Australian Government

Department of Education, Employment and Workplace Relations

MEM09220A Apply surface modelling techniques to 3-D drawings

Release: 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

MEM09220A Apply surface modelling techniques to 3-D drawings

Modification History

Release 1 - New unit of competency

Unit Descriptor

This unit of competency covers preparing the 3-D computer-aided design (CAD) environment and application of surface modelling techniques to 3-D drawings.

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 application of surface modelling techniques using CAD modelling software for computer processing and presentation purposes.

This unit includes applications in CAD, computer graphics and part geometric design, finite element mesh generation, 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 surface modelling requirements	1.1	Check purpose, scope and information requirements for surface 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	Perform surface modelling	2.1	Prepare 3-D environment for drawing work
		2.2	Identify surface types, analyse surface data and prepare drawing for surface modelling
		2.3	Determine key features of surface modelling software package and select methodology appropriate for task
		2.4	Set up and apply wire frame modelling techniques
		2.5	Set up and apply surface modelling techniques
		2.6	Edit and manipulate surfaces and apply rendering techniques
		2.7	Exploit surface modelling software to optimise

productivity

3	Prepare views and annotations	3.1	Display isometric and orthographic perspectives
		3.2	Extract properties from the surface model
		3.3	Annotate drawing and complete required documentation
4	Complete CAD operations	4.1	Confirm drawing 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	Prepare drawings for presentation
		4.4	Evaluate work and identify areas for improvement
		4.5	Close applications, perform CAD housekeeping and maintain organisational filing system

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Required Skills and Knowledge

Required skills

Required skills include:

- obtaining relevant job instructions and specifications
- creating and manipulating surfaces in 3-D space
- saving drawing files in the appropriate format
- extracting the physical properties of shapes and surfaces created in 3-D space
- 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
- applying rendering techniques to a 3-D model
- using various materials and surface finish options

Required knowledge

Required knowledge includes:

- purpose for which the model is to be used
- principle tools used in the creation and manipulation of model surfaces
- terminology associated with surface modelling
- features and uses of geometric, freeform and derived surfaces
- features and uses of wire frame and surface modelling techniques
- surface types
- features and uses of rendering techniques
- features and uses of materials and surface finishing options
- number of views required
- CAD software features
- procedures for creating ruled and revolved surfaces in 3-D space
- applications of ruled and revolved surfaces
- rendering types and preferences, render lighting techniques, views and scenes
- 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 and surfaces created in 3-D space
- hazard and control measures associated with using CAD system, including housekeeping
- safe work practices and procedures
- terminology associated with surface 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.

Overview of assessment	A person who demonstrates competency in this unit must be able to apply surface modelling techniques to 3-D models using CAD systems.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	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. Specifically the candidate must be able to: • 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 apply surface modelling techniques that meet design specifications.
Context of and specific resources for assessment	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. 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 CAD systems or other units requiring the exercise of the skills and knowledge covered by this unit.

Method of assessment	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.

Range Statement

Wire frame modelling techniques	Wire frame modelling techniques may include: • setting and using work planes • shifting and working with coordinate system • moving through 3-D space • changing 'Z' depth • construction techniques • wire frame editing
Surface modelling techniques	Surface modelling techniques may include: • definition and use of surface primitives • box, cylinder, cone, torus, wedge and editing surface primitives
Surface types	Surface types may include: • geometric, freeform and derived surfaces • draft, revolved, ruled, lofted, swept, coons, offset trimmed, fillet, blend, parametric and Non-Uniform Rational B-Spline (NURBS) surfaces • surface normals and reversing
Rendering techniques	Rendering techniques may include: • rendering types and preferences • render lighting techniques • views and scenes
Appropriate personnel	Appropriate personnel may include: • supervisor • leading hand • foreman • manager • site engineer • trainer • mentor • teacher • team member
OHS requirements	OHS requirements may include: • legislation • personal protective equipment • material safety management systems • hazardous substances and dangerous goods code • awards provisions

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	• safe work practices
Environmental requirements	Environmental requirements may refer to: • liquid waste • solid waste • gas, fume, vapour, and smoke emissions, including fugitive emissions • excessive energy and water use • excessive noise
Resource requirements	Resource requirements may include: • computer software • stationary • software reference documentation • reference texts • consumables • computer • printing equipment

Unit Sector(s)

Drawing, drafting and design

Custom Content Section

Not applicable.