

National Technical and Vocational Qualification Framework

NTVQF

**Competency Standards
For
Welding
NTVQ, Level 1-4**



Bangladesh Technical Education Board

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Introduction

These Competency Standards were developed by the Standards and Curriculum Development Committee (SCDC) **for the occupation 'Welder'** that was established under the sub-sector Industry Skills Council (ISC) and with the assistance of the Technical and Vocational Education Reform project. This project is funded by the European Union, the International Labour Organization and the Government of Bangladesh.

The competency standards are the foundation on which new competency based curriculum will be developed that responds better to the needs of industry for skilled workers. The members of the SCDCs are primarily from industry but with representatives from the Bangladesh Technical Education Board (BTEB) and the Directorate of Technical Education (DTE), Bureau of Manpower Employment and Training (BMET), NGO, and Private Training providers. Persons who will successfully complete the new TVET programs based on these competency standards will receive a qualification in the new National Technical and Vocational Qualification Framework (NTVQF).

Endorsed by

Industry Skills Council
Date:

Bangladesh Technical Education Board
(BTEB)
Date:

Bangladesh NTVQF with Job Classifications

NTVQF LEVELS	EDUCATION SECTORS			Job Classification
	Pre-Vocation Education	Vocational Education	Technical Education	
NTVQF 6			Diploma in engineering or equivalent	Middle Level Manager /Sub Assistant Engr. etc.
NTVQF 5		National Skill Certificate 5 (NSC 5)		Highly Skilled Worker / Supervisor
NTVQF 4		National Skill Certificate 4 (NSC 4)		Skilled Worker
NTVQF 3		National Skill Certificate 3 (NSC3)		Semi-Skilled Worker
NTVQF 2		National Skill Certificate 2 (NSC 2)		Medium -Skilled Worker
NTVQF 1		National Skill Certificate 1 (NSC 1)		Basic Skilled Worker
Pre-Voc 2	National Pre-Vocation Certificate NPVC 2			Pre-Vocation Trainee
Pre-Voc 1	National Pre-Vocation Certificate 1 NPVC 1			Pre-Vocation Trainee

Annex 1: NTVQF level Descriptors

NTVQF Level	Knowledge	Skill	Responsibility	Job Class.
6	Comprehensive actual and theoretical knowledge within a specific study area with an awareness of the limits of that knowledge.	Specialised and restricted range of cognitive and practical skills required to provide leadership in the development of creative solutions to defined problems	- Mange a team or teams in workplace activities where there is unpredictable change - Identify and design learning programs to develop performance of team members	Supervisor / Middle Level Manager /Sub Assistant Engr. etc.
5	Very broad knowledge of the underlying, concepts, principles, and processes in a specific study area	Very broad range of cognitive and practical skills required to generate solutions to specific problems in one or more study areas.	- Take overall responsibility for completion of tasks in work or study - Apply past experiences in solving similar problems	Highly Skilled Worker / Supervisor
4	Broad knowledge of the underlying, concepts, principles, and processes in a specific study area	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	- Take responsibility, within reason, for completion of tasks in work or study - Apply past experiences in solving similar problems	Skilled Worker
3	Moderately broad knowledge in a specific study area.	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	Work or study under supervision with some autonomy	Semi-Skilled Worker
2	Basic underpinning knowledge in a specific study area.	Basic skills required to carry out simple tasks	Work or study under indirect supervision in a structured context	Medium Skilled Worker
1	Elementary understanding of the underpinning knowledge in a specific study area.	Limited range of skills required to carry out simple tasks	Work or study under direct supervision in a structured context	Basic Skilled Worker
Pre-Voc 2	Limited general knowledge	Very limited range of skills and use of tools required to carry out simple tasks	Work or study under direct supervision in a well-defined, structured context.	Pre-Vocation Trainee
Pre-Voc 1	Extremely limited general knowledge	Minimal range of skills required to carry out simple tasks	Simple work or study exercises, under direct supervision in a clear, well defined structured context	Pre-Vocation Trainee

**National Competency Standards for Certificate in Welding
(SMAW/GMAW/GTAW) (NTVQF Level 1, 2, 3 & 4)**

S. No.	Unit Code and Title		UoC Level	Nominal Duration (Hours)
Generic (5 UoCs required)				200
1.	GN 1001A1	Use basic mathematical concepts	1	40
2.	GN 1002A1	Apply OSH practices in the workplace	1	30
3.	GN 2003A1	Use English in the workplace	2	70
4.	GN 2004A1	Operate in a self- directed team	2	30
5.	GN 2005A1	Present and apply workplace information	2	30
Sector Specific (5 UoCs required)				150
6.	TRASS1006A1	Interpret technical drawing	1	40
7.	TRASS1007A1	Work in the manufacturing industry	1	20
8.	TRASS1008A1	Use hand and power tools	1	40
9	TRASS1009A1	Use graduated measuring instruments	1	20
10	TRASS3010A1	Apply quality systems and procedure	3	30
Occupation Specific – Compulsory (5 UoCs required)				290
11.	TRAWEL1011A1	Apply fundamentals of welding metallurgy in the workplace	1	30
12.	TRAWEL1012A1	Perform spot welding	1	40
13.	TRAWEL1013A1	Perform gas cutting and welding	1	60
14.	TRAWEL3026A1	Inspect and test welds	3	90
15.	TRAWEL3027A1	Estimate cost of jobs	3	70
Complete any ONE of the following THREE electives				540
Specialised Elective: SMAW (5 UoCs required)				540
16a	TRAWEL1028A1	Perform Shielded Metal Arc Welding (SMAW) for Basic Purposes – Positions 1F, 2F, 3F, 4F, 1G and 2G	1	70
17a	TRAWEL2014A1	Perform Shielded Metal Arc Welding (SMAW) – Positions 1G and 2G	2	110
18c	TRAWEL3015A1	Perform Shielded Metal Arc Welding (SMAW) – Positions 3G and 4G	3	150
19a	TRAWEL4016A1	Perform Shielded Metal Arc Welding (SMAW) – Positions 5G and 6G	4	140
20a	TRAWEL4017A1	Perform Shielded Metal Arc Welding (SMAW) – Position 6GR	4	70

Specialised Elective: GMAW (5 UoCs required)				540
16b	TRAWEL1028A1	Perform Shielded Metal Arc Welding (SMAW) for Basic Purposes – Positions 1F, 2F, 3F, 4F, 1G and 2G	1	70
17b	TRAWEL2018A1	Perform Gas Metal Arc Welding (GMAW or MIG) – Positions 1G and 2G	2	110
18b	TRAWEL3019A1	Perform Gas Metal Arc Welding (GMAW or MIG) – Positions 3G and 4G	3	150
19b	TRAWEL4020A1	Perform Gas Metal Arc Welding (GMAW or MIG) – Positions 5G and 6G	4	140
20b	TRAWEL4021A1	Perform Gas Metal Arc Welding (GMAW or MIG) – Position 6GR	4	70
Specialised Elective: GTAW (5 UoCs required)				540
16c	TRAWEL1028A1	Perform Shielded Metal Arc Welding (SMAW) for Basic Purposes – Positions 1F, 2F, 3F, 4F, 1G and 2G	1	70
17c	TRAWEL2022A1	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Positions 1G and 2G	2	110
18c	TRAWEL3023A1	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Positions 3G and 4G	3	150
19c	TRAWEL4024A1	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Positions 5G and 6G	4	140
20c	TRAWEL4025A1	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Position 6GR	4	70
Total Nominal Learning Hours for each Specialization (SMAW/GMAW/GTAW)				1180

Course Structure for National Certificate in Welding (NTVQF Level 1)

National Certificate in Welding (SMAW)

S. No.	Unit Code and Title		UoC Level	Nominal Duration (Hours)
Generic (2 UoCs required)				70
1.	GN1001A1	Use basic mathematical concepts	1	40
2.	GN1002A1	Apply OSH practices in the workplace	1	30
Sector Specific (4 UoCs required)				120
3.	TRASS1006A1	Interpret technical drawing	1	40
4.	TRASS1007A1	Work in the manufacturing industry	1	20
5.	TRASS1008A1	Use hand and power tools	1	40
6.	TRASS1009A1	Use graduated measuring instruments	1	20
Occupation Specific (SMAW) – Compulsory (3 UoCs required)				170
7.	TRAWEL1012A1	Perform Spot Welding	1	40
8.	TRAWEL1013A1	Perform Gas cutting and Welding	1	60
9.	TRAWEL1028A1	Perform Shielded Metal Arc Welding (SMAW) under supervision – Positions 1F, 2F, 3F, 4F, 1G and 2G	1	70
Total Nominal Learning Hours				360

Course Structure for National Certificate in Welding (NTVQF Level 2):

National Certificate in Welding (SMAW) (NTVQF Level 2)

National Certificate in Welding (GMAW) (NTVQF Level 2)

National Certificate in Welding (GTAW) (NTVQF Level 2)

S. No.	Unit Code and Title		UoC Level	Nominal Duration (Hours)
Generic (3 UoCs required)				130
1.	GN 2003A1	Use English in the workplace	2	70
2.	GN 2004A1	Operate in a self directed team	2	30
3.	GN 2005A1	Present and apply workplace information	2	30
Occupation Specific – Compulsory (1 UoC required)				30
4.	TRAWEL1011A1	Apply Fundamentals of Welding Metallurgy in the Workplace	1	30
Complete any ONE of the following THREE electives				110
Specialised Elective: SMAW (1 UoC required)				110
5a.	TRAWEL2014A1	Perform Shielded Metal Arc Welding (SMAW) – Positions 1G and 2G	2	110
Specialised Elective: GMAW (1 UoC required)				110
5b.	TRAWEL1018A1	Perform Gas Metal Arc Welding (GMAW) – Positions 1G and 2G	2	110
Specialised Elective: GTAW (1 UoC required)				110
5c.	TRAWEL1022A1	Perform Gas Tungsten Arc Welding (GTAW) – Positions 1G and 2G	2	110
Total Nominal Learning Hours				270

Course Structure for National Certificate in Welding (NTVQF Level 3):

National Certificate in Welding (SMAW) (NTVQF Level 3)

National Certificate in Welding (GMAW) (NTVQF Level 3)

National Certificate in Welding (GTAW) (NTVQF Level 3)

S. No.	Unit Code and Title		UoC Level	Nominal Duration (Hours)
Sector Specific (1 UOC required)				30
1	TRASS3010A1	Apply quality systems and procedures	3	30
Occupation Specific – Compulsory (1 UoC required)				90
2.	TRAWEL3026A1	Inspect and test welds	3	90
Complete ONE of the following THREE specialised electives (1 UoC required)				150
Specialised Elective (SMAW Welding) – Compulsory (1 UoC required)				150
3a	TRAWEL3015A1	Perform Shielded Metal Arc Welding (SMAW) – Positions 3G and 4G	3	150
Specialised Elective (GMAW Welding) – Compulsory (1 UoC required)				150
3b	TRAWEL3019A1	Perform Gas Metal Arc Welding (GMAW or MIG) – Positions 3G and 4G	3	150
Specialised Elective (GTAW Welding) – Compulsory (1 UoC required)				150
3c	TRAWEL3023A1	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Positions 3G and 4G	3	150
Total Nominal Learning Hours for each Welding (SMAW/GMAW/GTAW)				270

Course Structure for National Certificate in Welding (NTVQF Level 4):

National Certificate in Welding (SMAW) (NTVQF Level 4)

National Certificate in Welding (GMAW) (NTVQF Level 4)

National Certificate in Welding (GTAW) (NTVQF Level 4)

S. No.	Unit Code and Title		UoC Level	Nominal Duration (Hours)
Occupation Specific – Compulsory (1 UoC required)				70
1	TRAWEL3027A1	Estimate cost of jobs	3	70
Complete any ONE of the following THREE specialised electives				210
Specialised Elective: SMAW – 2 UoCs required				210
2a	TRAWEL4016A1	Perform Shielded Metal Arc Welding (SMAW) – Positions 5G and 6G	4	140
3a	TRAWEL4017A1	Perform Shielded Metal Arc Welding (SMAW) – Position 6GR	4	70
Specialised Elective: GMAW – 2 UoCs required				210
2b	TRAWEL4020A1	Perform Gas Metal Arc Welding (GMAW or MIG) – Positions 5G and 6G	4	140
3b	TRAWEL4021A1	Perform Gas Metal Arc Welding (GMAW or MIG) – Position 6GR	4	70
Specialised Elective: GTAW – 2 UoCs required				210
2c	TRAWEL4024A1	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Positions 5G and 6G	4	140
3c	TRAWEL4025A1	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Position 6GR	4	70
Total Nominal Learning Hours for each Specialization (SMAW/GMAW/GTAW)				280

List of Abbreviations

General

BMET – Bureau of Manpower Employment and Training
BTEB – Bangladesh Technical Education Board
DTE – Directorate of Technical Education
ILO – International Labour Organization
ISC – Industry Skills Council
NPVC – National Pre-Vocation Certificate
NTVQF – National Technical and Vocational Qualification Framework
SCDC – Standards and Curriculum Development Committee
TVET – Technical Vocational Education and Training
UoC – Unit of Competency

Occupation Specific Abbreviations

AWS – American Welding Society
CNG – Compressed Natural Gas
GMAW – Gas metal Arc Welding
GTAW – Gas Tungsten Arc Welding
HAZ – Heat Affected Zone
LPG – Liquid Petroleum Gas
MSDS – Material Safety Data Sheet
OSH – Occupational Safety and Health
PPE – Personal Protective Equipment
SMAW – Shielded Metal Arc Welding
SOP – Standard Operating Procedures
WPS – Weld Procedure Specifications

GENERIC UNITS

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	GN1001A1: Use Basic Mathematical Concepts
Nominal Hours	40 hours
Unit Descriptor	This requires the knowledge, skill and attitude to apply mathematical methods such as addition, subtraction, multiplication, and division, among others, in the routine tasks of an organisation.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the Range of Variable Training Components
1. Identify calculation requirements in the workplace	1.1 Calculation requirements are identified from <i>workplace information</i>
2. Select appropriate mathematical methods for the calculation	2.1. Appropriate <i>Mathematical methods</i> are selected to carry out the calculation. 2.2. <i>System and units of measurement</i> to be followed are determined.
3. Use basic mathematical concepts to calculate workplace calculation.	3.1. Calculations are completed using appropriate methods such as addition, subtraction, multiplication and division. 3.2. Systems and units of measurement for the task are applied to workplace calculation.
Range of Variables	
Variable	Range (May include but not limited to)
1. Equipment and tools	1.1 Calculator 1.2 Computer with office software
2. Mathematical methods	2.1. Addition 2.2. Subtraction 2.3. Division 2.4. Multiplication 2.5. Ratio on any types of real values (such as whole numbers, fractional numbers, percentages, numbers with exponents)
3. System and units of measurement	3.1. Measurement 3.2. Volume 3.3. Weight

	3.4. Mass 3.5. Density 3.6. Percentage 3.7. Length / Breadth / Thickness 3.8. Capacity 3.9. Time 3.10. Temperature 3.11. Budget, Pay/ Wages, Leave entitlements 3.12. Material usage 3.13. Speed 3.14. Costing
4. Workplace information	4.1 Project documents 4.2 Graphs 4.3 Charts 4.4 Tables 4.5 Spread sheets 4.6 Item price quotations 4.7 Equipment manuals
5. Budget	5.1 Budget of consumables 5.2 Calculation for software components 5.3 Hardware equipment 5.4 Maintenance budget of a set-up 5.5 Cost estimation
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 Applied mathematical methods such as addition, subtraction, division and multiplication to workplace calculations.
2. Underpinning knowledge	2.1. Calculation requirements in the workplace 2.2. Select appropriate mathematical methods 2.3. Equipment and tools 2.4. Mathematical language, symbols and terminology 2.5. Application of units 2.6. Workplace information 2.7. Using arithmetic processes to find solutions to simple mathematical problems
3. Underpinning skill	3.1. Ability to identify calculation requirements from workplace information 3.2. Ability to select appropriate mathematical methods 3.3. Ability to use appropriate technology

	3.4. Ability to use mathematical language, symbols and terminology 3.5. Understanding of appropriate units of measurement (such as kg, meter) and application may include measurement, volume, weight, density, percentage etc. 3.6. Ability to include workplace information (project documents, graphs, charts, tables, spread sheets, item price quotations, equipment manuals) 3.7. Ability to use arithmetic processes to find solutions to simple mathematical problems 3.8. Ability to apply in the workplace.
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, equipment and physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities.
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test 6.4 Portfolio 6.5 Log book
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	GN1002A1: Apply OSH practices in the workplace
Nominal Hours	30 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude required to identify and apply OSH in the workplace. This also covers identifying, controlling and reporting OSH hazards, conducting of work in a safe manner, following emergency response procedure and maintaining and improving health and safety in the workplace.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the Range of Variable Training Components
1. Identify, control and report OSH hazards	1.1 Immediate work area is routinely checked for OSH hazards prior to commencing and during work. 1.2 Hazards and unacceptable performance are identified and corrective action is taken within the level of responsibility. 1.3 OSH hazards and incidents are reported to appropriate personnel according to workplace procedures. 1.4 Safety Signs and symbols are identified and followed
2. Conduct work safely	2.1. Apply OSH practices in the workplace. 2.2. Appropriate personal protective equipment (PPE) is selected and worn.
3. Follow emergency response procedures	3.1. Emergency situations are identified and reported according to workplace reporting requirements. 3.2. Emergency procedures are followed as appropriate to the nature of the emergency and according to workplace procedures. 3.3. Workplace procedures for dealing with accidents, fires and emergencies are followed whenever necessary within scope of responsibilities.

4. Maintain and improve health and safety in the work place	4.1 Risks are identified and appropriate control measures are implemented in the work area. 4.2 Recommendations arising from risk assessments are implemented within level of responsibility. 4.3 Opportunities for improving OSH performance are identified and raised with relevant personnel. 4.4 Safety records according to company policies are maintained.
Range of Variables	
Variable	Range (May include but not limited to)
1. Company policies	1.1. Job-related Standard Operating Procedures (SOPs) and OSH-specific procedures. Examples of OSH procedures include consultation and participation, emergency response, response to specific hazards, incident investigation, risk assessment, reporting arrangements and issue resolution procedures
2. Workplace procedures	2.1. OSH system and related documentation including policies and procedures 2.2. Standard Operating Procedures (SOPs) 2.3. information on hazards and the work process, hazard alerts, safety signs and symbols 2.4. Labels 2.5. Material Safety Data Sheets (MSDSs) and manufacturers' advice.
3. Hazards	3.1. OSH incidents include near misses, injuries, illnesses and property damage, noise, handling hazardous substances, other hazards 3.2. Working with and near moving equipment/load shifting equipment 3.3. Broken or damaged equipment or materials
4. Personal Protective equipment (PPE)	4.1 Goggles 4.2 Ear muffs 4.3 Ear plugs 4.4 Gloves 4.5 Clothing 4.6 Apron 4.7 Helmet 4.8 Boots

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 Identified, controlled and reported OSH hazards 1.2 Followed work safety. 1.3 Followed emergency response procedures. 1.1 Maintained and improved health and safety in the workplace.
2. Underpinning knowledge	2.1. Personal protective equipment - Hand gloves, safety shoes, safety goggles, masks, apron, 2.2. Identification of tools and equipment 2.3. Hazardous events 2.4. Tools, equipment, machinery and relevant accessories. 2.5. Communication 2.6. Job roles, responsibilities and compliance 2.7. Workplace laws
3. Underpinning skill	3.1. Ability to use the appropriate PPE. 3.2. Ability to identify tools and equipment. 3.3. Ability to quick response and to take safety precautions for different hazardous situations. 3.4. Ability to operate and use tools, equipment, machinery and accessories properly as per SOP (Company standards). 3.5. Ability to communicate with peers and supervisors. 3.6. Ability to apply in the workplace.
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, equipment and physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities.
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation

	6.3 Written test 6.4 Portfolio 6.5 Log book
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place
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National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	GN2003A1: Use English in the workplace
Nominal Hours	70 hours
Unit Descriptor	This unit specifies the competency required to be able to read, write and understand basic English in the workplace.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the Range of Variable training components
1. Read and understand workplace documents in English	1.1 <i>Workplace documents</i> are read and understood. 1.2 <i>Visual information</i> is interpreted.
2. Write simple routine workplace documents in English	2.1 Simple routine workplace documents are prepared using key words, phrases, simple sentences and visual aids where appropriate. 2.2 Key information is written in the appropriate places in standard forms.
3. Listen to conversation in English	3.1 Active listening in English language is demonstrated to the required workplace standard.
4. Perform conversation in English	4.1 Conversation is performed in English with peers, customers and management to the required workplace standard.
Range of Variables	
Variable	Range (May include but not limited to)
1. Workplace documents	1.1 Schedules and itineraries 1.2 Agenda 1.3 Simple reports such as progress and incident reports 1.4 Job sheets 1.5 Operational manuals 1.6 Brochures and promotional material 1.7 Visual and graphic materials 1.8 Standards 1.9 OSH information

2. Visual information	2.1 Signs 2.2 Maps 2.3 Diagrams 2.4 Forms 2.5 Labels 2.6 Graphs 2.7 Charts
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 Used basic English in the workplace 1.2 Read and understood workplace documents in English 1.3 Constructed simple routine workplace documents in English 1.4 Listened to conversation in English 1.1 Communicated with peers, customers and management using English to the required workplace standard
2. Underpinning knowledge	2.1. Read workplace documents in English 2.2. Write simple routine workplace documents in English 2.3. Listen to conversation in English 2.4. Perform conversation in English 2.5. Interaction skills (i.e., teamwork, interpersonal skills, etc.) 2.6. Job roles, responsibilities and compliances
3. Underpinning skill	3.1. Ability to read and understand workplace documents in English, using appropriate vocabulary and grammar, and standard spelling and punctuation. 3.2. Ability to write simple routine workplace documents in English, such as: Schedules and agendas, job sheets, operational manuals and brochures, and promotional material. 3.3. Ability in active listening in English language is demonstrated to the required workplace standard. 3.4. Ability to perform conversation in English with peers, customers and management, to the required workplace standard. 3.5. Work effectively with others: ○ listening and questioning skills ○ ability to follow simple directions

4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, equipment and physical facilities appropriate to perform activities. 5.2 Materials, consumables needed to perform activities.
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test 6.4 Portfolio 6.5 Log book
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	GN2004A1: Operate in a self-directed team
Nominal Hours	30 hours
Unit Descriptor	This unit specifies 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 <i>Italicized</i> terms are elaborated in the Range of Variable Training Components
1. Identify team goals and processes	1.1 Team goals 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. Workplace staff regulation 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	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. Organize information 3.2. Understand and convey intended meaning 3.3. Participate in a variety of workplace discussions 3.4. Comply with Organization's requirements in the use of written and electronic communication methods
4. Required attitude	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, sub-ordinates and seniors in workplace

5. Resource implication	The following resources MUST be provided: 5.1 Variety of Information 5.2 Communication tools 5.3 Simulated workplace
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test 6.4 Portfolio 6.5 Log book
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	GN2005A1: Present and apply workplace information
Nominal Hours	30 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude to communicate and deliver up-to-date information in an interactive work environment as per workplace standard.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the Range of Variable Training Components
1. Identify information requirements	1.1 <i>Sources of Information</i> requirements in the workplace are identified
2. Process Data	2.1. Data is collected and correlated as per prescribed <i>method</i> . 2.2. Relevant data is used as references in accordance with the objectives of the program. 2.3. Information is applied according to workplace requirements.
3. Analyse, interpret and organize information	3.1. Collected information is analysed, interpret and organize as required for workplace.
4. Apply and present workplace information	4.1 Findings and recommendations are summarized and presented in a user-friendly manner. 4.2 Draft report/ <i>forms</i> are prepared based on standard format. 4.3 Graphs and other visual presentations are prepared to highlight <i>analysis</i> /interpretation of information. 4.4 Reports/forms are submitted and distributed to relevant departments/persons.
Range of Variables	
Variable	Range (May include but not limited to)
1. Sources of information	1.1 Daily job instructions 1.2 Specifications 1.3 Standard operating procedures 1.4 Charts

	1.5 Lists 1.6 Documents 1.7 Computer data 1.8 Drawings 1.9 Sketches 1.10 Tables 1.11 Technical manuals and/or charts 1.12 Surveys 1.13 Interviews 1.14 Front-end analysis 1.15 Functional analysis
2. Forms	2.1. Questionnaires 2.2. Profile 2.3. Accident/incident report form 2.4. Work order 2.5. Purchase order,
3. Methodologies	3.1. Qualitative 3.2. Quantitative
4. Statistical analysis	4.1 Average (mean, median, mode) 4.2 Percentage 4.3 Frequency distribution
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 Communicated and delivered current information in an interactive work environment as per workplace standard.
2. Underpinning knowledge	2.1. Identify information 2.2. Identify data 2.3. Workplace standard
3. Underpinning skill	3.1. Collecting information 3.2. Collecting data 3.3. Demonstrating, interpreting and/or following data sheet or instruction 3.4. Performing task as per data sheet or instruction 3.5. Keeping records and reports
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, equipment and physical facilities appropriate to perform activities. 5.2 Materials, consumables needed to perform activities.
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test 6.4 Portfolio 6.5 Log book
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place
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SECTOR SPECIFIC UNITS

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency – Transport

Unit Code and Title	TRASS1006A1: Interpret technical drawing
Nominal Hours	40 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude required to interpret technical drawing.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the Range of Variable Training Components
1. Follow OSH practises	1.1 Safe work practices observed and personal protective equipment (PPE) worn as required for the work performed.
2. Select technical drawing	2.1. <i>Drawing</i> is selected and checked to ensure that it conforms to the job requirements. 2.2. Drawing is validated.
3. Interpret technical drawing	3.1. Drawing components, assemblies are identified. 3.2. Dimensions are identified according to job requirement 3.3. Clearances/tolerances are checked for compliance with work place standards. 3.4. <i>Instructions</i> are identified and followed accurately. 3.5. Material specifications are identified. 3.6. Symbols in drawing/s are interpreted.
Range of Variables	
Variable	Range (May include but not limited to)
1. Drawing	1.1 Technical drawing, sketch
2. Instructions	2.1. Note, Instruction, special instruction, precaution
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 Selected and Interpreted technical drawing 1.2 Used and followed instruction according to job requirement.
2. Underpinning knowledge	2.1. Occupational safety and health (OSH) 2.2. Workplace standard 2.3. Sequence of drawing 2.4. Methods of checking

3. Underpinning skill	3.1. Practice workplace safety 3.2. Reading / interpreting information on the drawing, following data 3.3. sheet, instruction and manuals, technical drawing 3.4. Perform measurements, calculations 3.5. Perform the task 3.6. Perform checking 3.7. Keeping records
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, equipment and physical facilities appropriate to perform activities. 5.2 Materials, consumables needed to perform activities.
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test 6.4 Portfolio 6.5 Log book
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place

Accreditation Requirements

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National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRASS1007A1: Work in the manufacturing Industry
Nominal Hours	20 hours
Unit Descriptor	This unit specifies the knowledge, skills and attitude required to identify roles and responsibilities and work in the manufacturing industry.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the Range of Variable Training Components
1. Identify job roles and responsibilities in the manufacturing industry	1.1 Job roles and responsibilities in the manufacturing industry are identified. 1.2 Employee relationships within the manufacturing industry are identified.
2. Identify and observe OSH in the manufacturing industry.	2.1. <i>Personal protective equipment (OSH)</i> in the manufacturing industry is Identified and observed. 2.2. Manufacturing industry <i>hazard</i> is identified 2.3. Safe work practices are followed when using equipment in the work environment.
3. Plan work activities	3.1. Common goals, objectives and tasks are identified and clarified with appropriate persons. 3.2. Individual tasks are determined and agreed on according to workplace environment.
4. Work with others	4.1 <i>Effective interpersonal skills</i> are applied to interact with others and to contribute to activities and objectives. 4.2 Assigned tasks are performed in accordance with job <i>requirements</i> , specifications and workplace environment. 4.3 Work requirements are confirmed with colleagues.
Range of Variables	
Variable	Range (May include but not limited to)
1. Occupation Safety and Health(OSH)	1.1 Personal protective equipment (PPE), 1.2 Helmet 1.3 Eye shield 1.4 Gloves 1.5 Goggles

	1.6 safety shoes 1.7 full sleeve apron 1.8 first aid kits
2. Hazards	2.1. Mechanical hazards 2.2. Electrical hazards 2.3. Fire hazards and other work place hazards.
3. Effective interpersonal skills	3.1. Basic listening and speaking skills 3.2. use of terminology and jargon 3.3. communicating and receiving feedback 3.4. interpretation of instructions 3.5. Basic principles of effective communication.
4. Requirements	4.1 Requirements as directed in verbal modes or written in specifications or 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	1.1 Determine job roles and responsibilities in the manufacturing industry 1.2 Identify and observe OSH in the manufacturing industry. 1.3 Determine Individual tasks and agreed on according to workplace environment.
2. Underpinning knowledge	2.1 Job roles and responsibilities in the manufacturing industry
3. Underpinning skill	3.1 Observe job roles and responsibilities in the manufacturing industry 3.2 Performing OSH in the manufacturing industry job requirement 3.3 Perform assigned tasks in accordance with job requirements
4. Required attitude	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, sub-ordinates and seniors in workplace

5. Resource implication	The following resources must be provided: 5.1 Tools, equipment and physical facilities appropriate to perform activities. 5.2 Materials, consumables needed to perform activities.
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test 6.4 Portfolio 6.5 Log book
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRASS1008A1: Use Hand & Power Tools
Nominal Hours	40 hours
Unit Descriptor	This unit covers using a range of manual tools, hand held power tools and fixed power tools for hand held operations for a variety of general engineering applications.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Use Manual tools	1.1 Manual tools such as hammer, different type of wrenches, files, chisel, vices, etc, can be identified and used.
2. Identify and observe OSH in the manufacturing industry.	2.1. OSH in the manufacturing industry is Identify and observed. 2.2. Safe work practices are followed when using equipment in the work environment.
3. Use power tools	3.1. Manual tools and Power tools are identified and selected conforming to the task requirements. 3.2. Power tools are used as per operational maintenance for a specific sequence of operations – which may include clamping , alignment and adjustments to produce desired outcomes conforming to job specifications which may include finish, size or shape. 3.3. All safety requirements are complied with before, during and after use. 3.4. Unsafe or faulty tools are identified and marked for repair /reject before, during and after use according to current procedures. 3.5. Operational maintenance of tools, including hand sharpening, is undertaken according to standard procedures. 3.6. Power tools are cleaned and stored safely in appropriate location according to standard workshop procedures and manufacturers' recommendations.

Range of Variables	
Variable	Range (May include but are not limited to)
1. Manual Tools	1.1 Hammer 1.2 Different type of wrenches 1.3 Files 1.4 Chisel 1.5 Hacksaw etc.
2. Power tools	2.1. Electric or pneumatic/hydraulic drills 2.2. Grinders 2.3. Jigsaws 2.4. Nibblers 2.5. Cutting saws 2.6. Sanders 2.7. Planers 2.8. Routers 2.9. Pedestal drills 2.10. Pedestal grinders.
3. Clamping	3.1. Multi grips, vices 3.2. Jigs and fixtures 3.3. Clamps etc.
4. Job specifications	4.1 Finish size or shape etc
5. Operational maintenance	5.1 Hand sharpening 5.2 Cleaning 5.3 Lubricating and tightening 5.4 Simple tools repairs and adjustments 5.5 Using engineering principles 5.6 Tools 5.7 Equipment 5.8 Procedures to statutory and regulatory requirements.
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 proper using procedure of manual tools such as hammer, file, wrenches, pliers, screwdrivers etc. 1.2 Used hand tools as per workplace requirement 1.3 Maintained safety precaution for using hand & power tools. 1.4 Maintained operation procedure of power tools. 1.5 Used power tools as per workplace requirement.

2. Underpinning knowledge	2.1. Classification of tools 2.2. Safely use Hand tool & Power tools 2.3. Types of Hand & Power tools 2.4. Working principals of Hands & Power tools 2.5. Preventive Maintenance 2.6. Methods and Techniques 2.7. Storage Procedures
3. Underpinning skill	3.1. Identifying Appropriate Tools 3.2. Using Hand tool & Power tools safely 3.3. Performing Preventive Maintenance 3.4. Practicing OSH 3.5. Storing tools and equipment
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, equipment and physical facilities appropriate to perform activities. 5.2 Materials, consumables needed to perform activities.
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test 6.4 Portfolio 6.5 Log book
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place

Accreditation Requirements

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National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRASS1009A1: Use Graduated Measuring Instruments
Nominal Hours	20 hours
Unit Descriptor	This unit specifies the Knowledge, skills and attitude to required to use graduated measuring instruments and associated minor calculations
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practises	1.1 Safe work practices observed and <i>personal protective equipment (PPE)</i> worn as required for the work performed
2. Select the job to be measured	2.1. Job to be measured is identified 2.2. Interoperate <i>documents</i> and Specifications
3. Select measuring device	3.1. Measuring equipment is selected according to job requirements 3.2. Tolerance and/or clearance limits are identified according to job requirements
4. Take measurements	4.1 <i>Routine adjustments</i> are done as required 4.2 <i>Measurements</i> are taken accurately 4.3 Measurements are checked against job requirement.
5. Measurements are recorded and communicated	5.1 Measurements are recorded on form/drawings/sketches 5.2 Recorded measurements are interpreted and communicated to supervisor
6. Clean and store measuring instruments	6.1 Measuring instruments are cleaned and stored
Range of Variables	
Variable	Range (May include but are not limited to)
1. Documents	1.1 Drawings 1.2 Sketches 1.3 technical manuals

	1.4 Specifications 1.5 written instructions
2. Routine adjustments	2.1. Calibration 2.2. simple zeroing 2.3. scale adjustment
3. Measurements	3.1 Measuring length 3.2 Angle 3.3 Diameter 3.4 Clearances 3.5 Time 3.6 temperature
4. Personal protective equipment (PPE)	4.1 Eye shield 4.2 Helmet 4.3 leather gloves 4.4 full sleeve apron 4.5 Goggles 4.6 safety shoes
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 Identified the proper graduated measuring instrument 1.2 Taken Measurement accurately 1.3 Record of measurement 1.4 Interpreted written inspection
2. Underpinning knowledge	2.1. OSH 2.2. Identify Instruments 2.3. Workplace standard 2.4. Sequence of using the instruments 2.5. Method s of checking for instruments
3. Underpinning skill	3.1. Practice workplace safety 3.2. Use PPE 3.3. Use of instruments 3.4. Demonstrate / interpreting and following data sheet, instruction and manuals, technical drawing 3.5. Perform measurement 3.6. Checking for conformance to specification 3.7. Keeping record and report

4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Materials relevant to the proposed activity 5.2 Measuring instrument 5.3 Relevant drawings, manuals, codes, standards and reference material
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test 6.4 Portfolio 6.5 Log book
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place

Accreditation Requirements

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency – Transport

Unit Code and Title	TRASS3010A1: Apply quality systems and procedures
Nominal Hours	30 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude required for working within quality improvement systems and applying established quality procedures within a manufacturing environment.
Elements of Competency	Performance Criteria <i>Italicized</i> terms should be elaborated in the range of variables
1. Follow OSH practices	1.1 Safe work practices observed and personal protective equipment (PPE) worn as required for the work performed.
2. Work within a quality system	2.1. Instructions and procedures are followed strictly and duties are performed in accordance with demand of quality management system . 2.2. Conformance to specifications is ensured. 2.3. Defects are detected and reported to authority according to standard operating procedures. 2.4. Customer's satisfaction is ensured in performing an operation or quality of product or services.
3. Apply and monitor a quality system improvement	3.1. Performance measurement systems are identified. 3.2. Performance is assessed at regular intervals. 3.3. Specifications and standard operating procedures are established and identified. 3.4. Defects are detected and reported according to standard operating procedures. 3.5. Process improvement procedures are participated in. 3.6. The improvement of internal / external customer / supplier relationships is participated in. 3.7. Performance of operation or quality of product or service is monitored to ensure customer satisfaction.

4. Take responsibility for his/her own quality	4.1 Concept of supplying product or service to meet the customer's requirements is understood and accordingly applied. 4.2 Responsibility is taken for quality of own work.
5. Apply standard procedures for each job	5.1 Quality system procedures for each job are followed. 5.2 Conformance to specification is ensured in every case at all situations.
Range of Variables	
Variable	Range (May include but are not limited to)
1. Quality improvement system	A system comprising some or all of the following elements: 1.1 Quality inspection 1.2 Quality control 1.3 Quality improvement 1.4 Total quality control 1.5 Quality assurance
2. Customer	2.1. Person or organisation receiving the product or service.
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 Used personal protective equipment. 1.2 Maintained proper specification and standard of product. 1.3 Checked product for quality assurance as per drawing & specification. 1.4 Detected defects and take corrective and/or quality improvement actions. 1.5 Ensured customer satisfaction.
2. Underpinning knowledge	2.1. The reasons why good quality should be maintained and poor quality should be eliminated 2.2. Meanings of the key terms – quality, quality assurance, quality control, quality inspection, quality improvement and total quality control 2.3. Process and procedures for improving and maintaining quality - Deming's Quality Cycle, Standard Operating Procedures (SoPs), product and process specifications, and tolerance limits 2.4. Defects, and procedures for addressing defects 2.5. Record keeping within the quality improvement system in the workplace

	2.6. Factors, which affect the successful implementation of the quality systems and procedures 2.7. Importance of taking ownership for quality of products and services 2.8. Types of customers/suppliers and their needs/responsibilities 2.9. Factors affecting customer relationships and customer satisfaction
3. Underpinning skill	3.1. Identify the role of self and others within the quality improvement system 3.2. Define quality. 3.3. Identify product and process specifications and tolerance limits 3.4. Detect defects, take corrective and/or quality improvement actions 3.5. Keep records in accordance with standard operating procedures. 3.6. Identify customer requirements and always meet those requirements
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Materials relevant to the proposed activity 5.2 Measuring instrument 5.3 Relevant drawings, manuals, codes, standards and reference material
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test 6.4 Portfolio 6.5 Log book
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

OCCUPATION SPECIFIC UNITS

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL1011A1: Apply Fundamentals of Welding Metallurgy in the Workplace
Nominal Hours	30 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude required to apply fundamentals of welding metallurgy in the workplace.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practises	1.1 Safe work practices observed and <i>personal protective equipment (PPE)</i> worn as required for the work performed. 1.2 Hazards are identified and risks are minimised or eliminated.
2. Demonstrate application of mechanical properties and chemical properties	2.1 Application of <i>mechanical properties</i> of metals are demonstrated as required by workplace. 2.2 Application of <i>chemical properties of base metals</i> are demonstrated as required by workplace. 2.3 <i>Chemical effects of elements in steel</i> are demonstrated. 2.4 <i>Elements in steel</i> are demonstrated 2.5 Heat the base metal properly avoid <i>distortion prevention measures</i>
3. Demonstrate the effects of variation of current and travel speed of electrode	3.1. The effects of variation of current on heat input in welds are demonstrated using the formula $H \propto I^2RT$. 3.2 The effect of travel speed of electrode is demonstrated.
4. Identify zone of welds	4.1 Demonstrate <i>weld zone</i> (metal) 4.2. Demonstrate Heat affected Zone (HAZ) . 4.3 Demonstrate Base metal zone.
5. Demonstrate application of heat treatment	5.1. Application of <i>heat treatment</i> is demonstrated.

6. Clean and store equipment.	6.1 Equipment is cleaned according to workplace procedures. 6.2 Equipment are stored according to workplace procedures. 6.3 Preserved of electrodes according to specification
Range of Variables	
Variable	Range (May include but are not limited to)
1. Metals	1.1 Iron, carbon steel 1.2 Stainless steel 1.3 Copper 1.4 Aluminium 1.5 Bronze 1.6 Gun metal 1.7 Brass etc.
2. Mechanical properties	2.1. Strength 2.2. Ductility 2.3. Hardness 2.4. Toughness 2.5. Fatigue Strength 2.6. Melting temperature 2.7. Weld ability
3. Chemical properties of base metal and alloys	3.1. Oxidation 3.2. Reduction 3.3. Ionization 3.4. Metallic Bond 3.5. Carburization
4. Chemical effects of elements in steel	4.1 Corrosion due to oxidation 4.2 Reduction 4.3 Hardness 4.4 Toughness 4.5 Brittleness
5. Elements in steel	5.1 Carbon 5.2 Sulphur 5.3 Phosphorous 5.4 Silicon 5.5 Manganese 5.6 Chromium 5.7 Molybdenum 5.8 Nickel 5.9 Aluminium on steel

6. Weld Zones	6.1 Weld metal Zone 6.2 Heat affected Zone (HAZ) 6.3 Base metal zone
7. Heat treatment	7.1 Annealing 7.2 Normalizing 7.3 Quenching 7.4 Preheating 7.5 Post heating 7.6 Thermal stress relieving
8. Preservation of electrodes.	8.1 Electrodes are to be preserved in Electrode Dryer or Electrode oven.
9. Distortion prevention measures	9.1 Preheating 9.2 Setting up of jigs 9.3 Fixtures, clamps etc.
10. PPE (Personal Protective Equipment)	10.1 Eye shield (Head Screen) 10.2 Skull helmet 10.3 Leather gloves 10.4 Boiler Suit (Cotton) 10.5 Leather apron 10.6 Arm Guards 10.7 Safety goggles 10.8 Safety shoes.
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 Follow OSH practice. 1.2 Identify weld zones.
2. Underpinning knowledge	Clear concept on: 2.1. Mechanical properties 2.2. Chemical properties 2.3. Elements of steel and its chemical effect 2.4. Effect of current increasing and decreasing and calculating heat input using formula. 2.5. Effect of travel speed of electrode. 2.6. Weld zones 2.7. Heat treatment 2.8. Cleaning and Storing Equipment.

3. Underpinning skill	3.1. Ability to identify mechanical properties 3.2. Ability to identify chemical properties. 3.3. Ability to calculate heat input by using formula 3.4. Ability to identify weld zones 3.5. Ability to select and apply proper heat treatment 3.6. Properly cleaning and storing equipment.
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, Chart and consumables to perform activities.
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Written test 6.3 Portfolio
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL1012A1: Perform Spot Welding
Nominal Hours	40 hours
Unit Descriptor	This Unit covers the knowledge, skills and attitude are required to spot weld sheet metal and wire mesh for manufacturing purposes.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practises	1.1 Safe work practices observed and personal protective equipment (PPE) worn as required for the work performed. 1.2 Hazards are identified and risks are minimised or eliminated.
2. Set up spot welding machine	2.1. Spot welding machine is identified. 2.2. Collect tools, equipment & materiel . 2.3. Spot welding machine is set up and adjusted as per workplace requirements.
3. Perform Spot weld of thin metal sheets	3.1. Work pieces are prepared as per work place requirements. 3.2. Welding is tested on a sample. 3.3. Heat the base metal properly avoid distortion prevention measures 3.4. Spot weld is performed as per job specification .
4. Spot weld wire mesh	4.1 Spot weld of wire mesh is performed as per job specification. 4.2 Welds are cleaned in accordance with standard operating procedures. 4.3 Weld is checked for quality and any defects are identified and corrective action is taken to standard operating procedures.
5. Clean and store equipment.	5.1 Equipment is cleaned according to workplace procedures. 5.2 Equipment is stored according to workplace procedures.

Range of Variables	
Variable	Range (May include but not limited to)
1. PPE (Personal Protective Equipment)	1.1 Personal protective equipment's 1.2 Safety Goggles 1.3 Helmet 1.4 First aid kit 1.5 Leather gloves 1.6 Safety shoes
2. Equipment	2.1 Spot welding machine 2.2 Grinder 2.3 General workshop equipment 2.4 Shearing machine 2.5 Sheet bending machine 2.6 Rolling machine
3. Tools	3.1 Hammer 3.2 Sniper 3.3 Self-locking pliers 3.4 Wire brush 3.5 Vice 3.6 files 3.7 Measuring tape
4. Materials	4.1 Mild steel 4.2 Stainless Steel 4.3 Filler wire (MS) 4.4 Filler wire (SS)
5. Wire (thickness)	5.1 0.5mm to 3mm
6. Defects	6.1 Lack of penetration 6.2 Excess penetration 6.3 Undercut 6.4 Lack of fusion 6.5 Notches 6.6 Irregular shape and dimension
7. Distortion prevention measures	7.1 Appropriate current 7.2 Tack weld 7.3 Hold time setting 7.4 Setting up of jigs 7.5 Fixtures 7.6 Clamps etc.

8. Specifications	8.1 All welds should match the welding procedure specifications. 8.2 No holes should appear on the work piece
9. Weld Procedure Specification (WPS)	9.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html And other related international standards
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 Follow OSH practice. 1.2 Probable defects in spot welding. 1.3 Repair procedure of defects.
2. Underpinning knowledge	2.1. Relevant OSH practices 2.2. Spot welding machine set up procedure 2.3. Spot welding parameter 2.4. Procedure of Spot welding 2.5. Application of spot welding
3. Underpinning skill	3.1. Complying OSH requirements 3.2. Ability to select and set up spot welding machine 3.3. Ability to perform sound weld 3.4. Ability to visually inspect and identify defect, if any. 3.5. Ability to repair defect
4. Required attitude	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, sub-ordinates and seniors in workplace 4.9 Clean and return the equipment to store
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities.

6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL1013A1: Perform Gas Cutting and Gas Welding
Nominal Hours	60 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to prepare the materials, perform Gas Cutting, Gas welding and operation of the equipment.
Elements of Competency	Performance Criteria <i>Italicized</i> terms should be elaborated in the range of variables
1. Follow OSH practises	1.1 Safe work practices observed and <i>personal protective equipment (PPE)</i> worn as required for the work performed. 1.2 Hazards are identified and risks are minimised or eliminated.
2. Identify cutting and welding requirements	2.1. Cutting requirements are identified and noted from procedures/ drawings/ specifications. 2.2. Welding requirements are identified and noted from procedures/ drawings/ specifications.
3. Select cutting process, and set up equipment	3.1. <i>Cutting process</i> is selected as per standard. 3.2. Equipment is selected and set up as per job specification.
4. Prepare materials for gas cutting and welding	4.1 <i>Materials</i> are cleaned and marked for cutting as per noted dimension. 4.2 Materials are cleaned and assembled for welding.
5. Perform gas cutting	5.1 Safe cutting practices are applied. 5.2 Material is cutting as per different <i>cutting process</i> . 5.3 Materials are cleaned after cutting in accordance with standard operating procedures. 5.4 Cut is checked for quality and any defects are identified and rectified as per standard operating procedures. 5.5 Heat the base metal properly avoid <i>distortion prevention measures</i>

6. Set up gas welding equipment and perform gas welding	6.1 Gas welding set are setup and adjusted <i>fuel gas</i> according to standard operating procedures. 6.2 Gas welding is performed according to <i>welding position</i> . 6.3 <i>Welds</i> are cleaned in accordance with standard operating procedures. 6.4 Filler materials are selected and collected. 6.5 Weld is checked for quality and any <i>defects</i> are identified and rectified
7. Clean and store tools & equipment.	7.1 Tools & equipment are cleaned according to workplace requirement. 7.2 Tools & equipment are stored according to workplace requirement. 7.3 <i>Preserved filler materials</i> are to be store according to specification
Range of Variables	
Variable	Range (May include but not limited to)
1. PPE(Personal Protective Equipment)	1.1 Eye shield (Head Screen) 1.2 Skull helmet 1.3 Leather gloves 1.4 Boiler Suit (Cotton) 1.5 Leather apron 1.6 First aid kit 1.7 Arm Guards 1.8 Safety goggles 1.9 Safety shoes.
2. Equipment	2.1 Manual gas cutting/welding equipment 2.2 Semi-automatic cutting set
3. Tools	3.1 Chipping hammer 3.2 Ballpeen hammer 3.3 Tongs 3.4 Wire brush 3.5 Weld gauge 3.6 Grinder 3.7 Hand shear machine 3.8 Spark lighter 3.9 Nozzle cleaner 3.10 Utility wrench
4. Filler Metal	4.1 Filler materials are to be preserved according to specification.

5. Materials	5.1 Mild steel, 5.2 Medium carbon steel 5.3 Plate thickness 10 mm for gas cutting 5.4 Plate thickness 4 mm for gas welding
6. Cutting process	6.1 Manual 6.2 Semi-automatic 6.3 Straight line cutting as per job specification
7. Weld positions	7.1 1F, 2F, 1G, 2G,
8. Welds	8.1 Fillet and bevel
9. Fuel gas	9.1 Oxygen 9.2 Acetylene 9.3 liquid petroleum gas (LPG/ CNG)
10. Defects	10.1 Lack of penetration 10.2 Excess penetration 10.3 Crack 10.4 Undercut 10.5 Lack of fusion 10.6 Notches 10.7 Irregular shape and dimension 10.8 Warping
11. Distortion prevention measures	11.1 Tack Weld 11.2 Tack weld 11.3 Setting up of jigs 11.4 Fixtures 11.5 C clamps etc.
12. Weld Procedure Specification (WPS)	12.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html And other related international standards
Special Notes Appropriate cutting allowances should be taken into account.	
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 practice 1.2 Interpreted drawing and specification 1.3 Defects of weld are identified and rectified 1.4 Defects of cutting are identified and rectified 1.5 Tools & equipment are cleaned and stored according to workplace requirement

2. Underpinning knowledge	2.1 Relevant OSH practices 2.2 Gas cutting and welding machine set up procedure 2.3 Gas cutting and welding parameter 2.4 Procedure of gas cutting and welding 2.5 Application of gas cutting and welding
3. Underpinning skill	3.1 Complying OSH requirements 3.2 Ability to select and set up cutting and welding set 3.3 Ability to perform sound cutting and cutting 3.4 Ability to visually inspect and identify defect, if any. 3.5 Ability to repair defect
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities.
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.

Accreditation Requirements

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National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL3026A1: Inspect and Test Welds
Nominal Hours	90 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to Inspect & Test welds using destructive and non-destructive tests.
Elements of Competency	Performance Criteria <i>Italicized</i> terms should be elaborated in the range of variables
1. Follow OSH practises	1.1 Safe work practices observed and <i>personal protective equipment (PPE)</i> worn as required for the work performed. 1.2 Hazards are identified and risks are minimised or eliminated.
2. Inspect weld	2.1. Weld is inspected by destructive or non-destructive tests. 2.2. Inspection report are noted in the record sheet.
3. Test weld	3.1. Select and collect <i>testing material</i> 3.2. Weld materials are tested by using <i>testing equipment</i> . 3.3. Visual test is carried out according to work place standard. 3.4. <i>Destructive</i> or <i>non-destructive</i> tests are identified as per job requirement. 3.5. <i>Defects</i> are identified and keep record
4. Clean and store equipment.	4.1 Equipment is cleaned according to workplace procedures. 4.1 Equipment is stored according to workplace procedures.
Range of Variables	
Variable	Range (May include but not limited to)
1. PPE (Personal Protective Equipment)	1.1 Eye shield (Head Screen) 1.2 Helmet 1.3 Leather gloves 1.4 Leather apron 1.5 Leather arms Guard 1.6 Safety goggles 1.7 First aid kit 1.8 Safety shoes.

2. Testing Equipment	2.1 Device for Hydraulic Test (Leak test) 2.2 Rock well hardness test equipment 2.3 Magnetic particle test equipment 2.4 Chirpy test equipment 2.5 Dye penetration test kit 2.6 Bending test equipment 2.7 Tensile test equipment 2.8 Nick break test equipment
3. Testing material	3.1 Test Dyes. 3.2 X-ray films 3.3 Cadmium capsule 3.4 Gel for ultrasonic test
3. Destructive test	3.1. Hardness test 3.2. Metallographic test 3.3. Bend test 3.4. Tensile test 3.5. Nick break test 3.6. Charpy test etc.
4. Non-destructive test	4.1 Visual test 4.2 Radiographic test 4.3 Ultrasonic test 4.4 Magnetic Particle Test 4.5 Dye-penetrant test 4.6 Leak test etc.
5. Defects	5.1 Lack of penetration 5.2 Excess penetration 5.3 Porosity 5.4 Crack 5.5 Slag inclusions 5.6 Spatter 5.7 Undercut 5.8 Lack of fusion 5.9 Notches 5.10 Irregular shape and dimension
7. Weld Procedure Specification (WPS)	3.5 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
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 practice. 1.2 Visual test is carried out according to work place standard 1.3 Destructive or non-destructive tests are identified as per job requirement. 1.4 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1. OSH practices for inspection 2.2. Welding procedure, welder's qualification test 2.3. Widely used code, standard, specification used for welding 2.4. Sequence of inspection and testing of weld 2.5. Application, limitation and advantages of different types of NDT and DT test. 2.6. Reporting of inspection
3. Underpinning skill	3.1. Ability to follow OSH practice 3.2. Ability to prepare a check list from work place requirement or standard 3.3. Ability to check the conformity of material and consumables to requirement 3.4. Ability to prepare a sequence of inspection 3.5. Ability to find out the defects visually 3.6. Ability to check the calibration certificate of welding equipment. 3.7. Ability to check the validity of consumables for NDT test 3.8. Ability to clean and store equipment properly
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Relevant tools, test equipment's and physical facilities appropriate to perform activities. 5.2 Materials to perform activities

6. Methods of assessment	6.1 Demonstration 6.2 Oral questioning 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

Unit Code and Title	TRAWEL3027A1: Estimate Cost of Jobs
Nominal Hours	70 hours
Unit Descriptor	This units specifies the knowledge, skill and attitude are required to estimate cost of the jobs in welding
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Determine job specification and volume of work	1.1 Job specification of work is identified. 1.2 Weld volume of work is identified calculated.
2. Identify cost elements and calculate costs	2.1. Indirect costs are identified and calculated, e.g. Overhead costs . 2.2. Direct costs are identified and calculated. 2.3. Indirect costs are identified and calculated.
3. Calculate total cost	3.1. Total cost of work is calculated.
Special Notes Profit is not added to the calculated cost.	
Range of Variables	
Variable	Range (May include but not limited to)
1. Overhead costs	1.1 Management 1.2 VAT & Tax 1.3 Power 1.4 Phone 1.5 Depreciation of Capital items
2. Direct costs	2.1 Labour 2.2 Consumable materials 2.3 Electricity
3. Indirect costs	3.1 Indirect materiel 3.2 Indirect labour
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 Estimated direct cost of jobs 1.2 Estimated indirect cost of jobs 1.3 Estimated overhead cost of jobs 1.4 Estimated total cost 1.5 Identified cost elements 1.6 Performed mathematical calculation.

2. Underpinning knowledge	2.1. Identification of job specification and volume of work 2.2. Elements of cost 2.3. Mathematical calculation by calculator or computer
3. Underpinning skill	3.1. Ability to identify job specification and volume of work 3.2. Ability to identify cost elements 3.3. Ability to calculate cost of each element 3.4. Ability to calculate total cost
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

Specialised Elective: (SMAW)

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

Unit Code and Title	TRAWEL1028A1: Perform Shielded Metal Arc Welding (SMAW) under supervision – Positions 1F, 2F, 1G and 2G
Nominal Hours	70 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude necessary to perform, under supervision, Shielded Metal Arc Welding (SMAW) to the standards required for basic purposes in 1F, 2F, 1G, and 2G positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised and eliminated. 1.2 Personal Protective Equipment (PPE) worn as required for the work to be performed. 1.3 Safe work practices are observed.
2. Select and prepare the materials for the welding job	2.1 Weld requirements are identified from workplace instruction. 2.2 Plates, tools, equipment and electrodes are selected and collected as per job requirements. 2.3 Plates are marked and cut as per job specification. 2.4 Edges of plate are prepared as per job specification.
3. Set up the welding job and equipment in accordance with requirements	3.1 Job is set up taking steps to avoid distortions with appropriate root gap, using a clamp, tack weld at required position (1F, 2F, 1G, 2G) 3.2 Welding equipment is set up and adjusted in accordance with job specification.
4. Perform the welding job under supervision.	4.1 Welding is performed as per job specification. 4.2 Welds are cleaned, checked for quality and defects are identified. 4.3 Corrective action is taken to meet the standards for basic purposes where load bearing is not critical. 4.4 Tack the base metal properly avoid distortion prevention measures
5. Complete the shut down and housekeeping procedures effectively.	5.1 Welding Machine shutdown procedures are conducted in accordance with workplace requirements 5.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 5.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.

Range of Variables	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1. Skull helmet 2.2. Eye Shield (Head Screen) 2.3. Leather hand gloves 2.4. Leather apron 2.5. Boiler Suit (Cotton) 2.6. Leather arms guard 2.7. Safety goggles 2.8. Safety Shoes
3. Plates	3.1. MS Plates 3-10 mm thickness range
4. Tools	4.1 Clamps 4.2 Ball pin hammer 4.3 Chipping hammer 4.4 Tongs 4.5 Wire brush 4.6 Cup brush 4.7 Weld gauge 4.8 Grinder 4.9 Centre punch 4.10 Number and Letter punch
5. Electrodes	5.1 8,10,12 SWG 5.2 Electrodes/filler materials are to be preserved in Electrode Dryer or Electrode oven.
6. Equipment	6.1 SMAW - AC Welding Machine 6.2 DC Welding Machine 6.3 Diesel generator
7. Distortion prevention measures	7.1 Preheating 7.2 Tack weld 7.3 Setting up of jigs 7.4 Fixtures 7.5 Clamps etc.
8. Defects	8.1 Lack of penetration 8.2 Excess penetration 8.3 Porosity 8.4 Crack 8.5 Slag inclusions

	8.6 Spatter 8.7 Undercut 8.8 Lack of fusion 8.9 Notches 8.10 Irregular shape and dimension
9. Weld Procedure Specification (WPS)	9.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
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 practice 1.2 Marked and cut the plate as per job 1.3 Took steps to avoid distortions. 1.4 Selected proper electrode as per job 1.5 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1. Hazards and OSH procedures in a welding workplace 2.2. PPE and Tools in a welding workplace 2.3. Types, selection and preparation of plates 2.4. Types and selection of electrodes 2.5. Types and setting up of SMAW welding equipment 2.6. Types of Welding Joints and Welding Positions 2.7. Types of Welding Defects 2.8. Prevention and Rectification of Welding Defects 2.9. Welding Procedures and Techniques 2.10. Shut down and housekeeping procedures
3. Underpinning skill	3.1. Ability to follow OSH procedures in a welding workplace 3.2. Ability to select materials and prepare for welding job 3.3. Ability to use materials, tools and equipment appropriately and set up a welding job 3.4. Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.5. Ability to prevent and rectify welding defects 3.6. Ability to complete the shut down and housekeeping

4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL2014A1: Perform Shielded Metal Arc Welding-Position 3F, 4F, 1G, 2G
Nominal Hours	110 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to perform shielded metal arc welding in 3F, 4F, 1G, 2G positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practises	1.1 Safe work practices observed and <i>personal protective equipment (PPE)</i> worn as required for the work performed. 1.2 Hazards are identified and risks are minimised or eliminated.
2. Select and prepare materials	2.1 <i>Materials, tools</i> and <i>equipment</i> are selected and collected as per job requirements. 2.2 Measuring instruments are used as per workplace requirements. 2.3 Materials (plate) are marked and cut as per dimension of specification's drawing. 2.4 Edges are prepared as per job specification to meet industry requirements. 2.5 Materials are assembled and aligned with required root gap as per job specification. 2.6 Weld gauge is used as per workplace requirements.
3. Set up welding job and equipment	4.1 Job is set up using a clamp at required position (3F, 4F 1G and 2G) 4.2 Welding equipment is set up and adjusted as per job requirements.
4. Perform Shielded Metal Arc Welding-Position 3F, 4F, 1G and 2G	6.1 Weld is performed as per specification and standard (WPS). 6.2 Welds are cleaned in accordance with standard operating procedures 6.3 Tack the base metal properly avoid <i>distortion prevention measures</i> 6.4 Weld is checked for quality and any defects are identified and rectified as per standard operating procedures.
5. Clean and store equipment.	7.1 Equipment is cleaned and stored according to workplace procedures. 7.2 Electrodes to be preserved according to specification.

Range of Variables	
Variable	Range (May include but not limited to)
1. Personal protective equipment (PPE)	1.1 Skull helmet 1.2 Eye Shield (Head Screen) 1.3 Leather hand gloves 1.4 Leather apron 1.5 Boiler Suit (Cotton) 1.6 Leather arms guard 1.7 Safety goggles 1.8 Safety Shoes
2. Equipment	2.1. AC welding machine 2.2. DC welding machine 2.3. Diesel generator
3. Tools	3.1. Chipping hammer 3.2. Ballpeen hammer 3.3. Tongs 3.4. Wire brush 3.5. Cup brush 3.6. Weld gauge 3.7. Measuring tap 3.8. Grinder 3.9. Air arc equipment
4. Materials	4.1 Low carbon steel 4.2 Medium carbon steel 4.3 Stainless steel 4.4 Plate thickness 10mm to 20mm
5. Defects	5.1 Lack of penetration 5.2 Excess penetration 5.3 Porosity 5.4 Crack 5.5 Slag inclusions 5.6 Spatter 5.7 Undercut 5.8 Lack of fusion 5.9 Irregular shape and dimension
6. Distortion prevention measures	6.1 Preheating 6.2 Tack weld 6.3 Setting up of jigs 6.4 Fixtures 6.5 Clamps.

7. Weld Procedure Specification (WPS)	7.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html And other related international standards
Special Notes Related Knowledge for the unit: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
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 practice 1.2 Edge prepared properly. 1.3 Took steps to avoid distortions. 1.4 Selected proper electrode as per job 1.5 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1. Hazards and OSH procedures in a welding workplace 2.2. PPE and Tools in a welding workplace 2.3. Types, selection and preparation of plates 2.4. Types and selection of electrodes 2.5. Types and setting up of SMAW welding equipment 2.6. Types of Welding Joints and Welding Positions 2.7. Types of Welding Defects 2.8. Prevention and rectification of Welding Defects 2.9. Welding Procedures and Techniques 2.10. Shut down and housekeeping procedures
3. Underpinning skill	3.1. Ability to follow OSH procedures in a workplace 3.2. Ability to select materials and prepare for welding job 3.3. Ability to use materials, tools and equipment appropriately and set up a welding job 3.4. Ability to perform welding job to meet the standards. 3.5. Ability to prevent and rectify welding defects 3.6. Ability to complete the shut down and housekeeping procedures effectively
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place. 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL3015A1: Perform Shielded Metal Arc Welding-Positions 3G and 4G
Nominal Hours	150 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to perform shielded metal arc welding in 3G (Vertical Up) and 4G (Overhead) positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practises	1.1 Hazards are identified and risks are minimised or eliminated. 1.2 Safe work practices observed and <i>personal protective equipment (PPE)</i> worn as required for the work performed.
2. Select and prepare materials	2.1 Materials are selected 2.2 Weld gauge and measuring instruments are used as per workplace requirements. 2.3 Materials (plate) are marked and cut as per dimension of specification's drawing. 2.4 Edges are prepared as per job specification to meet industry requirements. 2.5 Materials are assembled and aligned with required root gap.
4. Set up welding Job and equipment	4.1 Job is set up using a clamp or positioner at required position (3G or 4G). 4.2 Welding equipment is set up and adjusted as per job requirements.
5. Perform Shielded Metal Arc Welding-Position 3G, 4G	5.1 Weld is performed as per specification and standard (WPS) 5.2 Welds are cleaned in accordance with standard operating procedures. 5.3 Tack the base metal properly avoid <i>distortion prevention measures</i> 5.4 Weld is checked for quality and any defects are identified and rectified as per standard operating procedures.
6. Clean and store equipment.	6.1 Equipment is cleaned and stored according to workplace procedures. 6.2 Electrodes to be preserved according to specification.

Range of Variables	
Variable	Range (May include but not limited to)
1. PPE (Personal Protective Equipment)	1.1 Skull helmet 1.2 Eye Shield (Head Screen) 1.3 Leather hand gloves 1.4 Leather apron 1.5 Boiler Suit (Cotton) 1.6 Leather arms guard 1.7 Safety goggles 1.8 Safety Shoes
2. Tools	2.1. Clamps 2.2. Ball pin hammer 2.3. Chipping hammer 2.4. Tongs 2.5. Wire brush 2.6. Cup brush 2.7. Weld gauge 2.8. Grinder 2.9. Centre punch 2.10. Number and Letter punch 2.11. Air arc equipment
3. Equipment	3.1 AC welding machine, 3.2 DC welding machine 3.3 Diesel generator
4. Materials	4.1 Low carbon steel, 4.2 Mild carbon steel, 4.3 Carbon steel, 4.4 Stainless steel 4.5 Plate thickness 9mm to 20mm
5. Electrodes	5.1 8,10,12 SWG 5.2 Electrodes are to be preserved in Electrode Dryer or Electrode oven.
6. Defects	6.1 Lack of penetration 6.2 Excess penetration 6.3 Porosity 6.4 Crack 6.5 Slag inclusions 6.6 Spatter 6.7 Undercut 6.8 Lack of fusion 6.9 Notche 6.10 Irregular shape and dimension

7. Distortion prevention measures	7.1 Preheatin 7.2 Tack weld 7.3 Setting up of jigs 7.4 Fixtures 7.5 Clamps .
8. Weld Procedure Specification (WPS)	8.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html And other related international standards.
Special Notes Related Knowledge for the unit: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
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 practice 1.2 Edge prepared properly. 1.3 Took steps to avoid distortions. 1.4 Selected proper electrode as per job 1.5 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1. Hazards and OSH procedures in a welding workplace 2.2. PPE and Tools in a welding workplace 2.3. Types, selection and preparation of plates 2.4. Types and selection of electrodes 2.5. Types and setting up of SMAW welding equipment 2.6. Types of Welding Joints and Welding Positions 2.7. Types of Welding Defects 2.8. Prevention and rectification of Welding Defects 2.9. Welding Procedures and Techniques 2.10. Shut down and housekeeping procedures
3. Underpinning skill	3.1. Ability to apply relevant OSH practices 3.2. Ability to identify weld requirements from welding 3.3. Ability to select and prepare material properly 3.4. Ability to set up job 3.5. Ability to set up welding equipment 3.6. Ability to follow procedure

	3.7. Ability to produce a sound weld 3.8. Ability to detect defects visually 3.9. Ability to repair defects.
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place. 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL4016A1: Perform Shielded Metal Arc Welding-Positions 5G and 6G
Nominal Hours	140 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to perform shielded metal arc welding on pipe in 5G (Fixed horizontal) and 6G (Fixed inclined) positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practises	1.1 Safe work practices observed and personal protective equipment (PPE) worn as required for the work performed. 1.2 Hazards are identified and risks are minimised or eliminated.
2. Select and prepare materials	2.1 Materials are selected 2.2 Weld gauge and or measuring instruments are used as per workplace requirements. 2.3 Materials (pipe) are marked and cut as per dimension of specification's drawing. 2.4 Edges are prepared as per job specification to meet industry requirements. 2.5 Materials (pipe) are assembled and aligned with required root gap.
3. Set up welding Job and equipment	3.1 Collect tools, equipment and electrode 3.2 Job is set up using a clamp or positioner at required position (5G or 6G) 3.3 Welding equipment is set up and adjusted as per job requirements.
4. Perform Shielded Metal Arc Welding-Position 5G, 6G	4.1 Weld is performed as per specification and standard (WPS). 4.2 Welds are cleaned in accordance with standard operating procedures. 4.3 Tack the base metal properly avoid distortion prevention measures 4.4 Weld is checked for quality and any defects are identified and rectified
7. Clean and store equipment.	7.1 Equipment is cleaned and stored according to workplace procedures. 7.2 Electrodes to be preserved according to specification.

Range of Variables	
Variable	Range (May include but not limited to)
1. Personal Protective Equipment (PPE)	1.1 Skull helmet 1.2 Eye Shield (Head Screen) 1.3 Leather hand gloves 1.4 Leather apron 1.5 Boiler Suit (Cotton) 1.6 Leather arms guard 1.7 Safety goggles 1.8 Safety Shoes
2. Equipment	2.1 AC welding machine 2.2 DC welding machine 2.3 Diesel generator
3. Tools	3.1 Clamps 3.2 Ball pin hammer 3.3 Chipping hammer 3.4 Tongs 3.5 Wire brush 3.6 Cup brush 3.7 Weld gauge 3.8 Grinder 3.9 Centre punch 3.10 Number and Letter punch 3.11 Air arc equipment
4. Materials (Pipe)	4.1 Low carbon steel 4.2 Mild carbon steel 4.3 Carbon steel 4.4 Stainless steel 4.5 Alloy steel 4.6 Cast Iron
5. Electrodes	5.1 8,10,12 SWG 5.2 Electrodes are to be preserved in Electrode Dryer or Electrode oven.
6. Defects	6.1 Lack of penetration 6.2 Excess penetration 6.3 Porosity 6.4 Crack 6.5 Slag inclusions 6.6 Spatter 6.7 Undercut

	6.8 Lack of fusion 6.9 Notches 6.10 Irregular shape and dimension
7. Distortion prevention measures	7.1 Preheating 7.2 Tack weld 7.3 Setting up of jigs 7.4 Fixtures 7.5 Clamps etc.
8. Weld Procedure Specification (WPS)	8.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards

Special Notes

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

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 practice 1.2 Edge prepared properly. 1.3 Took steps to avoid distortions. 1.4 Selected proper electrode as per job 1.5 Positioned of pipe at 45 degree 1.6 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1. Hazards and OSH procedures in a welding workplace 2.2. PPE and Tools in a welding workplace 2.3. Types, selection and preparation of plates 2.4. Types and selection of electrodes 2.5. Types and setting up of SMAW welding equipment 2.6. Types of Welding Joints and Welding Positions 2.7. Types of Welding Defects 2.8. Prevention and rectification of Welding Defects 2.9. Welding Procedures and Techniques 2.10. Shut down and housekeeping procedures

3. Underpinning skill	3.1 Ability to apply relevant OSH practices 3.2 Ability to identify weld requirements from welding 3.3 Ability to select and prepare material properly 3.4 Ability to set up job 3.5 Ability to set up welding equipment 3.6 Ability to follow procedure 3.7 Ability to produce a sound weld 3.8 Ability to detect defects visually 3.9 Ability to repair defects. 3.10 Ability to minimize and rectify distortion
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
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National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL4017A1: Perform Shielded Metal Arc Welding-Position 6GR
Nominal Hours	70 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to perform shielded metal arc welding on pipe in 6GR (Y and K joint) positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practises	1.1 Hazards are identified and risks are minimised or eliminated. 1.2 Safe work practices observed and personal protective equipment (PPE) worn as required for the work performed.
2. Select and prepare materials	2.1 Materials are selected 2.2 Weld gauge and measuring instruments are used as per workplace requirements. 2.3 Materials (pipe) are marked and cut as per dimension of specification's drawing. 2.4 Edges are prepared as per job specification to meet industry requirements. 2.5 Materials (pipe) are assembled and aligned with required root gap.
3. Set up welding Job and equipment	3.1 Collect tools equipment and electrode 3.2 Job is set up using a clamp at required position (6GR) 3.3 Welding equipment is set up and adjusted as per job requirements
4. Perform Shielded Metal Arc Welding-Position 6GR	4.1 Weld is performed as per specification and standard (WPS). 4.2 Welds are cleaned in accordance with standard operating procedures. 4.3 Tack the base metal properly avoid distortion prevention measures 4.4 Weld is checked for quality and any defects are identified and rectified as per standard operating procedures.
5. Clean and store equipment.	5.1 Equipment is cleaned and stored according to workplace procedures. 5.2 Electrodes to be preserved according to specification.

Range of Variables	
Variable	Range (May include but not limited to)
1. PPE (Personal Protective Equipment)	1.1 Skull helmet 1.2 Eye Shield (Head Screen) 1.3 Leather hand gloves 1.4 Leather apron 1.5 Boiler Suit (Cotton) 1.6 Leather arms guard 1.7 Safety goggles 1.8 Safety Shoes
2. Equipment	2.1 AC welding machine 2.2 DC welding machine 2.3 Diesel generator
3. Tools	3.1 Clamps 3.2 Ball pin hammer 3.3 Chipping hammer 3.4 Tongs 3.5 Wire brush 3.6 Cup brush 3.7 Weld gauge 3.8 Grinder 3.9 Centre punch 3.10 Number and Letter punch 3.11 Air arc equipment
4. Materials (Pipe)	4.1 Low carbon steel 4.2 Mild carbon steel 4.3 Carbon steel 4.4 Stainless steel 4.5 Alloy steel 4.6 Cast Iron
5. Electrodes	5.1 8,10,12 SWG 5.2 Electrodes are to be preserved in Electrode Dryer or Electrode oven.
6. Defects	6.1 Lack of penetration 6.2 Excess penetration 6.3 Porosity 6.4 Crack 6.5 Slag inclusions 6.6 Spatter 6.7 Undercut

	6.8 Lack of fusion 6.9 Notches 6.10 Irregular shape and dimension
7. Distortion prevention measures	7.1 Preheating 7.2 Tack weld 7.3 Setting up of jigs 7.4 Fixtures 7.5 Clamps etc.
8. Weld Procedure Specification (WPS)	8.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
Special Notes Related Knowledge for the unit: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
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 practice 1.2 Edge prepared properly. 1.3 Took steps to avoid distortions. 1.4 Selected proper electrode as per job 1.5 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace 2.2 PPE and Tools in a welding workplace 2.3 Types, selection and preparation of plates 2.4 Types and selection of electrodes 2.5 Types and setting up of SMAW welding equipment 2.6 Types of Welding Joints and Welding Positions 2.7 Types of Welding Defects 2.8 Prevention and rectification of Welding Defects 2.9 Welding Procedures and Techniques 2.10 Shut down and housekeeping procedures
3. Underpinning skill	3.1 Ability to apply relevant OSH practices 3.2 Ability to identify weld requirements from welding 3.3 Ability to select and prepare material properly

	3.4 Ability to set up job 3.5 Ability to set up welding equipment 3.6 Ability to follow procedure 3.7 Ability to produce a sound weld 3.8 Ability to detect defects visually 3.9 Ability to repair defects. 3.10 Ability to minimize and rectify distortion
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.4 Demonstration with oral questioning 6.5 Direct observation 6.6 Written test
7. Context of assessment	7.3 Competencies may be assessed in the work place or a simulated work place 7.4 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

Specialised Elective (GMAW)

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL1028A1: Perform Shielded Metal Arc Welding (SMAW) under supervision – Positions 1F, 2F, 1G and 2G
Nominal Hours	70 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude necessary to perform, under supervision, Shielded Metal Arc Welding (SMAW) to the standards required for basic purposes in 1F, 2F, 1G, and 2G positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms should be elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised and eliminated. 1.2 Personal Protective Equipment (PPE) worn as required for the work to be performed. 1.3 Safe work practices are observed.
2. Select and prepare the materials for the welding job	2.1 Weld requirements are identified from workplace instruction. 2.2 Plates, tools, equipment and electrodes are selected and collected as per job requirements. 2.3 Plates are marked and cut as per job specification. 2.4 Edges of plate are prepared as per job specification.
3. Set up the welding job and equipment in accordance with requirements	3.1 Job is set up taking steps to avoid distortions with appropriate root gap, using a clamp, tack weld at required position (1F, 2F, 1G, 2G) 3.2 Welding equipment is set up and adjusted in accordance with job specification.
4. Perform the welding job under supervision.	4.1 Welding is performed as per job specification. 4.2 Welds are cleaned, checked for quality and defects are identified. 4.3 Tack the base metal properly avoid distortion prevention measures 4.4 Corrective action is taken to meet the standards for basic purposes where load bearing is not critical. 4.5 Weld is checked for quality and any defects are identified and rectified as per standard operating procedures.

5. Complete the shut down and housekeeping procedures effectively.	5.1 Welding Machine shutdown procedures are conducted in accordance with workplace requirements 5.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 5.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.
Range of Variables	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1 Skull helmet 2.2 Eye Shield (Head Screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler Suit (Cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety Shoes
3. Plates	3.1 MS Plates 3-10 mm thickness range
4. Tools	4.1 Clamps 4.2 Ball pin hammer 4.3 Chipping hammer 4.4 Tongs 4.5 Wire brush 4.6 Cup brush 4.7 Weld gauge 4.8 Grinder 4.9 Centre punch 4.10 Number and Letter punch
5. Electrodes	5.1 8,10,12 SWG 5.2 Electrodes/filler materials are to be preserved in Electrode Dryer or Electrode oven.
6. Equipment	6.1 SMAW - AC Welding Machine 6.2 DC Welding Machine 6.3 Diesel generator
7. Distortion prevention measures	7.1 Preheating 7.2 Setting up of jigs 7.3 Tack weld 7.4 Fixtures 7.5 Clamps etc.

8. Defects	8.1 Lack of penetration 8.2 Excess penetration 8.3 Porosity 8.4 Crack 8.5 Slag inclusions 8.6 Spatter 8.7 Undercut 8.8 Lack of fusion 8.9 Notches 8.10 Irregular shape and dimension
9. Weld Procedure Specification (WPS)	9.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
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 practice 1.2 Marked and cut the plate as per job 1.3 Took steps to avoid distortions. 1.4 Selected proper electrode as per job 1.5 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace 2.2 PPE and Tools in a welding workplace 2.3 Types, selection and preparation of plates 2.4 Types and selection of electrodes 2.5 Types and setting up of SMAW welding equipment 2.6 Types of Welding Joints and Welding Positions 2.7 Types of Welding Defects 2.8 Prevention and Rectification of Welding Defects 2.9 Welding Procedures and Techniques 2.10 Shut down and housekeeping procedures
3. Underpinning skill	3.1 Ability to follow OSH procedures in a welding workplace 3.2 Ability to select materials and prepare for welding job 3.3 Ability to use materials, tools and equipment appropriately and set up a welding job

	3.4 Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.5 Ability to prevent and rectify welding defects 3.6 Ability to complete the shut down and housekeeping procedures effectively
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
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National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

Unit Code and Title	TRAWEL2018A1: Perform GAS Metal Arc Welding (GMAW or MIG) Position 3F, 4F, 1G, 2G
Nominal Hours	110 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to perform weld in 3F, 4F, 1G (flat), 2G (horizontal) positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised 1.2 Safe work practices observed and personal protective equipment (PPE) worn as appropriate to the work performed.
2. Select and prepare materials	2.1 Base Materials , wire reel and shielding gas are selected. 2.2 Materials (plate) are marked and cut as per dimension of specification, drawing. 2.3 Edges are prepared as per specification to meet job requirements. 2.4 Materials are assembled and aligned with required gap. 2.5 Weld gauge or measuring instruments are used as per work place specifications.
3. Set up welding Job and equipment	3.1 Collect tools and equipment 3.2 Job is set up using clamps/jig/fixtures at required position (3F, 4F, 1G, 2G) 3.3 Welding machine and accessories are set up and adjusted as per job requirements.
4. Perform GAS Metal Arc Welding (GMAW or MIG) Position 3F, 4F, 1G , 2G	4.1 Weld performed as per specification and standard (WPS). 4.2 Welds are cleaned in accordance with standard operating procedures. 4.3 Weld is checked for quality and any defects are identified and corrective action
5. Minimise and rectify distortion	5.1 Distortion prevention measures are selected appropriate to material and process 5.2 Distortion is rectified 5.3 Distractive and Non distractive test are perform
6. Complete the shut down and housekeeping procedures effectively.	6.1 The shutdown procedures are conducted in accordance with workplace requirements 6.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 6.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.

Range of Variables	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire, 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1 Eye Shield (Head Screen) 2.2 Leather hand gloves 2.3 Leather apron 2.4 Boiler Suit (Cotton) 2.5 Leather arms guard 2.6 Safety goggles 2.7 Safety Shoes 2.8 Fume respirator 2.9 First aid kit
3. Base Metals	3.1. Mild steel 3.2. Carbon Steel 3.3. Alloy Steel 3.4. Strength steel 3.5. Aluminium 3.6. Backing strip 3.7. Plates 3-10 mm thickness range
4. Shielding gas	4.1 Inert gases (Such as Argon, Helium) 4.2 Reactive gases (Such as Nitrogen or Carbon-Dioxide) 4.3 Mixture of Inert and reactive gases
5. Wire reel (Electrode)	5.1 Wire reel (0.8 to 2.00 mm) 5.2 Filler materials are preserved in suitable place.
6. Tools	6.1 Clamps 6.2 Ballpeen hammer 6.3 Chipping hammer 6.4 Nose Plier 6.5 Tongs 6.6 Wire brush 6.7 Cup brush 6.8 Weld gauge 6.9 Grinder 6.10 Centre punch 6.11 Number and Letter punch 6.12 Air arc equipment
7. Equipment	7.1 GMAW - AC Welding Machine 7.2 GMAW -DC Welding Machine

8. Distortion prevention measures	9.2 Preheating 9.3 Tack weld 9.4 Setting up of jigs 9.5 Fixtures 9.6 Clamps etc.
9. Defects	9.1 Lack of penetration 9.2 Excess penetration 9.3 Porosity 9.4 Crack 9.5 Undercut 9.6 Lack of fusion 9.7 Notches 9.8 Irregular shape and dimension
10. Non Destructive Test (NDT)	10.1 Dye penetrant test 10.2 Ultrasonic test 10.3 Magnetic Particle test 10.4 Visual test
11. Destructive Test (DT)	11.1 Tensile test 11.2 Bend test 11.3 Hardness test 11.4 Break test
12. Distortion prevention measures	12.1 Preheating 12.2 Tack weld 12.3 Setting up of jigs 12.4 Fixtures 12.5 Clamps etc.
13. Weld Procedure Specification (WPS)	13.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
Special Notes Related Knowledge for the module: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
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 practice 1.2 Selected weld defects and rectified 1.3 Identified emergency shutdown procedure and work place 1.4 Tools & equipment are cleaned and stored according to workplace requirement

2. Underpinning knowledge	2.1. Hazards and OSH procedures in a welding workplace 2.2. PPE and Tools in a welding workplace 2.3. Types, selection and preparation of plates 2.4. Types, and selection of wire reel 2.5. Types and setting up of GMAW welding equipment 2.6. Types of welding joints and welding positions 2.7. Types of welding defects 2.8. Prevention and rectification of welding defects 2.9. Welding procedures and techniques 2.10. Shut down and housekeeping procedures
3. Underpinning skill	3.1. Ability to follow OSH procedures in a welding workplace 3.2. Ability to select materials and prepare for welding job 3.3. Ability to use materials, tools and equipment appropriately and set up a welding job 3.4. Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.5. Ability to prevent and rectify welding defects 3.6. Ability to complete the shut down and housekeeping procedures effectively
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place. 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL3019A1: Perform GAS Metal Arc Welding (GMAW or MIG) -Positions 3G and 4G
Nominal Hours	150 hours
Unit Descriptor	This unit competency covers the knowledge, skills and attitude are required to perform weld in 3G (vertical Up), 4G (overhead) positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised or eliminated. 1.2 Safe work practices observed and personal protective equipment (PPE) worn as appropriate to the work performed.
2. Select and prepare materials	2.1 Base Materials, wire reel and shielding gas are selected. 2.2 Materials (plate) are marked and cut as per dimension of specification, drawing. 2.3 Edges are prepared as per specification to meet job requirements. 2.4 Materials are assembled and aligned with required root gap. 2.5 Weld gauge or measuring instruments are used as per work place specifications.
3. Set up welding Job and equipment	3.1 Collect tools and equipment 3.2 Job is set up using clamps/jig/fixtures at required position (3G, 4G) 3.3 Welding machine and accessories are set up and adjusted as per job requirements.
4. Perform GAS Metal Arc Welding (GMAW or MIG) - Position 3G, 4G	4.1 Weld performed as per specification and standard (WPS). 4.2 Welds are cleaned in accordance with standard operating procedures. 4.3 Weld is checked for quality and any defects are identified and corrective action is taken to standard operating procedures.
5. Minimise and rectify distortion	5.1 Distortion prevention measures are selected appropriate to material and process 5.2 Distortion is rectified 5.3 Distractive and Non distractive test are perform

6. Complete the shut down and housekeeping procedures effectively.	6.1 The shutdown procedures are conducted in accordance with workplace requirements 6.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 6.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.
Range of Variables	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire, 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1 Eye Shield (Head Screen) 2.2 Leather hand gloves 2.3 Leather apron 2.4 Boiler Suit (Cotton) 2.5 Leather arms guard 2.6 Safety goggles 2.7 Safety Shoes 2.8 Fume respirator 2.9 First aid kit
3. Base Metals Shielding gas	3.1 Mild steel 3.2 Carbon Steel 3.3 Alloy Steel 3.4 Strength steel 3.5 Aluminium 3.6 Backing strip 3.7 Plates 3-10 mm thickness range
4. Shielding gas	4.1 Inert gases (Such as Argon, Helium) 4.2 Reactive gases (Such as Nitrogen or Carbon-Dioxide) 4.3 Mixture of Inert and reactive gases
5. Wire reel (Electrode)	5.1 Wire reel (0.8 to 2.00 mm) 5.2 Filler materials are preserved in suitable place.
6. Tools	6.1 Clamps 6.2 Ballpeen hammer 6.3 Chipping hammer 6.4 Nose Plier 6.5 Tongs 6.6 Wire brush 6.7 Cup brush 6.8 Weld gauge 6.9 Grinder

	6.10 Centre punch 6.11 Number and Letter punch 6.12 Air arc equipment
7. Equipment	7.1 GMAW - AC Welding Machine 7.2 GMAW -DC Welding Machine
8. Distortion prevention measures	8.1 Preheating 8.2 Tack weld 8.3 Setting up of jigs 8.4 Fixtures 8.5 Clamps etc.
9. Defects	9.1 Lack of penetration 9.2 Excess penetration 9.3 Porosity 9.4 Crack 9.5 Undercut 9.6 Lack of fusion 9.7 Notches 9.8 Irregular shape and dimension
10. Non Destructive Test (NDT)	10.1 Dye penetrant test 10.2 Ultrasonic test 10.3 Magnetic Particle test 10.4 Visual test
11. Destructive Test (DT)	11.1 Tensile test 11.2 Bend test 11.3 Hardness test 11.4 Break test
12. Weld Procedure Specification (WPS)	12.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
Special Notes Related Knowledge for the module: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	

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 practice 1.2 Selected weld defects and rectified 1.3 Identified emergency shutdown procedure and work place 1.4 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace 2.2 PPE and Tools in a welding workplace 2.3 Types, selection and preparation of plates 2.4 Types, and selection of wire reel 2.5 Types and setting up of GMAW welding equipment 2.6 Types of welding joints and welding positions 2.7 Types of welding defects 2.8 Prevention and rectification of welding defects 2.9 Welding procedures and techniques 2.10 Shut down and housekeeping procedures
3. Underpinning skill	3.1 Ability to follow OSH procedures in a welding workplace 3.2 Ability to select materials and prepare for welding job 3.3 Ability to use materials, tools and equipment appropriately and set up a welding job 3.4 Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.5 Ability to prevent and rectify welding defects 3.6 Ability to complete the shut down and housekeeping procedures effectively
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities

6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

Unit Code and Title	TRAWEL4020A1: Perform GAS Metal Arc Welding (GMAW or MIG) -Positions 5G and 6G
Nominal Hours	140 hours
Unit Descriptor	This competency covers the knowledge, skills and attitude are required to perform weld on pipe in 5G (horizontal fixed position) upward, 6G (in 45° angle) positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised or eliminated 1.2 Safe work practices observed and personal protective equipment (PPE) worn as appropriate to the work performed.
2. Select and prepare materials	2.1 Base Materials, wire reel and shielding gas are selected. 2.2 Materials (pipes) are marked and cut as per dimension of specification, drawing. 2.3 Edges are prepared as per specification to meet job requirements. 2.4 Materials are assembled and aligned with required gap. 2.5 Weld gauge or measuring instruments are used as per work place specifications.
3. Set up welding Job and equipment	3.1 Collect tools and equipment's 3.2 Job is set up using clamps/jig/fixtures at required position (5G, 6G) 3.3 Welding machine and accessories are set up and adjusted as per job requirements.
4. Perform GAS Metal Arc Welding (GMAW or MIG) - Position 5G, 6G	4.1 Weld performed as per specification and standard (WPS). 4.2 Welds are cleaned in accordance with standard operating procedures. 4.3 Weld is checked for quality and any defects are identified and corrective action is taken to standard operating procedures.
5. Minimise and rectify distortion	5.1 Distortion prevention measures are selected appropriate to material and process 5.2 Distortion is rectified 5.3 Distractive and Non distractive test are perform
6. Complete the shut down and housekeeping procedures effectively.	6.1 The shutdown procedures are conducted in accordance with workplace requirements 6.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 6.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.

Range of Variables	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire, 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1 Eye Shield (Head Screen) 2.2 Leather hand gloves 2.3 Leather apron 2.4 Boiler Suit (Cotton) 2.5 Leather arms guard 2.6 Safety goggles 2.7 Safety Shoes 2.8 Fume respirator 2.9 First aid kit
3. Base Metals (Pipe)	3.1 Mild steel 3.2 Carbon Steel 3.3 Stainless steel 3.4 Pipe thickness 6 mm - 20 mm range 3.5 Pipe diameter 100 mm – 350 mm range
4. Wire reel (Electrode)	4.1 Wire reel (0.8 to 2.00 mm) 4.2 Filler materials are preserved in suitable place.
5. Shielding gas	5.1 Inert gases (Such as Argon, Helium) 5.2 Reactive gases (Such as Nitrogen or Carbon-Dioxide) 5.3 Mixture of Inert and reactive gases
6. Tools	6.1 Clamps 6.2 Ballpeen hammer 6.3 Chipping hammer 6.4 Nose Plier 6.5 Tongs 6.6 Wire brush 6.7 Cup brush 6.8 Weld gauge 6.9 Grinder 6.10 Centre punch 6.11 Number and Letter punch 6.12 Air arc equipment
7. Equipment	7.1 GMAW - AC Welding Machine 7.2 GMAW -DC Welding Machine

8. Distortion prevention measures	8.1 Preheating 8.2 Tack weld 8.3 Setting up of jigs 8.4 Fixtures 8.5 Clamps etc.
9. Defects	9.1 Lack of penetration 9.2 Excess penetration 9.3 Porosity 9.4 Crack 9.5 Undercut 9.6 Lack of fusion 9.7 Notches 9.8 Irregular shape and dimension
10. Non Destructive Test (NDT)	10.1 Dye penetrant test 10.2 Ultrasonic test 10.3 Magnetic Particle test 10.4 Visual test
11. Destructive Test (DT)	11.1 Tensile test 11.2 Bend test 11.3 Hardness test 11.4 Break test
12. Weld Procedure Specification (WPS)	12.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
Special Notes Related Knowledge for the module: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants	
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 practice 1.2 Selected weld defects and rectified 1.3 Identified emergency shutdown procedure and work place 1.4 Tools & equipment are cleaned and stored according to workplace requirement

2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace 2.2 PPE and Tools in a welding workplace 2.3 Types, selection and preparation of plates 2.4 Types, and selection of wire reel 2.5 Types and setting up of GMAW welding equipment 2.6 Types of welding joints and welding positions 2.7 Types of welding defects 2.8 Prevention and rectification of welding defects 2.9 Welding procedures and techniques 2.10 Shut down and housekeeping procedures
3. Underpinning skill	3.1 Ability to follow OSH procedures in a welding workplace 3.2 Ability to select materials and prepare for welding job 3.3 Ability to use materials, tools and equipment appropriately and set up a welding job 3.4 Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.5 Ability to prevent and rectify welding defects 3.6 Ability to complete the shut down and housekeeping procedures effectively
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

Unit Code and Title	TRAWEL4021A1: Perform GAS Metal Arc Welding (GMAW or MIG) - Position 6GR
Nominal Hours	70 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to perform weld on pipe in 6GR (T, Y, K joints) position.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised or eliminated. 1.2 Safe work practices observed and personal protective equipment (PPE) worn as appropriate to the work performed.
2. Select and prepare materials	2.1 Base Materials, wire reel and shielding gas are selected. 2.2 Materials (pipes) are marked and cut as per dimension of specification, drawing. 2.3 Edges are prepared as per specification to meet job requirements. 2.4 Materials (pipes) are assembled and aligned with required root gap. 2.5 Weld gauge or measuring instruments are used as per work place specifications.
3. Set up welding Job and equipment	3.1 Collect tools and equipment 3.2 Job is set up using clamps/jig/fixtures at required position (6GR) 3.4 Welding machine and accessories are set up and adjusted as per job requirements.
4. Perform GAS Metal Arc Welding (GMAW or MIG) - Position 6GR	4.1 Weld performed as per specification and standard (WPS). 4.2 Welds are cleaned in accordance with standard operating procedures. 4.3 Weld is checked for quality and any defects are identified and corrective action
5. Minimise and rectify distortion	5.1 Distortion prevention measures are selected appropriate to material and process 5.2 Distortion is rectified 5.3 Distractive and Non distractive test are perform
6. Complete the shut down and housekeeping procedures effectively.	6.1 The shutdown procedures are conducted in accordance with workplace requirements 6.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 6.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.

Range of Variables	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire, 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1 Eye Shield (Head Screen) 2.2 Leather hand gloves 2.3 Leather apron 2.4 Boiler Suit (Cotton) 2.5 Leather arms guard 2.6 Safety goggles 2.7 Safety Shoes 2.8 Fume respirator 2.9 First aid kit
3. Base Metals (Pipe)	3.1 Mild steel 3.2 Carbon Steel 3.3 Stainless steel 3.4 Pipe thickness 6 mm - 20 mm range 3.5 Pipe diameter 100 mm – 350 mm range
4. Wire reel (Electrode)	4.1 Wire reel (0.8 to 2.00 mm) 4.2 Filler materials are preserved in suitable place.
5. Shielding gas	5.1 Inert gases (Such as Argon, Helium) 5.2 Reactive gases (Such as Nitrogen or Carbon-Dioxide) 5.3 Mixture of Inert and reactive gases
6. Tools	6.1 Clamps 6.2 Ballpeen hammer 6.3 Chipping hammer 6.4 Nose Plier 6.5 Tongs 6.6 Wire brush 6.7 Cup brush 6.8 Weld gauge 6.9 Grinder 6.10 Centre punch 6.11 Number and Letter punch 6.12 Air arc equipment
7. Equipment	7.1 GMAW - AC Welding Machine 7.2 GMAW -DC Welding Machine
8. Distortion prevention measures	8.1 Preheating 8.2 Tack weld

	8.3 Setting up of jigs 8.4 Fixtures 8.5 Clamps etc.
9. Defects	9.1 Lack of penetration 9.2 Excess penetration 9.3 Porosity 9.4 Crack 9.5 Undercut 9.6 Lack of fusion 9.7 Notches 9.8 Irregular shape and dimension
10. Non Destructive Test (NDT)	10.1 Dye penetrant test 10.2 Ultrasonic test 10.3 Magnetic Particle test 10.4 Visual test
11. Destructive Test (DT)	11.1 Tensile test 11.2 Bend test 11.3 Hardness test 11.4 Break test
12. WPS: Weld Procedure Specification	12.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
Special Notes Related Knowledge for the module: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
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 practice 1.2 Selected weld defects and rectified 1.3 Identified emergency shutdown procedure and work place 1.4 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace 2.2 PPE and Tools in a welding workplace 2.3 Types, selection and preparation of plates

	2.4 Types, and selection of wire reel 2.5 Types and setting up of GMAW welding equipment 2.6 Types of welding joints and welding positions 2.7 Types of welding defects 2.8 Prevention and rectification of welding defects 2.9 Welding procedures and techniques 2.10 Shut down and housekeeping procedures
3. Underpinning skill	3.1 Ability to follow OSH procedures in a welding workplace 3.2 Ability to select materials and prepare for welding job 3.3 Ability to use materials, tools and equipment appropriately and set up a welding job 3.4 Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.5 Ability to prevent and rectify welding defects 3.6 Ability to complete the shut down and housekeeping procedures effectively
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

Specialised Elective: (GTAW)

National Technical and Vocational Qualification Framework for Bangladesh
Unit of Competency

Unit Code and Title	TRAWEL1028A1: Perform Shielded Metal Arc Welding (SMAW) under supervision – Positions 1F, 2F, 1G and 2G
Nominal Hours	70 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude necessary to perform, under supervision, Shielded Metal Arc Welding (SMAW) to the standards required for basic purposes in 1F, 2F, 1G, and 2G positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised and eliminated. 1.2 Personal Protective Equipment (PPE) worn as required for the work to be performed. 1.3 Safe work practices are observed.
2. Select and prepare the materials for the welding job	2.1 Weld requirements are identified from workplace instruction. 2.2 Plates, tools, equipment and electrodes are selected and collected as per job requirements. 2.3 Plates are marked and cut as per job specification. 2.4 Edges of plate are prepared as per job specification.
3. Set up the welding job and equipment in accordance with requirements	3.1 Job is set up taking steps to avoid distortions with appropriate root gap, using a clamp, tack weld at required position (1F, 2F, 1G, 2G) 3.2 Welding equipment is set up and adjusted in accordance with job specification.
4. Perform the welding job under supervision.	4.1 Tack the base metal properly avoid distortion prevention measures 4.2 Welding is performed as per job specification. 4.3 Welds are cleaned, checked for quality and defects are identified.

	4.4 Corrective action is taken to meet the standards for basic purposes where load bearing is not critical. 4.5 Weld is checked for quality and any defects are identified and corrective action
5. Complete the shut down and housekeeping procedures effectively.	5.1 Welding Machine shutdown procedures are conducted in accordance with workplace requirements 5.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 5.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.
Range of Variables	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1 Skull helmet 2.2 Eye Shield (Head Screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler Suit (Cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety Shoes
3. Plates	3.1 MS Plates 3-10 mm thickness range
4. Tools	4.1 Clamps 4.2 Ball pin hammer 4.3 Chipping hammer 4.4 Tongs 4.5 Wire brush 4.6 Cup brush 4.7 Weld gauge 4.8 Grinder 4.9 Centre punch 4.10 Number and Letter punch
5. Electrodes	5.1 8,10,12 SWG 5.2 Electrodes/filler materials are to be preserved in Electrode Dryer or Electrode oven.

6. Equipment	6.1 SMAW - AC Welding Machine 6.2 DC Welding Machine 6.3 Diesel generator
7. Distortion prevention measures	7.1 Preheating 7.2 Tack weld 7.3 Setting up of jigs 7.4 Fixtures 7.5 Clamps etc.
8. Defects	8.1 Lack of penetration 8.2 Excess penetration 8.3 Porosity 8.4 Crack 8.5 Slag inclusions 8.6 Spatter 8.7 Undercut 8.8 Lack of fusion 8.9 Notches 8.10 Irregular shape and dimension
9. Weld Procedure Specification (WPS)	9.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
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 practice 1.2 Marked and cut the plate as per job 1.3 Took steps to avoid distortions. 1.4 Selected proper electrode as per job 1.5 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace 2.2 PPE and Tools in a welding workplace 2.3 Types, selection and preparation of plates 2.4 Types and selection of electrodes 2.5 Types and setting up of SMAW welding equipment 2.6 Types of Welding Joints and Welding Positions 2.7 Types of Welding Defects 2.8 Prevention and Rectification of Welding Defects 2.9 Welding Procedures and Techniques 2.10 Shut down and housekeeping procedures

3. Underpinning skill	3.1 Ability to follow OSH procedures in a welding workplace 3.2 Ability to select materials and prepare for welding job 3.3 Ability to use materials, tools and equipment appropriately and set up a welding job 3.4 Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.5 Ability to prevent and rectify welding defects 3.6 Ability to complete the shut down and housekeeping
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL2022A1 - Perform GAS Tungsten Arc Welding (GTAW or TIG): Position 3F, 4F, 1G, 2G
Nominal Hours	110 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to perform weld on plate in 1G (flat), 2G (horizontal) positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised or eliminated. 1.2 Safe work practices observed and personal protective equipment (PPE) worn as appropriate to the work performed.
2. Select and prepare materials	2.1 Base Materials, filler rod and shielding gas are selected 2.2 Materials (plate) are marked and cut as per dimension of specification, drawing 2.3 Edges are prepared as per specification to meet job requirements 2.4 Materials are assembled and aligned with required gap. 2.5 Weld gauge or measuring instruments are used as per work place specifications
3. Set up welding Job and equipment	3.1 Collect tools, equipment, Tungsten electrode and Ceramic Cap 3.2 Job is set up using clamps/jig/fixtures at required position (3F, 4F, 1G, 2G) 3.3 Welding machine and accessories are set up and adjusted as per job requirements.
4. Perform GAS Tungsten Arc Welding (GTAW or TIG) - Position 3F, 4F, 1G, 2G	4.1 Joints are cleaned up as per specification 4.2 Weld performed as per specification and standard (WPS) 4.3 Joints are cleaned to specifications 4.4 Weld is checked for quality and any defects are identified and corrective action
5. Minimise and rectify distortion	5.1 Distortion prevention measures are selected appropriate to material and process 5.2 Distortion is rectified 5.3 Distractive and Non distractive test are perform

6. Complete the shut down and housekeeping procedures effectively.	6.1 Welding Machine shutdown procedures are conducted in accordance with workplace requirements 6.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 6.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.
Range of Variables	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire, 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1 Eye Shield (Head Screen) 2.2 Leather hand gloves 2.3 Leather apron 2.4 Boiler Suit (Cotton) 2.5 Leather arms guard 2.6 Safety goggles 2.7 Safety Shoes 2.8 Fume respirator 2.9 First aid kit
3. Base Metals	3.1 Mild steel 3.2 Carbon Steel 3.3 Alloy Steel 3.4 Strength steel 3.5 Aluminium 3.6 Backing strip 3.7 Plates 3-10 mm thickness range
4. Shielding gas	4.1 Inert gases (Such as Argon, Helium)
5. Filler rod	5.1 Filler rod (02 mm to 3.2 mm) 5.2 Filler materials are preserved in suitable place.
6. Tungsten Electrode (diameter)	6.1 2mm -2.5mm
7. Ceramic Cap	1.4 6 no. to 15 no.
8. Equipment	8.1 GTAW - AC Welding Machine 8.2 GTAW -DC Welding Machine
9. Distortion prevention measures	9.1 Preheating 9.2 Tack weld 9.3 Setting up of jigs 9.4 Fixtures 9.5 Clamps etc.

10. Defects	10.1 Lack of penetration 10.2 Excess penetration 10.3 Porosity 10.4 Crack 10.5 Undercut 10.6 Lack of fusion 10.7 Notches 10.8 Irregular shape and dimension
11. Non Destructive Test (NDT)	11.1 Dye penetrant test 11.2 Ultrasonic test 11.3 Magnetic Particle test 11.4 Visual test
12. Destructive Test (DT)	12.1 Tensile test 12.2 Bend test 12.3 Hardness test 12.4 Break test
13. WPS: Weld Procedure Specification	13.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
Special Notes Related Knowledge for the module: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
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 practice 1.2 Selected weld defects and rectified 1.3 Identified emergency shutdown procedure and work place 1.4 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace 2.2 PPE and Tools in a welding workplace 2.3 Types, selection and preparation of plates 2.4 Types, and selection of wire reel 2.5 Types and setting up of GMAW welding equipment 2.6 Types of welding joints and welding positions

	2.7 Types of welding defects 2.8 Prevention and rectification of welding defects 2.9 Welding procedures and techniques 2.10 Shut down and housekeeping procedures
3. Underpinning skill	3.1 Ability to follow OSH procedures in a welding workplace 3.2 Ability to follow OSH procedures in a welding workplace 3.3 Ability to select materials and prepare for welding job 3.4 Ability to use materials, tools and equipment appropriately and set up a welding job 3.5 Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.6 Ability to prevent and rectify welding defects 3.7 Ability to complete the shut down and housekeeping
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.3 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL3023A1: Perform GAS Tungsten Arc Welding (GTAW or TIG) - Position 3G, 4G
Nominal Hours	150 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to perform weld on plate in 3G (vertical up), 4G (overhead) positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised or eliminated. 1.2 Safe work practices observed and personal protective equipment (PPE) worn as appropriate to the work performed.
2. Select and prepare materials	2.1 Base Materials, filler rod and shielding gas are selected. 2.2 Materials (plate) are marked and cut as per dimension of specification, drawing. 2.3 Edges are prepared as per specification to meet job requirements. 2.4 Materials are assembled and aligned with required gap. 2.5 Weld gauge or measuring instruments are used as per work place specifications.
3. Set up welding Job and equipment	3.1 Collect tools, equipment, tungsten electrode and ceramic cap . 3.2 Job is set up using clamps/jig/fixtures at required position (3G, 4G) 3.3 Welding machine and accessories are set up and adjusted as per job requirements.
4. Perform GAS Tungsten Arc Welding (GTAW or TIG) - Position 3G , 4G	4.1 Weld performed as per specification and standard (WPS). 4.2 Welds are cleaned in accordance with standard operating procedures. 4.3 Weld is checked for quality and any defects are identified and corrective action is taken to standard operating procedures.
5. Minimise and rectify distortion	5.1 Distortion prevention measures are selected appropriate to material and process 5.2 Distortion is rectified 5.3 Distractive and Non distractive test are perform

6. Complete the shut down and housekeeping procedures effectively.	6.1 The shutdown procedures are conducted in accordance with workplace requirements 6.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 6.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.
Range of Variables	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire, 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1 Eye Shield (Head Screen) 2.2 Leather hand gloves 2.3 Leather apron 2.4 Boiler Suit (Cotton) 2.5 Leather arms guard 2.6 Safety goggles 2.7 Safety Shoes 2.8 Fume respirator 2.9 First aid kit
3. Base Metals	3.1 Mild steel 3.2 Carbon Steel 3.3 Alloy Steel 3.4 Strength steel 3.5 Aluminium 3.6 Backing strip
4. Plate thickness	4.1 Plates 3-10 mm thickness range
5. Shielding gas	4.4 Inert gases (Such as Argon, Helium)
6. Filler rod dia	6.1 Filler rod (02 mm to 3.2 mm) 6.2 Filler materials are preserved in suitable place.
7. Tungsten Electrode (diameter)	7.5 2mm -2.5mm
8. Ceramic Cap	8.1 6 no. to 15 no.
9. Equipment	9.1 GTAW - AC Welding Machine 9.2 GTAW -DC Welding Machine
10. Distortion prevention measures	10.1 Preheating 10.2 Tack weld 10.3 Setting up of jigs 10.4 Fixtures 10.5 Clamps etc.

11. Defects	11.1 Lack of penetration 11.2 Excess penetration 11.3 Porosity 11.4 Crack 11.5 Undercut 11.6 Lack of fusion 11.7 Notches 11.8 Irregular shape and dimension
12. Non Destructive Test (NDT)	12.1 Dye penetrant test 12.2 Ultrasonic test 12.3 Magnetic Particle test 12.4 Visual test
13. Destructive Test (DT)	13.1 Tensile test 13.2 Bend test 13.3 Hardness test 13.4 Break test
14. WPS: Weld Procedure Specification	14.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
Special Notes Related Knowledge for the module: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
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 practice 1.2 Selected weld defects and rectified 1.3 Identified emergency shutdown procedure and work place 1.4 Tools & equipment are cleaned and stored according to workplace requirement
2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace 2.2 PPE and Tools in a welding workplace 2.3 Types, selection and preparation of plates 2.4 Types, and selection of wire reel 2.5 Types and setting up of GMAW welding equipment 2.6 Types of welding joints and welding positions

	2.7 Types of welding defects 2.8 Prevention and rectification of welding defects 2.9 Welding procedures and techniques 2.10 Shut down and housekeeping procedures
3. Underpinning skill	3.1 Ability to follow OSH procedures in a welding workplace 3.2 Ability to select materials and prepare for welding job 3.3 Ability to use materials, tools and equipment appropriately and set up a welding job 3.4 Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.5 Ability to prevent and rectify welding defects 3.6 Ability to complete the shut down and housekeeping procedures effectively
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place 7.2 Competencies may be assessed in a simulated work place.

Accreditation Requirements

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National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL4024A1: Perform GAS Tungsten Arc Welding (GTAW or TIG) -Positions 5G , 6G
Nominal Hours	140 hours
Unit Descriptor	This unit covers the knowledge, skills and attitude are required to perform weld on pipe in 5G (horizontal fixed position) upward, 6G (in 45° angle fixed) positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised or eliminated 1.2 Safe work practices observed and personal protective equipment (PPE) worn as appropriate to the work performed.
2. Select and prepare materials	2.1 Base Materials, filler rod and shielding gas are selected. 2.2 Materials (pipes) are marked and cut as per dimension of specification, drawing. 2.3 Edges are prepared as per specification to meet job requirements. 2.4 Materials (pipes) are assembled and aligned with required gap. 2.5 Weld gauge or measuring instruments are used as per work place specifications.
3. Set up welding Job and equipment	3.1 Collect tools, equipment, tungsten electrode and ceramic cap . 3.2 Job is set up using clamps/jig/fixtures at required position (5G, 6G) 3.3 Welding machine and accessories are set up and adjusted as per job requirements.
4. Perform weld GAS Tungsten Arc Welding (GTAW or TIG) -Position 5G , 6G	4.1 Weld performed as per specification and standard (WPS). 4.2 Welds are cleaned in accordance with standard operating procedures. 4.3 Weld is checked for quality and any defects are identified and corrective action is taken to standard operating procedures.
5. Minimise and rectify distortion	5.1 Distortion prevention measures are selected appropriate to material and process 5.2 Distortion is rectified 5.3 Distractive and Non distractive test are perform

6. Complete the shut down and housekeeping procedures effectively.	6.1 The shutdown procedures are conducted in accordance with workplace requirements 6.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 6.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.
Range of Variables⁷	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire, 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1 Eye Shield (Head Screen) 2.2 Leather hand gloves 2.3 Leather apron 2.4 Boiler Suit (Cotton) 2.5 Leather arms guard 2.6 Safety goggles 2.7 Safety Shoes 2.8 Fume respirator 2.9 First aid kit
3. Base Metals	3.1 Mild steel 3.2 Carbon Steel 3.3 Stainless steel 3.4 Pipe thickness 6 mm - 20 mm range 3.5 Pipe Diameter 100 mm – 350 mm range
4. Shielding gas	4.1 Inert gases (Such as Argon, Helium)
5. Filler rod dia	5.1 Filler rod (02 mm to 3.2 mm) 5.2 Filler materials are preserved in suitable place.
6. Tungsten Electrode (diameter)	6.1 2mm -2.5mm
7. Ceramic Cap	7.1 6 no. to 15 no.
8. Equipment	8.1 GTAW - AC Welding Machine 8.2 GTAW -DC Welding Machine
9. Distortion prevention measures	9.1 Preheating 9.3 Tack weld 9.2 Setting up of jigs 9.4 Fixtures 9.5 Clamps etc.
10. Tools	10.1 Clamps 10.2 Ballpeen hammer 10.3 Chipping hammer

	10.4 Nose Plier 10.5 Tongs 10.6 Wire brush 10.7 Cup brush 10.8 Weld gauge 10.9 Grinder 10.10 Centre punch 10.11 Number and Letter punch 10.12 Air arc equipment
11. Defects	11.1 Lack of penetration 11.2 Excess penetration 11.3 Porosity 11.4 Crack 11.5 Undercut 11.6 Lack of fusion 11.7 Notches 11.8 Irregular shape and dimension
12. Non Destructive Test (NDT)	12.1 Dye penetrant test 12.2 Ultrasonic test 12.3 Magnetic Particle test 12.4 Visual test
13. Destructive Test (DT)	13.1 Tensile test 13.2 Bend test 13.3 Hardness test 13.4 Break test
14. WPS: Weld Procedure Specification	14.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
Special Notes Related Knowledge for the module: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
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 practice 1.2 Selected weld defects and rectified 1.3 Identified emergency shutdown procedure and work place 1.4 Tools & equipment are cleaned and stored according to workplace requirement

2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace 2.2 PPE and Tools in a welding workplace 2.3 Types, selection and preparation of plates 2.4 Types, and selection of wire reel 2.5 Types and setting up of GMAW welding equipment 2.6 Types of welding joints and welding positions 2.7 Types of welding defects 2.8 Prevention and rectification of welding defects 2.9 Welding procedures and techniques 2.10 Shut down and housekeeping procedures
3. Underpinning skill	3.1 Ability to follow OSH procedures in a welding workplace 3.2 Ability to select materials and prepare for welding job 3.3 Ability to use materials, tools and equipment appropriately and set up a welding job 3.4 Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.5 Ability to prevent and rectify welding defects 3.6 Ability to complete the shut down and housekeeping procedures effectively
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.2 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or a simulated work place

Accreditation Requirements

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

National Technical and Vocational Qualification Framework for Bangladesh

Unit of Competency

Unit Code and Title	TRAWEL4025A1: Perform GAS Tungsten Arc Welding (GTAW or TIG) -Position 6GR
Nominal Hours	70 hours
Unit Descriptor	This unit covers the Knowledge, skills and attitude are required to perform weld on pipe in 6GR (inclined in 45° angle fixed and T, Y or K joints) positions.
Elements of Competency	Performance Criteria <i>Italicized</i> terms are elaborated in the range of variables
1. Follow OSH practices	1.1 Hazards are identified and risks are minimised or eliminated. 1.2 Safe work practices observed and personal protective equipment (PPE) worn as appropriate to the work performed.
2. Select and prepare materials	2.1 Base Materials, filler rod and shielding gas are selected. 2.2 Materials (pipes) are marked and cut as per dimension of specification's drawing. 2.3 Edges are prepared as per specification to meet job requirements. 2.4 Materials (pipes) are assembled and aligned with required root gap. 2.5 Weld gauge or measuring instruments are used as per work place specifications.
3. Set up welding Job and equipment	3.1 Collect tools, equipment, tungsten electrode and ceramic cap . 3.2 Job is set up using clamps/jig/fixtures at required position (6GR) 3.3 Welding machine and accessories are set up and adjusted as per job requirements.
4. Perform weld GAS Tungsten Arc Welding (GTAW or TIG) Position 6GR	4.1 Weld performed as per specification and standard (WPS). 4.2 Welds are cleaned in accordance with standard operating procedures. 4.3 Weld is checked for quality and any defects are identified and corrective action is taken to standard operating procedures.
5. Minimise and rectify distortion	5.1 Distortion prevention measures are selected appropriate to material and process 5.2 Distortion is rectified 5.3 Distractive and Non distractive test are perform

6. Complete the shut down and housekeeping procedures effectively.	6.1 The shutdown procedures are conducted in accordance with workplace requirements 6.2 Equipment and tools are cleaned and stored in accordance with workplace requirements. 6.3 The wastes are disposed off and the workplace is cleaned in accordance with workplace requirements.
Range of Variables	
Variable	Range (May include but not limited to)
1. Hazards	1.1 Fire, 1.2 Radiation 1.3 Poisonous Gases and Air Quality
2. Personal Protective Equipment (PPE)	2.1 Eye Shield (Head Screen) 2.2 Leather hand gloves 2.3 Leather apron 2.4 Boiler Suit (Cotton) 2.5 Leather arms guard 2.6 Safety goggles 2.7 Safety Shoes 2.8 Fume respirator 2.9 First aid kit
3. Base Metals	3.1 Mild steel 3.2 Carbon Steel 3.3 Stainless steel 3.4 Pipe thickness 6 mm - 20 mm 3.5 Pipe Diameter 100 mm – 350 mm range
4. Shielding gas	4.1 Inert gases (Such as Argon, Helium)
5. Filler rod dia	5.1 Filler rod (02 mm to 3.2 mm) 5.2 Filler materials are preserved in suitable place.
6. Tungsten Electrode dia	6.1 2mm -2.5mm
7. Ceramic Cap	7.1 6 no. to 15 no.
8. Tools	8.1 Clamps 8.2 Ballpeen hammer 8.3 Chipping hammer 8.4 Nose Plier 8.5 Tongs 8.6 Wire brush 8.7 Cup brush 8.8 Weld gauge 8.9 Grinder 8.10 Centre punch 8.11 Number and Letter punch 8.12 Air arc equipment

9. Equipment	9.1 GTAW - AC Welding Machine 9.2 GTAW -DC Welding Machine
10. Distortion prevention measures	10.1 Preheating 10.2 Tack weld 10.3 Setting up of jigs 10.4 Fixtures 10.5 Clamps etc.
11. Defects	11.1 Lack of penetration 11.2 Excess penetration 11.3 Porosity 11.4 Crack 11.5 Undercut 11.6 Lack of fusion 11.7 Notches 11.8 Irregular shape and dimension
12. Non Destructive Test (NDT)	12.1 Dye penetrant test 12.2 Ultrasonic test 12.3 Magnetic Particle test 12.4 Visual test
13. Destructive Test (DT)	13.1 Tensile test 13.2 Bend test 13.3 Hardness test 13.4 Break test
14. WPS: Weld Procedure Specification	14.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. Bangladesh Standards and Testing Institute http://www.bsti.gov.bd/list.html and other related international standards
Special Notes Related Knowledge for the module: Procedure qualification test, Welder's qualification test, Production technology (plate and profile), Welding joints for steel plates, Basic metallurgy (steel), shrinking and deformation, weld imperfections, Equipment for SMAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
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 practice 1.2 Selected weld defects and rectified 1.3 Identified emergency shutdown procedure and work place 1.4 Tools & equipment are cleaned and stored according to workplace requirement

2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace 2.2 PPE and Tools in a welding workplace 2.3 Types, selection and preparation of plates 2.4 Types, and selection of wire reel 2.5 Types and setting up of GMAW welding equipment 2.6 Types of welding joints and welding positions 2.7 Types of welding defects 2.8 Prevention and rectification of welding defects 2.9 Welding procedures and techniques 2.10 Shut down and housekeeping procedures
3. Underpinning skill	3.1 Ability to follow OSH procedures in a welding workplace 3.2 Ability to select materials and prepare for welding job 3.3 Ability to use materials, tools and equipment appropriately and set up a welding job 3.4 Ability to perform welding job to meet the standards for basic purposes where load bearing is not critical. 3.5 Ability to prevent and rectify welding defects 3.6 Ability to complete the shut down and housekeeping procedures effectively
4. Required attitude	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, sub-ordinates and seniors in workplace
5. Resource implication	The following resources must be provided: 5.1 Tools, Equipment and Physical facilities appropriate to perform activities. 5.3 Materials, consumables to perform activities
6. Methods of assessment	6.1 Demonstration with oral questioning 6.2 Direct observation 6.3 Written test
7. Context of assessment	7.1 Competencies may be assessed in the work place or simulated work place 7.2 Competencies may be assessed in a simulated work place.
Accreditation Requirements Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any national qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.	