CURRICULUM

FOR THE TRADE OF

TIG/MIG WELDER

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT& ENTREPRENURESHIP
DIRECTORATE GENERAL OF TRAINING

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1. ACKNOWLEDGEMENT

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Co-ordinator for the course: Sh. NirmalyaNath., ADT

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
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2.	M. Thamizharasan, JDT	CSTARI, Kolkata	Expert
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2. BACKGROUND

2. 1. Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

2. 2. Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

2. 3. Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

3. RATIONALE

[Need for Apprenticeship in **TIG/MIG Welder** trade]

Apprenticeship course in the trade of TIG/MIG Welder tradeis necessary due to following reasons:

1. This course is meant forthe candidates who aspire to become a professional welder.
2. Designs, fabricates, joins, and repairs equipment, fixtures and various types of metal objects and structures using oxygen-acetylene, electric arc, MIG and TIG welding techniques.
3. Weld manufactured parts and sub-assemblies using various welding methods as appropriate to materials used.
4. Use jigs, fixtures, and assembly blueprints.
5. Locate positions and welds parts using TIG and MIG welding equipment as specified in blueprints.
6. Adjust welding equipment to desired amperage and wire feed.
7. Proficient with various hand tools including but not limited to, TIG welding tools, MIG welding tools, spot welding tools, stud gun, hand grinder, and drill.
8. Analyzes plans, drawings, work samples, specifications, and work orders to determine work requirements and sequence of welding assignments.
9. Estimates material and labour.
10. Knowledge of applicable codes.
11. Knowledge of welding techniques, (oxygen-acetylene, electric arc, and TIG), tools and equipment.
12. Skills in the fabrication, joining and repair of a variety of metal objects, equipment, fixtures and structures.
13. Knowledge of raw materials, production processes, quality control, costs, and other techniques for maximizing the effective manufacture and distribution of goods.
14. Ability to identify and measure material.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Welder (Gas & Electric) while doing gas welding fuses metal parts together using welding rod and oxygen acetylene flame. Examines parts to be welded, cleans portion to be joined, holds them together by some suitable device and if necessary makes narrow groove to direct flow of molten metal to strengthen joint. Selects correct type and size of welding rod, nozzle etc. and tests welding, torch. Wears dark glasses and other protective devices while welding. Releases and regulates valves of oxygen and acetylene cylinders to control their flow into torch. Ignites torch and regulates flame gradually. Guides flame along joint and heat it to melting point, simultaneously melting welding rod and spreading molten metal along joint shape, size etc. and rectifies defects if any.

Welder (Gas & Electric) while doing Arc welding,fuses metals using arc-welding power source and electrodes. Examines parts to be welded, cleans them and sets joints together with clamps or any other suitable device. Starts welding power source and regulates current according to material and thickness of welding. Connect one lead to part to be welded, selects required type of electrode and clamps other lead to electrode holder. May join parts first at various points for holding at specified angles, shape, form and dimension by tack welding. Establish arc between electrode and joint and maintain it throughout the length of the joint.

TIG/MIG Welder welds M.S. Sheet and M.S. Pipe by GAS welding process.Welds M.S. Plate in all position by SMAW process. Cuts Straight, Bevel & Circular on MS Plate by Oxy-Acetylene cutting process. Undertakes repair & maintenance works. Setup GTAW plant and weld M.S, S.S and Aluminium sheets in all positions. Welds Tubes by GTAW process and setup and Weld Lap, "T", corner and butt joint on M.S, S.S and Aluminium by GMAW process. Welds by FCAW process.

Plan and organize assigned work and detect & resolve issues during execution in his own work area within defined limit. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

Reference NCO

i) NCO-2004: 7212.10

ii) NCO-2004: 7212.20

5. GENERAL INFORMATION

1. **Name of the Trade** **: TIG/MIG WELDER**

2. **N.C.O. NCO-2004** :**7212.10, 7212.20**

3. **Duration of Apprenticeship Training**

(Basic Training + Practical Training): 15 Months

3.1 **For Freshers: -**Duration of Basic Training: -

a) Block –I : 3 months

Total duration of Basic Training: **3 months**

Duration of Practical Training (On -job Training): -

a) Block–I: 12 months

Total duration of Practical Training: **12 months**

3.2 **For ITI Passed: -** Duration of Basic Training: - **NIL**

Duration of Practical Training (On -job Training): **12 months**

4. **Entry Qualification** **:**Passed 10th class examinationunder 10+2 system of educationor its equivalent.

5. **Selection of Apprentices** **:** The apprentices will be selected as per Apprenticeship Actamended time to time.

6. **Rebate for ITI passed trainees** **:** i) **Three months (**Basic training) in the trade of **Welder**
ii) **Three months(**Basic training) for Fabrication sector with advance module in **TIG/ MIG welder** under CoE.

Note: Industry may impart training as per above time schedule, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspect is compromised.

6. COURSE STRUCTURE

Training duration details: -

Time (in months)	1-3	4-15
Basic Training	Block– I	-----
Practical Training (On - job training)	----	Block – I

Components of Training	Duration of Training in Months →														
↓	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Basic Training Block - I															
Practical Training Block - I															

7. SYLLABUS

7.1 BASIC TRAINING (BLOCK – I)

DURATION: 03 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** :**TIG/MIG Welder**
2) **Hours of Instruction** : 500 Hrs.
3) **Batch size** : 20
4) **Power Norms** : 16 KW for Workshop
5) **Space Norms** : 80 Sq.m.
6) **Examination** : The internal assessment will beheld on completion of the eachBlock.
7) **Instructor Qualification** :

1. INSTRUCTORS' QUALIFICATION	: Degree in Mechanical / Metallurgy / Production Engineering/Mechatronics with on year experience in relevant field. **OR** Diploma in Mechanical and allied with two years experience in relevant field. **OR** 10th Class Pass + NTC/NAC in the Trade of "Welder" With 3 years post qualification experience in the relevant field.
2. DESIRABLE QUALIFICATION	**:** Preference will be given to a candidate with CIC (Craft Instructor Certificate) in Welder trade.

8) **Tools, Equipments& Machinery required** : - As per Annexure – I

7.1.1 DETAILSYLLABUS OF CORE SKILL

Block– I
Basic Training

Sl.No.	Workshop Calculation and Science	Duration (hrs.)	Engineering Drawing	Duration (hrs.)
1.	**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	20	Introduction to Engineering Drawing and Drawing Instruments : - Conventions - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.	30
2.	**Basic Mathematics** - BODMAS rule Fraction-Addition, Subtraction, multiplication and Division-Problem solving, Decimal-Addition. Simple calculation using Scientific Calculator.		Lines : - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment	
3.	Conversion of Fraction to Decimal and vice-versa.		Free hand drawing of - Lines, polygons, ellipse, etc. - geometrical figures and blocks withdimension	

			Transferring measurement from the given object to the free hand sketches.	
4.	**Percentage**: Introduction, Simple calculation. Changing percentage to fraction and decimal & vice-versa.		Drawing of Geometrical Figures: Definition, nomenclature and practice of - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.	
5.	**Material Science** : Definition, properties (physical & mechanical) and uses of Metal, Non-metal, Alloy &Insulator. Types of ferrous and Non-ferrous metals. Difference between Ferrous and Non-Ferrous metals.		Sizes and Layout of Drawing Sheets - Selection of sizes - Title Block, its position and content - Item Reference on Drawing Sheet (Item List)	
6.	**Mass, Weight and Density**: Mass, Unit of Mass, Weight, difference between mass and weight. Density, unit of density. Relation between mass, weight & density. Simple problems related to mass, weight, and density.		Method of presentation of Engineering Drawing - Pictorial View - Orthographic View - Isometric view	
7.	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids –		- Drawing of Solid figures (Cube, Cuboids, Cone) with dimensions.	

	cube, cuboid, cylinder and Sphere.			
8.	**Elasticity:** Elastic & Plastic material. Stress & strain and their units. Young's modules. Ultimate stress and breaking stress.		Free hand Drawing of Solid figures (Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions.	
9.	**Heat & Temperature**: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, Scale of temperature, relation between different scale of temperature. Thermometer, pyrometer. Transmission of heat, conduction, convection, radiation.		Free Hand sketch of hand tools and measuring tools used in respective trades.	
10.	**Basic Electricity:** Introduction and use of Electricity. AC, DC & their comparisons. Current, Voltage,Resistance& their units. Power, Energy & their units. Insulator and conductors & their uses.		Projections: - Concept of axes plane and quadrant. - Orthographic projections - Method of first angle and third angle projections (definition and difference) - Symbol of 1st angle and 3rd angle projection as per IS specification.	
11.	-----		Drawing of Orthographic projection in 3rd angle.	

7.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

Block –I
Basic Training Institute Level Training: - (03 Months)

Week No	Trade Practical	Trade Theory
1	**Induction Training** - Importance of trade Training - Machinery used in the trade. - Introduction to safety equipment and their use etc. - Hack sawing, filing square to dimensions. - Marking out on MS plate and punching.	**General** - Elementary First Aid - Different process of metal joining methods: Bolting, riveting, soldering, brazing, seaming etc. - Introduction and definition of welding. - Importance of Welding in Industry. - Arc and Gas Welding Equipments, tools and accessories - Arc and Gas Welding terms and definitions.
2	- Setting up of Arc welding machine & accessories and striking an arc. - Setting of oxy-acetylene welding equipment, Lighting and setting of flame. - Setting up of GMAW/GTAW welding machine & accessories.	- Various Welding Processes and its applications. - Types of welding joints and its applications. - Edge preparation and fit up for different thickness, Surface Cleaning. - Safety precautions in Shielded Metal Arc Welding, and Oxy-Acetylene Welding and Cutting. - Safety precautions pertaining to GTAW & GMAW. - Role of stiffeners in controlling distortion.
3	**Gas Welding & Cutting Practice** - Fusion run without and with filler rod on M.S. sheet 2 mm thick in flat position. - Edge joint on MS sheet 2 mm thick in flat position without filler rod. - Marking and straight line cutting of MS plate. 10 mm thick by gas.	**Gas Welding And Cutting** - Common gases used for welding & cutting, flame temperatures and uses. - Chemistry of oxy-acetylene flame. - Types of oxy-acetylene flames and uses. - Oxy-Acetylene Cutting Equipment, principle, parameters and application. - Color coding for different gas cylinders. - Gas regulators, types and uses. - Purging : Importance, Method of giving. - Oxy acetylene gas welding Systems

		(Low pressure and High pressure). - Difference between gas welding blow pipe(LP & HP) and gas cutting blow pipe.
4	**Gas WeldingPractice** - Straight line beads on M.S. plate 10 mm thick in flat position. - Weaved bead on M. S plate 10mm thick in flat position. - Square butt joint on M.S. sheet 2 mm thick in flat Position **.** - Fillet "T" joint on M.S. Plate 10 mm thick in flat position.	**Gas Welding And Cutting** - Gas welding techniques. Rightward and Leftward techniques. - Gas welding filler rods, specifications and sizes. - Gas welding fluxes - types and functions. - Gas Brazing &Soldering : principles, types fluxes & uses. - Gas welding defects, causes and remedies.
5	**GMAW Practices** - Straight line beads on MS plate by GMAW welding. - Lap joint on MS plate by GMAW welding in down hand position. - Open corner joint on MS plate in down hand position. - "T" joint on MS sheet in flat position by GMAW welding.	**GMAW** - Basic electricity applicable to arc welding and related electrical terms & definitions. - Heat and temperature and its terms related to welding. - Principle of arc welding and characteristics of arc. - Arc welding power sources: Transformer, Motor Generator set, Rectifier and Inverter type welding machines and its care & maintenance. - Advantages and disadvantages of A.C. and D.C. welding machines. - Welding positions as per EN &ASME : flat, horizontal, vertical and over head position. - Weld slope and rotation. - Welding symbols as per BIS & AWS. - Recent advances in power sources which gives better penetration and better root fusion with minimum heat addition.
6	**GMAW Practices** - "T" joint on MS sheet in horizontal, vertical, overhead positionby GMAW welding. - CO_2 straight line bead, different position of CO_2, Single "V' butt joint by CO_2 welding in down hand position, Single "V' butt joint by	**GMAW** - Introduction to GMAW - equipment - accessories. - Various names of the process.(MIG- - MAG/ CO2 WELDING, FCAW). - Advantages& Limitations - Trouble shooting in MIG welding - Electrode : types, functions of flux,

	Argoshield welding in flat position (Gas: Argon and CO_2 mixture).	coating factor, sizes of electrode Coding of electrode as per BIS, AWS, - Effects of moisture pick up. - Storage and baking of electrodes. - Special purpose electrodes and their applications. - Types of weld defects, causes and remedy in GMAW process. - Data and Tables related to CO2 welding.
7	**GTAW Practices** - Setting up GTAW welding plant and establishing the arc. - Beading practice on MS sheet by GTAW.	**GTAW** - Introduction to GTAW welding. - Various names of the process.(TIG, Argon arc welding). - Equipments& accessories. - Advantages & Limitations. - Reading of Welding procedure specifications (WPS). - Reading of Procedure qualification Record (PQR)
8	**GTAW Practices** - Square butt joint on MS in down hand position. - Beading practice on SS, aluminum by TIG/GTAW.	**GTAW** - Arc length - types - effects of arc length. - Polarity: Types and applications. - Tungsten electrode, Types, sizes, and uses. coding as per BIS,AWS. - Type of shielding gases- Types & properties.
9	**GTAW Practices** - Open corner joint on MS sheet in down hand position. - Lap joint on MS sheet in down hand position by GTAW. - Tee joint on MS sheet in down hand position. - Lap joint on MS sheet in Horizontal position by GTAW.	**GTAW** - GTAW Welding consumables -Types & Specifications as per BIS & AWS - Tables & data relating to TIG welding. - Different type of weld joints- plates & pipes - Advantages of root pass welding of pipes by TIG welding - Types of weld defects, causes and remedy in GTAW process.
10	- Horizontal, Vertical, Downward and Overhead welding by GMAW/GTAW. - Gas cutting, plasma cutting, profile cutting. Bending.	**Other Processes** - Submerged Arc welding - Principles, application-Types of fluxes, welding head, power source and Parameter setting. - Micro plasma welding principles, Equipment, power source, parameter settings, Advantages & limitations.

		- Plasma Cutting principles and advantages. - Specification of pipes, various types of pipe joints, pipe welding positions and procedure. - Difference between pipe welding and plate welding. - Pipe development for Elbow joint, "T" joint, Y joint and branch joint. - Manifold System.
11	**Structural Welding Practice** - Structural pipe welding butt joint on MS pipe 0 50 and 3mm WT in 1G position. - Fillet Lap joint on M.S. Plate 10 mm in vertical position	**Metals & Properties** - Classification of steel. - Welding of low, medium and high carbon steel and alloy steels. - Effects of alloying elements on steel - Basic welding metallurgy. - Weldability of metals, Importance of pre-heating, post heating and maintenance of inter pass temperature. - Stainless steel types- Weld decay and Weldability. - Arc blow - causes and methods of controlling. - Distortion in arc & gas welding and methods employed to minimize distortion. - Arc Welding defects, causes and Remedies. - Preheating and Post heating. - Distortion and methods of control. - Stress Relieving or Post Welding Heat Treatment (PWHT).
12	**Testing Practices** - Dye penetrant - Magnetic particle testing	**Inspection** - Inspection & testing of weldments. - Visual inspection methods. - Inspection kits - universal gauge, Fillet gauge, etc. - Non-destructive Testing methods. - PT, MPT, UT & RT. - Destructive testing - Bend test & tensile test.
13	- **Revision & Internal assessment.**	

7.1.3 EMPLOYABILITY SKILLS

GENERAL INFORMATION

1)	**Name of the subject**	**:**	**EMPLOYABILITY SKILLS**
2)	**Applicability**	**:**	ATS- Mandatory for fresher only
3)	**Hours of Instruction**	**:**	**55Hrs.**
4)	**Examination**	**:**	The examination will be held at the end of two years Training by NCVT.
5)	**Instructor Qualification**	**:**	

i) MBA/BBA with two years experience or graduate in sociology/social welfare/Economics with two years experience and trained in Employability skill from DGET Institute.

And

Must have studied in English/Communication Skill and Basic Computer at 12th /diploma level

OR

ii) Existing Social Study Instructor duly trained in Employability Skill from DGET Institute.

7.1.3.1 SYLLABUS OF EMPLOYABILITY SKILLS

Block – I
Basic Training

Topic No.	Topic	Duration (in hours)
	English Literacy	**7**
1.	**Reading** Reading and understanding simple sentences about self, work and environment	
2.	**Writing** Construction of simple sentences Writing simple English	
3.	**Speaking / Spoken English** Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality,Resumes or curriculum vita essential parts, letters of application reference to previous communication.	
	I.T. Literacy	**10**
1.	**Basics of Computer** Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	
2.	**Word processing and Worksheet** Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets. Use of External memory like pen drive, CD, DVD etc,	
3.	**Computer Networking and INTERNET** Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication.	
	Communication Skill	**18**
1	**Introduction to Communication Skills** Communication and its importance Principles of Effective communication Types of communication - verbal, nonverbal, written, email, talking on phone. Nonverbal communication - components-Para-language Body - language Barriers to communication and dealing with barriers.	
2	**Listening Skills** Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.	

3	**Motivational Training** Characteristics Essential to Achieving Success The Power of Positive Attitude Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.	
4	**Facing Interviews** Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview	
	Entrepreneurship skill	**8**
1.	**Concept of Entrepreneurship** **Entrepreneurship**- Entrepreneurship - Enterprises:-Conceptual issue. Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.	
2.	**Institutions Support** Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes& procedure & the available scheme.	
	Productivity	
1.	**Productivity** Definition, Necessity.	
2.	**Affecting Factors** Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.	
3.	**Personal Finance Management** Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	**6**
1	**Safety & Health** Introduction to Occupational Safety and Health importance of safety and health at workplace.	
2	**Occupational Hazards** Basic Hazards, Chemical Hazards, Vibro-acoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.	
3	**Accident & safety** Basic principles for protective equipment. Accident Prevention techniques - control of accidents andsafety measures.	
4	**First Aid** Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person	
	Labour Welfare Legislation	
1	**Welfare Acts**	

	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Employees Provident Fund Act.	
	Quality Tools	**6**
1.	**Quality Consciousness :** Meaning of quality, Quality Characteristic	
2.	**Quality Circles :** Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.	
3.	**House Keeping :** Purpose of Housekeeping, Practice of good Housekeeping.	
4.	**Quality Tools** Basic quality tools with a few examples	

7.2 PRACTICAL TRAINING (ON-JOB TRAINING)

(BLOCK – I)

DURATION: 12 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** :**TIG/MIG Welder**

2) **Batch size** :a) Apprentice selection as per Apprenticeship guidelines.

b) Maximum 20 candidates in a group.

3) **Examination** : i) The internal assessment will be held on completion of the block

ii) NCVT exam will be conducted at the end of Apprenticeship Training

4) **Instructor Qualification** :

(A) : Essential (any one of the below)

(i) NTC/NAC with Three years Experience in relevant field with Craft Instructors Training Certificate.

(ii) Diploma in Mechanical and allied with two years experience in relevant field.

(iii) Degree in Mechanical / Metallurgy / Production Engineering/Mechatronics with oneYear experience in relevant field.

(B) Desirable qualification: for (ii) & (iii) Craft Instructors Training Certificate.

5) **Infrastructure for On Job Training** : - As per Annexure – II

7.2.1 BROAD SKILL COMPONENT TO BE COVERED DURING ON- JOB TRAINING

BLOCK – I (Duration- 12 months)

The candidate should be competent to execute following operation/ skills after completion of the industrial training: -

1. Straight line beads on SS plate by GMAW welding, Lap &Square butt and T joint on S.S sheet.
2. Straight line beads on Aluminium plate by GMAW welding,Single "V" and fillet joint on Aluminium plate.
3. Square butt joint on MS sheet in Horizontal & Vertical position by GMAW welding.
4. Lap & Tee joint on MS sheet in Vertical position, Square butt joint on MS sheet in Overhead positionby GMAW welding.
5. Square butt joint and Open corner joint on SS and Aluminium sheet by TIG/GTAW in Flat position.
6. Square butt joint and Lap joint on SS sheet in Vertical position by GTAW welding.
7. Tee joint on SS sheet in Vertical position, Square butt joint welding of SS sheet with back purging Technique.
8. Square butt joint on Aluminium sheet in Vertical position, Single V butt joint on Aluminum sheet by TIG/GTAW.
9. Square butt joint on Tube welding practice on MS, SS &Aluminium tube metals in rolled position.
10. Plasma cutting of SS sheets & Aluminum plates.
11. Use of jigs & fixture in welding shop and use of different weld gauges.
12. Position welding - horizontal, vertical, down/over head, inclined, rotary.
13. Edge preparation by grinding on pipes.
14. Pipe flange welding by TIG/GTAW, various types of pipe joints.
15. Dissimilar welding like SS and MS by SMAW/TIG.
16. Root pass welding pipes by TIG in 5G, 6G positions.
17. Submerged Arc welding (SAW) on plates and pipes, parameter setting of Micro plasma cutting.
18. Dimensional inspection of weldments, Weld test specimen preparation, Visual inspection of weldments. Dye penetrant, Magnetic particle testing. Weld testing and inspection, specimen preparation, visual, magnetic, ultrasonic, radiographic.
19. **Ultrasonic Testing, Radiographic film reviewing:** Ultrasonic Testing, Radiographic film reviewing.

8. ASSESSMENT STANDARD

8.1 Assessment Guideline:

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrape/wastage and disposal of scarp/wastage as per procedure, behavioral attitude and regularity in training.

The following marking pattern to be adopted while assessing:

a)Weightage in the range of 60-75% to be allotted during assessment under following performance level:

For this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.

In this work there is evidence of:

- Good skill levels in the use of hand tools, machine tools and workshop equipment
- Many tolerances while undertaking different work are in line with those demanded by the component/job.
- A fairly good level of neatness and consistency in the finish
- Occasional support in completing the project/job.

b)Weightage in the range of above75%- 90% to be allotted during assessment under following performance level:

For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.

In this work there is evidence of:

- Good skill levels in the use of hand tools, machine tools and workshop equipment
- The majority of tolerances while undertaking different work are in line with those demanded by the component/job.

- A good level of neatness and consistency in the finish
- Little support in completing the project/job

c)Weightage in the range of above 90% to be allotted during assessment under following performance level:

For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.

In this work there is evidence of:

- High skill levels in the use of hand tools, machine tools and workshop equipment
- Tolerances while undertaking different work being substantially in line with those demanded by the component/job.
- A high level of neatness and consistency in the finish.
- Minimal or no support in completing the project

8.2 FINAL ASSESSMENT- ALL INDIA TRADE TEST FOR APPRENTICE

SUBJECTS	Marks	Sessional Marks	Full Marks	Pass Marks	Duration of Exam.
Practical	300	100	400	240	08 hrs.
Trade Theory	100	20	120	48	3 hrs.
Workshop Cal. & Sc.	50	10	60	24	3 hrs.
Engineering Drawing	50	20	70	28	4 hrs.
Employability Skill	50	-	50	17	2 hrs.
Grand Total	**550**	**150**	**700**	**-**	

Note: - The candidate pass in each subject conducted under all India trade test.

9. FURTHER LEARNING PATHWAYS

- On successful completion of the course and 10th standard,trainees can opt for CITS course.

Employment opportunities:

On successful completion of this course, the candidates may be gain fully employed in the following industries:

- Structural Fabrication like bridges, Roof structures, Building & construction.
- Automobile and allied industries
- Site construction activities for power stations, process industries and mining.
- Service industries like road transportation and Railways.
- Ship building and repair
- Infrastructure and defense organizations
- In public sector industries (Central/State) and private industries in India & abroad.
- Petrochemical industries.
- Self-employment

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE:TIG/ MIG WELDER

LIST OF TOOLS & EQUIPMENTS FOR 20APPRENTICES

Trainees Tools Kit

SI. No.	Name of the items	Quantity
1	Welding helmet fiber	20 nos.
2	Welding hand shield fiber	20 nos.
3	Chipping hammer with metal handle 250 Grams	20 nos.
4	Chisel cold flat 19 mm x 150 mm	20 nos.
5	Centre punch 9 mm x 127 mm	20 nos.
6	Dividers 200 mm	20 nos.
7	Stainless steel rule 300mm	20 nos.
8	Scriber 150 mm double point	20 nos.
9	Flat Tongs 350mm long	20 nos.
10	Hack saw frame fixed 300 mm	20 nos.
11	File half round bastard 300 mm	20 nos.
12	File flat 350 mm bastard	20 nos.
13	Hammer ball pane 1 kg with handle	20 nos.
14	Tip Cleaner	20 nos.
15	Try square 6"	20 nos.

General Machinery Shop outfit

SI. No.	Name and Description of Tools	Quantity
16	Spindle key	4
17	Screw Driver 300mm blade and 250 mm blade	1 each

18	Number punch 6 mm	2 set
19	Letter punch 6 mm	2 set
20	Magnifying glass 100 mm .dia	2 nos
21	Universal Weld measuring gauge	2 nos
22	Earth clamp 600A	6 nos
23	Spanner D.E. 6 mm to 32mm	2 sets
24	C-Clamps 10 cm and 15 cm	2 each
25	Hammer sledge double faced 4 kg	1
26	S.S tape 5 meters flexible in case	1
27	Electrode holder 600 amps	6
28	H.P. Welding torch with 5 nozzles	2 sets
29	Oxygen Gas Pressure regulator double stage	2
30	Acetylene Gas Pressure regulator double stage	2
31	CO_2 Gas pressure regulator, with flow meter	2 set
32	Argon Gas pressure regulator with flow meter	2 set
33	Metal rack 182 cm x 152 cm x 45 cm	1
34	First Aid box	1
35	Steel lockers with 8 Pigeon holes	2
36	Steel almirah / cupboard	2
37	Black board and easel with stand	1
38	Flash back arrester (torch mounted)	4 pairs
39	Flash back arrester (cylinder mounted)	4 pairs

General Installation

40	Welding Transformer with all accessories (400A , OCV 60 - 100 V, 60% duty cycle)	2 sets
41	Welding Transformer or Inverter based welding machine with all accessories (300A , OCV 60 - 100 V, 60% duty cycle)	2 sets
42	D.C Arc welding rectifiers set with all accessories (400 A. OCV 60 -100 V, 60% duty cycle)	1 sets
43	GMAW welding machine 400A capacity with air cooled torch, Regulator, Gas preheater, Gas hose and Standard accessories	2 set
44	AC/DC GTAW welding machine with water cooled torch 300 A, Argon regulator, Gas hose, water circulating system and standard accessories.	2 set
45	Air Plasma cutting equipment with all accessories, capacity to cut 25 mm clear cut	01 set
46	Air compressor suitable for air plasma cutting system	01 no
47	Auto Darkening Welding Helmet	02 no
48	Portable abrasive cut-off machine	1 No
49	Pug cutting machine Capable of cutting Straight & Circular with all accessories	01 set
50	Pedestal grinder fitted with coarse and medium grain size grinding wheels dia. 300 mm	1
51	Bench grinder fitted with fine grain size silicon carbide green grinding wheel dia. 150 mm	1
52	AG 4 Grinder	2 Nos
53	Suitable gas welding table with fire bricks	2 Nos

54	Suitable Arc welding table with positioner	9
55	Trolley for cylinder (H.P. Unit)	2
56	Hand shearing machine capacity to cut 6 mm sheets and flats	1
57	Power saw machine 18"	1
58	Portable drilling machine (Cap. 6 mm)	1
59	Oven, electrode drying 0 to 250°C, 10 kg capacity	1
60	Work bench 340x120x75 cm with 4 bench vices of 150 mm jaw opening	4 sets
61	Oxy Acetylene Gas cutting blow pipe	2 sets
62	Oxygen, Acetylene Cylinders	2 each*
63	CO_2 cylinder	2 Nos *
64	Argon gas cylinder	2 Nos *
65	Anvil 12 sq. inches working area with stand	1 No.
66	Swage block	1 No.
67	Die penetrant testing kit	1 set
68	Magnetic particle testing Kit	1 set
69	Fire extinguishers (foam type and CO_2 type)	1
70	Fire buckets with stand	4 nos
71	Suitable gas cutting table	1 No.
72	Welding Simulators for SMAW/GTAW/GMAW	1 each (Optional)

NOTE:

1. * Optionally Gas cylinders can also be hired as and when required
2. No additional items are required to be provided for unit or batch working in the Second shift except the items under trainee's tool kit and steel lockers.

Class Room Furniture for Trade Theory

Sl. No	Names & Description of Furniture	Quantity
1	Instructor's table and Chair (Steel)	1 set
2	Students chairs with writing pads	16
3	White board size 1200mm X 900 mm	1
4	Instructors lap top with latest configuration pre-loaded with O.S and MS Office package.	1
5	LCD projector with screen.	1
6	Welding Process, Inspection & codes DVD/ CDs	1 set each (optional)

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: TIG/MIG WELDER

LIST OF TOOLS& EQUIPMENTS FOR 20APPRENTICES

1) **Space Norms** : 45 Sq. m.(For Engineering Drawing)

2) Infrastructure:

A: TRAINEES TOOL KIT:-

Sl. No.	Name of the items	Quantity (indicative)
1.	Draughtsman drawing instrument box	20 nos.
2.	Set square celluloid 45^0 (250 X 1.5 mm)	20 nos.
3.	Set square celluloid 30^0-60^0 (250 X 1.5 mm)	20 nos.
4.	Mini drafter	20 nos.
5.	Drawing board (700mm x500 mm) IS: 1444	20 nos.

B: FURNITURE REQUIRED

Sl. No.	Name of the items	Quantity (indicative)
1	Drawing Board	as required
2	Models : Solid & cut section	as required
3	Drawing Table for trainees	as required
4	Stool for trainees	as required
5	Cupboard (big)	01 no.
6	White Board (size: 8ft. x 4ft.)	01 no.
7	Trainer's Table	01 no.
8	Trainer's Chair	01 no.

ANNEXURE – II

INFRASTRUCTURE FOR ON-JOB TRAINING

TRADE: TIG/MIG WELDER

For Batch of 20APPRENTICES

Actual training will depend on the existing facilities available in the establishments. However, the industry should ensure that the broad skills defined against On-Job Training part (i.e. 12 months) are imparted. In case of any short fall the concern industry may impart the training in cluster mode/ any other industry/ at ITI.

ANNEXURE-III

GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1.Due care to be taken for proper & inclusive delivery among the batch. Some of the following some method of delivery may be adopted:

A) LECTURE
B) LESSON
C) DEMONSTRATION
D) PRACTICE
E) GROUP DISCUSSION
F) DISCUSSION WITH PEER GROUP
G) PROJECT WORK
H) INDUSTRIAL VISIT

2. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. may be adopted.

3. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.