



CAD STANDARDS Version 2

VENUE AND PRODUCTION DRAWINGS

Based upon the European Draughting Standards
For
Technical Communication in Theatres (TCT)
Version 14C

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1 Lines

Clear use of different line forms, widths and colours can help convey extra meaning. Standardisation of line forms and weights is important to establish a logical hierarchy within the drawing, leading the reader automatically to the most important information

Each line is made of two variable parts









Its form (dotted, dashed, continuous etc.)

It's width or weight.

These elements combined form a Line Style.

Line Styles for most commonly occurring situations are defined in the following sections.

1.01	Line Form
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	Continuous
	Long Dash (ISO 03W100)
	Short Dash (ISO 02W100)
	Dotted (ISO 07W100)
	Datum (PHANTOM)
	Centre (ISO 08W100)
	Phantom (ISO 12W100)
	Track (TRACKS)

It is recommended that the above line forms are used wherever possible and that their proportions are maintained to be close to above.






The AutoCAD LineType names are in parentheses; where possible we have tried to use ISO Standard LineTypes.

The recommended Line Widths are shown below. It should be emphasised that these widths are the widths of the Lines when plotted. When using Line Widths it may be necessary to adjust their Settings so that they are shown realistically onscreen. Once set Line Widths do not need to be displayed unless required. LWT should be set to Off in electronically exchanged Drawing Files

Line Width by Common Scales

	1:100	1:50	1:25
Ultra Thin	0.12	0.18	0.25
Thin	0.18	0.25	0.35
Medium	0.25	0.35	0.50
Thick	0.35	0.50	0.70
Ultra Thick	0.50	0.70	1.00

It is recommended that the above line forms and widths are used wherever possible. Other line forms and or widths should only be used if they help clarify a drawing. In such cases new Line Styles should be noted on a Legend.

	Ultra Thin LWT .25
	Thin LWT .35
	Medium LWT .50
	Thick LWT .70
	Ultra Thick LWT 1.0

Definitive Line Styles (Pre set combinations of Form and Width)

1.03	Border Lines
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Drawing Border; Title Block; Drawing Division; Notation Box

An Ultra Thick Single Continuous Line

1.04	Drawing Lines
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Edge Line

An Ultra Thick Single Continuous Line

Major Structural Information between Floor Level and +1800mm

A Thick Continuous Line

Minor Structural Information between Floor Level and +1800mm

A Medium Continuous Line

Detail Below Floor Level

A Thin Short Dashed Line

Permanent Features above +1800mm

A Medium Long Dashed Line

Non-Permanent Features above +1800mm

A Thin Long Dashed Line

Hidden Detail

A Medium Short Dashed Line

1.05	Reference Lines
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Stage Centre; Setting and Datum Lines

A Thin Datum Style Line with additions of CL, SL and DL as necessary

Centre, Axis and Loci Lines

A Thin Centre Line

1.06	Other Lines
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Break Line

A Thin Continuous Line with a 'break' symbol placed at the Midpoint

Phantom Line

A Thin Phantom Line used to show Adjacent Parts or Alternate positions

1.07	Other Objects
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Objects with thickness such as LX Bars etc should be drawn full size to show the space they take up.

Polylines should be used to represent such items, with LineTypes as appropriate, according to position. Polylines are not affected by any LineWidth settings.

Standard Line Styles

<p>Ultra Thick (1.0mm) Continuous</p> <hr style="border: 2px solid black;"/> <p>Ultra Thick (1.0mm) Continuous</p> <hr style="border: 2px solid black;"/> <p>Thick (.7mm) Continuous</p> <hr style="border: 1.5px solid black;"/> <p>Medium (.5mm) Continuous</p> <hr style="border: 1px solid black;"/> <p>Thin (.35mm) Short Dash</p> <hr style="border: 1px dashed black;"/> <p>Medium(.5mm) Long Dash</p> <hr style="border: 1px dashed 2px black;"/> <p>Thin (.35mm) Long Dash</p> <hr style="border: 1px dashed 1px black;"/> <p>Medium (.5mm) Short Dash</p> <hr style="border: 1px dashed 1px black;"/> <p>Thin(.35mm) Datum</p> <hr style="border: 1px dashed 1px black;"/> <p>Thin (.35mm) Centre</p> <hr style="border: 1px dashed 1px black;"/> <p>Thin(.35mm) Continuous</p> <hr style="border: 1px solid black;"/> <p>Thin (.35mm) Continuous</p> <hr style="border: 1px solid black;"/>	<p>Border Line: Drawing Border, Title Block Drawing Division, Notation Box Edge Line</p> <p>Major Structural Information between Floor Level and +1800mm Minor Structural Information between Floor Level and +1800mm Detail below Floor Level</p> <p>Permanant Features above 1800mm</p> <p>Non-Permanant Features above 1800mm</p> <p>Hidden Detail</p> <p>Stage Centre, Setting and Datum Lines</p> <p>Centre, Axis and Loci Lines</p> <p>Break Line</p> <p>Phantom Line: Adjacent Part or Alternate Position</p>
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Outline of a Filled Area

A Thick Continuous Line

Outline of an Unfilled Area (An Area too large to Fill)

An Ultra Thick Continuous Line

Area Fill (Cross Hatch)

Thin, Uniformly spaced Diagonal (45°) Continuous Lines

Area Fill (Material)

A Hatch representing the Material used

Sectional Fill (Area too small to use other Fills)

Solid Fill



Hatching: Area Fill (Cross Hatch)
Outlines of filled area - A Thick, Continuous Line
Hatching ANSI 31



Hatching: Area Fill (Material)
Outlines of filled area - A Thin, Continuous Line
Hatching AR-CONC (Example only, Hatch as appropriate for material)



Hatching: Sectional Fill, Area too small for other Fills
Outlines of filled area - Any
Hatching SOLID

1.09

Movable Elements

Elements with more than one position such as Tormentors, Portal or LX Bridges or Orchestra Pit Lifts should be drawn in their 'Normal' position using the appropriate Standard Line Style. Minimum and Maximum extent of travel should be shown using a *Thin Phantom Line*

1.10

New Lines

It is acknowledged that on occasion, to aid clarity to a complex drawing, new Line Styles will be created. In such cases the definition of such Line Styles should be clearly marked on a Legend.

2 Text

2.01	Size
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Text can be divided into two types

Major Text Information that anyone using a drawing should note as of primary importance

Minor Text Less important information but nonetheless necessary to the understanding of a drawing.

The recommended heights of Text are as follows

Major Text

	1:100	1:50	1:25
Drawn Size (1:1)	200	200	200
Plotted Size	2mm	4mm	8mm

Minor Text

	1:100	1:50	1:25
Drawn Size (1:1)	100	100	100
Plotted Size	1mm	2mm	4mm

As can be seen from above it is not recommended that drawings containing important textual information are distributed plotted at 1:100.

2.02	Font
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A clear *sans serif* font should be used.

Arial, which this document is written in is recommended as the Standard font. In this case the TEXTFILL system variable should be set to On (1)

2.03	Language
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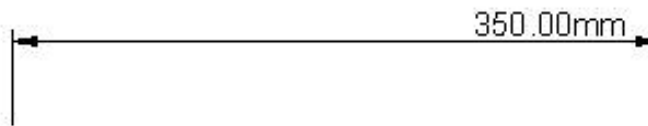
Text should be in English plus any other language. Each Language text should be on a separate Layer.

3 Dimensions

3.01	Dimension Lines
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Surveyed Reference Dimension

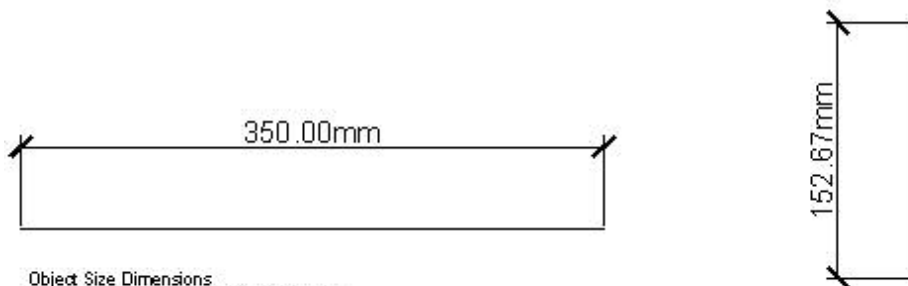
A Thin Continuous Line Terminating in Arrows with Thin Continuous Extension Lines. Text adjacent to an Arrow



Surveyed Reference Dimensions
Thin (.35mm) Continuous line terminated in an arrow at each end
Thin (.35mm) Continuous extension lines
Dimension Text located adjacent to an arrow

Object Size Dimension

A Thin Continuous Line Terminating in Ticks, with Thin Continuous Extension Lines. Text centre positioned above Horizontal Dimensions and to the Left of Vertical Dimensions



Object Size Dimensions
Thin (.35mm) Continuous extension lines
Thin (.35mm) Continuous line terminated in a tick at each end
Dimension Text located centrally on Horizontal Dimensions

Dimension Text located to the Left on Vertical Dimensions

3.02	Leaders
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Leader to the Outline of an Object

A Thin Continuous Line terminating in an Arrow

Leader to a Surface

A Thin Continuous Line terminating in a Dot



4 Layers

Layer Names should perform several functions, they should

- Indicate what type of information is contained on a Layer
- Allow for automatic grouping and sorting by software
- Allow for further expansion by the end user with the use of sub groups (Layer Families)

4.01	Layer Names (Parent Layers)
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0	
1	Basic
1A	Datum Line
2	Floor
3	Subfloor
4	Flying
5	LX
6	Sound & AV
7	Scenic Elements
8	Services
9	General Notes
<u>10</u>	<u>Effects: Pyro, Smoke Water etc</u>

4.02	Parent Layer Content
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<i>0</i>	This Layer is created automatically by some software and it cannot be deleted. Some software does not use layer "0" at all. Therefore it should only be used as a temporary layer (work in progress) if at all.
1 Basic	This layer contains the fundamental structural information required to establish if a set fits the space. Including sightline reference points from critical seats, FOH Building outlines, reference lines that all dimensions are taken from (Setting, Centre and Datum lines and their symbols
2 Floor	Details of traps, integral revolves etc. Alternative stage shapes and pit formats.
3 Subfloor	Details of the structure supporting the stage (showing areas to be avoided or considered when planning floor alterations or effects through the stage surface.)

- 4 Flying** Details of the flying system, bar ends and centres indicated, position of suspension centres, grid details, areas where motors can be rigged, access points etc.
- 5 LX** Permanent LX positions / rig details. Circuit outlets, numbering and types, position of dimmers. Follow spot positions and type, control room information.
- 6 Sound** Microphone and speaker positions and equipment information. Alternative operating positions. Cue light information. Video camera and monitor positions.
- 7 Scenic Elements** Items of Scenery, including temporary structures, floors, Stage extensions, flying pieces etc.
- 8 Services** Building services details, plumbing runs; “domestic” power runs, fire and security alarm details (sensors, sprinklers, hoses etc.)
- 9 General Notes** Optional layer for storage of notation (text). *Text in general should stay on the layer to which it relates*

4.03 Further Expansion of Layers (Child & Grandchild Layers)

The above layers represent how a Parent Layer structure should be created for a Library plan. If the end user wishes to add more information on further (Child) Layers the following protocol should be adopted.

Further information relating to Parent Layers is drawn on a Child Layer with a letter (suffix) following the original Parent Layer number and a brief description of the type of information.

Child Layers may be further subdivided into separate Layers so they can be switched on or off as required. All these ‘Grandchild’ Layers are given common Child Layer designators is Number/Letter with extra descriptions as appropriate. It should be noted that it might well be the case that no drawing elements exist on the Parent Layers but only on the Child or Grandchild Layers. Different shades of the Parent Layer Colour are shown to add definition as shown below.

Examples

4 Flying The Parent Layer

4 Flying - Text Text relating to the Parent Flying Layer

4a CW Bars Counter Weight Bars. This layer shows the bars full extent across the stage

4a CW Bars@CL This shows a short section of the bar on the Centre Line for indicative Purposes

4a CW Bars@Ends This shows a short section of the bar at the Extreme Bar Ends for indicative Purposes

4a CW Bars@Gallery This shows a short section of the bar at the Gallery side that the flies are operated from. These would be next to the Hanging Plot List.

4.04	Layer Colours
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Colours have been assigned to Layers in order that anyone opening a new drawing will have immediate references to work with.

The basic colours assigned to the Parent Layers are as follows

Layer	Title	Colour	Use for
1	Basic	White/Black	Building Structure
1A	Datum	Yellow	Setting & Centre Line
2	Floor	Grey 8	Floor/Revolves etc
3	Subfloor	Red	Basement Detail etc
4	Flying	Green	Bar Positions etc
5	LX	Cyan	LX Information
6	Sound & AV	Blue	Sound Information
7	Scenic	<i>Not assigned</i>	Scenery etc
8	Services	Magenta	Ring Mains, Water etc
9	General Notes	White/Black	General Notes

Colours for Child/Grand Child Layers should use shades of the Parent Layer colour to differentiate.

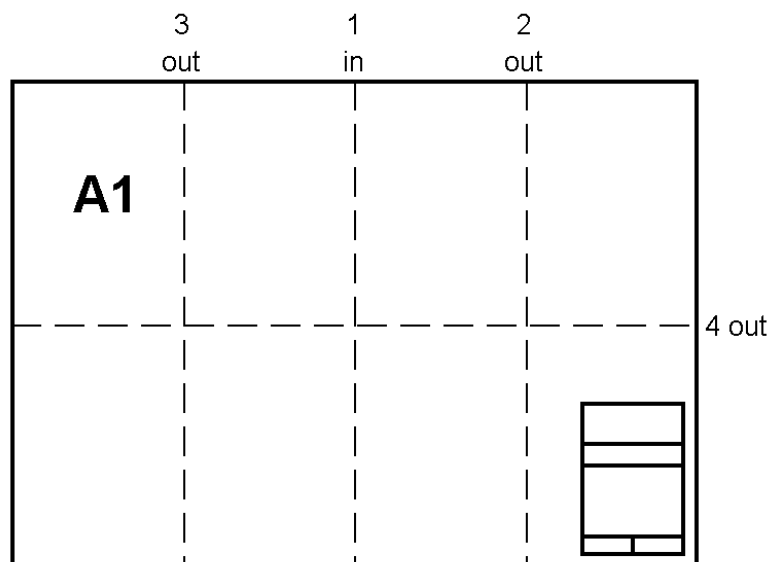
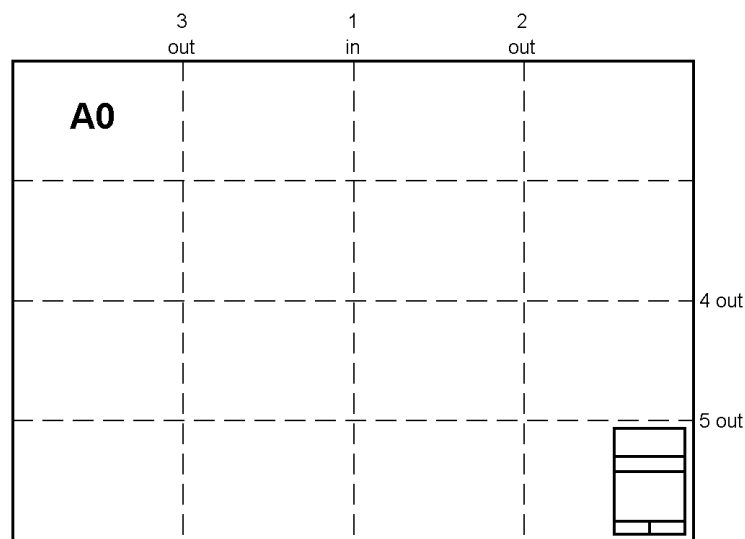
An example of a typical Layer Family is shown below.

4 Flying			 Green	CONTINUOUS	Parent Layers	
4 Flying - Text			 Green	CONTINUOUS		
4a CW Bars			 76	CONTINUOUS		Child Layers
4a CW Bars - Ends			 76	CONTINUOUS		
4a CW Bars@ CL			 76	CONTINUOUS		
4a CW Bars@ Gallery			 76	CONTINUOUS		

5 Title Blocks

5.01 Position and Construction

The title block should be positioned, where possible, at the bottom right-hand corner of the sheet, so that when the plan is drawer stored, or folded appropriately, **the title and number are always clearly visible**. Figure shows the recommended method of folding A0 and A1 size sheets.



The position of the title block should only be changed in exceptional circumstances, if for example the drawings are always stored in a hanging rack. The title and number should still remain clearly visible when the drawing

is folded. The title block will therefore always be positioned in a drawing corner.

It is sometimes useful if the line marking the left-hand edge of the title panel continues up for the full extent of the sheet, since this reserves a strip along the side of the sheet for the addition of notes, revisions, etc.

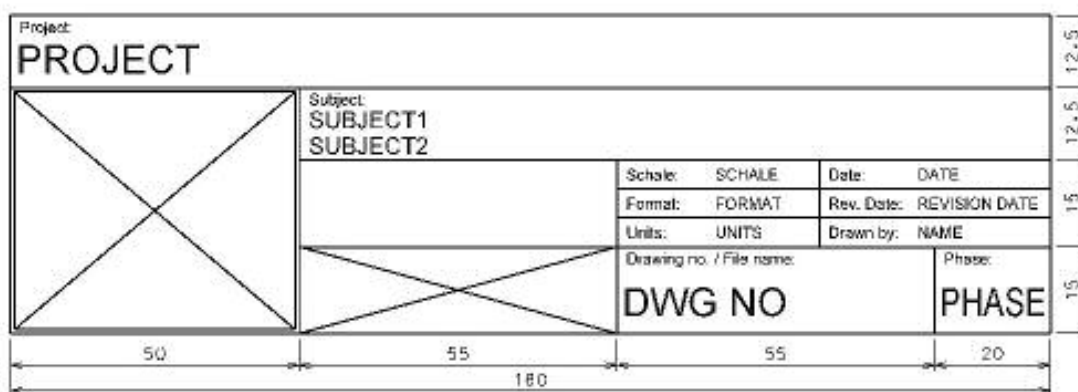
Line and text widths and layout within the title block should be chosen for greatest clarity. See sections 5 and 6 for Line Weight and Text details.

5.02	Essential Information – Title Blocks
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Sample Title Blocks

Revisions :	
Date :	Description :

Company		Production Office Any Street TOWN, A1 2BC Tel: 0123 45678 Fax: 0123 45679 po@company.org
Theatre Royal		
The Greatest Show on Earth		
GroundPlan Act 2, Sc.3		
Scale :	Date :	Drawn By :



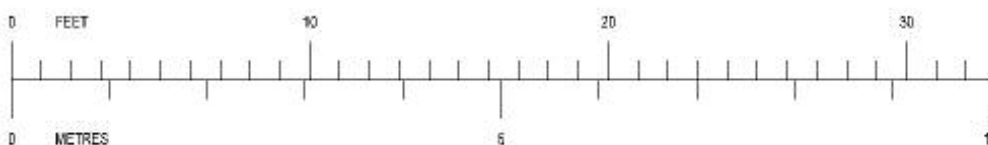
5.03 Optional Information – Notation Box

The Notation Box may carry further information, such as the venue logo, the project designer (director, lighting designer). The name of the producing company; the name of the person preparing and checking the drawing, job reference, essential stage information, software used to produce the drawing, etc.

5.04 Scale Bar

It is recommended that a scale indicator be included in the drawing, to enable both the checking of plan print accuracy, and rough scaling on site without need for a scale rule.

The scale bar should be drawn 1:1 and placed outside the title block, to allow for prints in different scales.



5.05	Legend
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The use of a Legend is necessary to define the meaning of non-standard symbols, line types (and line widths) contained in the drawing.

If the drawing conforms to the Standards laid down in this document, it is not necessary to include a Legend if the following phrase is clearly visible:

**This drawing has been prepared in accordance with the ABTT
CAD Standards for Theatre Groundplans and Sections.**

Unless non standard Line Styles etc are used.

5.06	Other Information – Notation Box
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Any other relevant information such as vital Dimensions, SWLs of Flying units etc should be contained in a Box, placed outside the Theatre Walls on the Drawing. The bottom left hand corner is recommended for such an item.

The Border of the box should be in accordance with the Standard Line Styles.

5.07	Hanging Plot List
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A Hanging plot list should be drawn preferably outside the theatre walls or otherwise at a convenient place.

BAR	DIST	CONTENT	WEIGHT
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- Use “H” to indicate that a fly is a manually operated Hemp Line
- Use “CW” to indicate that a fly is manually operated Counter Weight Line
- Use “M” to indicate that a fly is Motorised
- Use “C” to indicate that a fly is Computer controlled
- Use “W” to indicate a manually operated Winch

BAR	DIST	CONTENT	WEIGHT
W 42	+10500		
CW 41	+10250	CYC	175Kg
H 40	+10000		
CW 39	+9750		
CW 38	+9500		
CW 37	+9250		
M 36	+9000		

6 Drawing Border

Electronic Library plans do not include a border because of the various plot formats that may eventually be used. Separate Templates in most programs' libraries contain approved borders for the standard ISO 'A' format paper sizes.

Printed plans, where possible, should always include a border. The border should be kept simple and clear. The choice of continuous line of ultra thick line weight is recommended in keeping with section 5.

In UK Theatre practice 1:25 and 1:50 are the most commonly used scales, 1:75 or 1:100 are also used. Apart from these scales, plots should be at ISO scales 1:10, 1:20, 1:50 or 1:100 etc.

Some programs using 'PaperSpace' to plot from automatically produce a Border as part of the process. Where possible this borders width should be in accordance with the Standard, i.e. an Ultra Thick Continuous Line.

A border is strongly recommended as a way to ensure that the complete drawing is contained within the media it is finally presented in.

7 3 Dimensional Drawings

3 Dimensional drawing is usually done using a combination of Solids, and Meshes. This stage is known as the Wireframe.

These drawings can then have photorealistic surfaces added to them and Rendered to produce realistic looking images.

3 Dimensional Elements of a drawing should take on the approximate properties of the materials they are representing. Many programs allow the applying of Texture or Materials based on bitmaps to the 3D entities.

In terms of Layer control, 3D drawing of the Wireframe should follow the Parent/Child hierarchy outlined above within the current Layering protocol.

In some programs, a separate layer is not required to display a separate colour for 3 D Objects. In such cases, it is for the user to decide upon the creation of extra layers or not.

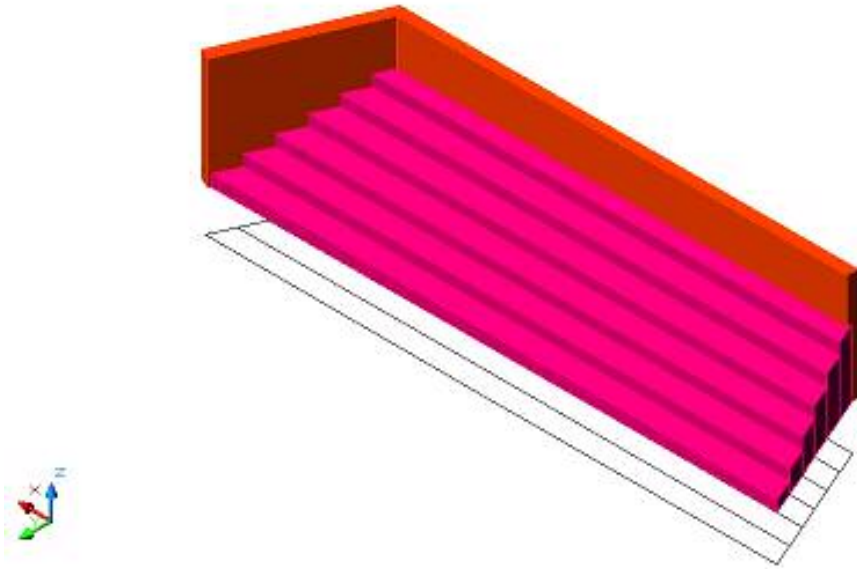
In that 3Dimensional drawings are representative of real life solid objects, Linetypes and Line Widths may be ignored and all Wireframes should be constructed in Continuous lines

Extra layers are not required for the Materials or Textures of a Rendered drawing.

Example



Simple Auditorium Plan - Layer 1f Auditorium Colour - Black



Auditorium with 3D Elements added (Shown above Plan for clarity)
Layer 1f 3D Auditorium - Colours as per decorative finishes

Compiled by Steve Green - Scottish Opera
David Ripley - cad4theatre

Version 2 Additions by David Ripley – cad4theatre

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