Overview

This standard identifies the competences you need to set up and operate a computer aided modelling system to produce detailed three-dimensional models for engineering activities, in accordance with approved procedures. The CAD models produced will be relatively straightforward and uncomplicated, and are likely to be based on existing models but will require some changes (such as changes to shape/profile, additional features, dimensional differences) and will include surface modelling, solid modelling and wire frame modelling.

You will be given a detailed 'model' brief or a request for change/modification order, and you will be required to access these requirements and to extract all necessary information in order to carry out the modelling operations. You will be expected to produce models in a 3D modelling environment and to produce 2D and 3D prints or plots. You will be expected to use current British, European and company standards to produce the drawing template and to carry out the drawing activities.

Your responsibilities will require you to comply with organisational policy and procedures for working in the drawing office or CAD suite. You will be required to report any problems with the computer hardware, software or modelling procedures that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will be sufficient to provide a sound basis for your work, and will provide an informed approach to applying the appropriate computer aided drawing procedures and techniques for 3D modelling for producing or modifying engineering drawings. You will understand the CAD system and software used, and its application, and will know about the various tools and techniques used to produce the models and drawings, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when working with the computer modelling/drawing system. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.
Performance criteria

You must be able to:

1. produce/modify drawings that are sufficiently and clearly detailed
2. produce/modify drawings in the required formats
3. use codes and other references that follow the required conventions
4. make sure that drawings are checked and approved within agreed timescales by authorised people
5. ensure that drawings are properly registered and stored securely
6. ensure that changes are completed as required by organisational procedures
Knowledge and understanding

You need to know and understand:

1. the specific safety precautions to be taken when working with CAD modelling systems (to include items such as 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)

2. good housekeeping arrangements (such as cleaning down work surfaces; putting media, manuals and unwanted items of equipment into safe storage; leaving the work area in a safe and tidy condition)

3. the correct start up and shutdown procedures to be used for the computer systems

4. how to identify and select the correct 3D drawing software package from the on-screen menu or graphical equivalent; 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)

5. 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)

6. the importance of protecting the computer system from viruses, and the implications if the correct procedure is not followed

7. the sources and methods for obtaining any required technical information relevant to the drawing being produced (such as drawing briefs, request for changes or modifications to drawings; sample components, sketches, existing models)

8. types of drawing that may be produced by the modelling software

9. how to set up the viewing screen to show multiple views of the component to help with drawing creation (to include isometric front and side elevations)

10. the national, international and organisational standards and conventions that are used for the models/drawings

11. the application and use of modelling tools (such as for straight lines, curves and circles); how to add dimensions and text to drawings

12. how to access, recognise and use a wide range of standard
13. the applications of different 3D modelling programs (such as surface, solid and wire frame)

14. the need for document control (such as ensuring that completed drawings are approved, labelled and stored on a suitable storage medium); the need to create backup copies and to file them in a separate and safe location, filing and storing hard copies for use in production

15. the extent of your own responsibility, and to whom you should report if you have problems that you cannot resolve when producing the drawings
1. Prepare the CAD system for operation by carrying out all of the following:
   1. power up the equipment and activate the appropriate modelling software
   2. set up the modelling environment and select a suitable template/folder
   3. set up and check that all peripheral devices are connected and correctly operating (such as keyboard, mouse, light pen, digitiser/tablet, scanner, printer, plotter)
   4. set the drawing datum at a convenient point (where applicable)
   5. create a modelling template to the required standards, to include all necessary detail (such as title, file/drawing number, material, date)

2. Use three of the following to obtain the necessary data to produce the required model:
   1. model brief/request
   2. specifications
   3. change order/modification request
   4. sample component
   5. manuals
   6. previous models/designs
   7. sketches
   8. standards reference documents (such as limits and fits, tapping drill charts)
   9. notes from meetings/discussions
   10. other available data

3. Take into account three of the following, as appropriate to the model being produced:
   1. function
   2. cost
   3. physical space
   4. quality
   5. lifetime of the product
   6. operating environment
   7. manufacturing method
   8. tolerances
   9. interfaces
10. ergonomics
11. clearance
12. safety
13. materials
14. aesthetics

4. Carry out **all** of the following before producing the engineering model:
   1. obtain all the required data and information you need to produce the required model
   2. review the data and information to identify the model requirements
   3. recognise and deal with problems (such as lack of, or incorrect, information and technical issues)

5. Use **one** of the following modelling tools:
   1. surface modelling
   2. solid modelling
   3. wire frame modelling

6. Use **all** of the following CAD operations to highlight design areas in the modelling environment:
   1. pan
   2. isometric
   3. zoom

7. Produce models which include the use of **eight** of the following from the part feature menu:
   1. constrained parts
   2. solid model
   3. mirror
   4. extrude
   5. wire frame
   6. radius
   7. revolve
   8. rib
   9. rectangular pattern
   10. hide
   11. cut/remove
   12. circular pattern
8. Modify parts in the assembly environment, using **eight** of the following features:
   1. constrained parts and assemblies
   2. insertion of standard components
   3. hidden detail
   4. straight lines
   5. symbols and abbreviations
   6. hatching and shading
   7. dimensions
   8. curved surfaces
   9. surface texture
   10. angular surfaces
   11. circles or ellipses
   12. parts lists
   13. text
   14. material colour
   15. other specific detail

9. Produce the following drawings, to provide sufficient detail for manufacture:
   1. 3D isometric or model view to provide a pictorial view
      Plus **one** more from the following:
   2. first angle 2D drawings (2 or 3 views) with dimensions
   3. third angle 2D drawings (2 or 3 views) with dimensions
   4. the most informative model that could be dimensioned

10. Save and store models in appropriate locations, to include carrying out **all** of the following:
    1. ensure that your model has been checked and approved by the appropriate person/s
    2. check that the model is correctly titled, referenced and annotated
    3. save the model to an appropriate storage medium (such as hard drive, disc, external storage device)
    4. create a separate backup copy and place it in safe storage
    5. produce a hard copy printout of the model for file purposes (where required)
6. register and store the models in the designated company information system (where appropriate)
7. record and store any changes to the models, and reasons for the changes in the designated company information system (where appropriate)

11. Produce models which comply with **one** of the following:
   1. organisational guidelines
   2. statutory regulations and codes of practice
   3. CAD software standards
   4. BS and ISO standards
   5. other international standard
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