CURRICULUM

FOR THE TRADE OF

MECHANIC (LIFT AND ESCALATOR)

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

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

CONTENTS

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2. Otis
3. Kone Pvt. Ltd.

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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.	Sanjay Kumar, Joint Director	CSTARI, Kolkata	Expert Member
2.	L.K. Mukherjee Dy Director	CSTARI, Kolkata	Expert Member
3.	K.V.S.Narayana, Trg Officer	CSTARI, Kolkata	Expert member
4.	Bharat Kumar Nigam, Trg Officer	CSTARI, Kolkata	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 **Mechanic(Lift and Escalator)** trade)

Nowadays every building, industry, shopping mall, structure, airport, railway station, bus stations etc are equipped with various kinds of elevators, escalators and moving auto walks. This trade course is need of the hour. This course is meant for candidates who aspire to become a professional lift and escalator mechanic with installation and maintenance skills. Lift and Escalator mechanic has got huge abroad job opportunities. Trained Lift and escalator mechanics are needed for

1. Installing, testing, servicing and maintaining various kinds of elevators, escalators and moving auto walks in shopping malls, industries, multistoried buildings in IT field and residential buildings, airport, hospitals, subways stations and railway stations.
2. The Elevator, escalator and conveyor manufacturing industries.
3. The Lift operators in hospitals and shopping malls.
4. The Lift and escalator mechanic in public and private organizations.

Skilled manpower is the need of the hour and 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 need for various kinds of elevators, escalators and moving auto walks is increasing day by day. Hence, more skilled workers are needed every year. 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:

1. Install service and maintain various types of elevators, escalators and moving walkways in industries, shopping malls, subway stations, airport, multi storied residential building and perform other related tasks.

2. Install various kinds of electrical and electronic control switches, safety devices, control panels, limit switches and power wiring for control drives.

3. Test / check and adjust, replace any defects in controllers, safety devices, wiring by using meggar, multimeter and related tools.

4. Measure electrical quantities using electrical meters, install, connect, start, run, reverse and stop DC and AC machines along with protective and controlling devices and maintain them.

5. Carry out industrial wiring as per BIS recommendation and IE rules.

6. Fabricate, test and troubleshoot simple electronic circuit and wiring of controller, alarm, displays, sensors and PLC s

Reference NCO & NOS:

i) NCO-2004: 8333.70

5. GENERAL INFORMATION

1. **Name of the Trade** **: Mechanic (Lift and Escalator)**

2. **N.C.O. Code No. (**NCO-2004) : 8333.70

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

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 in 10^{th} class examination under 10+2 system of education or its equivalent.

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

6. **Rebate for ITI passed trainees:-** 1 year to the passed out ITI/ITC trainees in the trade of Lift Mechanic/Lift and Escalator Mechanic. *They will undergo 1 year On-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

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

GENERAL INFORMATION

1) **Name of the Trade** : **Mechanic (Lift and Escalator)**

2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)

3) **Batch size** : 16 nos.

4) **Power Norms** : 6 KW

5) **Space Norms** : 98 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** :

Degree in Mechanical/Electrical/Electrical & Electronics Engg. from recognized engg. College/university with one year experience in the relevant field OR Diploma in Mechanical/Electrical/Electrical & Electronics Engg. from recognized board of technical education with two years experience in the relevant field OR NTC/NAC in the Trade of "Lift Mechanic/ Lift and Escalator Mechanic" With 3 years post qualification experience in the relevant field.

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

7.1.1 DETAIL SYLLABUS OF CORE SKILL

A. Block– I
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
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**	**Unit**: 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 & Simplification**: Fractions, Decimal fraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems Simplification using BODMAS.	
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.		**Square Root** : Square and Square Root, method of finding out square roots, Simple problem using calculator	
4	**Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.		**Ratio &Proportion:** Simple calculation on related problems.	

5	**Free Hand sketch:** Hand tools and measuring instruments used in electronics mechanics trades		**Percentage:** Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	
6	**Free hand drawing :** - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension . - Transferring measurement from the given object to the free hand sketches.		**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.	

B. Block- II

Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1	**Symbolic Representation** (as per BIS SP:46-2003) of : - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings	**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	**Construction of Scales and diagonal scale**		**Work, Power and Energy**: work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.	
3	**Three phase Induction motor** Free hand sketching of Slip-ring and Squirrel cage Induction motor. Typical wiring diagram for drum controller operation of A.C. wound rotor motor.			
4	Drawing the schematic diagram of Autotransformer starter, DOL starter and Star Delta Starter. Drawing the schematic diagram of A.C. motor speed control by SCR /AC Drive.		**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	
5	**Distribution of Power** Types of insulator used in over head line. (Half sectional views) Different type of distribution systems and methods of connections. Layout diagram of a substation. Single line diagram of substation feeders.		**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle. Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids – cube, cuboid, cylinder and Sphere.	

7.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I
Basic Training

Week No.	Professional Skills (275 Hours)	Professional Knowledge (120 Hours)
1.	Implementation in the shop floor of the various safety measures. Visit to the different sections of the Institute. Demonstration on elementary first aid. Artificial Respiration Practice on use of fire extinguishers. **Personnel safety** • Use of hard hat, Safety belt, Cut resistance gloves • Dust mask, Ear plug, Head lamp,	Occupational Safety and Health Basic safety introduction, Personal protection. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution and personal safety message. Use of Fire extinguishers. Visit and observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard. **Study of** • Importance of personnel safety in lift • Applications and proper use of - Hard hat, Safety belt, lifeline , Baricade, Cut resistance gloves, goggels, dust musk, head lamp, ear plug, JHA, cardinal rules,
2.	Practice in using cutting pliers, screw drivers, etc. skinning the cables and jointing practice on single strand and multi stranded conductor. Demonstration and Practice on bare conductors joints-- such as Britannia, straight, T, Western union Joints Practice on soldering-Measurement of Resistance. Determination of specific Resistance.	Fundamental of electricity. Electron theory-free electron, Fundamental terms, definitions, units and effects of electric current Explanation, Definition and properties of conductors, insulators and semi-conductors. Wires/cable & its specification. Types of wire joints & uses. Solders, flux and soldering technique. Types & properties of resistors Specific Resistance.
3.	Verification of Ohm's Law, Verification of Kirchoff's Laws. Verification of laws of series, parallel and combination circuits. Verification of open circuit and closed circuit network. Measuring unknown resistance using different methods- a) Using Wheatstone Bridge b) By voltage drop method. Experiment to demonstrate the variation of resistance of a metal with the change in temperature.	Ohm's Law - Simple electrical circuits and problems. Resistors -Laws of Resistance. Series, parallel and combination circuits. Kirchoff's Laws and applications. Wheatstone bridge principle and its applications. Effect of variation of temperature on resistance. Different methods of measuring the values of resistance.

4.	Demonstration and identification of types of cables. Demonstration and practice on using standard wire gauge & micrometer. Practice on crimping thimbles, Lugs. Identification and use of wiring accessories Practice on installation and overhauling common electrical accessories. Fixing of switches, holder plugs etc. in wooden/PVC/ Metallic boards. • Mounting/ fixing of MCB, MCCB • Fixing Bus bars • Tapping connections from Bus bars	Introduction of National Electrical Code Voltage grading of different types of Insulators, Temp. Rise permissible. Types of wires and cables standard wire gauge. Specification of wires and Cables-insulation and voltage grades-Low , medium and high voltage Precautions in using various types of cables / Ferrules Common Electrical wiring Accessories, their specifications in line with NEC -Explanation of switches, lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, Use & specification of Fire alarm, MCB, ELCB, and MCCB. • Specification & ratings of MCB, MCCB, ELCB, ACB • Bus bars size and spacing • Procedure for control panel erection
5.	Grouping of Dry cells for a specified voltage and current. Practice on Battery Charging, Preparation of battery charging, Testing of cells, and Installation of batteries and Charging of batteries by different methods. Charging of a Lead acid cell, filling of electrolytes-Testing of charging .checking of discharged and fully charged battery. Care and maintenance of Batteries Practice on Earthing – Different methods of earthing. Measurement of Earth resistance by earth tester. Testing of Earth Leakage by ELCB and relay.	Chemical effect of electric current-Principle of electrolysis. Faraday's Law of electrolysis. Basic principles of Electroplating and Electro chemical equivalents. Explanation of Anodes and Cathodes. Cells - Primary & Secondary Lead acid cell-description, methods of charging-Precautions to be taken & testing equipment, Ni-cadmium & Lithium cell, Cathode protection. Electroplating, Anodizing. Different types of lead acid cells. Application of battery/cell in Inverter, Battery Charger, UPS, etc. Lead Acid cell, general defects and remedies. Nickel Alkali Cell-description charging. Power and capacity of cells. Efficiency of cells. Rechargeable dry cell, description advantages and disadvantages. Care and maintenance of cells Grouping of cells of specified voltage and current, Sealed Maintenance free Batteries, Solar battery. Earthing - Principle of different methods of earthing .i.e. Pipe, Plate etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB). In absence of latest revision in respective BIS provision for Earthing it is recommended to follow IEC guidelines.

6.	ALLIED TRADES: Marking use of chisels and hacksaw on flats, sheet metal filing practice, filing true to line. Sawing and planning practice. Practice in using firmer chisel and preparing simple half lap joint. Drilling practice in hand drilling and power drilling machines. Grinding practice in using taps and dies, threading hexagonal and square nuts etc. cutting external threads on stud and on pipes, riveting practice. Practice in using snips, marking and cutting of straight and curved pieces in sheet metals. Bending the edges of sheets metals. Riveting practice in sheet metal. Practice in making different joints in sheet metal in soldering the joints.	Introduction of fitting trade. Safety precautions to be observed Description of files, hammers, chisels hacksaw frames and blades- their specification and grades. Care and maintenance of steel rule, try square and files. Marking tools description and use. Description of carpenter's common hand tools such as saws planes, chisels mallet claw hammer, marking, dividing and holding tools-their care and maintenance. Types of drills description and drilling machines, proper use, care and maintenance. Description of taps and dies, types of rivets and riveted joints. Use of thread gauge. Description of marking and cutting tools such as snubs shears punches and other tools like hammers, mallets, etc. used by sheet metal workers. Different types soldering materials, fluxes and process. Types of different soldering irons and their proper uses. Use of different bench tools used by sheet metal worker.
7.	Trace the magnetic field. Assembly / winding of a simple electro magnet. Use of magnetic compass. Identification of different types of Capacitors. Charging and discharging of capacitor, Testing of Capacitors using DC voltage and lamp.	Magnetism - classification of magnets, methods of magnetizing, magnetic materials. Properties, care and maintenance. Para and Diamagnetism and Ferro magnetic materials. Principle of electro-magnetism, Maxwell's corkscrew rule, Fleming's left and right hand rules, Magnetic field of current carrying conductors, loop and solenoid. MMF, Flux density, reluctance. B.H. curve, Hysteresis, Eddy current. Principle of electro-magnetic Induction, Faraday's Law, Lenz's Law. Electrostatics: Capacitor- Different types, functions and uses.
8.	Determine the characteristics of RL,RC and RLC in A.C. Circuits both in series and parallel. 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.	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. Generation of sine wave, phase and phase difference. Inductive and Capacitive reactance Impedance (Z), power factor (p.f). Active and Reactive power, Simple problems on A.C. circuits, single phase and three-phase system etc.

		Problems on A.C. circuits. 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.
9.	Determine the resistance by Colour coding Identification of active/passive components. Diodes-symbol - Tests - Construct & Test Half wave rectifier ckt. Full wave rectifier ckt. Bridge rectifier ckt. Electronic Power Devices • Demonstration of simple Power control circuits by S.C.R & TRIAC, DIAC • Simple Characteristics of GTO • Demonstration of simple Power control circuits by UJT, FET, JFEET, MOSFET, IGBT • Identification of triggering circuits • Checking of inverter/UPS circuit • Practice on A/D and D/A converter • Identification of pins of different ICs • Check various registers, counters and timers • Practice using simple circuits for Speed control of motor by thyristor • Run stepper/servo motor using electronic controller	Basic electronics- Semiconductor energy level, atomic structure 'P' type and 'N' type. Type of materials -P-N-junction. Classification of Diodes - Reverse and Forward Bias, Heat sink. Specification of Diode PIV rating. Explanation and importance of D.C. rectifier circuit. Half wave, Full wave and Bridge circuit. Filter circuits-passive filter. • Types of electronic power devices • Working principle of SCR, DIAC & TRIAC • Working principle of GTO • Working principle UJT, FET, JFEET, MOSFET, IGBT • Biasing and FET as amplifier and switch • Analog to Digital converter • Digital to analog converter • Various types of ICs, buffer register, counters and timers • Digital memory types - ROM, RAM, EPROM • Applications of power devices • Speed control of motor by thyristor • Concept of stepper/servo motor

10.	Basic Civil/drafting Work • Drawing plan • Elevation of points, lines, surfaces, solids • Dimensioning techniques. • Drawing different types of foundation • Footing, piles, grillages • Foundation raft & well foundation. • Demonstrate & use of spirit level, water level ,plumb bob Use of Lifting Tools and Simple Welding • Demonstrate & use of tape, dial gauge, scale, try square • Demonstrate & Practice of chain block, hoist, pulleys, shackle, ceiling etc • Practice of arc welding • Simple project job as per drawing	Study of • Definition and types of projections. • Methods of projection as per IS. • Projection of points, lines, planes and solids. • Concept of brick well , RCC well • Foundation: Types, Purpose & causes of failure of foundation • Drawing of footing foundation, excavation, shoring& simple machine foundations. • Measuring tools: tape, dial gauge, scale, try square • Lifting tools: chain block, hoist, pulley, shackle, ceiling, etc • Introduction to basic Fabrication work: fastening, temporary, semi-permanent, permanent • Process of welding, brazening • Concept of different types of welding • Types of electrode
11.	Indian Electricity Rules • Preparation of check list for Do's and Don'ts for operation and maintenance Basic Panel wiring • Practice of wiring in control panel • Saddling, dressing and squiring of cables • Fixing and connection of thermostats, timers • Demonstrate the emergency safety devices	Study of • Indian Electricity rules pertaining to operation, construction and maintenance of Lifts and Escalators • Statutory provisions for getting license Study of • Types of wires and cables used in lift • Wiring procedures and techniques • Types of switches for control & power wiring • Types of Thermostats, timers and mercury switches • Emergency equipment of the elevator (Emergency light , Automatic rescue device ,door sensor , emergency alarm)
12.	• Identification of different types of transformer • Connection of Control transformers. • Use of C.T. & P.T. • Connection of three phase transformer • Measure voltages at different tapings	Study of • Single Phase Transformer • Types and Classification • Specification and simple problems on e.m.f. equation, turns ratio and efficiency Three Phase Transformer Types & Connections
13.	Basic Electrical motor: Identify the parts of DC motors Connection of DC motors Running of DC motors at different speeds Identify the parts AC generators Practice voltage building up Measure voltage and frequency	Principle of DC Generation Construction and types of DC motors Starting & Speed control methods of DC motors Principle of electromagnetic induction Faraday's law, Lenz's law Principle of AC Generation Flemings Right Hand/Left Hand rule

B. Block –II
Basic Training

Week No.	Professional Skills	Professional Knowledge
1.	AC MOTORS AND STARTING METHODS Identify the parts AC motors Connecting and Running different types of single phase motor Testing of different types of single phase motor Connecting and Testing of three phase induction motor Running of three phase induction motor using different types starters - DOL, Soft Starter Change of direction of rotation Connect and test different control elements as per drawing Identification of terminals and connection of synchronous motor. Synchronous permanent magnet motor Speed control	Study of Working principle, construction of A.C. motors single phase motors, Characteristics & testing single phase motors Starting methods and applications Working principle, construction of A.C. motors three phase induction motors, Characteristics & testing three phase induction motors Starting methods and applications of poly phase induction motor. Common Motor control circuit elements - start/stop push buttons, indicators, contactors, etc. Simple drawings for starting and control circuit Construction and working principle of synchronous motor Construction and working principle of synchronous permanent magnet motor Size/rating of motor applicable for lift and escalator
2.	AC/DC DRIVES Identification of different parts of AC/DC drive Connection and operation of lift motor through VVVF drives Speed control through drive Practice connection and operation of lift motor through drive Connection of A/D and D/A converters with drive	Study of Types of AC/DC drives Functions and block diagram Applications of AC/DC drive Basic parameter setting in variable voltage variable frequency(VVVF) drive Size and selection of drives used in lifts and escalators Study of Specific control logic for lift motor operation Parameter settings of drives for lift motor operation. Interfacing of A/D and D/A converters with drive

3.	Operation of lift • Demonstrate the working of elevator • Components of elevator • Practice Fixing of template • Practice Fixing of bracket • Practice Fixing of guide rail • Demonstrate counter weight, buffer, car frame , emergency stop switch • Demonstrate landing zone, top over travel • Demonstration of over speed Governor, safety circuit, overhead clearance, car bottom clearance Type, construction and parts of lift • Demonstration of elevator types • Demonstration of types of elevator well/pit	Study of • Components of elevator • Types of elevator • Capacity, speed of the elevator • Methods and procedure for Template setting • Hoist way measurement, Bracket measurement & fixing. • Guide rail hoisting & plumbing. • Concept of counter weight, buffer, car frame , emergency stop switch • Different types of door, landing zone, top over travel, head room, • Elevator safety (over speed Governor, safety circuit, overhead clearance, car bottom clearance) • Common safety features of the elevator - ATT, overload, ISC, Fire, Earth quake Study of • Types of elevator - passenger elevator ,service elevator, freight elevator • Concept of elevator well, elevator pit, pit depth

4.	Practice fixing Guide rails, reed switch, magnet Observe running clearance Fixing of limit switches Inspect car top Fixing/checking of electromagnet brake Fixing of cams and pulleys Demonstrate fixing of Machine beam and beam support Demonstration/fixing of spur gear, worm gear and Bearings Demonstrate fixing of car components Fixing of car lighting and fan Fixing/ adjustment of compensation chain, governor tension weight Demonstrate/practice installation of door Demonstrate/practice installation of cage Practice rope fitting Practice installation of travelling cable Demonstrate safe use of scaffolding Preparation of check list for commissioning and its report Preparation of documents for licensing Checking of wiring , motor, check list before start up Inspection run and normal run	• Types and procedure of fixing Guide rails, reed switch magnet • Importance of Running clearance • Types of limit switch and their application • Importance Car top Inspection • Electromagnetic brakes for lifts. • Types of Drum & pulleys, guiding shoes, cam, Toe guard, retiring cam, limit cam and sheave used in lift • Process of fixing Machine beam and beam support • Dead end hitch, spur gear, worm gear and Bearings • Difference between Geared and Gearless machine • • Components of Car Operating Panel • Hall fixture and lantern • Compensation chain, cage bulldog clip, governor tension weight and counter screen, • Types of Doors and procedure of installation • Cage fitting, function of isolation. • Concept and Calculation of roping/ run by (1:1 , 2:1, 4:1) • Procedure of travelling cable installation. • Types scaffolding & their standards • Concept of scaffold less installation system • Concept of commissioning • Procedure/steps of commissioning • Procedure of getting elevator license and commissioning certificate

5.	Basic Construction and Parts of Escalators • Demonstration of different escalator arrangements • Demonstration of moving walkways • Practice calculation of boarding and alighting areas for different sizes and types of escalators • Practice calculation of pit area and support requirements • Demonstration of different parts of step and step chain assembly • Demonstration of comb plate and hand rail parts • Demonstration/fixing of different control and electrical equipment • Demonstration/fixing of drive unit, drive chain and shaft • Fixing Different covers and panels • Fixing barriers and caution plates	Study of • Types of Escalator arrangements -parallel, multiple parallel, cross over • Typical applications • Moving walkways and applications • Selection/ Calculation of - speed, step widths, inclination • Boarding and alighting areas • Pits and supports • Components/Parts of escalators • Step parts and assemblies • Step chain parts and assemblies • Comb plate parts • Hand rails and related parts Electrical and control parts • Motors and brake assemblies • Drive unit, drive chain and shafts • Lubrication system and other miscellaneous parts • Covers, Decking, trim plates, panels, etc. • Barriers, barrier assembly and caution plates
6.	FUNCTIONAL OPERATION OF LIFT • Familiarization with different control system • Its installation and repair • Understating the automatic levelling function • Practice and set various operations • Practice manual and automatic push bottom operation • Identify different alarming modes • Identification of different components of control circuits. • Tracing of control circuit diagram and necessary repair. • Inspection of performance during Test& Trial. • Record of observation. • Practice alteration and adjustment as necessary	Study of • Various systems of control of lift and their utility • Rheostatic control and variable voltage control • Single speed, double speed, and logic circuit control. • Automatic levelling with change of load, Auxiliary motor micro drive • Automatic levelling with main motor at various speeds • Automatic levelling devices. • The floor selector type, hoist-way switching devices • Operation without mechanical contact. Manual operation, Push bottom, • Automatic operation holds in push bottom operation, full automatic push button operation, dual operation and signal operation. • Alarming system Study of • Various electrical &electronic control circuits • Logic circuits used in lifts. • Test and trial of mechanical, electrical and electronic system of lift. • Procedure of test with minimum and maximum level.

7.	SELECTION AND INSTALLATION OF LIFTS • Measure and adjust clearance between wall and car • Measure and adjust clearance between adjacent car • Calculate car area for different no. of passengers • Calculate elevator speed for different applications • Calculate capacity of elevator (Kg) as per no. of passengers • Installation of different types of ropes, guide, buffers, counter weight, etc. • Installation of governor and pulley • Installation of car gate	Study of • Size and shape of car • Clearance and allowances between car and the wall. • Space required for the erection of lift of different capacity. • Required car area according to no. Of passenger. • Selection of elevator speed for various types of lift. • Capacity of elevator • Selection of location of Lift Machine. • Selection of rope, guiderail, buffers, counterweight • Systematic installation procedure • Types of governor and pulley • Types of Car gate, etc.
8.	MAINTENANCE PROCEDURE • Checking of physical location of all components of lift as per drawing • Practice repairing and replacement of different mechanical components. • Practice repairing and replacement of different electrical and electronic components • Checking of physical location of all components of escalators and moving walkways as per drawing • Servicing of various mechanical/electrical parts of escalators and moving walkways as per drawing	• Concept of lift maintenance. • Methods / Types of maintenance. • Preparing check List. • Concept of maintenance schedule. • Preparing and follow-up of maintenance schedule • Preventive maintenance, running maintenance and brake-down maintenance. • Spare parts used for lift and escalators maintenance. • Inventory / stocking of spare parts. • Preservation of spare parts.
9.	LUBRICATION • Practice draining out old grease and oils • Refilling oil dashpots and grease cups. • Lubrication on cargate, cam Bellows, buffer, rope, guiderail etc.	• Types of lubricants, its properties and use in lifts. • Importance of lubrication. • Lubrication during installation and periodical lubrication. • Disadvantage of improper lubrication

10.	TESTING OF LIFT • Servicing and checking of lift's main supply, switches, fuses and contacts. • Examine & adjust all moving contacts of the controller, • Tightening connections and secure wires. • Check motor connections brush position, air gap, bearing etc. • Check brake shoe, magnetic coil, oil in magnet case, dash pot adjustment etc. • Check oil level at worm gear, replace oil if necessary. • Check shaft bearing, drum, drive sheave for excessive play &proper lubrication. • Careful examination of safety governor for proper operating condition and lubrication. • Carefully examine all ropes for any damage and broken wire and proper lubrication. • Examine main &counter weights, guide rail for lubrication and efficient functioning of brackets and rail clips.	Study of • Effects of faulty power supply, i.e. single phasing, loose contact, improper voltage etc. • Effect of wrong brush bedding and positioning • Effects faulty and loose braking system. • Different types of bearings used in lift. Their specification and properties. • Gear, worm and worm wheel used in lift and their function • Function of various parts of governor
11.	• Check car shoes, buffers and its lubricants. • Carefully examine safety devices, tripping rod for its setting (set even) • Check levelling for car platform. • Check emergency opening of door and other emergency safety devices. • Check movement of travelling cables for foul. • Examine top and bottom final shaft way limit switches and other limit switches for their proper operation • Renew contacts orreplace limit switches if required • Examine safety plank switch under carplat form	• Types of spring, function and use. • Concept of wear and tear. • System of levelling and alignment • Types of Shaft and shaft coupling. • Function of emergency cut out in trip system. • Necessity of electrical/mechanical interlocks. • Importance of regular cleaning, dusting and lubrication.
12.	Examine door contacts and gate contacts, adjusting and renewing parts where necessary. • Examine emergency cut out switches for door and gate contacts. • Examine light &fan switches and fixture in the car for proper operation. • Cleaning of top, bottom and inside car, lift pit, governor, machine, controller and other parts. • Check machine room for proper cleanliness • Check proper functioning of relays, timers, signaling system, alarming system, indications, electrical interlocks etc. • Prepare servicing report. • Record operational state and recommendation	• Importance of recording parameters and other service records of lift • Explanation and function of Auto rescue device (ARD)

	if any. • Familiarization with Auto Rescue Device operating system and connection to lift System	
13.	Revision & Assessment	

7.1.3 EMPLOYABILITY SKILLS

GENERAL INFORMATION

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

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

And

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

OR

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

7.1.3.1 SYLLABUS OF EMPLOYABILITY SKILLS

A. Block – I

Basic Training

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

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 Lift & Escalator Mechanic/ Lift Mechanic 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)

1. Familiarization with all departments of the Elevator Company
2. Safety - personal safety occupational hazards, Working safety. Job Safety standard. Environmental pollution related to the trades, its consequences, mitigation and remedies.
3. Checking and examining of Lift shaft
4. Setting of template
5. Fixing of racket
6. Installation of rail, machine setting
7. Erecting and setting of lift cars, doors bottom springs, lift rail cables etc.
8. Checking of lift rope. Laying out of rope through pulleys and lightening Practice of rope at load end and lift car.
9. Testing of motors, its direction and speed
10. Operation of Electro Magnetic Brakes, setting of Brake Shoes and Hand Brake Lever
11. Practice on installing switchgear .
12. Installation and adjusting pulleys with motors
13. Mounting and fixing of motors with its accessories .
14. Mounting of pedestal bearing.
15. Practice of wiring and erection of control panel .Mounting of main wire service switch and fuses.
16. Test and functional operation of various relays. Practice of connecting relays in the circuits.
17. Tracing of control circuits. Diagram and necessary repair.
18. Selection and installation of a lift with its accessories considering all the factors .
19. Check main supply. Switch fuses and contacts.
20. Examine and adjust all moving contacts of the controller , tightening connections and secure wires.
21. Check and adjust motor connections, brush positions, air gap , bearing etc.
22. Check brake shoe , magnetic coil , oil in magnet case ,dash pot adjustment etc.

B. BLOCK – II (09 months)

1. Check oil level at worm gear , replace oil if necessary .
2. Check and adjust shaft bearing , drum drive sheave for excessive play and proper lubrication .
3. Careful examination of safety governor for proper operating condition and lubrication .
4. Care full examination of all ropes for any damage and broken wire and proper lubrication .
5. Examine main and counter weights , guide rail for lubrication and efficient functioning of brackets and rail clips.
6. Check car shoes for wear & tear .
7. Check buffers and its lubricants. Examine safety devices .
8. Check tripping rod for its setting .
9. Check leveling for car platform
10. Study adjustment and maintenance of other emergency safety devices
11. Check movement of traveling cables for foul.
12. Examine top and bottom final shaft way limit.
13. Examine door contacts and gate contacts, adjusting and renewing parts where necessary .
14. Examine emergency cut out switches for door and gate contacts
15. Examine light and fan switches and fixtures in the car for proper operations.
16. Clean top , bottom and inside car , .
17. Examine lift pit for accumulation of water , garbage if any.
18. Study microprocessor and PLC control drive.
19. Fixing of V.F. control in door operation , door sensor , test tool, safety check.
20. Governor recalibration and testing . Earthquake devices .
21. Demonstration on power supply stabilizer UPS and SMPS .
22. Testing Connecting And Disconnecting of ICs from circuit.
23. Identification of gate and checking the T/T.
24. Fabricate and check various register and counters.

8. ASSESSMENT STANDARD

8.1 Assessment Guideline:

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

The following marking pattern to be adopted while assessing:

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

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

In this work there is evidence of:

- 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. Install ,test, service and maintain various kinds of elevators, escalators and moving auto walks in shopping malls, industries, multi-storied buildings in IT filed and residential buildings ,airport, hospitals, subways stations and railway stations.
2. Elevator, escalator and conveyor manufacturing industries.
3. Lift operator in hospitals and shopping malls.
4. Lift and escalator mechanic in public and private organizations.
5. Huge abroad job opportunities.

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: MECHANIC (LIFT AND ESCALATOR)
LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

A : TRAINEES TOOL KIT:-

Sl. No.	Name of the items	Quantity
1	Steel Tape, 15 m length	17 Nos.
2	Plier Insulated, 150 mm	17 Nos.
3	Plier Side Cutting, 150 mm	17 Nos.
4	Screw Driver, 100 mm	17 Nos.
5	Screw Driver, 150 mm Electrician Connector, screw driver insulated	17 Nos.
6	handle thin stem, 100 mm	17 Nos.
7	Heavy Duty Screw Driver , 200 mm	17 Nos.
	Electrician Screw Driver thin stem insulated	
8	handle, 250 mm	17 Nos.
9	Punch Centre , 150 mm X 9 mm	17 Nos.
10	Knife Double Bladed Electrician	17 Nos.
11	Neon Tester	17 Nos.
12	Steel Rule 300 mm	17 Nos.
13	Hammer, cross peen with handle	17 Nos.
14	Hammer, ball peen With handle	17 Nos.
15	Gimlet 6 mm.	17 Nos.
16	Bradawl	17 Nos.
17	Scriber (Knurled centre position)	17 Nos.
18	Pincer 150 mm	17 Nos.

B : TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS

Sl. No.	Name of the items	Quantity
1.	First aid box	01 set
2.	C- Clamp 200 mm, 150 mm and 100 mm	2 Nos each
3.	Spanner Adjustable 150 mm,300mm	2 Nos each
4.	Blow lamp 0.5 ltr	1
5.	Melting Pot	1
6.	Ladel	1No
7.	Chisel Cold firmer 25 mm X 200 mm	2
8.	Chisel 25 mm and 6 mm	2 Nos each
9.	Hand Drill Machine	1
10.	Portable Electric Drill Machine 6 mm capacity	
11.	Pillar Electric Drill Machine 12 mm capacity	1
12.	Allen Key	1 set
13.	Oil Can 0.12 ltr	1
14.	Grease Gun	1 No
15.	Out Side Micrometer	2
16.	Motorised Bench Grinder	1
17.	Rawl plug tool and bit	2 set
18.	Pulley Puller	2
19.	Bearing Puller	2
20.	Pipe vice	4
21.	Thermometer 0 to 100 deg Centigrade	1 No.
22.	Scissors blade 150 mm	4 Nos.
23.	Crimping Tool	2 sets
24.	Wire stripper 20 cm	2 Nos.
25.	Chisel Cold flat 12 mm	2 Nos.
26.	Mallet hard wood 0.50 kg	4 Nos.
27.	Hammer Extractor type 0.40 kg	4 Nos.
28.		2 Nos.
29.	Hacksaw frame 200 mm 300 mm adjustable	each
30.	Try Square 150 mm blade	4 Nos.
31.		2 Nos.
32.	Outside and Inside Divider Calliper	each
33.	Pliers flat nose 150 mm	4 Nos.
34.	Pliers round nose 100 mm	4 Nos.
35.	Tweezers 100 mm	4 Nos.
36.		2 Nos.
37.	Snip Straight and Bent 150 mm	each
38.	D.E. metric Spanner	2 Nos.
39.	Drill hand brace	4 Nos.
40.	Drill S.S. Twist block 2 mm, 5 mm 6 mm set	
41.	of 3	4 Set
42.		2 Nos.

43.	Plane, smoothing cutters 50 mm	each
44.	Gauge, wire imperial	2 Nos.
45.	File flat 200 mm 2nd cut	8 Nos.
46.	File half round 200 mm 2nd cut	4 Nos.
47.	File round 200 mm 2nd cut	4 Nos.
48.	File flat 150 mm rough	4 Nos.
49.	File flat 250 mm bastard	4 Nos.
50.	File flat 250 mm smooth	4 Nos.
51.	File Rasp, half round 200 mm bastard	4 Nos.
52.	Soldering Iron 25 watt, 65 watt, 125 watt	2 Nos. each
53.	Copper bit soldering iron 0.25 kg.	2 Nos.
54.	Desoldering Gun	4 Nos.
55.	Hand Vice 50 mm jaw	4 Nos.
56.	Table Vice 100 mm jaw	8 Nos.
57.	Pipe Cutter to cut pipes upto 5 cm. dia	4 Nos.
58.	Pipe Cutter to cut pipes above 5 cm dia	2 Nos.
59.	Stock and Die set for 20 mm to 50 mm G.I. pipe	1 set
60.	Stock and Dies conduit	1 No.
61.	Ohm Meter; Series Type & Shunt Type	2 Nos. each
62.	Multi Meter (analog) 0 to 1000 M Ohms, 2.5	
63.	to 500 V	2 Nos.
64.	Digital Multi Meter	6 Nos.
65.	A.C. Voltmeter M.I. 0 -500V A.C	1 No.
66.	Milli Voltmeter centre zero 100 - 0 - 100 m volt	1 No.
67.	D.C. Milli ammeter 0 -500m A	1 No.
68.	Ammeter MC 0-5 A, 0- 25 A	1 No. each
69.	A.C. Ammeter M.I. 0-5A, 0-25 A	1 No. each
70.	Kilo Wattmeter 0-1-3 kw	1 No.
71.	A.C. Energy Meter, Single phase 5 amp. Three	1 No. each
72.	Phase 15 amp	
73.	Power Factor Meter	1 No.
74.	Frequency Meter	1 No.
75.	Flux meter	1 No.
76.	Wheat Stone Bridge with galvanometer and battery	1 No.
77.	Laboratory Type Induction Coil	1 No.
78.	DC Power Supply 0-30V, 2 amp	1 No.
79.	Rheostat 0 -1 Ohm, 5 Amp 0 -10 Ohm, 5 Amp 0- 25 Ohm, 1 Amp 0- 300 Ohm, 1 Amp	1 No. each
80.	1 Phase Variable Auto Transformer	1 No.
81.	Battery Charger	1 No.
82.	Hydrometer	1 No.
83.	Miniature Breaker 16 amp (Raw Material)	1 No.
84.	Working Bench 2.5 m x 1.20 m x 0.75 m	4 Nos.
85.	Fire Extinguisher CO2, 2 KG	2 Nos.

86.	Fire Buckets With Stand	2 Nos.
87.	Mini Drafter	8
88.	Drawing Board with stand	8
89.	French Curves set	4
90.	Drawing Compass set	4
91.	Diagonal scale	4
92.	Dial gauge	2
93.	Chain pulley block 2 ton	1
94.	Shackle	2
95.	Ceiling rope nylon/steel	50 mtr
96.	Control transformer single phase 250 W With 12v, 24v, 48v, 110v and 240v tapping	1
97.	Single phase transformer 1 KVA with enclosure and input/output terminals	1
98.	Current transformer 50/5, 20/5, 20/1 ampere	01 each
99.	Potential transformer 240/110, 415/110 volt	01 each
100.	Analog/Digital converter with four input/output	02
101.	Digital /Analog converter with four input/output	02
102.	Soft starter 3 phase, 415 V, 15 A	01
103.	Industrial safety hat	04
104.	Industrial safety shoe (different size)	04
105.	Fall arrest personnel safety belt	04
106.	Life line rope - nylon braided made from high tenacity multifilament yarn 13 mm dia.	04
107.	Safety net 3 x 3 meter	02
108.	Head lamp 3 W with battery	02
109.	Slings 2 ton capacity	01
110.	Elevator rope cutter upto 32mm	02
111.	Elevator limit switches	04
112.	Electric Hammer type drill machine 22mm capacity with all accessories - 750W, 240V	01
113.	Electric Hand grinding machine with 110 mm wheel diameter - 750W, 240V	01
114.	Electric hand blower - 750 W, 240V	01
115.	Rail alignment gauge	02
116.	Working Plank 10 x 15 inch	04
117.		

C: General Installation: -

Sl. No.	Name of the items	Quantity
1.	Mini welding machine - 150A, 240V With connecting cable, electrode holder, earthing clamp, safety glass, safety gloves	01
2.	Elevator control panel suitable for 5/8 passenger lift having separate input, output and cable alley chamber. Fitted with PLC controller and	01

	related accessories	
3.	DC compound motor 2 KW, 220V with switch fuse unit, voltmeter, ammeter, field regulator, armature regulator and four point starter	01
4.	Single phase capacitor start induction motor with starting panel - 1KW, 240V	01
5.	Universal motor with starting panel - 0.75 KW, 240V	01
6.	Three phase Squirrel cage induction motor with DOL starting panel - 3 KW, 415 V	01
7.	Synchronous permanent magnet motor with starting panel - 2 KW, 3 phase, 415 V (can be used as generator when coupled with DC compound motor)	01
8.	Digital AC drive trainer - 3 Phase, 2 KW	01
9.	Servo motor Trainer - 250 W, 220/110 V	01
10.	Desktop multimedia computer - i3/i5 processor, 2GB RAM, 500 GB HDD, 19.5" TFT monitor. With suitable UPS and computer table	01
11.	Working model of Escalator	01
12.	Electromagnet break assembly	01
13.	Over speed governor for passenger lift	01
14.	Door simulator set (car door, landing door and door drive unit)	01
15.	5/8 Passenger lift installed with all control and safety accessories	01

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. Quantity may be sufficient as per seats utilization / allocated.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: MECHANIC (LIFT AND ESCALATOR)

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: LIFT AND ESCALATOR MECHANIC

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.