



**Maldives National Skills Development Authority**



# **National Competency Standard for Welding Techniques**

**Standard Code: CONS01V2/20**

**Qualification Name: National Certificate III in Welding Techniques**

**Qualification Code: CONS01Q1L3V2/20**

## PREFACE

Technical and Vocational Education and Training (TVET) Authority was established with the vision to develop a TVET system in the Maldives that is demand driven, accessible, beneficiary financed and quality assured, to meet the needs of society for stability and economic growth, the needs of Enterprise for a skilled and reliable workforce, the need of young people for decent jobs and the needs of workers for continuous mastery of new technology.

TVET system in the Maldives flourished with the Employment Skills Training Project (ESTP) funded by ADB with the objective of increasing the number of Maldivians, actively participating in the labor force, employed and self-employed. The Project supported expansion of demand driven employment-oriented skills training in priority occupations and to improve the capacity to develop and deliver Competency Based Skill Training (CBST). The project supported delivery of CBST programs to satisfy employer demand-driven needs.

Recognizing the importance of developing the youth sector to enable Maldives to transition from an upper-middle-income country to high-income country, the World Bank Country Partnership Framework (CPF) proposes to finance the Maldives Enhancing Employability and Resilience of Youth (MEERY) project. As part of the MEERY project is financing for skills development and entrepreneurship in priority sectors such as tourism, ICT and construction sector MEERY continues to provide support to TVET Authority to develop National Occupational Standard, instructional materials, assessment resource book and trainees log book for the National Occupational Standard for "Welding Techniques". As part of the MEERY Project, TVET Authority has only undertaken to review standard which were developed in the ESTP Project to increase the economic opportunities for youth's trainees and promote equitable economic & social development in the country.

The National Competency Standards (NCS) provide the base for this training. Currently CBST is offered for six key sectors in the Maldives: Tourism, Fisheries and Agriculture, Transport, Construction, Social and the Information and Technology sectors. These sectors are included as priority sectors that play a vital role in the continued economic growth of the country.

The NCS are developed in consultation with Employment Sector Councils representing employers. They are designed using a consensus format endorsed by the Maldives Qualifications Authority (MQA) to maintain uniformity of approach and the consistency of content amongst occupations. This single format also simplifies benchmarking the NCS against relevant regional and international standards. NCS specify the standards of performance of a competent worker and the various contexts in which the work may take place. NCS also describes the knowledge, skills and attitudes required in a particular occupation. They provide explicit advice to assessors and employers regarding the knowledge, skills and attitudes to be demonstrated by the candidates seeking formal recognition for the competency acquired following training or through work experience. By sharing this information, all participants in the training process have the same understanding of the training required and the standard to be reached for certification. Certification also becomes portable and can be recognized by other employers and in other countries with similar standards.

NCS are the foundation for the implementation of the TVET system in Maldives. They ensure that all skills, regardless of where or how they were developed can be assessed and recognized. They also form the foundation for certifying skills in the Maldives National Qualification Framework (MNQF).

NCS are developed by the Technical and Vocational and Education Training Authority of Ministry of Higher Education. The NCS are endorsed by the Employment Sector Councils of the respective sectors and validated by the Maldives Qualification Authority.



Mohamed Hashim  
Minister of State for Higher Education  
TVET Authority



Ahmed Nisham  
Director, Standard Development & Statistics  
TVET Authority


TECHNICAL PANEL MEMBERS			
#	Name	Designation	Organization
01	Ahmed Iaan	Senior Welder, Grade 3, Level 3	MACL
02	Ismail Ali	Assistant lecturer	Maldives Polytechnic
03	Abdulla Hassan	Engineer	Maldives Ports Limited
04	Mohamed Arshad	Assistant Engineer	STELCO
05	Abdulla Iyad Ahmed	Senior Technical Officer	HDC
06	Ibrahim Nishar	Freelancer	Freelancer

VERSION	DEVELOPER	DATE	STANDARD CODE
V1	TVET Authority	2015	
V2	Maldives Institute of Technology	28th of September, 2020	CONS01V2/20

# EMPLOYMENT SECTOR COUNCILS

#	Name	Designation	Organization
01	Hassan Shameem	Managing Director	INOCA Pvt Ltd
02	Mohamed Naseer	President	Contractors Association
03	Ismail Ameen	Professional Member	Architect Association of Maldives
04	Mohamed Musthafa	Director General	Ministry of Environment and Energy
05	Mohamed Rasheed	Assistant Director, Project Management and Development	Housing Development Corporation
06	Adnan Haleem	Secretary General	Maldives National Association of Construction Industry
07	Ahmed Musthaq	General Manager Engineering and Maintenance	Maldives Airports Company Limited
08	Ahmed Migdhad	Director	Ministry of Economic Development
09	Hussain Shiyam	Civil Engineer	Association of Civil Engineers
10	Mariyam Abdul Rahman	Director	Ministry of Youth, Sports and Community Empowerment
11	Ibrahim Shareef Hassan	Manager of Academic and Student Structure Board	Maldives Institute of Technology (MIT)
12	Mohamed Haikal Ibrahim	Head of Department Engineering	Maldives National University
13	Mohamed Shahud	Assistant Engineer	Ministry of National Planning
14	Muaz Ibrahim	Assistant Manager Projects	MWSC
15	Mohamed Waheed	Assistant Lecturer Grade 2	Maldives Polytechnic

National Occupational Standard has been endorsed by:

 Hassan Shameem Chairperson Construction Employment Sector Council	Mohamed Naseer Vice-Chairperson Construction Employment Sector Council
Technical and Vocational Education and Training Authority Ministry of Higher Education Handhuvaree Hingun, M. World Dream Male', Maldives	
Date of Endorsement: 2015	Date of Revision: 28th of September, 2020



## **Standard Development Process**

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To begin with, Welding Techniques occupations were profiled through study of the occupation across Maldivian workplaces. Referred occupational profiling process led to the development of the Draft Occupational Standard.

Referred draft occupational standard is then submitted to a team of Technical Panel (TP) selected from the Maldivian workplaces to review the Welding Techniques Standard. The members of the TP provided technical support by recommending changes to the Welding Techniques Standard through incorporation of units of competencies and editing of the already included competency units. Purpose of this process was to develop a standard that reflects authentic work practices of Welding Techniques across the Maldives. Technical Panel meetings continued in reviewing the Welding Techniques Standard until the Final Draft is developed and agreed among all the participating members.

Final Draft of Welding Techniques Standard is then submitted to the Construction Employment Sector Council for endorsement and validation. A brief report on how the National Occupational Standard of Welding Techniques was compiled is also presented to the Construction Employment Sector Council together with the standard. Council members ensured that the industry needs, including all the core and common competencies presented in the Welding Techniques standard reflect the work practices of Welding Techniques occupations across the Maldives. With further editing, Welding Techniques Standard has been endorsed by the Council.

With the endorsement from the Construction Employment Sector Council, final document of the National Occupational Standard of Welding Techniques is submitted to Maldives Qualification Authority (MQA) for approval. With approval from MQA, the National Occupational Standard of Welding Techniques is published on TVETA website, to be used by training providers in delivering Welding Techniques programs across the Maldives.

## **Description of “Welding Techniques”**

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Welders play an important role within the construction sector of the Maldives as they undertake creation of all kinds of structures with varying sizes, levels of complexity, and uses. To complete projects from simple structures to large, complex ones like bridges, dams, and manufacturing plants, services of qualified and competent welders are of crucial need.

National Certificate-3 in “Welding Techniques” are mapped and organized in such a way to ensure those competent in the referred qualification will have the knowledge and skills to contribute positively to the local construction industry.

## **Job opportunities upon completion of “National Certificate III in Welding Techniques”**

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Upon successful completion of the National Certificate III in Welding Techniques students can work in the following jobs.

1. *Welder at Resort*
2. *Welder at construction company*
3. *Welder at welding workshop*
4. *Welding entrepreneur*

## KEY FOR CODING

### Coding Competency Standards and Related Materials

DESCRIPTION	REPRESENTED BY
Industry Sector as per ESC (Three letters)	Construction Sector (CON) Fisheries and Agriculture (FNA) Information, Communication and Technology (ICT) Transport Sector (TRN) Tourism Sector (TOU) Social Sector (SOC) Foundation (FOU)
Competency Standard	S
Occupation with in an industry sector	Two digits 01-99
Unit	U
Common Competency	CR
Core Competency	CM
Optional / Elective Competency	OP
Assessment Resources Materials	A
Learning Resources Materials	L
Curricular	C
Qualification	Q1, Q2 etc.
MNQF level of qualification	L1, L2, L3, L4 etc.
Version Number	V1, V2 etc.
Year of Last Review of standard, qualification	By “/” followed by two digits responding to the year of last review, example /20 for the year 2020

1. Endorsement Application for Qualification 01		
2. NATIONAL CERTIFICATE III IN WELDING TECHNIQUES		
<b>3. Qualification code:</b> CONS01Q1L3V2/20		<b>Total Number of Credits: 62</b>
<b>4. Purpose of the qualification</b>  The holders of this qualification will be will be competent to work as a Welder. The level III qualification presented here will facilitate preparing students to the entry level workplace tasks and the competency units are mapped in such a way to fulfill the knowledge and skills requirements of National Certificate-3 of Welding Techniques.		
<b>5. Regulations for the qualification</b>		National Certificate III in Welding Techniques will be awarded to those who are competent in units 1+2+3+4+5+6+7+8+9+10+11+12+13+14+15+16+17+18+19
<b>6. Schedule of Units</b>		
Unit No	Unit Title	Code
<b>Common Competencies</b>		
01	Apply work ethics and professionalism	CONCM01V2/20
02	Provide effective customer care	CONCM02V2/20
03	Perform basic computer operations	CONCM03V2/20
<b>Core Competencies</b>		
04	Apply effective communication and teamwork skills	CONS01CR04V2/20
05	Apply mathematics and drawing skills	CONS01CR05V2/20
06	Perform basic workshop practice	CONS01CR06V2/20
07	Apply safe welding practices	CONS01CR07V2/20
08	Perform soldering and brazing	CONS01CR08V2/20
09	Perform basic oxy-acetylene welding in 1G-3G positions	CONS01CR09V2/20
10	Perform basic oxy-acetylene and plasma cutting	CONS01CR10V2/20
11	Perform Manual Arc Welding on mild steel plates in 1F, 2F, 3F, 1G, 2G Positions	CONS01CR11V2/20
12	Perform Manual Arc Welding on mild steel plates 3G, 4G and 4F Positions	CONS01CR12V2/20
13	Perform pipe bending, grinding, sanding and metal polishing	CONS01CR13V2/20
14	Perform welding of Mild Steel Pipes by Manual Arc Welding in All Positions	CONS01CR14V2/20
15	Perform welding of Stainless-Steel Plates on Pipes in Flat Positions	CONS01CR15V2/20
16	Plan and Prepare Estimates for Welding	CONS01CR16V2/20
17	Apply basic TIG and cast-iron welding skills	CONS01CR17V2/20
18	Undertake welding project using flat bars and pipe	CONS01CR18V2/20
19	Apply basic sheet-metals fabrication skills	CONS01CR19V2/20

<b>7.Accreditation requirements</b>	The training provider should place trainees in relevant industry or sector to provide the trainees the hands-on experience exposure related to this qualification.
<b>8. Recommended sequencing of units</b>	As appearing under the section 06



## Units Details

#	Unit Title	Code	Level	No of credits
01	Apply work ethics and professionalism	CONCM01V2/20	III	03
02	Provide effective customer care	CONCM02V2/20	III	05
03	Perform basic computer operations	CONCM03V2/20	III	03
04	Apply effective communication and teamwork skills	CONS01CR04V2/20	III	03
05	Apply mathematics and drawing skills	CONS01CR05V2/20	III	03
06	Perform basic workshop practice	CONS01CR06V2/20	III	02
07	Apply safe welding practices	CONS01CR07V2/20	III	02
08	Perform soldering and brazing	CONS01CR08V2/20	III	03
09	Perform basic oxy-acetylene welding in 1G-3G positions	CONS01CR09V2/20	III	03
10	Perform basic oxy-acetylene and plasma cutting	CONS01CR10V2/20	III	03
11	Perform Manual Arc Welding on mild steel plates in 1F, 2F, 3F, 1G, 2G Positions	CONS01CR11V2/20	III	05
12	Perform Manual Arc Welding on mild steel plates 3G, 4G and 4F Positions	CONS01CR12V2/20	III	05
13	Perform pipe bending, grinding, sanding and metal polishing	CONS01CR13V2/20	III	03
14	Perform welding of Mild Steel Pipes by Manual Arc Welding in All Positions	CONS01CR14V2/20	III	03
15	Perform welding of Stainless-Steel Plates on Pipes in Flat Positions	CONS01CR15V2/20	III	03
16	Plan and Prepare Estimates for Welding	CONS01CR16V2/20	III	02
17	Apply basic TIG and cast-iron welding skills	CONS01CR17V2/20	III	03
18	Undertake welding project using flat bars and pipe	CONS01CR18V2/20	III	05
19	Apply basic sheet-metals fabrication skills	CONS01CR19V2/20	III	03

### Packaging of National Qualifications:

National Certificate III in Welding Techniques will be awarded to those who are competent in units 1+2+3+4+5+6+7+8+9+10+11+12+13+14+15+16+17+18+19

**Qualification Code:** CONS01Q1L3V2/20

## Competency Standard for Welding Techniques

UNIT TITLE <b>Apply work ethics and professionalism</b>					
<b>DESCRIPTOR</b>	This module covers the knowledge, skills and attitudes required in demonstrating proper work values and professionalism while working as a Welding Technician. Besides ethical values, knowledge and skills also developed on maintaining integrity at work.				
<b>CODE</b>	CONCM02V1/20	<b>LEVEL</b>	III	<b>CREDIT</b>	03

ELEMENTS OF COMPETENCIES		PERFORMANCE CRITERIA
1. Define the purpose of work		1.1 One's unique sense of purpose for working and the whys of work are identified, reflected on and clearly defined for one's development as a person and as a member of society. 1.2 Personal mission is in harmony with company's values.
2. Apply work values/ethics		2.1 Work values/ethics/concepts are identified and classified in accordance with company's ethical standard guidelines. 2.2 Work policies are undertaken in accordance with company's policies, guidelines on work ethical standard. 2.3 Resources are used in accordance with company's policies and guidelines. 2.4 Punctuality, absence from work, sick, family and annual leave is maintained alignment to the Employment Act of the Maldives
3. Deal with ethical problems		3.1 Company ethical standards, organizational policy and guidelines on the prevention and reporting of unethical conduct/behavior are followed. 3.2 Work incidents/situations are reported according to company protocol/guidelines. 3.3 Resolution and/or referral of ethical problems identified are reported/documented based on standard operating procedure
4. Maintain integrity of conduct in the workplace		4.1 Personal behavior and relationships with co-workers and/or clients are demonstrated consistent with ethical standards, policy and guidelines. 4.2 Work practices are satisfactorily demonstrated and consistent with industry work ethical standards, organizational policy and guidelines. 4.3 Instructions to co-workers are provided based on ethical lawful and reasonable directives

### **Range Statement**

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance.

### **Tools, equipment and material used in this unit may include:**

For the purpose of delivering the assignment, students need to be familiarized with the following.

- ✓ Employment act of Maldives

## **ASSESSMENT GUIDE**

### **Forms of assessment**

Assessment for the unit needs to be holistic and must include real or simulated workplace activities.

### **Assessment context**

Assessment of this unit must be completed on the job or in a simulated work environment which reflects a range of practices.

### **Critical aspects (for assessment)**

It is critical that the assessment undertaken for this module be holistic and involve the following.

- ✓ Group discussion
- ✓ Role play
- ✓ Self-paced learning
- ✓ Written
- ✓ Demonstration
- ✓ Observation
- ✓ Interviews/questioning

### **Assessment conditions**

Assessment must reflect both events and processes over a period of time.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<p>Knowledge to be developed:</p> <ul style="list-style-type: none"> <li>✓ Work responsibilities/job functions</li> <li>✓ Company code of conduct/values</li> <li>✓ Concept of work values/ethics</li> <li>✓ Company policies and guidelines</li> <li>✓ Work ethical standard</li> <li>✓ Company's identified ethical problems</li> <li>✓ Work incidents/situation</li> <li>✓ Standard operating procedures</li> <li>✓ Report writing and documentation</li> <li>✓ Fundamental rights at work including gender sensitivity</li> <li>✓ Corporate social responsibilities</li> <li>✓ Human and interpersonal Relations</li> <li>✓ Value Formation</li> <li>✓ Professional Code of Conduct and Ethics</li> </ul>	<p>Skills to be developed:</p> <ul style="list-style-type: none"> <li>✓ Purpose for working and the why's of work are identified, reflected and linked to self-development</li> <li>✓ Work values/ethics/concepts are identified and classified in accordance with company's ethical standard</li> <li>✓ Work policies are undertaken in accordance with company's policies.</li> <li>✓ Resources are used in accordance with company's policies and guidelines.</li> <li>✓ Work incidents/situations are reported according to company guidelines</li> <li>✓ Personal behavior and relationships with co-workers and clients are within ethical standard</li> <li>✓ Work practices are satisfactorily demonstrated and consistent.</li> <li>✓ Instructions to co-workers are provided based on ethical lawful and reasonable directives</li> </ul>

UNIT TITLE <b>Provide effective customer care</b>					
DESCRIPTOR	This unit addresses the importance of caring for customers in the hospitality industry, especially while working as a Lifeguard. It is a very important unit related to providing effective customer care and will include greetings, identifying needs of, delivering quality customer care, handling of inquiries, complaints and managing angry customers.				
CODE	CONCM05V2/20	LEVEL	III	CREDIT	05

ELEMENTS OF COMPETENCIES		PERFORMANCE CRITERIA
1. Greet customers and colleagues	1.1. Customers and colleagues greeted according to standard procedures and social norms 1.2. Sensitivity to cultural and social differences demonstrated	
2. Identify and attend to customer needs	2.1 Appropriate interpersonal skills are used to ensure that customer needs are accurately identified 2.2 Customer needs are assessed for urgency so that priority for service delivery can be identified 2.3 Personal limitation in addressing customer needs is identified and where appropriate, assistance is sought from supervisor 2.4 Customers informed correctly 2.5 Personal limitation identified and assistance from proper sources sought when required	
3. Deliver service to customers	3.1 Customer needs are promptly attended to in line with organizational procedure 3.2 Appropriate rapport is maintained with customer to enable high quality service delivery 3.3 Opportunity to enhance the quality of service and products are taken wherever possible	
4. Handle inquiries	4.1 Customer queries handled promptly and properly 4.2 Personal limitations identified and assistance from proper sources sought when required	
5. Handle complaints	5.1 Responsibility for handling complaints taken within limit of responsibility 5.2 Personal limitations identified and assistance from proper sources sought when required 5.3 Operational procedures to handling irate or difficult customers followed correctly 5.4 Details of complaints and comments from customers properly recorded	
6. Handle and manage angry customers	6.1 Apply principles related to anger management 6.2 Meet with angry customers and console them accordingly 6.3 Maintain a log book for recording customer service incidents.	

## **Range Statement**

Procedures included:

- ✓ Greeting procedure
- ✓ Complaint and comment handling procedure
- ✓ Incidence reporting procedures
- ✓ General knowledge of property
- ✓ Standard operating procedures for service deliveries
- ✓ Non-verbal and verbal communication
- ✓ Dress and accessories
- ✓ Gestures and mannerisms
- ✓ Voice tonality and volume
- ✓ Culturally specific communication customs and practices
- ✓ Cultural and social differences

Includes but are not limited to:

- ✓ Modes of greeting, fare welling and conversation
- ✓ Body language/ use of body gestures
- ✓ Formality of language

Interpersonal skills:

- ✓ Interactive communication
- ✓ Good working attitude
- ✓ Sincerity
- ✓ Pleasant disposition
- ✓ Effective communication skills
- ✓ Customer needs

Customer with limitation may include:

- ✓ Those with a disability
- ✓ Those with special cultural or language needs
- ✓ Unaccompanied children
- ✓ Parents with young children
- ✓ Pregnant women
- ✓ Single women

**Tools, equipment and materials required may include:**

- ✓ Relevant procedure manuals
- ✓ Availability of telephone, printer, computer, internet, etc.
- ✓ Availability of data on projects and services; tariff and rates, promotional activities in place etc.

## **ASSESSMENT GUIDE**

### **Form of assessment**

Assessment for the unit needs to be holistic and must include real or simulated workplace activities.

### **Assessment context**

Assessment of this unit must be completed on the job or in a simulated work environment which reflects a range of practices.

### **Critical aspects (for assessment)**

It is essential that competence is fully observed and there is ability to transfer competence to changing circumstances and to respond to unusual situations. This unit may be assessed in conjunction with all units which form part of the normal job role.

- ✓ Assessment requires evidence that the candidate:
- ✓ Complied with industry practices and procedures



- ✓ Used interactive communication with others
- ✓ Complied with occupational, health and safety practices
- ✓ Promoted public relation among others
- ✓ Complied with service manual standards
- ✓ Demonstrated familiarity with company facilities, products and services
- ✓ Applied company rules and standards
- ✓ Applied telephone ethics
- ✓ Applied correct procedure in using telephone, printer, computer, internet
- ✓ Handled customer complaints
- ✓ Depict effective communication skills

#### **Assessment conditions**

- ✓ Theoretical assessment of this unit must be carried out in an examination room where proper examination rules are followed.
- ✓ Assessment of hygienic work practices must be constantly evaluated.

### **UNDERPINNING KNOWLEDGE AND SKILLS**

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<p>Knowledge to be developed:</p> <ul style="list-style-type: none"> <li>✓ effective customer services principles, including requirements to meet customer service needs and expectations</li> <li>✓ workplace products and services</li> <li>✓ customer service reporting procedures</li> <li>✓ customer service problem-resolution procedures.</li> </ul>	<p>Skills to be developed:</p> <ul style="list-style-type: none"> <li>✓ promote products and services in a clear and direct manner</li> <li>✓ identify customer needs and expectations</li> <li>✓ resolve customer concerns and complaints by taking appropriate action, including: <ul style="list-style-type: none"> <li>• handling customer needs in a courteous, discreet and sensitive manner</li> <li>• addressing customer complaints and escalating where necessary</li> </ul> </li> <li>✓ apply workplace procedures relating to customer feedback, including: <ul style="list-style-type: none"> <li>• customer service and continuous improvement processes</li> <li>• workplace customer service practices</li> </ul> </li> </ul>

UNIT TITLE      Perform basic computer operations					
DESCRIPTOR	This unit describes the performance outcomes, skills and knowledge required to start up a personal computer or business computer terminal; to correctly navigate the desktop environment; and to use a range of basic functions.				
CODE	CONCM06V2/20	LEVEL	III	CREDIT	03

ELEMENTS OF COMPETENCIES		PERFORMANCE CRITERIA
1. Start computer, system information and features		1.1. Adjust workspace, furniture and equipment to suit user ergonomic requirements 1.2. Ensure work organization meets organizational and occupational health and safety (OHS) requirements for computer operation 1.3. Start computer or log on according to user procedures 1.4. Identify basic functions and features using system information 1.5. Customize desktop configuration, if necessary, with assistance from appropriate persons 1.6. Use help functions as required
2. Organize files using basic directory and folder structures		2.1 Create folders/subfolders with suitable names 2.2 Save files with suitable names in appropriate folders 2.3 Rename and move folders/subfolders and files as required 2.4 Identify folder/subfolder and file attributes 2.5 Move folders/subfolders and files using cut and paste, and drag and drop techniques 2.6 Save folders/subfolders and files to appropriate media where necessary 2.7 Search for folders/subfolders and files using appropriate software tools 2.8 Restore deleted folder/subfolders and files as necessary
3. Print information		3.1 Print information from installed printer 3.2 View progress of print jobs and delete as required 3.3 Change default printer if installed and required
4. Shut down computer		4.1 Close all open applications 4.2 Shut-down computer according to user procedures
5. Basic Microsoft Word and Excel skills		5.1. Ensure data is entered, checked and amended in accordance with organizational and task requirements, to maintain consistency of design and layout 5.2. Format spreadsheet using software functions; to adjust page and cell layout to meet information

	<p>requirements, in accordance with organizational style and presentation requirements</p> <p>5.3. Ensure formulae are used and tested to confirm output meets task requirements, in consultation with appropriate personnel as required</p> <p>5.4. Use manuals, user documentation and online help to overcome problems with spreadsheet design and production</p> <p>5.5. Format document using appropriate software functions to adjust page layout to meet information requirements, in accordance with organizational style and presentation requirements</p> <p>5.6. Use system features to identify and manipulate screen display options and controls</p> <p>5.7. Use manuals, user documentation and online help to overcome problems with document presentation and production</p>
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### **Range Statement:**

This unit covers computer hardware to include personal computers used independently or within networks, related peripherals, such as printers, scanners, keyboard and mouse, and storage media such as disk drives and other forms of storage. Software used must include but not limited to word processing, spreadsheets, database and billing software packages and Internet browsing software.

### **Tools, equipment and materials required may include:**

- ✓ Storage device
- ✓ Different software and hardware
- ✓ Personal computers system
- ✓ Laptop computer
- ✓ Printers
- ✓ Scanner
- ✓ Keyboard
- ✓ Mouse
- ✓ Disk drive /CDs, DVDs, compressed storage device

## **ASSESSMENT GUIDE**

The assessment guide provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and skills, the range statement and the assessment guidelines for this occupational standard

### **Forms of assessment**

A range of assessment methods should be used to assess practical skills and knowledge. The following examples are appropriate for this unit:

- ✓ direct questioning combined with review of portfolios of evidence and third-party workplace reports of on-the-job performance by the candidate
- ✓ demonstration of techniques
- ✓ oral or written questioning to assess knowledge of computer operations and functions
- ✓ review of shortcuts created
- ✓ review of folders/subfolders created.

### **Critical aspects (for assessment)**

Evidence of the following is essential:

- ✓ navigation and manipulation of the desktop environment within the range of assigned workplace tasks
- ✓ knowledge of organizational requirements for simple documents and filing conventions
- ✓ application of simple keyboard functions to produce documents with a degree of speed and accuracy relevant to the level of responsibility required.

#### **Assessment conditions**

- ✓ Competency is to be assessed in the workplace or a simulated environment that accurately reflects performance in a real workplace setting.
- ✓ Assessment must include direct observation of tasks.
- ✓ Where assessment of competency includes third-party evidence, individuals must provide evidence
- ✓ Assessors must verify performance evidence through questioning on skills and knowledge to ensure correct interpretation and application

#### **UNDERPINNING KNOWLEDGE AND SKILLS**

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<p>Knowledge required:</p> <ul style="list-style-type: none"> <li>✓ Basic ergonomics of keyboard and computer use</li> <li>✓ Main types of computers and basic features</li> <li>✓ Of different operating systems</li> <li>✓ Main parts of a computer</li> <li>✓ Storage devices and basic categories of memory</li> <li>✓ Relevant software</li> <li>✓ General security and computer Viruses</li> </ul>	<p>Skills required:</p> <ul style="list-style-type: none"> <li>✓ communication skills to identify lines of communication, to request advice, to effectively question, to follow instructions and to receive feedback</li> <li>✓ problem-solving skills to solve routine problems in the workplace, while under direct supervision</li> <li>✓ technology skills to use equipment safely while under direction, basic keyboard and mouse skills and procedures relating to logging on and accessing a computer</li> <li>✓ basic typing techniques and strategies.</li> </ul>

<b>UNIT TITLE     Apply effective communication and teamwork skills</b>					
<b>DESCRIPTOR</b>	This unit addresses the need for effective communication and team work skills across the workplace. The unit facilitates development proper communication, team work, adaptability, reliability while working in the workplace.				
<b>CODE</b>	CONS01CR04V2/20	<b>LEVEL</b>	III	<b>CREDIT</b>	03

<b>ELEMENTS OF COMPETENCIES</b>	<b>PERFORMANCE CRITERIA</b>
1. Communicate with customers and colleagues	1.1. Proper channels and methods of communication use 1.2. Workplace interactions with customers and colleagues appropriately made 1.3. Appropriate non-verbal communication used 1.4. Appropriate lines of communication followed 1.5. Perform electronic communication such as sending emails and using of instant messaging.
2. Maintain teamwork	2.1 Interpret benefits of teamwork in the workplace 2.2 Maintain characteristics of good team member 2.3 Contribute to team while attending work tasks
3. Demonstrate adaptability and reliability at all times	3.1 Interpret characteristics of managing adaptability 3.2 Identify and list factors to be reliable at workplace 3.3 Practice adaptability and reliability at work

### Range Statement

As per the range of communication protocols are involved, students need to undertake the following.

- ✓ Standard communication process and protocols with clients and colleagues
- ✓ Minute taking after formal meetings and discussions
- ✓ Reporting organizational hierarchy to colleagues
- ✓ Sending electronic communication with write up and attachment
- ✓ Work related documents

### Tools, equipment and materials required may include:

Tools, equipment and materials used for this unit may include but not limited to the following.

- ✓ Computer or Laptop
- ✓ Note pads
- ✓ Pens/pencils
- ✓ Minute taking forms with formats

## ASSESSMENT GUIDE

### Forms of assessment

Assessment for the unit needs to be continuous and holistic and must include real or simulated workplace activities.

### Critical aspects (for assessment)

It is essential that competence is fully observed and there is ability to transfer competence to changing circumstances and to respond to unusual situations in the critical aspects of communicating effectively with others involved in or affected by the work. This unit may be assessed in conjunction with all and units which form part of the normal job role.

### Assessment conditions

It is preferable that assessment reflects a process rather than an event and occurs over a period of time to cover varying circumstances.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"><li>✓ Proper communication channels and methods</li><li>✓ Operation of computers and other equipment used for workplace communication</li><li>✓ Appropriate team building strategies</li><li>✓ Ways to contribute the teamwork within the workplaces</li><li>✓ Ways to strengthen adaptability and reliability across workplaces</li></ul>	<ul style="list-style-type: none"><li>✓ Handling of communications among customers and colleagues</li><li>✓ Operate computers and other gadgets used for workplace communication</li><li>✓ Practice effective Team Building skills</li><li>✓ Practice adaptability and reliability across workplaces</li></ul>



UNIT TITLE <b>Apply mathematics and Drawing skills</b>					
DESCRIPTOR	The aim of this module is to enable the candidate to: Use calculation to solve simple workshop problems, construct plane figures, and develop patterns. Sketch and dimension simple orthographic projections, sectional and pictorial views.				
CODE	CONS01CR05V2/20	LEVEL	III	CREDIT	03

ELEMENTS OF COMPETENCIES		PERFORMANCE CRITERIA
1. Perform simple workshop calculations		1.1. Perform simple calculations on: fractions and decimals, calculations to a number of significant figures, decimal places 1.2. Identify and use the multiples and sub-multiples of units 1.3. Perform calculations on: perimeter and area of plane figures (i.e. square and rectangle, triangle, circle), volume and surface area (i.e. cube, rectangular prism, cylinder), mass of containers and their contents (i.e. cube, rectangular prism, cylinder) 1.4. Perform mathematical calculations involving formulas, angles, triangles and geometric construction 1.5. Identify and use formulas for SI quantities: length, area, volume, mass, density
2. Apply knowledge of mathematics in welding		2.1 Identify the elements of a circle Parts: radius, diameter, circumference, chord, sector, segment, arc, tangent 2.2 Identify and use the ratio of sides of 45° and 60° right angled triangles. 2.3 Identify and use the rules of 3:4:5 and 5:12:13 for the sides of right-angled triangles. 2.4 Solve simple workshop problems involving Pythagoras and right-angled triangles. 2.5 Evaluate and transpose simple formulae associated with workshop problems. 2.6 Convert minutes and seconds to decimal fractions of a degree.
3. Demonstrate simple drawing		3.1. Identify common welding symbols and bolted connections 3.2. Identify angles, plane figures and types of drawing 3.3. Identify first and third angle orthographic projections of isometric or oblique views. 3.4. Identify single plane sectional views of simple components. 3.5. Perform basic drafting 3.6. Read and interpret drawings

### Range Statement

As per the range of mathematics and drawing, students need to undertake the following.

- ✓ Use calculations to solve simple workshop problems.

- ✓ Make sketches of simple first and third angle orthographic projections from actual objects and pictorial views.
- ✓ Make sketches of simple sectional views.
- ✓ Develop patterns of three-dimensional figures and their frustums between parallel planes.
- ✓ Construct plane figures from given data

**Tools, equipment and materials required may include:**

Tools, equipment and materials used for this unit may include but not limited to the following.

- ✓ Calculator
- ✓ Drawing tools
- ✓ Drawing table
- ✓ Note pads
- ✓ Pens/pencils

**ASSESSMENT GUIDE**

**Forms of assessment**

Assessment for the unit needs to be continuous and holistic and must include real or simulated workplace activities.

**Critical aspects (for assessment)**

It is essential that competence is fully observed and there is ability to transfer competence to changing circumstances and to respond to unusual situations in the critical aspects of mathematics and drawing. This unit may be assessed in conjunction with all and units which form part of the normal job role.

**Assessment conditions**

It is preferable that assessment reflects a process rather than an event and occurs over a period of time to cover varying circumstances.

**UNDERPINNING KNOWLEDGE AND SKILLS**

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>✓ Use calculations to solve simple workshop problems</li> <li>✓ Use mathematics in welding related mathematical problems in linear measurements</li> <li>✓ Apply geometric formulas to solve problems in welding</li> <li>✓ Describe orthographic projections and auxiliary and sectional views</li> <li>✓ Knowledge on isometric drawings of basic objects</li> <li>✓ Knowledge on dimensioned drawing of a simple object</li> </ul>	<ul style="list-style-type: none"> <li>✓ Perform simple workshop calculations</li> <li>✓ Solve welding related mathematical problems related to linear measurement</li> <li>✓ Solve problems involving geometric formulas</li> <li>✓ Draw orthographic projections and auxiliary and sectional views</li> <li>✓ Sketch isometric drawings of basic objects</li> <li>✓ Sketch a dimensioned drawing of a simple object</li> </ul>

<b>UNIT TITLE</b>	<b>Perform basic workshop practice</b>				
<b>DESCRIPTOR</b>	Students commencing a career in welding need to develop a good basic knowledge of mechanical fittings practices prior to proceeding to the development of welding knowledge and skills				
<b>CODE</b>	CONS01CR06V2/20	<b>LEVEL</b>	III	<b>CREDIT</b>	02

<b>ELEMENTS OF COMPETENCIES</b>	<b>PERFORMANCE CRITERIA</b>
1. Identify and explain functions tools used in welding workshop	1.1 Sketch and name tools used in the welding workshop 1.2 Explain functions of the identified tools and scope of their use
2. Identify and explain properties of various metals and their applications	2.1 Identify various metals used in welding 2.2 Undertake tests on identifying the metal 2.3 Interpret functions and properties of various metals 2.4 Explain welding techniques that may be used on different metals 2.5 Explain application of metals
3. Use measuring instruments properly	3.1 Identify names and functions of various measuring instruments used in welding workshop 3.2 Demonstrate use of various measuring instruments
4. Apply general and electrical safety related to welding	4.1 Apply general and electrical safety related to welding 4.2 Observe safe connection of welding plants to electrical networks
5. Perform basic workshop practices	5.1 Undertake marking out on metals 5.2 Perform metal cutting using hack-saw 5.3 Perform drilling holes on metal pieces 5.4 Perform filing on metal pieces

### Range Statement:

Work connected to this unit shall take place at a mechanical workshop with welding equipment installed.

Tools, equipment and material used

- ✓ Basic Workshop Tools
- ✓ Basic Measuring Instruments
- ✓ Electrical connection to welding equipment

## ASSESSMENT GUIDE

### Forms of assessment

Continuous/holistic assessment is suitable to assess the competencies of a welder with regard to this unit.

### Critical aspects (for assessment)

The assessment must confirm that the candidate is able to:

- ✓ Identify basic workshop tools
- ✓ Undertake basic workshop practices such as cutting, filing, hack sawing
- ✓ Perform electrical safety related to welding
- ✓ Identify metals and their applications,

### Assessment conditions

The candidate will have access to

- ✓ All tools, equipment, material, blue prints, sketches, workshop drawings and other documentation required.
- ✓ The candidate will have access to all welding tools and equipment including welding accessories

The candidate will be required to:

- ✓ Orally, or by other methods of communication, answer questions asked by the assessor.
- ✓ Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- ✓ Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, and that he/she possess the required underpinning knowledge.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"><li>✓ Basic workshop tools</li><li>✓ Basic measuring instruments</li><li>✓ Basic electrical safety</li><li>✓ Metals and their applications in engineering</li></ul>	<ul style="list-style-type: none"><li>✓ Proper use of tools</li><li>✓ Perform workshop practices</li><li>✓ Wear safety equipment</li><li>✓ Undertake electrical connection of welding plant with supervision.</li></ul>

UNIT TITLE      Apply safe welding practices					
DESCRIPTOR	This unit of competency defines the skills and knowledge required to identify risks associated with welding operations. The unit will prepare learners to perform welding operations using safe techniques and reduce or eliminate welding hazards.				
CODE	CONS01CR07V2/20	LEVEL	III	CREDIT	02

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Identify risks associated with welding	1.1 Obtain and interpret work-related safety information 1.2 Identify pollutants formed by welding processes 1.3 Identify occupational diseases and injuries that are associated with welding 1.4 Identify factors associated with increased risk 1.5 Identify exposure levels for pollutants 1.6 Identify risks and potential health effects associated with specific metals and gases in welding 1.7 Identify other hazards of welding
2. Reduce risks associated with welding	2.1 Use manual handling techniques 2.2 Implement procedures to control hazards and workplace safety procedures 2.3 Report workplace safety non-compliances in accordance with workplace procedures
3. Develop basic firefighting skills	3.1 Fundamental firefighting knowledge is developed 3.2 Identify and select firefighting equipment based on different class of fire 3.3 Undertake basic firefighting skills related to minor fire incidents
4. Develop basic first aid skills	4.1 Identify common equipment and materials 4.2 Develop knowledge about common incidents requiring first aid skills 4.3 Provide basic first aid skills

### Range Statement

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) need to be included during the delivery of the competency unit.

Safety practices while working in the workshop and include fire safety and safe lifting techniques and its preferred unit range be decided keeping the work environment across Maldivian workplaces.

### Tools, equipment and material used

This unit may include all the welding safety equipment and may include the following

1. Welding gloves
2. Helmet with eye protection
3. Welding jackets
4. Welding pants
5. Welding respirator
6. Ear muff or plugs
7. Welding work boots

## ASSESSMENT GUIDE

### Forms of assessment

Assessment for the unit needs to be continuous and holistic and must include real or simulated workplace activities.

### Critical aspects (for assessment)

It is essential that competence is fully observed and there is ability to transfer competence to changing circumstances and to respond to unusual situations in the critical aspects of welding safety.

Applying safe practices with others involved be given priority to ensure they are safe throughout the welding job or task.

### Assessment conditions

It is preferable that assessment reflects a process rather than an event and occurs over a period of time to cover varying circumstances.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>✓ Safe welding practices and procedures and use of personal protective equipment</li> <li>✓ characteristics and properties of common metals and welding materials</li> <li>✓ effect of gas and electrical welding operations on metals</li> <li>✓ effect of various treatments on a range of commonly used metals</li> <li>✓ work-related safety information</li> <li>✓ pollutants present as a result of welding activities</li> <li>✓ Hazards associated with welding processes and methods to minimize those hazards.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Follow and adhere to safe work instructions, and safe work practices</li> <li>✓ identifying risks and hazards associated with welding</li> <li>✓ implementing risk control measures and procedures, including using appropriate manual handling techniques and personal protective equipment</li> <li>✓ Reporting workplace non-compliances in accordance with safe workplace procedures.</li> </ul>



UNIT TITLE <b>Perform soldering and brazing</b>					
DESCRIPTOR	This unit covers the competencies required to perform soldering and brazing of ferrous and non-ferrous metals, using nonferrous solders and brazing alloys, while ensuring safe work practices in the use of material and equipment at all times.				
CODE	CONS01CR08V2/20	LEVEL	III	CREDIT	03

ELEMENTS OF COMPETENCIES		PERFORMANCE CRITERIA	
1. Prepare the job for Soldering / Brazing		1.1 Solderability of the parts to be joined ascertained	
		1.2 Material required for the job, selected according to specifications	
		1.3 Material cut, to required sizes for soldering/brazing	
2. Prepare the edges and surfaces to be joined		2.1 Soldering/Brazing joints/surfaces prepared according specification	
		2.2 Surfaces/edges de-rusted and cleaned thoroughly by sanding/filing /scraping/chemical applications	
		2.3	
3. Prepare for Soldering / Brazing		3.1 Suitable heating device selected, as appropriate for the job	
		3.2 Suitable solder / brazing alloys and flux selected to suit the metal to be joined	
		3.3 Flux applied on the surfaces to be joined	
		3.4 Parts to be soldered aligned and secured using suitable clamping devices	
4 Solder metal parts		4.1 Wetting process carried out to ease soldering	
		4.2 Soldering performed to the required specification	
		4.3 Soldered joint cleaned as necessary	
		4.4 Necessary repairs made to ensure the required quality	
5 Braze Metal parts		5.1 Wetting process carried out to ease brazing	
		5.2 Brazing performed to the required specification, and taking care of distortions	
		5.3 Brazed joint cleaned as necessary	
		5.4 Necessary repairs made to ensure the required quality	

### Range Statement

Work connected to this unit may take place in a welding/ training workshop or worksite. It shall include soldering/brazing of all kinds of metals using non-ferrous solders/ brazing alloys of various compositions.

**Tools, equipment and material used in this unit may include,**

- ✓ Measuring and marking out tools
- ✓ Hand tools
- ✓ Hand shears & bench shears
- ✓ Guillotine machine
- ✓ Pedestal grinder
- ✓ Gas cutting equipment including the profile cutter
- ✓ Sanding papers
- ✓ Safety gear and equipment
- ✓ Soldering iron
- ✓ Soldering torch

- ✓ Blow lamp
- ✓ Gas welding equipment
- ✓ Clamps and other clamping devices
- ✓ Ferrous and non-ferrous metals
- ✓ Soldering and brazing fluxes
- ✓ Different types solders and spelters (soldering brazing alloys)

## ASSESSMENT GUIDE

### Forms of assessment

A holistic assessment is suitable to assess the competencies of the welder with regard to this unit.

### Critical aspects (for assessment)

- ✓ Safety practices at all times. (Special caution when using fluorides fluxes and cadmium solders).
- ✓ Ensure the quality of the joint; avoid joints with excess solder, joints with no solder at all, joints with insufficient solder, and flux residue in the joint.

### Assessment conditions

The candidate will have access to:

- ✓ All tools, equipment, material and documentation required. The candidate will be permitted to refer to the following documents:
- ✓ Any relevant workplace procedures
- ✓ Any relevant product manufacturing specifications.
- ✓ Any relevant drawings, manuals, codes, standards and reference material. The candidate will be required to:
- ✓ Orally, or by other methods of communication, answer questions asked by the assessor.
- ✓ Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- ✓ Present evidence of credit for any off-job training related to this unit.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>✓ Difference between soldering and welding</li> <li>✓ Sort soldering/hard soldering process</li> <li>✓ Soldering and brazing alloys (Filler rods working temperatures and applications)</li> <li>✓ Type of soldering and brazing fluxes and their uses</li> <li>✓ Use and control of soldering/brazing Irons, Torches, blow lamps and Gas welding equipment</li> <li>✓ Soldering and brazing methods</li> <li>✓ Defects in soldered joints and corrections</li> <li>✓ Solderability of material</li> <li>✓ Safety precautions and procedures and the use of safety gear</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of soldering/brazing</li> <li>✓ Flame setting for brazing when using gas-welding equipment</li> <li>✓ Cleaning of workpieces for soldering/brazing</li> <li>✓ Wetting of work surface</li> <li>✓ Correct use of fluxes and soldering/brazing alloys</li> <li>✓ Protection from hazardous fumes</li> <li>✓ Detection of faults by visual means and their corrections</li> <li>✓ Cleaning and finishing of soldered/brazed work pieces</li> <li>✓ Follow safety procedures and handle safety gear</li> </ul>

UNIT TITLE	Perform basic oxy-acetylene welding in 1G-3G positions				
DESCRIPTOR	This Unit covers the competencies required for setting the welding equipment and to perform oxy-acetylene welding of steel while ensuring safe work practices in the use of material and equipment at all times				
CODE	CONS01CR09V2/20	LEVEL	III	CREDIT	03

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Cut material to required sizes	1.1 Material selected for the job according to specification 1.2 Measurements marked accurately on selected material according to drawings 1.3 Material cut according to measurements in drawing.
2. Prepare weld joints	2.1 Joint prepared according to specifications 2.2 Metal parts cleaned for welding
3. Arrange gas welding equipment	3.1. gas welding equipment set for safe operation 3.2. Suitable welding nozzle and gas pressure selected according to material thickness 3.3. Suitable welding rods and flux selected for the job as necessary
4. Tack weld the metal pieces	4.1 Parts aligned and secured for welding using clamps to suit specification 4.2 Work pieces tack welded in position
5. Weld steel plates in 1G and 3G positions by Oxy-Acetylene welding	5.1 Welding torch ignited and adjusted to get the required flame 5.2 Metal plates welded by manipulating the torch, with correct gap, feed, travel speed and angle using flux as necessary 5.3 Weld checked for continuity evenness, quality and completeness 5.4 Weld joint cleaned as required 5.5 Weld joint checked for defects visually 5.6 Any repairs to the welded joint made as necessary to ensure a quality weld

### Range Statement

Work connected to this unit may take place in a welding / training workshop or worksite. It will include all types of joints including building up.

### Tools, equipment and material

Tools, equipment and material used in this unit may include, but not limited to the following.

- ✓ Measuring and marking out tools
- ✓ Hand tools
- ✓ Hand shears & bench shears
- ✓ Guillotine machine
- ✓ Hand hack saw & power saw
- ✓ Pedestal grinder
  - Gas cutting equipment including the profile cutter
- ✓ Disc grinder
- ✓ Safety gear and equipment

- Welding tool kit (Holding devices, chipping hammer, Wire brushes)
- ✓ Oxygen and acetylene cylinders
- ✓ Gas welding equipment
- ✓ Mild steel plates (thickness up to 6mm)
- ✓ Fluxes

## ASSESSMENT GUIDE

### Forms of assessment

Continuous assessment/holistic assessment is suitable to assess the competencies of the welder with regard to this unit.

### Critical aspects (for assessment)

- ✓ Safe practice in all operations.
- ✓ Quality of welded joint - Correct bead formation, no lack of fusion, no pores and cracks, correct penetration, no burnt areas. Assessment condition

### Assessment conditions

- ✓ All tools, equipment, material and documentation required. The candidate will be permitted to refer to the following documents:
- ✓ Any relevant workplace procedures.
- ✓ Any relevant product manufacturing specifications.
- ✓ Any relevant drawings, manuals, codes, standards and reference material. The candidate will be required to:
- ✓ Orally, or by other methods of communication, answer questions asked by the assessor.
- ✓ Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- ✓ Present evidence of credit for any off-job training related to this unit

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>✓ Properties of material &amp; heat implications in welding</li> <li>✓ Gas welding process</li> <li>✓ Hazards in using gas for welding &amp; safety precautions</li> <li>✓ Nozzle sizes to suit different thickness of metal</li> <li>✓ Control of gas input with regulators</li> <li>✓ Selection and use of different fluxes for welding</li> <li>✓ Different welding techniques</li> <li>✓ Identification of welding gases</li> <li>✓ Welding symbols &amp; specifications according to standards</li> <li>✓ Visual tests testing</li> <li>✓ Follow safety procedures and handle welding positions</li> <li>✓ Types of joints and grooves</li> </ul>	<ul style="list-style-type: none"> <li>✓ Read and interprets sketches / drawings</li> <li>✓ Application of electric welding equipment for metal welding Clamping/Holding work pieces</li> <li>✓ Sequence of lighting the torch</li> <li>✓ Cleaning, &amp; finishing the weld</li> <li>✓ Visual testing of welds and correction of defects</li> <li>✓ Manipulating welding torch with correct speed maintaining, correct angle, weaving speed, feed</li> <li>✓ Cleaning &amp; finishing the weld as required</li> <li>✓ Built up surfaces with gas welding safety gear</li> </ul>

<ul style="list-style-type: none"> <li>✓ Build up techniques</li> <li>✓ Weld defects and correction</li> <li>✓ Selection of filler rods</li> <li>✓ Methods of reducing warping and distortion</li> <li>✓ Stress relieving</li> <li>✓ Safety precautions and procedures and the use of safety gear</li> </ul>	
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UNIT TITLE      Perform basic oxy-acetylene and plasma cutting					
DESCRIPTOR	This unit covers the competencies required for the preparation of the material, oxy-acetylene and plasma equipment, and the cutting of steel by oxy-acetylene and plasma equipment. Safe work practices shall be followed at all times in the use of material and equipment.				
CODE	CONS01CR10V2/20	LEVEL	III	CREDIT	03

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Arrange gas welding equipment for cutting	1.1 Gas cutter set, assembled for cutting operations, considering all safety precautions and procedures 1.2 Suitable cutting nozzle and gas pressure selected, according to material thickness
2. Cut steel plates/bars/angles/ pipes by oxy acetylene / oxy fuel flame, manually	2.1 Material selected and cleaned as required for the job 2.1 Measurements marked accurately on selected material, according to drawings 2.2 Cutting torch ignited, and flame adjusted for cutting 2.3 Steel cut by manipulating the cutting torch with correct gap, travel speed and angle 2.4 Cut surface checked for evenness and required dimensions
3 Cut steel plate by plasma	3.1. Material selected and cleaned as required for the job 3.2. Set appropriate nozzle speed according to the plate thickness 3.3. Set the current of the plasma cutter 3.4. Plasma cutting machine operated to cut plates, considering all safety precautions and procedures 3.5. Cut surface checked for evenness and required dimensions

### Range Statement

Work connected to this unit may take place in a welding / training workshop or in a worksite

### Tools, equipment and material used in this unit may include,

- ✓ Measuring and marking out tools
- ✓ Hand tools
- ✓ Gas cutting equipment for manual cutting
- ✓ Safety gear and equipment
- ✓ Mild steel plates/ bars/ angles/ pipes etc.
- ✓ Oxygen and acetylene cylinders
- ✓ Liquefied petroleum Gas (LPG) cylinder
- ✓ Equipment related to cutting metal



## ASSESSMENT GUIDE

### Forms of assessment

Continuous assessment / holistic assessment is suitable to assess the competencies in the welder, with regard to this unit.

### Critical aspects (for assessment)

- ✓ Safety in all operations
- ✓ Measurements, evenness, of the cut
- ✓ No burnt areas, vertical drag lines, no deep draglines, no slag hanging on the kerf.

### Assessment conditions

The candidate shall have access to:

- ✓ All tools, equipment, material and documentation required.
- ✓ Any relevant workplace procedures.
- ✓ Any relevant product manufacturing specifications.
- ✓ Any relevant drawings, manuals, codes, standards and reference material. The candidate shall be required to:
- ✓ Orally, or by other methods of communication, answer questions asked by the assessor.
- ✓ Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- ✓ Present evidence of credit for any off-job training related to this unit.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"><li>✓ Reading &amp; interpretation of drawings</li><li>✓ Types of measuring and marking tools and their uses</li><li>✓ Use hand tools</li><li>✓ Properties of metals</li><li>✓ Safety procedures related to gas cutting.</li><li>✓ Gas and Plasma cutting process</li><li>✓ Nozzle sizes to suit different thickness of MS sheet</li><li>✓ Use and control of gas input, with regulators</li><li>✓ Set the appropriate electrical setting of plasma cutters</li><li>✓ Sequence of igniting gas cutting torch</li><li>✓ Types of flames and flame setting Standards and codes related to gas cutting</li><li>✓ Safety precautions and procedures and the use of safety gear</li></ul>	<ul style="list-style-type: none"><li>✓ Marking out procedures</li><li>✓ Care &amp; maintenance of tools &amp; equipment</li><li>✓ Use of hand tools</li><li>✓ Gas cutting techniques</li><li>✓ Plasma cutting techniques</li><li>✓ Interpretation of drawings</li><li>✓ Use of gas cutting machine for metal cutting purpose</li><li>✓ Ignite, cutting torch adjustment of flame, to suit the material thickness</li><li>✓ Gas cutting to get a smooth cut on the material as per requirement</li><li>✓ Use of equipment to cut metal using mechanical means</li><li>✓ Follow safety procedures and handle safety gear</li></ul>

<b>UNIT TITLE</b>	<b>Perform Manual Arc Welding on mild steel plates in 1F, 2F, 3F, 1G, 2G Positions</b>				
<b>DESCRIPTOR</b>	This unit covers the competencies required for setting the welding equipment and to perform manual arc welding of steel plates in 1F, 2F, 3F, 1G, 2G positions and build up, while ensuring safe work practices in the use of material and equipment at all times.				
<b>CODE</b>	CONS01CR11V2/20	<b>LEVEL</b>	III	<b>CREDIT</b>	05

<b>ELEMENTS OF COMPETENCIES</b>	<b>PERFORMANCE CRITERIA</b>
1. Cut material to required sizes	1.1 Material selected and measurements marked accurately on selected material, according to drawing / template 1.2 Material cut according to measurements in the drawing / template
2. Prepare weld joints	2.1 Material selected and measurements marked accurately on selected material, according to drawing / template 2.2 Material cut according to measurements in the drawing /template
3. Arrange arc welding equipment	3.1 AC or DC welding equipment selected and assembled for safe operation 3.2 Suitable welding electrodes selected as required for the job 3.3 Welding current, polarity selected, according to material, type of joint, position and welding electrode
4. Tack weld the metal pieces	4.1. Parts aligned and secured for welding, using clamps, to suite specifications 4.2. Work pieces' tack welded in positions 4.3. Back plates inserted where necessary
5. Weld steel plates, in 1F, 2F, 3F, 1G, 2G positions by manual arc welding	5.1 Arc strike and necessary adjustments made to suit the job 5.2 Metal plates welded in 1F, 2F, 3F, 1G, 2G, positions, by manipulating the electrode holder keeping correct arc gap, travel speed and angle 5.3 Deformations/distortions prevented/checked while welding is in progress and preventive / corrective actions taken as required 5.4 Weld, chipped and ground as necessary 5.5 Adequate runs of weld performed, to build up the required thickness of the bead 5.6 Weld, checked for continuity, evenness, quality and completeness 5.7 Edges of the welded seam cleaned and ground as

	<p>necessary</p> <p>5.8 Joint checked visually, to identify any weld defects</p> <p>5.9 Any repairs to the welded joint made, as necessary, to ensure quality weld</p>
6. Build up metal by manual arc	<p>6.1 Areas to be built up, identified and marked, and prepared</p> <p>6.2 Equipment, polarity, selected, and adjustments made to suit the requirements</p> <p>6.3 Metal built up by manipulating the electrode keeping correct arc gap, travel speed and angle</p> <p>6.4 Weld chipped/ground as necessary</p> <p>6.5 Adequate runs of weld performed as necessary, and deformations taken care of</p> <p>6.6 Weld checked for continuity, evenness, quality and completeness</p> <p>6.7 Welded metal cleaned, ground and metal edges levelled as necessary</p>

### Range Statement

Work connected to this unit may take place in a welding/ training workshop or worksite.

**Tools, equipment and material used in this unit may include,**

- ✓ Measuring and marking out tools
- ✓ Hand tools
- ✓ Hand shears & bench shears
- ✓ Guillotine machine
- ✓ Hand hack saw & power saw
- ✓ Pedestal grinder
- ✓ Gas cutting equipment including the profile cutter
- ✓ Grinder
- ✓ Safety gear and equipment
- ✓ Electric arc welding tool kit
- ✓ Clamps and other clamping devices
- ✓ Plates / bars / angles of mild steel
- ✓ Plate thickness from 6mm
- ✓ Electric arc welding electrodes for ordinary welding & to suit the material to be welded / built up
- ✓ Threaded pipe, rod for welding

## ASSESSMENT GUIDE

### Forms of assessment

Continuous assessment and / or holistic assessment are suitable to assess the competencies of the welder with regard to this unit.

### Critical aspects (for assessment)

- ✓ Safe practices in all operations.
- ✓ Quality of welded joint – correct bead formation, no lack of fusion no undercuts, no pores and cracks, no slag inclusions, end crater sufficiently filled up, correct penetration, no top bead depression.

### Assessment conditions

The candidate will have access to:

- ✓ All tools, equipment, material and documentation required.

The candidate will be permitted to refer to the following documents:

- ✓ Any relevant workplace procedures.
- ✓ Any relevant product and manufacturing specifications.
- ✓ Any relevant drawings, manuals, codes, standards and reference material.

The candidate will be required to:

- ✓ Orally, or by other methods of communication, answer questions asked by the assessor.
- ✓ Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- ✓ Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"><li>✓ Read and interpret engineering drawing</li><li>✓ Properties of material &amp; heat implications in welding</li><li>✓ Electric arc welding process</li><li>✓ Hazards in using electricity for welding &amp; its safety</li><li>✓ Electrode sizes to suit different type of welds, positions and purpose</li><li>✓ Techniques of prevention and correction of deformation / distortion</li><li>✓ Use &amp; control of welding current according to different types of welds, positions and purpose</li><li>✓ Types of welding electrodes and their specifications</li><li>✓ Principles of operation of welding rectifier, transformer and generator / converter</li><li>✓ Correct use of polarity in welding</li></ul>	<ul style="list-style-type: none"><li>✓ Ability to read and interpret an engineering drawing</li><li>✓ Application of electric welding equipment for manual metal welding purposes</li><li>✓ Adjustment of electric current to suit different types of electrodes, welds, positions and purpose</li><li>✓ Prevention and correction of deformation / distortion and the use of equipment</li><li>✓ Manipulation of the welding electrode, and welding with correct speed, arc length and angle according to weld positions</li><li>✓ Chipping and cleaning of welds using chipping hammer &amp; wire brush</li><li>✓ Grinding of welds using angle grinder</li><li>✓ Application of welding techniques to get a fine and even spread of ripples in weld, on the material required</li><li>✓ Visual testing of welds</li></ul>

<ul style="list-style-type: none"> <li>✓ Welding positions</li> <li>✓ Types of joints and grooves</li> <li>✓ Electric arc welding techniques</li> <li>✓ Welding with either AC or DC to suit the application</li> <li>✓ Welding symbols &amp; specifications according to standards</li> <li>✓ Weld defects and correction</li> <li>✓ Effect of arc blow and how to eliminate</li> <li>✓ Safety precautions and procedures and the use of safety gear.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Correction of weld defects</li> <li>✓ Building up and hard facing of metal with electric arc welding</li> <li>✓ Welding with AC and DC</li> <li>✓ Reduce effect of arc blow</li> <li>✓ Follow safety procedures and handle safety gear.</li> </ul>
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<b>UNIT TITLE      Perform Manual Arc Welding on mild steel plates 3G, 4G and 4F Positions</b>					
<b>DESCRIPTOR</b>	This unit covers the competencies required for setting the welding equipment and to perform manual arc welding of steel plates in 3G, 4G and 4F positions, while ensuring safe work practices in the use of material and equipment at all times.				
<b>CODE</b>	CONS01CR12V2/20	<b>LEVEL</b>	III	<b>CREDIT</b>	05

<b>ELEMENTS OF COMPETENCIES</b>	<b>PERFORMANCE CRITERIA</b>
1. Cut material to required sizes	1.1 Material required for the job selected and measurements marked accurately on selected material according to drawings / template 1.2 Read and interpreted drawings and marked measurements, accurately on material selected 1.3 Material cut according to measurements in the drawing/ template
2. Prepare edges	2.1 Prepared edges according to specifications 2.2 Metal parts cleaned and aligned for welding
3. Arrange arc welding equipment	3.1. AC or DC arc welding equipment selected and assembled for safe operation 3.2. Suitable welding electrodes selected for the job as required 3.3. Welding current, polarity selected according to material, type of joint, position and welding electrode
4. Tack weld the metal pieces	4.1. Parts aligned and secured for welding using clamps to suit specifications 4.2 Work piece's tack welded in positions 4.3. Back plates inserted where necessary
5. Weld steel plates, in positions 3G, 4G and 4F by manual arc welding	5.1 Arc struck and necessary adjustments made to suit the job 5.2 Metal plates weld in positions 3G, 4G and 4F by manipulating the electrode holder keeping correct arc gap, travel speed and angle 5.3 Deformations / distortions / prevented / checked while welding is in progress and preventive /corrective 5.4 Weld chipped and ground as necessary 5.5 Adequate runs of weld performed according to the type of weld joint 5.6 Weld checked for continuity, evenness, quality and completeness 5.7 Edges of the welded seam, cleaned and ground as necessary 5.8 Joint checked visually to identify any weld defects 5.9 Any repairs to the welded joint made as necessary to ensure quality

## **Range Statement**

Work connected to this unit may take place in a welding/ training workshop or worksite. It will include all types of joints and positions including building up and hard facing.

### **Tools, equipment and material used in this unit may include,**

- ✓ Measuring and marking out tools
- ✓ Hand tools
- ✓ Hand shears & bench shears
- ✓ Guillotine machine
- ✓ Hand hack saw & power saw
- ✓ Hand drill, pillar drill, and pedestal grinder
- ✓ Gas cutting equipment including the profile cutter
- ✓ Disc grinder
- ✓ Safety gear and equipment
- ✓ Electric arc welding tool kit
- ✓ Portable grinder with accessories
- ✓ Clamps and other clamping devices
- ✓ Plates / bars / angles / pipes of mild steel, stainless steel, carbon steel, cast iron
- ✓ Plate thickness of approximately 6 mm
- ✓ Electric arc welding electrodes for ordinary welding & hard facing to suit the material to be welded / built up

## **ASSESSMENT GUIDE**

### **Forms of assessment**

Continuous assessment is suitable to assess the competencies of the welder with regard to this unit.

### **Critical aspects (for assessment)**

- ✓ Safe practices in all operations.
- ✓ Quality of welded joint – correct bead formation, no lack of fusion no undercuts, no pores and cracks, no slag inclusions, end crater sufficiently filled up, correct penetration, no top bead depression.

### **Assessment conditions**

The candidate will have access to:

- ✓ All tools, equipment, material and documentation required.

The candidate will be permitted to refer to the following documents:

- ✓ Any relevant workplace procedures.
- ✓ Any relevant product manufacturing specifications.
- ✓ Any relevant drawings, manuals, codes, standards and reference material.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>✓ Properties of materials &amp; heat implications in welding</li> <li>✓ Electric arc welding process</li> <li>✓ Hazards in using electricity for welding&amp; its safety</li> <li>✓ Electrode sizes to suit different type of welds, positions and purpose</li> <li>✓ Use &amp; control of welding current according to different types of welds, positions and purpose</li> <li>✓ Types of welding electrodes and their specifications</li> <li>✓ Principles of operation of welding rectifier, transformer and generator /converter</li> <li>✓ Correct use of polarity in welding</li> <li>✓ Techniques of prevention and correction of deformation/distortion</li> <li>✓ Welding positions</li> <li>✓ Types of joints and grooves</li> <li>✓ Electric arc welding techniques</li> <li>✓ Welding with either AC or DC to suit the application</li> <li>✓ Welding symbols &amp; specifications according to standards</li> <li>✓ Weld defects and correction</li> <li>✓ Knowledge on Engineering Drawing including projections &amp; pattern development</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of electric welding equipment for manual metal welding purposes</li> <li>✓ Adjustment of electric current to suit different types of electrodes, welds, positions and purpose</li> <li>✓ Manipulation of the welding electrode, and welding with correct speed, arclength and angle according to weld positions</li> <li>✓ Chipping and cleaning of welds using chipping hammer &amp; wire brush</li> <li>✓ Grinding of welds using angle grinder</li> <li>✓ Prevention and correction of deformation/distortion and the use of equipment</li> <li>✓ Application of welding techniques to get a fine and even spread of ripples in weld, on the material</li> <li>✓ Cleaning&amp; finishing the weld as required</li> <li>✓ Visual testing of welds</li> <li>✓ Correction of weld defects</li> <li>✓ Ability to read an engineering drawing including               <ul style="list-style-type: none"> <li>✓ it's projections &amp; pattern development</li> </ul> </li> <li>✓ Welding with AC and DC</li> <li>✓ Follow safety procedures and handle safety gear</li> </ul>



<b>UNIT TITLE      Perform pipe bending, grinding, sanding and metal polishing</b>					
<b>DESCRIPTOR</b>	This unit covers the competencies required for performing pipe bending, grinding of welded joints and sanding and metal polishing of welded surfaces related to pipe and other welding tasks.				
<b>CODE</b>	CONS01CR13V2/20	<b>LEVEL</b>	III	<b>CREDIT</b>	03

<b>ELEMENTS OF COMPETENCIES</b>	<b>PERFORMANCE CRITERIA</b>
1.Undertake bending of pipes	1.1 Read the drawing provided for the bending assignment 1.2 Learnt to operate the bending equipment 1.3 Clamp and fix the tube to bent 1.4 Perform bending 1.5 Check the bend against the given drawing
2.Perform grinding of welded joints	2.1 Proper safety gears are worn prior to commencement of grinding 2.2 Proper grinding wheels and equipment selected 2.3 Undertake grinding of the welded joints
3.Perform sanding and metal polishing of welded joints	3.1 Proper safety gears related to sanding and polishing is worn 3.2 Proper sanding and metal polishing materials identified and selected 3.3 Proper sanding and metal polishing techniques learnt 3.4 Undertake sanding and metal polishing till proper finishing status is attained

### Range Statement

Work connected to this unit may take place in a welding/ training workshop or worksite. It will include bending of steel pipes, grinding of welded joints and sanding and metal polishing of welded joints.

**Tools, equipment and material used in this unit may include,**

- ✓ Mechanical Pipe bender
- ✓ Grinder and wheels
- ✓ Sanding equipment and
- ✓ Different metal polish for different finishes

## ASSESSMENT GUIDE

### Forms of assessment

Continuous assessment is suitable to assess the competencies of the welder with regard to this unit.

### Critical aspects (for assessment)

- ✓ Safe practices in all operations.
- ✓ Quality of polish related to various welding jobs – appropriate grinding, sanding and metal polishing techniques

### Assessment conditions

The candidate will have access to:

- ✓ All tools, equipment, material and documentation required.

The candidate will be permitted to refer to the following documents:

- ✓ Any relevant workplace procedures.
- ✓ Any relevant product manufacturing specifications.
- ✓ Any relevant drawings, manuals, codes, standards and reference material.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"><li>✓ Procedures related to bending steel pipes</li><li>✓ Techniques on performing various beds</li><li>✓ Safe and effective grinding knowledge of welded joints</li><li>✓ Proper use of sanding materials and</li><li>✓ Sanding techniques</li><li>✓ Different metal polishes and their applications</li><li>✓ Metal polishing techniques</li></ul>	<ul style="list-style-type: none"><li>✓ Undertake bending of steel pipes</li><li>✓ Undertake grinding of welded joints</li><li>✓ Undertake sanding</li><li>✓ Selection of proper metal polish</li><li>✓ Undertake metal polishing</li></ul>

<b>UNIT TITLE</b>	<b>Perform welding of Mild Steel Pipes by Manual Arc Welding in All Positions</b>				
<b>DESCRIPTOR</b>	This unit covers the competencies required for setting the welding equipment and to perform manual arc welding of steel pipes in all positions, while ensuring safe work practices in the use of material and equipment at all times.				
<b>CODE</b>	CONS01CR14V2/20	<b>LEVEL</b>	III	<b>CREDIT</b>	03

<b>ELEMENTS OF COMPETENCIES</b>	<b>PERFORMANCE CRITERIA</b>
1. Cut material to required sizes	1.1 Material selected as required for the job according to specifications 1.2 Measurements marked accurately on selected material according to drawings 1.3 Material cut according to measurements in the drawing
2. Prepare weld joint	2.1 Edges prepared according to specifications 2.2 Prepared metal parts cleaned aligned and secured as required for welding
3. Arrange arc welding equipment	3.1 AC or DC arc welding equipment selected and assembled for safe operation 3.2 Suitable welding electrodes selected for the job as per specifications 3.3 Selected suitable welding current, according to material, type of joint, position and welding electrode
4. Tack weld the metal pieces	4.1 Parts secured for welding using clamps and other devices 4.2 Work pieces aligned and tack welded to suit specifications
5. Weld steel Pipes, in all positions 3G and 4G by manual arc welding	5.1 Arc struck and necessary adjustments made to suit the job 5.2 Steel pipes welded in all positions by manipulating the holder keeping correct arc gap, travel speed and angle 5.3 Weld, chipped and ground as necessary 5.4 Adequate runs of weld performed according to the type of weld joint, taking care of deformations 5.5 The weld checked for continuity, evenness, quality and completeness 5.6 Edges of the welded seam cleaned, ground, and levelled as necessary 5.7 Visual check performed to identify any weld defects according to the requirements 5.8 Any repairs to the welded joint made as necessary to ensure an even weld and penetration according to required quality

### **Range Statement**

Work connected to this unit may take place in a welding/ training workshop or worksite. It will include all types of joints and positions, as applicable.

Tools, equipment and material used in this unit may include,

- ✓ Measuring and marking out tools
- ✓ Hand tools
- ✓ Hand hack saw & power saw
- ✓ Pedestal grinder
- ✓ Gas cutting equipment
- ✓ Angle grinder
- ✓ Safety gear and equipment
- ✓ Electric arc welding tool kit
- ✓ Clamps and other clamping devices
- ✓ Steel pipes
- ✓ Electric arc welding electrodes to suit the material to be welded

## **ASSESSMENT GUIDE**

### **Forms of assessment**

Continuous assessment or holistic assessment is suitable to assess the competencies of the welder in this unit.

### **Critical aspects (for assessment)**

- ✓ Safe practices in all operations.
- ✓ Quality of welded joint – correct bead formation, no lack of fusion no undercuts, no pores and cracks, no slag inclusions, end crater sufficiently filled up, correct penetration, no top bead depression.

### **Assessment conditions**

The candidate shall have access to:

- ✓ All tools, equipment, material and documentation required. The candidate shall be permitted to refer to the following documents:
- ✓ Any relevant workplace procedures.
- ✓ Any relevant product manufacturing specifications.
- ✓ Any relevant drawings, manuals, codes, standards and reference material. The candidate shall be required to:
- ✓ Orally, or by other methods of communication, answer questions asked by the assessor.
- ✓ Identify superiors who can be approached for the collection of competency evidence where appropriate.
- ✓ Present evidence of credit for any off-job training related to this unit.
- ✓ Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>✓ Properties of material &amp; heat implications in welding</li> <li>✓ Electric arc welding process</li> <li>✓ Hazards in using electricity for welding &amp; its safety</li> <li>✓ Electrode sizes to suit different type of welds, positions and purpose</li> <li>✓ Use &amp; control of welding current according to different types of welds, positions and purpose</li> <li>✓ Types of welding electrodes and their specifications</li> <li>✓ Principles of operation of welding rectifier, transformer and generator / converter</li> <li>✓ Correct use of polarity in welding</li> <li>✓ Welding positions</li> <li>✓ Types of weld joints and grooves applicable to pipes</li> <li>✓ Electric arc welding techniques</li> <li>✓ Welding with either AC or DC to suit the application</li> <li>✓ Welding symbols specifications according to standards</li> <li>✓ Weld defects and correction</li> <li>✓ Destructive and non-destructive testing of welds</li> <li>✓ Knowledge on Engineering Drawing including projections &amp; pattern development</li> <li>✓ Types of pipe joints and applications</li> <li>✓ Making simple templates</li> <li>✓ Standards and codes on pipe welds</li> <li>✓ Safety precautions and procedures and the use of safety gear</li> </ul>	<ul style="list-style-type: none"> <li>✓ Application of electric welding equipment for manual metal welding purposes</li> <li>✓ Adjustment of electric current to suit different types of electrodes, welds, positions and purpose</li> <li>✓ Manipulation of the welding electrode, and welding with correct speed, arc length and angle according to weld positions</li> <li>✓ Chipping and cleaning of welds using chipping hammer &amp; wire brush</li> <li>✓ Grinding of welds using angle grinder</li> <li>✓ Application of welding techniques to get a fine and even spread of ripples in weld, on the material</li> <li>✓ Cleaning &amp; finishing the weld as required</li> <li>✓ Visual testing of welds</li> <li>✓ Correction of weld defects</li> <li>✓ Ability to read and interpret an engineering drawing including its projections &amp; pattern development</li> <li>✓ Welding with AC and DC</li> <li>✓ Follow safety procedures and handle safety gear</li> </ul>

UNIT TITLE      Perform welding of Stainless-Steel Plates on Pipes in Flat Positions					
DESCRIPTOR	This unit covers the competencies required for setting the welding equipment and to perform manual arc welding of stainless-steel plates in all positions, while ensuring safe work practices in the use of material and equipment at all times.				
CODE	CONS01CR15V2/20	LEVEL	III	CREDIT	03

ELEMENTS OF COMPETENCIES		PERFORMANCE CRITERIA
1. Cut material to required sizes		1.1. Material selected and measurements marked accurately on selected material, according to drawings/templates 1.2. Material cut according to measurements in the drawing/template
2. Prepare weld joints		2.1. Joints prepared according to specifications 2.2. Metal parts cleaned for welding as necessary
3. Prepare equipment		3.1. Parts aligned and secured for welding, using clamps to suit specifications 3.2. Work pieces' tack welded in positions 3.3. Back plates inserted where necessary
4. Tack weld the metal pieces		4.1. Parts aligned and secured for welding, using clamps to suit specifications 4.2. Work piece's tack welded in positions 4.3. Back plates inserted where necessary
5. Weld stainless steel plates on pipes in flat positions using available welding types		5.1. Arc strike and necessary adjustments made to suit the job 5.2. Metal plates on pipes welded in flat positions by manipulating the electrode holder keeping correct arc gap, travel speed and angle 5.3. Deformations / distortions prevented or checked while welding is in progress and preventive / corrective action taken as required 5.4. Weld, chipped and ground as necessary 5.5. Adequate runs of weld performed to build up the required thickness of the bead 5.6. Weld, checked for continuity, evenness, quality and completeness 5.7. Edges of the welded seam cleaned and ground as necessary 5.8. Joint checked visually to identify any weld defects 5.9. Any repairs to the welded joint made, as necessary, to ensure quality weld

**Range Statement:**

Work connected to this unit may take place in a welding/ training workshop or worksite. It includes all types of joints and positions.

**Tools, equipment and material used in this unit may include,**

- ✓ Measuring and marking out tools
- ✓ Hand tools
- ✓ Hand shears & bench shears
- ✓ Guillotine machine
- ✓ Hand hack saw & power saw
- ✓ Pedestal grinder
- ✓ Gas cutting equipment including the profile cutter
- ✓ Grinder
- ✓ Safety gear and equipment
- ✓ Electric arc welding tool kit
- ✓ Clamps and other clamping devices
- ✓ Plates /sheets of stainless steel
- ✓ Electric arc welding electrodes for welding stainless steel

Work shall be performed to drawings, sketches, specifications and instructions as appropriate and to predetermined standards of quality and safety, and adhering to relevant environmental regulations.

Welded joints shall be finished as required by the job specification

**ASSESSMENT GUIDE****Forms of assessment**

Continuous and / or holistic assessment is suitable to assess the competencies in this unit.

**Critical aspects (for assessment)**

- ✓ Safe practices in all operations.
- ✓ Quality of welded joint – correct bead formation, no lack of fusion, no undercuts, no pores and cracks, no slag inclusions, end crater sufficiently filled up, correct penetration, no top bead depression.

**Assessment conditions**

The candidate will have access to:

- ✓ All tools, equipment, material and documentation required. The candidate will be permitted to refer to the following documents:
- ✓ Any relevant workplace procedures.
- ✓ Any relevant product manufacturing specifications.
- ✓ Any relevant drawings, manuals, codes, standards and reference material. The candidate will be required to:
- ✓ Orally, or by other methods of communication, answer questions asked by the assessor.
- ✓ Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- ✓ Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria and that he/she possesses the required underpinning knowledge.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>✓ Engineering drawing including</li> <li>✓ projection and pattern development</li> <li>✓ Properties of stainless steel &amp; heat</li> <li>✓ implications in welding</li> <li>✓ Electric arc welding process for welding</li> <li>✓ stainless steel</li> <li>✓ Hazards in using electricity for welding &amp; its safety</li> <li>✓ Electrode sizes to suit different type of welds, positions</li> <li>✓ Use &amp; control of welding current according to different types of welds, positions and purpose</li> <li>✓ Types of welding electrodes for welding stainless steel and their specifications</li> <li>✓ Principles of operation of welding rectifier, transformer and generator / converter</li> <li>✓ Correct use of polarity in welding</li> <li>✓ Classification of welding positions</li> <li>✓ Types of joints and grooves</li> <li>✓ Electric arc welding techniques for welding stainless steel</li> <li>✓ Welding with either AC or DC to suit the application.</li> <li>✓ Welding symbol &amp; specifications according to standards</li> <li>✓ Weld defects and correction safety gear</li> <li>✓ Destructive and nondestructive testing of welds</li> <li>✓ Effect of arc blow and how to eliminate</li> </ul>	<ul style="list-style-type: none"> <li>✓ Ability to read and interpret an engineering drawing</li> <li>✓ Application of manual metal arc welding to weld stainless steel</li> <li>✓ Adjustment of electric current to suit different types of electrodes, welds, positions and purpose</li> <li>✓ Manipulation of the welding electrode,</li> <li>✓ and welding with correct speed, arc length and angle according to weld positions</li> <li>✓ Chipping and cleaning of welds using chipping hammer &amp; wire brush</li> <li>✓ Grinding of welds using angle grinder</li> <li>✓ Application of welding techniques to get a fine and even spread of ripples, in weld on the material</li> <li>✓ Cleaning &amp; finishing the weld as require</li> <li>✓ Visual testing of welds</li> <li>✓ Correction of weld defects</li> <li>✓ Welding with AC and DC</li> <li>✓ Reduce effect of arc blow</li> <li>✓ Prevention and correction of deformation or distortion and the use of equipment.</li> <li>✓ Follow safety procedures and handle</li> <li>✓ safety gear</li> </ul>



<b>UNIT TITLE</b>	<b>Plan and Prepare Estimates for Welding</b>				
<b>DESCRIPTOR</b>	This unit covers the competencies required to plan and prepare estimates for Oxy- acetylene welding, manual arc welding, spot welding, soldering and brazing and cutting metal by Oxy-acetylene / Oxy-fuel flame.				
<b>CODE</b>	CONS01CR16V2/20	<b>LEVEL</b>	III	<b>CREDIT</b>	02

<b>ELEMENTS OF COMPETENCIES</b>	<b>PERFORMANCE CRITERIA</b>
1. Determine customer requirements	1.1. Data required for welding job, collected from the models, sketches or drawings supplied, or by visiting the client's sites (free hand drawing with isometric drawing) 1.2. Purpose & type of the welding and material required, determined by interpreting sketches/drawings/ models supplied by customer/client 1.3. Conceptual drawings, work plan, for the job prepared, briefed to client & approval for the production obtained
2. Develop a sketch and prepare estimates for the fabrication	2.1. Sketches /drawings prepared with available data 2.2. Accessories, and other fixtures / components listed as required for the welding of the job listed 2.3. Machinery & tools required for the welding job listed 2.4. Material quantified and cost estimated including added percentage for wastage 2.5. Welding time estimated considering worksite conditions and welding hours & charges for welding of individual components of the job calculated 2.6. Complete estimate for the welding prepared, by adding full cost of production, cost for transport & logistics, inclusive of overheads and profit, according to company policy
3. Prepare work plan & obtain clients approval to commence work	3.1. Work plans/flowcharts for the welding each item of the prepared & due dates for completion estimated 3.2. Cost of entire welding job & the due date of delivery/handing over informed to the client 3.3. Approval to commence the welding job obtained from the client, by submitting drawings, cost estimate & other relevant information and by negotiating & agreeing to deliver on targets.

## **Range Statement:**

Work connected to this unit shall take place at a company office or construction work sites.

### **Tools, equipment and material used in this unit may include,**

- ✓ Measuring and marking out tools
- ✓ Free hand Drawing (Isometric drawing)
- ✓ Drawing instruments
- ✓ Drawing paper
- ✓ Flow chart paper
- ✓ Ancillary handling tools
- ✓ Models
- ✓ Specimen forms
- ✓ Safety gear

## **ASSESSMENT GUIDE**

### **Forms of assessment**

Continuous/holistic assessment is suitable to assess the competencies of a welder with regard to this unit.

### **Critical aspects (for assessment)**

The assessment must confirm that the candidate is able to:

- ✓ Gather information from client
- ✓ Interpret drawings/sketches
- ✓ Calculate costs
- ✓ Calculate welding times

### **Assessment conditions**

The candidate will have access to

- ✓ All tools, equipment, material, blue prints, sketches, workshop drawings and other documentation required.
- ✓ The candidate will be permitted to refer to the following documents:
- ✓ Relevant work place procedures
- ✓ Relevant products manufacturer's information
- ✓ Relevant drawings, manuals, codes, standards & reference material

The candidate will be required to:

- ✓ Orally, or by other methods of communication, answer questions asked by the assessor.
- ✓ Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- ✓ Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, and that he/she possess the required underpinning knowledge.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> <li>✓ Properties of steel</li> <li>✓ Specification on commonly used steel sections</li> <li>✓ Types of semi-finished metal products like L, U channels &amp; their current market price</li> <li>✓ Producers to be followed when making estimates, standard components of estimates, standard methods of calculating labors overhead-cost etc.</li> <li>✓ Methods of communication as practiced at workshop /construction sites/fabrication yard</li> <li>✓ Reading and interpretation of plans and related knowledge of symbols in metal fabrication / welding drawings</li> <li>✓ Safely precautions when working on platforms scaffolding and at heights</li> <li>✓ Customer handling techniques</li> <li>✓ Tools, equipment, machinery and material used for welding</li> <li>✓ Measuring tools and taking measurements</li> <li>✓ Methods of preparing work plans</li> <li>✓ Knowledge of safety gear</li> </ul>	<ul style="list-style-type: none"> <li>✓ Interpret blueprints /sketches/engineering drawing to determine scope of metal fabrication and the skills in developing an idea from details available with clients or model</li> <li>✓ Measuring of intricate shapes</li> <li>✓ Drawing sketches and assembly drawings of the components</li> <li>✓ Measurements &amp; marketing out</li> <li>✓ Safe working at heights and adherence</li> </ul>

<b>UNIT TITLE     Apply basic TIG and cast-iron welding skills</b>					
<b>DESCRIPTOR</b>	This unit provided introductory skills development to advance welding practices such as TIG welding and Cast-iron welding techniques.				
<b>CODE</b>	CONS01CR17V2/20	<b>LEVEL</b>	III	<b>CREDIT</b>	03

<b>ELEMENTS OF COMPETENCIES</b>	<b>PERFORMANCE CRITERIA</b>
1. Plan and prepare to weld	1.1 Hazards associated with the work are identified and risks are managed 1.2 Tools and equipment are selected and checked for serviceability 1.3 Work area is prepared and work is planned to carry out TIG and Cast-iron welding
2. Weld materials using TIG welder	2.1 TIG welding equipment is prepared, set up and adjusted for specific welding job requirement 2.2 TIG welding equipment is used according to manufacturer operating procedures and safety and environmental requirements 2.3 Weld test runs are conducted according to workplace instructions and weld specifications 2.4 Materials are welded using standard or inverter TIG process to industry standards
3.Undertake cast-iron welding	3.1 Arc welding equipment is prepared, set up and adjusted for specific welding job requirement 3.2 Preparation activities prior to welding is performed 3.3 Undertake welding of cast-iron according to manufacturer operating procedures and safety and environmental requirements 3.4 Weld areas checked for quality of the weld

### **Range Statement**

Work connected to this unit shall take place at a company office or construction work sites.

### **Tools, equipment and material used**

- ✓ Welding tools
- ✓ Arc welding equipment and accessories
- ✓ TIG welding equipment and accessories
- ✓ Accessories to undertake cast-iron welding

## ASSESSMENT GUIDE

### Forms of assessment

Continuous/holistic assessment is suitable to assess the competencies of a welder with regard to this unit.

### Critical aspects (for assessment)

The assessment must confirm that the candidate is able to:

- ✓ Gather information from client
- ✓ Undertake basic TIG welding tasks
- ✓ Undertake welding of simple cast-iron welding job

### Assessment conditions

The candidate will have access to

- ✓ All tools, equipment, material, blue prints, sketches, workshop drawings and other documentation required.
- ✓ The candidate will have access to TIG welding equipment and accessories
- ✓ Accessories to undertake welding of cast-iron
- ✓ Arc-welding equipment and accessories

The candidate will be required to:

- ✓ Orally, or by other methods of communication, answer questions asked by the assessor.
- ✓ Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- ✓ Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, and that he/she possess the required underpinning knowledge.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"><li>✓ Procedures related to welding</li><li>✓ Fundamentals of TIG welding</li><li>✓ Types of cast-iron and their welding techniques</li><li>✓ Good practice and procedures for undertaking of cast-iron welding</li></ul>	<ul style="list-style-type: none"><li>✓ Following workplace procedures accordingly</li><li>✓ Wear safety equipment</li><li>✓ Undertake TIG welding</li><li>✓ Undertake welding of cast-iron using manual arc welding</li><li>✓ Inspect welded joint for quality</li></ul>

UNIT TITLE Undertake welding project using flat bars and pipes					
DESCRIPTOR	This unit provided opportunity to apply welding skills learnt in the program in making a welding project				
CODE	CONS01CR18V2/20	LEVEL	III	CREDIT	05

ELEMENTS OF COMPETENCIES	PERFORMANCE CRITERIA
1. Undertake designing of a Welding Project using flat bars, pipes and thin sheet	1.1 Sketch a commonly used household welding product 1.2 Consult with instructor and gain approval for the design
2. Plan, prepare, estimate and procure materials	2.1 Breakdown the tasks and plan the work 2.2 Prepare list of materials 2.3 Determine cost of making the projects 2.4 Consult with the instructor on the plan and the costs
3. Fabricate Welding Project to the developed design and measurements	3.1 Product making commenced as per the plan 3.2 Undertake proper safety techniques 3.3 Prepare the product using the design and the measurements

### Range Statement

Work connected to this unit shall take place at a company office or construction work sites.

### Tools, equipment and material used

- ✓ Welding tools
- ✓ Arc welding equipment and accessories
- ✓ TIG welding equipment and accessories
- ✓ Accessories to undertake cast-iron welding

## ASSESSMENT GUIDE

### Forms of assessment

Continuous/holistic assessment is suitable to assess the competencies of a welder with regard to this unit.

### Critical aspects (for assessment)

The assessment must confirm that the candidate is able to:

- ✓ Compile, design and detail a project
- ✓ Apply safety throughout the project
- ✓ Apply welding techniques to fabricate the project
- ✓ Perform welding skills to develop the project

### Assessment conditions

The candidate will have access to

- ✓ All tools, equipment, material, blue prints, sketches, workshop drawings and other documentation required.
- ✓ The candidate will have access to welding equipment and accessories

The candidate will be required to:

- ✓ Orally, or by other methods of communication, answer questions asked by the assessor.
- ✓ Identify superiors who can be approached for the collection of competency evidence, where appropriate.
- ✓ Present evidence of credit for any off-job training related to this unit.

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, and that he/she possess the required underpinning knowledge.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"><li>✓ Product design</li><li>✓ Refresh plans, estimates and prepare materials lists</li><li>✓ Apply safety throughout the assignment</li></ul>	<ul style="list-style-type: none"><li>✓ Following workplace procedures accordingly</li><li>✓ Wear safety equipment</li><li>✓ Undertake welding</li><li>✓ Evaluate finished product</li></ul>

<b>UNIT TITLE</b>	<b>Apply basic sheet-metal fabrication skills</b>				
<b>DESCRIPTOR</b>	This unit deals with the skills and knowledge required to undertake marking out and development, familiarization with tools and equipment used for metal fabrication, familiarization with fabrication processes such as cutting, bending, forming, joining and finishing processes and undertake fabrication projects using welding and non-welding techniques of joining				
<b>CODE</b>	CONS01CR19V2/20	<b>LEVEL</b>	III	<b>CREDIT</b>	03

<b>ELEMENTS OF COMPETENCIES</b>	<b>PERFORMANCE CRITERIA</b>
1. Mark out and develop sheet metal work	1.1 Appropriate development method and material is chosen and applied in accordance with the work plan 1.2 Datum points are established to ensure efficient use of materials in accordance with the work plan 1.3 Marking out/development is performed within established tolerances and in accordance with the work plan 1.4 Marking out and development is checked to ensure compliance with specifications and the work plan
2. Practice usage of sheet metal fabrication tools and equipment	2.1 Sheet metal tools and equipment is identified 2.2 Apply safe and effective use of sheet metal fabrication tools and equipment 2.3 Practice use of sheet metal fabrication tools and equipment.
3. Practice cutting, bending, forming, joining and finishing processes	3.1 Undertake proper cutting, bending, forming and joining of sheet metals 3.2 Practice sheet metal fabrication process on different sheet metal materials
4. Fabricate Sheet metal projects with mechanical and welding joining processes	4.1 Perform fabrication of Sheetmetal job that involves joining with mechanical processes such folding / tab joints, riveting, self-clinching. 4.2 Perform fabrication of Sheetmetal job that involves joining with various welding techniques.

### Range Statement

Work connected to this unit may take place in a welding/ training workshop or worksite with tools and equipment for performing metal fabrication jobs or tasks and may include the following.

- ✓ Sheet metal work may include, to a range of up to 3mm, fabrication of cladding, protective covers, cabinets, boxes and ducting.
- ✓ Developments may include hoppers, chutes, conical and spherical shapes and spirals.
- ✓ Fabrication methods may include cutting, bending, rolling, beading, soldering and welding.

### Tools, equipment and material used in this unit may include,

- ✓ All the relevant tools and equipment to undertake fabrication of simple sheet metal job



## ASSESSMENT GUIDE

### Forms of assessment

Continuous assessment is suitable to assess the competencies related performing Sheetmetal jobs or tasks like other competency units of Welding Techniques program.

### Critical aspects (for assessment)

Evidence for competence in this unit shall be considered holistically and need to focus on the following.

- ✓ Preparation and planning of work
- ✓ Layout, marking off/out and developing techniques and procedures
- ✓ Metal fabrication techniques such proper cutting, bending, forming and joining of sheet metals such as folding / tab joints, riveting, self-clinching
- ✓ Relevant standards and procedures
- ✓ Completion of work procedures

### Assessment conditions

The candidate will have access to:

- ✓ All tools, equipment, material and documentation needed to successfully implement the competency unit.

## UNDERPINNING KNOWLEDGE AND SKILLS

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
Knowledge to be developed: <ul style="list-style-type: none"><li>✓ Theoretical knowledge related to relevant plant and equipment, its location</li><li>✓ Fundamentals of Technical drawings</li><li>✓ Knowledge on hazardous materials and their handling</li><li>✓ Proper knowledge related to marking off/out and development methods</li><li>✓ Proper use of hand and portable power tools</li><li>✓ Knowledge related to basic metallurgy</li><li>✓ Knowledge on the use of sheet metal working machinery</li><li>✓ Knowledge related to different fabrication techniques</li></ul>	Skills to be developed: <ul style="list-style-type: none"><li>✓ Relevant plant and equipment, its location</li><li>✓ Technical drawings and manufacturers manuals</li><li>✓ Hazardous materials and their handling</li><li>✓ Marking off/out and development methods</li><li>✓ Hand and portable power tools</li><li>✓ Basic metallurgy</li><li>✓ Sheet metal working machinery</li><li>✓ Fabrication techniques</li><li>✓ Soldering and welding</li><li>✓ Geometric concepts</li><li>✓ Engineering principles</li><li>✓ Installation techniques</li></ul>