

## Section 3: CAD Conventions#

### 3.3 CAD Layers, Naming Conventions and Drawing Colours#

When constructing a CAD model, various portions of the model are placed on different layers. The layers should be designed to distinguish material in the model according to important criteria, for example, building part, building phase, site stratum, material, chronological standing, etc. Each layer should hold only a portion of the model as putting too much on a single layer may cause problems when the model is used for analysis. Objects can be moved from layer to layer, but this is harder to handle if many objects are held on a single layer. More importantly, the way that the model is segmented will affect its usefulness.

Using different layers requires some system for assigning portions of the model to particular layers and a naming convention for those layers. For example, a model of an historic structure may have many layers - for phases, materials, functions, designer/builder, and so on. Potentially all models can be segmented in any number of ways. The scheme chosen should make it possible to find material according to multiple criteria and in this way the layering scheme permits users to access the layers very much as they might access parts of a database.

A shortcoming of the layering systems in CAD software is that there is no facility for creating a hierarchical scheme to match hierarchical recording systems. For example, a surveyor may record the ridge board, rafters and truss beams as separate components that taken together comprise the roof of a building. This is a hierarchical system but CAD software does not allow one layer to contain other layers, thus it may be difficult to re-group the separate roof components. One way of working around this shortcoming is to use the layer or file naming conventions to create relationships between components, e.g. all names beginning with A form a set which comprises AA, AB, AC etc.

#### 3.3.1 Naming Conventions for CAD Layers

It is important to adopt a systematic approach to naming layers in CAD models. CAD systems permit searches based on layer names and some systems permit searches using 'wild-cards' which enable retrieval of sets of layers with structured names. In complex CAD models or models comprising cross-referenced files, it is important to be able to bring together layers without causing confusions through inappropriate use of layer names. For example, users often begin with layer names like wall and door, then graduate to *wall1* and *door1*. As the model grows, layer names grow longer, more complicated and harder to remember. Layers cannot easily be selected from the model according to their characteristics; instead a user must know all of the layer names and type in a subset when trying to select specific portions of a model. Even then it is difficult to be sure that all the relevant layers have been accessed.

The layer-naming scheme should be designed and specified as early in the project as possible. As the model grows, the use of the scheme will become more and more important. In deciding upon a layer-naming scheme, CAD users have the option of either adopting an existing convention or developing their own system. In either case it is important to make sure that the naming convention is documented, can be consistently applied and allows some flexibility for modification as the model develops.

The CSA layer-naming convention is an example of an existing scheme. It is a systematic naming convention that is based on layer names designed to specify the contents of each layer. Each character in the layer name designates information according to its position as well as by the letter itself (see Appendix 2). The CSA convention is a conceptual scheme that permits the layers of any CAD model to be accessed according to logical analytic categories that are meaningful and useful for

a specific project. It is more general and more adaptable than a discipline-specific scheme, but works well only with programs that permit 'wild-card' searches for layers.

Some organisations define layer-naming conventions that are designed to meet specific, practical needs, for example architects might define conventions to be used by different professionals working on a development. English Heritage (English Heritage, 2005) has developed a systematic layer-naming convention for buildings archaeology, photogrammetric recording and topographic survey. This system accommodates CAD layers produced by other professions and has some of the features of the CSA system but with a more prescriptive list of layers.

Both the CSA and the English Heritage conventions have enough flexibility to be modified for specific projects. As a general rule any such changes should be systematically implemented throughout the model. With a complex scheme such as the CSA convention, the original model and layer-name models should be backed up and saved and checked once the new system has been established.

Documenting the layer-naming scheme is critical to a CAD project. Such documentation should include a list of the layer names or codes with a description of each. A description of how the layer-naming scheme has been developed and how it is applied is also useful, especially with a complex scheme. One method of tying the layer-naming convention to the CAD file is actually to include the scheme as a layer within the model.

### **3.3.2 Conventions for Selecting Drawing Colours**

It may seem that colours should be used like layers, to specify analytic aspects of a model. For example, a specific colour might be assigned to a given structure, or to a given stratum in an archaeological site. This can be done, but different colours should not be assigned to objects on the same layer of a drawing. The objects should be placed on appropriate layers first and then a colour should be assigned to each layer. All entities on a given layer will then be the same colour. The visual result may be the same, but the process is different because the layers, not the colours, hold the analytical distinctions.

There are two reasons to resist the temptation to use colours, rather than layers, to hold meaning:

- It is easier to change colours than to change layers and inadvertent colour changes could result in loss of meaning
- The print process generally uses colours or line weights in the model to determine the line colour or weight that is printed on paper. This means that the colours in the model may need to be changed every time a paper drawing is produced, since each tends to serve a particular purpose and emphasise different points.

The danger of losing important distinctions is too great if colours have been changed, and any distinctions between portions of the model should be made using layers.