



Australian Government

MEM234004 Design for engineering-related noise and vibration mitigation

Release: 1

MEM234004 Design for engineering-related noise and vibration mitigation

Modification History

Release 1. Supersedes and is equivalent to MEM234004A Design for engineering-related noise and vibration mitigation.

Application

This unit of competency defines the skills and knowledge required to design noise and vibration mitigation systems for product, plant and equipment across all forms of manufacturing and engineering, to ensure satisfactory operation, safety and comfort of people using, or in the proximity of the product, plant and equipment.

Design activities can be reverse engineering, design rectification or modifications of an existing design. This unit includes the selection and use of appropriate measuring and monitoring equipment, modelling and calculations, and the incorporation of noise and vibration mitigation techniques into designs.

The client may be internal or external to the designer's organisation.

This unit applies to individuals working as a Principal Technical Officer or in an equivalent engineering-related position who are required to design for engineering related noise and vibration mitigation.

This unit does not cover structural or civil engineering-related noise mitigation techniques such as the design of noise barriers and anechoic chambers. Individuals completing this work either already have or are developing skills and experience in scientific principles, mathematics, measurement and evaluation of noise and vibration, computer software and file handling.

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

Pre-requisite Unit

Nil

Competency Field

Engineering science

Elements and Performance Criteria

Elements	Performance Criteria
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<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Clarify the design brief and specifications for noise and vibration mitigation	1.1 Establish features of product, plant or equipment design specification likely to generate noise and vibration 1.2 Confirm technical, commercial and environmental parameters of the brief or contract 1.3 Determine stakeholders to be consulted in design process 1.4 Assess work health and safety (WHS), regulatory, sustainability or environmental regulations and issues relevant to noise and vibration mitigation design task 1.5 Confirm design brief, including budget and schedule, and provide preliminary advice on feasibility
2. Evaluate design analysis and prepare concept proposals	2.1 Appraise initial qualitative and quantitative analysis of the design task using appropriate equipment and techniques 2.2 Carry out required modelling and calculations using appropriate software and validation techniques 2.3 Generate noise and vibration mitigation solutions that respond to the design brief 2.4 Check feasibility and evaluate solutions against design criteria, ensuring conformity to standards and codes, technical, economic and WHS requirements 2.5 Determine social and sustainability implications of solutions 2.6 Present concept proposals to client
3. Design for noise and vibration mitigation	3.1 Evaluate concept proposals with client and select preferred solution 3.2 Ensure that design solution is optimised with respect to the noise and vibration mitigation design task 3.3 Finalise noise and vibration mitigation design and ensure preparation of all required documentation, drawings, specifications and instructions 3.4 Consult with client and stakeholders to obtain sign-off on design 3.5 Monitor installation and commissioning with stakeholders and make any necessary adjustments to design

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.	
Parameters of the design brief include:	• new equipment or fault analysis, rectification or modification to an existing design • determination of the degree of innovation and creativity expected by the client • design process limits and budgets • product cost limits and budgets • performance specifications • equipment availability, capacities and restrictions • specified administrative, communication and approval procedures • other special features and limits in the design brief.
WHS, regulatory, sustainability and environmental issues include:	• WHS acts, regulations and relevant standards • industry codes of practice • risk assessments • registration requirements • safe work practices • 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 • state and territory regulatory requirements.
Initial qualitative and quantitative analysis includes:	• a hazard and risk analysis related to existing or proposed plant or equipment • routine noise and vibration monitoring data or investigative measurements.
Equipment and techniques include:	• data required to test requirements • spectrum analysis or simple noise measurement of linear sound pressure levels • microphones and preamplifiers • specialist applications requiring supplementary transducers to locate source of noise • noise meters (hand-held, a-weighted, noise dose or precision options) • recording techniques and equipment for the appropriate

	- environment and sound characteristics • calibration • electrodynamics exciter • sinusoidal and random excitation • sub and super harmonics • force testing and structural response • simulated and real environment testing of shock • calibration.
Noise and vibration mitigation solutions include:	• controlling the source • controlling the transmission path • controlling the receiver • changing the operating condition of plant and machinery • vibration isolation • active vibration control.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM234004A Design for engineering-related noise and vibration mitigation.

Links

Companion Volume Implementation Guides are available on VETNet -

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

Assessment Requirements for MEM234004 Design for engineering-related noise and vibration mitigation

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include:

- interpreting features of plant and equipment and parameters of the brief or contract
- advising client based on discipline knowledge and work health and safety (WHS) and regulatory standards
- researching sustainability implications and current industrial design techniques
- determining WHS, regulatory and risk management requirements
- designing noise and vibration mitigation solutions
- selecting appropriate noise measurement and testing equipment and techniques on at least two occasions
- selecting appropriate vibration measurement and testing techniques on at least two occasions
- modelling and calculating using appropriate software and validation techniques
- generating and evaluating solutions for feasibility against design criteria on at least two occasions
- communicating, negotiating and reviewing with stakeholders and client throughout the process to obtain agreement on proposal and sign-off on design.

Note: Where a volume and/or frequency is not specified, demonstration must be provided at least once.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- design brief parameter requirements
- common sources of noise and vibration in plant and equipment
- features of plant or equipment in relation to noise and vibration mitigation
- feasibility and evaluation methods and design criteria
- WHS and regulatory requirements, codes of practice, standards, risk minimisation and registration requirements
- techniques and equipment used to measure noise and vibration in plant and equipment
- noise and vibration modelling and calculation techniques

- current options and trends in performance analysis, modelling and simulation software and underpinning program techniques incorporating software validation
- physiological effects of noise and vibration
- risk factors for vibration and the human body
- industrial health and safety including audiometric testing
- noise and vibration concepts including vibration, noise, transmission of noise and vibration, and harmonic excitation
- sources of noise generation in plant and equipment
- noise mitigation control measures
- sources of vibrations in plant and equipment
- vibration mitigation and shock control measures
- options for noise reduction in machine design (rotor bearing positioning)
- statistical energy analysis (SEA)
- techniques for:
 - continuous improvement
 - problem-solving and decision-making
 - root cause analysis (RCA) or failure mode and effects analysis (FMEA) or design review based on failure mode (DRBFM), and Pareto analysis.
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Assessment Conditions

- Assessors must:
 - have vocational competency in designing for engineering related noise and vibration mitigation at least to the level being assessed with relevant industry knowledge and experience
 - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
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