



Australian Government

MEM23121 Analyse loads on frames and mechanisms

Release: 1

MEM23121 Analyse loads on frames and mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM23121A Analyse loads on frames and mechanisms.

Application

This unit of competency defines the skills and knowledge required to analyse loads on mechanisms, frames and structural support elements including linkages, rods, shafts and beam elements within machines and mechanisms. It includes a focus on safe working practices, work health and safety (WHS) compliance requirements, function and features of frames and mechanisms, load and deflection analysis for static and dynamic elements, and traditional and software-based techniques.

This unit applies to the analysis of loads on mechanisms, beams, frames and support elements either individually or with the assistance of a professional engineer for more complex calculations of loads and stresses. It is suitable for people working as mechanical detailers or designers and draftspersons, and for those pursuing careers and qualifications in mechanical engineering or related disciplines.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

MEM23004 Apply technical mathematics

MEM23007 Apply calculus to engineering tasks

MEM23109 Apply engineering mechanics principles

Competency Field

Engineering science

Elements and Performance Criteria

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Establish scope of frame and mechanism analysis	1.1 Determine compliance requirements of WHS and regulatory requirements, codes of practice, standards and risk assessment considerations for design and use of machines and equipment 1.2 Identify features, functions, operating conditions and performance

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	requirements of frames, beams and mechanisms 1.3 Investigate sustainability implications of frames and mechanisms 1.4 Review design loads, working stresses, allowable deformations and factor of safety for elements 1.5 Review element arrangements, assembly and fastening methods 1.6 Identify any complex load calculations to be done with, or obtained from, a professional engineer 1.7 Establish availability of technical and professional assistance 1.8 Identify and evaluate appropriate analysis techniques, software and software validation techniques 1.9 Identify stakeholders to be consulted on selection tasks
2. Analyse loads and performance of frames and mechanisms	2.1 Estimate static and dynamic operating conditions and determine design or selection parameters 2.2 Optimise frame, beam and mechanism elements for strength, deflection, arrangement and fastening 2.3 Review analysis with stakeholders and make any required adjustments 2.4 Confirm compliance of frames and mechanisms with WHS and regulatory requirements, standards and codes of practice
3. Report results	3.1 Record results of analysis 3.2 Provide documentation including calculations, specifications diagrams and drawings

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance.

Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.	
Structural support and machine elements include:	• beam, strut and tie elements of machines and machine supports subject to bending, tension, compression and shear stresses including: • shafts, levers, cams and linkages • frames, stanchions and beams • mechanisms for converting linear to rotary motion and rotary to linear motion • mechanisms with up to five linkages • lifting machines.
Machine mechanisms include:	• a device to produce a constrained motion while producing a required output • an assembly of elements or links which can be called kinematic pairs (turning, sliding, rolling or skidding pairs), which remain in contact throughout their motions. One link, typically the base element, is fixed.
WHS, regulatory requirements and organisational procedures include:	• WHS acts, regulations and relevant standards • codes of practice • risk assessments • registration requirements • safe work practices • state and territory regulatory requirements.
Load calculations to be done with, or obtained from, a professional engineer and include one or more of the following:	• regulatory or organisational requirement for professional engineer involvement • static and dynamic complex analysis of loads, including resulting stresses and deformations • choice of graphical and mathematical methods and software options.
Appropriate licensed technical and professional assistance includes:	• technical support and advice relating to elements which have intrinsic dangers • professional support for technologies.
Sustainability includes:	• 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.
Appropriate	• software employed for performance analysis and/or modelling

computer-aided solutions and validation techniques include:	including program techniques and algorithms including the use of finite element analysis (FEA) and numerical methods within object-oriented modelling techniques • 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.
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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM23121A Analyse loads on frames and mechanisms.

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>