



# **Competency Standard (CS)**

**Welding & Fabrication**

**Level-2**

**Light Engineering Sector**

**Competency Standard Code: CS-LE-WF-L2-EN-V1**



**National Skills Development Authority  
Chief Advisor's Office  
Government of the People's Republic of Bangladesh**



## Copyright

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This Competency Standard for **Welding & Fabrication** 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. " **Welding & Fabrication**" 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 – 2 in

### Welding & Fabrication, 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
LES	- Light Engineering Sector
CNC	- Computer and Numerical Control
BNQF	- Bangladesh National Qualification Framework
SMAW	- Shielded Metal Arc Welding
WF	- Welding & Fabrication
STP	- Skills Training Provider
SOP	- Standard Operating Procedure
UoC	- Unit of Competency
4 IR	- 4th Industrial Revolution





Approved by  
36<sup>th</sup> Authority meeting of NSDA  
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**Competency Standards for National Skill Certificate – 2 in  
Welding & Fabrication  
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 -WF-01-L2-V1	Use Hand Tools and Power Tools	2	20
5.	OU- LE -WF-02-L2-V1	Perform Metal Cutting & Bending	2	50
6.	OU- LE -WF-03-L2-V1	Perform SMAW in 2F and 3F Positions	2	85
7.	OU- LE -WF-04-L2-V1	Perform GMAW in 2F and 3F Position	2	50
8.	OU- LE -WF-05-L2-V1	Perform GTAW in 2F Position	2	70
9.	OU- LE -WF-06-L2-V1	Assemble and Finish the Products	2	40
Total Nominal Hours				360

## Units & Elements at a Glance:

### Generic Units of Competencies (30 hours)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
GU-01-L1-V1	Perform Computations Using Basic Mathematical Concepts	<ol style="list-style-type: none"> <li>1. Identify calculation requirements in the workplace</li> <li>2. Select appropriate mathematical methods for the calculation.</li> </ol>	15
GU-02-L1-V1	Apply Occupational Health and Safety (OHS) Procedure in the Workplace	<ol style="list-style-type: none"> <li>1. Use tool/instrument to perform calculations</li> <li>1. Identify OSH policies and procedures</li> <li>2. Follow OSH procedure</li> <li>3. Report hazards and risks</li> <li>4. Respond to emergencies</li> <li>5. Maintain personal well-being</li> </ol>	15

### Sector Specific Units of Competencies (15 Hours)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
SU-LE-02-L2-V1	Interpret Technical Drawings	<ol style="list-style-type: none"> <li>1. Follow OSH practices</li> <li>2. Select technical drawing</li> <li>3. Interpret drawing</li> </ol>	15

### Occupation Specific Units of Competencies (315 Hours)

Code	Unit of Competency	Elements of Competency	Hours
OU-LE-WF-01-L2-V1	Use Hand Tools and Power Tools	<ol style="list-style-type: none"> <li>1. Prepare for work</li> <li>2. Use hand tools</li> <li>3. Use power tools</li> <li>4. Identify measuring process</li> <li>5. Measure and record measurements</li> <li>6. Perform basic preventive maintenance.</li> <li>7. Maintain workplace cleanliness and store tools</li> </ol>	20
OU-LE-WF-02-L2-V1	Perform Metal Cutting	<ol style="list-style-type: none"> <li>1. Prepare for cutting</li> <li>2. Perform gas cutting</li> <li>3. Perform plasma cutting</li> <li>4. Perform disc cutting</li> <li>5. Perform bending</li> <li>6. Clean and store tools</li> </ol>	50

OU-LE-WF-03-L2-V1	Perform SMAW in 2F and 3F Positions	<ol style="list-style-type: none"> <li>1. Follow OSH practices</li> <li>2. Select tools, equipment and prepare materials</li> <li>3. Set up welding machine</li> <li>4. Perform welding in 2F and 3F Position</li> <li>5. Clean and store tools</li> </ol>	85
OU-LE-WF-04-L2-V1	Perform GMAW 2F and 3F position	<ol style="list-style-type: none"> <li>1. Follow OSH practices</li> <li>2. Select tools, equipment and prepare materials</li> <li>3. Set up welding machine</li> <li>4. Perform welding in 2F and 3F Position</li> <li>5. Clean and store tools</li> </ol>	50
OU-LE-WF-05-L2-V1	Perform welding in 2F position using GTAW	<ol style="list-style-type: none"> <li>1. Follow OSH practices</li> <li>2. Select tools, equipment and prepare materials</li> <li>3. Set up welding machine</li> <li>4. Perform welding in 2F Position</li> <li>5. Clean and store tools</li> </ol>	70
OU-LE-WF-06-L2-V1	Assemble and Finish the products	<ol style="list-style-type: none"> <li>1. Prepare for work Follow</li> <li>2. Position and align the parts</li> <li>3. Join the parts of assembling</li> <li>4. Apply primer on fabricated product</li> <li>5. Clean and store tools</li> </ol>	40

## **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: <ul style="list-style-type: none"> <li>1.1 Identified calculation requirements from workplace LEormation</li> <li>1.2 Selected appropriate method to carry out the calculation requirements</li> <li>1.3 Selected measurements</li> <li>1.4 Selected appropriate methods</li> <li>1.5 Used tool/instrument</li> <li>1.6 Added numbers</li> <li>1.7 Subtracted numbers</li> <li>1.8 Multiplied numbers.</li> <li>1.9 Divided numbers.</li> <li>1.10 Completed calculations using appropriate tools/instruments</li> </ul>
2. Underpinning Knowledge	<ul style="list-style-type: none"> <li>2.1. Numerical concept</li> <li>2.2. Basic mathematical methods such as addition, subtraction, multiplication and division and percentage.</li> <li>2.3. Mathematical language, symbols and terminology.</li> <li>2.4. Measuring units</li> </ul>
3. Underpinning Skills	<ul style="list-style-type: none"> <li>3.1 Interpreting numerical concept</li> <li>3.2 Interpreting mathematical methods such as addition, subtraction, multiplication and division and percentage.</li> <li>3.3 Interpreting mathematical language, symbols and terminology.</li> <li>3.4 Interpreting measuring units.</li> </ul>
4. Underpinning Attitudes	<ul style="list-style-type: none"> <li>4.1. Commitment to occupational health and safety</li> <li>4.2. Environmental concerns</li> <li>4.3. Eagerness to learn</li> <li>4.4. Tidiness and timeliness</li> <li>4.5. Respect for rights of peers and seniors in workplace</li> <li>4.6. Communication with peers and seniors in workplace</li> </ul>

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.	

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

<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
<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 aspects of competency	Assessment required evidence that the candidate: <ul style="list-style-type: none"> <li>1.1 stated OHS policies and safe operating procedures</li> <li>1.2 followed safety signs and symbols</li> <li>1.3 used personal protective equipment (PPE)</li> <li>1.4 maintained workplace clear and tidy</li> <li>1.5 assessed and Controlled hazards</li> <li>1.6 followed emergency procedures</li> <li>1.7 responded to emergencies</li> <li>1.8 maintained personal well-being</li> </ul>
2. Underpinning knowledge	<ul style="list-style-type: none"> <li>2.1 Define OHS</li> <li>2.2 OHS Workplace Policies and Procedures</li> <li>2.3 Work Safety Procedures</li> <li>2.4 Emergency Procedures</li> <li>2.5 Hazard control procedure</li> <li>2.6 Different types of Hazards</li> <li>2.7 PPE and there uses</li> <li>2.8 Personal Hygiene Practices</li> <li>2.9 OHS Awareness</li> </ul>
3. Underpinning skills	<ul style="list-style-type: none"> <li>3.1 Accessing OHS policies</li> <li>3.2 Handling of PPE</li> <li>3.3 Handling cleaning tools and equipment</li> <li>3.4 Writing report</li> <li>3.5 Responding to emergency procedures</li> </ul>
4. Required attitude	<ul style="list-style-type: none"> <li>4.1 Commitment to occupational health and safety</li> <li>4.2 Sincere and honest to duties</li> <li>4.3 Promptness in carrying out activities</li> <li>4.4 Environmental concerns</li> <li>4.5 Eagerness to learn</li> <li>4.6 Tidiness and timeliness</li> <li>4.7 Respect of peers and seniors in workplace</li> <li>4.8 Communicate with peers and seniors in workplace</li> </ul>
5. Resource implications	<ul style="list-style-type: none"> <li>5.1 Workplace</li> <li>5.2 Equipment and outfits appropriate in applying safety measures</li> <li>5.3 Tools, materials and documentation required</li> <li>5.4 OHS Policies and Procedures</li> </ul>

6. Methods of assessment	<p>Competency should be assessed by:</p> <p>6.1 Written test</p> <p>6.2 Demonstration</p> <p>6.3 Oral Questioning</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 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 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 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 Instruction 2.3 Workplace standard 2.4 Sequence of drawing 2.5 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	Methods are included 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 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	<b>OU-LE -WF-01-L2-V1: Use Hand Tools, Power Tools and Measuring Tools</b>
Unit Descriptor	<p>This unit covers the skills, knowledge and attitude required in using hand tools, power tools and measuring tools.</p> <p>It includes preparing for work, using hand tools, using power tools, identifying measuring process, measuring and recording measurements, performing basic preventive maintenance and maintaining workplace cleanliness and storing tools.</p>
Nominal Hours	<b>20 Hours</b>
Elements of Competency	Performance Criteria
	<b><u>Bold and Underlined</u></b> terms are elaborated in the Range of Variables.
1. Prepare for work	1.1 <b><u>PPE</u></b> is collected and worn as per requirement 1.2 Appropriate <b><u>tools</u></b> are identified as per requirement 1.3 <b><u>Applications</u></b> of tools are defined 1.4 <b><u>Hand tools</u></b> and <b><u>power</u></b> tools are prepared for use 1.5 Sources of power supply for power tools are identified
2. Use hand tools	2.1 Safety precautions are ensured before using hand tools 2.2 Proper hand-eye coordination is applied in the use of hand tools 2.3 Unsafe or faulty tools are identified and marked for repair
3. Use power tools	3.1 Appropriate power tools are selected as per job requirement 3.2 Safe work practice is observed 3.3 Power supply outlet and electrical cord are inspected and confirmed safe for use following established workplace safety requirements 3.4 Safety precautions are ensured before using power tools following the manufacturer's operating specifications 3.5 The proper sequence of operation is applied for using power tools 3.6 Unsafe or faulty power tools are identified and marked for repair 3.7 Operate power tools safely to perform a work activity
4. Identify measuring process	4.1 Job to be measured is identified 4.2 Measuring requirements is identified and interpreted 4.3 Measuring procedures are identified as per requirements
5. Measure and record measurements	5.1 <b><u>Measuring instruments</u></b> is selected and collected according to measurement requirements 5.2 Measuring instruments are calibrated as per requirement 5.3 <b><u>Measurements</u></b> are taken accurately as per drawing and specification 5.4 Measurements are checked against job requirement 5.5 Measurements are recorded as per workplace procedure

6. Perform basic preventive maintenance.	6.1 Tools are cleaned as per standard procedure 6.2 Appropriate lubricants are identified 6.3 Tools are lubricated as required 6.4 Defective tools are inspected and corrected or replaced as per standard procedure 6.5 Tools are inspected, repaired and replaced after use
7. Maintain workplace cleanliness and store tools	7.1 Workplace is cleaned as per standard procedure 7.2 Hazardous materials are identified, separated and disposed as per workplace procedure 7.3 Waste materials are disposed as per environment requirement 7.4 Tools are cleaned and stored safely in appropriate location
<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. Apron/Overalls/Boiler suit 1.8. Welding helmet/Auto dark helmet 1.9. Safety helmet 1.10. Face shield 1.11. Arm guard 1.12. Leg guard 1.13. Hand shield 1.14. Safety belt
2. Tools	2.1 Hand Tools 2.2 Power Tools 2.3 Measuring 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	<ul style="list-style-type: none"> <li>4.1 Adjustable wrench</li> <li>4.2 C-clamp</li> <li>4.3 Chisels</li> <li>4.4 Files <ul style="list-style-type: none"> <li>▪ Round file</li> <li>▪ Flat file</li> <li>▪ Triangular file</li> <li>▪ Half round files</li> <li>▪ Square file</li> <li>▪ Knife file</li> </ul> </li> <li>1.1 Hacksaw</li> <li>1.2 Ball peen Hammer</li> <li>1.3 Sledge hammers</li> <li>1.4 Tongs</li> <li>1.5 Chipping hammer</li> <li>1.6 Steel wire brush</li> <li>1.7 Combination pliers</li> <li>1.8 Neon tester</li> <li>1.9 Snips</li> <li>1.10 Hand shares</li> <li>1.11 Anvil</li> <li>1.12 Center punches</li> <li>1.13 Prick punches</li> <li>1.14 Number punches</li> <li>1.15 Letter punches</li> <li>1.16 Scarpers</li> <li>1.17 Assorted Screwdrivers</li> <li>1.18 Spanners and Wrenches</li> <li>1.19 Grip vice</li> <li>1.20 Jigs and fixtures</li> <li>1.21 Allen key set</li> </ul>
5. Power Tools	<ul style="list-style-type: none"> <li>5.1 Angle Grinder/Off hand grinder</li> <li>5.2 Circular cutting machine/disc cutter</li> <li>5.3 Power saw</li> <li>5.4 Pedestal grinding machine</li> <li>5.5 Pneumatic chisel</li> <li>5.6 Hand drill</li> <li>5.7 Pedstall drill machine</li> </ul>

6. Measuring instruments	6.1 Try square 6.2 Steel tape 6.3 Divider 6.4 Steel rule 6.5 Vernier caliper 6.6 Fillet gauge 6.7 Welding gauge 6.8 Wire gauge 6.9 Vernier bevel protector 6.10 Trammel 6.11 Outside caliper 6.12 In side caliper 6.13 Angle plate 6.14 Sprit level
7. Measurements	7.1 Measuring length 7.2 Angle 7.3 Diameter (internal and external) 7.4 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.	
Critical aspects of competency	Assessment required evidence that the candidate: 1.1 collected ppe and worn as per requirement 1.2 used hand tools 1.3 used power tools 1.4 identified measuring process 1.5 measured and recorded measurements 1.6 performed basic preventive maintenance. 1.7 maintained workplace cleanliness and store tools 1.8 inspected, separated and corrected of defective tools 1.9 cleaned workplace and store tools
2. Underpinning knowledge	2.1 List the hand tools used for welding and fabrication 2.2 Functions and Procedures of using hand tools for welding works 2.3 List the power tools used for welding and fabrication 2.4 Functions and Procedures of using power tools for welding and fabrications works. 2.5 Applications of tools 2.6 Fabrications and its uses 2.7 Mention list of measuring instruments and their functions 2.8 Measurements 2.9 Care of hand and power tools 2.10 Preventive maintenance 2.11 Corrective maintenance 2.12 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-WF-02-L2-V1: Perform Metal Cutting and Bending</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitudes required to perform metal cutting and bending.</p> <p>It specifically includes preparing for cutting, performing gas cutting, performing plasma cutting, performing disc cutting, performing bending and cleaning and storing tools.</p>
<b>Nominal Hours</b>	<b>50 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. Prepare for cutting	<p>1.1 <b><u>PPE</u></b> is selected and collected as per requirements</p> <p>1.2 PPE is worn as required</p> <p>1.3 Safe work practices followed as per workplace standard</p> <p>2.1 Cutting requirements are identified and noted from procedures, drawings and specifications</p> <p>2.2 <b><u>Materials</u></b> are cleaned and marked for cutting as per noted dimension</p>
2. Perform gas cutting	<p>2.1 <b><u>Cutting process</u></b> is selected as per standard</p> <p>2.2 Cutting nozzles are selected as per plate thickness</p> <p>2.3 Equipment is <b><u>set up</u></b> as per job specification</p> <p>2.4 Flame is adjusted as per job requirement</p> <p>2.5 Metal is pre-heated as per standard operating procedure as required</p> <p>2.6 Metal is <b><u>cut</u></b> as per standard operating procedures</p> <p>2.7 Cut is checked for quality and any defects are identified and rectified as per standard operating procedures</p> <p>2.8 Supply of oxygen and acetylene gas is put-off following standard operating procedure</p>
3. Perform plasma cutting	<p>3.1 Plasma cutter is <b><u>set up and adjusted</u></b> as per job specification</p> <p>3.2 Materials are cut using proper plasma arc and <b><u>procedure</u></b></p> <p>3.3 Cut is checked for quality.</p> <p>3.4 Defects are identified and rectified if any as per standard operating procedures.</p> <p>3.5 Plasma cutter is turned off and disconnected it from the power supply</p>
4. Perform disc cutting	<p>4.1 Cutting process is selected as per standard</p> <p>4.2 Cutting disc are selected as per the type and thickness of materials</p> <p>4.3 Disc cutter/grinder is set up and adjusted as per job requirement and instruction manual</p> <p>4.4 Materials are cut by following proper parameter and safe procedure.</p> <p>4.5 Cut is checked for quality.</p>

	4.6 Defects are identified and rectified if any as per standard operating procedures. 4.7 Disc cutter is turned off and disconnected it from the power supply
5. Perform bending	5.1 Right materials are identified as per drawing 5.2 Materials are measured and marked using scribe, chalk or marker 5.3 Press brakes, punch and die are set according to the bend angle and radius required. 5.4 Manual and machine bending is performed as per job requirement 5.5 Bending angle and radius are checked and adjusted as per job requirement
6. Clean and store tools	6.1 Tools and equipment are cleaned and stored as per workplace standard. 6.2 Waste material are disposed as per workplace procedure 6.3 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 Safety helmet 1.11 Arm guard 1.12 Leg guard
2. Materials	2.1 MS Sheet 2.2 Medium carbon steel plate (6 mm ~ 10mm thickness) 2.3 Aluminium 2.4 Stainless steel 2.5 GI Sheet 2.6 MS and GI pipe
3. Cutting process	3.1 Manual 3.2 Semi-automatic 3.3 Straight line cutting as per job specification 3.4 Curve line cutting
4. Set up	4.1 Oxy Acetylene Regulator set up 4.2 Flashback arrestor/protector

	4.3 Cutting torch with nozzle set up 4.4 Hose pipe and connector 4.5 Cutting/Grinding disc set up 4.6 Power supply 4.7 Plasma torch and nozzle 4.8 Air supply
5. Cut	5.1 Straight cut 5.2 Bevel cut 5.3 Circular cut 5.4 Zigzag cut
6. Set up and adjust	6.1 Set up <ul style="list-style-type: none"> <li>▪ Power supply</li> <li>▪ Air supply</li> <li>▪ Torch assembly</li> </ul> 6.2 Adjust <ul style="list-style-type: none"> <li>▪ Ampere</li> <li>▪ Air Pressure</li> <li>▪ Cutting Speed</li> </ul>
7. Defects	7.1 Distortion 7.2 Warping 7.3 Dirty nozzle 7.4 Excess pre heat flame 7.5 Excess cutting oxygen 7.6 Karf defect
8. Tools	8.1 Chipping hammer 8.2 Ball peen hammer 8.3 Tongs 8.4 Wire brush 8.5 Grinder 8.6 Spark lighter 8.7 Nozzle cleaner 8.8 Utility wrench 8.9 Flashback Arrestor
9. Equipment	8.10 Manual gas cutting equipment 8.11 Semi-auto gas cutting machine 8.12 Plasma cutting machine 8.13 Pedestal disc cutter 8.14 Air compressor
<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 prepared for cutting 1.2 performed gas cutting

	1.3 performed plasma cutting 1.4 performed disc cutting 1.5 performed bending 1.6 cleaned and stored tools
2. Underpinning knowledge	2.1 Nomenclature of oxygen and acetylene cylinder 2.2 Pressure regulator 2.3 Cutting torch 2.4 Selection of cutting nozzle 2.5 Leak testing procedure 2.6 Oxy acetylene flames 2.7 Flashback 2.8 Back fire 2.9 Pre and post-heating 2.10 Parameter of plasma cutting 2.11 Plasma cutting procedure 2.12 List of equipment used for plasma cutting 2.13 Comparison among the gas cutting, plasma cutting and disc cutting 2.14 Precaution of disc cutting
3. Underpinning skills	3.1 Selecting PPE 3.2 Handling tools and equipment 3.3 Selecting and interpreting drawings and specification 3.4 Preparing materials for cutting 3.5 Setting and adjusting tools and equipment 3.6 Applying different techniques of cutting 3.7 Identifying defect of cutting 3.8 Rectifying cutting 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 Required workplace 5.2 Tools, equipment and facilities appropriate to processes or activity 5.3 Stand by firefighting equipment 5.4 Materials relevant to the proposed activity 5.5 Relevant drawings, manuals, codes 5.6 Standards and reference material
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 assessment	of	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 a 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-WF-03-L2-V1: Perform SMAW in 2F &amp; 3F Positions</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitudes required of a worker to perform SMAW - 2F and 2F positions.</p> <p>It specifically includes the tasks of following OSH practices, selecting tools, equipment and preparing materials, setting up welding machine, performing welding in 2F and 3F position and cleaning and storing tools.</p>
<b>Nominal Hours</b>	<b>85 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 <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 tools, equipment and prepare materials	2.1 Weld requirements are identified from workplace instruction 2.2 <b><u>Materials, tools, equipment</u></b> and <b><u>electrodes</u></b> are selected and collected as per job requirements 2.3 Job surface is cleaned as per requirement
3. Set up welding machine	3.1 Welding machine is prepared as per standard procedure 3.2 Ampere is set as per job requirements
4. Perform welding in 2F and 3F Position	4.1 Straight, weaving and padding bead are performed using SMAW 4.2 Tack welding is performed and alignment is checked as per job requirement 4.3 Welding is performed in 2F positions as per job requirement 4.4 Welding is performed in 3F positions as per job requirement 4.5 Welds are cleaned as required 4.6 Weld quality is checked and <b><u>defects</u></b> are identified and rectified as required
5. Clean and store tools	5.1 Welding Machine shutdown are conducted 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>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 Overalls 1.9 Welding 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. Materials	2.1 MS plates 6-10 mm thickness 2.2 MS Pipe
3. Tools	3.1 Ball pin hammer 3.2 Chipping hammer 3.3 Try square 3.4 Tongs 3.5 Wire brush 3.6 Chisels 3.7 Steel tape 3.8 C-clamp 3.9 Table vice 3.10 Anvil 3.11 Steel cup brush 3.12 Center/trick punch 3.13 3.14 Circular cutting machine 3.15 Angle grinder machine
4. Equipment	4.1. Electrode oven 4.2. AC welding machine 4.3. DC welding machine 4.4. Circular cutting machine 4.5. Angle grinder machine
5. Electrodes	5.1 2.5 and 3.2 mm
6. Defects	6.1 Lack of fusion 6.2 Lack of penetration 6.3 Porosity 6.4 Excess fusion 6.5 Excess penetration 6.6 Crack 6.7 Slag inclusions 6.8 Spatter 6.9 Undercut

	6.10 Irregular shape and dimension 6.11 Arc crater 6.12 Pin hole 6.13 Blow hole 6.14 Over lap 6.15 Distortion
<b>Evidence Guide</b> The evidence must be authentic, valid, sufficient, reliable and consistent to meet the requirements of the current version of the unit of competency.	
1. Critical Aspects	1.1 Set up equipment 1.2 Adjusted ampere 1.3 Selected appropriate electrode angle 1.4 Maintained travel speed 1.5 Performed welding 2F and 2F positions
2. Underpinning knowledge	2.1. Welding transformer 2.2. Rectifier 2.3. Polarity 2.4. Welding positions 2.5. Electrodes 2.6. Selection of electrodes 2.7. Tack weld 2.8. Welding current 2.9. Electrode angle 2.10. Arc length 2.11. Travel speed 2.12. Causes and rectification 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. Adjusting welding machine 3.5. Setting parameter of welding 3.6. Maintaining welding arc and arc length 3.7. Following welding procedure
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, Welding guide line 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, training manuals, poster, codes, standards and reference material
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 a 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-WF-04-L2-V1: Perform GMAW in 2F and 3F position.</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitudes required to perform GMAW in 2F and 3F position.</p> <p>It specifically includes the tasks of following OSH practices, selecting tools, equipment and preparing materials, setting up welding machine, performing welding in 2F and 3F position, cleaning and storing tools.</p>
<b>Nominal Hours</b>	<b>50 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 <b><u>PPE</u></b> 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. Select tools, equipment and prepare materials	2.1 Welding Requirements are identified from workplace instruction 2.2 <b><u>Tools, equipment and accessories</u></b> are selected and collected as per job requirements 2.3 <b><u>Materials and Consumables</u></b> are selected as required 2.4 <b><u>Wire</u></b> for GMAW is selected and collected as per job requirements 2.5 Contact tip is selected as per wire diameter 2.6 Drive roller is selected as per wire diameter 2.7 Job is prepared as per job requirement
3. Set up welding machine	3.1 Welding machine is prepared as per standard procedure 3.2 Wire feed unit is setup as per job requirement 3.3 Gas flow meter is adjusted as required 3.4 Ampere is set as per job requirements 3.5 Wire feeding speed is adjusted as per job requirement
4. Perform welding in 2F and 3F position	4.1 Job is positioned and clamped according to <b><u>welding position</u></b> 4.2 Tack weld is performed and alignment is checked as per job requirement 4.3 Welding is performed as per job specification 4.4 Welds are cleaned as per job requirements 4.5 Weld quality is checked and <b><u>defects</u></b> are identified 4.6 Defects are rectified following SOP
5. Clean and store tools	5.1 Welding Machine shutdown are conducted following SOP 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. PPE	1.1 Protective mask 1.2 Dark eye lenses 1.3 Safety Goggles (white) 1.4 Safety shoes 1.5 Overalls 1.6 Leather Apron 1.7 Leather cap 1.8 Auto Helmet 1.9 Leather hand gloves 1.10 Full sleeve leather jacket 1.11 Leather arm-guard 1.12 Safety belt
2. Tools	2.1 Nose pliers 2.2 Ball pin hammer 2.3 Chipping hammer 2.4 Try square 2.5 Tongs 2.6 Wire brush 2.7 Chisels 2.8 Steel tape 2.9 C-clamp 2.10 Table vice 2.11 Anvil 2.12 Cup brush 2.13 Center/trick punch 2.14
3. Equipment and accessories	3.1 GMAW machine 3.2 CO <sub>2</sub> Gas cylinder 3.3 CO <sub>2</sub> regulator with heater 3.4 Circular cutting machine 3.5 Angle grinder machine 3.6 Contact tip 3.7 Nozzles 3.8 Nozzle body 3.9 CO <sub>2</sub> Liner 3.10 Ceramic filter 3.11 Drive roller

4. Materials and consumables	4.1 MS plate thickness 6 ~10 mm 4.2 MS pipe 4.3 CO <sub>2</sub> gas/reactive gas 4.4 Wire 4.5 Colling gel/grease
5. Wire	5.1 Solid wire 1.2mm (max)
6. Welding position	6.1 2F and 3F
7. Defects	7.1 Lack of penetration 7.2 Lack of fusion 7.3 Excess penetration 7.4 Crack 7.5 Slag inclusions 7.6 Spatter 7.7 Excessive Reinforcement 7.8 Poor Reinforcement 7.9 Overlap 7.10 Blow hole 7.11 Pin hole 7.12 Porosity 7.13 Undercut 7.14 Arc crater 7.15 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. Followed OSH 1.2. Set up equipment 1.3. Adjusted ampere 1.4. Selected appropriate gun angle 1.5. Maintained travel speed 1.6. Adjusted wire feeding speed 1.7. Performed welding 1.8. Checked and rectified welding defects
2. Underpinning knowledge	2.1. Define GMAW 2.2. Describe GMAW machine 2.3. Welding gun 2.4. Wire feeder unit 2.5. GMAW wire 2.6. Welding current 2.7. Arc length 2.8. Functions of regulator 2.9. Shielding gas

	2.10. Travel speed 2.11. Causes and rectification of welding defects 2.12. Destructive Test 2.13. Non-Destructive Test
3. Underpinning skills	3.1. Selecting PPE 3.2. Selecting drawings and specification 3.3. Handling tools and equipment 3.4. Adjusting welding machine 3.5. Setting parameter of welding 3.6. Preparing Edges 3.7. Applying techniques of GMAW welding
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 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, GMAW guide line and facilities appropriate to processes or activity. 5.3. Materials relevant to the proposed activity. 5.4. 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 a 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.	

Unit Code and Title	<b>OU-LE-WF-05-L2-V1: Perform GTAW in 2F Position</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitudes required to perform welding in 2F position using GTAW.</p> <p>It specifically includes the tasks of following OSH practices, selecting tools, equipment and preparing materials, setting up welding machine, performing welding in 2F position, cleaning and storing tools.</p>
<b>Nominal Hours</b>	<b>70 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 <b><u>PPE</u></b> 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. Select tools, equipment and prepare materials	2.1 Weld requirements are identified from workplace instruction 2.2 <b><u>Tools, equipment and accessories</u></b> are selected and collected as per job requirements 2.3 <b><u>Materials and Consumables</u></b> are selected as required 2.4 Filler metal for GTAW is selected and collected as per job requirements 2.5 Tungsten electrodes is selected as per job requirement 2.6 Argon Gas cylinder is collected
3. Set up welding machine	3.1 Welding machine is prepared as per standard procedure 3.2 Gas flow meter is adjusted as required 3.3 Ampere is set as per job requirements 3.4 Tip angle of tungsten electrodes is grinded as per job requirement
4. Perform welding in 2F position	4.1 Job is cleaned and prepared as per welding requirements 4.2 Tack weld is performed and alignment is checked as per job requirement 4.3 Job is positioned and clamped as required 4.4 Welding is performed as per job specification 4.5 Welds are cleaned as per standard operating procedure 4.6 Weld quality is checked visually, defects are identified and rectified as required
5. Clean and store tools	5.1 Welding Machine is shutdown as per operating manual 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 Safety glasses/Goggles 1.2 Leather hand gloves for TIG welding 1.3 Ear plugs 1.4 Air respirator 1.5 Safety shoes/boots 1.6 Aprons 1.7 Face masks 1.8 Overalls 1.9 Welding helmet/Auto dark helmet 1.10 Safety helmet 1.11 Face shield 1.12 Arm guard
2. Tools	2.1 Ball pin hammer 2.2 Chipping hammer 2.3 Try square 2.4 Tongs 2.5 Wire brush 2.6 Chisels 2.7 Steel tape 2.8 C-clamp 2.9 Table vice 2.10 Anvil 2.11 Steel cup brush 2.12 Center/trick punch
3. Equipment and accessories	3.1 GTAW machine set with standard accessories 3.2 Inert gas (Argon) cylinder 3.3 Regulator with flow meter 3.4 Shearing machine 3.5 Angle grinding machine 3.6 Ceramic cup
4. Materials and consumables	4.1 SS sheet thickness 2 ~ 4 mm (max) 4.2 Filler metal according to base metal 4.3 Tungsten electrode 4.4 Cleansing agent
5. Defects	5.1 Improper arc strike 5.2 Arc crater 5.3 Burn through 5.4 Concavity/convexity 5.5 Cracks 5.6 Crater cracks 5.7 Lack of fusion

	5.8 Overlap 5.9 Tungsten inclusion 5.10 Undercut
<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: <ol style="list-style-type: none"> <li>1.1. followed OSH practices</li> <li>1.2. selected tools, equipment and prepare materials</li> <li>1.3. set up welding machine</li> <li>1.4. performed 2F welding</li> <li>1.5. cleaned and store tools</li> </ol>
2. Underpinning Knowledge	<ol style="list-style-type: none"> <li>2.1. Operational procedure of GTAW</li> <li>2.2. Application of GTAW</li> <li>2.3. Basic components of GTAW equipment</li> <li>2.4. advantages to the GTAW process</li> <li>2.5. Shielding gas</li> <li>2.6. Electrode</li> <li>2.7. Materials that can be weld</li> <li>2.8. Butt welding</li> <li>2.9. 2F welding position</li> <li>2.10. Welding defects</li> <li>2.11. Causes and rectification of defects</li> <li>2.12. Visual test</li> </ol>
3. Underpinning Skills	<ol style="list-style-type: none"> <li>3.1. Following OSH</li> <li>3.2. Handling tools and equipment</li> <li>3.3. Using accessories</li> <li>3.4. Interpreting drawings and specification</li> <li>3.5. Interpreting and following instructions</li> <li>3.6. Applying the techniques of TIG welding</li> <li>3.7. Communicating in the workplace</li> </ol>
4. Underpinning attitudes	<ol style="list-style-type: none"> <li>4.1. Commitment to occupational health and safety</li> <li>4.2. Environmental concerns</li> <li>4.3. Eagerness to learn</li> <li>4.4. Tidiness and timeliness</li> <li>4.5. Respect for rights of peers and seniors in workplace</li> <li>Respect for rights of peers and seniors in workplace</li> </ol>
5. Resource implications	The following resources must be provided: <ol style="list-style-type: none"> <li>5.1. Workplace</li> <li>5.2. Tools, equipment, TIG guide line and facilities appropriate to processes or activity.</li> <li>5.3. Materials relevant to the proposed activity.</li> </ol>



	5.4. Equipment and outfits appropriate in applying safety measures. 5.5. Relevant drawings, manuals, training manuals, poster, codes, standards and reference material. 5.6. Standby firefighting system
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 a 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-WF-06-L2-V1: Assemble and Finish the Products</b>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, skills and attitudes required to assemble and finish the products.</p> <p>It specifically includes preparing for work, positioning and aligning the parts, joining the parts of assembling, applying primer on fabricated product, cleaning and storing tools</p>
<b>Nominal Hours</b>	<b>40 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. Prepare for work	<p>1.1 OSH practices are followed as per workplace requirement</p> <p>1.2 <b><u>PPE</u></b> is collected and worn as per requirements</p> <p>1.3 Assembling and finishing requirements are identified from workplace instruction</p> <p>1.4 <b><u>Tools, equipment and accessories</u></b> are selected and collected as per job requirements</p> <p>1.5 <b><u>Materials and Consumables</u></b> are selected as required</p> <p>1.6 House keeping is followed to ensure the work area is clean, well-lit, and organized.</p>
2. Position and align the parts	<p>2.1 all parts are inspected for any damage or defects.</p> <p>2.2 All parts are clean if necessary to remove any debris or contaminants.</p> <p>2.3 Lay out the parts are done according to the assembly sequence.</p> <p>2.4 Parts are aligned as per the assembly drawings.</p> <p>2.5 <b><u>Holding devices</u></b> are used to hold the parts in place.</p>
3. Join the parts of assembling	<p>3.1 Tack welds are done as required and checked alignment of the parts</p> <p>3.2 Necessary adjustments are made to ensure that the assembly is precise.</p> <p>3.3 the parts are joined using appropriate <b><u>methods</u></b> to Ensure that the joints are secure and meet the required specifications.</p> <p>3.4 all fasteners are tightened to the specified torque levels to ensure that all joints are secure and there are no gaps.</p> <p>3.5 Final inspection is done of assembled product for quality, as per specified standard</p> <p>3.6 Assembling defects are identified and rectified following SOP</p>
4. Apply primer on fabricated product	<p>4.1 Assembled parts are checked and inspected for any <b><u>defects</u></b></p> <p>4.2 Surfaces of the assembled are prepared for priming following the <b><u>preparation process</u></b></p>

	4.3 A primer coat is applied to the surface if required, especially for metal parts that need protection from corrosion.
5. Clean and store tools	5.4 Assembling and painting Machine is shutdown as per operating manual 5.5 Equipment and tools are cleaned and stored in accordance with workplace requirements 5.6 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 Safety glasses/Goggles 1.2 Leather hand gloves for TIG welding 1.3 Ear plugs 1.4 Air respirator 1.5 Safety shoes/boots 1.6 Aprons 1.7 Face masks 1.8 Overalls 1.9 Welding helmet/Auto dark helmet 1.10 Safety helmet 1.11 Face shield 1.12 Arm guard
2. Tools	2.1 Ball pin hammer 2.2 Chipping hammer 2.3 Try square 2.4 Tongs 2.5 Wire brush 2.6 Chisels 2.7 Steel tape 2.8 C-clamp 2.9 Table vice 2.10 Anvil 2.11 Steel cup brush 2.12 Center/trick punch
3. Equipment and accessories	3.1 GTAW machine set with standard accessories 3.2 Inert gas (Argon) cylinder 3.3 Regulator with flow meter 3.4 Shearing machine 3.5 Angle grinding machine 3.6 Ceramic cup
4. Materials and consumables	1.1 MS 1.2 SS

	1.3 Electrode 1.4 Wire 1.5 Carbondioxide 1.6 Inert gas 1.7 Filler metal according to base metal 1.8 Tungsten electrode 1.9 Cleansing agent 1.10 Grinding disc
5. Holding devices	5.1 Jig & Fixture 5.2 C Clamp 5.3 Vice 5.4 Grip pliers
5. Joining methods	6.1 Welding 6.2 Bolting 6.3 Riveting
6. Defects	7.1 Misalignments 7.2 Rough edges 7.3 Surface imperfections
7. Process	8.1 Cleaning 8.2 Deburring 8.3 Grinding
<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 followed osh practices 1.2 selected tools, equipment and prepare materials 1.3 prepared for work 1.4 positioned and align the parts 1.5 joined the pats of assembling 1.6 applied primer on fabricated product 1.7 cleaned and stored tools
2. Underpinning Knowledge	2.1. Importance of alignment 2.2. List the holding devices and their functions 2.3. Defects of assembling 2.4. Joining methods of parts 2.5. Necessity of using primer
3. Underpinning Skills	3.1. Following OSH 3.2. Handling tools and equipment 3.3. Using accessories 3.4. Interpreting drawings and specification 3.5. Interpreting and following instructions 3.6. Communicating 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 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, TIG guide line 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, training manuals, poster, codes, standards and reference material. 5.6. Standby firefighting system
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 a 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 NSDA

## Development of Competency Standard

The Competency Standards for National Skills Certificate Level- 2 in Welding and Fabrication is Developed by NSDA on 29 August, 2024.

### List of resources persons

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1.	<b>Md. Jahid Hossain</b> proprietor	AHJ Engineering Workshop, Sapura, Rajshahi.	Mobile: 01750368988 Email: <a href="mailto:ntr.jahid96@gmail.com">ntr.jahid96@gmail.com</a>	
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9.	<b>Md. Nazrul Islam</b> Competency Standard Expert	National Skills Development Authority (NSDA)	Mobile: +880 1711 273708 Email: <a href="mailto:ndewli@yahoo.com">ndewli@yahoo.com</a>	

## Validation of Competency Standard

The Competency Standards for National Skills Certificate Level-2 in Welding and Fabrication is Validated by NSDA on 22 September, 2024.

### List of the members

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1.	<b>Md. Abdur Razzaque</b> Chairman Light Engineering Sector ISC Mobile: 01819 245588 E-mail: bcioa2008@gmail.com	Chairman	
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