



COMPETENCY STANDARD FOR Welding

(Light Engineering Sector)

Level: 03

Competency Standard Code: CSWL0007L3V1

**National Skills Development Authority
Prime Minister's Office, Bangladesh**

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Introduction

The National Skills Development Authority 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**" 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 ISC, employer associations and employers.

Generally, a competency standard informs curriculum, learning materials, assessment and certification of trainees enrolled in skills training. Trainees who successfully pass the assessment will receive a qualification in the NSQF 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

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 components 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 representative from NSDA, Key Institutions, ISC, and industry experts to identify the competencies required of an occupation in **light Engineering sector**.

Competency standards describe the skills, knowledge and attitude needed to perform effectively in the workplace. CS acknowledge that people can achieve technical and vocational competency in many ways by emphasizing 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 guide

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 components 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 – 03 in Welding

Level descriptors of NTVQF/ NSQF (BNQF 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 analyze, 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 information 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 information. 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 information 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. |

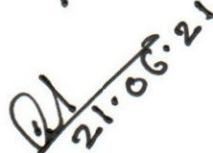
List of Abbreviations

| | |
|-------------|---|
| CS | - Competency Standard |
| ISC | - Industry Skills Council |
| FPS | - Foot, Pound, Second |
| GMAW | - Gas Metal Arc Welding |
| GTAW | - Gas tungsten arc Welding |
| NSDA | - National Skills Development Authority |
| MKS | - Meter, Kilogram, Second |
| NSQF | - National Qualifications Framework |
| OSH | - Occupational Safety and Health |
| PPE | - Personal Protective Equipment |
| SMAW | - Shielded Metal Arc Welding |
| SS | - Stainless Steel |
| SCVC | - Standards and Curriculum Validation Committee |
| STP | - Skills Training Provider |
| SOP | - Standard Operating Procedure |
| UoC | - Unit of Competency |

Approval of Competency Standard

Members of the Approval Committee:

| Member | Signature |
|---|---|
| Dulal Krishna Saha Executive Chairman (Secretary) National Skills Development Authority |  21.06.21 |
| Md. Nurul Amin Member (Admin & Finance) & Member (Registration & Certification) Joint Secreatry National Skills Development Authority |  21.06.21 |
| Alif Rudaba Member (Planning & Skills Standard) Joint Secreatry National Skills Development Authority |  |

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 21.06.21

Dulal Krishna Saha

Executive Chairman (Secretary)

National Skills Development Authority

Date:

National Competency Standards for National Skill Certificate – 3 in Welding

Course Structure

| SL | Unit Code and Title | | UoC Level | Nominal Hours |
|----------------------------------|---------------------|--|-----------|---------------|
| Generic Competencies | | | | 30 |
| 1. | GU004L2V1 | Work in a self-directed team | 3 | 15 |
| 2. | GU005L2V1 | Carry out workplace interaction in English | 3 | 15 |
| Occupation Specific Competencies | | | | 240 |
| 3. | OUWEL001L3V1 | Perform Shielded Metal Arc Welding on Pipe using (SMAW) – 1G Positions | 3 | 10 |
| 4. | OUWEL002L3V1 | Perform Shielded Metal Arc Welding on Pipe using (SMAW) – 2G Positions | 3 | 20 |
| 5. | OUWEL003L3V1 | Perform Shielded Metal Arc Welding on Pipe using (SMAW) – 5G Positions | 3 | 40 |
| 6. | OUWEL004L3V1 | Perform SMAW – 6G Positions | 3 | 75 |
| 7. | OUWEL005L3V1 | Perform SMAW – 6GR Positions | 3 | 40 |
| 8. | OUWEL006L3V1 | Perform GMAW on pipe -1G and 5G positions | 3 | 55 |
| Total Nominal Learning Hours | | | | 270 |

Units & Elements at a Glance:

Generic Competencies (30 Hours)

| Code | Unit of Competency | Elements of Competency | Duration (Hours) |
|------------|--|---|------------------|
| GU004L2V1 | Work in a self-directed team | <ol style="list-style-type: none">1. Identify team goals and processes2. Communicate and cooperate with team members3. Work as a team member4. Solve problems as a team member | 15 |
| GU005L2V1 | Carry out workplace interaction in English | <ol style="list-style-type: none">1. Interpret workplace communication and etiquette2. Interpret workplace documents3. Participate in workplace meetings and discussions4. Practice professional ethics at workplace | 15 |
| Total Hour | | | 30 |

Occupation Specific Competencies (240 Hours)

| Code | Unit of Competency | Elements of Competency | Hours |
|--------------------|---|--|------------|
| OUWEL001L3V1 | Perform SMAW on Pipe– 1G Position | <ol style="list-style-type: none"> 1. Follow OSH practices 2. Select tools, equipment and prepare materials 3. Set up welding machine 4. Perform welding 1G position on pipe 5. Clean and store tools | 10 |
| OUWEL002L3V1 | Perform SMAW on Pipe using – 2G Positions | <ol style="list-style-type: none"> 1. Follow OSH practices 2. Select tools, equipment and prepare materials 3. Set up welding machine 4. Perform welding 2G position 5. Clean and store tools | 20 |
| OUWEL003L3V1 | Perform SMAW on Pipe– 5G Positions | <ol style="list-style-type: none"> 1. Follow OSH practices 2. Select tools, equipment and prepare materials 3. Set up welding machine 4. Perform welding 5G position 5. Clean and store tools | 40 |
| OUWEL004L3V1 | Perform SMAW – 6G Positions | <ol style="list-style-type: none"> 1. Follow OSH practices 2. Select tools, equipment and prepare materials 3. Set up welding machine 4. Perform welding 6G positions Clean and store tools | 75 |
| OUWEL005L3V1 | Perform SMAW – 6GR Positions | <ol style="list-style-type: none"> 6. Follow OSH practices 7. Select tools, equipment and prepare materials 8. Set up welding machine 9. Perform welding Clean and store tools | 40 |
| OUWEL006L3V1 | Perform GMAW on pipe 1G and 5G positions | <ol style="list-style-type: none"> 1. Follow OSH practices 2. Select tools, equipment and prepare materials 3. Set up welding machine 4. Perform welding Clean and store tools | 55 |
| Total Hours | | | 240 |

Generic Competencies

| | |
|--|---|
| Unit Code and Title | GU004L3V1: Work in a Self-Directed Team |
| Nominal Hours | 15 Hours |
| Unit Descriptor | This unit Covered the knowledge, skills and attitude to communicate and work within a team in an interactive work environment as per the workplace standard. |
| Elements of Competency | Performance Criteria Bold & Underlined terms are elaborated in the Range of Variables Training Components |
| 1. Identify team goals and processes | 1.1 <u>Team goals</u> and processes are identified 1.2 Roles and responsibilities of team members are identified 1.3 Relationships within team and with other work areas are identified |
| 2. Communicate and cooperate with team members | 2.1. Effective interpersonal skills are used to interact with team members and to contribute to activities and objectives 2.2. Formal and informal forms of communication are used effectively to support team achievement 2.3. Diversity is respected and valued in team functioning 2.4. Views and opinions of other team members are understood and reflected accurately 2.5. <u>Workplace staff regulation</u> is used correctly to assist communication |
| 3. Work as a team member | 3.1 Duties, responsibilities, authorities, objectives and task requirements are identified and clarified with team 3.2 Tasks are performed in accordance with organizational and team requirements, specifications and workplace procedures 3.3 Team members support other members as required to ensure team achieves goals and requirements 3.4 Agreed reporting lines are followed using standard operating procedures |
| 4. Solve problems as a team member | 4.1 Current and potential problems faced by team are identified 4.2 Procedures for avoiding and managing problems are identified 4.3 Problems are solved effectively and in a manner that supports the team |
| Range of Variables | |
| Variable | Range (May include but not limited to) |

| | |
|---|--|
| 1. Team goals and processes | 1.1 Identifying the problem 1.2 Consider solutions 1.3 Action 1.4 Follow-up. |
| 2. Workplace staff regulation | 2.1 Organization / company's code of conduct, complaint handling / grievance policies and procedures |
| Evidence Guide 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 communicated and worked within a team in an interactive work environment as per workplace standard. 1.2 dealt with a range of communication/ information at one time. 1.3 made constructive contributions in workplace issues 1.4 presented information clearly and effectively in written form 1.5 asked appropriate questions 1.6 provided accurate information |
| 2. Underpinning knowledge | 2.1 Organization requirements for written and electronic communication methods 2.2 Effective verbal communication methods |
| 3. Underpinning skill | 3.1 Organizing information 3.2 Understanding and conveying intended meaning 3.3 Participating in a variety of workplace discussions 3.4 Compiling with Organization's requirements in the use of written and electronic communication methods |
| 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 implication | 5.1 Variety of Information 5.2 Communication tools 5.3 Simulated workplace |
| 6. Methods of assessment | 6.1. Written Test 6.2. Demonstration 6.3. Oral Questioning 6.4. Portfolio |

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|---|---|
| 7. Context of assessment | <p>7.1 Competency assessment must be done in NSDA Accredited Assessment center</p> <p>7.2 Assessment should be done by NSDA certified/ nominated assessor</p> |
| <p>Accreditation Requirements</p> <p>Training Providers must be accredited by 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 national skills qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.</p> | |

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| Unit Code and Title | GU005L3V1: Carryout Workplace Interaction in English |
| Nominal Hours | 15 Hours |
| Unit Descriptor | <p>This unit covers the knowledge, skills and attitudes required to carry out workplace interaction.</p> <p>It specifically includes – interpreting workplace communication and etiquette; reading and understand workplace documents; participating in workplace meetings and discussions; and practicing professional ethics at workplace.</p> |
| Elements of Competency | <p>Performance Criteria <u>Bold & Underlined</u> terms are elaborated in the Range of Variables Training Components</p> |
| 1. Interpret workplace communication and etiquette | <p>1.1 Workplace code of conducts are interpreted as per organizational guidelines</p> <p>1.2 Appropriate lines of communication are maintained with supervisors and colleagues</p> <p>1.3 Workplace interactions are conducted in a <u>courteous manner</u> to gather and convey information</p> <p>1.4 Questions about routine <u>workplace procedures and matters</u> are asked and responded as required</p> |
| 2. Interpret Workplace Documents | <p>2.1 Workplace documents are interpreted as per standard.</p> <p>2.2 Assistance is taken to aid comprehension when required from peers / supervisors</p> <p>2.3 Visual information / symbols / signage's are understood and followed</p> <p>2.4 Specific and relevant information are accessed from <u>appropriate sources</u></p> <p>2.5 Appropriate medium is used to transfer information and ideas</p> |
| 3. Participate in workplace meetings and discussions | <p>3.1 Team meetings are attended on time and followed meeting procedures and etiquette</p> <p>3.2 Own opinions are expressed and listened to those of others without interruption</p> <p>3.3 Inputs are provided consistent with the meeting purpose and interpreted and implemented meeting outcomes</p> |
| 4. Practice professional ethics at workplace | <p>4.1 Responsibilities as a team member are demonstrated and kept promises and commitments made to others</p> <p>4.2 Tasks are performed in accordance with workplace procedures</p> <p>4.3 Confidentiality is respected and maintained</p> |

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| | 4.4 Situations and actions considered inappropriate or which present a conflict of interest are avoided |
| Range of Variables | |
| Variable | Range (may include but not limited to): |
| 1. Courteous Manner | 1.1 Effective questioning 1.2 Active listening 1.3 Speaking skills |
| 2. Workplace Procedures and Matters | 2.1 Notes 2.2 Agenda 2.3 Simple reports such as progress and incident reports 2.4 Job sheets 2.5 Operational manuals 2.6 Brochures and promotional material 2.7 Visual and graphic materials 2.8 Standards 2.9 OSH information 2.10 Signs |
| 3. Appropriate Sources | 3.1 HR Department 3.2 Managers 3.3 Supervisors |
| Evidence Guide | |
| 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 workplace code of conducts is as per organizational guidelines 1.2 maintained workplace documents as per standard 1.3 followed workplace instructions and symbols 1.4 followed and implemented meeting outcomes |
| 2. Underpinning Knowledge | 2.1 Workplace communication and etiquette 2.2 Workplace documents, signs and symbols 2.3 meeting procedure and etiquette |
| 3. Underpinning Skills | 3.1 Interpreting performance of workplace communication and etiquette 3.2 Interpreting workplace instructions and symbol 3.3 Interpreting workplace code of conducts is as per organizational guidelines 3.4 Interpreting workplace documents as per standard 3.5 Interpreting and implementing meeting outcomes |

| | |
|--|---|
| 4. Underpinning Attitudes | 4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace |
| 5. Resource Implications | The following resources must be provided: 5.1 Relevant tools, Equipment, software and facilities needed to perform the activities. 5.2 Required learning materials. |
| 6. Methods of Assessment | Methods of assessment 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 NSDA accredited assessment centre 7.2 Assessment should be done by an NSDA certified/ nominated assessor |
| Accreditation Requirements Training Providers must be accredited by 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 national skills qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA. | |

Occupation Specific Competencies

| Unit Code and Title | OUWEL002L3V1: Perform SMAW on Pipes – 1G Position |
|--|--|
| Nominal Hours | 10 Hours |
| Unit Descriptor | <p>This unit covers the knowledge, skills and attitudes required to Perform SMAW on pipe –1G position.</p> <p>It specifically includes the tasks of following OSH practices, selecting tools, equipment and preparing materials, setting up welding machine, performing welding 1G position on pipe and cleaning and storing tools.</p> |
| Elements of Competency | Performance Criteria |
| | <u>Bold and Underlined</u> terms are elaborated in the Range of Variables. |
| 1. Follow OSH practices | 1.1 <u>PPE</u> 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 <u>Tools, equipment, materials</u> and <u>electrodes</u> are selected and collected as per job requirements 2.3 Plate surface are cleaned as per job specification 2.4 Job is prepared as required |
| 3. Set up welding machine | 3.1 Welding machine is prepared as per standard procedure 3.2 Ampere are set as per job requirements |
| 4. Perform welding | 4.1 Tack welding is performed and alignment is checked as per job requirement 4.2 Electrode's angle is maintained as per job requirement 4.3 Key hole techniques are maintained during root pass as required 4.4 Consecutive hot pass, filling pass and cover pass/reinforcement is performed as required 4.5 Welds are cleaned as per job requirements 4.6 Weld quality is checked visually and <u>defects</u> 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 |
| Range of Variables | |

| Variables | Range (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. Tools | 2.1 Jig and fixture/C-clamp 2.2 Ball pin hammer 2.3 Chipping hammer 2.4 Tongs 2.5 Flat file 2.6 Weld gauge 2.7 Wire brush 2.8 Wire cup brush 2.9 Angle Grinder 2.10 Bevel protector |
| 3. Equipment | 3.1 Electrode oven 3.2 AC welding machine 3.3 DC welding machine 3.4 Circular cutting machine 3.5 Angle grinder machine |
| 4. Materials | 4.1 MS pipes wall thickness 10 - 12 mm (150 mm dia) |
| 5. Electrodes | 5.1 E6010(2.5 mm/12 SWG) 5.2 E6011(2.5 mm/12 SWG) 5.3 E6013(2.5 and 3.2 mm/12 and 10 SWG) 5.4 E7016(2.6 and 3.2 mm/12 and 10 SWG) 5.5 E7017(2.5 and 3.2 mm/12 and 10 SWG) 5.6 E7018(2.5 and 3.2 mm/12 and 10 SWG) |

| | |
|---|--|
| 6. Defects | 1.1 Lack of fusion 1.2 Lack of penetration 1.3 Porosity 1.4 Excess fusion 1.5 Excess penetration 1.6 Crack 1.7 Slag inclusions 1.8 Spatter 1.9 Undercut 1.10 Irregular shape and dimension 1.11 Arc crater 1.12 Pin hole 1.13 Blow hole 1.14 Over lap 1.15 Distortion 1.16 Undercut 1.17 Arc crater 1.18 Poor bead appearance |
| Evidence Guide 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 |
| 2. Underpinning knowledge | 2.1 Edge preparation 2.1.1 Bevel angle 2.1.2 Root face 2.2 Root gap 2.3 Tack weld 2.4 Welding passes 2.5 Reinforcement 2.6 Electrodes 2.7 Welding current 2.8 Electrode angles 2.9 Arc length 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 Following OSH 3.2 Interpreting drawings and specification 3.3 Handling hand tools and equipment 3.4 Adjusting welding machine 3.5 Communicating in the workplace 3.6 Maintaining welding process and procedures |
| 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 |
| 6. 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 Relevant drawings, manuals, codes, standards and reference material 5.5 Standby firefighting system |
| 7. Methods of assessment | 6.1 Demonstration 6.2 Oral questioning 6.3 Written test 6.4 Portfolio |
| 9. Context of assessment | 7.1 Competency assessment must be done in NSDA accredited assessment centre 7.2 Assessment should be done by a NSDA certified/nominated assessor |
| Accreditation Requirements Training Providers must be accredited by 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 national skills qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA. | |

| Unit Code and Title | OUWEL002L3V1: Perform SMAW on Pipes – 2G Position |
|--|--|
| Nominal Hours | 20 Hours |
| Unit Descriptor | <p>This unit covers the knowledge, skills and attitudes required of perform SMAW on pipes – 2G position</p> <p>It specifically includes the tasks of following OSH practices, selecting tools, equipment and preparing materials, setting up welding machine, performing welding 2G position on pipe, cleaning and storing tools.</p> |
| Elements of Competency | Performance Criteria <u>Bold and Underlined</u> terms are elaborated in the Range of Variables. |
| 1. Follow OSH practices | 1.1 <u>PPE</u> 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 <u>Tools, equipment, materials</u> and <u>electrodes</u> are selected and collected as per job requirements 2.3 Plate surface are cleaned as per job specification 2.4 Job is prepared as required |
| 3. Set up welding machine | 3.1 Welding machine is prepared as per standard procedure 3.2 Ampere are set as per job requirements |
| 4. Perform welding | 4.1 Tack welding is performed and alignment is checked as per job requirement 4.2 Electrode's angle is maintained as per job requirement 4.3 Key hole techniques are maintained during root pass as required 4.4 Consecutive hot pass, filling pass and cover pass/reinforcement is performed as required 4.5 Welds are cleaned as per job requirements 4.6 Weld quality is checked visually and <u>defects</u> 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 |

| Range of Variables | |
|----------------------------------|---|
| Variables | Range (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. Tools | 2.1 Jig and fixture/C-clamp 2.2 Ball pin hammer 2.3 Chipping hammer 2.4 Tongs 2.5 Flat file 2.6 Weld gauge 2.7 Wire brush 2.8 Wire cup brush 2.9 Angle Grinder 2.10 Bevel protector |
| 3. Equipment | 3.1. Electrode oven 3.2. AC welding machine 3.3. DC welding machine 3.4. Circular cutting machine 3.5. Angle grinder machine |
| 4. Materials | 4.1. MS pipes wall thickness 10 - 12 mm (150 mm dia) |
| 5. Electrodes | 5.1 E6010(2.5 mm/12 SWG) 5.2 E6011(2.5 mm/12 SWG) 5.3 E6013(2.5 and 3.2 mm/12 and 10 SWG) 5.4 E7016(2.6 and 3.2 mm/12 and 10 SWG) 5.5 E7017(2.5 and 3.2 mm/12 and 10 SWG) 5.1 E7018(2.5 and 3.2 mm/12 and 10 SWG) |
| 6. Defects | 6.1 Lack of fusion |

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| | 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 6.16 Undercut 6.17 Arc crater 6.18 Poor bead appearance |
| Evidence Guide 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 of competency | 1.1 Following OSH 1.2 Set up equipment 1.3 Adjusted ampere 1.4 Selected appropriate electrode angle 1.5 Maintained travel speed 1.6 Maintained key hole techniques 1.7 Performed welding |
| 2. Underpinning knowledge | 2.1. Edge preparation 2.1.1. Bevel angle 2.1.2. Root face 2.2. Root gap 2.3. Tack weld 2.4. Welding passes 2.5. Reinforcement 2.6. Electrodes 2.7. Welding current 2.8. Electrode angles 2.9. Arc length 2.10. Travel speed 2.11. Causes and rectification of welding defects 2.12. Destructive test 2.13. Nondestructive test |

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| 3. Underpinning Skills | 3.1. Following OSH 3.2. Interpreting drawings and specification 3.3. Handling hand tools and equipment 3.4. Adjusting welding machine 3.5. Communicating in the workplace 3.6. Maintaining welding process and procedures |
| 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 Relevant drawings, manuals, codes, standards and reference material. 5.5 Standby firefighting system |
| 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 NSDA accredited assessment centre 7.2. Assessment should be done by a NSDA certified/nominated assessor |
| Accreditation Requirements Training Providers must be accredited by 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 national skills qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA. | |

| Unit Code and Title | OUWEL003L3V1: Perform SMAW on Pipes – 5G Position |
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| Nominal Hours | 40 Hours |
| Unit Descriptor | <p>This unit covers the knowledge, skills and attitudes required to perform SMAW on pipes – 5G Position</p> <p>It specifically includes the tasks of It specifically includes the tasks of following OSH practices, selecting tools, equipment and preparing materials, setting up welding machine, performing welding 5G position on pipe and cleaning and storing tools.</p> |
| Elements of Competency | <p>Performance Criteria <u>Bold and Underlined</u> terms are elaborated in the Range of Variables.</p> |
| 1. Follow OSH practices | <p>1.1 <u>PPE</u> 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> |
| 2. Select tools, equipment and prepare materials | <p>2.1 Weld requirements are identified from workplace instruction</p> <p>2.2 <u>Tools, equipment, materials</u> and <u>electrodes</u> are selected and collected as per job requirements</p> <p>2.3 Pipes are cleaned as per job specification</p> <p>2.4 Job is prepared as required</p> |
| 3. Set up welding machine | <p>3.1 Welding machine is prepared as per standard procedure</p> <p>3.2 Ampere are set as per job requirements</p> |
| 4. Perform welding | <p>4.1 Tack welding is performed and alignment is checked as per job requirement</p> <p>4.2 Electrode's angle is maintained as per job requirement</p> <p>4.3 Key hole techniques are maintained during root pass as required</p> <p>4.4 Consecutive hot pass, filling pass and cover pass/reinforcement is performed as required</p> <p>4.5 Welds are cleaned as per job requirements</p> <p>4.6 Weld quality is checked visually and <u>defects</u> are identified and rectified as required</p> |
| 5. Clean and store tools | <p>5.1 Welding Machine shutdown are conducted</p> <p>5.2 Equipment and tools are cleaned and stored in accordance with workplace requirements</p> |

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| | 5.3 The wastes are disposed and the workplace is cleaned in accordance with workplace requirements |
| Range of Variables | |
| Variable | Range (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. Tools | 2.1 Jig and fixture/C-clamp 2.2 Ball pin hammer 2.3 Chipping hammer 2.4 Tongs 2.5 Flat file 2.6 Weld gauge 2.7 Wire brush 2.8 Cup brush 2.9 Angle Grinder 2.10 Bevel protector 2.11 Try square |
| 3. Equipment | 3.1 Electrode oven 3.2 AC welding machine 3.3 DC welding machine 3.4 Circular cutting machine 3.5 Angle grinder machine |
| 4. Materials | 4.1 MS pipes wall thickness 10 - 12 mm (150 mm dia) |
| 5. Electrodes | 5.1 E6010(2.5 mm/12 SWG) 5.2 E6011(2.5 mm/12 SWG) 5.3 E6013(2.5 and 3.2 mm/12 and 10 SWG) 5.4 E7016(2.6 and 3.2 mm/12 and 10 SWG) 5.5 E7017(2.5 and 3.2 mm/12 and 10 SWG) |

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| | 5.6 E7018(2.5 and 3.2 mm/12 and 10 SWG) |
| 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 6.16 Undercut 6.17 Arc crater 6.18 Poor bead appearance |
| Evidence Guide 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 5G positions on pipe |
| 2. Underpinning knowledge | 2.1. Edge preparation 2.1.1. Bevel angle 2.1.2. Root face 2.2. Root gap 2.3. Tack weld 2.4. Welding passes 2.5. Reinforcement 2.6. Electrodes 2.7. Welding current 2.8. Electrode angles 2.9. Arc length 2.10. Travel speed 2.11. Causes and rectification of welding defects 2.12. Destructive test |

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| | 2.13. Non-Destructive test |
| 3. Underpinning Skills | 3.1. Following OSH 3.2. Interpreting drawings and specification 3.3. Handling hand tools and equipment 3.4. Adjusting welding machine 3.5. Communicating in the workplace 3.6. Maintaining welding process and procedures |
| 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 and facilities appropriate to processes or activity. 5.3 Materials relevant to the proposed activity. 5.4 Relevant drawings, manuals, codes, standards and reference material 5.5 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 NSDA accredited assessment centre 7.2. Assessment should be done by a NSDA certified/nominated assessor |

Accreditation Requirements

Training Providers must be accredited by 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 national skills qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

| Unit Code and Title | OUWEL004L3V1: PERFORM SMAW – 6G position |
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| Nominal Hours | 75 Hours |
| Unit Descriptor | <p>This unit covers the knowledge, skills and attitudes required to perform SMAW– 6G position.</p> <p>It specifically includes the tasks of following OSH practices, selecting tools, equipment and preparing materials, setting up welding machine, performing welding machine 6G position, cleaning and storing tools.</p> |
| Elements of Competency | Performance Criteria <u>Bold and Underlined</u> terms are elaborated in the Range of Variables. |
| 1. Follow OSH practices | 1.4 PPE is selected and collected as per requirements. 1.5 PPE is worn as required 1.6 Safe work practices followed as per workplace standard |
| 2. Select tools, equipment and prepare materials | 2.5 Weld requirements are identified from workplace instruction 2.6 Tools, equipment, materials and electrodes are selected and collected as per job requirements 2.7 Pipes are cleaned as per job specification 2.8 Job is prepared as required |
| 3. Set up welding machine | 3.3 Welding machine is prepared as per standard procedure 3.4 Ampere are set as per job requirements |
| 4. Perform welding 6G positions | 4.1 Tack welding is performed and alignment is checked as per job requirement 4.2 Pipe is fixed in $45^{\circ} \pm 5^{\circ}$ with horizontal line 4.3 Electrode's angle is maintained as per job requirement 4.4 Key hole techniques are maintained during root pass as required 4.5 Consecutive hot pass, filling pass and cover pass/reinforcement is performed as required 4.6 Welds are cleaned as per job requirements 4.7 Weld quality is checked visually and defects are identified and rectified as required |
| 5. Clean and store tools | 5.1 shutdown Welding Machine is conducted as per SOP 5.2 Equipment and tools are cleaned and stored in accordance with workplace requirements 5.1 The wastes are disposed and the workplace is cleaned in accordance with workplace requirements |

| Range of Variables | |
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| Variable | Range (may include but not limited to): |
| 1. Personal Protective Equipment | 1.17 Dust mask 1.18 Safety glasses/Goggles 1.19 Leather hand Gloves 1.20 Ear plugs 1.21 Air respirator 1.22 Safety shoes/boots 1.23 Aprons 1.24 Face masks 1.25 Overalls 1.26 Welding helmet/Auto dark helmet 1.27 Safety helmet 1.28 Face shield 1.29 Arm guard 1.30 Leg guard 1.31 Hand shield 1.32 Safety belt |
| 2. Tools | 2.1 Jig and fixture/C-clamp 2.2 Ball pin hammer 2.3 Chipping hammer 2.4 Tongs 2.5 Flat file 2.6 Weld gauge 2.7 Wire brush 2.8 Cup brush 2.9 Angle Grinder 2.10 Bevel protector 2.11 Try square |
| 3. Equipment | 3.1 Electrode oven 3.2 AC welding machine 3.3 DC welding machine 3.4 Circular cutting machine 3.5 Angle grinder machine |
| 4. Materials | 4.1 MS pipes wall thickness 10 - 12 mm (150 mm dia) |
| 5. Electrodes | 5.7 E6010(2.5 mm/12 SWG) 5.8 E6011(2.5 mm/12 SWG) 5.9 E6013(2.5 and 3.2 mm/12 and 10 SWG) 5.10 E7016(2.6 and 3.2 mm/12 and 10 SWG) 5.11 E7017(2.5 and 3.2 mm/12 and 10 SWG) 5.12 E7018(2.5 and 3.2 mm/12 and 10 SWG) |

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| 6. Defects | 6.19 Lack of fusion 6.20 Lack of penetration 6.21 Porosity 6.22 Excess fusion 6.23 Excess penetration 6.24 Crack 6.25 Slag inclusions 6.26 Spatter 6.27 Undercut 6.28 Irregular shape and dimension 6.29 Arc crater 6.30 Pin hole 6.31 Blow hole 6.32 Over lap 6.33 Distortion 6.34 Undercut 6.35 Arc crater 6.36 Poor bead appearance |
| Evidence Guide 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 practices 1.2 Adjusted ampere 1.3 Selected appropriate electrode angle 1.4 Maintained travel speed 1.5 Maintained key hole techniques 1.6 Performed root pass 1.7 Performed Hot pass 1.8 Performed Filling pass 1.9 Performed Cover pass |
| 2. Underpinning knowledge | 2.1 Edge preparation 2.1.1 Bevel angle 2.1.2 Root face 2.2 Root gap 2.3 Tack weld 2.4 Welding passes 2.5 Electrodes 2.6 Electrode baking 2.7 Welding current 2.8 Polarity 2.9 Electrode angles 2.10 Arc length 2.11 Travel speed |

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| | 2.12 Causes and rectification of welding defects 2.13 Destructive test 2.14 Nondestructive test |
| 3. Underpinning skills | 3.1. Following OSH 3.2. Interpreting drawings and specification 3.3. Handling hand tools and equipment 3.4. Adjusting welding machine 3.5. Following welding procedure specification 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 NSDA accredited assessment centre 7.2. Assessment should be done by a NSDA certified/nominated assessor |

Accreditation Requirements

Training Providers must be accredited by 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 national skills qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

| Unit Code and Title | OUWEL005L3V1: Perform SMAW - 6GR position |
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| Nominal Hours | 40 Hours |
| Unit Descriptor | <p>This unit covers the knowledge, skills and attitudes required to perform SMAW on pipe – 6GR Positions</p> <p>It specifically includes the tasks of following OSH practices, selecting tools, equipment and preparing materials, setting up welding machine, performing welding machine, cleaning and storing tools.</p> |
| Elements of Competency | Performance Criteria <u>Bold and Underlined</u> terms are elaborated in the Range of Variables. |
| 6. Follow OSH practices | 1.1 <u>PPE</u> is selected and collected as per requirements 1.2 PPE is worn as required 1.3 Safe work practices followed as per workplace standard |
| 7. Select tools, equipment and prepare materials | 2.1 Weld requirements are identified from workplace instruction 2.2 <u>Tools, equipment, materials</u> and <u>electrodes</u> are selected and collected as per job requirements 2.3 Pipes are cleaned as per job specification 2.4 Edge of one piece of pipe is beveled at $37^{\circ} \pm 2^{\circ}$ and another is prepared at 90° |
| 8. Set up welding machine | 8.1. Welding machine is prepared as per standard procedure 8.2. Ampere are set as per job requirements |
| 9. Perform welding | 9.1. Tack welding is performed and alignment is checked as per job requirement 9.2. Restriction plate is fixed as per standard operating procedure 9.3. Pipe is fixed in $45^{\circ} \pm 5^{\circ}$ angle 9.4. Electrode's angle is maintained as per job requirement. 9.5. Key hole techniques are maintained during root pass as required 9.6. Consecutive hot pass, filling pass and cover pass/reinforcement is performed as required 9.7. Weld quality is checked visually and <u>defects</u> are identified and rectified as required |
| 10. Clean and store tools | 5.1 Shutdown of Welding Machine is conducted following SOP 5.2 Equipment and tools are cleaned and stored in accordance with workplace requirements |

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| | 5.3 The wastes are disposed and the workplace is cleaned in accordance with workplace requirements |
| Range of Variables | |
| Variables | Range (may include but not limited to): |
| 7. 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. Materials | 2.1 MS pipes wall thickness 10 - 12 mm (150 mm dia) 2.2 Restriction plate (18" dia) |
| 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 Try square |
| 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 |

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| 5. Electrodes | 5.1 E6010(2.5 mm/12 SWG) 5.2 E6011(2.5 mm/12 SWG) 5.3 E6013(2.5 and 3.2 mm/12 and 10 SWG) 5.4 E7016(2.6 and 3.2 mm/12 and 10 SWG) 5.5 E7017(2.5 and 3.2 mm/12 and 10 SWG) 5.6 E7018(2.5 and 3.2 mm/12 and 10 SWG) |
| 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 6.16 Undercut 6.17 Arc crater 6.18 Poor bead appearance |
| Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency. | |
| 11.Critical aspects of competency | 1.1. Followed OSH 1.2. Set up equipment 1.3. Adjusted ampere 1.4. Selected appropriate electrode angle 1.5. Maintained travel speed 1.6. Maintained key hole techniques 1.7. Performed root pass 1.8. Performed hot pass 1.9. Performed filling pass |

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| | 1.10. Performed cover pass |
| 12.Underpinning knowledge | 12.1 Edge preparation 12.1.1 Bevel angle 12.1.2 Root face 12.2 Root gap 12.3 Tack weld 12.4 Welding passes 12.5 Electrodes 12.6 Welding current 12.7 Electrode angles 12.8 Arc length 12.9 Travel speed 12.10 Restriction plate 12.11 Welding process in restriction 12.12 Alignment 12.13 Causes and rectification of welding defects 12.14 Destructive test 12.15 Nondestructive test |
| 13.Underpinning Skills | 13.1 Following OSH 13.2 Interpreting drawings and specification 13.3 Handling hand tools and equipment 13.4 Adjusting welding machine 13.5 Following welding procedure specification 13.6 Communicating in the workplace 13.7 Performing measurement 13.8 Checking alignments |
| 14.Underpinning attitudes | 4.6 Commitment to occupational health and safety 4.7 Environmental concerns 4.8 Eagerness to learn 4.9 Tidiness and timeliness 4.10 Respect for rights of peers and seniors in workplace |
| 15.Resource implications | The following resources must be provided: 5.6 Well ventilated workplace 5.7 Tools, equipment and facilities appropriate to processes or activity. 5.8 Materials relevant to the proposed activity. 5.9 Equipment and outfits appropriate in applying safety measures. 5.10 Relevant drawings, manuals, codes, standards and reference material 5.11 Standby firefighting system |

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| 16.Methods of assessment | 6.5 Demonstration 6.6 Oral questioning 6.7 Written test 6.8 Portfolio |
| 17.Context of assessment | 7.3 Competency assessment must be done in NSDA accredited assessment centre 7.4 Assessment should be done by a NSDA certified/nominated assessor |
| <p>Accreditation Requirements</p> <p>Training Providers must be accredited by 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 national skills qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.</p> | |

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| Unit Code and Title | OUWEL006L3V1: Perform GAMW on Pipe-1G and 5 G Positions |
| Nominal Hours | 55 Hours |
| Unit Descriptor | <p>This unit covers the knowledge, skills and attitudes required for Welding on Pipes Using GMAW in 1G and 5G Positions.</p> <p>It specifically includes the tasks of following OSH practices, selecting tools, equipment and preparing materials, setting up welding machine, performing welding and cleaning and storing tools.</p> |
| Elements of Competency | <p>Performance Criteria</p> <p><u>Bold and Underlined</u> terms are elaborated in the Range of Variables.</p> |
| 1. Follow OSH practices | <p>1.1 <u>PPE</u> 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> |
| 2. Select tools, equipment and prepare materials | <p>2.1 Weld requirements are identified from workplace instruction</p> <p>2.2 <u>Tools, equipment and accessories</u> are selected and collected as per job requirements</p> <p>2.3 <u>Materials and Consumables</u> are selected as required</p> <p>2.4 Pipes are marked and cut as per dimension of specification and drawing</p> <p>2.5 Edges are prepared as specification to meet job requirements</p> <p>2.6 Pipes are assembled and aligned with required gap</p> |
| 3. Set up welding machine | <p>3.1 Job is set up using clamps/jig/fixtures at required <u>positions</u></p> <p>3.2 Welding machine and accessories are set up and adjusted as per job requirements</p> |
| 4. Perform welding | <p>4.1 Tack weld is performed and alignment is checked as per job requirement</p> <p>4.2 Weld is performed as per job specification and standard</p> <p>4.3 Welds are cleaned as per job requirements</p> <p>4.4 Weld quality is checked and <u>defects</u> are identified</p> <p>4.5 Defects are rectified following SOP</p> |
| 5. Clean and store tools | <p>5.1 Welding Machine shutdown are conducted</p> <p>5.2 Equipment and tools are cleaned and stored in accordance with workplace requirements</p> <p>5.3 The wastes are disposed and the workplace is cleaned in accordance with workplace requirements</p> |
| Range of Variables | |
| Variable | Range (may include but not limited to): |

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| 1. PPE | 1.1 Protective mask 1.2 Dark eye lenses 1.3 Safety Goggles (white) 1.4 Safety shoes 1.5 Protective clothing. 1.6 Leather Apron 1.7 Auto Helmet 1.8 Leather hand gloves 1.9 Full sleeve leather jacket 1.10 Leather arm-guard 1.11 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 Steel cup brush 2.13 Center/trick punch 2.14 Wire spacer |
| 3. Equipment and accessories | 3.1 GMAW machine 3.2 CO2 Gas cylinder 3.3 CO2 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 CO2 Liner 3.10 Ceramic filter |
| 4. Materials and consumables | 4.1 Pipes 4.1.1 MS Pipes (diameter 100 mm – 350 mm and Wall thickness 6 mm – 20 mm) 4.1.2 Carbon steel pipes (diameter 100 mm – 350 mm and Wall thickness 6 mm – 20 mm) 4.1.3 SS Pipes (diameter 50 mm – 150 mm and Wall thickness 2 mm – 20 mm) |

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| | 4.2 Wire 4.2.1 Solid wire 1.2mm (Max) 4.2.2 Fluxed core wire 1.2mm (Max) 4.3 Shielding gas 4.3.1 Inert gas (argon, helium) 4.3.2 Active gas (Nitrogen or carbon – dioxide) 4.3.3 Mixture of inert and active gases |
| 5. Positions | 5.1 1G 5.2 5G |
| 6. Defects | 6.1 Lack of penetration 6.2 Lack of fusion 6.3 Excess penetration 6.4 Crack 6.5 Slag inclusions 6.6 Spatter 6.7 Excessive Reinforcement 6.8 Poor Reinforcement 6.9 Overlap 6.10 Blow hole 6.11 Porosity 6.12 Undercut 6.13 Arc crater 6.14 Poor bead appearance |

Evidence Guide

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

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| 1. Critical aspects of competency | 1.1. Followed OSH 1.2. Set up equipment 1.3. Adjusted ampere 1.4. Performed welding 1.5. Checked and rectified welding defects |
| 2. Underpinning knowledge | 2.1. Define GMAW 2.2. GMAW wire 2.3. Welding current 2.4. Arc length 2.5. Functions of regulator 2.6. Shielding gas 2.7. Causes and rectification of welding defects 2.8. Destructive test 2.9. Non-destructive test |
| 3. Underpinning skills | 3.1. Selecting PPE 3.2. Selecting drawings and specification |

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| | 3.3. Handling hand tools and equipment 3.4. Adjusting welding machine 3.5. Following welding procedure and system |
| 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 |
| 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 NSDA accredited assessment centre 7.2. Assessment should be done by a NSDA certified/nominated assessor |

Accreditation Requirements

Training Providers must be accredited by 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 national skills qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Development of Competency Standard

The Competency Standards for National Skills Certificate in **Welding** Standard is developed by NSDA on 14-21 March, 2021.

Respectable members:

| | | |
|-----|--|--------|
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Validation of Competency Standard by Standard and Curriculum Validation Committee

The Competency Standards for National Skills Certificate in **Welding** Standard is validated by SCVC on 23 and 24 May 2021.

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This Competency Standard for **Welding** 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 for individuals who graduated through the established standard via competency-based assessment to be suitably qualified for a relevant job.

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