

GOVERNMENT OF THE PUNJAB
TECHNICAL EDUCATION & VOCATIONAL
TRAINING AUTHORITY



CURRICULUM FOR
WELDER (SMAW)
(3 –MONTH COURSE)
REVISED AUGUST 2024

CURRICULUM SECTION
ACADEMICS DEPARTMENT
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TRAINING OBJECTIVES:

1. The prime objective of this course of WELDER (SMAW) 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 relating human resource development programs.
8. Provide technical and vocational training basis which reflects the requirements of the industry.

CURRICULUM SALIENTS:

Entry Level	:	Middle
Duration of course	:	3 – Months
Total Training Hours	:	400 Hours
No. of days per week	:	6 days per week
Training hours per day	:	7 hrs/ day (Friday 5 hrs)
Training hours per week	:	31 Hours per week
Training Methodology	:	Practical 90%
	:	Theory 10%
Medium of instruction	:	Urdu
• 1 hour per week for Work Ethics		

SKILL & KNOWLEDGE 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 plate piece.
6. Measure, cut and place / stack MS Plate to the given size.
7. Making bevel of the plate to make it ready for welding.
8. Tacking the two welding pieces for joint.
9. Arc welding of common plates joints in all positions.
10. Perform the SMAW welding of common welding joints in all positions on plates.
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.

SCHEME OF STUDIES

WELDER (SMAW)

(3– Months Course)

Sr. No.	Detail of Topics	Theory Hours	Practical Hours	Total Hours
1.	General Safety Precautions	2	-	2
2.	Welding Safety Measures	3	-	3
3.	Materials Technology	1	-	1
4.	Welding Technology & Terminology	1	-	1
5.	Polarity	1	1	2
6.	Welding Machines	1	1	2
7.	Welding Joints	1	4	5
8.	Types Of Welds	1	3	4
9.	Test Positions Of Pipe & Plate	2	16	18
10.	Welding Techniques	1	2	3
11.	Grinding, Beveling & Tacking	2	20	22
12.	Introduction to Different Welding Processes	9	20	29
13.	Shielded Metal Arc welding	8	250	258
14.	Oxy-fuel Gas Welding & Cutting	2	20	22
15.	Welding Defects, Causes & Remedies	2	13	15
16.	Inspection & Testing Of Welds	2	10	12
17.	Interview/Test Guidance For Welder	1	-	1
TOTAL		40	360	400

DETAIL OF COURSE CONTENTS

Welder (SMAW)
(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 1.11 Emergency Fire drill 1.12 Accidents & First Aid 1.13 Emergency Response & Assembly Point	2hrs	-	2
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	3hrs	-	3
3.	Materials Technology 3.1 Ferrous Metals 3.2 Non Ferrous Metals 3.3 Pipe & Plate Materials	1hrs	-	1
4.	Welding Technology & Terminology 4.1 Introduction Of Welding 4.2 Types Of welding	1hrs	-	1

	4.3 Weld-ability 4.4 Arc & Arc Length 4.5 Welding Variables (Current, Voltage, Travel Speed) 4.6 Arc Energy & Heat Input 4.7 Heat Affected Zone 4.8 Types of Bevel			
5.	Polarity 5.1 AC & DC Polarity 5.2 DC Straight Polarity 5.3 DC Reverse Polarity	1hr	1	2
6.	Welding Machines 6.1 AC Transformer 6.2 Rectifier 6.3 DC Generator 6.4 DC Invertor	1hr	1	2
7.	Welding Joints 7.1 Types Of Welding Joints	1hrs	4	5
8.	Types Of welds 8.1 Groove Weld 8.2 Fillet Weld 8.3 Back Or Backing Weld 8.4 Surfacing 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 9.3 Plate Test Positions In Groove Weld 1G, 2G. 3G, 4G 9.4 Plate Test Positions In Fillet Weld 1F, 2F. 3F, 4F	2hrs	16	18
10.	Welding Techniques 10.1 Puddling 10.2 Leftward/Forward/Forehand 10.3 Rightward/Backward/Backhand	1hrs	2	3

	10.4 Vertical Up/Uphill 10.5 Vertical Down/Downhill 10.6 Overhead 10.7 Stringer 10.8 Weaving			
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	7hrs	20	27
13.	Shielded Metal Arc Welding 13.1 Introduction 13.2 Principle Of Operation 13.3 Arc Shielding 13.4 Electrodes (Size In SWG)(mm) 13.5 Types Of Electrodes 13.6 Classification Of Electrodes	7 hrs	250	257

	13.7 Use Of Welding Electrode 13.8 Care Of Electrode 13.9 Use Of Electrode Drying Oven 13.10 Tools & Equipment Used In SMAW 13.11 Applications Of SMAW 13.12 Tools & Equipment Used In SMAW 13.1.1 Square Butt Joint (1G, 2G, 3G, 4G) 13.1.1.1 Preparation 13.1.1.2 Control of electrode 13.1.1.3 Movement Of Electrode For Root Pass 13.1.1.4 Movement Of Electrode For Filling Pass 13.1.1.5 Movement Of Electrode For Capping 13.1.1.6 Proper Fusion 13.1.2 Corner Joint Welding (1F, 2F, 3F, 4F) 13.1.2.1 Preparation 13.1.2.2 Tacking 13.1.2.3 Angle of Electrode 13.1.3 T-Joint Fillet Weld (1F, 2F, 3F, 4F) 13.1.3.1 Preparation 13.1.3.2 Tacking of piece 90° 13.1.3.3 Angle of Electrode 13.1.3.4 Proper Multi Beads 13.1.3.5 Control Equal Legs 13.1.4 Single V Butt Joint (3G Up, 2G) 13.1.4.1 Preparation of root face 13.1.4.2 Root pass 13.1.4.3 Hot Pass 13.1.4.4 Filling Bead 13.1.4.5 Capping Multi Bead			
14.	Oxy-fuel Gas Welding & Cutting 14.1 Function Of Oxygen/Acetylene Cylinder 14.2 Gas Welding/Cutting Torches	2hrs	20	22

	14.3 Back Fire/Flash Back 14.4 OFW Flames 14.5 Gas Welding/Cutting Techniques			
15.	Welding Defects, Causes & Remedies 15.1 Imperfection, Discontinuity & Defect 15.2 Porosity 15.3 Inclusion 15.4 Lack Of Fusion 15.5 Inadequate Joint Penetration 15.6 Cracks 15.7 Under-fill & Under-cut 15.8 Crater 15.9 Spatter 15.10 Arc Strike 15.11 Distortion	2hrs	13	15
16.	Inspection & Testing Of Welds 16.1 Visual Inspection 16.3 Non-destructive Tests	2hrs	10	12
17.	Interview/Test Guidance For Welder 20.1 Professional work Ethics (according to NAVTTC Annexure-I)	4hr	-	4
Total		40	360	400

PRACTICAL PLANS

WELDER (SMAW)

(3– Months Course)

Sr. No.	Detail of Practical
1.	Bead making on plate With SMAW
2.	Grinding On Plate
3.	Gas Cutting Practice On Plate
4.	Making Layers On Plate
5.	Capping On Plate 1G Test Position
6.	Capping On Plate 2G Test Position
7.	Capping On Plate 3G Test Position
8.	Tee joint 1F Test Position (Plate)
9.	Tee joint 2F Test Position (Plate)
10.	Tee joint 3F Test Position (Plate)
11.	Tee joint 4F Test Position (Plate)
12.	Corner joint 1F Test Position (Plate)
13.	Corner joint 2F Test Position (Plate)
14.	Corner joint 3F Test Position (Plate)
15.	Lap Joint 1F Test Position (Plate)
16.	Lap Joint 2F Test Position (Plate)
17.	Lap Joint 3F Test Position (Plate)
18.	Butt joint 1G Test Position (Plate)
19.	Butt joint 2G Test Position (Plate)
20.	Butt joint 3G Test Position (Plate)

LIST OF TOOLS / EQUIPMENT / WORKSHOP

(For Class Of 25 Students)

Name of Course	Welder (SMAW)
Duration of Course	3 – Months

Sr. No.	Name of Tools / Equipment	Quantity
1	WELDING RECTIFIER / Inverter / Welding Machine	8 Nos.
2	WELDING HELMET	25 Nos.
3	ANGLE GRINDER 5"	8 Nos.
4	ANGLE GRINDER 7"	8 Nos.
5	DECICATOR	8 Nos.
6	ELECTRODE OVEN	1 No.
7	ADJUSTABLE WRENCH 12"	2 Nos.
8	GAS CUTTING TORCH	1 Nos.
9	GRINDING TABLE	4 Nos.
10	WELDING TABLE/STAND	8 Nos.
11	BEVEL MACHINE	1 No.
12	Bench vice (size 5")	8 Nos.
13	Steel Foot Rule 300 mm	8 Nos.
14	Welding Face shield	8 Nos.
15	Oxygen LPG Manifold station	1 No.
16	Oxygen Cylinder New	2 Nos.
17	LPG Cylinder New	02 Nos.
18	Gas Welding Goggle	8 Nos.
19	Flash Back Arrestor LPG & Oxygen	2 Set
20	Oxygen Regulator	2 Nos.
21	LPG Regulator	2 Nos.
22	ARC Welding Station / Welding Cabin	8 Nos.
23	Gas Welding/Cutting Table	1 Nos.

LIST OF CONSUMABLE MATERIALS

(For Class of 25 Students)

Name of Course	Welder (SMAW)
Duration of Course	3 – Months

Sr. No.	MATERIAL	WEIGHT PER TRAINEE	For 25 TRAINEE	Remarks
1.	Chipping Hammer	1 No.	25 Nos.	
2.	Grinding Disc 7"	2 Nos.	50 Nos.	
3.	Cutting Disc 5"	2 Nos.	50 Nos.	
4.	Electrode E 7018 2.5mm	20 Kg	500 Kg	
5.	Electrode E 7018 3.2mm	10Kg	250 Kg	
6.	Leather Apron	1 Nos.	25 Nos	
7.	Glass Black	2 Nos.	50 Nos.	
8.	Glass White	12 Nos.	300 Nos.	
9.	Holder	1 No.	25 Nos.	
10.	WIRE BRUSH	1 Nos.	25 Nos.	
11.	POWER BRUSH	-	8 Nos.	
12.	Thimble / Earth Clamp	1	25 Nos.	
13.	MS Plate 12mm (250mm*150mm*12 mm)	2 Nos.	50 Nos.	
14.	MS Plate 10mm (250mm*150mm*10 mm)	2 Nos.	50 Nos.	
15.	Leather Gloves	1 Nos.	25 Nos.	
16.	Coverall	1 No.	25 Nos.	
17.	Safety Shoes	1 No.	25 Nos.	
18.	Safety Helmet / Welding Helmets	1 No.	25 Nos.	
19.	Safety Google	1 No.	25 Nos.	
20.	Ear Plugs	1 No.	25 Nos.	
21.	Welding Book	1 No.	25 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.** ARC WELDING (Basic Fundamentals) by JOHN R.WALKER South Holland, Illions The Good Heart-Will Cox (Company) INC
- 2.** OXYACETYLENE WELDING (Basic Fundamentals) by RONALD J.BAIRD South Holland, Illions The Good Heart-Will Cox (Company) INC
- 3.** MODERN WELDING Althose Turnguist Bowditch South Holland, Illions The Good Heart-Will Cox (Company) INC
- 4.** OXYACETYLENE HAND BOOK by LINDE, Linde Company
- 5.** WELDING SKILLS by JOSEPH W.GIACHINO Pub. American Technical Publisher
- 6.** GAS WELDING AND CUTTING YENSEXER Mosco – Pease Publisher

QUALIFICATION OF TEACHER

DAE in “Met. & Welding / Mechanical” with two years relevant Industrial/teaching Experience.

OR

Two years proficiency certificate with 5 years relevant Industrial Experience.

Curriculum Development Committee

Sr. #	Name & Designation	Status	Signature
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	