

Pearson BTEC Level _ Higher Nationals in Engineering (RQF)

Unit 32: CAD for Maintenance Engineers

Unit Workbook 1

in a series of 1 for this unit

Learning Outcomes 1, 2, 3 & 4

2D CAD Drawings, Blocks, Schematics & Data Extraction

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Sample

INTRODUCTION

Create and modify CAD drawings.

- *Introduction to the User Interface:*
 - Command line, Status Bar, panel titles and tabs.
 - Recognise and apply absolute relative and polar coordinates.
- *Drafting Aids:*
 - Grid, snap, object snap, ortho and polar tracking.
- *Draw Commands:*
 - Line types, circle, text, hatching, dimensioning.
- *Modifying Commands:*
 - Copy, rotate, move, erase, scale, chamfer, fillet.
 - Creating and defining text and dimension styles.
- *Creating Layers:*
 - Layers/levels, colour.
- *Viewing Commands:*
 - Zoom, pan, viewports and layouts.

Construct, insert and export blocks with textual attributes.

- *Creating and editing blocks and write blocks.*
- *Defining, editing and managing attributes.*
- *Inserting blocks from external sources.*
- *Attribute extraction.*
- *Dynamic and nested blocks.*
- *Using the design centre and tool palettes.*

Produce complex schematic drawings.

- *Create block library and table legend, including symbols and description.*
- *Create electrical, electronic, hydraulic and pneumatic schematic drawings.*

Transfer information to external sources.

- *Electronic transfer of information:*
 - Data extraction and data extraction (DXE) files.
 - Extracting data to tables and spreadsheets.
 - Organise and refine the extracted data.
 - Table styles and formatting data extraction tables.

GUIDANCE

This document is prepared to break the unit material down into bite size chunks. You will see the learning outcomes above treated in their own sections. Therein you will encounter the following structures;

Purpose

Explains *why* you need to study the current section of material. Quite often learners are put off by material which does not initially seem to be relevant to a topic or profession. Once you understand the importance of new learning or theory you will embrace the concepts more readily.

Theory

Conveys new material to you in a straightforward fashion. To support the treatments in this section you are strongly advised to follow the given hyperlinks, which may be useful documents or applications on the web.

Example

The examples/worked examples are presented in a knowledge-building order. Make sure you follow them all through. If you are feeling confident then you might like to treat an example as a question, in which case cover it up and have a go yourself. Many of the examples given resemble assignment questions which will come your way, so follow them through diligently.

Question

Questions should not be avoided if you are determined to learn. Please do take the time to tackle each of the given questions, in the order in which they are presented. The order is important, as further knowledge and confidence is built upon previous knowledge and confidence. As an Online Learner it is important that the answers to questions are immediately available to you. Contact your Unit Tutor if you need help.

Challenge

You can really cement your new knowledge by undertaking the challenges. A challenge could be to download software and perform an exercise. An alternative challenge might involve a practical activity or other form of research.

Video

Videos on the web can be very useful supplements to your distance learning efforts. Wherever an online video(s) will help you then it will be hyperlinked at the appropriate point.

1.1 Creation & Modification of 2D CAD Drawings

The use of CAD software in maintenance has gradually become more commonplace over time and is now often used by engineers to produce vital 2D schematic drawings, useful for electrical and hydraulic circuits, distribution systems, steam ranges, structural elevations and building layouts.



Figure 1.1: Floorplan Example

Using 2D CAD software means that a designer is able to produce incredibly accurate drawings, quickly rectify mistakes or make changes and keep an accurate record of these changes, it is also highly flexible allowing for multiple layers such as electrical and mechanical components. Specific drawing standards are also easily adhered to and the speed at which drawings can be produced is greatly increased compared to manual drafting, whilst collaborating on designs is also made much easier. The industry standard CAD packages come with a considerable cost and, with a new version released each year, the CAD user must constantly keep up to date with the latest advances and changes. Additionally, there is always a risk that work could be lost, corrupted or subject to cyber-attack, to combat these threats there is also an associated cost and effort.

There are many 2D CAD software packages available, a good example of a commonly used industry standard is AutoCAD. In order to become familiar and proficient on the use of any 2D CAD software, the best method is to practice and use as many tutorials and videos as possible. Download the latest AutoCAD educational version for free from:

<https://www.autodesk.com/education/free-software/featured>

When you have downloaded the software, open it and watch the 'Getting Started Videos' in the 'Learn' tab, as well as these, watch the following tutorial video for an overview:

Video

<https://www.youtube.com/watch?v=ONapRVyXn2E>

Use the following guide to practice AutoCAD basics and ensure that you review all 12 sections in order to become familiar with the basic features of the software.

<https://knowledge.autodesk.com/support/autocad/learn/caas/CloudHelp/cloudhelp/2018/ENU/AutoCAD-Core/files/GUID-2AA12FC5-FBB2-4ABE-9024-90D41FEB1AC3-htm.html>

Use the Autodesk AutoCAD Help Home to view tutorials and videos for help on a range of subjects in the User's Guide.

<http://help.autodesk.com/view/ACD/2018/ENU/>

Pay particular attention to the user interface, using different aids and commands and creating layers.

Challenge

Create a 2D drawing of the floorplan of your house or workplace, try to include some details such as large items of furniture, with accurate locations and sizes.

Sample

1.2 Blocks

Blocks are specific groups of objects that act as a single 2D object, they are used to create repeated content such as components which are commonly used and standard details or notes. They are a very useful tool in 2D CAD design because they save the designer from re-drawing exactly the same object every time that they wish to use it. It is possible to create brand new custom blocks which may be specific to a certain application, or to use a block from a library which is built into the CAD software, or even from an online catalogue of blocks.

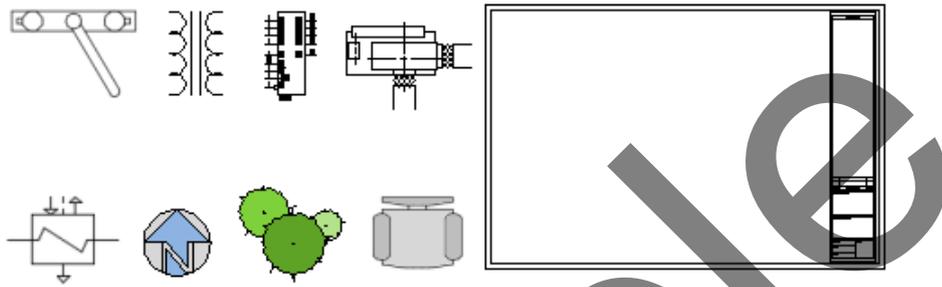


Figure 1.2: Various Block Examples

Dynamic blocks have flexibility and some degree of intelligence so that they can accommodate variable attributes, such as colour, layer, linetype, lineweight, material, name, orientation, scale and rotation. Any kind of block can be added to your own library, this library is known as a design centre or tool palette generally. There are many tutorial videos available which can help in explaining these versions of block libraries, such as the following:

Video

<https://www.youtube.com/watch?v=k0nJBS7RWH8>

<https://www.youtube.com/watch?v=TT0zrZYQyFo>

<https://www.youtube.com/watch?v=pf34RMSfP2Y>

Review the AutoCAD tutorials on blocks and attributes to become familiar and more competent in their use.

<https://knowledge.autodesk.com/support/autocad/getting-started/caas/CloudHelp/cloudhelp/2015/ENU/AutoCAD-Core/files/GUID-2DA2ADA1-C8CC-4E61-9598-06580FFD3544-htm.html>

<https://knowledge.autodesk.com/support/autocad/learn-explore/caas/screencast/Main/Details/f5684b6a-5141-4bfe-880a-09ab3354dfa9.html>