

**POWER ENGINEERING COMPETENCY FRAMEWORK FOR POWER ENGINEERING PROFESSIONALS IN PUBLIC SERVICE
TECHNICAL SKILLS AND COMPETENCIES (TSC) REFERENCE DOCUMENT**

TSC Category	Electrical and Power Engineering Fundamentals					
TSC Title	Electrical Systems Design					
TSC Description	Review electrical systems design to ensure safety, compliance, cost-effectiveness and energy-efficiency					
TSC Proficiency Description	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
		<Insert TSC Code>	<Insert TSC Code>	<Insert TSC Code>	<Insert TSC Code>	
		Verify adherence of electrical system designs to technical specifications and project requirements	Review electrical system designs for safety, cost-effectiveness and energy-efficiency	Provide recommendations to optimise electrical system designs for safety, cost-effectiveness and energy-efficiency	Drive compliance of electrical system designs with regulatory requirements and industry standards, and provide technical approvals	
Knowledge		<ul style="list-style-type: none"> • Fundamentals of electrical systems design • Electrical safety principles and practices • Electrical drawing standards • Earthing and bonding principles and techniques • Electrical equipment selection methods • Fundamentals of load calculations • Fundamentals of equipment sizing • Fundamentals of system sizing • Relevant regulations, industry standards, and codes of practice 	<ul style="list-style-type: none"> • Electrical systems design and modification methods • Electrical protection and control methods • Electrical safety principles and practices • Electrical systems construction, installation and commissioning standards • Energy efficiency principles • Principles of Design for Safety (DfS) • Principles of Design for Manufacturability (DfM) • Relevant regulations, industry standards, and codes of practice 	<ul style="list-style-type: none"> • Electrical and power engineering concepts • Local and international electrical safety standards • Local and international electrical construction and commissioning best practices and standards • Local and international electrical maintenance best practices and standards • Electrical maintenance strategies implementation • Methods of interpreting condition-monitoring system data • Energy efficiency optimisation techniques • Principles of Design for Safety (DfS) • Principles of Design for Manufacturability (DfM) • Relevant regulations, industry standards, and codes of practice 	<ul style="list-style-type: none"> • Electrical and power engineering concepts • Local and international electrical safety best practices, and standards • Electrical systems design and modification practices • Electrical standards and local and international regulations • Emerging trends in energy-efficient electrical systems • Energy efficiency industry best practices • Principles of Design for Safety (DfS) • Principles of Design for Manufacturability (DfM) • Relevant regulations, industry standards, and codes of practice 	

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Abilities		<ul style="list-style-type: none"> • Check adherence to electrical safety principles and practices • Verify electrical system designs • Verify electrical system designs against technical specifications and project requirements • Check relevant data from the electrical plans and other loads as inputs for electrical load estimation • Consider emergency standby and critical load • Oversee load calculations and equipment schedules • Monitor development of electrical schematics • Verify compliance with regulations, industry standards, and codes of practice 	<ul style="list-style-type: none"> • Review area classification layouts and sections applying specific codes • Review low voltage (LV) and high voltage (HV) system designs, sizing and fault rating of electrical systems components • Ensure integration of electrical systems design considerations for loading, contingency, emergency and future needs • Review electrical protection and control systems and selection of settings and parameters • Review integration of energy saving elements into the electrical systems designs for energy-efficiency • Oversee the construction, installation and commissioning of electrical equipment and systems • Review electrical system designs for adherence to DfS and DfM principles Review compliance with regulations, industry standards, and codes of practice 	<ul style="list-style-type: none"> • Provide recommendations to optimise the accuracy of the design, description and philosophy of main power distribution, power generation and/or grid supply • Advise on the development and implementation of area classification layouts and sections • Enhance the design of electrical protection and control systems and selection of settings and parameters • Optimise electrical system designs for energy efficiency Evaluate low voltage (LV) and high voltage (HV) system designs and variable settings and parameters • Evaluate electrical systems designs taking into considerations loading, contingency, emergency and future needs • Evaluate safety, manufacturability and maintainability issues of electrical systems • Ensure compliance with regulations, industry standards, and codes of practice 	<ul style="list-style-type: none"> • Prescribe electrical safety standards • Drive compliance to electrical safety working procedures • Provide acceptance for designs of main electrical systems, power distribution and power generation systems • Approve area classification layouts and sections for the facilities • Benchmark electrical equipment integrity management systems against agency, statutory or regulatory requirements • Drive adoption of energy-efficient solutions in electrical systems design • Advocate adherence to DfS and DfM principles and practices • Drive compliance with regulations, industry standards, and codes of practice 	
Range of Application		<p>Range of application includes, but is not limited to:</p> <ul style="list-style-type: none"> • Electrical installations and power systems in buildings, facilities and infrastructure, including but not limited to: Building electrical systems e.g. transformers, switchboards and wiring systems, battery systems, fire protection systems, security systems, uninterruptible power supply (UPS) systems, standby power generation, lighting systems, lightning 				

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		<p>protection systems, relay and protection systems, air-conditioning and mechanical ventilation systems, lightings, lifts and escalators, amusement rides, and building management systems</p> <ul style="list-style-type: none"> • Electrical installations and power systems in water treatment plants and waste-to-energy plants, including but not limited to: Environmental compaction systems (ECS), conveyor belts, baghouse filters, high-tension power equipment including power transformers, switchgears, generators, distributed control system and field instruments, refuse crane system, motors and variable speed drives, pumps, air-conditioning system, fire alarm system, actuators, lightings, incinerator-boilers, turbo-generators and power distribution network, and control and monitoring systems • Electrical installations and power systems in railway and air traffic management systems, including but not limited to: High voltage power systems, railway traction power systems, aircraft ground power supply systems, AC/DC and DC/AC converters, and signalling, communication and control systems and equipment, airfield lighting systems, and public announcement systems • Renewable and distributed energy resources, including but not limited to: Solar photovoltaic installations, microgrids and energy storage systems • Systems used in transmission network system planning, control and management, including but not limited to: energy management systems, information technology (IT) and operational technology (OT) systems, substation remote control unit (RCU) systems, interruptible load monitoring system, distributed generator monitoring system, flexible AC transmission systems (FACTS), and supervisory control and data acquisition (SCADA) systems 	
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