

OPERATOR ROLLING MILL EQUIPMENTS (LONG PRODUCTS)

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 ROLLING MILL EQUIPMENTS (LONG PRODUCTS)

(Revised in 2018)

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Developed By

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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.



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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 Rolling Mill Equipments (Long Products) trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of 1 year + 3 months duration (01 Block of 15 months duration including basic training). 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.

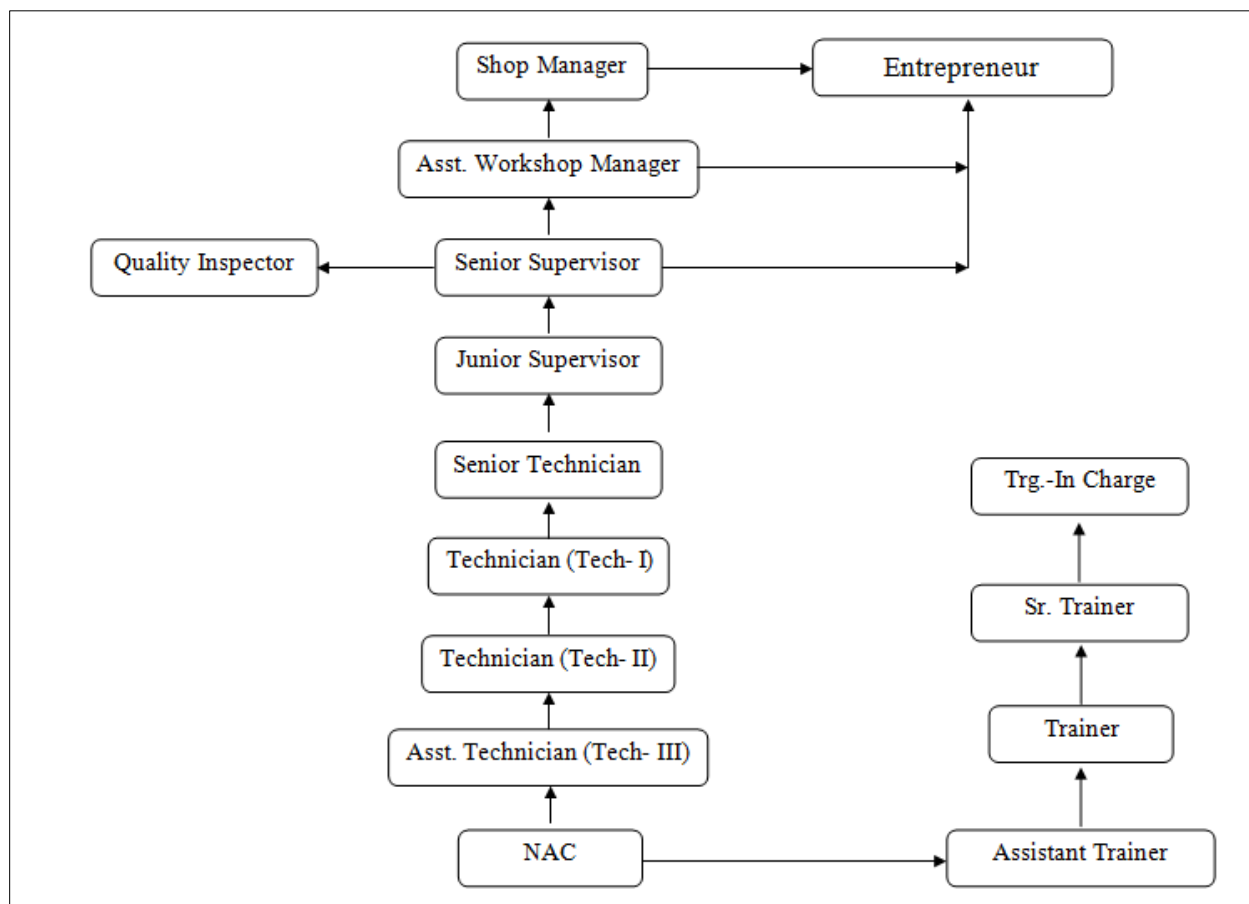
Broadly candidates need to demonstrate that they are able to:

- 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.

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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 three months & 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

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A. Basic Training

For 02 yrs. course (Engg.) :-(**Total 06 months:** 03 months in 1styr. + 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 1styr. + 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

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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.

Brief description of Job roles of Operator Rolling Mill Equipments (Long Products)

The main job responsibilities are as follows:

- Operation and maintenance of reheating furnaces.
- Fuel Mixing
- Mill operation, Mill Setting
- Rolling operation
- Quality Inspection of rolled product.
- Safety & emergency situations.
- Trimming and shearing principles.

Reference NCO: 8122.20 ; Roller, Sheet Mill/Mill Operator



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4. NSQF LEVEL COMPLIANCE

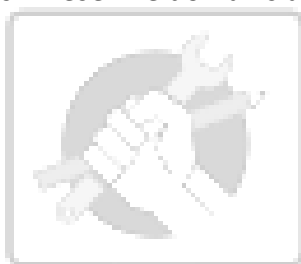
NSQF level for Operator Rolling Mill Equipments (Long Products) trade under ATS: Level 4

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 Rolling Mill Equipments (Long Products) 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 Rolling Mill Equipments(Long Products)
NCO - 2015	88122.20
NSQF Level	Level – 4
Duration of Apprenticeship Training (Basic Training + On-Job Training)	3 months + One year (01 Block of 15 month 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 10 th 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	-----
CTS trades eligible for Operator Rolling Mill Equipments (Long Products) Apprenticeship	-----

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 Rolling Mill Equipments (Long Products) course of 3 months + One year duration (01 Block of 15 month duration including basic training) 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, 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, Assembly drawing, 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. **Overview of Rolling Mills**
 - Concept of Rolling, Types of Rolling Mills, Types of Rolling (Hot & Cold),
 - Types of Rolled Products, Various Techno-economic parameters, Shop Specific Safety measures.
2. **Process Technology (Rolling Mills)**

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- Introduction to different mills e.g. Blooming Mill, Billet Mill, Section Mill, Merchant Mill, Skelp Mill, Wire Rod Mills, Rail Mill & Roll Shop.
- Rolling Mills Sections
 - a. Reheating Furnaces
 - b. Mill Operations
 - c. Roll Building (operations). Roll Setting & Adjustments
 - d. Guard /Guide Making/Setting
 - e. Template Making
 - f. Straightening Machine Operation, Inspection & Detection of Defects and Despatch of materials.
- 3. **Reheating Furnace**
 - Introduction to different types of Furnaces.
 - Operating Practice of Charging & Discharging of Materials from the Furnace.
 - Judging temperature of materials inside the Furnace.
 - Operating procedure of Pusher Bar in the Furnace.
 - Furnace lighting up and closing down procedure.
 - Demonstration on control of the inside temperature of Furnace.
 - Different types of Instruments used for temperature measurement, pressure control etc.
 - Cleaning different parts of the furnace and maintaining good housekeeping.
- 4. **Mill Operations**
 - Safety precautions for Mill Operations.
 - Introduction to different mills e.g. Blooming Mill, Billet Mill, Section Mill, Merchant Mill, Skelp Mill, Wire Rod Mills, Rail Mill & Roll Shop.
 - Operating procedure of different pulpits.
 - Checking various points for pulpit operation.
 - Demonstration on Rapid Quenching process, Heat treatment, Cutting & Bundling operation, Colour coding & Inspection
 - Cleaning / Lubricating different parts and maintaining good housekeeping
- 5. **Roll Building Operations**
 - Safety precautions for Roll Assembling and Roll Building.
 - Points to be checked during Roll assembling in different mills for smooth rolling.
 - Setting the bearing, cramp bars, guides and guards of different mills.
 - Checking all the points for roll building.
 - Cleaning / lubrication of different parts and maintaining good housekeeping.
 - Hammering technique.
- 6. **Guide & Guard Making**
 - Safety precautions for Guide & Guard making.
 - Grinding machine operation
 - Understanding of guard dimension i.e. Heel Height, Guard length
 - Doing leveling, alignment and adjustment of dummy cramp bar.
 - Grinding Wheel Changing technique from grinder.
 - Vice Setting technique and Supporting equipment.

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- Cleaning / lubrication of different parts and maintaining good housekeeping.
- 7. **Template Making**
 - Safety precautions for Guide & Guard making.
 - Marking of lines and curve.
 - Flatness checking practice of the surface.
 - Hack saw cutting Practice.
 - Using of Scriber, Marking/draw the Template drawing of different section on slate.
 - To ensure development of knowledge & Skill to finish the Template
 - Clean/lubricate different parts and maintain good housekeeping.
 - Inspection of template.
- 8. **Straightening Machine Operation**
 - Observing the Safety precautions while operating Straightening m/c.
 - Maintaining the safety of the equipment.
 - Information exchange during shift changeover
 - Stacking of different rolls after removal from m/c.
 - Emergency procedure.
 - Post roll changing procedure.
 - Rectification of defects like
 - a. sweep.
 - b. out of square.
 - c. camber.
 - Roll changing procedure.
 - Hammering technique.
- 9. **Finishing & Despatch of Materials**
 - Observing the Safety precautions during Dispatch.
 - Implementation of dispatch procedures including slinging / deslinging of materials, safety precautions, material identification, marking, colour coding and adjustment of wagons.

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.

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electrical and	
apply in day to day work. <i>[Different mathematical calculation & science -Work, Power & Energy, Geometry & Mensuration, Heat & Temperature, Levers & Simple machine, Centre of gravity, Power transmission, Pressure]</i>	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. <i>[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Electrical & electronic symbol]</i>	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 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	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment

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in day to day work by optimally using available resources.	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	
<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 surroundings where nature of job is routine type, situation of clear choice & predictable. 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 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.</i>	

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.	Safety Precautions to be followed at site. Fire precautions causes and types of fire, precaution against outbreak of fire. Fire extinguisher types and uses. Proper centering erection, proper scaffolding making & precautions to be taken while working at higher attitudes and during hot repair. Precautions to be followed in Gas hazardous area. Precaution during dismantling
2.	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. Drill on fire fighting & safety	Induction & Safety Training Company Profile, Significance of Steel Business Plant familiarization, Layout, Product Mix, Objectives. Safety, Health & Environment Awareness Basic skill development training on Fitting, Use of Tools, Measuring Instruments, Coupling & Alignment, Welding, Gas Cutting.
3.	Video demo of the related processes	Overview of Rolling Mills • Concept of Rolling, Types of Rolling Mills, Types of Rolling (Hot & Cold), • Types of Rolled Products, Various Techno-economic parameters • Shop Specific Safety measures.
4.	Video demo of process technology.	Process Technology • Introduction to different mills e.g. Blooming Mill, Billet Mill, Section Mill, Merchant Mill, Skelp Mill, Wire Rod Mills, Rail Mill & Roll Shop. • Rolling Mills Sections a. Reheating Furnaces

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		b. Mill Operations c. Roll Building (operations). Roll Setting & Adjustments d. Guard /Guide Making/Setting e. Template Making f. Straightening Machine Operation, Inspection & Detection of Defects and Despatch of materials.
5	video demo of the reheating furnace processes	Reheating Furnace a) Safety precautions to be taken during Furnace operation. b) Understanding different types of Furnaces. c) Functions of different parts of a Furnace. d) Different types of fuels used in various Furnaces.
6	Practice on drive of reheating furnace.	Reheating Furnace e) Materials to be heated inside the furnace for different mills. f) The Entry and Exit temperature of material. g) Principle of charging & discharging of furnace. h) The controlling parameters to maintain the inside temperature of the furnace. i) Importance of cleaning different parts of the furnace and housekeeping.
7	video demo of the mill operating processes	Mill Operations a) Safety precautions to be taken for Mill operations b) The points to check during Roll assembly in different mills. c) Functions of pulpit operations. d) Points to check during pulpit operation. e) Function of Rapid Quenching process f) Finishing procedure: Heat treatment, Cutting & Bundling operation, Colour coding & Inspection g) Importance of cleaning / lubrication of different parts and housekeeping.
8	video demo of the roll operations processes	Roll Building Operations 1) Safety precautions to be taken for Roll Building. 2) Points to be checked during Roll assembling in different mills. 3) Functions of Guide and stripper guards.

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		4) Points to be checked during Roll Building. 5) Importance of cleaning / lubrication of different parts and housekeeping. 6) Hammering technique.
9.	video demo of the guide & guard processes	Guide & Guard Making - Safety precautions to be taken for Guide & Guard making. - Digital measuring instruments. - Importance of grinder and spirit level. - Understanding of Guard line and its implication - Understanding Basics of guard drawing. - Understanding Type of grinding wheel and its implications. - Understanding Type of vice and how to set it. - Holding Grinding machine during grinding. - Parameters to be checked while fitting the guard on Roll Pass - Importance of cleaning/lubrication of different parts and housekeeping.
10	Practice on template making.(Involving different safety precaution, marking, measuring and other related operations)	Template Making - The safety precautions to be followed while filing the template. - Construction ,use, function and type of marking, measuring & cutting tools such as vices , hammers, hacksaw, files, drill, scriber, steel rule & digital instruments. - Elementary details of Roll Pass Drawing - Type of Template used in Roll Shop, inspection of template & criteria for rejection. - Template making Technique - Understanding Type of vice and how to set it. - Importance of cleaning / lubrication of different parts and housekeeping
11	video demo of the related skills	Straightening Machine Operation - The safety precautions to be followed for straightening operation. Maintaining specified tolerance for straightness. - Aligning of Rolls after changing the section. - Co-ordination by Straightener for

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		a. two bars not released simultaneously on outgoing side. b. safe movement of people on outgoing side. c. matching the speed of entry at ingoing with the speed of removal at outgoing side. 4. Taking first bar at slow speed. 5. Keeping all same size Rolls together in one place. 6. Dressing all same size Rolls in a single set in Roll Shop. 7. Using Hammer for tightening / opening Lock nut and Ring nut. 8. Using Sample piece for fixing liners in between Roll pairs for Out of Square adjustment.
12	Video demo of finishing & despatch of materials process.	Finishing & Despatch of Materials 1. Safety precautions to be followed during dispatch of material. 2. Understanding of materials as per dimensions and quality. 3. To understand the dispatch procedures as per the requirement of the Customer. 4. To understand the Stack Card System and maintenance of the same to facilitate loading activities. 5. To understand the basics of system for Despatch module
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.	Introduction to Engineering drawing, its importance and uses in engineering fields. Simple definitions of Points, Lines, Parallel straight lines.	Applied workshop problems involving simple addition, subtraction, multiplication, division and common fractions.
2.	Geometrical construction of Square, Rectangle, Triangle, Circle, Polygons, etc.	Science- Definition, Nomenclature, various branches, significance and definitions of important terms.
3.	Drawing different types of lines.	Rounding of decimal values, use of approximation.
4.	Free hand sketch of Hand tools used in the trade.	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.
5.	Screw Threads – Forms of Various Screw threads used in general in the industry – Nomenclature, convention	Workshop problems related to average.
6.	Fastening Devices – Temporary and Permanent. Meaning and difference. Temporary Device – Hexagonal Bolt, Nut, Check Nut, Washer.	Workshop problems related to percentage.
7.	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.	Workshop problems related to ratio and proportion.
8.	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.	Workshop problems related on time & work.
9.	Permanent Fastening Devices- Rivets – different parts and their types Different types of rivet heads.	Profit & Loss and problems concerning to workshop practices.
10.	Rivets Joints – Lap joint and Butt or Strap joint. Lap Joint – a) Single Riveted, b) Double	Properties of Matter- Different types of Properties of Matter e.g. Mechanical, Electrical, Chemical, Magnetic.

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	riveted, i) Chain, ii) zig – zag Butt Joint – a) Single plate or strap, b) Double plate or strap	
11.	Keys and Cotter Joints, Difference between Keys and Cotters, Different types of Keys.	Properties of Matter (Mechanical) - Tenacity, Toughness, Malleability, Ductility, Elasticity, Plasticity, Brittleness, Hardness (concept & definition)
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

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9.2 EMPLOYABILITY SKILLS

(Duration: 55hrs)

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 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.	

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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	
1.	Concept of Entrepreneurship Entrepreneurship- Entrepreneurship - Enterprises:-Conceptual issue. Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.	8
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.	6
3.	Personal Finance Management Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	
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.	

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	Accident Prevention techniques - control of accidents and safety measures.	
4.	First Aid Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person	
	Labour Welfare Legislation	
1.	Welfare Acts Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Employees Provident Fund Act.	6
	Quality Tools	
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	

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10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

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

Block – I

1. Overview of Rolling Mills

- Concept of Rolling, Types of Rolling Mills, Types of Rolling (Hot & Cold),
- Types of Rolled Products, Various Techno-economic parameters, Shop Specific Safety measures.

2. Process Technology (Rolling Mills)

- Introduction to different mills e.g. Blooming Mill, Billet Mill, Section Mill, Merchant Mill, Skelp Mill, Wire Rod Mills, Rail Mill & Roll Shop.
- Rolling Mills Sections
 - a. Reheating Furnaces
 - b. Mill Operations
 - c. Roll Building (operations). Roll Setting & Adjustments
 - d. Guard /Guide Making/Setting
 - e. Template Making
 - f. Straightening Machine Operation, Inspection & Detection of Defects and Despatch of materials.

3. Reheating Furnace

- Introduction to different types of Furnaces.
- Operating Practice of Charging & Discharging of Materials from the Furnace.
- Judging temperature of materials inside the Furnace.
- Operating procedure of Pusher Bar in the Furnace.
- Furnace lighting up and closing down procedure.
- Demonstration on control of the inside temperature of Furnace.
- Different types of Instruments used for temperature measurement, pressure control etc.
- Cleaning different parts of the furnace and maintaining good housekeeping.

4. Mill Operations

- Safety precautions for Mill Operations.
- Check points during Roll assembling in different mills for smooth rolling.
- Operating procedure of different pulpits.
- Checking various points for pulpit operation.
- Demonstration on Rapid Quenching process, Heat treatment, Cutting & Bundling operation, Colour coding & Inspection

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- Cleaning / Lubricating different parts and maintaining good housekeeping

5. Roll Building Operations

- Safety precautions for Roll Assembling and Roll Building.
- Points to be checked during Roll assembling in different mills for smooth rolling.
- Setting the bearing, cramp bars, guides and guards of different mills.
- Checking all the points for roll building.
- Cleaning / lubrication of different parts and maintaining good housekeeping.
- Hammering technique.

6. Guide & Guard Making

- Safety precautions for Guide & Guard making.
- Grinding machine operation
- Understanding of guard dimension i.e. Heel Height, Guard length
- Doing leveling, alignment and adjustment of dummy cramp bar.
- Grinding Wheel Changing technique from grinder.
- Vice Setting technique and Supporting equipment.
- Cleaning / lubrication of different parts and maintaining good housekeeping.

7. Template Making

- Safety precautions for Guide & Guard making.
- Marking of lines and curve.
- Flatness checking practice of the surface.
- Hack saw cutting Practice.
- Using of Scriber, Marking/draw the Template drawing of different section on slate.
- To ensure development of knowledge & Skill to finish the Template
- Clean/lubricate different parts and maintain good housekeeping.
- Inspection of template.

8. Straightening Machine Operation

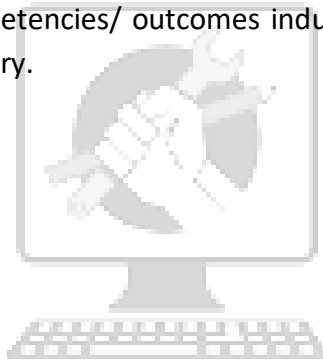
- Observing the Safety precautions while operating Straightening m/c.
- Maintaining the safety of the equipment.
- Information exchange during shift changeover
- Stacking of different rolls after removal from m/c.
- Emergency procedure.
- Post roll changing procedure.
- Rectification of defects like
 - a. sweep.
 - b. out of square.
 - c. camber.
- Roll changing procedure.

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- Hammering technique.
- 9. **Finishing & Despatch of Materials**
- Observing the Safety precautions during Dispatch.
- Implementation of dispatch procedures including slinging / deslinging of materials, safety precautions, material identification, marking, colour coding and adjustment of wagons.

Note:

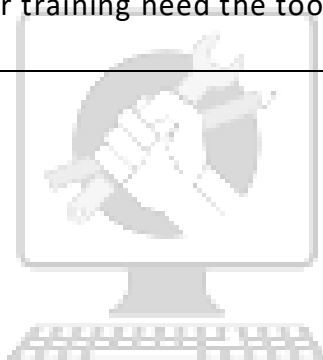
1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.
2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.



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INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

OPERATOR ROLLING MILL EQUIPMENTS (LONG PRODUCTS)			
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.	As per training need the tools & equipment		



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Operator Rolling Mill Equipments (Long Products)

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: OPERATOR ROLLING MILL EQUIPMENTS (LONG PRODUCTS)

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° (250 X 1.5 mm)		20+1 set
3.	Set square celluloid 30°-60° (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
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

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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.
<i>Note: - Above Tools & Equipments not required, if Computer LAB is available in the institute.</i>		

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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	Maximum Marks (Total 100 Marks)	15	5	10	5	10	10	5	10	15	15	Total internal assessment Marks	Result (Y/N)
	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	
1													
2													