CABLE JOINTER

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 4

SECTOR – ELECTRICAL (Including New and Renewable Energy)

सत्यमेव जयते

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

CABLE JOINTER

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 4

Developed By

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

ACKNOWLEDGEMENT

The DGT sincerely expresses appreciation for the contribution of the Industry, State Directorate, Trade Experts and all others who contributed in revising the curriculum. Special acknowledgement to the following industries/organizations who have contributed valuable inputs in revising the curricula through their expert members:

1. Torrent Power Ltd, Surat, Gujarat.
2. Tata Power Co. Ltd, Thane, Maharashtra
3. Reliance Infrastructure Ltd., Mumbai
4. BTC, BEST, Mumbai

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

Co-ordinator for the course: BN Sridhar, Dy Director, FTI, Bangalore

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
1.	B N Sridhar, Dy Director	FTI, Bangalore	Expert Member
2.	Ketan Patel Dy Director	RDAT, Mumbai	Expert Member
3.	Shreeshail. P Training Officer	FTI, Bangalore	Expert Member

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1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

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

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

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

1.2 Changes in Industrial Scenario

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

1.3 Reformation

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

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

2. TRAINING SYSTEM

2.1 GENERAL

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

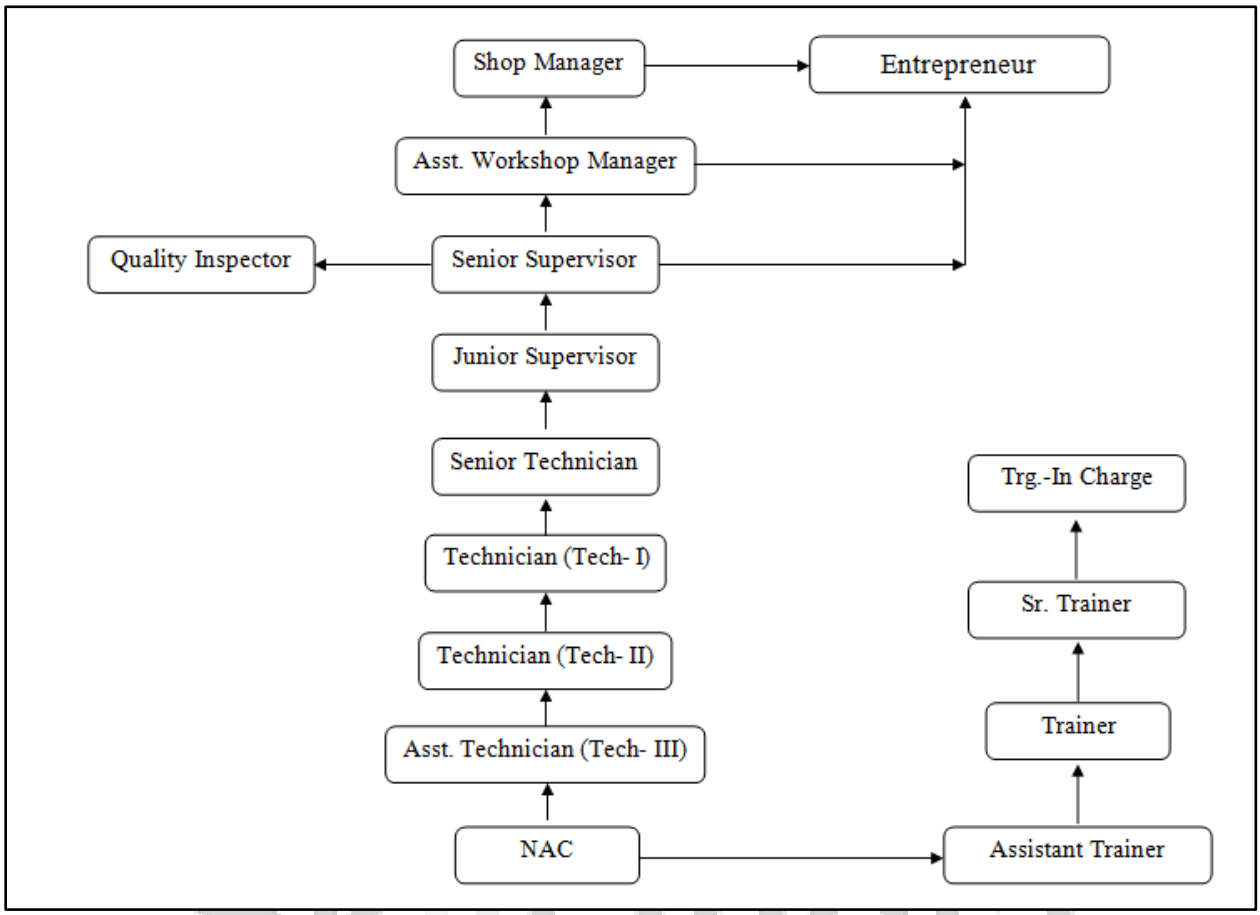
Cable Jointer trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge,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

Broadly candidates need to demonstrate that they are able to:

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

2.2 CAREER PROGRESSION PATHWAYS:

- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

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

Total training duration details: -

Time (in months)	1-3	4-12	13-15	16-24
Basic Training	**Block– I**	**-----**	**Block – II**	**------**
Practical Training (On - job training)	**----**	**Block – I**	**------**	**Block – II**

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A. Basic Training

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

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

S No.	Course Element	Total Notional Training Hours	
		For 02 Yrs. course	**For 01 Yr. course**
1.	Professional Skill (Trade Practical)	550	275
2.	Professional Knowledge (Trade Theory)	240	120
3.	Workshop Calculation & Science	40	20
4.	Engineering Drawing	60	30
5.	Employability Skills	110	55
	Total (Including internal assessment)	**1000**	**500**

B. On-Job Training:-

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

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

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

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

C. Total training hours:-

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

2.4 ASSESSMENT & CERTIFICATION:

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

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

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

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

2.4.1 PASS REGULATION

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

2.4.2 ASSESSMENT GUIDELINE

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

Assessment will be evidence based comprising the following:

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

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

Performance Level	Evidence
(a) Weightage in the range of 60 -75% to be allotted during assessment	

For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b)Weightage in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Weightage in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief description of Job roles:

Read and interpret the blue print reading (Electrical layout Drawing as per BIS specification & standards)

Carryout Installation, maintenance & repair works of Electrical AC/ DC machinery, lighting circuits and equipments used in industries.

Practice on using fitting, plumbing and sheet metal tools.

Use of electrical instrument(analog/digital) like voltmeter, Ammeter, Wattmeter, Energy Meter, Wheatstone bridge, oscilloscope, Earth tester, Tong tester, Megger etc to measure to different electrical quantities.

Carry out Wiring & Earthing System.

Identify various types of LT / HT cables and its application.

Jointing/termination process of different type of cable.

Procedure for heat/cold sinks cable joint termination.

Different methods of laying/ installation of cables.

Carry out maintenance, test, fault finding & repairing of Underground cable.

Reference NCO: 7422.0800 Cable Jointer

4. NSQF LEVEL COMPLIANCE

NSQF level for Cable Jointer 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 Cable Jointer 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	CABLE JOINTER
NCO - 2015	7422.0800 Cable Jointer
NSQF Level	Level – 4
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) Block–I: 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	8th Class under 10+2 System of Education
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.
Infrastructure for Basic Training	As per related Trade of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	01year
CTS trades eligible for Cable Jointer Apprenticeship	1. Wireman 2. Electrician

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 Cable Jointer course of 02 years duration under ATS.

Block I & II:-

1. Recognize & comply safe working practices, environment regulation and housekeeping.

2. Understand and explain different mathematical calculation & science in the field of study. *[Different mathematical calculation & science – Conversion of Units, Percentage, & Mensuration-Area & Volume of different surfaces and solids, and Properties of materials, Ferrous & non-ferrous metals, Mass, weight, Density, Specific Gravity etc.]*

3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical figures like Triangles, Square, Rectangle, Rhombus, Parallelogram, Circle etc., Lettering & Numbering, Freehand sketching of Hand tools used for Cable Jointer /Wireman/Electrician/ trade & wire joints, Signs & symbols for Electrical components used in electrical circuits and AC/DC systems,Electrical wiring diagram of different lamps, Schematic diagram of plate and pipe earthing, insulators used in over head line, Layout diagram of a substation, Single line Diagram of Electrical substation feeders.]*

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. Knowledge of precautions to be followed while working in electrical jobs.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Observe & practice safety in all electrical works. Provide First Aid. Personal Safety Equipment & their importance.
4. Identify & use all basic hand tools.
5. Check the gauges of wire & select suitable wires for the required current rating. Perform wire joints & provide cable glands. Soldering practice.
6. Carry out marking out the components as per specification and standard procedure for Hack- sawing, filing, drilling, riveting, fitting and allied operations for the given job.
7. Execute pipe joints, dismantle and assemble valves & fittings in pipes and test for leakages.
8. Make sheet metal articles for the given job.
9. Perform Arc / Gas welding and brazing operation to join and cut mechanical components / metals.
10. Connect & measure voltage, current, resistance power & energy in DC &AC(1ph & 3ph) circuits. Use of power analyzer, measurement of THD, Harmonics due to digital switching.
11. Electrical wiring: Repair / replace switches, sockets, light points. Provide new points in PVC casing capping & PVC conduits.
12. Replace bulbs, tubes, trouble shooting, repair & maintenance. Wire up in PVC casing & capping.
13. Decides the size of cable & provides power supply to machines &equipments, provide earth connections.
14. Provide light/socket points, for various equipments and appliances
15. Provide power supply to motors, equipments& appliances. Crimping the lugs, providing cable glands & connections.
16. Install pipe & plate earth stations. Measure earth resistance, improve the same & maintain earth stations. Earth Monitoring systems with reference to various standards, familiarization with health monitoring equipment.

Block – II

17. Observe & practice safety in all electrical works. Practice providing First Aid.
    Aware of safety practices used to avoid return current during working on cable. HT/LT cable in the trench where other utilities cables exists to avoid any type of accident /incident at site.
18. Various types of cables and their application.
19. Familiar with various component used while jointing. The necessity of each component used in jointing/activities carried out in jointing & probable long term

effects of the same if that activity or component is not used in prescribed manner should be understood.

20. Phasing Out: Facing the end of the cut cables, Spacing between the different cables, Staggering the joint positions, Positioning the two cables to be joined for correct phase sequence, Positioning the two cables to be joined for straight and end termination, Positioning the two cables to be joined for correct phase sequence by voltmeter and megger and battery box, Different types of terminations.
21. Various types of HT & LT cables Joints and their application
22. Know about the use of various jointing materials, suitable equipment/tools for different processes in jointing of cables.
23. Prepare core and make various types of cable joints like/termination i.e. Straight Joints, Reducing joints, T-joints upto 11 kv, Different types of terminations, End termination in trifurcating boxes.
24. Different types of tapping, Flowering, stress cone making, cable core polishing, cable PVC sheath cutting, Ferrule filing, Moisture testing, wrapping copper mesh, connecting sharing ferrule,etc.
25. **(JOINTING/TERMINATION PROCESS)**
    End preparation of core for soldering, crimping including joints in aluminium conductor, Phasing out, Fitting and sweating/crimping of ferrules, Filing and sand papering.
26. **(JOINTING/TERMINATION PROCESS)**
    Penciling of core insulation, Preparation of cores, Fitting of joint boxes, Use of spacers, Plumbing, Heating and pouring of bitumen compound, Preparation of epoxy resin compound and pouring, use of protection boxes.
27. **(PROCEDURE FOR HEAT/COLD SINKS CABLE JOINT TERMINATION)** Insulation of joints (only in the case of fully insulated cables), Special precautions regarding cleanliness, speed, moisture free work, safety against fire and electrical hazards.
28. Testing of underground cables, trouble shooting, Locating faults, open circuit, short circuit & leakage in cables, Repairs of faulty cables.
29. **(METHODS OF LAYING CABLES/INSTALLATION)**
    Identify shortest route, avoiding road/rail/pipeline/drain crossing, Marinating statutory clearance and regulations, Cable route marking by markers and flags ,Trial pits, Excavation of trenches-methods of digging by manual and mechanical methods, Methods of cable laying in different system bending radius of cables, Cables laying equipments , cable pulling by winch and power roller, Alightment of cables for termination.
30. Different system of cable lying i.e. solid, Laid direct-temporary LT cables, Laid in ducts, Laid on trays and risers, Laid on cleat on walls, Laid underground , Direct in ground method, Micro tunnel method of cable laying Earthing: Connectivity to Earthy through armour & its importance.

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.

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2. Understand, explain different mathematical calculation & science in the field of study. apply in day to day work.*[Different mathematical calculation & science - Conversion of Units, Percentage, & Mensuration-Area & Volume of different surfaces and solids, and Properties of materials, Ferrous & non-ferrous metals, Mass, weight , Density, Specific Gravity etc.]*	2.1 Explain concept of basic science related to the field such as Material science - Properties of materials, Ferrous & non-ferrous metals, etc.
	2.2 Mass, weight, Density, Specific Gravity etc.
	2.3 Use scale/ tapes to measure as per specification.
	2.4 Calculate area / volume of the materials.
	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.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-. Geometrical figures like Triangles, Square, Rectangle, Rhombus, Parallelogram, Circle etc., Lettering & Numbering, Freehand sketching of Hand tools used for Cable Jointer / Wireman / Electrician/ trade & wire joints, Signs & symbols for Electrical components used in electrical circuits and AC/DC systems, Electrical wiring diagram of different lamps, Schematic diagram of plate and pipe earthing, insulators used in over head line, Layout diagram of a substation, Single line Diagram of Electrical substation feeders.]*	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.
	3. 4. Read & interpret the signs and symbols for electrical components and AC/DC systems.
	3. 5. Encounter drawings with electrical circuit diagrams and layout diagrams.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as Ammeter, voltmeter, meggar, earth tester etc. (as per tool list).
	4.2 Ascertain the functionality & correctness of the

	instrument.
	4.3 Measure dimension of the components & record data to analyse them with given drawing/measurement.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	5.1 Explain the concept of productivity and quality tools and apply during execution of job.
	5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws.
	5.3 Knows benefits guaranteed under various acts.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution.
	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7. 1. Explain personnel finance and entrepreneurship.
	7. 2. Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
	7. 3. Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize the work related to the occupation.	8. 1. Use documents, drawings and recognize hazards in the work site.
	8. 2. Plan workplace/ assembly location with due consideration to operational stipulation
	8. 3. Communicate effectively with others and plan project tasks
	8. 4. Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.
SPECIFIC OUTCOME	
Block-I& II (Section:10 in the competency based curriculum)	
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **Block – I& II** (section: 10) must ensure that the trainee works in familiar, predictable, routine, situation of clear choice. Assessment criteria should broadly cover the*	

*aspect of **Planning** (Identify, ascertain, etc.); **Execution** apply factual knowledge of field of knowledge, recall and demonstrate practical skill during performing the work in routine and repetitive in narrow range of application, using appropriate rule and tool, complying with basic arithmetic and algebraic principles and language to communicate in written or oral with required clarity; **Checking/ Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for his/her own work and learning.*

8. SYLLABUS

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

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1.	1. Implementation ofvarious safety measures in the shop floor. Visit to different sections of the Institute. 2. Demonstration of elementary first aid. Artificial Respiration. 3. Practice on use of fire extinguishers. 4. **Occupational Safety & Health.** 5. **Importance of housekeeping & good shop floor practices.** 6. Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, 7. Personal protective Equipment(PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. 8. Preventive measures for electrical accidents & steps to be taken in such accidents. 9. Use of Fire extinguishers.	**Occupational Safety & Health** Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers. Visit & observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard **Soft Skills**: its importance and Job area after completion of training. Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies e.g.; power failure, fire, and system failure.
2.	10. Familiarization with signs and symbols of Electrical accessories.	Fundamental of electricity: Fundamental terms- Current, Voltage definitions, AC, DC, Phase, Neutral, Earth. Units & effects of electric current.
3.	11. Skinning the cables 12. Demonstration & Practice on bare conductors joints--such as rat tail, Britannia, straight, Tee, Western union Joints 13. Practice in soldering & brazing	Solders, flux and soldering technique. Resistors types of resistors & properties of resistors. Introduction of National Electrical Code. Explanation, Definition and properties of conductors, insulators and semi-

	14. Practice on crimping thimbles, Lugs. 15. Demonstration and identification of types of cables. Demonstration & practice on using standard wire gauge &micrometer.	conductors. Types of wires & cables, standard wire gauge. Specification of wires & Cables- insulation & voltage grades- Low , medium & high voltage
4.	16. Verification of Ohm's Law, 17. Measuring unknown resistance 18. Verification of laws of series and parallel circuits. 19. Experiment on poly phase circuits. Current, voltage, power and power factor measurement in single & poly-phase circuits. Measurement of energy in single and poly-phase circuits. - Use of phase sequence meter. 20. Practice on three phase four wire system for understanding phase and line voltage & current.	Ohm's Law - Simple electrical circuits and problems. Reading of simple Electrical Layout. **Resistors -**Law of Resistance. Series and parallel circuits & related calculation. **Alternating Current -**Comparison and Advantages D.C and A.C. Related terms Frequency, Instantaneous value, R.M.S. value Average value, Peak factor, form factor, sine wave, phase and phase difference. Inductive and Capacitive reactance, Impedance (Z), power factor (p.f). Active and Reactive power. Single Phase and three-phase system etc. Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load. Three phase four wire system Use of power analyzer, measurement of THd, Harmonics due to digital switching.
5-6.	21. Demonstration of trade hand 22. tools. Use, care & maintenance of various hand tools. 23. Practice on installation and overhauling common electrical accessories as per simple Electrical circuit / Layout. 24. Make test board. 25. Identify basic Hand Tools for filing, chiseling, cutting, drilling, etc.	Identification of Trade-Hand tools- Specifications Common Electrical Accessories, their specifications in line with NEC 2011- Explanation of switches lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, with individual switches, Two way switch .Security surveillance, Fire alarm, MCB, ELCB, MCCB.

	26. Chipping practice and practice in grinding hardening and tempering of chisels.	Series –parallel testing board & use. Introduction to fitting trade. Descriptions, General Care & Maintenance of Hammer, Chisels, Try Square, etc.
7.	27. Filing practice, filing true to line. 28. Marking, sawing and drilling practice in hand drilling & power drilling machine. 29. Practice in using taps and dies, threading hexagonal and square nuts etc. Cutting external threads on stud and on pipes and riveting practices. 30. Practice in using sand paper and polishing.	Descriptions, General Care & Maintenance of hacksaw, drilling machine, etc Description of taps and dies, types of rivets and riveted joints. Finishing and polishing materials and their process.
8.	31. Simple sheet metal work Cutting, bending and jointing. Jointing of metals by soft soldering. Making of simple sheet metal articles. 32. Preparation of channel clamps as used in line construction, Bending of pipe to required shape. Hardening and tempering common smithy cutting tools.	Sheet metal workers common hand tools. Sheet and wire gauges. Blow lamp and its use. Pipe and pipe fittings, Description of simple soldering and brazing common joints. Description and use of Black smiths tools such as cutting tools, punches, swages, swage blocks, anvil, sledge hammer, etc. Various terms used like cutting, drawing, forging upsetting, bending etc.
9.	33. Practice in making Eye bolt, stay bolt 'U' clamps and 'J' clamps. 34. Practice in brazing and welding operation like brazing copper pipe, welding mild steel ring etc.	Metals in common use, properties, temperature chart of various metals. Anne hardening, tempering and case hardening. Description of brazing and welding. Their application importance in smithy.
10.	35. Practice in casing, Capping and Conduit wiring . 36. Testing of wiring installation by Meggar. 37. Fixing of calling bells/buzzers.	**Electric wirings**, I.E. rules. Types & selection of wirings both domestic and industrial. Specifications for wiring. Grading of cables and current ratings. Principle of laying out in domestic wiring. Estimate the cost of wiring system Voltage drop concept.
11-12.	38. Identification & demonstration on conduits and accessories & their uses, cutting , threading & laying,	**Wiring system -** P.V.C., concealed system. Specifications, standards for

	Installation, Testing, 39. Maintenance and Repairing of wiring. 40. Application of fuses, relay, MCB, ELCB. 41. **Practice on Earthing**- different methods of earthing. 42. Measurement of Earth resistance by earth tester. Testing of Earth Leakage by ELCB and relay.	conduits and accessories Power Wiring Control Wiring Information Communication Entertainment Wiring. Testing of wiring installation by meggar Study of Fuses, Relays, Miniature circuit breakers (MCB), ELCB, etc. **Earthing**- Principle of different methods of earthing & selection. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB).
13.	43. Identify & select different type of Instruments. 44. Use of **-P**MMC , MI meter, Multi-meter(Digital/Analog) , Wattmeter, P F meter, Energy meter, Frequency meter, 45. Phase sequence meter, Digital Instruments, etc 46. Range extension of meters.	**Electrical Measuring Instruments -** Types, indicating types PMMC & MI meter (Ammeter, Voltmeter) Range extension Multimeter(Digital/Analog) Wattmeter P.F. meter Energy meter (Digital/analog) Insulation Tester (Megger), Earth tester. Frequency meter Phase Sequence meter Multimeter –Analog and Digital Tong tester Techometer.
	Assessment/Examination 03days	

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.*

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

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	47. Identify of single & multicore and their application. 48. Demonstrate Constituents of different types of cable.	Advantage of the underground cable Necessity of single and multicore cables. Constituents of cable and their choice including.
2.	49. Identify different type of cable base on classification & construction. 50. Correct use of various tools necessary for cable jointing work.	**Classification /Construction of various types of cables including.** H –type S.L. type H.S.L. type Pressure type Belted cable (IS:9968 part 1and 2)
3.	51. Measurement of earth resistance and testing the continuity of earth conductors. Use of earth resistance tester/Megger. 52. Selection and use of dielectric tape depending on voltage rating.	**Classification /Construction of various types of cables including.** XPLE cables (cross linked polyethylene cables IS:1798 of 1985) ELOS TO MERACK CABLES (Synthetic rubber cables) FRLS cable (fire resistant low smoke cable) Basic knowledge of submarine cable.
4.	53. Preparation of Armour for earthling cutting of Armors and sheath. 54. Stripping the cable insulation following safety procedure.	**Construction of EHT oil filled cables,** Construction of gas filled cables Feature & Importance, Construction of XLPE cables Constructional features of various types of LT, HT and EHT cables.
5	55. Demonstrate Constituents of EHT oil filled cable. 56. Demonstrate Constituents of Gas filled cable. 57. Measurement of resistance of conducting material.	Aluminum copper as conducting materials, physical, chemical and electrical properties, standard and solid conductors. Earthed and unearthed cables. Different types of insulation, sheathes, amour screening and serving. Advantages OF H-TYPE Cables Difference Between SL AND HSL Type Cables.
6-7	58. Identify the cable base on current carrying capacity.	Current carrying capacity and selection of cables effect of:-

	59. Measurement of insulation resistance between the cores and between the cores and earth. Earth continuity in cables. 60. Identify & select different type of cable laying method.	Ground/air temperature Depth of laying Grouping of proximity of cables Thermal resistivity of soil and conditions of soil. Limitation imposed by insulating material. (Basis for selection of LT,HT and EHT cables (short circuit with stand capacity and length versus voltage drops). Derating Factor & its significance. **Methods of laying cables with their advantages and disadvantages** laying directly in ground, in air and in ducts. Bending radius and preparation of trench. Effects of vertical runs on impregnated cables.
8.	61. Practice of laying of cable in trenches/pipe.	**Methods of laying cables with their advantages and disadvantages** Protection from mechanical damages, cable spiking and cable identification Single core cables, trefoil formation, cross bending etc.
9.	62. Making up a straight splice for different cables. 63. Jointing of cables in lead sleeves.	Various types of joints and their methods Preparation of case for various jointing soldering, crimping etc . Various components of joints and termination (glands, sockets, sleeves, ferrules etc.) Composition of solder and use flux. Knowledge of sharing ferrule.
10-12.	64. Jointing of cables in epoxy sleeves. 65. Termination of cable conductor. 66. Test the underground cables for open, short circuit & ground fault and also check insulation resistance. 67. Testing of cables before commission.	Method of soldering and crimping. Use of crimping tools (hydraulic- crimping tool kit) Precautions to be observed at every stage of cable jointing. Working principle of testing kit, cable fault finding bridges induction coil, etc. Knowledge of Battery box and discharge rod. Testing of cables before commissioning.

		Location of cables faults.
13.	68. Determine the location of cable fault. 69. Measurement of earth resistance.	Importance of earthing of cables and other identical equipments and methods. Basic information of RMU(Ring Main Unit) Standards and code of practice for laying cables. I.S. specifications and manufacturer's specifications to be understood and followed.
	Assessment/Examination 03 days	

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

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	**Engineering Drawing: Introduction and its importance** -Viewing of engineering drawing sheets. Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 **Drawing Instruments** : their Standard and uses - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
2.	Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals	**Lines :** - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment
3.	**Percentage**: Introduction, Simple calculation.	**Drawing of Geometrical Figures**: Definition, nomenclature and practice of - - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements
4.	**Material Science**: properties -Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals.	**Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.
5.	Introduction of Iron, Cast Iron,	Free Hand sketch of hand tools, measuring

	Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.	tools used in Electrician /wireman/ Lineman trade. Free hand sketch of wire joints.
Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	**Mass ,Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals	**Signs & Symbols of AC/DC System** Symbols used in electrical circuits. Electrical components.
2.	Square Root: Square and square root, method of finding out square roots. Simple problem using calculation.	Electrical wiring diagram of different lamps, room (3/4 point), stair case. Schematic diagram of plate and pipe earthing,
3.	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Surface area of solids – cube, cuboid, cylinder and Sphere.	Types of insulator used inover head line. (Half sectional views)
4.	Volume of solids – cube, cuboid, cylinder and Sphere. Measurement of angles.	Layout diagram of a substation. Single line Diagram of Electrical substation feeders.

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)	
1. English Literacy Duration : 20 Hrs.	Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy Duration : 20 Hrs.	Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web

	page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills Duration : 15 Hrs. Marks : 07	
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success. The Power of Positive Attitude. Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude
Block – II **Duration – 55 hrs.**	
4. Entrepreneurship Skills Duration : 15 Hrs. Marks : 06	
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas,

	Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes& procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity Duration : 10 Hrs. Marks : 05	
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education Duration : 15 Hrs. Marks : 06	
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.

Basic Provisions	Idea of basic provision legislation of India. Safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation Duration : 05 Hrs.	Marks : 03
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
8. Quality Tools Duration : 10 Hrs.	Marks : 05
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOBTRAINING)

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

Block – I

1. Knowledge of precautions to be followed while working in electrical jobs.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Observe & practice safety in all electrical works. Provide First Aid. Personal Safety Equipment & their importance.
4. Identify & use all basic hand tools.
5. Check the gauges of wire & select suitable wires for the required current rating. Perform wire joints & providing cable glands. Soldering practice.
6. Carry out marking out the components as per specification and standard procedure for Hack- sawing, filing, drilling, riveting, fitting and allied operations for the given job.
7. Execute pipe joints, dismantle and assemble valves & fittings in pipes and test for leakages.
8. Make of sheet metal articles for the given job.
9. Perform Arc / Gas welding and Brazing operation to join and cut mechanical components / metals.
10. Connect & measure voltage, current, resistance power & energy in DC & AC (1ph & 3ph) circuits. Use of power analyzer, measurement of THD, Harmonics due to digital switching.
11. Electrical wiring: Repair / replace switches, sockets, light points. Provide new points in PVC casing capping & PVC conduits.
12. Replacing the bulbs, tubes, trouble shooting, repair & maintenance. Wire up in PVC casing & capping.
13. Decides the size of cable & provides power supply to machines &equipments, provide earth connections.
14. Provide light/socket points, for various equipments and appliances
15. Provide power supply to motors, equipments & appliances. Crimping the lugs, providing cable glands & connections.
16. Install pipe & plate earth stations. Measure earth resistance, improve the same & maintain earth stations. Earth Monitoring systems with reference to various standards, familiarization with health monitoring equipment.

Block – II

17. Observe & practice safety in all electrical works. Practice providing First Aid. Aware of safety practices used to avoid return current during working on cable. HT/LT cable in the trench where other utilities cables exists to avoid any type of accident / incident at site.
18. Various types of cables and their application.
19. Familiar with various component used while jointing. The necessity of each component used in jointing/activities carried out in jointing & probable long term

effects of the same if that activity or component is not used in prescribed manner should be understood.

20. Phasing Out: Facing the end of the cut cables, Spacing between the different cables, Staggering the joint positions, Positioning the two cables to be joined for correct phase sequence, Positioning the two cables to be joined for straight and end termination, Positioning the two cables to be joined for correct phase sequence by voltmeter and megger and battery box, Different types of terminations.
21. Various types of HT & LT cables Joints and their application
22. Know about the use of various jointing materials, suitable equipment/tools for different processes in jointing of cables.
23. Prepare core and make various types of cable joints like/termination i.e. Straight Joints, Reducing joints, T-joints upto 11 kv, Different types of terminations, End termination in trifurcating boxes.
24. Different types of tapping, Flowering, stress cone making, cable core polishing, cable PVC sheath cutting, Ferrule filing, Moisture testing, wrapping copper mesh, connecting sharing ferrule,etc.
25. **(JOINTING/TERMINATION PROCESS)** End preparation of core for soldering, crimping including joints in aluminium conductor, Phasing out, Fitting and sweating/crimping of ferrules, Filing and sand papering.
26. **(JOINTING/TERMINATION PROCESS)** Penciling of core insulation, Preparation of cores, fitting of joint boxes, Use of spacers, Plumbing, Heating and pouring of bitumen compound, Preparation of epoxy resin compound and pouring, use of protection boxes.
27. **(PROCEDURE FOR HEAT/COLD SINKS CABLE JOINT TERMINATION)** Insulation of joints (only in the case of fully insulated cables), Special precautions regarding cleanliness, speed, moisture free work, safety against fire and electrical hazards.
28. Testing of underground cables, trouble shooting, Locating faults, open circuit, short circuit & leakage in cables, Repairs of faulty cables.
29. **(METHODS OF LAYING CABLES/INSTALLATION)** Identify shortest route, avoiding road/rail/pipeline/drain crossing, Marinating statutory clearance and regulations, Cable route marking by markers and flags ,Trial pits, Excavation of trenches-methods of digging by manual and mechanical methods, Methods of cable laying in different system bending radius of cables, Cables laying equipments , cable pulling by winch and power roller, Alightment of cables for termination.
30. Different system of cable lying i.e. solid, Laid direct-temporary LT cables, Laid in ducts, Laid on trays and risers, Laid on cleat on walls, Laid underground , Direct in ground method, Micro tunnel method of cable laying Earthing: Connectivity to Earthy through armour & its importance.

Note:

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

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

CABLE JOINTER			
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	Combination pliers	200 mm insulated	21 nos.
2	Screw driver	200 mm	21 nos.
3	Screw driver	100 mm	21 nos.
4	Terminal screw driver	75 mm (Connector)	21 nos.
5	Neon tester	500 volts (Pencil bit type)	21 nos.
6	Knife D.B. Electrician		21 nos.
7	Steel tape	3 mt length	21 nos.
8	Hammer ball pein	0.25 Kg.	21 nos.
9	Try square	200 mm	21 nos.
10	Firmer chisel	12 mm	21 nos.
11	Firmer chisel	6 mm	21 nos.
12	Tenon saw	250 mm	21 nos.
13	Wood rasp file	250 mm	21 nos.
14	File round (Half) 2nd cut	250 mm	21 nos.
15	File round 150 mm	250 mm	21 nos.
16	Plumb bob	115 grams	21 nos.
17	Bradawl	150 mm X 6 mm square pointer	21 nos.

18	Ratchet brace	6 mm capacity	21 nos.
19	Ratchet bit	4 & 6 mm	21 nos.
20	Barwoodmallet	1 Kg (75 mm X 150 mm)	21 nos.
B : INSTRUMENTS & GENERAL SHOP OUTFIT			
21.	C- clamp	100mm, 150mm, 200mm	2 Nos. each
22.	Pliers side cutting	200 mm	8
23.	Pliers flat nose	150 mm	4
24.	Pliers round nose	200 mm	4
25.	Pliers long nose	200 mm	8
26.	Screw driver heavy duty	250 mm	8
27.	Screw driver	7 mm X 300 mm	8
28.	Firmer chisel	25 mm	8
29.	Firmer chisel	18 mm	8
30.	Mortise chisel	6 mm	4
31.	Iron plane	300 mm X 50 mm blade	4
32.	Marking gauge		4
33.	Bevel square	150 mm	4
34.	Cold chisel flat	25 mm X 200 mm	4
35.	Cold chisel flat	18 mm X 200 mm	4
36.	Hammer ball pein	0.50 Kg.	4
37.	Hammer ball pein	0.75 Kg.	4
38.	Hammer ball pein	1.0 Kg.	4
39.	Hammer cross pein	0.50 Kg.	4
40.	Rawl tool holder and bit	No. 8, 10, 14 and 16.	2 Nos. each
41.	Wall jumber octagonal	37 mm X 450 mm and 37 X 600 mm	4 Nos. each
42.	Centre punch	100 mm	2
43.	Hammer ball pein	0.12 Kg.	2
44.	File flat	300 mm rough	4
45.	File flat 2nd cut	300 mm	4
46.	File flat bastard	250 mm	4

Cable Jointer

47.	File flat smooth	250 mm	4
48.	File half round 2nd cut	150 mm	4
49.	File half round smooth	150 mm	4
50.	File round 2nd cut	300 mm	4
51.	File round smooth	150 mm	4
52.	File triangular 2nd cut	150 mm	2
53.	Spanner double ended	set of 6	2 set
54.	Adjustable spanner	350 mm	1
55.	Allen keys		1 set
56.	Steel rule	300 mm	4
57.	Steel measuring tape	20 meters	1
58.	Hacksaw frame adjustable	200 mm to 300 mm	4
59.	S. S. Twist drill	3 mm to 6 mm	2 set
60.	Spirit level	300 mm	1
61.	Electric soldering iron	125 watts 230 – 250 V	2
62.	Electric soldering iron	750 watts 230 – 250 V	2
63.	Blow lamp	1 liter capacity	2
64.	Laddle		2
65.	Melting pot	200 mm X 150 mm	1
66.	Forge with hand blower		1
67.	Pipe vice	100 mm	4
68.	Conduit die set	suitable for 9 mm, 18 mm, 25 mm and 30 mm	4
69.	Bench vice	150 mm	4
70.	Hand vice	50 mm jaw	4
71.	Rubber gloves	5000 volts	4
72.	Megger cum-continuity tester	500 volts	2
73.	Voltmeter M.I.	multi range 0 – 150, 300, 600 V	1
74.	Ammeter M.I. panel board type	0 – 15 Amp	1
75.	Ammeter M.C. centre zero	0 -5 Amp (0 - 5 – 0)	1
76.	Single phase KWH meter	5 A, 250 V AC	1
77.	Wattmeter Dynamo meter type 5 Amps, 250 V	5 A, 250 V AC	1
78.	Multimeter Miliampers	0 – 5 , 100, 200 , 500 0 – 100, 1000, 10000 Ohms,	1

Cable Jointer

		0 -150, 300, 600 V AC/DC	
79.	Earth megger with all accessories	0 – 10 Ohms, 500 V	1
80.	Conduit pipe cutting and threading machines adjustable	for 15 mm to 30 mm	1
81.	Conduit pipe bending machine suitable	for 15 mm, 13 mm, 25 mm and 30 mm	1
82.	Bar magnet		1
83.	Horse shoe magnet		1
84.	Wheat stone bridge		1
85.	Crimping tool		1 set
86.	Rubber matting	2 meters X 1 meter X 9 mm	2
87.	Work bench	2.5 X 1.20 X 0.75 meters	2
88.	Steel locker standard size	with 8 drawers in each	2
89.	Almirach	1.8 X 1..2 X 0.45 meters	2
90.	Instructors chair		1
91.	Instructor table		1
92.	Demostration table	2.5 X 1.20 X 0.75 meter	1
93.	Black board with eraser		1
94.	Stools		20
95.	Fire extinguishers		2
96.	Metal rack	180 X 150 X 45 cm	1
97.	Fire buckets		4
C : GENERAL MACHINERY INSTALLATIONS			
	NIL	-----	--

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: CABLE JOINTER

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		21
2.	Set square celluloid	45^o(250 X 1.5 mm)	21
3.	Set square celluloid	30^o-60^o(250 X 1.5 mm	21
4.	Mini drafter		21
5.	Drawing board	(700mm x500 mm) IS: 1444	21
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

Cable Jointer

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

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

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

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