

Title	Demonstrate and apply knowledge of trade calculations to solve problems for mechanical engineering trades		
Level	3	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 29398.</p> <p>People credited with this unit standard are able to identify and calculate the effects of forces on components and structures; perform calculations using Pascal's Law; Interpret engineering tables and charts and use data to ensure correct equipment operation; calculate size, volume and mass of three dimensional objects; and choose and apply appropriate engineering calculations to solve problems in engineering situations.</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> ; 29398, <i>Apply knowledge of basic trade calculations 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 *Engineering materials* – materials generally used in mechanical engineering such as steel, aluminium, copper alloys and other metals, and plastics and composites such as nylon or carbon fibre.

- 4 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

Identify and calculate the effects of forces on components and structures.

Evidence requirements

- 1.1 Type and magnitude of forces acting on component members are identified from the applied loads.
Range forces include tensile and compressive forces.
- 1.2 Nature and magnitude of forces are determined for simple mechanical systems.
Range simple mechanical systems include lever systems; counterweights, clamping arrangements.
- 1.3 Punching forces are calculated.
- 1.4 Strength of different engineering materials of the same cross sectional area is calculated and compared.
Range types of strength – tensile and shear. Evidence is required of calculations of the strength of a minimum of two different engineering materials.

Outcome 2

Perform calculations using Pascal's Law.

Evidence requirements

- 2.1 Pascal's Law is explained and an example of its application in mechanical engineering is stated.
- 2.2 Calculations are performed involving hydrostatic pressure and piston forces in compressed fluid situations.
Range evidence is required of a minimum of two calculations.

Outcome 3

Extract and interpret data from engineering tables to ensure correct equipment selection and operation.

Range data may include but is not limited to pump pressure and flow specifications; cooling curves for heat treatment of steel; power, torque and fuel consumption of engines.

Evidence requirements

3.1 Data from engineering tables is extracted, interpreted and applied to select and/or ensure the correct operation of equipment.

Range evidence is required of application of three sets of data.

Outcome 4

Calculate size, volume and mass of three dimensional objects.

Evidence requirements

4.1 Dimensions of regular vessels are calculated to suit a designated volumetric capacity.

Range regular vessels may include – rectangular, cylindrical, elliptical, spherical, conical; evidence is required of calculations for three different vessel.

4.2 Mass of regular vessels is determined for costing or lifting purposes.

Range empty vessels, full vessels; evidence is required of calculations for three different vessels.

Outcome 5

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

Evidence requirements

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

Range calculations may include – forces on components and structures, Pascal's Law, Interpreting engineering tables and charts, size, volume and mass of three dimensional objects; evidence is required for a minimum of three problems including two or more different methods

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.