

CURRICULUM

FOR THE TRADE OF

CRANE OPERATOR OVERHEAD
(STEEL INDUSTRY)

UNDER

APPRENTICESHIP TRAINING SCHEME

2017



सत्यमेव जयते
Government of India

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

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1. TATA Steel, Jamshedpur

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

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

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

2. BACKGROUND

2. 1. Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry. There are four categories of apprentices namely; **trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

2. 2. Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

2. 3. Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.

- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

3. RATIONALE

(Need for Apprenticeship in Crane Operator Overhead Steel Industry trade)

- 1) Operates overhead crane to lift, move, and position loads, such as machinery, equipment, products, and solid or bulk materials, using hoisting attachments, such as hook, sling, electromagnet, or bucket.
- 2) Observes load hookup and determines safety of load.
- 3) Responsible in leading their entire team which participates in the moving such as spotters and flaggers.
- 4) Ensuring the smooth ongoing operation and productivity of the Facility.
- 5) Using the grab and crane bridge to feed the treatment line with waste.
- 6) Selecting bulky waste and non-conforming waste to be removed from the pit.
- 7) Keeping the work place area clean and tidy.
- 8) Working to health and safety, environmental other standards as they apply to the process.
- 9) Processing and movement of material.
- 10) Carry out daily checks in accordance with company procedures.
- 11) Maintaining standard operating procedures as required.
- 12) Manipulates or depresses crane controls, such as pedals, levers, and buttons, to regulate speed and direction of crane and hoist movement according to written, verbal, or signal instructions.
- 13) Cleans and maintains crane and hoisting mechanism.
- 14) Inspects crane for defective parts and notifies supervisor of defects or malfunctions.
- 15) May attach load to hook or other crane accessory prior to operating crane.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Overhead Crane Operator Overhead Crane Operator; Bridge Crane Operator operates electrically-driven crane running on overhead rails laid on metal bridge to lift, move and lower heavy objects from one place to another. Switches on power supply; takes position in overhead cabin and signals ground crew to move away from crane; manipulates levers and controls to check and assure bridge hoist, lifting tackle etc., are free from mechanical jamming and in working order; operates controls to move bridge along rails and lifting equipment along bridge tackle for loads to be attached; follows signals from ground crew to raise, move and lower load in desired position observing proper operating and safety conditions. Shuts down power supply on completion of work. May undertake minor repairs to crane.

Reference NCO:

- i) **NCO-2015:** -- 8343.0700

5. GENERAL INFORMATION

1. **Name of the Trade** : **CRANE OPERATOR OVERHEAD (STEEL INDUSTRY)**
2. **N.C.O. Code No.** : **NCO-2015: -- 8343.0700**
3. **Duration of Apprenticeship Training (Basic Training + Practical Training):** 15 Months
4. **Duration of Basic Training:** -
 - a) Block –I : 3 months

Total duration of Basic Training: 3 months
5. **Duration of Practical Training (On -job Training):** -
 - a) Block–I: 12 months

Total duration of Practical Training: 12 months
6. **Entry Qualification** : Passed in 10th class examination
7. **Selection of Apprentices:** The apprentices will be selected as per Apprentices Act amended time to time.
8. **Rebate for ITI passed trainees** : **NIL**

Note: Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.

6. COURSE STRUCTURE

Training duration details: -

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

| Components of Training ↓ | Duration of Training in Months → | | | | | | | | | | | | | | |
|-------------------------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Basic Training Block - I | | | | | | | | | | | | | | | |
| Practical Training Block - I | | | | | | | | | | | | | | | |

7. SYLLABUS
7.1 BASIC TRAINING
(BLOCK – I)
DURATION: 03 MONTHS

GENERAL INFORMATION

- 1) **Name of the Trade** : **CRANE OPERATOR OVERHEAD STEEL INDUSTRY**
- 2) **Hours of Instruction** : 500 Hrs.
- 3) **Batch size** : 20
- 4) **Power Norms** : 3 KW for Workshop
- 5) **Space Norms** : 70 Sq. m.
- 6) **Examination** : The internal assessment will be held on completion of each Block.
- 7) **Instructor Qualification** :

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

OR

ii) NTC/NAC in the trade of **CRANE OPERATOR OVERHEAD** with three year post qualification experience in the relevant field.
Preference will be given to a candidate with Craft Instructor Certificate (CIC)

- 8) **Tools, Equipments & Machinery required:** - As per Annexure – I

7.1.1 DETAIL SYLLABUS OF CORE SKILL

A. Block– I Basic Training

| Topic No. | a) Engineering Drawing | Duration (in hours) | b) Workshop Science & Calculation | Duration (in hours) |
|-----------|---|---------------------|---|---------------------|
| | | 30 | | 20 |
| 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 riveted, i) Chain, ii) zigzag Butt Joint – a) Single plate or strap, b) Double plate or strap | | Properties of Matter- Different types of Properties of Matter e.g. Mechanical, Electrical, Chemical, Magnetic. | |
| 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 | |

7.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I

Basic Training

| Week No. | Professional Skills | Professional Knowledge |
|----------|--|--|
| 1. | <p>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.</p> <p>Preventive measures for electrical accidents & steps to be taken in such accidents.</p> <p>Importance of housekeeping & good shop floor practices.</p> <p>Disposal procedure of waste materials like cotton waste, metal chips/burrs etc.</p> <p>Fire& safety: Use of Fire extinguishers.</p> <p>Safety regarding working with different types of steam and its First-Aid.</p> | <p>Importance of safety and general precautions observed 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.</p> <p>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.</p> <p>Accidents- Definition types and causes. First-Aid, nature and causes of injury and utilization of first-aid.</p> <p>Introduction to 5S, VMW (Visual Work Place) concept & its application.</p> <p>Fire: - Types, causes and prevention methods. Fire Extinguisher, its types.</p> <p>Define environment, environment Pollution, Pollutants, type of Pollution (Air pollution, water pollution, soil pollution noise pollution, thermal pollution, radiation.</p> <p>Global warming its causes and remedies.</p> <p>Industrial Waste its types, sources and waste Management.</p> |
| 2. | <p><u>Fitting Shop (Tolerance $\pm .05$ mm) :</u></p> <ul style="list-style-type: none"> ● Safety in fitting shop. ● Tools used in fitting - their purpose and function. ● Marking the job. ● Different types of chisels and their selection. ● Use of hacksaw. | <p>Importance of Material Handling in steel industry, and various types of material handling equipment</p> <p>Different types of cranes commonly used in Steel Industry and their specific used.</p> <p>General description and construction of simple E.O.T. crane</p> <p>Duties and Responsibilities of a crane operator</p> <p>Main parts of an E.O.T. crane and functions of each</p> |

| | | |
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| | | Long Travel and Cross Travel assemble Special purpose cranes and functions of each |
| 3. | <p><u>Fitting Shop (Tolerance $\pm .05$ mm) :</u></p> <ul style="list-style-type: none"> • Types of files and their uses. • Chipping. • Drilling and tapping. • Counter sinking. • Preparation of studs, nuts, etc, • Simple fitting exercises. | <p>Lifting devices: Simple hook, C-hook, Ramshorn Hook, Spreader Beam, Claw, Magnet Brab Bucket etc and criteria for selecting a particular device Ropes and slings, choice of a sling for a particular load.</p> |
| 4. | <p><u>Electrical Shop:</u></p> <ul style="list-style-type: none"> • Use of basic hand tools for electrical trade group. • Use of electrical appliances such as switches, plugs cut outs, fuses, regulator etc. • Making simple circuits on board. • Verification of Ohm's Law. | <p>The electrical system of crane – power supply, main and trolley bus bars, isolator, circuit breaker, fuses, contact panel resistances, motors, master controllers, eldros etc. Crane operation – handling over, taking over, perstart checks, sequence in starting the crane, moving the crane, stopping the crane, reversing, braking, parking etc.</p> |
| 5. | <p><u>Electrical Shop:</u></p> <ul style="list-style-type: none"> • Use of electrical measuring instruments'. • Locating and rectifying faults in simple circuits. • Running , care and maintenance of all types of D.C. and A.C. motors, and starter, generators, rectifiers, • Electrical maintenance aspects. | <ul style="list-style-type: none"> • Types of brakes. • Function and types of Limit switch • Drives and inter locks in a crane • Crane signals • Stops to be taken in case of emergency power failure, fire in the cabin or crane, sudden failure of some vital parts. • General safety rules • Shut down produces. |
| 6. | <p><u>Welding Shop:</u></p> <ul style="list-style-type: none"> • Safety in welding shop. • Use of hand tools for oxy-acetylene welding. • Use of welding torch, acetylene generators and oxygen cylinder. • Simple welding and gas cutting exercises • Brazing and soldering | <ul style="list-style-type: none"> • Types and classification of cranes, I. S. I. specification (15807; 4137, 3177) covering the cranes with special reference to steel plant application. • Tong cranes - rigid and flexible "type, construction tong ' opening, closing and slewing mechanism • Method of inspection of crane equipment and checking their suitability for working. • Safety devices in a crane and proper use and function of each. |
| 7. | - Do - | <ul style="list-style-type: none"> • Safety on cranes. • Uses and misuses of a crane. • Unsafe conditions for crane movement. • Care of chains, slings, hooks, magnet etc. |

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| | | <ul style="list-style-type: none"> Common defects - causes and remedial measures. |
| 8. | <p><u>Maintenance Shop</u></p> <ul style="list-style-type: none"> Dismantling, assembling, repairing, changing of parts and lubrication of vices. Valves - types. Gasket cutting and fitting. | <p>General instruction for crane operator. Do's and don'ts for a good operator. Magnet cranes - special features and safety measures. Comparative study of AC & DC cranes. General maintenance instructions.</p> |
| 9. | <p><u>Maintenance Shop</u></p> <ul style="list-style-type: none"> Pumps. Hydraulic equipment. Gear boxes. Bearing and fittings dismantling and assembling. Couplings, pillow block's. | <p>Preventive and running maintenance of crane. Lubrication system of a crane. Testing and commissioning of a crane. Testing and taking over of a crane after repairs.</p> |
| 10. | <p><u>Rigging:</u></p> <ul style="list-style-type: none"> Wire ropes, slings. Judgment and shifting of weight. Lifting equipment. | <p>Provisions under factory act relating to operation and maintenance of a crane. First aid. Fire fighting. Study of some typical breakdown cases - cause and steps taken to rectify it. Cost factors - cost of equipment-and cost of an accident. Fast wearing crane parts and their norms of rejection.</p> |
| 11. | <p><u>Rigging:</u></p> <ul style="list-style-type: none"> Different types of knots. Chain pulley blocks, hooks. Grease, lubricants and lubricating system. Tools used in maintenance. | <p>Importance and growth of Iron and Steel Industry in India Technological innovation in steel making Name, location, present capacity and future plans of steel producing industries</p> |
| 12. | - Do - | <p>Raw materials needed for the Iron and Steel Industry. Their availability in India Special feature of steel industry, steel production .through integrated steel plants and through smaller units (including mini steel plant). Raw materials preparation methods : sintering pelletizing and their relative advantages and disadvantages.</p> |
| 13. | Revision & Internal Assessment | |

7.1.3 EMPLOYABILITY SKILLS

GENERAL INFORMATION

- 1) **Name of the subject** : **EMPLOYABILITY SKILLS**
- 2) **Applicability** : **ATS- Mandatory for fresher only**
- 3) **Hours of Instruction** : **110 Hrs. (55 hrs. in each block)**
- 4) **Examination** : **The examination will be held at the end of two years Training by NCVT.**
- 5) **Instructor Qualification** :

i) MBA/BBA with two years experience or graduate in sociology/social welfare/Economics with two years experience and trained in Employability skill from DGET Institute.

And

Must have studied in English/Communication Skill and Basic Computer at 12th /diploma level

OR

ii) Existing Social Study Instructor duly trained in Employability Skill from DGET Institute.

7.1.3.1 SYLLABUS OF EMPLOYABILITY SKILLS

A. Block – I Basic Training

| Topic No. | Topic | Duration (in hours) |
|-----------|---|---------------------|
| | English Literacy | 15 |
| 1 | Pronunciation : Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech) | |
| 2 | Functional Grammar Transformation of sentences, Voice change, Change of tense, Spellings. | |
| 3 | Reading Reading and understanding simple sentences about self, work and environment | |
| 4 | Writing Construction of simple sentences Writing simple English | |
| 5 | Speaking / Spoken English Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication. | |
| | I.T. Literacy | 15 |
| 1 | Basics of Computer Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer. | |
| 2 | Computer Operating System Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications. | |
| 3 | Word processing and Worksheet Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets | |
| 4. | Computer Networking and INTERNET Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page | |

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| | and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes. | |
| | Communication Skill | 25 |
| 1 | Introduction to Communication Skills Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body - language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort. Case study/Exercise | |
| 2 | Listening Skills Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills. | |
| 3 | Motivational Training Characteristics Essential to Achieving Success The Power of Positive Attitude Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning. Case study/Exercise | |
| 4 | Facing Interviews Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview | |
| 5 | Behavioral Skills Organizational Behavior Problem Solving Confidence Building Attitude Decision making Case study/Exercise | |
| | Entrepreneurship skill | 15 |
| 1 | Concept of Entrepreneurship Entrepreneurship- Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. Management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business. | |

| | | |
|---|--|-----------|
| 2 | Project Preparation & Marketing analysis Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of Product Life Cycle (PLC), Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix. | |
| 3 | Institutions Support Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme. | |
| 4 | Investment Procurement Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes. | |
| | Productivity | 10 |
| 1 | Productivity Definition, Necessity, Meaning of GDP. | |
| 2 | Affecting Factors Skills, Working Aids, Automation, Environment, Motivation How improves or slows down. | |
| 3 | Comparison with developed countries Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages. | |
| 4 | Personal Finance Management Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance. | |
| | Occupational Safety, Health & Environment Education | 15 |
| 1 | Safety & Health Introduction to Occupational Safety and Health importance of safety and health at workplace. | |
| 2 | Occupational Hazards Basic Hazards, Chemical Hazards, Vibro-acoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention. | |
| 3 | Accident & safety Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures. | |
| 4 | First Aid Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person | |
| 5 | Basic Provisions Idea of basic provision of safety, health, welfare under legislation of India. | |
| 6 | Ecosystem Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance. | |
| 7 | Pollution Pollution and pollutants including liquid, gaseous, solid and hazardous waste. | |
| 8 | Energy Conservation Conservation of Energy, re-use and recycle. | |

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| 9 | Global warming Global warming, climate change and Ozone layer depletion. | |
| 10 | Ground Water Hydrological cycle, ground and surface water, Conservation and Harvesting of water | |
| 11 | Environment Right attitude towards environment, Maintenance of in -house environment | |
| | Labour Welfare Legislation | 5 |
| 1 | Welfare Acts Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act. | |
| | Quality Tools | 10 |
| 1 | Quality Consciousness : Meaning of quality, Quality Characteristic | |
| 2 | Quality Circles : Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles. | |
| 3 | Quality Management System : Idea of ISO 9000 and BIS systems and its importance in maintaining qualities. | |
| 4 | House Keeping : Purpose of Housekeeping, Practice of good Housekeeping. | |
| 5 | Quality Tools Basic quality tools with a few examples | |

7.2 PRACTICAL TRAINING (ON-JOB TRAINING)
(BLOCK – I)
DURATION: 12 MONTHS

GENERAL INFORMATION

- 1) **Name of the Trade** : **CRANE OPERATOR**
- 2) **Batch size** : a) Apprentice selection as per Apprenticeship guidelines.
b) Maximum 20 candidates in a group.
- 3) **Examination** : i) The internal assessment will be held on completion of each block
ii) NCVT exam will be conducted at the end of 2nd year.
- 4) **Instructor Qualification** :

i) Degree/Diploma in **Mechanical** Engg. from recognized university/Board with one/two year post qualification experience in the relevant field.

OR

ii) NTC/NAC in the trade of **CRANE OPERATOR** with three year post qualification experience in the relevant field.

Preference will be given to a candidate with Craft Instructor Certificate (CIC)

- 5) **Infrastructure for On-Job Training** : - As per Annexure – II

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

A. BLOCK - I

DURATION: 12 MONTHS

1. Safety aspects of crane operations.
2. Reading, Understanding, Interpreting & follow SOP (Standard Operating Procedure)
3. Taking over and handing over crane.
4. Family its and locating main parts.
5. Signaling.
6. Checks before starting a crane.
7. Sequence in starting a crane.
8. Checks after starting and before moving the crane.
9. Procedure for lifting heavy loads.
10. Testing of limit switches and brakes.
11. Testing of slings, ropes and magnets.
12. Moving the load.
13. Long travel movements.
14. Cross travel.
15. Lifting, lowering and positioning of load.
16. Control of swing.
17. Simple driving exercises on an E.O.T. Crane.
18. Parking and leaving the crane.
19. Steps to be taken in case of power failure.
20. Steps to be taken in case of fire in the cabin.
21. Steps to be taken in case of break-down.
22. Steps to be taken in case of accident or collision.
23. Driving practice on different types of cranes like semi-portal, magnet, mobile, tong type etc.
24. Standard Crane Signal exercises.
25. Cleaning and maintenance.
26. Lubrication and servicing.
27. Exercises in giving artificial respiration.
28. -Diagonal, curve and step driving. .
29. Crossing obstacles on the Shop Floor.
30. Checking and operation of electrical system supply to bus bars, isolators, circuit breaker, fuses, resistances, control power:, motors, master controllers.
31. Checking and operation of eldros, hydraulic brake, brake drum, wheels and driving pinions, couplings, ropes, hooks, traverses and all load carrying equipment including magnets.

ASSESSMENT STANDARD

8.1 Assessment Guideline:

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrape/wastage and disposal of scarp/wastage as per procedure, behavioral attitude and regularity in training.

The following marking pattern to be adopted while assessing:

a) Weightage in the range of 60-75% to be allotted during assessment under following performance level:

For this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.

In this work there is evidence of:

- demonstration of good operational skills while executing the assigned job.
- different accuracy achieved while undertaking different skills demanded by the job.
- a fairly good level of neatness and consistency in handling controls.
- occasional support in completing the project/job.

b) Weightage in the range of above 75%- 90% to be allotted during assessment under following performance level:

For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.

In this work there is evidence of:

- good skill levels in operation while executing the assigned job.
- the majority of the accuracy achieved while undertaking different skills demanded by the job.
- a good level of neatness and consistency in handling controls.
- little support in completing the job.

c) Weightage in the range of above 90% to be allotted during assessment under following performance level:

For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.

In this work there is evidence of:

- high skill levels in operation while executing the assigned job.
- accuracy while undertaking different work being substantially in line with those demanded by the job.
- a high level of neatness and consistency in the finish.
- minimal or no support in completing the project

8.2 FINAL ASSESSMENT- ALL INDIA TRADE TEST FOR APPRENTICE

| SUBJECTS | Marks | Sessional Marks | Full Marks | Pass Marks | Duration of Exam. |
|---------------------|--------------|------------------------|-------------------|-------------------|--------------------------|
| Practical | 300 | 100 | 400 | 240 | 08 hrs. |
| Trade Theory | 100 | 20 | 120 | 48 | 3 hrs. |
| Workshop Cal. & Sc. | 50 | 10 | 60 | 24 | 3 hrs. |
| Engineering Drawing | 50 | 20 | 70 | 28 | 4 hrs. |
| Employability Skill | 50 | - | 50 | 17 | 2 hrs. |
| Grand Total | 550 | 150 | 700 | - | |

Note: - The candidate pass in each subject conducted under all India trade test.

8. FURTHER LEARNING PATHWAYS

Employment opportunities:

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

1. Manufacturing & Process industries like steel plant, and other related heavy industries where shifting of materials using overhead crane is essential etc.

TOOLS & EQUIPMENT FOR BASIC TRAINING

**INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL
KNOWLEDGE**

TRADE: CRANE OPERATOR

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

A. TRAINEES TOOL KIT (For each additional unit trainees tool kit sl. 1-18 is required additionally)

| Sl. no. | Name of the Tool & Equipments | Specification | Quantity |
|----------------|---|----------------------------------|-----------------|
| 1 | Steel Rule with metric & British graduation | 150 mm, Stainless steel | 16 nos. |
| 2 | Try Square. | 150 mm blade | 16 nos. |
| 3 | Caliper inside spring type. | 150 mm | 16 nos. |
| 4 | Caliper hermaphrodite spring type | 150 mm | 16 nos. |
| 5 | Caliper outside spring type | 150 mm | 16 nos. |
| 6 | Divider spring type | 150 mm | 16 nos. |
| 7 | Scriber | 150 mm | 16 nos. |
| 8 | Centre Punch | 10 mm and Length - 120 mm | 16 nos. |
| 9 | Screw driver | 150mm insulated flat type | 16 nos. |
| 10 | Chisel cold flat | 20 mm X 150 mm High carbon steel | 16 nos. |
| 11 | Hammer ball peen With handle | 450 grams (1 lb) | 16 nos. |
| 12 | Hammer ball peen With handle. | 220 grams (1/2 lb) | 16 nos. |
| 13 | File flat - second cut | 250 mm | 16 nos. |
| 14 | File flat smooth | 250 mm. | 16 nos. |
| 15 | File half round second cut | 150 mm. | 16 nos. |

| | | | |
|----|--------------------------|--------|---------|
| 16 | Hacksaw frame fixed type | 300 mm | 16 nos. |
| 17 | Safety goggles. | | 16 nos. |
| 18 | Dot punch | 100 mm | 16 nos. |

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

| INSTRUMENTS | | | |
|----------------------------|--|--|--------|
| 19. | Steel Rule Graduated both in Metric and English Unit | 300 mm Stainless steel | 4 nos. |
| 20. | Straight edge steel | 300 mm or above | 2 nos. |
| 21. | Spirit Level metal Type - 2 | 300 mm Basic Length Accuracy 0.1mm/Meter | 1 no. |
| 22. | Stud Extractor EZY - out | Set of 8 | 2 sets |
| 23. | Combination Set | 300 mm | 2 nos. |
| 24. | Micrometer outside. | 25 - 50 mm | 2 nos. |
| 25. | Vernier caliper | 150 mm | 4 nos. |
| 26. | Wire gauge, metric standard. | | 1 no. |
| GENERAL SHOP OUTFIT | | | |
| 27. | Surface plate C.I/Granite with Stand and Cover | 600 x 600 mm | 1 nos. |
| 28. | Marking table (Mild steel) | 900X900X900 mm | 1 no. |
| 29. | Universal scribing block. | 220 mm | 2 nos. |
| 30. | V-Block pair with clamps | 150 x 100 x 100 mm | 2 nos. |
| 31. | Angle plate | 150 X 150 X 250 mm | 2 nos. |
| 32. | Punch letter set. | 3 mm | 1 no. |
| 33. | Punch number set. | 3 mm | 1 no. |
| 34. | Portable hand drill (Electric) | 0 to 13 mm Capacity | 1 no. |
| 35. | Drill twist straight shank | 3 mm to 12 mm by 0.5 mm H.S.S. | 2 sets |
| 36. | Drill twist Taper shank | 8 mm to 20 mm by 0.5 mm H.S.S. | 2 sets |
| 37. | | | |
| 38. | Taps and dies complete set | 5, 6, 8, 10 & 12 mm set of 5 | 2 Sets |
| 39. | File knife edge smooth | 150 mm | 4 nos. |
| 40. | File feather edge smooth | 150 mm | 4 nos. |
| 41. | File triangular smooth | 200 mm | 8 nos. |
| 42. | File round second cut | 200 mm | 8 nos. |
| 43. | File square second cut | 250 mm | 8 nos. |
| 44. | Feeler gauge | Gauge Feeler / Thickness - 0.05 mm to 0.3 mm by 0.05 and 0.4 | 1 set |

| | | | |
|-----|--|---|------------|
| | | mm to 1 mm by 0.1 mm - 13 leaves | |
| 45. | File triangular second cut. | 200 mm | 8 nos. |
| 46. | File hand second cut. | 150 mm | 8 nos. |
| 47. | File card. | 3"x5" size, brass or steel wire | 8 nos. |
| 48. | Oil Can | 250 ml | 2 nos. |
| 49. | Pliers combination insulated | 150 mm | 2 nos. |
| 50. | Wooden handle forged Soldering Iron copper bit. | 230V, 250 W, 350 gm | 2 nos. |
| 51. | Blow Lamp | 0.5 litre | 2 nos. |
| 52. | Spanner- Double Ended | 6x7, 8x9, 10x11, 12x13, 14x15, 16x17, 18x19, 20x22 | 1 set each |
| 53. | Spanner adjustable | 150 mm | 2 nos. |
| 54. | Interchangeable ratchet socket set | 12 mm driver, sized 10-32 mm set of 18 socket & attachments. | 1 set |
| 55. | Double Ended tubular Box spanner set with Tommy bar. | A/F 6-25 mm set of 10 Tommy Bar Dia 6, 8, 10, 12, 14, 16 | 1 set |
| 56. | Scraper flat | 150 mm | 8 nos. |
| 57. | Chisel cold flat | 9 mm X 100 mm | 8 nos. |
| 58. | Combination Plier Insulated | 200 mm | 4 Nos. |
| 59. | Screw Driver Insulated | 4mm X 150 mm, Diamond Head | 4 Nos. |
| 60. | Screw Driver Insulated | 6mm X 150 mm | 4 Nos. |
| 61. | Electrician screw driver thin stem insulated handle | 4mm X 100 mm | 4 Nos. |
| 62. | Neon Tester | 500 V | 4 Nos. |
| 63. | Wire Cutter and Stripper | 150 mm | 4 Nos. |
| 64. | Relay- a. Cut out Relays b. Reverse current c. Over current d. Under voltage | a. 16A, 440V b. 16A, 440V c. 16A, 440V d. 360V-440V | 1 No. each |
| 65. | Series Test Lamp | 230V, 60W | 4 Nos. |
| 66. | Miniature Breaker | 16 amp | 2 Nos. |
| 67. | MCCB | 100Amps, Triple pole | 1 No. |
| 68. | Fuses | HRC Glass Rewire Type | 3 Each |
| 69. | Digital Multi Meter | DC 200mv -1000v, 0 – 10A & AC 200mv- 750v , 0-10A, resistance 0-20 MΩ and 3 1/2 digit | 2 Nos. |
| 70. | 3- point D.C. Starter | For 2.5 KW DC motor | 1 No. |
| 71. | 4- point D.C. Starter | For 2.5 KW DC motor | 1 No. |
| 72. | Vice bench | 150 mm | 20 nos. |
| 73. | Bench working. | 2400 x 1200 x 900 mm | 4 nos. |
| 74. | Almirah. | 1800 x 900 x 450 mm | 2 nos. |
| 75. | Lockers with 8 drawers (standard size). | One locker for each trainee | 3 nos. |

| | | | |
|-----|------------|----------------------|-------|
| 76. | Metal rack | 1820 x 1820 x 450 cm | 1 no. |
|-----|------------|----------------------|-------|

F. LIST OF ADDITIONAL TOOLS FOR ALLIED TRADE IN WELDING

| Sl. no. | Name of the Tool & Equipments | Specification | Quantity |
|---------|--|-----------------------------|----------|
| 6 | Oxy - acetylene gas welding set equipment with hoses, Oxygen & Acetylene cylinders, regulator and other accessories. | | 1 Set. |
| 7 | Gas welding table with positioner with Fire Bricks | 900 X 600 X 750 mm | 1 No |
| 8 | Welding torch tips of different sizes for Oxy - acetylene gas welding | To fit nozzle no. 1, 2, & 3 | 1 Set |
| 9 | Gas lighter. | | 2 Nos |
| 10 | Trolley for gas cylinders. | | 1 No |
| 11 | Chipping hammer. | | 2 Nos |
| 12 | Gloves (Leather) | | 2 Pairs |
| 13 | Leather apron. | | 2 Nos |
| 14 | Spindle key for cylinder valve. | | 2 Nos. |
| 15 | Welding torches. | Nozzles no. 1, 2, & 3 | 1 Set. |
| 16 | Welding goggles | | 4 Pairs. |
| 17 | Welding helmet with coloured flame retardent glass | | 2 Nos. |
| 18 | Tip cleaner | | 5 Sets. |

G. LIST OF TOOLS & ACCESSORIES FOR PNEUMATICS AND HYDRULICS

| Sl. no. | Name of the Tool & Equipments | Specification | Quantity |
|---------|--|---|----------|
| 1 | Compressor unit | suitable for Pressure: 8 bar, Delivery: 50 lpm (or more), Reservoir capacity: 24 Litres (or more), 230V, 50 Hz, with pressure regulator and water separator | 1 No. |
| 3 | Pneumatic Workstation with 40 square mm aluminium profile legs, wooden work surface, and one pedestal drawer unit having 5 drawers, each with handles and individual locks, on metallic full panel drawer slide: | (1) Work Table – Size (Approx.) L1200mm X W900mm X H900mm, with four castor wheels including two lockable wheels at the front side, (2) Drawer – Size (Approx.) – L460mm x W495mm x H158mm each, and overall size of Drawer unit (Approx.) - L470mm x W495mm x H825mm and (3) Drawer slide height (Approx.) | 1 No |

| | | | |
|---|--|--|--------|
| | | 85mm. | |
| 4 | Carrier for mounting components, such as PB & relay boxes. | | 1 No |
| 5 | Cut section model for pneumatic components | | 1 set |
| 6 | Hydraulic Trainer Kit, each consisting of the following matching components and accessories: | | 01 set |
| | I. Hydraulic Power pack | with (1) external gear pump having a delivery rate of 2.5 lpm, (approx.) @ 1400 rpm operating pressure 60 bar, coupled to a single-phase AC motor (230 V AC) having start capacitor and ON/OFF switch and overload protection, (2) pressure relief valve adjustable from 0 – 60 bar, (3) oil reservoir, ≥5 litres capacity having sight glass, drain screw, air filter, and P and T ports. | 1 No. |
| | II. Pressure relief valve | pilot-operated | 1 No |
| | III. Drip tray, steel | size 1160 mm x 760 mm. | 1 No. |
| | IV. Pressure Gauge | Glycerin-damped, Indication range of: 0 – 100 bar | 1 No. |
| | V. Four-Way distributor | with five ports, equipped with a pressure gauge | 1 No. |
| | VI. Double acting hydraulic cylinder | with a control cam, Piston diameter 16 mm, Piston rod diameter 10 mm, Stroke length 200 mm. | 1 No. |
| | VII. Suitable Weight | for vertical loading of hydraulic cylinder | 1 No. |
| | VIII. Mounting kit for weight | for realizing pulling and pushing load. | 1 No. |
| | IX. 3/2-way directional control valve | with hand lever actuation. | 1 No. |
| | X. 4/2-way directional control valve | with hand lever actuation. | 1 No. |
| | XI. 4/3-way directional control valve | closed-centre position, with hand lever actuation. | 1 No. |
| | XII. Non-return valve. | | 1 No. |
| | XIII. Pilot-operated check valve | pilot to open. | 1 No. |
| | XIV. One-way flow control valve | with integrated check valve. | 1 No. |
| | XV. T-Connector with self sealing coupling nipples (2 Nos.) and quick coupling socket (1 No.). | | 2 Nos. |
| | XVI. Profile plate, | Anodised Aluminium, 1100x700 mm, with carriers, mounting frames and mounting accessories (To be fitted onto the Hydraulic workstation) | 1 set |

**INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND
ENGINEERING DRAWING**

TRADE: CRANE OPERATOR

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

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

2) **Infrastructure:**

A : TRAINEES TOOL KIT:-

| Sl. No. | Name of the items | Quantity (indicative) |
|----------------|--|------------------------------|
| 1. | Draughtsman drawing instrument box | 20 Nos. |
| 2. | Set square celluloid 45 ⁰ (250 X 1.5 mm) | 20 Nos. |
| 3. | Set square celluloid 30 ⁰ -60 ⁰ (250 X 1.5 mm) | 20 Nos. |
| 4. | Mini drafter | 20 Nos. |
| 5. | Drawing board (700mm x500 mm) IS: 1444 | 20 Nos. |

B : FURNITURE REQUIRED

| Sl. No. | Name of the items | Quantity (indicative) |
|----------------|---------------------------------|------------------------------|
| 1 | Drawing Board | 20 Nos. |
| 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 |

INFRASTRUCTURE FOR ON-JOB TRAINING

TRADE: CRANE OPERATOR

For Batch of 20 APPRENTICES

Actual training will depend on the existing facilities available in the establishments. However, the industry should ensure that the broad skills defined against On-Job Training part (*i.e. 12 months*) are imparted. In case of any short fall the concern industry may impart the training in cluster mode/ any other industry/ at ITI.

GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1. Due care to be taken for proper & inclusive delivery among the batch. Some of the following some method of delivery may be adopted:

- A) LECTURE
- B) LESSON
- C) DEMONSTRATION
- D) PRACTICE
- E) GROUP DISCUSSION
- F) DISCUSSION WITH PEER GROUP
- G) PROJECT WORK
- H) INDUSTRIAL VISIT

2. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. may be adopted.

3. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.