CURRICULUM

FOR THE TRADE OF

CABLE JOINTER

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

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

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3. Reliance Infrastructure ltd. Mumbai
4. BTC, BEST, Mumbai

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

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
1.	BN 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

2. 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.

3. RATIONALE

(Need for Apprenticeship in CABLE JOINTER trade)

It is generally observed that institutionally trained youth have not produced desired result because training imparted in institutions alone is not enough for acquisition of skills but needs to be supplemented by training in the actual world of work.

The Electrical Power sector plays a very important role not only in GDP growth but also in providing employment in the country. The generation, transmission & distribution capacity is continuously increasing as per the Government vision to provide 24 Hours power supply to all over India so it is estimated that it requires more skilled workers every year. It requires better connectivity between Generating stations to end user for reliable service. The cable provide reliable service, rugged construction, superior appearance and better safety. The underground cable gives better safety so it used in Power station, substation, submarine crossing, big cities, etc. So, Cable jointer require at each point of transmission & distribution of power. A large number of skilled workers coming out of technical institutes do not possess the required skills and are not readily employable. The industries have to spend time and money on their training. It has been observed that most of the existing Industrial Training Institutes run by the government and private sector do not have on the job training facilities.

It is therefore needed to interact with the industry to provide on the job training to the Semi skilled workers and also make changes in the curriculum. So to supply the skilled manpower demand, the Apprenticeship Training approach with the revised, industrial friendly curriculum is required.

4. JOB ROLES: REFERENCE NCO

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 & NOS:

i) NCO-2004: 7245.20 (857.30)

5. GENERAL INFORMATION

1. **Name of the Trade** **: CABLE JOINTER**

2. **N.C.O. Code No. (**NCO-2004) : 7245.20

3. **Duration of Apprenticeship Training (Basic Training + Practical Training):** 2years

3.1 For Freshers: Duration of Basic Training: -

a) Block –I : 3 months

b) Block – II : 3 months

Total duration of Basic Training: 6 months

Duration of Practical Training (On -job Training)

a) Block–I: 9 months

b) Block–II : 9 months

Total duration of Practical Training: 18 months

3.2 For ITI Passed: Duration of Basic Training: - NIL

Duration of Practical Training (On-job Training): 12 Months

4. **Entry Qualification** : Passed **8th Class under 10+2 System of Education**

5. **Selection of Apprentices:** The apprentices will be selected as per Apprenticeship Act amended time to time.

6. **Rebate for ITI passed trainees**:- **One year rebate** for those who have passed **CTS- WIREMAN / ELECTRICIAN** Trade. They will undergo One year On-the-job Training

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	4-12	13-15	16-24
Basic Training	Block– I	-----	Block – II	------
Practical Training (On - job training)	----	Block – I	------	Block – II

Components of Training	Duration of Training in Months																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Basic Training Block - I																								
Practical Training Block - I																								
Basic Training Block - II																								
Practical Training Block - II																								

7. SYLLABUS

6.1 BASIC TRAINING
(BLOCK – I & II)
DURATION: 06 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** : **Cable Jointer**
2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)
3) **Batch size** : 20 nos.
4) **Power Norms** : 5 KW for Workshop
5) **Space Norms** : 70 Sq.m. (For basic Training of Block-I & II)
6) **Examination** : The internal assessment will be held on completion of each Block.
7) **Instructor Qualification** :

i) Degree/Diploma in Electrical 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 Electrician / Wireman / Cable Jointer 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

6.1.1 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)
1	**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.	**30**	Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	**20**
2	**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		Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals	
3	**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		**Percentage** : Introduction, Simple calculation.	

4	**Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.		**Material Science** : properties - Physical & Mechanical, Types – Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys	
5	Free Hand sketch of hand tools, measuring tools used in Electrician /wireman/ Lineman trade. Free hand sketch of wire joints.			

B. Block- II
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1	**Signs & Symbols of AC/DC System** Symbols used in electrical circuits. Electrical components.	**30**	**Mass ,Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals	**20**
2	Electrical wiring diagram of different lamps, room (3/4 point), stair case. Schematic diagram of plate and pipe earthing,		Square Root: Square and square root, method of finding out square roots. Simple problem using calculation.	
3	Types of insulator used in over head line. (Half sectional views)		**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Surface area of solids – cube, cuboid, cylinder and Sphere.	
4	Layout diagram of a substation . Single line Diagram of Electrical substation feeders.		Volume of solids – cube, cuboid, cylinder and Sphere. measurement of angles.	

7.1.1 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I
Basic Training

Week No.	Professional Skills	Professional Knowledge
1	Implementation of various safety measures in the shop floor. Visit to different sections of the Institute. Demonstration of elementary first aid. Artificial Respiration. Practice on use of fire extinguishers. **Occupational Safety & Health.** **Importance of housekeeping & good shop floor practices.** Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipment(PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. 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 eg; power failure, fire, and system failure.
2	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	Skinning the cables Demonstration & Practice on bare conductors joints--such as rat tail, Britannia, straight, Tee, Western union Joints Practice in soldering & brazing Practice on crimping thimbles,	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-conductors. Types of wires & cables, standard wire gauge. Specification of wires & Cables-insulation & voltage

	Lugs. Demonstration and identification of types of cables. Demonstration & practice on using standard wire gauge & micrometer.	grades- Low , medium & high voltage
4	Verification of Ohm's Law, Measuring unknown resistance Verification of laws of series and parallel circuits. 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. 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	Demonstration of trade hand tools. Use, care & maintenance of various hand tools. Practice on installation and overhauling common electrical accessories as per simple Electrical circuit / Layout. Make test board.	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. Series –parallel testing board & use.
6 -7	Identify basic Hand Tools for filing, chiseling, cutting, drilling, etc. Chipping practice and practice in grinding harding and tempering of chisels. Filing practice, filing true to line. Marking, sawing and drilling practice in hand drilling &	Introduction to fitting trade. Descriptions , General Care & Maintenance of Hammer, Chisels, Try Square, etc Descriptions, General Care & Maintenance of different type of files. Descriptions, General Care & Maintenance of hacksaw, drilling machine, etc Description of taps and dies, types of rivets and riveted joints.

	power drilling machine. Practice in using taps and dies, threading hexagonal and square nuts etc. Cutting external threads on stud and on pipes and riveting practices. Practice in using sand paper and polishing.	Finishing and polishing materials and their process.
8-9	Simple sheet metal work Cutting, bending and jointing. Jointing of metals by soft soldering. Making of simple sheet metal articles. Preparation of channel clamps as used in line construction, Bending of pipe to required shape. Hardening and tempering common smithy cutting tools. Practice in making Eye bolt, stay bolt 'U' clamps and 'J' clamps. Practice in brazing and welding operation like brazing copper pipe, welding mild steel ring etc.	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. 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.
10-11	Practice in casing, Capping and Conduit wiring . Testing of wiring installation by meggar. -Fixing of calling bells/buzzers. Identification & demonstration on conduits and accessories & their uses, cutting , threading & laying Installation, Testing, Maintenance and Repairing of wiring. Application of fuses, relay, MCB, ELCB.	**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. **Wiring system -** P.V.C., concealed system. Specifications, standards for 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.

12	**Practice on Earthing**- different methods of earthing. Measurement of Earth resistance by earth tester. Testing of Earth Leakage by ELCB and relay.	**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	Identify & select different type of Instruments. Use of **-P**MMC , MI meter, Multi-meter(Digital/Analog) , Wattmeter, P F meter, Energy meter, Frequency meter, Phase sequence meter, Digital Instruments, etc 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	

B. Block –II
Basic Training

Week No.	Professional Skills	Professional Knowledge
1	Identify of single & multicore and their application. 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.
2-3	Identify different type of cable base on classification & construction. Correct use of various tools necessary for cable jointing work. Measurement of earth resistance and testing the continuity of earth conductors. Use of earth resistance tester/Megger. Selection and use of dielectric tape depending on voltage rating.	**Classification /Construction of various types of cables including.** (1)H –type (2) S.L. type (3) H.S.L. type (4) Pressure type (5) Belted cable (IS:9968 part 1and 2) (6) XPLE cables (cross linked polyethylene cables IS:1798 of 1985) (7) ELOS TO MERACK CABLES (Synthetic rubber cables) (8) FRLS cable (fire resistant low smoke cable) (9) Basic knowledge of submarine cable.
4-5	Preparation of Armour for earthling cutting of Armors and sheath. Stripping the cable insulation following safety procedure. Demonstrate Constituents of EHT oil filled cable. Demonstrate Constituents of Gas filled cable. Measurement of resistance of conducting material.	**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. Aluminium 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	Identify the cable base on current carrying capacity. Measurement of insulation resistance between the cores and between the cores and earth. Earth continuity in cables.	Current carriying capacity and selection of cables effect of:- (a) Ground/air temperature (b) Depth of laying (c) Grouping of proximity of cables (d) Thermal resistivity of soil and conditions of soil. (e) Limitation imposed by insulating material. (f) Basis for selection of LT,HT and EHT cables (short circuit with stand capacity and length

		versus voltage drops). (g) Derating Factor & its significance.
7-8	Identify & select different type of cable laying method. Practice of laying of cable in trenches/pipe.	**Methods of laying cables with their advantages and disadvantages** (a) laying directly in ground, in air and in ducts. (b) Bending radius and preparation of trench. (c) Effects of vertical runs on impregnated cables. (d) Protection from mechanical damages, cable spiking and cable identification (e) Single core cables, trefoil formation, cross bending etc.
9-10	Making up a straight splice for different cables. Jointing of cables in lead sleeves. Jointing of cables in epoxy sleeves. Termination of cable conductor.	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 Method of soldering and crimping. Use of crimping tools (hydraulic- crimping tool kit) Precautions to be observed at every stage of cable jointing.
11	Test the underground cables for open, short circuit & ground fault and also check insulation resistance.	Working principle of testing kit, cable fault finding bridges induction coil , etc.. Knowledge of Battery box and discharge rod.
12 - 13	Testing of cables before commission. Determine the location of cable fault. Measurement of earth resistance.	Testing of cables before commissioning. Location of cables faults. Repairing faulty cable (sectionalizing and location of cable fault). 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 03days	

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 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	

B. Block– II
Basic Training

Topic No.	Topic	Duration (in hours)
	Entrepreneurship skill	**10**
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	**10**
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 legislation of India. 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.	
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	**5**
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	
	Leadership and Team Building skills.	**5**
	Leadership Discipline and Morale Team Work Case Study/ Exercise	
	Meet the Mentor **Role - play as a Supervisor**	**5**
	Organizing and Planning.	**5**
	Time Management Group Dynamics Case Study/ Exercise	

7.2 PRACTICAL TRAINING (ON-JOB TRAINING)
(BLOCK – I & II)
DURATION: 18 MONTHS (9 months in each block)

GENERAL INFORMATION

1) **Name of the Trade** : **Cable Jointer**

2) **Duration of On-Job Training** : As per Apprenticeship Act amended time to time.

3) **Batch size** : 20

4) **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.

5) **Instructor Qualification** :

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

OR

ii) NTC/NAC in the trade of Electrician / Wireman / Cable Jointer with three year post qualification experience in the relevant field.

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

6) **Tools, Equipments & Machinery required** : - As per Annexure – II

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

A. BLOCK – I (09 months)

Week No.	Professional Skills
1	Observe & practice safety in all electrical works. Practice providing First Aid. Personal Safety Equipment & their importance.
2	Identify & use all basic hand tools.
3	Check the gauges of wire & select suitable wires for the required current rating. Practice wire joints & providing cable glands. Soldering practice.
4	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.
5	Execute pipe joints, dismantle and assemble valves & fittings in pipes and test for leakages.
6	Making of sheet metal articles for the given job.
7	Perform Arc / Gas welding and Brazing operation to join and cut mechanical components / metals.
8	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.
9	Electrical wiring: Repair / replace switches, sockets, light points. Provide new points in PVC casing capping & PVC conduits.
10	Replacing the bulbs, tubes, trouble shooting, repair & maintenance. Wire up in PVC casing & capping.
10	Decides the size of cable & provides power supply to machines & equipments, provide earth connections.
11	Provide light/socket points, for various equipments and appliances
12	Providing power supply to motors, equipments& appliances. Crimping the lugs, providing cable glands & connections.
13	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.
	Project Work
	REVISION
	Examination

B. BLOCK – II (09 months)

Week No.	Professional Skills
1	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.
2	Various types of cables and their application.
3	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.
4	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.
5	Various types of HT & LT cables Joints and their application.
6	Use of various jointing materials, suitable equipment/tools for different processes in jointing of cables.
7	To 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.
8	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.
9	**(JOINTING/TERMINATION PROCESS)** End preparation of core for soldering, crimping including joints in aluminum conductor, Phasing out, Fitting and sweating/crimping of ferrules, Filing and sand papering.
10	**(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.
11	**(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.
12	Testing of underground cables, trouble shooting, Locating faults, open circuit, short circuit & leakage in cables, Repairs of faulty cables.
13	**(METHODS OF LAYING CABLES/INSTALLATION)** Identifying 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.
14	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.
	Project Work
	REVISION
	Examination

8. ASSESSMENT STANDARD

7.1 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:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- many tolerances while undertaking different work are in line with those demanded by the component/job.
- 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 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 the use of hand tools, machine tools and workshop equipment
- the majority of tolerances while undertaking different work are in line with those demanded by the component/job.
- 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 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 the use of hand tools, machine tools and workshop equipment
- tolerances while undertaking different work being substantially in line with those demanded by the component/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 (SUMMATIVE ASSESSMENT)

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.

9. FURTHER LEARNING PATHWAYS

Employment opportunities:

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

1. Power Generation, Transmission & Distribution industries.
2. Central & State Government and Public sector
3. Private industries in India & abroad.
4. Infrastructure, defence and railway organisations
5. Self employment

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: CABLE JOINTER

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

A : TRAINEES TOOL KIT:-

Sl. No.	Name of the items	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) 2^{nd} cut 250 mm	21 nos.
15	File round 150 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	Barwood mallet 1 kg. (75 mm X 150 mm)	21 nos.

B : TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS

Sl. No.	Name of the items	Quantity (Indicative)
	C- clamp, 100mm, 150mm, 200mm	2 Nos. each
1	Pliers side cutting 200 mm	8
2	Pliers flat nose 150 mm	4
3	Pliers round nose 200 mm	4
4	Pliers long nose 200 mm	8
5	Screw driver heavy duty 250 mm	8
6	Screw driver 7 mm X 300 mm	8
7	Firmer chisel 25 mm	8
8	Firmer chisel 18 mm	8
9	Mortise chisel 6 mm	4
10	Iron plane 300 mm X 50 mm blade	4
11	Marking gauge	4
12	Bevel square 150 mm	4
13	Cold chisel flat 25 mm X 200 mm	4
14	Cold chisel flat 18 mm X 200 mm	4
15	Hammer ball pein 0.50 Kg.	4
16	Hammer ball pein 0.75 Kg.	4
17	Hammer ball pein 1.0 Kg.	4
18	Hammer cross pein 0.50 Kg.	4
19	Rawl tool holder and bit No. 8, 10, 14 and 16.	2 Nos. each
20	Wall jumber octagonal 37 mm X 450 mm and 37 X 600 mm	4 Nos. each
21	Centre punch 100 mm	2
22	Hammer ball pein 0.12 Kg.	2
23	File flat 300 mm rough	4
24	File flat 300 mm 2nd cut	4
25	File flat 250 mm bastard	4
26	File flat 250 mm smooth	4
27	File half round 150 mm 2nd cut	4
28	File half round 150 mm smooth	4
29	File round 300 mm 2nd cut	4
30	File round 150 mm smooth	4
31	File triangular 150 mm 2nd cut	2
32	Spanner double ended set of 6	2 set
33	Adjustable spanner 350 mm	1
34	Allen keys	1 set
35	Steel rule 300 mm	4
36	Steel measuring tape 20 meters	1
37	Hacksaw frame adjustable 200 mm to 300 mm	4

38	S. S. Twist drill 3 mm to 6 mm	2 set
39	Spirit level 300 mm	1
40	Electric soldering iron 125 watts 230 – 250 V	2
41	Electric soldering iron 750 watts 230 – 250 V	2
42	Blow lamp 1 liter capacity	2
43	Laddle	2
44	Melting pot 200 mm X 150 mm	1
45	Forge with hand blower	1
46	Pipe vice 100 mm	4
47	Conduit die set suitable for 9 mm, 18 mm, 25 mm and 30 mm	4
48	Bench vice 150 mm	4
49	Hand vice 50 mm jaw	4
50	Rubber gloves 5000 volts	4
51	Megger 500 volts cum-continuity tester	2
52	Voltmeter M.I. multi range 0 – 150, 300, 600 V	1
53	Ammeter M.I. 0 – 15 Amp panel board type	1
54	Ammeter M.C. centre zero 0 -5 Amp (0 - 5 – 0)	1
55	Single phase KWH meter 5 A, 250 V AC	1
56	Wattmeter Dynamo meter type 5 Amps, 250 V	1
57	Multimeter 0 – 5 , 100, 200 , 500 miliampers, 0 – 100, 1000, 10000 Ohms, 0 -150, 300, 600 V AC/DC	1
58	Earth megger 0 – 10 Ohms, 500 V with all accessories	1
59	Conduit pipe cutting and threading machines adjustable for 15 mm to 30 mm	1
60	Conduit pipe bending machine suitable for 15 mm, 13 mm, 25 mm and 30 mm	1
61	Bar magnet	1
62	Horse shoe magnet	1
63	Wheat stone bridge	1
64	Crimping tool	1 set
65	Rubber matting 2 meters X 1 meter X 9 mm	2
66	Work bench 2.5 X 1.20 X 0.75 meters	2
67	Steel locker standard size with 8 drawers in each	2
68	Almirach 1.8 X 1..2 X 0.45 meters	2
69	Instructors chair	1
70	Instructor table	1
71	Demostration table 2.5 X 1.20 X 0.75 meter	1
72	Black board with eraser	1
73	Stools	20
74	Fire extinguishers	2
75	Metal rack 180 X 150 X 45 cm	1
76	Fire buckets	4

C : GENERAL MACHINERY INSTALLATIONS:-

Sl. No.	Name of the items	Quantity
	NIL	

Note: In case of basic training setup by the industry the tools, equipment and machinery available in the industry may also be used for imparting basic training.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: CABLE JOINTER

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
2.	Set square celluloid 45^0 (250 X 1.5 mm)	20
3.	Set square celluloid 30^0-60^0 (250 X 1.5 mm)	20
4.	Mini drafter	20
5.	Drawing board (700mm x500 mm) IS: 1444	20

B : FURNITURE REQUIRED

Sl. No.	Name of the items	Quantity (indicative)
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

ANNEXURE – II

TOOLS & EQUIPMENT FOR ON-JOB TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

TRADE: CABLE JOINTER

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. 9 months + 9 months) are imparted. In case of any short fall the concern industry may impart the training in cluster mode/ any other industry/ at ITI.

ANNEXURE-III

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.