CURRICULUM

FOR THE TRADE OF

MARINE ENGINE FITTER

UNDER

APPRENTICESHIP TRAINING SCHEME

2017

सत्यमेव जयते
Government of India

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

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10. Marine Globe india, Mumbai
11. Rx Marine International, Mumbai
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2. BACKGROUND

2. 1. Apprenticeship Training Scheme under Apprentice Act 1961

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

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

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

2. 2. Changes in Industrial Scenario

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

2. 3. Reformation

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

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

3. RATIONALE

(Need for Apprenticeship in **MARINE ENGINE FITTER** trade)

The revised Apprenticeship Training Scheme (ATS) shall make the students more adapt to industry requirement through latest theoretical & practical inputs as -

1. Good synergy between Basic Training (Theoretical Inputs) & Practical Training (On The Job Training) unlike earlier scheme where students need to complete one year classroom training before getting Practical Training (On The Job Training).

2. Students will be thoroughly skilled for maintenance, repair & servicing Marine Parts & Engines

3. Students will be equipped to handle fault measurement and diagnostic according to new mechanical and electronics technology.

4. Dismantling and assembling defective unit or parts of Engines, Propeller, impeller, engine radiator, and other new technology aggregate etc. according to nature of repairs to be done, using hoist, jack, pullers,and hand tools.

5. Measures essential parts like cylinder, bores piston, sizes crank pins etc. using gauges, micrometre and other precision tools and get cylinders re-bored, liners filled, valve seats refaced, bearings replaced etc. as necessary.

6. Repairs or overhauls and assembles engine such as replacing defective parts, scrapping bearings, setting timing, cleaning injectors, tuning carburettor etc. according to maker's specification.

7. Students will be able to read & understand manual related to lubricants, joints, loose parts and test performance of engine.

5.GENERAL INFORMATION

1. **Name of the Trade** **: MARINE ENGINE FITTER**

2. **N.C.O. Code No.** : 7233.22

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 with Science and Mathematics under 10+2 system of Education 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 **Marine engine fitter**

Note: Port & 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.

5. 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																								

6.SYLLABUS

6.1 BASIC TRAINING

(BLOCK – I & II)

DURATION: 06 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** : **MARINE ENGINE FITTER**

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

3) **Batch size** : 16

4) **Power Norms** : 3 KW for Workshop

5) **Space Norms** : Work shop 85 Sq. meter.
Class room : 30 Sq.meter.

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

7) **Instructor Qualification** :

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

OR

ii) 10 thNTC/NAC in the trade of '**Marine engine fitter'** with three year PostQualificationexperience in the relevant field.

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

6.1.1 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.**			

6.1.2 DETAILS OF SYLLABUS OF PROFESSIONAL SKIL & PROFESSIONAL KNOWLEDGE

Marine Engine Fitter

Block –I

Basic Training

Week No	Professional Skill	Professional Knowledge

1	Importance of trade training, List of tools &Machinery used in the trade.' **Occupational Safety & Health Importance of housekeeping & good shop floor practices.** Health & Safety: Introduction to safety equipmentsand their uses. Introduction of first aid, operation of Electrical mains. 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. Health, Safety and, Environment guidelines. Disposal procedure ofwaste materials like cottonwaste, metal chips/burrs etc. Personal protective Equipments(PPE):- Use of Fire extinguishers. Identification of tools &equipments as per desired specifications for marking & sawing. Selection of material as per application. Marking out lines, gripping suitably in vice jaws, hack-sawing to given dimensions, sawing different types of metals of different sections.	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 IndustrialTraining Institute system including stores procedures. **Soft Skills: its importance and Job area after completion of training.** Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept&its application.Environmentguidelines.Legislations&regulationsasapplicable.Response to emergencies eg; power failure,fire, and system failure. Linear measurements- its units, dividers, calipers, hermaphrodite, centre punch, dot punch, their description and uses of different types of hammers. Description, use and care of 'V' Blocks, marking off table. Measuring standards (English, Metric Units), Angularmeasurements, subdivisions,trysquare, ordinary depth gauge, protractor-description, uses and cares. Bench vice types, uses, care &maintenance,vice clamps.

2	Filing- Parallel,Flatand Square (Rough finish). Filing practice: Filing Channel, Surface filing. Marking of straight and parallel lines with odd leg Calipersand steel rule, marking practice with dividers,odd leg calipers and steelrule (circles, arcs, parallel lines). Marking straight lines and arcs using scribing block and dividers & punching Saw along a straight line, curved line, on different sections of metal. File and saw on M.S. Square and pipe. Straight saw on thick section, M.S. angle and pipes. Filing flat, square, and parallel to an accuracy of 0.5mm.	Files- specifications, description, materials, grades, cuts, file elements, uses. Types of files- convex, taper, needle, care and maintenance of files, Special files: types, description. Hacksaw frames and blades, material, parts and grade of blade, care & maintenance. Marking off and layout tools: dividers, scribing block, odd leg calipers, punches- description, classification, types and material. Caliper- Types, Uses, Care & Maintenance. Surface plate and auxiliary marking equipment, 'V' block,angleplates,parallel block, description, types and uses.
3	File steps and finish with smooth file with an accuracy of ± 0.25 mm.	Verniercalipers, graduations, reading, use and care. Micrometer- outside and inside –parts graduation, leading, use and care. Description of Digital micrometer.Vernier height gauge : material construction,parts,graduations (English& Metric)uses, care and maintenance,Verniermicrometer, parts, graduation, use,Careandmaintenance.Screwthreadmicrometer: graduation and use. Dial test indicator, parts, graduation, Method of use, Care and maintenance. Digital dial indicator.Vernier bevel protractor, graduations, reading,use and care, Description of dial Vernier Caliper& Digital verniercaliper Inside micrometer: parts, graduations ,LC, reading , uses, care and maintenance,DepthMicrometer : parts, graduations ,LC, reading , uses, care and maintenance.

4.	Marking of straight lines, circles, profiles and various geometrical shapes and cutting the sheets with snips. Bend sheet metal into various curvature forms, fold sheet metal at angle stakes. Make simple square container with wired edge.	Safety precautions to be observed in a sheet metal workshop, sheets and sizes, Commercialsizes and various types of metal sheets, coatedsheets and their uses as per BIS specifications. Marking and measuring tools, wing compass, Prick punch, snips, types and uses. Stakes types, parts & their uses. Various types of sheet metal joints, their selection andapplications, tolerance for various joints, theirselection& application. Wired edges –Types, sizes, and selection for various works. Riveting tools, dolly & snaps description anduses. Method of riveting. Shearing machine-description, parts and uses.
5	Marking according to simple blue prints for locating position of holes, scribing lines on chalked surfaces with marking tools, finding center of round bar with the help of 'V' block and marking block. Joining straight line to an arc. Chipping flat surfaces along a marked line. More difficult work in marking out including tangents, templates involving use of vernier protractor.	Chisels- materials, types, cutting angles. Power Saw, band saw, Circular saw machines used for metal sections cutting. Drill- material, types, parts and sizes (fraction, metric, number, letter drill). Drill angle-cutting angle for different materials, cutting speed feed for different materials. Drill holding devices-their uses. Counter sink, counter bore and spot facing-tools and nomenclature. Determining hole size. Drilling machine: Sensitive (bench type, pillar type) upright, radial, gang and multi spindledrilling machine.
6	Make & assemble simple job by different basic fitting operations. File thin metal to an accuracy of 0.5 mm. Chipping, Chamfering, grooving and slotting. Make riveted lap and butt joint. Use of counter sunk head rivet.	Physical properties of engineering material: colour, weight, structure, and conductivity,magnetic properties, fusibility, specific gravity. Mechanical properties: ductility, malleabilityhardness, brittleness, toughness, tenacity, andelasticity. Cast Iron: types, properties and uses. Wrought iron- : properties and uses. Steel: types, properties and uses. Composition of ferrous alloy like HSS, stainless steel etc. Non-ferrous metals (copper, aluminum, tin, lead, zinc) properties and uses. Aluminium and its alloys. Uses,advantages and limitation.

7	Drill through & blind holes, Drill holes at an angle using swivel table of drilling machine. Cutting threads using dies.	Description of tap, material, types and using method of hand tap. Taps- British standard and metric /BIS.Determination of tap drill size. Tap wrench: types and their uses. Removal of broken tap, studs (tap stud extractor).Dies: British standard,metricandBISstandard, material, parts, types Grindingwheel:Types& Specification (Abrasive type, grit size, grade, structures & bond) use, mounting and dressing.
8	Cutting & Threading of pipe. Flaring of pipes andpipe joints. Fitting of pipes as per sketch.	Pipes and pipe fitting- commonly used pipes. Pipe schedule and standard sizes. Use of tools such as pipe cutters, pipe wrenches, pipe dies, and tap, pipe bending machine etc. Conditions used for pipe work to be followed.
9-10	Welding - Striking and maintaining arc, laying Straight-line beads by Manual Metal Arc welding. Setting up of Oxy-acetylene flames and making fusion runs with and without filler rod. Practice to make straight beads and "T' joint by Gas and Arc welding. Making square butt joint on MS by brazing. Make straight cutting by Gas	Safety-importance of safety and general precautions observed in a welding shop. Precautions in electric and gas welding. (Before during and after welding). Welding Machines and Accessories. Description, method of operating CO_2 welding. Method of operating Gas welding equipment: Types of Joints-Butt and fillet. Oxygen acetylene cutting-machine parts, uses, method of handling, cutting torch-description, parts, function and uses. Description of brazing process and its application. Metallurgical and metal working processes such as Heat treatment, various heat treatment methods -normalizing, annealing, hardening, case hardening and tempering.
11	Identification of major components of diesel engine and its accessories. Different types of Starting and Stopping Method of Diesel Engine.	Introduction to Engine: Description of internal & external combustion engines, Classification of IC engines, Principle&workingof 2&4-stroke diesel engine (Compression ignition Engine (C.I)&sparkignitionengine(S.I) ,differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection, Technical terms used in engine, Engine specification. General Description of Motor Vehicles

12	**BASIC ELECTRICAL AND ELECTRONICS** Identify and interpret electrical/electronic system concern. Practice on measuring circuit voltage, ampere and resistance. Practice on measuring voltage drop. Practice on installing crimp connector and terminal end. Practice on soldering wires. Practice ontesting fuses and relays-test diodes	General principles of electrical engineering-structure of atoms- voltage- current- fuses-electrical conduction- current direction- types of current- voltage drop- resistance- PTC and NTC resistors- types of resistors- ohm's law-resistorcircuits-Electromagnetism-electromagnetic induction- description ofmultimeter- function and types of relays-semiconductors- N type and P type semiconductors- description of diodes and transistors.safety precautions to be observedwhile working with electrical equipment.
13	**BATTERY** Remove and connect battery terminal from a battery- clean terminals- check voltage of a battery- check cranking voltage-check charging voltage-top up distilled water up to the level-connecting two batteries in series-charging a battery – test battery-specific gravity test.	Purpose of battery- types- construction and Workingprinciple of a leadacid battery-maintenance free batteries- battery ratings-battery charging methods- trouble shooting abattery.
Assessment / Examination		

DETAILS OF SYLLABUS OF PROFESSIONAL SKIL & PROFESSIONAL KNOWLEDGE

Marine Engine Fitter

Block –II

Basic Training

Week No	Professional Skill	Professional Knowledge
1	**General Shop Safety** First aid and fire safety use of fire extinguishers. Identify fuels, oils and chemicals used in the engines and accessories – handling of shop safety equipment –handling of safety devices – first aid – practice hazard waste disposal	Importance of safety and general precautions observed in the industry / shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industry system stores procedures. Introduction of first aid, operation of electrical mains. Behavior based safety, unsafe act & situations
2	BASIC WELDING AND SHEET METAL Practice on heating, cutting using welding torch. Practice on making rectangular tray. Pipe bending fitting nipples unions in pipes soldering and brazing of pipes	Basis of gas welding, constructional and working principle of gas and acetylene welding equipment. Sheet metal operations shearing, bending drawing, squeezing. Sheet metal joints Fastening methods – riveting soldering brazing. Fluxes used on common joints sheet and wire gauges different types of pipe fittings.
3	FASTENERS AND BEARINGS Practice on general cleaning, checking and on loosening and tightening of various types of screwing joints using screwing tools, removal of broken stud / bolt from blind hole. Remove and replace bearings from the given jobs	Threads – thread categorization – types of threads – types of screwed joints – types of nuts – property classes of bolts- screw locking arrangements – types and description of screwing tools- description and types different types of bearings.
4-5	Practice on Checking engine oil, Draining engine oil replacing oil filter refilling engine oil, overhauling of oil pump, oil coolers, air cleaners and air filters and adjust oil pressure relief valves, repairs to oil flow pipe lines and unions if necessary	Explain lubrication system, functions of oil, Viscosity and its grade as per SAE, oil additives, synthetic oils,
6-7	Practice on start engine adjust idling Speed and damping device pneumatic governor and venture control unit checking performance of engine with offload adjusting timings start engine – adjusting Idle speed of the engine fitted with mechanical governor checking – high speed operation of the engine Checking performance for missing cylinder by isolating defective injectors and test dismantle and replace defective parts and reassemble and refit back to the engine	Explain different types Marine & Stationary engine

8	SHAFTING AND PROPELLERS Transmission system – Transmits power from the engine to the propeller, Propeller Mounting Propeller and cone completing the arrangement.	Working principle of propeller Shaft & transmission of power Propeller maintenance
9-10	Removing starter motor from vehicle, and performance test for pull – in test, Hold – in test Pinion (Plunger) return test, No-Load performance test. Solenoid test for hold in coil open circuit, Armature test – Grounded test, open circuit test, pull-in coil open circuit test, field coil test. Inspections of brush length wear as per service manual. Trouble shooting, Possible causes and remedy for starter motor not running, starting motor running, but not cranking engine. Growler testing for rotors. Checking starting system, Jump –starting a vehicle	Explain starting system. Explain working of growler machine and its working
11-12	Checking a charging system for the cause of under charge, no charge, and over charge conditions. Removing &replacing an alternator, trouble shooting, possible causes and remedy for warning lamp does not glow when ignition switch is on warning lamp 'on' while the alternator is running, warning lamp glows 'dim' while the alternator is running, warning lamp flickers considerably.	Explain charging system. Explain Procedure of replacing alternator
13	Identify and interpret electrical / electronic system concern. Practice on measuring circuit voltage, ampere and resistance. Practice on measuring voltage drop. Practice on installing crimp connector and terminal end. Practice on soldering wires practice on testing fuses and relays – test diodes	General principals of electrical engineering-structure of atoms – voltage – current –fuses – electrical conduction – current direction – types of current – voltage drop – resistance PTC and NTC resistors- types of resistors ohm's law resistor circuits – electro magnetism – electromagnetic induction – description of multi meter – function and types of relays semiconductors – N type and P type semi conductors description of diodes and transistors. Safety precautions to be observed while working with electrical equipment.
Assessment / Examination		

6.1.3 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.

6.1.3.1 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	

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

GENERAL INFORMATION

1. Name of the Trade : **MARINE ENGINE FITTER**

a) Apprentice selection as per Apprenticeship

2. Batch size : Maximum 16 Candidates in a group

3.Examination : (i) The Internal Assessment will be held on completion ofeach block

(ii) NCVT Exam will be conducted at the end of year.

4.Instructor Qualification :

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

OR

iv) 10 th NTC/NAC in the trade of '**Marine engine fitter'**with three year postQualificationexperience in the relevant field.

5. Infrastructure for on – job training : As per Annexure - II

6.2.1 Broad Skill Component to be covered during on-job training.

Marine Engine Fitter

Block –I

On Job Training – I (9 Months)

Topic No	Professional Skill	Professional Knowledge
1	Familiarization with the industry Health, Safety & Environment introduction to safety equipments and their uses	Importance of safety and general precautions observed in the industry / shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industry system stores procedures. Introduction of first aid, operation of electrical mains. Behavior based safety, unsafe act & situations
2	Repair and maintain ordinary fitters tools such chisel, hammer, screw driver, scriber, centre punches, dividers,	Introduction to work simplification related to the trade-job study, job analysis, planning of sequence of operation
3	Make various joints wiring hemming, soldering, form locked grooved and knocked up single hem straight and curved edges form double hemming, punch holes- using hollow and solid punches.	Explain sheet metal joints, their selection and application, tolerance for various joints, their selection & application. Wired edges single and double hem.
4	Bend sheet metal into various curvature form, wired edges- straight and curves, fold sheet metal at angle using stakes. Bend sheet metal to various curvatures. Make simple square, container with wired edge and fix handle.	Further support or demonstration if required during performing related skills.
5	Measuring Practice on cylinder bore for taper and out-of-round with dial bore gauges. Measuring practice to measure wear on crank shaft run out, and valve guide with dial Indicator. Measuring practice to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge. Measuring practice to check the end gap of a piston ring, Piston to cylinder wall clearance with feeler gauge. Practice to check engine manifold vacuum with vacuum gauges. Practice to check the air Pressure inside the vehicles tires is maintained at the recommended setting	Explain telescope gauges, dial bore gauges dial Indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.

6	Measuring Practice on Cam height, Crankshaft Journal dia, Crankshaft journal dia, valve stem dia, Piston diameter, and Piston pin dia with outside micrometers. Measuring practice on the height of the rotor of an oil pump from the surface of the housing or any other auto component measurement with depth micrometer. Measuring practice on valve spring free length Measuring practice on cylinder bore, connecting red bore, Inside diameter (ID) of a camshaft bearing with telescope gauges	Explain Telescope gauges, Dial bore gauges, Dial Indicators, Straightedge, feeler gauge, thread pitch gauge vacuum gauge, tire pressure gauge.
7	Removing starter motor from vehicle, and performance test for pull – in test, Hold – in test Pinion (Plunger) return test, No-Load performance test. Solenoid test for hold in coil open circuit, Armature test – Grounded test, open circuit test, pull-in coil open circuit test, field coil test. Inspections of brush length wear as per service manual. Trouble shooting, Possible causes and remedy for starter motor not running, starting motor running, but not cranking engine. Growler testing for rotors. Checking starting system, Jump –starting a vehicle	Explain starting system. Explain working of growler machine and its working
8	Practice on removing the valves and its parts from the cylinder head, cleaning & decarburizing. Inspection of cylinder head and manifold surfaces for warping, crackes and flatness. Checking valve seats & valve guide – Replacing the valve if necessary. Testing leaks of valve seats for leakage – Dismantle rocker shaft assembly – clean & check rocker shaft – and levers, for wear and cracks and reassemble. Check valve springs, tappets, pushrods, tappet screws and valve stem cap. Reassembling valve parts in sequence, refit cylinder head and manifold & rocker arm assembly, adjustable valve clearance, starting engine after decarburizing	Valves & Valve trains Explain Valve operating mechanism and its components
9	Cleaning and checking of cylinder blocks surface for any crack, flatness, measure cylinder bore for taper &ovality, Clean oil gallery passage and oil pipeline, Bore – descale water Passages and examine removing cylinder liners from scrap cylinder block, practice in measuring and refitting new liners as per maker's recommendations, precautions while fitting new liners.	Description of cylinder block, Cylinder block Construction, and different type of cylinder Sleeves (liner)

10	Checking of flywheel and mounting flanges, spigot, bearing. Check vibration damper for defects, practice on removing cam shaft from engine block, Check for bend & twist of camshaft. Inspection of cam lobe, camshaft journals and bearings and measure cam lobe lift. Fixing bearing inserts in cylinder block & Cap check nip and spread clearance & oil holes & Locating lugs fix crank shaft on block –torque bolts – check end play remove shaft – check seating, repeat similarly for connecting rod and check seating and refit	Description and function of the fly wheel and vibration damper. Crankcase & oil pump gears timing mark, chain sprockets, chain tensioners etc. function of clutch & coupling Units attached to flywheel
11	Overhauling of cylinder head assembly, use of use of service manual for clearance and other parameters, practice on removing rocker arm assembly manifolds	Explanation of Cylinder head assembly procedures
12	Reassemble all parts of engine incorrect sequence and torque all bolt sand nuts as per workshop manual of the engine, engine component procedures – testing cylinder compression, checking idle speed, removing & replacing cam belt, inspecting & adjusting an engine drive belt replacing an engine drive belt.	Engine assembly procedure with aid of special tools and gauges used for engine assembling.
13	Practice on checking and Testing of Cooling System	Explain need for Cooling systems Basic Cooling System Components

Marine Engine Fitter

Block –II

On Job Training –II (9 Months)

Topic No	Professional Skill	Professional Knowledge
1	BASIC WELDING AND SHEET METAL Practice on heating, cutting using welding torch. Practice on making rectangular tray. Pipe bending fitting nipples unions in pipes soldering and brazing of pipes	Basis of gas welding, constructional and working principle of gas and acetylene welding equipment. Sheet metal operations shearing, bending drawing, squeezing. Sheet metal joints Fastening methods – riveting soldering brazing. Fluxes used on common joints sheet and wire gauges different types of pipe fittings.
2	Practice on Checking engine oil, Draining engine oil replacing oil filter refilling engine oil, overhauling of oil pump, oil coolers, air cleaners and air filters and adjust oil pressure relief valves, repairs to oil flow pipe lines and unions if necessary	Explain lubrication system, functions of oil, Viscosity and its grade as per SAE, oil additives, synthetic oils,
3	Practice on dismantling air compressor and exhauster and cleaning all parts- measuring wear in the cylinder, reassembling all parts and fitting them in the engine. Dismantling & assembling of turbocharger, check for axial clearance as per service manual Check Exhaust system for rubber mounting for damage deterioration and out of position for leakage, loose connection, don't and damage, practice on exhaust manifold removal and Installation.	Explain Intake & exhaust systems – Explain diesel induction & Exhaust systems. Intake system components – explain function of air cleaners, different type air cleaners, different type air cleaner, Intake manifolds and material, Explain exhaust system components explain function of exhaust manifold, exhaust pipe, Extractors, mufflers – reactive, absorptive, combination, Electronic mufflers.

4	Practice on removing & cleaning fuel tanks checking leaks in the fuel lines, Soldering & repairing pipe lines and unions, brazing nipples to high pressure line studying the fuel feed system in diesel engines, draining of water separators Bleeding of air from the fuel lines, servicing primary & Secondary filters. General maintenance of fuel injection pump (FPI) Removing a fuel injection pump from an engine – refit the pump to the engine re – set timing fill lubricating – oil start and adjust sloe speed of the engine. Practice on overhauling of injectors and testing of injector.	Explain diesel fuel systems – explain functions of diesel fuel injection concept of quiet diesel technology & clean diesel technology. Explain diesel fuel system components Explain Electronic diesel control – Electronic diesel control systems, (CRDI) system (HEUI) diesel injection system sensors, actuators and ECU (Electronic control unit) Used in diesel engines.
5	Practice on start engine adjust idling Speed and damping device pneumatic governor and venture control unit checking performance of engine with offload adjusting timings start engine – adjusting Idle speed of the engine fitted with mechanical governor checking – high speed operation of the engine Checking performance for missing cylinder by isolating defective injectors and test dismantle and replace defective parts and reassemble and refit back to the engine	Explain different types Marine & Stationary engine
6	Simple repairs in fuel feed systems – over hauling of fuel pump, carburetors fuel filters and air cleaners repair to a car carburetors - adjusting float level and slow speed adjustments- studying the fuel flow circuit in carburetor practice in engine tune up in a vehicle – testing vacuum and compression of engine	Explain Carburetor settings Explain engine tune – up procedures Explain vacuum and compression testing
7	Identification of Air Conditioning components, performance test on A/c unit, Checking Charged state of refrigerant, Inspecting & adjusting an engine drive belt, replacing an engine drive belt. Checking a heating system, compressor rotation test air gap check, Refrigerant recovery – evacuating – charging of A/c system Replenishing compressor oil level troubles diagnose and remedy for no cooling or warm air, cool air comes out only intermittently, Insufficient cooling abnormal noise from compressor, Magnetic clutch, condenser, evaporator, blower motor, diagnosis test for high & Low pressure gauge – pressure high and low	Describe air conditioning system / HVAC. Explain use of AC Gas charging machine and its maintenance

8	Construction of hydraulic circuits using all frequently used valves like check valves flow control valve, pressure relief valve actuators, directional control valves, hydraulic accumulator, etc.	Fundamentals of hydraulic & pneumatics, Symbols of various hydraulics pneumatic elements. Application of different types of hydraulic components. Description of air compressors impact wrenches, description of power tools and equipment. Safety precautions to be observed while working with hydraulic and pneumatics equipments
9	Identify and interpret electrical / electronic system concern. Practice on measuring circuit voltage, ampere and resistance. Practice on measuring voltage drop. Practice on installing crimp connector and terminal end. Practice on soldering wires practice on testing fuses and relays – test diodes	General principals of electrical engineering- structure of atoms – voltage – current – fuses – electrical conduction – current direction – types of current – voltage drop – resistance PTC and NTC resistors- types of resistors ohm's law resistor circuits – electro magnetism – electromagnetic induction – description of multi meter – function and types of relays semiconductors – N type and P type semi conductors description of diodes and transistors. Safety precautions to be observed while working with electrical equipment.
10	SUPER CHARGERS AND TURBO CHARGERS Remove and replace super charger- dismantle and assemble super charger- dismantle & assemble turbo chargers	Need for super charging – effects of increasing volumetric efficiency – description of super charging systems – working principle of a super charger – description of turbo charger- components of turbo charger and its functions – boost pressure control – description of variable turbine geometry.
11	SHAFTING AND PROPELLERS Transmission system – Transmits power from the engine to the propeller, Propeller Mounting Propeller and cone completing the arrangement.	Working principle of propeller Shaft & transmission of power Propeller maintenance
12	BOILERS Boiler mountings - Accessories – arrangements Boiler Maintenance	Types of boiler – boiler components, boiler operation- feed water treatment – safety valves – Fuel Supply - Air supply Water level gauges
13	TURBINE Dismantle & Assembling of Turbine Checking of Rotor, blades & Gland sealing Turbine lubrications,	Types of turbine – Working principle of turbine – Turbine Construction- Lubricating oil systems - Turbine Protection.
14	Recommended procedure for application of paints to ship & vessel	Marine paint specialty – types – Indian standards, recommended paints for inside and outside of ship / vessel. Anti-fouling, leaching, pigment operation for paints.

15	Practice in erecting overhauled engines on stands & foundations preparation of templates of foundation holes of engine base, preparation of holding down bolts and nuts and boxes for foundation and observing vibrations.	Foundations for diesel engine in marine details of foundation bolts & nuts its dimensions boxes to suit engine base – purpose of template need for aligning the engine on HD bolts. Checking methods for alignment.

7.ASSESSMENT STANDARD

7.1 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

7.2 FINAL ASSESSMENT- ALL INDIA TRADE TEST

(SUMMATIVE ASSESSMENT FOR TWO YEARS TRADE)

SUBJECTS	Marks	Sessional Marks	Full Marks	Pass Marks	Duration of Exam.
Practical	270	30	300	180	**08 hrs.**
Trade Theory	150	20	170	50	3 hrs.
Workshop Cal. & Sc.	75	10	85	24	3 hrs.
Engineering Drawing	75	20	95	30	4 hrs.
Employability Skill	50		50	17	2 hrs.
Grand Total	**620**	**80**	**700**	**-**	

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

8.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.
2. Automobile and allied industries
3. Service industries like road transportation and Railways.
4. Ship building and repair
5. Infrastructure and defence organisations
6. In public sector industries (Central and State) and private industries in India & abroad.
7. Self employment

9.Annexure - I

MARINE ENGINE FITTER

TOOLS AND EQUIPMENTS FOR 16 TRAINEES + ONE

A. Trainees Kit – (As per the below table)

SL. No.	Name of the Items	Qty
1.	Hammer Ball peen 0.75 Kg	17 Nos.
2.	Chisel cold flat 19 mm X 200 mm	17 Nos.
3.	Steel rule 15 cm (English and Metric)	17 Nos.
4.	Screw driver 15 cm	17 Nos.
5.	Screw driver 30 cm 9mm Blade	17 Nos.
6.	Screw driver 20 cm 9mm Blade	17 Nos.
7.	Spanner D.E. set of 12 metric 8-32 mm	17 Nos.
8.	Pliers combination 15 cm	17 Nos.
9.	Centre Punch	17 Nos.
10.	Hand File Flat 200 mm (Second Cut)	17 Nos.
11.	Ring spanner set of 12 metric 8-32 mm	17 Nos.
12.	Steel tool box with locks and keys	17 Nos.
13.	Safety goggles	17 Nos.
14.	Safety Helmets	17 Nos.
15.	Hand Gloves (Leather)	17 Nos.

B. GENERAL Machinery Shop Outfit (As per the table)

SL.NO.	NAME & DESCRIPTIONOF MACHINES	QUANTITY
1.	Rule Steel 30cm	2
2.	Dividers Spring 15 cm	2
3.	Prick Punch 15 cm	4
4.	Chisel cross cut 9x3 mm	4
5.	Hammer ball Peen 0.5 Kg	4

6.	Hammer copper 1 Kg with blade	2
7.	Engineer square 15 cm blade	4
8.	Scriber 15 cm	4
9.	Scriber block universal	1
10.	Marking out tables 90 cm x 60 cm x 90 cm (high)	1
11.	Surface plate 60 x 60 cm blade	1
12.	Angle Plate	1
13.	Hacksaw frame	4
14.	V - block 75 x 38 mm pair with clamps	2
15.	Punch hollow set of 6	2 sets
16.	Number Punch set 3mm	1 set
17.	Letter Punch set 3 mm	1 set
18.	Hand vice 150 mm	2
19.	Screw driver, Electrician type 20cm size	2
20.	File, flat 35cm bustard	2
21.	File, flat 25 cm second cut	2
22.	File flat 20 cm smooth	2
23.	File flat safe edge 25 cm smooth	2
24.	File, triangular 15 cm second cut	2
25.	File, half round 40 cm second cut	2

26.	File round 30 cm, Second cut	2
27.	File square 20 cm second cut	2
28.	Screw Pitch Gauge (BSW,BSP,BSF and Metric)	1 Set Each
29.	Drill, Twist, metric 3mm to 12mm by 1mm parallel shank	1 set
30.	Taps and Dies complete set in box B.A. ,B.S.W. ,BSF American and metric	1 set
31.	H.S.S Hand reamer, adjustable 10.5 mm to 11.25 mm 11.25 mm to 12.75 mm 12.78mm to 14.25 mm and 14.25 to 15.75mm	1set
32.	Scraper, flat 25 cm handled	2
33.	Scraper half round 25cm	2
34.	Scraper triangular 25cm	2
35.	Micrometer outside 0 to 150mm	1 set
36.	Micrometer (Inside) 25mm to 150mm	1 set
37.	Verniercaliper set 25 or 20 cm inside outside Depth to read both inches and in mm	1
38.	Hammer planishing	2
39.	Setting hammer	2
40.	Mallet (Wooden)	2
41.	Trammel 30 cm	1
42.	Blow lamp 0.5 litre	2
43.	Soldering iron 120 watts	2
44.	Soldering iron, copper 225 gms (Fire heated)	2
45.	Pliers nose (round and straight)	2 each
46.	Snip straight	1
47.	Pot melting	2
48.	Poker	2
49.	Open Spanners, double ended set of 12 metric size 8 to 32	4 set
50.	Spanners, double off-set double set of 7 W/W from 3 mm to 13.5 mm	4 set
51.	Double open ended ignition spanner of B.A. 0x 1 to 8x9 set	1 set

	of 5 Spanner, Clyburn 15cm	
52.	Adjustable Spanner 6inch, 12inch &18 inches	1 each
53.	Box spanner set upto 32 mm	1 set
54.	Spanners ring of set of 6 S.I.	1 set
55.	Spanner for sparking plug	1 set
56.	Pipe Ranches Stilson type 6,12, 18 inches	2 each
57.	Set of Allen Key 1 mm to 12 mm by 1mm	2 set
58.	Double open ended spanner American A/F size from 7.5 mm x 99 mm to 19 mm x 20.5 mm set of 6	1
59.	Torque Wrench	1
60.	Drill Drift 10mm x 150mm	2
61.	Grease Gun	2
62.	Oil Can 0.5 liter	2
63.	Chain block 1 ton capacity	1
64.	Tray cleaning 45 x 30 cm	1
65.	Drilling machine pillar type capacity upto 20mm dia with motor	1
66.	Valve Grinding Stick (consumable)	6

67.	Valve seat cutting tools complete with guide & pilot bar (all angle) in a box	1 set
68.	Extractor stud "ezy out" Type	1 set
69.	Compression gauge	1
70.	Oil Stone (consumable)	2
71.	Piston Ring Remover and compressing tool	1 set each
72.	Fire extinguisher CO_2, Mechanical Foam	1 each
73.	Fire buckets and stands	1
74.	Tachometer (counting type)	1
75.	Puller set 6 inch & 12 inch	1 set
76.	Lifting jack mechanical 3 ton	2 Nos.
77.	Injection testing set (Hand operated)	1
78.	Injection cleaning kit	2 sets
79.	Tube Expander with cutter (for copper tubes)s	1 Set

C. **GENERAL MACHINARY**

SL.NO.	NAME & DESCRIPTIONOF MACHINES	QUANTITY
1.	Bench Grinder with two 17.5 cm wheels	1
2.	Arbor press hand operated 2 ton capacity	1
3.	Diesel engine cut away model two show working parts for demonstration (One 2 stroke & one 4 stroke)	1
4.	Diesel engine 4 stroke Multi cylinder 4/6 vehicular type Indian Make contemporary model	1
5.	Petrol engine (Running condition, car type) Indian make	1

6.	Diesel engine (Running condition) Stationary type	1
7.	Petrol engine vertical (2 stroke)	1
8.	Portable Hand Blower Electrically Operated	1
9.	Battery charger	1
10.	Hydrometer (consumable tool)	1

D. WORKSHOP FURNITURE

SL.NO	NAMES & DESCRIPTION OF FURNITURE	QUANTITY
1.	Work bench 250x120x75 with four vices of 12.5 cm	4
2.	Locker with 8 drawers (standard size)	2
3.	Metal Rack 180x150x45cm	2
4.	Steel almirah / cupboard	1
5.	Black board and easel	1
6.	Instructor's Desk or table	1
7.	Chair	1

10.ANNEXURE – II

INFRASTRUCTURE FOR ON-JOB TRAINING

TRADE: MACHINIST

For Batch of 16 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.

11.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.