Title	**Create complex three-dimensional engineering models**		
Level	**5**	**Credits**	**12**

Purpose	People credited with this unit standard are able to: prepare three-dimensional environment; create and modify three-dimensional models in assembly modelling; produce output from three-dimensional models; and confirm output.

Classification	Mechanical Engineering > Engineering Drawing and Design

Available grade	Achieved

Entry information	
Recommended skills and knowledge	Unit 2436, *Create three-dimensional engineering models using CAD software under supervision,* or demonstrate equivalent skills and knowledge.

Explanatory notes

1 References
AS 1100.101:1992, *Technical drawing – General principles.*
AS 1100.201:1992, *Technical drawing – Mechanical engineering drawing*.
BS EN ISO 7083:1995 *Technical drawings. Symbols for geometrical tolerancing. Proportions and dimensions*.

2 Definitions
IGES - initial graphics exchange specification
STEP – standard for the exchange of product data
STL - STereoLithography
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.
Complex 3D model – any sophisticated combination of 3D lines, surfaces, or solids that represent typical engineering parts or components, and which require the application of at least two geometric tolerances such as straightness, flatness, cylindricity, or roundness. Examples may include but are not limited to – sectional assembly of a globe valve; belt drive assembly, incorporating housing, shaft, pulley, and gear; cast iron (CI) jaw support; sectional view of axial piston motor or radial piston motor; axial cylindrical end cam.
Job specifications refers to instructions relevant to the safe completion of the specific task, such as technical specifications, assembly instructions, drawings, parts lists, standards, codes of practice, test and commissioning procedures, and verbal instructions.

Three dimensional (3D) CAD software refers to software developed to draw and manipulate objects that have height, width and depth.
Workplace procedures refers 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 The following apply to this unit standard:
Models produced for this unit standard must be in accordance with the Standards listed in the references, or their international equivalent.

4 Range
Assessment against this unit standard requires the production of at least two, complex 3D models using any proprietary 3D computer aided design software. Operations at this level may include Boolean operations, and should include variable radius fillets, and free form surfacing.

Outcomes and evidence requirements

Outcome 1

Prepare three-dimensional environment to job specifications.

Evidence requirements

1.1 Coordinate system is established.

1.2 Orientation is established.

1.3 Views are established.

Outcome 2

Create and modify three-dimensional models in an assembly modelling environment.

Evidence requirements

2.1 Models are created in three-dimensional space using assembly modelling techniques to job specifications.

Range includes but is not limited to – mate, insert, tangent; evidence is required for a minimum of four components.

2.2 Fillets are created on model in three-dimensional space to job specifications.

2.3 Editing functions are used to modify three dimensional geometric shapes.

Range includes but is not limited to – extrude, revolve, loft, sweep.

2.4 Models are manipulated in three-dimensional space to job specifications.

Outcome 3

Produce output from three-dimensional models.

Evidence requirements

3.1 Print copies of three-dimensional models are produced to job specifications and in accordance with workplace procedures or accepted industry practice.

Range orthographic and either isometric, oblique, or perspective views, including working dimensions.

3.2 Physical properties are extracted to job specifications.

3.3 Drawing files are saved for retrieval using various software extensions in accordance with workplace procedures or accepted industry practice.

Range files to include native format, and one other standard format which may include but is not limited to – IGES, Parasolid, STEP, STL.

Outcome 4

Confirm output.

Evidence requirements

4.1 Output is checked for compliance with job specifications.

4.2 Any non-conformance is corrected to job specifications.

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	31 October 1994	31 December 2011
Revision	2	14 April 1997	31 December 2011
Revision	3	5 January 1999	31 December 2011
Revision	4	23 May 2001	31 December 2011
Review	5	26 July 2004	31 December 2011
Rollover and Revision	6	20 March 2009	31 December 2014
Review	7	17 November 2011	31 December 2021
Review	8	15 September 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 (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 on qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.