

**SKILLS FRAMEWORK FOR MARINE AND OFFSHORE  
TECHNICAL SKILLS & COMPETENCIES (TSC) REFERENCE DOCUMENT**

<b>TSC Category</b>	Marine Manufacturing					
<b>TSC</b>	Computer Numerical Control Operations					
<b>TSC Description</b>	Programme and configure computer numerical control machines and equipment to manufacture marine equipment and ship, rig and/or conversion components					
<b>TSC Proficiency Description</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Level 4</b>	<b>Level 5</b>	<b>Level 6</b>
	<b>MAR-MMF-1002-1.1</b>	<b>MAR-MMF-2002-1.1</b>	<b>MAR-MMF-3002-1.1</b>	<b>MAR-MMF-4002-1.1</b>		
	Execute computer numerical control (CNC) manufacturing tasks according to workflow plans	Apply knowledge of computer numerical control (CNC) manufacturing techniques to ensure tasks are conducted in compliance with manufacturing workflows and product specifications provided	Interpret structural, arrangement and equipment drawings to provide details of material, measurement scales and tolerances to be applied during the manufacturing processes	Evaluate and compare the feasibility of using computer numeric control (CNC) manufacturing as a preferred method against other conventional methods of manufacturing based on time, cost and material serving, and advice on implementation		
<b>Knowledge</b>	<ul style="list-style-type: none"> <li>• Technical drawings and specifications of components</li> <li>• CNC machining techniques and set-ups</li> <li>• Tooling applications and limitations</li> <li>• Machining parameters of CNC mills, lathes, cutters, drills and grinders for cutting speed, feed rate, cutter revolution, wire speed, amperage requirement, spark gap, electrode wear, and rate of metal removal</li> </ul>	<ul style="list-style-type: none"> <li>• CNC programming and codes</li> <li>• Classification of CNC machines</li> <li>• Types of tool and equipment defects</li> <li>• Machining operational and sequencing pitfalls</li> <li>• Relevant legislation and regulatory requirements</li> <li>• Relevant workplace safety and health (WSH) practices, guidelines and regulations</li> <li>• Relevant quality assurance and quality control (QA/QC) policies and procedures</li> <li>• Types of ships and rigs, terminologies and features</li> </ul>	<ul style="list-style-type: none"> <li>• Verification methods for computer numerical control (CNC) programming and work processing</li> <li>• Technical drawing features and their applications in manufacturing</li> <li>• Principles of computer-aided manufacturing (CAM)</li> <li>• Types of materials and their properties</li> </ul>	<ul style="list-style-type: none"> <li>• Component design parameters</li> <li>• Process design parameters</li> <li>• Principles of design for manufacturing and assembly (DFMA)</li> <li>• Methods to conduct feasibility analysis</li> <li>• Methods of increasing manufacturing efficiency and reducing costs</li> </ul>		
<b>Abilities</b>	<ul style="list-style-type: none"> <li>• Identify job requirements based on manufacturing requirements</li> <li>• Select appropriate machining tools</li> </ul>	<ul style="list-style-type: none"> <li>• Programme CNC machines and control systems based on manufacturing requirements</li> </ul>	<ul style="list-style-type: none"> <li>• Analyse technical drawings and specifications to translate relevant information into</li> </ul>	<ul style="list-style-type: none"> <li>• Review engineering component production plans to assess and compare effectiveness of CNC manufacturing</li> </ul>		

**SKILLS FRAMEWORK FOR MARINE AND OFFSHORE  
TECHNICAL SKILLS & COMPETENCIES (TSC) REFERENCE DOCUMENT**

	<ul style="list-style-type: none"> <li>• Set up tooling, register and record tool settings, off-sets and compensations</li> <li>• Carry out operational dry runs to identify and mitigate possible errors</li> <li>• Operate CNC machines to manufacture components</li> <li>• Check final manufactured components for conformance with specifications</li> </ul>	<ul style="list-style-type: none"> <li>• Apply in-process quality checks</li> <li>• Ensure product specifications are met, correct materials are used and manufacturers' instructions are followed</li> <li>• Verify correctness of final manufactured components against specifications</li> <li>• Minimise material consumption</li> <li>• Coordinate CNC engineering projects</li> </ul>	<p>manufacturing requirements</p> <ul style="list-style-type: none"> <li>• Identify geometric features of technical drawings to determine dimensions</li> <li>• Apply CAM techniques to manufacture components</li> <li>• Produce safe and efficient tool paths for CNC machining processes</li> <li>• Evaluate post-process tool path data to generate machine specific codes</li> <li>• Verify CNC programming by analysing manufacturing outputs against inputted codes</li> <li>• Manage CNC engineering projects</li> <li>• Identify suitable alternative materials</li> </ul>	<p>against traditional manufacturing</p> <ul style="list-style-type: none"> <li>• Evaluate whether machining plans are in accordance with DFMA principles</li> <li>• Formulate and propose engineering solutions for complex and vaguely defined designs</li> <li>• Submit full evaluation reports on whether the engineering designs meet functional requirements</li> <li>• Reduce production costs by analysing and eliminating the factors that affect time, cost, and quality of manufacturing and service processes</li> </ul>		
--	---	---	---	--	--	--