



Australian Government

MEM23124A Measure and analyse noise and vibration

Release: 1

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Modification History

Release 1 - New unit. Replaces MEM23094A, but not equivalent.

Unit Descriptor

This unit of competency covers the monitoring, measurement and analysis of noise and vibration. It includes equipment calibration and use, analysis of data, standards for exposure limits, work health and safety (WHS) and mitigation measures.

Application of the Unit

This unit applies to machinery and equipment generated noise and vibration, including mechanical shock generated in commercial and industrial environments. It is suitable for people working as asset maintenance technicians or noise and vibration specialists. It is suitable for people working as technicians in engineering or related industries and those pursuing careers and qualifications in engineering or related disciplines.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEM23004A Apply technical mathematics

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

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| 1 | Determine scope of investigation into noise or vibration | 1.1 | Identify machinery and equipment to be investigated for noise and vibration measurement and analysis |
| | | 1.2 | Determine stakeholders to be consulted on analysis tasks |
| | | 1.3 | Determine software required for the analysis of the task |
| | | 1.4 | Determine regulatory, standards and risk management noise and vibration compliance requirements |
| | | 1.5 | Investigate sustainability implications of noise and vibration |
| | | 1.6 | Apply systems thinking, continuous improvement problem solving and constraint and contingency management |
| | | 1.7 | Determine available sources for any required technical and professional assistance |
| 2 | Prepare for noise measurement and analysis | 2.1 | Identify noise exposure limits appropriate to the equipment, process and employee, community and environmental context |
| | | 2.2 | Review and identify available sound measuring equipment and components and suitability for required measurements |
| | | 2.3 | Select sound measuring equipment |

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| 3 | Measure and analyse sound data | 3.1 | Set up and site sound measurement equipment for desired measurements |
| | | 3.2 | Calibrate sound measurement equipment |
| | | 3.3 | Take sound measurements using appropriate techniques for particular application and environment |
| | | 3.4 | Process, analyse and interpret noise data |
| | | 3.5 | Relate data to plant and equipment performance |
| 4 | Review options for noise elimination or mitigation and protection | 4.1 | Review options for noise elimination, mitigation and protection measures |
| | | 4.2 | Prepare report and make recommendations |
| 5 | Prepare for vibration measurement and analysis | 5.1 | Identify vibration exposure limits appropriate to the equipment, process and employee, community and environmental context |
| | | 5.2 | Review and identify available vibration measuring equipment and components and suitability for required measurements |
| | | 5.3 | Select vibration measuring equipment |
| 6 | Measure and analyse vibration and shock data | 6.1 | Set up and site or mount vibration and shock measurement equipment |
| | | 6.2 | Calibrate equipment |
| | | 6.3 | Take measurements |
| | | 6.4 | Process, analyse and interpret vibration and shock data |
| | | 6.5 | Relate data to plant and equipment performance |
| 7 | Review options for vibration and shock elimination or mitigation and | 7.1 | Review options for vibration and shock elimination or damping and isolating |
| | | 7.2 | Prepare report and make recommendations |

protection

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| 8 | Investigate developments in the field of noise and vibration measurement in predictive equipment maintenance | 8.1 | Investigate developments in acoustic, vibration and shock measurement |
| | | 8.2 | Investigate the use of condition monitoring in predictive maintenance programs |
| 9 | Record and report | 9.1 | Record and report results of review, measurement, analysis and recommendations |
| | | 9.2 | Provide documentation, such as calculations, data records and analysis and assessments |

Required Skills and Knowledge

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

Required skills

Required skills include:

- determining parameters and context of noise and vibration measurement and analysis tasks
- determining WHS, other regulatory and risk management compliance requirements, including noise and vibration, noise dose and vibration exposure limits
- reviewing physics of sound and vibration, effects of noise, vibration and shock on humans, measuring equipment and mitigation measures
- selecting equipment
- siting, setting up and calibrating equipment prior to use
- measuring, analysing, interpreting and recording
- relating data to plant and equipment performance
- applying systems thinking, continuous improvement problem solving and constraint and contingency management
- investigating sustainability implications, developments in acoustic, vibration and shock measurement, condition monitoring in predictive maintenance programs
- recording, reporting and documenting results of review, measurement, data, analysis and calculations, interpretations and recommendations

Required knowledge

Required knowledge includes:

- characteristics and measurement of noise and vibration, and sources of noise and vibration
- noise and vibration concepts and terminology
- ISO and other vibration severity standards
- limitations of broadband vibration and trend analysis
- principles of using vibration analysis as an indicator of machine and equipment condition
- causes and effects of vibration and noise in industrial and commercial equipment, such as damaged product, limited processing speeds and catastrophic machine failure
- typical engineering components subject to vibration
- relevant WHS and regulatory requirements, codes of practice, standards, risk minimisation and registration requirements
- calculations, formulae and laws relating to vibration and sound measurement, including allowable exposure using AS 2670 Physiological effects of noise and vibration
- range and capacity of equipment for measuring vibration and sound
- noise measurement and testing techniques and equipment for various environments and

- sound characteristics in vibration measurement and testing
- acoustic emission in vibration measurement and testing
- shock testing, including applications requiring laboratory testing (e.g. anechoic chambers)
- vibration trend analysis
- noise and vibration concepts (e.g. vibration, noise, transmission of noise and vibration and harmonic excitation)
- common sources of noise generation (e.g. fans, motors, engines and ducts)
- noise mitigation and protection measures, such as:
 - isolation
 - insulation
 - personal hearing protection
 - exposure limitation policies
- vibration and shock control equipment and techniques
- community noise
 - noise and vibration measurement and analysis applications, such as:
 - condition monitoring for plant
 - acoustic emissions for fault detection
 - modal analysis of dynamic properties of structures or room acoustics
 - correlation of modal analysis with finite element analysis (FEA)
 - statistical energy analysis

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 measure and analyse noise and vibration and make recommendations for mitigation and protection.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	<p>Assessors must be satisfied that the candidate can competently and consistently:</p> <ul style="list-style-type: none"> • determine compliance with WHS and regulatory requirements, and risk management with particular emphasis on automation safety • review physics of sound and vibration, effects of noise, vibration and shock on humans, measuring equipment and mitigation measures • identify noise and vibration, noise dose and vibration exposure limits • select appropriate measuring equipment for measuring task • calibrate, site and set up equipment • correctly measure and record noise and vibration • analyse and interpret measurement results • relate data to plant and equipment performance • recommend noise and vibration elimination, mitigation and protection measures • investigate sustainability implications • report and document results and recommendations • apply systems thinking, continuous improvement problem solving and constraint and contingency management.
Context of and specific resources for assessment	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.

Sound measuring equipment	<p>Sound measuring equipment may include:</p> <ul style="list-style-type: none"> • microphones • cables/connectors • meters • recorders • analysers/comper and software
Set-up and measurement techniques	<p>Set-up and measurement techniques may include:</p> <ul style="list-style-type: none"> • microphone positioning • meter time constants • frequency filter settings
Purpose for sound	Purposes for sound measurements may include:

measurements	<ul style="list-style-type: none"> • simple sound level or spectrum • limited or full frequency band • standards to be met • impulsive or consistent noise
Vibration	Vibration refers to continuous or sporadic vibration whether or not associated with noise and also includes mechanical shock
Vibration and shock measuring equipment	<p>Vibration and shock measuring equipment may include:</p> <ul style="list-style-type: none"> • accelerometer • impedance heads • cables • mounting media • calibrators • preamplifier • meters • filters • recorders • analysers/computer and software
Appropriate technical and professional assistance	<p>Appropriate technical and professional assistance may include:</p> <ul style="list-style-type: none"> • technical support and advice relating to elements which have intrinsic dangers, such as: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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	<p>WHS, regulatory requirements and enterprise procedures may include:</p> <ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> state and territory regulatory requirements
Standards and codes	Standards and codes refer to all relevant Australian and International standards and codes applicable to a particular noise and vibration measurement and analysis task
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	<p>Continuous improvement implementation may relate to plant, products, processes, systems or services, including design, development, implementation or manufacture, commissioning, operation or delivery and maintenance.</p> <p>Improvement processes may include techniques, such as:</p> <ul style="list-style-type: none"> 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	<p>Constraints and contingencies may be:</p> <ul style="list-style-type: none"> financial organisational, procedural or cultural physical constraints, such as limits to resources, limits to site access or logistical limitations

Unit Sector(s)

Competency field

Unit sector Engineering science

Custom Content Section

Not applicable.