## Subsea Engineering Competency Profile

### Subsea Tree and Tooling Mechanical Design Elective

This competency demonstrates a subsea engineer to have a working knowledge of the processes and activities which must be undertaken to specify and mechanically design a subsea tree and its associated tooling.

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<td>Working knowledge of:</td>
<td>Can deliver design elements of subsea trees at FEED and Detailed Design. Capable of at least 5 of the following items:</td>
<td>Can describe the design process for subsea trees and the key drivers for different designs. Has worked in the FEED or detail design process for subsea trees representing either the manufacturer’s or client’s perspective.</td>
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<tr>
<td>● The technical specification and mechanical design of subsea trees and associated structures and tooling.</td>
<td>● Preparing or reviewing technical specifications for subsea trees including, horizontal and vertical layouts, guideline and guideline-less configurations.</td>
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<td>● Relevant international standards associated with the design of subsea trees and tooling.</td>
<td>● Contributes to design reviews related to subsea trees.</td>
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<td>● Assembly and sub-component design and how each interacts, including control systems, jumpers, chokes, valves, connectors, flow meters and other sensors and instrumentation.</td>
<td>● Preparing or reviewing installation and workover procedures.</td>
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<td>● Hydraulic design principles and methods.</td>
<td>● Controlling interfaces external to the subsea tree, including control systems, wellheads, jumpers or templates, and rigs and vessels.</td>
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<td>● The impact of design upon the performance of the product during manufacture, testing, installation, commissioning and operation, including the effects of hydrostatic head</td>
<td>● Participating in risk analyses for subsea facilities, including HAZIDs and HAZOPs.</td>
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<td>● Design qualification, verification and validation requirements and methods.</td>
<td>● Specifying purchase and / or manufacture requirements for products and components.</td>
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<td>● Production and reservoir isolations and barrier proving</td>
<td>● Specifying quality assurance requirements.</td>
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<td>● Specifying test methods for subsea trees and tools, interpreting test results and performing troubleshooting.</td>
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<td>ELEMENT OF COMPETENCE</td>
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| Awareness of:          | • Identifying risks and opportunities and developing technical solutions to improve the performance of subsea trees and production systems.  
                          • Providing technical support during manufacture, installation / retrieval, commissioning and operation. | Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence |
| International standards relating to lifting, welding, coating and painting, cathodic protection and quality assurance. | | |
| ROV interfaces, diver accessibility and operations. | | |
| Installation, workover and retrieval operations for subsea trees | | |
| Control systems and wellhead systems. | | |
| Diverless connection systems | | |
| Risk assessment methods. | | |
| Resolution of manufacturing defects and errors. | | |
| The key materials available and their limitations, including austenitic and duplex steels, polymers, elastomers, carbon steel and structural steel. | | |
| Destructive and non-destructive testing of components and assemblies. | | |
| Methods of handling, packing and transport available and the associated advantages and disadvantages. | | |
| Quality control management systems and requirements. | | |
| Flow assurance and the effects on tree design including chemical dosing requirements | | |
| Human factors in design | | |