WELDER CURRICULUM NVC LEVEL-2

TABLE OF CONTENTS

1. Introduction

A welder is a skilled tradesman who specializes in joining materials together or fills and repairs holes on metal constructions. Welders work on all types of industrial, manufacturing and construction applications; some even work underwater to repair oil rig foundations, ship hulls and other types of sub-aquatic structures. Skilled welders know the welding specifications of many types of materials. Apprenticeship or education/certification enables the learners to get familiar with advanced welding techniques. Through the application of these techniques and skills, they may weld manually or use machines to weld metal components.

Welders typically work from drawings or specifications, then use their knowledge of base metals and joining techniques to select the appropriate material for the job. They cut, position, and tack weld the material/s in preparation for one of the many welding processes. The difficulty of the job depends on the types of materials and welding positions. Regardless of the type of welding process, welders are exposed to intense and blinding heat and radiations and must take special care to ensure their own safety and the safety of those around them. Welders wear special gloves and aprons to prevent sparks and flame from burning their clothes and skin. In addition to taking safety precautions, welders also maintain their equipment and work with various power tools to prepare materials for welding. The specific job duties of a welder vary depending on the skills of the welder and the industry in which he works. Due to universal need for their skills, welders are in high demand not only nationally but also internationally.

In order to meet the domestic and worldwide demand for welders, National Vocational and Technical Training Commission (NAVTTC) in collaboration with TVET Sector Support Programme (TVET-SSP) has developed national

vocational qualifications comprising of generic, functional and technical competency standards for welder occupation. To facilitate the process of developing national qualifications for welder, a Qualification Development Committee (QDC) was established under NVQF Operational Manual-1.

2. Purpose of this training programme

The purpose of this training programme is to provide the Green skills to the trainees in the field of Mechanical and convert it into value added product, which is acceptable by International market and fit-in a skilled graduate into National Vocational Qualification Framework for his / her vertical career progression and qualification equivalencies at par with acceptable international standards.

to set high professional standards for welder's job. These national qualifications will support training providers in enhancing the quality of training and assessment in Pakistan. The specific objectives of developing these qualifications are as under:

- Improve the overall quality of training delivery and setting national benchmarks for training of welders in the country
- Provide flexible pathways and progressions to learners enabling them to receive relevant, Up-to-date and recent skills
- Provide basis for competency-based assessment, which is recognized and accepted by employers
- Establish a standardized and sustainable system of training for welders in the country.

Green skills incorporation in TVET aims to build capacity of skilled workforce, which is aware of environmental hazards and accordingly adopts more sustainable and environment friendly practices at the workplace. The workforce that

possesses competencies and relevant knowledge & understanding oriented to green occupations is more employable and become an asset for businesses, enterprises and communities in developing green economies that result in improved human well-being and reducing environmental risks.

3. Overall objectives of the training course

This objectives of the training course is to developed by considering the demands of skilled and qualified welders for both domestic and international markets. The primary objectives of this training programme are to:

- Develop and enhance skill level of the incumbent in the industry.
- Impart training and provide the industry a workforce with recognized and certified job knowledge, skills and attitude.
- Reduce unemployment and poverty in the society.
- Provide opportunity to those who want to equip themselves with such knowledge and skills which shall be helpful for their employment after completing this training.
- Enable the trainees to start their own business with professional approach.
- Establish coordination among employers, workers and government agencies relating to human resource development programs.
- Provide basis of technical and vocational training reflecting the requirements of the industry.
- Capacity building of the workforce and trainers in modern competency based trainings, methodologies and processes as envisaged under NVQF.

4. Competencies to be gained after completion of course

After completing this course, the trainee will be capable of performing Competency standards, which are benchmarks for the performance, cover the commercial aspects of a welder's job. Required skills, underpinning knowledge and attitudes expected of a welder have been incorporated in these competency standards while setting standards for the performance of a welder.

5. Job opportunities available immediately and in the future

Job opportunities available immediately and in the future for the successful trainees.

- Steel manufacturing industry
- Construction industry
- Fertilizer industry
- Chemical industry
- Sugar industry
- Cement industry
- Thermal power plants
- Nuclear power plants
- Industrial projects
- PN Shipyards
- Pak Railways
- Pakistan Ordnance Factory, Wah Cantt.
- Heavy Mechanical Complex-1, Taxila
- Heavy Forge and Foundry, Taxila
- Heavy Mechanical Complex-3,Taxila
- National Scientific and Engineering commission, Pakistan
- Pakistan Atomic Energy Commission
- Pakistan International Airlines (PIA)
- Tri-forces of Pakistan

- Water and Power Development Authority (WAPDA)
- Tractor and Agricultural Equipment Industry
- Automobile industry
- Local industry
- Local metal fabrication shops
- TEVTAs
- Training Institutes
- Self-employment etc.

6. Trainee entry level

Entry requirements for this qualification is minimum Middle/Grade 8 certificate, Preferably Matric Certificate.

7. Minimum qualification of trainer

D.A.E / B. Tech. / B.E. / G-II with 3 years' experience in the field of welding.

8. Recommended trainer trainee ratio

The recommended trainer and trainee ratio per class is 1:25

9. Medium of instruction

Urdu / English

10. Curriculum Development committee

The following members participated in the Curriculum development workshop from 13 to 14 Feb 2018, in Lahore:

S.No.	Name	Organization
1.	Dr. Mirza Nadeem Baig	Pakistan Welding Institute (DACUM Facilitator)
2.	Saba Sadiq	DESCON Technical Institute, Lahore
3.	Basit Ali	Infinity College of Engineering, Lahore
4.	M. Aslam Khatak	Heavy Mechanical Complex, Taxila
5.	Malik M. Nazir Awan	Pakistan Welding Institute, Islamabad
6.	Aziz Ullah Khan	Technical Support Organization, Chashma Nuclear Power Generating Station, Kundian, Mianwali
7.	Azhar Iqbal	Heavy Mechanical Complex-3, Taxila
8.	Awais Tanoli	Heavy Mechanical Complex-3, Taxila

11. Curriculum Review committee

The following members participated in the Curriculum Review workshop from 02 to 07 Sep 2024, in Lahore:

S.No	Name	Designation	Organization
1	Mr. Ishfaq Hussain Shah	Instructor (Welding) GTTI Mianwali	P-TEVTA, Lahore
2	Engr. Hassan Ali	Instructor (Mechanical) GTVC(B), Mardan	KP-TEVTA, Peshawar
3	Engr. Kishore Kumar	Assistant Professor GCT Hyderabad	S-TEVTA, Karachi
4	Mr. Hafiz Muhammad Farooq	Trade Instructor (Welding) GTTC Darya Khan	P-TEVTA, Lahore
5	Syed Salman Nasir Ali Shah	DACUM Facilitator	P-TEVTA, Lahore
CONVENERS			
1	Muhammad Ishaq	Deputy Director	NAVTTC, Islamabad
2	Muhammad Asim	Deputy Director	NAVTTC, Islamabad
3	Shams Shahbaz	Assistant Director Operation II	P-TEVTA, Lahore
4	Engr. Hafiz Waqas Hashmi	Assistant Director Curriculum	P-TEVTA, Lahore

12. Duration of the course (total time, theory & practical)

Module.	Competency Standards	Theory Hours	Practical Hours	Total Contact Hours	Credit Hours
Module 00	Introduction to Work Ethics	3	0	3	0.3
Module 01	Perform Basic Communication Skills	12	51	63	6.3
Module 02	Maintain Safety at Workplace	12	21	33	3.3
Module 03	Prepare Materials for Welding	12	36	48	4.8
Module 04	Carry Out Gas Welding and Gas Cutting Operations	15	87	102	10.2
Module 05	Carry Out Shielded Metal Arc Welding (SMAW) in different Positions	15	114	129	12.9
Module 06	Carry Out Gas Metal Arc Welding (GMAW) in different Positions	15	114	129	12.9
Module 07	Carry Out Gas Tungsten Arc Welding (GTAW) in different Positions	15	114	129	12.9
Module 08	Carry out Flux Cored Arc Welding (FCAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions	12	54	66	6.6
Module 09	Carry Out Submerged Arc Welding (SAW)	12	48	60	6
Module 10	Develop entrepreneurship skills	38	0	38	3.8
Total		**161**	**639**	**800**	**80**

13. Summary of competency standards

The proposed curriculum is composed of 15 modules that will be covered in 1200 hours. This course should be delivered in a one-year period. The distributions of contact hours (practical & theory) are:

- Theory: (20%) Practical (80%)
- Theory: 161 hours
- Practical: 639 hours **Total**: 800 hours

14. Summary – overview of the curriculum

Module Title	Learning Units	Theory Days / hours	Work place Days / hours	Total Time frame of modules
Module 00. 0715WEL00 Introduction to Work Ethics	LU-1. Understand the Concept of Work Ethics. LU-2. Recognize the Importance of Professionalism. LU-3. Acknowledge the Impact of Work Ethics on Job Performance.	03	00	03
Module 01. 0715WEL01 Perform Basic Communication Skills	LU-1. Perform Work in Team LU-2. Deal with Clients in Workshop/Industry LU-3. Perform Basic IT Skills LU-4. Conduct Mock Interview	12	51	63
Module 02. 0715WEL02 Maintain Safety at Workplace	LU-1. Apply Personal Protective Equipment (PPE's) in Workshop LU-2. Handle Hazardous Materials as per SOP's LU-3. Operate Fire Extinguisher as per given Instructions LU-4. Apply Emergency Response in Workshop	12	21	33
Module 03. 0715WEL03 Prepare Materials for Welding	LU-1. Measure and Mark Material/s as per Drawing / Job Requirement	12	36	48

Module Title	Learning Units	Theory Days / hours	Work place Days / hours	Total Time frame of modules
	LU-2. Cut and Prepare Edge/s of Base Materials LU-3. Prepare Welding Consumables as per Job Requirement LU-4. Fit-up Base Materials as per Job Requirement			
Module 04. 0715WEL04 Carry Out Gas Welding and Gas Cutting Operations	LU-1. Perform Flame Making on Gas Welding Torch LU-2. Perform Puddle Formation and Straight Bead on Base Metal LU-3. Carry Out Gas Cutting on Base Metal LU-4. Carry out Soldering and Brazing on Base Metal LU-5. Perform Project Work as per Instructions	15	87	102
Module 05. 0715WEL05 Carry Out Shielded Metal Arc Welding (SMAW) in different Positions	LU-1. Prepare Welding Machine and accessories for SMAW LU-2. Perform Striking and Blind Bead on Base Metal LU-3. Perform Fillet Welds on Mild Steel Plates / Pipes LU-4. Perform Groove Welds on Mild Steel Plates / Pipes LU-5. Perform Post Welding Procedures	15	114	129
Module 06. 0715WEL06 Carry Out Gas Metal Arc	LU-1. Prepare Welding Machine and Accessories for GMAW LU-2. Perform Blind Bead on Base Metal	15	114	129

Module Title	Learning Units	Theory Days / hours	Work place Days / hours	Total Time frame of modules
Welding (GMAW) in different Positions	LU-3. Perform Fillet Welds on Mild Steel Plates / Pipes LU-4. Perform Groove Welds on Mild Steel Plates / Pipes LU-5. Perform Post Welding Procedures			
Module 07. 0715WEL07 Carry Out Gas Tungsten Arc Welding (GTAW) in different Positions	LU-1. Prepare Welding Machine and Accessories for GTAW LU-2. Perform Blind Bead on Base Metal LU-3. Perform Fillet Welds on Mild Steel Plates / Pipes LU-4. Perform Groove Welds on Mild Steel Plates / Pipes LU-5. Perform Post Welding Procedures	15	114	129
Module 08. 0715WEL08 Carry out Flux Cored Arc Welding (FCAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions	LU-1. Prepare Welding Machine and Accessories for FCAW LU-2. Perform Fillet Welds on Mild Steel Plates. LU-3. Perform Groove Welds on Mild Steel Plates. LU-4. Perform Post Welding Procedures	12	54	66
Module 09. 0715WEL09 Carry Out Submerged Arc Welding (SAW)	LU-1. Prepare Welding Machine and Accessories for SAW LU-2. Perform Fillet Welds on Mild Steel Plates LU-3. Perform Groove Welds on Mild Steel Plates	12	48	60

Module Title	Learning Units	Theory Days / hours	Work place Days / hours	Total Time frame of modules
	LU-4. Perform Post Welding Procedures			
Module 10. 0715WEL10 Develop entrepreneurship skills	LU-1. LU-2. LU-3. LU-4.	38	00	38
	Total Hours	**161**	**639**	**800**

15. Core Modules

MODULE 0 - 0715WEL00 - Introduction to Work

Objective: This module covers the knowledge and skills required to instill a strong understanding of the importance of professional behaviour, responsibility, and integrity in the workplace. Learners will recognize how ethical conduct influences safety, teamwork, and overall job performance, ensuring they meet industry standards and contribute positively to their work environment.

Duration: **3 Hours** **Theory:** **3 Hours** **Practice:** **0 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Understand work ethics	**Trainee will be able to:** • Understand the Concept of Work Ethics. • Recognize the Importance of Professionalism.	• Definition and importance of Work Ethics. • Professionalism in the Workplace.	Theory-3 Hrs Practical-0 Hrs Total- 3 Hrs	• White board marker • White board • Multimedia /Projector	Class Room

	• Acknowledge the Impact of Work Ethics on Job Performance.	• Impact of Work Ethics on Job Performance. • Job Roles and Career Pathways.		• Relevant videos/ photos	

MODULE 1 - 0715WEL01 - Perform Basic Communication Skills

Objective: This module covers the knowledge and skills required to apply communication skills at workplace in accordance with the organization's guidelines and procedures. You are expected to work in a team to achieve common organizational goals and avoid conflicts. This competency standard would also enable you to use basic computer skills to communicate effectively and prepare work related documents.

Duration: **63 Hours** **Theory:** **12 Hours** **Practice:** **51 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Work in Team	**Trainee will be able to:** • Treat team members with respect and maintain positive relationship to achieve common organizational goals.	• Introduction to Team Roles and Responsibilities	Theory-3 Hrs Practical-9 Hrs Total- 12 Hrs	• White board marker • White board • Multimedia /Projector • Visual Aids	Class Room and workshop

	• Listen to instructions carefully and follow them. • Adopt communication skills appropriate to work activities and company procedures. • Identify problems and resolve them through discussion and mutual agreement.	• Importance of Listening to Instructions. • Introduction to communication skills. • Language for effective communication. • Introduction to Team Performance. • Sources of conflict and their resolutions.			

		<u>Practical Activity</u>: Make a team of 3-5 trainees: 1. Each team is tasked with designing a layout for a new welding workstation for five No's of SMAW machines and two pedestal grinding machines. Considering the availability of space, equipment, and safety. 2. Discuss the problems raised during work in team.			

		3. Make a report for the Workshop Incharge.			
LU2. Deal with Clients in Workshop/ Industry	**Trainee will be able to:** • Collect and confirm work requirements from clients using Appropriate communication Procedures. • Provide clear information to clients about work requirements including costs and time needed to accomplish the task.	• Introduction and scope of Client Communication. • Client Needs and requirements. • Types of Information to Collect. • Customer Service Skills.	Theory-3 Hrs Practical-9 Hrs Total- 12 Hrs	• Data Sheets • Visual Aids	Class Room and workshop

	• Negotiate with clients regarding wages, time, labor requirements etc.	• Techniques for negotiating project terms **<u>Practical Activity</u>:** Make a team of 3-5 trainees: • Observe a role play scenario of team where client's interactions are essential and discuss appropriate responses and actions for making two No's of Tables.			
LU3. Perform Basic IT Skills	**Trainee must be able to:** • Create folders and files and learn major commands of operating system/windows.	• Introduction to the Operating System. • Major windows commands.		• Computer with relevant accessories .	Class Room and workshop

	• Type text and use major commands such as printing, editing, creating tables, header footer, footnotes, table of contents and page number etc. • Make the document as per work specifications and client's requirement. • Use internet for sending/receiving emails and connecting	• Introduction to M.S Word. • Major commands used in M.S Word document. • CV making and Application Writing in M.S Word. • Introduction to Internet browsers. • Sending/receiving of emails.	Theory-3 Hrs Practical-24 Hrs Total- 27 Hrs	• M.S Word Software	

	through social or other media.	• Overview of social media. **<u>Practical Activity</u>:** • Trainees to design the CV / Application by using M.S Word Software. • Please make sure to shut down the computers after completion of practical activity. • Switch off the lights and fans of the lab.			
LU4. Conduct Mock Interview	**Trainee must be able to** • Preparation for the Interview as per Job requirement.	• Purpose of Mock Interview. • Preparation for Mock Interview.		• White board marker • White board	Class Room and workshop

	• Set Up Professional Appearance and Etiquette for interview. • Presentation of Skills and Experience during Interview.	• Develop Interview Questions. • Conducting the Mock Interview. • Introduction to Interview Skills. **<u>Practical Activity</u>:** Conduct and observe mock interview for "welder job" by creating groups where trainees can practice answering questions in a simulated interview environment.	Theory-3 Hrs Practical-9 Hrs Total- 12 Hrs	• Questions sheet	

MODULE 02 - 0715WEL02 - Maintain Safety at Workplace

Objective: This module covers the knowledge and skills required to maintain safety at workplace in accordance with the organization's approved guidelines and procedures. You will be expected to identify and use Personal Protective Equipment (PPE) according to the job requirement and potential hazards at workplace. The underpinning knowledge regarding OSH will be sufficient to provide the basis for your work.

Duration: **33 Hours** **Theory:** **12 Hours** **Practice:** **21 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Apply Personal Protective Equipment (PPE's) in Workshop	**Trainee will be able to:** • Arrange the required personal protective equipment • Check functional condition of PPE's	• Introduction to Personal Protective Equipment (PPE's). • Types and importance of PPE's. • Inspection and Maintenance of PPE's.	Theory-3 Hrs Practical-6 Hrs Total- 9 Hrs	• Welding helmets • Safety goggles • Apron • Safety shoes • Safety gloves • Respirators	Class Room and workshop

	• Wear personal protective equipment • Store PPE at correct place after use.	• PPE's Selection and Adaptation. • Importance of Proper Storage of PPE's. • Disadvantages/ Consequences of Improper PPE's Storage. **<u>Practical Activity</u>:** • Practice of trainees to correctly put on and take off PPE's for performing welding (i.e. Helmet, Apron, Shoes, and Gloves). • Please make sure to safely store the PPE's		• Safety helmets	

		in the assigned place/rack.			
LU2. Handle Hazardous Materials as per SOP's	**Trainee will be able to:** • Identify Hazardous Materials and Interpret Safety Data Sheets (SDS). • Comply Safe Handling Procedures and storage Protocols	• Introduction to Hazardous Materials. • Common hazardous materials in welding shop. • Significance and structure of Safety Data Sheets (SDS). • Standard Operating Procedures (SOPs) in Safe Handling and Storage Procedures. • Spill and Leak Management.	Theory-3 Hrs Practical-6 Hrs Total- 9 Hrs	• SOPs Charts • Regulatory Charts • Safety Data Sheets(SDS) • Visual Aids	Class Room and workshop

	• Identify Spill and Leak Procedures and Waste Disposal of Hazardous Materials	• Waste Disposal Procedures. **<u>Practical Activity</u>:** Make a team of 3-5 trainees: • Trainees to Identify and categorize hazardous materials commonly used in welding, including lifting, transferring, and transporting.			
LU3. Operate Fire Extinguisher as per given Instructions	**Trainee must be able to:** • Select fire extinguisher based on the type and size of the fire.	• Introduction to Fire Safety. • Types of Fire Extinguishers.	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs	• Fire Extinguisher • Visual Aids	Class Room and workshop

	• Check expiry of fire extinguisher • Apply appropriate fire extinguishing technique such as using the PASS method (Pull, Aim, Squeeze, Sweep) for extinguishing the small fire.	• Maintenance of Fire Extinguishers. • PASS Technique of Fire Extinguishers. **<u>Practical Activity</u>:** Engage the trainees in simulated fire situations where they must choose the correct extinguisher and operate it according to the given instructions.			
LU4. Apply Emergency Response in Workshop	**Trainee must be able to** • Take emergency response training	• Introduction to Workshop Hazards. • Emergency Response Protocols.	Theory-3 Hrs Practical-6 Hrs Total- 9 Hrs	• First Aid Box With necessary medicines, i.e.	Class Room and workshop

	• Assess risk and determine course of action • Operate emergency equipment and supplies • Use First Aid Box in emergency as per set standards.	• Potential risks associated with welding tasks. • Safety measures and actions to mitigate risks. • Emergency Communication. • Evacuation Procedures. • First aid box and their uses. • First Aid in the Workshop. **<u>Practical Activity</u>:**		bandages, pyodine, sunny plast, burn gel etc. • Hearing Protection • Respiratory Mask • First Aid Box • Stretcher • Fire Buckets • Fire Extinguisher	

		Make a team of 3-5 trainees: • Practice using first aid supplies correctly (e.g., applying bandages, using burn gel).			

MODULE 03 - 0715WEL03 - Prepare Material for Welding

Objective: This module covers the knowledge and skills required to prepare materials for a specific job. The standard covers specific knowledge of marking the material as per drawing/job requirement, setting up cutting equipment, cutting and preparing edges of base materials, cleaning surfaces and edges, preparing welding consumables and fitting up base materials.

Duration: **48 Hours** **Theory:** **12 Hours** **Practice:** **36 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Measure and Mark Material/s as per Drawing / Job Requirement	**Trainee will be able to:** • Select and obtain required material/s as per job. • Select correct measuring tools as per job requirements.	• Materials Properties and specifications. • Purpose of measurement. • Types of Measuring Tools.	Theory-3 Hrs Practical-6 Hrs Total- 9 Hrs	• Steel foot rule • Steel Tape • Vernier Caliper • Vernier Height Gauge • Scriber	Class Room and workshop

	• Select correct marking tools as per job requirements. • Mark the area to be cut as per drawing / job requirements.	• Tool Calibration and Maintenance. • Marking tools and their purposes. • Criteria for selecting marking tools. • Techniques for marking materials. • Introduction to drawings and specifications. • Transfer measurements from drawing to work piece.			

		• Mark the specified area to be cut as per drawing. **Practical Activity:** Trainees to perform measurement on Steel foot rule, steel tape, Vernier caliper, Vernier Height gauge.			
LU2. Cut and Prepare Edge/s of Base Materials	**Trainee will be able to:** • Select correct cutting equipment as per job requirements. • Set-up cutting equipment as per manufacturer's Instructions / job requirements.	• Types of cutting equipment. • Set up cutting equipment.	Theory-3 Hrs Practical-18 Hrs Total- 21 Hrs	• Pedestal Drill Machine with accessories • Flat File • Line Scriber	Class Room and workshop

	• Cut the base material as per job specifications and dimensions provided in the drawing. • Prepare edges of the base materials as per Drawing / WPS. • Check dimensions of the prepared edges as per Drawing / WPS.	• Appropriate cutting method for base material. • Techniques for edges preparation of base materials. • Check dimensions and measurement results. • Edge cleaning requirements.		• Center Punch • Hammer • Counter Sink • Counter Bores • Tap & Die Set • Hand Hack Saw	

	• Clean the edges of the base materials as per job requirements.	• Techniques for edge cleaning. **<u>Practical Activity</u>:** Trainees to perform practice on M.S plate (Dimension: 80mm x 60mm x 15mm) including Filing, Marking, Center Punching, Drilling, Counter Sinking, Counter Boring, Threading, Sawing operations.			
LU3. Prepare Welding Consumables as per Job Requirement	**Trainee must be able to:** • Select correct welding consumables as per job requirements / WPS.	• Introduction to welding consumables.	Theory-3 Hrs Practical-6 Hrs Total- 9 Hrs	• Flat File • Hammer • Hand shear • Scriber • Try square	Class Room and workshop

	• Prepare consumables in accordance with required Specifications. • Dispose Defective Consumables in accordance with Green practices i.e. Recycle, Reuse defective metal pieces.	• Types and specifications of welding consumables • Introduction to green practices • Recycle and reuse defective metal pieces. **<u>Practical Activity</u>:** • Trainees to prepare base metal from M.S plate as per instructions/drawing including Leveling,		• Hand Grinder • Beveling Machine	

		Mill scale, Squaring, Beveling. • Make Recycling bins from scrap metal pieces. • Make scrapers from metal sheets.			
LU4. Fit-up Base Materials as per Job Requirement	**Trainee must be able to** • Select required tools and equipment to fit-up base materials. • Tack weld joint/s as per drawing / welding procedure Specifications (WPS).	• Tools and equipment for fit-up. • Work area and materials for tack welding. • Welding techniques for tacking.	Theory-3 Hrs Practical-6 Hrs Total- 9 Hrs	• Hammer • Rivet Gun • Bevel Protractor • Welding Gauges	Class Room and workshop

	• Verify root gap as per drawing / welding procedure Specifications (WPS). • Verify alignment as per applicable code / standard.	• Importance of root gap • Tools and Equipment for Measuring Root Gap • Importance of welding alignment. • Alignment verification **<u>Practical Activity</u>:** Trainees to perform Tacking and checking of root gap of base metal prepared from M.S plate.			

MODULE 04 - 0715WEL04 - Carry Out Gas Welding And Gas Cutting Operations

Objective: This module covers the knowledge and skills required to This competency standard is designed for gain hands-on experience in striking arcs, creating clean cuts, and producing quality welds, along with understanding the importance of maintenance and troubleshooting techniques. Upon completion, participants will be proficient in executing gas welding and cutting operations to industry standards.

Duration: **102 Hours** **Theory:** **15 Hours** **Practice:** **87 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Flame Making on Gas Welding Torch	**Trainee will be able to:** • Inspect welding torch and components for damage or wear. • Identify Gas cylinders and Acetylene cylinders.	• Introduction to gas welding torch. • Components and functions of gas welding torch. • Purpose of gas cylinders in welding.	Theory-3 Hrs Practical-9 Hrs Total- 12 Hrs	• Oxy-Acetylene Gas Welding Plant with all Accessories. • Gas Welding Table with Fire Brick • Tip Cleaner	Class Room and workshop

	• Make Weld Flames on Welding/Cutting Torch. • Adjust the flame to achieve a neutral, carburizing, or oxidizing flame as required.	• Comparison between Oxygen and Acetylene cylinders. • Handling and Storage of Gas Cylinders • Types of welding flames: • Ignite welding/cutting torch. • Flame adjustment techniques. • Impact of flame type on weld quality.		• Spark Lighter	

		<u>Practical Activity</u>: Trainees to perform the flame making on a gas welding torch to achieve the desired flame (Neutral, Oxidizing, and Carburizing) characteristics for Oxy-Acetylene gas welding.			
LU2. Perform Puddle Formation and Straight Bead on Base Metal	**Trainee will be able to:** • Demonstrate strike arc consistently on base metal. • Maintain stable weld puddle by controlling the arc length, travel speed, and heat input.	• Base metal for welding operation • Strike and Control the Arc • Concept of welding puddle in gas welding. • Factors affect weld puddle stability.	Theory-3 Hrs Practical-18 Hrs Total- 21 Hrs	• Oxy-Acetylene Gas Welding Plant with all Accessories. • Gas Welding Table with Fire Brick • Tip Cleaner	Class Room and workshop

	• Identify and address common weld defects, making necessary adjustments to techniques.	• Common welding defects. • Techniques for preventing weld defects. **<u>Practical Activity</u>:** Trainees to perform puddle formation on M.S plate of size 3mm thick.		• Spark Lighter • Hammer • Center Punch • Line Scriber • Flat File	
LU3. Carry Out Gas Cutting on Base Metal	**Trainee must be able to:** • Ignite and Adjust Welding torch / Cutting torch. • Perform Oxy-Acetylene Gas Cutting M.S Plate.	• Inspection of welding/cutting torch • Oxy-Acetylene gas cutting.	Theory-3 Hrs Practical-12 Hrs Total- 15 Hrs	• Oxy-Acetylene Gas Cutting Plant with all Accessories. • Gas Cutting Table with Fire Brick	Class Room and workshop

	• Follow operational Instructions of cutting torch • Identify and prepare base metal for cutting. • Identify and address common defects, such as beveling or excessive dross.	• Oxy-Acetylene gas cutting operation on MS Plate • Operational Instructions of cutting torch. • Base metal properties • Base Metal Selection for Cutting • Common welding defects. • Techniques to address beveling or excessive dross issues.		• Tip Cleaner • Spark Lighter • Hand Vice • Leather Gloves • Leather Apron • Safety Shoes	

		Practical Activity: Trainees to perform gas cutting on M.S plate. (Dimensions: 150mm x 75mm x 12mm) or as per instructions. • Collect and properly dispose of or recycle welding wastes, such as metal scraps and used consumables.			
LU4. Carry out Soldering and Brazing on Base Metal	**Trainee must be able to:** • Select correct soldering and brazing equipment and materials (solder, flux, brazing rods).	• Soldering and brazing equipment • Solder / flux materials and brazing rods.	Theory-3 Hrs Practical-24 Hrs Total- 27 Hrs	• Oxy-Acetylene Gas Welding Plant with all Accessories	Class Room and workshop

	• Perform Soldering on different Metals as per requirement and standard procedures. • Perform Brazing on different Metals as per requirement and standard procedures. • Inspect the soldered or brazed joints for uniformity, smoothness, and the absence of defects such as voids or cracks.	• Introduction to Soldering • Types of metals used in soldering • Soldering techniques • Brazing principles • Material identification and suitability for brazing • Brazing procedures on metals • Common defects in joints • Inspection tools and equipment • Corrective measures for defective joints		• Gas Welding Table with Fire Brick • Soldering Iron 450 Watt With Stand • Brass Filler Rod • Leather Gloves • Gas Welding Goggle • Safety Shoes • Leather Apron	

		<u>Practical Activity</u>: Trainees to perform Butt/Lap/T joints by soldering and brazing on mild steel (M.S) plates (specified thickness and dimensions as per instructions), demonstrating proper techniques, safety measures, and inspection methods. • Collect and properly dispose of or recycle welding wastes, such as metal scraps and used consumables.		• Tong • Tip Cleaner • Wire Brush • Spark Lighter • Hand Vice	

LU5. Perform Project Work as per Instructions	**Trainee must be able to:** • Perform Puddle formation from M.S Plate. • Perform Brazing on Lap/Butt joint from M.S Plate.	• Introduction to puddle formation • Tools and equipment for puddle formation. • Introduction to Lap and Butt joint. • Brazing procedure on Lap/Butt joint from M.S plate **<u>Practical Activity</u>:** 1. Trainees to perform the gas welding on Lap/Butt/T joint from M.S plate and M.S pipe considering appropriate procedure.	Theory-3 Hrs Practical-24 Hrs Total- 27 Hrs	• Oxy-Acetylene Gas Welding Plant with all Accessories. • Gas Welding Table with Fire Brick • Tip Cleaner • Spark Lighter • Hand Vice • Leather Gloves • Leather Apron • Safety Shoes	Class Room and Workshop

MODULE 05 - 0715WEL05 - Carry Out Shielded Metal Arc Welding (SMAW) in different Positions

Objective: This module covers the knowledge and skills required to This Competency Standard is designed to gain basic knowledge and skills required to perform Shielded Metal Arc Welding (SMAW) operations in Flat (1F, 1G), Horizontal (2F, 2G), Vertical (3F, 3G), Overhead (4F, 4G) and Pipe Welding (5F, 5G, 6G) positions at workplace. The standard covers specific knowledge of performing Shielded Metal Arc Welding (SMAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in positions of plate/Pipe. The standard also covers post welding Procedures comprising cleaning, measuring, inspecting and repairing welds at workplace.

Duration: **129 Hours** **Theory:** **15 Hours** **Practice:** **114 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare Welding Machine and Accessories for SMAW	**Trainee must be able to:** • Identify welding requirements, welding procedure specifications and/or technical drawings.	• Job requirements as per WPS/drawings	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs	• SMAW power source with all accessori	Class Room and workshop

	• Prepare SMAW welding machine in accordance with welding procedure specifications/ manufacturer instructions. • Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer's instructions.	• Introduction and types of SMAW power source. • SMAW power source accessories • Current setting as per job requirement • Welding output current AC/DC • Classification of SMAW electrodes		es • Mild steel plates • SMAW electrodes • Electrode backing oven • Angle cutting Machine/ Cut off Machine • Grinder • Cutting discs • Grinding discs • Bevelling machine • Chipping hammer • MS wire brush	

	• Set polarity indicated in the welding procedure specifications.	• Polarity, Types and uses **<u>Practical Activity</u>:** Trainees to identify the parts and accessories of the SMAW machine.		• Fume extractors • Exhaust fans • Pencil Grinder • WPS/ instruction sheet • Welding tables • Jigs and fixtures • Fire Blankets Lights / Emergency Lights	
LU2. Perform Striking and Blind Bead on Base Metal	**Trainee will be able to:** • Use the correct striking technique to avoid sticking the	• Principles of arc striking and blind bead welding.	Theory-3 Hrs Practical-18 Hrs Total- 21 Hrs	• SMAW power source with all accessori	Class Room and workshop

	electrode to the base metal. • Adjust the arc length as needed to avoid excessive spatter and achieve a smooth weld bead. • Produce uniform bead with consistent width and height along the weld path.	• Techniques for striking an arc. • Concept of arc length in welding. • Relationship between arc length, spatter, and bead quality. • Factors effecting a uniform weld bead. **Practical Activity:** Trainees to perform striking of electrode on base metal and make blind bead on M.S plate.		es • Mild steel plates • SMAW electrodes • Electrode backing oven • Angle cutting Machine/ Cut off Machine • Grinder • Cutting discs • Grinding discs • Chipping hammer • MS wire brush • Fume extractors	

		select welding rods and other materials that have lower environmental impact.		• Exhaust fans • Pencil Grinder • WPS/ instruction sheet • Welding tables	
LU3. Perform Fillet Welds on Mild Steel Plates / Pipes	**Trainee must be able to:** • Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld. • Maintain gap between electrode	• Welding parameters' adjustment. • Effects of Arc Length • Striking the arc and	Theory-3 Hrs Practical-45 Hrs Total- 48 Hrs	• Mild steel plates • SMAW electrodes • Electrode backing oven • Grinder • Angle cutting Machine/ Cut off Machine • Cutting discs	Class Room and workshop

	and base metal as per standard practices. • Carry out welding in different positions on Mild steel plates/pipes as per standard procedures and according to given requirements • Make Project work as per instruction.	maintaining the arc gap • Standard procedure for fillet weld on mild steel plate and pipe in 1F, 2F, 3F, 4F and 5F positions. • Visual Inspection • Acceptance criteria for welding defects **Practical Activity:** Make a fillet weld (Butt/Lap/T-joint) in 1F, 2F, 3F, 4Fand 5F		• Grinding discs • Chipping hammer • MS wire brush • File set • Tongs • Combination Plier • Grip Plier/Burner Plier • Ear plugs • Fume extractors • Exhaust fans • WPS/ instruction sheet	

		positions with SMAW Process.		• Welding tables • Jigs and fixtures • Fire Blankets • Fire Extinguishers • Cotton gloves • Leather apron • Welding gloves • Welding helmet • Safety goggles • Safety helmet • Safety shoes • Set of nose pliers	

				• Set of screw drivers	
LU4. Perform Groove Welds on Mild Steel Plates / Pipes	**Trainee must be able to:** • Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld. • Maintain gap between electrode and base metal as per standard practices.	• Welding parameters' adjustment. • Gap between electrode and base metal. • Standard procedure for groove weld on	Theory-3 Hrs Practical-45 Hrs Total- 48 Hrs	• Mild steel plates • SMAW electrodes • Electrode backing oven • Grinder • Angle cutting Machine/ Cut off Machine • Cutting discs • Grinding discs • Chipping hammer • MS wire	Class Room and workshop

	• Carry out welding in different positions on Mild steel plates/pipes as per standard procedures and according to given requirements • Deposit root pass, filling passes and capping pass as per welding procedure specifications/job requirements. • Make Project work as per instruction.	mild steel plate and pipe in 1G, 2G, 3G, 4G, 5G and 6G positions. • Root face, root gap and root pass • Hot pass • Filling pass • Capping pass • Weaving and stringer technique • Carry out visual Inspection		brush • File set • Tongs • Combination Plier • Grip Plier/Burner Plier • Ear plugs • Fume extractors • Exhaust fans • WPS/ instruction sheet • Welding tables • Jigs and fixtures	

	• Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects	• Acceptance criteria for welding defects **<u>Practical Activity</u>:** • Make a groove weld (Butt-joint) in 1G, 2G, 3G, 4G, 5G and 6G positions with SMAW process			
LU5. Perform Post Welding Procedures	**Trainee must be able to:** • Inspect weld visually and mark any visual defects, as required. • Carry out repair work in accordance with	• Introduction to welding defects • Types of welding defects,causes and remedies • Methods of welding repairing.	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs	• Penetrants spray • Inspection tools	Class Room and Workshop

	approved procedures, as required. • Maintain and store tools / equipment / consumable materials in accordance with organization guidelines. • Apply 6 R's as per Green practices	• Clean the work area • Occupational safety practice at the workplace • Organization's/ workshop guidelines for storing tools, equipment and consumablematerials. **Practical Activity:** Trainees to perform visual inspection of the welded job, and mark any visual defects if occurred.			

MODULE 06 - 0715WEL06 - Carry Out Gas Metal Arc Welding (GMAW) in Different Positions

Objective: This module covers the knowledge and skills required to perform Gas Metal Arc Welding (GMAW) operations in Flat (1F, 1G), Horizontal (2F, 2G), Vertical (3F, 3G), Overhead (4F, 4G) and Pipe Welding (5F, 5G, 6G) positions at workplace. The standard covers specific knowledge of performing Gas Metal Arc Welding (GMAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in positions of plate/Pipe. The standard also covers post welding Procedures comprising cleaning, measuring, inspecting and repairing welds at workplace.

Duration: **129 Hours** **Theory:** **15 Hours** **Practice:** **114 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare Welding Machine and Accessories for GMAW	**Trainee will be able to:** • Identify welding requirements, welding procedure specifications and/or technical drawings. • Prepare GMAW welding machine in	• Welding requirements as per WPS/technical drawings • Introduction to	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs	• GMAW power source with all accessories • Mild steel plates • GMAW	Class Room and workshop

	accordance with welding procedure specifications/ manufacturer instructions. • Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer's instructions. • Set polarity indicated in the welding procedure specifications.	GMAW power source • GMAW power source accessories • Current and voltage setting as per job requirement • MIG wire as per job requirement • Polarity and its types • Uses of polarity		electrodes • Electrode backing oven • Angle cutting Machine/ Cut off Machine • Grinder • Cutting discs • Grinding discs • Bevelling machine • Chipping hammer • MS wire brush • Fume extractors	

		<u>Practical Activity</u>: Trainees to identify the parts and accessories of the GMAW machine.		• Exhaust fans • Pencil Grinder • WPS/ instruction sheet • Welding tables • Jigs and fixtures • Fire Blankets • Lights/ Emergency lights	
LU2. Perform Blind Bead on Base Metal	**Trainee will be able to:** • Adjust arc length as needed to avoid excessive spatter and achieve a smooth weld bead.	• Arc length in welding. • Relationship between arc length, spatter, and bead quality.	Theory-3 Hrs Practical-18 Hrs Total- 21 Hrs		Class Room and workshop

	• Produce uniform bead with consistent width and height along the weld path.	• Factors for uniform weld bead. • Concept of maintaining width and height throughout the weld path. **<u>Practical Activity</u>:** Trainees to perform striking of electrode on base metal and make blind bead on M.S plate.			
LU3. Perform Fillet Welds on Mild Steel Plates / Pipes	**Trainee must be able to:** • Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job	• Current and Voltage setting as per job requirement	Theory-3 Hrs Practical-45 Hrs Total- 48 Hrs		Class Room and workshop

	requirements to produce acceptable weld. • Maintain gap between electrode and base metal as per standard practices. • Carry out welding in different positions on Mild steel plates/pipes as per standard procedures. • Make Project work as per instruction.	• Effects of Arc Length • Striking the arc and maintain the arc gap. • Introduction to Fillet weld on mild steel in 1Fand 2F positions • Terms used in making project work • Visual Inspection			

	• Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects	• Acceptance criteria for welding defects **<u>Practical Activity</u>:** • Make a fillet weld (T-joint) in 1Fand 2F positions with GMAW process. • Set the wire feed speed correctly to minimize wastage. Use only the amount of welding wire needed for the job.			
LU4. Perform Groove Welds on Mild Steel Plates / Pipes	**Trainee must be able to:** • Adjust welding parameters (current, voltage	• Welding parameters	Theory-3 Hrs Practical-45 Hrs Total- 48 Hrs		Class Room and workshop

	etc.) as per welding procedure specifications/job requirements to produce acceptable weld. • Maintain gap between electrode and base metal as per standard practices. • Carry out welding in different positions on Mild steel plates/pipes as per standard procedures and	• Effects of Arc Length • Striking of arc on base metal • Maintaining the arc gap • Overview of groove weld on mild steel plate and pipe in 1G, 2G, 3G, 4G, 5G and 6G positions.			

	according to given requirements • Deposit root pass, filling passes and capping pass as per welding procedure specifications/job requirements. • Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects • Make Project work as per instruction.	• Root face, root gap and root pass • Hot pass, Filling pass and Capping pass. • Visual Inspection • Criteria for welding defects • Weaving and stringer technique **<u>Practical Activity</u>:**			

		Make a groove weld (Butt-joint) in 1G, 2G, 3G, 4G, 5G and 6G positions with GMAW process			
LU5. Perform Post Welding Procedures	**Trainee must be able to:** • Carry out finishing work of welds following standard procedures. • Inspect weld visually and mark any visual defects, as required. • Carry out repair work in accordance with approved procedures, as	• Introduction to welding defects • Types of welding defects,causes and remedies • Types of visual defects. • Methods for welding repair	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs		Class Room and Workshop

	required. • Maintain and store tools/equipment/ consumable materials in accordance with organization guidelines. • Apply 6 R's as per Green practices.	• Occupational safety practice at the workplace • Organization's/ workshop guidelines for storing tools, equipment and consumablematerials **Practical Activity** Trainees to perform visual inspection of the welded job, and mark any visual defects if occurred.			

MODULE 07 - 0715WEL07 - Carry Out Gas Tungsten Arc Welding (GTAW) in different Positions

Objective: This module covers the knowledge and skills required to This Competency Standard is designed to gain basic knowledge and skills required to perform Gas Tungsten Arc Welding (GTAW) operations in Flat (1F, 1G), Horizontal (2F, 2G), Vertical (3F, 3G), Overhead (4F, 4G) and Pipe Welding (5F, 5G, 6G) positions at workplace. The standard covers specific knowledge of performing Gas Tungsten Arc Welding (GTAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in positions of plate/Pipe. The standard also covers post welding Procedures comprising cleaning, measuring, inspecting and repairing welds at workplace.

Duration: **129 Hours** **Theory:** **15 Hours** **Practice:** **114 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare Welding Machine and Accessories for GTAW	**Trainee must be able to:** • Identify welding requirements, welding procedure specifications and/or technical drawings.	• Job requirements in workshop • Introduction to	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs	• GTAW power source with all accessories • Mild steel	Class Room and workshop

	• Prepare GTAW welding machine in accordance with welding procedure specifications/ manufacturer instructions. • Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer's instructions. • Set polarity indicated in the welding procedure specifications.	GTAW power source • GTAW power source accessories • Current setting • Cored/tubular wire as per job requirement • Define of Polarity • Types of polarity and its uses		plates • • GTAW electrodes • Electrode backing oven • Angle cutting Machine/ Cut off Machine • Grinder • Cutting discs • Grinding discs • Bevelling machine • Chipping hammer • MS wire	

		Practical Activity: Trainees to identify the parts and accessories of the GTAW machine.		brush • Fume extractors • Exhaust fans • Pencil Grinder • WPS/ instruction sheet • Welding tables • Jigs and fixtures • Fire Blankets • Lights/ Emergency lights	
LU2. Perform Blind	**Trainee will be able to:** • Adjust arc length as needed to avoid	• Concept of arc length in welding.	Theory-3 Hrs Practical-18 Hrs Total- 21 Hrs	• Mild steel plates • GTAW	Class Room and workshop

Bead on Base Metal	excessive spatter and achieve a smooth weld bead. • Produce uniform bead with consistent width and height along the weld path.	• Relationship between arc length, spatter, and bead quality. • Factors that contribute to producing a uniform weld bead. **<u>Practical Activity</u>:** • Trainees to perform striking of electrode on base metal and make blind bead on M.S plate.		electrodes • Electrode backing oven • Grinder • Angle cutting Machine/ Cut off Machine • Cutting discs • Grinding discs • Bevelling machine • Chipping hammer • MS wire brush • File set • Tongs	

				• Combination Plier • Grip Plier/Burner Plier • Ear plugs • Fume extractors • Exhaust fans • Pencil Grinder • WPS/ instruction sheet • Welding tables • Jigs and fixtures • Fire	

				Blankets • Fire Extinguishers • Cotton gloves • Leather apron • Welding gloves • Welding helmet • Safety goggles • Safety helmet • Safety shoes • Set of nose pliers	

				• Set of screw drivers	
LU3. Perform Fillet Welds on Mild Steel Plates / Pipes	**Trainee will be able to:** • Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld. • Maintain gap between electrode and base metal as per standard practices. • Carry out welding in different positions on Mild steel plates/pipes	• Current and Voltage setting as per job requirement • Effects of Arc Length • Striking the arc and maintainingthe arc gap • Overview of Fillet weld on mild steel in	Theory-3 Hrs Practical-45 Hrs Total- 48 Hrs		Class Room and workshop

	as per standard procedures and according to given requirements. • Make Project work as per instruction. • Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects	1Fand 2F positions • Terms in making project work • Visual Inspection • Acceptance criteria for welding defects **<u>Practical Activity</u>:** Make a fillet weld (T-joint) in 1Fand 2F positions with GTAW process..			

		Use the correct size and type of tungsten electrode for the job. Sharpen electrodes properly to avoid wastage and ensure optimal performance.			
LU4. Perform Groove Welds on Mild Steel Plates / Pipes	**Trainee must be able to:** • Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld.	• Current setting as per job requirement • Effects of Arc Length	Theory-3 Hrs Practical-45 Hrs Total- 48 Hrs		Class Room and workshop

	• Maintain gap between electrode and base metal as per standard practices. • Carry out welding in different positions on Mild steel plates/pipes as per standard procedures. • Deposit root pass, filling passes and capping pass as per welding procedure specifications/job requirements.	• Striking the arc and maintaining the arc gap • Introduction of groove weld on mild steel plate and pipe in 1G, 2G, 3G, 4G, 5G and 6G positions. • Root face, root gap and root pass • Hot pass, Filling pass and Capping pass			

	• Make Project work as per instruction. • Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects	• Weaving and stringer technique • Visual Inspection • Acceptance criteria for welding defects **Practical Activity:** Make a groove weld (Butt-joint) in 1G, 2G, 3G, 4G, 5G and 6G positions with GTAW process.			

LU5. Perform Post Welding Procedures	**Trainee must be able to:** • Carry out finishing work of welds following standard procedures. • Inspect weld visually and mark any visual defects, as required. • Carry out repair work in accordance with approved procedures, as required.	• Introduction to welding defects • Types of welding defects,causes and remedies • Types of visual defects. • Methods for welding repair	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs		Class Room and Workshop

	• Maintain and store tools/equipment/ consumable materials in accordance with organization guidelines. • Apply 6 R's as per Green practices	• Occupational safety practice at the workplace • Organization's / workshop guidelines for storing tools, equipment and consumable materials **Practical Activity:** Trainees to perform visual inspection of the welded job, and mark any visual defects if occurred.			

MODULE 08 - 0715WEL08 - Carry out Flux Cored Arc Welding (FCAW) in Flat (1F, 1G) and Horizontal (2F, 2G) Positions

Objective:

This module covers the knowledge and skills required to prepare perform Flux Cored Arc Welding (FCAW) operations at workplace. The standard covers specific knowledge of performing Flux Cored Arc Welding (FCAW) by selecting and setting up welding equipment, installing consumables, adjusting welding parameters and making fillet and groove welds in Flat (1F, 1G) and Horizontal (2F, 2G) Positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace.

Duration: **66 Hours** **Theory:** **12 Hours** **Practice:** **54 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare Welding Machine and Accessories for FCAW	**Trainee will be able to:** • Identify welding requirements from the job, welding procedure specifications and/or technical drawings.	• Welding requirements as per WPS/technical drawings	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs	• FCAW power source with all accessories	Class Room and workshop

	• Prepare FCAW welding machine in accordance with welding procedure specifications/manufacturer instructions • Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions • Set polarity indicated in the welding procedure specifications.	• Introduction to FCAW power source • FCAW power source accessories • Current and voltage setting as per job requirement • Flux-Cored wire Selection as per job requirement • Define of Polarity • Types of polarity and		• Mild steel plates • FCAW electrodes • Electrode backing oven • Angle cutting Machine/ Cut off Machine • Grinder • Cutting discs • Grinding discs • Bevelling machine • Chipping hammer • MS wire	

		its uses **<u>Practical Activity</u>:** Trainees to identify the parts and accessories of the GTAW machine.		brush • Fume extractors • Exhaust fans • Pencil Grinder • WPS/ instruction sheet • Welding tables • Jigs and fixtures • Fire Blankets • Lights/ Emergency lights	
LU2. Perform Fillet Welds	**Trainee will be able to:** • Adjust welding parameters (current,	• Current and Voltage setting as per job	Theory-3 Hrs Practical-24 Hrs	• Mild steel plates • FCAW	Class Room and workshop

on Mild Steel Plates	voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld. • Maintain gap between electrode and base metal as per standard practices. • Carry out welding in Flat (1F) and Horizontal (2F) positions following standard procedures.	requirement • Effects of Arc Length • Striking the arc and maintainingthe arc gap • Standard procedure used to fillet weld on mild steel in 1Fand 2F positions	Total- 27 Hrs	electrodes • Electrode backing oven • Grinder • Angle cutting Machine/ Cut off Machine • Cutting discs • Grinding discs • Bevelling machine • Chipping hammer • MS wire brush • File set • Tongs	

	• Make Project work as per instruction. • Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects	• Terms in making project work • Visual Inspection • Criteria for welding defects **Practical Activity:** • Make a fillet weld (T-joint) in 1Fand 2F positions with FCAW process. Use the appropriate type and size of flux-cored wire for the welding job to minimize waste and ensure effective use of materials.		• Combination Plier • Grip Plier/Burner Plier • Ear plugs • Fume extractors • Exhaust fans • Pencil Grinder • WPS/ instruction sheet • Welding tables • Jigs and fixtures • Fire	

				Blankets • Fire Extinguishers • Cotton gloves • Leather apron • Welding gloves • Welding helmet • Safety goggles • Safety helmet • Safety shoes • Set of nose pliers	

				• Set of screw drivers	
LU3. Perform Groove Welds on Mild Steel Plates.	**Trainee must be able to:** • Adjust welding parameters (current, voltage etc.) as per welding procedure specifications/job requirements to produce acceptable weld. • Maintain gap between electrode and base metal as per standard practices.	• Current setting as per job requirement • Effects of Arc Length • Striking the arc and maintaining the arc gap	Theory-3 Hrs Practical-24 Hrs Total- 27 Hrs		Class Room and workshop

	• Carry out welding in Flat (1G) And Horizontal (2G) positions following standard procedures. • Deposit root pass, filling passes and capping pass as per welding procedure specifications/job requirements. • Make Project work as per instruction.	• Introduction to Groove weld on mild steel plate and pipe in 1G and 2G positions. • Proper Fit up as per requirement • Root face, root gap and root pass • Hot pass, filling pass and Capping pass • Weaving and stringer technique			

	• Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects	• Visual Inspection • Acceptance criteria for welding defects **<u>Practical Activity</u>:** Make a groove weld (Butt-joint) in 1G and 2G positions with FCAW process			
LU4. Perform Post Welding Procedures	**Trainee must be able to:** • Carry out finishing work of welds following standard procedures. • Inspect weld visually and mark	• Introduction to welding defects • Types of welding defects,causes and remedies • Types of visual defects.	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs		Class Room and workshop

	any visual defects, as required. • Carry out repair work in accordance with approved procedures, as required. • Maintain and store tools/equipment/consumable materials in accordance with organization guidelines. • Apply 6 R's as per Green practices.	• Methods for welding repair • Occupational safety practice at the workplace • Organization's/workshop guidelines for storing tools,			

		equipment and consumable materials **<u>Practical Activity</u>:** Trainees to perform visual inspection of the welded job, and mark any visual defects if occurred.			

MODULE 09 - 0715WEL09 - Carry Out Submerged Arc Welding (SAW)

Objective:

This module covers the knowledge and skills required to gain basic knowledge and skills required to perform Submerged Arc Welding (SAW) operations at workplace. The standard covers specific knowledge of performing Submerged Arc Welding (SAW)) by selecting and setting up welding equipment, installing consumables, adjusting and welding parameters and making fillet and groove welds at different positions of plate. The standard also covers post welding operations comprising cleaning, measuring, inspecting and repairing welds at workplace

Duration: **60 Hours** **Theory:** **12 Hours** **Practice:** **48 Hours**

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Prepare Welding Machine and Accessories for SAW	**Trainee will be able to:** • Identify welding requirements from the job, welding procedure specifications and/or technical drawings.	• Job requirements as per WPS/technical drawings	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs	• SAW power source with all accessories • Wire spool	Class Room and workshop

	• Prepare SAW welding machine in accordance with welding procedure specifications/manufacturer instructions. • Set up welding machine accessories and consumables as per job requirements, welding procedure specifications and/or manufacturer instructions. • Set polarity indicated in the welding procedure specifications.	• Introduction to SAW power source and its types • SAW power source accessories • Current and voltage setting as per job requirement • Selection of cored/tubular wire as per job requirement • Define of Polarity • Types of polarity and its uses		for SAW • Granular Flux • Mild steel plates • M.S Pipe • Angle cutting Machine/ Cut off Machine • Grinder • Cutting discs • Grinding discs • Bevelling machine • Chipping hammer • Pencil	

		<u>Practical Activity</u>: Trainees to identify the parts and accessories of the SAW machine.		Grinder • WPS/ instruction sheet	
LU2. Perform Fillet Welds on Mild Steel Plates	**Trainee will be able to:** • Adjust welding parameters (current, voltage, wire feed speed, welding speed etc.) as per welding procedure specifications/job requirements to produce acceptable Weld.	• Current and Voltage setting as per job requirement	Theory-3 Hrs Practical-24 Hrs Total- 27 Hrs	• SAW power source with all accessories • Wire spool for SAW • Granular Flux • Mild steel plates • M/S Pipe	Class Room and workshop

	• Maintain gap between electrode and base metal as per standard practices • Carry out welding in 1F position following standard procedures. • Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects	• Effects of Arc Length • Striking the arc and maintainingthe arc gap • Introduction of fillet weld on mild steel in 1Fand 2F positions • Visual Inspection • Acceptance criteria for welding defects **<u>Practical Activity</u>:** • Make a fillet weld (T-joint) in 1Fand 2F positions with SAW process.		• Angle cutting Machine/ Cut off Machine • Grinder • Cutting discs • Grinding discs • Bevelling machine • Chipping hammer • Pencil Grinder • WPS/ instruction sheet	

		Set the correct welding parameters (voltage, current, and travel speed) based on the material and thickness to optimize energy use and prevent overheating.			
LU3. Perform Groove Welds on Mild Steel Plates.	**Trainee must be able to:** • Adjust welding parameters (current, voltage, wire feed Speed, Welding speed etc.) as per welding procedure Specifications / job Requirements to produce acceptable Weld.	• Current setting as per job requirement	Theory-3 Hrs Practical-18 Hrs Total- 21 Hrs	• SAW power source with all accessories • Wire spool for SAW • Granular Flux • Mild steel plates	Class Room and workshop

	• Maintain gap between electrode and base metal as Per standard practices. • Carry out welding in 1G position following standard procedures • Deposit root pass, filling passes and capping pass as per welding procedure specifications/job requirements.	• Effects of Arc Length • Striking the arc and maintaining the arc gap • Overview of groove weld on mild steel plate and pipe in 1G position. • Proper Fit up as per requirement • Root face, root gap and root pass • Hot pass, filling pass and Capping pass		• M.S Pipe • Angle cutting Machine/ Cut off Machine • Grinder • Cutting discs • Grinding discs • Beveling machine • Chipping hammer • Pencil Grinder WPS/ instruction sheet	

	• Make Project work as per instruction. • Follow applicable manufacturing codes and standards for acceptance criteria of visual welding defects	• Weaving and stringer technique • Visual Inspection • Acceptance criteria for welding defects **Practical Activity:** Make a groove weld (Butt-joint) in 1G and 1G positions with SAW process			
LU4. Perform Post Welding Procedures	**Trainee must be able to:** • Carry out finishing work of welds following standard procedures.	• Introduction to welding defects • Types of welding defects,causes and remedies	Theory-3 Hrs Practical-3 Hrs Total- 6 Hrs		Class Room and workshop

	• Inspect weld visually and mark any visual defects, as required. • Carry out repair work in accordance with approved procedures, as required. • Maintain and store tools / equipment / consumable materials in accordance with organization guidelines. • Apply 6 R's as per Green practices	• Types of visual defects. • Methods for welding repair • Occupational safety practice at the workplace • Organization's / workshop guidelines for storing tools,			

		equipment and consumable materials **<u>Practical Activity</u>:** Trainees to perform visual inspection of the welded job, and mark any visual defects if occurred.			