

Curriculum

For

Welder (Gas & Tig)

Six Months Duration Course

Code: VI82S003

1.Introduction

NAME OF COURSE:

Welder Technician GAS, TIG-MS, TIG-ALUMINUM AND STAINLESS STEEL

6 Months (800 hrs)

OVERALL OBJECTIVE OF COURSE

1. The prime objective of this course of Welder Technician is to develop and enhance the skill level of the incumbent in the industry.
2. Semi-skilled and skilled worker produced by this training would help to reduce unemployment and poverty in the society.
3. To impart the training and provide the industry with workforce whose scope with job knowledge and skills are identified.
4. This curriculum is designed to train the Middle / Matric pass persons who are facing a lot of shortage of Welders in the field of industry.
5. This training program will provide opportunity to those who want to equip themselves with such knowledge and skills which will be helpful for their employment after completing this training of 06 months and would enable them to start their own business with professional approach.
6. Further, this Curriculum is developed by considering the requirements of local and international market and need of the trade enabling the passouts to meet the job market to reduce the shortage of Semi Skilled and Skilled workers in the area.
7. To establish coordination among employer's, workers and government relating to human resource development programs.
8. Provide technical and vocational training basis which reflects the requirements of the industry.

CURRICULUM SALIENT

Medium of Instructions	:	Urdu / English / Regional Language
Entry Level	:	Matric / Middle
Duration of courses	:	6-Months
Total Training Hours	:	800 Hrs
Per Week Hours	:	40 Hrs
Per Day Hours	:	7 Hrs (Friday 5 Hrs)
Training Methodology	:	Practical 80 % Theory 20 %

COMPETENCIES GAINED AFTER COMPLETION OF COURSE

Knowledge Competencies:

1. Safety precautions applicable to Welding machines, tools and equipment during welding operations.
2. The common types of materials and their uses.
3. Express the knowledge of welding, marking, identifying of material, cutting tools & instruments, their uses and safety.
4. Define basic principles of welding symbols, read & interpretation of drawings, bevel preparation and tacking.
5. Express the knowledge of Gas welding & cutting tools, equipment their use and safety.
6. Express the knowledge of GTAW (TIG) welding tools, equipment their use and safety.
7. Describe the knowledge of welding joints, positions, their use and selection.
8. Express the knowledge of inspecting and testing welded joints to ensure weld quality.
9. Understand application of work Permit & WPS.
10. Understand welding defects & their recognition and rectification process.

Skill Competencies:

1. Observe all safety precautions about tools and equipment.
2. Common working hand tools (measuring, grinding, cutting tools, welding tools), their use and maintenance.
3. Preparation of working piece.
4. Grinding on working piece.
5. Use pencil grinders and cutting discs for the preparation of pipe piece.
6. Measure, cut and place / stack MS Pipe to the given size.
7. Making bevel of the pipe to make it ready for welding.
8. Tacking the two welding pieces for joint.
9. Gas welding of common welding joints in all positions.
10. Perform the GTAW (TIG) - MS welding of common welding joints in all positions.
11. Execute the GTAW (TIG) - Aluminum welding of common welding joints in all positions.

12. Inspect and test welding joints.
13. Distinguish different metals & electrodes.
14. Understand electricity & control of welding machines.
15. Able to make bevel & cuts by grinders.
16. Able to prepare his job according to WPS

JOB OPPORTUNITIES AVAILABLE IMMEDIATELY AND IN THE FUTURE

- Steel manufacturing industry.
- Construction industry.
- Fertilizer industry
- Chemical industry
- Sugar industry
- Industrial projects.
- Shipyards.
- Railway.
- Pakistan Ordnance Factory Wah.
- Heavy Mechanical Complex Taxila.
- Heavy Forge and Foundry Taxila.
- Tractor and Agricultural Equipment Industry.
- Automobile industry.
- Local industry.
- Local metal fabrication shops.
- Self employment.

TRAINEE ENTRY LEVEL

The trainee selected should be minimum **Matric** in qualification, whereas **Middle** pass may also be considered, who have earned practical experience of welding prior to the admission.

MINIMUM QUALIFICATION OF TRAINER

1. D.A.E / B. Tech experience in the field of welding
2. 5-Years experience in Industry / teaching
3. CSWIP or Other welding qualification would be added advantage
4. Computer Proficiency

MEDIUM OF INSTRUCTION I.E. LANGUAGE OF INSTRUCTION

Medium of instruction would be Urdu, but the English would also be there, as the jargons, terminologies, standards, tools and equipment name are in English and they have to be learnt in the same language.

SEQUENCE OF THE MODULES

1. Overview about the program –Curriculum for Welder Technician –

Module Title and Aim	Learning Units	Theory ¹ Days/hours	Workplace ² Days/hours	Timeframe of modules
Module - A Follow Safety Rules	<ol style="list-style-type: none"> 1. Wear work clothes 2. Wear safety gears 3. Prepare the workplace 4. Deal with work hazards, accidents & injuries 5. Inspect connections and regulators 6. Use of extinguishers 7. Place gas cylinders in appropriate location 8. Ensure proper ventilation systems 	15 hrs	35 hr	# 1
Module -B Work permit System	<ol style="list-style-type: none"> 1. Understanding Work permit system 2. Knowledge about types of work permits 3. Acquisition of work permit 	5 hrs	25 hrs	# 2
Module - C Perform Maintenance Operation	<ol style="list-style-type: none"> 1. Replace damaged welding cables 2. Replace cutting tools 3. Clean the tip of the welding nozzle 4. Change the holder and welding pliers 5. Clean welding guns 6. Clean machines and equipment 7. Replace hoses of the Gas Cylinders 8. Replace timer of the Gas regulators 	10 hrs	25 hrs	# 3
Module – D Communicate to Others	<ol style="list-style-type: none"> 1. Communicate with supervisor 2. Communicate with Engineer 	10 hrs	15 hrs	# 4

¹ Learning hours in training provider premises

² Training workshop, laboratory and on-the-job workplace

	<ol style="list-style-type: none"> 3. Communicate with peers 4. Communicate with helpers 5. Communicate with client / customer 			
Module – E Basic bench work	<ol style="list-style-type: none"> 1. Organize the Bench work place. 2. Organize the Bench work tools. 3. Observe Tools, Job and personal safety. 4. Prepare the jobs following the drawing. 5. Arithmetic's / Geometrical terminologies and problem solving. 6. Define kinds of welding, their principles and use. 	24 hrs	100 hrs	# 5, Can also be offered Independe nt subject to the module “A” is completed
Module - F Perform GAS (Oxy-Acetylene) Welding.	<ol style="list-style-type: none"> 1. Organize the work place 2. Prepare the required welding equipment 3. Remove surface base metal defects 4. Set the suitable Gas Pressure 5. Determine the suitable Tip / Nozzle size 6. Connect the Tip / Nozzle to the torch. 7. Select the welding positions 8. Bake the electrode 9. Select the suitable grinder (cutting, grinding) 10. Remove Slag 11. Remove visual defects 	20 hrs	10 hrs	# 6, Can also be offered independe ntly subject to the module “E” is completed
Module -G- Perform GTAW/TIG – MS Welding Operation	<ol style="list-style-type: none"> 1. Organize workplace 2. Prepare the required welding machine 3. Remove surface base metal defects. 4. Prepare the raw material. 5. Adjust pressure of the inert gas 6. Select and prepare the Tungsten Electrode. 7. Set the current voltage, and Polarity. 8. Select Suitable size of 	18 hrs	120 hrs	# 7, Can also be offered independe ntly subject to the module “F” is completed

	filler wire. 9. Weld the metals on different joints and positions. 10. Clean welding joint after welding 11. Remove visual defects			
Module – H Perform GTAW/TIG - Aluminum & Stainless Steel welding operation.	1. Organize workplace 2. Prepare the required welding machine 3. Remove surface base metal defects 4. Prepare the raw material 5. Adjust pressure of Inert Gas. 6. Select and Prepare the Tungsten electrode 7. Set current and voltage. 8. Select size for the welding wire. 9. Weld the metals on different joints and positions. 10. Select welding position 11. Remove visual defects	18 hrs	146 hrs	# 7, Can also be offered independently subject to the module "G" is completed
Module – I Repair Welding Defects	1. Receive instruction from supervisor 2. Trace the defected location 3. Remove defected area 4. Re-weld defected area	6 hrs	16 hrs	# 8
Module – J Upgrade work skills	1. Benefit from experienced people 2. Read books in the field 3. Watch videos on the subject 4. Continue practicing welding operations 5. Make visits to exhibitions and factories	8 hrs	17 hrs	# 9
Module – K Prepare Equipment, tools & appliances	1. Prepare welding machines 2. Keep electrode in suitable place 3. Prepare measure tools & equipment 4. Prepare welding power connectors 5. Clean tools	8 hrs	12 hrs	# 10

	6. Prepare production fixtures			
Module – L Clear Work place at the time of completion of Work	<ol style="list-style-type: none"> 1. Place tools in proper place 2. Shut down power supplies / gas cylinder 3. Dispose waste material 4. Return leftover consumables 	10 hrs	12 hrs	# 11
Module - M Welding Procedure Specification	<ol style="list-style-type: none"> 1. Reading WPS 2. Understanding WPS 3. Abbreviations and terminologies 4. Standards 	8 hrs	12 hrs	# 12

1. Welding Technician Curriculum Contents (Teaching and Learning Guide)

Module – A :

Follow Safety Rules

Objective of the Module: To understand the safety requirements and standards

Duration: 50 hours Theory: 15 hours Practice: 35 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
A-1. Wear work clothes	1.1 Select and use the Safety Clothes according to the Work and Environment	<p>Knowledge of:</p> <p>1.1.1 Work safety and environment</p> <p>1.1.2 Type of safety clothing</p> <p>1.1.3 Use of safety clothing</p> <p>Ability to:</p> <p>1. Perform while wearing safety clothing whole working</p> <p>2. Indentify the work environment and selecting proper clothing</p>	2 hrs	<ul style="list-style-type: none"> - Coverall - Welding Apron - Face Shield - Welding Gloves - Safety Shoes - Ear Plugs - Ear Muffs - Breathing operates - Safety belt 	Classroom
A-2 Wear Safety Gears	2.1 Identify and select the Safety Gears work operations	<p>Knowledge of:</p> <p>2.1.1 Explain the Safety gears and their kinds i.e; Face Shield, Safety Shoes, Welding Helmets, Goggles, Ear Plugs, Ear Muffs, Welding Gloves, etc</p> <p>2.1.2 Safety at work and its importance</p> <p>Ability to:</p> <p>1. Use safety gears and equipments</p>	2+4 hrs	<ul style="list-style-type: none"> - White/ Black board - OHP - Transparences - Information sheets - Exercise sheets - Work sheets - Coverall - Welding Apron - Face Shield - Welding Gloves - Safety Shoes - Ear Plugs/muffs 	Class Room Workshop

		<p>2. Identify safety requirements</p> <p>3. Perform in safe environment</p>		<ul style="list-style-type: none"> - Helmets 	
A-3 Prepare the Work place	3.1 Determine the Housekeeping advantages and Select the Tools and Equipment required to perform the job	<p>Knowledge of:</p> <p>3.1.1 Prepare the work place adopting Housekeeping to start the activity</p> <p>3.1.2 Safe working environment and its advantages</p> <p>3.1.3 Effects on Performance because of workplace</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Selection and identify the tools required 2. Place and handle the tools and equipment to be used 	2+4 hrs	<ul style="list-style-type: none"> - White/ Black board - OHP - Transparencences - Information sheets - Exercise sheets - Work sheets - Cleaning Equipment - Mobbing Brush - Dust bins 	Class room Workshop
A-4 Deal with work hazards, accidents & Injuries	4.1 Know work hazards, injuries and required first aid during welding job performance	<p>Knowledge of:</p> <p>4.1.1 Health hazards occurring due to welding</p> <p>4.1.2 Possible injuries that can occur during welding</p> <p>4.1.3 First Aid provision and Emergency response</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Remain conscious and provide first aid to the fellow who is suffering 2. To assembly in case of 	2+4 hrs	<ul style="list-style-type: none"> - White/ Black board - OHP - Transparencences - Information sheets - Exercise sheets - Work sheets - First aid box with Medicines 	Class room Workshop

		emergency 3. Respond and call in the first aid			
A-5. Inspect connections and regulators	5.1. Know about the current hazards and proper connections 5.2 Able to understand the function of regulators and gas cylinders	Knowledge of: 5.1.1 Current flow 5.1.2 Electrical connection, receptacles 5.1.3 Earth and proper safety requirements 5.2.1 Gas Cylinders, their types and usage 5.2.2 Type of regulators and Connections. 5.2.3 Current flow Ability of: 1. Insulating, connectors, and thimbles installations 2. Regulators installations. 3. Back fire arresters function and their installation before start of work	2+4 hrs	- White/ Black board - OHP - Transparencences - Information sheets - Exercise sheets - Work sheets - Regulator - Backfire Arresters - Thimble - Lugs - Female Connector - Male Connector - Receptacles	Classroom Workshop
A-6. Use of Fire Extinguishers	6.1. Fire safety, Hazards and Respond in case of fire 6.2 Fire extinguishers and other techniques	Knowledge of: 6.1.1 Causes of Fire 6.1.2 Fire Hazards 6.1.3 Fire Safety 6.1.4 Process and respond in case of emergency 6.2.1 Types of fire extinguishers 6.2.2 Welding fire 6.2.3 Sparks and	3+10 hrs	- White/ Black board - OHP - Transparencences - Information sheets - Exercise sheets - Work sheets - Fire Extinguishers of all types - Fire Blankets - Water Buckets	Class Room Workshop

		<p>spatters</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Use the fire extinguishers 2. Use of fire blankets 3. Use of Water and Sand 4. Remain safe and keep others safe as well 5. Making precautionary measures 6. Respond correctly in case of emergency 		- Sand Buckets	
A-7. Place gas cylinders in appropriate location	7.1 Place and Handle the cylinders properly to Keep safe working conditions	<p>Knowledge of:</p> <ol style="list-style-type: none"> 7.1.1 Cylinders and their types 7.1.2 Use of cylinders 7.1.3 Shifting / mobilizing the cylinders 7.1.4 Keeping the full and empty cylinders in proper place 7.1.5 Hazards of mishandling with cylinders 7.1.6 Cylinder trolleys and their functions <p>Ability to:</p> <ol style="list-style-type: none"> 1. Place and shift cylinders 2. Keep the work place safe 	2+7 hrs	<ul style="list-style-type: none"> - White/ Black board - OHP - Transparencs - Information sheets - Exercise sheets - Work sheets 	Class Room Workshop
A-8. Ensure	8.1 Understand the	Knowledge of:			

proper ventilation systems	ventilation system keep the smoke free zone of work place	8.1.1 Ventilations systems 8.1.2 Ducting and its types 8.1.3 Exhaust Fans 8.1.4 Smoke Catchers / Extractor. Ability to: 1. Place the welding plant where there is proper ventilation 2. Keep the environment smoke free	2+2 hrs	- White/ Black board - OHP - Transparencs - Information sheets - Exercise sheets - Work sheets - Exhaust Fans - Ducts	Classroom Workshop
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Module – B : Title..... Work Permit System

Objective of the Module:To Control the completion time and Manage Material.

Duration: 30 hours Theory: 5 hours Practice: 25 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
B-1 Follow Work permit system	1.1 Understand execution of the job and working conditions	<p>Knowledge of:</p> <p>1.1.1 Prerequisites for start of the job</p> <p>1.1.2 Importance of Work Permit</p> <p>1.1.3 Analyze the work place conditions and hazards</p> <p>1.1.4 Plan the job for proper execution</p> <p>Ability to:</p> <p>1. Follow the permission and authorities and responsibilities of the job</p> <p>2. Take precautions</p>	2+9 hrs	<ul style="list-style-type: none"> - White/ Chalk board - Stationery - Work Permit Document - Job analysis form - Cost analysis form - Time control form - Material control form - Inspection report form - And other 	Class Room Workshop
B-2 Assess requirement of work permit	2.1 Know and describe the work permits	<p>Knowledge of:</p> <p>2.1.1 Work Permit System</p> <p>2.1.2 Hot work permits</p> <p>2.1.3 Cold work permits</p> <p>Ability to:</p> <p>1. Assess the job and generate required work permit</p>	2+8 hrs	<ul style="list-style-type: none"> - White/Chalk board - OHP - Transparencies - Relevant forms / documents - Information sheets - Exercise sheet - Work sheet 	Classroom
B-3 Acquisition of work permit	3.1 Accomplish the work	<p>Knowledge of:</p> <p>3.1.1 Know the issuer</p>	1+8 hrs	<ul style="list-style-type: none"> - White/Chalk board 	Classroom

	permit	<p>3.1.2 Know the responsible person.</p> <p>3.1.3 Process & procedure to get the work Permit</p> <p>3.1.4 Process & procedure to accomplish the work permit</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Coordinate with supervisor and safety personnel 2. Assess safety requirement and work permit acquisition 		<ul style="list-style-type: none"> - OHP - Transparencies - Relevant forms / documents - Information sheets - Case study - Exercise sheet - Work sheet 	Workshop
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Module – C : Title.....Perform Maintenance Operation

Objective of the Module:To keep the Machines, Equipments and Tools ready for Operation

Duration: 35 hours Theory: 10 hours Practice: 25 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
C-1 Replace damaged welding cables	1.1 Keep the cables in good condition for execution of the assigned job	<p>Knowledge of:</p> <p>1.1.1 Welding Cables</p> <p>1.1.2 Thimbles and Lugs</p> <p>1.1.3 Knowledge of causes which damages the cable</p> <p>Ability to:</p> <p>1. Repair the joints</p> <p>2. Remove defective cables</p> <p>3. Install thimbles and lugs</p>	1+3 hrs	<ul style="list-style-type: none"> - Relevant tools and material - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheet - Work sheet 	Classroom Workplace
C-2 Replace cutting tools	2.1 Handling of the grinder and cutting tools	<p>Knowledge of:</p> <p>2.1.1 Grinders and their safe use</p> <p>2.1.2 Type of cutting Discs</p> <p>2.1.3 Sizes of cutting Discs</p> <p>2.1.4 Hand and electrical saws</p> <p>2.1.5 Filling tools</p> <p>Ability to:</p> <p>1. Handle, Use and Replace the cutting tools safely</p>	1+3 hrs	<ul style="list-style-type: none"> - Relevant tools and material - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheet - Work sheet 	Classroom Workplace
C-3 Clean the tip of the welding	3.1 Kinds and sizes of the	<p>Knowledge of:</p> <p>3.1.1 Welding Nozzles and</p>	1+3 hrs	<ul style="list-style-type: none"> - Relevant tools and 	Classroom

nozzle	welding nozzles 3.2 cleaning tools and techniques	<p>their types</p> <p>3.1.2 Sizes of the welding nozzles</p> <p>3.2.1 Cleaning tools</p> <p>3.2.2 Efficiency due to clean nozzles</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Clean the nozzle 2. Adjust the flames 3. Perform welding using gases 		<p>material</p> <ul style="list-style-type: none"> - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheet - Work sheet 	Workplace
C-4 Change the holder and welding pliers	4.1 Know the types and size of the welding holder	<p>Knowledge of:</p> <p>4.1.1 Welding holders types and their sizes</p> <p>4.1.2 Current capacity of the welding holder</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Change the welding holder 2. Plug the holder to the cable and welding Machine 	1+3 hrs	<ul style="list-style-type: none"> - Relevant tools and material - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheet - Work sheet 	Classroom Workplace
C-5 Clean welding guns	5.1 Use and clean the welding guns	<p>Knowledge of:</p> <p>5.1.1 Gas cutting sets</p> <p>5.1.2 Welding guns types and their sizes</p> <p>5.1.3 Hose pipes and their maintenance</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Change the welding gun / gas cutter and cleaning procedure 2. Nozzle installations and replacement 	1+3 hrs	<ul style="list-style-type: none"> - Relevant tools and material - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheet - Work sheet 	Classroom Workplace

C-6 Clean machines and equipment	6.1 Clean & keep maintenance of welding machines / rectifiers	<p>Knowledge of:</p> <p>6.1.1 Types of welding machines / rectifiers</p> <p>6.1.2 Welding current settings and flow</p> <p>6.1.3 Earths and safe operations</p> <p>6.1.4 Slag and carbon removal from the thimbles / connectors / receptacles</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Change the welding machine 2. Clean the welding machines and connectors 3. Plugging the machine to the receptacles 4. Changing of the receptacles 	2+4 hrs	<ul style="list-style-type: none"> - Relevant tools and material - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheet - Work sheet 	Classroom Workplace
C-7 Replace hoses of the Gas Cylinders	7.1 Change and maintain the hose pipes used with gas cylinders	<p>Knowledge of:</p> <p>7.1.1 Types of Hose pipe and their sizes</p> <p>7.1.2 Clamping and installation of the hose pipe with the cylinders and welding guns</p> <p>7.1.3 Types of gases and their uses</p> <p>7.1.4 LPG / Acetylene / Oxygen hose pipes</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1 Change the hose 	2+3 hrs	<ul style="list-style-type: none"> - Relevant tools and material - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheet - Work sheet 	Classroom Workplace

		<p>pipes</p> <p>2 Removal of the damaged pipes</p> <p>3 Making joints in the pipe for repair and length increasing</p>			
C-8 Replace timer of the Gas regulators	8.1 Changing and maintenance of the gas welding equipment	<p>Knowledge of:</p> <p>8.1.1 Gas regulators</p> <p>8.1.2 Calibration and testing of the regulators</p> <p>8.1.3 Making connections with the regulators and timers</p> <p>Ability to:</p> <p>1 Install and Test the regulators before starting the job</p> <p>2 Use and change of timers and regulators</p> <p>3 Installation of backfire arresters and safe operations</p>	1+3 hrs	<ul style="list-style-type: none"> - Relevant tools and material - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheet - Work sheet 	Classroom Workplace

Module – D : Title.....Communication to others

Objective of the Module: To perform work with controlled time and quality Assurance

Duration: 25 hours Theory: 10 hours Practice: 15 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
D-1 Communicate with Supervisor	1.1 Understand the direct orders and respond to them	<p>Knowledge of:</p> <p>1.1.1 Understand commands</p> <p>1.1.2 Understand Instructions of the supervisor</p> <p>1.1.3 Know and understand the assigned task</p> <p>1.1.4 Explain clearly the problems of tasks</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Identify task problem and take guideline from the supervisor 2. Keep supervisor informed about the progress of work 3. Achieve target with Time management and work performance 	2+2 hrs	<ul style="list-style-type: none"> - One case study - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheets - Work sheets 	Classroom Workshop
D-2 Communicate with Engineer	2.1 Follow the instructions and order of the engineer	<p>Knowledge of:</p> <p>2.1.1 Understand assigned task with details</p> <p>2.1.2 Take guideline from the engineers on particular task</p>	2+2 hrs	<ul style="list-style-type: none"> - One case study - White/Chalk board - OHP - Transparencies - Information sheets 	Classroom Workshop

		<p>2.1.3 Manage time and work performance</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Update the work progress 2. Achieve target of job / task 3. Take guideline on the drawing and job specifications 		<ul style="list-style-type: none"> - Exercise sheets - Work sheets 	
D-3 Communicate with peers	3.1 Share knowledge and problem solving abilities	<p>Knowledge of:</p> <ol style="list-style-type: none"> 3.1.1 Team building 3.1.2 Performance abilities 3.1.3 Knowledge sharing and learning 3.1.4 Understand the inter-related tasks with fellows 3.1.5 Better understanding of job <p>Ability to:</p> <ol style="list-style-type: none"> 1. Perform and compete with fellow 2. Take and give guidelines to each other 3. Solve the problem on job and off the job as well 4. Better safe working environment 	2+4 hrs	<ul style="list-style-type: none"> - One case study - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheets - Work sheets 	Classroom Workshop
D-4 Communicate with helpers	4.1 Command and	<p>Knowledge of:</p> <ol style="list-style-type: none"> 4.1.1 Giving the orders to 	2+3 hrs	<ul style="list-style-type: none"> - One case study 	Classroom

	provide guideline to subordinates	<p>4.1.2 Making helpers to learn about tools and equipments</p> <p>4.1.3 Completing the task with the assistance of helpers</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Perform the job 2. Keep healthy working environment 3. Follow Safety requirements 		<ul style="list-style-type: none"> - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheets - Work sheets 	Workshop
D-5 Communicate with client / customer	3.1 Understand requirement of the client / customer	<p>Knowledge of:</p> <ol style="list-style-type: none"> 3.1.1 Client information and importance 3.1.2 Benefits for client 3.1.3 Job requirements and their details 3.1.4 Building company image <p>Ability to:</p> <ol style="list-style-type: none"> 1. Meet the requirement of the job 2. Execute the job according to the client requirements 3. Respond Better work methodology 	2+4 hrs	<ul style="list-style-type: none"> - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheets - Work sheets 	

Module – E : Title..... Basic Bench Work

Objective of the Module: To Identify, Select and perform Operations with basic metal working Tools

Duration: 124 hours Theory: 24 hours Practice: 100 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
E-1 Organize the Bench work Tools.	1.1 Identify the suitable tools for the job.	<p>Knowledge of:</p> <p>1.1.1 Measuring Tools: Steel foot rules, Steel Tape, Vernier Caliper, Calipers (Internal & external), Micrometer, Gauges, Solid Steel Square, Protectors.</p> <p>1.1.2 Marking Tools: Steel scribes, Divider, Centre Punch, Surface Gauge.</p> <p>1.1.3 Cutting tools: Shears, Saws, Chisels, Punches, Drills /Counter sinks, Thread cutting Tapes & Dies.</p> <p>1.1.4 Files Scraper and Grinders; Files-Single cut, Cross cut, Rasp and their shapes. Scrapers- Flat and Triangle. Grinders- Grades, Wheels, Discs and Pencils.</p> <p>1.1.5 Hammers: Kinds, Shapes and Weights.</p> <p>Ability :</p> <p>1. Select the right basic</p>	4 hrs	<ul style="list-style-type: none"> - Original Tools - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheets - Work sheets 	Class Room

		tools for metal work			
E-2 Organize the Bench work Place.	2.1 Is able to select basic metal working tools.	<p>Knowledge of:</p> <p>2.1.1 Select the tools for jobs.</p> <p>2.1.2 Place the tools in proper manners</p> <p>2.1.3 Place Exercise sheet/drawing on bench</p> <p>2.1.4 Care the respective tools</p> <p>2.1.5 Care the job</p> <p>2.1.6 Self safety</p> <p>Ability to:</p> <p>1. Manage his workplace in good presenting condition</p>	1 hrs	<ul style="list-style-type: none"> - Trainees tool kit - Working Clothes - Duster for placing tools on bench - Bench cleaning brush 	Class room
E-3.Observe Tools, Job and personal safety.	3.1 Observe safety for tools, work and personal to complete the Job.	<p>Knowledge of:</p> <p>3.1.1 Measuring tool safety</p> <p>3.1.2 Marking tools safety</p> <p>3.1.3 Cutting tools safety</p> <p>3.1.4 Files, Scraper and Grinder safety</p> <p>3.1.5 Jobs safety</p> <p>3.1.6 Personal safety</p> <p>Ability to:</p> <p>2. Perform his work safely with quality.</p>	1 hrs	<ul style="list-style-type: none"> - Original Tools - White/Chalk board - OHP - Transparencies - Information sheets - Exercise sheets - Work sheets 	Class room

E-4 Prepare the jobs according to the drawings.	3.1 Accomplish the job with its requirement and quality	<p>3.1.1 Skill of basic bench work exercises</p> <p>i. Filing Exercise (channel) 30 hrs</p> <p>ii. Squaring 10 hrs</p> <p>iii. Marking 04 hrs</p> <p>iv. Sawing 08 hrs</p> <p>v. Drilling 10 hrs</p> <p>vi. Countersinking/boring 04 hrs</p> <p>vii. Threading 10 hrs</p> <p>viii. Stretching 12 hrs</p> <p>ix. Sheet metal box 12 hrs</p> <p>Ability to:</p> <p>1. Make the jobs in size as per given drawings.</p>		<ul style="list-style-type: none"> - Table, vice and bench work tool kit - MS Channel 100x75x38x6 - MS Flat 100x62.5x15 <ul style="list-style-type: none"> - do – - do – - do – - do – - MS Flat 173x25x2.5 - MS Sheet 132x162x1 	<p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p>
E-5 Arithmetic's / Geometrical terminologies and problem solving :	<p>5.1 Solve the Simple Math Questions</p> <p>5.2 Understand and Read the Drawing</p>	<p>Knowledge of:</p> <p>3.1.5 Addition and Subtractions</p> <p>3.1.6 Multiplications and Divisions</p> <p>3.1.7 Diameter and Circumference finding</p> <p>3.1.8 Percentage finding</p> <p>3.1.9 Conversion of Inches to Metric to Inches</p> <p>5.2.1 Kinds of Lines</p> <p>5.2.2 Kinds of Angles</p> <p>5.2.3 Drawing the Radius</p> <p>5.2.4 Corner finding from Isometric views</p> <p>5.2.5 Views finding</p> <p>5.2.6 Matching of views</p>	16 hrs	<ul style="list-style-type: none"> - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Class room

		<p>Ability to:</p> <ol style="list-style-type: none"> 1. Solve mathematical problems 2. Read the Drawings for the completion of job. 			
E.6 Define kinds of welding, their principles and use.	6.1 Explain the different kinds of Welding:	<p>Knowledge of:</p> <ol style="list-style-type: none"> 6.1.1 Kinds of Pressure Welding, their principles and Uses 6.1.2 Kinds of Fusion Welding, their Principles and Uses <p>Ability to:</p> <ol style="list-style-type: none"> 1. Differentiate Pressure and Fusion welding machines and equipments 	2 hrs	<ul style="list-style-type: none"> - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Class room

Module – F : Title..... Perform GAS (Oxy-Acetylene) Welding

Objective of the Module:To Weld with Oxy-Acetylene welding process on different Joints and welding Positions

Duration: 125 hours Theory: 20 hours Practice: 105 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
F-1 Organize the work place	1.1 Identify and Select the Gas Welding Equipment and accessories	<p>Knowledge of:</p> <p>1.1.1 Gas cylinders and Acetylene Generators</p> <p>1.1.2 Gas Regulators</p> <p>1.1.3 Welding and cutting Torches with Tips / Nozzles</p> <p>1.1.4 Flash back Arresters</p> <p>1.1.5 Hoses with fittings and couplings</p> <p>1.1.6 Other accessories i.e: welding goggle, spark lighter, Burner pliers, etc.</p> <p>1.1.7 Care and safety rules</p> <p>Ability to:</p> <p>1. Differentiate, Identify and select the proper equipment and accessories</p> <p>2. Adopt the Care and Safety rules</p>	3 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
F-2 Prepare the required welding equipment	2.1 Assemble the Gas welding Equipment.	<p>Knowledge of:</p> <p>2.1.1 Cylinder perching</p> <p>2.1.2 Regulators and cylinders</p> <p>2.1.3 Connectors and Flash back Arresters</p> <p>2.1.4 Hoses with fittings and</p>	2+3 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets 	Classroom Workplace

		<p>couplings</p> <p>2.1.5 Torches and hoses</p> <p>2.1.6 Welding Tips/Nozzles</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Connect the Equipment securely 2. Place all required tools and Accessories at the work place 3. Adopt care and safety 		- Work Sheets	
F-3 Prepare the base metal for welding	3.1 Clean and size the metals before welding	<p>Knowledge of:</p> <p>3.1.1 Understand the Size of the job</p> <p>3.1.2 Determine preparation of edges to be welded</p> <p>3.1.3 Edges and Surface cleaning methods</p> <p>3.1.4 Tacking the base metals</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Cut, size, prepare, clean and tack the base metals 	2 hrs	- Relevant tools and equipment - Metal pieces	Workplace
F-4 Determine the Regulators and Set suitable Gas Pressure	<p>4.2 Explain the kinds of Regulators</p> <p>4.3 Adjust the Oxy-Acetylene Pressure</p>	<p>Knowledge of:</p> <p>4.1.1 Function of Regulator</p> <p>4.1.2 Difference between single stage and double stage Regulators</p> <p>4.1.3 Reading of cylinder pressure</p> <p>4.1.4 Oxygen working</p>	2 hrs	- Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets	Classroom

		<p>pressure</p> <p>4.1.5 Acetylene working pressure</p> <p>4.1.6 Cutting pressure of Oxy- Acetylene</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Select the proper Regulator 2. Adjust the required pressure for welding and cutting 			
F-5 Determine the kinds of Torches and Tip / Nozzle size	<p>5.1 Explain Kinds of welding Torches</p> <p>5.2 Select welding Tip / Nozzle</p>	<p>Knowledge of:</p> <p>5.1.1 Function of welding Torch</p> <p>5.1.2 Kinds of welding Torches (Low pressure, High pressure)</p> <p>5.1.3 Advantages of Low pressure / Injector type torch</p> <p>5.2.1 Welding Tips / Nozzle sizes</p> <p>5.2.2 Selection according to the job thickness</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Select the suitable Torch and Tip / Nozzle for the job 	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
F-6 Explain welding	6.1 Determine the different	<p>Knowledge of:</p> <p>6.1.1 Types of welding</p>	3.hrs		Classroom

Joints and Positions.	6.2 welding Joints Explain the different welding Positions	<p>Joints; i.e. Butt joint, Lap joint, Corner joint, Tee joint and Edge joint etc.</p> <p>6.1.2 Preparation of welding edge i.e. Square, Vee, Half Vee, Single Bevel Double bevel,</p> <p>6.2.1 Types of welding positions i.e. Flat, Horizontal, Vertical and Over head</p> <p>6.2.2 Welding techniques i.e. Forehand and Back hand</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Determine and select the welding joint and position 2. Select the proper welding Technique 			
F-7 Select the welding Filler metals.	7.1 Determine the filler metal / rod considering kinds of base metal and its thickness	<p>Knowledge of:</p> <p>7.1.1 Common welding rods</p> <p>7.1.2 Filler rod sizes</p> <p>7.1.3 Selection of filler rod</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Select the filler rod considering the type of base metal and job thickness 	2 hr	<ul style="list-style-type: none"> - Filler rods of different metals and size - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheet - Work Sheets 	Classroom
F-8 Weld the Metals	8.1 Weld the metals with Oxy-	Knowledge of:		<ul style="list-style-type: none"> - Oxy-Acetylene Equipment 	

	Acetylene process on different Joints and Positions	8.1.1 Gas welding practical exercises	2.hrs		
			2 hrs		
		I. Lightening of Flame		- do –	Workplace
		II. Adjusting of flames (Carburizing, Neutral, Oxidizing)	4 hrs	- do –	Workplace
		III. Blind weld flat/Pool making	4 hrs		
		IV. Double flange edge joint	8 hrs	- MS 200x100x3mm 1pcs.	Workplace
		V. Butt joint flat	6 hrs	- MS 200x100x1mm 2pcs.	Workplace
			10 hrs	- MS 200x100x2mm 2pcs.	Workplace
		VI. Corner joint outside flat	6 hrs	- MS 200x100x2mm 2pcs.	Workplace
		VII. V-Butt joint flat	10 hrs	- MS 200x100x4mm 2pcs.	Workplace
		VIII. Corner joint outside horizontal	10 hrs	- MS 200x100x2mm 2pcs.	Workplace
		IX. Butt joint horizontal	8 hrs	- MS 200x100x2mm 2pcs.	Workplace
		X. T-Joint horizontal	8 hrs	- MS 200x100x3mm 2pcs.	Workplace
		XI. Square butt joint vertical	8 hrs	- MS 200x100x2mm 2pcs.	Workplace
		XII. Square butt joint Overhead	8 hrs	- MS 200x100x2mm 2pcs.	Workplace
		XIII. Square butt joint flat on rolling pipe	10 hrs	- MS pipe dia.2"x50xwall thick 2mm, 2pcs	Workplace
XIV. Square butt joint horizontal on pipe		- Dia.2"x50xwall thick 2mm, 2pcs	Workplace		
XV. Square butt joint fix (oh, vu, f.)		- Dia.3"x50xwall thick 3mm, 2pcs	Workplace		
	Ability to:				

		1. Weld the MS properly with gas welding process on different joints and positions			
F-9 Clean weld and Inspect the visual defects	10.1 Clean the weld properly 10.2 Find the visual defects	<p>Knowledge of:</p> <p>9.1.1 Use of wire brush 9.1.2 Hand tools to clean the weld 9.1.3 Filing and grinding 10.2.1 Visual inspection of weld 10.2.2 Kinds of visual defects</p> <p>Ability to:</p> <p>1. Clean the weld piece 2. Inspect and find the defects</p>	2.hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Workshop
F-10 Remove visual defects	10.1 Clean the weld properly 10.2 Prepare and repair the welding defect	<p>Knowledge of:</p> <p>10.1.1 Identify the tools to clean the defect 10.1.2 Prepare the weld for re-weld 10.2.1 Re-weld the defective area</p> <p>Ability to:</p> <p>1. Identify the defect and remove the defect by using the grinding / polishing / filling and re-weld</p>	2.hrs	<ul style="list-style-type: none"> - Defective weld pieces - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
F-11 Oxy-Acetylene cutting process	11.1 Select and use the Oxy-Acetylene Cutting	<p>Knowledge of:</p> <p>11.1.1 Cutting torches 11.1.2 Cutting Tips/Nozzles 11.1.3 Gases pressure</p>	3 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies 	Classroom

	equipment and technique	adjustment 11.1.4 Flame cutting process 11.1.5 Free hand cutting, Guide bar cutting, Curve / Circular cutting and Machine cutting 11.1.6 Observe safety rules Ability to: 1. Cut the metal with Oxy-Acetylene flame 2. Adopt Safety rules		- OHP - Information sheets - Exercise Sheets - Work Sheets	
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Module – G : Title.....Perform GTAW / TIG – MS welding Operations

Objective of the Module: To Weld MS metal with GTAW / TIG welding process on different Joints and Welding Positions

Duration: 138 hours Theory: 18 hours Practice: 120 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
G-1 Organize workplace	1.1 Arrange the tools and equipment required to perform the job	<p>Knowledge of:</p> <p>1.1.1 Tools required</p> <p>1.1.2 TIG Welding Machines Transformer / rectifiers</p> <p>1.1.3 Gas flow meter</p> <p>1.1.4 Selection of filler rod</p> <p>1.1.5 Other accessories</p> <p>1.1.6 Grinders</p> <p>1.1.7 Fire Safety precautions</p> <p>Ability to:</p> <p>1. Organize the workplace to execute the job</p> <p>2. Perform job in time safely</p>	2.hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
G-2 Prepare the required welding machine	2.1 Identify the welding machine / rectifier required to execute the job according to the WPS	<p>Knowledge of:</p> <p>2.1.1 Current and its terminologies</p> <p>2.1.2 Alternating current(AC) and Direct current(DC)</p> <p>2.1.3 Construction of welding transformer</p> <p>2.1.4 Types of the Welding Machines</p> <p>2.1.5 TIG welding Torch assembly</p> <p>2.1.6 Current settings</p>	4 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom

		<p>2.1.7 Kinds of Tungsten Electrode and preparation</p> <p>2.1.8 Types of inert gases</p> <p>2.1.9 TIG Welding accessories</p> <p>2.1.10 Safe working conditions</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Select AC / DC current 2. Set the Gas Flow rate 			
G-3 Remove surface base metal defects	3.1 Prepare the welding pieces	<p>Knowledge of:</p> <p>3.1.1 Base metal i.e. Mild steel and Carbon Steel etc.</p> <p>3.1.2 Read the drawing to prepare the pieces in size</p> <p>3.1.3 File or Grind to remove the slag / defects</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Cut and Size the metals 2. Grind and buff the metals 3. Prepare for the joint 	2.hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
G-4 Set pressure of the inert gas	4.1 Install the gases and attachments	<p>Knowledge of:</p> <p>4.1.1 Gases and their types</p> <p>4.1.2 Install gas regulators and backfire arrester</p>	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies 	Classroom

		<p>4.1.3 Hose pipes</p> <p>4.1.4 Gas Flow meter and dial indicators</p> <p>4.1.5 Valves to control the gas pressure rate</p> <p>4.1.6 Control the gas flow rate at welding gun</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Install the gas regulator and welding gun. 2. Control the pressure of the gas with welding gun nozzle and valve 		<ul style="list-style-type: none"> - OHP - Information sheets - Exercise Sheets - Work Sheets 	
G-5 Select welding position	4.2 Set the welding positions required	<p>Knowledge of:</p> <p>4.2.1 Describe the Welding Positions (Vertical, Horizontal, Flat, Overhead,)</p> <p>4.2.2 Understand the terminologies (IG, 2G, 3G, 4G, 5G & 6G)</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Perform and execute the job according to the WPS / job order 2. Set the welding pieces at the required position 	1.hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
G-6 Set current voltage and polarity	6.1 Set the electric current	<p>Knowledge of:</p> <p>6.1.1 Explain DCSP and DCRP</p> <p>6.1.2 Current /Voltage setting considering job</p>	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP 	Classroom

		<p>thickness</p> <p>6.1.3 Current setting considering kind of Tungsten electrode</p> <p>6.1.4 Current setting considering size of Tungsten electrode</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Set the desired current 2. Connect the required polarity 3. Install male / female connectors 		<ul style="list-style-type: none"> - Information sheets - Exercise Sheets - Work Sheets 	
G-7 Select suitable filler wire	7.1 Select kind of filler metal according to the base metal	<p>Knowledge of:</p> <p>7.1.1 Kind of base metal</p> <p>7.1.2 Welding filler Rod / Wire types</p> <p>7.1.3 Welding Rod/wire sizes</p> <p>7.1.4 Welding joint making</p> <p>7.1.5 Feeding techniques according to the welding position</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Select the filler rod 2. Manual skill of feeding the filler rod 	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
G-8 MS welding with TIG welding process	8.1 Weld the MS with TIG welding process on different	<p>8.1.1 TIG welding practical Exercises:</p> <ol style="list-style-type: none"> I. Striking and maintaining of arc II. Running short beads III. Breaking and restarting 	<p>4 hrs</p> <p>4 hrs</p> <p>4 hrs</p>	<ul style="list-style-type: none"> - Complete TIG welding equipment with AC/DC - MS 200x100x5mm 1pcs - MS 200x100x5mm 1pcs - MS 200x100x5mm 1pcs 	<p>Workplace</p> <p>Workplace</p> <p>Workplace</p>

	joints and positions.	<p>the arc</p> <p>IV. Straight Bead welding V. Outside corner joint Horizontal</p> <p>VI. Square butt joint flat VII. Outside Corner joint Vertical up</p> <p>VIII. Square butt V. up IX. Square butt overhead X. Tee joint or Overlap horizontal</p> <p>XI. Tee or Overlap joint Vertical up</p> <p>XII. V. joint flat</p> <p>XIII. V. joint V. up</p> <p>XIV. Square butt joint on pipe in rolling</p> <p>Ability to: Weld the MS properly with TIG welding process on different joints and position</p>	<p>8 hrs</p> <p>4 hrs</p> <p>8 hrs</p> <p>8 hrs</p> <p>10 hrs</p> <p>12 hrs</p> <p>8 hrs</p> <p>8 hrs</p> <p>12 hrs</p> <p>14 hrs</p> <p>16 Hrs</p>	<p>- MS 200x100x5mm 1pcs</p> <p>- MS 200x100x2mm 2pcs</p> <p>- MS 200x100x2mm 2pcs</p> <p>- MS 200x100x2mm 2pcs</p> <p>-</p> <p>- MS 200x100x2mm 2pcs</p> <p>- MS 200x100x2mm 2pcs</p> <p>- MS 200x100x2mm 2pcs</p> <p>- MS 200x100x2mm 2pcs</p> <p>- MS200x100x4...5mm 2pcs</p> <p>- MS 200x100x4...5mm 2pc</p> <p>- MS dia. 2"x50xwall thickness 2mm 2pcs</p>	<p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p>
G-9 Clean welding joint after welding	9.1 Clean the welded pieces to inspect the defects	<p>Knowledge of:</p> <p>9.1.1 Welding Slag 9.1.2 Use of power brush 9.1.3 Hand tools to remove slag 9.1.4 Filing and grinding</p> <p>Ability to:</p> <p>1. Clean the slag of the welded piece 2. Clean the joint and</p>	1 hrs	<p>- Relevant Equipment</p> <p>- White/Chalk board</p> <p>- Transparencies</p> <p>- OHP</p> <p>- Information sheets</p> <p>- Exercise Sheets</p> <p>- Work Sheets</p>	Classroom

		Inspect visual defects			
G-10 Remove visual defects	10.1 Identify the visual defects and remove them	<p>Knowledge of:</p> <p>10.1.1 Visual inspection of the welded joint / piece</p> <p>10.1.2 Find Welding defects</p> <p>10.1.3 Identify the tools to remove the defect</p> <p>Ability to:</p> <p>1. Identify the defect and remove the defect by using the grinding / polishing / filing / re-welding techniques</p>	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom

Module – H : Title..... Perform GTAW / TIG – Aluminum and Stainless steel welding Operations

Objective of the Module: .. To Weld Aluminum and Stainless steelmet with GTAW / TIG welding process on different Joints and Welding Positions

Duration: 164 hours Theory: 18 hours Practice: 146 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
H-1 Organize workplace	1.1 Arrange the tools and equipment required to perform the job	<p>Knowledge of:</p> <p>1.1.1 Tools required</p> <p>1.1.2 TIG Welding Machines / rectifiers</p> <p>1.1.3 Gas flow meter</p> <p>1.1.4 Selection of filler rod</p> <p>1.1.5 Other accessories</p> <p>1.1.6 Grinders</p> <p>1.1.7 Fire Safety precautions</p> <p>Ability to:</p> <p>1 Organize the workplace to execute the job</p> <p>2 Perform job in time safely</p>	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
H-2 Prepare the required welding machine	2.1 Identify the welding machine / rectifier required to execute the job according to the WPS	<p>Knowledge of:</p> <p>2.1.1 Current and its terminologies</p> <p>2.1.2 Alternating current(AC) and Direct current(DC)</p> <p>2.1.3 Construction of welding transformer</p> <p>2.1.4 Types of the Welding Machines</p> <p>2.1.5 TIG welding Torch assembly</p> <p>2.1.6 Current settings</p> <p>2.1.7 Kinds of Tungsten</p>	4 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom

		<p>Electrode and preparation</p> <p>2.1.8 Types of inert gases</p> <p>2.1.9 TIG Welding accessories</p> <p>2.1.10 Safe working conditions</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1 Select AC / DC current 2 Set the Gas Flow rate 3 Prepare Tungsten electrode 			
H-3 Remove surface base metal defects	3.1 Prepare the welding pieces	<p>Knowledge of:</p> <p>3.1.1 Kind of Base metal i.e. Aluminum and Stainless steel.</p> <p>3.1.4 Read the drawing to prepare the pieces in size</p> <p>3.1.5 File or Grind to remove the slag / defects</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1 Cut and Size the metals 2 Grind and buff the metals 3 Prepare for the joint 	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
H-4 Set pressure of the inert / active gas	3.1 Install the gases and attachments	<p>Knowledge of:</p> <p>3.1.1 Gases and their types</p> <p>3.1.2 Install gas regulators and backfire arrester</p>	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies 	Classroom

		<p>3.1.3 Hose pipes</p> <p>3.1.4 Gas Flow meter and dial indicators</p> <p>3.1.5 Valves to control the gas pressure rate Control the gas flow rate at welding gun</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1 Install the gas regulator and welding gun. 2 Select the proper gas cup size 3 Control gas flow rate 		<ul style="list-style-type: none"> - OHP - Information sheets - Exercise Sheets - Work Sheets 	
H-5. Select welding position	5.1 Set the welding positions required	<p>Knowledge of:</p> <p>5.1.1 Welding Positions (Vertical, Horizontal, Flat, Overhead,)</p> <p>5.1.2 Understand the terminologies (IG, 2G, 3G, 4G, 5G & 6G)</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1 Perform and execute the job according to the WPS / job order 2 Set the welding piece at the required position 	1 hr	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
H-6 Set voltage	6.1 understand the electric current	<p>Knowledge of:</p> <p>6.1.1 Electric Current</p> <p>6.1.2 Flow of Current</p> <p>6.1.3 Dial of the welding machine</p> <p>6.1.4 Setting the current</p>	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets 	Classroom

		<p>Ability to:</p> <ol style="list-style-type: none"> 1. Set the desired current of the welding plant 2. Check the proper connection of the welding machine to the receptacles and terminals 3. Install male / female connectors 		<ul style="list-style-type: none"> - Exercise Sheets - Work Sheets 	
H-7 Select Aluminum and Stainless steel filler rod	7.1 Select kind of filler metal according to the base metal	<p>Knowledge of:</p> <ol style="list-style-type: none"> 7.1.1 Kinds of Aluminum base metal 7.1.2 Aluminum filler rod types 7.1.3 Aluminum filler rod sizes 7.1.4 Filler rod Feeding techniques 7.1.5 Kinds of Stainless steel base metal 7.1.6 Stainless steel filler rod types 7.1.7 Stainless steel filler rod sizes 7.1.8 Filler rod Feeding techniques <p>Ability to:</p> <ol style="list-style-type: none"> 1. Select the filler rod 2. Manual skill of feeding the filler rod 	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom

H-8 Aluminum welding with TIG welding process	a. Weld the Aluminum with TIG welding process on different joints and positions.	<p>➤ TIG welding Aluminum practical Exercises:</p> <p>I. Straight Bead welding 3 hrs</p> <p>II. Outside corner joint Horizontal 3 hrs</p> <p>III. Square butt joint flat 6 hrs</p> <p>IV. Outside Corner joint Vertical up 6 hrs</p> <p>V. Square butt V. up 10 hrs</p> <p>VI. Square butt overhead 10 hrs</p> <p>VII. Tee joint or Overlap horizontal 8 hrs</p> <p>VIII. Tee or Overlap joint Vertical up 8 hrs</p> <p>IX. V. joint flat 8 hrs</p> <p>X. Square butt joint Oh 10 hrs</p> <p>Ability to:</p> <p>1. Weld the Aluminum properly with TIG welding process on different joints and position</p>		<p>- Complete TIG welding equipment AC machine</p> <p>- Al 200x100x3 mm 1pcs</p> <p>- Al 200x100x2mm 2pcs</p> <p>- Al 200x100x2mm 2pcs</p> <p>- Al 200x100x2mm 2pcs</p> <p>- Al 200x100x2mm 2pcs</p> <p>- Al 200x100x2mm 2pcs</p> <p>- Al 200x100x2mm 2pcs</p> <p>- Al 200x100x4mm 2pcs</p> <p>- Al 200x100x4mm 2pcs</p>	<p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p>
H-9 Stainless Steel welding with TIG welding process	9.1 Weld the Stainless steel with TIG welding process on different joints and positions.	<p>9.1.1 TIG welding Stainless Steel practical Exercises:</p> <p>I. Straight Bead welding 3 hrs</p> <p>II. Outside corner joint Horizontal 3 hrs</p> <p>III. Square butt joint flat 8 hrs</p> <p>IV. Outside Corner joint Vertical up 6 hrs</p> <p>V. Square butt V. up 8 hrs</p>		<p>- Complete TIG welding equipment AC / DC machine</p> <p>- SS200x100x3mm 1pcs</p> <p>- SS 200x100x2mm2pcs</p> <p>- SS200x100x2mm 2pcs</p> <p>- SS200x100x2mm 2pcs</p> <p>- SS200x100x2mm 2pcs</p>	<p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p> <p>Workplace</p>

		VI. Square butt overhead VII. Tee joint or Overlap horizontal VIII. Tee or Overlap joint Vertical up IX. V. joint flat X. Square butt joint Oh Ability to: 1. Weld the Stainless steel properly with TIG welding process on different joints and position	10 hrs 8 hrs 8 hrs 9 hrs 8 hrs	- SS200x100x2mm 2pcs - SS200x100x2mm 2pcs - SS200x100x2mm 2pcs - SS200x100x4mm2pcs - SS200x100x2mm 2pcs	Workplace Workplace Workplace Workplace Workplace
H-10 Clean welding joint after welding	10.1 Remove slag from the welded piece	Knowledge of: 10.1.1 Welding Slag 10.1.2 Use of power brush 10.1.3 Hand tools to remove slag 10.1.4 Filling and grinding Ability to: 1. Clean the slag of the welded piece 2. Clean the joint to inspect the defects	1 hr	- Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets	Classroom
H-11 Remove visual defects	11.1 Identify visual defects and remove them	Knowledge of: 11.1.1 Visual inspection of the welded joint / piece 11.1.2 Find Welding defects 11.1.3 Identify the tools to remove the defect Ability to:	2 hrs	- Defective welded pieces - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets	Classroom

		1. Identify the defect and remove the defect by using the grinding / polishing / filling / welding techniques		- Exercise Sheets - Work Sheets	
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Module – I : Title..... Repair Welding Defects

Objective of the Module: Inspect and Identify Welding Defects and Repair

Duration: 22 hours Theory: 6 hours Practice: 16 hour

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
I-1 Receive instruction from supervisor	1.1 Perform according the order / guideline of the superior	<p>Knowledge of:</p> <p>1.1.1 Inspection of the welded piece</p> <p>1.1.2 Analysis of the defects</p> <p>1.1.3 Directions of the supervisor</p> <p>1.1.4 Plan the possible remedies</p> <p>Ability to:</p> <p>1. Take orders and perform the corrective action plan</p> <p>2. Understand and execute the job repair order</p>	2+4 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom Workplace
I-2 Trace the defected location	2.1 Perform inspection of the welding job	<p>Knowledge of:</p> <p>2.1.1 Visual inspection</p> <p>2.1.2 Welding defects i.e. lack of fusion, cracks, lack of penetration, Slag/Solids inclusions</p> <p>Ability to:</p> <p>1. Trace the possible defect through visual inspection</p>	2.hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets - Defective welded pieces 	Classroom

I-3 Remove defected area	3.1 Treat and remove the defected welding area	<p>Knowledge of:</p> <p>3.1.1 Defects of the welding job</p> <p>3.1.2 Techniques of removing the defect</p> <p>3.1.3 Grinding and cutting</p> <p>3.1.4 Surface cleaning and preparing the defective part for re-welding</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Remove the defective part / defective fusions etc. 	2+6 hrs	<p>Relevant Equipment</p> <ul style="list-style-type: none"> - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets - Defective welded pieces 	Classroom Workplace
I-4 Re-weld defected area	2.2 Able to re-prepare the defective piece for re-welding	<p>Knowledge of:</p> <p>2.2.1 Remove the slag</p> <p>2.2.2 Grind / cut the defect</p> <p>2.2.3 Filing and starting the re-welding job</p> <p>2.2.4 Filling and capping</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Re-weld the joint according to the specification 2. Inspect the joint to see the defect which has been removed and proper welding is done 	6 hrs	<p>Relevant Equipment</p> <ul style="list-style-type: none"> - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Workplace

Module – J : Title.....Up Grade Workskill

Objective of the Module: To improve Knowledge and Skill required with the development of Technology

Duration: 25 hours Theory: 8 hours Practice: 17 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
J-1 Benefits from experienced people	1.1 Enhance the Knowledge and Skill with the help of others	<p>Knowledge of:</p> <p>1.1.1 New Welding skills and techniques</p> <p>1.1.2 Enhance knowledge about contemporary changes</p> <p>1.1.3 Experience people guidance through practical activities preformed</p> <p>Ability to:</p> <p>1. Increase the knowledge and improve the skill by making learning out of other's experiences</p>	2.hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
J-2 Read books in the field	2.1 Developing the habit of reading books to gain knowledge about technology	<p>Knowledge of:</p> <p>2.1.1 New techniques and methodologies</p> <p>2.1.2 Prior learning's and correction in pervious learning</p> <p>2.1.3 Enhance the subject information</p> <p>Ability to:</p> <p>1. Learn new advancements and</p>	2+3 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom Workplace

		adopt the same in one's own practices 2. Sharing the information with others and taking guidelines			
J-3 Watch videos on the subject	2.3 Use of Audio Visual Aids to enhance learning	Knowledge of: 2.3.1 Practical aspect of performing the new technique in executing the job 2.3.2 Observe and learning of correct welding Ability to: 1. Enhance the skill and techniques of proper welding under safe operation	1+6 hrs	- Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets	Classroom Workplace
J-4 Continue practicing of welding operations	4.1 Adopt new learning and perform those in executing the job	Knowledge to: 4.1.1 Keep abreast himself with new techniques 4.1.2 Correct the prior learning 4.1.3 Practice the learning in executing the job Ability to: 1. Perform the job in more effective and efficient manner 2. Keep safety standards in observation and follow them	1+6	- Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets	Classroom Workplace
J-5 Make visits to exhibitions and factories	5.1 Learn the practical implication	Knowledge of: 5.1.1 Modern skills used in the industry	2+2 hrs	- Relevant Equipment - White/Chalk board	Classroom Workplace

	of the technology changes and adoptability	<p>5.1.2 Modern machinery being inducted in the industry</p> <p>5.1.3 Contemporary knowledge about welding techniques and materials introduced</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Enhance his learning by observation and exclusive practical aspect. 2. Abreast the knowledge of the welding field 3. Plan better execution of the job 		<ul style="list-style-type: none"> - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	
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Module – K : Title..... Prepare Equipment, Tools and Appliances

Objective of the Module: Keep the Equipment, Tools and Appliances ready for use in Operation

Duration: 20 hours Theory: 8 hours Practice: 12 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
K-1 Prepare welding machines	1.1 Make the welding machines ready for job execution and keep them running	<p>Knowledge of:</p> <p>1.1.1 Welding machines maintenance</p> <p>1.1.2 Welding Machines cleaning process</p> <p>1.1.3 Replace parts of the machines</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Keep the welding machines in running condition 2. Replace few part and make minor repairs 	2+2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom Workshop
K-2 Prepare welding power connections	2.1 Understand the power connection of all welding and other equipments	<p>Knowledge of:</p> <p>2.1.1 Power connections</p> <p>2.1.2 Current and its flow</p> <p>2.1.3 Receptacles and their installation</p> <p>2.1.4 Thimbles and lugs</p> <p>2.1.5 Power switches</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Connect the welding power supply properly 2. Remove and repair defective parts 	2+2	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom Workshop

K-3 Clean tools	3.1.1 Maintain and arrange the tools required	<p>Knowledge of:</p> <p>3.1.1 Gather the required tools</p> <p>3.1.2 Clean and arrange them after proper working</p> <p>3.1.3 Place the tools in tool box / working area</p> <p>3.1.4 Hazards of unclean tools</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Plan and execute the job with proper clean tools 2. Clean the tools after use 	2+4 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom Workplace
K-4 Prepare production fixtures	4.1 Understand production fixture requirements	<p>Knowledge of:</p> <p>4.1.1 Lifting and handling tools and equipments</p> <p>4.1.2 Planning of the job.</p> <p>4.1.3 Efficient and progressive production</p> <p>4.1.4 Rigging activities</p> <p>4.1.5 Working area cleaning, house-keeping and safety measures</p> <p>Ability to:</p> <ol style="list-style-type: none"> 1. Plan the production and know the requirement 2. Execute the job properly 3. Understand the mass production 	2+4 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom Workplace

		4. Lift the heavy jobs through rigging assistance			
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Module – L : Title..... Clear Work Place on the Completion of work

Objective of the Module: ...To Take all Measures to make the workplace ready available for next job operation

Duration: 22 hours Theory: 10 hours Practice: 12 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
L-1. Place tools in proper place	1.1 Gather the tools and place them proper before and after completion of job	Knowledge of: 1.1.1 Tools requirement 1.1.2 Tools safety 1.1.3 Tools placement 1.1.4 Tools handling 1.1.5 Efficient working with help of hand and power tools 1.1.6 Ensure proper cabling and connections of all power tools 1.1.7 Place in the tool properly in working area Ability to: 1. Use the tools effectively 2. Safety of tools and working safety 3. Return of tools after use	3+3 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom workplace

L-2 Shut down power supplies / gas cylinder	2.1 Complete and make the working area / equipment safe	<p>Knowledge of:</p> <p>2.1.1 Disconnection of equipment</p> <p>2.1.2 Power supply cut off</p> <p>2.1.3 Gas regulators turning off</p> <p>Ability to:</p> <p>1. Turn off all the equipment in use</p>	2 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom
L-3 Dispose waste material	3.1 Do neat and clean housekeeping	<p>Knowledge of:</p> <p>3.1.1 Housekeeping</p> <p>3.1.2 Safety hazards due to waste materials</p> <p>3.1.3 Segregation of waste material</p> <p>3.1.4 Disposal procedure and precautions of different types of waste</p> <p>Ability to:</p> <p>1. Complete the job and clean the area making it ready for the next job</p> <p>2. Make environment and working safe for himself as well as for others</p>	2+4 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom workplace
L-4 Return leftover consumables	4.1 Collect and return the leftover materials / consumables	<p>Knowledge of:</p> <p>4.1.1 Issuance and return procedures</p> <p>4.1.2 Gate passes etc</p> <p>4.1.3 Using materials and consumables efficiently</p>	3+5 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets 	Classroom

		Ability to: 1. Execute the job and make the leftover safe for the next working day or for the next job		- Work Sheets	
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Module – M : Title..... Welding Procedure Specifications

Objective of the Module: Understand the terms and standards followed for welding in the industry

Duration: 20 hours Theory: 8 hours Practice: 12 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
M-1. Reading WPS	1.1 Get the information of job to be executed	Knowledge of: 1.1.1 Materials required for a job 1.1.2 Consumables required for a job 1.1.3 Procedures to be adopted Ability to: 1. Perform the job and work accordingly	2 hrs	- Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets	Classroom
M-2 Understanding WPS	2.1 Translate and understand the job requirements	Knowledge of: 2.1.1 Material detailed specifications 2.1.2 Positions to be used 2.1.3 Current and other standards to be followed Ability to: 1. Perform the job according to the details	2 hrs	- Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets	Classroom

		provided. 2. Comply with the drawings and directions of supervisor			
M-3 Abbreviations & terminologies	1.1 Understand the abbreviations	<p>Knowledge of:</p> <p>1.1.1 All welding terms and abbreviations / terminologies</p> <p>1.1.2 Welding symbols</p> <p>1.1.3 Reading of drawing and symbols</p> <p>Ability to:</p> <p>1. Execute the job according to the specification required</p>	2+6 hrs	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom Workplace
M-4 Standards	4.1 Understand the required standard which is to be followed	<p>Knowledge of:</p> <p>4.1.1 American Society of Mechanical Engineers (ASME) Codes</p> <p>4.1.2 American Welding Society (AWS) Codes</p> <p>4.1.3 Safety Standards of ISO and IIW</p> <p>Ability to:</p> <p>1. Understand and use the terminologies and standard to be followed as per WPS</p>	2+6	<ul style="list-style-type: none"> - Relevant Equipment - White/Chalk board - Transparencies - OHP - Information sheets - Exercise Sheets - Work Sheets 	Classroom and Net working place

2. Assessment Template

Module – A.....Follow Safety Rules

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Wear work clothes	15	35	1.1 Select and use the Safety Clothes according to the Work and Environment	Objective / Short answer / Oral	Test of Module at the end of 7 th day of training
2. Wear safety gears			2.1 Identify and select the Safety Gears work operations	Objective / Short answer / Oral	
3. Prepare the workplace			3.1 Determine the Housekeeping advantages and Select the Tools and Equipment required to perform the job	Objective / Short answer / Oral	
4. Deal with work hazards, accidents & injuries			4.1 Know work hazards, injuries and required first aid during welding job performance	Objective / Short answer / Oral	
			4.2 Know about the current hazards and proper connections	Objective / Short answer / Oral	
5. Inspect connections and regulators			5.1 Able to understand the function of regulators and gas cylinders	Objective / Short answer / Oral	
6. Use of extinguishers			6.1 Fire safety, Hazards and Respond in case of fire	Objective / Short answer / Oral	
	6.2 Fire extinguishers and other technique	Objective / Short answer / Oral			
7. Place gas			7.1 Place and Handle the cylinders	Objective / Short	

cylinders in appropriate location 8. Ensure proper ventilation systems			properly to Keep safe working conditions 8.1 Understand the ventilation system keep the smoke free zone of work place	answer / Oral Objective / Short answer / Oral	
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Module – BWork Permit System

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Understanding Work permit system 2. Knowledge about types of work permits 3. Acquisition of work permit	5 hrs	25 hrs	1.1 Understand execution of the job and working conditions 2.1 Know and describe the work permits 3.1 Accomplish the work permit	Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral	Test of Module at the end of 10 th day of training

Module – CPerformance Maintenance Operation

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Replace damaged welding cables 2. Replace	10 hrs	25 hrs	1.1 Keep the cables in good condition for execution of the assigned job 2.1 Handling of the grinder and cutting	Objective / Short answer / Oral Objective / Short	Test of Module at the end of 14 th day of training

cutting tools 3. Clean the tip of the welding nozzle 4. Change the holder and welding pliers 5. Clean welding guns 6. Clean machines and equipment 7. Replace hoses of the Gas Cylinders 8. Replace timer of the Gas regulators			tools 3.1 Kinds and sizes of the welding nozzles 3.2 Cleaning tools and techniques 4.1 Know the types and size of the welding holder 5.1 Use and clean the welding guns 6.1 Clean & keep maintenance of welding machines / rectifiers 7.1 Change and maintain the hose pipes used with gas cylinders 8.1 Changing and maintenance of the gas welding equipment	answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral	
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Module – D Communication to Others

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Communicate with supervisor 2. Communicate with Engineer 3. Communicate with peers 4. Communicate with helpers 5. Communicate with client / customer	10 hrs	15	1.2 Understand the direct orders and respond to them 2.1 Follow the instructions and order of the engineer 3.1 Able to sharing knowledge and problem solving abilities 4.1 Command and provide guideline to subordinates 5.1 Understand requirement of the client / customer	Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral	Test of Module at the end of 17 th day of training

Module – E... .. Basic Bench Work

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Organize the Bench work place. 2. Organize the Bench work tools. 3. Observe Tools, Job and personal safety. 4. Prepare the jobs following the drawing. 5. Arithmetic's / Geometrical terminologies and problem solving. 6. Define kinds of welding, their principles and use.	24	100	1.2 Identify the suitable tools for the job. 2.1 Select basic metal working tools. 2.1 Observe safety for tools, work and personal to complete the Job. 4.1 Accomplish the job with its requirement and quality 5.1 Solve the Simple Math Questions 5.2 Understand and Read the Drawing 6.1 Explain the different kinds of Welding:	Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Practical Skill Test Objective / Short answer / Oral Objective / Short answer / Oral	Test of Module at the end of 33 rd day of training

Module – F Perform GAS (Oxy-Acetylene) Welding

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Organize the work place	20	105	1.1 Identify and Select the Gas Welding Equipment and	Objective / Short answer / Oral	Test of Module at

2. Prepare the required welding equipment			accessories		
3. Remove surface base metal defects			2.1 Assemble the Gas welding Equipment.	Objective / Short answer / Oral	the end of 50 th day of training
4. Set the suitable Gas Pressure			3.1 Clean and size the metals before welding	Objective / Short answer / Oral	
5. Determine the suitable Tip / Nozzle size			4.1 Explain the kinds of Regulators 4.2 Adjust the Oxy-Acetylene Pressure	Objective / Short answer / Oral	
6. Connect the Tip / Nozzle to the torch.			5.1 Explain Kinds of welding Torches	Objective / Short answer / Oral	
7. Select the welding Joints			6.1 Select welding Tip / Nozzle	Objective / Short answer / Oral	
8. Select Welding positions			7.1 Determine the different welding Joints	Objective / Short answer / Oral	
9. Kinds of filler metals			8.1 Explain the different welding Positions	Objective / Short answer / Oral	
10. Acquire Skill			9.1 Determine the filler metal / rod considering kinds of base metal and its thickness	Objective / Short answer / Oral	
11. Remove Slag			10.1 Weld the metals with Oxy-Acetylene process on different Joints and Positions	Practical Skill Test	
12. Remove visual defects			11.1 Clean the welded surfaces to find the visual defects	Objective / Short answer / Oral	
13. Oxy-Acetylene Cutting			12.1 Prepare and repair the welding defect	Objective / Short answer / Oral	
			13.1 Select and use the Oxy-Acetylene Cutting equipment and technique	Objective / Short answer / Oral	

Module – H Perform GTAW / TIG – Aluminum & Stainless Steel Welding Operations

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Organize workplace	18 hrs	146 hrs	1.1 Arrange the tools and equipment required to perform the job	Objective / Short answer / Oral	Test of Module at the end of 85 th day of training
2. Prepare the required welding machine			1.2 Identify the welding machine / rectifier required to execute the job according to the WPS	Objective / Short answer / Oral	
3. Remove surface base metal defects			1.3 Prepare the welding pieces	Objective / Short answer / Oral	
4. Prepare the raw material			1.4 Install the gases and attachments	Objective / Short answer / Oral	
5. Adjust pressure of Inert Gas.			1.5 Set the welding positions required	Objective / Short answer / Oral	
6. Select and Prepare the Tungsten electrode			1.6 understand the electric current	Objective / Short answer / Oral	
7. Set current and voltage.			1.7 Select kind of filler metal according to the base metal	Objective / Short answer / Oral	
8. Select size for the welding wire.			1.8 Weld the Aluminum with TIG welding process on different joints and positions.	Practical Skill Test Aluminum	
9. Weld the metals on different joints and positions.			1.9 Weld the Stainless steel with TIG welding process on different joints and positions.	Practical Skill Test Stainless Steel	
10. Select welding position			1.10 Remove slag from the welded piece	Objective / Short answer / Oral	
11. Remove visual defects			1.11 Identify visual defects and remove them	Objective / Short answer / Oral	

Module – I Inspect and Identify Welding Defects and Repair

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Receive instruction from supervisor 2. Trace the defected location 3. Remove defected area 4. Re-weld defected area	6	16	1.2 Perform according the order / guideline of the superior 1.3 Perform inspection of the welding job 1.4 Treat and remove the defected welding area 1.5 Able to re-prepare the defective piece for re-welding	Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral	Test of Module at the end of 90 th day of training

Module – J Up Grade Work Skill

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Benefit from experienced people 2. Read books in the field 3. Watch videos on the subject 4. Continue practicing welding operations 5. Make visits to	8 hrs	17 hrs	1.2 Enhance the Knowledge and Skill with the help of others 3.2 Developing the habit of reading books to gain knowledge about technology 3.1 Use of Audio Visual Aids to enhance learning 4.1 Adopt new learning and perform those in executing the job 5.1 Learn the practical implication of	Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short	Test of Module at the end of 93 rd day of training

exhibitions and factories			the technology changes and adoptability	answer / Oral	
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Module – K Prepare Equipment, Tools and Appliances

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Prepare welding machines	8	12	1.2 Make the welding machines ready for job execution and keep them running	Objective / Short answer / Oral	Test of Module at the end of 96 th day of training
2. Prepare welding power connectors			1.3 Understand the power connection of all welding and other equipments	Objective / Short answer / Oral	
3. Clean tools			1.4 Maintain and arrange the tools required	Objective / Short answer / Oral	
4. Prepare production fixtures			1.5 Understand production fixture requirements	Objective / Short answer / Oral	

Module – L..... Clear Workplace on the Completion of Work

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Place tools in proper place	10 hrs	12 hrs	1.1 Gather the tools and place them proper before and after completion of job	Objective / Short answer / Oral	Test of Module at the end of 98 th day of training
2. Shut down power			2.4 Complete and make the working area / equipment safe	Objective / Short answer / Oral	

supplies / gas cylinder					
3. Dispose waste material			3.1 Do neat and clean housekeeping	Objective / Short answer / Oral	
4. Return leftover consumables			4.1 Collect and return the leftover materials / consumables	Objective / Short answer / Oral	

Module – M

Learning Units	Theory Days/hours	Workplace Days/hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
1. Reading WPS 2. Understanding WPS 3. Abbreviations and terminologies 4. Standards	8	12	1.2 Get the information of job to be executed 1.3 Translate and understand the job requirements 1.4 Understand the abbreviations 1.5 Understand the required standard which is to be followed	Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral Objective / Short answer / Oral	Test of Module at the end of 100 th day of training

Supportive notes

- Assessment context
- Critical aspects
- Assessment condition
- Resources required for assessment

3. List of Tools, Machinery & Equipment

Name of Trade	GAS and TIG Welding Technician
Duration	6 Months (800 hrs)

BASIC BENCH WORKING

Sr. No.	NAME OF ITEM
1.	Steel rule 30 cm
2.	Steel Tape 3 meter
3.	Steel Tape 5 meter
4.	Sprit level 12 inch/30 Cm
5.	Work benches
6.	Bench vice 5"
7.	Hammer ball peen 500gm
8.	Hammer cross peen 500 gm
9.	Hammer 1000 gm
10.	Sledge hammer 8000 gm
11.	Hand Hacksaw frame (blade size 12"/30 cm)
12.	Outside Caliper 6"/15 Cm
13.	Inside Caliper 6"/15 Cm
14.	File flat 300 x 1
15.	File half round 250 x 1
16.	File round 250 x 1
17.	File triangular 200 x 1
18.	Try square 8"
19.	Combination Pliers 8"
20.	Open end spanner set in Inch. (double end ¼ to 1")
21.	Open end spanner set in mm (double end 6mm to 32mm)
22.	Screw driver straight 8" & 12"
23.	Screw driver Philips 8" & 12"
24.	Spanner adjustable 8", 10" & 12"
25.	Anvil 100 Kg with stand
26.	Allen key set 3mm to 12mm
27.	Hand shear straight 12"
28.	Blow lamp kerosene oil
29.	Soldering Iron 300 Watt.
30.	Chisel flat & crosscut
31.	Centre punch
32.	Twist Drill set 25 pieces (3-13 mm)
33.	Counter sink set 25 pieces (3-13 mm)
34.	Hand vice
35.	Tape and die set (6-12 mm)
36.	Line scribe
37.	Vernier Caliper 6"
38.	Vernier height gauge

39.	Angle plate
40.	Safety goggle
41.	Pedestal drill machine
42.	Pedestal grinder heavy duty wheel size 300 x 50mm
43.	Electric Hand drill machine
44.	Power saw
45.	Bench shear
46.	Hand disc grinder 7"
47.	Hand disc grinder 4"
48.	Lever Shear Blade size 12" with profile cutting
49.	Cutoff machine dia. 14" with angle adjustment

GAS WELDING EQUIPMENT AND ACCESSORIES

Sr. No.	NAME OF ITEM
50.	Gas welding working stations
51.	Cylinder trolley or Manifold system (one)
52.	Cylinder for Oxygen gas with key
53.	Cylinder for Acetylene gas with key
54.	Regulator (oxygen) double stage
55.	Regulator (acetylene) double stage
56.	Flashback arrester acetylene
57.	Flashback arrester oxygen
58.	Hose pipe (oxygen) 4 meter each
59.	Hose pipe (acetylene) 4 meter each
60.	Oxy-acetylene welding and cutting set (injector type) complete with tip Cleaner needles.
61.	Steel table with fire bricks top
62.	Spark lighter
63.	Welding goggles
64.	Burner pliers or Tong
65.	Stool
66.	Table for gas cutting

GTAW / TIG WELDING EQUIPMENT AND ACCESSORIES

Sr. No.	NAME OF ITEM
67.	GTAW/TIG Welding Transformer 50-250 amp complete with leads, earth clamp and electrode holder
68.	GTAW/TIG Welding Rectifier (AC / DC) 50-300 amp complete with leads, earth clamp and electrode holder
69.	Welding face shield complete
70.	Welding helmet complete
71.	Chipping hammer
72.	Steel wire brush
73.	Leather gloves (pair)
74.	Leather apron
75.	Welding Table
76.	Stool
77.	Welding Booth

CONSUMEABLE (MINIMUM REQUIRED FOR SIX MONTH)

Sr. No.	NAME OF ITEM
1.	MS Channel 75x38x6mm
2.	MS Flat 62.5x15mm
3.	MS Flat 25 x1mm
4.	Ms Sheet 2mm thick
5.	MS Sheet 3mm
6.	MS Plate 4mm
7.	MS Plate 5mm
8.	MS Pipe dia.2"x 2mm
9.	MS Pipe dia. 3"x3mm
10.	Aluminum sheet 2mm
11.	Aluminum sheet 3mm
12.	Brass Sheet 50x25x1mm
13.	Stainless steel sheet 1mm
14.	Stainless steel sheet 2mm
15.	Stainless steel Plate 4mm
16.	MS filler rod 1mm gas welding
17.	MS filler rod 2mm gas welding
18.	MS filler rod 3.2 mm gas welding
19.	Aluminum filler rod 2mm
20.	Aluminum filler rod 2.5mm
21.	Aluminum filler rod 3.2mm
22.	Stainless steel rod 1mm
23.	Stainless steel rod 1.5mm
24.	Stainless steel rod 2.5mm
25.	Stainless steel rod 3.2mm
26.	Tungsten Electrode dia.1.5mm
27.	Tungsten Electrode dia.2.5mm
28.	Tungsten Electrode dia.3.2mm
29.	Tungsten Electrode dia.4mm
30.	Oxygen Gas
31.	Acetylene Gas
32.	Carbon dioxide (Co2)Gas
33.	Argon Gas

REFERENCE BOOKS FOR TEACHER

1. Modern Welding
By Althouse - Turnquist - Bowditch.
2. Welding Skills and Practices
By Giachino - Weeks.
3. Welding Skills
By Giachino - Weeks.
4. Welding Principles & Practices
By Sacks.
5. Practical Welding Technology
By Rudy Mohler.
6. Principles of Welding Technology
By L. M. Gourd.
7. Oxy-Acetylene Welding basic fundamentals
By Ronald J. Baird.
8. Brazing and soldering of Metals
N. Lashko - S. Lashko
9. Technology of the Metal Trade (GTZ)
Appold - Feiler - Reinhard - Schmith.
10. Oxy-Acetylene handbook,
By LINDE

ASSESSMENT OF TRAINEES ACHIEVEMENT

- Monthly Theory test (Objective / short answer type) should be conducted.
- Each practical exercise should be marked on the provided marking criteria.
- Final theory test should be Objective / Short answer type, not more than 30minutes.
- Final practical test should be from the skill, the trainees have performed during training.

Passing Marks in Theory each Test 40 %

Passing Marks in Practical each exercise 60 %

RESULT:

Sessional marks obtained in Theory (A) 20%

Final Marks obtained in Theory (B) 80%

Total (A + B) = "C"

Sessional Marks obtained in Practical (D) 30%

Final Marks obtained in Practical (E) 70%

Total (D + E) = "F"

Certification Marks will be in percentage = 20 % of "C" + 80% of "F"

GENERAL RECOMMENDATIONS

TEXT BOOKS:

The text book should be based on approved national curriculum with:

1. Fully illustrated.
2. Simple and easy Urdu/English.
3. Examples from every day life.
4. Uniformity in terminology.
5. Technical terms / terminologies should not be translated.
6. Objective type and short answer test items should be at the end of each chapter.

PRACTICAL MANUAL:

For uniform standard through out the country, the Manual should be prepared. This manual should contain:

1. Practical drawings with sizes and title.
2. Material.
3. Tools and instruments required.
4. Sequence of Operations.
5. Marking criteria sheet for each practical test, in which marks may be distributed as Dimensions and sizes 20%, Trade skill 70%, Tidiness of workplace and safety 10%. This may also be applied for Final Trade Test marking sheet.

LESSON PLAN

The teacher should prepare lesson plans for Classroom of each topic. This will provide guideline to the teacher regarding;

- a. Topic.
- b. Objectives.
- c. Teaching aids required.
- d. Motivation.
- e. Sequence of knowledge transfer.
- f. Chalkboard / Whiteboard layout to be developed during lesson delivery.
- g. Revision of important points.
- h. Test the Achievement of trainees.

WORKSHOP:

In order to facilitate the Trainees to develop the desired skills and competencies, it is recommended that:

- a. Practical activities by the trainees should be carried out individually.
- b. Workshop should be fully equipped as stipulated in the curriculum.
- c. Budget provision should be made to replace/purchase the latest tools and equipments to up date the equipment.
- d. Recommended consumables should be provided for practical in reasonable quantity.
- e. The teacher should himself be able to make / demonstrate the practical exercises to the desired skill level.

EVALUATION OF CURRICULUM

The curriculum development is continuous process; a follow-up committee should be formed to check its proper implementation and evaluation. It is recommended that National and Provincial evaluation committees should be formulated on permanent basis.

The committee may comprise on following:

- a. Curriculum experts.
- b. Teacher Trainers.
- c. Subject specialists.
- d. Curriculum designer.
- e. Industrial experts.

The Committees will be expected to:

- a. Evaluate the shortcomings and achievements of the curriculum.
- b. Remain in contact with the teacher to obtain feedback.
- c. Suggest proposals for the amendment / revision of course.

SCHEME OF STUDIES

Name of Trade: Welder Gas & TIG

Sr #	Modules	Theory Hours	Practical Hours	Total Hours
1	Module A Follow Safety Rules	15	35	50
2	Module B Work Permit system	5	25	30
3	Module C Perform Maintenance	10	25	35
4	Module D Communicate to other	10	15	25
5	Module E Basic bench work	24	100	124
6	Module F Perform gas welding	20	105	125
7	Module G Perform GTAW(MS)	18	120	138
8	Module H GTAW(AL,S.S) welding	18	146	164
9	Module I Repair welding defect	6	16	22
10	Module J Upgrade work skills	8	17	25
11	Module K Prepare equipment tools and appliances	8	12	20
12	Module L Clean work place at	10	12	22

	completion of work			
13	Module M Welding procedure	8	12	20
TOTAL HOURS		160	640	800