

Unit 804

Producing mechanical engineering drawings using a CAD system

UAN:	J/600/5794
Level:	Level 2
Credit value:	11
GLH:	61
Relationship to NOS:	This unit has been derived from national occupational standard Performing Engineering Operations Unit No. 4: Producing mechanical engineering drawings using a CAD system (Suite 2).
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	<p>This unit covers the skills and knowledge needed to prove the competences required to set up and operate a computer aided drawing system to produce detailed drawings for mechanical engineering activities. It will prepare the learner for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or it will act as a basis for the development of additional skills and occupational competences in the working environment. The type of drawings produced will include detail component drawings for manufacturing, assembly and sub-assembly drawings, installation drawings, fault location aids such as flow diagrams, and modification drawings.</p> <p>The learner will be given a specific drawing brief or a request for a change/modification to a drawing, and they will be required to access these requirements and extract all necessary information in order to carry out the drawing operations. The learner will need to select the appropriate equipment and drawing software to use, based on the type and complexity of the drawing functions to be carried out. The learner will be expected to use current British, European and company standards to produce a drawing template for a range of paper sizes, that must include the drawing title, scale</p>

used, date of drawing, material to be used and other relevant information. The learner will then be expected to produce fully detailed drawings to enable the manufacture, assembly, installation or modification of the product to take place. On completion of the drawing activities, the learner will be expected to return all documentation, reference manuals or specifications to the designated location, to shut down the CAD system correctly and to leave the work area in a safe and tidy condition.

The learner's responsibilities will require them to comply with health and safety requirements and organisational policy and procedures for working with the CAD equipment. The learner will need to take account of any potential difficulties or problems that may arise with the computer hardware, software or drawing procedures, and to seek appropriate help and advice in determining and implementing a suitable solution. The learner will work under a high level of supervision, whilst taking responsibility for their own actions and for the quality and accuracy of the work that they carry out.

The learner's knowledge will provide an understanding of their work, and will enable them to apply appropriate computer aided drawing procedures and techniques for generating mechanical engineering drawings. The learner will understand the computer system and software used, and its application, and will know about the various tools and techniques used to produce the drawings, to the required depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety precautions required when working with the computer drawing system. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Learning outcome

The learner will:

1. Produce mechanical engineering drawings using a CAD system

Assessment criteria

The learner can:

- 1.1 Work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
- 1.2 Prepare the CAD system for operation by carrying out all of the following:
 - check that all the equipment is correctly connected and in a safe and usable working condition (such as cables undamaged, correctly connected, safely routed)
 - power up the equipment and activate the appropriate drawing software
 - set up the drawing system to be able to produce the drawing to the appropriate scale
 - set up and check that all peripheral devices are connected and correctly operating (such as keyboard, mouse, light pen, digitiser/tablet, scanner, printer, plotter)
 - set the drawing datum at a convenient point (where applicable)
 - set up drawing parameters (to include layers, line types, colour, text styles) to company procedures or to suit the drawing produced
 - create a drawing template to the required standards, which includes all necessary detail (such as title, drawing number, scale, material, date, etc)
- 1.3 Plan the drawing activities before they start them
- 1.4 Use appropriate sources to obtain the required information for the drawing to be created
- 1.5 Use three of the following to obtain the necessary data to produce the required drawings:
 - drawing brief
 - drawing change or modification request
 - manuals
 - calculations
 - sketches
 - specifications
 - regulations
 - sample component
 - existing drawings/designs
 - other available data
 - standards reference documents (such as limits and fits, tapping drill charts)
 - notes from meetings/discussions
- 1.6 Take into account three of the following design features, as appropriate to the drawing being produced:
 - function

- quality
 - manufacturing method
 - ergonomics
 - materials
 - cost
 - life of the product
 - tolerances
 - clearance
 - aesthetics
 - physical space
 - operating environment
 - interfaces
 - safety
- 1.7 Carry out all of the following before producing the engineering drawing:
- ensure that the data and information they have is complete and accurate
 - review the data and information to identify the drawing requirements
 - recognise and deal with problems (such as information-based and technical)
- 1.8 Access and use the correct drawing software
- 1.9 Use appropriate techniques to create drawings, in the required formats, that are sufficiently and clearly detailed
- 1.10 Interpret and produce drawings, using two of the following methods of projection:
- first angle orthographic projections
 - isometric/oblique projections
 - third angle orthographic projections
- 1.11 Produce two of the following types of drawing:
- detail drawings
 - general arrangement drawings
 - sub-assembly drawings
 - installation drawings
- 1.12 Produce mechanical drawings which include ten of the following:
- straight lines
 - dimensions
 - angled lines
 - text
 - insertion of standard components
 - symbols and abbreviations
 - curved/contour lines
 - circles or ellipses
 - geometrical tolerancing
 - hidden detail
 - sectional detail
 - parts lists

<ul style="list-style-type: none"> • other specific detail <p>1.13 Use codes and other references that follow the required conventions</p> <p>1.14 Produce drawings which comply with the following:</p> <ul style="list-style-type: none"> • BS and ISO standards <p>Plus one more from the following:</p> <ul style="list-style-type: none"> • organisational guidelines • statutory regulations and codes of practice • CAD software standards • other international standard <p>1.15 Make sure that drawings are checked and approved by the appropriate person</p> <p>1.16 Save the drawings in the appropriate medium and location to include all of the following:</p> <ul style="list-style-type: none"> • ensure that their drawing has been checked and approved by their supervisor • check that the drawing is correctly titled and referenced • save the drawing to an appropriate storage medium (such as hard drive, disc, CD, external storage device) • create a separate backup copy and place it in safe storage • produce a hard copy printout of the drawing for file purposes • register and store the drawings in the appropriate company information system (where appropriate) • record and store any changes to the drawings in the company information system (where appropriate) <p>1.17 Produce hard copies of the finished drawings</p> <p>1.18 Deal promptly and effectively with problems within their control and seek help and guidance from the relevant people if they have problems that they cannot resolve</p> <p>1.19 Shut down the CAD system to a safe condition on completion of the drawing activities</p>

<p>Learning outcome</p> <p>The learner will:</p> <p>2. Know how to produce mechanical engineering drawings using a CAD system</p>
<p>Assessment criteria</p> <p>The learner can:</p> <p>2.1 Describe the specific safety precautions to be taken when working with computer systems (to include safety guidance relating to the use of Visual Display Unit (VDU) equipment and work station environment (such as lighting, seating, positioning of equipment), Repetitive Strain Injury (RSI); the dangers of trailing leads and cables; how to spot faulty or dangerous electrical leads, plugs and connections)</p> <p>2.2 Describe good housekeeping arrangements (such as cleaning down work surfaces; putting disks, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)</p> <p>2.3 Describe the relevant sources and methods for obtaining any required technical information relevant to the drawing being</p>

- produced (such as drawing briefs, specification sheets, request for changes or modifications to drawings; technical information such as limits and fits, contraction allowances, bearing selection, surface finish)
- 2.4 Describe the basic principles of engineering manufacturing operations, assembly and installation methods, and limitations of the equipment/processes that are used to produce the drawn item (such as machining methods, joining processes, fabrication, casting and forging), and how these can influence the way they present the drawing
 - 2.5 Describe the functionality of the component being drawn, and its interrelationship with other components and assemblies
 - 2.6 Describe the correct start-up and shutdown procedures to be used for the computer systems
 - 2.7 Describe the identification of the correct drawing software package from the menu or operating environment; the various techniques that are available to access and use the CAD software (such as mouse, menu or tool bar, light pens, digitisers and tablets, printers or plotters, and scanners)
 - 2.8 Describe the use of software manuals and related documents to aid efficient operation of the relevant drawing system
 - 2.9 Explain how to deal with system problems (such as error messages received, peripherals which do not respond as expected, obvious faults with the equipment or connecting leads)
 - 2.10 Describe the types of drawings that may be produced by the software (such as first and third angle drawings, sectional elevations, isometric or oblique drawings)
 - 2.11 Explain how to set up the viewing screen to show multiple views of the drawing to help with drawing creation (to include isometric front and side elevations)
 - 2.12 Describe the national, international and organisational standards and conventions that are used for the drawings
 - 2.13 Explain how to set up the drawing template parameters (such as layers of drawings, scale, paper size, colour setup, line types, dimension system and text styles)
 - 2.14 Describe the application and use of drawing tools (such as for straight lines, curves and circles; how to create hatching and shading on drawings; how to add dimensions and text to drawings; producing layers of drawings)
 - 2.15 Explain how to access, recognise and use a wide range of standard components and symbol libraries from the CAD equipment
 - 2.16 Describe the need for document control (such as ensuring that completed drawings are approved, labelled and stored on a suitable storage medium)
 - 2.17 Explain how to save and store drawings, (such as determining document size; how to check that there is sufficient space to save the file in their chosen destination; saving and naming the file/drawing)
 - 2.18 Describe the need to create backup copies, and to file them in a separate and safe location away from electromagnetic sources
 - 2.19 Explain how to produce hard copies of the drawings, and the advantages and disadvantages of printers and plotters
 - 2.20 Explain when to act on their own initiative and when to seek help and advice from others
 - 2.21 Describe the importance of leaving the work area and equipment in

a safe condition on completion of the drawing activities (such as correctly isolated, removing and disposing of waste)