



# **Competency Standard (CS)**

**Gas Metal and Flux Cored Arc Welding - 3G & 4G**

**Level-3**

**Light Engineering Sector**

**Competency Standard Code: CS-LE- GMAW & FCAW -3G & 4G  
-01-L3-EN-V1**



**National Skills Development Authority  
Prime Minister's Office  
Government of the People's Republic of Bangladesh**



## Copyright

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This Competency Standard for **Gas Metal & Flux Cored Arc Welding- 3G & 4G** is a document for the development of curricula, teaching and learning materials, and assessment tools. It also serves as the document for providing training consistent with the requirements of industry in order to meet the qualification of individuals who graduated through the established standard via competency-based assessment for a relevant job.

Public and private institutions may use the LEormation contained in this standard for activities benefitting Bangladesh.

## Introduction

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The NSDA aims to enhance an individual's employability by certifying completeness with skills. NSDA works to expand the skilling capacity of identified public and private training providers qualitatively and quantitatively. It also aims to establish and operationalize a responsive skill ecosystem and delivery mechanism through a combination of Well-defined set of mechanisms and necessary technical supports.

Key priority economic growth sectors identified by the government have been targeted by NSDA to improve current job skills along with existing workforce to ensure required skills to industry standards. Training providers are encouraged and supported to work with industry to address identified skills and knowledge to enable industry growth and increased employment through the provision of market responsive inclusive skills training program. " **Gas Metal & Flux Cored Arc Welding- 3G & 4G** " is selected as one of the priority occupations of **Light Engineering** Sector. This standard is developed to adopt a demand driven approach to training with effective inputs from Industry Skills Councils, employer associations and employers.

Generally, a competency standard LEorms curriculum, learning materials, assessment and certification of trainees enrolled in Skills Training. Trainees who successfully pass the assessment will receive a qualification in the Bangladesh National Qualification Framework (BNQF) and will be listed on the NSDA's online portal.

This competency standard is developed to improve skills and knowledge in accordance with the job roles, duties and tasks of the occupation and ensure that the required skills and knowledge are aligned to industry requirements. A series of stakeholder consultations, workshops were held to develop this document.

The document also details the format, sequencing, wording and layout of the Competency Standard for an occupation which is comprised of Units of Competence and its corresponding elements.

## Overview

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A **Competency Standard** is a written specification of the knowledge, skills and attitudes required for the performance of an occupation, trade or job corresponding to the industry standard of performance required in the workplace.

The purpose of a competency standards is to:

- provide a consistent and reliable set of parts for training, recognising and assessing people's skills, and may also have optional support materials
- enable industry recognised qualifications to be awarded through direct assessment of workplace competencies
- encourage the development and delivery of flexible training which suits individual and industry requirements
- encourage learning and assessment in a work-related environment which leads to verifiable workplace outcomes

Competency standards are developed by a working group comprised of occupation specific experts, academicians, representatives from NSDA and ISC to identify the competencies required of an occupation in **Light Engineering Sector**.

Competency standards describe the knowledge, skills and attitude needed to perform effectively in the workplace. CS acknowledge that people can achieve technical and vocational competency in many ways by emphasising what the learner can do, not how or where they learned to do it.

With competency standards, training and assessment may be conducted at the workplace or at training institute or any combination of these.

Competency standards consist of a number of units of competency. A unit of competency describes a distinct work activity that would normally be undertaken by one person in accordance with industry standards.

Units of competency are documented in a standard format that comprises of:

- unit title
- nominal duration
- unit code
- unit descriptor
- elements and performance criteria
- variables and range statement
- curricular content guide
- assessment evidence guides

Together, all the parts of a unit of competency:

- describe a work activity
- guide the assessor to determine whether the candidate is competent or not yet competent

The ensuing sections of this document comprise of a description of the relevant occupation, trade or job with all the key parts of a unit of competency, including:

- a chart with an overview of all Units of Competency for the relevant occupation, trade or job including the Unit Codes and the Unit of Competency titles and corresponding Elements
- the Competency Standard that includes the Unit of Competency, Unit Descriptor, Elements and Performance Criteria, Range of Variables, Curricular Content Guide and Assessment Evidence Guide.

## .Competency Standards for National Skill Certificate – 3 in

### Gas Metal & Flux Cored Arc Welding- 3G & 4G, Light Engineering Sector

#### Level Descriptors of Skills Sector, BNQF Level 1-6

Level & Job classification	Knowledge Domain	Skills Domain	Responsibility Domain
6-Mid-Level Manager/ Sub Assistant Engineer	Comprehensive actual and theoretical knowledge within a specific work or study area with an awareness of the validity and limits of that knowledge, able to analyse, compare, relate and evaluate.	Specialised and wider range of cognitive and practical skills required to provide leadership in the development of creative solutions to defined problems. Communicate professional issues and solutions to the team and to external partners/users.	Work under broad guidance and self-motivation to execute strategic and operational plan/s. Lead lower-level management. Diagnose and resolve problems within and among work groups.
5-Supervisor	Broad knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to scrutinize and break LEormation into parts by identifying motives or causes.	Broad range of cognitive and practical skills required to generate solutions to specific problems in one or more work or study areas. Communicate practice-related problems and possible solutions to external partners.	Work under guidance of management and self-direction to resolve specific issues. Lead and take responsibility for the work and actions of group/team members. Bridge between management.
4-Highly Skilled Worker	Broader knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to solve problems to new situations by comparing and applying acquired knowledge.	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying the full range of methods, tools, materials and LEormation. Communicate using technical terminology and IT technology with partners and users as per workplace requirements.	Work under minimal supervision in specific contexts in response to workplace requirements. Resolve technical issues in response to workplace requirements and lead/guide a team/ group.
3-Skilled Worker	Moderately broad knowledge in a specific work or study area, able to perceive ideas and abstract from drawing and design according to workplace requirements.	Basic cognitive and practical skills required to use relevant LEormation in order to carry out tasks and to solve routine problems using simple rules and tools. Communicate with his team and limited external partners upholding the values, nature and culture of the workplace	Work or study under supervision with considerable autonomy. Participate in teams and responsible for group coordination.
2-Semi Skilled Worker	Basic understanding of underpinning knowledge in a specific work or study area, able to interpret and apply common occupational terms and instructions.	Skills required to carry out simple tasks, communicate with his team in the workplace presenting and discussing results of his work with required clarity.	Work or study under supervision in a structured context with limited scope of manipulation
1 –Basic Skilled Worker	Elementary understanding of ability to interpret the underpinning knowledge in a specific study area, able to interpret common occupational terms and instructions.	Specific Basic skills required to carry out simple tasks. Interpret occupational terms and present the results of own work within guided work environment/ under supervision.	Work under direct supervision in a structured context with limited range of responsibilities.

## List of Abbreviations

NSDA	- National Skills Development Authority
CS	- Competency Standard
SCVC	- Standard and Curriculum Validation Committee
ISC	- Industry Skills Council
CBLM	- Competency Based Learning Material
UoC	- Unit of Competency
PPE	- Personal Protective Equipment
OSH	- Occupational Safety and Health
CBC	- Competency Based Curriculum
LE	- Light Engineering Sector
GMAW	- Gas Metal Arc Welding
FCAW	- Flux Cored Arc Welding
BNQF	- Bangladesh National Qualification Framework
STP	- Skills Training Provider
SOP	- Standard Operating Procedure
UoC	- Unit of Competency
4 IR	- 4th Industrial Revolution





Approved by  
34<sup>th</sup> the Authority meeting, held on 27.06.2024



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**Competency Standards for National Skill Certificate – 3 in  
Gas Metal & Flux Cored Arc Welding-3G & 4G**

**Course Structure**

SL	Unit Code and Title		UoC Level	Nominal Hours
Generic Units of Competencies				30
1.	GU-01-L1-V1	Perform Computations Using Basic Mathematical Concepts	1	15
2.	GU-02-L1-V1	Apply OSH Procedure in the Workplace	1	15
Sector Specific Units of Competencies				15
3.	SU- LE -01-L2-V1	Interpret Technical Drawing	2	15
Occupation Specific Units of Competencies				315
4.	OU- LE - GM &FCAW -01-L3-V1	Use Hand Tools and Power Tools	1	15
5.	OU- LE - GM &FCAW -02-L3-V1	Use Measuring Instruments	1	15
6.	OU- LE -GM & FCAW-03-L3-V1	Perform Straight, Weaving and Padding Bead Using GMAW &FCAW	3	50
7.	OU- LE - GM & FCAW -04-V1	Perform Gas Metal & Flux Cored Arc Welding-1G & 2G	3	75
8.	OU- LE - GM & FCAW-05-V1	Perform GAS Metal and Flux Cored Arc Welding –3G	3	80
9.	OU- LE - GM & FCAW-06-V1	Perform GAS Metal and Flux Cored Arc Welding –4G	3	80
Total Nominal Hours				360



## **Generic Unit of Competenceis**

<b>Unit Code and Title</b>	<b>GU-01-L1-V1: Perform Computations Using Basic Mathematical Concepts</b>
<b>Unit Descriptor</b>	<p>This unit of competency requires the knowledge, skills and attitude to perform computations using basic mathematical concepts in the workplace.</p> <p>It specifically includes the tasks of identifying calculation requirements in the workplace, selecting appropriate mathematical method/concept for the calculation and using appropriate instruments/tools to perform calculation.</p>
<b>Nominal Hours</b>	<b>15 Hours</b>
<b>Elements of Competency</b>	<p><b>Performance Criteria</b></p> <p><b>Bold &amp; Underlined</b> terms are elaborated in the Range of Variables Training Components</p>
1. Identify calculation requirements in the workplace	<p>1.1 Job requirements are identified;</p> <p>1.2 <b><u>Measurements</u></b> are selected in accordance with job requirement;</p> <p>1.3 Calculation requirements are identified from <b><u>workplace Information</u></b> ;</p>
2. Select appropriate mathematical methods for the calculation.	<p>2.1 Mathematical methods are identified;</p> <p>2.2 <b><u>Appropriate method</u></b> is selected to carry out the calculation requirements;</p> <p>2.3 Tolerance and clearance limits are identified and adjusted according to the job requirements;</p>
3. Use tool/instrument to perform calculations	<p>3.1 Work instructions are confirmed and applied to the job in hand;</p> <p>3.2 Materials to be measured are identified as per job specification;</p> <p>3.3 Appropriate <b><u>tool/ instrument</u></b> is selected based on materials to be measured;</p>
<b>Range of Variables</b>	
<b>Variable</b>	<b>Range</b> (may include but not limited to)
1. Measurements	<p>1.1 Length</p> <p>1.2 Width</p> <p>1.3 Weight</p> <p>1.4 Volume</p> <p>1.5 Tolerance</p>
2. workplace Information	<p>2.1 Job Order</p> <p>2.2 Design</p> <p>2.3 Working drawing</p> <p>2.4 Verbal instructions</p> <p>2.5 Written Instruction</p>
3. Appropriate method	3.1 Addition



	3.2 Subtraction 3.3 Division 3.4 Multiplication 3.5 Conversion 3.6 Percentage and ratio calculation
4. Tool/ Instrument	4.1 Calculator 4.2 Scale 4.3 Measuring tape 4.4 Marker
<b>Evidence Guide</b> The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Identified calculation requirements from workplace LEormation 1.2 Selected appropriate method to carry out the calculation requirements 1.3 Selected measurements 1.4 Selected appropriate methods 1.5 Used tool/instrument 1.6 Added numbers 1.7 Subtracted numbers 1.8 Multiplied numbers. 1.9 Divided numbers. 1.10 Completed calculations using appropriate tools/instruments
2. Underpinning Knowledge	2.1. Numerical concept 2.2. Basic mathematical methods such as addition, subtraction, multiplication and division and percentage. 2.3. Mathematical language, symbols and terminology. 2.4. Measuring units
3. Underpinning Skills	3.1 Interpreting numerical concept 3.2 Interpreting mathematical methods such as addition, subtraction, multiplication and division and percentage. 3.3 Interpreting mathematical language, symbols and terminology. 3.4 Interpreting measuring units.
4. Underpinning Attitudes	4.1. Commitment to occupational health and safety 4.2. Environmental concerns 4.3. Eagerness to learn 4.4. Tidiness and timeliness 4.5. Respect for rights of peers and seniors in workplace 4.6. Communication with peers and seniors in workplace

5. Resource Implications	5.1. Work place 5.2. Materials relevant to the proposed activity 5.3. All tools, equipment, material and documentation required. 5.4. Relevant specifications or work instructions
6. Methods of Assessment	Assessment methods may include but not limited to: 6.1. Written Test 6.2. Demonstration 6.3. Oral Questioning 6.4. Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by an NSDA certified/ nominated assessor
<b>Accreditation Requirements</b> Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

<b>Unit Code and Title</b>	<b>GU-02-L1-V1: Apply Occupational Health and Safety (OHS) Procedure in the Workplace</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitudes required to apply occupational health and safety (OHS) procedure in the workplace.</p> <p>It specifically includes identifying OHS policies and procedures, following OHS procedure, reporting hazards and risks, responding to emergencies, and maintaining personal well-being.</p>
<b>Nominal Hours</b>	<b>15 Hours</b>
<b>Elements of Competency</b>	<p><b>Performance Criteria</b>  <b><u>Bold &amp; Underlined</u></b> terms are elaborated in the Range of Variables</p>
1. Identify OSH policies and procedures	<p>1.1. <b><u>OHS policies</u></b> and <b><u>safe operating procedures</u></b> are accessed and stated</p> <p>1.2. <b><u>Safety signs and symbols</u></b> are identified and followed</p> <p>1.3. Emergency response, evacuation procedures and other contingency measures are determined according to workplace requirements</p>
2. Follow OSH procedure	<p>2.1 <b><u>Personal protective equipment (PPE)</u></b> is selected and collected as required</p> <p>2.2 Personal protective equipment (PPE) is correctly used in accordance with organization OHS procedures and practices</p> <p>2.3 A clear and tidy workplace is maintained as per workplace standard</p> <p>2.4 PPE is maintained to keep them operational and compliant with OHS regulations</p>
3. Report hazards and risks.	<p>3.1 <b><u>Hazards</u></b> and risks are identified, assessed and controlled</p> <p>3.2 Incidents arising from hazards and risks are reported to designated authority</p>
4. Respond to emergencies	<p>4.1 Alarms and warning devices are responded</p> <p>4.2 Workplace <b><u>emergency procedures</u></b> are followed</p> <p>4.3 <b><u>Contingency measures</u></b> during workplace accidents, fire and other emergencies are recognized and followed in accordance with organization procedures</p> <p>4.4 First aid procedures is applied during emergency situations</p>
5. Maintain personal well-being	<p>5.1 OHS policies and procedures are adhered to</p> <p>5.2 OHS awareness programs are participated in as per workplace guidelines and procedures</p> <p>5.3 Corrective actions are implemented to correct unsafe condition in the workplace</p> <p>5.4 <b><u>“Fit to work” records</u></b> are updated and maintained according to workplace requirements</p>
<b>Range of Variables</b>	

<b>Variables</b>	<b>Range</b> (may include but not limited to):
1. OHS policies	1.1. Bangladesh standards for OHS 1.2. Fire Safety Rules and Regulations 1.3. Code of Practice 1.4. Industry Guidelines
2. Safe operating procedures	2.1 Orientation on emergency exits, fire extinguishers, fire escape, etc. 2.2 Emergency procedures 2.3 First Aid procedures 2.4 Tagging procedures 2.5 Use of PPE 2.6 Safety procedures for hazardous substances
3. Safety signs and symbols	3.1 Direction signs (exit, emergency exit, etc.) 3.2 First aid signs 3.3 Danger Tags 3.4 Hazard signs 3.5 Safety tags 3.6 Warning signs
4. Personal Protective Equipment (PPE)	4.1 Gas Mask 4.2 Gloves 4.3 Safety boots 4.4 Face mask 4.5 Overalls 4.6 Goggles and safety glasses 4.7 Sun block 4.8 Chemical/Gas detectors
5. Hazards	5.1 Chemical hazards 5.2 Biological hazards 5.3 Physical Hazards 5.4 Mechanical and Electrical Hazard 5.5 Mental hazard 5.6 Ergonomic hazard
6. Emergency Procedures	6.1 Fire fighting 6.2 Earthquake 6.3 Medical and first aid 6.4 Evacuation
7. Contingency measures	7.1 Evacuation 7.2 Isolation 7.3 Decontamination
8. "Fit to Work" records	8.1 Medical Certificate every year 8.2 Accident reports, if any 8.3 Eye vision certificate

**Evidence Guide**

The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency

1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 stated OHS policies and safe operating procedures 1.2 followed safety signs and symbols 1.3 used personal protective equipment (PPE) 1.4 maintained workplace clear and tidy 1.5 assessed and Controlled hazards 1.6 followed emergency procedures 1.7 followed contingency measures 1.8 implemented corrective actions
2. Underpinning knowledge	2.1 Define OHS 2.2 OHS Workplace Policies and Procedures 2.3 Work Safety Procedures 2.4 Emergency Procedures 2.5 Hazard control procedure 2.6 Different types of Hazards 2.7 PPE and there uses 2.8 Personal Hygiene Practices 2.9 OHS Awareness
3. Underpinning skills	3.1 Accessing OHS policies 3.2 Handling of PPE 3.3 Handling cleaning tools and equipment 3.4 Writing report 3.5 Responding to emergency procedures
4. Required attitude	4.1 Commitment to occupational health and safety 4.2 Sincere and honest to duties 4.3 Promptness in carrying out activities 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect of peers and seniors in workplace 4.8 Communicate with peers and seniors in workplace
5. Resource implications	5.1 Workplace 5.2 Equipment and outfits appropriate in applying safety measures 5.3 Tools, materials and documentation required 5.4 OHS Policies and Procedures
6. Methods of assessment	Competency should be assessed by: 6.1 Written test 6.2 Demonstration

	6.3 Oral Questioning
7. Context of Assessment	<p>7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module.</p> <p>7.2 Assessment should be done by an NSDA certified/nominated assessor</p>
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.</p>	

## **Sector Specific Unit of Competencies**

<b>Unit Code and Title</b>	<b>SU- LE -01-L2-V1: Interpret Technical Drawing</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skill and attitude required in interpreting technical drawings.</p> <p>It includes following OSH practices, selecting technical drawing and interpreting technical drawing</p>
<b>Nominal Hours</b>	<b>15 Hours</b>
<b>Elements of Competency</b>	<p><b>Performance Criteria</b>  <b><u>Bold and Underlined</u></b> terms are elaborated in the Range of Variables.</p>
1. Follow OSH practices	1.1 Safe work practices observed as required for the work performed 1.2 Hazards are identified and controlled 1.3 Necessary PPE are selected and worn as per work requirement
2. Select technical drawing	2.1 <b><u>Drawing</u></b> is selected and checked to ensure that it conforms to the job requirements 2.2 Drawing is validated
3. Interpret technical drawing	3.1 Drawing components, assemblies are identified 3.2 Dimensions are identified according to job requirement 3.3 Clearances/tolerances are checked for compliance with work place standards 3.4 <b><u>Instructions</u></b> are identified and followed accurately 3.5 Material specifications are identified 3.6 Symbols in drawing/s are interpreted
<b>Range of Variables</b>	
<b>Variables</b>	<b>Range</b> (may include but not limited to):
1. Drawing	1.1 Technical drawing 1.2 sketch
2. Instructions	2.1 Note 2.2 Instruction 2.3 Special Instruction 2.4 Precaution
<b>Evidence Guide</b>	
The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 Selected and interpreted technical drawing 1.2 Used and followed instruction according to job requirement.



2. Underpinning knowledge	2.1 OSH 2.2 Workplace standard 2.3 Sequence of drawing 2.4 Methods of checking
3. Underpinning skills	3.1 Practicing workplace safety 3.2 Reading / interpreting information on the drawing, following data 3.3 Performing measurements, calculations 3.4 Perform checking 3.5 Keeping records
4. Underpinning attitudes	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace
5. Resource implications	5.1 Tools, equipment and physical facilities 5.2 Materials, consumable needed to perform activities
6. Methods of assessment	6.1 Workplace observation 6.2 Demonstration 6.3 Oral questioning 6.4 Written test 6.5 Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by an NSDA certified/nominated assessor
<b>Accreditation Requirements</b> Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

## **Occupation Specific Unit of Competencies**

Unit Code and Title	OU- LE - GM &FCAW -01-L3-V1: Use Hand Tools and Power Tools
Unit Descriptor	<p>This unit covers the skills, knowledge and attitude required in using hand tools and power tools.</p> <p>It includes identifying tools, using hand tools, power tools, performing basic preventive maintenance and maintaining workplace cleanliness and storing tools.</p>
Nominal Hours	15 Hours
Elements of Competency	<p><b>Performance Criteria</b>  <b><u>Bold and Underlined</u></b> terms are elaborated in the Range of Variables.</p>
1. Prepare for work	<p>1.1 <b><u>PPE</u></b> is collected and worn as per requirement</p> <p>1.2 Appropriate <b><u>tools</u></b> are identified as per requirement</p> <p>1.3 <b><u>Applications</u></b> of tools are defined</p> <p>1.4 <b><u>Hand tools</u></b> and <b><u>power</u></b> tools are prepared for use</p> <p>1.5 Sources of power supply for power tools are identified</p>
2. Use hand tools	<p>2.1 Appropriate tool is used as per job requirement</p> <p>2.2 Proper hand-eye coordination is applied in the use of hand tools</p> <p>2.3 Unsafe or faulty tools are identified and marked for repair</p>
3. Use power tools	<p>3.1 Route for power supply is established in accordance with worker safety requirements</p> <p>3.2 Proper sequence of operations is determined in using power tools</p> <p>3.3 Power tools are used as required</p>
4. Perform basic preventive maintenance.	<p>4.1. Tools are cleaned as per standard procedure</p> <p>4.2. Appropriate lubricants are identified</p> <p>4.3. Tools are lubricated as required</p> <p>4.4. Defective tools are inspected and corrected or replaced as per standard procedure</p> <p>4.5. Tools are inspected, repaired and replaced after use</p>
5. Maintain workplace cleanliness and store tools	<p>5.1 Workplace is cleaned as per standard procedure</p> <p>5.2 Hazardous materials are identified, separated and disposed as per workplace procedure</p> <p>5.3 Waste materials are disposed as per workplace procedure</p> <p>5.4 Tools are cleaned and stored safely in appropriate location</p>
Range of Variables	
Variables	Range (may include but not limited to):
1. Personal Protective Equipment	<p>1.1. Dust mask</p> <p>1.2. Safety glasses/Goggles</p> <p>1.3. Leather hand Gloves</p>

	1.4. Ear plugs 1.5. Air respirator 1.6. Safety shoes/boots 1.7. Aprons 1.8. Overalls/Boiler suit 1.9. Welding (SMAW)helmet/Auto dark helmet 1.10. Safety helmet 1.11. Face shield 1.12. Arm guard 1.13. Leg guard 1.14. Hand shield 1.15. Safety belt
2. Tools	2.1 Hand Tools 2.2 Power Tools
3. Applications	3.1 Adjusting 3.2 Aligning 3.3 Assembling 3.4 Clamping 3.5 Cleaning 3.6 Cutting 3.7 Dismantling 3.8 Finishing 3.9 Hand sharpening 3.10 Lubricating 3.11 Scraping 3.12 Simple Tool Repairs 3.13 Tightening
4. Hand tools	4.1 Adjustable wrench 4.2 C-clamp 4.3 Chisels 4.4 Files <ul style="list-style-type: none"> <li>1.1.1 Round file</li> <li>1.1.2 Flat file</li> <li>1.1.3 Triangular file</li> <li>1.1.4 Half round files</li> <li>1.1.5 Square file</li> <li>1.1.6 Knife file</li> </ul> 1.2 Hacksaw 1.3 Ball pein Hammers 1.4 Sledge hammers 1.5 Tongs 1.6 Chipping hammer 1.7 Steel wire brush

	1.8 Combination pliers 1.9 Neon tester 1.10 Snips 1.11 Hand shares 1.12 Anvil 1.13 Center punches 1.14 Prick punches 1.15 Number punches 1.16 Letter punches 1.17 Scarpers 1.18 Screwdrivers 1.19 Spanners and Wrenches 1.20 Grip vice 1.21 Jigs and fixtures
5. Power Tools	5.1 Angle Grinder/Off hand grinder 5.2 Circular cutting machine/disc cutter 5.3 Power saw 5.4 Pedestal grinding machine 5.5 Pneumatic chisel
<b>Evidence Guide</b> The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
Critical aspects of competency	Assessment required evidence that the candidate: 1.1 Collected PPE and worn as per requirement 1.2 Used hand tools and power tools safely 1.3 Determined proper sequence of operations in using power tools. 1.4 Inspected, separated and corrected of defective tools. 1.5 Lubricated tools 1.6 Cleaned Workplace and store tools
2. Underpinning knowledge	2.1 Functions and Procedures of using hand tools for Welding (SMAW) works 2.2 Functions and Procedures of using power tools for Welding (SMAW) works 2.3 Care of hand and power tools 2.4 Preventive maintenance 2.5 Corrective maintenance 2.6 Storage Procedures
3. Underpinning skills	3.1 Applying OSH in the workplace 3.2 Handling tools and equipment 3.3 Applying appropriate procedure to use hand and power tools 3.4 Communicating skills in the workplace

4. Underpinning attitudes	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace
5. Resource implications	5.1 Adequate workplaces 5.2 Materials for Welding (SMAW) work 5.3 Hand tools and power tools appropriate to Welding (SMAW) work 5.4 Information and documentation 5.5 Product specifications 5.6 Manual, Codes, Standards and reference materials
6. Methods of assessment	6.1 Workplace observation 6.2 Demonstration 6.3 Oral questioning 6.4 Written test 6.5 Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by NSDA certified/ nominated assessor
<b>Accreditation Requirements</b> Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

<b>Unit Code and Title</b>	<b>OU- LE - GM &amp;FCAW -02-L3-V: Use Measuring Instruments</b>
<b>Unit Descriptor</b>	<p>This unit covers the skills, knowledge and attitude required in use measuring instruments.</p> <p>It includes following OSH practices, selecting the job to be measured, measuring device, taking measurements and cleaning and storing measuring instruments.</p>
<b>Nominal Hours</b>	<b>15 Hours</b>
<b>Elements of Competency</b>	<b>Performance Criteria</b> <b><u>Bold and Underlined</u></b> terms are elaborated in the Range of Variables.
1. Follow OSH practices	1.1. PPE is selected and collected as per requirements 1.2. PPE is worn as required 1.3. Safe work practices followed as per workplace standard
2. Identify measuring methods	2.1 Job to be measured is identified 2.2 Measuring requirements is identified and interpreted 2.3 Measuring procedures are identified as per requirements
3. Measure and record measurements	3.1. <b><u>Measuring instruments</u></b> is selected and collected according to measurement requirements 3.2. Measuring instruments are calibrated as per requirement 3.3. <b><u>Measurements</u></b> are taken accurately 3.4. Measurements are checked against job requirement 3.5. Measurements are recorded as per workplace procedure
4. Clean and store measuring instruments	4.1. <b><u>Routine maintenance</u></b> is done as required 4.2. Measuring instruments are cleaned and stored 4.3. Waste material are disposed as per workplace procedure 4.4. Workplace is cleaned as per workplace standard
<b>Range of Variables</b>	
<b>Variables</b>	<b>Range</b> (may include but not limited to):
1. Measuring instruments	1.1 Try square 1.2 Steel tape 1.3 Divider 1.4 Steel rule 1.5 Vernier caliper 1.6 Fillet gauge 1.7 Welding gauge 1.8 Wire gauge 1.9 Vernier bevel protector 1.10 Trammel 1.11 Outside caliper 1.12 In side caliper 1.13 Sprit level 1.14 Angle plate

2. Routine maintenance	2.1. Lubricating 2.2. Tighten screws 2.3. Using anti-rust liquid
3. Measurements	3.1 Measuring length 3.2 Angle 3.3 Diameter (internal and external) 3.4 Depth
<b>Evidence Guide</b> The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 identified the proper graduated measuring instrument 1.2 taken Measurement accurately 1.3 recorded of measurement 1.4 interpreted written inspection
2. Underpinning knowledge	2.1 Functions of each measuring instruments 2.2 Measuring procedure of measuring instruments 2.3 Care and storing procedure
3. Underpinning skills	3.1 Practicing workplace safety 3.2 Handling measuring instruments 3.3 Keeping record
4. Underpinning attitudes	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace
5. Resource implications	5.1 Adequate workplaces 5.2 Materials 5.3 Measuring instruments
6. Methods of assessment	6.1 Workplace observation 6.2 Demonstration 6.3 Oral questioning 6.4 Written test 6.5 Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by NSDA certified/ nominated assessor
<b>Accreditation Requirements</b> Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to	



conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

<b>Unit Code and Title</b>	<b>OU-LE- GM &amp; FCAW-03-L3-V1: Perform Straight, Weaving and Padding Bead Using GMAW &amp;FCAW</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitudes required to perform weld beads and padding using GMAW and FCAW.</p> <p>It specifically includes following OSH practices, selecting and preparing materials, setting up welding machine, performing beads and padding, cleaning and storing tools.</p>
<b>Nominal Hours</b>	<b>50 Hours</b>
<b>Elements of Competency</b>	<b>Performance Criteria</b> <u><b>Bold and Underlined</b></u> terms are elaborated in the Range of Variables.
1. Follow OSH practices	1.1 <b><u>PPE</u></b> is selected and collected as per requirements 1.2 Personal protective equipment (PPE) is worn as required 1.3 Safe work practices followed as per workplace standard
2. Select and prepare materials	2.1 Weld requirements are identified from workplace instruction 2.2 <b><u>Plates, tools</u></b> and <b><u>electrodes</u></b> are selected and collected as per job requirements 2.3 Plates are marked and cut as per job specification 2.4 Plate surface is cleaned as per job specification
3. Set up welding machine	3.1 Ampere is adjusted and set as per job requirement 3.2 Welding <b><u>accessorie</u></b> are set and adjusted 3.3 Earth clamp is connected to the job/work piece as required
4. Perform beads	4.1. Job is set up as per workplace standard 4.2. Straightweld bead and padding are performed as per job requirement 4.3. Weaving is followed as per instructions during bead and padding 4.4. Travel speed and angle are maintained as per standard operating procedure 4.5. Welds are cleaned, checked for quality and defects are identified 4.6. Corrective action is taken to rectify defects and meet the quality
5. Clean and store tools	5.1 Tools and equipment are cleaned and stored as per workplace standard 5.2 Waste material is disposed as per workplace procedure 5.3 Workplace is cleaned as per workplace standard
<b>Range of Variables</b>	
<b>Variables</b>	<b>Range</b> (may include but not limited to):
1. Personal Protective Equipment	1.1 Dust mask 1.2 Safety glasses/Goggles 1.3 Leather hand Gloves

	1.4 Ear plugs 1.5 Air respirator 1.6 Safety shoes/boots 1.7 Aprons 1.8 Face masks 1.9 Overalls 1.10 Welding helmet/Auto dark helmet 1.11 Safety helmet 1.12 Face shield 1.13 Arm guard 1.14 Leg guard 1.15 Hand shield 1.16 Safety belt
2. Plates	2.1 MS plates 8-1 mm thickness range
3. Tools	3.1 Ball peen hammer 3.2 Chipping hammer 3.3 Try square 3.4 Tongs 3.5 Wire brush 3.6 Cup brush 3.7 Angle Grinder
4. Electrodes	4.1 1.2 Diameter of Solid Wire for GMAW 4.2 1.2 Diameter of Flux Cored Wire for FCAW
5. Accessories	4.3 Nozzle 4.4 Contact tip 4.5 Gas diffuser 4.6 Ceramic cup 4.7 Liner 4.8 Wire feed unit 4.9 Wire relay 4.10 Euro connector 4.11 Heater
<b>Evidence Guide</b> The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	1.1 Set up equipment 1.2 Adjusted ampere 1.3 Selected appropriate electrode angle 1.4 Maintained travel speed 1.5 Performed beads and padding 1.6 Followed weaving

2. Underpinning knowledge	2.1 Welding symbols 2.2 Beads and padding 2.3 Weavings 2.4 Ferrous metal 2.5 Different between metal plate, sheet and bar 2.6 Types of electrodes 2.7 Ampere setting procedure 2.8 Proper electrode angle 2.9 Proper Arc length 2.10 Welding travel speed 2.11 Defects of welds
3. Underpinning skills	3.1 Selecting PPE 3.2 Selecting drawings and specification 3.3 Handling hand tools and equipment 3.4 Setting welding machine 3.5 Maintaining welding arc and arc length 3.6 Performing welding procedure 3.7 Maintaining proper electrode angle 3.8 Maintaining welding travel speed 3.9 Identifying welding Defects
4. Underpinning attitudes	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace
5. Resource implications	The following resources must be provided: 5.1 Workplace 5.2 Tools, equipment and facilities appropriate to processes or activity. 5.3 Materials relevant to the proposed activity. 5.4 Equipment and outfits appropriate in applying safety measures. 5.5 Relevant drawings, manuals, codes, standards and reference material.
6. Methods of assessment	Assessment methods may include but not limited to 6.1. Demonstration 6.2. Oral questioning 6.3. Written test 6.4. Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module.

	7.2 Assessment should be done by NSDA certified/ nominated assessor
<b>Accreditation Requirements</b> Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

<b>Unit Code and Title</b>	<b>OU-LE- GM&amp;FCAW-04-L3-V1: Perform Gas Metal &amp; Flux Cored Arc Welding-1G &amp; 2G</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitudes required to Perform GMAW &amp;FCAW–1G and 2G</p> <p>It specifically includes the tasks of following OSH practices, selecting tools, equipment and preparing materials, setting up welding machine, performing welding in 1G and 2G position and cleaning and storing tools.</p>
<b>Nominal Hours</b>	<b>75 Hours</b>
<b>Elements of Competency</b>	<p><b>Performance Criteria</b>  <b><u>Bold and Underlined</u></b> terms are elaborated in the Range of Variables.</p>
1. Follow OSH practices	<p>1.1 <b><u>Personal Protective Equipment (PPE)</u></b> is selected and collected as per requirements</p> <p>1.2 Personal protective equipment (PPE) is worn as required</p> <p>1.3 Safe work practices followed as per workplace standard</p>
2. Select tools, equipment and prepare materials	<p>2.1 Weld requirements are identified from workplace instruction</p> <p>2.2 <b><u>Base metals, wire reel</u></b> and <b><u>shielding gas</u></b> are identified and collected.</p> <p>2.3 <b><u>Plates, tools, equipment</u></b> and <b><u>electrodes</u></b> are selected and collected as per job requirements</p> <p>2.4 Plate surface are cleaned as per job specification</p> <p>2.5 Job is prepared as per job requirement</p>
3. Set up welding machine	<p>3.1 Ampere are set as per job requirements</p> <p>3.2 <b><u>Accessories</u></b> are set and adjusted as per requirement</p> <p>3.3 Earth clamp is connected to the job/work piece as required</p>
4. Perform welding 1G and 2G	<p>4.1 Tack welding is performed and alignment is checked as per job requirement</p> <p>4.2 Travel speed and <b><u>angle</u></b> are maintained as per job requirement</p> <p>4.3 Key hole techniques are maintained as required</p> <p>4.4 Welding in 1G positions is performed as per job specification</p> <p>4.5 Welding in 2G positions is performed as per job specification</p> <p>4.6 Welds are cleaned as per job requirements</p> <p>4.7 Weld quality is checked visually and <b><u>defects</u></b> are identified</p>
5. Clean and store tools	<p>5.1 Welding Machine shutdown are conducted as per standard procedure</p>

	5.2 Equipment and tools are cleaned and stored in accordance with workplace requirements 5.3 The wastes are disposed and the workplace is cleaned in accordance with workplace requirements
<b>Range of Variables</b>	
<b>Variable</b>	<b>Range</b> (may include but not limited to):
1. Personal Protective Equipment	1.1 Dust mask 1.2 Safety glasses/Goggles 1.3 Leather hand Gloves 1.4 Ear plugs 1.5 Air respirator 1.6 Safety shoes/boots 1.7 Aprons 1.8 Face masks 1.9 Overalls 1.10 Welding helmet/Auto dark helmet 1.11 Safety helmet 1.12 Face shield 1.13 Arm guard 1.14 Leg guard 1.15 Hand shield 1.16 Safety belt
2. Plates	2.1 MS plates 10 -14 mm thickness range
3. Tools	3.1 Jig and fixture/C-clamp 3.2 Ball pin hammer 3.3 Chipping hammer 3.4 Tongs 3.5 Flat file 3.6 Weld gauge 3.7 Wire brush 3.8 Cup brush 3.9 Angle Grinder 3.10 Bevel protector 3.11 Table vice 3.12 Anvil 3.13 Steel tape 3.14 Try square 3.15 Nose pliers
4. Equipment	4.1 Welding machine 4.2 Semi Auto cutter 4.3 Manual cutter
5. Electrodes	5.1 0.8-1.2 Diameter of Solid Wire for GMAW

	5.2 1.2 Diameter of Flux Cored Wire for FCAW
6. Accessories	6.1 Nozzle 6.2 Contact tip 6.3 Gas diffuser 6.4 Ceramic cup 6.5 Liner 6.6 Wire feed unit 6.7 Wire relay 6.8 Euro connector 6.9 Heater
7. Angle	7.1 Travel angle 7.2 Work angle
8. Defects	8.1 Lack of penetration 8.2 Lack of fusion 8.3 Excess penetration 8.4 Crack 8.5 Slag inclusions 8.6 Spatter 8.7 Reinforcement 8.8 overlap 8.9 Blow hole 8.10 Porosity 8.11 Undercut 8.12 Arc crater 8.13 Poor bead appearance
<b>Evidence Guide</b> The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	1.1. Set up equipment 1.2. Adjusted ampere 1.3. Selected appropriate electrode angle 1.4. Maintained travel speed 1.5. Maintained key hole techniques 1.6. Performed welding 1G and 2G positions
2. Underpinning knowledge	2.1. Surface preparation 2.2. Edge preparation 2.2.1. Bevel angle 2.2.2. Root face 2.3. Root gap 2.4. Tack weld 2.5. Welding passes 2.6. Welding Defects



	2.7. Gauging 2.8. Lean pass 2.9. Electrodes 2.10. Polarity 2.11. Welding current 2.12. Travel speed and angle 2.13. Arc length 2.14. Causes of welding defects
3. Underpinning skills	3.1. Selecting PPE 3.2. Selecting drawings and specification 3.3. Handling hand tools and equipment 3.4. Setting welding machine 3.5. Performing welding procedure 3.6. Identifying weld defects
4. Underpinning attitudes	4.1. Commitment to occupational health and safety 4.2. Environmental concerns 4.3. Eagerness to learn 4.4. Tidiness and timeliness 4.5. Respect for rights of peers and seniors in workplace 4.6. Respect for rights of peers and seniors in workplace.
5. Resource implications	The following resources must be provided: 5.1. Workplace 5.2. Tools, equipment, 5.3. Materials relevant to the proposed activity. 5.4. Equipment and outfits appropriate in applying safety measures. 5.5. Relevant drawings, manuals, training manuals, poster, codes, standards and reference material.
6. Methods of assessment	6.1. Demonstration 6.2. Oral questioning 6.3. Written test 6.4. Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by NSDA certified/nominated assessor
<b>Accreditation Requirements</b> Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

<b>Unit Code and Title</b>	<b>OU- LE - GM&amp;FCAW -05-L3-V1: Perform GAS Metal and Flux Cored Arc Welding –3G</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitudes required to perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) - positions 3G.</p> <p>It includes following Occupational Safety and Health (OSH) practices, preparing for welding, setting up equipment and job for welding, carrying out GMAW and FCAW position 3G, Minimizing and rectifying distortion and performing housekeeping and storing equipment.</p>
<b>Nominal Hours</b>	<b>80 Hours</b>
<b>Elements of Competency</b>	<p><b>Performance Criteria</b>  <b><u>Bold &amp; Underlined</u></b> terms are elaborated in the Range of Variables</p>
1. Follow Occupational Safety and Health (OSH) practices	<p>1.1 <b><u>Hazards</u></b> are identified and risks are minimized and eliminated.</p> <p>1.2 <b><u>Personal Protective Equipment (PPE)</u></b> is used.</p> <p>1.3 Safe work environment are ensured .</p>
2. Prepare for welding	<p>2.1 Weld requirements are identified as per SOP.</p> <p>2.2 <b><u>Base metals, wire reel</u></b> and <b><u>shielding gas</u></b> are identified and collected.</p> <p>2.3 <b><u>Tools</u></b> and <b><u>equipment</u></b> are selected and collected as per job requirements.</p> <p>2.4 Job is prepared as required</p>
3. Setup equipment and job for welding	<p>3.1 Welding equipment is set and adjusted in accordance with job specification</p> <p>3.2 Welding machine and <b><u>accessories</u></b> are set up and adjusted as per job requirements</p> <p>3.3 Job is set avoiding distortions using <b><u>appropriate process</u></b> at required position for 3G .</p>
4. Carry out GMAW and FCAW position 3G	<p>5. Tack the base metal properly avoiding distortion</p> <p>5.1 Travel speed and <b><u>angle</u></b> are maintained as per job requirement</p> <p>5.2 Welding is performed as per standard welding procedure and workplace requirement.</p> <p>5.3 Welds are cleaned, checked for quality and <b><u>defects</u></b> are identified.</p>

6. Perform housekeeping and store equipment	6.1 Welding machine shutdown procedures are followed 6.2 Equipment and tools are cleaned and stored as per workplace requirements. 6.3 Wastes are disposed off as per environmental compliants 6.4 Workplace is cleaned as per workplace requirements..
<b>Range of Variables</b>	
<b>Variable</b>	<b>Range</b> (may include but not limited to):
1. Hazards	1.1 Physical 1.2 Electrical & Mechanical 1.3 Biological 1.4 Chemicals 1.5 Mental 1.6 Ergonomic
2. Personal Protective Equipment (PPE)	2.1 Safety helmet 2.2 Eye shield (head screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler suit (cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety shoes 2.9 Respirator
3. Base metals	3.1 Mild steel 3.2 Low carbon steel 3.3 Plates 10-14 mm thickness range
4. Wire reel (Electrode)	4.1 Wire reel (0.8 to 1.2 mm) 4.2 Filler materials are preserved in suitable place
5. Shielding gas	5.1 Reactive gases 5.2 Mixture of Inert and reactive gases
6. Tools	6.1 Clamps 6.2 Ball peen hammer 6.3 Chipping hammer 6.4 Nose Pliers 6.5 Tongs 6.6 Wire brush 6.7 Cup brush 6.8 Weld gauge 6.9 Grinder 6.10 Combination pliers 6.11 nose pliers 6.12 Cylinder Key

	6.13 Utility wrench
7. Equipment	7.1 GMAW/FCAW welding machine set 7.2 Auxiliary Diesel generator 7.3 Magnetic dust particle collector
8. Appropriate processes	8.1 Maintaining root gap 8.2 Using back strip, 8.3 Applying backing ceramic, 8.4 Using clamp 8.5 Performing tack weld
9. Defects	9.1 Lack of penetration 9.2 Excess penetration 9.3 Porosity 9.4 Crack 9.5 Slag inclusions 9.6 Spatter 9.7 Undercut 9.8 Lack of fusion 9.9 Notches 9.10 Irregular shape and dimension 9.11 Lack of side wall fusion 9.12 Under fill 9.13 Burn throw 9.14 Pin/Blow hole 9.15 Arc crater 9.16 Overlap
10. Distortion prevention measures	10.1 Tack weld 10.2 Setting up of jigs 10.3 Fixtures 10.4 Clamps
<b>Special Notes</b> <b>Related Knowledge for the module:</b> Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
<b>Evidence Guide</b> The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	

1. Critical aspect of competency	<p>Assessment required evidences that the candidate:</p> <ul style="list-style-type: none"> <li>2.1 followed OSH practice</li> <li>2.2 selected and collected plates, tools, equipment and electrodes as per job requirements</li> <li>2.3 marked and cut the plate</li> <li>2.4 setup equipment and job</li> <li>2.5 performed welding as per WPS</li> <li>2.6 Followed welding machine shut down procedure.</li> </ul>
2. Underpinning knowledge	<ul style="list-style-type: none"> <li>2.1 Hazards and OSH procedures in a welding workplace.</li> <li>2.2 PPE and tools in a welding workplace.</li> <li>2.3 Types, selection and preparation of job</li> <li>2.4 Types, and selection of wire reel.</li> <li>2.5 Types and setting up of GMAW and FCAW welding equipment.</li> <li>2.6 Types of welding joints and welding positions.</li> <li>2.7 Functions of different components of welding machines</li> <li>2.8 Functions of different attachments</li> <li>2.9 Amper setting</li> <li>2.10 Travel and work angle</li> <li>2.11 Wire feed speed</li> <li>2.12 Welding procedures and techniques.</li> <li>2.13 Types of welding defects.</li> <li>2.14 Shut down and housekeeping procedures.</li> </ul>
3. Underpinning skills	<ul style="list-style-type: none"> <li>2.1 Following OSH practice.</li> <li>2.2 preparing a check list from work place requirement or standard.</li> <li>2.3 Preparing a sequence of inspection.</li> <li>2.4 Communication Skills</li> <li>2.5 Problem solving skills</li> <li>2.6 Identifying welding wire size and codes</li> <li>2.7 Setting welding wire</li> <li>2.8 Applying the techniques of GMAW/FCAW</li> <li>2.9 Finding out defects visually.</li> <li>2.10 Cleaning and storing equipment properly.</li> </ul>
4. Required attitudes	<ul style="list-style-type: none"> <li>2.1 Commitment to occupational safety and health.</li> <li>2.2 Promptness in carrying out activities.</li> <li>2.3 Sincere and honest to duties.</li> <li>2.4 Eagerness to learn.</li> <li>2.5 Tidiness and timeliness.</li> <li>2.6 Environmental concerns.</li> <li>2.7 Respect for rights of peers and seniors at workplace.</li> <li>2.8 Communicate with peers and seniors at workplace.</li> </ul>

5. Resource implication	<p>The following resources must be available:</p> <p>2.1 workplace (actual or simulated)</p> <p>2.2 tools, equipment and physical facilities appropriate to perform activities</p> <p>2.3 materials, consumables to perform activities.</p>
6. Methods of assessment	<p>Methods of assessment may include but not limited to:</p> <p>2.1 written test</p> <p>2.2 demonstration</p> <p>2.3 oral questioning</p> <p>2.4 portfolio.</p>
7. Context of Assessment	<p>7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module.</p> <p>7.2 Assessment should be done by NSDA certified/ nominated assessor</p>
<p><b>Accreditation Requirements</b></p> <p>Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.</p>	

<b>Unit Code and Title</b>	<b>OU- LE – GM &amp; FCAW -06-L3-V1: Perform GAS Metal and Flux Cored Arc Welding –4G</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitudes required to perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) -positions 4G.</p> <p>It includes following Occupational Safety and Health (OSH)practices, preparing for welding, setting up welding job and equipment, carrying out GMAW and FCAW in 4G position, Minimizing and rectifying distortion and performing housekeeping and storing equipment</p>
<b>Nominal Hours</b>	<b>80 Hours</b>
<b>Elements of Competency</b>	<p><b>Performance Criteria</b>  <b><u>Bold &amp;Underlined</u></b> terms are elaborated in the Range of Variables</p>
1. Follow Occupational Safety and Health (OSH) practices	<p>1.1 <b><u>Hazards</u></b> are identified and risks are minimized and eliminated.</p> <p>1.2 <b><u>Personal Protective Equipment (PPE)</u></b> is used.</p> <p>1.3 Safe work environment are ensured.</p>
2. Prepare for welding	<p>2.1 Weld requirements are identified as per SOP.</p> <p>2.2 <b><u>Base materials, wire reel</u></b> and <b><u>shielding gas</u></b> are identified and collected.</p> <p>2.3 <b><u>tools and equipment</u></b> are selected and collected as per job requirements.</p> <p>2.4 Plates are marked and cut as per job specification.</p> <p>2.5 Edges of plate are prepared as per job specification</p>
3. Setup equipment and job for welding	<p>3.1 Welding equipment is set and adjusted in accordance with job specification</p> <p>3.2 Welding machine and accessories are set up and adjusted as per job requirements</p> <p>3.3 Job is set avoiding distortions using <b><u>appropriate process</u></b> at required position for 3G .at required position for 4G.</p>
4. Carry out GMAW and FCAW in 4G position	<p>4.1 Tack the base metal properly avoiding distortion</p> <p>4.2 Travel speed and <b>angle</b> are maintained as per job requirement</p> <p>4.3 Welding is performed as per standard procedure and workplace requirement</p> <p>4.4 Welds are cleaned, checked for quality and <b>defects</b> are identified.</p>

5. Perform housekeeping and store equipment	5.1 Welding machine shutdown procedures are followed 5.2 Equipment and tools are cleaned and stored as per workplace requirements. 5.3 Wastes are disposed off 5.4 Workplace is cleaned as per workplace requirements..
<b>Range of Variables</b>	
<b>Variable</b>	<b>Range (may include but not limited to):</b>
1. Hazards	1.1 Physical 1.2 Electrical & Mechanical 1.3 Biological 1.4 Chemicals 1.5 Mental 1.6 Ergonomic
2. Personal Protective Equipment (PPE)	2.1 Safety helmet 2.2 Eye shield (head screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler suit (cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety shoes 2.9 Respirator
3. Base metals	3.1 Mild steel 3.2 Low carbon steel 3.3 Plates 10-14 mm thickness range
4. Wire reel (Electrode)	4.1 Wire reel (0.8 to 1.2 mm) 4.2 Filler materials are preserved in suitable place
5. Shielding gas	5.1 Reactive gases 5.2 Mixture of Inert and reactive gases



6. Tools	6.1 Clamps 6.2 Ball peen hammer 6.3 Chipping hammer 6.4 Nose Pliers 6.5 Tongs 6.6 Wire brush 6.7 Cup brush 6.8 Weld gauge 6.9 Grinder 6.10 Combination pliers 6.11 nose pliers 6.12 Cylinder Key 6.13 Utility wrench
7. Equipment	7.1 GMAW/FCAW welding machine set 7.2 Auxiliary Diesel generator 7.3 Magnetic dust particle collector
8. Defects	8.1 Lack of penetration 8.2 Excess penetration 8.3 Porosity 8.4 Crack 8.5 Slag inclusions 8.6 Spatter 8.7 Undercut 8.8 Lack of fusion 8.9 Notches 8.10 Irregular shape and dimension 8.11 Lack of side will fusion 8.12 Under fill 8.13 Burn throw 8.14 Pin/Blow hole 8.15 Arc crater 8.16 Overlap
9. Distortion prevention measures	9.1 Tack weld 9.2 Setting up of jigs 9.3 Fixtures 9.4 Clamps

**Special Notes**

**Related Knowledge for the module:** Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for GMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.

**Evidence Guide**

The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.

1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 followed OSH practice 1.2 selected and collected plates, tools, equipment and electrodes as per job requirements 1.3 marked and cut the plate 1.4 setup equipment and job 1.5 performed welding as per WPS 1.6 Followed welding machine shut down procedure.
2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace. 2.2 PPE and tools in a welding workplace. 2.3 Types, selection and preparation of job 2.4 Types, and selection of wire reel. 2.5 Types and setting up of GMAW and FCAW welding equipment. 2.6 Types of welding joints and welding positions. 2.7 Functions of different components of welding machines 2.8 Functions of different attachments 2.9 Amper setting 2.10 Travel and work angle 2.11 Wire feed speed 2.12 Welding procedures and techniques. 2.13 Types of welding defects. 2.14 Shut down and housekeeping procedures.
3. Underpinning skills	3.1 Following OSH practice. 3.2 preparing a check list from work place requirement or standard. 3.3 Preparing a sequence of inspection. 3.4 Communication Skills 3.5 Problem solving skills 3.6 Identifying welding wire size and codes 3.7 Setting welding wire 3.8 Applying the techniques of GMAW/FCAW 3.9 Finding out defects visually.

	3.10 Cleaning and storing equipment properly.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated) 5.2 tools, equipment and physical facilities appropriate to perform activities 5.3 materials, consumables to perform activities.
6. Methods of assessment	Assessment methods may include but not limited to: 6.1 written test 6.2 demonstration 6.3 oral questioning 6.4 portfolio.
7. Context of Assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by NSDA certified/nominated assessor
<b>Accreditation Requirements</b> Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

## References

1. Competency Standard on Welding (SMAW) Level 3, Philippine  
<https://tesda.gov.ph>
2. CS on Welding of BTEB
3. CS on Welding of NSDA

## Development of Competency Standard

The Competency Standards for National Skills Certificate Level- 3 in Gas Metal and Flux Cored Arc Welding 3G and 4G is Developed by NSDA on 28-29 May, 2024.

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## Validation of Competency Standard

The Competency Standards for National Skills Certificate Level-3 in Gas Metal & Flux Cored Arc Welding -3G & 4G is Validated by NSDA on 11 June 2024.

### List of the members

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