# What is CAD?

**CAD** is an acronym for **Computer Aided Design** or Computer Aided Drafting. It can also be expressed as CADD, an acronym for Computer Assisted Design and Drafting.

In simple terms CAD is the use of computers to create technical drawings, designs and design documentation either directly or from a 3D virtual model. The use of CAD replaces, or is a companion to manual methods of design and communication of designs and ideas.

**CAD** has evolved to include the production of 2 dimensional (2D) drawings and 3 dimensional (3D) virtual models of real or imagined objects.

An interface between the human operator and the CAD software is used to allow the designer to interact with the drawing or virtual model, essentially allowing the images of the mind to manifest as mathematical algorithms in cyberspace and appear as images on a screen. CAD data is used to convey the actual design, the design intent and also to assist in downstream processes related to the design such as engineering, suitability testing, manufacturing and marketing. In the virtual world CAD is also used to create objects and characters in video and film production.

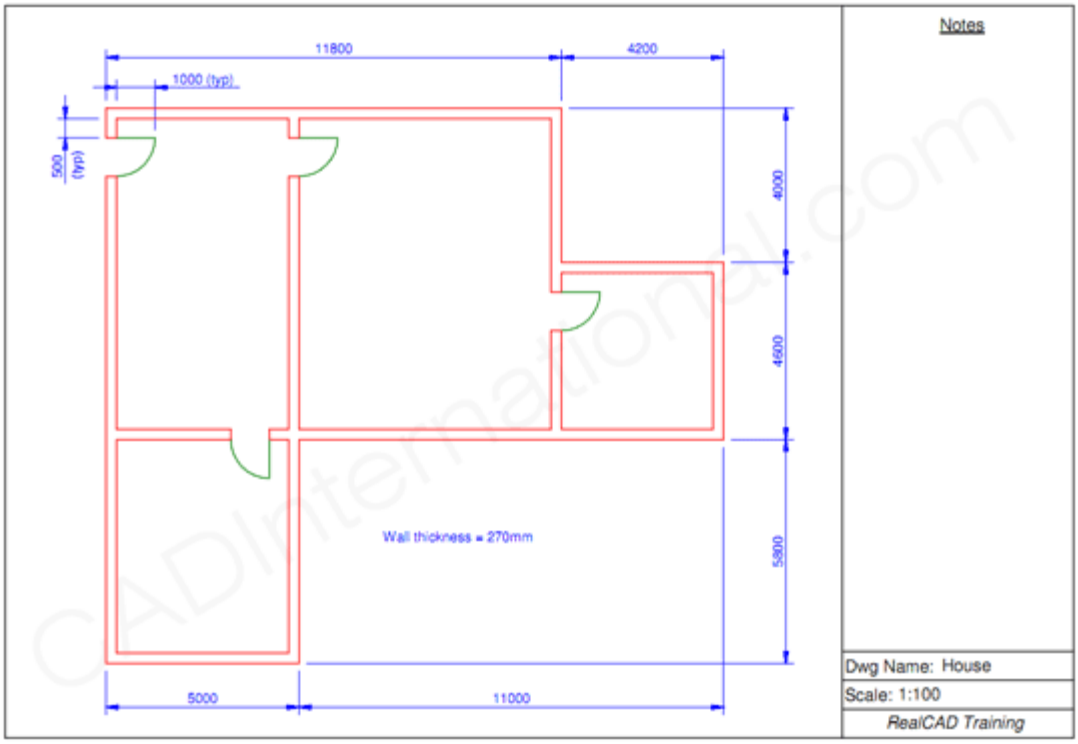
## What is CAD then?

It is a generic term that covers a process of design using computers as the design tool. It encompasses a very large variety of software products and related hardware. The best known of these software products is AutoCAD®, but this is only one of hundreds of CAD software programs available.

## 2D CAD Software

At its most basic, CAD is a drafting tool to replace the traditional 2D drawing and documentation methods used by designers and drafters for hundreds, if not thousands of years – tools such as pens, pencils, protractors, compasses, drafting machines and rules. Basic 2D CAD software allows the designer to 'draw' and display on the computer screen, lines, arcs, circles, curves, points, ellipses, hatching, text and dimensions, all of which are used to accurately describe objects or ideas and are governed by a set of interpretative rules. This 2D communication process allows manufacturers to build objects by interpreting the various views being presented and mentally creating 3D images or models

in the viewer's mind and then translating those into actual forms such as in buildings or cars or even in a pair of spectacles that you may be wearing now.




A distinct advantage of 2D CAD over manual methods would:

- firstly be the high level of accuracy of the drawing and its dimensional information,
- secondly is the consistency of the drawings being produced regardless of the state or ability of the operator
- and thirdly the ability to rapidly make design changes to the drawing without restarting the drawing or manually erasing line work from a physical sheet of drawing material.

## 3D CAD Software

With 3D CAD software the process is further extended allowing 2D drawings to be automatically generated from data contained as a result of viewing the 3D model. It also allows the presentation of 3D views in the same way. Further to this it allows designers to interrogate the 3D model data to check for clearances, surface properties, mass properties, appearance from any given angle or perspective and it allows direct changes in the drawings to be made automatically by making changes to the 3d model.

Over time, improvements in the speed of computer hardware and in the mathematics behind the methods of expressing real world objects in terms of solids and surfaces with form, texture, colour and purpose allowed CAD to become significantly more useful by allowing designers to 'model' designs rather than simply draw them. These 'virtual' models (described as mathematical algorithms in the software) are then displayed on screen as 3D models that the designer can interact with, changing its form, shape, colour, and environment. Today most 2D drawings are produced as a result of modeling the desired outcome in 3D first. Interestingly many of the initial ideas that are catalysts for 3D design are still drawn by hand on 2D paper using a pen or pencil before being transposed into digital for using CAD. At the other end of the scale, in many manufacturing processes 2D drawings are no longer needed and the models surface or solids data is used to directly manufacture the object itself by Computer Assisted Manufacturing (CAM) processes.

## CAD for every purpose

Because of its huge importance, CAD is a driving force in almost all areas of scientific research from nanotechnology to exploring space and is used in nearly all areas of traditional design including CAD for architecture, CAD for interior design, CAD for product design, CAD for manufacturing design, CAD for mechanical design, CAD for electrical design, CAD for electronics design and printed circuits, CAD for furniture design, CAD for signage, CAD for landscape design, CAD for movie making and more.

CAD is what could be defined as a revolution in our creative world. No other set of tools has changed the way we design and manufacture our world as much in all of mans' history on this planet.

CAD has allowed the process of communicating design ideas from the designer to the client to manufacturer in a way that leaves little room for delay or misunderstanding. The creation of drawings and virtual 3D models can mean that prototyping of designs is no longer required. Virtual models can be visualised and engineered without the need to construct real world models first, this then leads to more rapid and more reliable final construction or manufacturing, and because designs can be communicated between countries over vast distances electronically in complete 3D detail from all angles, manufacturing can be outsourced to the most efficient or least expensive suppliers.

To keep the benefits of CAD in context, there are still currently times when the use of pen and paper is a better medium than CAD tools in their current form although this too will change. Due in part to our method of learning design by first using crayons or chalk or pencil, we typically become more adept at using our hands directly connected to a drawing tool such as pen or pencil to convey our design thoughts in the most fluid manner, without thought to the process.

It is envisaged that with the advent of faster processors and touch screen or 3D virtual screen technology CAD will take the next leap and allow the designer to be immersed in the scene with direct contact of his or her body gestures to the design process. Waiving of the hand, pushing of the elbow, nodding of the head and verbal direction may all be able to be interpreted by the advanced CAD tools of the near future and we suggest this will eventually be surpassed by direct link to the brain. Rember, the CAD we have today wasn't even dreamt of only a few years ago.

Enjoy.