



Subsea Engineering Competency Profile



MATERIALS AND CORROSION ENGINEERING FUNDAMENTALS

MC-001

This competency demonstrates a subsea engineer to have a broad understanding of:

- the selection of materials (metallic and non-metallic) and coatings to manage the range of environmental conditions and process stream compositions that subsea equipment is exposed to
- the issues associated with internal and external corrosion of materials used in the construction of subsea facilities
- the methods for managing materials and corrosion throughout the lifecycle of the subsea facilities.

This competency enables a subsea engineer to recognise the issues that arise from the selection and combination of materials in the design and manufacture of equipment and the required mitigations available to protect the equipment function are installed and operable for the life of field.

ELEMENT OF COMPETENCE	WHAT THIS COMPETENCE MEANS IN PRACTICE	INDICATORS OF ATTAINMENT
<p>Knowledge of metallic materials principles and how these apply to subsea equipment:</p> <ul style="list-style-type: none"> • Materials engineering – strength and durability/fatigue, effect of temperature and pressure on material properties. • Materials selection criteria, including qualification and testing • Welding of metals • Fracture mechanics • Materials compatibility • Preservation • Inspection, NDT and Failure Analysis • Erosion 	<p>Capable of identifying outcomes resulting from the use of various materials, in their respective service environments, over the lifecycle of the parent equipment.</p> <p>Can identify material selection drivers and risks related to subsea equipment design, manufacture and operation.</p> <p>Can identify material compatibility issues with the fluid composition, temperature and pressure.</p> <p>Can identify and describe materials degradation issues that may arise throughout the lifecycle of subsea equipment</p> <p>Can identify and describe machining, fabrication, welding and NDT processes and their limitations.</p>	<p>Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence</p> <p>Has participated as a member of a design or operations team that has involved materials selection and/or corrosion mitigation on subsea equipment. Has dealt with CRA and Carbon Steel in corrosive production service.</p>



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ELEMENT OF COMPETENCE	WHAT THIS COMPETENCE MEANS IN PRACTICE	INDICATORS OF ATTAINMENT
<p>Knowledge of non-metallic materials principles and how these apply to subsea equipment:</p> <ul style="list-style-type: none"> ● Materials engineering – strength and durability/fatigue, effect of temperature and pressure on material properties. ● Materials selection criteria, including qualification and testing ● Preservation and Chemical compatibility ● Coating Types, Purpose and Specifications ● Inspection, NDT and Failure Analysis ● Degradation mechanisms of non-metallics ● Erosion 	<p>Can recognise the impacts and mitigation of corrosion, from various mechanisms, resulting from the internal action of hydrocarbons and the external action of the environment on subsea equipment</p>	<p>Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence</p> <p>Has provided input into, or applied the results of, corrosion or cathodic protection assessments for the design or operation of a subsea system.</p> <p>Has applied the results from inspection, corrosion probes, non-destructive testing and laboratory analysis to fitness for service assessments.</p> <p>Has interfaced with the corrosion engineering and process engineering teams to ensure the operating conditions are within the integrity limits of the equipment.</p>
<p>Knowledge of corrosion principles and how these apply to subsea systems:</p> <ul style="list-style-type: none"> ● Corrosion Chemistry ● Corrosion Engineering – effect of temperature and pressure, mitigation of corrosion using electrochemical methods or chemical inhibitors or materials selection and the effects of welding ● Internal and external corrosion failure mechanisms ● Cathodic protection design ● Corrosion management and monitoring throughout the equipment’s life cycle 		