

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

TSC Category	Marine and Offshore System Design					
TSC	Heat Transfer System Design					
TSC Description	Design heat transfer systems by applying concepts of thermodynamics in marine engineering to provide for the heating requirements of ships, rigs and/or conversions					
TSC Proficiency Description	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
		MAR-MSD-2007-1.1	MAR-MSD-3007-1.1	MAR-MSD-4007-1.1		
		Interpret machinery system designs to gauge heating requirements and carry out basic marine engineering calculations to obtain the capacities, flow rates, safety equipment, storage, pump and piping specifications of the steam systems	Analyse complex thermodynamic calculations by applying concepts of thermodynamics in marine engineering to produce the heat load analysis for ships, rigs and/or conversions under varying load and weather conditions	Develop steam generation, storage and transfer equipment lists that are in line with customers' requirements by reviewing the heat load analysis, and ensure incorporation of appropriate safety devices and systems		
Knowledge		<ul style="list-style-type: none"> Principles of steam flow dynamics Types of marine engineering drawings Applications of heat exchangers, jacket heaters, trace heating and other heat transfer methods Steam boilers, turbines, tank heating, equipment heating, pipeline tracings and other applications of steam systems 	<ul style="list-style-type: none"> Advanced concepts of thermodynamics in marine engineering Dry, saturated, superheated and other phases of steam and their applications Low, medium and high pressure steam systems and their applications Working principles of marine equipment to ascertain heating requirements Factors affecting steam demand Principles of system drawing processes Conventions used in steam system drawings Principles of structural stress analysis to aid in designing pressure ships Principles of marine engineering calculations to determine maximum steam capacity 	<ul style="list-style-type: none"> Procedures for formulating steam systems Methods for evaluating the efficiency of steam systems Manufacturers' recommendations and limitations Legislative requirements governing design and installation of steam systems Methods of segregating steam in different phases Types of steam generating equipment Types of steam transfer pipeline configurations Sensors for pressure and flow measurements Actuators for pressure and flow regulation Electro-pneumatic, electronic and other instrumentation and control systems 		

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			<ul style="list-style-type: none"> Principles of numerical computation of flow rates, pressures and storage ship capacities 			
Abilities		<ul style="list-style-type: none"> Determine appropriate data for executing relevant steam system design calculations Identify sources for retrieving relevant data Interpret structural and arrangement drawings Interpret equipment drawings to ascertain steam demand 	<ul style="list-style-type: none"> Carry out heat load analysis for ships, rigs and/or conversions Evaluate type of steam required for each equipment Evaluate methods of heat transfer to tanks, equipment and ship systems, pipelines and other auxiliaries Incorporate data pertaining to losses in steam systems Ascertain materials for storage, pumping and piping equipment Tabulate calculations and prepare technical specification sheets for steam systems Execute accurate flow rate, pressure, steam output and storage capacity calculations Incorporate relevant safety features into steam systems 	<ul style="list-style-type: none"> Evaluate performance specification analysis on selection of sensors and actuators Evaluate performance specification analysis on selection of pumping systems Evaluate performance specification analysis on selection of piping specifications and configurations Evaluate applications of industry standards and international conventions in drawings Evaluate final reports on selected components used to meet the system requirements Incorporate system isolation based on phases of steam 		