

CURRICULUM

FOR THE TRADE OF

FITTER (STEEL PLANT)

UNDER

APPRENTICESHIP TRAINING SCHEME

2017



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

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1. TATA Steel, Jamshedpur

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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 Fitter (Steel Plant) trade)

1. Connect columns, beams, and girders with bolts, following blueprints and instructions from supervisors.
2. Pull, push, or pry structural steel members into approximate positions for bolting into place.
3. Hoist steel beams, girders, or columns into place, using cranes or signaling hoisting equipment operators to lift and position structural steel members.
4. Verify vertical and horizontal alignment of structural steel members, using plumb bobs, laser equipment, transits, or levels.
5. Cut, bend, or weld steel pieces, using metal shears, torches, or welding equipment.
6. Bolt aligned structural steel members in position for permanent riveting, bolting, or welding into place.
7. Force structural steel members into final positions, using turnbuckles, crowbars, jacks, or hand tools.
8. Fasten structural steel members to hoist cables, using chains, cables, or rope.
9. Assemble hoisting equipment or rigging, such as cables, pulleys, or hooks, to move heavy equipment or materials.
10. Read specifications or blueprints to determine the locations, quantities, or sizes of materials required.
11. Unload and position prefabricated steel units for hoisting as needed.
12. Erect metal or precast concrete components for structures, such as buildings, bridges, dams, towers, storage tanks, fences, or highway guard rails.
13. Fabricate metal parts, such as steel frames, columns, beams, or girders, according to blueprints or instructions from supervisors.
14. Drive drift pins through rivet holes to align rivet holes in structural steel members with corresponding holes in previously placed members.
15. Dismantle structures or equipment.
16. Ride on girders or other structural steel members to position them or use rope to guide them into position.
17. Insert sealing strips, wiring, insulating material, ladders, flanges, gauges, or valves, depending on types of structures being assembled.
18. Place blocks under reinforcing bars used to reinforce floors.
19. Hold rivets while riveters use air hammers to form heads on rivets.
20. Catch hot rivets in buckets and insert rivets in holes, using tongs.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Fitter Steel Plant identifies metals, tools; carrying out fitting and fabrication operations like measuring, marking out, sawing, grinding, drilling, chiselling, threading, tapping, scraping, manual lapping and inspecting of components in order to fit a component as per specifications. It also involves basic oxy-fuel gas cutting and basic manual arc welding as per given instructions and under supervision. He dismantles, removes and replaces faulty equipment at component or unit level on a variety of different types of mechanical assemblies and sub-assemblies and diagnosing, locating faults, overhauling, fitting and adjusting mechanical systems and equipment, checking vibration etc. to ensure fitness of equipment prior to hand over and informing supervisor, operations, etc

He does Leveling, Alignment and Balancing ensures alignment of moving parts (e.g. Pumps, blowers, fans etc.). He does regular upkeep of Hydraulic/Pneumatic equipment/system, checking of hydraulic medium (hydraulic mineral oil), air pressure, identifying problem and rectifying breakdowns in hydraulic and pneumatic system.

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-2015: --7126.0301, 7126.9900, 7224.0102, 7233.0101, 7233.0121, 7233.2901,
7233.9900, 7412.0202

5. GENERAL INFORMATION

1. **Name of the Trade** : **FITTER (STEEL PLANT)**
2. **N.C.O. Code No.** : **NCO-2015: --7126.0301, 7126.9900, 7224.0102**
3. **Duration of Apprenticeship Training (Basic Training + Practical Training):**2years
4. **Duration of Basic Training:** -
 - a) Block –I : 3 months
 - b) Block – II : 3 months

Total duration of Basic Training: 6 months
5. **Duration of Practical Training (On -job Training):** -
 - a) Block–I: 9 months
 - b) Block–II : 9 months

Total duration of Practical Training: 18 months
6. **Entry Qualification** : Passed 10th class examination under 10+2 system of education or its equivalent.
7. **Selection of Apprentices:** The apprentices will be selected as per Apprenticeship Act amended time to time.
8. **Rebate for ITI passed trainees** : i) **One year** in the **Fitter** under CTS.

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** : **FITTER (STEEL PLANT)**
- 2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)
- 3) **Batch size** : 20
- 4) **Power Norms** : 3.51 KW
- 5) **Space Norms** : 88 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 **Fitter (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)
		30		20
1	<p>Engineering Drawing: Introduction and its importance</p> <p>-Viewing of engineering drawing sheets.</p> <p>Method of Folding of printed Drawing Sheet as per BIS SP:46-2003</p> <p>Drawing Instruments : their Standard and uses</p> <p>- 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.</p>		<p>Unit: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units.</p>	
2	<p>Lines :</p> <p>- Definition, types and applications in Drawing as per BIS SP:46-2003</p> <p>- Classification of lines (Hidden, centre, construction, Extension, Dimension, Section)</p> <p>- Drawing lines of given length (Straight, curved)</p> <p>- Drawing of parallel lines, perpendicular line</p> <p>- Methods of Division of line segment</p>		<p>Fractions & Simplification: Fractions, Decimal fraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems</p> <p>Simplification using BODMAS.</p>	
3	<p>Drawing of Geometrical Figures: Definition, nomenclature and practice of -</p> <p>- Angle: Measurement and its types, method of bisecting.</p> <p>- Triangle -different types</p> <p>- Rectangle, Square, Rhombus, Parallelogram.</p>		<p>Square Root : Square and Square Root, method of finding out square roots, Simple problem using calculator</p>	

	- Circle and its elements.		
4	Lettering and Numbering as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.		Ratio & Proportion: Simple calculation on related problems.
5	Free Hand sketch: Hand tools and measuring instruments used in electronics mechanics trades		Percentage: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.
6	Free hand drawing : - Lines, polygons, ellipse, etc. - Geometrical figures and blocks with dimension. -Transferring measurement from the given object to the free hand sketches.		Material Science : Properties - Physical & Mechanical, Types -Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.

B. Block- II
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
		30		20
1	Symbolic Representation (as per BIS SP:46-2003) of : - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings		Mass ,Weight and Density : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals	
2	Construction of Scales and diagonal scale		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.	
3	LED, IRLED, photo diode, photo transistor, opto-coupler symbols symbol of Logic gates		Algebra: Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	
4	Half adder, full adder, multiplexer and de-multiplexer		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.	
5	UJT, FET, MOSFET, DIAC, TRIC, SCR, IGBT symbols and circuits of FET Amplifier, SCR using UJT triggering, snubber circuit, light dimmer circuit using TRIAC, UJT based free running oscillator.		Trigonometry: Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding height and distance by trigonometry.	

7.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I Basic Training

Week No.	Professional Skills	Professional Knowledge
1.	Cardiopulmonary Usage of Resuscitation (CPR)	<p>Familiarization with the Institute & steel industry.</p> <p>Machinery used in the trade and type of work done by the trainees in the trade.</p> <p>Importance of safety, general safety precautions observed in the Institute and in the section.</p> <p>Importance of the trade & trade training, Related instructions & subjects to be taught.</p> <p>Salient features of Apprentices' Act.</p> <p>Introduction to general, behavioural and Road safety Overview of steel manufacturing process.</p>
2.	<p>Marking lines, Cut metals pieces of different profiles & selections by hack-sawing (straight, inclined & curved line) to an accuracy of 0.5mm</p> <p>Filing flat, square and steps to an accuracy of 0.5mm (Measurement by Precision Instrument).</p>	<p>Introduction of first aid. Causes and type of fires, fire precautions against outbreak of fire, different type of fire extinguishers and their uses. Precautions while working at height. Gas safety Electrical safety Quality-brief introduction of improvement techniques followed in the organization-Small group activities (SGA), Quality Circle (QC)</p> <p>Importance of house keeping</p>

3.	<p>Checking and setting of micrometer, Vernier calipers. Filing flat, square, steps and contour surfaces to an accuracy of 0.4mm.</p>	<p>Linear measurements & its units. Classification and functional detail of following basic measuring and marking tools:-</p> <ul style="list-style-type: none"> • Steel Rule • Calipers, • Divider, Trammel • Try Square • Marking Punch <p>Classification and functional detail of Files. Filing technique. Precision Measuring Instruments: Concept of precision & accuracy Micrometer (outside, inside and depth) – working principle, use & care, calculation of least count. Vernier calipers, principle, calculation of least count, use and care.</p>
4.	<p>Transfer of dimensions from drawing to work pieces. Finding center of a round bar with the help of 'V' block and marking block. Filing flat, square, steps and contour surfaces to an accuracy of 0.3mm Chipping practice on flat surface, slots & oils grooves, and chamfer at different angle on MS plate.</p>	<p>Classification and functional detail of following marking devices: Surface plate, angle plate, marking block and V-Block. Chipping technique. Introduction and care of pedestal grinding machine. Related hazards, risk and precautions. Interchangeability-Definition and its necessity, basic size, actual size, limits, deviation, Tolerance, allowance, clearance, interference, Fits-Definition, types, description with sketches. Method of expressing Tolerance as per BIS, Hole and Shaft basis (BIS standard) Related calculation on Limit, Fit and Tolerance. Surface finish – importance, symbol, measuring techniques. Lapping & honing process Jigs & fixtures-type & uses</p>
5.	<p>Use of drilling machine for drilling through & blind holes, counter sinking on MS flat. Drilling on cylindrical surface. Reaming of drilled hole by hand reamer. Filing flat, square, steps and contour surface to an accuracy of 0.2mm. Internal & external threading by Taps & Die</p>	<p>Classification and functional detail of Drill, tap, dies & Reamer. Drilling machines: -Bench, pillar & radial -Drilling operation -Cutting speed, feed & depth of cut. Related hazards, risk and precautions. Grinding wheel specification Bond, structure,</p>

	Making internal threads with taps (through holes and blind holes).	grade, abrasives, Types and their applications, care during mounting and operation. related hazards, risk and precautions.
6.	Scraping practice on flat & curved surfaces Filing practice on internal and external profiles to an accuracy of 0.2mm.	Scrapers: Types and use Marking media, Prussian blue, red lead, chalk and their special application and description. Precision measuring instruments: Classification, use, least count Vernier height gauge, Dial test indicator, Digital Micrometer, Vernier Bevel protractor Gauges- Classification and uses of Sine bar, Slip gauge, Limit gauge, Feeler gauge, thread gauge, screw pitch gauge, taper gauge. Brief Introduction to ferrous metals used for hand tools. Concept of normalizing, annealing, tempering, case hardening. Related hazards, risk and precautions.
7.	Identification of various types of fasteners & locking devices, checking threads, use of various type of spanners, Use of circlip and circlip plier. Filing & fitting mating components within an accuracy of $\pm 0.10\text{mm}$ & angular 30 minutes. Tightening of nut with the help of torque wrench	Introduction to fasteners, screw threads, related terminology and specification. Keys-types & use,(parallel, sunk, tangential, gib head, woodruff, key ways.) Related hazards, risk and precautions Types of nuts, bolt, studs, locking devices for nut, wrench and spanner, pliers, screw drivers, Circlip, split pin, Concept of torque & torque wrench. Different types of rivets and their application.

8.	<p>Identification of various components of mechanical power transmission system- Shafts, coupling, keys, gears, bearing, belts, chains pulley, rope.</p> <p>Measuring shaft and coupling bore for finding out taper & ovality and to determine the type of fit.</p> <p>Finding out the size of key for a given set of shaft & bore. Key making, mounting of coupling on shaft with key.</p>	<p>Elements of mechanical power transmission, type of spindles and shafts (Universal spindle, Plain shaft, Hollow shaft, crank shaft, cam shaft).</p> <p>Positive and Non-positive driver, Friction drive, Gear drive, Belt drive, Chain drive and Rope drive.</p> <p>Basic concept of Clutches</p> <p>Couplings: Concept of coupling and its type viz. Rigid coupling- Muff coupling, Flange coupling, Flexible coupling, Pin-bush coupling, Chain coupling, Gear coupling, Spider coupling, Tyre coupling, Grid coupling, Oldham-coupling, Fluid coupling, Universal coupling.</p> <p>Belts- Belt specification (Flat and V) Pulley used for belts driver.</p>
9.	<p>Identification of various types of bearings.</p> <p>Identification of various types of rolling contact bearing and Tools-tackles used for mounting and dismounting.</p>	<p>Bearing: Type, description and function of sliding and rolling contact bearings- Solid bush, Split bush, Collar and Pivot bearing.</p> <p>Type of Rolling contact bearings-Bell bearings-Deep groove, Angular contact, magneto bearing, Self aligning and Ball thrust bearing.</p> <p>Roller bearing-Cylindrical-Needle roller, Taper roller, Spherical roller, self aligning and Spherical roller thrust bearing. ISO bearing designation code.</p>
10.	<p>Filing & fitting mating components within an accuracy of ± 0.12 mm & angular within 30 minutes.</p>	<p>Gear: Type, description and function of gears-Spur, Single helical, Double helical, Spiral, Bevel, Straight and Spiral bevel, Worm gears, Rack and pinion.</p> <p>Gear terminology.</p> <p>Gear train- simple, compound, reverted and epicyclic.</p> <p>Types of Gear box Gear meshing</p> <p><u>Lubrication (oil and Grease)</u> Concept of lubrication Types and properties of Oil and Grease. Methods of oil lubrication-</p>

		Once through and centralized system-grease guns, centralized system.
11.	Plane and Step turning up to an accuracy of 0.1 mm Removal of broken studs from an assembly.	Introduction to lathe machines and lathe operations. Cutting tools. Speed, feed & depth of cut Lathe accessories and attachment. Related hazards, risk and precautions. Type of taper and methods of taper turning. Introduction to Shaper machine and shaper operations. Quick return mechanism of shaper. Speed, feed & depth of cut. Types of pipe, tubes and different fittings. Tools used in pipe work.
12.	Making key in a shaper machine up to an accuracy of 0.1mm. Lap and finish flat surfaces by hand only Tool grinding.	Leveling Definition and importance of leveling, Concept of Soft foot, Methods of checking and correcting soft foot. Types of levels-Sprit level, Water level, Dumpy level. Alignment: Definition and importance of alignment, Type of misalignment, Shaft vs. coupling alignment, Concept of Soft foot, Concept of axial float, Concept of indicator sag, Dial Test Indicator, Plumbing Understanding plumbing, method of checking the verticality of pole or structure, Calculation of packing required to make corrections. Balancing Understanding importance of balancing and reasons of unbalancing. Types of unbalancing
13.	Revision & Internal Assessment	

B. Block –II
Basic Training

Week No.	Professional Skills	Professional Knowledge
1.	Use of different type of valve like: Gate, Globe, butterfly, Diaphragm.	Pipe bending and jointing methods. Different types of expansions joints and their application in steel industry. Supports and hangers. Pipe colour code. Safety precaution to be observed while working at pipeline. Constructional detail of different type of valve & their uses like: Gate, Globe, butterfly, Diaphragm.
2.	Identification of various types of centrifugal pumps, their parts. Identification of various types of fans, Blowers, their parts. Identification of various types of compressors, their parts.	Pump Function of pump. Types and working principle of centrifugal pump. Vertical turbine pump. Constructional detail of pump. Starting and stopping Series & parallel operation of pump. Pump performance and characteristics. Cavitations & aeration Fan & Blowers Types and working principle Constructional detail of Fans & Blowers. Compressors Compression theory Types of compressors Constructional detail of compressors, working mechanism , loading unloading.

3.	<p>Electrical: Safety precautions to be observed while working in electric shop. Identification of electrical accessories. Making simple wiring circuits and measurement of current and voltage. Identification of passive and active electronic components. Observation of waveforms in a power Verification of logic gate operations.</p>	<p>Safety in electrical shop Passive circuit elements-resistors, capacitors and inductors. Its identification and testing. Colour code. Ohm' law and its applications. Energy sources. Series and parallel connections. Basic principle of DC generators and motors, alternators and AC motors and transformers. Introduction to electronics and its industrial applications. Diodes and transistors. Introduction to digital electronics- numbers system and logic gates Programmable logic controller (PLC)-General concept of working, Relay Logic Control vs PLC, Block diagram, applications.</p>
4.	<p>Identification and familiarization of various types of hydraulic elements such as pumps, valves, actuators and oil filters.</p>	<p>Basic principles of Hydraulic- Advantage & limitation of hydraulic system, hydrostatic transmission, Pascal's law, Brahma's press, pressure & flow, speed of an actuator. Function and construction of gear pump, vane pump and piston pump, cylindrical & hydraulic motor.</p>
5.	<p>Simulation of hydraulic circuits. -Simple hydraulic circuits. Practical on hydraulic circuits.</p>	<p>Auxiliary & fluid conditioner: Reservoir, filter, strainer, pressure gauge, pipe & pipe fitting, accumulator, seal & packing. Simple hydraulic circuits: - Hydraulic symbols - Study of different hyd. Circuits Related hazards, risk and precautions. Electro hydraulic circuit, Electrical components - Switches - Solenoid - Relay</p>

6.	<p>Identification of various types of pneumatic elements such as: control valves, actuators, filter, pressure regulator and lubricator.</p> <p>Overhauling of pneumatic cylinders</p> <p>- Practice on Pneumatic circuit</p>	<p>Basic principle of pneumatic system.</p> <p>Advantages & limitation.</p> <p>Air preparation.</p> <p>Functional details of pneumatic cylinder, motor, control valves and FRL unit.</p> <p>Introduction to Pneumatic actuators Pneumatic Symbols Pneumatic circuit Electrical control components</p> <ul style="list-style-type: none"> - Switches - Solenoid - Relay
7.	<p>Video demo of awareness on environment pollution.</p> <p>Use of vibration meter to take measurement.</p> <p>Practice on accuracy testing of machine tools.</p>	<p>Awareness on environment pollution and effects.</p> <p>Basic knowledge of air pollution control equipment. (ESP, Bag house, cyclone separators etc.) Major emission and pollution source and their effect on environment.</p> <p>Control of NO_x and SO_x and SPM to permissible level.</p> <p>Standard of ambient air quality, work environment, effluent discharge.</p> <p>Dust handling and disposal system. Control of water pollution- effluent treatment plans</p> <p>Occupational health and ergonomics.</p>

<p>8.</p>	<p>Setting up of an arc welding machine, Straight bead practice. Edge preparation for same thickness of plate for arc welding. Laying straight-line bead on 12mm M.S. Plate in flat position and Horizontal position. Making butt, lap, tee and corner joint by arc on 12 mm M.S. Plate on Flat, Horizontal position.</p>	<p>Metal joining Method & its advantages Welding (Fusion, Non-fusion & Pressure) Common tools used in welding, Classification of welding processes. Arc Welding accessories. Electric Arc Welding – Manual Metal Arc Welding - effect of variations in welding procedure on weldments during manual metal Arc Welding. Basic Welding joints & Positions:- Purpose of root gap, tacking & key hole in the job pieces during welding. Arc Welding Machine:- AC & DC Welding Machine advantages & disadvantages of AC & DC Welding. Safety Precautions: Related to Arc welding m/c & accessories. Manual Metal Arc Welding Electrodes:- Sizes & Coding Edge Preparation:- Necessity of edge preparation, Nomenclature of butt & fillet weld. Welding Symbols. Weld defects.</p>
<p>9.</p>	<p>Setting up of a gas welding set. Making different types of flames with gas welding equipment. Making straight beads with and without filler rod. Making square butt joint using plates / sheets of up to 3mm thickness. Setting up to gas cutting set. Setting up & adjustment of flame. Gas cut plates and sheets for the required dimensions – Straight cut, bevel cut, piercing hole and profile cutting.</p>	<p>High Pressure Oxy-Acetylene Welding equipments & Accessories Safety precautions in handling Oxy-Acetylene Gas welding set. Systems of Oxy-Acetylene Welding- Flashback & backfire Types of Oxy-Acetylene flames:- Gases used in welding & Gas flame combination. Filler Rods for Gas Welding Safety in gas cutting process. Principle of gas cutting. Oxy-Acetylene-Oxy L.P.G. cutting equipments. Name and application of other metal joining methods.</p>

10.	Dismantle, inspect and do minor repairs and assemble machine tools such as drill, shaper, lathe and power saw machines.	<p>Knowledge of different tools & tackles used in rigging.</p> <p>Construction and capacity of wire rope.</p> <p>Capacity of ropes (other than wire rope).</p> <p>Application of knots and hitches.</p> <p>Care and maintenance of wire rope.</p> <p>Different type of jacks, chain block and pull lift.</p> <p>Knowledge of different types of scaffolding.</p> <p>Material movement by using different rigging tools and techniques.</p> <p>Safety appliances & precautions in rigging.</p> <p>Maintenance of tools and tackles.</p> <p>Principle & mode of material handling.</p> <p>Various components used in belt conveyor system & their functions.(Pulleys, idlers, scrapers, skirts, belt, take up unit system and safety devices)</p> <p>Vibratory screen- working mechanism.</p> <p>Feeders:- types, working, mechanism.</p>
11.	<p>Practice of different type of knots & hitches used in material handling Reaving sets of pulley block.</p> <p>Splicing of manila rope.</p> <p>Inspection of wire rope.</p>	<p>Different types of raw materials used for Iron making.</p> <p>Process of sinter, coke, iron and steel making.</p> <p>Awareness of rolling process. Rolling of long & flat product,- Hot & cold rolling.</p> <p>Sources of water, Various types of impurities in water (Total suspended, dissolved solids and dissolved gases) Soft & hard water, filtration. Awareness of water quality parameters.</p> <p>Introduction to cooling circuits- open/close</p> <p>Introduction to Cooling Towers, Heat Exchangers</p>
12.	<p>Identification of different components of machine tools.</p> <p>Inspection of machine tool components. Demo on maintenance tools.</p> <p>Demonstration on belt joining</p>	<p>Power transmission and lubrication system in machine tools.</p> <p>Accuracy testing of machine tools.</p> <p>Various maintenance practices.</p> <p>Maintenance strategy- Reactive, Preventive, Predictive and proactive Importance of inspection.</p> <p>Chain and Pulley Blocks-</p> <p>Uses and working principle</p>

		<p>-Cranes and Hoists -Crab and winch, slings, rollers, bars and levers. Engineering material and their properties Heat and temperature</p>
13.	Assessment / Examination (03 days)	

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	

	<p>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.</p> <p>Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.</p>	
	Communication Skill	25
1	<p>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</p>	
2	<p>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.</p>	
3	<p>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</p>	
4	<p>Facing Interviews Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview</p>	
5	<p>Behavioral Skills Organizational Behavior Problem Solving Confidence Building Attitude Decision making Case study/Exercise</p>	

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** : **FITTER (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 **Fitter (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

DURATION: 09 MONTHS

Sl. No.	Topics
1.	Demonstration of common jigs and Fixture for drilling.
2.	Dismounting and Mounting of pedestal & hand grinding wheel Filing & fitting mating components within an accuracy of $\pm 0.10\text{mm}$ & angular within 30 minutes
3.	Belts- Installation of belts. Alignments o belts. Problems related to belts(Creep and slip) Belt maintenance. Sheave alignment, Chain drive-Roller chain, Silent chain, alignment of sprockets, maintenance of chain drive. Installing drive belts, Measuring and adjusting the belt tension.
4.	Mounting of split bush bearing with proper clearance, measuring clearance with the help of lead wires.
5.	Inspection and mounting of ball bearing on shaft with proper fit by i) Impact sleeve ii) hydraulic or mechanical press iii) heating-in oil bath & induction heater. Mounting of ball & roller bearing in gear box housing.
6.	Dismounting of rolling contact bearing by using i) Hydraulic puller ii) Hydraulic press and iii) Mechanical pullers.
7.	Mounting of taper roller bearing, clearance adjustment i) back to back and ii) Face to face position. Mounting of taper bore bearing with adopter sleeve. Mounting of taper bore bearing with withdrawal sleeve.
8.	Bearing: Plummer blocks Mounting of sliding contact bearings, measurement and adjustment of clearances in bearings. Methods of Mounting and Dismounting of rolling contact bearing. Checking and adjustment of bearing clearance. Mounting-dismounting and adjustment of taper roller bearing. (Back to back, Face to face and tandem) Mounting of taper bore bearing with adopter and withdrawal sleeve.

	<p>Handling and storage of bearings. Related hazards, risk and precautions.</p>
9.	<p>Checking size of solid bush bearing, journal and housing for proper fit. Checking split bush bearing for proper contact on journal and housing by impression testing.</p>
10.	<p>Overhauling of gear box (Pre cleaning, dismantling, clearing, inspection, repair/replacement, assemble). Identification of lubricators. Demo on centralized lubrication system (plant) Demonstration on various lubrication fittings. Cleaning/Changing filters Identification & Fitting of different type of seals Preparation & Fitting gasket for different joint surfaces.</p>
11.	<p><u>Lubrication (oil and Grease)</u> Warning & protective devices used in centralized lubrication system (Pressure switch, temperature gauge, level indicator and relief valve.) Lubrication fittings. Storage and handling Contamination control Leakage prevention-Shaft seals, sealing devices and O rings.</p>
12.	<p>Gear: Checking of backlash and root clearance with feeler gauge, Dial Test Indicator and lead wire. Impression testing of gear mesh with Prussian blue. Running maintenance Related hazards, risk and precautions</p>
13.	<p>Shaft alignment, Doing the pre-check: coupling fit, eccentricity, perpendicularity, finding soft-foot with feeler, dial gauge and making corrections.</p>
14.	<p>Checking for soft foot, checking for leveling, calculation of required amount of packing and shim for 4 legged bed, putting shim and do final check.</p>
15.	<p>Leveling Method of leveling. Preparation of packing and shim. Alignment: Actions to be taken before alignment, Methods of checking and correcting soft foot, Methods of alignment- Rim and Face readings on Stationary Machine, Rim and face reading on machine to be seamed.</p>
16.	<p>Checking the verticality of a pole with the help of plum bob, calculating the amount of packing required and making the corrections.</p>
17.	<p>Checking misalignment with the help of Taper gauge, Feeler gauge and Dial test indicator for - i) Rim and face readings on stationary machine (SM) ii) Rim and Face reading on machine to be seamed (MTBS)</p>
18.	<p>Doing the related calculations to find out the rectification value adjusting for indicator sag. Preparing the appropriate shims, Correcting misalignment in vertical plane by shifting to required distance.</p>

	Checking and correcting alignment with straight edge and thread: V-pulley and sprocket.
19.	Locking static unbalance in a rotor, finding the correction weight.
20.	Use of power saw Cutting & Threading of pipe. Fitting of pipes as per sketch.
21.	Balancing Method of static balancing. Method of correction. -Addition and removing mass -Mass centering.

B. BLOCK – II**DURATION: 09 MONTHS**

Sl. No.	Topics
1.	Bending of pipes as per drawing. Making pipe joint (flaring and ferrule).
2.	Assembly and disassembly of valves. Making and replacement of gaskets. Overhauling of valves applicable to steel industry.
3.	Pump Preventive & Schedule maintenance of pumps. Gland packing changing procedure. Concept of Mechanical seal Trouble shooting in pump. Overhauling of pump. Priming of pump, Fitting gland packing. Starting and stopping of pumps. Trouble shooting in pump operation.
4.	Fan & Blowers Starting and stopping of Fans and Blowers Different parts of Fans & Blowers Concept of surge Preventive & scheduled maintenance. Dismantling, cleaning assembly of fans, Blowers, their parts.
5.	Starting stopping of compressors Cleaning and changing of filters.
6.	Compressors Different parts and their function. Loading unloading system. Concept of air dryer Preventive & schedule maintenance.
7.	Measurement current, voltage, resistance and power. Use of multimeters. Various types of switches, breakers, fuses, lamps, proximity, switches, relays and contactor in electrical circuits. Introduction to industrial process control system and equipment- sensors, transmitters, and final control elements. Measurement of displacement, pressure, temperature, flow, level and speed. Application of encoders.
8.	Testing of power supply (AC & DC) Demonstration of use of test lamp and megger. Connections of DC/AC motors and its speed control. (Demonstration only)
9.	Instrumentation demonstration on various measuring devices demonstration of PLC.
10.	Control valves: Different type of control valves used in hydraulic System Function of pressure control valve, directional control valve, check valve, flow control valve.
11.	Overhauling of

	<ul style="list-style-type: none"> - Valves - Hydraulic pumps - Hydraulic actuators.
12.	<p>Observation of</p> <ul style="list-style-type: none"> - Emission and pollution control equipment. - dust handling & disposal system - effluent treatment plans - Emission monitoring equipment.
13.	<p>Use of mechanical & hydraulic jack, rope puller, chain puller, chain block, winch Inspection of tools and tackles Loading, unloading and shifting of common and uncommon shapes of material.</p> <p>Hand signal used in rigging.</p> <p>Maintenance practice- Pulley lagging, belt sway control belt sway control belt joining methods.</p>
14.	Demonstration on Belt conveyor system, Vibratory screen & feeder.
15.	Demonstration of water treatment plant Operation of water treatment of water treatment plant Observation of Cooling Tower, Heat Exchanger.
16.	<p>Type/methods of inspection-shutdown inspection, Inspection of running equipments and inspection of spare parts.</p> <p>Commonly used gadgets for inspection.</p> <p>Concept of inspection check-list.</p>
17.	<p>Importance of condition monitoring.</p> <p>Various techniques used for condition monitoring (vibration, temperature, sound and lubricant condition) Take the vibration reading.</p>
18.	Logging checklist for machine tools.
19.	Preparing inspection check-list, taking measurement with the help of industrial thermometer and temperature gun.
20.	<p>Training on Iron and Steel manufacturing and recognition of equipment in the plant for Iron making, steel making and rolling.</p> <p>Material Handling-different types of appliances and tackles used for shifting, loading and unloading of machine and equipment.</p>
21.	<p>Overhauling/ Assembly practice:</p> <ol style="list-style-type: none"> a. Bearing assembly b. Gear/Pulley mounting c. Seals, packing and gasket fitting d. Gear box overhauling e. Pump overhauling f. Valve overhauling g. Jack overhauling h. Hydraulic cylinder and valves overhauling i. Lifting hoist overhauling j. Belt joining <p>Maintenance welding techniques Overview of lubrication systems. Maintenance of machine tools such as drill, shaper, planner, lathe and power saw. Alignment of machines.</p>
22.	Maintenance of Fans, Blowers and compressor

	Use and application of pneumatic tools- (i) Grinder (ii) Torque Wrench and (iii) Drill.
23.	<p>Application of hydraulics/ pneumatics systems</p> <p>Application of PLC, Control systems (Hydraulics, pneumatics etc.) Changing of hydraulics/ pneumatics components in the system. Changing of hoses. Observation of pressure testing of cylinders.</p> <p>Concept of hoseveyors</p> <p>Observation on energy isolation systems (Positive Isolation).</p>
24.	<p>Inspection of plant machinery and system. Condition based maintenance of running equipment.</p> <p>Observation of Water Treatment and Cooling Water System.</p> <p>Special precautions in the handling of heavy equipments, removal and replacement of heavy parts. Maintenance-Its importance in productivity, types and preventive maintenance.</p>

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:

- demonstration of good operational skills while executing the assigned job.
- different accuracy achieved while undertaking different skills demanded by the job.
- a fairly good level of neatness and consistency in handling controls.
- occasional support in completing the project/job.

b) Weightage in the range of above 75%- 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 operation while executing the assigned job.
- the majority of the accuracy achieved while undertaking different skills demanded by the job.
- a good level of neatness and consistency in handling controls.
- little support in completing the 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 operation while executing the assigned job.
- accuracy while undertaking different work being substantially in line with those demanded by the job.
- a high level of neatness and consistency in the finish.
- minimal or no support in completing the project

8.2 FINAL ASSESSMENT- ALL INDIA TRADE TEST FOR APPRENTICE

SUBJECTS	Marks	Sessional Marks	Full Marks	Pass Marks	Duration of Exam.
Practical	300	100	400	240	08 hrs.
Trade Theory	100	20	120	48	3 hrs.
Workshop Cal. & Sc.	50	10	60	24	3 hrs.
Engineering Drawing	50	20	70	28	4 hrs.
Employability Skill	50	-	50	17	2 hrs.
Grand Total	550	150	700	-	

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

9. FURTHER LEARNING PATHWAYS

Employment opportunities:

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

1. Manufacturing & Process industries like steel plant etc.

TOOLS & EQUIPMENT FOR BASIC TRAINING**INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL
KNOWLEDGE****TRADE: FITTER (STEEL PLANT)****LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES**

Sl. No.	Item	Qty
1.	Steel Rule 15cm with metric graduation	As required.
2.	Try Square 10cm blade.	
3.	Caliper outside 15cm spring	
4.	Caliper inside 15cm spring.	
5.	Caliper 15cm hermaphrodite	
6.	Divider 15cm spring	
7.	Straight Scriber 15cm.	
8.	Centre Punch 10cm.	
9.	Screw driver 15cm	
10.	Chisel cold flat 10cm	
11.	Hammer ball peen 0.45 kg. With handle	
12.	Hammer ball peen 0.22 kg. With handle	
13.	File flat 25cm. second cut	
14.	File flat 25 cm. smooth	
15.	File half round second cut 15cm.	
16.	Hacksaw frame fixed 30cm.	
17.	Safety goggles.	
18.	Dot slot punch 10 cm.	
19.	Steel Rule 30cm to read metric.	
20.	Steel Rile 60cm.	
21.	Straight edge 45cm steel	
22.	Surface plate 45x45 cm Cl/Granite.	
23.	Marking table 91x91x122 cm.	
24.	Universal scribing block 22cm.	
25.	V-Block pair 7cm and 15cm with clamps	
26.	Square adjustable 15cm blade.	
27.	Angle plate 10 x 20 cm.	
28.	Spirit Level 15cm metal	
29.	Punch letter 3mm set.	
30.	Punch number set 3mm	
31.	Punch hollow 6mm to 19 set of 5	
32.	Punch round 3mm x 4mm set of 2.	
33.	Portable hand drill (Electric)0 to 6mm	
34.	Drill twist s/s 1.5 to 12mm by 0.5 mm	
35.	Drill twist S/S 8mm to 15mm by ½ mm	

36.	Taps and dies complete set in box B.A	
37.	Taps and dies complete set in box with-worth.	
38.	Taps and dies complete set in box 3-18mm set of 10	
39.	File warding 15cm smooth	
40.	File knife edge 15cm smooth	
41.	File cut saw 15cm smooth	
42.	File feather edge 15cm smooth	
43.	File triangular 15cm smooth	
44.	File round 20 cm second cut	
45.	File square 15cm second cut	
46.	File square 25cm second cut	
47.	Feeler gauge 10 blades	
48.	File triangular 20cm second cut	
49.	File flat 30cm second cut	
50.	File flat 20cm bastard	
51.	File flat 30cm bastard.	
52.	File Swiss type needle set of 12.	
53.	File half round 25cm second cut.	
54.	File half round 25cm bastard	
55.	File round 30cm bastard	
56.	File hand 15cm second cut.	
57.	Card file.	
58.	Oil Stone 15cm x 5cm x 2.5cm	
59.	Stone carborandum 15cm x 5cm x 5cm x 4cm.	
60.	Oil Can 0.25 litres.	
61.	Pliers Combination 15 cm	
62.	Soldering Iron 350 gm.	
63.	Blow lamp 0.50 litres.	
64.	Spanner D.E. 6-25mm set of 10 pcs.	
65.	Spanner adjustable 15cm	
66.	Interchangeable ratchet socket set with a 12mm driver, sized 10-32mm set of 18 socket & attachments.	
67.	Box spanner set 6-25mm set of 8 with Tommy bar.	
68.	Glass magnifying 7cm	
69.	Clamp toolmaker 5cm and 7.5cm set of 2.	
70.	Clamp "C" 5cm	
71.	Clamp "C" 10cm	
72.	Hand Reamer adjustable cover max 9,12,18mm-set of 3	
73.	Hand Reamer taper 4-9mm set of 6 OR 4-7mm set of 4.	
74.	Reamer parallel 12-16mm set of 5.	
75.	Scraper flat 15cm	
76.	Scraper triangular 15cm	
77.	Scraper half round 15cm	
78.	Chisel cold 9mm cross cut 9mm diamond.	
79.	Chisel cold 19mm flat	
80.	Chisel cold 9mm flat	

81.	Stud Extractor EZY-out	
82.	Combination Set 30cm.	
83.	Micrometer 0-25 mm outside.	
84.	Micrometer 25-50mm outside.	
85.	Micrometer 50-75mm outside.	
86.	Micrometer inside 25-50 mm with extension rods.	
87.	Vernier calliper 15cm	
88.	Vernier height gauges 30cm.	
89.	Vernier bevel protractor.	
90.	Screw pitch gauge.	
91.	Wire gauge, metric standard.	
92.	Drill twist Taper Shank 12mm to 25mm x 1.5.	
93.	Drill chunk 12mm.	
94.	Pipe wrench 40cm	
95.	Pipe wrench 30cm	
96.	Pipe vice 100mm	
97.	Adjustable pipe tap set BSP with die set cover pipe size 15, 20,25,32,38,50mm.	
98.	Wheel dresser (One for 4 units).	
99.	Machine vice 10 cm	
100.	Machine vice 15 cm	
101.	Sleeve drill Morse 0-1,1-2,2-3.	
102.	Vice bench 12cm jaws.	
103.	Vice leg 10cm jaw.	
104.	Bench working 240 x 120 x 90 cm.	
105.	Almirah 180 x 90 x 45cm	
106.	Lockers with 8 drawers (standard size).	
107.	Metal rack 182 x 182 x 45 cm	
108.	Instructor Table	
109.	Instructor Chair	
110.	Black Board with eraser.	
111.	Fire extinguisher (For 4 units)	
112.	Fire Buckets	
113.	Wing compass 25.4cm or 30cm.	
114.	Hand hammer 1kg. with handle	
115.	Slip Gauge as Johnson metric set.	
116.	Carbide Wear Block 1mm-2mm.	
117.	Gauge snap Go and Not Go 25 to 50mm by 5mm.Set of 6pcs.	
118.	Gauge plug single 3 ended 5 to 55 by 5mm. Set of 11 pcs.	
119.	Gauge telescopic upto 150mm.	
120.	Dial test indicator. 01mm on stand.	
121.	Sine bar 125mm.	
122.	Sine bar 250mm.	
123.	Lathe tools H.S.S. tipped set.	
124.	Lathe tools bit 6mm x 75mm.	
125.	Lathe tools bit 8mm x 75mm.	

126.	Lathe tools bit 10mm x 85mm.	
127.	Arm strong type tool bit holder R.H.	
128.	Arm strong type tool bit holder L.H.	
129.	Arm strong type tool bit holder straight.	
130.	Stilson wrenches 25cm.	
131.	Pipe cutter 6mm to 50mm wheel type.	
132.	Pipe bender spool type up to 25mm. with stand manually operated.	
133.	Adjustable pipe chain tonge to take pipes up to 300mm.	
134.	Adjustable spanner 38 cm long.	
135.	Dial vernier caliper 0-200 mm LCO 0.05mm.(Universal type)	
136.	Screw thread micrometer with interchangeable 0-25mm. Pitch anvils	
137.	for checking metric threads 60.	
138.	Depth micrometer 0-25mm. 0.01mm.	
139.	Vernier caliper 0-150mm. L.C. 0.02mm.	
140.	Comparators stand with dial indicator LC 0.01mm.	
141.	Engineer's try square (knife-wedge) 150mm blade.	
LIST OF ADDITIONAL TOOLS FOR ALLIED TRADE IN WELDING		
142.	Transformer welding set 150 amps.-continuous welding current, with all accessories and electrode holder.	
143.	Welder cable to carry 200 amps. With flexible rubber cover	
144.	Lungs for cable	
145.	Earth clamps.	
146.	Arc welding table (all metal top) 122cm x 12cm x 60mm with positioner.	
147.	Oxy-acetylene gas welding set equipment with hoses, regulator and other accessories.	
148.	Gas welding table with positioner	
149.	Welding torch tips of different sizes	
150.	Gas lighter.	
151.	Trolley for gas cylinders.	
152.	Chipping hammer.	
153.	Gloves (Leather)	
154.	Leather apron.	
155.	Spindle key for cylinder valve.	
156.	Welding torches 5 to 10 nozzles.	
157.	Welding goggles.	
158.	Welding helmet with coloured glass.	
159.	Tip cleaner	

The specifications of the items in the above list have been given in Metric Units. The items which are available in the market nearest of the specification as mentioned above, if not available as prescribed should be procured Measuring instruments such as steel rule which are graduated both English and Metric Units may be procured, if available.

General Machinery Installation

Drilling machine pillar sensitive 0-20 mm cap with chuck & key

Drilling machine pillar sensitive 0-12 mm cap motorised with chuck and key.

Grinding machine (general purpose) D.E. pedestal with 20cm dia wheels rough and smooth with twist drill grinding-attachment.

**INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND
ENGINEERING DRAWING**

TRADE: FITTER (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

INFRASTRUCTURE FOR ON-JOB TRAINING

TRADE: FITTER (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.

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.