding
- AK0202 Fit up and tack welding techniques and practices
- AK0203 Welding techniques using Gas Tungsten Arc Welding
- AK0204 Work piece cleaning, dressing and inter-pass cleaning practices
- AK0205 Visual inspection procedures and quality indicators
- AK0206 Practices related to quality, health, safety, and protection of the environment when using Gas Tungsten Arc Welding
- AK0207 Root, filler and cap welding techniques

Internal Assessment Criteria

- IAC0201 The minimum requirements of current accepted international standards are met. e.g. (AWS D1.1 and ISO9606) standards
- IAC0202 Health, quality, safety and environmental protection practices are adhered to
- IAC0203 Welding equipment setup and settings/parameters are correct and can be explained for different applications
- IAC0204 Welding imperfection and defects are recognized through visual inspection, the causes and prevention thereof is explained, and defects are rectified

3.2.5.3 Provider Programme Accreditation Criteria

Physical Requirements:

Demonstrate access to:

- Gas Tungsten Arc Welding equipment
- Consumables
- Material
- Welder equipment and welding cubicle per learner

Human Resource Requirements:

- Qualified welder with 3 years operational welding experience, **and**
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,
- Completed Moderator qualification would be added advantage

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,

- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.2.5.4 Exemptions

- As required

3.2.6. AM-06: Produce plate butt welds on carbon steel material using the Shielded Metal Arc Welding process, NQF Level 04 (8 Credits)

3.2.6.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to develop plate butt welding skills to the minimum requirements of internationally accepted welding standards (AWS D1.1 and ISO9606) in a controlled learning environment using the Shielded Metal Arc Welding process.

The learner will be required to:

- PM-06-PS01: Produce a single pass plate butt welds using the Shielded Metal Arc Welding process
- PM-06-PS02: Produce a multi pass plate butt welds using the Shielded Metal Arc Welding process

3.2.6.2 Guidelines for Practical Skills

3.2.6.2.1. PM-06-PS01: Produce a single pass plate butt weld using the Shielded Metal Arc Welding process

Scope of Practical Skill

Given an approved Shielded Metal Arc Welding procedure, welding equipment, material and consumables the learner must be able to:

- PA0101 Produce a square butt weld in the flat position (1G), including fit up and tack
- PA0102 Produce a square butt weld in the horizontal position (2G), including fit up and tack
- PA0103 Produce a square butt weld in the vertical up position (3G), including fit up and tack
- PA0104 Produce a square butt joint in the overhead position (4G), including fit up and tack

Applied Knowledge

- AK0101 Material preparation for Shielded Metal Arc Welding
- AK0102 Fit up and tack welding techniques and practices
- AK0103 Welding techniques using Shielded Metal Arc Welding
- AK0104 Visual inspection procedures and quality indicators
- AK0105 Work piece cleaning and dressing practices

- AK0106 Practices related to quality, health, safety, and protection of the environment when using Shielded Metal Arc Welding

Internal Assessment Criteria

- IAC0101 The minimum requirements of current accepted international standards are met e.g. AWS D1.1 and ISO9606 standards
- IAC0102 Health, quality, safety and environmental protection practices are adhered to
- IAC0103 Welding equipment setup and settings/parameters are correct and can be explained for different applications
- IAC0104 Welding imperfection and defects are recognized through visual inspection, the causes and prevention thereof is explained, and defects rectified

3.2.6.2.2. PM-07-PS02: Produce a multi pass plate butt weld using the Shielded Metal Arc Welding process

Scope of Practical Skill

Given an approved Shielded Metal Arc Welding procedure, welding equipment, material and consumables. The learner must be able to;

- PA0201 Produce a single V butt weld in the flat position (1G), including fit up and tack
- PA0202 Produce a single V butt weld in the horizontal position (2G), including fit up and tack
- PA0203 Produce a single V butt weld in the vertical up position (3G), including fit up and tack
- PA0204 Produce a single V butt joint in the overhead position (4G), including fit up and tack

Applied Knowledge

- AK0201 Material preparation for Shielded Metal Arc Welding
- AK0202 Fit up and tack welding techniques and practices
- AK0203 Welding techniques using Shielded Metal Arc Welding
- AK0204 Work piece cleaning and dressing practices
- AK0205 Visual inspection procedures and quality indicators
- AK0206 Practices related to quality, health, safety, and protection of the environment when using Shielded Metal Arc Welding

Internal Assessment Criteria

- IAC0201 The minimum requirements of current accepted international standards are met e.g. AWS D1.1 and ISO9606 or equivalent standards
- IAC0202 Health, quality, safety and environmental protection practices are adhered to
- IAC0203 Welding equipment setup and settings/parameters are correct and can be explained for different applications
- IAC0204 Welding imperfection and defects are recognized through visual inspection, the causes and prevention are explained, and rectified

3.2.6.3 Provider Programme Accreditation Criteria

Physical Requirements:

Demonstrate access to:

- Shielded Metal Arc Welding equipment
- Consumables
- Material
- Welder equipment and welding cubicle per learner.

Human Resource Requirements:

- Qualified welder with 3 years operational welding experience, **and**
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,
- Completed Moderator qualification would be added advantage

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.7.5.4 Exemptions

As required

3.2.7. AM-07: Produce plate butt welds on carbon steel using the Gas Tungsten Arc Welding process, NQF Level 04 (8 Credits)

3.2.7.1 Purpose of the Practical Skill Modules

The focus of the learning in this module is on providing the learner an opportunity to develop plate butt welding skills to the minimum requirements of internationally accepted welding standards (AWS D1.1 and ISO9606) in a controlled learning environment using the Gas Tungsten Arc Welding process.
The learner will be required to:

- PM-07-PS01: Produce a single pass plate butt weld using the Gas Tungsten Arc Welding process
- PM-07-PS02: Produce a multi pass plate butt weld using the Gas Tungsten Arc Welding process

3.2.7.2 Guidelines for Practical Skills

3.2.7.2.1. PM-07-PS01: Produce a single pass plate butt weld using the Gas Tungsten Arc Welding process

Scope of Practical Skill

Given an approved Gas Tungsten Arc Welding procedure, welding equipment, carbon steel material and consumables. The learner must be able to:

- PA0101 Produce a square butt weld in the flat position (1G), including fit up and tack
- PA0102 Produce a square butt weld in the horizontal position (2G), including fit up and tack
- PA0103 Produce a square butt weld in the vertical up position (3G), including fit up and tack
- PA0104 Produce a square butt joint in the overhead position (4G), including fit up and tack

Applied Knowledge

- AK0101 Material preparation for Gas Tungsten Arc Welding
- AK0102 Fit up and tack welding techniques and practices
- AK0103 Welding techniques using Gas Tungsten Arc Welding
- AK0104 Work piece cleaning and dressing practices
- AK0105 Visual inspection procedures and quality indicators
- AK0106 Practices related to quality, health, safety, and protection of the environment when using Gas Tungsten Arc Welding

Internal Assessment Criteria

- IAC0101 The minimum requirements of current accepted international standards are met e.g. AWS D1.1 and ISO9606 standards
- IAC0102 Health, quality, safety and environmental protection practices are adhered to
- IAC0103 Welding equipment setup and settings/parameters are correct and can be explained for different applications
- IAC0104 Welding imperfection and defects are recognized through visual inspection, the causes and prevention thereof is explained, and defects are rectified

3.2.7.2.2. PM-07-PS02: Produce a multi pass plate butt weld using the Gas Tungsten Arc Welding process

Scope of Practical Skill

Given an approved Gas Tungsten Arc Welding procedure, welding equipment, carbon steel material and consumables. The learner must be able to;

- PA0201 Produce a single V butt weld in the flat position (1G), including fit up and tack
- PA0202 Produce a single V butt weld in the horizontal position (2G), including fit up and tack
- PA0203 Produce a single V butt weld in the vertical up position (3G), including fit up and tack
- PA0204 Produce a single V butt joint in the overhead position (4G), including fit up and tack

Applied Knowledge

- AK0201 Material preparation for Gas Tungsten Arc Welding
- AK0202 Fit up and tack welding techniques and practices
- AK0203 Welding techniques using Gas Tungsten Arc Welding
- AK0204 Work piece cleaning and dressing practices
- AK0205 Visual inspection procedures and quality indicators
- AK0206 Practices related to quality, health, safety, and protection of the environment when using Gas Tungsten Arc Welding

Internal Assessment Criteria

- IAC0201 The minimum requirements of current accepted international standards are met e.g. BS EN 5817, ISO 9606 or equivalent standards
- IAC0202 Health, quality, safety and environmental protection practices are adhered to
- IAC0203 Welding equipment setup and settings/parameters are correct and can be explained for different applications
- IAC0204 Welding imperfection and defects are recognized through visual inspection, the causes and prevention thereof is explained, and defects are rectified

3.2.7.3 Provider Programme Accreditation Criteria

Physical Requirements:

Demonstrate access to:

- Shielded Metal Arc Welding equipment
- Consumables
- Material
- Welder equipment and welding cubicle per learner.

Human Resource Requirements:

- Qualified welder with 3 years operational welding experience, **and**
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,
- Completed Moderator qualification would be added advantage

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis

- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.2.7.4 Exemptions

- As required

3.2.8. AM-08: Produce plate butt welds on carbon steel material using the Gas Tungsten Arc Welding and Shielded Arc Welding process combination, NQF Level 04, Credits 04

3.2.9.1 Purpose of the Application Modules

The focus of the learning in this module is on providing the learner an opportunity to develop plate butt welding skills to the minimum requirements of internationally accepted welding standards (ASME IX and ISO9606) in a controlled learning environment using the Gas Tungsten Arc and Shielded Metal Arc Welding processes combination.

The learner will be required to:

- PM-08-PS01: Produce a multi pass plate butt weld using the Gas Tungsten Arc Welding and Shielded Metal Arc Welding processes combination.

3.2.8.2 Guidelines for Practical Skills

3.2.8.2.1. PM-08-PS01: Produce a multi pass plate butt weld using the Gas Tungsten Arc Welding and Shielded Metal Arc Welding processes combination

Scope of Practical Skill

Given an approved Gas Tungsten Arc Welding and Shielded Metal Arc Welding combination procedure, welding equipment, ferrous material and consumables. The learner must be able to:

- PA0101 Produce a V butt plate weld in the flat position (1G)
- PA0102 Produce a V butt plate weld with the pipe in the fixed horizontal position (2G)
- PA0103 Produce a V butt plate weld with the pipe in the fixed vertical position (3G)

Applied Knowledge

- AK0101 Material preparation for Gas Tungsten Arc Welding and Shielded Metal Arc Welding combination
- AK0102 Fit up and tack welding techniques and practices
- AK0103 Welding techniques using Gas Tungsten Arc Welding and Shielded Metal Arc Welding combination
- AK0104 Work piece cleaning and dressing practices
- AK0105 Visual inspection procedures and quality indicators
- AK0106 Practices related to quality, health, safety, and protection of the environment when using Gas Tungsten Arc Welding and Shielded Metal Arc Welding processes combination

Internal Assessment Criteria

- IAC0101 The minimum requirements of current accepted international standards are met e.g. ASME IX and ISO9606 standards
- IAC0102 Health, quality, safety and environmental protection practices are adhered to
- IAC0103 Welding equipment setup and settings/parameters are correct and can be explained for different applications
- IAC0104 Welding defects are recognized through visual inspection, the causes and prevention thereof is explained, and defects are rectified

3.2.8.3 Provider Programme Accreditation Criteria

Physical Requirements:

Demonstrate access to:

- Gas Metal Arc Welding equipment and Shielded Metal Arc Welding equipment combination
- Consumables
- Material
- Welder equipment and welding cubicle per learner.
- Welding jigs or manipulator for positional plate welding

Human Resource Requirements:

- Qualified welder with 3 years operational welding experience, **and**
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,
- Completed Moderator qualification would be added advantage

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.2.8.4 Exemptions

- As required

3.2.9. AM-09: Produce pipe welds on ½ inch Ǿ, 2-inch Ǿ and 6-inch Ø carbon steel material using the Gas Tungsten Arc Welding process, with carbon steel and carbon steel welding consumables in the 2G, 5G and 6G positions, NQF Level 04, Credits 12

3.2.9.1 Purpose of the Application Modules

The focus of the learning in this module is on providing the learner an opportunity to develop pipe-welding skills to the minimum requirements of internationally accepted welding standards (ASME IX and ISO9606) in a controlled learning environment using the Gas Tungsten Arc Welding process.

The learner will be required to:

- AM-09-PS01: Produce a multi pass pipe butt weld using the Gas Tungsten Arc Welding process

3.2.9.2 Guidelines for Practical Skills

3.2.9.2.1. PM-09-PS01: Produce a multi pass pipe butt weld using the Gas Tungsten Arc Welding process

Scope of Practical Skill

Given an approved Gas Tungsten Arc Welding procedure, welding equipment, ferrous material and consumables. The learner must be able to:

- PA0101 Produce a V butt pipe weld with the pipe in the fixed horizontal position (2G)
- PA0102 Produce a V butt pipe weld with the pipe in the fixed vertical position (5G)
- PA0103 Produce a V butt pipe weld in the inclined 45-degree fixed position (6G)

Applied Knowledge

- AK0101 Material preparation for Gas Tungsten Arc Welding
- AK0102 Fit up and tack welding techniques and practices
- AK0103 Welding techniques using Gas Tungsten Arc Welding
- AK0104 Work piece cleaning and dressing practices
- AK0105 Visual inspection procedures and quality indicators
- AK0106 Practices related to quality, health, safety, and protection of the environment when using Gas Tungsten Arc Welding

Internal Assessment Criteria

- IAC0101 The minimum requirements of current accepted international standards are met e.g. ASME IX and ISO9606 standards
- IAC0102 Health, quality, safety and environmental protection practices are adhered to
- IAC0103 Welding equipment setup and settings/parameters are correct and can be explained for different applications

- IAC0104 Welding imperfection and defects are recognized through visual inspection, the causes and prevention thereof are explained, and defects are rectified

3.2.9.3 Provider Programme Accreditation Criteria

Physical Requirements:

Demonstrate access to:

- Gas Tungsten Arc Welding equipment
- Consumables
- Material
- Welder equipment and welding cubicle per learner.
- Welding jigs for positional pipe welding

Human Resource Requirements:

- Qualified welder with 3 years operational welding experience, **and**
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,
- Completed Moderator qualification would be added advantage

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.2.9.4 Exemptions

- As required

3.2.10 AM-10: Produce pipe welds on Schedule 40, 6-inch Ø carbon steel material using the Gas Tungsten Arc Welding (GTAW / TIG) and Shielded Metal Arc (SMAW/MMA) Welding processes, with carbon steel and carbon steel welding consumables NQF Level 04 (16 Credits)

3.2.10.1 Purpose of the Application Modules

The focus of the learning in this module is on providing the learner an opportunity to develop pipe-welding skills to the minimum requirements of internationally accepted welding standards (ASME IX and ISO9606) in a controlled learning environment using the Gas Tungsten Arc and Shielded Metal Arc Welding processes.

The learner will be required to:

- PM-09-PS01: Produce a multi pass pipe butt weld using the Gas Tungsten Arc Welding and Shielded Metal Arc Welding processes

3.2.10.2 Guidelines for Practical Skills

3.2.10.2.1. PM-10-PS01: Produce a multi pass pipe butt weld using the Gas Tungsten Arc Welding and Shielded Metal Arc Welding processes

Scope of Practical Skill

Given an approved Gas Tungsten Arc Welding and Shielded Metal Arc Welding procedure, welding equipment, ferrous material and consumables. The learner must be able to:

- PA0101 Produce a V butt pipe weld in the flat position (1G) on a rotating axis
- PA0102 Produce a V butt pipe weld with the pipe in the fixed horizontal position (2G)
- PA0103 Produce a V butt pipe weld with the pipe in the fixed vertical position (5G)
- PA0104 Produce a V butt pipe weld in the inclined 45-degree fixed position (6G)

Applied Knowledge

- AK0101 Material preparation for Gas Tungsten Arc Welding and Shielded Metal Arc Welding
- AK0102 Fit up and tack welding techniques and practices
- AK0103 Welding techniques using Gas Tungsten Arc Welding and Shielded Metal Arc Welding
- AK0104 Work piece cleaning and dressing practices
- AK0105 Visual inspection procedures and quality indicators
- AK0106 Practices related to quality, health, safety, and protection of the environment when using Gas Tungsten Arc Welding and Shielded Metal Arc Welding processes

Internal Assessment Criteria

- IAC0101 The minimum requirements of current accepted international standards are met e.g. ASME IX and ISO9606 standards
- IAC0102 Health, quality, safety and environmental protection practices are adhered to
- IAC0103 Welding equipment setup and settings/parameters are correct and can be explained for different applications
- IAC0104 Welding defects are recognized through visual inspection, the causes and prevention thereof is explained, and defects are rectified

3.2.10.3 Provider Programme Accreditation Criteria

Physical Requirements:

Demonstrate access to:

- Shielded Metal Arc Welding equipment
- Consumables
- Material
- Welder equipment and welding cubicle per learner.
- Welding jigs for positional pipe welding

Human Resource Requirements:

- Qualified welder with 3 years operational welding experience, **and**
- Completed a recognized qualification in occupational related education and training
- Completed an Assessor qualification,
- Completed Moderator qualification would be added advantage

Legal Requirements

- Compliance with occupational safety, health and environmental protection legislation
- Conduct Risk Assessment,
- Potential Deviation Analysis
- Behavioural Based Safety
- Hazard Identification Risk Assessment

3.2.10.4 Exemptions

- As required

Total number of credits for Application Modules: 78 credits, 780 hours, 97.5 days

SECTION 4: ASSESSMENT

To be declared competent in this skills programme the learners will be provided with a written summative assessment over 1-2 hours duration covering the following areas:

4.1 Assessment of Knowledge Modules

- Explanation of the workshop safe work procedures, precautions and Personal Protective Equipment required for SMAW, GTAW welding processes
- Demonstration of an understand of the acceptable standard when selecting, using and caring for hand and power tools
- Description of the SMAW, GTAW welding processes
- Explanation of the potential causes of Welding imperfection and defects when welding with SMAW, GTAW processes
- Identification and correlation of welding symbols to a type of joint
- Explanation of the classification and application of welding consumables for SMAW, GTAW welding processes

4.2 Assessment of Application Modules

The summative assessment model must be practical tasks in a workshop with adherence to applicable health and safety protocols (including COVID-19 related protocols)

The practical modules of this skills program shall require the learner to produce positional fillet, butt and pipe weld specimens using a variety of arc welding processes including, Shielded Metal Arc Welding (SMAW / MMA) and Gas Tungsten Arc Welding (GTAW / TIG).

All test coupons are required to be produced in accordance with the welding parameters specified in the relevant welding procedure specifications (WPS).

For the learner to be deemed competent the welded test coupons must meet the visual, non-destructive and if applicable, the destructive acceptance criteria of the relevant welding code. Welding coding standards deemed applicable for the practical assessment of this skills program include:

- ASME IX Boiler and Pressure Vessel Code
- AWS D1.1 Structural Code
- BS EN 5817, ISO 9606

The welding test coupons to be produced as per relevant Welding Procedure Specifications for the assessment of the Application Modules ought to include a representative selection of the following:

- SMAW/MMA Process –material to be used is carbon steel with carbon steel welding consumables (E-6013 and E-7018-1)
- Fillets: 1F, 2F, 3F, 4F
- Plate butts: 1G,2G,3G,4G
- No Pipe included in this process

GTAW/TIG Process on carbon steel material, using~~,~~ carbon steel and carbon steel consumables (ER-70-S-6)

- Fillets: 1F, 2F, 3F
- Plates butts: 1G, 2G, 3G
- Pipes: 2G, 5G, 6G

GTAW/TIG and SMAW Processes combination on carbon steel pipe material, using carbon steel and carbon steel consumables (ER-70-S-6 / E-7018 - 1)

- Pipes: 2G, 5G, 6G