

Syllabus for the trade
of

PLASTIC PROCESSING OPERATOR

(SEMESTER PATTERN)

UNDER

CRAFTSMEN TRAINING SCHEME

Designed in: 2013

By

Government of India
Central Staff Training and Research Institute
Directorate General of Employment & Training
Ministry of Labour & Employment
EN -81, Sector-V, Salt Lake City,
Kolkata-700091

List of the Members of Trade Committee Meeting for the trade of “Plastic processing Operator” held on 26.03.2012 at ITI, Panvel, Raigardh, Maharashtra.

| Sl. No. | Name and Designation ,Shri | Organization | Remarks |
|----------------|------------------------------------|---------------------------------|----------------|
| 1. | Mr. R. K. Pathak, Director | ATI, Mumbai – 400 022 | Chairman |
| 2. | Mr. R.N. Bidnur, Ex.GM | Reliance Industries | Member |
| 3. | Mr. Vikash Rane, Plant Incharge | Reliance Industries | Member |
| 4. | Mr. Shenoy, Director | Indian Plastic Institute | Member |
| 5. | Mr. N.P.Shinde | Dipak Fertilizers, Taloja | Member |
| 6. | Mr. Kulkarni | Godson Electronics, Panvel | Member |
| 7. | Mr. Thomas Joshep | Kisan Group, Boieser, Taloja | Member |
| 8. | Mr. Pankaj Gore | Weener Plastic, Boieser, Taloja | Member |
| 9. | Mr. D.S.Jagtap, Principal | I. T. I, Panvel | Member |
| 10. | Mr. R.S.Sankhe, Vice Principal | I. T. I, Panvel | Member |
| 11. | Mr.S.W.Kale, Training Officer, PPO | COE Wada, Thane. | Member |
| 12. | Mr. M. T. Tamboli, Instructor, PPO | I. T. I, Vangaon | Member |
| 13. | Mr. P.G. Chavan, Instructor, PPO | I. T. I, Ambarnath | Member |
| 14. | Mr. V.K. More, Instructor, PPO | I. T. I, Panvel | Member |
| 15. | Mr. G.M.Pachbhoi, Instructor, PPO | I. T. I, Panvel | Member |
| 16. | Mr. Abhinoy Nandi, Dy. Director | ATI, Mumbai | Member |

List of members attended the Workshop to finalize the syllabi of existing CTS into Semester Pattern held from 6th to 10th May'2013 at CSTARI, Kolkata.

| Sl. No. | Name & Designation | Organisation | Remarks |
|----------------|---|--|----------------|
| 1. | R.N. Bandyopadhyaya, Director | CSTARI, Kolkata-91 | Chairman |
| 2. | K. L. Kuli, Joint Director of Training | CSTARI, Kolkata-91 | Member |
| 3. | K. Srinivasa Rao, Joint Director of Training | CSTARI, Kolkata-91 | Member |
| 4. | L.K. Mukherjee, Deputy Director of Training | CSTARI, Kolkata-91 | Member |
| 5. | Ashoke Rarhi, Deputy Director of Training | ATI-EPI, Dehradun | Member |
| 6. | N. Nath, Assistant Director of Training | CSTARI, Kolkata-91 | Member |
| 7. | S. Srinivasu, Assistant Director of Training | ATI-EPI, Hyderabad-13 | Member |
| 8. | Sharanappa, Assistant Director of Training | ATI-EPI, Hyderabad-13 | Member |
| 9. | Ramakrishne Gowda, Assistant Director of Training | FTI, Bangalore | Member |
| 10. | Goutam Das Modak, Assistant Director of Trg./Principal | RVTI, Kolkata-91 | Member |
| 11. | Venketesh. Ch. , Principal | Govt. ITI, Dollygunj, Andaman & Nicobar Island | Member |
| 12. | A.K. Ghate, Training Officer | ATI, Mumbai | Member |
| 13. | V.B. Zumbre, Training Officer | ATI, Mumbai | Member |
| 14. | P.M. Radhakrishna pillai, Training Officer | CTI, Chennai-32 | Member |
| 15. | A.Jayaraman, Training officer | CTI Chennai-32, | Member |
| 16. | S. Bandyopadhyay, Training Officer | ATI, Kanpur | Member |
| 17. | Suriya Kumari .K , Training Officer | RVTI, Kolkata-91 | Member |
| 18. | R.K. Bhattacharyya, Training Officer | RVTI, Trivandrum | Member |
| 19. | Vijay Kumar, Training Officer | ATI, Ludhiana | Member |
| 20. | Anil Kumar, Training Officer | ATI, Ludhiana | Member |
| 21. | Sunil M.K. Training Officer | ATI, Kolkata | Member |
| 22. | Devender, Training Officer | ATI, Kolkata | Member |
| 23. | R. N. Manna, Training Officer | CSTARI, Kolkata-91 | Member |
| 24. | Mrs. S. Das, Training Officer | CSTARI, Kolkata-91 | Member |
| 25. | Jyoti Balwani, Training Officer | RVTI, Kolkata-91 | Member |
| 26. | Pragna H. Ravat, Training Officer | RVTI, Kolkata-91 | Member |
| 27. | Sarbojit Neogi, Vocational Instructor | RVTI, Kolkata-91 | Member |
| 28. | Nilotpal Saha, Vocational Instructor | I.T.I., Berhampore, Murshidabad, (W.B.) | Member |
| 29. | Vijay Kumar, Data Entry Operator | RVTI, Kolkata-91 | Member |

GENERAL INFORMATION

1. Name of the Trade : **PLASTIC PROCESSING OPERATOR**
2. NCO Code No. :
3. Duration : one year (2 Semesters)
4. Power Norms : 13.6 Kw
5. Space Norms : Adequate space need to be decided
6. Entry qualification : Passed 10th class examination under 10+2 system of education with Science and Mathematics or its equivalent.
7. Unit Size : 16 (No. of Trainees)
8. Instructor's/ Trainer's Qualification: a) Tenth Class Passed + NTC + NAC
: b) Preference will be given to a Candidate with Craft Instructor Certificate

Note : At Least One Instructor must have Degree/Diploma in Mechanical Engg

**Syllabus for the Trade of
 “PLASTIC PROCESSING OPERATOR ” under C.T.S.
 (Semester Code No. PPO-01)**

SEMESTER – I

| Sl. NO | TRADE PRACTICAL | TRADE THEORY | ENGINEERING DRAWING | WORKSHOP CALCULATION AND SCIENCE |
|---------------|---|---|--|--|
| 1. | Familiarization with the institute, importance of trade training , machinery used in the trade, types of jobs made by the trainees in the trade : introduction to safety and fire fighting equipments and their use related to plastic processing | Introduction about safety ,fire fighting equipments its precautions observed in the section. Introduction about occupational health hazards followed in plastic industries | Free hand sketching of straight lines rectangles, circles, polygons, simple solids, cubes etc. | Introduction to Iron & Steel – its properties & uses. Difference between Iron & Steel. |
| 2. | Marking, Hacksawing, Filing on mild steel flat as per required dimensions using steel rule, calipers, punches etc. | Linear measuring tools. Introduction to hand tools used for marking, punching, sawing, filing etc. marking table. | Free hand sketching of hand tools used in the section. | Definition of Various heat treatment processes of Steel and its alloys. |
| 3. | Practice of drilling (through & blind holes)on flat surfaces . Forming internal threads with taps to standard size and preparing studs and bolts | Bench vice-its types and parts. Files – its description types, grades & cut. Hacksaw - its type use and care. | Introduction about Lettering – its practice – types of lettering (single stroke & gothic letters) | -do - |
| 4. | -do- | Introduction to dies and taps its use and care. Introduction to precision measuring instruments - vernier caliper, micrometer, height gauge, bevel protector. Least count calculation and its measurements. | Introduction to Engineering drawing, drawing board, T- square, set- squares, scales, French curves and its uses. | Decimal & fractions. Algebra – addition, subtraction, multiplication and division. |

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| 5. | Safety precaution and first aid about electricity while working on machines. Basic knowledge about fixing and connecting of electrical accessories like switches, holders, fuse, plug sockets on electrical board. | Safety precaution and first aid while working on machine. Drilling machines-its type – (portable, bench type, pillar type), parts & working procedure. | Free hand sketching of nuts bolts and screw threads with dimension. | -do- |
| 6. | -do- | -do- | Dimensioning – its types, terms, notations, placing of dimensions, unit of dimensioning and its general rules. Scales - its introduction, types and application in drawing. | Algebra - solving of simple equations, quadratic equations. |
| 7 & 8 | Testing of various plastics material. | Identification of various plastics material (Thermoplastic & Thermosetting plastic), its properties and applications. | Introduction of Projection - its principle and method of projections. Draw orthographic projections in I & III angle (simple components to complex components). | -do- |
| 9 - 11 | Injection Moulding Familiarization with the basic idea of mechanical electrical and hydraulic system of injection moulding machines in IRO and its different parts and their respective functions. Operating and controlling of injection | Injection Moulding Introduction to Injection Moulding Process. Introduction about injection moulding machine – its types (plunger type, screw type). Description about different types of | -do- | Definition of heat & temperature and their differences. Relation between Fahrenheit, Celsius scale. |

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| | <p>moulding machine in IRO & TRO (fitting of mould ejector, locking and cooling of mould, adjusting feed of screw or ram, temperature controlling, fitting and adjusting nozzle, controlling of injection pressure and speed).</p> | <p>injection Moulds and its parts.</p> <p>Processing defects, causes, remedies.</p> <p>Trouble shooting of injection moulding machine.</p> | | |
| 12 & 13 | <p>Microprocessor Controlled & PLC Injection Moulding Machine</p> <p>Machine setting procedure, setting for process-parameters.</p> | <p>Microprocessor Controlled & PLC Injection Moulding machine.</p> <p>Introduction to basic concepts of Micro-processor control, comparison of Micro-processor controlled machine with conventional machine.</p> <p>Introduction to basic principles & features of Thermoset Injection Moulding Process, All electrical Injection Moulding Machines, Multi injection Moulding Machines</p> | - do - | Square root – the square root of perfect square of a whole number and decimals. |
| 14. | <p>Oiling, lubrication and preventive maintenance of injection moulding machine</p> | <p>Introduction about Oiling, lubrication and preventive maintenance of injection moulding machine</p> | <p>Drawing of Isometric views from orthographic projection and vice-versa.</p> | <p>Temperature measuring instruments used in the workshop – their description and use</p> |
| 15 | <p>Compression Moulding:</p> <p>Familiarization with basic idea of mechanical electrical and hydraulic system of compression moulding machine and its different parts and their</p> | <p>Compression Moulding</p> <p>Introduction to Compression Moulding Process. Compression moulding machine – (Hand operated & Semi automatic) its</p> | - do- | <p>Definition of mass & weight, their units and differences.</p> |

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| | respective functions. | description, different parts and their respective functions. | | |
| 16 & 17 | Operating and controlling of compression moulding machine in IRO & TRO, movement of platen top or bottom adjustment and its control. adjusting pressure in terms of per square area and total tonnage, fitting and heating of moulds, controlling temperature, checking of bulk factor/density etc. | Description about different types of compression Moulds and its parts. Processing Defects, Causes, and Remedies etc. Trouble shooting of Compression Moulding Machine. | - do - | Forces – definition its unit, compressive, tensile and shear force. Newton's laws of motion & gravitation. |
| 18 | Oiling, lubrication and preventive maintenance of compression moulding machine | Transfer Moulding Process. Introduction about Oiling, lubrication and preventive maintenance of compression moulding machine | Draw third view from the given two orthographic views. | Definition and calculation of speed, velocity, acceleration & their units. Difference between speed & velocity. |
| 19 & 20 | Fibre Reinforce Plastic (FRP) process (hand layup process). | Introduction about fibre reinforce plastic process method. | - do - | -do- |
| 21 to 24 | Revision | | | |
| 25 | Project Work / Industrial Visit | | | |
| 26 | Examination | | | |

**Syllabus for the Trade of
“PLASTIC PROCESSING OPERATOR ” under C.T.S.
(Semester Code No. PPO-02)**

SEMESTER – II

| Sl. NO. | TRADE PRACTICAL | TRADE THEORY | ENGINEERING DRAWING | WORKSHOP CALCULATION & SCIENCE |
|---------|--|---|---|--|
| 1-3 | <p>Blow Moulding Process</p> <p>Familiarization with basic idea of mechanical, electrical, hydraulic and pneumatic system of blow moulding machine and its different parts and their respective functions.</p> | <p>Blow Moulding Process</p> <p>Introduction to Blow Moulding Process and its latest processing techniques.</p> <p>Blow moulding machine (Hand operated & Automatic) –its description, different parts and their respective functions. Sequence of operation.</p> | <p>Sectional views – introduction, application, section line, full sections, half sections, aligned section, revolve section, remove section.</p> | <p>Calculation of areas of plane figures formed by the combination of standard figures.</p> |
| 4-6 | <p>Operating and controlling of blow moulding machine in IRO & TRO (setting of die, adjusting mandrel, controlling Parisian, adjusting thickness uniformity).</p> | <p>Description about Blow Moulds and its parts.</p> <p>Processing defects, causes, remedies etc.</p> <p>Trouble shooting of Blow moulding machine.</p> | -do- | <p>Calculation of volumes of standard solids prisms, cylinder, spheres, cone, pyramid, frustum of cone and pyramids.</p> |
| 7 | <p>Oiling, lubrication and preventive maintenance of Blow moulding machine</p> | <p>Introduction about Oiling, lubrication and preventive maintenance of Blow moulding machine</p> | -do- | -do- |
| 8-10 | <p>Extrusion Process</p> <p>Familiarization with basic idea of mechanical, electrical and hydraulic system of extrusion machine and its different parts and</p> | <p>Extrusion Process</p> <p>Introduction to different extrusion process and its latest processing</p> | <p>Reading of assembly drawing for Injection Moulding Die Assy. Draw different parts with dimensions, fits</p> | <p>Definition of work, Power & energy – their units’. Calculations of work, Power & energy.</p> |

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| | their respective functions. | techniques. Extrusion machine – its description, use of different parts and their functions. | and tolerance. | |
| 11-13 | Operating and controlling of extrusion machine in IRO & TRO. (changing and cleaning of screws in extruder, adjusting and controlling temperature, adjusting screen pack arrangement, adjusting variable speed, setting and adjusting die head for pipe, profile, reprocessing and blown film etc). | Description about extrusion dies and its parts. Processing defects, causes, remedies etc. Trouble shooting of extruder machine. | -do- | -do- |
| 14 | Oiling, lubricating and preventive maintenance of extruder machine. | Introduction about Oiling, lubrication and preventive maintenance of extruder machine. | Reading of assembly drawing for Compound Moulding Die Assy. Draw different parts with dimensions, fits and tolerance. | Friction its definitions, and component its effect. Laws of friction, angle of friction and its related calculations. |
| 15-17 | Operating and controlling of thermoforming & vacuum forming machine in IRO & TRO. | Thermoforming & vacuum forming – its brief description and use. Processing technique of different plastic material. | -do- | -do- |
| 18-19 | Demo about rotational moulding machine. | Introduction about Rotational Moulding process. | Reading of assembly drawing of Blow Moulding Die Assy. Draw different parts with dimensions, fits and tolerance. | Electricity – definitions, Ohm's Law, electrical work, power, energy and units. |
| 20 | Practice for Annealing, Stress Relieving, Warpage Control, De-flashing and Printing of | Post Moulding Operations: Annealing, Stress Relieving, Warpage | -do- | -do - |

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| | finish products. | Control, De-flashing and Printing. | | |
| 21 | Practice of Pre-drying of Plastics Materials | Importance of Pre- drying of Plastics Materials | -do- | Ratio, proportion and its problems. |
| 22- 23 | Fabricating acrylic sheet ABS- sheet, HIPS sheet, HMHDPE blocks etc. involving, drilling screwing buffing sanding. | Brief description of machinery used for buffing, sanding, welding and their application. | Reading of assembly drawing of Extrusion Die Assy. Draw different parts with dimensions, fits and tolerance. | -do- |
| 24 | Statistical Process Control (SPC) Statistical Quality Control (SQC) Product Dimensions Measurements | Introduction to Statistical Process Control (SPC), Statistical Quality Control (SQC). Product Dimensions Measurements | -do- | -do- |
| 25 | i) Revision | | | |
| 26 | Examination | | | |

**LIST OF TOOLS AND EQUIPMENT FOR 16 TRAINEES + ONE
FOR THE TRADE OF “PLASTIC PROCESSING OPERATOR”**

A. TRAINEE’S TOOL KIT (SEMESTER – I & II)

| Sl. No. | Name of the Items | Quantity |
|---------|--|----------|
| 1 | Steel Rule 300 mm in English and Metric combined | 17 nos. |
| 2 | Engineer’s Square 150 mm with knife edge | 17 nos. |
| 3 | Hacksaw frame adjustable with pistol grip for 200-300 mm blade | 17 nos. |
| 4 | Centre punch 100 mm | 17 nos. |
| 5 | Prick punch 150 mm | 17 nos. |
| 6 | File flat Medium 250 mm | 17 nos. |
| 7 | File flat 2 nd cut Medium 250 mm | 17 nos. |
| 8 | File flat safe edge 200 mm | 17 nos. |
| 9 | File triangular smooth 200 mm | 17 nos. |
| | | 17 nos. |

B. TOOLS AND EQUIPMENTS (SEMESTER – I & II)

| Sl. No. | Name of the Items | Quantity |
|---------|--|-------------|
| 1 | Caliper inside spring type-150 mm | 17 nos. |
| 2 | Caliper outside spring type-150 mm | 17 nos. |
| 3 | Divider spring type – 150 mm | 17 nos. |
| 4 | Odd leg caliper firm joint 0- 150 mm | 17 nos. |
| 5 | Screw driver – 150 mm | 17 nos. |
| 6 | Screw driver – 200 mm | 17 nos. |
| 8 | File card | 17 nos. |
| 9 | Hammer Ball Peen 0.5 kg with handle | 17 nos. |
| 10 | Workbench 240 cm x 120 cm x 75 cm (Each bench fitted with 4 vices) | 4 nos. |
| 12 | Bench Vice of 150 mm | 17 nos. |
| 13 | Outside micrometer 0-25 mm, with 0.01 mm least count | 4 nos. |
| 14 | Vernier caliper-Range 200 mm, with 0.02 mm least count | 4 nos. |
| 15 | Vernier bevel protractor-Blade range 150 and 300 mm, dial 1 ⁰ , least count 5’ (min.) with head, Acute Angle attachment | 2 nos. each |
| 16 | Vernier height gauge - Range 300 mm, with 0.02 mm least count | 2 nos. each |
| 17 | Surface plate 300 x 300 x 80 mm | 2 nos. each |
| 18 | HSS Twist Drill with St. Shank Ø5 to Ø12 mm in steps of 0.5 mm | 2 nos. each |
| 19 | HSS Twist Drill St. Shank Ø5 mm to Ø12 mm in steps of 1 mm | 2 nos. each |
| 20 | Portable hand drill (electric) | 2 nos. each |
| 21 | Drill Chuck with key with 12 mm capacity | 2 nos. each |
| 22 | Taps and dies complete set in box M5, M6, M8, M10 | 2 nos. . |

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| 23 | Steel lockers for 8 trainees each (Pigeon Cup Board) | 2 nos. |
| 24 | Steel Almirah 180 cm x 60 cm x 45 cm | 2 nos. |
| 25 | Fire Extinguisher | 2 nos. |
| 26 | Fire buckets with stand | 2 nos. |
| 27 | Electric switches, fuses, holders, lamps, wood boards, plug sockets, solder, flux, wires and cables, battens, and other consumables. | As required |

- **General Machinery Shop Outfit (as per the table)**

| Sl.No. | Name and description of Machines | Quantity |
|--|--|---------------|
| 1 | Pillar Drilling Machine 0-20 mm capacity. | 1 no |
| 2 | Bench Pedestal Grinding machine (General purpose) D.E. with 20 cm dia. capacity | 1 no. |
| 3 | Test Equipment for plastic (MFI & Hardness Tester) | 1 no |
| 4 | Plastic scrap grinder | 1 no. |
| 5 | Pre heater 12 trays of 25 kgs. of 20 minutes capacity. | 1 no. |
| Injection Moulding (SEMESTER – I I) | | |
| 1 | Hand operated Injection Moulding machine with (a) 13 grams capacity (b) 30 grams capacity | 1 no. each |
| 2 | Automatic Injection Moulding Machine with moulds and accessories as required 40 T capacity (with Microprocessor/PLC controller) | 1 No. |
| Compression Moulding (SEMESTER – I) | | |
| 1 | Hand operated Compression Moulding Machine with moulds – 40 T. capacity | 2 nos. |
| 2 | Automatic compression moulding machine with moulds and accessories as required – 40 T capacity (with Microprocessor /PLC controller) | 1 |
| Blow Moulding (SEMESTER – II) | | |
| 1 | Hand operated Blow Moulding Machine with moulds and accessories of 1/4 liter capacity | 1 no. |
| 2 | Auto Blow Moulding Machine with set of moulds and accessories 1 liter capacity (with Microprocessor/PLC controller) | 1 no. |
| Extrusion Process (SEMESTER – II) | | |
| 1 | 30 mm extruder with downstream lines such as film pipe with re-processing unit. | 1 no. |
| 2 | Pipe extrusion machine of 30 mm capacity | 1 no. |
| 3 | Extrusion for Blow film single layer of 30 mm capacity | 1 no. |
| 4. | Printing Machine with oxidizing Treatment nut | 1 no. |