THE REPUBLIC OF KENYA

COMPETENCY BASED CURRICULUM

FOR

WELDING ARTISAN

LEVEL 4

KISII NATIONAL POLYTECHNIC
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KISII

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FOREWORD

The provision of quality education and training is fundamental to the Government's overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya's development blueprint and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training. A key feature of this policy is the radical change in the design and delivery of the TVET training. This policy document requires that training in TVET be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that this curriculum has been developed.

It is my conviction that this curriculum will play a great role towards development of competent human resource for the Welding and Fabrication sector's growth.

PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING
MINISTRY OF EDUCATION

PREFACE

Kenya Vision 2030 aims to transform the country into a newly industrializing, "middle-income country providing a high-quality life to all its citizens by the year 2030". Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labor force.

Kisii National Polytechnic (KNP) in conjunction with Welding Sector Skills Advisory Committee (SSAC) have developed this curriculum.

This curriculum has been developed following the CBET framework policy; the CBETA Standards and guidelines provided by the TVET Authority and the Kenya National Qualification framework designed by the Kenya National Qualification Authority.

This curriculum is designed and organized with an outline of learning outcomes; suggested delivery methods, training/learning resources and methods of assessing the trainee's achievement. The curriculum is competency-based and allows multiple entry and exit to the course.

I am grateful to the Council members, Council Secretariat, Welding Sector Skills Advisory Committee (SSAC), expert workers and all those who participated in the development of this curriculum.

Prof. CHARLES M. M. ONDIEKI, PhD, FIET (K), CON. ENG TECH.
CHAIRMAN, TVET CDACC

ACKNOWLEDGEMENT

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support was received from various organizations.

I recognize with appreciation the role of the Welding Sector Skills Advisory Committee (SSAC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the Welding and Fabrication sector for their valuable input and all those who participated in the process of developing this curriculum.

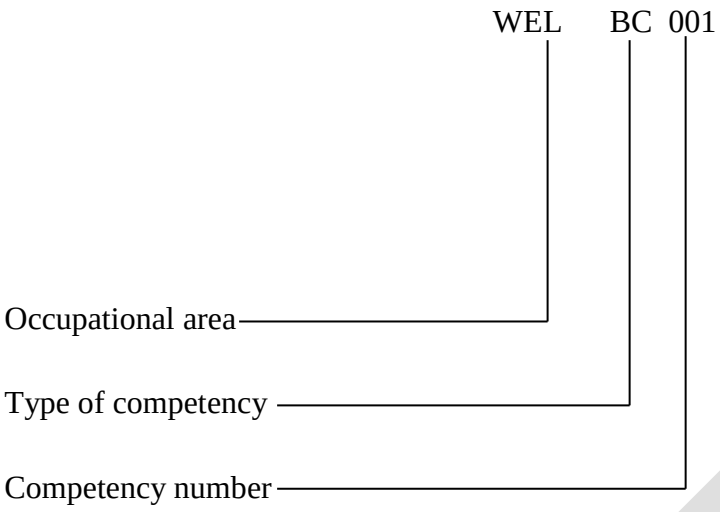
I am convinced that this curriculum will go a long way in ensuring that workers in Welding and Fabrication sector acquire competencies that will enable them to perform their work more efficiently.

DR. LAWRENCE GUANTAI M'ITONGA, PhD
COUNCIL SECRETARY/CEO
TVET CDACC

ACRONYMS

BC	Basic competency
CBET	Competency Based Education and Training
CC	Common competency
CR	Core competency
CU	Curriculum
ENG	Engineering
KCSE	Kenya Certificate of Secondary Education
KNP	Kisii National Polytechnic
KNQA	Kenya National Qualifications Authority
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
TVET	Technical and Vocational Education and Training
WEF	Welding and Fabrication
KS	Kenyan Standard
ISO	International Organization for Standardization
BS	British Standard
NEMA	National Environmental Management Authority
ASME	American Society of Mechanical Engineers

KEY TO UNIT CODE



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OVERVIEW

Welding Level 4 qualification consists of competencies that a person must achieve to enable him/her to carry out various welding processes including Gas welding in all positions, Manual Metal Arc Welding MMAW, Tungsten Inert Gas (TIG) welding, Gas Metal Arc Welding (GMAW) and Oxyacetylene (gas) Welding.

The units of competency comprising this qualification include the following Basic, Common and Core competencies:

Basic Units of Competency		
Unit Code	**Unit Title**	**Duration in Hours**
WELBC001	Communication skills	40
WELBC002	Mathematics	40
WELBC003	Computer Applications in Welding	40
WELBC004	Entrepreneurship skills	60
WELBC005	Employability skills	30
WELBC006	Environmental, occupational safety and health practices	40
TOTAL NUMBER OF HOURS		250
Common Units of Competency		
Unit Code	**Unit Title**	**Duration in Hours**
WELCC001	Workplace health, safety, environmental and emergency	40
WELCC002	Workplace essential skills	35
WELCC003	Plan and organise work activities	35
WELCC004	Fundamental skills of welding works	30
WELCC005	Technical Drawing	30
TOTAL NUMBER OF HOURS		170
Core Units of Competency		
Unit Code	**Unit Title**	**Duration in Hours**
WELC001	Manual metal arc (stick) welding	120
WELC002	Tungsten Inert Gas welding (Gas Tungsten arc welding)	80
WELC003	Metal Inert Gas welding (Gas Metal arc welding)	100

WELC004	Oxyacetylene (Gas) welding	80
TOTAL NUMBER OF HOURS		380
INDUSTRIAL ATTACHMENT		300
GRAND TOTAL		**1100**

The total duration of the course is 1100 hours including 300 hours' industrial attachment

Entry Requirements

A trainee entering this course should have any of the following minimum requirements:

a) Kenya Certificate of Secondary Education (KCSE) mean grade E (plain).

OR

b) Equivalent qualification as determined by Kenya National Qualifications Authority (KNQA) level 3

OR

c) NITA Trade Test Grades III

OR

d) Completion of primary education and certified work experience equivalent to a minimum period of two years in a particular field provided the applicant is at least 18 years of age

Industrial Attachment

An individual enrolled in this course will undergo three hundred (300) hours industrial attachment in a welding and fabrication firm.

An individual enrolled in one of the core units of learning will undergo a forty (45) hours attachment.

Assessment

The course will be assessed at two levels: internal and external.

a) **Internal assessment**: conducted continuously by the trainer (internal assessor) who is monitored by an accredited internal verifier.

b) **External assessment**: conducted by an external assessor who is monitored by an accredited external verifier.

Certification

An individual will be awarded a Certificate of Competency on demonstration of competence in a unit of competency. To be awarded a National Certificate in Welding Artisan Level 4, an individual must demonstrate competence in all the units of competency as given in this qualification pack.

These certificates will be awarded by Kisii National Polytechnic

COMMON UNITS OF COMPETENCY

COMMUNICATION SKILLS

UNIT CODE: WELBC001

Unit Description

This unit describes the competencies required to lead in the dissemination and discussion of ideas, information and issues in the workplace.

Learning Outcomes

By the end of this unit, the trainee will be able to:

1. Obtain and convey workplace information
2. Complete relevant work-related documents
3. Communicate information about workplace processes
4. Lead workplace discussion
5. Identify and communicate issues arising in the workplace

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Obtain and convey workplace information	• Communication process • Modes of communication • Medium of communication • Effective communication • Barriers to communication • Flow of communication • Sources of information • Types of questions • Organizational policies • Workplace etiquette • Ethical work practices in handling communication	• Observation • Interview • Third party reports
2. Complete relevant work-related documents	• Types and purposes of workplace documents and forms • Methods used in filling forms and documents • Recording workplace data • Process of distributing workplace forms and documents • Report writing • Types of workplace reports	• Observation • Interview • Third party reports
3. Communicate information about workplace processes	• Communication process • Modes of communication • Medium of communication • Effective communication • Barriers to communication • Flow of communication • Sources of information • Organizational policies	• Observation • Interview • Portfolio

	• Organization requirements for written and electronic communication methods • Report writing • Effective questioning techniques (clarifying and probing) • Workplace etiquette • Ethical work practices in handling communication	
4. Lead workplace discussion	• Methods of discussion e.g. ✓ Coordination meetings ✓ Toolbox discussion ✓ Peer-to-peer discussion • Solicitation of response	• Observation • Interview • Third party reports
5. Identify and communicate issues arising in the workplace	• Identification of problems and issues • Organizing information on problems and issues • Relating problems and issues • Communication barriers affecting workplace discussions	• Observation • Interview • Portfolio

Suggested Delivery Methods

- Discussion
- Role play
- Brainstorming

Recommended Resources

- Desktop computers/laptops
- Internet connection
- Projectors
- Telephone
- Report writing templates

MATHEMATICS

UNIT CODE:WELBC002

Unit Description

This unit describes the competencies required by a worker in order to competently: Identify and use whole numbers and simple fractions, decimals and percentages; Identify, measure and estimate familiar quantities for work, Read and use familiar maps, plans and diagrams for work, Identify and describe common 2D and some 3D shapes for work, construct simple tables and graphs for work using familiar data, Identify and interpret information in familiar tables, graphs and charts for work.

Learning Outcomes

By the end of this unit, the trainee will be able to:

1. Identify and use whole numbers and simple fractions, decimals and percentages for work
2. Identify, measure and estimate familiar quantities for work
3. Read and use familiar maps, plans and diagrams for work
4. Identify and describe common 2D and some 3D shapes for work
5. Construct simple tables and graphs for work using familiar data
6. Identify and interpret information in familiar tables, graphs and charts for work

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Identify and use whole numbers and simple fractions, decimals and percentages for work	• Whole numbers • Simple fractions • Decimals • Percentages • Sizes • Problem solving methods • calculations using the 4 operations • Recording and communicating numerical information	• Oral • Written • Practical test • Observation
2. Identify, measure and estimate familiar quantities for work	• Measurement information • Units of measurement • Estimate familiar and simple amounts • Selection of appropriate measuring equipment • Calculate using familiar units of measurement • Check measurements and results against estimates	• Oral • Written • Practical test • Observation

	• Using informal and some formal mathematical and general language • Record or report results	
3. Read and use familiar maps, plans and diagrams for work	• Maps, plans and diagrams • Locate items and places in familiar maps, plans and diagrams • Recognize common symbols and keys in familiar maps, plans and diagrams • Direction and location of objects, or route or places • Use of informal and some formal oral mathematical language and symbols	• Oral • Written • Practical test • Observation
4. Identify and describe common 2D and some 3D shapes for work	• Common 2D shapes and 3D shapes • Classification of common 2D shapes and designs • Description of Use informal and some formal language to describe common two-dimensional shapes and some common three-dimensional shapes • Construction of common 2D shapes • Match common 3D shapes to their 2D sketches or nets	• Oral • Written • Practical test • Observation
5. Construct simple tables and graphs for work using familiar data	• Types of graphs • Determination of data to be collected • Selection of data collection method • Collection of data • Determination of variables from the data collected • Order and collate data • Construct a table and enter data • Construct a graph using data from table • Check results • Report or discuss graph information related to work using informal and some formal mathematical and general language	• Oral • Written • Practical test • Observation

6. Identify and interpret information in familiar tables, graphs and charts for work	• Tables construction and labeling • i.e. title, headings, rows and columns • Interpreting information and data in simple tables • Relaying information of relevant workplace tasks on/in a table • Identify familiar graphs and charts in familiar texts and contexts • Locate title, labels, axes, scale and key from familiar graphs and charts • Identify and interpret information and data in familiar graphs and charts • Relate information to relevant workplace tasks	• Oral • Written • Practical test • Observation

Suggested Delivery Methods

- Instructor led facilitation of theory
- Practical demonstration of tasks by trainer
- Practice by trainees/ role play
- Discussion
- Observations and comments and corrections by trainers

Recommended Resources

- Standard operating and/or other workplace procedures manuals
- Specific job procedures manuals
- Mathematical tables

COMPUTER APPLICATIONS

UNIT CODE: WELBC003

Unit Description

This unit covers the competencies required to effectively demonstrate digital literacy in a working environment. It entails identifying and using digital devices such as smartphones, tablets, laptops and desktop PCs for purposes of communication and performing work related tasks at the work place.

Summary of Learning Outcomes

1. Identify computer hardware and software
2. Apply security measures to data, hardware and software
3. Apply computer software in solving tasks
4. Apply internet and email in communication at workplace

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Identify computer hardware and software	• Meaning of a computer • Functions of a computer • Components of a computer • Classification of computers	• Written • Oral • Observation
2. Apply security measures to data, hardware and software	• Data security and control • Security threats and control measures • Types of computer crimes • Detection and protection against computer crimes	• Written tests • Oral presentation • Observation • Projects
3. Apply computer software in solving tasks	• Operating system • Word processing • Spread sheets • Data base	• Oral questioning • Observation • Project
4. Apply internet and email in communication at workplace	• Computer networks • Uses of internet • Electronic mail (e-mail) concept	• Oral questioning • Observation • Oral presentation • Written report

Suggested Delivery Methods

- Instructor led facilitation of theory
- Demonstration by trainer
- Practical work by trainee
- Viewing of related videos
- Project
- Group discussions
- **Recommended Resources**
- Desk top computers
- Laptop computers
- Other digital devices
- Printers
- Storage devices
- Internet access
- Computer software

ENTREPRENEURSHIP SKILLS

UNIT CODE: WELBC004

Unit Description

This unit describes the competencies critical to demonstration of entrepreneurial skills. It includes creating and maintaining small scale business, establishing small scale business customer base, managing and growing a small business.

Summary of Learning Outcomes

By the end of this unit, the trainee will be able to:

1. Create and maintain small scale business
2. Establish small scale business customer base
3. Manage small scale business
4. Grow/ expand small scale business

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Create and maintain small scale business	• Starting a small business • Legal regulatory requirements in starting a small business • SWOT/ PESTEL analysis • Conducting market/industry survey • Generation and evaluation of business ideas • Matching competencies with business opportunities • Forms of business ownership • Location of a small business • Legal and regulatory requirement • Resources required to start a small business • Common terminologies in entrepreneurship • Entrepreneurship in national development • Self-employment • Formal and informal employment • Entrepreneurial culture • Myths associated with entrepreneurship	• Observation • Case studies • Individual/group assignments • projects • Written • Oral

	• Types, characteristics, qualities & role of entrepreneurs • History, development and importance of entrepreneurship • Theories of entrepreneurship • Quality assurance for small businesses • Policies and procedures on occupational safety and health and environmental concerns	
2. Establish small scale business customer base	• Good staff/workers and customer relations • Marketing strategy • Identifying and maintain new customers and markets • Product/ service promotions • Products / services diversification • SWOT / PESTEL analysis • Conducting a business survey • Generating Business ideas • Business opportunities	• Observation • Case studies • Individual/group assignments • projects • Written • Oral
3. Manage small scale business	• Organization of a small business • Small business' business plan • Marketing for small businesses • Managing finances for small business • Production/ operation process for goods/services • Small business records management • Book keeping and auditing for small businesses • Business support services • Small business resources mobilization and utilization • Basic business social responsibility • Management of small business • Word processing concepts in small business management • Computer application software • Monitoring and controlling business operations	• Oral • Observation • Case studies • Individual/group assignments • projects • Written
4. Grow/expand small scale business	• Methods of growing small business	• Observation • Case studies

	• Resources for growing small business • Small business growth plan • Computer software in business development • ICT and business growth	• Individual/group assignments • projects • Written

Suggested Delivery Methods

- Instructor led facilitation of theory
- Demonstration by trainer
- Practice by trainee
- Role play
- Case study

Recommended Resources

- Case studies for small businesses
- Business plan templates
- Lap top/ desk top computer
- Internet
- Telephone
- Writing materials

EMPLOYABILITY SKILLS

UNIT CODE:WELBC005

Unit Description

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating critical safe work habits, demonstrating workplace learning and workplace ethics.

Summary of Learning Outcomes

By the end of this unit, the trainee will be able to:

1. Conduct self-management
2. Demonstrate critical safe work habits
3. Demonstrate workplace learning
4. Demonstrate workplace ethics

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Conduct self-management	• Self-awareness • Formulating personal vision, mission and goals • Strategies for overcoming life challenges • Emotional intelligence • Assertiveness • Expressing personal thoughts, feelings and beliefs • Developing and maintaining high self-esteem • Developing and maintaining positive self-image • Articulating ideas and aspirations • Accountability and responsibility • Good work habits • Self-awareness • Self-development • Financial literacy • Healthy lifestyle practices	• Observation • Written • Oral interview • Third party report
2. Demonstrate critical safe work habits	• Stress and stress management • Punctuality and time consciousness • Interpersonal communication • Sharing information	• Observation • Written • Oral interview • Third party report

	• Leisure • Integrating personal objectives into organizational objectives • Resources utilization • Setting work priorities • HIV and AIDS • Drug and substance abuse • Handling emerging issues	
3. Demonstrate workplace learning	• Personal training needs identification and assessment • Managing own learning • Contributing to the learning community at the workplace • Cultural aspects of work • Variety of learning context • Application of learning • Safe use of technology • Identifying opportunities • Workplace innovation • Performance improvement • Handling emerging issues • Future trends and concerns in learning	• Observation • Oral interview • Written • Third party report
4. Demonstrate workplace ethics	• Meaning of ethics • Ethical perspectives • Principles of ethics • Values and beliefs • Ethical standards • Organization code of ethics • Common ethical dilemmas • Organization culture • Corruption, bribery and conflict of interest • Privacy and data protection • Diversity, harassment and mutual respect • Financial responsibility/accountability • Etiquette • Personal and professional integrity • Commitment to jurisdictional laws • Emerging issues in ethics	• Observation • Oral interview • Written • Third party report

Suggested Methods of Delivery

- Instructor lead facilitation of theory
- Demonstrations
- Simulation/Role play
- Group Discussion
- Presentations
- Projects
- Case studies
- Assignments

Recommended Resources

- Computers
- Stationery
- Charts
- Video clips
- Audio tapes
- Radio sets
- TV sets
- LCD projectors

ENVIRONMENTAL & OCCUPATIONAL SAFETY AND HEALTH PRACTICES

UNIT CODE:WELBC006

Unit Description

This unit describes the competencies required to practice safety and health, and comply with OSH requirements relevant to work.

Summary of Learning Outcomes

By the end of this unit, the trainee will be able to:

1. Control environmental hazard
2. Control environmental Pollution
3. Demonstrate sustainable resource use
4. Evaluate current practices in relation to resource usage
5. Observe workplace procedures for hazards and risk prevention
6. Participate in arrangements for workplace safety and health maintenance

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Control environmental hazard	• Purposes and content of Environmental Management and Coordination Act 1999 • Purposes and content of Solid Waste Act • Storage methods for environmentally hazardous materials • Disposal methods of hazardous wastes • Types and uses of PPE in line with environmental regulations • Occupational Safety and Health Standards (OSHS)	• Written questions • Oral questions • Observation of work procedures
2. Control environmental Pollution control	• Types of pollution • Environmental pollution control measures • Types of solid wastes • Procedures for solid waste management • Different types of noise pollution • Methods for minimizing noise pollution	• Written questions • Oral questions • Observation of work procedures • Role play

3. Demonstrate sustainable resource use	• Types of resources • Techniques in measuring current usage of resources • Calculating current usage of resources • Methods for minimizing wastage • Waste management procedures • Principles of 3Rs (Reduce, Reuse, Recycle) • Methods for economizing or reducing resource consumption	• Written questions • Oral questions • Observation of work procedures • Role play
4. Evaluate current practices in relation to resource usage	• Collection of information on environmental and resource efficiency systems and procedures, • Measurement and recording of current resource usage • Analysis and recording of current purchasing strategies. • Analysis of current work processes to access information and data • Identification of areas for improvement	• Written questions • Oral questions • Observation of work procedures • Role play
5. Identify Environmental legislations/conventions for environmental concerns	• Environmental issues/concerns • Environmental legislations /conventions and local ordinances • Industrial standard /environmental practices • International Environmental Protocols (Montreal, Kyoto) • Features of an environmental strategy	• Written questions • Oral questions • Observation of work procedures
6. Observe workplace procedures for hazards and risk prevention	• Arrangement of work area and items in accordance with Company housekeeping procedures • Adherence to work standards and procedures • Application of preventive and control measures, including use of safety gears/PPE • Study and apply standards and procedures for incidents and emergencies.	• Oral questions • Written questions • Observation of work procedures
7. Participate in arrangements for workplace safety and health maintenance	• Participating in orientations on OSH requirements/regulations of tasks • Providing feedback on health, safety, and security concerns to appropriate	• Oral questions • Written tests • Practical test

	personnel as required in a sufficiently detailed manner • Practice workplace procedures for reporting hazards, incidents, injuries and sickness • OSH requirements/ regulations and workplace safety and hazard control procedures are reviewed, and compliance reported to appropriate personnel • Identification of needed OSH-related trainings are proposed to appropriate personnel	• Observation of practical work by trainees

Suggested Delivery Methods

- Instructor led facilitation of theory
- Practical demonstration of tasks by trainer
- Practice by trainees/ role play
- Discussion
- Observations and comments and corrections by trainers

Recommended Resources

- Standard operating and/or other workplace procedures manuals
- Specific job procedures manuals
- Machine/equipment manufacturer's specifications and instructions
- Personal Protective Equipment (PPE) e.g.
  - Mask
  - Face mask/shield
  - Safety bootsn
  - Safety harness
  - Arm/Hand guard, gloves
  - Eye protection (goggles, shield)
  - Hearing protection (ear muffs, ear plugs)
  - Hair Net/cap/bonnet
  - Hard hat
  - Face protection (mask, shield)
  - Apron/Gown/coverall/jump suit
  - Anti-static suits
  - High-visibility reflective vest

COMMON UNITS

WORKPLACE HEALTH, SAFETY, ENVIRONMENTAL AND EMERGENCY PRACTICES

UNIT CODE: WELCC001

Unit Description

This unit standard has been developed to assist with the advancement of people who wish to gain paid employment or enter into self-employment in a variety of contexts. It specifies the competencies required to: Apply workplace health and safety practices; Perform basic firefighting techniques; Perform first aid practices; Adhere to site emergency plans; and apply environmental integrity.

Learning Outcomes

By the end of this unit, the trainee will be able to:

1. Apply workplace health and safety practices
2. Perform basic fire fighting
3. Perform basic first aid
4. Comply with site emergency plans
5. Maintain environmental awareness

Learning Outcomes, Specific Learning Outcomes and Content

Learning Outcome 1: Apply workplace health, safety and environmental practices		
Specific Learning Objectives	**Content**	**Suggested Assessment Methods**
1.1 Describe factors affecting health and safety in the workplace	• General safety knowledge safety is a core value responsible for personal safety and the safety of others • STDs, HIV and AIDS • Main categories of hazards ✓ chemical ✓ Sensory	• Written and/or oral evidence

	✓ Environmental ✓ physical • Common injuries and hazards ✓ use of damaged equipment ✓ slips, trips and falls ✓ hearing loss ✓ crushing/impact ✓ loss of control of heavy lifts ✓ equipment and motor vehicle accidents ✓ burns batteries, tires, pressurised hydraulic and fuel systems ✓ confined space ✓ inexperience and lack of training complacency, boredom, inattention, lack of focus on safety • drugs and alcohol • fatigue	
1.2 Interpret and apply general work site, legislative and employer safety rules	• Employer safety rules and policies developed to govern the work of all employees based on company philosophy, experience, safety record ✓ often tied to discipline policies ✓ often go beyond OHS&E regulations ✓ training and supervision • Motivation underlying safety programmes o motivated by regulations	Written questions Oral questions Performance evidence of demonstrating safe working practices in a simulated environment

	○ motivated by ethics, legitimate concerns ○ motivated by cost of lost time and injury claims ○ motivated by liability	
1.3 Use Personal Protective Equipment (PPE)	• PPE types and function ○ head protection ○ respiratory protection ○ eye protection ○ hearing protection ○ hand protection ○ foot protection ○ high visibility vest ○ fall protection ○ body protection ○ other • Procedures for using PPE	Written and/or oral evidence on types and function of PPE Performance evidence of using PPE
Learning Outcome 2: Perform basic fire fighting		
2.1 Demonstrate fire prevention techniques	• Causes of fire • Classes of fire A, B, C, D, and E • Fire prevention techniques and general housekeeping • Procedures for fire prevention	Written and/or oral evidence Performance evidence of fire prevention
2.2 Operate basic firefighting equipment	• Types and function of basic firefighting equipment • Safety signs/symbols on fire equipment	Written evidence of operating basic firefighting equipment

	• Procedures for operating basic firefighting equipment	Performance evidence of operating basic firefighting equipment (simulation)
2.3 Demonstrate basic firefighting procedures	• Precautions to be taken when fighting fires • Steps to be taken when containing fires • Firefighting techniques • Firefighting report • Procedures for basic fire fighting	Written and/or oral evidence Performance evidence of simulated basic fire fighting
Learning Outcome 3: Perform occupational first aid		
3.1 Determine the nature and context of the injury/medical emergency	• Applicable Occupational Health, Safety and Environmental legislation and regulations • Applicable company policies and standards • Nature of injuries/medical emergency • Appropriate treatment and equipment • Context of the injury/medical emergency	Written and/or oral evidence of nature and context of an injury/medical emergency Performance evidence of demonstrating first aid procedures Performance evidence of monitoring the condition of an injured person Performance evidence of handing over injured person to medical personnel
3.2 Demonstrate occupational first aid procedures	• Occupational first aid concept • Identification and function of occupational first aid equipment • Appropriate treatments • Factors to consider when monitoring the condition of an injured person	

	• Prioritising injuries • Implications of the context of an injury on basic first aid treatment • Implications of **NOT** prioritising injuries if there are more than one • Procedures for demonstrating first aid • Procedures for monitoring the condition of an injured person • Procedures for handing over injured person to medical personnel	Performance evidence of completing first aid report
3.3 Complete incident report	• Condition of the injured person • Incident reporting • Appropriate personnel • Procedures for completing incident report	
Learning Outcome 4: Comply with site emergency plans		

4.1 Prepare for emergencies	• Company policies and procedures
	• Site emergency response plans
	  ○ evacuation routes
	  ○ procedures contact
	  ○ protocol
	• Types of fire, i.e., class A, B, C, and D
	• Types of fire extinguishers
	• Identification and assessment of potential hazards and risks on work site
		Written and/or oral evidence

4.2 Respond to emergencies		Performance evidence of responding to simulated emergencies

	• Location of emergency response equipment, such as fire extinguishers and first aid kits/stations and how to use them • Inspection requirements for safety equipment and supplies	
Learning Outcome 5: Maintain environmental awareness		
5.1 Describe general environmental values	• Habitat and ecological values • Impacts and potential hazards to humans • Endangered species	Written and/or oral evidence
5.2 Describe general environmental impacts	• Global warming, carbon emissions • Pollution • Sedimentation • Dust • Habitat reduction • Habitat degradation	Written and/or oral evidence
5.3 Describe and demonstrate spill control techniques	• Potential sources of spills: broken lines/mechanical failures o fuel o lubricants o other Refueling o fuel storage o storage of other products o Sewage o Concrete operations	Performance evidence of demonstrating spill control techniques

	○ Water system chlorination and flushing • Measures to reduce risk of spills ○ safe storage facilities ○ designated fuelling areas ○ high priority given to repair of machinery leaks ○ company policies • Spill control techniques protect area of incident ○ use of appropriate protective equipment ○ control source ○ control spread/movement of spill and counter measure ○ other • Procedures for spill control techniques	
5.4 Describe work site techniques to minimise environmental damage	• Minimise erosion • Sediment control techniques	Written and/or oral evidence

Suggested Delivery Methods

- Instructor led facilitation of theory
- Group and individual activities
- Practical demonstration of task
- Guided practice by learners
- Self-paced learning

List of Recommended Resources

1. Text books, websites, manuals

a) Fundamental principles of occupational health and safety, by ILO www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/.../wcms_093550.pdf

b) Numerous videos, toolbox talks and safety tips and checklists can be found at:www.safety.cat.com

c) Manufacturers' manuals; Equipment maintenance documentation

2. Tools and equipment and materials

a) PPE including, Range of basic fire fighting equipment, coveralls, ear plugs and muffs, eyewash station, face shields, safety glasses, goggles, first aid kit, gloves, hard hat, masks (particle, vapour), safety boots, spill kit, high visibility vest

WORKPLACE ESSENTIAL SKILLS

Unit Code: WELCC002

Unit Description

This unit specifies the competencies required to: Follow principles of work ethics; Resolve conflict with others; Demonstrate effective speaking and listening skills; Read and interpret work document; Interact with team members; and Perform individual role in a team.

Learning Outcomes

By the end of this unit, the trainee will be able to:

1. Demonstrate work ethics and principles
2. Demonstrate basic conflict resolution techniques
3. Demonstrate effective speaking and listening skills
4. Read and interpret work documents
5. Demonstrate effective participation in a team

Learning Outcomes, Specific Learning Outcomes and Content

Learning Outcome 1: Demonstrate work ethics and principles		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
1.1 Define work ethics and principles	• Meaning of work ethics • Importance of work ethics and principles including, but not limited to: □ honesty □ selflessness □ consistency □ moral □ courage □ respect	Written and/or oral evidence of core work ethics Performance evidence of work ethics
1.2 Describe core work ethics applicable to an organisation	• Principles of work ethics and expectations of an organisation may include but are not limited to: □ being punctual □ prepared for work □ co-operative □ productive □ respectful □ technology minded □ innovative	
1.3 Apply work ethics for activities in an organisation	• Purpose of work ethics to an organisation □ presenting positive image of the industry □ instilling confidence □ maintaining relations with the general public • Demonstration of work ethic procedures	

Learning Outcome 2: Demonstrate basic conflict resolution techniques		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
2.1 Analyse problem at the work site	• Definition of conflict andconflict resolution	Written and/or oral evidence of identifying conflict resolution techniques
2.2 Identify conflict resolution techniques	• Resolution techniques o Listen, then speak out o Gather the group o Be impartial o Do not postpone conflict resolution o Promote teamwork o Broadcast praise	
2.3 Apply conflict resolutiontechniques	• Procedures for conflict resolution • Consider corganisation's regulations and policies • Evaluate problem or conflict resolution	Performance evidence of applying conflict resolution techniques

Learning Outcome 3: Demonstrate effective speaking and listening skills		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
3.1 Apply contextual knowledge	Language variations social interactions workplace interactions Facial expressions Gestures	Performance evidence of effective speaking and listening skills that may include but are not limited to: o role plays o site or field visits o group interactions o simulation
3.2 Apply knowledge of language forms and features	• Ways of asking for: information making offers giving commands • Pronunciations intonation accent variations • Express emotions verbal visual body language facial expressions	
3.3 Respond to and compose texts	• Active listening • Contribute to ideas, information and questions • Use of intonation • Formulate open and closed questions appropriate to the context • Use of comments or questions to expand on ideas • Use of interaction skillsinitiating topics making positive	

	statements voicing disagreement in an appropriate manner speaking clearly and varying tone volume and pace appropriately	
Learning Outcome 4: Read and interpret work documents		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
4.1 Describe and interpret work documents 4.2 Complete work documents for a specific task	Types and use of workdocuments: Work plans Charts Job cards Maps Work schedule/procedures Job safety analysisSafety manuals Lift plans others Procedures for completing documents	Written and/or oral evidence of types and use of work documents Performance evidence of completing documents
4.3 Demonstrate document filing and storage procedures	• Storage and filing methods • Procedures for filing and storing documents	Performance evidence of document filing and storing
4.4 Retrieve documents	• Procedures for identifying and locating documents: Date of storage File reference number Storage facility, e.g. shelves, cabinets	Performance evidence of document retrieval

Learning Outcome 5: Demonstrate effective participation in a team		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
5.1 Define team members and their individual role within the team	Identification of team members, including: cross cultural diversities language barriers Role of individual teammembers	Performance evidence of effective participation in a team including assistance and support to individual team members to achieve group targets
5.2 List the features of effective teamwork	• Features of effective teamwork: team goals are clear and understood team roles are balanced communication is open and clear a positive attitude conflict is managed constructively ideas, not individuals, are critically analysed timelines and benchmarks are set and monitored outcomes are delivered	
5.3 Determine strengths and weaknesses of working in teams	• Strengths of team work sharing of skills andknowledge improved efficiency productivity some tasks are complex and cannot be done by one individual • Weaknesses of team work some work is not suited for team approach	

	Team work requires negotiation of roles and responsibilities	
5.4 Provide assistance and support to team members	• Identification of strengths and weaknesses of individual team members • Identification of required team member support • Procedures for providing assistance to individual team members	

Suggested Delivery Methods

- ❑ Instructor led facilitation of theory
- ❑ Group and individual activities
- ❑ Practical demonstration of task
- ❑ Guided practice by learners
- ❑ Self-paced learning

List of Recommended Resources

1. Text books, websites, manuals

a) Employment, by Cathy Filmore Hoyt ISBN-13: 978-1881020349 Communication and Writing (Workplace essential skills), by Cathy Filmore Hoyt ISBN-13: 978-1881020356

b) Numerous videos, CD-ROM, Workbooks, Online lessons can be found at:www.litlink.ket.org ›

Home Space › WES, Pre-GED, & GED Info

c) Manufacturers' manuals; Equipment maintenance documentation

2. Tools and equipment and materials

a) Overhead projector and screen, Computer and LCD projector and screen, Computers withinternet access, Flipchart stand, Flipchart paper, Flipchart markers, OHP transparencies, Transparency pens, Pencils and writing paper Smartboard/Whiteboard/Chalkboard, Markers/chalk

PLAN AND ORGANISE WORK ACTIVITIES

UNIT CODE: WELCC003

Unit Description

This unit standard specifies the competencies required to: Apply time management techniques; Apply quality improvement principles; and Apply productivity improvement measures.

Learning Outcomes

By the end of this unit, the trainee will be able to:

1. Develop and implement time management plan
2. Apply quality improvement principles
3. Apply productivity improvement measures

Learning Outcomes, Specific Learning Outcomes and Content

Learning Outcome 1: Develop and implement time management plan		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
1.1 Outline the importance of time management	• Enhanced efficiency • Improved decision-makingability • Reduced stress-level • Improved self-discipline	Written and/or oral evidence
1.2 Select the type of activity plan for a given task	• Types of activity time plan: clock cards; timesheets; attendance registers; diaries, Gantt Chart, job cards and electronic access cards • Description of features of each activity time plan	Oral task and/or performance evidence of the trainee selection of activity plan
1.3 Prepare the activity plan for the selected task	• Interpretation and preparation of activity time plan for a given task - typical practical exercise common to workplace operations	Evidence of prepared activity plan
1.4 Use the prepared activity plan to accomplish given task	• Reading of a time plan time schedule purpose of the time plan activity, work load • Relationship between time plan and give activities	Written and/or oral evidence

Learning Outcome 2: Apply quality improvement principles		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
2.1 Explain quality management principles	• Management principle customer focus leadership involvement of people process approach system approach to management continuous improvement factual approach to decision making mutually beneficial supplier relationships	Written and/or oral evidence
2.2 Describe principles of quality control	Quality control / improvement principles product improvement process improvement people based improvement PDCA cycle	Written and/or oral evidence
2.3 Select and apply quality improvement principles for a given task	• Procedures for quality improvement principles	Presentation and/or performance evidence of applying quality improvement principles for a given task

Learning Outcome 3: Apply productivity improvement measures		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
3.1 Describe the term 'Productivity'	- Define 'productivity' - Productivity cycle - Output versus Input - Resources expected to be used / Resources actually consumed - Non-productive time (NPT), e.g. equipment downtime	Performance evidence of effective speaking and listening skills that may include but are not limited to: role plays site or field visits group interactions simulation
3.2 Determine general challenges in production activities	• Define 'Production' - Finished goods - Finished services • Common factors for production: - Land - Labour - Capital • Challenges	
3.3 Describe measures to enhance workplace productivity for a simulated environment	• Measures to enhance productivity Training programme for labour/Skills development - Effective and efficient communication - Set clear goals and provide feedback - Motivation, e.g. incentives for good performance - Optimising site facilitiesAvailability of resources	

Suggested Delivery Methods

- Instructor led facilitation of theory
- Group and individual activities
- Practical demonstration of task
- Guided practice by learners
- Self-paced learning

List of Recommended Resources

1. Text books, websites, manuals

a) Employment, by Cathy Filmore Hoyt ISBN-13: 978-1881020349 Communication and Writing (Workplace essential skills), by Cathy Filmore Hoyt ISBN-13: 978-1881020356

b) Numerous videos, CD-ROM, Workbooks, Online lessons can be found at: www.litlink.ket.org › Home Space › WES, Pre-GED, & GED Info

c) Manufacturers' manuals; Equipment maintenance documentation

2. Tools and equipment and materials

a) Overhead projector and screen, Computer and LCD projector and screen, Computers withinternet access, Flipchart stand, Flipchart paper, Flipchart markers, OHP transparencies, Transparency pens, Pencils and writing paper Smartboard/Whiteboard/Chalkboard, Markers/chalk

FUNDAMENTAL SKILLS IN WELDING WORKS

UNIT CODE: WELCC004

Apply Hand Tools Used In Welding Works

Relationship to Occupational Standards

This unit addresses the unit standard: ENG/OS/WEL/CC/03/4/A -Apply

Duration of Unit: 40 hours

Unit Description

This module describes the skills, knowledge and attitudes required by a welder in order to understand various tools used in welding, application, care, maintenance and safe storage of the hand tools.

Learning Outcomes

By the end of this unit, the trainee will be able to:

1. Apply hand tools used in welding operations
2. Apply power tools and equipment used in welding operations
3. Perform basic measurements and calculations.
4. Perform advanced measurements

Learning Outcomes, Specific Learning Outcomes and Content

Learning Outcome 1: Select correct tools for the task to be performed		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
1.1 Identify task to be performed	Identify task to be performed - Free hand drawing - Purpose of sketching a drawing in welding - Conversion of scale and dimensions - Types of symbol identified - Types of scales - Purpose of scales - Conversion of scale and dimensions	Written/oral assessment assessment
1.2 Select tools per task	- Types of tools identified - Purpose of tools explained	Written assessment

Learning Outcome 2:

Demonstrate care and maintenance of welding tools

Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
2.1 Describe the purpose for care and maintenance of hand tools	- Types of hand tools - Types of maintenance - Handling of hand tools	Written/oral assessment Practical assessment
2.2 Demonstrate hand tool maintenance procedures	- Maintenance procedures - Manufacturer specification	Written/oral assessment Practical assessment

2.3 Apply maintenance schedule	Maintenance safety Observe timely maintenance Filling schedule chart Keeping maintenance records	Written/oral assessment Practical assessment

Learning Outcome 3: Demonstrate safe use of welding tools		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
3.1 Demonstrate knowledge of hand tools	Types of hand tools Instructional manuals	Written/oral assessment
3.2 Use hand tools	Task identification Procedures for using different hand tool Defects in tools Personal effect of mishandling tools	Written/oral assessment Practical assessment

Learning Outcome 4:

Store welding tools

Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
4.1 Inspect tools	Common defects Reporting	Written/oral assessment
4.2 Demonstrate tool storage procedure	Importance of storage Types of storage Procedures for tool storage	Written assessment Practical assessment

4.3 Maintain records of tools	□ Purpose of recording □ Types of recording	Written assessment

Suggested Delivery Methods

- □ Instructor led facilitation of theory
- □ Group and individual activities
- □ Practical demonstration of task
- □ Guided practice by learners
- □ Self-paced learning

List of Recommended Resources

1. Text books, websites, manuals

a) Fabrication and Welding Engineering, by Roger Timings ISBN-13: 978-0750666916
b) Lincoln Electric Canada www.lincolnelectric.com/en-ca/equipment/weldin-gear/tools/…handtools.aspx
c) Manufacturers' manuals; Equipment maintenance documentation

2. Tools and equipment and materials

a) Hand tools
b) Power tools
c) Machine tools
d) Vernier calipers, steel rule, tape measure, divider, height gauge, depth gauge.
e) PPE including safety shoes, gloves, hard hat, dust coat/heat resistant overall and/or apron, helmet

TECHNICAL DRAWING

UNIT CODE: WELCC005

Unit Description

This module describes the skills, knowledge and attitudes required by a welder in order to read drawing, symbols and interpret various type of welding drawings and understand the convection working drawing and being able to make sketches of parts to scale and safe storage procedures.

Summary of Learning Outcomes

1. Demonstrate knowledge of scales, lines, symbols and types of drawings
2. Extract material requirements and specifications from drawings
3. Demonstrate storage and care of drawings

Learning Outcomes, Specific Learning Outcomes and Content

Learning Outcome 1: Demonstrate knowledge of scales, lines, symbols and types of drawings		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
1.1 Identify types of lines, symbols and their uses.	Types of lines Types of symbol Use of symbols Purpose of lines	Written assessment
1.2 Sketch tools shapes related to welding	Free hand drawing Purpose of sketching a drawing in welding	Written assessment Practical assessment
1.3 Draw according to scales and specification	Types of scales Purpose of scales Conversion of scale and dimensions	Written assessment

Learning Outcome 2: Extract material requirements and specifications from drawings		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
2.1 Reading and interpretation of drawing	Types of views Procedure in reading and interpreting physical drawing	Written assessment
2.2 Identification of material required as per drawing	Acronyms materials used in welding drawing	Written assessment

	Procedure of extracting materials from a drawing	
2.3 Symbols, sign and dimensions were obtained	Meaning and purpose of symbols and signs Types and details of the dimensions	Written assessment
Learning Outcome 3: Demonstrate storage and care of drawings		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
3.1 Demonstrate care of drawings	Collection of drawing instrument and materials Care of drawings instruments and materials	Observation Written assessment
3.2 Demonstrate storage of drawings	Store drawings/ specifications safely File drawings	Observation Written assessment

Suggested Delivery Methods

- Instructor led facilitation of theory
- Group and individual activities
- Practical demonstration of task
- Guided practice by learners
- Self-paced learning

List of Recommended Resources

1. Text books, websites, manuals

a) Textbook of machine drawing, by K.C. John ISBN: 9788120337213 8120337212
b) Welding symbols on drawings www.weldersuniverse.com/welding_symbols.html
c) Manufacturers' manuals; Equipment maintenance documentation

2. Tools and equipment and materials

a) Drawing instruments, drawing table, drawing papers, pencils, rubber, stencils, masking tape
b) PPE including safety shoes, dust coat/heat resistant overall and/or apron

CORE COMPETENCIES

MANUAL METAL ARC (STICK) WELDING

UNIT CODE: WELC001

Unit Description

This module describes the skills, knowledge and attitudes required by a welder in order to safely perform manual metal arc welding of mild steel and stainless steel in all positions. It involves preparation, welding and inspection of a workpiece(s) after welding according to national and international standards and procedures.

Summary of Learning Outcomes

1. Apply safety to a workplace
2. Apply housekeeping principles to welding work area
3. Prepare tools, equipment, consumables and work pieces for manual arc (stick) welding processes
4. Weld work pieces in all positions in accordance with national and international specifications and procedures
5. Inspect finished product quality against national and international specifications and procedures

Learning Outcomes, Specific Learning Outcomes and Content		
Learning Outcome 1: Apply safety to a workplace		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
1.1 Identify correct PPE for the job	□ Meaning of term PPE □ Types of PPE identified □ Purpose of PPE explained	Written assessment Practical assessment of selecting PPE from array of options
.1.2 Demonstrate correct wearing of PPE	□ Correct type of PPE for the job selected □ PPE worn correctly (e.g.: hard hat not worn over other head covering) □ Safe and correct handling, use, maintenance and storage of different types of PPE	Practical assessment
1.3 Obtain all required permits and approvals prior to starting work	□ Cold work and hot work permits □ Approvals that could be required are identified (e.g.: construction permits)	Practical assessment of completing permit application individual activity
1.4 Report any incidents, hazards and risks	□ Difference between risk and hazard explained □ Risk assessment conducted □ Risk/accident/incident reporting process explained	Written assessment Practical assessment of conducting risk assessment as group activity Written assessment of risk/accident/incident report writing as individual activity

Learning Outcome 2:

Apply housekeeping principles to welding work area

Specific Learning Outcomes	Content	Suggested Assessment Methods
2.1 Maintain workplace cleanliness	Reason for cleaning 5S principles explained Apply 5S to a work area What is a clean workplace in welding Purpose of cleaning and storage	Written assessment Visual inspection of simulated workplace Practical assessment of cleaning process
2.2 Store tools, equipment and unused materials and consumables in a safe area.	Care of tools, equipment and consumables by type Storage of tools, equipment and consumables Reason for care and storage explained	Written assessment Practical assessment of storage process
2.3 Store completed work pieces	Recall the different storage procedure for different work pieces Store work pieces correctly	Written assessment

Learning Outcome 3:

Prepare tools, equipment, consumables and work pieces for manual arc (stick) welding processes

Specific Learning Outcomes	Content	Suggested Assessment Methods
3.1 Interpret drawing and specification for manual arc welding (stick) mild steel	Collect drawings/ specifications Interpret drawings/specifications	Written assessment

	Store drawings/ specifications safely	
3.2 Obtain consumables, materials, tools and equipment for job	□ Identify materials, consumables, equipment and tools for the drawing □ Collect all required consumables, materials, tools and equipment	Practical assessment in form of group work
3.3 Clean and prepare work station	□ Apply 5s to the area □ Ensure all required materials, equipment, tools and consumable are available and correct □ Ensure drawing/ specification are available	Practical assessment
3.4 Prepare work pieces according to specifications	□ Work pieces are measured, marked and cut according to drawing/ specification □ Work pieces are prepared as required	Practical assessment
3.5 Set up equipment according to manufacturer's specification	□ Equipment is set up as per specifications of brand (manufacturers requirements) and national/ international requirements □ Safety is taken into account for all activities	Practical assessment

Learning Outcome 4:

Weld work pieces in all positions in accordance with national and international specifications and procedures

Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
4.1 Carry out welding process according to drawings and specifications	□ Work piece secured to bench or similar □ Tacking done if required	Practical assessment Workpiece to be submitted as part of portfolio

	□ Seam is welded in correct position and type (fillet, groove, bevel etc.) □ Seam is complete and accurate according to drawing/specification □ Weld integrity explained	
4.2 Identify and adhere to all relevant safety aspects during the welding process	□Assessment of risks before work □ Consequence of not using PPE during process (Mask, gloves etc.) □ How to work safely	Practical assessment of individual task risk assessment Practical assessment of PPE use
4.3 Describe accidents and incidents report procedure	□ Incident or accident reporting process and forms discussed	Written assessment of individual task to compile incident/ accident report on generic forms

Learning Outcome 5:

Inspect finished product quality against national and international specifications and procedures

Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
5.1 Inspect weld for full coverage	□ How to ensure complete weld and importance	Practical assessment
5.2 Inspect weld appearance, quality and integrity in accordance with the specifications	□ Standards for welding in different positions explained and demonstrated	Practical assessment
5.3 Inspect weld dressing as required by the specification	□ Different types of dressing (file, grind, paint etc.) explained □ Practice various methods of dressing	Practical assessment

5.4 Report any defects according to workplace procedure	□ Reporting practices and types □ Demonstrate generic process and forms	Written assessment of individual activity to complete a defect report

Suggested Delivery Methods

- □ Instructor led facilitation of theory
- □ Group and individual activities
- □ Practical demonstration of task
- □ Guided practice by learners
- □ Self-paced learning

List of Recommended Resources

1. Text books, websites, manuals

a) Fabrication and Welding Engineering, by Roger Timings ISBN-13: 978-0750666916

b) Lincoln Electric Canada www.lincolnelectric.com/en-ca/equipment/weldin-gear/tools/…handtools.aspx

c) Manufacturers' manuals; Equipment maintenance documentation

2. Tools and equipment and materials

a) Chipping hammer, Measuring tape, Adjustable wrenches (various sizes), Pipe cutters, Hand Drill, Brushes (various bristle brushes for cleaning and scrubbing), Marking pen, Tool boxes, Wire cutter, Try squares, "C" clamps, Cold chisels (various sizes), Files (flat, half-round, rat-tail, bastard), Hammers ball peen, Pipe stands, Pipe wrenches, Vice grips, Scribers, Straight edges, Vernier callipers, Pliers (needle nose, slip joint), Punches, Screwdrivers, Snips (heavy duty sheet metal cutting), Scrapers (various sizes), Stamping tools, Hack saw, Metal markers, Wire brush, Depth gauge, Protractor, Spirit level, grinder, power hacksaw, drill (cord/cordless), Welding rods, drill bits, Arc welder, Bench grinder, and mild steel (of various thickness)

b) PPE including safety shoes, gloves, hard hat, dust coat/heat resistant overall and/or apron, welding helmet

TUNGSTEN INERT GAS WELDING (GAS TUNGSTEN ARC WELDING)

UNIT CODE: WELC002

Unit Description

This module describes the skills, knowledge and attitudes required by a welder in order to safely weld mild steel, stainless steel and aluminium in all positions using the TIG method. This involves preparation, welding and inspection of a workpiece(s) after welding according to national and international standards and procedures.

Summary of Learning Outcomes

By the end of this unit, the trainee will be able to:

1. Apply safety to a workplace
2. Apply housekeeping principles to welding work area
3. Prepare tools, equipment, consumables and work pieces for TIG welding processes
4. Weld work pieces in all positions in accordance with national and international specifications and procedures
5. Inspect finished product quality against national and international specifications and procedures

Learning Outcomes, Specific Learning Outcomes and Content

Learning Outcome 1: Apply safety to a workplace		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
1.1 Identify correct PPE for the job 1.2 Demonstrate correct wearing of PPE	□ Meaning of term PPE □ Types of PPE identified □ Purpose of PPE explained □ Correct type of PPE for the job selected □ PPE worn correctly (e.g.: hard hat not worn over other head covering) □ Safe and correct handling, use, maintenance and storage of different types of PPE	Written assessment Practical assessment of selecting PPE from array of options Practical assessment
1.3 Obtain all required permits and approvals prior to starting work	□ Cold work and hot work permits □ Approvals that could be required are identified (e.g.: construction permits)	Practical assessment of completing permit application individual activity
1.4 Report any incidents, hazards and risks	□ Difference between risk and hazard explained □ Risk assessment conducted □ Risk/accident/incident reporting process explained	Written assessment Practical assessment of conducting risk assessment as group activity Written assessment of risk/accident/incident report writing as individual activity

Learning Outcome 2:

Apply housekeeping principles to welding work area

Specific Learning Outcomes	Content	Suggested Assessment Methods
2.1 Maintain workplace cleanliness	Reason for cleaning 5S principles explained Apply 5S to a work area What is a clean workplace in welding Purpose of cleaning and storage	Written assessment Visual inspection of simulated workplace Practical assessment of cleaning process
2.2 Store tools, equipment and unused materials and consumables in a safe area.	Care of tools, equipment and consumables by type Storage of tools, equipment and consumables Reason for care and storage explained	Written assessment Practical assessment of storage process
2.3 Store completed work pieces	Recall the different storage procedure for different work pieces Store work pieces correctly	Written assessment

Learning outcome 3:
Prepare tools, equipment, consumables and work pieces for TIG welding processes

Specific Learning Outcomes	Content	Suggested Assessment Methods
3.1 Interpret drawing and specification for TIG welding mild steel	Collect drawings/ specifications	Written assessment
	Interpret drawings/specifications	
	Store drawings/ specifications safely	
3.2 Obtain consumables, materials, tools and equipment for job	Identify materials, consumables, equipment and tools for the drawing	Practical assessment in form of group work
	Collect all required consumables, materials, tools and equipment	
3.3 Clean and prepare work station	Apply 5s to the area	Practical assessment
	Ensure all required materials, equipment, tools and consumable are available and correct	
	Ensure drawing/ specification are available	
3.4 Prepare work pieces according to specifications	Work pieces are measured, marked and cut according to drawing/ specification	Practical assessment
	Work pieces are prepared as required	
3.5 Set up equipment according to manufacturer's specification	Equipment is set up as per specifications of brand (manufacturers requirements) and national/ international requirements	Practical assessment
	Safety is taken into account for all activities	

Learning Outcome 4:

Weld work pieces in all positions in accordance with national and international specifications and procedures

Specific Learning Outcomes	Content	Suggested Assessment Methods
4.1 Carry out welding process according to drawings and specifications	□ Work piece secured to bench or similar □ Tacking done if required □ Seam is welded in correct position and type (fillet, groove, bevel etc.) □ Seam is complete and accurate according to drawing/specification □ Weld integrity explained	Practical assessment Workpiece to be submitted as part of portfolio
4.2 Identify and adhere to all relevant safety aspects during the welding process	□ Assessment of risks before work □ Consequence of not using PPE during process (Mask, gloves etc.) □ How to work safely	Practical assessment of individual task risk assessment Practical assessment of PPE use
4.3 Describe accidents and incidents report procedure	□ Incident or accident reporting process and forms discussed	Written assessment of individual task to compile incident/ accident report on generic forms

Learning Outcome 5:

Inspect finished product quality against national and international specifications and procedures

Specific Learning Outcomes	Content	Suggested Assessment Methods
5.1 Inspect weld for full coverage	How to ensure complete weld and importance	Practical assessment
5.2 Inspect weld appearance, quality and integrity inccordance a with the specifications	Standards for welding in different positions explained and demonstrated	Practical assessment
5.3 Inspect weld dressing as required by the specification	Different types of dressing (file, grind, paint etc) explained Practice various methods of dressing	Practical assessment
5.4 Report any defects according to workplace procedure	Reporting practices and types Demonstrate generic process and forms	Written assessment of individual activity to complete a defect report

Suggested Delivery Methods

- Instructor led facilitation of theory
- Group and individual activities
- Practical demonstration of task
- Guided practice by learners
- Self-paced learning

List of Recommended Resources

1. Text books, websites, manuals

a) Fabrication and Welding Engineering, by Roger Timings ISBN-13: 978-0750666916

b) Lincoln Electric Canada www.lincolnelectric.com/en-ca/equipment/weldin-gear/tools/…handtools.aspx

c) Manufacturers' manuals; Equipment maintenance documentation

2. Tools and equipment and materials

a) Chipping hammer, Measuring tape, Pipe cutters, Hand Drill, Brushes (various bristle brushes for cleaning and scrubbing), Marking pen,
Try squares, "C" clamps, Cold chisels (various sizes),

Files (flat, half-round, rat-tail, bastard), ball peen, Pipe stands, Pipe wrenches, Vice grips, Scribers, Straight edges, Vernier callipers, Pliers (needle nose, slip joint), Punches, Screwdrivers, Snips (heavy duty sheet metal cutting), Scrapers (various sizes), Stamping tools, Hack saw, Metal markers, Wire brush, Protractor, Spirit level, Tape measure, Grinder, Power saw, Power hacksaw, Wire brush, Filler rods, Tungsten welding rods, Sand paper, Drill bits, TIG welder, Bench grinder, Table saw, Shielding gas cylinder, mild steel (various thickness)

b) PPE including safety shoes, gloves, hard hat, dust coat/heat resistant overall and/or apron, welding helmet

METAL INERT GAS WELDING (GAS METAL ARC WELDING)

UNIT CODE: CWEL003

Unit Description

This module describes the skills, knowledge and attitudes required by a welder in order to safely weld mild steel, stainless steel and carbon steel in all positions using the MIG welding method. This involves preparation, welding and inspection of a workpiece(s) after welding according to national and international standards and procedures.

Summary of Learning Outcomes

1. Apply safety to a workplace
2. Apply housekeeping principles to welding work area
3. Prepare tools, equipment, consumables and work pieces for MIG welding processes
4. Weld work pieces in all positions in accordance with national and international specifications and procedures
5. Inspect finished product quality against national and international specifications and procedures

Learning Outcomes, Specific Learning Outcomes and Content

Learning Outcome 1: Apply safety to a workplace		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
1.1 Identify correct PPE for the job	□ Meaning of term PPE □ Types of PPE identified □ Purpose of PPE explained	Written assessment Practical assessment of selecting PPE from array of options
1.2 Demonstrate correct wearing of PPE	□ Correct type of PPE for the job selected □ PPE worn correctly (e.g.: hard hat not worn over other head covering) □ Safe and correct handling, use, maintenance and storage of different types of PPE	Practical assessment
1.3 Obtain all required permits and approvals prior to starting work	□ Cold work and hot work permits □ Approvals that could be required are identified (e.g.: construction permits)	Practical assessment of completing permit application individual activity
1.4 Report any incidents, hazards and risks	□ Difference between risk and hazard explained □ Risk assessment conducted □ Risk/accident/incident reporting process explained	Written assessment Practical assessment of conducting risk assessment as group activity Written assessment of risk/accident/incident report writing as individual activity

Learning Outcome 2: Apply housekeeping principles to welding work area		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
2.1 Maintain workplace cleanliness	□ Reason for cleaning □ 5S principles explained □ Apply 5S to a work area □ What is a clean workplace in welding □ Purpose of cleaning and storage	Written assessment Visual inspection of simulated workplace Practical assessment of cleaning process
2.2 Store tools, equipment and unused materials and consumables in a safe area.	□ Care of tools, equipment and consumables by type □ Storage of tools, equipment and consumables □ Reason for care and storage explained	Written assessment Practical assessment of storage process
2.3 Store completed work pieces	□ Recall the different storage procedure for different work pieces □ Store work pieces correctly	Written assessment

Learning Outcome 3:

Prepare tools, equipment, consumables and work pieces for MIG welding processes

Specific Learning Outcomes	Content	Suggested Assessment Methods
3.1 Interpret drawing and specification for MIG welding mild steel	□ Collect drawings/ specifications □ Interpret drawings/specifications □ Store drawings/ specifications safely	Written assessment
3.2 Obtain consumables, materials, tools and equipment for job	□ Identify materials, consumables, equipment and tools for the drawing □ Collect all required consumables, materials, tools and equipment	Practical assessment in form of group work
3.3 Clean and prepare work station	□ Apply 5s to the area □ Ensure all required materials, equipment, tools and consumable are available and correct □ Ensure drawing/ specification are available	Practical assessment
3.4 Prepare work pieces according to specifications	□ Work pieces are measured, marked and cut according to drawing/ specification □ Work pieces are prepared as required	Practical assessment
3.5 Set up equipment	□ Equipment is set up as per	Practical assessment

according to manufacturer's specification	specifications of brand (manufacturers requirements) and national/ international requirements	
	□ Safety is taken into account for all activities	

Learning Outcome 4:

Weld work pieces in all positions in accordance with national and international specifications and procedures

Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
4.1 Carry out welding process according to drawings and specifications	□ Work piece secured to bench or similar □ Tacking done if required □ Seam is welded in correct position and type (fillet, groove, bevel etc.) □ Seam is complete and accurate according to drawing/specification □ Weld integrity explained	Practical assessment Workpiece to be submitted as part of portfolio
4.2 Identify and adhere to all relevant safety aspects during the welding process	□ Assessment of risks before work □ Consequence of not using PPE during process (Mask, gloves etc.) □ How to work safely	Practical assessment of individual task risk assessment Practical assessment of PPE use
4.3 Describe accidents and incidents report procedure	□ Incident or accident reporting process and forms discussed	Written assessment of individual task to compile incident/ accident report on

		generic forms

Learning Outcome 5:

Inspect finished product quality against national and international specifications and procedures

Specific Learning Outcomes	Content	Suggested Assessment Methods
5.1 Inspect weld for full coverage	How to ensure complete weld and importance	Practical assessment
5.2 Inspect weld appearance, quality and integrity in accordance with the specifications	Standards for welding in different positions explained and demonstrated	Practical assessment
5.3 Inspect weld dressing as required by the specification	Different types of dressing (file, grind, paint etc.) explained Practice various methods of dressing	Practical assessment
5.4 Report any defects according to workplace procedure	Reporting practices and types Demonstrate generic process and forms	Written assessment of individual activity to complete a defect report

Suggested Delivery Methods

- Instructor led facilitation of theory
- Group and individual activities
- Practical demonstration of task
- Guided practice by learners
- Self-paced learning

List of Recommended Resources

1. Text books, websites, manuals

a) Fabrication and Welding Engineering, by Roger Timings ISBN-13: 978-0750666916

b) Lincoln Electric Canada www.lincolnelectric.com/en-ca/equipment/weldin-gear/tools/…handtools.aspx

c) Manufacturers' manuals; Equipment maintenance documentation

2. Tools and equipment and materials

a) Chipping hammer, Measuring tape, Pipe cutters, Hand Drill, Brushes (various bristle brushes for cleaning and scrubbing), Marking pen,

Try squares, "C" clamps, Cold chisels (various sizes),

Files (flat, half-round, rat-tail, bastard), ball peen, Pipe stands, Pipe wrenches, Vice grips, Scribers, Straight edges, Vernier callipers, Pliers (needle nose, slip joint), Punches, Screwdrivers, Snips (heavy duty sheet metal cutting), Scrapers (various sizes), Stamping tools, Hack saw, Metal markers, Wire brush, Protractor, Spirit level, Tape measure, Grinder, Power saw, Power hacksaw, Wire brush, Filler rods, Tungsten welding rods, Sand paper, Drill bits, MIG welder, Bench grinder, Table saw, Shielding gas cylinder, Mild steel (various thickness)

a) PPE including safety shoes, gloves, hard hat, dust coat/heat resistant overall and/or apron, welding helmet

OXYACETYLENE (GAS) WELDING

UNIT CODE: CWEL004

Unit Description

This module describes the skills, knowledge and attitudes required by a welder in order to safely weld mild steel, stainless steel and carbon steels in all positions using the GAS welding method. This involves preparation, welding and inspection of a workpiece(s) after welding according to national and international standards and procedures.

Summary of Learning Outcomes

1. Apply safety to a workplace
2. Apply housekeeping principles to welding work area
3. Prepare tools, equipment, consumables and work pieces for GAS welding processes
4. Weld work pieces in all positions in accordance with national and international specifications and procedures
5. Inspect finished product quality against national and international specifications and procedures

Learning Outcomes, Specific Learning Outcomes and Content

Learning Outcome 1: Apply safety to a workplace		
Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
1.1 Identify correct PPE for the job	□ Meaning of term PPE □ Types of PPE identified □ Purpose of PPE explained	Written assessment Practical assessment of selecting PPE from array of options
1.2 Demonstrate correct wearing of PPE	□ Correct type of PPE for the job selected □ PPE worn correctly (e.g.: hard hat not worn over other head covering) □ Safe and correct handling, use, maintenance and storage of different types of PPE	Practical assessment
1.3 Obtain all required permits and approvals prior to starting work	□ Cold work and hot work permits □ Approvals that could be required are identified (e.g.: construction permits)	Practical assessment of completing permit application individual activity
1.4 Report any incidents, hazards and risks	□ Difference between risk and hazard explained □ Risk assessment conducted □ Risk/accident/incident reporting process explained	Written assessment Practical assessment of conducting risk assessment as group activity Written assessment of risk/accident/incident report writing as individual activity

Learning Outcome 2:

Apply housekeeping principles to welding work area

Specific Learning Outcomes	Content	Suggested Assessment Methods
2.1 Maintain workplace cleanliness	□ Reason for cleaning □ 5S principles explained □ Apply 5S to a work area □ What is a clean workplace in welding □ Purpose of cleaning and storage	Written assessment Visual inspection of simulated workplace Practical assessment of cleaning process
2.2 Store tools, equipment and unused materials and consumables in a safe area.	□ Care of tools, equipment and consumables by type □ Storage of tools, equipment and consumables □ Reason for care and storage explained	Written assessment Practical assessment of storage process
2.3 Store completed work pieces	□ Recall the different storage procedure for different work pieces □ Store work pieces correctly	Written assessment

Learning Outcome 3:

Prepare tools, equipment, consumables and work pieces for GAS welding processes

Specific Learning Outcomes	Content	Suggested Assessment Methods
3.1 Interpret drawing and	□ Collect drawings/	Written assessment

specification for GAS welding mild steel	specifications □ Interpret drawings/specifications □ Store drawings/ specifications safely	
3.2 Obtain consumables, materials, tools and equipment for job	□ Identify materials, consumables, equipment and tools for the drawing □ Collect all required consumables, materials, tools and equipment	Practical assessment in form of group work
3.3 Clean and prepare work station	□ Apply 5s to the area □ Ensure all required materials, equipment, tools and consumable are available and correct □ Ensure drawing/ specification are available	Practical assessment
3.4 Prepare work pieces according to specifications	□ Work pieces are measured, marked and cut according to drawing/ specification □ Work pieces are prepared as required	Practical assessment
3.5 Set up equipment according to manufacturer's specification	□ Equipment is set up as per specifications of brand (manufacturers requirements) and national/ international requirements □ Safety is taken into account for all activities	Practical assessment

Learning Outcome 4:

Weld work pieces in all positions in accordance with national and international specifications and procedures

Specific Learning Outcomes	**Content**	**Suggested Assessment Methods**
4.1 Carry out welding process according to drawings and specifications	□ Work piece secured to bench or similar □ Tacking done if required □ Seam is welded in correct position and type (fillet, groove, bevel etc.) □ Seam is complete and accurate according to drawing/specification □ Weld integrity explained	Practical assessment Workpiece to be submitted as part of portfolio
4.2 Identify and adhere to all relevant safety aspects during the welding process	□ Assessment of risks before work □ Consequence of not using PPE during process (Mask, gloves etc.) □ How to work safely	Practical assessment of individual task risk assessment Practical assessment of PPE use
4.3 Describe accidents and incidents report procedure	□ Incident or accident reporting process and forms discussed	Written assessment of individual task to compile incident/ accident report on generic forms

Learning Outcome 5:

Inspect finished product quality against national and international specifications and procedures

Specific Learning Outcomes	Content	Suggested Assessment Methods
5.1 Inspect weld for full coverage	□ How to ensure complete weld and importance	Practical assessment
5.2 Inspect weld appearance, quality and integrity in accordance with the specifications	□ Standards for welding in different positions explained and demonstrated	Practical assessment
5.3 Inspect weld dressing as required by the specification	□ Different types of dressing (file, grind, paint etc.) explained □ Practice various methods of dressing	Practical assessment
5.4 Report any defects according to workplace procedure	□ Reporting practices and types □ Demonstrate generic process and forms	Written assessment of individual activity to complete a defect report

Suggested Delivery Methods

- □ Instructor led facilitation of theory
- □ Group and individual activities
- □ Practical demonstration of task
- □ Guided practice by learners
- □ Self-paced learning

List of Recommended Resources

1. Text books, websites, manuals

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c) Manufacturers' manuals; Equipment maintenance documentation

2. Tools and equipment and materials

b) Chipping hammer, Measuring tape, Pipe cutters, Hand Drill, Brushes (various bristle brushes for cleaning and scrubbing), Marking pen,

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Files (flat, half-round, rat-tail, bastard), ball peen, Pipe stands, Pipe wrenches, Vice grips, Scribers, Straight edges, Vernier callipers, Pliers (needle nose, slip joint), Punches, Screwdrivers, Snips (heavy duty sheet metal cutting), Scrapers (various sizes), Stamping tools, Hack saw, Metal markers, Wire brush, Protractor, Spirit level, Tape measure, Grinder, Power saw, Power hacksaw, Wire brush, Filler rods, Tungsten welding rods, Sand paper, Drill bits, GAS welder, Bench grinder, Table saw, Shielding gas cylinder, Mild steel (various thickness)

a) PPE including safety shoes, gloves, hard hat, dust coat/heat resistant overall and/or apron, welding helmet