

National Technical and Vocational Qualifications Framework

NTVQF

Competency Standards
for
Welding
NTVQF Level – I, II, III & IV.



Bangladesh Technical Education Board (BTEB)
Agargaon, Sher-E-Bangla Nagar, Dhaka-1207

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Introduction

These Competency Standards were developed by the Technical Sub Committee (TSC) that was established by **Transport Equipment Industry Skills Council**. The rules of Skill Development Policy are maintained to develop the standards. 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 TSC are primarily from industry and training institutes. The members were trained and guided by an International Expert and National Experts to develop the standard. 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).

Competency Standards are nationally agreed and industry-determined competencies required for effective work performance. These are presented in a consistent format following sequence such as:

- Unit Title
- Unit Code
- Nominal Hours
- Unit descriptor
- Elements and performance criteria
- Range of Variables
- Evidence Guide

The Competency Standards are the core element for training, assessment and certification of skilled workers. Candidates who are successful in the assessment will receive a qualification in the National Technical and Vocational Qualification Framework (NTVQF).

This document contains Course structures for each qualification. This structure contains the Unit code, Unit of Competency and nominal hours for the competencies.

The Competency Standard for Welding was developed by the Technical Sub Committee (TSC) that was established under the **Transport Equipment Industry Skills Council**. The technical support was provided by BTEB and both financial and technical support was provided by KOICA. The technical experts are primarily from industry nominated by Industry Skills Council with representatives from the Bangladesh Technical Education Board (BTEB), KOICA involved in this occupation. The Standards and Curriculum Development Committee (SCDC) of BTEB reviewed this document.

Endorsed by

Industry Skills Council
Date:

Approved by

Bangladesh Technical Education Board (BTEB)
Date:

National Competency Standards for National Skill Certificate – I, II, III & IV in Welding in Transport Equipment Sector

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 (NSC 3)		Semi-Skilled Worker
NTVQF 2		National Skill Certificate 2 (NSC 2)		Basic Skilled Worker
NTVQF 1		National Skill Certificate 1 (NSC 1)		Basic Worker
Pre-Voc 2	National Pre-Vocation Certificate 2 (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	Manage 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	Basic 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 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

List of Abbreviation

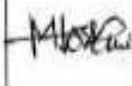
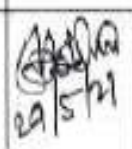
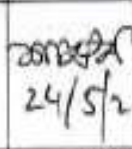
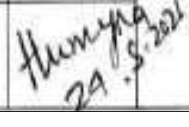
General

DTE	Directorate of Technical Education
BTEB	Bangladesh Technical Education Board
BMET	Bureau of Manpower Employment and Training
ILO	International Labour Organization
ISC	Industry Skills Council
NPVC	National Pre-Vocation Certificate
NTVQF	National Technical and Vocational Qualifications Framework
SAARC	South Asian Association for Regional Cooperation
SCDC	Standards and Curriculum Development Committee
TVET	Technical and Vocational Education and Training
TSC	Technical Sub Committee
UoC	Unit of Competency
CS	Competency Standard

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
OAW	Oxy Acetylene Welding
RSW	Resistance Spot Welding
MIG	Metal Inert Gas Welding
MAG	Metal Active Gas Welding
OFC	Oxy Fuel Gas Cutting

Bangladesh Technical Education Board (BTEB)
Standard and Curriculum Development Committee
National Competency Standards & Course Accreditation Document
for
Welding, Level – I, II, III & IV for
Transport Equipment Sector
Meeting held on 24.05.2021, 9.30 AM

SL No.	Name	Address and Contact number	Designation of (SCDC)	Signature	Remarks
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02.	Mr. Md. Idrish Ali,	Flat # C2/FC, Protik Apartment, Block-j, Road-12/4, South Bonasree, Gopan, Dhaka.	Member		
03.	Mr. Md. Salah Uddin,	Consultant, H R Engineering & ship repairs ltd. Dhaka	Member		
04.	Mr. Rabiul Hossain	Mechanical Engineer, House-43, Road-8/2, Block-E, south Banasree, Dhaka.	Member		
05.	Mohammad Mosharaf Hossain,	Jr Instructor, Dhaka Polytechnic Institute, Dhaka. Phone:	Member		
06.	Mr. Md. Moktar Hossain,	Instructor (Mechanical), Bangladesh Koria Technical Training Center, Darius Salam Road, Nirpur, Dhaka.	Member		
07.	Dr. Md. Shah Alam Majumder	Specialist (C.A), BTEB, Dhaka	Member		
08.	Mrs. Humyra Maisur	Quality Assurance Officer, BTEB, Dhaka	Member		

The Qualification of the Competency Standards

1. Title of Qualification: National Skill Certificate –I, II, III & IV in Welding in Transport Equipment Sector	
2. Qualification Code:	TRAWEL
3. Endorsement Date:	24th May 2021
4. Purpose of the Qualification	The NSC - I in Welding Qualification consists of a set of Welding works of competencies that a person must achieve in order to work competently in the Transport Equipment Sector as a Welder Assistant. In particular, he/she should be able to: 1. Apply basic mathematics for measurement and calculation 2. Practice Occupational Safety and Health (OSH) procedures 3. Work in the manufacturing industry 4. Use hand tools and power tools 5. Interpret technical drawing 6. Use graduated measuring instruments 7. Perform gas and plasma cutting 8. Perform Shielded Metal Arc Welding (SMAW) under supervision – positions 1F, 2F and 1G 9. Perform spot welding The NSC - II in Welding Qualification consists of a set of Welding works of competencies that a person must achieve in order to work competently in the Transport Equipment Sector as a Jr. Welder. In particular, he/she should be able to: 1. Work in a team environment 2. Use English in the workplace 3. Present and apply workplace information 4. Perform basic inspection and testing of welds 5. Perform Shielded Metal Arc Welding (SMAW) – positions 3F, 4F and 2G 6. Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – positions 3F, 4F, and 2G The NSC - III in Welding Qualification consists of a set of Welding works of competencies that a person

	must achieve in order to work competently in the Transport Equipment Sector as a Welder. In particular, he/she should be able to: 1. Apply quality systems and procedures 2. Apply fundamentals of welding metallurgy in the workplace 3. Perform Shielded Metal Arc Welding (SMAW) – positions 3G and 4G 4. Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – positions 3G 5. Perform Gas Tungsten Arc Welding (GTAW) – positions 2G in Pipe The NSC - IV in Welding Qualification consists of a set of Welding works of competencies that a person must achieve in order to work competently in the Transport Equipment Sector as a Sr. Welder In particular, he/she should be able to: 1. Perform Shielded Metal Arc Welding (SMAW) – positions 5G and 6G in Pipe 2. Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – positions 4G 3. Perform Gas Tungsten Arc Welding (GTAW or TIG) – positions 5G in pipe
5. Regulatory Arrangements	The holder of this qualification should have been assessed by a BTEB certified assessor and found to be competent in the units listed.
6. Accreditation Requirements	The qualifications shall be offered in compliance with the accreditation requirements set by BTEB.
7. Transition Arrangements	In the absence of certified assessors, the BTEB shall appoint trainers who have undergone assessment trainings.
8. Contact for Comments	Chairman Bangladesh Technical Education Board (BTEB) Agargaon, Sher-E-Bangla Nagar, Dhaka-1207.

National Competency Standards for National Skill Certificate – I, II, III & IV in Welding in Transport Equipment Sector

Course Structure

SL	Unit Code & Title		UoC Level	Nominal Hours
The Generic Competencies (05 UoCs required)				190
1.	GN1001A2	Apply Basic Mathematics for Measurement and Calculation	1	40
2.	GN1002A2	Practice Occupational Safety and Health (OSH) Procedures	1	30
3.	GN1003A2	Work in a Team Environment	1	20
4.	GN2004A2	Use English in the Workplace	2	70
5.	GN3006A2	Present and Apply Workplace Information	3	30
The Sector Specific Competencies (05 UoCs required)				150
1.	TRASS1001A1	Work in the Manufacturing Industry	1	20
2.	TRASS1002A1	Use Hand Tools and Power Tools	1	40
3.	TRASS1003A1	Interpret Technical Drawing	1	40
4.	TRASS1004A1	Use Graduated Measuring Instruments	1	20
5.	TRASS3005A1	Apply Quality Systems and Procedures	3	30
The Occupation Specific Competencies (13 UoCs required)				900
1.	TRAWEL1001A2	Perform Gas and Plasma Cutting	1	30
2.	TRAWEL1002A2	Perform Shielded Metal Arc Welding (SMAW) Under Supervision – Positions 1F, 2F and 1G	1	120
3.	TRAWEL1003A2	Perform Spot Welding	1	20
4.	TRAWEL2004A2	Perform Basic Inspection and Testing of Welds	2	40

5.	TRAWEL2005A2	Perform Shielded Metal Arc Welding (SMAW) – Positions 3F, 4F and 2G	2	60
6.	TRAWEL2006A2	Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – Positions 3F, 4F, and 2G	2	80
7.	TRAWEL3007A2	Apply Fundamentals of Welding Metallurgy in the Workplace	3	30
8.	TRAWEL3008A2	Perform Shielded Metal Arc Welding (SMAW) – Positions 3G and 4G	3	90
9.	TRAWEL3009A2	Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – Positions 3G	3	60
10.	TRAWEL3010A2	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Positions 2G in Pipe	3	80
11.	TRAWEL4011A2	Perform Shielded Metal Arc Welding (SMAW) – Positions 5G and 6G in Pipe	4	120
12.	TRAWEL4012A2	Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – Positions 4G	4	80
13.	TRAWEL4013A2	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Positions 5G in Pipe	4	90
Total Nominal Learning Hours				1240

National Competency Standards for National Skill Certificate – I, II, III & IV in Welding in Transport Equipment Sector

Course Structure – Level - I

SL	Unit Code & Title		UoC Level	Nominal Hours
The Generic Competencies (02 UoCs required)				70
1.	GN1001A2	Apply Basic Mathematics for Measurement and Calculation	1	40
2.	GN1002A2	Practice Occupational Safety and Health (OSH) Procedures	1	30
The Sector Specific Competencies (04 UoCs required)				120
1.	TRASS1001A1	Work in the Manufacturing Industry	1	20
2.	TRASS1002A1	Use Hand Tools and Power Tools	1	40
3.	TRASS1003A1	Interpret Technical Drawing	1	40
4.	TRASS1004A1	Use Graduated Measuring Instruments	1	20
The Occupation Specific Competencies (03 UoCs required)				170
1.	TRAWEL1001A2	Perform Gas and Plasma Cutting	1	30
2.	TRAWEL1002A2	Perform Shielded Metal Arc Welding (SMAW) Under Supervision – Positions 1F, 2F and 1G	1	120
3.	TRAWEL1003A2	Perform Spot Welding	1	20
Total Learning Hours				360
On-the Job Training				160
Total Nominal Hours				520

**National Competency Standards for National Skill Certificate – I, II, III & IV in
Welding in Transport Equipment Sector**

Course Structure – Level - II

SL	Unit Code & Title		UoC Level	Nominal Hours
The Generic Competencies (03 UoCs required)				120
1.	GN1003A2	Work in a Team Environment	1	20
2.	GN2004A2	Use English in the Workplace	2	70
3.	GN3006A2	Present and Apply Workplace Information	3	30
The Occupational Specific Competencies (03 UoCs required)				180
1.	TRAWEL2004A2	Perform Basic Inspection and Testing of Welds	2	40
2.	TRAWEL2005A2	Perform Shielded Metal Arc Welding (SMAW) – Positions 3F, 4F and 2G	2	60
3.	TRAWEL2006A2	Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – Positions 3F, 4F, and 2G	2	80
Total Learning Hours				300
On-the Job Training				216
Total Nominal Hours				516

**National Competency Standards for National Skill Certificate – I, II, III & IV in
Welding in Transport Equipment Sector**

Course Structure – Level - III

SL	Unit Code & Title		UoC Level	Nominal Hours
The Sector Competency (01 UoC required)				30
1.	TRASS3005A1	Apply Quality Systems and Procedures	3	30
The Occupation Specific Competencies (04 UoCs required)				260
1.	TRAWEL3007A2	Apply Fundamentals of Welding Metallurgy in the Workplace	3	30
2.	TRAWEL3008A2	Perform Shielded Metal Arc Welding (SMAW) – Positions 3G and 4G	3	90
3.	TRAWEL3009A2	Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – Positions 3G	3	60
4.	TRAWEL3010A2	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Positions 2G in Pipe	3	80
Total Learning Hours				290
On-the Job Training				216
Total Nominal Hours				506

National Competency Standards for National Skill Certificate I, II, III & IV in Welding in Transport Equipment Sector

Course Structure – Level - IV

SL	Unit Code & Title		UoC Level	Nominal Hours
The Occupational Specific Competencies (03 UoCs required)				290
1.	TRAWEL4011A2	Perform Shielded Metal Arc Welding (SMAW) – Positions 5G and 6G in Pipe	4	120
2.	TRAWEL4012A2	Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – Positions 4G	4	80
3.	TRAWEL4013A2	Perform Gas Tungsten Arc Welding (GTAW or TIG) – Positions 5G in Pipe	4	90
Total Learning Hours				290
On-the Job Training				216
Total Nominal Hours				506

The Generic Competencies

National Technical and Vocational Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Apply Basic Mathematics for Measurement and Calculation
Unit Code	GN1001A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to apply basic mathematics for measurement and calculation. It includes identifying calculation requirements in the workplace, selecting appropriate mathematical methods for calculation and performing basic workplace calculations.
Nominal Hours	40 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Identify calculation requirements in the workplace	1.1 <i>Calculation requirements</i> are identified from <i>workplace documents</i> . 1.2 <i>Relevant information</i> is interpreted from the workplace documents.
2. Select appropriate mathematical methods for calculation	2.1 Appropriate <i>mathematical methods</i> are selected to carry out the calculation. 2.2 <i>System of units</i> and <i>parameters of measuring units</i> to be used are determined.
3. Perform basic workplace calculations	3.1 Appropriate <i>measuring instruments</i> are selected as per requirement. 3.2 Measurements of solid and liquid are taken using measuring instrument. 3.3 Calculations are completed using appropriate methods.
Range of Variables	
Variable	Range (may include but not limited to):
1. Calculation requirements	1.1 Area of simple shapes 1.1.1 Triangle 1.1.2 square

	1.1.3 Rectangle 1.1.4 Circle 1.2 Volume 1.3 Diameter 1.4 Radius 1.5 Unit conversion
2. Workplace documents	2.1 Technical drawing 2.2 Working drawing 2.3 Charts 2.4 Tables
3. Relevant information	3.1 Dimensions 3.1.1 Length 3.1.2 Width 3.1.3 Height 3.1.4 Depth 3.1.5 Angle 3.2 Unit of measurement 3.3 System of unit 3.4 Tolerances 3.5 Shapes of object
4. Mathematical methods	4.1 Addition 4.2 Subtraction 4.3 Division 4.4 Multiplication 4.5 Ratio on any types of real values (such as whole numbers, fractional numbers, percentages)
5. System of unit	5.1 SI (International System of Units) 5.2 MKS (Meter, Kilogram, Second) 5.3 FPS (Foot, Pound, Second) 5.4 CGS (Centimetre, Gram, Second)
6. Parameters of measuring units	6.1 Length / Breadth / Thickness 6.2 Area 6.3 Volume 6.4 Mass 6.5 Density 6.6 Time 6.7 Temperature

	6.8 Speed 6.9 Angle
7. Measuring instruments	7.1 Measuring tape / Scale / Foot roller 7.2 Measuring cup 7.3 Balance 7.4 Protractor
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment requires evidences that the candidate: 1.1 identified calculation requirements from workplace documents; 1.2 selected appropriate mathematical methods as per requirement; 1.3 determined system of units and parameters of measuring units; 1.4 selected appropriate measuring instrument for taking measurement of objects; and 1.5 performed measurement using measuring instrument.
2. Underpinning knowledge	2.1 List of workplace documents. 2.2 Calculation requirements in the workplace. 2.3 Unit of measurement. 2.4 System of units. 2.5 Unit conversion methods. 2.6 List of units of measurement. 2.7 Unit conversion chart. 2.8 Basic mathematical methods. 2.9 Generic measuring instruments and Equipment required for calculation. 2.10 Mathematical language, symbols and terminology. 2.11 Application of units. 2.12 Workplace documents / instructions. 2.13 Use arithmetic processes to find solutions of simple mathematical problems.
3. Underpinning skills	3.1 Identifying calculation requirements from workplace document / information. 3.2 Selecting and using appropriate mathematical methods. 3.3 Using mathematical symbols and terminology. 3.4 Applying appropriate units of measurement for calculating

	volume, weight, mass, density, length / breadth / thickness, time and temperature. 3.5 Interpreting workplace document for measurement and calculation. 3.6 Identifying calculation requirements from workplace document / information. 3.7 Using arithmetic processes to find solutions of simple mathematical problems.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn mathematics and calculation process. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace.
5. Resource implication	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials consumable to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.

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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Practice Occupational Safety and Health (OSH) Procedures
Unit Code	GN1002A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to practice occupational safety and health (OSH) procedures. It includes interpreting OSH policies and procedures, applying personal health and safety practices, identifying and reporting OSH hazards and risks, following emergency response procedures, and maintaining and improving safety and health hygiene in the workplace.
Nominal Hours	30 Hours
Elements of competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Interpret OSH policies and procedures	1.1 <i>Occupational Safety and Health (OSH) policies</i> are clarified. 1.2 <i>Safe operating procedures</i> are followed. 1.3 <i>Safety signs and symbols</i> are identified and followed. 1.4 Workplace safety conditions are regularly reported to designated authority. 1.5 Safety restrictions are identified and followed.
2. Apply personal health and safety practices	2.1 Personal health and hygiene are interpreted. 2.2 Personal Health and hygiene are maintained according to health and hygiene procedures. 2.3 <i>Personal Protective Equipment (PPE)</i> are worn correctly and stored after use. 2.4 Clean and tidy workplace is maintained. 2.5 OSH equipment is maintained to keep them operational and compliant with OSH regulations. 2.6 Obtain work permit for the designated area and apply OSH practices in the workplace.

3. Identify and report OSH hazards and risks	3.1 Immediate work area is routinely checked for OSH hazards prior to commencing and during work 3.2 Hazards and risks are identified. 3.3 Corrective actions are taken to mitigate hazards and risks within the level of responsibilities. 3.4 OSH hazards and risk are reported to authorized personnel according to workplace procedures. 3.5 Incidents arising from hazards and risks are reported to designated authority. 3.6 Details of incidents are recorded accurately and clearly. 3.7 Environmental issues in the workplace are assessed and ensured. 3.8 Availability of the environmental protection policy and act are ensured at the workplace.
4. Follow emergency response procedures	4.1 Emergency situations are identified and reported according to workplace requirements. 4.2 Workplace emergency procedures are followed as appropriate to the nature of the emergency and according to workplace procedures. 4.3 Workplace procedures for dealing with accidents, fires and emergencies are followed. 4.4 Emergency response plans and procedures are implemented.
5. Maintain and improve safety hygiene in the workplace	5.1 Preventive measures are taken for OSH. 5.2 Corrective actions are taken to correct unsafe conditions in the workplace. 5.3 Appropriate control measures are implemented in the workplace. 5.4 Recommendations arising from risk assessments are implemented within level of responsibility. 5.5 Opportunities for improving Occupational Safety and Health hygiene performance are identified and reported to relevant personnel. 5.6 Safety records are maintained according to company policies. 5.7 “Fit to work” records are updated and maintained according to workplace requirements. 5.8 Maintain accident records according to company policies.

Range of Variables	
Variable	Range (may include but not limited to):
1. Occupational Safety and Health (OSH) Policies	1.1 Bangladesh standards for OSH 1.2 Building code 1.3 Fire safety rules and regulations 1.4 Code of practice 1.5 Industry guidelines 1.6 Organizational work policies
2. Safety signs and symbols	2.1 Direction signs (exit, emergency exit, etc.) 2.2 First aid signs 2.3 Danger Tags 2.4 Hazard signs 2.5 Safety tags 2.6 Warning signs
3. Safe operating procedures	3.1 Orientation on emergency exits, fire extinguishers, fire escape, etc. 3.2 Emergency procedures 3.3 First Aid procedures 3.4 Tagging procedures 3.5 Use of PPE 3.6 Safety procedures for hazardous substances
4. Personal Protective Equipment (PPE)	4.1 Gas / face mask 4.2 Hand / industrial gloves 4.3 Safety boots / shoes 4.4 Safety helmet / cap / mob cap / hair net 4.5 Overalls / aprons / overcoat 4.6 Goggles and safety glasses 4.7 Ear plugs 4.8 Sun block

5. Hazards	5.1 Chemical hazards such as acids, caustic, substances, etc. 5.2 Biological hazards such as bacteria, viruses, insects etc. 5.3 Physical hazards: 5.3.1 ergonomic 5.3.2 radiation 5.3.3 heat and cold stress 5.3.4 light 5.3.5 noise etc.
6. Policy and act	6.1 Guideline 6.2 Regulation 6.3 Instruction 6.4 Manual
7. Emergency situations	7.1 Earth quake 7.2 Floods 7.3 Hurricanes 7.4 Tornadoes 7.5 Fires 7.6 Toxic gas releases 7.7 Chemical spills 7.8 Radiological accidents 7.9 Explosions
8. Workplace emergency procedures	8.1 Fire fighting 8.2 First aid 8.3 Emergency treatment 8.4 Evacuation
9. Workplace procedures	9.1 OSH system and related documentation including policies and procedures. 9.2 Standard Operating Procedures (SOPs). 9.3 Information on Hazards and work process, hazard alerts, safety signs and symbols. 9.4 Labels. 9.5 Material Safety Data Sheets (MSDSs) and manufacturers' advice.
10. "Fit to Work" records	10.1 Medical Certificate every year 10.2 Accident reports, if any

Evidence Guide

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

1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 identified and followed safety signs and symbols; 1.2 identified hazards and risks; 1.3 identified and reported emergency situations; 1.4 followed workplace emergency procedures; and 1.5 maintained safety records according to company policies.
2. Underpinning knowledge	2.1 Importance of Occupational Safety and Health (OSH). 2.2 OSH workplace policies and procedures. 2.3 Personal hygiene. 2.4 Types of incidents. 2.5 OSH policies, SOP, workplace emergency procedures. 2.6 Safety Sign and Symbols. 2.7 Types of hazards. 2.8 Types of Personal Protective Equipment (PPE) and uses. 2.9 Report and record procedure.
3. Underpinning skills	3.1 Identifying and using PPE as per job requirements. 3.2 Following OSH policies and procedures. 3.3 Identifying risks and hazards. 3.4 Reporting hazards and risks. 3.5 Responding to emergency procedures.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace.
5. Resource implication	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 equipment and outfits appropriate in applying safety measures; 5.3 tools, materials and documentation required; and

	5.4 relevant specifications or work instructions.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Work in a Team Environment
Unit Code	GN1003A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to work in a team environment. It includes interpreting team objectives and work processes, defining team role and scope, working as a team member, and communicating and cooperating with team members.
Nominal Hours	20 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Interpret team objectives and work processes	1.1 Objectives of team are defined from available <i>sources of information</i> . 1.2 Work plan is interpreted. 1.3 Working processes are clearly interpreted.
2. Define team role and scope	2.1 Team structure and reporting relationship within the team are identified and interpreted. 2.2 <i>Role and responsibilities</i> of team members are defined according to job description. 2.3 Scopes of jobs for <i>team members</i> are identified and interpreted according to job requirements.
3. Work as a team member	3.1 Individual duties, responsibilities, authorities are clarified. 3.2 Tasks of team members are identified as per workplace standards. 3.3 Effective <i>forms of communication</i> are used to interact with team members. 3.4 Communication channels are maintained as per <i>workplace context</i> .
4. Communicate and cooperate with team	4.1 Effective <i>interpersonal skills</i> are applied to interact with team members. 4.2 Views and opinions of other team members are respected

members	and reflected accurately. 4.3 Appropriate workplace terminology is used for effective communication. 4.4 Ideas related to team plans are contributed and recommendations for improving team work are move forward.
Range of Variables	
Variable	Range (may include but not limited to):
1. Sources of information	1.1 Standard Operating Procedures (SOP) 1.2 Job description 1.3 Operations Manuals 1.4 Organizational structures
2. Role and responsibilities	2.1 Contributing to overall team objectives 2.2 Completing individual deliverables 2.3 Providing expertise 2.4 Documenting the process 2.5 Mutual accountability
3. Team members	3.1 Employee / workers 3.2 Supervisor / manager 3.3 Peers / colleagues 3.4 Employee representative 3.5 Coach / mentors
4. Forms of communication	4.1 Verbal communication 4.2 Written communication 4.3 Nonverbal communication
5. Workplace context	5.1 National Laws and Statutes 5.2 Standard Operating Procedures 5.3 Workplace Rules and Regulations
6. Interpersonal skills	6.1 Listening skills 6.2 Negotiation 6.3 Problem-solving 6.4 Decision-making 6.5 Assertiveness 6.6 Work Ethic 6.7 Body Language 6.8 Collaboration

	6.9 Positive Attitude 6.10 Workplace Etiquette
7. Workplace terminology	7.1 Sector 7.2 Occupation 7.3 Profession 7.4 Career 7.5 Field 7.6 Job 7.7 Task 7.8 Position 7.9 Master Craft Person (MCP) 7.10 Administrator 7.11 Manager 7.12 Annual Confidential Report (ACR)
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 demonstrated knowledge in working in a team environment; 1.2 interpreted work plan; 1.3 maintained communication channels; and 1.4 viewed and respected other team member's opinions.
2. Underpinning knowledge	2.1 Team objective, sources of information and work process. 2.2 Team structure, reporting relation, role and responsibilities, and scope of job. 2.3 Individual duties, responsibilities and authorities. 2.4 Tasks requirements, effective form of communication and workplace context. 2.5 Interpersonal skills, views and opinion of team members and workplace terminologies. 2.6 Idea related to team plan and recommendation.
3. Underpinning skills	3.1 Identifying role and responsibilities of team. 3.2 Identifying roles and responsibilities of individual members. 3.3 Participating in team discussion. 3.4 Working as a team member.

4. Required attitudes	4.1 Promptness in carrying out activities. 4.2 Sincere and honest to duties. 4.3 Eagerness to learn. 4.4 Positive attitude. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace. 4.9 Loyal to the senior colleagues
5. Resource implication	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 operations manual, job description manuals and organogram; and 5.3 sample case studies documents.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Use English in the Workplace
Unit Code	GN2004A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to use English in the workplace. It includes practicing to prepare simple sentence, read and interpret workplace documents in English, writing simple routine workplace documents in English, listen conversation in English, and performing conversation in English.
Nominal Hours	70 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Practice to prepare simple sentence	1.1 Common vocabulary is identified usually used in the workplace. 1.2 Spelling and correct punctuation of the identified vocabulary are checked and learned. 1.3 Correct sentences are formed and practiced in written and spelled orally.
2. Read and interpret workplace documents in English	2.1 <i>Workplace documents</i> are collected. 2.2 Workplace documents are read and interpreted. 2.3 <i>Visual information</i> is interpreted in English.
3. Write simple routine workplace documents in English	3.1 Simple routine workplace documents are prepared using key words, phrases, simple sentences and visual aids where appropriate. 3.2 Key information is written in the appropriate places in standard forms.

4. Listen conversation in English	4.1 Way of active listening are interpreted. 4.2 Conversation text is interpreted / written correctly after active listening. 4.3 Attention to the speaker is created / communicated through <i>non-verbal means</i>. 4.4 Appropriate response and feedback are provided in English.
5. Perform conversation in English	5.1 Conversation / dialogue is performed in English as per job requirements with peers, customers and management. 5.2 Good gesture and posture are used during conversation. 5.3 Clear and simple sentences are used during conversation. 5.4 Pauses are used for emphasizing the important portion of the dialogue. 5.5 Information is communicated to the clients.
Range of Variables	
Variable	Range (may include but not limited to):
1. Workplace documents	1.1 Schedules and itineraries 1.2 Agenda 1.3 Meeting minutes 1.4 progress and incident reports 1.5 Job sheets 1.6 Operational manuals 1.7 Brochures and promotional material 1.8 Visual and graphic materials 1.9 Standards 1.10 Occupational Safety and Health (OSH) information 1.11 Safety instructions 1.12 Safety precautions checklist
2. Visual information	2.1 Signs 2.2 Maps 2.3 Diagrams 2.4 Forms 2.5 Labels 2.6 Graphs 2.7 Charts

3. Non-verbal means	3.1 Sings 3.2 Symbols 3.3 Touch 3.4 Physical expression 3.5 Eye contact 3.6 Facial expression
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 interpreted Workplace documents; 1.2 interpreted visual information; 1.3 prepared workplace documents in English; 1.4 interpreted / written the text of conversation correctly after active listening; 1.5 provided responses and feedback; and 1.6 used good gesture and posture during conversation.
2. Underpinning knowledge	2.1 Workplace documents. 2.2 Technique of writing workplace documents in English. 2.3 Listening techniques in English. 2.4 Conversation and dialogue procedure in English. 2.5 Interaction skills, job roles, responsibilities and compliances issues in English.
3. Underpinning skills	3.1 Reading and interpreting workplace documents in English. 3.2 Using vocabulary and grammar, and standard spelling and punctuation. 3.3 Writing simple routine workplace documents in English, such as: schedules and agendas, job sheets, operational manuals and brochures, and promotional material. 3.4 Demonstrating listen English language to required workplace standard. 3.5 Performing conversation in English with peers, customers and management. 3.6 Working effectively with others. 3.7 Listening and questioning skills. 3.8 Following simple directions.

4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace.
5. Resources implication	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables needed to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated workplace after completing of the training module. 7.2 Assessment should be done by a BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Present and Apply Workplace Information
Unit Code	GN3006A2
Nominal Hours	This unit covers the knowledge, skills and attitudes required to present and apply workplace information. It includes reading and interpreting workplace documents, identifying information requirements, processing, analyzing, and interpreting data and organizing and disseminating workplace information.
Unit Descriptor	30 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Read and interpret workplace documents	1.1 Workplace documents are interpreted as per standard. 1.2 Assistance is taken to aid comprehension when required from peers/supervisors. 1.3 Visual information/ symbols/signage's are understood and followed.
2. Identify information requirements	2.1 Specific and relevant documents are accessed from <i>sources of information.</i> 2.2 Information requirements in the workplace are interpreted. 2.3 Required information are identified.
3. Process, analyze, and interpret data	3.1 Data is collected and correlated as per prescribed <i>methodologies.</i> 3.2 Relevant data is used as references in accordance with the objectives of the program. 3.3 Collected data is analyzed, interpreted and organized as required for workplace.

4. Organize and disseminate workplace information	4.1 Findings and recommendations are summarized and presented in a user-friendly manner. 4.2 Draft report / forms are prepared based on standard format. 4.3 Graphs and other visual presentations are prepared to highlight analysis / interpretation of information. 4.4 Reports / forms are submitted and distributed to relevant departments / persons.
Range of Variables	
Variables	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. Methodologies	2.1 Qualitative 2.2 Quantitative
3. Forms	3.1 Questionnaires 3.2 Profile 3.3 Accident/incident report form 3.4 Work order 3.5 Requisition 3.6 Purchase order 3.7 Money invent form 3.8 Material dispatch
4. 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, recent and meet all requirements of current version of the Unit of Competency.

1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 understood and followed visual information / symbol / signage; 1.2 interpreted required information; 1.3 analyzed, interpreted and organized collected data; 1.4 prepared draft report / forms, graphs and other visual presentation; and 1.5 submitted and distributed reports / forms to relevant departments / persons.
2. Underpinning knowledge	2.1 Workplace documents. 2.2 Specific and relevant documents. 2.3 Data collection methodologies. 2.4 Identify information. 2.5 Identify data. 2.6 Workplace standard.
3. Underpinning skills	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. 3.6 Submitting and distributing reports / forms to relevant departments / persons.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.

5. Resource implications	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials consumable needed to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.
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.	

The Sector Specific Competencies

National Technical and Vocational Qualifications Framework for Bangladesh
Unit of Competency

Unit Title	Work in the Manufacturing Industry
Unit Code	TRASS1001A1
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to work in the manufacturing industry. It includes identifying job roles and responsibilities in manufacturing industries and observe OSH in the manufacturing industry and planning work activities
Nominal Hour	20 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Identify job roles and responsibilities in manufacturing industries	1.1 Job roles and responsibilities in the manufacturing industries are identified. 1.2 Relationship within the manufacturing industries employees is identified.
2. Identify and observe OSH	2.1 <i>Occupational Safety and Health (OSH)</i> in the manufacturing industries is identify and observed. 2.2 Safe work practices are followed when using equipment in the work environment. 2.3 <i>Hazards</i> are identified and report to the designate personnel. 2.4 Hazardous materials are identified and isolated.
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 Effective interpersonal skills are applied to interact with others and to contribute to activities and objectives. 4.2 Assigned tasks are performed in accordance with job requirements, specifications and workplace environment. 4.3 Work requirements are confirmed with colleagues.
Range of Variables	
Variables	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 hazard and other work place hazards etc.
3. Effective interpersonal skills	3.1 Basic listening and speaking skills 3.2 Use terminology and jargon 3.3 Communicating and receiving feedback 3.4 Interpretation of instructions 3.5 Basic principles of effective communication
4. Work requirements	4.1 Directed in verbal modes 4.2 Written in specification or procedures
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	

1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 followed job role accordance with industries requirement; 1.2 developed relationship with industries fellow; 1.3 identified and isolated different types of hazards; 1.4 used Personal Protective Equipment (PPE); and 1.5 applied effective interpersonal skills to achieve the goals of industry.
2. Underpinning knowledge	2.1 Key duties/responsibilities of Manufacturing technician. 2.2 Responsibilities of Supervisors. 2.3 Responsibilities of Employers. 2.4 Responsibilities of Workers. 2.5 Common Hazards. 2.6 Ways to reduce the risk. 2.7 Common goals of the manufacturing industry. 2.8 Environment-friendly practices in the workplace in material use and waste management. 2.9 Energy efficient practices.
3. Underpinning skills	3.1 Improving employee employer relationships. 3.2 Creating a positive relationship with employees. 3.3 Observing OSH in manufacturing industries. 3.4 Identifying OSH policies and procedures. 3.5 Following personal work safety practices. 3.6 Reporting hazards and risks. 3.7 Responding to emergency procedures. 3.8 Maintaining physical well-being in the workplace. 3.9 Ensuring environment-friendly practices in the workplace in material use and waste management. 3.10 Ensuring energy efficient practices in the workplace.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Environmental concerns. 4.5 Eagerness to learn. 4.6 Tidiness and timeliness. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace.

5. Resource implications	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 tools and equipment appropriate to workplace; 5.3 materials relevant to the proposed activity; and 5.4 equipment and outfits appropriate in applying safety measures.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context for assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.

Accreditation Requirements

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National Technical and Vocational Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Use Hand Tools and Power Tools
Unit Code	TRASS1002A1
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to use hand and power tools. It includes using manual tools and power tools and cleaning and storing hand and power tools.
Nominal Hours	40 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow OSH practices	1.1 Personal Protective Equipment (PPE) is used. 1.2 Occupational Safety and Health (OSH) is followed.
2. Use Manual tools	2.1 <i>Personal Protective Equipment (PPE)</i> are used as per job requirement. 2.2 <i>Hand tools</i> are identified and use as per the work procedure.
3. Use power tools	3.1 <i>Power tools</i> are identified and selected conforming to task requirements. 3.2 Power tools are used for a specific sequence of operations which may include <i>clamping</i> , alignment and adjustment to produce desired outcomes conforming to <i>job specifications</i> . 3.3 All safety requirements are compiled 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 <i>Operational maintenance</i> of tools, including hand sharpening, is undertaken according to standard procedures.

	3.6 Power tools are stored safely in appropriate location according to standard workshop procedures and manufacturers' recommendations.
4. Clean and store hand and power tools	4.1 Waste materials are disposed of in accordance with work place requirements. 4.2 Hand and power tools are cleaned and stored safe place as per instruction manuals.
Range of Variables	
Variables	Range (may include but not limited to):
1. Personal Protective Equipment (PPE)	1.1 Safety shoes / Boots 1.2 Goggles / Glasses 1.3 Hand gloves 1.4 Apron / overall 1.5 Safety Helmet 1.6 Ear plug 1.7 Mask
2. Hand tools	2.1 Hammer 2.2 Different types of wrench 2.3 Different types of file 2.4 Chisel 2.5 Hacksaw 2.6 Different types of pliers 2.7 Different types of screw driver 2.8 Multi grips 2.9 Vices
3. Power tools	3.1 Electric or pneumatic/hydraulic drills 3.2 Grinders 3.3 Nibblers 3.4 Cutting saws 3.5 Sanders 3.6 Planers 3.7 Routers 3.8 Pedestal drills 3.9 Pedestal grinders
4. Clamping	4.1 Jigs and fixtures 4.2 Clamps etc.
5. Job specifications	5.1 Finish size or shape etc.

6. Operational maintenance	6.1 Hand sharpening 6.2 Cutting 6.3 Cleaning 6.4 Lubricating 6.5 Tightening 6.6 Simple tools repair and adjustments using engineering principles, tools, equipment and procedures to statutory and regulatory requirements
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidences that the candidate: 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; and 1.5 used power tools as per workplace requirement.
2. Underpinning Knowledge	2.1 Classification of tool. 2.2 Types of hand and power tools 2.3 Safely use of hand tools and power tools. 2.4 Working principles of hands & power tools 2.5 Preventive maintenance. 2.6 Methods and techniques. 2.7 Storage procedures. 2.8 Possible hazard and risk from using power tools in the assigned work place.
3. Underpinning skills	3.1 Identifying tools. 3.2 Using hand and power tools safely. 3.3 Performing preventive maintenance. 3.4 Practicing OSH. 3.5 Storing tools and equipment.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Environmental concerns. 4.5 Eagerness to learn. 4.6 Tidiness and timeliness.

	4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace.
5. Resource implications	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 tools and equipment appropriate to maintain workplace; 5.3 materials relevant to the proposed activity; and 5.4 relevant drawings, manuals, codes, standards and reference material.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context for assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Interpret Technical Drawing
Unit Code	TRASS1003A1
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to interpret technical drawing. It includes following OSH practices, selecting technical drawing and interpreting technical drawing
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
Nominal Hours	40 Hours
1. Follow OSH practices	1.1 Personal Protective Equipment (PPE) is used. 1.2 Occupational Safety and Health (OSH) is followed.
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 as per workplace standard. 3.4 <i>Instructions</i> are identified and followed accurately. 3.5 Material specification are identified. 3.6 Symbols in drawing are interpreted.
Range of Variables	
Variable	Range (may include but not limited to):
1. Drawing	1.1 Technical drawing 1.2 Sketch

2. Instructions	2.1 Note 2.2 Instruction 2.3 Special instruction 2.4 Precaution
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 identified dimension according to job requirement; 1.2 maintained clearances and tolerances according to workplace requirement; and 1.3 interpreted drawing symbols.
2. Underpinning knowledge	2.1 Occupational Health and Safety (OSH). 2.2 Workplace standard. 2.3 Sequence of drawing. 2.4 Methods of checking.
3. Underpinning skills	3.1 Practicing workplace safety. 3.2 Reading / interpreting information on the drawing, following data sheet, instruction and manuals, technical drawing. 3.3 Performing measurement, calculation. 3.4 Interpreting drawing. 3.5 Perform checking. 3.6 Keeping record.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Environmental concerns. 4.5 Eagerness to learn. 4.6 Tidiness and timeliness. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace.

5. Resource implications	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 materials relevant to the proposed activity; 5.3 all tools, equipment, material and documentation required; and 5.4 relevant specifications or work instructions.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context for assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Use Graduated Measuring Instruments
Unit Code	TRASS1004A1
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to use graduated measuring instrument. It includes following OSH practice, selecting the job to be measured and measuring device, taking measurement, measurements are recorded and communicated and cleaning and storing measuring instruments
Nominal Hours	20 Hours
Elements of Competency	Performance Criteria <i>Bold & Italicized</i> terms are elaborated in the Range of Variables
1. Follow OSH practices	1.1 Personal Protective Equipment (PPE) is used. 1.2 Occupational Safety and Health (OSH) is followed.
2. Select measuring device	2.1 Job is identified and selected for measurement. 2.2 Measuring equipment is selected according to job requirements. 2.3 Tolerance and/or clearance limit are identified according to job requirements.
3. Take measurement	3.1 <i>Routine adjustment</i> of the measuring instruments is done as per manufacturer manuals. 3.2 <i>Measurement</i> is taken as per job specifications 3.3 Measurement is checked against job requirement
4. Measurements are recorded and communicated	4.1 Measurements of <i>job samples</i> are recoded on form/drawing/ sketches. 4.2 Recorded measurements are interpreted and communicated to authority.
5. Clean and store measuring	5.1 Waste materials are disposed of in accordance with work place requirements.

instruments	5.2 Measuring instruments are cleaned and stored safe place as per instruction manuals.
Range of Variables	
Variable	Range (may include but not limited to):
1. Routine adjustments	1.1 Calibration 1.2 Simple zeroing 1.3 Scale adjustment
2. Measurements	2.1 Measuring length 2.2 Angle 2.3 Diameter 2.4 Clearances
3. Job samples	3.1 Machine parts 3.2 Prepared work piece 3.3 Work sample etc.
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 followed OSH practices; 1.2 identified the proper graduated measuring instrument; 1.3 took measurement; 1.4 recorded measurement; and 1.5 interpreted written inspection.
2. Underpinning knowledge	2.1 Relevant OSH. 2.2 Principles of using different graduated measuring instruments. 2.3 Workplace standard. 2.4 Sequence of using the instruments. 2.5 Maintaining rules of instruments.
3. Underpinning skills	3.1 Practicing workplace safety. 3.2 Using PPE. 3.3 Using of instruments. 3.4 Demonstrating / interpreting and following data sheet, instruction and manuals, and technical drawing. 3.5 Performing measurement. 3.6 Checking for conformance to specification. 3.7 Keeping record and report.

4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Environmental concerns. 4.5 Eagerness to learn. 4.6 Tidiness and timeliness. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace.
5. Resource implications	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 materials relevant to the proposed activity; 5.3 measuring instruments; and 5.4 relevant drawings, manuals, codes, standards and reference material.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context for assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Apply Quality Systems and Procedures
Unit Code	TRASS3005A1
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to apply quality systems and procedures. It includes following OSH practices, working within a quality system, applying and monitoring quality system improvement, taking responsibility for his / her own quality and applying standard procedures for each job.
Nominal Hours	30 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow OSH practices	1.1 Personal Protective Equipment (PPE) is used. 1.2 Occupational Safety and Health (OSH) is followed. 1.3 Environmental compliance and requirements are checked and reported to designated authority. 1.4 Availability of the environmental protection <i>policy and act</i> are ensured at the workplace.
2. Work within a quality system	2.1 Instructions and procedures are followed strictly and duties are performed in accordance with demand of <i>quality improvement system</i> . 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 interval. 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 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 not limited to):
1. Policy and act	1.1 Guideline 1.2 Regulation 1.3 Instruction 1.4 Manual
2. Quality improvement system	2.1 A system comprising some or all of the following elements: 2.1.1 Quality inspection 2.1.2 Quality control 2.1.3 Quality improvement 2.1.4 Total quality control 2.1.5 Quality assurance
3. Customer	3.1 Persons 3.2 Organizations receiving the products services

Evidence Guide

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

1. Critical aspects of competency	Assessment required evidences that the candidate: 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; and 1.6 checked environmental compliance in the workplace.
2. Underpinning knowledge	2.1 Reasons why good quality should be maintained and poor quality should be eliminated. 2.2 Meaning 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 - defects and procedures for addressing defects. 2.4 Record keeping within the quality improvement system in workplace. 2.5 Factors, which affect the successful implementation of the quality systems and procedures. 2.6 Environmental requirements.
3. Underpinning skills	3.1 Identifying roles of self and others within quality improvement system. 3.2 Following instructions, job sheets and standard operating procedures and actively participate in implementation of a quality improvement system. 3.3 Identifying product and process specifications and tolerance limits. 3.4 Detecting defects, take corrective and/or quality improvement actions. 3.5 Keeping records in accordance with standard operating procedures. 3.6 Identifying customer requirements and always meet those requirements. 3.7 Identifying environmental requirements and reporting any lapse.

4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Environmental concerns. 4.5 Eagerness to learn. 4.6 Tidiness and timeliness. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace.
5. Resource implications	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 work place procedure; 5.3 tools and equipment appropriate to maintain workplace; 5.4 materials relevant to the proposed activity; and 5.5 relevant drawings, manuals, codes, standards and reference material.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context for assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.
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.	

The Occupational Specific Competencies

National Technical and Vocational Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Perform Gas and Plasma Cutting
Unit Code	TRAWEL1001A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform gas and plasma Arc cutting. It includes following Occupational Safety and Health (OSH) practices, setting up equipment for cutting, preparing materials for gas / plasma arc cutting, performing gas cutting, plasma arc cutting and cleaning and storing tools & equipment.
Nominal Hours	30 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 Safe work practices are observed. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Hazards are identified and risks are minimized or eliminated. 1.4 All the health and environmental safety standards are properly followed.
2. Set up equipment for cutting	2.1 Manual cutting requirements are identified and noted from drawings and specifications. 2.2 Plasma arc cutting requirements are identified and noted from drawing and specifications. 2.3 Equipment is selected and set up as per job requirements.
3. Prepare materials for gas / plasma arc cutting	3.1 Materials are assembled for cutting. 3.2 <i>Materials</i> are cleaned and marked for cutting as per noted dimension. 3.3 <i>Cutting process</i> is selected as per standard procedure

4. Perform gas cutting	4.1 To avoid distortion prevention measures are heated base metal properly. 4.2 Materials are cut using proper oxy-acetylene / LPG flame. 4.3 Cut is checked for quality. 4.4 Defects are identified and rectified if any as per standard operating procedures. 4.5 Safety measures are ensured against hazards associated with the cutting process. 4.6 Proper ventilation is maintained at the workplace to protect personnel from harmful fumes.
5. Perform plasma arc cutting	5.1 Materials are cut using proper plasma flame. 5.2 Cut is checked for quality. 5.3 Defects are identified and rectified if any as per standard operating procedures.
6. Clean and store tools & equipment	6.1 Tools and equipment are cleaned according to workplace requirement. 6.2 Tools & equipment are stored according to workplace requirement. 6.3 Fuel gas cylinders are preserved according to specification. 6.4 Waste materials are disposed off in accordance with workplace procedures and relevant environmental regulations.
Range of Variables	
Variables	Range (may include but not limited to):
1. Personal Protective Equipment (PPE)	1.1 Skull helmet 1.2 Leather gloves 1.3 Boiler suit (cotton) 1.4 Leather apron 1.5 First aid kit 1.6 Arm guards 1.7 Safety goggles 1.8 Safety shoes

2. Materials	2.1 Mild steel 2.2 Medium carbon steel (thickness 10 mm)
3. Cutting process	3.1 Manual 3.2 Semi-automatic 3.3 Straight line cutting
4. Distortion prevention measures	4.1 Setting up of jigs 4.2 Fixtures 4.3 C-clamps
5. Oxy-acetylene flame	5.1 Pure acetylene 5.2 Neutral 5.3 Oxidizing 5.4 Carburizing
6. Defects	6.1 Distortion 6.2 Warping 6.3 Dirty nozzle 6.4 Excess pre heat flame 6.5 Excess cutting oxygen 6.6 Karf defect
7. Hazards associated	7.1 Fire 7.2 Thermal 7.3 Radiation 7.4 Electrical Shock
8. Tools	8.1 Chipping hammer 8.2 Ball peen hammer 8.3 Tongs 8.4 Wire brush 8.5 Grinder 8.6 Spark lighter 8.7 Nozzle cleaner 8.8 Utility wrench 8.9 Flashback Arrestor

9. Equipment	9.1 Manual gas cutting equipment 9.2 Semi-auto gas cutting machine 9.3 Plasma cutting machine
10. Fuel gas	10.1 Oxygen 10.2 Acetylene 10.3 Liquid petroleum gas (LPG/ CNG) 10.4 Compressed air
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 identified and noted manual and plasma cutting requirements from drawing and specifications; 1.2 cleaned and marked materials for cutting; 1.3 selected cutting process; 1.4 cut the materials using proper oxy-acetylene flame and safe cutting practices; and 1.5 identified and rectified defects.
2. Underpinning knowledge	2.1 OSH practices. 2.2 Setup procedure of gas and plasma cutting. 2.3 Parameter of gas and plasma cutting. 2.4 Procedure of gas and plasma cutting. 2.5 Procedure of applying gas and plasma cutting. 2.6 Interpretation of drawing and specification. 2.7 Procedure of storing tools and equipment. 2.8 Usages of purify air in plasma machine.
3. Underpinning skills	3.1 Selecting and setting up cutting equipment. 3.2 Preparing materials for gas and plasma cutting. 3.3 Performing gas and plasma cutting. 3.4 Applying techniques of rectifying defects. 3.5 Cleaning tools and equipment.

4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Sincere and honest to duties. 4.3 Promptness in carrying out activities. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context for assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Perform Shielded Metal Arc Welding (SMAW) Under Supervision – Positions 1F, 2F and 1G
Unit Code	TRAWEL1002A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform Shielded Metal Arc Welding (SMAW) under supervision – positions 1F, 2F and 1G. It includes following Occupational Safety and Health (OSH) practices, preparing for welding, setting up equipment and job for welding, performing SMAW under supervision and shutting down and housekeeping.
Nominal Hours	120 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 <i>Hazards</i> are identified and risks are minimized and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work environment is ensured.
2. Prepare for welding	2.1 Weld requirements are identified as per SOP. 2.2 <i>Plates, tools, equipment</i> and <i>electrodes</i> 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. Setup equipment and job for welding	3.1 Welding equipment is set and adjusted in accordance with job specification. 3.2 Job is set avoiding distortions using appropriate root gap, clamp and tack weld at required position for 1F, 2F and 1G.

4. Perform SMAW under supervision	4.1 To avoid <i>distortion preventive measures</i> base metal are tacked properly. 4.2 Welding is performed as per <i>Welding Procedure Specification (WPS)</i>. 4.3 Welds are cleaned, checked for quality and <i>defects</i> are identified. 4.4 Corrective action is taken to meet the standards
5. Perform shut down and housekeeping	5.1 Welding machine shutdown procedures are followed. 5.2 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 5.3 Wastes are disposed off accordance with workplace requirements 5.4 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal.' 5.5 Wastages are preserved in designated places. 5.6 Workplace is cleaned as per workplace requirements.
Range of Variables	
Variable	Range (may include but not limited to):
1. Hazards	1.1 Fire 1.2 Electrical 1.3 Radiation 1.4 Poisonous gases and air quality 1.5 Confined space
2. Personal Protective Equipment (PPE)	2.1 Safety helmet 2.2 Eye shield (head screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler suit (cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety shoes
3. Plates	3.1 MS Plates 6 -12 mm thickness
4. Tools	4.1 Clamps 4.2 Ball peen 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 Wire spacer
5. Equipment	5.1 SMAW - AC welding transformer / DC welding transformer / inverter/ rectifier 5.2 Generator 5.3 Electrode dryer/oven
6. Electrodes	6.1 Ø 2.6, 3.2 & 4.0 mm 6.2 Electrodes/filler materials are to be preserved in electrode dryer or electrode oven
7. Distortion prevention measures	7.1 Preheating / post heating 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. 8.2 Related international standards
9. Defects	9.1 Lack of penetration 9.2 Excess penetration 9.3 Porosity 9.4 Crack 9.5 Slag inclusions 9.6 Spatter 9.7 Undercut 9.8 Lack of fusion 9.9 Notches 9.10 Irregular shape and dimension 9.11 Lack of side wall fusion 9.12 Under fill 9.13 Burn throw 9.14 Pin/Blow hole 9.15 Arc crater 9.16 Overlap

Evidence Guide

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

1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 selected and collected plates, tools, equipment and electrodes; 1.2 marked and cut the plate; 1.3 setup equipment and job; 1.4 performed SMAW; and 1.5 followed welding machine shut down procedure.
2. Underpinning knowledge	2.1 Hazards and OSH procedures. 2.2 Use of PPE and tools. 2.3 Selection and preparation of plates. 2.4 Types and selection of electrodes. 2.5 Setting procedure of SMAW equipment. 2.6 Welding procedures and techniques. 2.7 Types of welding joints and welding positions. 2.8 Types of welding defects. 2.9 Prevention and rectification of welding defects. 2.10 Machine shut down and housekeeping procedures. 2.11 Require voltage and current 2.12 Impact of toxic gases and fumes from welding operation. 2.13 Ventilation requirement at the workplace to protect personnel from harmful welding effects. 2.14 Safe environmental protocols.
3. Underpinning skills	3.1 Selecting materials and prepare for welding. 3.2 Using materials, tools and equipment appropriately. 3.3 Performing SMAW. 3.4 Preventing and rectifying welding defects. 3.5 Completing machine shut down and housekeeping. 3.6 Ensuring environment-friendly practices in the workplace in material use and waste management.

4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated) 5.2 tools, equipment and physical facilities appropriate to perform activities 5.3 materials, consumables to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test 6.2 demonstration 6.3 oral questioning 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Perform Spot Welding
Unit Code	TRAWEL1003A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform spot welding. It includes following Occupational Safety and Health (OSH) practices, setting up spot welding machine, performing spot weld of thin metal sheets, spot weld wire mesh and cleaning and storing equipment.
Nominal Hours	20 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 Hazards are identified and risks are minimized or eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work practices are observed. 1.4 All the health and environmental safety standards are followed.
2. Setup spot welding machine	2.1 Spot welding machine is identified. 2.2 <i>Tools, equipment, materiel</i> and <i>base metal</i> are collected. 2.3 Spot welding machine is set 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 Spot weld is performed as per job <i>specification</i> .

4. Perform spot weld wire mesh	4.1 Spot weld of wire mesh is performed as per job specification. 5.7 Welds are cleaned in accordance with <i>Welding Procedure Specification (WPS)</i>. 4.2 Weld is checked for quality and <i>defects</i> are identified 4.3 Corrective action is taken for repairing the defects.
5. Clean and store equipment	5.1 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 5.2 Wastes are disposed off accordance with workplace requirements. 5.3 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal. 5.4 Wastages are preserved in designated places.
Range of Variables	
Variable	Range (may include but not limited to):
1. Personal Protective Equipment (PPE)	1.1 Safety goggles 1.2 Safety helmet 1.3 First aid kit 1.4 Leather gloves 1.5 Safety shoes 1.6 Apron 1.7 Boiler suit 1.8 Harness
2. Tools	2.1 Soft Hammer/Mallet 2.2 Sniper 2.3 Self-locking pliers 2.4 Wire brush 2.5 Vice 2.6 Files 2.7 Measuring tape/Steel rule 2.8 Permanent marker 2.9 Hack saw 2.10 Scriber

3. Equipment	3.1 Spot welding machine 3.2 Grinding machine 3.3 Shearing machine
4. Materials	4.1 Mild steel sheet 4.2 Stainless steel sheet 4.3 Wire (Mild steel) 4.4 Wire (Stainless steel)
5. Distortion prevention measures	5.1 Current setting 5.2 Electrode force setting 5.3 Setting up of jigs 5.4 Fixtures 5.5 Clamps etc.
6. Specifications	6.1 All welds should match the welding procedure specifications 6.2 Defect free work piece
7. Base metal	7.1 Metal sheet (0.3,0.45,1.5, 3.0, mm) 7.2 Wire (Ø1.6, 3.2 mm)
8. Weld Procedure Specification (WPS)	8.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. 8.2 Other related international standards
9. Defects	9.1 Indented surface 9.2 Crack in weld area 9.3 Asymmetrical spot weld 9.4 Expansion of metal 9.5 Spatter 9.6 Lack of fusion
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 identified and eliminated hazard risks; 1.2 set and adjusted spot welding machine; 1.3 performed spot weld for sheet metal job;

	1.4 performed spot weld for making a wire mesh; and 1.5 identified defects in spot welding.
2. Underpinning knowledge	2.1 Spot welding machine set up procedure. 2.2 Spot welding parameter. 2.3 Procedure of spot welding. 2.4 Application field of spot welding. 2.5 Procedure of testing welding. 2.6 Impact of toxic gases and fumes from welding operation. 2.7 Ventilation requirement at the workplace to protect personnel from harmful welding effects. 2.8 Safe environmental protocols.
3. Underpinning skills	3.1 Selecting and set up spot welding machine. 3.2 Performing spot weld. 3.3 Performing spot weld of wire mesh. 3.4 Inspecting and identifying defects. 3.5 Applying techniques of rectifying defect.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.

7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Perform Basic Inspection and Testing of Welds
Unit Code	TRAWEL2004A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform basic inspection and testing of welds. It includes following Occupational Safety and Health(OSH)practices, interpreting inspection of weld, testing weld and cleaning and storing equipment.
Nominal Hours	40 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 Hazards and risks are identified and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is worn. 1.3 Safe work practices are observed.
2. Interpret inspection of weld	2.1 Inspection requirements for welding are interpreted. 2.2 Type of inspection of welding are identified. 2.3 Destructive or non-destructive tests of welding are interpreted. 2.4 Inspection report are interpreted from template.
3. Perform simple testing of weld	3.1 Test sample are selected and collected 3.2 Visual test is carried out according to work place standard. 3.3 Weld job are tested by using <i>testing equipment</i> . 3.4 <i>Destructive</i> and <i>non-destructive simple tests</i> are performed as per job requirement. 3.5 <i>Defects</i> are identified and recorded.
4. Clean and store equipment	4.1 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 4.2 Wastes are disposed off accordance with workplace

	requirements. 4.3 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal. 4.4 Wastages are preserved in designated places.
Range of Variables	
Variables	Range (may include but not limited to):
1. Personal Protective Equipment(PPE)	1.1 Helmet 1.2 Leather gloves 1.3 Leather apron 1.4 Safety goggles 1.5 First aid kit 1.6 Safety shoes
2. Testing equipment	2.1 Dye penetration test kit 2.2 Bending test equipment 2.3 Fracture test machine 2.4 Torch light 2.5 Magnifying glass
3. Destructive test	3.1 Fracture 3.2 Bend
4. Non-destructive test	4.1 Visual 4.2 Dye-penetrant
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
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	

1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 identified and eliminated hazards; 1.2 interpreted inspection requirements for welding; 1.3 interpreted inspection report; 1.4 identified destructive or non-destructive tests; and 1.5 performed destructive or non-destructive tests.
2. Underpinning knowledge	2.1 Inspection requirements for welding. 2.2 Type of inspection of welding. 2.3 Difference between DT and NDT. 2.4 Visual test, MPT, DPT, bend test, fracture test. 2.5 Weld testing equipment's. 2.6 Types of defects.
3. Underpinning skills	3.1 Preparing a check list from work place requirement or standard. 3.2 Preparing a sequence of inspection. 3.3 Finding out defects visually. 3.4 Performing destructive or non-destructive tests. 3.5 Cleaning and storing equipment properly.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Sincere and honest to duties. 4.3 Promptness in carrying out activities. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect to peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 relevant tools, test equipment's and physical facilities appropriate to perform activities; and 5.3 materials to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.

7. Context for assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.
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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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Perform Shielded Metal Arc Welding (SMAW) - Positions 3F, 4F and 2G
Unit Code	TRAWEL2005A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform Shielded Metal Arc Welding (SMAW) – positions 3F, 4F and 2G. It includes following Occupational Safety and Health (OSH) practices, preparing materials for welding, setting up equipment and job for welding, performing shielded metal arc welding-position 3F, 4F and 2G and housekeeping and storing equipment.
Nominal Hours	60 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 <i>Hazards</i> are identified and risks are minimized and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work environment is ensured. 1.4 Ensured environmental compliance in the workplace.
2. Prepare materials for welding	2.1 Weld requirements are identified as per SOP. 2.2 Plates, <i>tools, equipment</i> 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 2.5 <i>Materials</i> are assembled and aligned with required root gap as per job specification.
3. Setup equipment and job for welding	3.1 Welding equipment is set and adjusted in accordance with job specification. 3.2 Job is set for avoiding distortions by using appropriate root gap, clamp and tack weld at required position for 3F, 4F and 2G.

4. Perform shielded metal arc welding-position 3F, 4F and 2G	4.1 To avoid <i>distortion preventive measures</i> base metal are tacked properly. 4.2 Welding is performed as per <i>Welding Procedure Specification (WPS)</i>. 4.3 Welds are cleaned, checked for quality and <i>defects</i> are identified. 4.4 Weld gauge is used as per workplace requirements 4.5 Corrective action is taken to meet the standards
5. Perform housekeeping and store equipment	5.1 Welding machine shutdown procedures are followed. 5.2 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 5.3 Wastes are disposed off accordance with workplace requirements. 5.4 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal. 5.5 Wastages are preserved in designated places. 5.6 Electrodes to be preserved according to specification.
Range of Variables	
Variable	Range (may include but not limited to):
1. Hazard	1.1 Fire 1.2 Electrical 1.3 Radiation 1.4 Poisonous gases and air quality 1.5 Confined space
2. Personal Protective Equipment (PPE)	2.1 Safety helmet 2.2 Eye shield (head screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler suit (cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety shoes
3. Tools	3.1 Chipping hammer 3.2 Ball peen hammer 3.3 Tongs 3.4 Wire brush 3.5 Cup brush

	3.6 Weld gauge 3.7 Measuring tap/Steel ruler 3.8 Grinder 3.9 Clamping device 3.10 Wire spacer
4. Equipment	4.1 SMAW - AC welding transformer / DC welding transformer / inverter/ rectifier 4.2 Generator 4.3 Electrode dryer/oven
5. Materials	5.1 Low carbon steel 5.2 Medium carbon steel 5.3 Plate thickness 6mm to 12mm
6. Distortion prevention measures	6.1 Pre heating / post heating 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. 7.2 Other related international standards
8. Defects	8.1 Lack of penetration 8.2 Excess penetration 8.3 Porosity 8.4 Crack 8.5 Slag inclusions 8.6 Spatter 8.7 Undercut 8.8 Lack of fusion 8.9 Notches 8.10 Irregular shape and dimension 8.11 Lack of side wall fusion 8.12 Under fill 8.13 Burn throw 8.14 Pin/Blow hole 8.15 Arc crater 8.16 Overlap

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 (weld), 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, recent and meet all requirements of current version of the Unit of Competency.

1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 selected and collected plates, tools, equipment and electrodes as per job requirements; 1.2 marked and cut the plate; 1.3 setup equipment and job; 1.4 performed shielded metal arc welding; 1.5 ensured environmental compliance in the workplace; and 1.6 followed welding machine shut down procedure.
2. Underpinning knowledge	2.1 Hazards and OSH procedures. 2.2 Use of PPE and tools. 2.3 Selection and preparation procedure of plates. 2.4 Types of electrodes. 2.5 Procedure of setting SMAW equipment. 2.6 Procedures and techniques of Welding 2.7 Types of welding joints and welding positions. 2.8 Types of welding defects. 2.9 Prevention and rectification of welding defects. 2.10 Machine shut down procedures. 2.11 Impact of toxic gases and fumes from welding operation. 2.12 Ventilation requirement at the workplace to protect personnel from harmful welding effects. 2.13 Safe environmental protocols.

3. Underpinning skills	3.1 Selecting materials and prepare for welding. 3.2 Using materials, tools and equipment. 3.3 Setting and adjusting welding equipment. 3.4 Performing shielded metal arc welding. 3.5 preventing and rectifying welding defects. 3.6 Completing machine shut down and housekeeping. 3.7 Ensuring environment-friendly practices in the workplace in material use and waste management.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – Positions 3F, 4F and 2G
Unit Code	TRAWEL2006A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – positions 3F, 4F and 2G. It includes following Occupational Safety and Health (OSH) practices, preparing materials for welding, setting up equipment and job for welding, performing shielded metal arc welding-position 3F, 4F and 2G and housekeeping and storing equipment.
Nominal Hours	80 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 <i>Hazards</i> are identified and risks are minimized and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work environment are ensured. 1.4 All the health and environmental safety standards are properly followed.
2. Prepare for welding	2.1 Weld requirements are identified as per SOP. 2.2 <i>Base materials, wire reel and shielding gas</i> are identified and collected. 2.3 <i>Tools and equipment</i> are selected and collected as per job requirements. 2.4 Plates are marked and cut as per job specification. 2.5 Edges of plate are prepared as per job specification
3. Setup equipment and job for welding	3.1 Welding equipment is set and adjusted in accordance with job specification. 3.2 Welding machine and accessories are set up and adjusted as per job requirements 3.3 Job is set avoiding distortions using appropriate root gap, clamp and tack weld at required position for 3F, 4F

	and 2G.
4. Perform GMAW and FCAW position 3F, 4F, and 2G	4.1 To avoid distortion preventive measures base metal are tacked properly. 4.2 Welding is performed as per Welding Procedure Specification (WPS). 4.3 Welds are cleaned, checked for quality and defects are identified.
5. Minimize 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 performed.
6. Perform housekeeping and store equipment	6.1 Welding machine shutdown procedures are followed 6.2 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 6.3 Wastes are disposed off accordance with workplace requirements. 6.4 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal. 6.5 Wastages are preserved in designated places. 6.6 Workplace is cleaned as per workplace requirements.
Range of Variables	
Variable	Range (may include but not limited to):
1. Hazards	1.1 Fire 1.2 Electrical 1.3 Radiation 1.4 Poisonous gases and air quality 1.5 Confined space
2. Personal Protective Equipment (PPE)	2.1 Safety helmet 2.2 Eye shield (head screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler suit (cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety shoes

3. Base metals	3.1 Mild steel 3.2 Carbon steel 3.3 Aluminium 3.4 Plates 3-12mm thickness
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 Ball peen hammer 6.3 Chipping hammer 6.4 Nose pliers 6.5 Tongs 6.6 Wire brush 6.7 Cup brush 6.8 Weld gauge 6.9 Grinder 6.10 Combination pliers 6.11 Nose pliers 6.12 Cylinder key 6.13 Utility wrench
7. Equipment	7.1 GMAW/FCAW welding transformer 7.2 Generator
8. Weld Procedure Specification (WPS)	8.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent 8.2 Other related international standards
9. Defects	9.1 Lack of penetration 9.2 Excess penetration 9.3 Porosity 9.4 Crack 9.5 Slag inclusions 9.6 Spatter 9.7 Undercut 9.8 Lack of fusion 9.9 Notches

	9.10 Irregular shape and dimension 9.11 Lack of side wall fusion 9.12 Under fill 9.13 Burn throw 9.14 Pin/Blow hole 9.15 Arc crater 9.16 Overlap
10. Distortion prevention measures	10.1 Preheating / post heating 10.2 Tack weld 10.3 Setting up of jigs 10.4 Fixtures 10.5 Clamps
11. Destructive Test (DT)	11.1 Fracture test 11.2 Bend test
12. Non-Destructive Test (NDT)	12.1 Dye Penetrant test 12.2 Visual test
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 (weld), 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, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 selected and collected plates, tools, equipment and wire reel; 1.2 marked and cut the plate; 1.3 setup equipment and job; 1.4 ensured environmental compliance in the workplace; and 1.5 performed GMAW and FCAW.

2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace. 2.2 PPE and tools in a welding workplace. 2.3 Types, selection and preparation of job 2.4 Types, and selection of wire reel. 2.5 Types and setting up of GMAW and FCAW welding equipment. 2.6 Types of welding joints and welding positions. 2.7 Welding procedures and techniques. 2.8 Types of welding defects. 2.9 Prevention and rectification of welding defects. 2.10 Shut down and housekeeping procedures. 2.11 Impact of toxic gases and fumes from welding operation. 2.12 Ventilation requirement at the workplace to protect personnel from harmful welding effect. 2.13 Safe environmental protocols.
3. Underpinning skills	3.1 Selecting and collecting tools and equipment. 3.2 Preparing edges of plate. 3.3 Setting and adjusting welding equipment. 3.4 Tacking base metal. 3.5 Selecting distortion prevention measures. 3.6 Performing distractive and non-distractive test. 3.7 Applying techniques to rectifying distortion. 3.8 Ensuring environment-friendly practices in the workplace in material use and waste management.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables to perform activities.

6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Interpret Fundamentals of Welding Metallurgy in the Workplace
Unit Code	TRAWEL3007A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to apply fundamentals of welding metallurgy in the workplace. It includes following Occupational Safety and Health (OSH) practices, demonstrating application of mechanical properties and chemical properties, demonstrating the effects of variation of current and travel speed of electrode, identifying zone of welds, demonstrating application of heat treatment and cleaning and storing equipment.
Nominal Hours	30 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 Hazards are identified and risks are minimized and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work environment is ensured. 1.4 Environmental compliance is checked and ensured in the workplace.
2. Interpret mechanical and chemical properties	2.1 Application of <i>mechanical properties</i> of metals are interpreted as required by workplace. 2.2 <i>Chemical properties of base metal</i> are interpreted as per standard 2.3 <i>Elements in steel</i> are interpreted. 2.4 Avoid <i>distortion prevention measures</i> base <i>metal</i> is heated properly. 2.5 <i>Heat treatment</i> application is interpreted as per job requirement.

3. Identify zone of welds and effects of variation of current	3.1 Weld zone (metal) is interpreted 3.2 Heat affected Zone (HAZ) is interpreted. 3.3 Base metal zone is interpreted. 3.4 Weld zone is identified and visualized. 3.5 The effects of variation of current on heat input in welds are interpreted using the formula $H \propto I^2RT$.
4. Clean and store equipment	4.1 Equipment is cleaned according to workplace procedures. 4.2 Equipment is stored according to workplace procedures. 4.3 Electrodes are preserved in electrode dryer or electrode oven
Range of Variables	
Variable	Range (may include but not limited to):
1. Personal Protective Equipment (PPE)	1.1 Safety helmet 1.2 Heat resistance gloves 1.3 Boiler suit (cotton) 1.4 Leather apron 1.5 Arm guards 1.6 Safety goggles 1.7 Safety shoes
2. Mechanical properties	2.1 Strength 2.2 Ductility 2.3 Hardness 2.4 Toughness 2.5 Fatigue strength 2.6 Malleability 2.7 Melting temperature 2.8 Weld ability 2.9 Brittleness
3. Chemical properties of base metal	3.1 Oxidation 3.2 Reduction 3.3 Ionization
4. Elements in steel	4.1 Carbon 4.2 Sulphur 4.3 Phosphorous 4.4 Silicon 4.5 Manganese

	4.6 Chromium 4.7 Molybdenum 4.8 Nickel 4.9 Aluminium
5. Metals	5.1 Iron, carbon steel 5.2 Stainless steel 5.3 Copper 5.4 Aluminium 5.5 Bronze 5.6 Gun metal 5.7 Brass 5.8 Manganese
6. Distortion prevention measures	6.1 Preheating / post heating 6.2 Setting up of jigs 6.3 Fixtures, clamps etc.
7. Heat treatment	7.1 Annealing 7.2 Normalizing 7.3 Quenching 7.4 Pre heating 7.5 Post heating
8. Weld zones	8.1 Weld metal zone 8.2 Heat affected zone (HAZ) 8.3 Base metal zone
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidences that the candidate: 1.1 interpreted chemical properties of base metal; 1.2 interpreted application of heat treatment; 1.3 identified heat affected / weld zones; and 1.4 preserved electrodes.
2. Underpinning knowledge	2.1 Mechanical properties of metal. 2.2 Chemical properties of base metal. 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 Weld zones.

	2.6 Procedures of applying heat treatment. 2.7 Procedures of preserving electrodes.
3. Underpinning skills	3.1 Applying techniques to heat metal. 3.2 Calculating heat input by using formula. 3.3 Identifying weld zones. 3.4 Heat treatment cleaning and storing equipment. 3.5 Applying techniques to preserve electrodes.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communication with peers and seniors at workplace.
5. Resources implication	The following resources must be provided: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, chart and consumables to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context for assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated workplace after completion of the training module. 7.2 Assessment should be done by a BTEB certified assessor.

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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Perform Shielded Metal Arc Welding (SMAW) - Positions 3G and 4G
Unit Code	TRAWEL3008A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform Shielded Metal Arc Welding (SMAW) positions 3G and 4G. It includes following Occupational Safety and Health (OSH) practices, preparing materials for welding, setting up equipment and job for welding, performing shielded metal arc welding-position 3G and 4G and housekeeping and storing equipment.
Nominal Hours	90 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 <i>Hazards</i> are identified and risks are minimized and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work environment is ensured. 1.4 Ensured environmental compliance in the workplace.
2. Prepare materials for welding	2.1 Weld requirements are identified as per SOP (standard operating procedure) . 2.2 Plates, <i>tools, equipment</i> 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. 2.5 <i>Materials</i> are assembled and aligned with required root gap as per job specification.
3. Setup equipment and job for welding	3.1 Welding equipment is set and adjusted in accordance with job specification. 3.2 Job is set avoiding distortions using appropriate root gap, clamp and tack weld at required position for 3G and 4G.

4. Perform shielded metal arc welding-position 3G and 4G	4.1 To avoid <i>distortion preventive measures</i> base metal are tacked properly. 4.2 Welding is performed as per <i>Welding Procedure Specification (WPS)</i>. 4.3 Welds are cleaned, checked for quality and <i>defects</i> are identified. 4.4 Weld gauge is used as per workplace requirements. 4.5 Corrective action is taken to meet the standards.
5. Perform housekeeping and store equipment	5.1 Welding machine shutdown procedures are followed 5.2 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 5.3 Wastes are disposed off accordance with workplace requirements. 5.4 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal. 5.5 Wastages are preserved in designated places. 5.6 Electrodes to be preserved according to specification.
Range of Variables	
Variable	Range (may include but not limited to):
1. Hazard	1.1 Fire 1.2 Electrical 1.3 Radiation 1.4 Poisonous gases and air quality 1.5 Confined space
2. Personal Protective Equipment (PPE)	2.1 Safety helmet 2.2 Eye shield (head screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler suit (cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety shoes
3. Tools	3.1 Chipping hammer 3.2 Ball peen hammer 3.3 Tongs 3.4 Wire brush 3.5 Cup brush

	3.6 Weld gauge 3.7 Measuring tap/Steel ruler 3.8 Grinder 3.9 Clamping device
4. Equipment	4.1 AC welding transformer / DC welding transformer / inverter/ rectifier 4.2 Generator 4.3 Electrode dryer/oven 4.4 Magnetic dust particle collector
5. Materials	5.1 Low carbon steel 5.2 Medium carbon steel 5.3 Plate thickness 6mm to 12 mm
6. Distortion prevention measures	6.1 Preheating / post heating 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. 7.2 Other related international standards
8. Defects	8.1 Lack of penetration 8.2 Excess penetration 8.3 Porosity 8.4 Crack 8.5 Slag inclusions 8.6 Spatter 8.7 Undercut 8.8 Lack of fusion 8.9 Notches 8.10 Irregular shape and dimension 8.11 Lack of side wall fusion 8.12 Under fill 8.13 Burn throw Pin/Blow hole Arc crater 8.14 Overlap

Evidence Guide

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

1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 selected and collected plates, tools, equipment and electrodes as per job requirements; 1.2 marked and cut the plate; 1.3 setup equipment and job; 1.4 performed shielded metal arc welding-position 3G and 4G; and 1.5 ensured environmental compliance in the workplace.
2. Underpinning knowledge	2.1 Hazards and OSH procedures. 2.2 Use of PPE and tools. 2.3 Selection and preparation of plates. 2.4 Types and selection of electrodes. 2.5 Setting procedure of SMAW equipment. 2.6 Welding procedures and techniques. 2.7 Types of welding joints and welding positions. 2.8 Types of welding defects. 2.9 Prevention and rectification of welding defects. 2.10 Machine shut down and housekeeping procedures. 2.11 Impact of toxic gases and fumes from welding operation. 2.12 Ventilation requirement at the workplace to protect personnel from harmful welding effect. 2.13 Safe environmental protocols.
3. Underpinning skills	3.1 Selecting materials and prepare for welding. 3.2 Using materials, tools and equipment appropriately. 3.3 Performing shielded metal arc welding-position 3G and 4G. 3.4 Applying techniques to prevent and rectify welding defects. 3.5 Completing machine shut down. 3.6 Ensuring environment-friendly practices in the workplace in material use and waste management.

4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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 Qualifications Framework for Bangladesh
Unit of Competency

Unit Title	Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – Positions 3G
Unit Code	TRAWEL3009A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) - positions 3G. It includes following Occupational Safety and Health (OSH) practices, preparing for welding, setting up equipment and job for welding, carrying out GMAW and FCAW position 3G, Minimizing and rectifying distortion and performing housekeeping and storing equipment.
Nominal Hours	60 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 <i>Hazards</i> are identified and risks are minimized and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work environment is ensured. 1.4 Ensured environmental compliance in the workplace.
2. Prepare for welding	2.1 Weld requirements are identified as per SOP. 2.2 <i>Base metals, wire reel and shielding gas</i> are identified and collected. 2.3 <i>Tools and equipment</i> are selected and collected as per job requirements. 2.4 Plates are marked and cut as per job specification. 2.5 Edges of plate are prepared as per job specification.
3. Setup equipment and job for welding	3.1 Welding equipment is set and adjusted in accordance with job specification 3.2 Welding machine and accessories are set up and adjusted as per job requirements 3.3 Job is set avoiding distortions using appropriate root gap, clamp and tacked weld at required position for 3G .

4. Carry out GMAW and FCAW position 3G	4.1 To avoid <i>distortion preventive measures</i> base metal are tacked properly 4.2 Welding is performed as per <i>Welding Procedure Specification (WPS)</i>. 4.3 Welds are cleaned, checked for quality and <i>defects</i> are identified.
5. Minimize and rectify distortion	5.1 <i>Distortion prevention measures</i> are selected appropriate to material and process. 5.2 Distortion is rectified. 5.3 <i>Distractive test</i> and <i>non-distractive test</i> are performed.
6. Perform housekeeping and store equipment	6.1 Welding machine shutdown procedures are followed 6.2 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 6.3 Wastes are disposed off in accordance with workplace requirements and considering the necessary environmental preservation/safeguarding procedure Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 6.4 Wastes are disposed off accordance with workplace requirements. 6.5 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal. 6.6 Workplace is cleaned as per workplace requirements.
Range of Variables	
Variable	Range (may include but not limited to):
1. Hazards	1.1 Fire 1.2 Electrical 1.3 Radiation 1.4 Poisonous gases and air quality 1.5 Confined space

2. Personal Protective Equipment (PPE)	2.1 Safety helmet 2.2 Eye shield (head screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler suit (cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety shoes 2.9 Respirator
3. Base metals	3.1 Mild steel 3.2 Carbon steel 3.3 Aluminium 3.4 Stainless steel 3.5 Plates 3-12 mm thickness
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 Ball peen hammer 6.3 Chipping hammer 6.4 Nose pliers 6.5 Tongs 6.6 Wire brush 6.7 Cup brush 6.8 Weld gauge 6.9 Grinder 6.10 Combination pliers 6.11 Cylinder key 6.12 Utility wrench 6.13 Wire spacer
7. Equipment	7.1 GMAW/FCAW welding transformer 7.2 Generator 7.3 Magnetic dust particle collector

8. Weld Procedure Specification (WPS)	8.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent 8.2 Other related international standards
9. Defects	9.1 Lack of penetration 9.2 Excess penetration 9.3 Porosity 9.4 Crack 9.5 Slag inclusions 9.6 Spatter 9.7 Undercut 9.8 Lack of fusion 9.9 Notches 9.10 Irregular shape and dimension 9.11 Lack of side wall fusion 9.12 Under fill 9.13 Burn throw 9.14 Pin/Blow hole 9.15 Arc crater 9.16 Overlap
10. Distortion prevention measures	10.1 Preheating /post heating 10.2 Tack weld 10.3 Setting up of jigs 10.4 Fixtures 10.5 Clamps
11. Destructive Test (DT)	11.1 Fracture 11.2 Bend
12. Non-Destructive Test (NDT)	12.1 Dye Penetrant 12.2 Visual

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 (weld), shrinking and deformation, weld imperfections, Equipment for GMAW and FCAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.

Evidence Guide

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

1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 selected and collected plates, tools, equipment and base metal; 1.2 marked and cut the plate; 1.3 setup welding equipment; 1.4 performed GMAW and FCAW welding; 1.5 performed distractive test and non-distractive test; and 1.6 ensured environmental compliance in the workplace.
2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace. 2.2 PPE and tools in a welding workplace. 2.3 Types, selection and preparation of job 2.4 Types, and selection of wire reel. 2.5 Types of welding machine, accessories. 2.6 Types and setting up of GMAW and FCAW welding equipment. 2.7 Types of welding joints and welding positions. 2.8 Welding procedures and techniques. 2.9 Types of welding defects. 2.10 Prevention and rectification of welding defects. 2.11 Shut down and housekeeping procedures. 2.12 Impact of toxic gases and fumes from welding operation. 2.13 Ventilation requirement at the workplace to protect personnel from harmful welding effect. 2.14 Safe environmental protocols.
3. Underpinning skills	3.1 Selecting tools and equipment. 3.2 Preparing edges of plate. 3.3 Setting and adjusting welding equipment and accessories. 3.4 Performing GMAW and FCAW position 3G. 3.5 Applying techniques to rectify distortion. 3.6 Performing housekeeping. 3.7 Ensuring environment-friendly practices in the workplace in material use and waste management.

4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Perform Gas Tungsten Arc Welding (GTAW or TIG) - Position 2G in Pipe
Unit Code	TRAWEL3010A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform Gas Tungsten Arc Welding (GTAW or TIG) -position 2G in pipe. It includes following Occupational Safety and Health(OSH) practices, preparing for welding, setting u welding job and equipment, carrying out Gas Tungsten Arc Welding (GTAW or TIG) - position 2G, minimizing and rectifying distortion and performing housekeeping and store equipment.
Nominal Hours	80 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 <i>Hazards</i> are identified and risks are minimized and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work environment are ensured. 1.4 Ensured environmental compliance in the workplace.
2. Prepare for welding	2.1 Weld requirements are identified as per SOP (Standard Operating Procedure). 2.2 <i>Base metals, filler rod and shielding gas</i> are selected. 2.3 Materials (pipe) are marked and cut as per dimension of specification, drawing. 2.4 <i>Tools and equipment</i> are selected and collected as per job requirements. 2.5 End of pipe are prepared as per job requirement.
3. Set up welding job and equipment	3.1 Tools, equipment, <i>tungsten electrode</i> and <i>ceramic cap</i> are collected. 3.2 Welding machine and accessories are set up and

	adjusted as per job requirements. 3.3 Job is set up using clamps/jig/fixtures at required position 2G.
4. Carry out Gas Tungsten Arc Welding (GTAW or TIG) - position 2G	4.1 Joints are cleaned up as per specification. 4.2 Weld performed as per specification and standard (WPS). 4.3 Weld Joints are cleaned to specifications. 4.4 Weld is checked for quality and any defects are identified and corrective action.
5. Minimize and rectify distortion	5.1 Distortion prevention measures are selected appropriate to material and process. 5.2 Distortion is rectified. 5.3 Distraction test and non-distraction test are performed.
6. Perform housekeeping and store equipment	6.1 Welding machine shutdown procedures are followed. 6.2 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 6.3 Wastes are disposed off accordance with workplace requirements. 6.4 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal. 6.5 Wastages are preserved in designated places. 6.6 Workplace is cleaned as per workplace requirements.
Range of Variables	
Variable	Range (may include but not limited to):
1. Hazards	1.1 Fire 1.2 Electrical 1.3 Radiation 1.4 Poisonous gases and air quality 1.5 Confined space
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 protection respirator 2.9 First aid kit
3. Base metals	3.1 Mild steel 3.2 Carbon steel 3.3 Stainless Steel 3.4 Aluminium 3.5 Pipe 100 -150 mm dia. wall thickness 2-12 mm
4. Filler rod	4.1 Filler rod (1.6 mm to 3.0 mm) 4.2 Filler materials are preserved in suitable place
5. Shielding gas	5.1 Inert gases (such as argon, helium)
6. Tools	6.1 Clamps 6.2 Ball peen hammer 6.3 Chipping hammer 6.4 Tongs 6.5 Wire brush 6.6 Cup brush 6.7 Weld gauge 6.8 Grinder 6.9 Wire spacer
7. Equipment	7.1 TAW –AC/DC welding transformer
8. Tungsten electrode (diameter)	8.1 $\varnothing$ 0.5 - 4.0 mm.
9. Ceramic cap	9.1 4 no. to 9 no.
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. Distortion prevention measures	11.1 Preheating /post heating 11.2 Tack weld 11.3 Setting up of jigs 11.4 Fixtures 11.5 Clamps
12. Destructive Test (DT)	12.1 Bend test 12.2 Break test
13. Non-Destructive Test (NDT)	13.1 Dye Penetrant 13.2 Visual test
14. WPS: Weld Procedure Specification	14.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent. 14.2 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 (weld), shrinking and deformation, weld imperfections, Equipment for GTAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 followed OSH practice; 1.2 selected and collected tools, equipment, tungsten electrode and ceramic cap; 1.3 set and adjusted welding machine and accessories; 1.4 performed Gas Tungsten Arc Welding - position 2G; 1.5 performed distractive test and non-distractive test; and 1.6 ensured environmental compliance in the workplace

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 pipe. 2.4 Types, and selection of filler rod. 2.5 Types and setting up of GTAW or TIG welding equipment. 2.6 Types of welding joints and welding positions. 2.7 GTAW or TIG welding procedures and techniques. 2.8 Types of welding defects. 2.9 Prevention and rectification of welding defects. 2.10 Shut down and housekeeping procedures. 2.11 Impact of toxic gases and fumes from welding operation. 2.12 Ventilation requirement at the workplace to protect personnel from harmful welding effect. 2.13 Safe environmental protocols.
3. Underpinning skills	3.1 Selecting tools and equipment. 3.2 Preparing edges of plate. 3.3 Setting and adjusting welding equipment and accessories. 3.4 Performing GTAW or TIG welding. 3.5 Applying techniques to rectify distortion. 3.6 Performing housekeeping. 3.7 Ensuring environment-friendly practices in the workplace in material use and waste management.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration;

	6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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 Qualifications Framework for Bangladesh

Unit of Competency

Unit Title	Perform Shielded Metal Arc Welding (SMAW) Positions 5G and 6G in Pipe
Unit Code	TRAWEL4011A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform Shielded Metal Arc Welding (SMAW) positions 5G and 6G in pipe. It includes following Occupational Safety and Health(OSH)practices, preparing for welding, setting up welding job and equipment, carrying out shielded metal arc welding-position 5G, 6G and performing housekeeping and storing equipment.
Nominal Hours	120 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 <i>Hazards</i> are identified and risks are minimized and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work environment is ensured. 1.4 Ensured environmental compliance in the workplace.
2. Prepare for welding	2.1 Weld requirements are identified as per SOP. 2.2 Low hydrogen electrode is collected 2.3 Base materials, electrode and <i>size of electrodes</i> are selected and collected. 2.4 <i>Materials (pipe)</i> are marked and cut as per dimension of specification, drawing. 2.5 <i>Tools</i> and <i>equipment</i> are selected and collected as per job requirements. 2.6 End of pipe are prepared as per job materials (pipe) are assembled and aligned with required root gap.

3. Setup welding job and equipment	3.1 Welding machine and accessories are set up and adjusted as per job requirements. 3.2 Job is set up using clamps/jig/fixtures at required position 5G and 6G.
4. Carry out shielded metal arc welding-position 5G, 6G	4.1 Joints are cleaned up as per specification. 4.2 Weld performed as per specification and standard (WPS). 4.3 Weld Joints are cleaned to specifications. 4.4 Weld is checked for quality and any defects are identified and corrective action.
5. Perform housekeeping and store equipment	5.1 Welding machine shutdown procedures are followed. 5.2 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 5.3 Wastes are disposed off accordance with workplace requirements. 5.4 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal. 5.5 Wastages are preserved in designated places.. 5.6 Workplace is cleaned as per workplace requirements.
Range of Variables	
Variable	Range (may include but not limited to):
1. Hazard	1.1 Fire 1.2 Electrical 1.3 Radiation 1.4 Poisonous gases and air quality 1.5 Confined space
2. Personal Protective Equipment (PPE)	2.1 Safety helmet 2.2 Eye shield (head screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler suit (cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety shoes

3. Size of electrode	3.1 8, SWG 3.2 10 SWG 3.3 12 SWG
4. Materials of pipe	3.1 Low carbon steel 3.2 Mild steel 3.3 Carbon steel
5. Tools	4.1 Clamps 4.2 Ball peen 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 Wire spacer
6. Equipment	6.1 SMAW - AC welding transformer / DC welding transformer / inverter/ rectifier 6.2 Generator 6.3 Electrode Dryer/woven 6.4 Magnetic dust collector
7. Defects	7.1 Lack of penetration 7.2 Excess penetration 7.3 Porosity 7.4 Crack 7.5 Slag inclusions 7.6 Spatter 7.7 Undercut 7.8 Lack of fusion 7.9 Notches 7.10 Irregular shape and dimension 7.11 Lack of side wall fusion 7.12 Under fill 7.13 Burn throw 7.14 Pin/Blow hole 7.15 Arc crater 7.16 Overlap

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 (weld), 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, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 selected and collected tools and equipment, electrode and pipe; 1.2 prepared end of pipe; 1.3 set and adjusted welding machine and accessories; 1.4 performed shielded metal arc welding-position 5G, 6G; 1.5 identified defects; and 1.6 ensured environmental compliance in the workplace.
2. Underpinning knowledge	2.1 Hazards and OSH procedures. 2.2 Use of PPE and tools. 2.3 Selection and preparation of pipe end. 2.4 Types and selection of electrodes. 2.5 Setting procedure of SMAW equipment. 2.6 Shielded metal arc welding procedures and techniques. 2.7 Types of welding joints and welding positions. 2.8 Types of welding defects. 2.9 Prevention and rectification of welding defects. 2.10 Preservation process of electrodes in electrode dryer or electrode oven. 2.11 Machine shut down and housekeeping procedures. 2.12 Impact of toxic gases and fumes from welding operation. 2.13 Ventilation requirement at the workplace to protect personnel from harmful welding effect. 2.14 Safe environmental protocols.
3. Underpinning skills	3.1 Selecting materials and prepare for welding. 3.2 Using materials, tools and equipment. 3.3 Setting and adjusting welding machine and accessories.

	3.4 Performing shielded metal arc welding. 3.5 Applying techniques of rectifying welding defects. 3.6 Ensuring environment-friendly practices in the workplace in material use and waste management. 3.7 Carrying out housekeeping.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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 Qualifications Framework for Bangladesh Unit of Competency

Unit Title	Perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) – Positions 4G
Unit Code	TRAWEL4012A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) -positions 4G. It includes following Occupational Safety and Health(OSH)practices, preparing for welding, setting up welding job and equipment, carrying out GMAW and FCAW position 4G, Minimizing and rectifying distortion and performing housekeeping and storing equipment
Nominal Hours	80 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 <i>Hazards</i> are identified and risks are minimized and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work environment is ensured. 1.4 Ensured environmental compliance in the workplace.
2. Prepare for welding	2.1 Weld requirements are identified as per SOP. 2.2 <i>Base materials, wire reel</i> and <i>shielding gas</i> are identified and collected. 2.3 <i>Tools and equipment</i> are selected and collected as per job requirements. 2.4 Plates are marked and cut as per job specification. 2.5 Edges of plate are prepared as per job specification
3. Setup equipment and job for welding	3.1 Welding equipment is set and adjusted in accordance with job specification 3.2 Welding machine and accessories are set up and adjusted as per job requirements 3.3 Job is set avoiding distortions using appropriate root gap, clamp and tacked weld at required position for 4G.

4. Carry out GMAW and FCAW position 4G	4.1 To avoid <i>distortion preventive measures</i> base metal are tacked properly. 4.2 Welding is performed as per <i>Welding Procedure Specification (WPS)</i>. 4.3 Welds are cleaned, checked for quality and <i>defects</i> are identified.
5. Minimize and rectify distortion	5.1 <i>Distortion prevention measures</i> are selected appropriate to material and process. 5.2 Distortion is rectified. 5.3 <i>Distractive</i> and <i>non-distractive</i> test are performed.
6. Perform housekeeping and store equipment	6.1 Welding machine shutdown procedures are followed 6.2 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 6.3 Wastes are disposed off accordance with workplace requirements 6.4 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal.' 6.5 Wastages are preserved in designated places. 6.6 Workplace is cleaned as per workplace requirements.
Range of Variables	
Variable	Range (may include but not limited to):
1. Hazards	1.1 Fire 1.2 Electrical 1.3 Radiation 1.4 Poisonous gases and air quality 1.5 Confined space
2. Personal Protective Equipment (PPE)	2.1 Safety helmet 2.2 Eye shield (head screen) 2.3 Leather hand gloves 2.4 Leather apron 2.5 Boiler suit (cotton) 2.6 Leather arms guard 2.7 Safety goggles 2.8 Safety shoes 2.9 Fume protection respirator

3. Base Metals	3.1 Mild steel 3.2 Carbon steel 3.3 Aluminium 3.4 Stainless steel 3.5 Plates 3-12 mm thickness
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 Ball peen hammer 6.3 Chipping hammer 6.4 Nose pliers 6.5 Tongs 6.6 Wire brush 6.7 Cup brush 6.8 Weld gauge 6.9 Grinder 6.10 Combination pliers 6.11 Cylinder Key 6.12 Utility wrench 6.13 Wire spacer
7. Equipment	7.1 GMAW/FCAW welding transformer 7.2 Generator 7.3 Magnetic dust particle collector
8. Defects	8.1 Lack of penetration 8.2 Excess penetration 8.3 Porosity 8.4 Crack 8.5 Slag inclusions 8.6 Spatter 8.7 Undercut 8.8 Lack of fusion 8.9 Notches 8.10 Irregular shape and dimension 8.11 Lack of side wall fusion

	8.12 Under fill 8.13 Burn throw 8.14 Pin/Blow hole 8.15 Arc crater 8.16 Overlap
9. Distortion prevention measures	9.1 Preheating / post heating 9.2 Tack weld 9.3 Setting up of jigs 9.4 Fixtures 9.5 Clamps etc.
10. Destructive Test (DT)	10.1 Fracture test 10.2 Bend test
11. Non-Destructive Test (NDT)	11.1 Dye Penetrant test 11.2 Visual test
12. Weld Procedure Specification (WPS)	12.1 WPS to be prepared complying AWS (American Welding Society) standard or equivalent 12.2 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 (weld), shrinking and deformation, weld imperfections, Equipment for GTAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 selected and collected plates, tools, equipment and base materials, wire reel and shielding gas; 1.2 marked and cut the plate; 1.3 setup and adjusted welding machine and accessories; 1.4 performed GMAW and FCAW position 4G; 1.5 performed distractive and non-distractive test; and

	1.6 ensured environmental compliance in the workplace.
2. Underpinning knowledge	2.1 Hazards and OSH procedures in a welding workplace. 2.2 PPE and tools in a welding workplace. 2.3 Types, selection and preparation of job 2.4 Types, and selection of wire reel. 2.5 Types and setting up of GMAW and FCAW welding equipment. 2.6 Types of welding joints and welding positions. 2.7 Welding procedures and techniques. 2.8 Types of welding defects. 2.9 Prevention and rectification of welding defects. 2.10 Shut down and housekeeping procedures. 2.11 Impact of toxic gases and fumes from welding operation. 2.12 Ventilation requirement at the workplace to protect personnel from harmful welding effect. 2.13 Safe environmental protocols.
3. Underpinning skills	3.1 Selecting tools and equipment. 3.2 Preparing edges of plate. 3.3 Setting and adjusting welding equipment and accessories. 3.4 Performing GMAW and FCAW position 4G. 3.5 Applying techniques to rectify distortion. 3.6 Carrying out distractive and non-distractive test. 3.7 Ensuring environment-friendly practices in the workplace in material use and waste management. 3.8 Performing housekeeping.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables to perform activities.

6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.
7. Context of assessment	7.1 Competency assessment must be done in a training centre or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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 Qualifications Framework for Bangladesh
Unit of Competency

Unit Title	Perform Gas Tungsten Arc Welding (GTAW or TIG) - Position 5G in Pipe
Unit Code	TRAWEL4013A2
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to perform Gas Tungsten Arc Welding (GTAW or TIG) -position 5G in pipe. It includes following Occupational Safety and Health(OSH) practices, selecting and preparing materials, setting up welding job and equipment, performing gas tungsten arc welding (GTAW or TIG) – position 5G, minimizing and rectifying distortion and completing the shut down and housekeeping procedures effectively.
Nominal Hours	90 Hours
Elements of Competency	Performance Criteria <i>Bold & italicized</i> terms are elaborated in the Range of Variables
1. Follow Occupational Safety and Health (OSH) practices	1.1 <i>Hazards</i> are identified and risks are minimized and eliminated. 1.2 <i>Personal Protective Equipment (PPE)</i> is used. 1.3 Safe work environment is ensured. 1.4 Ensured environmental compliance in the workplace.
2. Prepare for welding	2.1 Weld requirements are identified as per SOP (Standard Operating Procedure) 2.2 <i>Base metals, filler rod and shielding gas</i> are selected. 2.3 Materials (pipe) are marked and cut as per dimension of specification, drawing. 2.4 <i>Tools and equipment</i> are selected and collected as per job requirements. 2.5 End of pipe are prepared as per job.
3. Set up welding job and equipment	3.1 Tools, equipment, <i>tungsten electrode</i> and <i>ceramic cap</i> are collected. 3.2 Welding machine and accessories are set up and adjusted as per job requirements. 3.3 Job is set up using clamps/jig/fixtures at required position

	5G.
4. Carry out gas tungsten arc welding (GTAW or TIG) - position 5G	4.1 Joints are cleaned up as per specification. 4.2 Weld performed as per specification and standard (WPS). 4.3 Weld Joints are cleaned to specifications. 4.4 Weld is checked for quality and any defects are identified and corrective action.
5. Minimize and rectify distortion	5.1 Distortion prevention measures are selected appropriate to material and process. 5.2 Distortion is rectified. 5.3 Destructive test and non-destructive test are performed.
6. Perform housekeeping and store equipment	6.1 Welding machine shutdown procedures are followed 6.2 Equipment and tools are cleaned and stored as per workplace requirements and environmental regulations. 6.3 Wastes are disposed off accordance with workplace requirements 6.4 Necessary environmental preservation/safeguarding procedure is maintained during waste disposal. 6.5 Wastages are preserved in designated places. 6.6 Workplace is cleaned as per workplace requirements
Range of Variables	
Variable	Range (may include but not limited to):
1. Hazards	1.1 Fire 1.2 Electrical 1.3 Radiation 1.4 Poisonous gases and air quality 1.5 Confined space
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 protection respirator 2.9 First aid kit
3. Base metals	3.1 Mild steel

	3.2 Carbon steel 3.3 Stainless Steel 3.4 Aluminium 3.5 Pipe 100-150 mm dia wall thickness 2-12mm
4. Filler rod	4.1 Filler rod (1.2 mm to 3.0 mm) 4.2 Filler materials are preserved in suitable place
5. Shielding gas	5.1 Inert gases (such as argon, helium)
6. Tools	6.1 Clamps 6.2 Ball Peen hammer 6.3 Chipping hammer 6.4 Tongs 6.5 Wire brush 6.6 Cup brush 6.7 Weld gauge 6.8 Grinding machine 6.9 Wire spacer
7. Equipment	7.1 GTAW –AC/DC welding transformer
8. Tungsten electrode (diameter)	8.1 $\varnothing$ 0.5 -4.0 mm
9. Ceramic cap	9.1 4 no. to 8 no.
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. Distortion prevention measures	11.1 Preheating / post heat 11.2 Tack weld 11.3 Setting up of jigs 11.4 Fixtures 11.5 Clamps

12. Destructive Test (DT)	12.1 Bend test 12.2 Break test
13. Non-Destructive Test (NDT)	13.1 Dye Penetrant test 13.2 Visual test
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 (weld), shrinking and deformation, weld imperfections, Equipment for GTAW welding, construction and maintenance, overview of arc welding methods, steel welds ability, controlling deformation, security at outdoor welding sites, and health hazards due to pollutants.	
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspect of competency	Assessment required evidences that the candidate: 1.1 selected and collected plates, tools, equipment, base materials, filler rod and shielding gas; 1.2 collected tungsten electrode and ceramic cap; 1.3 marked and cut pipe; 1.4 prepared end of pipe; 1.5 setup and adjusted welding machine and accessories; 1.6 performed gas tungsten arc welding; and 1.7 ensured environmental compliance in the workplace.
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 pipe. 2.4 Types, and selection of filler rod. 2.5 Types and setting up of GTAW welding equipment. 2.6 Types of welding joints and welding positions. 2.7 Welding procedures and techniques. 2.8 Types of welding defects. 2.9 Prevention and rectification of welding defects. 2.10 Shut down and housekeeping procedures. 2.11 Impact of toxic gases and fumes from welding operation. 2.12 Ventilation requirement at the workplace to protect personnel from harmful welding effects.

	2.13 Safe environmental protocols.
3. Underpinning skills	3.1 Collecting tungsten electrode and ceramic cap 3.2 Preparing end of pipe 3.3 Setting and adjusting welding equipment and accessories. 3.4 Performing gas tungsten arc welding. 3.5 Applying techniques to rectify distortion. 3.6 Carrying out distractive and non-distractive test. 3.7 Ensuring environment-friendly practices in the workplace in material use and waste management. 3.8 Performing housekeeping.
4. Required attitudes	4.1 Commitment to occupational safety and health. 4.2 Promptness in carrying out activities. 4.3 Sincere and honest to duties. 4.4 Eagerness to learn. 4.5 Tidiness and timeliness. 4.6 Environmental concerns. 4.7 Respect for rights of peers and seniors at workplace. 4.8 Communicate with peers and seniors at workplace.
5. Resource implication	The following resources must be available: 5.1 workplace (actual or simulated); 5.2 tools, equipment and physical facilities appropriate to perform activities; and 5.3 materials, consumables to perform activities.
6. Methods of assessment	Methods of assessment may include but not limited to: 6.1 written test; 6.2 demonstration; 6.3 oral questioning; and 6.4 portfolio.

7. Context of assessment	7.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module. 7.2 Assessment should be done by BTEB certified assessor.
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.	

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