UTILITY OPERATOR

COMPETENCY BASED CURRICULUM

(Duration: 1 Year 3 Months)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 4

SECTOR – Production and Manufacturing

सत्यमेव जयते

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

Directorate General of Training

Skill India
कौशल भारत-कुशल भारत

UTILITY OPERATOR

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 4

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City,
Kolkata – 700 091

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1. TATA Steel, Jamshedpur

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

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
1.	**PRAKASH SINGH,** Chief Capability Development	Capability Development TATA Steel LTD, Jamshedpur-831001	Chairman
2.	**B.N. CHOWDHURY**, Head-Cadre and special training.	-Do-	Member
3.	**PAWAN KUMAR DAS**, SR. Manager, Training	-Do-	Member
4.	**MANU KUMAR VARMA** SR. Manager, Training	-Do-	Member
5.	**AKHILESH KUMARKARN**, SR. Manager, Training	-Do-	Member
6.	**SAKET KUMAR**, Manager	-Do-	Member
7.	**S.K. MAKUR**, SR. Manager	-Do-	Member
8.	**RABINDRA K. SINGH** Manager, Training	-Do-	Member
9.	**SATRUGHNA NAYAK**, JE-II	-Do-	Member
10.	**RAHUL SHARMA**, SR. Manager	-Do-	Member
11.	**JAI KISHORE**, Assistant Manager	-Do-	Member
12.	**SUNIL KUMAR**, Manager	-Do-	Member
13.	**TRIBENI PRASAD**, SR. Instructor	-Do-	Member
14.	**BINU SHARKAR ROY**, Assistant Manager	-Do-	Member
15.	**TAPAS KR. DHAR**, Manager	-Do-	Member
16.	**L. K. Mukherjee,** DDT	CSTARI, Kolkata	Member
17.	**N. Nath,** ADT	CSTARI, Kolkata	Member

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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.

Utility Operator trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of one year three months (01 Block of 15 months duration including basic training) 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:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs and solve problem during execution.
- Check the product as per specifications for functioning, identify and rectify errors in the system.
- Document the technical parameters related to the task undertaken.

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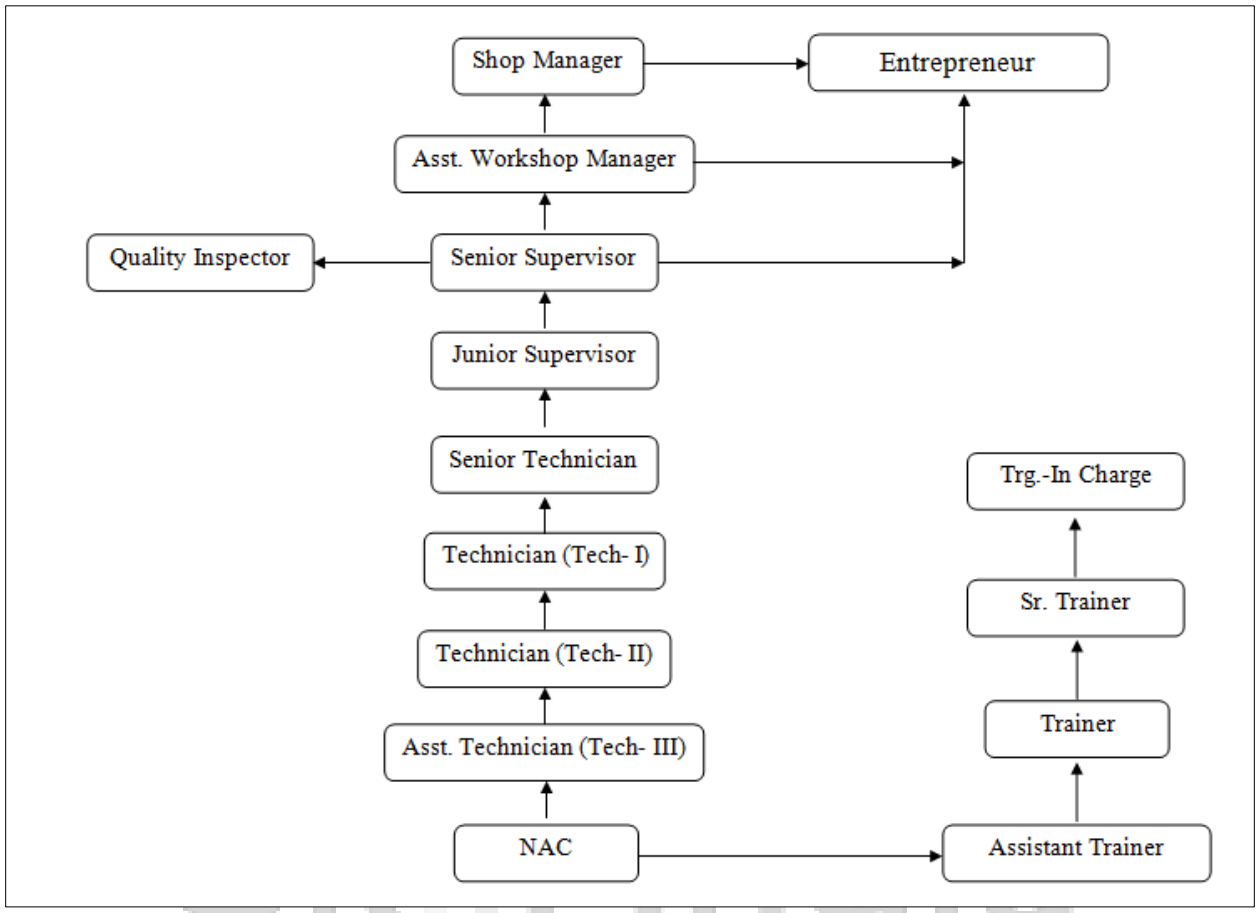
2.2 CAREER PROGRESSION PATHWAYS:

- 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 one year (*Basic Training and On-Job Training*) : -

Total training duration details: -

Time (in months)	**1-3**	**4 - 15**
Basic Training	**Block– I**	**-----**
Practical Training (On - job training)	**----**	**Block – I**

Utility Operator

A. Basic Training

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

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

S 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 (Engg.) :-(**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 (Engg.) :-(**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 (Engg.)	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. course (Engg.)	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:

Boiler, Attendant Boiler Attendant operates boilers to generate steam of required pressure by controlling and adjusting water feed, draught, evaporation, fire, etc., for heat or power. Opens water-pipe valve in tank through glass tube attached to it and closes water-pipe when boiler tank is filled with water to required level. Ensures that water level in indicator is always above minimum limit. Opens door of fire chamber of boiler, shovels fuel into fire box and rakes fire to obtain maximum heat or sets device which feeds gas, oil or other fuel automatically. Checks temperature and pressure of steam by reading gauges and feeds fuel or adjusts stoking accordingly. Operates different supply valves and ensures that steam is supplied to engine room at prescribed pressure. Controls air draught into boiler ensuring correct adjustment of air supply and preventing infiltration of extraneous air. Maintains water level and steam pressure as prescribed. Drains out excess water from drum by blowing down according to instructions or in presence of shift-in-charge. Undertakes cleaning of boiler tube ways and minor repairs, maintains general external cleanliness, lubricates mechanical parts of boiler and assists in commissioning, banking (reducing the rate of combustion in boiler furnace by covering fire with slack or fire coal) and shutting down boilers. Maintains prescribed records of readings in log book. May cut off automatic water feed and make direct connection to drum and blow off excess water in case of emergency. May remove ash from ash pan or slag from slag chamber. May clean boiler and flues. May operate boilers with different fuels such as gas, oils, coal and be designated accordingly.

Turbine Operator, Steam Turbine Operator, Steam; Turbo generator Operator, Steam operates steam powered turbine which drives generators for producing electricity. Starts turbine by opening valve for supply of steam into turbine to rotate turbine wheels; runs turbine at low speed for pre-determined length of time and notifies the Switch- Board Operator when ready to run turbine at full working speed; increases speed of turbine and ensures that automatic regulator maintains correct working speed; notifies Switch-Board Operator that turbine can be synchronised with other power units in plant. Observes gauges and meters to ensure proper handling of load by turbine and its proper functioning; alters power output of turbine and makes other adjustments as necessary. Cuts out unit evaporator to conduct blow down of turbine for periodic overhauling. May keep records of instrument readings. May repair and overhaul equipment and other auxiliaries.

Plan and organize assigned work and detect & resolve issues during execution. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

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

Reference NCO 2015: 1) 3131.0300 - Turbine Operator, Steam
2) 8182.0200 - Boiler, Attendant

4. NSQF LEVEL COMPLIANCE

NSQF level for Utility Operator trade under ATS: **Level 4**

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 Utility Operator trade under ATS mostly matches with the Level descriptor at Level- 4.

The NSQF level-4 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 4	Work in familiar, predictable, routine, situation of clear choice.	Factual knowledge of field of knowledge or study	Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	Language to communicate written or oral, with required clarity, skill to basic Arithmetic and algebraic principles, basic understanding of social political and natural environment.	Responsibility for own work and learning.

5. GENERAL INFORMATION

Name of the Trade	Utility Operator
NCO - 2015	NCO-2015: **3131.0300, 8182.0200**
NSQF Level	Level – 4
Duration of Apprenticeship Training (Basic Training + On-Job Training)	3 months + One year (01 Block of 15 months duration including basic training).
Duration of Basic Training	a) Block –I : 3 months **Total duration of Basic Training: 3 months**
Duration of On-Job Training	a) Block–I: 12 months **Total duration of Practical Training: 12 months**
Entry Qualification	Passed 10th class examination under 10+2 system of education or its equivalent
Selection of Apprenticeship	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
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	03 months - Broad Based Basic Training in Process Plant Maintenance Sector under Centre of Excellence Scheme and Advanced module of Centre of Excellence Scheme in Operation and Maintenance of Boiler and Steam Turbine
CTS trades eligible for Utility Operator Apprenticeship	**NA**

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 Utility Operator course of 01 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 electrical. *[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*
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]*
4. Select and ascertain measuring instrument and measure dimension of components 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. Overhaul of Hydraulic jack
2. Carry out preventive maintenance of machine.
3. Overhaul gear box, worn shaft welding, remove broken bolts by welding etc.
4. Carry out maintenance of anyone type of valve
5. Operate fans and blowers like forced draft fans, induced draft fans ,cooling tower fans (CT fan) including starting, stopping capacity adjustment ,fixing of blades of CT fans etc

6. Operate steam driven equipments like feed water pumps, fans, CEP (condenser extraction pump) including starting, stopping and capacity adjustment.
7. Carry out Operation of Fuel (i.e. Coal/oil/Gas) feeding mechanism including adjustment of flow of coal, Grate drive and draft regulation for proper combustion and use mechanical stoker.
8. Operate burners for oil and gas and also filters.
9. Carry out Operation and reading of gauge glass etc. Level control during the emergency operations and use of blow down valves. (Three element control) as part of Normal level control in Boilers.
10. Practice Operation of water, waste water disposal, softener equipment including feed water softener, Clarificulators precipitators, filters, chemical dosing etc. Pre and post chlorination system, reactivation of Ion exchanges etc.
11. Practice to work with and manage steam Boiler and economizer. (Evaporator, super heater chambers.)
12. Carry out Firing and raising, steam and blow down in Boilers with precautions and follow the steps for starting, firing and when raising steam.
13. Practice internal conditioning of Boiler water by checking the TDS and alkalinity by blow down to prevent sealing, priming, carry over and caustic gauging.
14. Practice periodical inspection of Boilers , preparation of boilers for testing by both Hydraulic test and steam test. (steam blowing test)
15. Practice Routine and Emergency operations of boilers in the event of:a) Loss of fire, b) Failure of F.D. fan. c) Failure of 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. 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 and failure of gauge glass.
16. Identify and explain different parts & fitting of a boiler such as steam and water drums, stoker gauge, water tubes and flow tubes, high and low water level alarm, gauge glasses, soot blowers, safety valves etc. forced draught induced draft and secondary draught fans, chimney, water walls, super heater & economiser, boiler controls, etc and explain functions.
17. Identify different parts of turbines; list their features of construction of blades, nozzles, governor parts, condensers, ejectors etc., and different types of pumps, compressors and different types of valves.
18. Identify parts of various turbines, sketch the construction and explain functions.
19. Carry out the process of DP test (Dye penetration)
20. Identify the steam cylinder, steam chest, diaphragms rotor blades, discs, glands, coupling, bearing etc.
21. Practice the method of gland sealing, steam seals, water seals, clearances, sealing pressure regulators and controls.
22. Identify the turbine auxiliaries such as condensers, ejectors extraction pumps, C.W. pumps etc.
23. Classify the types of Condensers , water flow, steam flow, constant water level control starting a condensing plant or stopping it, care and precautions to prevent loss of vacuum, causes of loss of vacuum, remedies, air leakages, condenser cleaning methods.

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24. Identify and start pumps like centrifugal and reciprocating, practice methods of priming, load the pumps and maintain the pumps.
25. Identify various air ejectors, like steam, hydraulic, starting ejectors, their sequence of operation, stopping method, practice starting an ejector in conjunction with a condensing plant.
26. Explain the function and use of evaporators, drain coolers and feed heaters, practice to start and stop their operation and maintain the feed water temperature.
27. Operate atmospheric relief valve and other safety devices.
28. Carry out operation of different types of Compressors and DG sets and maintenance.
29. Trace and explain the cooling water system.
30. Identify and explain the reheat and regenerative system.
31. Practice starting an condensing plant, steam turbine from cold condition, run it with a speed necessary for slow and uniform heating, avoid critical speed and vibration at critical speeds, practice the rules to be followed when removing and applying load on turbo-alterations, stopping a turbine, sequence of operations, stopping the condensing plant and other auxiliaries. Identify the feed water and steam cycle and the turning gear. **(Turbine plant operation)**
32. Explain the necessity of different instruments for measuring and recording temperature, pressure, flow etc. and co-relation of different data as recorded by various instruments and their relation to load and the turbine supervisory instrumentation.(**Instrumentation and control)**
33. Operate steam pressure reducing station and H.P., L.P. by pass station.
34. Carry out preparation of Project report.
35. Carry out process of plant light up
36. Carry out process of plant shut down.

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

GENERIC LEARNING OUTCOME	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply 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 off 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 & science in the field of study including basic	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction.

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]*	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 the with given drawing/measurement.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	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 remain sensitive towards such laws.
	5.3 Knows benefits guaranteed under various acts

6. Explain energy conservation, global warming and 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 recourses 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 familiarizes 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	
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **Block – I**(section: 10) must ensure that the trainee works in familiar, predictable, routine, situation of clear choice. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, etc.); **Execution** apply factual knowledge of field of knowledge, recall and demonstrate practical skill during performing the work in routine and repetitive in narrow range of application, using appropriate rule and tool, complying with basic arithmetic and algebraic principles and language to communicate in written or oral with required clarity; **Checking/ Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for his/her own work and learning.*	

8. SYLLABUS

BASIC TRAINING (Block – I)
Duration: (03) Three Months

Week No.	Professional Skills	Professional Knowledge
1.	Safety: - its importance, classification, personal, general, workshop and job safety. Occupational health and safety. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Importance of housekeeping & good shop floor practices. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Fire& safety: Use of Fire extinguishers. Safety regarding working with different types of steam and its First-Aid.	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Institute system including stores procedures. Introduction of First aid. Safety attitude development of the trainee by educating him to use Personal Protective Equipment (PPE). Response to emergencies e.g.; power failure, fire, and system failure. Accidents- Definition types and causes. First-Aid, nature and causes of injury and utilization of first-aid. Introduction to 5S concept & its application. Fire: - Types, causes and prevention methods. Fire Extinguisher, its types. Define environment, environment Pollution, Pollutants, type of Pollution (Air pollution, water pollution, soil pollution, sound noise pollution, thermal pollution, radiation. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management. Types of water (DM, RO, drinking treatment)
2.	Filling a flat surface of mild steel & cast iron. Filing flat & square to size to an accuracy of +0.1mm. Marking & punching of stepped & angular components & finishing of stepped & angular components & finishing the part to the required shape & size to an accuracy of +0.1mm.	Units of measurements –MKS,CGS,FPS, SI & its Conversation. Physical introduction to measuring instruments- Handling of Instruments- Exercise in the use of liner measuring instruments Such as steel rule of different ranges. Outside calipers, in side Calipers for measuring inside. Outside measurement, in side measurement, depth gauge. Check for flatness straightness & squareness. Marking & punching tools. & their uses.

		Hacksaw- types, specification & their uses. Classification & specification of files, shapes, sizes and grades. Bench vice constructional details. Introduction to lathe description. Lathe-types of lathe machine, parts of centre lathe and function, lathe operation.. Lathe cutting tools- Types & tools, angle cutting speed feed depth of cut for different lathe operation
3.	Holding the Job in 3jaw and 4 Jaw chuck Facing and plain turning operations use of measuring tools required for turning. method. center drilling, boring ., parting off knurling ,grooving. chamfering operation.	Introduction of special machine tools such as, Turret lathe, capstan lathe its working and maintenance. Basic of CNC.
4.	Use of hand tools, join practice with single and multi - stand conductors of different wires. Joining practice of bare conductors - soldering practice on printed circuit boards- Demonstration & practice on soldering the aluminum conductor, cable joints. Use of aluminum flux and Alca 'p' solder. Demonstration and practice of crimping of various wires.	General care & maintenance of common hand tools, wires & cable - conductors, insulators & semiconductors- their shapes, sizes with respect to low, medium & high voltage. Soldering printed circuit boards &its uses- different fluxes for different purpose on metal's- crimping equipment- joining of conductors by soldering. Importance of preventive maintenance and routine tests Earthing and its importance Resistance, voltage, current, open circuit and short circuits-ohm's law- voltage drop - series & parallel circuits-power & energy relations - electrical measuring instruments-millimeters common electrical accessories used in industries- bus-bars, replays, contactors, circuit breakers, etc.. Fuses tube light and its rating - materials used.
5.	Making of a simple circuit with a lamp and battery. Simple wiring practice with distribution boards, junction boxes, main switches two way and intermediate switches. Study and use of multi maters - measurement of current, voltage, resistance in DC\AC circuits. Demonstration & verification of ohm's law - series circuits - parallel circuits.	Fundamental of measuring instruments & systems: Safety and precautions in handling of electrical and electronics equipment's Principle of M. C. & M. I. meters, measurement value, shunt constructions & connection, voltage measurements, instrument sensitivity, meter accuracy, changing meter range. Using of AC/ DC meters. The purpose of process measurement, use of measurement, display& error in measurements & study of different types of measuring

	Demonstration in circuits -use of tong tester and megger.	instruments. Remote vs. local display. Errors in measurement systems, calibration, noise response time
6.	Electrical measurement & measuring instruments Testing and calibration of ammeters & volt meters of various types & construction of M. C. & M. I. Measurement of power by watt meter & calibration of watt meter, KWH meter.	Maintenance Introduction safety precaution in maintenance Vernier Bevel protector, Combination set, Sinebar, Dial Test Indicator, Slip Gauge, Introduction of different types pumps, Maintenance of Pump repairing, Pump shaft multistage pump & mechanical seal coupling and motor shaft coupling alignment, Pipe line. Preventive maintenance and breakdown maintenance. Iinstallation, New machine installation factor and preventive maintenance advantage& there uses. Maintenance of hydraulic system, Maintenance of pneumatic system, principal and working procedure of hydraulic and pneumatic system.
7.	Practical on Instrumentation trainer/ simulator, computerized instrumentation simulator. Principle of transducer operation	Introduction of special machine maintenance such as thread cutting, boring, spline cutting on NC & CNC machine Demonstration of different metals, ferrous and nonferrous metals. Limit, Fit , Tolerance , types of limit, types of fit, types of tolerance , Allowance ,types of allowance, Tolerance, system.
8.	Practice of Measuring by using of instruments. Pipe thread cutting, maintenance of pump & pipeline	Gauge necessity of gauge, Types of gauge their use. Pluge gauge, ring gauge, snap gauge, thread gauge, wire gauge, radius gauge, filler gauge. Surface finish terminology, roughness , roughness value, Roughness grade and roughness symbol, grinding and grinding process. Metal physical and mechanical properties of metal, Iron removing process from ORE, Ferrous Metal, Non Ferrous Metal, Ferrous and non ferrous allow its advantage.
9.	Practice on cutting thread. Sift & bush bearing turning & fitting	Heat treatment, Necessity, Terminology of Heat Treatment, Hardening, Tempering, Annealing, Normalizing, Case Hardening different types of case hardening methods. Power Transmission, Necessity , Advantage, Types of power Transmission belt , types of (V & flat belt) belts and their size and specification pulley and their

		kinds Introduction of different of types joints. Coupling & there types, use chain, chain sprockets, wire rope and clutch for power transmission system.
10.	Grinding of different job as per specification. Hardening on punch by using of heat treatment Pulley boring according to shaft.	Gear specification of Gear, Types of Gear and there use key and there types and there use. Lubricant and coolant, Necessity of lubricant and coolant, types of lubricant and there use types of collant & there use different types of lubricating system. Bearing, Introduction, Necessity types of bearing its construction and there use according to work. Gear Box, Different types of gear box and there uses Oil seal its use and there kinds gas kits. Welding introduction, Welding types of welding Different b/w transformer and rectifier welding machines its uses in maintenance shop. Specification of welding rods.
11.	Coupling boring and fitting Keyway cutting and shift pulley fitting	Basic concept of effective matching, Requirement of good machining practice factors affecting the performance of machining. Tool life and factor affecting it tool failure problem due to heat generation Jig, Fixtures templates roll of jig and fixture in mass production, types of jig and types of fixture factor to be considered for selecting and designing jig or fixture. Template and there use.
12.	Boring and bushing	Introduction of valves types of valves such as gate valve, diaphragm, globe, butterfly and safety valve, safety valve setting, needle valve, non return valve.
13.	**Revision & Internal Assessment**	

Note: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration : - 30 hrs.)**
1.	Applied workshop problems involving simple addition, subtraction, multiplication, division and common fractions.	Introduction to Engineering drawing, its importance and uses in engineering fields. Simple definitions of Points, Lines, Parallel straight lines.
2.	Science- Definition, Nomenclature, various branches, significance and definitions of important terms.	Geometrical construction of Square, Rectangle, Triangle, Circle, Polygons, etc.
3.	Rounding of decimal values, use of approximation.	Drawing different types of lines.
4.	Units – Definition, fundamental & derived units, system of units- FPS, CGS, MKS and SI units of some important parameters- Length , mass, time, density, current, voltage, pressure etc. Unit conversion.	Free hand sketch of Hand tools used in the trade.
5.	Workshop problems related to average.	Screw Threads – Forms of Various Screw threads used in general in the industry – Nomenclature, convention
6.	Workshop problems related to percentage.	Fastening Devices – Temporary and Permanent. Meaning and difference. Temporary Device – Hexagonal Bolt, Nut, Check Nut, Washer.
7.	Workshop problems related to ratio and proportion.	Different Methods of Preventions of rotation of Bolts - Check nut, Square headed bolt, Square headed bolt with square neck, cup headed bolt, Eye bolt, counter sunk headed bolt, rag bolt, etc.
8.	Workshop problems related on time & work.	Different Methods of locking of nuts :- a) Lock nuts, b) Split pin, c) Slotted nut , d) Symmonds nut, e) Castle nut, **f**) Wings nut, etc.
9.	Profit & Loss and problems concerning to workshop practices.	Permanent Fastening Devices- Rivets – different parts and their types Different types of rivet heads.

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10.	Properties of Matter- Different types of Properties of Matter e.g. Mechanical, Electrical, Chemical, Magnetic.	Rivets Joints – Lap joint and Butt or Strap joint. Lap Joint – a) Single Riveted, b) Double riveted, i) Chain, ii) zig – zag Butt Joint – a) Single plate or strap, b) Double plate or strap
11.	Properties of Matter (Mechanical) - Tenacity, Toughness, Malleability, Ductility, Elasticity, Plasticity, Brittleness, Hardness (concept & definition)	Keys and Cotter Joints, Difference between Keys and Cotters, Different types of Keys.
12.	Properties and uses of copper, zinc, lead, tin, aluminum, brass, bronze, solder, bearing metals, timber, and rubber.	---
13.	Engineering Material- Introduction, classification, Metallic- Non metallic material, physical and mechanical properties,	---
14.	Heat & temperature- Definition and its importance. Scales of Temperature, e.g. Fahrenheit, Centigrade, Kelvin- relationship between them.	---
15.	Transmission of heat- Conduction, Convection and Radiation. Examples from Industries (concept & definition)	---
16.	Transmission of Power and motion of Belt and Pulleys:- Driver and Follower – Open and Cross belt system of belt drives. Velocity ratio. Power Transmission by belt – Problems	---

9.2 EMPLOYABILITY SKILLS

(DURATION: - 55 HRS.)

Topic No.	Topic	Duration (in hours)
	English Literacy	**7**
1.	**Reading** Reading and understanding simple sentences about self, work and environment	
2.	**Writing** Construction of simple sentences Writing simple English	
3.	**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. Taking messages, passing messages on and filling in message forms, greeting and introductions office hospitality, resumes or curriculum vitae essential parts, letters of application reference to previous communication.	
	I.T. Literacy	**10**
1.	**Basics of Computer** Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	
2.	**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. Use of External memory like pen drive, CD, DVD etc,	
3.	**Computer Networking and INTERNET** 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.	
	Communication Skill	**18**
1	**Introduction to Communication Skills** Communication and its importance Principles of Effective communication Types of communication - verbal, nonverbal, written, email, talking on phone. Nonverbal communication - components-Para-language Body - language Barriers to communication and dealing with barriers.	

2	**Listening Skills** Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.	
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.	
4	**Facing Interviews** Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview	
	Entrepreneurship skill	**8**
1.	**Concept of Entrepreneurship** Entrepreneurship- Entrepreneurship - Enterprises:-Conceptual issue. Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.	
2.	**Institutions Support** 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.	
	Productivity	
1.	**Productivity** Definition, Necessity.	
2.	**Affecting Factors** Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.	
3.	**Personal Finance Management** Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	**6**
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 andsafety measures.	
4	**First Aid** Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person	
	Labour Welfare Legislation	
1	**Welfare Acts** Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Employees Provident Fund Act.	
	Quality Tools	**6**
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.	**House Keeping :** Purpose of Housekeeping, Practice of good Housekeeping.	
4.	**Quality Tools** Basic quality tools with a few examples	

10. DETAILS OF COMPETENCIES (ON-JOBTRAINING)

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

Block – I

1. Overhaul of Hydraulic jack
2. Carry out preventive maintenance of machine.
3. Overhaul gear box, worn shaft welding, remove broken bolts by welding etc.
4. Carry out maintenance of anyone type of valve
5. Operate fans and blowers like forced draft fans, induced draft fans ,cooling tower fans (CT fan) including starting, stopping capacity adjustment ,fixing of blades of CT fans etc
6. Operate steam driven equipments like feed water pumps, fans, CEP (condenser extraction pump) including starting, stopping and capacity adjustment.
7. Carry out Operation of Fuel (i.e. Coal/oil/Gas) feeding mechanism including adjustment of flow of coal, Grate drive and draft regulation for proper combustion and use mechanical stoker.
8. Operate burners for oil and gas and also filters.
9. Carry out Operation and reading of gauge glass etc. Level control during the emergency operations and use of blow down valves. (Three element control) as part of Normal level control in Boilers.
10. Practice Operation of water, waste water disposal, softener equipment including feed water softener, Clarificulators precipitators, filters, chemical dosing etc. Pre and post chlorination system, reactivation of Ion exchanges etc.
11. Practice to work with and manage steam Boiler and economizer. (Evaporator, super heater chambers.)
12. Carry out Firing and raising, steam and blow down in Boilers with precautions and follow the steps for starting, firing and when raising steam.
13. Practice internal conditioning of Boiler water by checking the TDS and alkalinity by blow down to prevent sealing, priming, carry over and caustic gauging.
14. Practice periodical inspection of Boilers, preparation of boilers for testing by both Hydraulic test and steam test. (steam blowing test)
15. Practice Routine and Emergency operations of boilers in the event of: a) Loss of fire, b) Failure of F.D. fan. c) Failure of 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. 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 and failure of gauge glass.

16. Identify and explain different parts & fitting of a boiler such as steam and water drums, stoker gauge, water tubes and flow tubes, high and low water level alarm, gauge glasses, soot blowers, safety valves etc. forced draught induced draft and secondary draught fans, chimney, water walls, super heater & economiser, boiler controls, etc and explain functions.
17. Identify different parts of turbines; list their features of construction of blades, nozzles, governor parts, condensers, ejectors etc., and different types of pumps, compressors and different types of valves.
18. Identify parts of various turbines, sketch the construction and explain functions.
19. Carry out the process of DP test (Dye penetration)
20. Identify the steam cylinder, steam chest, diaphragms rotor blades, discs, glands, coupling, bearing etc.
21. Practice the method of gland sealing, steam seals, water seals, clearances, sealing pressure regulators and controls.
22. Identify the turbine auxiliaries such as condensers, ejectors extraction pumps, C.W. pumps etc.
23. Classify the types of Condensers , water flow, steam flow, constant water level control starting a condensing plant or stopping it, care and precautions to prevent loss of vacuum, causes of loss of vacuum, remedies, air leakages, condenser cleaning methods.
24. Identify and start pumps like centrifugal and reciprocating, practice methods of priming, load the pumps and maintain the pumps.
25. Identify various air ejectors, like steam, hydraulic, starting ejectors, their sequence of operation, stopping method, practice starting an ejector in conjunction with a condensing plant.
26. Explain the function and use of evaporators, drain coolers and feed heaters, practice to start and stop their operation and maintain the feed water temperature.
27. Operate atmospheric relief valve and other safety devices.
28. Carry out operation of different types of Compressors and DG sets and maintenance.
29. Trace and explain the cooling water system.
30. Identify and explain the reheat and regenerative system.
31. Practice starting an condensing plant, steam turbine from cold condition, run it with a speed necessary for slow and uniform heating, avoid critical speed and vibration at critical speeds, practice the rules to be followed when removing and applying load on turbo-alterations, stopping a turbine, sequence of operations, stopping the condensing plant and other auxiliaries. Identify the feed water and steam cycle and the turning gear. **(Turbine plant operation)**
32. Explain the necessity of different instruments for measuring and recording temperature, pressure, flow etc. and co-relation of different data as recorded by various instruments

and their relation to load and the turbine supervisory instrumentation.(**Instrumentation and control)**

33. Operate steam pressure reducing station and H.P., L.P. by pass station.
34. Carry out preparation of Project report.
35. Carry out process of plant light up
36. Carry out process of plant shut down.

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

UTILITY OPERATOR			
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 with metric & British graduation	150 mm, Stainless steel	16 nos.
2	Try Square.	150 mm blade	16 nos.
3	Caliper inside spring type.	150 mm	16 nos.
4	Caliper hermaphrodite spring type	150 mm	16 nos.
5	Caliper outside spring type	150 mm	16 nos.
6	Divider spring type	150 mm	16 nos.
7	Scriber	150 mm	16 nos.
8	Centre Punch	10 mm and Length - 120 mm	16 nos.
9	Screw driver	150mm insulated flat type	16 nos.
10	Chisel cold flat	20 mm X 150 mm High carboon steel	16 nos.
11	Hammer ball peen With handle	450 grams (1 lb)	16 nos.
12	Hammer ball peen With handle.	220 grams (1/2 lb)	16 nos.
13	File flat - second cut	250 mm	16 nos.
14	File flat smooth	250 mm.	16 nos.
15	File half round second cut	150 mm.	16 nos.
16	Hacksaw frame fixed type	300 mm	16 nos.
17	Safety goggles.		16 nos.
18	Dot punch	100 mm	16 nos.

B. INSTRUMENTS AND GENERAL SHOP OUTFIT - For 2 (1+1) units no additional items are required

INSTRUMENTS			
19.	Steel Rule Graduated both in Metric and English Unit	300 mm Stainless steel	4 nos.

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20.	Straight edge steel	300 mm or above	2 nos.
21.	Spirit Level metal Type - 2	300 mm Basic Length Accuracy 0.1mm/Meter	1 no.
22.	Stud Extractor EZY - out	Set of 8	2 sets
23.	Combination Set	300 mm	2 nos.
24.	Micrometer outside.	25 - 50 mm	2 nos.
25.	Vernier caliper	150 mm	4 nos.
26.	Wire gauge, metric standard.		1 no.
27.	'U' tube manometers		1 no.
28.	Bourdon tube type gauges of various ranges.		5 nos.
29.	Aneroid barometers		1 no.
30.	Dead weight tester		1 no.
31.	Differential pressure transmitter (pneumatic)		1 no.
32.	Differential pressure transmitter (electronic- HART/ field bus type)		
33.	• Pressure transducers training kits. • Potentiometer • Capacitive • Reluctive • Strain gauge • LVDT load • Cell servo		1 no. each
34.	Orifice type flow meter		1 no.
35.	Ventury tube flow meter		1 no.
36.	Rotameter		1 no.
37.	Level transmitter (inter face)(HART/ field bus/ profibus compatible)		1 no. each
38.	Mercury in glass thermometer (various ranges)		1 no.
39.	Optical pyrometer with all accessories		1 no.
40.	Temperature transmitter, pneumatic		1 no.
41.	Pneumatic and electronic recorders (single point and multi point) both circular and strip chart types.		1 no. each
42.	PID controller trainer consisting of instrument panel, digital computer and interface system		1 no.
43.	Progmmable logic controller (micro PLC) trainer		1 no.

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GENERAL SHOP OUTFIT			
44.	Surface plate C.I/Granite with Stand and Cover	600 x 600 mm	1 nos.
45.	Marking table (Mild steel)	900X900X900 mm	1 no.
46.	Universal scribing block.	220 mm	2 nos.
47.	V-Block pair with clamps	150 x 100 x 100 mm	2 nos.
48.	Angle plate	150 X 150 X 250 mm	2 nos.
49.	Punch letter set.	3 mm	1 no.
50.	Punch number set.	3 mm	1 no.
51.	Portable hand drill (Electric)	0 to 13 mm Capacity	1 no.
52.	Drill twist straight shank	3 mm to 12 mm by 0.5 mm H.S.S.	2 sets
53.	Drill twist Taper shank	8 mm to 20 mm by 0.5 mm H.S.S.	2 sets
54.	Taps and dies complete set	5, 6, 8, 10 & 12 mm set of 5	2 Sets
55.	File knife edge smooth	150 mm	4 nos.
56.	File feather edge smooth	150 mm	4 nos.
57.	File triangular smooth	200 mm	8 nos.
58.	File round second cut	200 mm	8 nos.
59.	File square second cut	250 mm	8 nos.
60.	Feeler gauge	Gauge Feeler / Thickness - 0.05 mm to 0.3 mm by 0.05 and 0.4 mm to 1 mm by 0.1 mm - 13 leaves	1 set
61.	File triangular second cut.	200 mm	8 nos.
62.	File hand second cut.	150 mm	8 nos.
63.	File card.	3"x5" size, brass or steel wire	8 nos.
64.	Oil Can	250 ml	2 nos.
65.	Pliers combination insulated	150 mm	2 nos.
66.	Wooden handle forged Soldering Iron copper bit.	230V, 250 W, 350 gm	2 nos.
67.	Blow Lamp	0.5 litre	2 nos.
68.	Spanner- Double Ended	6x7, 8x9, 10x11, 12x13, 14x15, 16x17, 18x19, 20x22	1 set each
69.	Spanner adjustable	150 mm	2 nos.
70.	Interchangeable ratchet socket set	12 mm driver, sized10-32 mm set of 18 socket & attachments.	1 set
71.	Double Ended tubular Box spanner set with Tommy bar.	A/F 6-25 mm set of 10 Tommy Bar Dia 6, 8, 10, 12, 14, 16	1 set
72.	Scraper flat	150 mm	8 nos.

73.	Chisel cold flat	9 mm X 100 mm	8 nos.
74.	Combination Plier Insulated	200 mm	4 Nos.
75.	Screw Driver Insulated	4mm X 150 mm, Diamond Head	4 Nos.
76.	Screw Driver Insulated	6mm X 150 mm	4 Nos.
77.	Electrician screw driver thin stem insulated handle	4mm X 100 mm	4 Nos.
78.	Neon Tester	500 V	4 Nos.
79.	Wire Cutter and Stripper	150 mm	4 Nos.
80.	Relay- a. Cut out Relays b. Reverse current c. Over current d. Under voltage	 a. 16A, 440V b. 16A, 440V c. 16A, 440V d. 360V-440V	1 No. each
81.	Series Test Lamp	230V, 60W	4 Nos.
82.	Miniature Breaker	16 amp	2 Nos.
83.	MCCB	100Amps, Triple pole	1 No.
84.	Fuses	HRC Glass Rewire Type	3 Each
85.	Digital Multi Meter	DC 200mv -1000v,0 – 10A & AC 200mv- 750v , 0-10A, resistance 0-20 MΩ and 3 1/2 digit	2 Nos.
86.	3- point D.C. Starter	For 2.5 KW DC motor	1 No.
87.	4- point D.C. Starter	For 2.5 KW DC motor	1 No.
88.	Vice bench	150 mm	20 nos.
89.	Bench working.	2400 x 1200 x 900 mm	4 nos.
90.	Almirah.	1800 x 900 x 450 mm	2 nos.
91.	Lockers with 8 drawers (standard size).	One locker for each trainee	3 nos.
92.	Metal rack	1820 x 1820 x 450 cm	1 no.

F. LIST OF ADDITIONAL TOOLS FOR ALLIED TRADE IN WELDING

Sl. no.	Name of the Tool &Equipments	Specification	Quantity
6	Oxy - acetylene gas welding set equipment with hoses, Oxygen & Acetylene cylenders, regulator and other accessories.		1 Set.
7	Gas welding table with positioner with Fire Bricks	900 X 600 X 750 mm	1 No

8	Welding torch tips of different sizes for Oxy - acetylene gas welding	To fit nozzel no. 1, 2, & 3	1 Set
9	Gas lighter.		2 Nos
10	Trolley for gas cylinders.		1 No
11	Chipping hammer.		2 Nos
12	Gloves (Leather)		2 Pairs
13	Leather apron.		2 Nos
14	Spindle key for cylinder valve.		2 Nos.
15	Welding torches.	Nozzles no. 1, 2, & 3	1 Set.
16	Welding goggles		4 Pairs.
17	Welding helmet with coloured flame retardent glass		2 Nos.
18	Tip cleaner		5 Sets.

G. LIST OF TOOLS & ACCESSORIES FOR PNEUMATICS AND HYDRULICS

Sl. no.	Name of the Tool &Equipments	Specification	Quantity
1	Compressor unit	suitable for Pressure: 8 bar, Delivery: 50 lpm (or more), Reservoir capacity: 24 Litres (or more), 230V, 50 Hz, with pressure regulator and water separator	1 No.
3	Pneumatic Workstation with 40 square mm aluminium profile legs, wooden work surface, and one pedestal drawer unit having 5 drawers, each with handles and individual locks, on metallic full panel drawer slide:	(1) Work Table – Size(Approx.) L1200mmXW900mmXH900mm, with four castor wheels including two lockable wheels at the front side, (2) Drawer – Size (Approx.) – L460mmxW495mm xH158mm each, and overall size of Drawer unit (Approx.) - L470mmxW495mmxH825mm and (3) Drawer slide height (Approx.) 85mm.	1 No
4	Carrier for mounting components, such as PB & relay boxes.		1 No
5	Cut section model for pneumatic components		1 set
6	Hydraulic Trainer Kit, each consisting of the following		01 set

	matching components and accessories:		
I.	Hydraulic Power pack	with (1) external gear pump having a delivery rate of 2.5 lpm, (approx.) @ 1400 rpm operating pressure 60 bar, coupled to a single-phase AC motor (230 V AC) having start capacitor and ON/OFF switch and overload protection, (2) pressure relief valve adjustable from 0 – 60 bar, (3) oil reservoir, ≥5 litres capacity having sight glass, drain screw, air filter, and P and T ports.	1 No.
II.	Pressure relief valve	pilot-operated	1 No
III.	Drip tray, steel	size 1160 mm x 760 mm.	1 No.
IV.	Pressure Gauge	Glycerin-damped, Indication range of: 0 – 100 bar	1 No.
V.	Four-Way distributor	with five ports, equipped with a pressure gauge	1 No.
VI.	Double acting hydraulic cylinder	with a control cam, Piston diameter16 mm, Piston rod diameter10 mm, Stroke length 200 mm.	1 No.
VII.	Suitable Weight	for vertical loading of hydraulic cylinder	1 No.
VIII.	Mounting kit for weight	for realizing pulling and pushing load.	1 No.
IX.	3/2-way directional control valve	with hand lever actuation.	1 No.
X.	4/2-way directional control valve	with hand lever actuation.	1 No.
XI.	4/3-way directional control valve	closed-centre position, with hand lever actuation.	1 No.
XII.	Non-return valve.		1 No.
XIII.	Pilot-operated check valve	pilot to open.	1 No.
XIV.	One-way flow control valve	with integrated check valve.	1 No.
XV.	T-Connector with self sealing coupling nipples (2 Nos.) and quick coupling socket (1 No.).		2 Nos.

	XVI. Profile plate,	Anodised Aluminium, 1100x700 mm, with carriers, mounting frames and mounting accessories (To be fitted onto the Hydraulic workstation)	1 set
Machinery :			
1.	SS and SC centre lathe (all geared) with minimum specification	Centre height 150 mm and centre distance 1000 mm along with 3 & 4 jaw chucks, auto feed system, safety guard, taper turning attachment, motorized coolant system, lighting arrangement & standard accessories.	2 Nos.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: UTILITY OPERATOR

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+1 set
2.	Set square celluloid 45^o	(250 X 1.5 mm)	20+1 set
3.	Set square celluloid 30^o-60^o	(250 X 1.5 mm)	20+1 set
4.	Mini drafter		20+1 set
5.	Drawing board IS: 1444	(700mm x500 mm)	20+1 set
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1	Drawing Board		20
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

Utility Operator

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														