Syllabus

For the trade of

LIFT MECHANIC

Under CTS

2002

Designed by

Government of India
Ministry of Labour (D.G.E.&T.)
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN – Block, Sector – V, Salt Lake,
Kolkata-700091.

List of members of the Trade Committee Meeting approved the syllabus for the trade of "Lift Mechanic" under CTS held on 03.12.2002 at CSTARI

1.	Shri H.Somasundram, Director	CSTARI, Kolkata	Chairman
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10.	Shri P.K. Kolay, T.O.	CSTARI, Kolkata	Member
11.	Shri D.K.Saha, Elect. Maint.	CSTARI, Kolkata	Member
12.	Shri G. Nandi, Jr. D'man	CSTARI., Kolkata	Member

GENERAL INFORMATION

1.	Name of the trade	:	LIFT MECHANIC
2.	N.C.O. Code	:	
3.	Duration of Craftsmen Training	:	2 years *
4.	Entry Qualification	:	Passed in 10th class examination under 10+2 system of education with Science as one of the subjects or its equivalent.
5.	Unit Size	:	16 Trainees
6.	Space Requirement	:	As per the drawing given in syllabus.

* (NOTE:- The passed out I.T.I. trainees of Electrician and Wireman trade may be admitted directly in 2nd year depending upon availability of seat).

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop Calculation & Science
1	Visit to different sections of the Institute Demonstration on elementary first aid. Artificial respiration	Familiarization with the Institute & trade. Safety precautions to be observed in the trade during theoretical as well as practical classes. Elementary first Aid. Concept of Standard & standardization.	Introduction to Engineering drawing. Free hand sketching of St. lines & simple geometric figures rectangles,. Circles, polygons etc.	Revision of elementary mathematical process.
2.	Demonstration on Trade hand tools. Identification of simple types-screws, nuts & bolts, chasis, clamps, rivets etc. Removing of insulations from assorted wires and cables. Joining practice with single and stranded conductors or diff. Wires cables.	Fundamental terms, definitions and units related to the trade. Identification of Trade, Hand tools-Specifications and uses, Care and maintenance of hand tools. Wires & cables- Introduction type, specification (SWG & MM Square) & Use.	-do-	Electricity and its uses, Electric current positive. Use of switches & fuses. Conductors and insulators. Further practice in common fractions, division etc.
3 & 4	Demonstration and identification of different types of semi conductors.	Fundamental of electricity Electron theory- Solar system elements, free electrons- Fundamental terms, definitions, units & effects of electric current. Definition of conductors, Insulator and semi-conductor. Common conductor, Insulators and semi-conductors-their shapes, sizes with respect to low, medium and high voltage.	Conventional symbols of electrical installations and different semiconductors.	Matter, Atomic structure . Principal of work, Power, Energy. Applied workshop problems.

5.	Practice in soldering, de-soldering and use of flux.	Solders,. Flux and soldering technique. Resistors types of resistors & properties of resistors.	Reading of simple Blue Prints.	Properties and uses of copper, zinc, lead, tin aluminium, brass, bronze, solder, bearing metals, timber rubber.
6.	Demonstration and Practice on fixing common electrical accessories. Building/Layout/assemble of small electrical ckts. with common electrical accessories-Reading of Ammeter & Voltmeters. Demonstration on Testing & replacement of diff. Types of fuses.	Common Electrical Accessories, their specifications, Common Insulating materials as per B.I.S. -Concept of ckts.-types of ckts as per property, as per current Flow. Fuse-explanation types, rating & material. Explanation of Resistance, specific resistance, voltage, E.M.F., P.D., current, Load or work, circuit open & closed and short ckts.	Reading of electrical ckt. Diagram. (Various types). Preparation of elec. Ckt. As per practical connections.	-do-
7 & 8	Verification & Ohm's Law -do- of series ckt. -do- of parallel ckt Verification of Kirchhoff's law. Practice in testing and connecting domestic appliances	-Ohm's Law, series and parallel ckts. Kirchhoff's Law Reading of Analog & digital Ammeter and voltmeters only use-of protective devices of ckts-Fuses & their types Earthing etc. -Simple problems on ckts. -Conception of developments of domestic ckts, Alarm & a switch, A lamp, A fan with individual switches etc./Two way switch. Explanation of electrical	-do-	Mathematical calculation of V,I,R,W in various ckts.

		measuring Instruments-Ammeter, voltmeter, multi-meter, clamp meter, etc. **ACHIEVEMENTS:** The Trainees should be able to: (a) Make simple electrical ckts. with suitable controlling and protecting devices. (b) Select and connect Ammeter & Volt meter and read correctly.		
9.	Testing of E.M. Coils/calling bells/buzzers etc. Replacement old ones, testing and repairing.	Introduction to magnetism and its properties. Explanation of electro-magnetism-advantages & uses. Principles of electro magnetism, cork screw rule. Right hand rule, magnetic field of current carrying conductor loop, solenoid.	Draw the typical symbols used in electrical ckts.	Simple problems on work, power energy.
10.	Demonstration on Alternators and parts.	Principle of Electro-magnetic induction, Faraday's Law, Lenz's Law-Explanation and illustration. Principle of AC-Generator. Fleming's right hand rule. Use of slip rings and split rings.	Symbols used in 'Rotating machines and transformers' IS-2032 (Part-IV) 1908.	Standard algebraic formula $(a + b)^2$, $(a - b)^2$ Simultaneous equations with two unknown quantities.
11.	Demonstration on D.C. Generators and D.C. Motors.	Principle of D.C. generator – Practical uses. Fleming's left hand rule. Principle of D.C. motor.	Sketching of brush and brush gear of D.C. machines	Calculation of Volume and weight of simple solid bodies, cubes, parallelopoid, prism and shop problems.

12.&13.	Study of the characters of D.C. motors & A.C. motors. -Connection, starting, speed control system.	Types, characters and practical application of D.C. motors. -Starting of D.C. motors Introduction to alternating current. Comparison D.C. & A.C., Advantages of A.C. Alternating current & related terms- frequency Impedence, power factor, Average power, Reactive power.	Sketching of D.C. machines Lettering-Numbers Alphabets.	-do- Meaning of stress, strain, modules of elasticity, ultimate strength examples. Geometry-Properties of lines, angles, triangles and circles.
14.	Expl. On poly phase ckts. Current, voltage & power measurement in poly-phase ckts. Measurement of energy in single & poly-phase ckts.	Problems on A.C. ckts. both series & parallel power consumption P.F. etc. Concept of poly-phase Star & Delta connection Line Voltage & phase voltage, current power in a 3 ph. Ckt.	Free hand isometric sketching of simple objects with dimensions.	Factor of safety examples, Types of stresses.
15.	Demonstration on alternator Parts, voltage Building, load characters & regulation.	Explanation of Alternator, prime mover type advantages, parts regulation, phase sequence, specification of alternators & practical places of uses.	Exercises on Blue print reading of connection to motors through Ammeter, voltmeter & K.W. meters.	Effect of force on materials as expanding, bending, twisting and shearing, problems.
16.	Plate & pipe earthing. Improvement of earthing. Measurement of earth resistance.	Define-Earthing its importance. Types of earthing-Plate and G.I.pipe. Methods of making proper earthing. Earth resistance-Protection of building, fan lights. IS-732 & 2309.	Drawing of the schematic diagrams of plate and pipe earthing as per B.I.S.	Simple levers, use and advantages. Efficiency, Mechanical advantage, velocity ratio.

17.	Identification of types of transformers. Connection of transformers efficiencies of transformers. Use of C.T. & P.T.	Explanation & Definition of Transformer, classification- C.T., P.T. Specifications simple problems on e.m.f. equation, turns ratio and efficiency.	Drawing of various Transformers with step up and step down tappings. Reading of control ckt. Diagram related to transformer.	Practice of problems related to Transformer.
18 to 20	Identification of Induction motors (1-ph) squirrel cage type starting of Induction motor. Identification and testing of A.C. poly phase motor terminals. Study of D.O.L. Starter. Study Star/Delta starter. Connection of star/Delta starter with 3 ph. Motor and run with full load. Change of direction of rotation of A.C. M/cs.	Explanation of A.C. motors, Working principle construction of 1-ph motors Characters Principle of poly phase induction motor-types, their characteristics and industrial applications. Description of D.O. L. starter. Description of starter delta starter (both manual and Auto). Internal arrangement of a motor resistance starter for slip ring ind. motor. Motor control ckt. And starting devices.	Diagram of connection to a squirrel cage induction motor. Sketching the connection diagram of controlling & protective devices for Induction motors. Schematic diagram of magnetically operated A.C. motor starter with push button control.	Logarithms-Use of Logarithmic tables for multiplication & division Applied workshop problems involving, use of Logarithmic tables. Different forms of energy, heat mechanical and electrical, conversion from one to another.
21 to 23.	Demonstration and tests on – Multirange switches, Rotary switches control Panel Power Ckt. switches Thermostats & timers. Practice in control panel erection of electrical connection (hugging,	Explanation of- Different types of switches and switch gears- multirange switches, rotary switches, power circuit switches, thermostat, mercury switches etc. M.C.B., M.C.D., E.L.C.B. A.C.B. bus bar, side bus bar. Bus trunking and rising mains. I.E. rules	Practice drawing on various switches, symbols and control ckts. Reading /Tracing of control ckt. diagram.	Calculations of Volume area of weight of simple solid bodies-Cubes squares & hexagonal prisms and shop problems.

	clamping, dressing, straightening etc.).	regarding panel erection, bus bar, spacing bus bar chamber, danger boards.		
24.	Demonstration and use of Ammeter, Voltmeter, earth insulation Tester, multi meter (analog & digital) etc. Practice of connecting various electrical measuring instruments in the ckts.	Explanation of Electrical measuring Instruments. Ammeter Volt meter Earth Insulation Tester Multimeter	Drawing of simple solid and hollow bodies. Drawing of solenoid, CT.	Further problems on menstruations.

Achievements: 1) Should be able to identify D.C. M/Cs. & A.C. M/Cs.
2) Should be able to connect, test and run A.C. motor and reverse its direction of rotation by a starter.
3) Should be able to read/trace control panel diagram
4) Should be able to connect Measuring Instruments in the ckts.

25.	Identification of semiconductor. Diodes-symbol codes-Tests on Diodes. Characters of Diodes.	Introduction to electronics-conductor-Insulator-semiconductor energy level atomic structure. 'P' & 'N' type of materials-P—N-junction. Diode-classification of Diodes-Reversed Bias and Forward Bias.	Drawing B.I.S. symbols for electronic components. DIODE, TRANSISTOR Zener diode, S.C.R, I.C. etc.	Meaning of Horse Power & Brake horsepower. Simple problems on work power & energy. Forms & properties of matter. The molecule and atoms. Difference between mass and weight.
26.	Identification, Testing & use of special diodes.	V-1 Characteristics of diode. Use of junction diode as a	Symbols of special diodes. Plot the V-1 curve. Practical	-do-

	Demonstration of V-I characteristic. Use of junction diode as a switch. Prepare clipping & clamping ckt.	switch. Various types of special diode. Zener, schottky, Tunnel. LED etc. Clipping & clamping circuits.	related drawings.	
27 to 29.	Study of Half wave rectifier Ckt -do-Full " " -do-Bridge " " -do- Filter ckts -do- Oscilloscope -do- Different wave shapes and their values. Regulated Power supply unit with the group of 78 & 79 I.C.S.	Expl. and importance of C.C.-Rectifidr ckt. –Half wave, Full wave and Bridge ckt. Filter ckts-passive filter. Expl. and importance of oscilloscope working scope. Regulated Power supply unit	Drawing of B.I.S./I.S.I. symbols for Electronic devices, Drawing of half wave, Full wave & Bridge ckts. Drawing of regulated Power supply.	Calculation of Peak load current, DC load current, Peak inverse voltage, D.C. output voltage, ripple factor & frequency.
30 & 31	Study of a transistor-Identification of construction and terminals. -Tests of Transistors. Study of the characters of transistors.	Expl. of principle of working of a transistor-Types of Transistor, Characters of a transistors, Biasing of Transistors. Mode of use of transistor. D.C & A.C load lines. Use of Transistor as a switch.	Simple isometric Projection.	Reading and plotting of graphs.
32 & 33	Assembly & testing of a single stage Amplifier and checking in an oscilloscope Study of Types of wave shapes. -do- Cascade Amplifier.	Expl. & Definition of Amplifiers. How a transistor Amplifies. Signals –Pulse shapers cascade system. Bandwidth.	Drawing ckts for a single stage Amplifiers and Multi stage Amplifiers and types of signals.	Calculation of voltage gain & power gain

34 to 36	Study of simple ckts. Containing U.J.T. for triggering -do- FET as an amplifier & switch.	Expl. and working principle and Practical applications of U.J.T., F.E.T., JFET, MOSFET. D.C. Biasing & FET amplifier FET as a switch.	Drawing of ckts. containing U.J.T., F.E.T., MOSFET etc.	-do-
37 & 38	Study of simple ckt. Power control ckts by S.C.R & Triac & Diac & speed control by Thyrister.	Explanation & working principle Of SCR. DIAC & TRIAC. Speed control of motor by Thyrister.	Simple power control ckts. & Thyrister speed control ckt.	Calculation of motor speed control.
39.	Demonstration on power supply stabilizer	Power supply stabilizer	-do-	Use of trigonometric table, applied problems Calculation of areas of triangles & polygons.
40 & 41	Study of oscillator ckt. Voltage & current measurement-current And study wave shapes in scope.	Expl. and definition of oscillator-working principle Explanation of stages and types.	Drawing of various oscillator ckts.	Simple problems involving Trigonometric function.
42.	Simple applications of OP Amps.	Explanation of OP Amps. Properties and uses. Types.	Simple ckt. of OP Amps.	-do-
43	Identifying the pins, Testing, connecting & disconnecting of ICS from Ckt.	Explanation and construction of IC's. It's various types and uses.	-do-	Ratio & proportion shop problems plotting and reading of simple graphs.
44	Identification of gates and checking the T/T.	(Digital Principles & Gates) Decimal & corresponding	Symbols & drawing of various logic gates.	Boolean Algebra. Boolean Relations.

		Binary number , Decimal to Binary conversion & vice-versa. Bit, Byte & nibble. Hexadecimal number & conversions. BCD numbers. Logic Gates (2, 3 & 4 input) and T/T.		Sum of products methods. Binary addition. Binary subtraction. Related calculations.
45.	Fabricate & check Half adder, Full adder, and 2's complement adder-subtractor.	<u>(Arithmetic logic units)</u> Half adder, Full adder, 2's complement Adder-Subtract	Drawing as per Practical	-do-
46 & 47	Fabricate & check all the Flip-Flops as in Theory.	R.S. Latch, level clocking,. D-Latches, Edge-Triggered D-Flip-Flops, JK Flip-Flops, JK Master Slave flip-flop.	Drawing as per Practical	-do-
48	Fabricate & check various register & counters.	<u>(Registers, counters & Memory)</u> Buffer register, Shift Register, Ripple counters, ROMS, PROMS, EPROMS, RAMS	Drawing as per Practical	-do-
49 & 50		R E V I S I O N		
51.		INDUSTRIAL VISIT		
52.		T E S T		

Achievements:-
The Trainees should be able to:-

1) Identify D.C. machines and A.C. machines
2) Connect, Test and run both D.C & A.C. machines.
3) Connect, run & reverse A.C. motors
4) Identify, handle & minor repair of various switches, switchgears, M.C.B, M.C.D, A-C-B etc.
5) Identify & Test various electronic components.
6) Assemble, Test & rectify the faults of simple power supply ckts. Amplifier ckts.
7) " " " " Power control ckts.
8) Assemble & test various logic ckts.

53	Drilling practice in hand drilling & power drilling machines. Grinding of drill bits.	Marking tools description & Use. Types of drills, description of drilling machines, proper use, care and maintenance.	Free hand sketching of nuts & bolts with dimensions from samples.	Metric systems metric weights & measurements units-conversion factors.
54	Practice in using snips, marking & curved pieces in sheet metals. Bending the edges of sheet metals. Riveting practice in sheet metal. Practice in making different joints in sheet metal, soldering the joints.	Description of marking & cutting tools such as snibs Shears punches & other tools like hammers, mallets etc. used by sheet metal workers. Types of soldering irons-their proper uses. Use of different bench tools used by sheet metal worker. Soldering materials, fluxes and process.	Explanation of simple orthographic projection 3rd angle & development.	Mass-unit of mass force, absolute unit of force. The weight of a body unit of weight, shop problems.
55 & 56	Familiarizations with various visual and audio signals in lift cars and floors.	Indian Electricity rules regarding lift maintenance. Statutory provisions for getting license regarding operations & maintenance of lifts.	-do-	-do-

		Safety measures for operation and maintenance of lift. Check list with do's and don'ts.		
57 to 59	Demonstration of operation, mechanism and control of various types of lifts as mentioned in theory.	Various types of lifts, their uses and operation modes. Detail description and uses of – a) Passenger lifts, various sizes and capacities commonly used. b) Goods lifts, various sizes, capacities and uses according to suitability c) Vehicle lift, purpose and uses d) Shaft driven platform lift, It's various accessories and uses. e) Hospital lift, its Speciality capacity and use.	-do-	Meaning of friction, Examples, Meaning of C.G. Centrifugal force, Centripetal force Unit of work power & energy
60 to 65	Checking of lift shaft. Setting of template. Fixing of bracket & installation of rail. Machine setting. Practice of errection- Lift cars, Doors, bottom springs, lift rails, cables etc. Selection and checking of lift Rope. Laying out of rope through pulleys and	Construction of lifts- various types of body and door materials used. Metal body, wooden body, Transparent fibre body (glass look), Collapsible gate, sliding gate, Manual car gate, and Auto gate. Merits and demerits of different constructions of lifts. Types of door drive, types of lift drive. Types of lift control.	Study of installation/errection drawings of lifts.	Properties of different materials used in lifts. Meaning of- Tenacity, elasticity, malleability brittleness, hardness, compressibility and ductility with illustration.

	tightening practice of rope at load end and lift car. Placing/replacing of loads at rope ends.	Installation procedure of lift. Calculation of loading capacity of lift car, maximum capacity and safe to use capacity. Size and specification of lift rope as per maximum loading capacity. Calculation of weight at rope end. Opening and closing time of lift car doors (auto) and its regulations. Leveling cars and setting there off.		

Achievements:

The trainees should be able to:

1. Identify various visual & audio signals in lift car & floor.
2. Understand and handle operation, mechanism and control of various types of lifts.
3. Erect lift car, doors, rails, cables, perfect roping etc.

66 & 67	Functional Testing of motors, its directions and speed. Operation of electromagnetic brakes, setting of brake shoes and hand brake lever, Practice installing switchgear. Installation of pulleys with motors. Mounting and fixing of motors with its accessories.	Sizes and types of motors for various lifts. Electromagnetic brakes for lifts. Drum & pulleys connection at motor Terminals. Installation of switchgear. Function of over speed protection.	Drawing of electromagnetic brakes, connection diagram of motors. Alignment drawing Of lift motor related to lift car and its rails.	General condition of equilibrium for series of forces on a body. Plotting of point. -do- graph simple Reading and plotting of simple graph.

68 & 69	Familiarization with operation and function of various mechanical parts as in Theory. Practice replacing & fitting and adjustment.	Explanation and functions of Governors, gates, contacts, Door locks, guiding shoes, cam, Toe guard, Retiring cam, Limit cam, sheave, Machine beam and beam support, Dead end hitch, spur gear, herring bone gear, worm gear, Bearings.	Drawing of Drum drive arrangement, rope drive arrangement and external geared arrangement.	Calculation on moment, bending moment, shearing stress, factor of safety.
70.	Familiarization with location & function of various electrical parts as in Theory. Practice of fitting, adjustment & replacement.	Explanation and function of starter, actuator, reversing switch, controller, rectifier. Power Transformer, electric clutch, etc.	Drawing of various parts as mentioned in Theory.	-do-
71 & 72	Practice of wiring and errection of control panel. Mounting of main wire service switch and fuses.	Introduction to wiring: Techniques and procedures of lift wiring. Cables and types used in lift. Saddling, dressing and squiring of cables in lift pit lift duct and lift control room. Procedure of control panel errection.	Layout diagram of wiring and con troll panel.	Calculation of torque on A.C. motor, efficiency of a machine.
73	Test and functional operation of various relays. Practice of connecting relays in the ckts.	Description of various relays and their functions. -circuit brakers and overload relays, over speed slow down relay, phase failure protective relay, phase reversal protective relay etc.	Introduction to wiring diagram of lift- Layout drawing of wiring and connection, control ckt. Wiring diagram.	-do-

74	Identification, Test & functional operation of various limit switches and timers. Practice of connection.	Introduction to various limit switches – Terminal limit switches, over travel limit switches etc. –their function and use. Various types of timers used in lift and their purposes.	-do-	Meaning and example of friction. Explanation of center of gravity.
75	Identification, adjustment, repair and replacement of various safety devices as mentioned in Theory.	Principal safety and protective devices used in lift-Guide grips-over speed governor, governor switch, car operating switch, car safety switch, slack cable switch	- do-	Laws of friction. Limitation of friction, Co-efficient of friction. Angle of friction.

Achievements:-

Trainees should be able to: -

1. Select, check and layout rope, placing/replacing loads at rope end.
2. Select, check, placing & replacing of various electrical & mechanical parts.
3. Identify, adjust, and repair, replacement of various safety devices.

76 to 79	Familiarization with different control system, its errection and repair Understand the automatic leveling function and practice various operations.	Various systems of control of lift and their utility, Rheostatic control and variable voltage control. Single speed, double speed, and logic circuit control. Automatic leveling with change offload, Auxiliary motor micro drive. Automatic leveling with main motor at various speeds. Automatic leveling devices. The floor selector type, hoist-way	Study ckt. Drawing of electrical control system, Auto and Manual mode, alarming system.	Practice of various problems on friction and on inclined plane surface.

		switching devices, operating without mechanical contact. Manual operation, Push bottom automatic operation – hold in push bottom operation, full automatic push button operation dual operation, signal operation. Alarming system		
80 & 81	Identify of different components of control ckts. Tracing of control ckt. diagram and necessary repair.	Functional study of various electrical & electronic control ckts. And logic ckts. Used in lifts.	-do-	Representation of forces by vectors, simple problems on lifting tackles.
82 to 83	Inspection of performance during Test & Trial. Record of observation. Practice alteration and adjustment as necessary.	Test and trial of mechanical, electrical and electronic system of lift. Procedure of test with minimum and maximum level.	-do-	Load calculation of domestic & Industrial system.
84	Practice of safe working in lift: - - Electrical safety - Safety while working on live controller. - Safety while working on top of car & lift pit. - General awareness on public safety components. - Door safety.	Safety for maintenance men:- ❖ Safe use of hand & power tools. ❖ House keeping practice ❖ Proper method of hand lifting rigging and hoisting. ❖ Proper use of ladders step Ladders. Clothing, safety shoes, safety Glasses, hand protective Cream, leather gloves. Hard hats	-do-	

Achievements:-

The trainees should be able to:-

1) Handle different control system
2) Trace the control ckt. and rectify/replace the faculty components.

85 to 88	Selection & Installation of a lift with its accessories considering all the factors.	Selection and installation of elevators/lifts. -Size and shape of car - Clearance and allowances between car and the wall - Space required for the errection of lift/elevator for different capacity. - Required car area according to 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, guide rail, buffers, counter weight, governor, pulley, Types of Car gate, etc. Systematic install-ation procedure.	Study of various mechanical drawings and dimensions of lifts and accessories.	-do-
89.	-do-	Concept of lift maintenance. Methods/Types of maintenance. Carrying of lift test and preparing check charts.	Simple block diagram of electrical connection to the lift.	-do-

90 to 91	Practice repairing and replacement of different components.	Concept of maintenance schedule. Preparing and follow-up of maintenance schedule, preventive maintenance, running maintenance and brake-down Maintenance. Spare parts used for lift maintenance. Inventory/stocking of spare parts. Preservation of spare parts.	Free hand sketch of some important mechanical parts.	Properties and uses of lead, tin, Zinc, brass, bronze, high carbon steel, alloy steel.
92.	Practice draining out old grease and oils, refilling oil dashpots and grease cups. Lubrication on car gate, cam Bellows, buffer, rope, guide rail etc.	Types of lubricants, its properties and use in lifts. Importance of lubrication. Lubrication during installation and periodical lubrication. Disadvantage of improper lubrication.	-do-	Surface tension. Viscosity, density, Sp. Gravity & related problems.
93 to 98	Servicing of lifts - Check main supply, Switches, fuses and contacts.	Effect of defective power supply, i.e. 1 phasing, loose contact, improper voltage etc. Effect of wrong brush bedding and positioning. Efficiency of breaking system.	Drawing of drum drive arrangement, rope drive arrangement external geared arrangement.	Resolution of composition of forces. Problems on mensuration.
	- Examine & adjust all moving contacts of the controller, tightening connections and secure wires. - Check motor connections brush position, air gap, bearing etc.	Different types of bearings used in lift. Their specification and properties. Gear, worm and worm wheel, function of gears used in lift. Function of various parts of governor. Types of spring function & use.	Simple third angle projection. sectioning.	Determination of efficiency of simple machines like winch, pulley blocks & compound axles. Expl. of Factor of safety and types of stresses.

	- 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. - Care full examination of 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. - Check car shoes for wear & tear. - Check buffers and its Lubricants. - Carefully examine safety Devices. - Check tripping rod for its Setting (set even) - Check all moving parts of Safety devices for its	Concept of wear and tear. System of leveling and alignment. Shaft and shaft coupling. Function of emergency cut out in Trip system. Necessity of mechanical interlocks. Importance of regular cleaning, dusting up and lubrication. Importance of recording parameters and other theories related to lift services.		

	function, free movements. - Check leveling for car Platform. - Check emergency opening of door and other emergency Safety devices. - Check movement of Traveling cables for foul. - Examine top and bottom final shaft way limit switches for proper operation. - Check other limit switches for their proper operation. - Renew contacts or replace limit switches if required. - Examine safety plank switch under car platform - 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. - Clean top and inside car, and also bottom.. - Examine lift pit for accumulation of water, garbage if any.			

	- Clean governor, machine, controller and other parts. - Check machine room for proper cleanliness (free from oil, grease, dirt, rubbish) - Check proper functioning of relays, timers, signaling system, alarming system, indications, electrical interlocks etc. - Check effective operation of logic control system and rectify defects. - Prepare servicing report. Record operational state and recommendation if any.			
99.	Handle the emergency conditions in simulated situations as mentioned in theory. Practice rapid entrance to the hoist way or pit. Practice all safety measures and precautions to be taken in such operations and conditions. Rescue trap passenger.	Handling emergency conditions:- Handling swiftly and surely the conditions occurs with the lift - Car stalled away from the landing - Person caught between car & hoist way. - Car or counter weight striking the buffers Partial breakage of hoist rope.		

100 & 101	R E V I S I O N			
102	INDUSTRIAL VISIT			
103 & 104	REVISION & TEST			

Final achievement:-
The trainees should be able to:
1. Take active part in installation & Commissioning Work.
2. Carryout test and trials of lift while commissioning
3. Attend any fault and carry out break down maintenance.
4. Cary out preventive maintenance and plan for major maintenance
5.Carry out all regular & special servicing of lift and record observations with suggestions.

Social Studies: -The syllabus has already been approved and is same for all the Trades.

LIST OF TOOLS & EQUIPMENTS FOR THE TRADE OF LIFT MECHANIC

(For a batch of 16 Trainees)

Sl.No.	Items	Quantity
	Tool Kit	
1.	Rule wooden 4 fold 60 mm	16
2.	Scriber 150 mm x 4 mm (Knurled center position)	16
3.	Pineer 150 mm	16
4.	Plier insulated 150 mm	16
5.	Screw driver 150 mm	16
6.	Punch center 150 mm	16
7.	Knife double bladed electrician	16
8.	Hammer, cross pein 115 grams with handle	16
9.	Electrician connector, screw driver 100 mm insulated handle thin stem	16
10.	Electrician testing pencil/ neon Tester	16
11.	Heavy duty screw driver 200 mm	16
12.	Electrician screw driver 250 mm thin stem insulated handle	16
13.	Rule steel 300 mm	16
14.	Saw tenon 250 mm	16
15.	Hammer ball pein 0.75 kg. With handle	16
16.	Firmer chisel wood 12 mm	
17.	Plier sude cutting 150 mm	16
18.	Wire stripper 150 mm	16

Shop Tools, Instruments & Machinery

1.	Spanner 150 mm adjustable 15 degree as cly-burns	2
2.	Ladder	2
3.	Chisel cold flat 12 mm x 200 mm	2
4.	Drill machine hand 0 to 6 mm capacity	2
5.	Electric drill machine portable 6 mm capacity	1
6.	Pillar electric drill machine 12 mm capacity	1
7.	Allen key	1 set
8.	Oil can 0.12 litre	2
9.	Grease gun	1
10.	Bench grinder motorized	1
11.	Rawl plug tool and bit	2 set
12.	Pulley puller	1
13.	Bearing puller	1
14.	Multi meter 0 to 1000 M Ohms 2.5 to 5000 volt	1
15.	Ammeter 1 MA to 500 MA	1
16.	Ammeter 0 to 1 amp. D.C.	1
17.	Tong tester (Clipon meter)	1
18.	Stop watch	1
19.	Taco-meter or revolution counter with stop watch	1
20.	Scissors blade 150 mm	1
21.	Crimping tool	1 set
22.	Screw driver 100 mm	4
23.	Chisel cold flat 12 mm	4
24.	Mallet hard wood 0.50 kg.	4
25.	Hammer exactor type 0.40 kg. With handle	3
26.	Hacksaw frame 200 mm, 300 mm adjustable	4 (2 each)
27.	Square try 150 mm blade	4
28.	Divider 150 mm, outside & inside caliper	3 (each)
29.	Plier flat nose 100 mm	4

30.	Plier round nose 100 mm	4
31.	Plier 150 mm	4
32.	Tweezers 100 mm	4
33.	Snip straight 150 mm	2
34.	Fuse Puller	1
35.	Spanner D.E. W/W standard set	2
36.	Drill hand brace 0 to 100 mm	2
37.	Drill S.S. Twist block 3 mm, 5mm, 6 mm set of 3	4
38.	Plane, smoothing cutters, 50 mm	4
39.	Gauge, wire imperial	1
40.	File flat 200 mm 2nd cut	3
41.	File half round 200 mm 2nd cut	2
42.	File half round 200 mm-smooth	2
43.	File round 200 mm 2nd cut	2
44.	File round 100 mm 2nd cut	2
45.	File flat 150 rough	2
46.	File flat 250 mm smooth	2
47.	File flat 250 mm rough	2
48.	File flat 250 mm bastard	2
49.	Rasp, half round 200 bastard	2
50.	Iron, soldering 40 watt & 25 W	3 each
51.	A.C. voltmeter M.I. 0-500 V	1
52.	A.C. Ammeter M.I. 0-25 A	1
53.	A.C. Ammeter M.I. 0-5 A	1
54.	Megger 500 volts	1
55.	Vice, table jaw 100 mm	2
56.	Lockers with 3 drawers (Standard size)	2
57.	Bench working 2.5 x 1.20 x 0.75 meters	4
58.	Almirah 2.5 x 1.20 x 0.50 meter	2
59.	Phillips screw driver 8″	3
60.	Two cell flash light (Torch)	4
61.	Spin light socket wrench set	1
62.	Adjustable wrench 6″	3

63.	″ ″ 8″	3
64.	2 ton chain fall	1
65.	½ ton puller	1
66.	10 ton hydraulic jack	1
67.	Slings	3
68.	Wire rope cutter	1
69.	Thrust nut wrench	3
70.	Pulley block with poly propylene rope, 20 mm dia. (synthetic)	1
71.	Fall arrest personnel safety belt	4
72.	Industrial hard hat	4
73.	Industrial safety shoe (different size)	4
74.	Lifeline rope, nylon-braided cord, made from high tenacity multifilament yarn for 13 mm dia.	2
75.	Working plank 10” x 1.5”	2
76.	Rail alignment gauge	1
77.	Plumb bob	2
78.	Safety net	1
79.	Hand lamp	2
80.	Door simulator set (car door, landing door and door drive unit)	1 set (for 2 unit)
81.	Sprit level	1
82.	First Aid box	1
83.	I.C. puller tool	2
84.	Instructor’s table	1
85.	Instructor’s chair	2
86.	Fire extinguisher	2
87.	Fire buckets	4
88.	Metal rack 180 x 150 x 45 cm	4
89.	Wire stripper 20 cm	1
90.	Pipe cutter to cut pipes up to 5 cm dia	1
91.	Cut out, reverse current, over load voltage relays	1 each
92.	Starters for 3-phase, 400 V, 50 cycles, 2 to 5 H.P. A.C. motors	
	(a) Auto transformer type starter	1

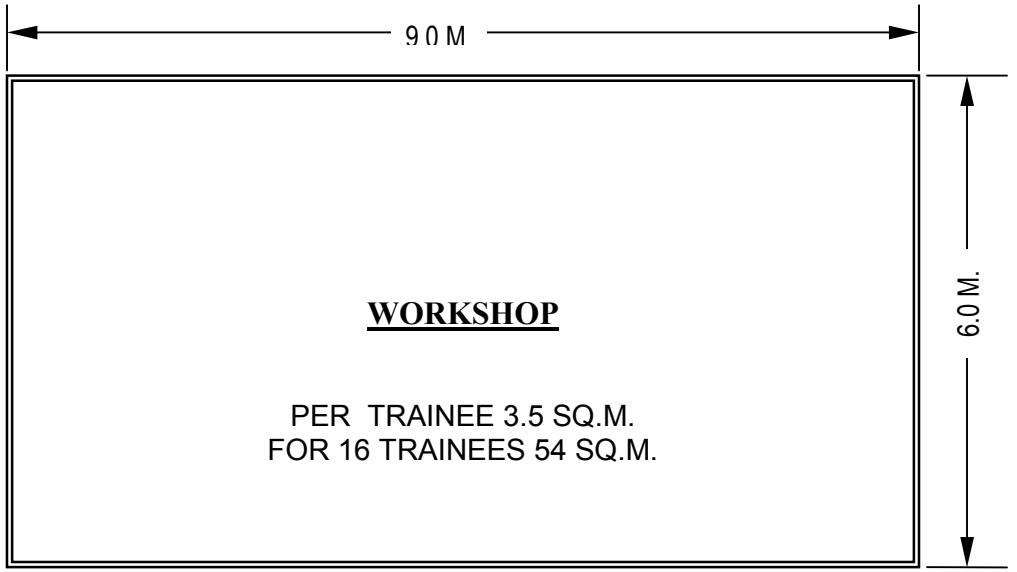
	(b) Star delta starter with manual, Semi-auto & Automatic	1
	(c) Direct on line starter	1
93.	Motor A.C. series type 230 V, 50 cycles,1/4 HP with starter and switch	1
	Electrical machine trainer	
94.	Suitable for demonstrating the construction and functioning of different types of DC Machines and AC machines (single phase and three phase). Should be complete with friction brake dynamo meter, instrument panel and power supply units	1 per institute
95.	Scientific calculator	2 nos.
96.	Multimeter (analog & digital)	2 nos.(1 each)
97.	Motor A.C. squirrel cage, 3 phase 400V, 50 cycle, 2 to 3 H.P. with star delta starter & triple pole switch fuse.	1 no.
98.	Motor A.C. phase wound slip ring type 5 H.P. 400 V 3 phase 50 cycles with starter & switch.	1 no.
99.	Motor A.C. single phase 230 volts. 1 H.P. 50 cycles series type with starter & switch	1 no.
100.	Motor A.C. single phase 230 volt, 50 cycles capacitor type with starter switch 1 HP	1
101.	Motor universal 230 volt, 50 cycles with starter/switch 1 HP	1
102.	Current transformer	2
103.	Oscilloscope	1
104.	Function Generator	1
105.	Stepper motor	1 no.
106.	Earth leakage ckt. Breaker	1 no.
107.	Thyrister drive 1 H.P. with techogenerator	1 no.
108.	Voltage Stabilizer manual and automatic	1 no. each
109.	5/8 Passenger lift with all accessories	1 no.

Note: 1. For each unit a trainee tool kit from Sl. No. 1 to 18 of " Tool Kit " and locker is required.

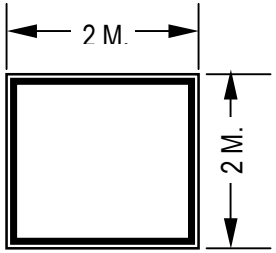
2. If two units are working simultaneously in any shift, additional shop's General Outfit, item from Sl. No. 1 to 93 of "Shop Tools, Instruments & Machinery" is required for second unit.

4. For each two units in a shift, one set of Machinery & Equipment from Sl. No. 95 to Sl. No.109 are required.

SPACE FOR THE TRADE OF"LIFT MECHANIC"



8 – PASSANGERS LIFT



HEIGHT OF TUNNEL – 15 TO 20 M.