CURRICULUM

FOR THE TRADE OF

OPERATOR (STEEL PLANT)

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

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

CONTENTS

1. ACKNOWLEDGEMENT

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1. TATA Steel, Jamshedpur

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

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
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3.	N. Nath, ADT	CSTARI, Kolkata	Expert

2. BACKGROUND

2. 1. Apprenticeship Training Scheme under Apprentice Act 1961

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

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

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

2. 2. Changes in Industrial Scenario

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

2. 3. Reformation

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

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.

- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.

- Scope has been extended also to non-engineering occupations.

- Establishments have been permitted to outsource basic training in an institute of their choice.

- The burden of compliance on industry has been reduced significantly.

3. RATIONALE

[Need for Apprenticeship in **Operator (Steel Plant)** trade]

Each operator in a steel plant has a specific job. There are different job titles in each of the different types of steel mills, and each has the different importance:

Bloom, Slab, Billet Mills

removes cinder from under the soaking pits;
directs and controls the operation of a blooming mill to process ingots into slabs and blooms;
does all the necessary hooking in the billet mill billet yard;
burns out defects on billets, slabs, and blooms with a hand scarfing torch, and checks and marks the surface defects;

Plate Mill

throws salt on slabs to remove scale as they enter the plate mill rolls;

Bar Mills

sets up, adjusts, and regulates the rolls and guides on a continuous roughing train of a bar mill;
catches the bar from one roll stand, loops and feeds it into the next stand;

Hot Strip Mills

sets up and operates a slitter line, slitting the coiled strip;
operates the equipment to coil or stack products being rolled on a mill;

Transportation

assist in the movement of freight cars in general plant switching, throwing switches, disengaging couplings, and signaling the engineer;

Coke Plant

operates the car dumper in dumping the coal cars;
operates the coke screening station;
cleans the air ports and cleans or replaces nozzles on the batteries;
operates the larry cars in charging coal into the coke ovens;

Blast Furnace

operates the hot blast stoves for two blast furnaces;
directs and performs work to prepare for casting and flushing a blast furnace;
fills mud guns, assists in preparing the iron trough;
operates the jib crane, pouring the hot metal;
cleans blast furnace tops, water scale, and stove top platforms;
operates the blast furnace skull cracker crane;

Open Hearth

operates the charging machine to place scrap and other materials into open hearth furnaces;
operates an open hearth furnace;
operates an overhead electric traveling crane;

Cold Strip and Sheet Mill

operates a plunger type pickling unit in pickling the sheet product;

sets up and operates a flying shear in slitting and end shearing the coiled strip steel to sheets;

sets up and operates shot blaster in removing scale and preparing the sheet product surfaces for coating;

Maintenance

melts and pours Babbitt for bearings and other parts requiring babbitting.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Bell Operator, Blast Furnace; Control Man, Blast Furnace operates bell gear at top of furnace by levers for charging raw materials into furnace. Watches indicator lamp for raw material stock line to assess charging load. Signals to Hoist Operator to draw loaded skip to bell mechanism and to lower empty skip. Operates motor to fill empty skip with coke. Keeps account of furnace charges. May do running repairs to different gadgets of bell operating room. May operate larry-car interlocks, witch for loading skip with raw material, and also operate skip-hoist mechanism and be designated as **CONTROLMAN, BLAST FURNACE**.

Furnace Operator, Open Hearth; Furnace Operator First Hand, Open Hearth (Steel Manufacture) operates open hearth furnace for making steel from blown metal (iron). Charges furnace with scrap, blown and molten metal received from convertor and blast furnace, chemicals etc., according to type of steel required. Controls fuel intake and flow of air in furnace to suit furnace condition. Takes care not to damage refractory work of furnace. Gets furnace ready for tapping and directs Furnace Operator Second Hand to open tapping hole of furnace closed for ascertaining suitability of further operation. May spray furnace sides with dolomite for maintaining proper furnace condition.

Furnace Operator, Second Hand, Open Hearth (Steel Manufacturing) assists Furnace Operator, First Hand taps molten steel from furnace and adds, chemicals, oxides, etc. Keeps oxide and fluxes ready for charging into furnace. Maintains spout for flow of molten steel in proper condition. Leads gang of Helpers and Khalasis on receipt of instructions from Furnace Operator First Hand to open tapping hole of furnace by compressed air gun, oxygen cylinder with pipes or other devices. Ensures that molten metal flows smoothly into laddle. Adds various chemicals, oxides and fluxes in laddle to obtain correct specification of steel. Closes tapping hole by dolomite, coke mixtures, etc. Repairs, maintains and dresses runner (channel for flow of molten steel) with fire clay bricks, loan, etc. during tapping intervals. May ssist Furnace Operator First Hand in changing furnace and in spraying dolomite on furnace banks (sides). May be designated as **FURNACE KEEPER** or **TAPPER**, if employed in blast furnace.

Charger, Reverberatory Furnace, Pulverized Coal Fired cleans and sets furnace for charging and charges raw material (Scrap iron, pig iron and steel scrap) in to furnace for melting. Removes sticking slag, junk, etc, from furnace by hand tools. Seals holes and doors of furnace (tapping hole, slag door, etc, with clay). Repairs molten metal runner for tapping. Keeps material ready for charging on trolley in front of charging door.

Opens charging door and pushes the raw materials into furnace on receipt of instructions from Furnace man, Reverberatory. Closes charging door, seals it
and hands over fully charged furnace to furnace man Reverberatory .May do minor repairs of furnace and chimney under guidance of furnace man Reverberatory.

Melter Reverberatory –Furnace, Pulverized Coal Fired; Fireman, Reverberatory Furnace, Pulverized Coal

Fired prepares furnace, lights fire and controls blast and feeding of pulverized coal in to furnace for maintaining required temperature. Sets log in side furnace and ignite them with flaming torch. Starts machine for feeding furnace with pulverized coal. Starts secondary blower after furnace acquires necessary temperature. Adjusts draft of chimney as per instructions of furnace man Reverberatory. Takes out slags through slag door, stirs metal and opens tap hole by metal bar for taping molten metal. Places slag trap before slag starts flowing into molten metal. Controls blast and feeding of pulverised coal under instructions from Furnace man, Reverberatory .May draw out samples at intervals as required by Furnace man Reverberatory.

Heater, Coke Oven regulates beating of coke oven batteries and maintains maximum efficiency of combustion and heat consumption. Records reading of control room meters, such as pressure gauges, fuel supply gauges, thermocouple recorders, etc. Ensures proper functioning of cellar equipments, such as valves, cocks, reversion machine, etc. Checks fuel and wall temperature of heating chambers (oven) after each reversal of gas, by optical pyrometer. Checks walls of ovens for black patches, distribution pipe pressure, differential drafts, heating valves of fuel gasses, etc. Arranges for waste gas analysis. Maintains record of oven temperature. Supervises gas change over and cleaning of individual distribution pipes, orifices, nipple, etc. May also adjust draft and fuel gas governors.

Controlman, Coke Oven records meter and gauge readings and controls pressure and draft in coke ovens. Watches readings of thermo -couple recorders, pressure gauges, governors etc., and reports irregularities to Heater. Arranges for gas reversion. Adjusts and maintains gas pressure and air draft after gas reversal. Checks working of chimney governors, foul gas governors and operates butterfly valves to prevent fluctuation of pressure inside coke oven battery. Checks deposition of tar in collecting main and arranges for its cleaning. Keeps in touch with blast furnace, coke oven gas holders, booster house and other departments to maintain flow of correct volume and pressure of gas into coke ovens. Keeps record of all pressure, draft and volume readings. May instruct Gas Man for operating gas reversal clock. May manually operate butterfly valves, if there is no governor. May also arrange for cleaning spray nozzles and cocks for proper flow of gases.

Power-Plant Operator operates boilers, turbines, generators, and auxiliary equipment at generating plant to produce electricity: Monitors control board and regulates equipment,

according to procedures and information obtained from recording and indicating instruments. Adjusts controls of water and cold feed systems, blowers, and igniters to start up or shut down boilers. Controls operation of boiler auxiliary equipment, such as water and vacuum pumps, coal driers and pulverizers, steam condensers, and soot blowers, to ensure efficient operation of boilers. Adjusts boiler controls to provide steam at specified temperature and pressure for turbine loads according to power demands. Adjusts controls to regulate speed, voltage, and phase of incoming turbines to coincide with voltage and phase of power being generated. Synchronizes incoming generating units with units in operation and closes circuit breaker at exact instant of coincidence. Monitors gauges to determine effect of generator load on related equipment, such as bus bars and voltage regulators. Adjusts transformer controls to regulate flow of power between generating stations and substations. Operates switchgear to regulate and transfer power loads to protect maintenance workers engaged in repairing or cleaning equipment. Records malfunctions of equipment, instruments, or controls on logsheet.

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:

NCO-2004: 8121.15, 8121.55, 8121.60, 8122.50, 8122.52, 8159.10, 8159.12, 8161.45

5. GENERAL INFORMATION

1. **Name of the Trade** **: OPERATOR (STEEL PLANT)**

2. **N.C.O. Code No.** : **NCO-2004:** 8121.15, 8121.55, 8121.60, 8122.50, 8122.52, 8159.10, 8159.12, 8161.45

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 physics, chemistry & 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) **NIL**

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** : **OPERATOR (STEEL PLANT)**
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. from recognized university/Board with one/two year post qualification experience respectively in the relevant field.

OR

ii) NTC/NAC in the trade of **Operator (Steel Plant)** 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. Safety regarding working with different types of steam and its First-Aid.	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Institute system including stores procedures. Introduction of First aid. Safety attitude development of the trainee by educating him to use Personal Protective Equipment (PPE). Response to emergencies e.g.; power failure, fire, and system failure. Accidents- Definition types and causes. First-Aid, nature and causes of injury and utilization of first-aid. Introduction to 5S concept & its application. Fire: - Types, causes and prevention methods. Fire Extinguisher, its types. Define environment, environment Pollution, Pollutants, type of Pollution (Air pollution, water pollution, soil pollution noise pollution, thermal pollution, radiation. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2.	Identification of tools & equipments as per desired specifications for marking & sawing(Hand tools , Fitting tools & Measuring tools) Selection of material as per application Visual inspection of raw material for rusting, scaling, corrosion etc. 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	Hand tools and its importance, steel rule, Try square, chisel, surface gauge and care & maintenance, Hacksaw frame, blades. Classification and types of chisels, files & uses, vices - its constructions and uses. Hammers and its types. Related safety. Marking block, Steel rule, and calipers- different types and uses. Combination set-its components and uses. Hacksaw blade, Hacksaw frame and its

	different types of metals of different sections.	types. Drill bits- parts, Types & uses.
3-4	a) Use of simple measuring and marking instruments. Use of steel rule, callipers, micrometers in measuring lengths. b) Marking of lines and curves. c) Flat chipping practice on mild steel. d) Hacksawing practice. e) Sharpening of chisel. f) Filing of flat surface up to an accuracy of 0.2mm.	a) Units of measurement in SI b) Construction, use, function and type of marking, measuring, testing and cutting tools such as vices, hammers, hacksaw, chisels, files, drill, tap, die, Steel rule,callipers, punches, reamer, scarpers etc c) Types, uses and working principle of precision instruments like micrometers,vernier callipers, depth gauge, dial indicators etc.. d) Introduction to various power transmission systems.
5-6	a) Marking out positions of holes, drilling and counter sinking. b) Internal and external threading. c) Dismantling and assembly of mechanical components using mechanical and hydraulic puller and press. d) Dismantle gear boxes, fans, blowers and identify various parts. e) Do levelling, alignment and balancing. f) Use of Lubrication equipments.	a) Different types of bearings and their use. b) Various types of gears, their use. c) Introduction to lubrication system. d) Safety precautions to observed while working on bench.
7-8.	a) Practical application of safety in electrical shop b) Measurement current, voltage, resistance, Power, Power factor; Testing of capacitors, frequency c) Making simple AC, DC circuits- Series, parallel and mixed circuits. Electric wiring practice. Earthing. d) Application of various types of switches, fuses, lamps, proximity switches, contactor, relays, lamps and MCB in electrical circuits. e) Use of test lamps, multi-meters, etc.	a) Safety precautions to be observed while working on electrical shop b) Current, voltage, resistance, inductance, capacitance & Ohm's Law. Work, power and energy; their units, measurements. c) Construction , types & use of switches, fuses, lamps, proximity switches, capacitors, relays, and MCB d) Function of test lamps, multi-meters, ammeter, volt meter, megger, watt meter, energy meter. e) Simple AC, DC circuits. Series, parallel and mixed circuits. Earthing & its purpose. f) Introduction to Electrical motors and starters. Speed control g) Function to multi-meters. h) Semiconductor diodes, constructions and lead identification

9-10.	f) Insulation testing g) Installation, running care & maintenance of electric meters. h) Practice on Soldering i) Study of gates, logic circuits j) Demonstration on various weighing system	i) DC power supply, rectifier, voltage regulator using IC's. SMPS,INVERTER,UPS, j) Bipolar transistors, construction, parameters, uses, testing and identification of leads. k) Solder, flux, soldering techniques l) Digital electronic- basic idea, gates, logic circuits m) Concept of various electronic weighing systems.
11.	Identification of various types of centrifugal pumps, their parts. Overhauling of pump. Priming of pump, Fitting gland packing. Starting and stopping of pumps. Trouble shooting in pump operation.	Centrifugal Pump, Fan, Blower and Compressor: - Function of pump. Types and working principle of centrifugal pump. Constructional detail of pump Starting and stopping Pump performance and characteristics. Capitation & aeration. Preventive & schedule maintenance of pumps. Gland packing changing procedure. Concept of Mechanical seal Trouble shooting in pump. Air compressors - cooling system, inter & after coolers, storage devices, Air dryers, compressor on load - off load regulation etc.
12.	Identification of various types of fans, Blowers, their parts. Dismantling, cleaning and assembly of parts. Identification of various types of compressors, their parts. Starting and stopping of compressors Cleaning and changing of filters Preventive & schedule maintenance of Blower & Compressor	Fan & Blowers: Types and working principle Constructional detail of Fans & Blowers. Starting and stopping of Fans and Blowers Different parts of Fans & Blowers Concept of surge. Preventive & scheduled maintenance. Compressors: Compression theory, Types of compressors Constructional detail of compressors, working mechanism Different parts and their function. Loading unloading system Concept of air dryer. Preventive & schedule maintenance.
13.	**Revision &Internal Assessment**	

B. Block –II .
Basic Training

Week No.	Professional Skills	Professional Knowledge
1-2.	a) Study of various types of fuels (Coal, Oil, Gases) b) Sample study of pit, lignite, bituminus coal and anthrasite c) Proximate & ultimate analysis of fuel d) Determination of flash and fire point of fuels, viscosity of furnace oils. e) Determination of composition and calorific values of fuels (oils, natural gas, BF gas, Coke Ovens gas etc.) f) Study of various zones of burner and control of flame length and flame temperature of a burner. Self sustaining flames, supported flames, flame sensors. g) Air & fuel ratio for complete combustion and analysis of the flue gas for un-burnt combustion and applying corrective measures.	a) Type of furnaces b) Introduction to fuel and combustion. c) Coal and types of coal. d) Natural and prepared fuel, non renewable (fossil fuels) and renewable fuel. e) Flash and fire point of fuel, viscosity of furnace of oils. f) Types of gaseous fuel available in a Steel plant & their uses. g) Composition and calorific values of fuel oils, natural gas, BF gas, Coke Ovens gas etc. h) Various conditions necessary to obtain maximum heat from the fuel burned – concept of air to fuel ratio i) Various zones of burner and control of flame length and flame temperature of a burner. Pilot burners. j) Self sustaining flames, supported flames, flame sensors. k) Methods of analysing the fuel gas for unburnt combustion and corrective measures l) Safety precautions to be observed
3-4	a) Measurement of pressure, temperature, level and flow. b) Use of recorder and manometers. c) Application of radiation pyrometers. d) Use of pressure gauges and vacuum gauges. Level gauges, flow gauges and rota meters. e) Use of Conductivity meter, pH meter, hardness meter and f) Use of gas analyzer. g) Calibration practice of instruments. h) Practice on setting & tuning of different controller- ON/OFF, P,I,PI,PD and PID controllers (electronic/pneumatic types) i) Study of Transducers, Sensors, Recorders)	a) Units of measurements for various parameters like pressure, temperature, level and flow. b) Mechanical and electrical means of measuring temperature. c) Construction & types of pressure gauges, vacuum gauges, level gauges, flow gauges and rota meters d) Introduction & application of recorder, manometers and radiation pyrometers & thermocouple. e) Introduction to conductivity meter, pH meter, hardness meter and f) Type of gas analyzer –NDIR,UV, Chemilumiscent

	j) Practice on controlling of pressure, temperature, level & flow using demonstration kits.	g) Concept of calibration of instruments. h) Introduction to process control & instrumentation. Principle of controlling different process control parameters **j)** Introduction to PLC and its architecture. Programming concept of PLC, Uses of PLC in automation of industrial process k) Safety precaution to be observed
5.	a) Familiarisation of various type of hydraulic elements such as: valves, actuators and fluid filters, b) Study of various types of pumps used in hydraulic system c) Familiarisation of various type of pneumatic elements such as: control valves, actuators, filter, pressure regulator and lubricator, their symbol. d) Making & study of simple hydraulic and pneumatic circuits. e) Study of simple Electro-hydraulic and Electro-pneumatic circuit. f) Maintenance & trouble shooting of hydraulic and pneumatic system	a) Basic principles of Hydraulic Power Transmission. b) Introduction to various types of Pumps, valves, actuators, hydraulic fluid and fluid filtration. c) Different types of pneumatic control valves, actuators, FRL unit. d) Symbols of hydraulic & pneumatic components. e) Simple hydraulic and pneumatic circuits. f) Safety precautions to be observed while working with hydraulic and pneumatic equipments. g) Study of simple Electro-hydraulic and Electro-pneumatic circuit. h) Maintenance & trouble shooting of hydraulic and pneumatic system
6.	a) Identification of various types of pumps, their parts and their functions b) Dismantling, cleaning of parts and assembly of parts for different types of pumps c) Priming of pump, fitting gland packing. d) Starting and stopping of pumps.	a) Constructional detail of pumps, types, working mechanism b) Different parts of pump and their function. c) Priming of pump, air locking d) Series & parallel operation of pump .
7.	e) Preventive & schedule maintenance of pumps, Trouble shooting in pump operation. f) Use of different type of valve like: Gate, Globe, butterfly, Diaphragm g) Assembly and disassembly of valves h) Demonstration on cavitations & aeration	e) Preventive & schedule maintenance of pumps, Trouble shooting in pump operation, Gland packing changing procedure f) Constructional detail of different type of valve & their uses like: Gate, Globe, butterfly, Diaphragm g) Symbols of valves h) Concept of Cavitations, & aeration.

8.	a) Identification of different type of pipe b) Application of different colour codes, pipe symbols and circuits. c) Pipe threading. d) Mark, cut and prepare different pipe joints.	a) Types of pipe b) Concept of different colour codes, symbols and circuits. c) Tubes, hoses, different fittings and assembly, Quick couplings
9.	e) Develop, mark, cut and prepare pipe bending. f) Use of tubes, hoses, different fittings and assembly, quick connecting couplings g) Practice coal injection lance assembly (including NRV) and its changing online	d) Repair techniques of pipe joints e) Safety precautions to be observed while working at pipeline carrying different materials.
10.	a) Cutting bricks to different shape and size. b) Mortars – preparation methods, proportion of different ingredient of mortar. c) Laying bricks for straight wall, arches etc. by using common masonry tools and by using different joining methods. d) Levelling jointing and plastering operation. e) Practice of simple drawing related to refractory work.	a) Introduction to refractories. Acid, basic, neutral and special refractories (stamping, LC castable, normal castable) b) Importance of refractories in Iron & Steel industry c) Different shape, size and quality of refractory bricks. d) Introduction to common masonry tools. e) Stamping material application along with expansion joints f) Knowledge of castable g) Use of refractories in coke-oven battery, L D Vessel, re-heating furnaces, blast furnace cast house h) Furnace operation for longer life of refractory lining. i) Reading simple drawing related to mason work. j) Safety precautions related to job.
11	a) Familiarization with computer b) Application of MS Office c) Practice on networking and internet & email	a) Basics of computer hardware and software. b) MS Office. c) Concepts of computer networking and Internet and email.
12	a) Use of protective devices b) Use of gas safety devices c) Use of firefighting equipment d) Use of problem solving techniques, control chart	a) Various hazard involve in different section steel plant b) OSHAS, Safety standard & slogan c) Safety symbols & chart d) Various protective devices used in steel plant e) Gas safety f) Fire fighting

		g) Quality management system h) TPM and TOC. i) Bench Marking, Suggestion management. j) Problem solving technique, control chart & their uses k) Attitude development l) Communication and presentation skill.
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** : **OPERATOR (STEEL PLANT)**

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. from recognized university/Board With one/two year post qualification experience in the relevant field.

OR

ii) NTC/NAC in the trade of Steam **Operator (Steel Plant)** 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. **Process Technology: Orientation on Steel manufacturing process**

a) **Coke Making**: Construction, type and use of crusher, feeder, screening. Detail of Oven, charging, heating techniques, pushing, quenching, CDQ operatin, isolation. Oven equipment: SCP, CGC, Coke guide car. Details of gas handling plant, Coke ovens byproduct plant & gas Exhauster booster, Safety involved in handling Poisonous Gas , Gas Holder.

b) Coke property testing & Quality control, Coke handling.

c) Sinter Making: Raw Material prepation, proportioning & handling for Sinter, Raw material Bedding and Blending (RMBB) equipment and operation. Detail of base mix preparation.

d) Sinter Making: Theory of Sinter making, Green Mix preparation, Sintering M/c, Sintering process, Sinter cooling, Screening & handling, Sinter quality control & sinter property testing.

e) Pellet Making : Raw Material prepation, proportioning & handling for pellet making Geen pellet preparation, pelletizing furnace and equipment, pelletizing operation including drying, induration, cooling. Pellet quality control & Pellet property testing

f) **Iron Making**: Basics of Cast house, Tap hole face maint., clay leakage control, trough & runners repair maintenance, mud gun and drill machine operation and maintenance, trough discharge, knowledge of furnace operation: blowing, burdening, back drafting, stopping and starting procedure. Construction of stoves, heating operation. Stock house, cooling system, coal injection, tar injection. Safety in Cast house. Hot Metal handling and logistics. Slag Granulation facility, equipment, operation & handling.

h) **Steel Making**: Primary steel making (including hotmetal handling, Hot metal desulphurization, detail of LD vessel & accessories, charging, blowing, sampling, tapping control (slag free tapping), on line purging & chemical control).

i) **Steel Making**: Secondary steel making including Ladle Furnace construction, operation, arching, refining, alloying, sampling. Power consumption and electrode handling.

RH- Construction, operation, vacuum system, refining, micro alloy addition, Oxygen blowing.

Continuous Casting: Billet, Slab, Thin slab Caster including equipment, operation details,

Shearing, marking and dispatch and yard management.

j) **Rolling technology**: Flat Product: Hot & cold rolling theory & process, Continuous & tandem mill, rolling defect etc. Processing lines: pickling, skin pass, galvanizing, annealing (Batch & Continuous), galvannealing, recoiling and stapping/ packaging etc.

k) **Rolling technology**: Long Product: Theory and Process for bar, rod and re-bar including mill layout, rolling stands (roughing and finishing).

l) **Elementary knowledge of heat treatment processes**

B. BLOCK – II (09 months)

1. **Reheating furnace:** Furnace types and their classification, like, re-heating furnaces, walking beam furnace, refining furnace. Furnace atmosphere and its control, Function of recuperator, regenerator. Drafts: forced and induced draft. Burners: Types and applications. Safety precaution and hazards.
   Re-Heating Furnaces:

   a) Charging & discharging of Furnace
   b) Judging & noting the temperature of material inside the furnace
   c) Controlling the air and fuel ratio to maintain temperature inside the furnace
   d) Control of furnace atmosphere
   e) Cleaning of burners

2. **Water treatment & cooling water system** Source of water, water impurities. Cause of water pollution and environmental norms. Problem related to impurities of water. pH value of water, Soft water, DM water, Identification of cat-ion and an-ion resins. Scale formation, corrosion, priming and foaming of boiler. Water treatment for condenser.
   Water Treatment & cooling water systems:

   a) Operation of water treatment plant
   b) Operation of waste disposal plant
   c) Testing of water quality like pH value etc

3. **Rigging and crane operation:** Introduction to various tools and tackles used in rigging, their safe load capacity. Different types of knots and hitches and their use, reaving pulley block, Safety while moving materials from one place to another and operating crane.
   Rigging & crane operation

   a) Use of rigging tools and tackles.
   b) Making knots and hitches, reaving pulley block and scaffolding.
   c) Use of crane signals.
   d) Loading, unloading and shifting common and uncommon shaped materials.
   e) Basic operation of EOT crane.

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

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 like steel plant.

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: OPERATOR (STEEL PLANT)

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)	6
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 Gauge. 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 : EQUIPMENT FOR ELECTRICAL MAINTENANCE.

Sl. No.	Name of the items	Quantity (indicative)
1.	Combination side cutting pliers with insulated.	1 No.
2.	Handle 180 mm.	1 No.
3.	Spindle blade screw driver 150 mm	1 No.
4.	Double bladed electrician knife	1 No.
5.	Engineer's cross pein hammer 200 gm. with handle.	1 No.
6.	Spindle blade screw driver(electricians) 100 mm.	1 No.
7.	Neon tester 500 V double prove type	1 No.
8.	Spindle blade screw driver engineer's 200	1 No.
9.	Scale AA 300	1 No.
10.	Diagonal Cutting nippers 125	1 No.
11.	Hand drilling machine 6 mm capacity	1 No.
12.	Engineer's square 150 B	1 No.
13.	Hammer plastic faced	1 No.
14.	Test lamp 200 V, 25 W.	1 No.
15.	Hacksaw frame AB 250-300	1 No.
16.	Tachometer	1 No.
17.	Flat file rough, 250 mm with two square edges.	1 No.
18.	Moving iron voltmeter portable type class 1.0, 0-500 V.	1 No.
19.	Moving Iron Ammeter portable type 1.0, 0-25 Amp.	1 No.
20.	Wattmeter Ironless electro dynamo meter type, portable class 1.0, 0-3000 W, voltage range:150 V,300 V, 600 V. Current range 2.5 A and 5 A	1 No.
21.	Wire stripping pliers 150 A	1 No.
22.	Insulation resistance tester500 V, 100 M-2	1 No.
23.	Reverse current cut out over lead relay) no voltage relay	1 Each
24.	Starters for 3phase 415 V, 50 Hz 3.7 to 7.5 KW,AC. Motor. (a)Auto-transformer type (f1oormounted, manually operated) (b)Star-de1ta type with O/L and N.V protection floor mounted and manually operated.	1 Each
25.	A.C Motor 3 phase, 50 HZ,415 V (Induction mo tor)	1 No.
	FURNITURE'S	
1.	Metal lockers 8 lockers type with individual locks 1980x910x480mm.	2 Nos.
2.	Metal office chair with arm, cane sit and back.	1 No.
3.	Metal shelving cabinet with 4 adjustable shelves 180x60x40 cm.	6 Nos.
4.	Metal office table with 3 drawers.	3 Nos.
5.	Work bench	4 Nos.
6.	Metal shelving rack open type 1800x900x500 with adjustable shelves.	4 Nos.
7.	Desk	1 No.
8.	Stool	1 No.

9.	Black Board with easel	2 Nos.
10.	Portable fire extinguisher water type (constant)	2 Nos.
11.	Galvanised mild steel fire bucket 4 liters.	4 Nos.

D : 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.	Drilling machine bench to drill up to 12inm dia along with accessories	1
6.	Gas Welding Table 1220mm x760nini	2
7.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels roueh and smooth	1
8.	Horizontal split casing pump	1
9.	Hydraulic jack HI-LIFT type -3 ton capacity.	1
10.	Hydraulic Leak Testing equipment	1
11.	Multi stage pump	1
12.	Overhead tank. pump, minimum 5000 litres with level indicators and piping layout	1
13.	Pipe Bending Machine (Hydraulic type) 12mm to 30mm	1
14.	Portable electric drill Machine	1
15.	Reciprocating Pump working for dismantling and assembling	1
16.	Submersible pump set, eight stage upto 10 KW7 15 HP	1
17.	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
18.	Welding plant Oxy-Acetylene complete (high pressure)	1
19.	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: OPERATOR (STEEL PLANT)

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: OPERATOR (STEEL PLANT)

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.