

NOCC-A21 Electrician: Competence Package

<b>Relevant Occupation/trade title:</b> Electrician				<b>SAQA ID:</b> 91761	
<b>Learning Area 6: Install wiring systems and accessories for low voltage in <u>industrial &amp; commercial buildings and premises (incl. earthing and bonding)</u></b>				<b>Total Hours:</b>	<b>168</b>
<b>Learning Project 3: Install control equipment into distribution boards and control panels (including termination and testing)</b>				<b>Total Hours:</b>	<b>40</b>
<b>Requisite learning areas/projects to be in place (Pre-requisite and co-requisite):</b>		<ul style="list-style-type: none"> <li>• LA 1 (LP 2, 3, 5, 7, 9, 10)</li> <li>• LA 2 (LP 1-7)</li> <li>• LA4 (LP 1-3)</li> <li>• LA5 (LP 1-3)</li> <li>• LA6 (LP1-2)</li> </ul>			
<b>Learning project description: Install Industrial control equipment into distribution boards and control panels including (termination and testing)</b>					
Activity phase	Practical Skills Modules Content	Underpinning Knowledge Module Content	Work Experience Module Content (Exposure to be given)	Didactical-methodological advice	Learning Materials / Tools and Equipment
<b>Reference to QCTO Curriculum</b>	PM-05-PS06 PM-06-PS01-02 PM-07-PS01-03 PM-08-PS01-05	KM-05-KT01 KM-05-KT02 KM-05-KT03	WM-01-WE01-03 WM-02-WE01-03 WM03-WE01-03		
<b>Planning/ Preparation</b>	<p><b>Provide access to (Given):</b> Work tasks/job cards, installation cubicles and materials and equipment as listed in last column;</p> <p><b>Apprentices must be able to do/perform the following (hard and soft) skills:</b></p> <p><b>Prepare layout of electrical installation circuits, control and protection devices</b></p> <ul style="list-style-type: none"> <li>• Determine the scope and specs of the electrical installation from work specifications</li> </ul>	<p><b>Knowledge of:</b></p> <ul style="list-style-type: none"> <li>• Occupational health and safety requirements (OHS Act)</li> <li>• Electrical Machinery regulation</li> <li>• Accident prevention &amp; first aid</li> <li>• Installation standards (SANS 10142-1)</li> <li>• Schematic drawings and manufacturers specifications</li> </ul>	<p><b>Under supervision:</b></p> <ul style="list-style-type: none"> <li>• Install and wire distribution boards and control panels</li> <li>• Perform risk assessment before planning to wire Meter Boards and Distribution Boards</li> <li>• Inspect tools and equipment and check manufacturers specifications</li> <li>• Prepare various types and sizes of enclosures to receive equipment</li> <li>• Select, arrange, mount and</li> </ul>	<ul style="list-style-type: none"> <li>• Research /Desk study</li> <li>• Case studies /scenarios</li> <li>• Technical discussions</li> <li>• Lecture/ instructions</li> <li>• Textbook work</li> <li>• Mind mapping</li> </ul>	<p><b>Print materials, electronic files, software applications incl.:</b></p> <ul style="list-style-type: none"> <li>• OHS Act</li> <li>• SANS 10142-1</li> <li>• Job cards/ work requests/ maintenance schedules and work permit examples</li> <li>• Manufacturer's specifications</li> <li>• Text books</li> <li>• Manuals for trainers and apprentices incl.</li> </ul>

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	<ul style="list-style-type: none"> <li>Identify, obtain, and understand safety and other regulatory requirements to which the electrical installation shall comply</li> <li>Determine load requirements for individual current-using equipment from job specifications or from consultation with appropriate personnel</li> <li>Obtain and check material needed for the installation work against job requirements</li> <li>Obtain and check tools, equipment and measuring devices needed for the installation work for correct operation and safety</li> </ul>	<ul style="list-style-type: none"> <li>Current carrying capacities of Conductors</li> <li>Rupturing capacities of Circuit Breakers</li> <li>Difference between a Circuit Breaker and Isolator/Switch Disconnecter</li> <li>Circuits that need protection on earth Leakage as per SANS 10142-1</li> <li>Working principles of various types and sizes of reusable standard single and three phase protective devices/switch- and control gear incl. fuses, circuit breakers, residual current devices, earth leakage circuit breakers, contactors, relays, timers, isolators</li> <li>Set of various types of reusable meters (Ammeters, Voltmeters, Kilowatt-hour meters, Energy control units, Electricity dispensers)</li> <li>Set of various types and sizes of terminal connectors and accessories</li> <li>Set of various types</li> </ul>	<p>wire various protective devices/ switch and control gear into enclosures</p> <ul style="list-style-type: none"> <li>Select, arrange, mount and wire different types of meters into enclosures</li> <li>Terminate conductors and connect protective devices/switch- and control gear and meters</li> <li>Conduct earthing and bonding</li> <li>Conduct load balancing on three phase distribution boards</li> <li>Install additional accessories to complete enclosure installation</li> <li>Label and tag circuits and place notices on the enclosure as required</li> <li>Engage in regular housekeeping activities, tool and equipment maintenance</li> <li>Store tools and equipment, record and report any defects on tools</li> <li>Provide work documentation, verbal and written reports as required by the company</li> </ul>		<p>multimedia software</p> <ul style="list-style-type: none"> <li>Set of presentation aids (videos, slides) for overhead or LED/LCD projectors</li> </ul> <p><b>Stationary machinery, mobile plants, transport, access and lifting equipment incl.:</b></p> <p><b>Hand- &amp; power tools and PPE incl.:</b></p> <ul style="list-style-type: none"> <li>Electrician's tool box with standard set of tools</li> <li>Drilling machine</li> <li>Drill bits</li> <li>Manual tap threading tool set</li> <li>Adjustable tap handle and reamer wrench</li> <li>Standard PPE</li> </ul> <p><b>Measuring and testing instruments incl.:</b></p> <ul style="list-style-type: none"> <li>Measuring tape</li> <li>Steel ruler</li> <li>Steel square</li> <li>Multi meter</li> <li>Continuity meter</li> </ul> <p><b>Training workshop and laboratory equipment incl.:</b></p>
<p><b>Implementation/ Execution</b></p>	<p><b>Arrange electrical installations circuits, control and protection devices</b></p> <ul style="list-style-type: none"> <li>Follow risk control measures and procedures for carrying out the work</li> <li>Ensure that the circuit / installation is isolated and locked out</li> <li>Prepare correct single and three phase board/panel layout of circuits, control and protective devices to ensure safe and functional operation of the installation</li> <li>Arrange and terminate earthing to comply with the protective system</li> </ul>				

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	<ul style="list-style-type: none"> <li>requirements</li> <li>• Select protective devices to meet the required switching and tripping currents, co-ordination and discrimination for overload and short-circuit protection</li> <li>• Select residual current devices to meet the required circuit, switching and tripping currents required</li> <li>• Select switchgear/ control gear to meet current, voltage and IP ratings and functional requirements</li> <li>• Select correct single and three phase kilowatt hour meters, ammeters, voltmeters, energy control units and electricity dispenser/pre-paid electric meters to meet measuring requirements</li> <li>• Prepare panel/board to accommodate control and protective devices, meters, links, safety services, and other distributor equipment</li> <li>• Arrange and install selected protective devices, meters, switch- and control gear</li> <li>• Terminate conductors and connect protective devices /switch- and control gear</li> <li>• Install blanking plates</li> <li>• Label specific circuits and notices on distribution board</li> <li>• Conduct visual inspection</li> <li>• Carry out Load balancing in</li> </ul>	<p>and sizes of earthing/grounding and bonding equipment (grounding bus bars, ground bar insulators, bonding straps, couplers, clamps, ground plates, earthing rods)</p> <ul style="list-style-type: none"> <li>• Circuit Breakers, Isolators/Switch Disconnectors</li> <li>• Load Balancing</li> <li>• Termination technics (loose connections, Hot spots, terminal connections)</li> <li>• Lock out Procedures</li> </ul> <p><b>Techniques for installing control equipment including termination and testing</b></p> <ul style="list-style-type: none"> <li>• Techniques for the installation of control equipment.</li> <li>• Techniques for termination and connection of control equipment.</li> <li>• Techniques for the inspection and testing control equipment</li> <li>• Inspection requirements and procedures</li> </ul>			<ul style="list-style-type: none"> <li>• Heavy workbench with stool, power supply and assembly vice</li> <li>• Bench mountable interchangeable training panel frame</li> <li>• Mountable punched hole frame and front panel frame</li> <li>• Basic panel systems for practicing wiring installation exercises</li> <li>• Training package for building service entry, mains systems and protective measures, control and switching system installation</li> <li>• Set of various types of distribution boards, control and starter panels, supply boards, meter boxes, switchgear cabinets, display terminals and cable splitter boxes</li> <li>• Accessories incl. racks, rails, brackets, doors, face plates, hinges, locking devices, weather seals, name plates and labels</li> <li>• Set of various types and sizes of reusable standard single and three phase protective devices/switch- and control gear incl. fuses,</li> </ul>
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	<p>accordance with Sans 10142-1 on three phase distribution boards.</p> <ul style="list-style-type: none"> <li>Inspect and test the installation of control equipment and terminations.(insulation and earth continuity test)</li> </ul>				<p>circuit breakers, residual current devices, earth leakage circuit breakers, contactors, relays, timers, isolators</p> <ul style="list-style-type: none"> <li>Set of various types of reusable meters (Ammeters, Voltmeters, Kilowatt-hour meters, Energy control units, Electricity dispensers)</li> <li>Set of various types and sizes of terminal connectors and accessories</li> <li>Set of various types and sizes of earthing/grounding and bonding equipment (grounding bus bars, ground bar insulators, bonding straps, couplers, clamps, ground plates, earthing rods)</li> </ul>
<b>Evaluation/ Documentation</b>	<p><b>Complete the work</b></p> <ul style="list-style-type: none"> <li>Follow OHS work completion risk control measures and procedures</li> <li>Conduct housekeeping activities</li> <li>Document reasons for selections made, including calculations</li> <li>Document electrical installation arrangement and specifications for all selected items and forward to appropriate personnel</li> </ul>				
<b>Total</b>	Hours: 40				
<b>Specialisation additions</b>					
<b>Assessment guidance</b>					

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### Criteria for assessment:

- Obtaining and understanding task instructions (interpreting)
- Adhering to safety precautions before, during and after the mounting procedure
- Identifying protection devices and components to be installed as per task instructions procedures and standards
- The correct personal protective equipment (PPE) is identified as per work place procedures.
- Identifying the correct switch and control devices and components needed for the installation work
- Selecting tools and equipment according to job requirement
- Ensuring proper isolation and lock-out procedures for installation work
- Identifying correct locations for mounting of equipment
- Mounting equipment in the enclosures in accordance with specified requirements
- Terminating of conductors and cabling to control equipment and accessories.
- Checking protective devices and components for loose connections or hot spots as per work place procedures
- Complete tests on control equipment and accessories.
- Recording and reporting All defects and suspected faults are recorded and reported in line with site best practices
- Disposing waste materials as per safety and environmental standards
- Completing installation documentation in accordance with relevant procedures
- Checking, cleaning and storing all tools and equipment correctly as per work site standards and procedures

Work in