Australian Government

MEM23120A Select mechanical machine and equipment components

Release 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

MEM23120A Select mechanical machine and equipment components

Modification History

Release 1 - New unit. Replaces MEM23091A, but not equivalent.

Unit Descriptor

This unit of competency covers the technical selection of mechanical machine and equipment components. It includes analysis of the application to determine suitability of components and use of performance analysis software.

Application of the Unit

This unit applies to selecting components of machines or equipment based on mechanical engineering-related technical criteria in order to ensure appropriate performance and compliance with standards. The unit applies to selection tasks based on analyses completed by an individual or the use of technical criteria supplied by professional engineers or equipment suppliers. The use of calculus for technical analysis is not covered by this unit.
The unit is suitable for people working as mechanical detailers or designers and draftspersons and those pursuing careers and qualifications in mechanical engineering or related disciplines. This unit does not cover selection of electric motors; electrical components; fluid power components, including pumps, control components and support structures; and structural fastening and welding with eccentric loadings. These are covered in other units.

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	Establish scope of machine components selection task	1.1	Identify stakeholders to be consulted on selection tasks
		1.2	Determine relevant compliance requirements of work health and safety (WHS) and regulatory requirements, codes of practice, standards, and risk assessment requirements for machines and equipment
		1.3	Review features and functions of mechanical machines and components
		1.4	Investigate sustainability implications of component selection task
		1.5	Establish availability of technical and professional assistance
2	Examine technical specifications for component selection	2.1	Confirm performance requirements of particular machines or equipment components
		2.2	Select appropriate analysis techniques using graphs, tables, nomograms or computer-aided solutions, as appropriate
		2.3	Analyse operating conditions of components and determine component selection criteria
		2.4	Review design loads, working stresses, allowable deformations and factor of safety for machine components
		2.5	Determine component arrangement, limits, fits and clearances, assembly, fastening and alignment methods

3	Select machine components	3.1	Specify arrangement and assembly requirements
		3.2	Advise stakeholders of selection and make any required adjustments
		3.3	Ensure traceability of analysis and component selection
4	Report results	4.1	Record results of scoping, principles and techniques identification and component selection procedures
		4.2	Provide documentation, such as calculations, estimations, specifications, diagrams and drawings

Required Skills and Knowledge

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

Required skills

Required skills include:

- applying safe working practices and procedures when working with machines and equipment
- component arrangement, limits, fits and clearances, assembly, fastening and alignment methods
- investigating sustainability implications of machine development, manufacture and use
- reviewing features and functions of machines and components
- identifying design features of machines, equipment and components, including:
  - loads
  - working stresses
  - allowable deformations and factor of safety
  - component arrangements
  - limits and fits
  - assembly, adjustment and fastening methods
- identifying relevant analysis support, such as graphs, tables, nomograms or computer-aided solutions and validation techniques
- selecting and specifying machine and equipment components, arrangement and assembly requirements
- communicating with stakeholders, professionals and technicians
- identifying and complying with relevant WHS and regulatory requirements and risk assessment procedures
- reporting and documenting results of component selection, including calculations, specifications, diagrams and drawings

Required knowledge

Required knowledge includes:

- WHS and regulatory requirements, codes of practice, standards and risk management requirements relevant to mechanical component selection processes
- current options and trends in performance analysis software, including underpinning program techniques and software validation techniques
- conditions for equilibrium
- reactions at beam supports (e.g. simply supported, overhung and cantilever beam with vertical and oblique concentrated, uniform and variable distributed loads and couples)

- shear force and bending moments, including diagrams
- vertical and oblique concentrated and uniform and variable distributed loads
- bending and shear stresses
- torsion distribution diagrams
- combined stresses
- properties of common machine and component materials
- stress concentration and fatigue due to alternating stresses
- deflection of beams
- bolted and welded connections with central loads (bolted joints may include friction forces)
- static versus dynamic forces, balanced and unbalanced
- dynamics and laws of rotational motion
- work and forms of mechanical energy and power
- dynamic systems
- mechanical power and drive efficiency
- mechanical drives
- block, band and disk brakes and clutches with single contact surface
- mechanical couplings and devices
- dynamic balancing of rotating masses
- stresses in flywheels
- stresses in thin walled pressure vessels

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 select a wide variety of mechanical machine and equipment components for safety, economy and fitness for purpose. Selections must be able to be justified through appropriate engineering analysis.
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 component arrangement, limits, fits and clearances, assembly, fastening and alignment of components • investigate sustainability implications of components selection task • review features and functions of machine and equipment components, design loads, working stresses, allowable deformations and factor of safety • select and specify machine components, including arrangement and assembly requirements • evaluate machine components and arrangements for compliance with WHS and regulatory requirements and risk assessment • 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.

Machine and equipment components	Machine and equipment components for this unit are limited to components peforming mechanical functions. Examples include: • shafts • bearings • couplings • power screws • gear drives • spur gears • chain and belt drives • brakes • clutches

Standards and codes	Standards and codes refer to all relevant Australian and international standards and codes applicable to a particular selection of mechanical machine and equipment components task

Appropriate licensed technical and professional assistance	Appropriate licensed 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

Sustainability implications	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
Analysis of machine and components	Analysis of machine and equipment components may include: • static and dynamic analysis of loads • the stresses and deformations resulting • the transmitted power, torque and speed • machine/operator interface in terms of ergonomics and safety • environmental effects, including noise, energy efficiency, heat generation and dust generation • graphical and mathematical methods and software options

Appropriate computer-aided solutions and validation techniques	Appropriate computer-aided solutions include: • performance analysis and computer-aided design (CAD) modelling Validation techniques include: • comparison of traditional solutions for simple design problems with software solutions to the same design problems • review of previously implemented design challenges which were completed using the software

Unit Sector(s)

Competency field

Unit sector Engineering science

Custom Content Section

Not applicable.