CURRICULUM

FOR THE TRADE OF

FIBER REINFORCED PLASTIC PROCESSOR

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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1. Renata Precision, Pune

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Co-ordinator for the course: Sh. Nirmalya Nath., ADT

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
1.	Kumbhar N. V.	Govt. ITI Aundh Pune	Expert
2.	Mondake R. V.	ITI Aundhe Pune	Expert
3.	APTE S K	AVTS ITI Aundhe Pune	Expert

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 **Fiber Reinforced Plastic Processor** trade)

1. Apply lacquers and waxes to mold surfaces to facilitate assembly and removal of laminated parts.
2. Apply layers of plastic resin to mold surfaces prior to placement of fiberglass mats, repeating layers until products have the desired thicknesses and plastics have jelled.
3. Bond wood reinforcing strips to decks and cabin structures of watercraft, using resin-saturated FRP.
4. Check all dies, templates, and cutout patterns to be used in the manufacturing process to ensure that they conform to dimensional data, photographs, blueprints, samples, and/or customer specifications.
5. Check completed products for conformance to specifications and for defects by measuring with rulers or micrometers, by checking them visually, or by tapping them to detect bubbles or dead spots.
6. Cure materials by letting them set at room temperature, placing them under heat lamps, or baking them in ovens.
7. Inspect, clean, and assemble molds before beginning work.
8. Mask off mold areas which are not to be laminated, using cellophane, wax paper, masking tape, or special sprays containing mold-release substances.
9. Mix catalysts into resins, and saturate cloth and mats with mixtures, using brushes.
10. Release air bubbles and smooth seams, using rollers.
11. Repair or modify damaged or defective FRP parts, checking thicknesses, densities, and contours to ensure a close fit after repair.
12. Select precut fiberglass mats, cloth, and wood bracing materials as required by projects being assembled.
13. Spray chopped fiber, resins, and catalysts onto prepared molds or dies using pneumatic spray guns with chopper attachments.
14. Trim cured materials by sawing them with diamond-impregnated cutoff wheels.
15. Trim excess materials from molds, using hand shears or trimming knives.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Operate processing machineries viz., Injection moulding machine, Compression moulding machine, Various FRP moulding technique observing standard operating procedure. Adjust and control working pressure temperature and perform testing and quality control with respect to manufacturing. Stop machines to remove finished work pieces or to change setup, according to required machining sequences. Perform running maintenance of machines & observe safety precautions thereof. Measure dimensions of finished work pieces to ensure conformance to specifications, using precision measuring instruments, templates, and fixtures.

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

Perform TPM (Total Production Management), TQM (Total Quality Management) and record keeping system.

Reference NCO:

i) **NCO-2004:** 8232.15, 8232.25, 8232.30, 8232.70

5. GENERAL INFORMATION

1. **Name of the Trade** **: FIBER REINFORCED PLASTIC PROCESSOR**

2. **N.C.O. Code No.** : **NCO-2004:** 8232.15, 8232.25, 8232.30, 8232.70

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 examination under 10+2 system of education or its equivalent

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

6. **Rebate for ITI passed trainees** : i) **Three months** in the trade of BBBT and **Six months** in Advance module in plastic processing Sector under CoE.
ii) Three months in the trade of Plastic Processing Operator

Note: Industry may impart training as per above time schedule for different block, 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 aspects 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 & II)
DURATION: 06 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** : **FIBER REINFORCED PLASTIC PROCESSOR**

2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)

3) **Batch size** : 20

4) **Power Norms** : 13.6 KW for Workshop

5) **Space Norms** : 200 Sq. m.

6) **Examination** : The internal assessment will be held on completion of each Block.

7) **Instructor Qualification** :

i) Degree/Diploma in Plastic Processing Engineering/Technology from recognized university/Board with one/two year post qualification experience respectively in the relevant field.

OR

ii) NTC/NAC in the trade of **FIBER REINFORCED PLASTIC PROCESSOR** with three year post qualification experience in the relevant field.

Preference will be given to a candidate with Craft Instructor Certificate (CIC)

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

7.1.1 DETAIL SYLLABUS 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 with dimension 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,		Method of presentation of Engineering Drawing - Pictorial View - Orthographic View - Isometric view	

	weight, and density.			
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 – cube, cuboid, cylinder and Sphere.		- Drawing of Solid figures (Cube, Cuboids, Cone) with dimensions.	
8.	**<u>Elasticity:</u>** 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		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.	

	conductors & their uses.			
11.	-----		Drawing of Orthographic projection in 3rd angle.	

7.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I

Basic Training

Week No.	Professional Skills	Professional Knowledge
1.	Safety: - its importance, classification, personal, general, workshop and job safety. Occupational health and safety. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Importance of housekeeping & good shop floor practices. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Fire& safety: Use of Fire extinguishers. Safety regarding working with different types of steam and its First-Aid.	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Institute system including stores procedures. Introduction of First aid. Safety attitude development of the trainee by educating him to use Personal Protective Equipment (PPE). Response to emergencies e.g.; power failure, fire, and system failure. Accidents- Definition types and causes. First-Aid, nature and causes of injury and utilization of first-aid. Introduction to 5S concept & its application. Fire: - Types, causes and prevention methods. Fire Extinguisher, its types. Define environment, environment Pollution, Pollutants, type of Pollution (Air pollution, water pollution, soil pollution noise pollution, thermal pollution, radiation. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2.	Introduction to safety equipment and their use related to the trade. General Bench work.Marking out lines, hacksawing to given dimension, sawing of different types of metals of different section.	Importance of the trade in the development of industrial economy of the country. **Safety** precautions first aid in electric shock. Conductor and insulator, symbols

		and signs, common terms of electrical work. Linear measurements - its units. Description and use of different kinds of hand tools used in bench work. Description use and care of marking blocks and marking table.
3.	Filing flat and square to a given dimension. Marking off straight and parallel lines with odd leg calipers and steel rule. Marking of areas using scribing blocks and dividers. Use of micrometer and vernier caliper.	Bench Vice – Its types- use care and maintenance. Hacksaw frames and Blocks - their types and method of using hammer, chisel and other tools- their types, use & care. Files - description, their grades, cuts and use. Try square, ordinary depth gauge, protestors, calipers, their description, use and care.
4.	Chipping flat surface along a marked line. Simple grinding practice.	Drilling process. Different types of drills - bench type, pillar type, radial type pang and multiple drilling machine and other drilling process including re amino operation. Measurements - its units. Micrometer and vernier, their types construction features. reading of micrometer and practice - use and care.
5.	Marking and drilling of holes on flat surface (through holes and blind holes). Exercise on simple reaming operation and doweling practice. Threading with taps and dies to standard size and preparing studs and Dolts. Exercises using different types of fasteners.	Locking Device - nuts and belts, keys and cotters -their types description and use. Threads and threading. Tap and Die - their description and use. Process of operating tap and die.
6.	Basic Electricity. Safety precaution and first-aid while working with Electricity, Joints on conductors,cables etc. Familiarisationwith different types of electrical measuring instruments such as voltmeter,ammeter,wattmeter and energy meter.	Simple electrical circuit. Essential requirements of any electrical circuit. Series and parallel circuits. Different types of resistance, fuses, earthing and fuses as protective device Electrical units - amps, volts and resistance ohms law, kirchcff[1]s Law and their application. General idea about insulted wires and cables - their proper selection and use.
7.	Practice in fixing and connecting electrical accessories such as, switches,holders,fuse,plug,sockets on T.W.board.Forming a simple electrical circuits(series and parallel) measuring insulation resistance and earth resistance.	**Materials and their types** Introduction to polymers in relation to other materials such as metal, ceramic, clay etc. Polymer - Definition, Examples - Wood, Plastics, Rubber, Body tissues etc.

		Quality control of plastic products - i) Sampling of raw material and finished products ii) Use of vernier and micrometer iii) Use of tensile, MFI, hardness,Impact testing machine iv) Identification of aesthetic properties.
8.	Practice in producing products like vehicle hood, boat, bath tub, helmet, dustbin, etc.	Plastics - Groups (i) Thermoplastic (ii) Thermo setting.Thermoplastic - simple method of identification, properties., uses and applications — (a) Low density (LOPE) polyethylene/linear low density polyethylene(LLDPE) (b) High density polyethylene HOPE (c) Polypropane (d) Ethyl Vinyl Acetate(EVA) (e) ultra HighMolecular Wt High Density Polyethylene (UMHDPE) (f) Polystyrene (g) High impact polystyrene (h) ABS (i) SAN (j) Nylon 6,66 etc. (k) AcetalHomopolymer Group and Copolymer (1) (i) Flexible (ii) Rigid. (m) acrylic (n) Polycarbonate (o) Cellulose – (i) Cellulose Acetate (ii) Cellulose Nitrate (iii) Cellulose CAB } Because of less use lecture time can be shorted. (p) (i) PBT – Polyebhylene Terephthalate ii) PET - Polyethylene Terephthalate (q) Polypheny1ene Oxide (r) P T F E (s) Polyurethene Hand layup process (lamination process),

		FRP process.
9.	Practice in producing large size products like safety boat, dashboard, doors, toilets, chairs, table, etc.	Reinforced Plastics (a) Thermoplastics (b) Thermoset Description and properties of Reinforcing materials/ Fillers and their types A. Fibrous Reinforcing materials 1) Jute/Sisal/Coconut 2) Cotton 3) Alpha Cellulose 4) Class 5) Caroon/Graphite 6) Nylon/Polyester/Rayon B.-Fillers and Extenders 1)-Calcium Carbonate/Talc 2)-Clay/Kaolin 3)-Mica *4)*-Asbestos 5)-Wood Flour 6)-Alumina 7)-Cellular materials Introduction to Matched mould process. Resin transfer moulding.
10.	-do-	Structure of the Fillers/Fibers/ Extenders Example: Round/Polyhedral- Clay ,Calcium-Carbonate Plate/Flake- Mica/Lancellar Glass Fibres- Glass,Asbestos, Syntheticfibers Cellular Structure- Vermiculite,foamed Class orhollow glass bead Adherence/Wet ability of Fillers/Fibers with Resin/ Plastics. Mould making - i.) Type of moulds ii) Construction of mould iii) Special features in relation to processing
11.	Practice in producing products like MCB & electrical products.	Thermosetting i) PhenolFornalolbvde (PF resin) ii)Urea for "(UP resin) iii)Melamine " (MP) iv)SMC and DMC v)Polyester Resin vi)Epoxy Resin vii)Silicone Resin Plastic Processes,Brief Description i)Injection moulding

		ii)Compression moulding iii) Transforming iv)Casting and Lamination v)Blow moulding Introduction to Pultrusion process.
12.	Practice in producing products like "I" beams, pipes, railings, etc.	Plastic processing machinery-Description,use, parts and their respective functions Processing techniques of different plastic materials Oiling, lubrication & Preventive maintenance of the plastic processing machineries. FRP mould types and its advantage & disadvantage.
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, non verbal, written, email, talking on phone. Non verbal 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) and 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** :**Fibre Reinforced Plastic Processor**

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 :

i) Degree/Diploma in Plastic Processing Engineering/Technology from recognized university/Board with one/two year post qualification experience in the relevant field.

OR

ii) NTC/NAC in the trade of **FIBER REINFORCED PLASTIC PROCESSOR** with three year post qualification experience in the relevant field.

Preference will be given to a candidate with Craft Instructor Certificate (CIC)

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

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

A. BLOCK – I (09 months)

1. Injection moulding by I.R.O. & T.R.O.
   i) Handling and fitting of mould.
   ii) Locking and cooling of mould.
   iii) Adjusting feed of screw or ram.
   iv) Temperature controlling,
   v) Fitting and adjusting nozzle.
   vi) Adjusting injection pressure and speed.
   vii) Basic idea of mechanical, electrical and hydraulic system in I.R.Oonly.
   viii) Moulding defects in T.R.O. only.
   ix) Safe handling of machine observing safety measure.

   The following materials may be used, while carrying cut the above mentioned operation:
   -LDPE, HDPE, PP, Polystyrene, ABS, Nylon, Glass filled Nylon and Talc/Calcium Carbonate filled PP.
   (N. B.) Various moulding defects are to be created purposely

2. Compression moulding (IRO & TRO)
   i) Movement of pattern top or bottom adjustment & control.
   ii) Adjusting pressure in terms of per square are and total tonnage.
   iii) Fitting of mould.
   iv) Heating of moulds.
   v) Controlling of temperature.
   vi) Checking of bulk factor/density.
   vii) Running maintenance of compression moulding observing safety.
   viii) Basic idea of mechanical, electrical & hydraulic system in IRO only.
   ix) Moulding defects in TRO only.

The following materials may be used in trial run observation (TRO) while carrying out the above mentioned operations:
- PF Resin, UF-Resin, MF-Resin and DMC/SMC.

(N. B.) Various moulding defects are to be created purposely

3. Testing and quality control with respect to manufacturing parameters, like temperature,pressure etc.
   i) Testing of mechanical properties i.e.tensile, impact, elongation and compressive.
   ii) Location of stress concentration due to temperature and pressure.
   iii) Testing of aesthetic property.
   iv) Cup flow testing-Bakelite.
   v) Measurement of various properties in relation to plastics.

4. Lamination, casting and fabrication.

i) Various FRF Moulding techniques
   a) FRP hand lay-up/contact moulding
   b) Casting,Fabrication & Finishing
ii) Casting of Polyesters
iii) Fabricating with Acrylic sheet, ABS sheet, HIPS sheet, UHMDPE blocks involving the following operations -
   (a)Screwing
   (b)Drilling
   (c) Welding
   (d)Buffing
   (e)Sanding

5. Plastic processing techniques and machineries. Working on any one of the following machines as available with the industry.
   i). Compression Moulding machine
   ii). Injection Moulding machine
   iii). Pultrusion Machine
6. Familiarizing with and practicing on the following FRP Processing techniques.
   i) Hand lay - up/contact moulding
   ii) Low - Pressure Double Contact Moulding
   iii) Filament winding
   iv) Resin Transfer Mou1ding(RTM)
7. Testing and quality control: Simple method of identification of Plastics and simple methods of tearing
8. Practice on Preventive Maintenance of the following plastic processing machines (any one).
   i) Compression Moulding Machine
   ii) Injection Moulding Machine
   iii) Pu1trusion Machine
   iv) Equipment required for various FRP Moulding techniques

   Note: Trade practical will be imparted in two systems i.e. idle run observation (IRO) and Trial Run Observation (TRO) in both manual and automatic machines.

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 trainees can opt for Diploma course (Lateral entry). [Applicable for candidates only who undergone ATS after CTS]
- On successful completion of the course trainees can opt for CITS course.

Employment opportunities:

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

1. Production & Manufacturing industries like Plastic Processing industries.

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: FIBER REINFORCED PLASTIC PROCESSOR

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

A : TRAINEES TOOL KIT:-

Sl. No.	Description	Qty.
1	Rule steel 15 cm with metric graduations	17 Nos.
2	Square try 10 cm blade	17 Nos.
3	Caliper outside 15 cm spring	17 Nos.
4	Caliper outside 15 cm spring	17 Nos.
5	Caliper outside 15 cm hermaphrodite	17 Nos.
6	Divider 15 cm spring	17 Nos.
7	Scriber 15 cm	17 Nos.
8	Punch centre 10 cm	17 Nos.
9	Screw driver 15 cm	17 Nos.
10	Chisel cold 10	17 Nos.
11	Hammer ball pein 0.45 kg. with handle	17 Nos.
12	Hammer ball pein 0.22 kg. with handle	17 Nos.
13	File flat 25 cm second cut	17 Nos.
14	File flat 25 cm smooth	17 Nos.
15	File half round 2nd cut 15 cm	17 Nos.

16	Hacksaw frame adjustable 20-30 cm	17 Nos.
17	Safety goggles	17 Nos.
18	Dot slot punch	17 Nos.

B: Tools, Instruments and General Shop Out fits

Sl. No.	**Description**	**Quantity**
1	Plate surface 45 cm x 45 cm	02 Nos.
2	Marking table 91 x 91 x 122 cm height	01 No.
3	Portable hand drill (Electric) 0 to 6 mm	02 Nos.
4	Drill brace hand 0 to 12 mm	02 Nos.
5	Drill twist S/S 1.5 to 12 mm by 0.4 mm	01 set
6	Drill twist S/S 8 to 15 mm by ½ mm	01 set
7	Taps and dies complete set in box B.S.F	01 No.
8	Taps and dies complete set in box (Metric)	01 No.
9	Micrometer 25-50 mm outside	03 Nos.
10	Vernier caliper 20 cm	01 No.
11	Vice bench 12 cm jaw	16 Nos.
12	Bench working 240 cm x 120 cm x 60 cm	04 Nos.
13	Lockers with 8 drawers (standard size)	02 Nos.
14	Almirah 180 x 90 x 30 cm	02 Nos.
15	Metal rack 182 x 182 x 4.5 cm	01 No.
16	Black board with easel	01 no.
17	Fire extinguisher (for 4 units)	02 Nos.
18	Fire buckets	02 Nos.
19	Hand hammer 1 kg. with handle	02 Nos.

20	Rule wooden 4 fold 600 mm	02 Nos.
21	Saw tennon 250 mm	02 Nos.
22	c-clamps (100 mm, 150 mm and 200 mm)	02 Nos. each
23	Drill machine hand 6 mm cap	02 Nos.
24	Rawal plug tool and kit	02 sets
25	Ammeter 0 to 500 Amp. DC	10 Nos.
26	Ammeter 0 to 1 Amp. DC	10 Nos.
27	Volt meter 0-300 V.A.C.	10 Nos.
28	A.C. Ammeter 0-5 to 0-25 Amp.	05 Nos. each
29	Meggar 500 volts	01 No.
30	Electric switches, fuses, holders, lamps, tech wood boards, plugs, sockets, solder, flux, wires and cables, battons, round blicks and other consumables.	As required

C : General Machinery Shop outfit

Sl. No.	**Name & Description of Machine**	**Quantity**
1	Drilling machine pillar sensitive 0-20 mm cap with swivel table motorized with chuck & key	01 No.
2	Grinding machine (general purpose) D.E. pedestal	01 No.
3	Auto injection moulding machine 80 T. cap.	01 No.
4	Hand operated injection moulding machines a) 13 grams capacity b) 30 grams capacity c) 60 grams capacity	 01 No. 01 No. 01 No.
5	Compression press 60 T cap. With moulds for DMC/SMC	01 No.
6	Test equipment (Tensile, MFI, hardness, load, impact identifying unit etc.	1 set
7	Accessories & moulds including scrap grinder	1 set

8	a) FRP contact moulding accessories b) Simple casting equipments using epoxy & polyster resin with mould	01 No. 01 No.
9	Hand operated compression moulding machine 60 T. Cap.	01 No.
10	Preheated 12 trays of 25 kgs. Of 20 minutes capacity	01 No.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: FIBER REINFORCED PLASTIC PROCESSOR

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

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	20 Nos.
2	Models : Solid & cut section	as required
3	Drawing Table for trainees	as required
4	Stool for trainees	as required
5	Cupboard (big)	01
6	White Board (size: 8ft. x 4ft.)	01
7	Trainer's Table	01
8	Trainer's Chair	01

ANNEXURE – II

INFRASTRUCTURE FOR ON-JOB TRAINING

TRADE: FIBER REINFORCED PLASTIC PROCESSOR

For Batch of 20 APPRENTICES

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