

Title	Apply knowledge of basic trade calculations for mechanical engineering trades		
Level	2	Credits	4

Purpose	<p>This unit standard is for use in the training and assessment for mechanical engineering trades and is one of a series of three unit standards for this purpose with 29397 and 29399.</p> <p>People credited with this unit standard are able to determine volume and mass of three dimensional objects; calculate centre of gravity and loads applied to multi leg lifting slings; calculate linear thermal expansion; calculate lengths and angles using trigonometric functions; extract data from tables to solve simple engineering problems; and apply engineering calculations to given problems.</p>
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Classification	Mechanical Engineering > Engineering Core Skills
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Available grade	Achieved
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Recommended skills and knowledge	29397, <i>Demonstrate knowledge of basic trade calculations and units for mechanical engineering trades</i> or demonstrate equivalent knowledge and skills.
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Explanatory notes

- 1 References
The International System of Units (SI), 8th edition, 2006, updated in 2014 (France: Bureau International des Poids et Mesures, 2006). Available at <http://www.bipm.org/en/publications/si-brochure/>
- 2 Definitions
Quantities – properties ascribed to phenomena, bodies or substances that can be quantified; e.g. force, length, pressure.
Value of a quantity – the quantitative expression of a particular quantity, expressed as a numerical value with unit; e.g. 1.7m, 1700mm, 0.75 kPa, 30lb/in²
- 3 Assessment information
For assessments, formulae and conversion factors shall be supplied, and use of calculators is permitted.
Assessments must reflect mechanical engineering applications.

Outcomes and evidence requirements

Outcome 1

Determine volume and mass of three dimensional objects.

Evidence requirements

1.1 Volume of regular objects is calculated.

Range regular objects – pyramid, sphere, cone, truncated cone.

1.2 Mass of solid objects is calculated using given material data.

Range evidence is required of calculations for three different objects.

Outcome 2

Calculate centre of gravity and loads applied to multi leg lifting slings from given data.

Evidence requirements

2.1 Centre of gravity is calculated for symmetrical and asymmetric loads.

Range evidence is required of calculations for three different loads including a minimum of one asymmetric load.

2.2 Formula is stated for calculating the Working Load Limit of a multi leg lifting sling used at an angle.

2.3 Load angle factors are used to calculate load carried by slings.

Range Sling types – equal angle two legged, equal angle four legged; evidence is required for calculations of three different sling angles.

Outcome 3

Calculate linear thermal expansion of common materials.

Range common materials include – aluminium, austenitic stainless steel (304), low carbon steel, nylon 6-6.

Evidence requirements

3.1 Coefficient of linear thermal expansion is compared and stated between common materials.

3.2 Linear thermal expansion is calculated using given data.

Range evidence is required of three calculations.

Outcome 4

Calculate lengths and angles using trigonometric functions.

Evidence requirements

4.1 Calculators are used to perform trigonometric calculations.

Range calculations involving trigonometric functions and inverse trigonometric functions.

4.2 Lengths and angles are calculated in triangles using trigonometry.

Range evidence is required of a minimum of six calculations including one angle and one length using sine, cosine and tangent.

4.3 Lengths of the arc of a circle are calculated.

Range evidence is required of three calculations.

Outcome 5

Extract data from engineering tables to solve simple engineering problems.

Evidence requirements

5.1 Calculations are performed to solve simple engineering problems using data extracted from engineering tables.

Range may include but is not limited to – welding consumables; fuel consumption; material cutting rates; evidence is required of calculations for three simple engineering problems.

Outcome 6

Choose and apply engineering calculations to solve problems in engineering situations.

Evidence requirements

6.1 Appropriate engineering calculations are chosen and applied to solve problems in engineering situations.

Range calculations may include – volume and mass of three dimensional objects, loads applied to multi leg lifting slings, linear thermal expansion, lengths and angles using trigonometric functions; evidence is required of a minimum of three problems each including two or more different engineering calculations.

Planned review date	31 December 2020
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Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	18 February 2016	N/A

Consent and Moderation Requirements (CMR) reference	0013
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

Please note

Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

Comments on this unit standard

Please contact Competenz at qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.