

List of trade committee members for the trade of welder
(Gas and Electric)

Members	Representing :
Thiru G. Jeevan Jayaraj Senior training officer,	M/s. Hindustan Motors Ltd. Tiruvellore
Thiru V. Muralindharan Officer incharge	M/s. L & T. Monfil Ltd., Chennai – 89.
Thiru A. Sathyanathan Training Officer Eutectic Section	M/s. Larsen & Tourbro Ltd. Mount Road, Chennai-2.
Thiru G. Pradakaran Welding Engineer	M/s. Binny Limited Engineering Division Meenambakkam, Chennai – 114.
Thiru K.A.K. Varma Deputy Manager	M/s. K.C.P. Limited, Chennai-600 019.
Thiru S. Anandan Welding Engineer.	M/s. Sivanantha Steel Limited Ambattur Industrial Estate Chennai – 58.
Thiru A.C. Sundar Area sales manager	M/s. ESAB India Ltd. Malavikka Mansion, Chennai
Thiru Y.h. Suresh Engineer.	Advani Oerlikon Limited Malavikka Mansion, Chennai.
Thiru k. Ponnusamy Joint Director (A.T.)	Directorate of Employment And Training, Chepauk, Chennai-5.
Thiru P. Kandaswamy Principal/Joint Director	Central Training Institute Guindy, Chennai-32.
Thiru K. Paneerselvam Special Officer	Directorate of Employment And Training, Chepauk, Chennai-5.
Thiru M. Tamizarasan Assistant Director of Trg.	Advanced Training Institute, Guindy, Chennai- 32.
Thiru A.P. Narayana Training Officer	Central Training Institute Guindy, Chennai- 32.
Thiru C. Srinivasan Training Officer	Central Training Institute Guindy, Chennai-32.
Thiru A.N. Lakshminathan Training Officer	Advanced Vocational Trg. System Govt. ITI Ambattur Chennai-98

Thiru M. Amiratham
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Thiru H. Victor Moses
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Thiru K.K. Valasaraj
Traning Officer

Govt. I.T.I.
Ambattur, Channai-98.

Thiru S. Selvaraj
Asstt. Trg. Officer (Maths)

Govt I. T.I.
Ambattur, Chennai – 98.

General Information

1. Name of The trade : Welder (Gas & Electric)
2. N.C.O. : 872,10, 872.20
3. Duration of craftsmen : 1 Year
4. Duration of Apprenticeship : 2 Years including 1 Year of
Basic Training
5. Entry Qualification : Passed the 10th Class
Examination Under 10 + 2 System of
education or its equivalent.

TRADE - WELDER

WEEK NO	Ex. NO.	Practical
1.		Induction Training: Familiarisation with the institute. Importance of Trade Training Machinery Used in the Trade. Introduction to safety equipment and their uses etc. Setting up of Arc and Gas Apparatus. Lighting and adjustment of flame. Striking an arc.
2.	G-1	Fusion Run with and without filler rod. M.S. Plate 2 mm position .
3.	E2	Straight line Beads on M.S. Plate M.S. 10 mm position F.
4.	G3 G5	are Butt joint on MS sheet M.S. sheet 3 mm Position F. Fillet weld lap joint M.S. sheet. M.S. sheet 3 mm Position F.
5.	E 4 E 6 E 8	Weaved bead on M.S. plate. M.S. Plate 10 mm Position F. Fillet weld open corner joint on M.S. Plate M.S. Plat 10 mm Position F.` Fillet Tee Joint on M.S. Plate. M.S. Plate 10 mm Position F.
6.	G 7	Oxy-Acetylene, hand cutting on M.S. Plate Straight and bevel.
7.	E 10 E 12 E 14	Fillet weld lap joint on MS Plate. M.S. Plate 5 mm Position F Butt weld in Open Square Butt Joint. MS Plate 5 Mm Position F. Butt Weld-Single Vee Butt Joint. M.S. Plate 10 mm Position F..
8.	G 9 G 11	Fillet Weld Tee joint M.S. Sheet 2 mm Position F. Fillet weld Outside Corner joint. MS sheet 2 mm Position F.
9.	E 16 E 13	Straight Line Beads on MS Plate. M.S. Plate 10 mm Position H .Fillet weld TEE Joint. MS plate 10 mm Position H.
10.	G 18 G 15	Butt weld single butt joint. MS Plate 2 mm` Right hand welding Technique Position H. Fusion Run with filler rod on MS sheet. MS Sheet 3.15 mm Position H.
11	E 20 E 22	Butt Weld Single Vee Butt joint on MS plate. MS plate 10 mm Position H. Straight Line Bead Vertical Upward. MS Plate 10 mm. ACHIEVEMENT: Should be able to weld joints

		uniformly to a length of not less than 15 cms by Gas and Arc Welding respectively.
12	Allied Trade Fitter	1. Marking out on MS plate or Flat. 2. Filing square to Dimensions.
13.		3. An edge chipping and cutting. 4. Hacksawing.
14.	G 17	Fillet Weld Inside Corner Joint. MS Sheet 2 mm Position H.
15	E 24 E 26	Laying Weaved Beads Vertical Upward MS Plate 10 mm Position V. Fillet weld Tee Joint. MS Plate 10 mm Position V.
16	G 19 G 21	Butt weld Square Butt Joint. MS Sheet 2 mm Position H. Fusion Run with filler rod on MS sheet. MS sheet 2 mm Position V.
17	E 28 E 30	Fillet Weld Lap Joint. MS Plate 10 mm Position V. Upward. Fillet Weld Outside Corner Joint. MS Plate 10 mm Position V. Upward.
18	G 23 G 25 G 27	Fillet weld Lap Joint. MS sheet 2 mm Position V. Fillet Weld Tee Joint. MS sheet 2 mm Position V. Fillet Weld Outside Corner Joint. MS sheet 2 mm Position V.
19	E 32 E 33 E 34 E 36	Butt Weld / Single Vee Butt Joint. MS Plate 10 mm Position V. Upward. Straight Line beads on MS Plate MS Plate 10 mm Position OH. Fillet Tee Joint. MS Plate 10 mm Position OH.
20	G 29 G 31	Butt Weld – Square Butt Joint. MS Sheet 2 mm Position V. Fusion run with filler rod. MS Sheet. MS Sheet 2 mm Position OH.
21	E 38 G 40	Fillet Lap Joint. MS Plate 10 mm Position OH. Butt Weld – Single Vee Butt Joint. MS Plate 2 mm Position OH.
		ALLIED TRADE-SHEET METAL WORKER
22	1 2 3 4	Marking. Cutting. Different angles, shapes (Geometrical). On Cutting notches, metal sheets. Making a cylinder, square , rectangular shapes. Different sheet metal joints and soldering practice.
23	1 2 3 4	Taper tray. Butt Joint – Soldering Practice. Elbow Joints. Pipe Joints – Tee Pipes – Equal and unequal pipes.

24	G 32 G 35	Fillet Weld TEE Joint. MS sheet 2 mm Position O.H. Butt Weld Square Butt Joint. MS sheet 2 mm Position O.H.
25	E 42 E 44	Fillet Weld Pipe Flange Joint. (Circular cutting). On MS Plate 6 mm Pipe 50 mm dia, wall thickness 3 mm Position. IG (Rolling). Pipe Butt Weld – Butt Joint on MS Pipe. 75 mm OD – 6 mm wall thickness.
26	G 37 G 40 G 41	Pipe Butt Joint on MS Pipe. MS Pipe 50 mm dia. 3 mm wall thickness. Position. IG (Rolling). Pipe L joint. MS Pipe 50 mm dia 3 mm WT Position F. Pipe 90 Degree TEE Joint. MS Pipe 25 mm dia 2 mm WT Position F.
27	E 46 E 43	Fusion Welding of Cast Iron – Maintenance work (only demonstration) Position F. Bronze Welding of Cast Iron – Broken Parts Position F.
28	G 43 G 45	Fusion Welding of Cast Iron – Butt Weld. Cast Iron Block 150 X 50 X 10 or 12 mm. Position F. Bronze Welding of Cast Iron Butt. Weld. Cast Iron Block 150 X 50 X 10 or 12 mm. Position F.
29	E 50	Butt Weld Copper Square Butt Joint. Copper sheet 150 X 50 X 3. 15 mm. Bronze Electrode Position F.
30	G 47 G 49	Fusion Welding of Copper – Butt Joint Copper Sheet 150 X 50 X 3. 15 mm Position F. Bronze Welding of Copper – Butt Joint. Copper sheet 150 X 50 X 3. 15 mm Position F.
31	E 52 E 54	Hard Facing on MS Round Rod. Micro flow metal spraying – Cold and Hot Process. MS Round 150 X 50 X 0 mm dia Position F. Repairing of Broken Machine Parts. By using Low Heat Input Electrodes.
32	G 51 G 53	Fusion Welding of Brass. Butt Weld. Brass sheet 3.15 mm Position F. Butt Weld of Stainless Steel Square Butt Joint Stainless steel sheet 2 or 3 mm Position F.
33	E 56 E 58	Welding of Stainless Steel. Butt Weld Square Butt Joint. Stainless steel sheet 3.15 mm Position F. Arc Gauging with Gouging Electrodes. MS Plate above 12 mm Position F.
33	E 60	MS Plate above 12 mm Position F. Carbon Arc Gouging on MS Plate 12 mm By using Carbon Electrodes.
34	G 55 G 57	Butt Weld – Square Butt Joint on Aluminum. Aluminum Sheet 3.15 mm Position F. Brazing of Copper to Brass Tube. (Bell Mouth Joint). Copper Tube and Brass Tube 25 mm OD X 2 mm WT. Position F.

		ACHIEVEMENT: The Trainees should be able to weld Ferrous and Non – ferrous metals to a reasonable standard.
35	E 62	Producing jobs as per Drawings. (Jobs involving all position welding).
36	G 59 G 61 G 63	Silver Brazing of Copper To Stainless Steel Tube – 12 mm dia. Oxy Acetylene Machine Cutting. Oxy – Acetylene Flame Gouging – Removing Welds.
37	E 64	Production jobs as per drawing such as Furniture items, Windows, Grills.
38	G 65	Production jobs as per drawing such as Furniture items, Windows, Grills.
39	G 65	Production jobs as per drawing such as Furniture items, Windows, Grills.
		TIG WELDING
40	TIG 66 TIG 67	Fusion Runs without filler rod on Aluminum . Aluminum Sheet 3 mm Position F. Fusion Runs with Filler Rod on Aluminum. Aluminum Sheet 3 mm – Position F.
41	TIG 68 TIG 69 TIG 70	Fillet weld lap joint on Aluminum. Aluminum Sheet 3 mm – Position F. Fillet Weld TEE joint on Aluminum. Aluminum sheet 3 mm – Position F. Butt Weld Square Butt Joint on Aluminum. Aluminum sheets 3 mm – Position F.
42	TIG 71 TIG 72 TIG 73	Fillet Weld Outside Corner Joint on Aluminum. Aluminum Sheet 3 mm – Position F. Butt Weld – Square Butt Joint on Aluminum Pipe. Aluminum Pipe 50 mm dia X 3 mm WT. Position F. Fusion Run without Filler Rod on Stainless Steel sheet . Stainless steel sheet – 2 mm Position F.
43	TIG 74 TIG 75 TIG 76	Fusion Run with filler rod on Stainless steel sheet. Stainless steel sheet – 2 mm Position F. Fillet weld- Lap joint on Stainless Steel sheet . Stainless Steel sheet 2 mm Position F. Fillet weld. TEE joint on Stainless Steel sheet. Stainless Steel sheet 2 mm Position F.
44	TIG 77 TIG 78 TIG 79	Fillet Weld – Outside Corner Joint. Stainless Steel Sheet 2 mm Position F. Steel weld square Butt Joint. Stainless Steel sheet 2 mm Position F. Butt weld – square Butt joint on Stainless Steel tube. Stainless Steel tube 30 or 40 mm O.D. 3 mm WT. Position F.
45	TIG 80 TIG 81	Butt Weld on M.S. Pipe. M.S. Pipe 50 mm OD X 3 mm WT Position. IG (Rolling). Fillet Tee Joint on MS Pipe. MS Pipe 50 mm OD X 3 mm WT.
46	TIG 82	Pipe Elbow Joints on MS Pipe. MS Pipe 50 mm OD X 3 mm WT. Position F.

		CO 2 WELDING
47	CO283	Straight line Beads on MS Plate 10 mm Position F.
	CO284	Fillet Weld TEE Joint on MS Flat 50 X 12 mm Position F.
	CO284	Fillet Weld Tee Joint. MS Flat 50 X 12 mm Position F.
48	CO285	Fillet Weld Lap Joint. MS Flat 50 X 12 mm Position F.
49	CO287	Straight Line Beads in Horizontal Position. MS Plate 10 mm.
50	CO288	Fillet Weld TEE Joint. MS Flat 50 X 10 mm Position H.
51		Preparation for Trade Test.
52		TRADE TEST.
Week no.	Theory	
1.	General discipline in the Institute – Elementary First Aid importance of Welding in Industry – Safety in Manual Metal Arc Welding – Safety in Oxy – Acetylene Welding and Cutting – Marking and Measuring tools – Materials Preparation method.	
2.	Gas Welding Hand Tools – Uses – Care and Maintenance Various Welding Processes – Their Classification and Their application .	
3.	Different Process of metal joining – Bolting – Riveting – Soldering – Brazing etc.	
4.	Oxy – Acetylene Cutting Equipment – Principle and Application – their care and maintenance.	
5.	Simple Electrical terms and their definitions – uses of Electricity as applied to welding – Electricity – AC – DC – Types of Electric Welding and applications.	
6.	Common Gases used for Welding- Oxygen. Hydrogen, Acetylene. Coal Gas etc. Types of Oxy – Acetylene flames – Their setting – uses - Various Gas combinations – Flame Temperatures and their uses – States of matter.	
7.	Nomenclature of Welding joints – Terms applied to each joint – Explanation with simple sketches – Welding symbols - Description and uses. Edge Preparation – application.	
8.	Chemistry and Structure of Oxy – Acetylene Flame. Manufacture of Calcium Carbide – Quality Control – Properties – Its impurities. Effect of each element on metals.	
9.	Principle of Arc Welding – Necessity of Welding Machines – Types of Machine – Construction – Advantages and disadvantages of each machine – Care and maintenance.	
10	Acetylene – its properties – Acetylene Generators Carbide to water type – Working Principle – Care and Maintenance – Water to Carbide type – working principle – care and maintenance. Comparison of two types of generators. Acetylene purifier – Hydraulic Back Pressure valve.	

11.	Arc and its characteristics – Arc length – types – uses – Advantage and disadvantages. Polarity – Types – Method of identification – uses of each type – Importance and indication of wrong polarity.
12	Safety precaution in Fitter Shop – Steel Rule types and its uses – Punches – types and its uses Try square – Scriber – its functions.
13.	Chisel – types and construction – Hacksaw Frame Hacksaw Blade – its types. Files – Parts, Types and uses – Hammer types – Parts and its uses. Vices and Clamps – their types.
14.	Oxygen – its properties – Manufacturing methods Oxygen Cylinder – D.A. Cylinder – Description – Method of Charging – Care and Maintenance.
15	Welding Position – Flat – Horizontal – Vertical and overhead – Slope and Rotation. Electrodes – Types – Objects of Flux coating – characteristic of Flux – I.S. – B.S. – A.W.S. – Specification. Criteria for choice of Electrodes.
16	Regulators – Types – Construction and uses. Care and Maintenance. Welding Blow Pipes – Types – Description – Operation – Construction – uses – Care and Maintenance – Difference between H.P.& L.P.System.
17	Effect of Moisture on Electrodes – Necessity and importance of baking the electrodes before use – storage conditions and handling of electrodes for better welding quality.
18	Faults in gas welding – definition of faults, their effects – Causes – corrections. Manifold system – Necessity – Operations – Limitations – Care and Maintenance .
19	Arc Blow – Definition – Its causes and effects – Methods to overcome in practice – Faults in Arc Welding – Definition – Effects Causes and Correction of each fault.
20	Welding Technique – Right Hand – Left Hand Explanation – Method – application – Linde Welding – Application .
21	Distortion in Arc Welding – Causes And effect. Methods employed to minimize its effects.
22	Sheet Metal Shop Safety rules – Measuring tools – Marking tools – Sheet Metal Hammers – Pullers – Mallets, punches. Grooves – Rivet set and uses – Types of sheets and uses – Soft solder and soldering process.
23	Development of parallel line method – Example s Taper try and different elbow and T pipes- Hand lever shears – Guillotine shearing machine - Circular Cutting - Machine parts . Description uses Nibbling shearing parts and uses .
24.	Methods employed to control distortion in Gas Welding – Stress relieving – Outdoor method – Edge preparations – Methods – Applications.
25	Welding of M.S. Pipe – Difference between pipe and plate welding- pipe development 90 degree and 45 degree branch pipe. Pipe Welding – Position 16, 26, 56, 66. Procedure of pipe welding.
26.	Specification for filler rods and wires for Gas Welding. Effect of atmosphere on metals. Use of Gas Welding flux and rods for different methods- Effect of alloying elements on Weld ability.
27	Cast Iron- determination of Weld ability- Preheating methods- Choice of Methods of Welding. (Arc)
28	Fusion Welding of Cast Iron – Bronze welding of Cast Iron- Determination of weld ability .

29	Welding of Copper – Properties –Weld ability methods- Preheat and postheat- Finishing of Weld –Effect of alloying elements.
30	Welding of copper by gas –Procedure-finishing of weld. Welding of copper, Bronze welding process- finishing of Welding.
31	Conservation of metallic- resources – Welding repairing need of the hour – Advantage of low heat input alloys in weld repair – Powder Welding – Tribology (wear and tear) – Hard surfacing electrodes- uses.
32	Classification of steel- Welding of High carbon steel- Low and Medium alloy steels- Limitations preheating and interpass Temperature of plate for such alloys during welding. Welding of stainless steel – Grades Edge preparation – Method of welding.
33	Welding of aluminum – Edge preparation – Flame and angle of blow pipe and filler rod – Flux preheating – Welding of Cast Aluminum – Preheating – Determination of preheating – Technique of welding.
34	Arc cutting of mild steel- Selection methods . Arc cutting Equipment – Arc gouging and its application – Types of Arc Cutting Electrodes. Air Arc Cutting and its applications.
35	Welding of dissimilar metals – choice of methods. Application of each method – Limitations. Different Flame cutting machines and cutting of quality – care and maintenance.
36	Resistance Welding – Principle of resistance welding – Types , Applications, Advantages – Laser Beam Welding and Cutting – Principle of Laser Beam – Description of equipments.
37	Modern Welding Process – Submerged Arc Welding Principle of the process – Equipment used Weld Procedure – advantages – Limitations. Electro Slag Welding – Weld Procedure – Advantages Limitations.
38	Inspection and Tasting of Weld – Destructive Non-destructive test Semi-Destructive Test Explanation of each method. Termite Welding. Economy in Welding. Simple Weld Estimation.
39	Introduction of TIG Welding-TIG Welding Equipments – Advantages of TIG Welding Process over Manual Metal arc Welding and Oxy-Acetylene Welding process.
40	Power Sources for TIG Welding – Types – Applications – Care and maintenance – High frequency unit – parts construction and uses – D.C. Suppressor Unit Construction application – Care and Maintenance. Tungsten Electrodes Types. sizes, uses.
41	Argon Gas – Properties – Uses – Ceramic shield Defects – Causes, and correction in TIG Welding Types of polarity and its application.
42	Datas/Tables for TIG Welding.
43	Introduction to CO2 Welding , CO2Welding Equipment and Accessories – Description of CO2 Welding set with diagram.
44	Mode of metal transfer in CO2 welding. Dip Transfer or Short circuiting transfer Spray Transfer (Free Flight) Globular Transfer (intermittent).
45	Welding Wires used in CO2 welding, its composition, diameters, applications. Wire feed system – Types – applications – Limitations – Care and maintenance.
46	Tables/Datas related to CO2 Welding, Information on solid flux Cored Wires.
47	Electron Beam Welding – Principle of the Process – Description of equipment – application of the process – Advantages over the metallic Arc Welding. Limitations.

48	Friction Welding – Principle of the process Description of Equipment. Application of the process – Advantages over the Metallic Arc Welding – Limitations.
49	Arc Brazing – Principle of the process – Description of the Equipment – Application of the process – Advantages .
	REFER the following Indian Standards for Trade Theory and practical
S 2811-1964	Recommendations for manual Tungsten Inert Gas Arc Welding of Stainless Steel.
S.2812 – 1964	Recommendations for Manual Tungsten Inert Gas Arc Welding of Aluminum and Aluminum Alloys.
S1393 – 1961	Code of practice for Training and of Oxy-Acetylene Welders.
S.817 – 1966	Code of Practice for training and testing of Metal Arc Welders.
S.1017 8 – 1981	Recommended procedure for CO ₂ Gas Shield Metal Arc Welding for Structural steel.
Week No.	Workshop calculation and science
1	Importance of Science and Calculation to The Trade Skill and Fundamental Arithmetical Operations – Addition , Subtraction, Multiplication and Division.
2	Properties and uses of cast iron , wrought iron, plain carbon steel and alloy steels.
3.	Properties and uses of cast iron, wrought iron, plain carbon steels and alloy steels.
4.	Properties and uses of copper, zinc ,Lead, Tin and Aluminum.
5.	Properties and uses of Brass , Bronze , Bearing Metal , Solder , Rubber and Timber .
6	Fraction – Addition , Subtraction, Multiplication and Division – Problems.
7	Fraction – Addition , Subtraction , Multiplication and Division – Problems.
8	Decimal – Addition , Subtraction , Multiplication and Division – Problems.
9	Decimal – Addition , Subtraction , Multiplication , and Division – Problems.
10	Fraction and Decimals Conversion – Fraction to Decimal and vice – versa .
11	System of Units – British , Metric and S.I. Units for Length, Mass , Area, Volume, Capacity, Time.
12	Conversions between British and Metric Systems.
13	The Square root – The Square and Square root of a whole Number and Decimal.
14	The Square root – Shop Problems .
15	Heat and Temperature - Effects of Heat , Thermometric Scales such as a Celsius, Fahrenheit and Kelvin- Temperature measuring Instruments.
16	Conversions between the above Scales of Temperature.

17	Units of Heat – Calorie, B.Th.U.,C.H.U.- Specific Heat, Latent Heat, Heat Loss and Heat Gain- Simple Problems.
18	Percentage – Changing Percent to Decimal and Fraction and vice versa – Problems on Percentages related to the Trade.
19	Percentage – Changing Percent to Decimal and Fraction and vice versa – Problems on Percentages related to the trade.
20	Definition of speed , Velocity, Acceleration , Mass , Weight and difference between Mass and Weight .
21	Newton’s Laws of Motion – Definition of Force- Units of Force in M.K.S. Systems and S.I. Unit of Force.
22	Ratio – Simple Problems in Ratios.
23	Proportion – Direct and Inverse Proportion – Shop Problems .
24	Work – Units of work in M.K.S. System and S.I. Unit of work - Simple Problems .
25	Power – Practical Units of Power such as Watt and Horse Power – Definition of I.H.P., B.H.P. and efficiency.
26	Definition of Energy. Potential Energy, Kinetic Energy, Law of Conservation of Energy – S.I. unit of Energy – Simple problems in P.E. and K.E.
27	Pythagoras Theorem- Shop Problems.
28	Algebraic symbols and Fundamentals – Addition , subtraction ,Multiplication and Division – Problems
29	Algebraic symbols and Fundamentals – Addition , subtraction ,Multiplication and Division – Problems
30	Algebra- Simple Equation- problem.
31	Algebra- Simultaneous Equations- problems
32	Algebra- Quadratic-Equations-problems.
33	Lever-Types of Levers with their examples.
34	Simple problems on straight and bell cranked levers.
35	Logarithms-Use of logarithmic tables-problems on multiplication and Division by using Logarithmic Tables.
36	Logarithms-Problems on power and roots by using Logarithmic tables.
37	Further Practice in the use of log table.
38	Meanings of Stress. Strain- Simple Problems.
39	Mensuration – Areas – Square, Rectangle, Equilateral Triangle Isosceles, Triangle, Right Angled Triangle, Scalene Triangle – problems.
40	Mensuration – Areas – Square, Rectangle, Equilateral Triangle Isosceles, Triangle, Right Angled Triangle, Scalene Triangle – problems
41	Areas – Hexagon, Circle, Circular ring, Sector, Ellipse – problems..
42	Areas – Hexagon, Circle, Circular ring, Sector, Ellipse – problems..
43	Mensuration – volume and weight of Simple Solid bodies such as, cube, Square prism, Rectangular prism hexagonal prism, triangular prism, cone, cylinder, hollow cylinder- shop problems.

44	Mensuration – volume and weight of Simple Solid bodies such as, cube, Square prism, Rectangular prism hexagonal prism, triangular prism, cone, cylinder, hollow cylinder- shop problems.
45	Mensuration – volume and weight of Simple Solid bodies such as, cube, Square prism, Rectangular prism hexagonal prism, triangular prism, cone, cylinder, hollow cylinder- shop problems.
46	Finding the Capacity in Litres of Square, Rectangle, hexagon, Cone and Cylinder Finding Shaped Vessels.
47	. Finding the Lateral surface Area and Total Surface area of Square, Rectangle, Hexagon, Cone and Cylinder shaped Solids and Vessels
48	. Finding the Lateral surface Area and Total Surface area of Square, Rectangle, Hexagon, Cone and Cylinder shaped Solids and Vessels
49	Further practice of Mensuration problems by using the Logarithm.
50	REVISION
51	REVISION
52	TEST
Week no	Engineering Drawing
1.	Importance of Engineering Drawing and its knowledge.
2.	Use of Drawing Instruments, T – Square, Drawing Board etc.
3.	Letters, Numbers and Alphabets as per. I S 696/1972.
4	Letters, Numbers and Alphabets as per. I S 696/1972.
5	Freehand Sketching of straight lines, rectangles, Circles, Polygons etc.
6	Use of different types of lines and symbols for drawing. Importance of putting dimension on the drawing as per I S 696/1972.
7	Freehand Sketching with dimension, scale and proportionate sketching.
8	Reading of simple blue print.
9	Isometric views and Oblique views with dimensions of such as Cube, rectangular, Block, Cylinder etc.
10	Explanation of simple Orthographic projection 1st angle, as per IS 696/1972.
11	Explanation of simple Orthographic projection 3 rd angle as per IS 696/1972 .
12	Sketching the views solid bodies when viewed perpendicular to their surfaces and axes.
13	Sketching the views solid bodies when viewed perpendicular to their surfaces and axes.
14	Freehand Sketching of plain and elevation of simple objects like Hexagonal bar, square bar, Circular bar , tapered bar and Hollow bar etc.
15	Reading of simple Blue Print.
16	Views of simple Hollow and Solid bodies with dimensions.
17	Views of simple Hollow and Solid Bodies with dimensions .
18	Construct a Orthographic Projection from the given Isometric view of shaped Blocks in first angle method.

19	Construct a Orthographic Projection from the given Isometric view of shaped Blocks in first angle method.
20	Construct an Orthographic Projection from the given Isometric view of shaped Blocks in 3 rd angle method .
21	Construct an Orthographic Projection from the given Isometric view of shaped Blocks in 3 rd angle method .
22	Exercise on Blue Print Reading , related to missing lines and missing views .
23	Simple Isometric Drawing – from the given Orthographic views of simple Objects.
24	Welding Symbols as per I.S.I. employed on Drawings.
25	Freehand Sketching of rivets and washers with dimensions from samples as per I.S.I.
26	Freehand Sketching of Riveted joints.
27	Freehand Sketching of Riveted joints.
28	Exercise on Blue Print Reading related to missing dimensions and missing section.
29	Freehand sketching of nuts and bolts with dimensions from samples.
30	Freehand sketching of hand tools of the trade.
31	Freehand sketching of hand tools of the trade.
32	Freehand sketching of hand tools of the trade.
33	Freehand sketching of keys and cotters with their dimension from sample as per I.S.I.
34	Freehand sketching of screw threads with their dimension from sample as per I.S.I.
35	Geometrical Development of Prism , Pyramid and Isometrics.
36	Exercise on Blue Print reading related identification of surface symbols.
37	Triangular Prism and Hexagonal Prism – Projection and Development.
38	Triangular Prism and Hexagonal Prism – Projection and Development.
39	Cylinder Projection and Development, Cone Projection and Development. Example based on right cones.
40	Cylinder Projection and Development, Cone Projection and Development. Example bases on right cones.
41	Views of simple solid bodies cut by section plane on drawing slandered methods (Full and Half Sections)I.S. 696 / 1972.
43	Exercises on Blue Print Reading.
44	Sketching of finished articles from drawing and preparation of sequence of operations.
45	Sketching of finished articles from drawing and preparation of sequence of operations.
46	Free sketching of simple objects related to the trade and preparation of simple working drawing from the sketches.
47	Free sketching of simple objects related to the trade and preparation of simple working drawing from the sketches.
48	Exercises on Blue Print Reading.

49	Conventional representation of materials by I.S.I.
50	Method of indicating surface roughness by I.S.
51	REVISION.
52	TEST.

S. No.	Trainees Kit	For Instructor	For Trainees
1.	Gloves pair leather	1	12
2.	Apron leather	1	12
3	Screen welding helmet type	1	12
4	Screen welding hand	1	12
5	Goggles pair welder	1	12
6	Hammer scaling 0.25kg. with handle	1	12
7	Chisel cold flat 19mm	1	12
8	Centre punch 9 mm X 127mm	1	12
9	Dividers 20 cm	1	12
10	Caliper outside 15 cm	1	12
11	Rule 60 cm two fold brass tipped to read inches and mm	1	12
12	Wire brush 15 cm X 3.7 cm	1	12
13	Spark lighter	1	12
14	Chipping screen hand	1	12
15	Safety boots for welders	1 pair	12 pair
16	Safety goggles	1 pair	12 pair
17	Square blade 15 cm		12
18	Scriber 15 cm		12
19	Tongs holding 30 cm		12
	SHOP OUTFIT		
20	Brass Rule 30 cm or nickel chrome steel 30 cm		4
21	Hammer ball pein 1 kg. With handle		4
22	Chisel cold cross 9 mm		8
23	Screw Driver 25 cm blade and 20 cm blade		1 each
24	Leg vice on stand 150 mm		1
25	Number bunch 6 mm and letter punch 6 mm		1 set
26	Hacksaw frame adjustable 30 CM		4
27	Hammering blocks 5 cm thick 60 sq.		2

28	Magnifying glass 15 cm		4
29	Weld measuring gauge fillet and butt		2
30	File half round bastard 30 cm		6
31	File flat 35 cm rough		6
32	Spanner 12 mm and 15 mm double ended		4
33	Spanner D.E. 6 mm 15 mm bc 1.5mm set of Nos.		1 set
34	Clamps 10 cm 15 cm 20 cm 30 cm		2 each
35	Hammer sledge double faced 3 kg.		1 no.
36	Pipe wrench 25 cm and 35 cm		1 each
37	Steel tape 182 cm flexible in case		3
38	Timmons square 60 cm X 30 cm		1
39	Welding torches with 10 nozzles 2 to 45 Low pressure with Nozzle		6 sets 2 sets
40	Eutalloy micro flow power welding process Hot		1 kit
41	Rototec power welding process cold		1 kit
42	Earth clamps		12 nos.
43	Pipe cutter (cap. 50 mm dia)		1 set
44	Cutting torch Oxy – Acetylene with cutting nozzle 3/64		2 sets
45	Heavy duty cutting and squouging blow pipe with cutting and squouging nozzles		1 set
46	Electrode holder 400 amps		6 nos.
47	Welding rubber hose, Oxygen and acetylene 8 mm		65 metres each
48	Rubber hose clips		50 nos.
49	Spindle key (for opening cylinder valve)		8 nos.
50	Pressure regulator oxygen double stage		8 nos.
51	Pressure regulator acetylene Regulators		8 nos.
52	Tip cleaner		8 sets
53	Glasses coloured 108mm X 82mm X 3mm DIN 11 A 13 A		16 nos.
54	Glass white 108 mm X 82 mm		32 nos.
55	Outfit spanner		8 nos.
56	Rubber hose pipe black and red 5 mm		30 mt.
57	Leather sleeves		12 pairs
	GENERAL INSTALLATION		
58	Transformer welding continuous welding current with all accessories 300 A 300 A		2 sets 2 sets

59	Arc welding set rectifier type 300-450 Amps amps continuous welding current with all accessories		1 set
60	Welding Generator DC rotary set 200-300 amps with all accessories		1 set
61	CO2 Welding Machine complete 400 amps		1 set
62	TIG Welding set complete 300 amps AC / DC		1 set
63	Welding cables to carry 350 amps with flexible rubber		45 meter
64	Lugs for cables		24 nos.
65	Oxygen cutting machine (Line & circle)_		1
66	Gas welding table 833cm X 92cm +60 cm fire bricks on stand with positioner		6 for one each trainee
67	Arc welding table all metal with positioner 122cm X 92cm X 60cm		6
68	Trolley for cylinder (H.P. Unit)		2
69	Bench shear hand capacity upto 5 mm		1
70	D.E. grinder 30 cm wheel motorized Pedestal type		1
71	Video bench 10 cm		6
72	Power hacksaw		1
73	Electrode driving over-thermostatically controlled temperature 0-250 C 10 KG / Cap.		1 no.
74	AG 7 Grinder		1 no.
75	Portable drilling machine (Cap. 6 mm)		1 no.
76	Braze weld equipment Eraser which can be used with exiting welding transformer		1 no
77	Fire extinguishers (foam type and CO2 type)		2 each
78	Metal rack 182 cm X 152 cm X 45 cm		1
79	Instructors table (Steel)		1
80	Black board with easel		1
81	Instructors chair (Steel)		1
82	First Aid box		1
83	Welding helmets		6 nos.
84	Fire buckets with stand		3 nos.
85	Steel lockers with 8 Pigeon holes		2 nos.

NOTE: 1. No additional items are required to be provided for the unit or batch working in the second shift except the items under trainees tool kit lockers.

2. Provision of cleaning of periodically welding helmets and goggles with antiseptic solution should be made as these are likely to be more than one trainee.

**SYLLABUS FOR THE TRADE OF WELDER (GAS & ELECTRIC)
UNDER
APPRENTICESHIP TRAINING SCHEME**

Period of Training: 2 Years

The Period of Training for this trade is 2 years consisting of Basic Training for a period of one year and shop training for the remaining period .

(The syllabus for this trade should be considered as a guide for imparting Apprenticeship Training according to the facilities available in industry.)

List of operations / skills to be learnt during Practical Training which includes Basic Training.

NOTE:

1. All freshers should undergo year Basic Training followed by one year training on the Shop Floor. The remaining operations / skills given in the list should be learnt on the shop floor. The apprentices should have more practice on the shop floor on these operations/ skills which have been already learnt during basic training and additional operations/ skills during the shop floor training and development method of work, speed, accuracy and finish in jobs.
2. The content of one year training in Industrial Training Institutes in this trade is exactly same as mentioned in 1 above. The trainees of Industrial Training Institutes who may be engaged for one year for shop floor training after one year training in Industrial training Institute should follow the same course of apprenticeship as in 1 above.

S NO.	List of operations / Skills to be learnt during Apprenticeship
	BASIC TRAINING: 1 YEAR
1.	Instructions in safety precautions as application to the trade.
2.	Use of Hammer and cold chisel.
3	Fitting as applicable to the trade welder.
4	Marking out from engineering drawing in mm/inch.
5	Brazing
6	Use of Chisels
7	Use of Clamps
8	Use of jigs and fixtures
9	Use of Hand Tool for Oxy – acetylene welding.
10	Use of Welding torch. Acetylene generators and Oxygen Cylinder
11	Use of high pressure dissolved acetylene cylinder
12	Preparation of surfaces for welding
13	Use of Heavy duty nozzles for welding
14	Oxy-Acetylene cutting
15	Use of light duty nozzles for welding
16	Use of hand tools in electric welding
17	Use of different types of filler rods
18	Use of different types of electrodes
19	Minimising distortion by weld sequence
20	Minimising distortion by control of heat spread
21	Welding of cast iron
22	Reclamation of worn parts by welding
23	Introduction to pipe, copper, Bronze and Brass Welding
24	Introduction of hard facing and aluminium brazing
25	Preheating and post heating for welding
26	Inspection and testing of welds
27	Welding of objects according to drawing
28	Use of protective appliances.

	SHOP TRAINING:1 YEAR
29	Instruction in safety precautions on the shop floor
30	Cutting of sheet metal to size.
31	Position Welding e.g., Horizontal, Vertical, Oblique and overhead
32	Use of Weld Gauges
33	Use of Fixtures to Minimise distortion
34	Welding of Stainless Steel
35	Pipe Welding
36	Copper Welding
37	Bronze Welding
38	Welding of Aluminium
39	Brass Welding
40	Hard facing
41	Aluminium Brazing
42	Welding by submerged Arc. TIG, MIG, MAG, plasma welding and cutting
43	Use of Resistance, Welding Machines, Spot, but and seam.
44	Gouging and grinding
45	Welding with low heat input electrodes wires and fluxes
46	Powder spray by torch method
47	Testing of Welds – Destructive and Non – destructive methods
48	Preparing simple jigs for production welding
49	Setting of Welding Machine for production work
50	Use of profile cutting Machine
51	Observation of machinery used in fabrication shops
52	Stress relieving operations of weldments.
NOTE	The operations / skills marked * are desirable. They must be carried where facilities are available in the establishment.
S.S.	The syllabus has already been approved and is same for all trades.