

**SYLLABUS FOR ELECTRICAL WORKMAN PERMIT**

(See Regulation 13)

**(A) For Electrical Wireman (MV)**

**(a) Domestic Installation upto 650 Volts**

- (i) General knowledge about A.C & D.C systems (Generation, Transmission & Distribution, both single phase & three phase in case of A.C system)
- (ii) General knowledge about conductors, insulators, semiconductors, resistors, fuse wires, electrical voltage, current, power & energy both in AC & DC systems.
- (iii) Selection and use of proper sizes, grades of solid & stranded conductors, use of wire gauge etc.
- (iv) Use of test lamps, bells, buzzer, continuity tester & battery in the testing requirements of circuits.
- (v) Methods of testing out of polarity, phasing out of circuits.
- (vi) Connections and diagrams for main switches, distribution boards ceiling roses, plugs, sockets, switches (including 2 way), lamp holders, fans with regulators, MCCB, MCB, RLCB, ELCB, rotary switches and changeover switches etc.
- (vii) Different types of wiring, fittings & other devices required for domestic wiring.
- (viii) Installation work of the classes and with the kinds of cables & wires for building wirings (for fans, lights, small motors and other appliances for domestic use) with CTS, conduit, cleat, wood casing and capping and other systems of wiring permitted under Indian standards (BIS) and safety regulation 2010 of Central Electricity Authority.
- (ix) EARTHING OF INSTALLATIONS: - Importance of earthing, running earth, GI pipe earthing, plate earthing etc.
- (x) Testing for fault, measuring insulation resistance by insulation tester and continuity tester.
- (xi) JOINTING & SOLDERING: - • Making straight & T-joint in solid & stranded conductors and soldering them. • Soldering plugs & sockets on wires & cables and finishing off & insulating.

**(b) For Industrial Installation up-to 650 V**

- (i) Wiring of 3-phase motors, generators with associated control gears with various type of wires and cables.
- (ii) Knowledge of current carrying capacity of different sizes of wires & cables used for industrial wiring. Choice & selection of appropriate size & grade of wires & cables for industrial appliances of various purpose of use.
- (iii) Knowledge of working of motors, generators with associated control gears, familiarity with normal type of faults and diagnoses of fault location.
- (iv) Measuring earth resistance with an earth testing instrument (earth tester)
- (v) Laying & jointing of cables of voltage up-to 650 V used in industrial wiring.
- (vi) Practice in terminating an underground cable to a Bus Bar chamber. Crimping Lugs to the conductor of the cable, connection to Bus Bar, loop connection for other circuit etc.
- (vii) General Knowledge of safety precautions for personnel & equipments, fire fighting, electric shock to a person, first aid and shock treatment.

**(B) For Electrical Lineman (MV)**

- (i) Knowledge of 3-phase & single phase voltage system up-to 650 V for connection of voltmeters, ammeters, energy meters etc.
- (ii) Knowledge about power & energy with simple calculations.
- (iii) Reading of energy meters, simple methods for ascertaining the correctness of meter readings by use of lamps for fixed time.
- (iv) Use of clamp on tester (ammeter), voltmeter, insulation tester and earth resistance tester.
- (v) Giving service connection in single & 3-phases and attending to the consumers' complaints.
- (vi) Construction, maintenance and operation of overhead and underground lines & installations including equipments upto 650 V.
- (vii) Maintenance of different switch gears, substation equipment, filtering of transformer oil, connection and maintenance of different types of street lights.
- (viii) Knowledge about operation of air-conditioning, ventilation system & lift.
- (ix) Station Batteries, battery charging equipment.
- (x) Knowledge about the use of stabilizers, inverters etc.

- (xi) Knowledge about the standard conventional symbols used for electrical equipments, systems, the drawings thereon and toolkit.
- (xii) Industrial switch boards, distribution system etc.
- (xiii) Acquaintance with safety regulation 2010 of CEA for overhead and underground lines upto 650 volt.

ENDORSEMENT FOR CABLE JOINTING – Workman possessing Wireman – MV & Lineman – MV permits will have endorsement for jointing upto 650 volts, if during practical test they are found to have acquired adequate knowledge and experience in cable jointing work for cables of different types and installations.

### **(C) For Electrical Workman (HT)**

(Overhead and underground installations and equipments upto 33 KV)

The syllabus prescribed for Lineman (MV) is common to the syllabus of Workman (HT) with the following syllabus.

- (i) General knowledge about the HV systems (Generation, Transmission & Distribution).
- (ii) Construction, Maintenance & Operation of over head lines installation, substations and equipments upto 33 KV.
- (iii) Knowledge about the line & substation, construction standards i.e. RECs, IS standards for HV systems.
- (iv) Principle and working of alternating current, direct current, generators and their parallel operations.
- (v) Principle & working of Transformers and their parallel operation.
- (vi) Principle & working of Alternating Current & Direct Current motors and their speed characteristics, controls etc.
- (vii) General use of protective switchgears, i.e. relays, CTs, PTs, Lightning arresters etc.
- (viii) Simple estimation of requirements of the materials.
- (ix) Measurement of power, power factor and improvement of power factor in both single phase and 3-phase system.
- (x) Earthing of HV systems.
- (xi) Different Circuit Breakers used in HV systems.

ENDORSEMENT FOR CABLE JOINTING – Workman possessing Workman – HT permits will have endorsement for jointing upto 33 KV, if during practical test they are found to have acquired adequate knowledge and experience in cable jointing work for cables of different types and installations.

**Additional Syllabus for Mining Workman:-**

Workman of MV & HT category will have endorsement for working in the mines.

WIRING: - Wiring layouts of different types such as cleats, lead covered, cab type sheathed for lighting purposes at the surface and armoured cables for power and lighting installation underground.

CIRCUIT KNOWLEDGE: - Electrical connections for DC & AC generators, DC & AC Motors, their starters and regulators, switch Board & Transformer etc, Distribution boards with circuit breakers, switch fuse units and gate switches, Battery charger and lamp cabin.

APPARATUS INCLUDING FLAME PROOF APPARATUS SUITABLE FOR USE IN HAZARDOUS LOCATIONS IN COAL AND OIL MINES:

INSTALLATION AND MAINTENANCE OF - : Electrical winders including automatic contrivances, haulages, ventilating fans, pump units and compressors, their controls gears and starters. • Rectifier, rotary convertors, electric locomotives and battery charging station. • Portable and transportable apparatus. • Power and lighting transformers and capacitors. • Safe signaling equipment including telephone equipment. • Shot firing apparatus including cables, their uses routine tests and maintenance.

Elementary calculation knowledge about power, load, energy consumption in pumping, hauling and other machineries etc..

TESTING AND FAULT ATTENDANCE – Detection and location of earth other faults in electrical apparatus and cables, low voltage and remote control circuits. Insulation and continuity tests, rectification of faults, tests for insulation resistance to earth, testing of leakage protective device, Earth testing and its continuity.

FLEXIBLE TRAILING CABLES FOR PORTABLE AND TRANSPORTABLE APPARATUS – Knowledge of different types of flexible cables including pliable armoured cables, their installation, maintenance fault detection, efficient repairs by vulcanized joints and testing.

SAFETY AND PROTECTIVE DEVICES - Knowledge of earth of metal frames of machineries. Use of H.R.C. cartridge, fuse in circuit breaker as back up protection. Overload, no-volt and earth leakage protection of circuit breakers and starters.

FIRE PRECAUTIONS – Fire extinguishing appliances & their use in mines & oil fields.

SAFETY RULES – working knowledge of the Safety Regulation-2010 of CEA with particular reference to chapter for Mining and Oil field. Safe & minimum clearance above the ground of lowest conductor of overhead lines or overhead cables.

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