

TSC Category	Precision Manufacturing Process					
TSC	Metal Forming					
TSC Description	Develop and optimise metal forming processes for manufacturing of quality products					
TSC Proficiency Description	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
				PRE-MPR-4037-1.1	PRE-MPR-5037-1.1	PRE-MPR-6037-1.1
				Determine metal forming and shaping processes appropriate for applications, and develop production plans for the required processes	Develop manufacturing plans, incorporating metal forming processes and apply defect control to facilitate manufacturing of products that meet requirements	Optimise applications of different forming methodologies for materials used in precision manufacturing
Knowledge				<ul style="list-style-type: none"> Principles of precision engineering Concepts and characteristics of forming processes Characteristics of material deformation Process parameters and materials for forming processes Principles of bending-based processes and their limitations Principles of spring-back in sheet metal forming Principles and limitations of stamping processes Principles and limitations of deep drawing processes 	<ul style="list-style-type: none"> Concepts and characteristics of bulk forming processes Characteristics of material deformation Types and characteristics of cold forging, related process parameters, tooling and design guidelines Types of defects related to forming modes Procedures for designing spin forming processes, and design concepts for pre-form, tooling and roller Types of sheet metal, strengths, associated forming processes, processing routes and process design guidelines Stamping, deep drawing and bending-based processes and limitations Concept of spring-back in sheet metal forming Concepts of finite element methods applied to metal forming processes 	<ul style="list-style-type: none"> Types of engineering processes and related principles of engineering used in forming work Methods and tools for evaluating engineering processes Criteria for engineering process evaluations Types and impact of recommendations for optimising engineering processes

**SKILLS FRAMEWORK FOR PRECISION ENGINEERING
TECHNICAL SKILLS AND COMPETENCIES (TSC) REFERENCE DOCUMENT**

					<ul style="list-style-type: none"> • Material failure mechanisms and mechanical testing methods 	
Abilities				<ul style="list-style-type: none"> • Determine appropriate metal forming and shaping processes to meet application requirements • Review accuracy of forming load calculations on forming and shaping designs • Develop forming process plans for metal forming and shaping, based on requirements for the particular applications • Supervise metal forming and shaping processes to achieve required solutions • Evaluate metal forming and shaping processes to identify causes of form defects • Design and set up quality control procedures to address product quality and compliance to regulatory requirements 	<ul style="list-style-type: none"> • Perform analyses on applications of different forming processes to achieve the most effective results • Develop manufacturing plans for bulk forming processes, based on selected materials and product shapes • Develop manufacturing plans for the process parameters and tooling required for forming processes • Perform material testing post-manufacturing processes, using approved defect control plans • Review failed processes and perform corrective actions • Prepare evaluation reports on engineering process plans' effectiveness in meeting functional requirements 	<ul style="list-style-type: none"> • Analyse and propose opportunities of improved forming approaches in manufacturing operations • Evaluate methods of analysis on finishing requirements for optimisation opportunities, in accordance with design specifications • Review selections of finishing processes for suitability to meet application requirements • Evaluate selections of finishing applications for conformity, in accordance with design specifications • Review finishing process plans for particular applications for optimisation opportunities • Evaluate quality control procedures for effectiveness in addressing product quality and compliance to regulatory requirements