

The ANT CAD Layer Name Format

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Revision History

Drafts

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Reference Documents

Using CAD to Model Buildings – Part 1, Part 2, Part 3

Contents

- CAD LAYER NAME FORMAT 1**
- 1.0 INTRODUCTION..... 1
 - 1.1 Other Industry Standards 1
- 2.0 STANDARD LAYER NAME FORMAT 2
 - 2.1 Standard Layer Field Descriptions 2
- 3.0 LAYER NAME PREFIX EXTENSION 3
 - 3.1 Prefix Field Descriptions..... 4
 - 3.2 Naming Linked Files..... 4
- 4.0 LAYER NAME SUFFIX EXTENSION 4
 - 4.1 Suffix Field Descriptions..... 5
- 5.0 GUIDELINES FOR USE 5
 - 5.01 Modelling versus CAD 5
 - 5.02 Software Limitations 6
 - 5.03 Data Exchange Requirements..... 6
 - 5.04 Project Size..... 6
 - 5.05 Master Lists..... 6
 - 5.06 Wildcard Filtering 7
 - 5.07 Drawing Requirements 7
 - 5.08 Annotation..... 7
 - 5.09 Amendments..... 7
 - 5.10 Grids 7
 - 5.11 Comments & Red-lining..... 8
- APPENDIX A –FULL LAYER NAME FORMAT & COMPLIANCE GRADES..... 9
- APPENDIX B – STANDARD LAYER NAME FIELDS..... 11
- APPENDIX C – WILDCARD TABLE..... 18
- APPENDIX D – GLOSSARY..... 19

CAD Layer Name Format

1.0 Introduction

The purpose of this document is to provide a flexible, but consistent, way to structure layer names in CAD files. The aim is to make layer names intelligible across the industry, so that even though your requirements for layer naming may differ from someone else's, you will both understand each other's intention.

This document provides an abridged description of the layer naming structure described in the *Using CAD to Model Buildings* document. *Using CAD to Model Buildings* contains three parts, Part 1 - *Guidelines for Using CAD to Model Buildings*, Part 2 – *Guidelines for Naming of Layers* and Part 3 – *Guidelines for Structuring Computer Files*.

The full layer naming format can be best described as a template, with placeholders (fields) for various types of information. Fields are separated by special characters that identify the type of field. Refer to [Appendix A](#) for a description of the full layer naming format.

The CAD Layer format in this document simplifies the full description by providing a 'Standard' layer naming format that can have additional information added to the beginning (layer name prefix), or end (layer name suffix).

The intention of this document is to provide guidance to Architects in constructing their in-house management system, and to create a benchmark that can be referred to when dealing with other building consultants and clients.

1.1 Other Industry Standards

There is an Australian standard for naming of layers - Australian Standard AS 13576 – 1999 “*Organization and naming layers for CAD*” (a direct copy of International Standard ISO13567-2.), which supersedes the previous Australian standard - AS 3883 - 1991 (a direct copy of British Standard BS1192 – Part 5.)

Both standards proscribe Layer Naming structures only. These standards have been reviewed and considered too cumbersome for the majority of architectural work, mainly due to their requirement for mandatory fields.

There are also a number of published guidelines more relevant to architectural work. The American Institute of Architects “CAD Layer Guidelines” was considered the most appropriate and this document builds on that guideline.

Work has also been done on establishing standards for computer modelling in the construction industry. STEP (ISO 10303 Standards for The Exchange of Product model data) is well developed in the area of manufacturing (particularly car assembly). The IAI (International Alliance for Interoperability) is attempting to establish standards for describing complete objects in building models (such as doors, windows, walls etc), building on standards created by STEP.

It is envisaged that the method computer software use will move gradually from dealing with drawing objects (lines, text etc) to complex building objects (doors, walls etc.) which will change the nature, and possibly lessen the importance, of layer name management.

2.1.2 Material or element Modifier

A description of the building material the object describes (brick, timber, etc), type of element (text, dimension etc.), or further description (modifier) of the object's element (above, below etc). Use for additional information to compliment what the Element describes. The range of these field names need not be as restricted as the range of element names. Users should be encouraged to exactly describe what they are representing, although there needs to be consensus on the field names used for the same material or modifier.

Identifying what material an object represents can impart information to other members of the design team that would otherwise require referring to notes, schedules, legends etc. This can lead to significant time saving and reduction of errors. It means drawings can progress quickly without the need for continually adding notes, hatching or dimensions. These can all be added later as the information is all there in the drawing file. (Notes, hatching and dimensions are only required to make information visible on a printed drawing).

2.1.3 Status

A code representing the information accuracy, or status, of an object. (Schematic, under review etc.) One of the problems with CAD files is it is not possible to identify the accuracy of information. A wall will have an exact position in a CAD file (up to 16 decimal places!), even if it has been drawn in what was intended to be a tentative location. If, (as is common) sketch design CAD files are used to create documentation drawings there is no way to identify which parts have been drawn or altered as the result of detailed design and which are left-overs from sketch design. Status can also be useful to represent the completeness or otherwise of a CAD file. As construction information is confirmed, approved, or constructed the status can be changed to reflect this. This means the same drawing can be used for package or staged issues.

2.1.4 Owner

A code representing the person who owns the object. Some software can use layers to identify who has permission to work on what objects within a file. This field can be used to identify which individual 'owns' which layers. It can also be used to identify who has added or altered objects in a file, for example in as-built drawings, or red-lining or commenting in drawings.

3.0 Layer Name Prefix Extension

The standard layer name can be extended to include other information. This Information is divided into a layer name *Prefix*, which contains information that is often found in linked files, and a *Suffix* which generally contains information about the graphical representation of objects. Prefix and Suffix extensions are optional.

discipline	stage	_location
------------	-------	-----------

where:

FIELD	DESCRIPTION	CHARACTERS	RULES
discipline	Building Team discipline	1 letter, lower-case	
stage	Information accuracy	1 number	
location	Location, level or option	Letters or numbers lower-case	Must begin with underscore ()

e.g. A2_planL1L9

Architectural, Schematic, Plan levels 1 to 9,

Refer to [Appendix B - Standard Layer Name Fields](#) for a full list of recommended layer field names.

Refer to [Appendix B - Standard Layer Name Fields](#) for a full list of recommended layer field names.

4.1 Suffix Field Descriptions

4.1.01 Representational Information

Information on where and how an object will be represented.
This is divided into:

Drawing Type

A description of the type of drawing the object appears in, (plan, elevation, furniture etc.)
This field is useful to separate information that occurs in the same location but in different planes, as in floor plans, reflected ceiling plans, slab set-out plans etc., or separate trades or contracts, such as furniture, electrical layout etc.

Drawing Scale

A description of the scale of the drawing the object appears in. (1:100 etc.)
Used where objects are only relevant to a particular scale. For example when a 1:5 detail is drawn over the top of a 1:50 wall section, or text for a 1:500 site plan is placed within a 1:100 floor plan.

4.1.02 Graphical Information

Information on how an object will appear when printed.
This is divided into:

Colour

A description of the colour that an object is normally printed in, whether the drawing is printed to paper or electronic file format.
Colours should comply with AutoCAD 256 colour numbers.
Used when colour can't be directly embedded, or when this information will be lost when transferring to another CAD system.

Linetype

A description of the line type that an object is normally printed in (dashed, dotted etc), whether the drawing is printed to paper or electronic file format.
Line type should comply with ISO 128-21:1997 descriptions.
Used when line type can't be directly embedded, or when this information will be lost when transferring to another CAD system.

Line Weight

A description of the pen width that an object is normally printed with. (0.25, 0.35 etc.), whether the drawing is printed to paper or electronic file format.
Pen widths should be described in ISO 9175 Part 1 standard widths.
Used when line weight can't be directly embedded, or when this information will be lost when transferring to another CAD system.

5.0 Guidelines for Use

5.01 Modelling versus CAD

Computer Aided Drafting (CAD) has been accessible to architects since the early 1980s. Its purpose, as the name suggests, was to use the computer as a tool in the production of drafted paper documents. These systems were primarily designed to mimic existing simple repetitive processes, therefore speeding up the production of paper drawings.
But computers can do much more than mimic lines on paper. They can store information by embedding it within a drawing file, for example in a layer name. Although this information doesn't appear when drawings are printed, it can be useful during the creation of drawings. Not only useful for

conveying information to the people using the CAD computer files, but also greatly assisting co-ordination across drawings.

This approach can be achieved using ordinary CAD software by considering plans, sections, details etc. as slices through the actual building. Where a slice is taken objects exactly located, and materials are described using layer names. Also drawings can be set up through linked files so that a particular part of a building is drawn once but occurs many times, mimicking a single model of the building.

The layer name format has been designed with this aim in mind. Try and consider your CAD files as a model of the actual building rather than an electronic version of paper drawings.

5.02 Software Limitations

Each AEC software package has it's own limitations on layer names. Some software will not be capable of containing all of the layer name fields. Where possible the fields that are capable of inclusion should follow the Layer name format and use the Standard Layer Name fields. (see [Appendix B](#)). Where divider characters (! + \$ %) are not supported replace them with the underscore (_) character.

5.03 Data Exchange Requirements

Data exchange between AEC software packages that don't support identical methods of directly embedding information leads to loss of data each time an exchange takes place. For example, if one has a separate attribute for pen weight, the other does not, the pen weight of objects is likely to be lost when the translation occurs.

If it is envisaged data exchange will occur reasonably frequently consideration should be given to including all information in the layer name, even if not actually required by the originating software. This ensures no data is lost during translation.

5.04 Project Size

The size of a project will dictate how the files will be structured, and in turn the number of layer name fields required.

One of the requirements of larger projects is for many people to be able to work on the project at the same time. Large projects need to be split over many files to facilitate this, typically using linked files to share information. These linked files typically remove the need for the *discipline*, *stage*, *location*, *type* and *scale* layer name fields as different levels, different types of drawings, and drawings of different scales are split into separate files.

Small projects with less people working on them may only need one file, with all drawings (plans, reflected ceilings, elevations, details etc.) generated from that one file. In this case all layer name fields may be used to distinguish objects that appear on the different drawings being produced. Projects may fall between these two extremes, or indeed move from having few to many people working on them.

By using layer fields a project that started as a single file can be split into a number of files by isolating the objects on the relevant layer fields and writing them out to a separate file.

5.05 Master Lists

Although [Appendix B](#) lists suggested standard layer field names it is not intended to be, nor could ever be, all encompassing. It is recommended an Office Master List be created.

Individual projects often generate new layer field names, these should be added to the Office Master List as they arise.

As a single list that covers all possibilities for all projects would be unmanageably long to actually use on a single project it is recommended each project have a Project Master List (created by cutting down the Office Master List), that, once created, can only be added to via an approval process.

5.06 Wildcard Filtering

If your software supports wildcard matching use it to filter layers.

e.g.	*WALL*	all walls
	ANNO	all annotation
	-cmt or *+1	all comments
	+0	all layers not plotted
	\$c	all layers that appear only on reflected ceiling

Refer also [Appendix C – Wildcard Table](#).

5.07 Drawing Requirements

There is no benefit in including more information than required for a particular purpose. The layer name structure allows only information required, or known to be included:

e.g.	WALL	a wall
e.g.	-plbd	plasterboard material
e.g.	GRID%001	grid, colour 1
e.g.	WALL\$c	wall, appears only on reflected ceiling plan

When additional information is known it can be added:

e.g.	WALL	becomes	WALL-plbd
e.g.	GRID	becomes	GRID-a

This means layers used in sketch design files can simply be renamed for documentation.

5.08 Annotation

Drawing annotation are all those objects that are not part of the actual building model. Generally these are text notes, cross references, dimensions, grid references, level references etc. Annotation objects are scale dependant. That is, their size in a file differs depending on what scale the drawing will be printed out at.

It is useful to be able to isolate all annotation. For example if a drawing is linked for reference only or when supplying backgrounds to consultants.

This can be achieved by identifying all annotation with the same element – e.g. ANNO, then manipulate them through wildcard filtering.

5.09 Amendments

Use a layer name describing the date the amendment is drawn. Date in ISO 8601 format

e.g.	AMDT-20000506	6 th May 2000
or.	AMDT-010506	6 th May 2001

Leading zeros are required for correct sorting. The Century can be dropped, although problems may occur with dates before the year 2000 and after the 2100.

5.10 Grids

Use the Modifier field of the layer name to describe the actual grid reference.

e.g. GRID-1 or GRID-a or GRID-1a

This means grids are identifiable without needing to find the written grid reference bubble (which may actually be in another file).

Grid references should use the GRID element field so all grid entities can be grouped together.

e.g. GRID-ref

5.11 Comments & Red-lining

It is useful to allocate layers for comments and red-lining. Comment notes, bubbles, dimensions, construction lines etc. can be used to remind oneself, other design team members, and consultants about current issues relating to objects in the CAD file. Printing of comments and red-lining can be controlled at print time, so they don't appear on issued drawings.

Although an annotation modifier (e.g. -cmt) identifies comments, use the appropriate status, (+1) to identify comments that must never appear on issued drawings.

e.g. ANNO-cmt for comments
 ANNO-cmt+1 for comments not printed on final (issued) drawings.
 ANNO-cmt+3am schematic comments by AM

e.g. ANNO-redl for red-lining
 ANNO-redl+1 for comments not printed on final (issued) drawings.

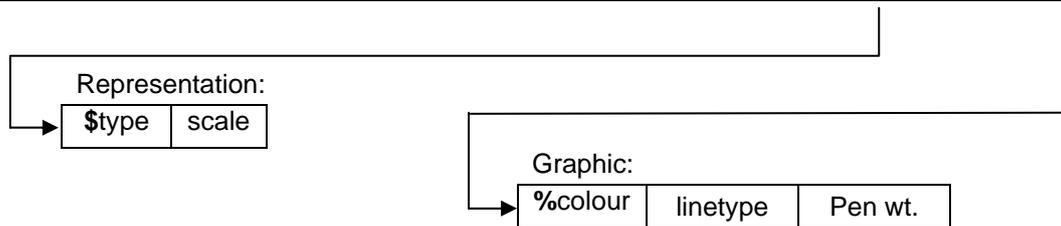
Comments can be turned into proper notes by simply changing the layer they reside on.

Appendix A –Full Layer Name Format & Compliance Grades

The Layer Name Format identifies particular fields by divider characters, type of character (number or letter), and to a lesser extent position. This structure means fields can be identified even if other fields are missing. It reduces the need to include dummy information or restrict fields to predefined lengths. Fields have been defined as being in either upper or lower case. This is suggested for readability only, using all upper or all lowercase is acceptable.

Full Layer Name Format

discipline	stage	_location	!	element	-material	+status	owner	\$represent.	%graphic
------------	-------	-----------	---	---------	-----------	---------	-------	--------------	----------



where:

FIELD	DESCRIPTION	CHARACTERS	RULES
discipline	Building Team discipline	1 letter, lower-case	
stage	Information accuracy	1 number	
location	Location, level, stage or option	Letters or numbers lower-case (4 recommended)	Must begin with underscore ()
!element	Building element	Letters, upper-case (4 recommended)	Exclamation (!) required if discipline &/or location used.
-material	Building material or Modifier or Annotation type	Letters or numbers, lower-case (4 recommended)	Must begin with dash (-)
+status	Information accuracy	1 number	Must begin with plus (+) Required if owner used.
owner	Owner	2 letters, lower-case	
\$represent.			Must begin with dollar (\$)
type	Type of drawing	1 letter, lower-case	Required if Scale used
scale	Scale of object	numbers	
%graphic			Must begin with percent (%)
colour	Plotted colour	3 numbers	Required if Linetype & Pen used
linetype	Plotted Line type	2 letters, lower-case	1 st char. linetype description, 2 nd char. linetype scale. Required if Pen used.
pen	Plotted Pen width	1 number	

e.g. A6_planL1L9!WALL-plbd+2am\$p100%007dh4

Architectural, for construction, Plan levels 1 to 9, wall, plasterboard, schematic, owned by AM, appears plan only, 1:100, black, half sized dashed line, 0.25 pen.

Where divider characters (! + \$ %) are not supported replace them with the underscore (_) character.

Layer Name Compliance Grades

These grades provide a way to describe the fields that an in-house standard uses. Layer grades can be referred to in contracts with other parties (client/Architects, consultant agreements, etc.).

Regular fields are always used within a layer namer, optional fields are used in addition to the regular fields when extra information is required for objects on that layer.

The [Standard Layer Name Format](#) described in this document is equivalent to Grade 2.0.

Layer Grades

Regular Fields								Optional Fields
0								all fields
1				Element				all other fields
2				Element	Material			all other fields
3				Element	Material	Status	Owner	all other fields
4	Discipline	Stage		Element	Material	Status		all other fields
5	Discipline	Stage		Element				all other fields
6	Discipline	Stage		Element	Material			all other fields
7	Discipline	Stage	Location	Element	Material			all other fields
8	Discipline	Stage	Location	Element	Material	Status		all other fields
9	Discipline	Stage	Location	Element	Material	Status	Owner	

Layer Sub Grades

Regular Fields						Optional Fields
Representation			Graphic			
.0						all fields
.1			colour			all other fields
.2			colour	linetype		all other fields
.3			colour	linetype	pen weight	all other fields
.4	type					all other fields
.5	type	scale				all other fields
.6	type	scale	colour			all other fields
.7	type	scale	colour	linetype		all other fields
.8	type	scale	colour	linetype	pen weight	all other fields

Grade 9.8 represents all information fields.

A layer complying with	Layer Grade 2.0	WALL-pbrd
	Layer Grade 3.0	WALL-pbrd+2am
	Layer Grade 0.1	%007
	Layer Grade 2.1	WALL-pbrd%007
	Layer Grade 5.5	a2!WALL\$p100

Appendix B – Standard Layer Name Fields

discipline **building consultant, 1 letter**

Discipline	Description	Notes
a	Architect	
b	Building surveyor	
c	Civil	
d	Drainage, Sewerage	
e	Electrical	
f	Fire services	
g	Geographical / Land Surveyor	
i	Interior	
k	Client	
l	Landscape	
m	Mechanical	
n	Acoustic	N for Noise
q	Quantity surveyor	
s	Structural	
t	Planning	
v	Lifts	V for Vertical Transport
w	Contractor & shop drawers	
x	Sub-contractors & shop drawers	
y	Specialist Designers	
z	Other	

stage **document stage, 1 number**

Stage	Description	Notes
0	Invisible (not plotted)	
1	Comments & redlining	not normally issued outside of office
2	Schematic only	
3	Developed design	
4	Preliminary for construction	pre-tender
5	Awaiting Approval for construction	tender
6	Approved for construction	after tender
7	As built	
8	Existing	
9	Dummy – has no meaning	Use if Discipline field included

Location, **letters &/or numbers**

Location	Description	Notes
_Level01	Level 1 only	
_Lev0180	Levels 1 to 80	
_Floor	Floor plan	
_Ceil	Reflected ceiling	
_Option1	Option 1	
etc.		

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element Building element, 4 letters

Element	Description		Colours	Notes
BLDG	Building outline		purples	
CEIL	Ceiling		yellows	
COLN	Columns		greens	
DOOR	Doors		browns	
EQPM	Equipment		reds	
FLOR	Floor		browns	
FURN	Loose furniture		purples	
GLAZ	Glazing		yellows	Windows to ceilings
HRAL	Handrails & balustrades		reds	
JNRY	Built in joinery		browns	
LIFT	Lift cars		reds	
PARO	Partitions (to underside ceilings) e.g. Office partitions		yellows	WALLs go through ceilings.
PART	Partitions - (do not go to ceiling) e.g. Toilet partitions		yellows	
RAMP	Ramps		reds	
ROOF	Roof		blues	
SANT	Sanitary fixtures		blues	
SITE	Site information		browns	
SLAB	Floor slabs		greens	
STRS	Stairs		reds	
STWR	Stormwater (DPs etc.)		blues	
WALL	Walls (not internal partitions)		greens	
WIND	Windows		blues	Windows within walls (not to ceiling)

element Services & Consultants element, 4 letters

Element	Description			Notes
CARS	Cars & trucks		yellows	
CARPK	Car parks		purples	
ELEC	Electrical items		reds	
EXHB	Exhibition items		reds	
FIRE	Fire services items		reds	
LITE	Lights		reds	
LSCP	Landscape information		greens	
MECH	Mechanical items		reds	
ROAD	Roads		blues	

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Representation – Drawing Type 1 letter

Type	Description	Notes
a	Mechanical	<i>(a)ir conditioning</i>
b	Building Sections	
c	Reflected Ceiling plan	
d	Demolition	
e	Elevation	
f	Furniture layout	<i>Fit-out</i>
g	Legend	<i>Le(g)end drgs & key drgs</i>
h		
i	Lighting	<i>L(i)ghting</i>
j	Joinery	<i>Joinery & fittings</i>
k	Sprinkler	<i>Sprin(k)ler & fire</i>
l	Layout (setout) plan	<i>Slab set-out</i>
m	Masterplan	
n		
o	Location plan	<i>(o)verall plan</i>
p	Floor Plan	
q		
r	Roof plan	
s	Site plan	
t	Detail	<i>De(t)ail</i>
u		
v		
w	Wall Sections	
x	Existing conditions	<i>E(x)isting conditions</i>
y	Electrical	<i>Electricit(y)</i>
z	Reference	<i>Cro(z) reference</i> ^A Z _A

Representation – Scale plotted scale, numbers

Scale	Description	Notes
1	1:1	
2	1:2	
5	1:5	
10	1:10	
100	1:100	
1000	1:1000	
10000	1:10,000	
etc.		

Graphic – colour plotted colour, 3 numbers

Colour.	Description	Notes
000	Dummy – has no meaning	use if line-type and/or pen. wt. included
001	red	
002	yellow	
003	green	
004	cyan	
005	blue	
006	magenta	
007	black (or white)	
008	gray	
↓		
255	Light gray	

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Graphic – line type

plotted line width, 2 letters, 1st letter linetype,
2nd letter scale of linetype

Linetype	Description	Notes
l	continuous Line	
d	dashed	
h	hidden	
p	phantom	
b	border	
t	dot	
c	centre	
v	divide	
a	dash-dot	
Linetype Scale	Description	Notes
s	standard	
d	Double size	
f	four times size	
e	Eight times	
h	Half size	
q	quarter size	
t	Oct (eighth) size	
ls	Dummy – continuous line standard scale	Use if pen wt. included

Graphic – pen wt

plotted line width, 1 number

Pen Wt.	Description	Notes
0 (zero)	Not plotted	
1	Thinnest width	0.10 mm
2	↑	0.13 mm
3		0.18 mm
4		0.25 mm
5		0.35 mm
6		0.5 mm
7		0.7 mm
8	↓	1.0 mm
9	Thickest width	2.0 mm

Appendix C – Wildcard Table

Wildcard Table Legend

A	an alphabetical character (A to Z)
N	a number (0 to 9)
* (asterisk)	Matches any character sequence, including an empty one, and it can be used anywhere in the search pattern: at the beginning, middle, or end
# (pound)	Matches any single number
@ (at)	Matches any single alphabetic character
? (question mark)	Matches any single character

Wildcard Table - to list all layers with a particular field:-

FIELD	WILDCARD	NOTES
discipline	A*!* or A*	use ! (exclamation) if some layers DON'T have Discipline field.
stage	@N*!* or @N*	use ! (exclamation) if some layers DON'T have Stage field.
location	*_AAAA*	can include numbers
element	*!AAAA* or AAAA*	*! (exclamation) optional if Discipline, Stage & Location not used.
material	*-AAAA*	can include numbers
status	*+N*	
owner	*+#AA*	
type	*\$A*	
scale	*\$@NN*	
colour	*%NNN*	
line type	*%###AA*	
pen	*%###@@N	

e.g.	*WALL*	all walls
	ANNO	all annotation
	+0	all layers not plotted
	\$C	all layers that appear only on reflected ceiling

Appendix D – Glossary

AEC		Architectural, Engineering, Construction. Used to describe the industry.
Annotation		parts of a drawing that describe the building model. Typically notes, dimensions, cross references, amendments.
Associative		When a computer object is associated with other objects, and relies on that relationship for it's functionality. Typically dimensions associated with the objects they dimension.
CIM		CAD Information Model
CAD		Computer Aided Drafting
Entities		A single identifiable object within a computer files (e.g. a line, text). Sometimes called <i>Objects</i> .
External Links		The linking of one file into another so it is visible and accessible to varying degrees. Sometimes called <i>External References</i> .
External References		The linking of one file into another so it is visible and accessible to varying degrees. Sometimes called <i>External Links</i> .
Layer		An attribute attached to an object in a computer file that allows for an arbitrary value. Objects with the same layer value can be manipulated together.
Object		A single identifiable (i.e. selectable) object within a computer files (e.g. a line, text, a block). Sometimes called <i>Entities</i> , although entities usually refer to primitive objects like lines, circles etc. In some software complex collections of objects can be identified as a single object (e.g. door, window, wall).
Object Orientated		Software that combines digital information into groupings called objects, and can manipulate these objects.