CURRICULUM

FOR THE TRADE OF

BOILER ATTENDANT

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

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

CONTENTS

1. ACKNOWLEDGEMENT

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

1. DVET, Maharashtra State
2. D.E.T., Gujarat State
3. Rashtriya Chemicals &Fertilizers Limited, Chembur, Mumbai
4. Bharat Petroleum Corporation Ltd., Mahul Refinery, Mumbai
5. Gujarat State Fertilizer Company Limited, Vadodara Gujarat
6. GSP Crop Science Pvt. Ltd. Nandesari, Vadodara
7. Nitrite Ltd., Nandesari, Vadodara
8. INEOS Styrolution India Ltd., Nandesari, Vadodara
9. Rubamin Ltd., Nandesari, Vadodara
10. Farmson Analgesic, Nandesari, Vadodara
11. Technology Exchange, Ahmedabad

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

Co-coordinators for the course: Shri Sunil Wakde ,ADT, ATI, Mumbai and

Shri L K Mukherjee, DDT, CSTARI, Kolkata

Sl. No.	Name & Designation Sri /Mr./Ms.	Organization	Remarks
1.	SA Pandav, RDD, Vadodara & Surat	DET, Gujarat	Expert
2.	Mr. R. S . Wagh , Training Officer	A.T.I. , Mumbai	Expert
3.	Mr. K. Lapashappa	A.T.I. , Mumbai	Expert
4.	Sri R. C. Sonavane, Craft Instructor	BTRI, Panvel	Expert
5.	Sri C. P. Jadhav , Craft Instructor	BTRI, Panvel	Expert
6.	Sri S.I. Rajput ,Craft Instructor	Govt. ITI. Mahad	Expert
7.	Sri N.J. Ware , Craft Instructor	Govt. ITI. Mahad	Expert
8.	Smt. S.G. Thakur ,Training Officer	Govt. ITI. Mahad	Expert
9.	Mr. Girish Labhane, Sr. Engineer (Mech)	R.C.F., Mumbai	Expert
10.	DK Sharma, MD	Technology Exchange, Ahmedabad	Expert
11.	Kamlesh Prajapati, Director	Technology Exchange, Ahmedabad	Expert
12.	Shri Sudhir Joshi, Dy. Manager (Trg. & HRD)	GSFC Ltd., Vadodara	Expert

13.	Shri Paresh Faldu, Sr. Manager (QC & QA)	GSP Crop Science. Pvt. Ltd., Nandesari, Vadodara	Expert
14.	Shri Navin Chauhan, Sr. Manager (Production)	Deepak Nitrite Ltd., Nandesari, Vadodara	Expert
15.	Shri Sunil Patel, Dy. Manager (QA)	INEOS Styrolution India Ltd., Nandesari, Vadodara	Expert
16.	Shri Chirag J. Patel, Maintenance Manager	Rubamin Ltd., Nandesari, Vadodara	Expert
17.	Shri Falgun Patel, Production Manager	Farmson Analgesic, Nandesari, Vadodara	Expert
18.	Smt. S. B. Sarvaiya, Principal	ITI Savli, Di-Vadodara	Expert
19.	Shri D. R. Sanchala, I/C Asst. Appre. Advisor	ITI Dashrath, Di-Vadodara	Expert
20.	Shri Nilesh H Patel I/C Asst.Appr. Advisor	ITI Tarsali, Vadodara	Expert
21.	Shri J P Gadhavi I/C Asst.Appr. Advisor	ITC Tarsali, Vadodara	Expert
22.	Mr. D. N. More, Training Officer	Govt. I.T.I. ,Mahad	Expert
23.	Mr. P.S. Rane, Craft Instructor	Govt. I.T.I. ,Panvel	Expert
24.	Mr. T. G, Chavan , Craft Instructor	Govt . I.T.I., Mulund	Expert
25.	Mr. S. S. Deshmane, Training Officer	Govt. I.T.I. , Ambernath	Expert
26.	Sri J. H. Suryawanshi, Training Officer	Govt. ITI, Mahad	Expert
27.	Sri P.R. Patil, Training Officer	Govt. ITI, Nagothane	Expert
28.	Sri A. N. Mancharkar, Craft Instructor	Govt. ITI, Ambernath	Expert
29.	Sri D.R. Markande, Astt. App. Adviser	Govt. BTRI, Vileparle	Expert
30.	Mr. Shah M. G. ,Supervisor Instructor	Govt. ITI, Tarsali ,Vadodara	Expert
31.	Mrs. Barve S. S. , Trade Instructor (Che - Phy)	Govt. ITI Mahad	Expert
32.	Mr. More Vilas K. ,Craft Instructor	Govt. I.T.I., Panvel,	Expert
33.	Mr. Tamboli Madhukar T. , Craft Instructor	Govt. I.T.I. Panvel,	Expert
34.	Mr.Chavan Padmakar G. , Craft Instructor	Govt. I.T.I., Wangaon,	Expert
35.	Mr. Chavan Dattatray M. , Craft Instructor	Govt. I.T.I., Wangaon	Expert
36.	Mr. Modi Alpesh V. , Principal	Govt. I.T.I. Dholera , Dist. Ahmedabad (GJ)	Expert
37.	Mrs. Phadnis K. K., Training Officer	ATI ,Mumbai	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 **Boiler Attendant** trade)

Apprenticeship training provides efficient and practical training for boiler operators, plant maintenance personnel, or indeed anyone associated with the safe operation and maintenance of boiler plant. The operation and safety of the boilers relies on boiler mountings and accessories , so the Boiler attendant is very important as they constantly monitor and operate different types of IBR boilers safely .

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

After completion of apprenticeship Training in "Boiler Attendant" trade, apprentices should be able to carry out safely the operation and management of boilers economically and also maintain necessary records and log book for management of boilers, diagnose faults of the boilers and its auxiliaries and carry out minor and major repairs. They must have sound knowledge of safety precautions and boilers safety rules.

Boiler operators typically work in facilities like power plants or boiler, engine, and mechanical rooms. They can be responsible for all of the systems that generate heat or electricity in a facility. Some of the equipment that they are responsible for includes:

- Low-pressure boilers
- High-pressure boilers
- Power boilers
- Steam boilers
- Hot water heating systems

Boiler operators will make manual adjustments to this equipment during their servicing. They are often on their feet, but they also have to be physically fit to crawl inside boilers during their inspections. Oftentimes, they will work in teams or under supervision, especially early in their career.

Reference NCO: 8162.20

5. GENERAL INFORMATION

1. **Name of the Trade** **: Boiler Attendant**

2. **N.C.O. Code No.** : 8162.20

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

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:**

1. Passed 10^{th} class examination under 10+2 system of education with Science & Mathematics or its equivalent.

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

6. **Rebate to ITI Passed out Trainees:** 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** : **Boiler Attendant**
2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)
3) **Batch size** : 20
4) **Power Norms** : 13 Kw
5) **Space Norms** : 110 Sq.m.

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

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

OR

ii) NAC in the trade of BOILER ATTENDANT 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 hrs)	b) Workshop Science & Calculation		Duration (in hrs)
		30	**Calculation (10)**	**Science (10)**	20
1	**Engineering Drawing**: Introduction and its importance **Drawing Instruments** : their Standard and 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. **(2 Hrs)** **Lines :** - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line **(2 Hrs)**		**Unit**: Systems of unit- CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units **(2 Hrs)**	**Material Science** : Properties - Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and non-Ferrous metals **(2Hrs)**	
2	**Drawing of Geometrical Figures**: Definition, nomenclature and practice of - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram, polygons. - Circle and its elements. **(4 Hrs)** **Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case **(4 Hrs)**		**Fractions** : Fractions, Decimal fraction, L.C.M., H.C.F. Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator. **(2Hrs**)	**Mass ,Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals. **(2Hrs)**	
3	**Practice of Lettering and Title Block (2 Hrs)** **Dimensioning practice**: - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance. **(2 Hrs)**		**Ratio & Proportion** : Simple calculation on related problems. **(2Hrs)**	**Speed and Velocity**: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation. **(2Hrs)**	

4	**Drawing of Solid figures** (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions. **(4 Hrs)** **Free Hand sketch of hand tools and measuring tools used in res**pective trades. **(4 Hrs)**		**Percentage** : Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa **(2Hrs)**	**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. **(2Hrs)**	
5	**Free-hand sketches** of Hand Tools, Screw drivers, Pliers, Spanner, Tweezer. Free-hand sketches of Vernier Caliper, micrometer, Depth Gauge, Dial Test Indicator, Bevel protractor **(4 Hrs)** **ISI symbols** of Generator, Voltmeter, Ammeter, Watt- meter. Resister, inductor, Capacitor, Transformer, AC & DC motors.etc. Drawing of pressure control process line**(2 Hrs)**		**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. **(2 Hrs)**	**Heat & Temparature**: 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. **(2 Hrs)**	

B. Block- II
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation		Duration (in hours)
			Calculation	Science	
1	**Drawing sketches of different types of valves**, such as gate valve, globe valve, ball valve, Plug Valve, check valve etc. **(4 Hrs)** **Drawing of different types locking devices** such as double nut, castle nut, pin etc.**(2 Hrs)**	30	Archimedes's principle, principle of floatation hydrometers. Centre of gravity and Equilibrium condition. **(2Hrs)**	Definition - viscosity, flash point, fire point, flash points of standard lubricating oils, octane number. **(2Hrs)**	20
2	**Symbolic representation of different types of valves**- gate valve, globe valve, butterfly valve, ball valve, diaphragm valve, control valve, non-return valve, and needle valve. **(2 Hrs)** **Free hand sketches** of Belt conveyor, Screw conveyer, Bucket elevator **(4 Hrs)**		Pressure, temperature, Boyle's law, Charles's law, Equation of perfect gas. Calculations.. **(2 Hrs)**	Newton's laws of motion unit of force, find out resultant force parallelogram law of forces, **(2Hrs)**	
3	**Drawing of pressure, Level , flow and temperature control system.** **(2 Hrs)** **Free hand sketches** of crushers, ball mill, hammer mill and centrifuges **(4 Hrs)**		Centre of Gravity, (C.G. Of square, rectangle, triangle, circle, semicircle, cone) & its calculations **(2 Hrs)**	Condition of equilibrium, kind of equilibrium, some examples of equilibrium in daily life,. **(2 Hrs)**	
4	**Free hand sketches** of steam jet ejector, steam trap **(2 Hrs)** **Diagram of distillation column** with all accessories Free hand sketches of process instrument- such as temperature indicator, level indicator, LIC, TIC, PI, PIC, FI, FIC **(4 Hrs)**		**Flow of fluids-** Equation of continuity, Bernoulli's theorem **(2 Hrs)**	Advantages & Disadvantages of friction, Limiting friction, Laws of limiting friction, Coefficient of friction, angle of friction, Inclined plane, Force of friction **(2 Hrs)**	
5	Flow sheet / Block diagram of 1.Sulphuric acid 2.Nitric acid 3.Ammonia 4. Urea 4. Ethanol		Flow measurement by orifice meter, venturi meter, Rota meter, U-tube manometer. **(2 Hrs)**	Latent heat, sensible heat, saturated steam, wet steam, superheated steam. Reynolds's number, at different velocities. **(2 Hrs)**	

7.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I

Basic Training

Week No.	Professional Skills(275Hrs)	Professional Knowledge(120 Hrs)
1	Filing practice, surface filing, Marking of Straight and Parallel lines with odd leg calipers and Steel Rule, Marking practice with dividers / odd leg calipers and Steel Rule (Circles, Arcs, Parallel lines)	Introduction of Trade and Importance of Safety and General Precautions observed in the workshop. Introduction of Steel Rule, Calipers types and uses
2	Filing Flat, Square and Parallel to an accuracy of 0.5 mm. Marking accuracy to simple Blue Print Reading using Scribing Block and Dividers.	Introduction of functions and types. Try square and functions & uses of scribing Block / Marking Block. Introduction of Files, Types of Filing – Details
3	Hacksawing along a straight line, Curved line, on different sections of Metal Straight Saw on Thick section, M.S. angle and Pipes.	Introduction of Hacksaw, types functions and Blade, specifications types & uses etc. types of Files, Special files, functions, uses.
4	Chipping Practice, using different types of Chisels on keyways, slots and practice of Chipping.	Introduction of Chisels, types, Chipping & types of Hammers uses & functions. Safety Precautions.
5	Exercise on Drilling Practice by different diameters of Holes and Tapping Practice – Threading Practice [External & Internal]	Introduction of Drill bits in detail and types, functions and Types of Drilling Machines. Introduction of Taps & types and other related details – Tap drill size calculation
6	Exercise on simple fitting involving different operations like filing to dimensions, drilling and tapping by using vernier callipers & Micrometers.	Introduction of precision instruments, vernier caliper, Micrometers, Vernier height gauge & other related instruments.
7	Making external thread using Dyes & its accessories. Checking by Square head	Introduction of Dyes, Types & Function, Safety Precautions during Dye operation. Introduction about combination set & its uses.
8	Making a Nut by using Taps – Simple Exercise on Screw threads.	Introduction about nomenclature of screw threads – types. Introduction about Nuts & Bolts – types of spanners & studs.
9	Making keys & key ways on round bar or M.S. flat (Key way Practice)	Introduction about fasteners – keys – keyways – types – functions & other related details.

10	Making simple joints on sheet metal involving different sheet metal joints.	Introduction of sheet metal – cutting snips – different sheet metal tools – stakes & types – Hand shearing maching & its function – types of sheet metal joints
11	Exercise on riveting by different types of rivets & simple fitting exercise.	Rivets – types & their uses, method of riveting – specification of rivet – safety precaution while riveting.
12	Exercise on filing, blind hole drilling, blind hole tapping.	Removing of broken tapes by various methods (stud extractors, Tap extractors) Safety precaution during blind hole tapping & drilling.
13	Make a fitting job – dove tail fitting with 0.10 tolerances.	Introduction of gauges – types – uses & functions (ring gauges, snap gauges, plug gauge etc.)
	Internal Assessment 03days	

B. Block –II
Basic Training

Week No.	Professional Skills (275Hrs)	Professional Knowledge(120Hrs)
1.	1. Verification of ohm's law 2. Specific resistance of wire by Wheatstone bridge 3.Electrical safety and safety at boiler and boiler house	Safety at work causes and types of fire. fire extinguishers types and uses General Safety precautions in Boiler house, different equipment and Instruments used for boiler. Electricity- electric safety Ohm's law, series & parallel connections, What is IBR and non IBR Boilers?
2.	Study different types pressure sensing elements. Dismantling and Assembling of bourdon tube Pressure gauge. Measurement of pressure using manometers. Draft gauge and its calibration Calibration of pressure gauge using dead weight tester and comparator.	**PRESSURE:** Definition of pressure. Types of pressure & their units. Types of pressure sensing elements- bourdon tube, diaphragms, capsules, and bellows. Pressure switches types and applications. Types of manometers. Dead weight tester and comparators and applications. Importance of ID fan & FD fan in Boiler
3.	Temperature measurement using – Filled system thermometers, bimetallic thermometers, Thermocouple & RTD. Calibration of Thermocouple and RTD temperature Transmitter, Measurement of temperature using Optical & Radiation pyrometer	**Temperature measurement :** Definition, Units of Temperature, modes of heat transfer ,Temperature gauges – bimetallic, liquid filled system thermometer working and application. Temperature sensors, RTD, Thermocouple, Optical and radiation pyrometer working and application.
4.	Dismantling, assembling of sight glass gauge. Level measurement using by sight glass and float type gauge. Installation and testing of hydrostatic level gauge. Installation and testing of venturi and orifice flow meter. Rota meter and testing	Basic properties of fluids, fluids in motion, getting fluids to flow, units of flow rate and quantity flow, factors affecting flow rate. Relation between flow rate and pressure, area, quantity. Head type flow meter types. Working and application of venturi and orifice flow meter. Rota meter working, application
5.	CO, CO_2 and O_2 Analyzer, pH measurement Study the working PID process loop.	Gases - CO, CO_2, O_2., Cooling tower. Working, Application of I to P, and valve positioner, ON-OFF controller, P, PI, PD, PID control limitations and application.
6.	ID Fan and FD Fan, Blowers	Blower construction and operation,
7. & 8.	Dismantling, overhauling and assembling of safety valve. Dismantling, overhauling and assembling of pressure switch.	Steam: Its heating and power properties: Principles of steam and application in Modern Boilers. Steam preventing, escape of heat, lagging, steam distribution, charging of steam and water line, steam quality, condensate handling, traps etc. Wet steam saturated steam, super heated steam and their properties. Boiling point, temperature and pressure relations, sensible heat, latest heat super heat, reheat and total heat. Use of steam table and entropy chart. boiling and condensation

9.	Dismantle, clean & Reassemble of different types of valves	Construction, working and uses of various types of valves.
10.	Dismantle, clean & Reassemble of different types of Pumps. Dismantle, clean & Reassemble of shell & tube Heat exchanger	Construction, working and uses of various types of Pumps Introduction /overview of thermodynamics Construction, working and uses of various types of heat exchangers, condenser & cooler
11.	Use and maintenance of lagging materials such as glass wool, asbestos and thermocol. Gasket cutting as per size of given flange diameter.	**Water treatment**: Object of feed water treatment – water analysis water of high Pressure boilers. Impurities in water and their harmful effects. Effects of other suspended matter such as Oil, alkalinity, hardness, etc. in feed water- Total dissolved solids – Methods of purification – use of Deacrators –Priming and foaming – scale formation and corrosion. Chemical cleaning of boiler, softening and de-mineraliser Plant.
12.&13	Hydraulic test of non-IBR boiler. Operation of non- IBR boiler and observation of all Parameters while operating boiler and testing of Boiler mounting and fittings, Boiler accessories. and shut down of boiler.	Types of boilers-fire tube and water tube boilers Forced circulation boilers. Preheater, Economizer, waste heat boiler. Boiler drum. Boiler mounting and fittings. Boiler accessories. What are IBR and non IBR Boiler? Knowledge of Indian Boilers Acts and Rules.
	Internal Assessment 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 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	**10**
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	**10**
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 legislation of India. 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	**5**
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	
	Leadership and Team Building skills.	**5**
	Leadership Discipline and Morale Team Work Case Study/ Exercise	
	Meet the Mentor **Role - play as a Supervisor**	**5**
	Organizing and Planning.	**5**
	Time Management Group Dynamics Case Study/ Exercise	

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** : **BOILER ATTENDANT**

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

OR

ii) NAC in the trade of BOILER ATTENDANT with three year post qualification experience in the relevant field.
Preference will be given to a candidate with Craft Instructor Certificate (CIC)

5) **Tools, Equipments & Machinery required** : - As per Annexure – II

7.2.1 BROAD SKILL COMPONENT TO BE COVERED DURING ON-JOB TRAINING

A. BLOCK – I

1. **Safety and best practices (5S, KAIZEN etc.)**
2. **Store procedure, Record keeping, inventory management and documentation**
3. **Identification and testing of feed water pump , check valves ,blow down valves, safety valves, Steam outlet valve, flow meters, blower, etc.**
4. **Repair & Maintenance work of Boiler and boiler mountings and fittings .**

DURATION: 09 Months (39 weeks)	
List of operations carried out in Boiler houses of Industries where steam is required.	
Sl. No	**List of operations/skills to be covered during Industrial Training**
1.	Introduction in safety precautions as applicable to the Boiler Attendant trade
2.	Reading and recording of process variables like pressure, temperature, flow, etc.
3.	Lubrication: Pumping out lubricating oil from drums, feeding oil to bearings of equipment, Pumps etc. use of grease gun. Operation of oil filters both – centrifugal and stationery.
4.	Operation of various types of valves: Check valve, stop valve, by pass valve, Gate valve, needle valve, steam valve, etc. Setting of feed water and steam regulators as well as serve control valves. Pumps: Operation of different types of pumps.
5.	Operation of fans and blowers like forced draft fans, induced draft fans etc. including starting, stopping capacity adjustment etc. Operation of steam driven equipments like feed water pumps, fans etc. if available.
6.	a) Operation of fuel (i.e. Coal /Oil/Gas) feeding mechanism including adjustment of flow of coal, Grate drive and draft regulation for proper combustion Use of mechanical stoker. b) Study of burners for oil and gas and also filters.
7.	Operation of ash disposal plant, function and maintenance of pumps, hydrovactors, hydro ejectors, clinker grinder and submerged type ash plants
8.	Normal level control in Boilers, Operation and reading of gauge glass etc. level control during the emergency operations and use of blow down valves.
9.	Operation of super heater and re-heater. Control of superheat and reheat temperature.
10.	Operation of steam pressure reducing station for auxiliary steam supply for oil heater, dearator pagging and process steam, if any.
11.	Operation of water softener equipment including feed water softener. Clarificulators, precipitators, filters, chemical, dosing etc. Pre and post chlorination System.

	Reactivation of Ion exchanges etc.
12.	Operation of pulverisers, exhauster, P.A. fans, Coal scales, Coal feeders. Coal classifiers, etc. regulation of primary air, control of mill temperature, regulation of secondary air and flame shape, use of pilot oil torches both as flame stabilizers and at start, use of load carrying oil burners, if any and regulation of air for proper combination of oil. Adjustment of coal fineness.
13.	Correct use of various types of cocks, mounting and accessories used on boilers. Firing and raising, steam and blow down in Boilers – precautions to be taken- procedure to be observed before starting, firing and when raising steam.
14.	Operation of boiler feed pumps – starting and stopping, including emergency operation, purpose of balance chamber, leak off and recirculation lines. Checking and correctness of pressure gauge.
15.	Internal conditioning of Boiler water by checking the TDS and alkalinity by blow down to prevent sealing, priming, carry over and causing gauging.
16.	Conditioning of steam and condensate cycle. Importance of silica in high pressure boilers and how it is controlled.
17.	Periodical cleaning and filling the boiler with demineraled or condensate for prevention of scale or other deposits on heating surfaces Periodical inspection of boilers – preparation of boilers for testing – Hydraulic test and steam test.
18.	Precautions to be taken before entering or allowing persons to enter a boiler which is connected to another boiler on the steam.
19.	Correct method of firing and combustion control for prevention of smoke.
20.	Testing the correctness of gauge glass and cocks by blowing through them

BLOCK – II

1. **Safety and best practices (5S, KAIZEN etc.)**
2. **Store procedure, Record keeping, inventory management and documentation**
3. **Identification and testing of feed water pump , check valves ,blow down valves, safety valves, Steam outlet valve, flow meters, blower, etc.**
4. **Repair & Maintenance work of Boiler and boiler mountings and fittings .**

DURATION: 09 Months (39 weeks)	
List of operations carried out in Boiler houses of Industries where steam is required.	
Sl. No	**List of operations/skills to be covered during Industrial Training**
1.	Priming of boiler – the danger of water logging steam pipes and precautions to be observed in running.
2.	Replacement of gauge glass. Procedure to be followed in the event of shortage of water bulging or facture of furnace of flat plates or bursting of tubes or of any accident to a boiler or a steam pipe.
3.	Adjustment of safety valves for correct blowing – pressure. Precaution to be taken when starting an economiser to work after period of rest. Detection of false water level and knowledge of alarm devices.
4.	Procedure to be adopted in putting as economiser into commission and also in putting it out of commission when boiler is on steam.
5.	Checking and renewal of gland packing's of pump and valves.
6.	Correct method of stocking boiler including cleaning and banking fires in a workman like manner to prevent avoidable smoke.
7.	Checking and adjustment of boiler mountings. Working knowledge and fitting of feed pump and injectors. Working of feed water heaters and dearators.
8.	Operation of easing a safety valve. Use of blow down cock or valve. Cleaning of oil torches. Adjustment of high steam and low water safety valve. Renewal of fusible plug.
9.	Use of spark ignitors and oil sumps for oil torches.
10.	Cleaning of economiser by using appropriate appliances
11.	Inter lock tripping of boiler auxiliaries and basic knowledge of purgainter lock. Operation and working of multicome dust collectors and electrostatic precipitators if available.
12.	Emergency operations of boilers in the event of : a) Loss of fire b) failure of one F.D. Fan c) Failure of one I.D. Fan d) Failure of one air pre-heater e) Fire in coal mill f) Fire in air pre-heater g) Boiler tube failure

	h) Failure of economiser tube, furnace tube and super heater tube, furnace tube and super heater tube i) Failure of boiler feed pump and sudden less of read j) Blocking of coal passage k) Failure of lagging l) Jamming of the grate, failure of gauge glass.
13.	Soot blowing and boiler furnace cleaning during operation. Use and care of different types of soot blowers.
14.	Importance of Draft temperature readings at special loads. Interpretation of deviation from standard reading for identical loads.
15.	Economical working of boilers.
16.	Entry and upkeep of log sheet, trouble log, etc.
17.	Observation of use, operation and maintenance of modern package type and automatic boilers.

7. 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 FOR APPRENTICE

SUBJECTS	Marks	Internal assessment based on competency	Full Marks	Pass Marks	Duration of Exam.
Basic Training(Block-I)		**250**	**250**	**150**	
Professional Skill	250		250	150	**08 hrs.**
Professional Knowledge	100		100	40	3 hrs.
Workshop Cal. & Sc.	50		50	20	3 hrs.
Engineering Drawing	50		50	20	4 hrs.
Employability Skill	50		50	20	3 hrs.
Basic Training (Block-II)		**250**	**250**	**150**	
Grand Total	**500**	**500**	**1000**	**550**	

Note: - The candidate pass in each subject conducted under All India Trade Test.

8. FURTHER LEARNING PATHWAYS

- On successful completion of the course trainees can opt for Diploma course (lateral entry). {Applicable for candidates only who undergone ATS after CTS}

Employment opportunities:

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

1. Production & Manufacturing industries.
2. Instrumentation & Chemical Process industries.
3. Power plants and Fertilizers industries in all over India
5. All sector of the industries where IBR Boilers are required for steam generation.
6. Infrastructure and defence organisations
7. In public sector industries like BHEL, BEML, NTPC, etc and private industries in India & abroad.
8. Self employment

ANNEXURE – I

9. TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: BOILER ATTENDANT

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

A : TRAINEES TOOL KIT:-

Sr. No.	Name of the items	Quantity (indicative)
1.	Steel Rule 15 cm with metric graduation	20
2.	Try Square 10 cm blade	20
3.	Caliper outside 15 cm spring	20
4.	Caliper inside 15 cm spring.	20
5.	Caliper 15 cm hermaphrodite	20
6.	Divider 15 cm spring	20
7.	Scriber 15 cm.	20
8.	Centre Punch 10 cm	20
9.	Screw driver 15 cm	20
10.	Chisel cold flat 10 cm	20
11.	Hammer ball peen 0.45 kg. With handle	20
12.	Hammer ball peen 0.22 kg. With handle.	20
13.	Chisel – Cold – Flat – 20 mm X 150 mm	20
14.	File flat 25 cm. second cut	20
15.	File flat 25 cm. smooth	20
16.	File half round second cut 15 cm.	20
17.	Hacksaw frame fixed 30 cm.	20
18.	Safety goggles.	20
19.	Dot slot punch 10 cm.	20

B : TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS

Sl. No.	Name of the items	Quantity (indicative)
1.	Steel Rule 30 cm	05
2.	Steel Rule 60 cm	05
3.	Straight edge 45 cm steel	02
4.	Surface plate 45 x 45 cm CI / Granite.	02
5.	Marking table 91 x 91 x 122 cm.	01
6.	Universal scribing block 22 cm.	02
7.	V-Block pair 7 cm and 15 cm with clamps	02
8.	Angle plate 10 x 20 cm	02
9.	Spirit Level 15 cm metal	01
10.	Punch letter 3 mm set.	01
11.	Punch number set 3 mm.	01
12.	Punch hollow 6 mm to 19 set of 5	02
13.	Punch round 3mm x 4 mm set of 2	02
14.	Portable hand drill (Electric) 0 to 6 mm	02
15.	Drill twist straight shank 1.5 to 12 mm by 0.5 mm	01 set
16.	Drill twist straight shank 3 mm to 15 mm by ½ mm	01 set
17.	Taps and dies complete set in box B.A	01
18.	Taps and dies complete set in box with-worth.	01
19.	Taps and dies complete set in box 3-18 mm set of 10	01
20.	File knife edge 15 cm smooth	05
21.	File warding 15 cm smooth	05
22.	File cut saw 15 cm smooth	05
23.	File feather edge 15 cm smooth	05
24.	File triangular 15 cm smooth	02
25.	File round 20 cm second cut	10
26.	File Square 15 cm second cut	05
27.	File square 25 cm second cut	05
28.	Feeler gauge 10 blades	1 set
29.	File triangular 20 cm second cut.	10
30.	File flat 30 cm second cut.	10
31.	File flat 20 cm bastard	10
32.	File flat 30 cm bastard.	10
33.	File Swiss type needle set of 12.	02
34.	File half round 25 cm second cut.	10
35.	File half round 25 cm bastard.	10
36.	File round 30 cm bastard.	10
37.	File hand 15 cm second cut.	10
38.	Soldering Iron 350 gm.	02
39.	Blow Lamp 0.50 liters.	02
40.	Spanner D.E. 6 -26 mm set of 10 pcs.	05 sets
41.	Interchangeable ratchet socket set with a 12 mm driver, size D10-32 mm set of 18 socket & attachments.	1 set
42.	Box spanner set 6-25 mm set of 8 with Tommy bar.	1 set
43.	Glass magnifying 7 cm	02
44.	Clamp toolmaker 5 cm and 7.5 cm set of 2.	02
45.	Clamp “C” 5 cm	02
46.	Clamp “C” 10 cm	02

47.	Hand Reamer adjustable cover max 9 ,12,18mm – set of 3	1 set
48.	Hand Reamer taper 4 -9mm set of 6 OR 4 -7 mm set of 4.	1 set
49.	Reamer parallel 12 - 16mm set of 5.	01
50.	Scraper flat 15 cm.	10
51.	Scraper triangular 15 cm	10
52.	Scraper half round 15cm	10
53.	Chisel cold 9 mm cross cut 9 mm diamond.	10
54.	Chisel cold 9 mm cross cut 9 mm diamond.	10
55.	Chisel cold 9 mm round noze.	10
56.	Stud Extractor EZY – out	02
57.	Micrometer 0 – 25 mm outside.	10
58.	Micrometer 25 – 50 mm outside.	05
59.	Micrometer 50 –75 mm outside.	2
60.	Micrometer inside 25 - 50 mm with extension rods.	01
61.	Vernier caliper 20 cm	01
62.	Vernier bevel protractor	01
63.	Vernier height gauges 30 cm.	01
64.	Screw pitch gauge.	01
65.	Drill twist Taper Shank 06 mm to 25 mm x 1.5 mm	01
66.	Drill chuck 12 mm.	01
67.	Pipe wrench 40 cm	01
68.	Pipe wrench 40 cm	01
69.	Pipe vice 100mm	01
70.	Adjustable pipe tap set BSP with die set cover pipe size15,20,25,32,38,50 mm.	01
71.	Wheel dresser (One for 4 units).	01
72.	Machine vice 10 cm	01
73.	Sleeve drill Morse 0 – 1, 1 – 2, 2 – 3.	01set
74.	Vice bench 12 cm jaw	20
75.	Vice leg 10 cm jaw	02
76.	Bench working 240 x 120 x 90 cm.	05
77.	Almirah 180 x 90 x 45 cm.	01
78.	Lockers with 6 drawers (standard size).	03
79.	Metal rack 182 x 182 x 45 cm	01
80.	Fire extinguisher (For 4 Units)	02
81.	Fire buckets.	02
82.	Hand hammer 1 kg. with handle and Mallet	02 each

83.	Resistance coils (2 Ohms, 5, ohms,10 ohms, 100 ohms)	2 sets
84.	Resistance boxes (0-100 ohms and 0 to 500 ohms)	2 sets
85.	Ampere meters DC: 0-1Amp, 0-3 Amp, 0-10Amp, 0-30Amp AC: 0-10Amp, 0-30Amp	2 each
86.	Volt meters DC : 0- 1V, 0-4 V, 0-10 V, , 0-50V 0-250 V AC : 0-250 V	2 each
87.	Rheostat : 25 Ohms , 100 ohms, 500 ohms	2each
88.	Wheatstone bridge	2 sets
89.	Potentiometer	2 sets
90.	Bourdon Tube Pressure gauges. (0- 10 Kg/sq. cm)	2 sets
91.	Mercury filled U-tube manometer (100 cms height)	2 nos.
92.	Dead weight tester with accessories and comparator	One set
93.	Pressure switch (0- 10 Kg/sq. cm)	2 nos
94.	Glass Rod Thermometer (Mercury and alcohol) Range: (various ranges)	2 each
95.	Bi-Metal thermometers, stem & dial (various ranges)	04
96.	RTD Resistance-bulb Wheatstone Bridge Thermometers (PT – 100, PT-1000)	02
97.	Thermo-couple Pyrometers (with different thermocouple)	10
98.	Thermo-couple with mill-volt-potentiometer pyrometer	02
99.	Optical Pyrometer and radiation pyrometer	One each
100.	Mercury in Steel Thermometers, Remote Indicating	2 nos
101.	ON-OFF Controller , , P, PI, PD controllers PID controller	One each
102.	Control valve with valve positioned and I/P convertor and P /I convertor	One set
103.	Flow meter Test rig (Rota meter- Venturi meter- Orifice meter – Pitot Tube- water meter)	1set
104.	Different types of valves (Gate, Globe, Needle, Ball, Plug, Butterfly, Diaphragm, check valves (NRVs), spring loaded safety valves, etc.)	2 sets
105.	Different types of pumps (Centrifugal pump, multistage centrifugal pump, Reciprocating and Gear pump test rigs)	1 each
106.	Plunger pump for hydraulic test of Non-IBR Boiler	1no.
107.	Digital P^H Meter	2 nos
108.	Gas analyses	1 no.
109.	Air Blowers	1 no

C : GENERAL MACHINERY INSTALLATIONS:-

General Machinery Installations –

Sl. No.	Name & Description of Machines	Quantity
1	Anvil 50 kg on stand	01
2	Drilling machine pillar sensitive 0-20mm cap with swivel table motorise with chuck and key.	01
3	Drilling machine pillar sensitive 0-12mm cap with swivel table motorise with chuck and key.	02
4	Forge portable hand blower 30cm to 45 cm	01
5	Grinding machine D.E. pedestal with 17mm diameter wheels rough and smooth with twist drill grinding attachment	01
6	Shell and tube Heat Exchanger	01
7	Non-IBR Boiler with all mounting & fitting, Accessories with feed water tank and control panel for operation of boiler. (100 kg steam output capacity)	01

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: BOILER ATTENDANT

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
2.	Set square celluloid 45^0 (250 X 1.5 mm)	20
3.	Set square celluloid 30^0-60^0 (250 X 1.5 mm)	20
4.	Mini drafter	20
5.	Drawing board (700mm x500 mm) IS: 1444	20

B : FURNITURE REQUIRED

Sl. No.	Name of the items	Quantity (indicative)
1	Drawing Board	As required
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

10.TOOLS & EQUIPMENT FOR ON-JOB TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

TRADE: BOILER ATTENDANT

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

11.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.