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| **TSC Category** | Marine and Offshore System Design | | | | | |
| **TSC** | Heating, Ventilation and Air Conditioning System Design | | | | | |
| **TSC Description** | Design heating, ventilation and air conditioning systems to maintain a specific air quality in the accommodation spaces of ships, rigs and/or conversions as well as in the refrigerated compartments for perishables in alignment with regulations | | | | | |
| **TSC Proficiency Description** | **Level 1** | **Level 2** | **Level 3** | **Level 4** | **Level 5** | **Level 6** |
| | | | **MAR-MSD-3008-1.1** | **MAR-MSD-4008-1.1** | **MAR-MSD-5008-1.1** | |
| | | | Analyse flow rates and compressor, condenser, receiver and vent fan capacities by retrieving data from equipment, structural and piping drawings to ensure sufficient air conditioning effect in the prescribed areas and executing basic marine engineering calculations | Develop programmable control systems by incorporating new technologies and linking them to operating principles of equipment and systems on-site and advise involved parties on programming techniques | Guide the formulation of heating, ventilation and air conditioning (HVAC) specification sheets and sketches, and approve equipment lists, position lists and calculations that are in line with international regulations governing air quality requirements in different spaces on-board ships, rigs and/or conversions and the equipment manufacturers' recommendations | |
| **Knowledge** | | | • Principles of fluid dynamics<br>• Marine engineering drawings<br>• Numerical computation of refrigerant quantity, air flow rates and capacities<br>• Types and properties of refrigerants<br>• Volume calculations for accommodations and refrigerated compartments<br>• Principles of thermodynamics<br>• Applications of different grades of refrigerants<br>• Types and specifications of refrigerant heat exchangers | • Principles of heating, ventilation and air conditioning (HVAC) system design<br>• Types and specifications of HVAC<br>• Types of piping configurations within air conditioning and reefer equipment<br>• Types of piping and ducting configurations connecting equipment to other spaces within ships and rigs<br>• Principles of pipe, duct and equipment insulation<br>• Sensors for pressure and flow measurements<br>• Types of control systems and actuators for | • Procedures for formulating HVAC system designs<br>• Performance criteria to measure efficiency of HVAC equipment<br>• Performance criteria to measure efficiency of ducting and ventilation<br>• Methods to execute feasibility analysis to ascertain HVAC system and refrigerant specifications<br>• Evaluation criteria for measuring effectiveness of HVAC systems<br>• Manufacturers' recommendations and limitations | |



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| | | | • Conventions used in system drawings | pressure and flow regulation<br>• Factors affecting performance of HVAC systems<br>• Principles of system drawing<br>• Methods of air filtration | • Legislative requirements governing storage and handling of refrigerants | |
| **Abilities** | | | • Determine appropriate data for executing relevant heating, ventilation and air conditioning (HVAC) system design calculations<br>• Identify sources for retrieving relevant data<br>• Execute accurate air flow rate, refrigerant flow rate, accommodation and refrigerated space volume and capacity calculations<br>• Interpret structural and arrangement drawings for HVAC design parameters<br>• Interpret equipment drawings and specification sheets | • Identify suitable HVAC systems depending upon output required<br>• Identify compressor, condenser and receiver specifications depending upon refrigerant and capacity requirements<br>• Identify piping specifications depending upon the type of refrigerant<br>• Identify ducting specifications for air circulation depending upon volume of spaces and flow rate requirements<br>• Incorporate suitable air filtration devices<br>• Gauge probability of system failure during operations<br>• Ensure safety features meet classification rules and requirements<br>• Draft HVAC system design drawings to be used by the manufacturing department | • Design process workflows to execute HVAC system designs<br>• Evaluate performance specification analysis on selection of sensors and actuators<br>• Evaluate performance specification analysis on selection of HVAC equipment<br>• Evaluate performance specification analysis on selection of ducting and ventilation specifications<br>• Evaluate efficiency of HVAC equipment<br>• Evaluate application of industry standards and international conventions in drawings<br>• Evaluate final reports on selected components used to meet the system requirements | |