

Overview

This standard identifies the competences you need to set up and operate a computer aided drawing (CAD) system to produce or modify fully detailed drawings for electrical or electronic engineering activities, in accordance with approved procedures.

The drawings produced will be relatively straightforward and uncomplicated, and are likely to be based on existing drawings but will require some changes (such as changes to circuit layout, changes or upgrading of components, change in connecting devices or wiring, dimensional differences), and will include circuit and wiring diagrams, block diagrams, schematics, printed circuit board layouts, electrical cabling/routeing, installation, assembly of panels and sub-assemblies.

You will be given a detailed drawing 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 drawing operations. 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 drawing 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 for the production or modification of electrical or electronic 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 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 CAD 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:

- P1 prepare the CAD system for operation
- P2 produce/modify drawings to defined requirements
- P3 produce/modify drawings in the required formats
- P4 use codes and other references that follow the required conventions
- P5 deal with problems within your control and report those that cannot be solved
- P6 ensure that drawings are registered, saved and stored in line with organisational procedures
- P7 ensure that changes are completed as required by organisational procedures

Knowledge and understanding

You need to know and understand:

- K1 how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- K2 the correct start up and shutdown procedures to be used for the computer systems
- K3 how to identify and select the correct drawing software package from the on-screen menu or graphical equivalent
- K4 the various techniques that are available to access and use the CAD software
- K5 how to deal with system issues
- K6 the importance of protecting the computer system from viruses, and the implications if the correct procedure is not followed
- K7 the sources and methods for obtaining any required technical information relevant to the drawing being produced
- K8 types of electrical/electronic drawing that may be produced by the software
- K9 the national, international and organisational standards and conventions that are used for the drawings
- K10 how to set up the drawing template parameters
- K11 the application and use of drawing tools
- K12 how to add dimensions and text to drawings, producing layers of drawings
- K13 how to access, recognise and use a wide range of standard electrical/electronic component and symbol libraries from the CAD equipment
- K14 the factors to be taken into account when producing electrical/electronic drawings
- K15 a basic understanding of the electrical/electronic equipment and circuits being

drawn and the function of the individual components within the circuits

K16 the selection of the various components and cables being used with regard to their operating ranges and current carrying capacity

K17 the use of specific regulations and standard reference tables when selecting components and cables

K18 the basic calculations that may be required to be carried out to verify the acceptability of components and circuits

K19 the need for document control

K20 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

K21 the extent of your own responsibility, and to whom you should report to if you have problems that you cannot resolve

Scope/range related to performance criteria

1. Prepare the CAD system for operation, by carrying out all of the following:
 - 1.1 power up the equipment and activate the drawing software
 - 1.2 set up the drawing system to be able to produce the drawing to the appropriate scale
 - 1.3 set up and check that all peripheral devices are connected and correctly operating (such as keyboard, mouse, light pen, digitiser/tablet, scanner, printer, plotter)
 - 1.4 set the drawing datum at a convenient point (where applicable)
 - 1.5 set up drawing parameters (to include layers, lines type, colour, text styles) to company procedures or to suit the drawing produced (where appropriate)
 - 1.6 create a drawing template to the required standards, to include all necessary detail (such as title, drawing number, scale, material, date)
2. Produce/modify drawings for one of the following activities:
 - 2.1 electrical engineering
 - 2.2 electronic engineering
3. Use three of the following to obtain the necessary data to produce the required drawings:
 - 3.1 drawing brief/request
 - 3.2 specifications
 - 3.3 change order/modification request
 - 3.4 electrical regulations
 - 3.5 manuals
 - 3.6 previous drawings/designs
 - 3.7 calculations
 - 3.8 other available data
 - 3.9 sketches
 - 3.10 standards reference documents (such as current carrying capacity of cables, component catalogues)
 - 3.11 notes from meetings/discussions
4. Take into account four of the following design features, as appropriate to the drawing being produced:
 - 4.1 function
 - 4.2 power supplies
 - 4.3 types of electrical or electronic components available
 - 4.4 operating voltages
 - 4.5 position/orientation of circuit elements/components
 - 4.6 aesthetics
 - 4.7 connections between components
 - 4.8 physical dimensions of the circuit
 - 4.9 method of installation (such as conduit, trunking, traywork)
 - 4.10 connectors/test point access
 - 4.11 types of cable (such as PVC, wire armoured, mineral insulated)
 - 4.12 safety
 - 4.13 use of appropriate technology for circuit design (such as single sided,

- double sided, multilayer, flexi-rigid)
- 4.14 signal integrity parameters (such as capacitance, inductance, resistance, insulation voltages)
- 4.15 specified operating environment conditions (such as temperature, humidity, shock and vibration)
- 5. Carry out all of the following before producing the drawing:
 - 5.1 obtain all the required data and information you need to produce the required drawing
 - 5.2 review the data and information to identify the drawing requirements
 - 5.3 recognise and deal with issues (information-based and technical)
- 6. Produce/modify one of the following types of drawing:
 - 6.1 circuit diagram
 - 6.2 circuit board assembly
 - 6.3 wiring diagram
 - 6.4 general assembly drawing
 - 6.5 block diagram
 - 6.6 panel assembly
 - 6.7 schematic
 - 6.8 installation
 - 6.9 system/distribution drawing
 - 6.10 cable and routeing
 - 6.11 circuit board layout
 - 6.12 manufacture of cable looms
- 7. Produce/modify electrical/electronics drawings which include ten of the following:
 - 7.1 straight and angled lines
 - 7.2 type and size of wires/cables
 - 7.3 curved/contour lines
 - 7.4 connection/termination details
 - 7.5 circles or ellipses
 - 7.6 test points
 - 7.7 dimensions
 - 7.8 electrical/electronic symbols and abbreviations
 - 7.9 text/parts lists
 - 7.10 colour/component coding
 - 7.11 insertion of standard electrical/electronic components
 - 7.12 fault diagnostics (such as flow diagrams)
 - 7.13 other specific electrical/electronic detail
- 8. Save and store drawings in appropriate locations, to include carrying out all of the following:
 - 8.1 ensure that your drawing has been checked and approved by the appropriate person/s
 - 8.2 check that the drawing is correctly titled, referenced and annotated
 - 8.3 save the drawing to an appropriate storage medium (such as hard drive, disc, external storage device)
 - 8.4 create a separate backup copy and place it in safe storage
 - 8.5 produce a hard copy printout of the drawing for file purposes (where

required)

8.6 register and store the drawings in the designated company information system (where appropriate)

8.7 record and store any changes to the drawings, and reasons for the changes in the designated company information system (where appropriate)

9. Produce/modify drawings which comply with one of the following:

9.1 organisational guidelines

9.2 CAD software standards

9.3 BS and ISO standards

9.4 other international standard

SEMTS205

Producing/modifying electrical or electronic engineering drawings using a CAD system



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