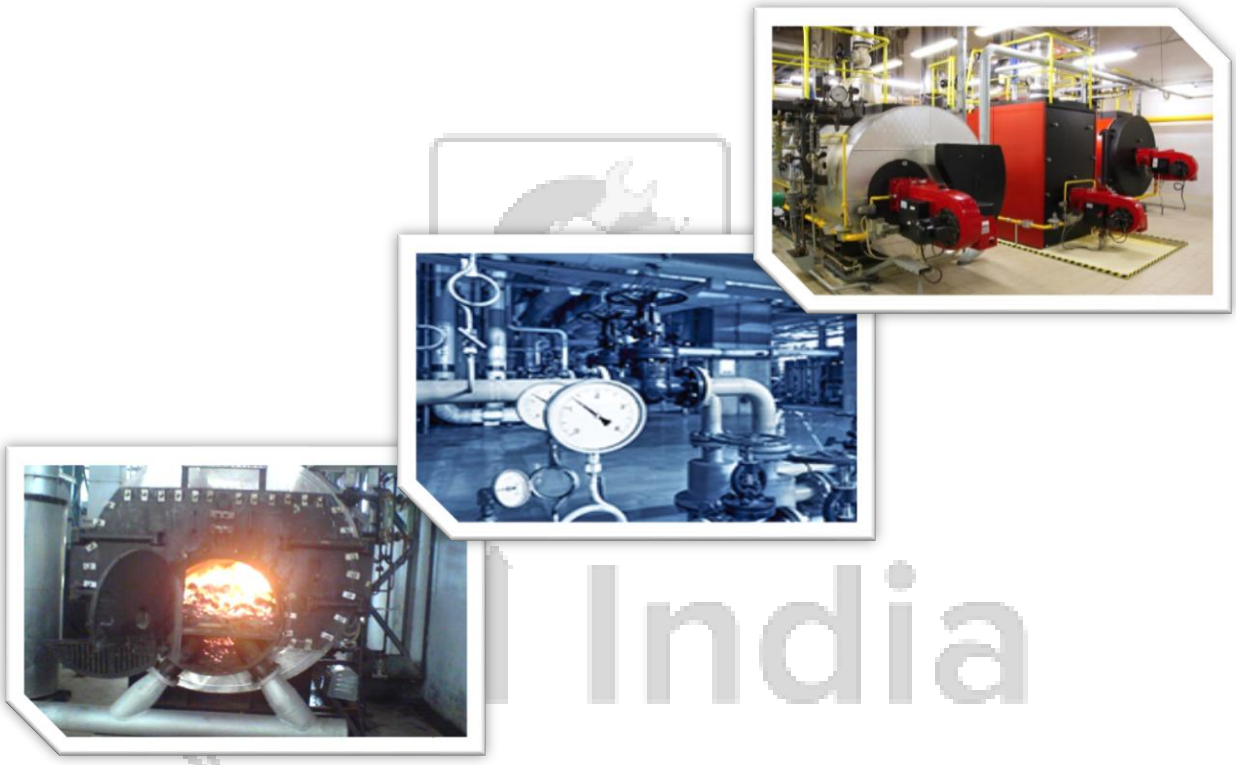
BOILER ATTENDANT

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5



SECTOR – Production and Manufacturing

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

BOILER ATTENDANT

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
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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.

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CONTENTS

1. BACKGROUND

1.1 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.

1.2 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.

1.3 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.

2. TRAINING SYSTEM

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

BOILER ATTENDANT trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

Broadly candidates need to demonstrate that they are able to:

1. Carry out safely the operation and management of boilers economically and also maintain necessary records and log book for management of boilers,
2. Diagnose faults of the boilers and its auxiliaries.
3. Carry out minor and major repairs.
4. They must explain knowledge of safety precautions and boilers safety rules.
5. Work in facilities like power plants or boiler, engine, and mechanical rooms.
6. Handle all of the systems that generate heat or electricity in a facility.

Such as:

- Low-pressure boilers
- High-pressure boilers
- Power boilers
- Steam boilers
- Hot water heating systems.
- Make manual adjustments to this equipment during their servicing.

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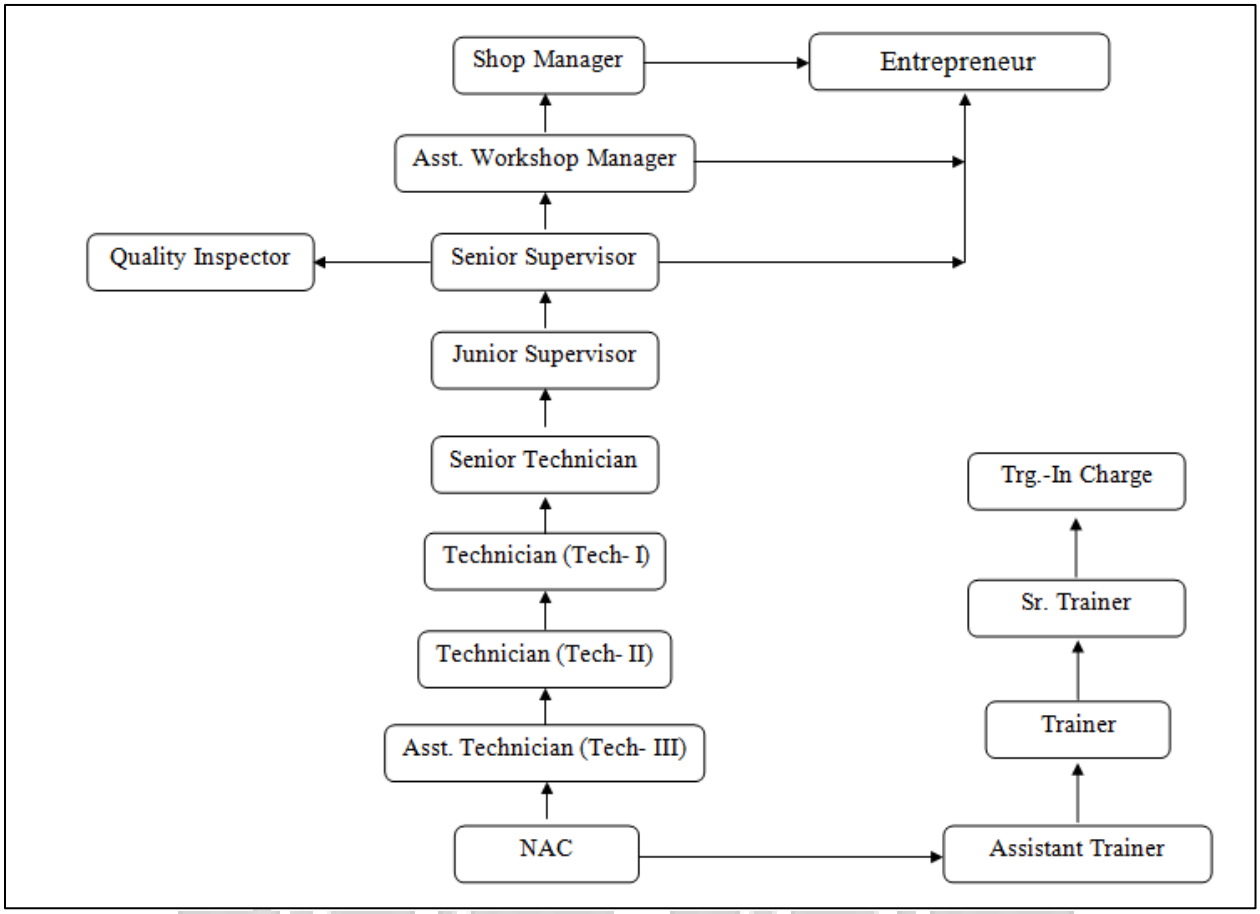
2.2 CAREER PROGRESSION PATHWAYS:

- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*): -

Total 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**

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A. Basic Training

For 02 yrs. course :-(Total 06 months: 03 months in 1st yr. + 03 months in 2nd yr.)

For 01 yr. course :-(Total 03 months: 03 months in 1st yr.)

Sl. No.	Course Element	Total Notional Training Hours	
		For 02 yrs. course	For 01 yr. course
1	Professional Skill (Trade Practical)	550	275
2	Professional Knowledge (Trade Theory)	240	120
3	Workshop Calculation & Science	40	20
4	Engineering Drawing	60	30
5	Employability Skills	110	55
	Total (including Internal Assessment)	**1000**	**500**

B. On-Job Training:-

For 02 yrs. Course :-(**Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course :-(**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 yrs. course	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. course	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training

institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NAC will be conducted by NCVT on completion of course as per guideline of Govt of India. The pattern and marking structure is being notified by govt of India from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

2.4.2 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 should be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

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Performance Level	Evidence
(a) Weightage in the range of 60 -75% to be allotted during assessment	
For performance in 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.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • 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	
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.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • 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	
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.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

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 Attendant 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-2015:

i) 8182.0200- Boiler, Attendant

4. NSQF LEVEL COMPLIANCE

NSQF level for BOILER ATTENDANT trade under ATS: **Level 5**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. professional knowledge,
c. professional skill,
d. core skill and,
e. Responsibility.

The Broad Learning outcome of BOILER ATTENDANT trade under ATS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context.	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and Learning and some responsibility for other's works and learning.

5. GENERAL INFORMATION

Name of the Trade	BOILER ATTENDANT
NCO - 2015	8182.0200
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) a) Block–I: 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
Selection of Apprenticeship	As per ITI instructors qualifications as amended time to time for the specific trade.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic Training	As per related trade of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	Nil
CTS trades eligible for BOILER ATTENDANT Apprenticeship	NA

Distribution of training on Hourly basis: (Indicative only)
A. Basic Training

Total hours (40 hrs./ wk X 13 wks.)	**Trade practical**	**Trade theory**	**Work shop Cal. &Sc.**	**Engg. Drawing**	**Employability skills**
520 Hours	830 Hours		40 Hours	60 Hours	110 Hours

B. On-Job Training – 3120 Hrs.

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.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the BOILER ATTENDANT course of 02 years duration under ATS.

Block I:-

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Understand and explain different mathematical calculation & science in the field of study including basic chemical. *[Different mathematical calculation & science – units, material science, fraction, mass, weight and density, ratio proportion, percentage, Work, Power & Energy, & Mensuration, Heat & Temperature,*
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Drawing instruments, lines, Geometrical figures, Dimensioning of solids ,drawing Layout ,free hand sketches,*
4. Select and ascertain measuring instrument and measure and record data.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
8. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1. Practice and understand precautions to be followed while working in shop.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Service all types of pump and its accessories by using servicing equipments.
4. Operate and maintained of all types of pumps used in boilers house.
5. Operate and maintained of all types fans and blowers.
6. Operates and maintained the fuel (i.e. Coal /Oil/Gas) feeding mechanism.
7. Operate and maintained the ash disposal plant, pumps, hydro vectors, hydro ejectors, clinker grinder and submerged type ash plants
8. Read, operate and control normal level in Boilers, the gauge glass etc.

9. Operates, Control and maintained the super heater and re-heater of superheat and reheat temperature.
10. Controls the steam pressure reducing station for auxiliary steam supply for oil heater, dearatorpagging and process steam, if any.
11. Operates and maintained the water softener and coal handling equipments.
12. Correct use of various types of cocks, mounting and accessories used on boilers.
13. Operates boiler and its other operations.
14. Operate the boiler feed pumps with safety.
15. Check and test Boiler water in chemical laboratory.
16. Conditioned the steam and condensate cycle.
17. Periodically inspect, service ant test the boilers.
18. Check calibrates the all types of gauges.

Block II

19. Prime the boiler with safety–
20. Replace of gauge glass as per Procedure.
21. Adjust the safety valves for correct blowing with the safety.
22. Procedure to be adopted in putting as economizer into commission and also in putting it out of commission when boiler is on steam.
23. Checked and renewed of gland packing's of pump and valves. Stocked boiler including cleaning and banking fires in a workman like manner to prevent avoidable smoke.
24. Checked and adjust boiler mountings.
25. Operates and maintained and service of easing a safety valve, blow down cock, fusible plug. Service of spark igniters and oil sumps for oil torches.
26. Services of economizer by using appropriate appliances
27. Operates and maintained and service of multi come dust collectors and electrostatic precipitators if available.
28. Operate boilers in Emergency 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 economizer 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,
m) Failure of gauge glass.

29. Operates , maintained and service Soot blowing and boiler furnace during operation
30. Explain Importance of Draft temperature readings at special loads. Interpretation of deviation from standard reading for identical loads.
31. Maintain Entries and upkeep of log sheet, trouble log, etc. operate and maintain of modern package type and automatic boilers.

Note: *Learning outcomes are reflection of total competencies of a trainee and assessment will be carried out as per assessment criteria.*

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

Outcomes to be assessed/NOSs to be assessed	Assessment criteria for the outcome
1. Recognize & comply with safe working practices, environment regulation and housekeeping.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	1.2 Recognize and report all unsafe situations according to site policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1.4 Identify, handle and store/ dispose of dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	1.5 Identify and observe site policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1.8 Identify and observe site evacuation procedures according to site policy.
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.
	1.11 Identify different fire extinguisher and use the same as per requirement.
	1.12 Identify environmental pollution & contribute to avoidance of same.
	1.13 Take opportunities to use energy and materials in an environmentally friendly manner.
	1.14 Avoid waste and dispose waste as per procedure.
	1.15 Recognize different components of 5S and apply the same in the working environment.
2. Understand, explain different mathematical calculation &	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight,

	science in the field of study including basic electrical and apply in day-to-day work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*	density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction.
		2.2 Measure dimensions as per drawing.
		2.3 Use scale/ tapes to measure for fitting to specification.
		2.4 Comply given tolerance.
		2.5 Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
		2.6 Ensure dimensional accuracy of assembly by using different instruments/gauges.
		2.7 Explain basic electricity, insulation & earthing.
3.	Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]*	3.1 Read & interpret the information on drawings and apply in executing practical work.
		3.2 Read & analyse the specification to ascertain the material requirement, tools, and machining/ assembly/maintenance parameters.
		3.3 Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
4.	Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as micrometers, vernier calipers, dial gauge, bevel protector and height gauge (as per tool list).
		4.2 Ascertain the functionality & correctness of the instrument.
		4.3 Measure dimension of the components & record data to analyse with the given drawing/measurement.
5.	Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day-to-day work	5.1 Explain the concept of productivity and quality tools and apply during execution of job.
		5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and

to improve productivity & quality.	remain sensitive towards such laws.
	5.3 Knows benefits guaranteed under various acts.
6. Explain energy conservation, global warming, pollution and contribute in day-to-day work by optimally using available resources.	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available resources optimally & remain sensitive to avoid environment pollution.
	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/ organize related task in day-to-day work for personal & societal growth.	7.1 Explain personnel finance and entrepreneurship.
	7.2 Explain role of various schemes and institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non-financing support agencies to familiarize with the policies/ programmes, procedure & the available scheme.
	7.3 Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize the work related to the occupation.	8.1 Use documents, drawings and recognize hazards in the work site.
	8.2 Plan workplace/ assembly location with due consideration to operational stipulation.
	8.3 Communicate effectively with others and plan project tasks.
	8.4 Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.

SPECIFIC OUTCOME
Block-I & II (Section:10 in the competency based curriculum)
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II** (section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking/ Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*

8. SYLLABUS

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills	Professional Knowledge
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	

BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills	Professional Knowledge
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 Deaerators –Priming and foaming – scale formation and corrosion. Chemical cleaning of boiler, softening and de-mineralized Water Plant.
12	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. Pre-heater, Economizer, waste heat boiler. Boiler drum. Boiler mounting and fittings. Boiler accessories. IBR and non IBR Boiler, Knowledge of Indian Boilers Acts and Rules.
13	**Internal Assessment 03 days**	

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	**Unit**: Systems of unit- CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units **Material Science** : Properties -Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and non-Ferrous metals	**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. **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.	**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. **Mass ,Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.	**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. **Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case
3.	**Ratio & Proportion** : Simple calculation on related problems. **Speed and Velocity**: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation.	**Practice of Lettering and Title Block** **Dimensioning practice**: - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance.
4.	**Percentage** : Introduction, Simple	**Drawing of Solid figures** (Cube, Cuboids,

	calculation. Changing percentage to decimal and fraction and vice-versa **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.	Cone, Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions. **Free Hand sketch of hand tools and measuring tools used in res**pective trades.
5.	**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. **Heat & Temperature**: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.	**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 **ISI symbols** of Generator, Voltmeter, Ammeter, Watt- meter. Resister, inductor, Capacitor, Transformer, AC & DC motors.etc. Drawing of pressure control process line

Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration : - 30 hrs.)**
1.	Archimedes's principle, principle of floatation hydrometers. Centre of gravity and Equilibrium condition. Definition - viscosity, flash point, fire point, flash points of standard lubricating oils, octane number.	**Drawing sketches of different types of valves**, such as gate valve, globe valve, ball valve, Plug Valve, check valve etc. **Drawing of different types locking devices** such as double nut, castle nut, pin etc.
2.	Pressure, temperature, Boyle's law, Charles's law, Equation of perfect gas. Calculations. Newton's laws of motion unit of force, find out resultant force parallelogram law of forces,	**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. **Free hand sketches** of Belt conveyor, Screw conveyer, Bucket elevator

3.	Centre of Gravity, (C.G. Of square, rectangle, triangle, circle, semicircle, cone) & its calculations Condition of equilibrium, kind of equilibrium, some examples of equilibrium in daily life,	**Drawing of pressure, Level , flow and temperature control system.** **Free hand sketches** of crushers, ball mill, hammer mill and centrifuges
4.	**Flow of fluids-** Equation of continuity, Bernoulli's theorem Advantages & Disadvantages of friction, Limiting friction, Laws of limiting friction, Coefficient of friction, angle of friction, Inclined plane, Force of friction	**Free hand sketches** of steam jet ejector, steam trap **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
5.	Flow measurement by orifice meter, venturi meter, Rota meter, U-tube manometer. Latent heat, sensible heat, saturated steam, wet steam, superheated steam. Reynolds's number, at different velocities.	Flow sheet / Block diagram of 1.Sulphuric acid 2.Nitric acid 3.Ammonia 4. Urea 4. Ethanol

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)	
1. English Literacy Duration : 20 Hrs.	Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
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.
2. I.T. Literacy Duration : 20 Hrs.	Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
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.
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.

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.
3. Communication Skills Duration : 15 Hrs. Marks : 07	
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.
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.
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.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude
Block – II	

Duration – 55 hrs.	
4. Entrepreneurship Skills Duration : 15 Hrs. Marks : 06	
Concept of Entrepreneurship	Entrepreneur - 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.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
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.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity Duration : 10 Hrs. Marks : 05	
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
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.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education Duration : 15 Hrs. Marks : 06	
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical

Hazards	Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation Duration : 05 Hrs.	Marks : 03
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.
8. Quality Tools Duration : 10 Hrs.	Marks : 05
Quality Consciousness	Meaning of quality, Quality characteristic.
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.

Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below: -

A. BLOCK – I

1. Repair & 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.
5. Pumps: Operation of different types of pumps.
6. 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.
7. 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. Study of burners for oil and gas and also filters.
8. Operation of ash disposal plant, function and maintenance of pumps, hydrovactors, hydro ejectors, clinker grinder and submerged type ash plants
9. Normal level control in Boilers, Operation and reading of gauge glass etc. level control during the emergency operations and use of blow down valves.
10. Operation of super heater and re-heater. Control of superheat and reheat temperature.
11. Operation of steam pressure reducing station for auxiliary steam supply for oil heater, deaerator pagging and process steam, if any.
12. 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.
13. 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.
14. 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.

15. 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.
16. Internal conditioning of Boiler water by checking the TDS and alkalinity by blow down to prevent sealing, priming, carry over and causing gauging.
17. Conditioning of steam and condensate cycle. Importance of silica in high pressure boilers and how it is controlled.
18. Periodical cleaning and filling the boiler with demineraled or condensate for prevention of scale or other deposits on heating surfaces.
19. Periodical inspection of boilers – preparation of boilers for testing – Hydraulic test and steam test.
20. Precautions to be taken before entering or allowing persons to enter a boiler which is connected to another boiler on the steam.
21. Correct method of firing and combustion control for prevention of smoke.
22. Testing the correctness of gauge glass and cocks by blowing through them Maintenance work of Boiler and boiler mountings and fittings.

B. BLOCK – II

23. Repair & Maintenance Priming of boiler – the danger of water logging steam pipes and precautions to be observed in running.
24. 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.
25. 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.
26. Procedure to be adopted in putting as economiser into commission and also in putting it out of commission when boiler is on steam.
27. Checking and renewal of gland packing's of pump and valves.
28. Correct method of stocking boiler including cleaning and banking fires in a workman like manner to prevent avoidable smoke.
29. Checking and adjustment of boiler mountings. Working knowledge and fitting of feed pump and injectors. Working of feed water heaters and deaerators.
30. Operation of easing a safety valve. Use of blow down cock or valve.
31. Cleaning of oil torches.
32. Adjustment of high steam and low water safety valve. Renewal of fusible plug.
33. Use of spark igniters and oil sumps for oil torches.
34. Cleaning of economizer by using appropriate appliances
35. Inter lock tripping of boiler auxiliaries and basic knowledge of purgainter lock.

Operation and working of multicome dust collectors and electrostatic precipitators if available.

36. 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 economizer 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.
37. Soot blowing and boiler furnace cleaning during operation. Use and care of different types of soot blowers.
38. Importance of Draft temperature readings at special loads. Interpretation of deviation from standard reading for identical loads.
39. Economical working of boilers.
40. Entry and upkeep of log sheet, trouble log, etc.
41. Observation of use, operation and maintenance of modern package type and automatic boilers. Work of Boiler and boiler mountings and fittings.

Note:

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.
2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

BOILER ATTENDANT			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
A. TRAINEES TOOL KIT (For each additional unit trainees tool kit Sl. 1-18 is required additionally)			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**Quantity**
1	Steel Rule	15 cm with metric graduation	20
2	Try Square 10 cm blade	10 mm blade	20
3	Caliper outside 15 cm spring	150 mm	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	10C m and	20
9	Screw driver	15 c m	20
10	Chisel cold flat 10 cm	15 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.		
19	Dot slot punch	10 cm.	
B : INSTRUMENTS & GENERAL SHOP OUTFIT			
1.	Steel Rule	30 cm	05
2.	Steel Rule	60 cm	05
3.	Straight edge steel	45 cm	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 metal	15 cm	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 smooth	15 cm	05
21.	File warding smooth	15 cm	05
22.	File cut saw smooth	15 cm	05
23.	File feather edge smooth	15 cm	05
24.	File triangular smooth	15 cm	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 diamond.	9 mm cross cut 9 mm	10
54.	Chisel cold diamond.	9 mm cross cut 9 mm	10
55.	Chisel cold round noze.	9 mm	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 with extension rods.	25 - 50 mm	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 jaw	12 cm	20
75.	Vice leg jaw	10 cm	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 with handle and Mallet	1 kg.	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			
1.	Anvil on stand	50 kg	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

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: BOILER ATTENDANT

LIST OF TOOLS& EQUIPMENTS FOR -20APPRENTICES

1) **Space Norms** : 45 Sq. m.(For Engineering Drawing)

2) Infrastructure:

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		20
2.	Set square celluloid 45^o	(250 X 1.5 mm)	20
3.	Set square celluloid mm)	30^o-60^o (250 X 1.5	20
4.	Mini drafter		20
5.	Drawing board	700mm x500 mm) IS: 1444	20
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
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

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
Note: - Above Tools & Equipments not required, if Computer LAB is available in the institute.		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :			**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :			**Date of Assessment :**
Name & Address of the Industry :			**Assessment location: Industry / ITI**
Trade Name :	**Semester:**		**Duration of the Trade/course:**
Learning Outcome:			

Sl. No	**Candidate Name**	**Father's/Mother's Name**	Safety consciousness	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA	**Total internal assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														