Title	**Demonstrate and apply advanced knowledge of strength of materials in mechanical engineering**		
Level	**6**	**Credits**	**15**

Purpose	People credited with this unit standard are able to demonstrate and apply advanced knowledge of the strength of materials used in mechanical engineering, and design pressure vessels to match operational requirements using strength of materials techniques.

Classification	Mechanical Engineering > Applied Principles of Mechanical Engineering

Available grade	Achieved

Entry information	
Recommended skills and knowledge	Previously acquired competence in the transposition of formulae, the manipulation of equations, and the use of trigonometric functions; and have previously acquired understanding of fundamental concepts of physics (mass, length, and time) and their derived units, including pressure, force, gravitational effect, velocity, acceleration, and energy, and hold Unit 21774, *Demonstrate and apply knowledge of mechanical dynamics*; and Unit 21783, *Demonstrate and apply knowledge of strength of materials in mechanical engineering*.

Explanatory notes

1 References
Health and Safety at Work Act 2015 and supporting Regulations.
Worksafe New Zealand. Approved code of practice for pressure equipment (excluding boilers), available from http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/acop-pressure-equipment-excluding-boilers.

2 Definitions
Accepted industry practice refers to approved codes of practice and standardised procedures accepted by the wider mechanical engineering industry sectors as examples of best practice.
Principles of strength of materials may refer to properties such as: stress (tension, compression, shear, torsion), associated strains, deflection, force (determinate and indeterminate), stress concentration.
Workplace procedures refer to procedures used by the organisation carrying out the work and applicable to the tasks being carried out. They may include but are not

limited to – standard operating procedures, safety procedures, equipment operating procedures, codes of practice, quality management practices and standards, procedures to comply with legislative and local body requirements.

3 Assessment information
Numerous reference texts and training manuals on the strength of materials are available and may be used; however, no one textbook or source of information is envisaged. All activities must comply with applicable workplace procedures and must be consistent with accepted industry practice.

Outcomes and evidence requirements

Outcome 1

Demonstrate and apply advanced knowledge of the strength of materials used in mechanical engineering.

Evidence requirements

1.1 The deflection of uniform and single stepped beams due to static loads is calculated by numerical and graphical methods.

1.2 The deflection of components due to impact loads is calculated using strain energy methods.

1.3 Strain in components is established.

Range lateral strain, Mohr's Circle, elastic constants, volumetric strain.

1.4 Strain measuring devices are explained in terms of their operation.

Outcome 2

Design pressure vessels to match operational requirements using strength of materials techniques.

Range one thin cylinder and one thick cylinder.

Evidence requirements

2.1 Pressure vessels are designed to conform with principles of strength of materials, and meet end-user requirements for fitness for purpose and resource usage.

2.2 Design limitations imposed by codes of practice, material suppliers' data, and construction method are identified in relation to the pressure vessels being designed.

Replacement information	This unit standard and unit standard 21783 replaced unit standard 11390.

Planned review date	31 December 2021

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	27 October 2005	31 December 2016
Rollover and Revision	2	19 March 2010	31 December 2017
Review	3	20 October 2016	N/A

Consent and Moderation Requirements (CMR) reference	0013

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 (CMRs). 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 qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.