TSC Category	Marine Manufacturing					
TSC	Laser and Optics Application					
TSC Description	Use of laser and optics to automate manufacturing processes by introducing amplified electromagnetism and optical technologies for steelwork and alignment processes					
TSC Proficiency Description	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**	**Level 6**
		MAR-MMF-2005-1.1	**MAR-MMF-3005-1.1**	**MAR-MMF-4005-1.1**	**MAR-MMF-5005-1.1**	**MAR-MMF-6005-1.1**
		Apply basics of laser and optics technologies on-site to execute alignment jobs and steelwork based on production plans	Deploy use of laser and optics technologies on-site based on operating procedures provided	Evaluate the effectiveness and sustainability of implemented laser and optics technologies for process improvements	Formulate new procedures for using laser and optics technologies in order to enhance manufacturing processes in alignment with organisational strategies	Explore wider applications of laser and optics technologies in the organisation by using expertise within the field to transform manufacturing workflows
Knowledge		• Applications of computer-aided design (CAD) and computer - aided manufacturing (CAM) to laser and optics systems • Principles of laser technologies • Properties and capabilities of different types of laser beams • Components of a laser system and functions of optical components • Laser hazards and corresponding safety measures • Mathematical calculations for laser processes • Laser selection criteria for different processes and materials • Mechanism of material removal in laser processes • Potential defects and their causes in laser processes	• Types of laser-material interaction techniques • Types of laser system designs • Concepts of optical metrology • Principles of interferometers, profilometers, confocal, phase shifting, interferometry • Principles of structured light, holography and speckle metrology • Instrumental set-up of optical metrology systems • Functional roles of fibre optics in metrologies and non-contact metrologies • Types of setup and operational procedures • Relevant Workplace Safety and Health (WSH) practices, guidelines and regulations • Relevant quality assurance and quality	• Precision manufacturing processes and operating procedures • Optical metrology characteristics, techniques and systems • Requirements of different advanced optical metrologies • Factors to be considered when selecting advanced optical metrology solutions • Impact of laser and optics technologies on manufacturing operations • Benefits and trade-offs of advanced optical metrologies • Methods and techniques involved in evaluating implementation of laser and optics technologies	• Applications of advanced optical metrology technologies • Impact of external conditions on implementation of advanced optical metrologies • Advanced optical metrology legislative requirements • Principles of change management	• Applications of emerging laser and optics technologies • Impact of laser and optics on manufacturing operations beyond alignment of ship, rig and conversion components • Impact of external conditions on implementation of laser and optics • Laser and optics legislative requirements

Effective Date: October 2017, Version 1.1

		• Types of ships and rigs, terminologies and features	control (QA/QC) policies and procedures			
Abilities		• Identify common laser hazards • Select appropriate lasers to perform the necessary functions as per set procedures • Use CAD and CAM to design and convert files for laser processing	• Perform analysis to determine laser requirements for manufacturing processes • Select laser processes to meet the component property requirements • Ensure selected raw materials are correct for the tasks in alignment with design specifications • Perform analysis to determine metrology requirements for manufacturing processes • Evaluate optical metrology functionalities in comparison to other measurement systems • Deploy metrology solutions for a given situation using optical metrology fundamentals • Establish the merits of selected optical metrology solutions • Evaluate whether the selected optical metrologies meet requirements • Assess and select machines for annual calibration	• Review current conventional metrologies to evaluate suitability for selecting new applications and systems to be integrated into current metrology set-ups • Evaluate various advanced optical metrology systems to compare strengths and limitations • Assess the feasibility of integrating advanced optical metrology into manufacturing processes • Assess the impact of improvements to manufacturing products and processes using laser and optics • Evaluate the benefits and trade-offs of implementing advanced optical metrologies to the business • Assess the risks of advanced optical metrologies on manufacturing operations	• Build a business cases for implementing laser and optics technologies • Plan the integration of advanced optical metrologies into manufacturing processes • Pilot implementation and review results to determine effectiveness of advanced optical metrologies • Develop operational procedures for advanced optical metrologies • Ensure procedures and operations are implemented according to plans and Workplace Safety and Health (WSH) requirements	• Lead innovation in laser and optics for manufacturing processes through adoption of new technologies • Build a business case for implementing laser and optics • Influence senior executive team • Refine parameters of laser processes to improve component properties • Propose opportunities of improved laser and optics approaches

Effective Date: October 2017, Version 1.1