



Australian Government

MEM23137A Evaluate rolling tools and processes

Release 1

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Modification History

Release 1 (MEM05v9).

Unit Descriptor

This unit of competency covers evaluation of hot and cold rolling tools for structural profiles and roll forming of sheet and strip. It includes roll design criteria, consideration of materials properties and product features, work health and safety (WHS) and sustainability implications.

Application of the Unit

This unit applies to tooling used for industrial rolling of sheet and strip metal. It is suitable for people working as tool designers and maintenance technicians or paraprofessionals and draftspersons, and those pursuing manufacturing engineering or related technical qualifications and careers.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEM23004A	Apply technical mathematics
MEM23109A	Apply engineering mechanic principles

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element.

Elements and Performance Criteria

1	Determine scope of rolling tool evaluation	1.1	Identify rolling tools and related rolling products for evaluation
		1.2	Confirm stakeholders to be consulted on evaluation
		1.3	Confirm that appropriate support, including technical and professional assistance, is available
		1.4	Identify relevant WHS and regulatory requirements, standards, codes of practice, risk management and organisational procedures
2	Prepare for evaluation of rolling tools	2.1	Identify principles and techniques required to evaluate and optimise rolling tools and related manufacturing processes
		2.2	Select appropriate analysis techniques, software and software validation techniques
		2.3	Investigate sustainability implications of roll tooling and related manufacturing processes
3	Evaluate rolling tools and related manufacturing processes	3.1	Review design and construction features of functions of rolling tools and related manufacturing processes
		3.2	Assess rolling tools and related manufacturing processes for compliance with WHS and other regulatory and risk management requirements
		3.3	Assess rolling tools, roll products and related processes for sustainability

- 3.4 Assess suitability of rolling tools for integration with quick changeover, preventative maintenance and other lean manufacturing-related techniques
 - 3.5 Review integration of rolling tools with production management and control software
 - 3.6 Apply systems thinking, continuous improvement, problem solving and decision making, and constraint and contingency management principles and techniques to evaluation
 - 3.7 Review rolling tools in relation to product manufacturability and process maintainability
- 4 Report results
- 4.1 Record results of evaluation
 - 4.2 Provide documentation, such as tool, product and process analysis, and computer-aided design (CAD) files

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- determining features and performance requirements of rolling tools in the manufacturing processes
- reviewing hot and cold rolling tools design and construction, including tooling materials, treatment, finishing and assembly, tool installation and operation, related manufacturing processes and materials processed
- selecting and using appropriate analysis techniques and software for evaluation and optimisation of rolling tools and related manufacturing processes
- identifying WHS, regulatory and risk management compliance
- investigating sustainability implications of rolling tools and associated manufacturing processes
- assessing use of rolling tools for integration with:
 - lean manufacturing systems and techniques
 - manufacturing control software, such as system control and data acquisition (SCADA) software
- establishing of cross-sectional dimensions
- developing of a flower pattern for progressive forming
- establishing product and roll orientation
- designing rolls to suit the flower pattern
- adding support operations, such as fixtures, guides, side rolls, straightening devices, cutting and punching
- applying systems thinking, continuous improvement, and constraint and contingency management to evaluation of rolling tools
- reporting and documenting scoping, principles and techniques identification and evaluation of tooling and related manufacturing processes, tooling graphics and models

Required knowledge

Required knowledge includes:

- properties of hot and cold working of metals and alloys, including:
 - recrystallisation temperature
 - grain size and microstructure
- functions and context of rolling tools in a manufacturing operation
- sources of technical and professional assistance

- WHS and regulatory compliance requirements and risk management practices for rolling tools and related manufacturing and maintenance processes
- sustainability and lean systems implications for rolling tools and related manufacturing processes
- hot rolling, including:
 - critical design considerations for tooling
 - multi-pass, multi-roll (eg. 3 high, 4 high mills) and reversing mills
 - range of hot rolled products
 - effect of hot rolling and variations in rolling process on properties of rolled materials
 - ring rolling
- cold rolling, including:
 - critical design considerations for tooling
 - related processes (e.g. pickling, cleaning, annealing and slitting)
 - range of cold rolled products
 - properties of cold rolled materials, including strength and hardness increase and ductility decrease
- hot and cold rolling effects
- roll forming:
 - thread rolling for screws and bolts
 - combined rolling techniques
- roll pass design features:
 - product mechanical properties:
 - yield strength in tension and shear
 - work hardening strain rate effect
 - driven and non-driven rolls, and applied tension
 - friction in rolling process
 - roll bite geometry
 - deflection compensation
 - roll materials, manufacture and heat treatment
 - roll force, torque and power
 - product guide systems
 - roll and product temperature and cooling rate control
- roll forming pass design features
- labour and skills distribution requirements
- systems thinking, continuous improvement, constraint and contingency management, and comparative supply chain performance
- WHS and regulatory requirements, codes of practice, standards, risk management and registration requirements
- documentation, drawings, specifications, instructions required, process information and programming

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	A person who demonstrates competency in this unit must be able to evaluate rolling tools and rolling processes for safety, economy and fitness for purpose.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently: - determine parameters and context of rolling tools in manufacturing processes - review design and construction features, functions, applications and limitations of rolling tools - identify principles, design, analysis techniques and software required to evaluate and optimise rolling tools and related manufacturing processes - evaluate WHS, regulatory and risk management compliance - report and document results.
Context of and specific resources for assessment	- This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, then a simulated working environment must be used where the range of conditions reflects realistic workplace situations. - The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. - Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. - Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.
Method of assessment	- Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package. - Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge. - Assessment methods must be by direct observation of

	tasks and include questioning on underpinning knowledge to ensure correct interpretation and application. • Assessment may be applied under project-related conditions (real or simulated) and require evidence of process. • Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances. • Assessment may be in conjunction with assessment of other units of competency where required.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Appropriate technical and professional assistance	Appropriate technical and professional assistance may include: • technical support and advice relating to elements which have intrinsic dangers, such as: • high pressure • energised fluid vessels • high temperatures and heat energy capacity • wiring with high current control voltages above extra low voltage • professional support for technologies, such as: • specialist electric motor drives and controllers • specialist materials, plastics, metal alloys and nano materials • special processes, foundry, alloy welding, heat treatment, sealing and fastening
WHS, regulatory requirements and enterprise procedures	WHS, regulatory requirements and enterprise procedures may include: • WHS Acts and regulations

	• relevant standards • codes of practice from Australian and overseas engineering and technical associations and societies • risk assessments • registration requirements • safe work practices • state and territory regulatory requirements
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Standards and codes	Standards and codes refer to all relevant Australian and international standards and codes applicable to roll tooling for engineering and related application tasks
Sustainability	Sustainability is used to mean the entire sustainable performance of the organisation/plant, including: • meeting all regulatory requirements • conforming to all industry covenants, protocols and best practice guides • minimising ecological and environmental footprint of process, plant and product • maximising economic benefit of process plant and product to the organisation and the community • minimising the negative WHS impact on employees, community and customer
Systems thinking	Systems thinking refers to the conduct of engineering work in a manner that demonstrates knowledge of how the interaction of different technical systems on equipment, machinery or structures, as well as the skills and techniques of personnel, combine to perform or support engineering-related operations, processes or projects. It embraces determining or establishing how the function of each technical system or component, as well as the skills and techniques of personnel, effects or potentially may effect, outcomes. Systems should be interpreted broadly within the context of the organisation and depending on the project or operation can include equipment, related facilities, material, software, internal services and personnel, and other organisations in the value chain
Continuous improvement implementation	Continuous improvement implementation may relate to plant, products, processes, systems or services, including design, development, implementation or manufacture, commissioning, operation or delivery and maintenance. Improvement processes may include techniques, such as: • balanced scorecard • current and future state mapping • measuring performance against benchmarks • process improvement, problem solving and decision making • data management, generation, recording, analysing, storing and use of software • training for improvement systems participation • technical training
Constraints and contingencies	Constraints and contingencies may be: • financial

	• organisational, procedural or cultural • physical constraints, such as limits to resources, limits to site access or logistical limitations • design constraints imposed by materials or process limitations
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Unit Sector(s)

Competency field

Unit sector Engineering science

Custom Content Section

Not applicable.