OPERATOR BLAST FURNACE IRON MAKING EQUIPMENTS

COMPETENCY BASED CURRICULUM

(Duration: 1 Year 3 Months)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 4

SECTOR – PRODUCTION & MANUFACTURING

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

OPERATOR BLAST FURNACE IRON MAKING EQUIPMENTS

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 4

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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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.

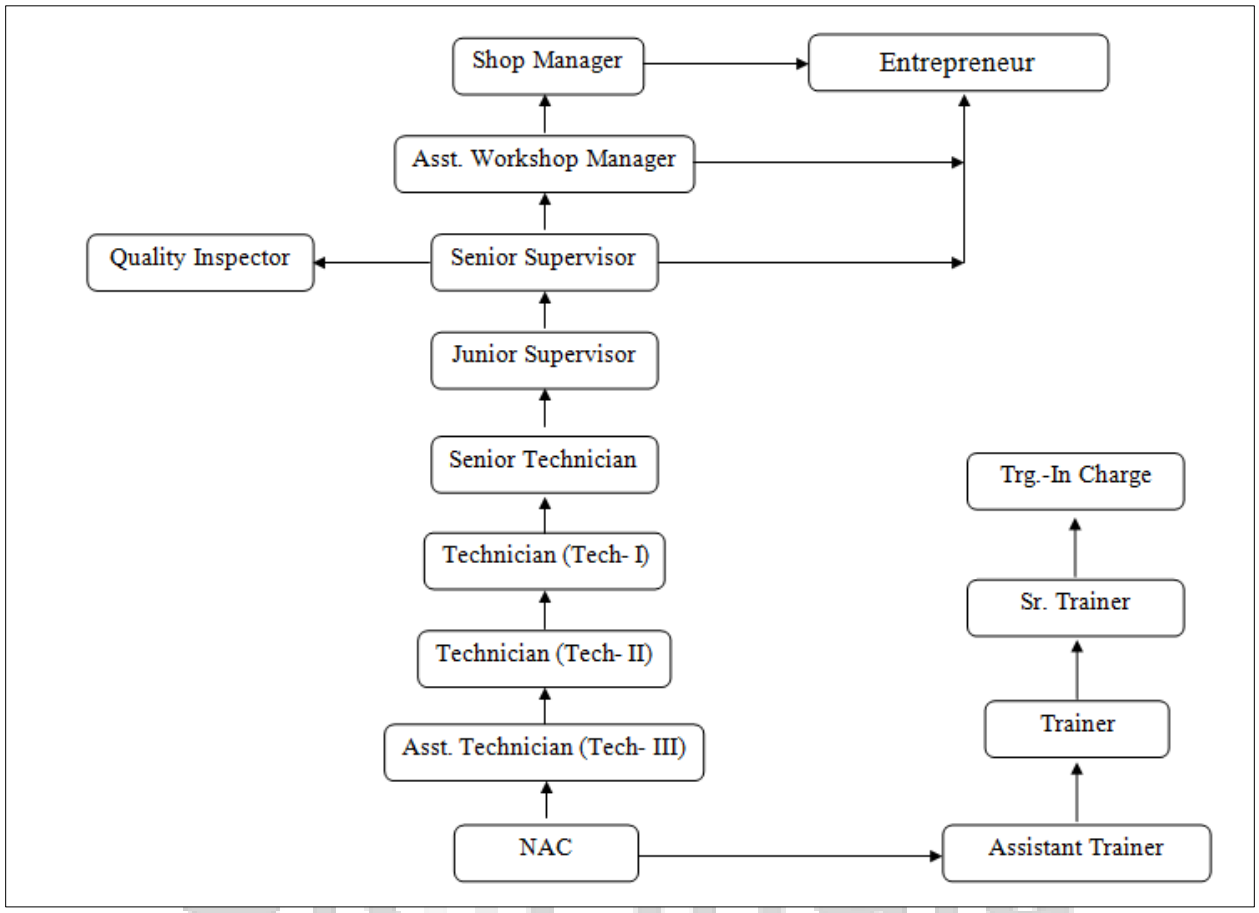
Operator blast furnace iron making equipments trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of one year three months (01 Block of 15months including basic training) duration. It mainly consists of Domain area and Core area. In the 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 job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

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**

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:

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 for "Operator blast furnace iron making equipments."

Operate and maintain the iron making (Blast Furnace) equipment efficiently and safely.

The main jobs are follows:

- Stock house operation, batching & screening, charging
- Control room operation
- Cast house preparation & operation
- Tapping & closing of tap hole i.e., tapping practice.
- Slag granulation.
- G.C.P equipment & operation.
- Safe working practice etc.

Reference NCO Code -2015:

i. **3131.0500 - Power Plant Operator**
ii. **3133.0200 - Furnace Operator (Chemical)**
iii. **3135.1300 - Furnace Operator (Smelting and Refining)**
iv. **3135.2600 - Furnace Man, Reverberatory, Pulverised Coal Fired**

4. NSQF LEVEL COMPLIANCE

NSQF level for Operator blast furnace iron making equipments 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 Operator (Steel Plant) 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	Operator Blast Furnace Iron Making Equipments
NCO - 2015	3131.0500, 3133.0200, 3135.1300, 3135.2600
NSQF Level	Level – 4
Duration of Apprenticeship Training (Basic Training + On-Job Training)	3 months + One year (15 months duration where 01 Block of 12 months duration).
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 with Science and Mathematics 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	Nil
CTS trades eligible for Operator Blast Furnace Iron Making Equipments Apprenticeship	1. Operator Blast Furnace Iron Making Equipments

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 operator blast furnace iron making equipments 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, Heat & Temperature, Levers & Simple machine, 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, 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
DURATION: 12 MONTHS

1. Perform safety appliances such as general safety appliances i.e. helmet, hand gloves etc, Cast house safety appliances i.e. apron, ankle guard etc, gas safety appliances & devices i.e. Gas masks, gas monitors etc.
2. Orient the different sections of Blast Furnace.
3. Perform the Housekeeping practices in various sections of Blast Furnace.
4. Perform the Regular & scheduled check up of all important check points

5. Operate various equipments in stock house & high line i.e. Belt conveyors, screens, weighing system, skip car operation etc.
6. Monitor the bunker position, belt condition, highline condition etc.
7. Monitor the process flow & filling of log books
8. Operate the various equipment i.e. charging equipment, Stoves, septum valve, bleeder valve, Primary Dust Catcher valve, hot blast valve, Snort valve etc.
9. Monitor all operational parameters & filling of log sheets.
10. Perform Visual inspection of Tuyeres, valve condition & other check points.
11. Perform OFF blast & ON blast operation
12. Submit Report of abnormalities
13. Perform Handling of emergency situations i.e. Power failure, cooling water line failure etc.
14. Check the oil levels in mud gun& drill machine, availability of sufficient clay for mud gun, checking of Tap hole face condition, filling of mud gun clay, cleaning of metal –slag runner, runner preparation, sample taking, poking, lancing, Rocking Runner operation etc.
15. Operate equipment i.e. Drums, Conveyors, recovery pumps, granulation pumps, Lubrication pumps etc.
16. Monitor operational parameters & filling log sheet/Log book.
17. Operate various pumps & valves in GCP pump houses – Isolation, pump changing etc.
18. Operate Electrostatic precipitators (Isolation, charging, flushing)
19. Operate slurry disposal system – thickeners, agitators & slurry disposal pumps, flushing & hosing
20. Operate various gas valves for gas line isolation & charging
21. Monitor water levels in Cooling Tower, Scrubber, hot sump and overflow control
22. Operate various pumps, cooling tower fans, valves – Isolation & changing
23. Monitor various parameters i.e. Pump bearing temp, amps, Emergency tank level, water flow rate, line pressure etc. & filling logbooks.
24. Operate major equipment i.e. centrifugal compressor, Screw compressor, Grinding Mill, Hot gas generator, conveyors, bag filters & Tar injection system.
25. Monitor various parameters and their control
26. Operate equipment & pouring of hot metal in pig casting machines.
27. Dismantle the boulders, positioning of ladles, heating of ladles.
28. Operate compressors, cooling water recirculation systems etc.
29. Operate Power Plant, Blower etc.
30. Distribution of clay mass to various furnaces

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, Heat & Temperature, Levers & Simple machine, 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 callipers, 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 (Trade Practical)	Professional Knowledge (Trade Theory)
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 obsed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Institute system including stores procedures. Introduction of First aid. Safety attitude development of the trainee by educating him to use Personal Protective Equipment (PPE). Response to emergencies e.g.; power failure, fire, and system failure. Accidents- Definition types and causes. First-Aid, nature and causes of injury and utilization of first-aid. Introduction to 5S concept & its application. Fire: - Types, causes and prevention methods. Fire Extinguisher, its types. Define environment, environment Pollution, Pollutants, type of Pollution (Air pollution, water pollution, soil pollution noise pollution, thermal pollution, radiation. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2.		**Induction & Safety Training** - Company Profile, Significance of Steel Business - Plant familiarization, Layout, Product Mix, Objectives. - Safety, Health & Environment Awareness - Basic skill development training on use of Tools, basic Measuring Instruments, Coupling & Alignment, Welding, Gas Cutting.
3.	**Video demo of Blast furnace & related safety process.**	**Overview of Blast Furnace & Related Safety Aspects** - Overview of Blast Furnace i.e. Blast Furnace Iron making process flow, technical details of

		Blast Furnaces, important operating parameters etc. - Different sections of Blast Furnace & their functions - General safety & Gas safety - Fire fighting system - Hazards in Blast Furnace - Shut down procedures - Handling of emergency situations - Role of Refractory Bricks
4.	**Video demo of housekeeping and environmental pollution control process.**	**HOUSE KEEPING & ENVIRONMENTAL POLLUTION CONTROL** - Importance of housekeeping & environmental pollution control - Factors affecting environment - Opportunities to control **STOCK HOUSE & HIGHLINE** - Introduction to various equipments in Stock House & Highline i.e. Bunker, Belt Conveyors, Screens, Weigh Hoppers, Skip Car etc. - Process flow & technical details - Important operational parameters & check points - Safety aspects - (Personal & equipment) - Various Standard Operating Practices to be followed - Communication system - Handling of emergency situations i.e. Failure of belt conveyors, Break down of Sinter Fines Belts, PLC system failure, Break down of Coke screen etc
5	**Video demo of furnace proper process.** Practice on Furnace process flow & technical details.(Involving different stoves, top charging equipment, hot blast etc.)	**FURNACE PROPER** - Overview of Blast Furnace process flow & technical details - Important equipment & their functions i.e. Stoves, Top charging equipment, Hot blast valves, bleeder valve, septum valve, snort valves, Tuyeres, back draft valves etc. - Important operational parameters & their control - Important check points - Safety aspects (Personal & equipment) - Various Standard Operating Practices to be

		followed especially OFF blast & ON blast activities - Co-ordination with concerned sections & departments - Handling of emergency situations - i.e. Power failure, blower failure, cooling water line failure, equipment failure etc.
6.	**Video demo of cast house process.**	**CAST HOUSE** - Introduction to important equipment in cast house -their function and technical details i.e. Mud gun, Drill Machine, Cast House crane, Rocking runner, Pusher car, skimmer plate etc. - Major activities to be done i.e. Inspection & filling of mud gun, cleaning & preparation of metal runner, slag runner etc - Safety aspects (Personal & Equipment) - Various Standard Operating Practices to be followed - Communication system - Handling of emergency situation i.e. Cast opening problem, Rocking runner tripping, Pusher car failure, Auto by-pass cut, cleaning & preparation of slag runners etc.
7.	Practice on cast house slag granulation process.(Involving different flow slag, granulation process etc.)	**CAST HOUSE SLAG GRANULATION PROCESS** - Overview & process flow Slag Granulation Process - Major equipment & technical details i.e. Granulation Mechanism, Granulation tank, Dewatering system, Pumps, conveyors, screens, feeders etc. - Important operational parameters & their control - Important check points - Major operational activities to be done i.e. Cleaning & inspection - Safety aspects - (Personal & Equipment) - Various Standard Operating Practices to be followed - Communication system - Handling of emergency situations i.e. Power failure, major equipment failure due to Mechanical problem, belt conveyor failure, pump failure etc.

8.	Practice on Gas cleaning plant.	**GAS CLEANING PLANT** - Overview of Gas Cleaning system – Process flow & technical details - Overview of GCP water recirculation system & slurry disposal system - Important equipment in Gas Cleaning plant and their function i.e. Primary Dust Catcher, Secondary dust catcher, Scrubber, Demister, Semi Clean gas line, Electro Static Precipitators, GCP Pumps etc. - Important parameters & check points - Major operational activities done in shop floor & control room - Safety aspects (Personal & Equipment) - Gas Safety devices & their application - Various Standard Operating Practices to be followed - Communication system - Handling of emergency situations i.e. Power failure, water line leakages, Pump Failure, Gas line leakages etc.
9.	**Video demo of BF-cooling water recirculation system process.**	**BF –COOLING WATER RECIRCULATION SYSTEM** 1. Process flow & technical details of water recirculation system 2. Various pumps, valves & their functions 3. Important parameters & check points 4. Major operational activities done 5. Safety aspects (Personal & Equipment) 6. Various Standard Operating Practices to be followed 7. Communication system 8. Handling of emergency situations i.e. Power failure, water line leakages, Pump Failure etc.
10.	**Video demo of coal dust/ tar injection system process.**	**COAL DUST/ TAR INJECTION SYSTEM** 1. Overview of Coal Dust/ Tar Injection system- Process flow & technical details 2. Major equipment in Coal Dust/Tar Injection system & their functions i.e. centrifugal compressor, Screw compressor, high rise conveyor, hot gas generator, grinding mill, distributor, bag filter, Tar injection system Pumps etc. 3. Important operational parameters & check

		point 4. Major operational activities done 5. Safety aspects (Personal & Equipment) 6. Various Standard Operating Practices to be followed 7. Communication system 8. Handling of emergency situation i.e. Power failure, equipment failure etc.
11.	**Video demo of PIG casting machine process.** Practice on PIG casting machine process.(Involving different pig moulds, conveyor chain, lime spray equipment etc.)	**PIG CASTING MACHINE** 1. Overview of Pig casting process-process flow & technical details 2. Major equipment and their functions i.e. Ladle Tilters, Pouring house, Pig moulds, conveyor chain, Lime spray equipment, wagon winch, storage yard etc. 3. Important tools & tackles required in operation i.e. Hammers, hooks, shovels, lancing pipes etc. 4. Important parameters & check points 5. Safety aspects (Personal & Equipment) 6. Various Standard Operating Practices to be followed 7. Communication system 8. Handling of emergency situations i.e. Equipment failure & Power failure during operation 9. Handling of emergency situation **LADLE REPAIR SHOP** 1. Function of Ladle repair shop 2. Major equipment & their functions 3. Important tools & tackles required 4. Safety aspects (Personal & Equipment) 5. Various Standard Operating Practices to be followed 6. Communication system
12.	**Video demo of centralized compressed air station & power plant (turbo blower) process.**	**CENTRALISED COMPRESSED AIR STATION** 1. Overview & process flow of Compressed air station- technical details 2. Major equipment & their functions in Compressed air station i.e. Compressors, cooling water recirculation system, receivers, Nitrogen manifolds, pipe lines etc. 3. Important parameters & their control

		4. Important check points 5. Safety aspects (Personal & Equipment) 6. Various Standard Operating Practices to be followed 7. Communication systems 8. Handling of emergency situations i.e. Power failure, equipment failure etc. **POWERPLANT (TURBO BLOWER) OVERVIEW** 1. Overview & Process flow 2. Important operating parameters 3. Relation with Blast Furnace operation 4. Communication system 5. Handling of emergency situations i.e. Power failure, Equipment failure etc. **TECHNICAL CELL** 1. Function of Technical cell 2. Overview of Quality parameters 3. Availability & storage of tools & tackles 4. Communication system
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. SYLLABUS - CORE SKILLS

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.
10.	Properties of Matter- Different types of Properties of Matter e.g.	Rivets Joints – Lap joint and Butt or Strap joint.

	Mechanical, Electrical, Chemical, Magnetic.	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

Sl. 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 vita 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-JOB TRAINING)

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

Block – I

DURATION: 12 MONTHS

1. Practice to use safety appliances.
2. Operate the arious equipment in stock house & high line i.e. Belt conveyors, screens, weighing system, skip car operation etc.
3. Monitor the bunker position, belt condition, highline condition, process flow & filling of log books.
4. Operate various equipments i.e. charging equipment, Stoves, septum valve, bleeder valve, Primary Dust Catcher valve, hot blast valve, Snort valve etc.
5. Perform Visual inspection of Tuyeres, valve condition & other check points. And perform OFF blast & ON blast operation.
6. Perform Handling of emergency situations i.e. Power failure, cooling water line failure etc.
7. Check the oil levels in mud gun& drill machine, availability of sufficient clay for mud gun, checking of Tap hole face condition, filling of mud gun clay, cleaning of metal – slag runner, runner preparation, sample taking, poking, lancing, Rocking Runner operation etc.
8. Operate equipment i.e. Drums, Conveyors, recovery pumps, granulation pumps, Lubrication pumps etc.
9. Operate various pumps & valves in GCP pump houses – Isolation, pump changing etc.
10. Operate Electrostatic precipitators (Isolation, charging, flushing), slurry disposal system thickeners, agitators & slurry disposal pumps, flushing & hosing.
11. Operate various gas valves for gas line isolation & charging, monitor water levels in Cooling Tower, Scrubber, hot sump and overflow control
12. Operate various pumps, cooling tower fans, valves, and monitor various parameters for Pump bearing temp, amps, Emergency tank level, water flow rate, line pressure etc.
13. Operate major equipment i.e. centrifugal compressor, Screw compressor, Grinding Mill, Hot gas generator, conveyors, bag filters & Tar injection system.
14. Operate equipment & pouring of hot metal in pig casting machines, compressors, cooling water recirculation systems, Power Plant, Blower etc.
15. Practice to dismantle the boulders, positioning of ladles, heating of ladles,

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

TRADE: OPERATOR BLAST FURNACE IRON MAKING EQUIPMENTS
LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

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

2) Infrastructure:

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**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 (700mm x500 mm) IS: 1444		20+1 set
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
6.	Drawing Board		20
7.	Models : Solid & cut section		as required
8.	Drawing Table for trainees		as required
9.	Stool for trainees		as required
10.	Cupboard (big)		01
11.	White Board (size: 8ft. x 4ft.)		01
12.	Trainer's Table		01
13.	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 **15**	Workplace hygiene **5**	Attendance/ Punctuality **10**	Ability to follow Manuals/ Written instructions **5**	Application of Knowledge **10**	Skills to handle tools & equipment **10**	Economical use of materials **5**	Speed in doing work **10**	Quality in workmanship **15**	VIVA **15**	**Total internal assessment Marks**	**Result (Y/N)**
1														
2														