

TSC Category	Discipline Engineering Specialisation					
TSC	Inspection Engineering Management					
TSC Description	Manage fixed equipment and piping inspection schemes, materials selection, construction, corrosion control, condition and fitness-for-service through on-stream, risk-based monitoring programmes and downtime inspections to provide inspection engineering technical support to maintenance, engineering design and project teams					
TSC Proficiency Description	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
		ECM-DEG-2003-1.1	ECM-DEG-3003-1.1	ECM-DEG-4003-1.1	ECM-DEG-5003-1.1	ECM-DEG-6003-1.1
		Identify and apply inspection engineering techniques, methods, standards, data analysis, life-cycle principles and equipment risk-based monitoring techniques to support inspection on fixed equipment and piping	Interpret inspection engineering techniques, methods, standards, data analyses, life-cycle principles and equipment risk-based monitoring techniques to conduct inspection engineering on fixed equipment and piping	Analyse inspection engineering techniques, methods, standards, data, life-cycle principles and equipment risk-based monitoring results to conduct inspection engineering on fixed equipment and piping	Review inspection engineering techniques, methods, standards, data analyses, life-cycle principles and equipment risk-based monitoring techniques to manage inspection engineering on fixed equipment and piping	Drive direction and strategies in inspection engineering on fixed equipment and piping to advocate on-stream risk-based monitoring programmes and downtime inspection
Knowledge		<ul style="list-style-type: none"> • Fitness-for-service (FFS) analysis methods • Pipelines and piping inspection methods • Welding technology, techniques, codes, and standards • Non-destructive testing (NDT) methods, comprising visual testing (VT), ultrasonic testing (UT), magnetic particles testing (MT), dye penetrant testing (PT), and radiographic testing (RT) • Methods of reading engineering diagrams • Design principles of piping, vessels, tanks, structures • Types of process machinery • Methods of positive material identification (PMI) 	<ul style="list-style-type: none"> • Fitness-for-service (FFS) analysis methods • Pipelines and piping inspection methods • Welding technology, techniques, codes, and standards • Principles of cathodic protection • Passive and de-passivation behaviour • Non-destructive testing (NDT) methods, comprising visual testing (VT), ultrasonic testing (UT), magnetic particles testing (MT), dye penetrant testing (PT), and radiographic testing (RT) • Fired and unfired pressure vessels inspection methods • Atmospheric storage tanks inspection methods 	<ul style="list-style-type: none"> • Quality management for design, construction, operations, modifications, repairs and abandonment • Fitness-for-service (FFS) methods and techniques • Pipelines and piping inspection methods • Welding technologies • Principles of cathodic protection • Fired and unfired pressure vessels inspection methods, techniques, codes, and standards • Failure investigation and prevention methods • Corrosion engineering • Types of risk-based assessments using API580/581 standards • API 571 standard damage mechanisms in the refinery industry 	<ul style="list-style-type: none"> • Engineering materials selection and application methods • Corrosion monitoring and control methods • High temperature materials performance and degradation principles • Welding and jointing technology • Non-destructive testing (NDT) comprising ultrasonic, magnetic flux, thermography, ionising radiation, phased array ultrasonic testing (UT), time of flight (ToF) • Special schemes of inspection (SSI) principles and methods • Inspection and examination techniques; hybrid methods • Robotic inspection technologies; benefits, 	<ul style="list-style-type: none"> • Equipment inspection benchmarking strategies • Enhanced special schemes of inspection (enhanced SSI) techniques and systems • Non-contact inspection strategies and emerging technology inspection trends • Maintenance strategy reviews; failure patterns and maintenance types • Decision analysis techniques and principles

**SKILLS FRAMEWORK FOR ENERGY AND CHEMICALS
TECHNICAL SKILLS AND COMPETENCIES (TSC) REFERENCE DOCUMENT**

		<ul style="list-style-type: none"> Principles of quality and inspection plans 		<ul style="list-style-type: none"> Passive and de-passivation behaviour 	<ul style="list-style-type: none"> installation and implementation 	
Abilities		<ul style="list-style-type: none"> Apply FFS methods and techniques to identify modes of failure, evaluate defects and linear remnant life assessments Conduct pipeline and piping inspections and recommend NDT applications Prepare inspection reference plans (IRPs) and appropriate IRPs Conduct integrity assessments of atmospheric storage tanks 	<ul style="list-style-type: none"> Interpret inspection engineering techniques, methods, standards, data analyses, life-cycle principles and equipment risk-based monitoring techniques Apply FFS methods and techniques to identify modes of failure, evaluate defects and linear remnant life assessments Perform structured failure investigations to identify failure modes and/or mechanisms Specify failure investigation testing requirements Calculate corrosion rates Conduct polarisation tests Conduct integrity evaluations of fired and unfired pressure vessels Conduct pipeline and piping inspections and recommend NDT applications Prepare inspection reference plans (IRPs) and appropriate IRPs Specify welding and NDT technique requirements in accordance with project specifications Conduct integrity assessments of atmospheric storage tanks and recommend repairs and alterations 	<ul style="list-style-type: none"> Analyse inspection engineering techniques, methods, standards, data, life-cycle principles and equipment risk-based monitoring results Apply quality control methods for design, construction, operation, modification, repair and abandonment of fixed equipment and piping Apply FFS methods and techniques to identify modes of failure, evaluate defects and linear remnant life assessments Perform structured failure investigations to identify failure modes and/or mechanisms Specify failure investigation testing requirements Review corrosion rates Conduct polarisation tests Conduct integrity evaluations of fired and unfired pressure vessels Review pipeline and piping inspections and recommend NDT applications Review inspection reference plans (IRPs) and appropriate IRPs Specify welding and NDT technique requirements in accordance with project specifications 	<ul style="list-style-type: none"> Analyse materials application standards and codes in the review process Review inspection engineering techniques, methods, standards, data analyses, life-cycle principles and equipment risk-based monitoring techniques Prepare quality control, inspection and test plans for project implementation Evaluate results and draw conclusions from failure investigations Prepare corrosion management strategies through information gathered from corrosion monitoring tools Review and specify high temperature materials degradation controls, materials selection and coatings Analyse and make recommendations on the influence of welding heat input in relation to metallurgical changes, either physical or chemical Advise on corrosion resistance properties and behaviours of base materials, overlay and welds Review and approve inspection NDT 	<ul style="list-style-type: none"> Lead the development of the organisation's inspection standards and strategies Review effective corrosion management strategies through information gathered from corrosion monitoring tools Lead corrosion management and system audits Lead special schemes of inspection (SSI) assessments and audits Review and approve inspection reference plans (IRPs) Verify anticipated improvements in plant safety, reliability and availability, following the application of enhanced SSIs Provide expert advice to management and fraternity on inspection technology

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			<ul style="list-style-type: none"> • Perform inspections of cathodic protection systems • Evaluate, select and specify NDT methods and techniques for inspections • Evaluate and interpret NDT results in line with relevant codes, standards and specifications 	<ul style="list-style-type: none"> • Conduct integrity assessments of atmospheric storage tanks and recommend repairs and alterations • Supervise inspections of cathodic protection systems • Evaluate, select and specify NDT methods and techniques for inspections • Evaluate and interpret NDT results in line with relevant codes, standards and specifications 	<p>procedures for NDT methods</p> <ul style="list-style-type: none"> • Integrate various data bases to calculate and report on the anticipated improvements in plant safety, reliability and availability following the application of enhanced special schemes of inspection (enhanced SSI) • Manage robotic inspection techniques applications 	
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