



Australian Government

Department of Education, Employment and Workplace Relations

MEM09221A Create 3-D model assemblies using computer-aided design (CAD) system

Release: 1

MEM09221A Create 3-D model assemblies using computer-aided design (CAD) system

Modification History

Release 1 - New unit of competency

Unit Descriptor

This unit of competency covers preparing the 3-D computer-aided design/drafting (CAD) environment, creating and modifying 3-D model assemblies and producing output to inform manufacture or assembly.

Application of the Unit

This unit is suitable for those working within a drafting work environment and may be applied across a range of engineering disciplines. This unit applies to the production of 3-D assemblies using CAD modelling software. Operations at this level include, but are not limited to the use of library items; modelling techniques to represent engineering components and standard parts, such as bearings, seals, gears and fasteners; editing and production of 2-D manufacturing drawings with section views. Work also includes extraction of properties and application of basic rendering techniques.

This unit includes applications in CAD, computer graphics and animation, rapid prototyping, medical testing and visualisation of scientific research.

Licensing/Regulatory Information

No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.

Pre-Requisites

MEM09002B Interpret technical drawing

MEM30031A Operate computer-aided design (CAD) system to produce basic drawing elements

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. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Determine assembly modelling requirements	1.1	Check purpose, scope and information requirements for assembly modelling task
		1.2	Interpret available information relevant to project and work requirements, and identify and address further information needs
		1.3	Identify and prepare equipment required to complete work
		1.4	Identify and apply relevant codes, standards and symbols relevant to work
		1.5	Consult appropriate personnel to ensure the work is coordinated effectively with others involved in the project
		1.6	Obtain and apply workplace occupational health and safety (OHS) and environmental procedures for work
2	Prepare 3-D environment	2.1	Set up a 3-D environment on the screen to allow multiple viewing
		2.2	Create 3-D views on the screen by manipulating drawing planes and inserting 3-D geometric shapes
		2.3	Establish coordinate system and orientation according to job requirements
		2.4	Determine key features of assembly modelling software package and select methodology appropriate for assembly task
		2.5	Create individual components within the assembly using adaptive technology

- 2.6 Access library items, as required, to create assemblies

- 3 Produce output from 3-D assembly model
 - 3.1 Perform drawing for assembly modelling
 - 3.2 Exploit features of assembly modelling software to optimise productivity
 - 3.3 Extract physical properties to job requirement, including volume, mass and centre of gravity
 - 3.4 Edit solid models of components and assemblies
 - 3.5 Apply rendering techniques

- 4 Complete CAD operations
 - 4.1 Confirm model accurately reflects specifications, is presented according to work requirements and contains all relevant information
 - 4.2 Save and file drawing elements according to organisational procedures
 - 4.3 Produce 2-D manufacturing drawings from the assembly models incorporating section views with all necessary annotation
 - 4.4 Evaluate work and identify areas for improvement
 - 4.5 Close applications, perform CAD housekeeping and maintain organisational filing system

Required Skills and Knowledge

Required skills

Required skills include:

- obtaining relevant job instructions and specifications
- creating the appropriate entities in 3-D space
- manipulating the entities in 3-D space
- modifying, where appropriate, existing 3-D models
- saving drawing files in the appropriate format
- extracting the physical properties of shapes created in 3-D space from the drawing file to meet job requirements
- reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents
- checking and clarifying task-related information
- checking for conformance to specifications
- undertaking numerical operations, geometry and calculations/formulae within the scope of this unit
- creating intelligent models using parametric modelling
- using pre-drawn library files to produce assemblies
- extracting mass and area properties from solid model
- applying rendering techniques to a 3-D model
- using various materials and surface finish options.
- producing hard copies of 3-D solid models
- saving 3-D models in various file formats for retrieval into other CAD application software

Required knowledge

Required knowledge includes:

- purpose for which the 3-D assembly model is to be developed
- principle tools used in the creation and manipulation of assembly models
- appropriate coordinate system for the job
- reasons for selecting the chosen coordinate system
- orientation of the model with respect to the coordinate system
- number of views required to establish the model
- top down and bottom up modelling techniques
- procedures for creating entities and components in 3-D space
- the entities that can be created/manipulated in 3-D space
- procedures for manipulating entities in 3-D space
- rendering types and preferences, render lighting techniques, views and scenes
- procedures for modifying existing 3-D assembly models
- procedures for saving drawing files

- the various formats in which drawing files can be saved
- reasons for using different formats when saving drawing files
- procedures for extracting data with respect to the physical properties of shapes created in 3-D space
- the physical properties of shapes created in 3-D space that can be extracted from the drawing file
- hazard and control measures associated with using CAD system, including housekeeping
- safe work practices and procedures
- terminology associated with solid assembly modelling

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.

<p>Overview of assessment</p>	<p>A person who demonstrates competency in this unit must be able to create 3-D model assemblies using CAD systems.</p>
<p>Critical aspects for assessment and evidence required to demonstrate competency in this unit</p>	<p>Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.</p> <p>Specifically the candidate must be able to:</p> <ul style="list-style-type: none"> • work within typical site/teamwork structures and methods • apply worksite communication procedures • comply with organisational policies and procedures, including quality requirements • participate in work meetings • comply with quality requirements • use industry terminology • apply appropriate safety procedures • select and use 3-D CAD software to create solid model assemblies that meet design specifications.
<p>Context of and specific resources for assessment</p>	<p>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, that is the candidate is not in productive work, then an appropriate simulation 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. The assessment environment should not disadvantage the candidate.</p> <p>This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with creating 3-D models using computer aided design systems or other units requiring the exercise of the skills and knowledge covered by this unit.</p>

Method of assessment	<p>Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways, including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.</p>
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Range Statement

Solid modelling assembly task	<p>Solid modelling assembly task may include:</p> <ul style="list-style-type: none"> • economic impact of design upon manufacturing • principles of design • engineering components and standard parts • edit solid models and assemblies • 2-D manufacturing drawings and annotation • 3-D printing of components and assemblies • rendering and use of colour on 3-D models and assemblies • production of hard copies of drawings for solid models, assemblies and orthogonal drawings • saving files for later retrieval • consolidation (e.g. project work) • parametric modelling • composite models • section models • library files and 3-D primitives • other relevant software packages for the production of 3-D models • 3-D printing of components and assemblies
Rendering techniques	<p>Rendering techniques may include:</p> <ul style="list-style-type: none"> • rendering types and preferences • render lighting techniques • views and scenes
Appropriate personnel	<p>Appropriate personnel may include:</p> <ul style="list-style-type: none"> • supervisor • leading hand • foreman • manager • site engineer • trainer • mentor • teacher • team member
OHS requirements	<p>OHS requirements may include:</p> <ul style="list-style-type: none"> • legislation • personal protective equipment • material safety management systems

	<ul style="list-style-type: none"> • hazardous substances and dangerous goods code • awards provisions • safe work practices
Environmental requirements	<p>Environmental requirements may refer to:</p> <ul style="list-style-type: none"> • liquid waste • solid waste • gas, fume, vapour, and smoke emissions, including fugitive emissions • excessive energy and water use • excessive noise
Resource requirements	<p>Resource requirements may include:</p> <ul style="list-style-type: none"> • computer software • stationary • software reference documentation • reference texts • consumables • computer • printing equipment

Unit Sector(s)

Drawing, drafting and design

Custom Content Section

Not applicable.