CURRICULUM

FOR THE TRADE OF

PUMP OPERATOR CUM MECHANIC

UNDER

APPRENTICESHIP TRAINING SCHEME

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

CONTENTS

1. ACKNOWLEDGEMENT

The DGT sincerely express appreciation for the contribution of the Industry, State Directorate, Trade Experts and all others who contributed in revising the curriculum. Special acknowledgement to the following industries/organizations who have contributed valuable inputs in revising the curricula through their expert members:

1. Bokaro Power Supply Co. (P) Ltd.
2. Damodar Valley Corporation Ltd.,
3. Volkswagen Academy, Pune
4. OCL Ltd. (Dalmia Group), Odisha
5. Bharat Heavy Electricals Ltd., Ranipet, Tamil Nadu
6. TATA Motors, Pune
7. JBM Group, Chennai
8. MTAB Technology (P) Ltd., Chennai

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

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

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2.	R. N. Manna, T.O.	CSTARI, Kolkata	Expert
3.	S. Bandypadhyay, T.O.	ATI, Kolkata	Member

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 **Pump Operator cum Mechanic** trade)

1. Monitors gauges and flow meters and inspects equipment to ensure that tank levels, temperatures, chemical amounts, and pressure are at specified levels, reporting abnormalities as necessary.
2. Records operating data such as products and quantities pumped, stocks used, gauging results, and operating times.
3. Communicates with other workers, using signals, radios, or telephones, to start and stop flows of materials or substances.
4. Tends vessels that store substances such as gases, liquids, slurries, or powdered materials, checking levels of substances by using calibrated rods or by reading mercury gauges and tank charts.
5. Turns valves and starts pumps to start or regulate flows of substances such as gases, liquids, slurries, or powdered materials.
6. Plan movement of products through lines to processing, storage, and shipping units, utilizing knowledge of interconnections and capacities of pipelines, valve manifolds, pumps, and tanager.
7. Reads operating schedules or instructions or receives verbal orders, in order to determine amounts to be pumped.
8. The Pump Operator cleans, lubricates, and repairs pumps and vessels, using hand tools and equipment.
9. Collects and delivers sample solutions for laboratory analysis.
10. Connects hoses and pipelines to pumps and vessels prior to material transfer, using hand tools.
11. Repairs pumps of process machinery: examines pumps for malfunctioning and to locate damage or wear, such as blowout packing, misalignment of pump shaft, slippage of drive belt, worn bearings, or need for lubrication.
12. Observes operation of pumps and feels for heat and vibration of parts to detect cause of malfunctioning.
13. Dismantles pumps and performs repairs, such as cleaning impellers, repacking stuffing boxes, tightening glands, and replacing bearings, using handtools.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Pumpman; Pump Operator; Pump House Attendant; Pump Driver; operates one or more power-driven machines for pumping, storing and supplying liquids or other fluid materials or for dewatering purposes. Starts pump, observes its operation and adjusts controls to maintain correct rate of pumping; stops pump when required quantity of fluid has been moved; cleans, oils and greases pump, tightens loose parts and performs other servicing tasks to keep pump and equipment in good running order and safe condition. May do minor repairs. May connect pipe lines from pump to vessel to be filled or emptied. May be designated according to type of pump operated or type of material (fluid) pumped, as PUMP OPERATOR, STEAM; PUMP OPERATOR, DIESEL; PUMP OPERATOR (ELECTRIC); TUBE WELL OPERATOR.

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 : 8169.40**

5. GENERAL INFORMATION

1. **Name of the Trade** **: PUMP OPERATOR CUM MECHANIC**

2. **N.C.O. Code No.** **: NCO-2004:** 8169.40

3. **Duration of Apprenticeship Training (Basic Training + Practical Training):**2years

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

a) Block –I : 3 months

b) Block – II : 3 months

Total duration of Basic Training: **6 months**

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

a) Block–I: 9 months

b) Block–II : 9 months

Total duration of Practical Training: **18 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 with Science and Mathematics or its equivalent

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

6. **Rebate for ITI passed trainees** : i) **One year** in the trade of **Pump Operator cum Mechanic**

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	4-12	13-15	16-24
Basic Training	Block– I	-----	Block – II	------
Practical Training (On - job training)	----	Block – I	------	Block – II

Components of Training	Duration of Training in Months →																							
↓	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Basic Training Block - I																								
Practical Training Block - I																								
Basic Training Block - II																								
Practical Training Block - II																								

7. SYLLABUS

7.1 BASIC TRAINING
(BLOCK – I & II)
DURATION: 06 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** : **PUMP OPERATOR CUM MECHANIC**
2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)
3) **Batch size** : 20
4) **Power Norms** : 11 KW for Workshop
5) **Space Norms** : 84 Sq. m.

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

i) Degree/Diploma in **Mechanical Engg./ Automobile** Engg. from recognized university/Board with one/two year post qualification experience respectively in the relevant field.

OR

ii) NTC/NAC in the trade of **Pump Operator cum Mechanic** 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

A. Block– I
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1.	Engineering Drawing: Introduction and its importance Different types of standards used in engineering drawing. Drawing Instruments: their uses 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**	**Units & Measurements-** FPS, CGS, MKS/SI unit, unit of length, Mass and time. Fundamentals and derived units Conversion of units and applied problems.	**20**
2.	Lines : types and applications in Drawing as per BIS SP:46-2003 Drawing geometrical object using all types of lines. **Drawing of Geometrical Figures:** Angle, Triangle, Square, Rectangle and Circle. **Letters: -** Lettering styles, Single stroke letters and numbers as per IS standard. Lettering practice		**Material Science** : properties - Physical & Mechanical, Types - Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals	
3.	**Dimensioning-** Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement, Alignment and indication of dimensions. **Scales**:-Types use and construction. Representative factor of scale.		**Mass .Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density,	
4.	Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view		**Speed and Velocity:** Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation. Average Velocity, Acceleration & Retardation. Related problems. Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force	

5.	**Constructions: -** Draw proportionate free hand sketches of plane figures. Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand		**Ratio & Proportion** : Simple calculation on related problems. **Percentage:** Introduction, Simple calculation.	
6.	Projections: Concept of axes plane and quadrant. Orthographic projections Method of first angle and third angle projections (definition and difference) Symbol of 1^{st} angle and 3^{rd} angle projection as per IS specification. Free hand Drawing of Orthographic projection from isometric/3D view of geometrical blocks		**Work, Power and Energy:** work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy. Meaning of H.P., I.H.P., B.H.P., and F.H.P. and CC and Torque.	

B. Block- II
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1.	**Screw :-** Its Types and Sizes, Screw thread, their standard forms as per BIS, external and internal thread.	**30**	**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	**20**
2.	**Rivets and Joints:-** Prepare a drawing sheet on rivets nomenclature and Joints.		**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.	
3.	Free hand Sketches for simple pipe line with general fittings.		**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. Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple solid blocks.	
4.	Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.		**Basic Electricity:** Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections - series, parallel, electric power, Horse power, energy, unit of electrical energy. Concept of earthling.	
5.	Simple exercises related to trade related symbols. Basic electrical and electronic symbols		**Simple machines** **Transmission of power:** - Transmission of power by belt, pulleys & gear drive. **Heat treatment process:** - Heat treatment and advantages.	

			Annealing, Normalizing, Hardening, Tempering.	
6.	Free hand sketch of trade related components / parts /cutting tool indicating angles.		**Trigonometry:** Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding the value of unknown sides and angles of a triangle by Trigonometrical method. Finding height and distance by trigonometry. Application of trigonometry in shop problems. (viz. taper angle calculation). Calculate the area of triangle by using trigonometry and application of Pythagoras theorem.	
7.			**Concept of pressure** - **Definition**:-Force, Pressure, and their units, atmospheric pressure, gauges used for measuring pressure, problems. Introduction to pneumatics & hydraulics systems.	
8.	**Simple exercises related to trade related Test Papers. Solution of NCVT test papers.**			

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.	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 eg; 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. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2	Identification of tools & equipments as per desired specifications related to the trade(Hand tools , Fitting tools & Measuring tools) Uses of marking tools, Punch, Try square & basic measuring tools, caliper, steel rule. Marking out lines, gripping suitably in vice jaws, hacksawing to given dimensions, sawing different types of metals of different sections. Chipping flat surfaces and grinding various angles to chisels, filing flat surface. Grooving with Hammer and chisel. Marking and Drilling holes on flat pieces. Tapping as per simple drawing. Practice on General cleaning, checking and use of nut, bolts, & studs etc. Removal of stud/bolt from blind hole. Use of Lubrication, Cutting Threads on a Bolt/ Stud with die. Adjustment of two piece Die, Reaming a hole/ Bush to suit the given pin/ shaft, scraping a given machined surface.	Hand & Power Tools:- Marking scheme, Marking material-chalk, Prussian blue. Cleaning tools- Scraper, wire brush, Emery paper, Description, care and use of Surface plates, steel rule, measuring tape, try square. Calipers-inside and outside. Dividers, surface gauges, scriber, punches-prick punch, center punch, pin punch, hollow punch, number and letter punch. Chisel-flat, cross-cut. Hammer- ball pein, lump, mallet. Screw drivers-blade screwdriver, Phillips screw driver, Ratchet screwdriver. Allen key, bench vice & C-clamps, Spanners- ring spanner, open end spanner & the combination spanner, universal adjustable open end spanner. Sockets & accessories, Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Side cutters, Tin snips, Circlip pliers, external circlips pliers. Air impact wrench, air ratchet, wrenches- Torque wrenches, pipe wrenches, car jet washers Pipe

		flaring & cutting tool, pullers-Gear and bearing.
3-4.	Identification of different pumps, its components, prime movers. Practice on operational safety Dismantling of reciprocating pumps- valves, pistons, cranks, seals etc. for inspection, repair & replacement. Cleaning of parts & assembling. Installing of reciprocating pumps.	Pump Industry in India - leading manufacturers, development in Pump Industry, trends, new product. Pumps-its importance for agricultural & industrial applications. Classification of pumps, its prime movers, parts and operation safety. Classification of reciprocating pump, construction and operation. Installation technique of reciprocating pump. Tools and equipment required & procedure.
5.	Familiarization with plain/journal bearings, anti-friction bearings used on machine assembly. Specification Mounting of bearing on shafts and in housing with proper fit & axis alignment. Use of proper tools. Removal of bearings from s hafts & housing by using pullers. Cleaning up & removing old metal form bearing and replacing with new metal. Checking of shafts for alignment with dial indicator.	Fasteners- Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners. Function of Gaskets, Selection of materials for gaskets and packing, oil seals. Cutting tools Study of different type of cutting tools like Hacksaw, File- Definition, parts of a file, specification, Grade, shape, different type of cut and uses., OFF-hand grinding with sander,
6-7.	Dismantling of rotary pumps- impeller, shaft, bearing etc, for inspection, Repair & replacement. Cleaning of parts and assembling. Checking for alignment, clearance, etc., Priming technique and its application. Installing, operating & testing of rotary pumps.	Classification of rotary pumps- Construction and operation- repairing procedure. Brief description of turbine & stage pumps, positive displacements and their advantages. Meaning of priming and its effect. Installation techniques of rotary pump-procedure, tools and equipments required
8.	Servicing of pumps and valves of general purpose and of corrosive fluids. Selection of gasket, packing & gland materials, marking & cutting off gasket as per shape & profile. Using gasket cement to stop leakage & for fixing	Different types of valves-their description, advantages & use. Special pumps & glands used for corrosive fluids. Different gasket cement used to prevent leakage and advantages of each over the other. Principle of direct reading pressure and temperature measuring instruments. Method to read and application of pressure and temperature measuring instruments
9.	Practice on making out key as per shaft, hub, keyways, preparing keys to fit into keyways.	Types of key and key ways, their uses and applications. Preparation of keys, allowable tolerance, clearances. Key fitting procedure-methods. Procedure for removing keys. Types & uses of key pullers
10.	Making different types of keys for fitting pulleys, Assembling and dismantling of bushes, bearings and couplings maintaining safety.	Types of pulleys solid, split, “V” groove, step, cone, taper, guided and jockey or rider pulleys, their functions and uses. Procedure to assemble and dismantle pulleys and impellers from

		shafts following safety precautions. Types of belt drives, velocity ratio of belt drive. Horse Power transmitted by belt. Ratio & driving tension in a belt. Parallel & cross belt drive, open & cross belt drive, angular belt drive. Methods of fixing and uses. Description, types and application of bushes, bearing and couplings. Procedure to fit bushes, bearings and coupling safely.
11.	Installation of seals leather polythene, asbestos, rope rubber and mechanical seals. Maintenance of lubrication systems. Fitting of flanges and assembling of pipe work, leak testing and rectification. Use of tee, elbow, bend, socket, rectifiers and other pipe fittings. Cutting threads for pipes.	Various seals- their use and places of application with advantages. Lubrication types of lubricant use & methods of lubrication. Various tools and accessories used in pipe fitting with their details. Use of protecting caps on threads. Pipe fitting technique. Procedure to fit flanges & for leak testing.
12.	Reconditioning of centrifugal pumps.	Principle of centrifugal pump. Construction and operation of centrifugal pump in series and parallel. Finding out defects and method to recondition centrifugal pump.
13.	**Revision & Internal Assessment**	

B. Block –II
Basic Training

Week No.	Professional Skills	Professional Knowledge
1.	Installation of stationary & coupled pumps, checking and correcting of alignment of pump with its prime movers and its serviceability test. Testing of pumps for their delivery flow & pressure. Reconditioning of centrifugal pumps.	Method of install, align and testing of pumps for their serviceability. Concept of lightening torque for different sizes of bolts.
2-3.	Dismantling identifying of parts, finding out defects, repairing, and replacement of components, cleaning, assembling, installing and testing of submersible pumps. Finding out & rectifying faults developed during operation.	Submersible pump- construction, operation and selection of appropriate type. Procedure to recondition, install and test of submersible pumps. Causes of failures and remedial measures.
4.	Identifying and rectifying defects of pump sets. Practice on preventive & scheduled maintenance of pump sets.	Defects in pump sets- procedure for detection of causes & rectification. Purpose and procedure for balancing of rotor. Procedure to be followed for preventive & scheduled maintenance, planning for spares and other stores.
5.	Familiarization with the safety precautions to be followed for electrical work. Treatment for electrical shock. Use of hand tools connected with electrical work and maintenance of electrical machines.	Safety rules to be followed in connection with electrical work. First aid when affected by electrical shock. Purpose, types, description and method to use common electrical hand tools.
6.	Verification of Ohm's law. Building up of electrical series, parallel and combination of series & parallel circuits. Measurement of current, voltage resistance. Exercise on fixing and connecting switches holders, fuses, plugs sockets, Push buttons, etc. Use of test lamp and neon tester. Identification of live, neutral and earthling wires. Measurement of electrical power and energy consumed for a definite period of time.	Description and method to use current, voltage and resistance measuring instruments and precaution to be taken. Insulation Tester description, method to use and precautions to be taken. Alternating current- Definition explanation and advantages over. Direct current and vice-versa. Concept and application of phase, star and delta connection. Procedure to identify live, neutral, single phase and 3-phase power supply. Method to measure power and energy consumed by electrical appliances using wattmeter and Energy meter.
7.	Identifying of A.C motors, their testing, identifying terminals, connecting running & reversing. Measuring speed of A.C motor using tachometer with stop watch. Dismantling, assembling of A.C motors & identification of parts. Starting a single phase A.C motor with Direct on line (D.O.L) starter. Starting a 3 phase motor with star-delta starter. Checking for proper running of motor, overheating etc. maintenance of motors use and	AC Motors – related terminology. Purpose, type, construction, operation, testing for correct functioning, maintenance and industrial applications. Trouble shooting & protection of induction motor.

	connection of single phase preventor trouble shooting in circuit	
8.	Identifying, selecting, use of different types of ropes such as hemp, manila, nylon, wire etc. Practicing different types of knots and its applications. Method of joining two ropes, Together for extension. Detection of unsafe/defective conditions of ropes and knots. Use of different types lifting tackles both mechanical and hydraulic such as – Screw jacks, chain pulley block, crabs and winches, rollers and bars, levers, lashing and packing. Care and maintenance of lifting equipment and safety to be observed by handling the equipment.	Specification and use of different types of ropes such as hemp, manila, nylon, wire etc. Specification and correct use of slings. Safety to be observed in use of ropes and slings. Description, operation, purpose, application, care and use of Different types of lifting tackles for components of pump set. Precaution to be observed while using lifting tackles.
9-10.	Identification of different type of stationary Engine and their applications. Familiarisation with diesel engines, tools and equipment required for maintenance, engine parts and their handling technique. Starting and stopping of engines. Running of engines and checking temperatures, fuel oil pressure and consumption on load and engine speed	Principle of Compression-ignition engine, Spark Ignition Engine, differentiate between 4-stroke and 2 stroke, C.I engine and S.I Engine, Otto cycle and Diesel cycle. Different type of starting and stopping method of Diesel Engine. Technical terms used in engine, Engine specification
11.	Cleaning of fuel tank, checking leaks in the fuel lines. Cutting, flaring of tubes to make T & Elbow fitting using unions. Fitting of lubrication pump oil filters, air filters, checking and adjusting of oil pressure. Preventive maintenance & repairing	Procedure to clean fuel tank & check leak in the fuel line. Lubrication system – types, description and advantages of each over others. Filters and oil coolers – their description functions and method to overhaul for efficient functioning.
12.	Practice on troubleshooting in for Engine Not starting – Mechanical & Electrical causes, High fuel consumption, Engine overheating, Low Power Generation, Excessive oil consumption, Low/High Engine Oil Pressure, Engine Noise.	Troubleshooting : Causes and remedy for Engine Not starting – Mechanical & Electrical causes, High fuel consumption, Engine overheating, Low Power Generation, Excessive oil consumption, Low/High Engine Oil Pressure, Engine Noise.
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**	**:**	**110 Hrs. (55 hrs. in each block)**
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

A. Block – I
Basic Training

Topic No.	Topic	Duration (in hours)
	English Literacy	**15**
1	**Pronunciation :** Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)	
2	**Functional Grammar** Transformation of sentences, Voice change, Change of tense, Spellings.	
3	**Reading** Reading and understanding simple sentences about self, work and environment	
4	**Writing** Construction of simple sentences Writing simple English	
5	**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. Cardinal (fundamental) numbers ordinal numbers. 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	**15**
1	**Basics of Computer** Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	
2	**Computer Operating System** Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.	
3	**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	
4.	**Computer Networking and INTERNET** Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. 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. Information Security and antivirus tools, Do's and Don'ts in	

	Information Security, Awareness of IT - ACT, types of cyber crimes.	
	Communication Skill	**25**
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 -characteristics, components-Para-language Body - language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort. Case study/Exercise	
2	**Listening Skills** Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.	
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. Case study/Exercise	
4	**Facing Interviews** Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview	
5	**Behavioral Skills** **Organizational Behavior** Problem Solving Confidence Building Attitude Decision making Case study/Exercise	

B. Block– II
Basic Training

Topic No.	Topic	Duration (in hours)
	Entrepreneurship skill	**15**
1	**Concept of Entrepreneurship** **Entrepreneurship**- Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. Management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.	
2	**Project Preparation & Marketing analysis** Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of Product Life Cycle (PLC), Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.	
3	**Institutions Support** Preparation of Project. 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.	
4	**Investment Procurement** Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.	
	Productivity	**10**
1	**Productivity** Definition, Necessity, Meaning of GDP.	
2	**Affecting Factors** Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.	
3	**Comparison with developed countries** Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.	
4	**Personal Finance Management** Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	**15**
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 and safety measures.	
4	**First Aid** Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person	
5	**Basic Provisions** Idea of basic provision of safety, health, welfare under legislation of India.	
6	**Ecosystem** Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.	
7	**Pollution** Pollution and pollutants including liquid, gaseous, solid and hazardous waste.	
8	**Energy Conservation** Conservation of Energy, re-use and recycle.	
9	**Global warming** Global warming, climate change and Ozone layer depletion.	
10	**Ground Water** Hydrological cycle, ground and surface water, Conservation and Harvesting of water	
11	**Environment** Right attitude towards environment, Maintenance of in -house environment	
	Labour Welfare Legislation	**5**
1	**Welfare Acts** Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.	
	Quality Tools	**10**
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	**Quality Management System :** Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.	
4	**House Keeping :** Purpose of Housekeeping, Practice of good Housekeeping.	
5	**Quality Tools** Basic quality tools with a few examples	

7.2 PRACTICAL TRAINING (ON-JOB TRAINING)
(BLOCK – I & II)
DURATION: 18 MONTHS (9 months in each block)

GENERAL INFORMATION

1) **Name of the Trade** : **PUMP OPERATOR CUM MECHANIC**

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 each block

ii) NCVT exam will be conducted at the end of 2nd year.

4) **Instructor Qualification** :

i) Degree/Diploma in **Mechanical Engg./ Automobile** Engg. from recognized university/Board with one/two year post qualification experience in the relevant field.

OR

ii) NTC/NAC in the trade of Pump **Operator cum Mechanic** with three year post qualification experience in the relevant field.

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

5) **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. Safety and best practices/Basic Industrial Culture (5S, KAIZEN, etc.)
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Cutting, flaring of tubes to make T & Elbow fitting using unions. Fitting of lubrication pump oil filters, air filters, checking and adjusting of oil pressure. Preventive maintenance & repairing.
4. Familiarization with plain/journal bearings, anti-friction bearings used on machine assembly. Specification Mounting of bearing on shafts and in housing with proper fit & axis alignment. Use of proper tools. Removal of bearings from s hafts & housing by using pullers.
5. Cleaning up & removing old metal form bearing and replacing with new metal. Checking of shafts for alignment with dial indicator.
6. Identification of different pumps, its components, prime movers. Practice on operational safety dismantling of reciprocating pumps- valves, pistons, cranks, seals etc. for inspection, repair & replacement. Cleaning of parts & assembling. Installing of reciprocating pumps.
7. Dismantling of rotary pumps- impeller, shaft, bearing etc, for inspection, Repair & replacement. Cleaning of parts and assembling. Checking for alignment, clearance, etc., Priming technique and its application. Installing, operating & testing of rotary pumps.
8. Servicing of pumps and valves of general purpose and of corrosive fluids. Selection of gasket, packing & gland materials, marking & cutting off gasket as per shape & profile. Using gasket cement to stop leakage & for fixing
9. Installation of seals leather polythene, asbestos, rope rubber and mechanical seals. Maintenance of lubrication systems. Fitting of flanges and assembling of pipe work, leak testing and rectification. Use of tee, elbow, bend, socket, rectifiers and other pipe fittings. Cutting threads for pipes.
10. Reconditioning of centrifugal pumps.
11. Identifying and rectifying defects of pump sets. Practice on preventive & scheduled maintenance of pump sets.
12. Making different types of keys for fitting pulleys, Assembling and dismantling of bushes, bearings and couplings maintaining safety.

B. BLOCK – II (09 months)

1. Dismantling identifying of parts, finding out defects, repairing, and replacement of components, cleaning, assembling, installing and testing of submersible pumps. Finding out & rectifying faults developed during operation.
2. Inspecting and Quality Controlling of finished products.
3. Material management and estimating the cost of repairing and reconditioning of pump sets.

4. Assembling and testing for correct function. Inspecting & rectifying causes of failure of reciprocating, centrifugal, submersible, steam and vacuum pump.
5. Use of different types lifting tackles both mechanical and hydraulic such as - Screw jacks, chain pulley block, crabs and winches, rollers and bars, levers, lashing and packing. Use of inclined plane, hydraulic trolleys etc. Care and maintenance of lifting equipment and safety to be observed by handling the equipment.
6. Installation of stationary & coupled pumps, checking and correcting of alignment of pump with its prime movers and its serviceability test. Testing of pumps for their delivery flow & pressure.
7. Oil engine filter repair services and overhauling of diesel or oil engines for efficient performance.
8. Locating the faults to electric system and repairing the coil/rewinding.
9. Installation of assembled or repaired engine in position and connecting with propulsion system.
10. Starting of engine ,tuning it up and observe performances noting of different reading such as temperature, fuel level, oil pressure etc and setting it to specified standard for optimum performance.
11. Checking, adjusting and lubricating engines periodically and performance testing.
12. Repairing and reconditioning of diesel, petrol, kerosene engines, electric motors & stream turbine.

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

(SUMMATIVE ASSESSMENT FOR TWO YEARS TRADE)

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 involved in pump manufacturing.
2. Structural Fabrication like bridges, Roof structures, Building & construction.
3. Automobile and allied industries
4. Service industries like road transportation and Railways.
5. Ship building and repair
6. Infrastructure and defence organisations
7. In public sector industries (Central and State) and private industries in India & abroad.
8. Self employment

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: PUMP OPERATOR CUM MECHANIC

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

A : TRAINEES TOOL KIT:-

Sl. No.	Name of the items	Quantity (indicative)
1.	Allen Key set of 12 pieces (2mm to 14mm)	(5+1)
2.	Caliper inside 15 cm Spring	6
3.	Calipers outside 15 cm spring	6
4.	Center Punch 10 mm. Dia. x 100 mm.	6
5.	Dividers 15 cm Spring	6
6.	Electrician Screw Driver 250mm	6
7.	Hammer ball peen 0.5 kg with handle	6
8.	Hands file 20 cm. Second cut flat	6
9.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	6
10.	Pliers combination 20 cm.	6
11.	Screw driver 20cm.X 9mm. Blade	6
12.	Screw driver 30 cm. X 9 mm. Blade	6
13.	Scriber 15 cm	6
14.	Spanner D.E. set of 12 pieces (6mm to 32mm)	6
15.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	6
16.	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	6
17.	Steel rule 30 cm inch and metric	6
18.	Steel tool box with lock and key (folding type) 400x200x150 mm	6
19.	Wire cutter and stripper	6

B : TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS

Sl. No.	Name of the items	Quantity (indicative)
1.	Adjustable spanner (pipe wrench 350 mm)	2
2.	Air blow sun with standard accessories	1
3.	Air impact wrench with standard accessories	4
4.	Air ratchet with standard accessories	4
5.	Allen Key set of 12 pieces (2mm to 14mm)	4
6.	Ammeter 300A/ 60A DC with external shunt	4
7.	Angle plate adjustable 250x150x175	1
8.	Angle plate size 200x100x200mm	2
9.	Anvil 50 Kgs with Stand	1
10.	Auto Electrical test bench	1
11.	Batteiy -charger	2
12.	Bearing and gear tester	2
13.	Belt Tensioner gauge	1
14.	Blow Lamp 1 litre	2
15.	Bradawl	2
16.	Caliper inside 15 cm Spring	4
17.	Calipers outside 15 cm spring	4
18.	Cam lock type screw driver	1
19.	Car Jet washer with standard accessories	1
20.	Carge winches 3. 5 tonnes	1
21.	Chain pipe wrench 65 m	2
22.	Chain Pulley Block-3 ton capacity with tripod stand	1
23.	Chisel 10 cm flat	4
24.	Chisels cross cut 200 mm X 6mm	4
25.	Circlip pliers Expandina and contractina type 15cm and 20cm each	4
26.	Clamps C 100mm	2
27.	Clamps C 150mm	2
28.	Clamps C 200mm	2
29.	Cleanina tray 45x30 cm.	4
30.	Compression testina aauae suitable for diesel Enaine	2
31.	Copper bit soldering iron 0.25 Ka	5
32.	crab	1
33.	Cylinder bore aauae capacity 20 to 160 mm	4
34.	DC Ohmmeter 0 to 300 Ohms, mid scales at 20 Ohms	4
35.	Depth micrometer 0-2 5mm	4
36.	Dial gauge type 1 Gr. A (complete with clamping devices and stand)	4
37.	Different type of Engine Bearing model	1 set
38.	Digital Tone Tester 0-20 A AC	2
39.	Dividers 15 cm Spring	4
40.	Drift Punch Copper 15 Cm	4
41.	Drill point angle gauge	1
42.	Drill twist 1.5 mm to 15 mm (various sizes) by 0.5 mm	4
43.	Electric Soldering Iron 230 V 60 watts 230 V 25 watts	2 each
44.	Electric testing screw driver	2

45.	Energy meter. AC. Single Phase. 5 Amps. 230 Volts	2
46.	Engineers square 700 mm	4
47.	Engineers stethoscope	1
48.	Feeler gauge 20 blades (metric)	4
49.	File flat 20 cm bastard	4
50.	File, half round 20 cm second cut	4
51.	File. Square 20 cm second cut	4
52.	File. Square 30 cm round	4
53.	File, triangular 15 cm second cut	4
54.	Files assorted sizes and types including safe edge file (20 Nos)	2 set
55.	Flat File 25 cm second cut	4
56.	Flat File 35 cm bastard	4
57.	Flow meter 0-400 It inin	2
58.	Forks clips 02 tonnes (copa)	1
59.	Forks clips 05 tonnes (copa)	1
60.	Foundation bolt	4
61.	Gasket hollow punches 5. 6. 8. 10. 12. 19. 25 mm dia.	l set
62.	Glow plug tester	2
63.	Granite surface plate 1600 x 1000 with stand and cover	1
64.	Grease Gun	2
65.	Growler	2
66.	Hacksaw frame adjustable 20-30 cm	10
67.	Hammer Ball Peen 0.75 Ka	4
68.	Hammer Chipping 0.25 Ka	4
69.	Hammer copper 1 Ka with handle	4
70.	Hammer Mallet	4
71.	Hammer Plastic	4
72.	Hand key way broacher	1
73.	Hand operated chain pulley block	1
74.	Hand operated crimping tool (i) for crimping up to 4mm and (ii) for crimpina up to 10mm	2
75.	Hand reamers adjustable 10.5 to 11.25 nun. 11.25 to 12.75 mm. 12.75 to 14.25 mm and 14.25 to 15.75 mm	2sets
76.	Hand Shear Universal 250mm	2
77.	Hand vice - 37 mm	2
78.	Hollow Punch set of seven pieces 6mm to 15mm	2 sets each
79.	Hydraulic wheel and bearing puller	2
80.	Injector - Multi hole type. Pintle type	4 each
81.	Injector cleaning unit	1
82.	Injector testing set (Hand tester)	1
83.	Insulated Screw driver 20 cm x 9mm blade	4
84.	Insulated Screw driver 30 cm x 9mm blade	4
85.	Ladle 150mm Dia	1
86.	Left cut snips 250mm	4
87.	Level bottle (sprit) 150 ml.	1
88.	Lifting jack screw type 3 ton capacity	4
89.	Magneto spanner set with S spanners	1 set
90.	Magnifying glass 75mm	2
91.	Manila ropes 12. 20. 30 nun dia.	2 sets
92.	Markina out table 90X60X90 cm.	1
93.	Masonary bit (Assorted up to 12 mm)	2set

94.	Master test bars (different size)	1
95.	Meaaer 500 V	2
96.	Mobile crank	1
97.	Multimeter diaital	5
98.	Oil can 0.5.0.25 liter capacity	2
99.	Oil Stone 15 cm x 5 cm x 2.5 cm	1
100.	Outside micrometer 0 to 25 mm	4
101.	Outside micrometer 25 to 50 mm	4
102.	Outside micrometer 50 to 75 mm	1
103.	Outside micrometer 75 to 100 mm	1
104.	Philips Screw Driver set of 5 pieces (100 mm to 300 nun)	2 sets
105.	Pin spanner set	2
106.	Pipe cutting tool	2
107.	Pipe flaring tool	2
108.	Pipe wrench 45 nun	2
109.	Pliers combination 20 cm.	2
110.	Pliers flat nose 15 cm	2
111.	Pliers round nose 15 cm	2
112.	Pliers side cutting 15 cm	2
113.	Plumb bob	1
114.	Pneumatic scraper with adjustable stroke	2
115.	Portable electric drill Machine	1
116.	Portable jack	1
117.	Power Supply 0-12 v. lamp	1
118.	Pressure aauae 0 -5 Ka cm2	2
119.	Prick Punch 15 cm	4
120.	Punch Letter 4mm (Number)	2 set
121.	Radius Gauae. Metric	2
122.	Ratchet chain pulley	1
123.	Rawl plug tool & kit	2
124.	Right cut snips 250mm	4
125.	Rivet sets snap and Dolly combined 3mm, 4mm, 6mm	4
126.	Rollers (steel tubes) from 40 to 65 mm dia.	5
127.	Rotary pump working for dismantling and assembling	1
128.	Scientific Calculator	2
129.	Scraper flat 25 cm	2
130.	Scraper half round 25 cm	2
131.	Scraper Triangular 25 cm	2
132.	Screw jacks	1
133.	Scriber 15 cm	2
134.	Scriber with scribina black universal	2
135.	Self alignment roller ball bearing	2
136.	Set of stock and dies - Metric	2 sets
137.	Shear legs (tripod)	1
138.	Shear Tin Man's 450 mm x 600mm	4
139.	Sheet Metal Gauge	2
140.	Single Phase 220 V Capacitor type AC Meter squirrel gage Induction motor	1
141.	Soldering Copper Hatchet type 500 gms	4
142.	Solid Parallels in pairs (Different size) in Metric	4

143.	Spanner Clyburn 15 cm	1
144.	Spanner D.E. set of 12 pieces (6mm to 32mm)	4
145.	Spanner T. flocks for screwing up and up-screwing inaccessible	2
146.	Spanner, adjustable 15cm.	2
147.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	2
148.	Spanners socket with speed handle. T-bar. ratchet and universal upto	2
149.	Spark lighter	2
150.	Spark plug spanner 14mm x 18mm x Size	2
151.	Square box wrenches	1
152.	Square T-wrenches	1
153.	SRDG ball bearing. DRDG ball bearing, self aligning ball bearing.	1
154.	Steel measuring tape 10 meter in a case	4
155.	Steel rule 15 cm inch and metric	4
156.	Steel rule 30 cm inch and metric	4
157.	Steel wire Brush 50mmx 150mm	5
158.	Straight edge gauge 2 ft.	2
159.	Straight edge gauge 4 ft.	2
160.	Stud extractor set of 3	2 sets
161.	Stud remover with socket handle	1
162.	Surface gauge with dial test indicator plunger type i.e. 0.01 nun	1
163.	Tachometer (Counting type)	1
164.	Taps and Dies complete sets (5 types)	1 set
165.	Taps and wrenches - UNC, UNF and metric	2 sets
166.	Telescope gauge	4
167.	Temperature gauge 0-100 de ac	2
168.	Thermostat	2
169.	Thimbles of different sizes	2
170.	Thread pitch gauge Metric.	1
171.	Threaded fastener type B	2
172.	Threaded fastener type C	2
173.	Threaded fastener type F	2
174.	Three cell torch	2
175.	Three Phase 50 Hz. 5 HP AC squirrel gage induction motor with star delta starter	1
176.	Timing lighter	1
177.	Torque wrenches 5-35 Km. 12-68 Nm & 50-225 Km	1 each
178.	Trammel 30 cm	2
179.	Travelling and gantry cranes	1
180.	Tube expander up to 62 mm	1
181.	Universal puller for removing pulleys, bearings	1
182.	V" Block 75 x 3S mm pair with Clamps	2
183.	Vacuum gauge to read 0 to 760 nun of Hg.	2
184.	vernier caliper 0-300 mm with least count 0.02mm	4
185.	Vibrometer	2
186.	Vice grip pliers	2
187.	Voltmeter AC to 500 V	2
188.	Wall hoists	1
189.	Water pump for dismantling and assembling	2
190.	Wattmeter AC DC. 0 to 10 K\v	2
191.	Wire Gauge (metric)	5

192.	Work bench 250 x 120 x 60 cm with 4 vices 12cm Jaw	1

C : GENERAL MACHINERY INSTALLATIONS:-

Sl. No.	Name & Description of Machines	Quantity (indicative)
1.	Arbor press hand operated 2 ton capacity	1
2.	Back pull out type centrifugal pump	1
3.	Bench lever shears 250mm Blade x 3mm Capacity	1
4.	Centrifugal pump coupled with mono block set	1
5.	Diesel engine 2 stroke vertical (up to 10 KW ISHP)	1
6.	Diesel Engine 4 stroke vertical (up to abouit 10 KW ISHP)	1
7.	Diesel Engine Driven portable pump set	1
8.	Diesel Engine upto 3.5 KW . 4.5 HP fitted with pump	1
9.	Discrete Component Trainer Basic Electronics Trainer	1
10.	Drilling machine bench to drill up to 12inm dia along with accessories	1
11.	Dual Magnetization Yoke : AC HWDC 230 VAC. 50Hz	1 set
12.	Gas Welding Table 1220mm x760nini	2
13.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels roueh and smooth	1
14.	Horizontal split casing pump	1
15.	Hydraulic jack HI-LIFT type -3 ton capacity.	1
16.	Hydraulic Leak Testing equipment	1
17.	Injector Testing set (Hand Tester)	1
18.	Liquid penetrant Inspection kit	1 set
19.	Multi stage pump	1
20.	Overhead tank. pump, minimum 5000 litres with level indicators and piping layout	1
21.	Pipe Bending Machine (Hydraulic type) 12mm to 30mm	1
22.	Pneumatic rivet gun	
23.	Portable electric drill Machine	1
24.	Reciprocating Pump working for dismantling and assembling	1
25.	Spring tension tester	1
26.	Submersible pump set, eight stage upto 10 KW7 15 HP	1
27.	Tin smiths bench folder 600 x 1.6mm	1
28.	Trolley type portable air compressor single cylinder with 45 liters capacity Air tank, along with accessories & with working pressure 6.5 kg sq cm	1
29.	Welding plant Oxy-Acetylene complete (high pressure)	1
30.	Welding Transformer (150-300 Amps)	1

Note: In case of basic training setup by the industry the tools, equipment and machinery available in the industry may also be used for imparting basic training.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: PUMP OPERATOR CUM MECHANIC

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: PUMP OPERATOR CUM MECHANIC

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. 9 months + 9 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.