ELECTRICIAN

NATIONAL OCCUPATIONAL ANALYSIS (2008)
Integrated With
INDIVIDUALIZED LEARNING MODULES

Revised November 10, 2010

Government of Alberta

Apprenticeship and Industry Training

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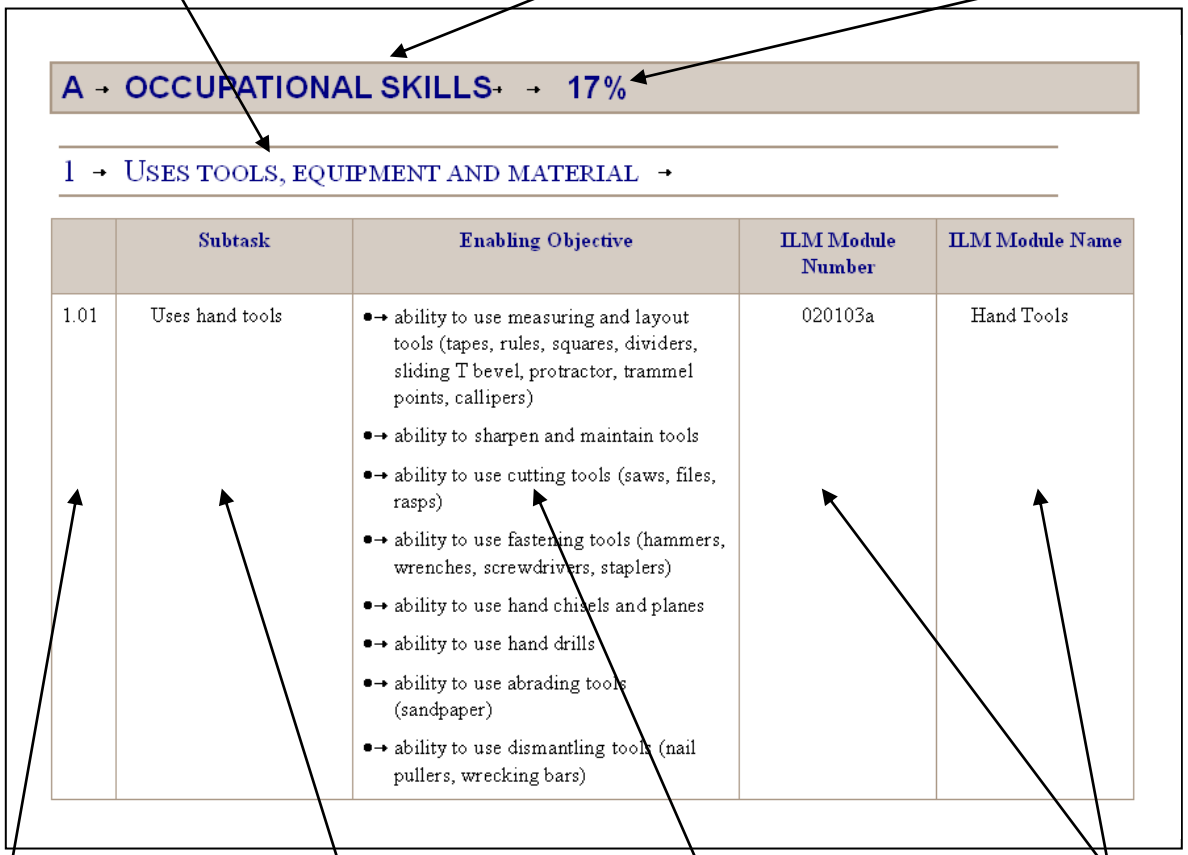
DOCUMENT DESCRIPTION

Tasks that are performed by skilled workers in this trade across Canada.

Block: A group of related tasks.

This number indicates the percentage of exam questions on the topic.



A → OCCUPATIONAL SKILLS → → 17%

1 → USES TOOLS, EQUIPMENT AND MATERIAL →

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
1.01	Uses hand tools	•→ ability to use measuring and layout tools (tapes, rules, squares, dividers, sliding T bevel, protractor, trammel points, callipers) •→ ability to sharpen and maintain tools •→ ability to use cutting tools (saws, files, rasps) •→ ability to use fastening tools (hammers, wrenches, screwdrivers, staplers) •→ ability to use hand chisels and planes •→ ability to use hand drills •→ ability to use abrading tools (sandpaper) •→ ability to use dismantling tools (nail pullers, wrecking bars)	020103a	Hand Tools

Subtask Number

Small divisions, when combined, describe the duties constituting a task.

The essential skills and knowledge required to perform the task and subtask.

Module name and number where information is available on the subtask/enabling objective.

A OCCUPATIONAL SKILLS 12%

1 USES AND MAINTAINS TOOLS AND EQUIPMENT

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
1.01	Maintains hand tools	• knowledge of types of hand tools such as screwdrivers, pliers, wrenches and measuring tapes • knowledge of hand tool limitations • ability to organize and store hand tools • ability to clean and lubricate hand tools • ability to recognize worn, damaged and defective hand tools		Considered on The Job Training
1.02	Maintains power tools	• knowledge of types of power tools such as drills and saws • knowledge of limitations of power tools • ability to clean power tools • ability to change power tool components such as chucks, bits and		Considered on The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		blades • ability to organize and store power tools • ability to lubricate power tool components • ability to recognize worn, damaged and defective power tools • ability to change cords and attachment plugs • ability to repair power tools to a limited degree		
1.03	Maintains powder-actuated tools	• knowledge of types of powder-actuated tools and their applications • knowledge of types of pins and shots • knowledge of certification requirements to operate powder-actuated tools • knowledge of manufacturers' operating and maintenance instructions • knowledge of powder-actuated tool	Plumber 060102b	Module Available on this topic Explosive Actuated Tools Considered on The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		components • ability to disassemble, clean and lubricate powder-actuated tools • ability to organize powder-actuated tools • ability to store powder-actuated tools and shots • ability to dispose of shots • ability to recognize worn, damaged and defective powder-actuated tools • ability to recognize hazards associated with powder-actuated tools		
1.04	Maintains electrical measuring equipment	• knowledge of types of electrical measuring equipment such as multimeters, voltage testers, non-contact voltage testers, insulation resistance meters and clamp ammeters • knowledge of applications of electrical measuring equipment • knowledge of limitations and ratings of electrical measuring equipment	030103b	Meters

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of electrical measuring equipment components such as leads and batteries • knowledge of electrical measuring equipment accessories • knowledge of environmental factors that affect readings • knowledge of manufacturers' specifications • ability to recognize worn, damaged and defective electrical measuring equipment • ability to organize and store electrical measuring equipment		
1.05	Maintains specialty tools	• knowledge of types of specialty tools such as knock-out punches, compression tools, diagnostic tools, benders and cutters • knowledge of manufacturers' specifications • knowledge of specialty tool limitations		Considered on The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to assemble specialty tools • ability to clean specialty tools • ability to recognize worn, damaged and defective specialty tools • ability to organize and store specialty tools		
1.06	Uses scaffolding and access equipment	• knowledge of types of access equipment such as scissor lifts, lift tables and articulated boom lifts • knowledge of types of scaffolding such as baker, tubular and frame • knowledge of certification requirements for scaffolding and access equipment • knowledge of safe angles of ladders • knowledge of three-point contact rule • knowledge of regulations regarding the use of scaffolding and access equipment • knowledge of worksite surroundings	Millwright 160101d	Modules Available on This Topic Ladders and Scaffolds

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of limitations of scaffolding and access equipment • ability to set up step ladders and extension ladders • ability to work from access equipment • ability to erect various types of scaffolding • ability to recognize unsafe, worn, damaged and defective scaffolding and access equipment		
1.07	Uses rigging, hoisting and lifting equipment	• knowledge of certification requirements regarding rigging, hoisting and lifting equipment • knowledge of types of rigging, hoisting and lifting equipment • knowledge of limitations of rigging, hoisting and lifting equipment • knowledge of anchor points • knowledge of load ratings • ability to use and understand hand	Millwright 160109aA 160109aB 160109b	Modules Available on This Topic Rigging Procedures – Part A Rigging Procedures – Part b Cranes and Hoists

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		signals • ability to recognize worn, damaged and defective rigging, hoisting and lifting equipment • ability to select rigging, hoisting and lifting equipment according to application • ability to secure load • ability to move load to final position		
1.08	Uses personal protective equipment (PPE) and safety equipment	• knowledge of types of PPE such as hard hats, safety glasses, safety footwear, gloves, fall arrest equipment and respiratory protection equipment • knowledge of types of safety equipment such as first aid kits and eye wash stations • knowledge of certification and training requirements for PPE and safety equipment • knowledge of types and operation of fire extinguishing equipment • knowledge of location of PPE and	030103a	Safety And On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		safety equipment • knowledge of shelf life of PPE and safety equipment • knowledge of Occupational Health and Safety (OH&S) regulations • knowledge of arc flash ratings such as NFPA70E • ability to select PPE according to task • ability to apply Workplace Hazardous Material Information System (WHMIS) procedures • ability to recognize limitations of use of PPE and safety equipment • ability to organize and store PPE and safety equipment • ability to recognize worn, damaged and defective PPE and safety equipment • ability to locate PPE and safety equipment		

2 ORGANIZES WORK

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
2.01	Interprets codes and regulations	• knowledge of codes such as building codes, the Canadian Electrical Code (CEC) and jurisdictional codes • knowledge of OH&S regulations • knowledge of code and regulation updates • ability to access and apply codes and regulations	030104a 030104b 030104m 030104n 030104o 030203q 030203r 030203s	Introduction to Code General Rules Section 2 Orthographic Projection/Diagrams Dimensioning and Scaling/Print and Diagram Nomenclature/Construction Drawings Print Reading/Applied Drawings Diagrams Specifications Drawings and Plans
2.02	Interprets plans, drawings and specifications	• knowledge of components of plans, drawings and specifications such as scale, legend, details and symbol • ability to cross-reference plans, drawings, specifications and contract documents • ability to locate information on plans,	030104m 030104n 030104o	Orthographic Projection/Diagrams Dimensioning and Scaling/Print and Diagram Nomenclature/Construction Drawings Print Reading/Applied Drawings

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		drawings, specifications and contract documents • ability to scale dimensions • ability to visualize finished product • ability to perform mathematical calculations	030203q 030203r 030203s	Diagrams Specifications Drawings and Plans
2.03	Uses documentation and reference material	• knowledge of types of documents such as shop drawings and catalogues • knowledge of company policies and procedures • knowledge of OH&S regulations • knowledge of WHMIS symbols and Material Safety Data Sheets (MSDS) • ability to complete work-related documents such as as-built drawings, work orders, log books and time sheets • ability to fill out safety documentation such as hazard assessment and first aid logs	030103a	Safety And On The Job Training
2.04	Communicates with others	• knowledge of trade terminology	030305g	Electrician Apprenticeship Training Program Orientation

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to communicate identified hazards • ability to communicate with supervisors • ability to communicate with co-workers • ability to coordinate work with other trades • ability to participate in safety and information meetings • ability to communicate with laypersons • ability to communicate with engineers and architects • ability to mentor apprentices		
2.05	Compiles a list of materials and supplies	• knowledge of project or task to be completed • knowledge of site conditions and restrictions • knowledge of available materials • ability to identify required materials		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		and supplies according to plans and specifications • ability to perform mathematical calculations • ability to interpret site measurements and instructions • ability to do material take-off • ability to do inventory control		
2.06	Plans project tasks and procedures	• knowledge of other trades' work requirements • knowledge of delivery dates and availability of materials • knowledge of sequence of operations • knowledge of utility and specification requirements • ability to establish and maintain schedules • ability to determine labour and equipment requirements • ability to coordinate work with other		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		trades such as shutdown requirements and installation sequencing • ability to apply specifications to contract documents • ability to draw and sketch layouts • ability to give and follow directions and instructions • ability to follow installation and operational sequences		

3 PERFORMS ROUTINE TRADE ACTIVITIES

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
3.01	Prepares work site	• knowledge of work site location • knowledge of building codes and regulations • knowledge of building structures such as walls, ceilings and floors • knowledge of equipment such as panel boards, switchgear and motor control		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		centres (MCC) • knowledge of work site hazards such as existing utilities, dust, temperature, chemicals and weather • ability to perform pre-job safety assessment • ability to control workplace access • ability to create openings and penetrations in structures and equipment • ability to lay out job materials and equipment		
3.02	Performs lock-out and tagging procedures	• knowledge of lock-out and tagging procedures • knowledge of legislation governing minimum standards for lock-out and tagging procedures • ability to recognize equipment for tagging • ability to locate and de-energize appropriate equipment	030103a	Safety

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to select approved equipment to ensure proper lock-out and tagging • ability to verify proper lock-out and tagging		
3.03	Handles materials and supplies	• knowledge of inventory systems • knowledge of storage requirements such as temperature, environmental conditions and stacking limitations • knowledge of safe work practices such as WHMIS • ability to store and organize materials and supplies • ability to locate materials and supplies • ability to verify shipments of materials and supplies • ability to load and unload materials and supplies • ability to coordinate the receiving of materials and supplies		Considered On The Job Training
3.04	Maintains safe work	• knowledge of WHMIS	030103a	Safety

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
	environment	• knowledge of workers' rights and responsibilities • knowledge of company safety policies and procedures • knowledge of site-specific fire safety and work permit procedures • knowledge of emergency procedures and location of on-site first aid stations and equipment • ability to locate and recognize safety documentation such as MSDS and WHMIS labels • ability to recognize and report potential hazards • ability to perform housekeeping practices		
3.05	Installs seismic restraint systems	• knowledge of jurisdiction regulations regarding seismic restraint systems • ability to identify seismic design requirements • ability to interpret seismic design		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		requirements • ability to select and use applicable methods to secure components		
3.06	Conducts operational tests	• knowledge of start-up and commissioning procedures such as rotational testing, voltage readings and current readings • knowledge of required documentation • knowledge of manufacturers' specifications • knowledge of sequence of operation of equipment • ability to select and use operational testing tools and equipment • ability to perform visual inspections • ability to adjust equipment to specifications such as motor overload protection, energy management systems and adjustable trip mechanism circuit breakers		Considered On The Job Training

B SYSTEMS, DISTRIBUTION AND SERVICES 25%

4 INSTALLS SERVICE ENTRANCE AND DISTRIBUTION EQUIPMENT

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
4.01	Installs supply services	• knowledge of types of supply services such as underground and overhead • 4.01.02 knowledge of supply service components such as conductors, insulators, meter sockets, conduit and panels • knowledge of installation conditions for supply services • knowledge of grounding requirements • knowledge of types of conductors such as triplex, TECK 90 and R90 • knowledge of connection methods to consumer service • knowledge of types of wiring methods • knowledge of installation methods for underground application	030104c 030104d 030104e 030104f 030203f 030203g 030302b 030304g 030407i	Conductor Materials and Sizes Service and Grounding Requirements Service Feeders and Branch Circuits Wiring Methods Service Ampacity for Apartments and Similar Buildings Service Protection and Control for Apartments and Similar Buildings Three-Wattmeter Connection Energy Measurement Service Feeders and Branch Circuit Requirements for a Single Dwelling

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to select and use tools and equipment such as threaders, torque wrenches and compression tools • ability to install and terminate conductors • ability to assemble and mount panels • ability to secure conduit and cable • ability to select and install mechanical protection for underground installations • ability to distinguish phase designations (colours) • ability to bend and install conduit	030407j 030407k 030407L	Electrical Requirements for Apartments and Similar Buildings Hotels and Motels Other Occupancies
4.02	Installs metering systems	• knowledge of types of transformers such as current transformers (CTs) and potential transformers (PTs) • knowledge of types of meters such as digital and analog • knowledge of utility company requirements for placement and accessibility of meters	030104d 030104e 030304g	Service and Grounding Requirements Service Feeder and Branch Circuits Energy Measurement

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of types and locations of cabinet enclosures • ability to select and use tools such as benders, hole saws and torque wrenches • ability to install and terminate conductors • ability to install PTs and CTs • ability to install and secure conduit and fittings • ability to assemble and mount metering equipment • ability to coordinate installation of meters with utility company		
4.03	Installs overcurrent protection	• knowledge of types of fuses such as time delay and non-time delay • knowledge of types of circuit breakers such as mechanical and adjustable • knowledge of branch circuit loads and demand factors	030103c 030103d 030104c 030104e	Conductors Splicing and Terminating (Low Voltage) Conductor Materials and Sizes Service Feeder and Branch Circuits

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of conductor sizes • knowledge of available fault current • knowledge of breaker and fuse ratings and interrupting capacity • ability to select and use tools such as hex wrenches, cable benders and mallets • ability to fasten and mount overcurrent protection devices using fasteners such as bolts, screws and fuse holders • ability to install and terminate conductors • ability to select and install breakers and fuses	030104g 030104h 030203g 030305b 030407b	Installation of Electrical Equipment Installation of Lighting Equipment Service Protection and Control for Apartments and Similar Buildings Protection and Control Protection, Control and Wiring Methods
4.04	Installs power distribution centres	• knowledge of types of transformers such as step-up and step-down • knowledge of meter stack requirements • knowledge of types of power distribution centres such as single-phase panel, three-phase panel and MCC	030104g 030305c 030407c	Installation of Electrical Equipment Installation of Equipment Grounding and Bonding and Distribution Layout

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of types of components such as transfer switches, overcurrent protection devices and fittings • knowledge of clearances of power distribution centres • ability to select and use tools and equipment • ability to install conduit and fittings • ability to install and terminate cables and bus ducts • ability to assemble and install cabinets and busbars • ability to identify and label components • ability to place and secure power distribution centres		
4.05	Installs temporary power	• knowledge of power and distribution as per local CEC and local jurisdictional regulations • knowledge of load requirements • knowledge of types of temporary	030305f	Pools, Mobile Homes and Temporary Wiring - Sections 68, 72 and 76

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		portable panels • knowledge of metering • knowledge of type of transformers such as indoor, outdoor, step-up and step-down • knowledge of temporary power uses such as for power tools, construction shack, lighting, welders and cranes • knowledge of types of cables and conductors used for temporary power • ability to select and use tools and equipment • ability to run cables and conductors from supply to temporary panel • ability to terminate conductors • ability to weatherproof temporary equipment such as panels, transformers and receptacle banks • ability to install masts and poles • ability to ground and bond equipment		

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
4.06	Installs surge protection systems	• knowledge of surge protection components such as lightning arresters, isolated ground panels and ground systems • knowledge of phase and voltage rating • knowledge of types of electrical equipment that require surge protection such as computers, electronic equipment and lighting • ability to install and connect surge protection equipment • ability to ground lightning arresters separate from system ground		Considered On The Job Training
4.07	Installs power conditioning devices	• knowledge of types of power conditioning devices • knowledge of power factors and power factor corrections • knowledge of power conditioning installation procedures • ability to select and use tools and equipment	030202f 030302c 030203p 030407e	Power Factor Correction Power Factor Correction Capacitor Bank Installations Installation of Capacitors and Transformers

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to mount power conditioning devices • ability to connect power conditioning devices		
4.08	Installs uninterruptible power supply (UPS) systems	• knowledge of requirements for battery bank installations • knowledge of types of UPS systems • knowledge of UPS components such as transfer switches, battery banks and generators • knowledge of uses and requirements of UPS systems such as lighting, computers and telephones • knowledge of specialty tools used for UPS installation such as insulated tools and torque wrenches • ability to select and use tools and equipment • ability to recognize hazards of battery bank installations such as explosions, burns and electrocutions	030406h	Uninterruptible Power Supply (UPS) Systems

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to install and connect transfer switches • ability to calculate demand factor • ability to assemble and mount battery banks, rectifiers and generators		
4.09	Performs start-up and shut-down procedures	• knowledge of single line diagrams, flow charts, and other documentation which details sequential process control • knowledge of sequential events during start up and shut-down operations • ability to follow start-up and shut-down procedures • ability to test cables for ground faults and phase identification • ability to check for phase rotation • ability to apply safety ground on shut-down • ability to remove safety ground on start-up • ability to verify busbar connections and		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		torquing of bolts • ability to check for loose hardware and tools		

5 INSTALLS SUB-PANELS, FEEDERS AND TRANSFORMERS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
5.01	Installs sub-panels	• knowledge of types of sub-panels by application • knowledge of components such as breakers and lugs • knowledge of sub-panel ratings such as current, voltage and capacity • knowledge of location and clearances of sub-panels • knowledge of applications that require sub-panels • ability to select and use tools and equipment	030103c 030104e 030203b 030203f 030407i 030407j 030407k	Conductors Service Feeder and Branch Circuits Service Conductor Ampacity for a Single Dwelling Service Ampacity for Apartments and Similar Buildings Service Feeder and Branch Circuit Requirements for a Single Dwelling Electrical Requirements for Apartments and Similar Buildings Hotels and Motels

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to mount sub-panel components • ability to mount breakers and fuses in sub-panel • ability to prepare sub-panel for conduit and cables	030407L	Other Occupancies
5.02	Installs feeders to sub-panels	• knowledge of types and sizes of cable, conduit and conductors • knowledge of parallel conductors • knowledge of types of fittings and connectors • knowledge of the effect of induction • knowledge of environment such as dry or wet, and above or below ground • knowledge of installation and support of cables and raceways • ability to select and use tools and equipment • ability to select type of conductor for application	030103c 030104e 030203b 030203f 030407i 030407j 030407k 030407L	Conductors Service Feeder and Branch Circuits Service Conductor Ampacity for a Single Dwelling Service Ampacity for Apartments and Similar Buildings Service Feeder and Branch Circuit Requirements for a Single Dwelling Electrical Requirements for Apartments and Similar Buildings Hotels and Motels Other Occupancies

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to pull cables and conductors • ability to install and secure cables and conduit • ability to terminate conductors and torque the lugs • ability to build and install racks • ability to install trays • ability to install bus ducts		
5.03	Installs low voltage transformers	• knowledge of types and sizes of transformers such as dry, oil-filled and single-phase • knowledge of low voltage transformer installation procedures and locations • knowledge of tap settings • knowledge of purpose of transformers such as step-up, step-down and isolation • knowledge of transformer clearances • knowledge of transformer winding	030304a 030304b 030304c 030304d 030304e 030304f 030305c 030407e	Transformers Induction, Turns Ratio, Polarity and Multiple Winding Transformer Load Test Transformer Losses, Impedance Voltage and Paralleling Autotransformers Transformer Connections Installation of Equipment Installation of Capacitors and

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		configuration • knowledge of purpose of transformer grounding • ability to select and use tools and equipment • ability to raise, mount and secure transformers • ability to install raceway systems • ability to terminate cables and conductors		Transformers

6 INSTALLS BONDING, GROUNDING AND CATHODIC PROTECTION SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
6.01	Installs grounding grids	• knowledge of grounding equipment such as rods, plates, electrodes, wire and crimps • knowledge of grounding requirements • knowledge of step potential	030104d 030203e 030305a	Service and Grounding Requirements Grounding Requirements for a Single Dwelling Grounding and Bonding

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of types of grounding wire such as bare, multi-stranded and insulated • ability to select and use tools and equipment • ability to thermit weld • ability to pull and fasten ground wire	030407c	Grounding, Bonding and Distribution Layout
6.02	Installs bonding conductors	• knowledge of bonding equipment such as lugs, wire and crimps • knowledge of continuity • knowledge of bonding requirements • ability to select and use tools and equipment • ability to bond equipment such as lights, plugs, sub-panels, trays and bus ducts • ability to terminate conductors, conduit and cables	030104d 030203e 030305a 030407c	Service and Grounding Requirements Grounding Requirements for a Single Dwelling Grounding and Bonding Grounding, Bonding and Distribution Layout
6.03	Installs ground fault protection systems	• knowledge of ground fault equipment such as relays and CTs	030305b	Protection and Control Protection, Control and Wiring

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of applications for ground fault protection systems such as pools, shipyards, kitchens and bathrooms • knowledge of installation methods • knowledge of location, clearance and access for ground fault protection systems • ability to select and use tools and equipment • ability to mount equipment • ability to terminate conductors • ability to adjust ground fault protection systems	030407b	Methods
6.04	Installs lightning arresters	• knowledge of types of lightning arresters • knowledge of use of extra stranded cable • knowledge of purpose of lightning arresters • knowledge of installation procedures		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to select and use tools and equipment • ability to pull, fasten and terminate conductors • ability to mount lightning arrester equipment • ability to attach wire to lightning arresters and ground electrode		
6.05	Installs cathodic protection systems	• knowledge of components of cathodic protection systems such as controllers and sensors • knowledge of purposes of cathodic protection systems • knowledge of hazards of working on cathodic protection systems • knowledge of a rectifier circuit • ability to select and use tools and equipment • ability to connect components of cathodic protection systems	030406i	Cathodic Protection

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to follow manufacturers' instructions		

7 INSTALLS POWER GENERATION SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
7.01	Installs generators and transfer switches	• knowledge of types of generators • knowledge of types of transfer switches such as manual and automatic • knowledge of load requirements • knowledge of generator requirements such as clearances, access, ventilation and fuel systems • knowledge of operation of transfer switches and generators • knowledge of control circuits and alarms for transfer switches and generators • ability to select and use tools and equipment	030102e 030402b 030402c 030403a 030403b	Generators Direct Current Generator Principles Types of Direct Current Generators Three Phase Alternators Paralleling Alternators

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to place and secure generator • ability to ground and bond generator • ability to terminate conductors and install raceways to transfer switches and generators • ability to program the generator controls for start-up and shut-down sequences		
7.02	Installs alternative power systems	• knowledge of types of alternative power systems such as photovoltaic, tidal and wind • knowledge of utility company requirements and regulations regarding alternative power systems • knowledge of operation of alternative power systems • knowledge of location requirements for maximum efficiency • ability to select and use tools and equipment • ability to mount components such as		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		solar panels, control panels and wind turbines • ability to connect conductors to power supply		

8 INSTALLS HIGH VOLTAGE SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
8.01	Installs high voltage equipment	• knowledge of types of high voltage equipment such as switchgear, cabinets, load regulators, transformers, insulators, poles and towers • knowledge of grounding and step potential • knowledge of the effect of inductance • knowledge of limits of approach for various voltages and equipment • knowledge of installation specifications • knowledge of locations of high voltage equipment such as underground and at	030304a 030304b 030304c 030304d 030304e 030304f 030305c 030407h	Transformers Induction, Turns Ratio, Polarity and Multiple Winding Transformer Load Test Transformer Losses, Impedance Voltage and Paralleling Autotransformers Transformer Connections Installation of Equipment Safety/Arc Flash/High Voltage

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		heights • knowledge of guarding requirements and methods • ability to select and use tools and equipment • ability to assemble high voltage equipment such as capacitor banks, rectifiers and transformers • ability to mount, support and secure large components • ability to locate transformers and equipment • ability to ground and bond all metallic components such as fences, towers and cabinets		
8.02	Installs high voltage cables	• knowledge of bending radius of high voltage cables • knowledge of high voltage principles and practices • knowledge of direct burial requirements	030407h	Safety/Arc Flash/High Voltage

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of types of cables such as armoured and concentric • knowledge of types of conductors such as aluminium and copper • knowledge of configurations, spacing and barriers • knowledge of marking requirements and practices • knowledge of installation materials such as insulators and supports • ability to select and use tools and equipment such as tuggers, cranes, jack stands and ropes • ability to calculate pulling tolerances and tension requirements • ability to install pulleys and sheaves • ability to rig pulls • ability to install supports • ability to pull high voltage cables		

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
8.03	Terminates high voltage cables	• knowledge of principles of high voltage such as corona effect and induction • knowledge of high voltage termination techniques • knowledge of types of connections for high voltage cables • knowledge of bonding and grounding for high voltage installation • ability to select and use tools and equipment • ability to secure and support cables • ability to select and use lugs, pin connectors and stress cone kits	030407h	Safety/Arc Flash/High Voltage
8.04	Tests high voltage systems	• knowledge of types of tests such as high pot test and inductor test • knowledge of purpose of tests such as detecting leakage current, phase identification and ensuring insulation integrity • knowledge of test requirements	030407h	Safety/Arc Flash/High Voltage And On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to select and use test equipment • ability to isolate conductors • ability to bleed capacitor banks • ability to bleed cables • ability to interpret test data		

C BRANCH CIRCUIT WIRING 26%

9 INSTALLS RACEWAYS AND CABLES

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
9.01	Installs raceways	• knowledge of types of raceways such as conduit, tray, floor duct and cellular floors • knowledge of raceway sizes • knowledge of types of fittings such as couplings and connectors • knowledge of installation requirements such as number of bends, support spacing and types of supports • ability to select and use tools and equipment • ability to select and install raceway according to the environment • ability to select fitting according to the installation environment such as weathertight, dust-tight and raintight fittings	030104f 030203i 030203j 030203k 030203l 030203m 030203n 030407f	Wiring Methods Overview of Hazardous Locations - Section 18 Class I Wiring Methods Class I Locations - Section 20 Installations in Class II Locations Installations in Class III Locations Corrosive and Wet Locations - Section 22 Hazardous and Special Locations

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
9.02	Installs cables	• knowledge of cable types and applications • knowledge of installation environment • knowledge of types of cable supports and fasteners such as staples and straps • knowledge of termination requirements such as connectors, anti-oxidants and bushings • knowledge of pulling tension when using power pullers for cable installation in raceways • knowledge of cable spacing and supports • ability to select and use tools and equipment • ability to construct support systems • ability to fasten cable supports	030104c	Conductor Materials and Sizes
9.03	Installs underground wiring	• knowledge of types of underground conduit and cable • knowledge of underground wiring	030104c	Conductor Materials and Sizes

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		techniques • ability to select and use tools and equipment • ability to locate utility services and wires • ability to place cable and conduit in trenches • ability to mark and backfill trenches		
9.04	Installs enclosures	• knowledge of types of enclosures such as boxes and cabinets • knowledge of installation environment • knowledge of clearances and accessibility • knowledge of types of fasteners • knowledge of sizing requirements for enclosures • ability to select and use tools and equipment • ability to secure and support enclosures	030104g	Installation of Electrical Equipment

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to create openings and knockouts in enclosures		
9.05	Installs conductors in raceways	• knowledge of types of conductors • knowledge of size, number and types of conductors • knowledge of lubricants • knowledge of fishing techniques and related hazards • knowledge of sizing requirements for enclosures • ability to select and use tools and equipment • ability to tag and pull conductors • ability to calculate raceway capacity • ability to strip and splice conductors	030104c	Conductor Materials and Sizes

10 INSTALLS POWER AND LIGHTING SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
10.01	Installs luminaires	• knowledge of types, functions and applications of luminaires • knowledge of types of fasteners • knowledge of structure surfaces such as T-bar, concrete and steel • knowledge of environment and classification • knowledge of types of supports such as chain, cable and box • knowledge of support and protection requirements • ability to select and use tools and equipment • ability to determine circuitry and demand loading • ability to assemble luminaires • ability to connect luminaires	030104h 030404i	Installation of Lighting Equipment Lighting

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to install lamps • ability to mount support to structure		
10.02	Installs devices (switches and receptacles)	• knowledge of types of devices • knowledge of types of fasteners • knowledge of environment and classification • knowledge of installation procedures • ability to select and use tools and equipment • ability to determine device configuration and ratings • ability to connect and mount devices • ability to select and install faceplates and covers	030103f 030103g 030104g 030104k	Switching Circuits Basic Circuits Using Buzzers and Chimes Installation of Electrical Equipment Class 1 and Class 2 Circuits
10.03	Installs lighting controls	• knowledge of types of lighting controls such as relays, dimming systems, photocells, motion sensors and timers • knowledge of types of fasteners • knowledge of environment and	030103h 030103i	Relays and Controls Low Voltage Switching

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		classification • knowledge of operation of lighting control systems • ability to select and use tools and equipment • ability to determine circuitry and demand loading • ability to assemble control components • ability to mount lighting controls to structure • ability to connect and program lighting controls		
10.04	Installs light posts	• knowledge of types of light posts such as street lights, traffic lights, bollard lights and parking lights • knowledge of types of fasteners • knowledge of light post installation procedures • knowledge of uses and requirements of light posts		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to select and use tools and equipment • ability to fabricate bases fitted with sleeves or conduit, anchoring bolts or studs and breakaways • ability to mount, fasten and shim for level • ability to connect and ground light post • ability to adjust and aim luminaires and photocells		
10.05	Installs branch circuit protection	• knowledge of types of branch circuit protection such as circuit breakers, fuses and fault protection • knowledge of conductor sizes and ampacity • knowledge of available fault current • knowledge of branch circuit protection installation procedures • ability to select and use tools and equipment	030203d	Feeder and Branch Distribution Requirements for a Single Dwelling

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to calculate demand load • ability to mount branch circuit protection devices		

11 INSTALLS HEATING, VENTILATION AND COOLING (HVAC) SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
11.01	Installs electric heating systems	• knowledge of types of electric heating systems • knowledge of types of fasteners • knowledge of environment and classification • knowledge of electric heating installation procedures • knowledge of heat loss and heat requirement calculations • ability to select and use tools and equipment • ability to assemble, mount and connect	030204a 030204b 030204c 030204d 030204e 030204f 030204g	Principles of Automatic Heating and Cooling Controls Temperature Sensing and Control Devices Basic Gas-Fired, Forced-Air Heating Systems Mid/High Efficiency, Gas-Fired, Forced-Air Heating Systems Basic Hot Water Heating Systems Cooling Systems HVAC Rooftop Units

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		electric heating • ability to calculate demand load • ability to determine wire size, overcurrent protection and disconnect means		
11.02	Connects ventilation and cooling systems	• knowledge of types of cooling systems such as refrigeration and air conditioning • knowledge of environment and classification • knowledge of connection procedures • ability to select and use tools and equipment • ability to calculate demand load • ability to determine wire size, overcurrent protection and disconnect means • ability to make electrical connections	030204a 030204b 030204c 030204d 030204e 030204f 030204g	Principles of Automatic Heating and Cooling Controls Temperature Sensing and Control Devices Basic Gas-Fired, Forced-Air Heating Systems Mid/High Efficiency, Gas-Fired, Forced-Air Heating Systems Basic Hot Water Heating Systems Cooling Systems HVAC Rooftop Units
11.03	Installs HVAC control systems	• knowledge of HVAC system operational requirements	030204a	Principles of Automatic Heating and Cooling Controls

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of electrical control devices such as thermostats, sensors and timers • knowledge of mechanical control devices such as solenoid valves, dampers and relays • knowledge of installation procedures • knowledge of control device location and accessibility requirements • ability to select and use tools and equipment • ability to mount electrical control devices • ability to connect control components • ability to calibrate and program control devices	030204b 030204c 030204d 030204e 030204f 030204g	Temperature Sensing and Control Devices Basic Gas-Fired, Forced-Air Heating Systems Mid/High Efficiency, Gas-Fired, Forced-Air Heating Systems Basic Hot Water Heating Systems Cooling Systems HVAC Rooftop Units

12 INSTALLS EMERGENCY LIGHTING SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
12.01	Installs exit lighting	• knowledge of types of exit lighting such as self-powered and remote-powered • knowledge of building code requirements for spacing and location • knowledge of AC and DC circuit requirements • knowledge of types of fasteners • knowledge of environment and classification • knowledge of types of emergency power supplies such as batteries and generators • ability to select and use tools and equipment • ability to integrate exit lighting and emergency lighting • ability to calculate emergency current supply • ability to mount and connect exit light	030203h	Electric Discharge Lighting, Emergency Systems and Unit Equipment

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
12.02	Installs battery-operated lighting	• knowledge of types of battery-operated lighting • knowledge of building code requirements for spacing and location • knowledge of AC and DC circuit requirements • knowledge of types of fasteners • knowledge of environment and classification • knowledge of battery types and sizing • ability to select and use tools and equipment • ability to integrate exit lighting and emergency lighting • ability to calculate battery demand load • ability to mount and connect emergency light systems	030203h	Electric Discharge Lighting, Emergency Systems and Unit Equipment

D MOTORS AND CONTROL SYSTEMS 20%

13 INSTALLS MOTOR CONTROLS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
13.01	Installs starters	• knowledge of types of starters such as full voltage, reduced voltage, manual and magnetic starters • knowledge of requirements of motor and operation • knowledge of manufacturers' specifications • knowledge of types of enclosures such as dry, wet and hazardous • ability to select and use tools and equipment • ability to select starter size • ability to adjust starters • ability to assemble components • ability to mount and connect starter	030205d 030205e 030205f 030205h 030305d 030305e	Protection Devices (General)/Protective Devices (Motor Circuits) Construction of Magnetic Motor Starters/Overload Devices Single Motor Control /Pilot Devices and Symbols Reversing Magnetic Starters Individual Motors Motor Banks

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		assembly • ability to calculate feeder requirements		
13.02	Installs variable frequency drives (VFD)	• knowledge of types of VFD • knowledge of types and sizes of enclosures such as wet, dry and hazardous • knowledge of motor specifications • knowledge of line and load conditioning • knowledge of harmonics • ability to select and use tools and equipment • ability to select drive size and voltage • ability to calculate feeder requirements for special conditions such as shielding requirements and length of cable • ability to determine location of drive • ability to connect drives • ability to calibrate and program drives	030406g	Variable Frequency Drives

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
13.03	Installs overload protection	• knowledge of types of overloads • knowledge of motor sizes, types and characteristics • ability to select and use tools and equipment • ability to calculate overload requirements • ability to determine the size of overload protection • ability to mount and connect overload protection	030205d 030205e 030305d 030305e	Protection Devices (General)/Protective Devices (Motor Circuits) Construction of Magnetic Motor Starters/Overload Devices Individual Motors Motor Banks
13.04	Installs motor controls	• knowledge of types of motor controls • knowledge of system requirements and applications • knowledge of control devices such as float and interlock switches • knowledge of multiple voltage systems • ability to select and use tools and equipment	030205b 030205f 030205c 030205d 030404b	Construction of Control Relays and Contactors/Operation of Relays Single Motor Control /Pilot Devices and Symbols Timers and Smart Relays Protection Devices (General)/Protective Devices (Motor Circuits) Control and Switching Circuits

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to select and install relays, contactors and control transformers • ability to determine location of devices • ability to terminate motor controls • ability to adjust control devices	030404c	Special Control Circuits
13.05	Installs Programmable Logic Controls (PLCs)	• knowledge of PLCs • knowledge of interface requirements • ability to select and use tools and equipment • ability to determine system requirements • ability to write and verify basic PLC programs • ability to program a PLC • ability to plan and install interface	030404e	Introduction to Programmable Logic Controllers

14 INSTALLS MOTORS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
14.01	Installs AC and DC motors	• knowledge of types of motors such as single-phase, three-phase and DC • knowledge of motor applications • knowledge of power, starting and duty requirements • knowledge of environment and classification • knowledge of system requirements • ability to select and use tools and equipment • ability to apply nameplate data • ability to mount and align motors • ability to terminate motors	030303aA 030303aB 030303b 030407g 030402a 030402d 030402e	Three Phase Induction Motors – Part A Three Phase Induction Motors – Part B Induction Motor Characteristics Individual Motors and Motor Banks Direct Current Machines Types of Direct Current Motors (Part 1) Types of Direct Current Motors (Part 2)
14.02	Installs motor overcurrent protection	• knowledge of types of motors • knowledge of types and sizes of fuses and breakers	030305b 030305d 030305e	Protection and Control Individual Motors Motor Banks

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of motor applications • knowledge of types of motor starters • knowledge of types of conductors • ability to select and use tools and equipment • ability to interpret motor nameplate data • ability to calculate overcurrent requirements • ability to select overcurrent devices • ability to select enclosures • ability to determine size of conductors • ability to terminate conductors		

E SIGNALLING AND COMMUNICATION SYSTEMS 9%

15 INSTALLS SIGNALLING SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
15.01	Installs fire alarm systems	• knowledge of codes and regulations applying to fire alarm system installation • knowledge of types of fire alarm systems • knowledge of components of fire alarm systems • knowledge of wiring methods • knowledge of manufacturers' specifications • knowledge of ancillary devices and circuits such as fan shut down, elevator recall and door release • ability to select and use installation tools and equipment such as wire and cable strippers and mineral-insulated cable tools	030405a 030405b 030405c 030405d 030103j	Fire Detection and Alarm Systems Fire Detection and Alarm System Regulations Fire Alarm System Occupancy Classifications Wiring Procedures for Fire Alarm systems Residential Alarm Systems and Smoke Alarms

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to follow installation procedures		
15.02	Installs nurse call systems	• knowledge of types of nurse call systems • knowledge of components of nurse call systems • knowledge of operating principles of nurse call systems • ability to select and use tools and equipment • ability to follow manufacturers' specifications • ability to follow installation procedures		Considered On The Job Training
15.03	Installs security and surveillance systems	• knowledge of types of security systems such as card access, door access and intrusion • knowledge of types of surveillance systems such as video, motion and heat • knowledge of manufacturers' specifications • knowledge of operating principles	030103j	Residential Alarm Systems and Smoke Alarms

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to select and use tools and equipment • ability to locate and mount system components • ability to follow installation procedures • ability to confirm operation of security and surveillance systems		

16 INSTALLS COMMUNICATION SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
16.01	Installs voice/data systems	• knowledge of types of cables such as copper, fiber optic and coaxial • knowledge of installation standards • knowledge of manufacturers' specifications such as bend radius, jacket stripping and splicing • knowledge of types of lines such as analog and digital	030104j	Data Cabling

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to select appropriate cable type according to specifications • ability to follow installation procedures • ability to confirm operation of the voice/data systems		
16.02	Installs public address (PA) systems	• knowledge of types of PA systems • knowledge of installation standards • knowledge of manufacturers' specifications • ability to select and use tools and equipment • ability to select appropriate cable type according to specifications • ability to follow installation procedures • ability to confirm operation of PA systems		Considered On The Job Training
16.03	Installs community antenna distribution and radio and television systems	• knowledge of community antenna distribution and radio and television equipment as defined by the CEC		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• knowledge of types of cables such as RG 59, RG 6, Category 5e and 6 • knowledge of manufacturers' specifications • ability to select and use tools and equipment • ability to select appropriate cable type according to specifications • ability to follow installation procedures • ability to confirm operation of the systems		
16.04	Installs building automation systems	• knowledge of types of building automation systems such as energy management systems, integrated building systems and smart buildings • knowledge of components of building automation systems such as cables and sensors • knowledge of manufacturers' specifications • ability to select and use tools and		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		equipment • ability to select components such as occupancy sensors, sail switches and dusk-to-dawn controls • ability to follow installation procedures • ability to confirm operation of systems		

F UPGRADING, MAINTENANCE AND REPAIR 8%

17 UPGRADES ELECTRICAL SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
17.01	Evaluates existing electrical systems	• knowledge of system components such as MCCs, transformers, panel boards and splitters • knowledge of types of systems by voltage and use • knowledge of system operation by sequence • knowledge of calculation and demand factors • knowledge of current code rules and jurisdictional regulations • ability to select and use tools and equipment • ability to calculate demand factors and loads • ability to determine upgrades to meet		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		current code regulations		
17.02	Replaces electrical systems and equipment	• knowledge of types of electrical systems and equipment • knowledge of system operation • knowledge of types of system components such as breakers, fuses and overcurrent and overload devices, panel boards, relays, capacitors, timers and terminal blocks • knowledge of removal and disposal procedures • ability to select and use tools and equipment • ability to perform shut-down procedures • ability to select corresponding replacement parts according to their rating		Considered On The Job Training

18 MAINTAINS ELECTRICAL SYSTEMS

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
18.01	Troubleshoots electrical systems	• knowledge of types of electrical systems • knowledge of electrical system concept and operation • knowledge of troubleshooting techniques • ability to select and use tools and equipment • ability to apply troubleshooting techniques • ability to recognize defective electrical components	030201d 030201e 030201f 030202a 030202bA 030202bB 030202c 030202d 030202e 030301d 030301e 030301fA	Introduction to ac Circuits Inductance and Inductive Reactance Capacitance and Capacitive Reactance Introduction to Series ac Circuits Series Resistive-Reactive Circuits - Part A Series Resistive-Reactive Circuits - Part B Series RLC Circuits Introduction to Parallel ac Circuits Parallel RLC Circuits Three-Phase Systems (General) Three-Phase Wye Connection Three-Phase Delta Connection - Part A

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
			030301fB 030302a 030303c 030401d 030403c 030403d 030403e	Three-Phase Delta Connection - Part B Three-Phase Power Phase Converters Three-Phase Basic Calculations Synchronous Motors (Part 1) Synchronous Motors (Part 2) Single-Phase Motors
18.02	Replaces electrical components	• knowledge of types of electrical systems • knowledge of electrical system operation • ability to select and use tools and equipment • ability to recognize defective electrical systems • ability to select equivalent replacement parts		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
		• ability to install replacement parts • ability to integrate new components into existing systems • ability to verify operation of replacement components		
18.03	Repairs electrical components	• knowledge of types of electrical systems • knowledge of electrical system operation • ability to select and use tools and equipment • ability to select approved materials • ability to recognize defective electrical components • ability to integrate new components into existing systems • ability to verify operation of repaired components		Considered On The Job Training And all modules

19 PERFORMS PREVENTATIVE MAINTENANCE

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
19.01	Tests system operation	• knowledge of system design • knowledge of system sequence • ability to select and use tools and equipment • ability to use evaluation techniques • ability to recognize potential system operation problems		Considered On The Job Training
19.02	Cleans components	• knowledge of cleaners • knowledge of operation of equipment • ability to select and apply cleaners • ability to follow maintenance schedule		Considered On The Job Training
19.03	Lubricates components	• knowledge of lubricants • knowledge of operation of equipment • ability to select and apply lubricants • ability to follow maintenance schedule		Considered On The Job Training

	Subtask	Enabling Objective	ILM Module Number	ILM Module Name
19.04	Establishes maintenance schedule	• knowledge of equipment being maintained • knowledge of manufacturers' specifications • knowledge of customer requirements • knowledge of environmental conditions • ability to create maintenance schedules		Considered On The Job Training
19.05	Implements maintenance schedule	• knowledge of equipment being maintained • knowledge of manufacturers' specifications • knowledge of customer requirements • knowledge of environmental conditions • ability to execute maintenance schedules • ability to record maintenance data		Considered On The Job Training

REFERENCES AND AVAILABILITY

Reference		Availability
Canadian Electrical Code Part I; C.S.A. – Current edition		Available at Northern Alberta Institute of Technology (NAIT) bookstore (Campus Reads and Needs) (780) 471 – 7717 or on line at www.nait.ca Also Available from most Colleges and Technical Institutes in Alberta, as well as various bookstores.