

GOVERNMENT OF THE PUNJAB
TECHNICAL EDUCATION & VOCATIONAL
TRAINING AUTHORITY



CURRICULUM FOR
ADVANCE MULTI WELDER
(3 –MONTH COURSE)

REVISED SEPTEMBER 2024

CURRICULUM SECTION
ACADEMICS DEPARTMENT

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TRAINING OBJECTIVES:

1. The prime objective of this course of ADVANCE MULTI WELDER is to develop and enhance the skill level of the incumbent in this trade of construction industry **in green environment.**
2. Semi-skilled and skilled worker produced by this training would help to reduce unemployment and poverty in the society **with pollution free solution.**
3. This curriculum is designed to train the Middle / Matric pass persons who are facing a lot of shortage of Plate Welders in the field of construction industry **by providing him awareness about the green environment.**
4. To impart the training and provide the industry with work force whose scope with job knowledge and skills are identified.
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 03 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 graduates to meet the job market to reduce the shortage of Semi-Skilled and Skilled workers in the area.
7. To establish coordination among with employer's, workers and government relation human resource development programs.

CURRICULUM SALIENTS:

Entry Level	:	Middle with Welder (SMAW) Certified OR Welding Experience from reputed organization OR any welding traditional short courses
Duration of course	:	3 – Months
Total Training Hours	:	400 Hours
No. of days per week	:	6 days per week
Training hours per day	:	7hrs./ day
Training hours per week	:	40 Hours per week
Training Methodology	:	Practical 90%
	:	Theory 10%
Medium of instruction	:	Urdu

SKILL PROFICIENCY DETAILS: -

On successful completion of this course, the trainee should be able to:

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. Arc welding of common plates & Pipes joints in all positions.
10. Perform the GTAW+SMAW welding of common welding joints in all positions on pipe.
11. Inspect and test welding joints.
12. Distinguish different metals & electrodes.
13. Understand electricity & control of welding machines.
14. Able to make bevel & cuts by grinders.
15. Able to prepare his job according to WPS.
16. Apply Arc Welding by selection of Electrodes.
17. Make welding on various parts / jobs as per design and drawing.
18. Read the drawing of building metal constructed job / projects.
19. Make the project of construction fabrication as per drawing & designs.

KNOWLEDGE PROFICIENCY DETAILS: -

On successful completion of this course, the trainee should be able to:

1. Safety precautions applicable to Welding machines, hand tools, equipment and machine tools.
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. Describe the knowledge of Arc welding tools, equipment, their use and safety.
7. Express the knowledge of SMAW (Stick Welding) and GTAW (TIG) welding tools, equipment their use and safety.
8. Describe the knowledge of welding joints, positions, their use and selection.
9. Express the knowledge of inspecting and testing welded joints to ensure weld quality.
10. Understand application of work Permit & WPS.
11. Understand welding defects & their recognition and rectification process.
12. Explain the arc welding by selection of current setting.
13. Explain the construction fabrication of the construction industry.
14. Explain the drawing of construction fabrication.

SCHEME OF STUDIES

ADVANCE MULTI WELDER

(3– Months Course)

Sr. No.	Detail of Topics	Theory Hours	Practical Hours	Total Hours
1.	General Safety Precautions	1	-	1
2.	Welding Safety Measures	1	-	1
3.	Materials Technology	1	-	1
4.	Welding Technology & Terminology	1	-	1
5.	Shielding	1	-	1
5.	Welding Machines	1	1	2
6.	Welding Joints & Symbols	1	4	5
7.	Types Of Welds	1	3	4
8.	Test Positions Of Pipe & Plate	2	16	18
9.	Welding Techniques	1	2	3
10.	Welding Methods Of Application	1	5	6
11.	Grinding, Beveling & Tacking	2	20	22
12.	Introduction to Different Welding Processes	4	20	25
13.	Shielded Metal Arc welding	4	85	89
14.	Gas Tungsten Arc Welding	4	122	126
15.	Gas Metal Arc Welding	4	31	35
16.	Oxy-fuel Gas Welding & Cutting	2	20	22
17.	Welding Defects, Causes & Remedies	2	13	15
18.	Inspection & Testing Of Welds	2	10	12
19.	Welding Procedure Qualification	3	8	11
20.	Interview/Test Guidance For Welder	1	-	1
Total		40	360	400

DETAIL OF COURSE CONTENTS

Advance Multi Welder (3-Months Course)

Sr. No.	Detail of Topics	Theory Hours	Practical Hours	Total Hours
1.	General Safety Precautions 1.1 HSE for Welders 1.2 Basic Safety Orientation Course 1.3 Safety Practice 1.4 Permit To Work 1.5 Importance Of Oxygen 1.6 Breathing apparatus 1.7 Work at Heights 1.8 Radiography 1.9 Causes Of Fire 1.10 Tool Box Talk	1	-	1
2	Safety Measures In Different Welding Processes according to green practices 2.1 Electric Shock 2.2 Arc Radiation 2.3 Fumes & Dust 2.4 Compressed Gases 2.5 Fire & Explosion 2.6 Noise	1hrs	-	1
3.	Materials Technology 3.1 Ferrous Metals 3.2 Non Ferrous Metals 3.3 Properties Of Metals 3.4 Pipe & Plate Materials	1hrs	-	1
4.	Welding Technology & Terminology 4.1 Introduction Of Welding 4.2 Types Of welding 4.3 Weld-ability 4.4 Arc & Arc Length	1hrs	-	1

	4.5 Welding Variables (Current, Voltage, Polarity, Travel Speed) 4.6 Arc Energy & Heat Input 4.7 Heat Affected Zone			
5.	Shielding 5.1 Gas Shielding 5.2 Flux Shielding 5.3 Inert & Semi-inert Gases	1hr	2	3
6.	Welding Machines 6.1 AC Transformer 6.2 DC Rectifier 6.3 DC Generator 6.4 Invertor	1hr	1	2
7.	Welding Joints & Symbols 7.1 Types Of Welding Joints 7.2 Basic Welding Symbols 7.3 Elementary Welding Symbols	1hrs	-	1
8.	Types Of welds 8.1 Groove Weld 8.2 Fillet Weld 8.3 Back Or Backing Weld 8.4 Flange Weld 8.5 Spot Or Projection weld 8.6 Seam Weld 8.7 Surfacing Weld 8.1 Types Of Welds According To Materials 8.1.1 Autogenous Weld 8.1.2 Homogenous Weld 8.1.3 Heterogeneous Weld 8.1.4 Dissimilar Weld	1hrs	3	4
9.	Test Positions of Pipe & Plate 9.1 Pipe Test Positions In Groove Weld 1G, 2G, 5G, 6G & 6GR 9.2 Pipe Test Positions In Fillet Weld 1F, 2F, 5F, 6F	2hrs	16	18

	9.3 Plate Test Positions In Groove Weld 1G, 2G, 3G, 4G 9.4 Plate Test Positions In Fillet Weld 1F, 2F, 3F, 4F			
10.	Welding Techniques 10.1 Puddling 10.2 Leftward/Forward/Forehand 10.3 Rightward/Backward/Backhand 10.4 Vertical Up/Uphill 10.5 Vertical Down/Downhill 10.6 Overhead 10.7 Stringer 10.8 Weaving	1hrs	2	3
11.	Grinding, Beveling & Tacking 11.1 Grinding 11.2 Kinds of Grinder 11.3 Grinding Disc 11.4 Grinding Position 11.5 Grinding Cutting Technique 11.6 Cutting Disc 11.7 Handling of hand grinder 11.8 Grinding Procedure 11.9 Safety Rules 11.10 What is Bevel 11.11 Bevel Gauge preparation 11.12 Bevel Making & Bevel Angle 11.13 Tack Welding & Plate Tacking	2hrs	20	22
12.	Introduction To Different Welding Processes 12.1 Shielded Metal Arc Welding (SMAW) 12.2 Gas Tungsten Arc Welding (GTAW) 12.3 Gas Metal Arc Welding (GMAW) 12.4 Flux Cored Arc Welding (FCAW) 12.5 Submerged Arc Welding (SAW) 12.6 Gas Welding	5hrs	20	25

13.	Shielded Metal Arc Welding 13.1 Introduction 13.2 Principle Of Operation 13.3 Arc Shielding 13.4 Types Of Electrodes 13.5 Classification Of Electrodes 13.6 Tools & Equipment's Used In SMAW 13.7 Applications Of SMAW	3hrs	85	88
14.	Gas Tungsten Arc Welding 14.1 Introduction 14.3 Principle Of Operation 14.4 Tungsten Electrodes (Size In SWG)(mm) 14.5 Classification Of Tungsten Electrodes 14.6 Filler rod/Filler Wire 14.7 HF start VS Lift Start VS Scratching Start 14.8 Process Variables 14.9 Purging/Gas Backing 14.10 Applications Of GTAW 14.11Tools & Equipment's Used In GTAW	4hrs	122	126
15	Gas Metal Arc Welding 15.1 Introduction 15.2 Principle of GMAW Operation 15.3 Arc Shielding 13.4 Tools & Equipment's Used In GMAW 13.5 Applications Of GMAW	2hrs	31	33
16.	Oxy-fuel Gas Welding & Cutting 16.1 Function Of Oxygen/Acetylene Cylinder 16.2 Gas Welding/Cutting Torches 16.3 Back Fire/Flash Back 16.4 OFW Flames 16.5 Gas Welding/Cutting Techniques	2hrs	20	22
17.	Welding Defects, Causes & Remedies	2hrs	13	15

	17.1 Imperfection, Discontinuity & Defect 17.2 Porosity 17.3 Inclusion 17.4 Lack Of Fusion 17.5 Inadequate Joint Penetration 17.6 Cracks 17.7 Under-fill & Under-cut 17.8 Crater 17.9 Spatter 17.10 Arc Strike 17.11 Distortion			
18.	Inspection & Testing Of Welds 18.1 Visual Inspection 18.2 Non-destructive Tests 18.3 Tightness Tests	2hrs	10	12
19.	Welding Procedure Qualification 19.1 Welding Variables 19.2 Welding Procedure Specification 19.3 Welding Qualification Record 19.4 Welder Performance Qualification 19.5 Expiration Of Qualification 19.6 Renewal Of Qualification 19.7 Welding Procedure List	3hrs	8	11
20.	Interview/Test Guidance For Welder 20.1 Professional work Ethics (according to NAVTTC Annexure-I)	4hr	-	4
Total		40	360	400

PRACTICAL PLANS
ADVANCE MULTI WELDER
(3– Months Course)

Sr. No.	Detail of Practical
1.	Bead making on plate With GTAW
2.	Bead making on plate With SMAW
3.	Bead making on plate With GMAW
4.	Grinding On Plate
5.	Grinding On Pipe
6.	Gas Cutting Practice On Plate
7.	Gas Cutting Practice On Pipe
8.	Making layers On Plate With GTAW
9.	Making layers On Plate With SMAW
10.	Making Layers On Pipe With GTAW
11.	Making Layers On Pipe With SMAW
12.	Capping On Plate 1G Test Position With GTAW
13.	Capping On Plate 2G Test Position With GTAW
14.	Capping On Plate 3G Test Position With GTAW
15.	Capping On Plate 1G Test Position With SMAW
16.	Capping On Plate 2G Test Position With SMAW
17.	Capping On Plate 3G Test Position With SMAW
18.	Capping On Plate 1G Test Position With GMAW
19.	Capping On Plate 2G Test Position With GMAW
20.	Capping On Plate 3G Test Position With GMAW
21.	Capping On Pipe 1G Test Position With GTAW
22.	Capping On Pipe 2G Test Position With GTAW
23.	Capping On Pipe 5G Test Position With GTAW
24.	Capping On Pipe 6G Test Position With GTAW
25.	Capping On Pipe 1G Test Position With SMAW
26.	Capping On Pipe 2G Test Position With SMAW
27.	Capping On Pipe 5G Test Position With SMAW

28.	Capping On Pipe 6G Test Position With SMAW
29.	Butt joint 2" 80 sch. 1G Test Position (Pipe) With GTAW
30.	Butt joint 2" 80 sch. 2G Test Position (Pipe) With GTAW
31.	Butt joint 2" 80 sch. 5G Test Position (Pipe) With GTAW
32.	Butt joint 2" 80 sch. 6G Test Position (Pipe) With GTAW
33.	Butt joint 6" 80 sch. 2G Test Position (Pipe) With Multi Processes
34.	Butt joint 6" 80 sch. 5G Test Position (Pipe) With Multi Processes
35.	Butt joint 6" 80 sch. 6G Test Position (Pipe) With Multi Processes

LIST OF TOOLS / EQUIPMENT / WORKSHOP

(For Class Of 25 Students)

Name of Course	Advance Multi Welder
Duration of Course	3 – Months

Sr. No.	Name of Tools / Equipment	Quantity	Unit
1.	Welding Machine Tig & SMAW (300 to 500Amp) with Accessories	8	Nos.
2.	GMAW welding machine with accessories	5	Nos.
3.	Welding face shield	25	Nos.
4.	Welding helmet	25	Nos.
5.	Safety helmet with Face Shield	25	Nos.
6.	Arc welding table	13	Nos.
7.	Chipping hammer	25	Nos.
8.	Apron	25	Nos.
9.	Leather gloves	25	Pair
10.	Argon gloves	25	Pair
11.	Leather Sleeve	25	Pair
12.	Welding Hood	25	Nos.
13.	O2 gas cylinder with gauge	3	Nos.
14.	C2H2 gas cylinder with gauge	2	Nos.
15.	Angle Grinder 7"	5	Nos.
16.	Tongs	12	Nos.
17.	Grip Plier (U Type)	12	Nos.
18.	Safety Shoes (Pair)	30	Pair
19.	Safety goggle	25	Nos.
20.	Ear Muff	25	Nos.
21.	Dusting Mask	5	Pkt
22.	Cotton Gloves	250	Nos.

LIST OF CONSUMABLE MATERIALS

(For Class of 25 Students)

Name of Course	Advance Multi Welder
Duration of Course	3 – Months

Sr. No.	MATERIAL	Qty	Unit	Remarks
1.	MS Flat 200X100X6 mm	250	kg	
2.	MS Plate 300X300X10 mm	200	kg	
3.	MS Plate 300X300X20 mm	500	kg	
4.	MS Pipe dia 60 x sch-80	50	ft	
5.	MS Pipe dia 168 x sch-80	50	ft	
6.	Electrode E7018-(SWG-12)	500	kg	
7.	Filler wire E70S-3 dia 2.5mm	250	kg	
8.	Wire Spool Er70S-6 dia 1mm	125	kg	
9.	Tungsten electrode dia 2.4mm	100	Nos	
10.	Collet pin dia 2.4mm	50	Nos	
11.	Collet body dia 2.4mm	15	Nos	
12.	Long cap for tig torch	25	Nos	
13.	Ceramic cup (6no)	50	Nos	
14.	Ceramic cup (7no)	25	Nos	
15.	Cutting disk dia 125x1mm	125	Nos	
16.	Cutting disk dia 125x3mm	75	Nos	
17.	Cutting disk dia 14inch	5	Nos	
18.	Grinding disk dia 7inchx1/4inch	75	Nos	
19.	Antispatter spray	5	Nos	
20.	Flap disk dia 5inch	50	Nos	

FURNITURE

Sr. No.	Name of Article	Quantity
1.	Instructor table with 3 drawers	01
2.	Wooden stool (for students)	25
3.	Chair for teacher	02
4.	White board (3 ½ x 5ft) with stand	01
5.	Steel Almirah (4 x 7 ft)	04

EMPLOYABILITY OF PASS-OUTS:

The pass-outs of this course may find job/employment opportunities in the following sectors / areas.

1. Construction Industry
2. Auto mobile industry
3. Repairing Work shop
4. Pakistan Ordinance Factory, Wah Cantt.
5. Heavy Mechanical Complex / Heavy Forge Foundry, Taxila.
6. PECO, Kot Lakhpat.
7. DESCON Engineering.
8. Pakistan Railways Workshops.
9. Tractor manufacturing units Packages.
10. Automobile Industry.

REFERENCE BOOKS:

1. Handbook of Structural Welding by John Lancaster
2. Gas Tungsten Arc Welding Handbook by William H. Minnick
3. ASME Section IX
4. ASME Section II
5. ASME Section V
6. www.MillerWelds.com
7. Guidelines For Shielded Metal Arc Welding (SMAW)

Min. QUALIFICATION OF TEACHER

a) Instructor

D.A.E in Mechanical / Met. & Welding / B. Tech. with experience in welding

OR

5-Years' experience in Relevant Field / Construction Computer proficiency

b) Demonstrator

Matric / Intermediate with 4-Years experience in welding experience in Construction Industry

Ability to use computer

Curriculum Revision Committee

Sr. #	Name & Designation	Status
1.	Rehman Tariq Instructor Metallurgy & Welding GSPCT Gujrat	Convener
2.	Muhammad Zahid Jan HOD (Welding Section) Descon Technical Institute 2-Km Defence Road off Multan Road, Mohlanwal, Lahore.	Member
3.	Muhammad Junaid Jr. Instructor (Mechanical) GCT Railway Road, Lahore	Member