CITT Theatre Drafting and Information Exchange Standards for CAD

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The original document on which these standards are based was written by and for users of CAD within the broad "Theatre Industry", including Designers, Production Managers, Construction Managers, draftsmen and commercial scenic contractors members of the Association of British Theatre Technicians (ABTT) who have generously agreed to allow us to modify them for use in the context of the Canadian "Theatre Industry". The need for these Canadian standards grew from the requirement of the Facilities Database, as sponsored by the Canada Council and piloted by CITT and CultureNet, to attach CAD files to the Technical Surveys available on the web site of the project. We would hope that they are accepted at large and continue to evolve with the Facilities Database Project.

Introduction

These standards are a reflection of the growing use of CAD within the industry and a desire from users for a common language through which to exchange mutually beneficial information.

Whilst some specifics relate purely to CAD they are also designed to be suitable guidelines for hand drawn paper drafting.

No mention of specific software is made. The standards are designed where possible to be applicable to most available CAD programmes.

This document deals with standards relating to the production of Venue Plans and Sections. It is intended that later additions will deal with LX plans, Design, Workshop, and 3 dimensional drawings.

These standards are provided to enable those in the theatre industry using CAD to exchange information in a common language. It does not prohibit the development of in-house practices for specific areas covered, but does provide a framework within which in-house practices could be developed.

The validity of exchanged CAD drawings is of paramount importance. This standard sets out what information should be presented and how. It also provides for a classification of drawings so the recipient is aware of what the drawing contains as well as the accuracy of the information.

It is assumed that (at this stage) all drafting will be in 2 dimensions, drawn on the computer at 1:1 (full scale), and plotted at an appropriate scale.

1 XYZ Grid

The Theatre industry has it's own unique language, CAD also has it's own language. It is important that the use of both languages is standardised where they cross over.

Common theatre practice when setting out is to refer dimensions back to two reference lines commonly known as the "centre line" and the "zero line". Both these lines are usually marked on the stage surface.

The zero line is usually defined as a line parallel to the front of the stage, and at a convenient position up and down stage so to allow the clear setting of a floor cloth or front wall of a set. In most cases the Zero line is on the upstage side of the proscenium, either the upstage surface of the plaster / brick structure or the upstage surface of the fire pocket (if there is one).

The Centre line is usually obtained by bisecting the proscenium and projecting a line from this point upstage and perpendicular to the front of the stage (or the Zero line).

An integral part of all CAD programmes is the use of an invisible 3 dimensional grid. Each direction within the grid is described by a letter, X, Y, or Z. All dimensions and relative positions are defined in relation to the grid. It is important therefore when surveying and eventually drawing to define where the imaginary grid is placed within the theatre and it's relative position to the traditional setting and centre lines.

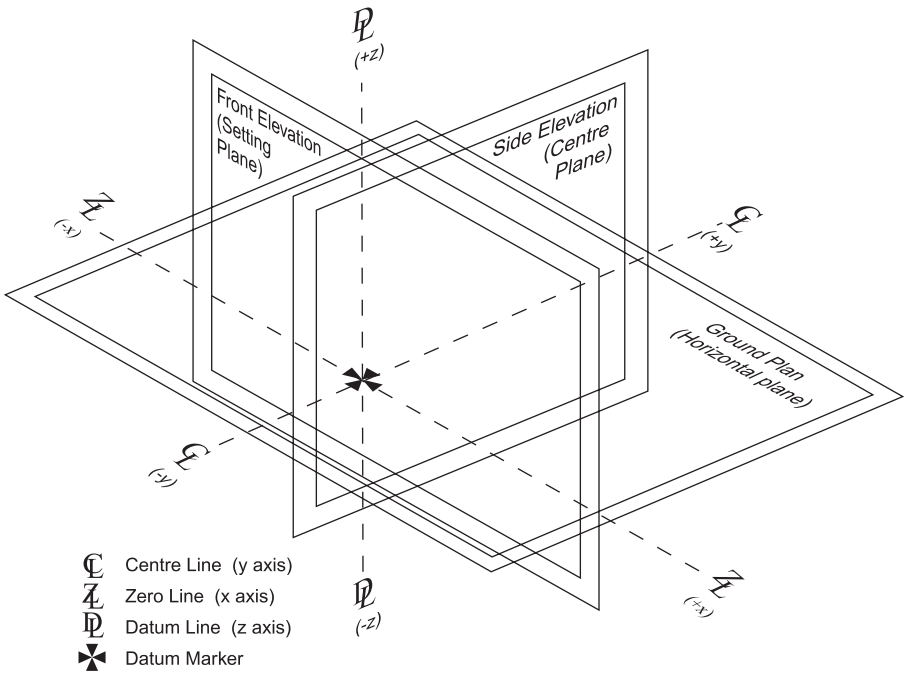


Figure 1.1

1.01 The Plan

The first point and probably the most important to understand is that a "plan" is not an aerial view of the stage. It is a common mistake to assume that if the roof (and grid) of a theatre were removed and you were able to hover overhead, what you would see would be a plan. In pure technical drawing using orthographic projection this would be true, but a drawing of this nature would not be very useful. It would focus on the equipment in the foreground, (fly bars, flown scenery etc.) and obscure the information we are more interested in, which mostly relates to the floor.

Instead what we consider to be a "plan" is actually a horizontal section through the building, with an indication of what lies above as well as below the section plane. Imagine a scanning laser mounted on a tripod at eye level projecting horizontally in all directions, or imagine the entire area filled with water up to eye level. The line created against the wall by the laser or by the water, is the shape of the wall that you should draw in a plan.

Best practice dictates that the section should be taken at 1.8m above the floor, or to be more precise above the 'horizontal plane". NB the floor is the "horizontal plane" unless it is raked. By taking the section at this level it will generally incorporate all doors, windows, wall mounted equipment, etc. Obviously no one position for this will be best suited for all buildings. It is important though to standardise so everyone reading a drawing understands what they are looking at.

A plan view of the stage uses X and Y co-ordinates. X relates to across the stage and Y to up and down the stage.

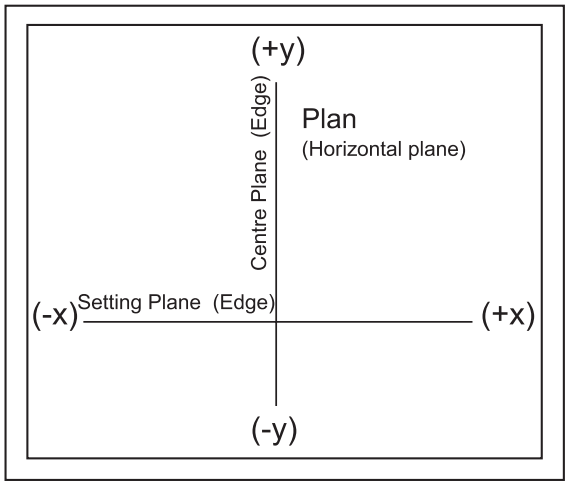


Figure 1.2

1.02 Section

A "section" is the general term used to describe the view if you were to cut the theatre in half along the centre Line. This is partly true. As with the Plan it is important to show not only what is in front of you but also what is behind. You will see later that different line types are used to denote what is in front of the view point from what is behind.

The traditional section is taken from Stage left (fig 1.3). Using this view point everything to the right is upstage and the audience is seated on the left. This view will be adopted as the CITT standard. A facility may chose to also produce a reverse section to show information that is substantially different from the standard section and is judged essential to the proper understanding of the physical constraints or technical infrastructure of the facility.

A sectional view (longitudinal) of the stage and auditorium will use the Y co-ordinate for up and down the stage and the Z co-ordinate for vertical measurements.

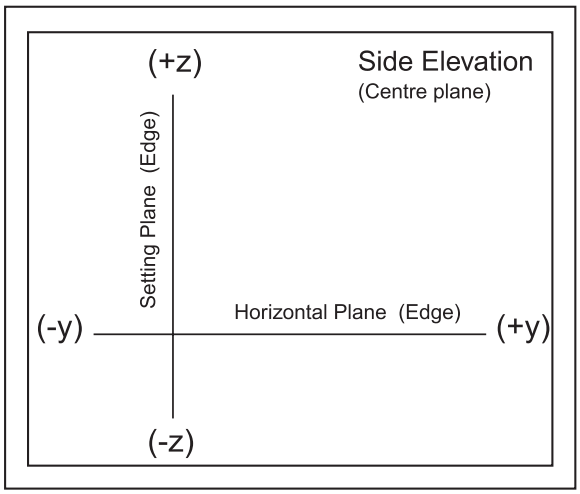


Figure 1.3

A section taken across the stage from side to side (parallel to the proscenium) may be useful to show in more detail the heights of flyfloors.

Other sections may be required for open stage venues, the use of additional sections should be to add clarity to existing information.

2. Surveying

New section relating to good practice for surveying setting out:

Reference line
Tolerances
Illustrations

The CITT team in its initial standardisation of Facilities Existing Plans has noted that many discrepancies exist in the plans that are presumed to be accurate by the facilities staff. These discrepancies often result from the origin of the plans that were from the initial construction set and have never been issued as "As Built".

We encourage facilities staff to review the following key measurements until their plans can be submitted to a full standardisation:

a. Proscenium opening
b. Centre line positioning
c. Zero line positioning
d. Depth of stage from Zero line to back wall from SL proscenium opening
e. Depth of stage from Zero line to back wall from SR proscenium opening
f. Spacing of fly pipes
g. Maximum flying height to stage floor
h. Location of any obstructions (beams, staircases, electrical panels, doors etc.) that may not be shown on existing plans
i. Width and height of loading doors

3. Key Measurements

The dimensioning of venues is standardised to follow the CAD practice of using an XYZ grid. Good practice requires that each venue surveyed must have reference plates set into permanent areas of the stage surface and walls that would allow surveys to be replicated from exactly the same point.

All dimensioning should therefore where practical originate from one of these three axis or lines, they are referred to as:

3.01 The Zero line. X-axis

This is a straight line across the stage and on its surface, where possible against the upstage face of the fire curtain pocket or similar most downstage obstruction.

3.02 The Centre line. Y-axis

This is a straight line running up and down stage bisecting the proscenium and at right angles to the zero line. *NB if the stage is flat the centre line will lie on the stage surface. If however the stage a raked the centre line will pass through and below the stage surface so as to remain on the "Horizontal Plane".*

3.03 The Datum Line. Z axis

This is a straight vertical (plumb) line passing through the intersection of the Zero line and Centre lines. These three lines intersect at the DATUM POINT. This becomes the reference point for all other dimensions on the plan. In CAD terms - The Origin. (0,0,0)

The terminology Height, Width and Depth is standardised to mean the following:

3.04 Height

A points vertical position measured from the 0 point on the horizontal plane. With a flat stage, this can be measured from any point on the stage surface.

3.05 Width

A points horizontal dimension measured along or parallel to the Zero line (across the stage).

3.06 Depth

A points horizontal dimension measured along or parallel to the centre line(up and down stage).

N.B. Care should be taken in describing a dimension relating for example, the size of cloth as being 8m metres high or 'a drop of' not 8m deep, or to describing the size of a pit as being 2m below the stage (negative height) not 2m deep.

3.07 Dimensional Information

The following list (fig.3.07) contains the key measurements required to provide a proper understanding of the structure and mechanics of the "typical proscenium theatre". It should be used as a guide to indicate the range of information required when dealing with theatres in the round, studio spaces etc. These venues will require a unique list of information as appropriate.

It is not intended to illustrate the scope of a survey required to produce a full drawing. A full survey will involve many more measurements being taken.

TBD

For a drawing to meet the agreed standard all the dimensions listed must have been checked on site by an appointed person and given in mm. Additionally, converted dimensions should be shown on the appropriate layer in Imperial measurements.

Because of the potential for confusion with the use of SL and SR when the plans are viewed by international readers, these indications will appear on the proper layer with a note to the reader as well as common international equivalents (i.e.: British - OP / PS; French - Côté Cour / Côté Jardin etc.)

Explanation of "clearance line" to follow.

Key Measurements

Shown on plan	*Meausurement from*	*To*	*Dimension (mm)*
√	Zero plane	Front of stage	
√	Zero plane	Clearance line Upstage	
	Zero plane	DS of false proscenium	
	Zero plane	US of false proscenium	
	Zero plane	DS of permanent bridge	
	Zero plane	US of permanent bridge	
	Zero plane	DS of pit opening on CL	
	Zero plane	US of pit opening on CL	
	Zero plane	Rear of pit	
	Zero plane	US of Proscenium	
	Zero plane	DS of Proscenium	
	Zero plane	DS of Fire Curtain	
	Zero plane	US of Fire Curtain	
	Zero plane	DS of trapable areas	
	Zero plane	US of trapable areas	
√	Center Plane	Clearance off SL loading gallery	
√	Center Plane	Clearance off SR loading gallery	
	Center Plane	SL wing wall	
	Center Plane	SR wing wall	
√	Center Plane	Clearance line on SL wall	
√	Center Plane	Clearance line on SR wall	
	Center Plane	False proscenium opening width (max) SL	
	Center Plane	False proscenium opening width (max) SR	
	Center Plane	False proscenium opening width (min) SL	
	Center Plane	False proscenium opening width (min) SR	
	Center Plane	SL pit wall	
	Center Plane	SR pit wall	
	Center Plane	SL forestage	
	Center Plane	SR forestage	
	Center Plane	SL Proscenium	
	Center Plane	SR Proscenium	
	Center Plane	SL of trapable area	
	Center Plane	SR of trapable area	
√	Horizontal Plane	Clearance under SL loading gallery	
√	Horizontal Plane	Clearance under SR loading gallery	
	Horizontal Plane	Clearance under any bridges or obstructions	
	Horizontal Plane	Grid surface (top face)	
	Horizontal Plane	Clearance under grid	

Figure 3.07

4. Lines

Clear use of different line forms, widths and colours can help convey extra meaning. Most printing however and hard-copy output work is currently done in black and white. The use of colour should be restricted to "on screen".

These standards will therefore not deal with the issue of line colour at output.

Standardisation of line form and weights is important to establish a logical hierarchy within the drawing, leading the reader automatically to the most important information. Some programmes allow far different line weights to be shown on screen other programmes do not apply the line weight until the drawing is plotted out. In this instance it is important for the end user to understand how the plot should be configured. This information should be contained within the drawing on the appropriate layer as a "plot information panel".

Each line is made of two variable parts:

Its form (dotted, dashed, continuous etc.)
Its width or weight.

More work required to look at various software problems, this might point towards needing to standardise colours on screen to denote differing line weights.

Line forms and widths for most commonly occurring situations are defined in the following sections.

4.01 Line Form

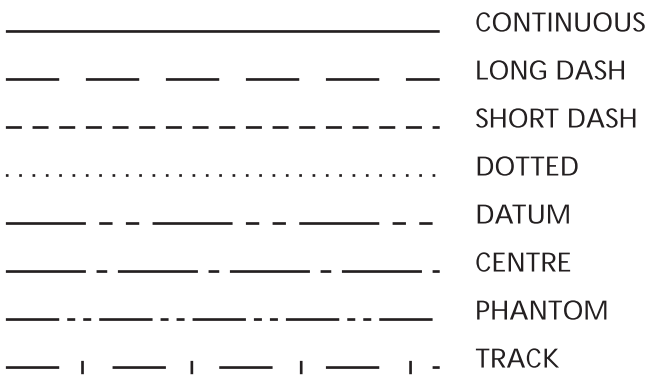


Figure 4.01

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

4.02 Line Widths (weight)

The recommended line widths are shown in Figure 4.2 below;

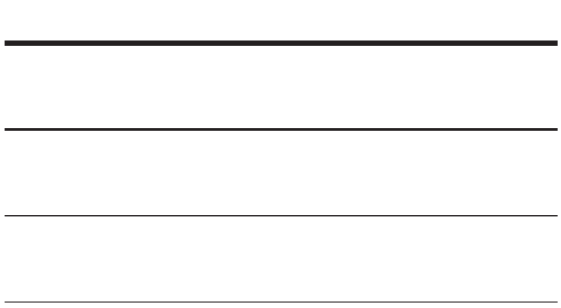


Figure 4.2

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.

4.03 Definitive Lines *(pre set combination of form and weight)*

4.03.01 Border Lines

Drawing Border	An Ultra thick single continuous line.
Title block	An Ultra thick single continuous line
Drawing Division	An Ultra, thick single continuous line
Notation Box	An Ultra thick single continuous line

4.03.02 Drawing Lines

Edge Line	An Ultra thick single continuous line
Major structural information between floor level and 1 1.8m	A thick continuous line
Minor Structural information between floor level and +.8m	A medium continuous line
Detail below Floor level	A thin dashed line.
Permanent features above +1.8m	A medium long dashed /line
Non-permanent features above +1.8m	A thin long dashed /line
Hidden detail	A medium dashed line

4.03.03 References Lines

Stage Centre, Zero and Datum lines	A thin datum style line with additions of the CL, ZL or DL symbol as necessary
Centre, Axis and Loci Lines	A thin centre line.

4.03.04 Leaders

Leader to an outline pointing to the referenced outline.	A thin continuous line terminated in an arrow
Leader to a surface	A thin continuous line and terminated In a dot on the referenced surface.

4.03.05 Dimension Lines

Surveyed reference dimension (3.07)	A thin continuous line terminated in an arrow with thin continuous extension lines. Text adjacent to an arrow.
Size Dimension	A thin continuous line terminated in a tick at each end between thin continuous extension line. Text centre, positioned above horizontal dimensions and to left of vertical dimensions.

4.03.06 Fill Lines

Outlines to filled area	A thick continuous line.
Outline to unfilled area (Area too large to fill)	An ultra-thick continuous line.
Area fill (Cross Hatch)	Thin, uniformly spaced diagonal continuous lines.
Area Fill (Material)	Other standard section lining patterns may be used to differentiate materials as required. These should be defined in the drawing Legend and should be in thin line width.
Sectional Fill (Area too small or thin for Cross Hatch or Material Fill)	Filled solid of proper scale thickness. (variation from scale are acceptable if required for clarity, but must be accompanied by an appropriate note).

4.03.07 Other Lines

Break Line	A thin continuous line with 'break' symbol centrally placed
Phantom Line	A thin phantom line for use in adjacent part, alternate position, of repeated feature

4.04 New Line types/ Widths

It is recognised that there will be times when the draftsperson wishes to represent information differently. This will fall into the of two categories:

New application, existing line type: A new application can be assigned to an existing defined line type, from Figure 4.01 as long as the meaning is clear.

New application, new line type: A new line type can be created. It should be similar in scale to those defined in figure 4.10 its use should be clearly stated. For example, substitution of hy(1/4) in place of t in the track line type, to create a line type for 1/4" hydraulic hose.

In any deviation from the above specifications, it is essential that the new line types end applications are presented in a clear Legend on every drawing in which they are used.

5. Text

TBD

5.01 Size

Text should be sized to print out at 2mm high. The default scale for printing CITT library theatre plan is 1:50. Therefore on these plans an actual text height of 2x50 = 100mm should be used.

5.02 Font

A clear sans serif typeface should be used. Where possible a standard aspect ratio of 3:2 (height:width) should be observed for lettering.

For clarity, text (notes and dimensions) should be kept to the finest recommended pen size appropriate. This will help distinguish annotation from drawing.

TBD

Recommended fonts are obtainable from the Plan Library.

6. Layer Naming

Layer/ Level names should perform several functions, they should

- indicate what type of information is contained in the layer.
- Allow for automatic grouping and sorting by software.
- Allow/ for further expansion by end user with the use of sub-groups.

6.01 Layer Names

0	Not used
01	Basic
01R	Reference Lines
01E	Basic text English
01F	Basic text Français
01BF	Basic fills
02	Floor
03	Subfloor
04	Flying
05	House and sightlines
06	LX
07	Sound/AV
08	Not yet defined
09	Services
10E	English GenNotes
10F	Notes Générales Français
11E	Title Block Imperial (Full Size)
11M	Title Block Metric (Full Size)
12	Layer Key and Plotting Notes

6.02 Layer Content

0

This layer is created automatically by some soft ware, 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)

01-Basic

This layer contains the fundamental structural information required to establish if a set fits the space as well as doors and other openings onto the performance area.

01R-Reference Lines

Reference lines that all dimensions are taken from (Zero, Centre and Datum lines and their symbols). This is kept on a distinct layer so as to allow for quick overlay to another facility by matching up common reference points.

01E-Basic text English

Text relating to the basic layer in English placed so as to not overlay the French text of layer 01F since it may be required to show both languages at the same time.

01F-Basic text Français

Text relating to the basic layer in French placed so as to not overlay the English text of layer 01C since it may be required to show both languages at the same time.

01BF-Basic fills

Hatched and filled areas relating to the basic layer only, including seating layouts These are presentation aids not required when considering technical questions relating to a venue. Switching off these layers speeds up software performance.

02-Floor

Details of traps, integral revolves, etc. Alternative stage shapes and pit formats.

03-SubFloor

Details of the structure supporting the stage (showing areas to be avoided or considered when planning floor alteration or effects through the stage surface.)

04-Flying

Details of the flying system, bar ends and centres indicated, position or suspension centres, grid details, areas where motors can be rigged. access points, etc.

05-House and Sightlines

Seating layout with extreme sightline positions shown and identified, FOH building outlines.

06-LX

Permanent LX positions/rig details. Circuit outlets, numbering and types, position of dimmers. Follow spot positions and type, control room information.

07-Sound

Microphone and speaker positions and equipment information. Alternative operating positions. Cue light information. Video camera and monitor positions.

08-Not Yet Defined

For future use as may be required.

09-Services

Building services details, plumbing runs, "domestic" power runs, fire and security alarm details (sensors, sprinklers, hoses etc.)

10E-GenNotes English

Optional layer for storage of notation (text) in English. Text in general should stay on the layer to which it relates. Place text so as to not overlay 10a' notes since it may be required to show both languages at the same time.

10F-GenNotes Français

Optional layer for storage of notation (text) in French. Text in general should stay on the layer to which it relates. Place text so as to not overlay 10a notes since it may be required to show both languages at the same time.

11E-Title Block Metric (full size)

11F-Title Block Imperial (full size)

12-Layer Key and plotting notes in English and French

6.03 Further expansion of Layers

The above layers represent how a layer structure should be created for a Library plan If the end user wishes to add more information on further layers a similar protocol should be adopted as is used around layer 1.

Further information relating to already established layers is drawn on a layer with a letter (suffix) following the original parent layer number and a brief description of the type of information.

7.01 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.

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 numbers should still remain clearly visible when the drawing is folded. The title block will therefore always be positioned in a drawing corner.

Line and text widths and layout within the title block should be chosen for greatest clarity. See sections 2 and 4 for Line Weight and Text details.

Figure 7.01 shows the recommended format.

7.02 Essential Information: (Facilities plans)

Illustration of the title block to show inclusion of:

Name, address, telephone number, fax number and e-mail address of the issuing venue/ drawing office/ draftsperson
Name of the producing company (if necessary)
Title of the project/ show
Title of the drawing
Scale of the drawing
Date of the first issue
Reference, description, and dates of subsequent revisions.

7.03 Optional Information

The panel 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.

7.04 Scale Bar

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

7.05 Legend

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 CITT standards, laid down in this document. It is not necessary to include a legend if the title block disclaimer is clearly visible.

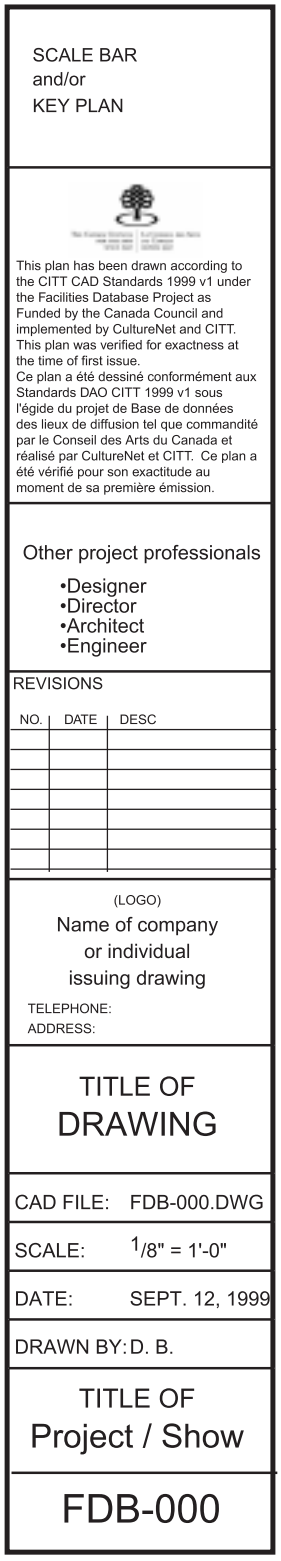


Fig 7.01

8. Drawing border

CITT library plans do not include a border because of the various plot formats that may eventually be used. Separate files in the library contain approved borders for the standard ??? **A format paper size. ???**

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 4.

9. Abbreviations

9.01 General

CL	Centre Line (of the stage in plan)
ZL	Zero Line (back of the iron where possible)
DL	Datum Line (Horizontal plane)
SL	Stage Left (actors viewpoint)
SR	Stage Right (actors viewpoint)
US	Up Stage
DS	Down Stage
onS	On Stage
offS	Off Stage
CO	Clear Opening
DIA	Diameter (of revolve for example)
RAD	Radius
CWT (SP) or SCWT	Single purchase counterweight
CWT (DP) or DCWT	Double purchase counterweight
HEMP	Direct flying bar on rope
FLYS	Area where the flying system is operated
SWL	Safe working light
WLL	Working load limit
DIM	Dimension
MAX	Maximum (dimensions)
MIN	Minimum (dimensions)
NTS	Not to scale (use given dimension only)
APPRX	Approximate
EST	Estimated (dimensions)
AVG	Average
VERT	Vertical
HOR	Horizontal
TYP	Typical
RP	Rear Projection Screen

9.02 Lighting and Sound

A	Ampere
KW	Kilowatt
V	Volt
kVA	Volt Amp Reactive

Ch	Channel
HW	Hard Wired
P	Patched
Hz	Hertz
AUX	Auxiliary
LX LDR	Vertical Lighting frame
2.4KW	2.4 Kilowatt (20A)outlet
6KW	6 Kilowatt (50A) outlet
IND	Independent circuit
ND	Non Dimable power outlet
POK	Floor pockets (in flooring)
LX	Lighting
ELEC	Electrical
FX	Sound
MIC	Microphone
SPKR	Loudspeaker
VID	Video
VID CAM	Video Camera
VID MON	Video Monitor

1O. Symbols

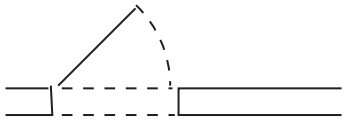
Symbols should be used to provide information and enhance the clarity of a drawing.

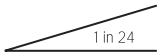
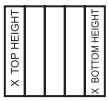
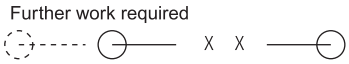
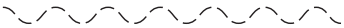
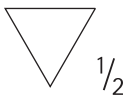
????(CITT, USITT, ABTT) standard symbols can be used without need for further annotations. all other symbols should be drawn from the appropriate standards or a full description given in the drawing legend.

Full/enhanced details should always be used in preference to symbolic representation where they add to the information provided on the drawing (e.g. full details of a door, its thickness and jamb section).

All symbols should be drawn with the appropriate line weight, style and level/layer structure.

Symbols for LX, Design and Construction drawings appear in later editions.

10.01	Break line Used to show foreshortened details (to fit on paper plot)	
10.02	Break line, Solids	
10.03	Break line, dimensions	
10.04	Size dimension	
10.05	Reference dimension (from ZL, CL, & DL)	
10.06	Centre Line Zero Line Datum Line	
	Datum Marker (physical mark on floor or wall used for setting out ZL, CL, & DL)	
10.07	Key Sightline (Seat number indicated)	
10.08	Spot position, Chain Hoist	
10.09	Spot position, Winch	
10.10	Spot position, Handline or Hemp	
10.11	Safety Curtain	
10.12	Door	
10.13	Opening	
10.14	Sliding Folding Door	

10.17	Ramp arrow points up	
10.18	Rake arrow points down rake	
10.19	Stairs steps of equal rise	
10.20	Stairs steps of unequal rise	
10.21	Stage Traps (modules)	
10.22	Fly Bar Showing overall length (indicated by circle centres) extension and suspension centres	
10.23	Drapes touching floor without fullness	
10.24	Drapes overhead without fullness	
10.25	Drapes touching floor with fullness	
10.26	Drapes overhead with fullness	
10.27	Legs on track	
10.29	Fire Point	
10.30	Hydraulic Power Point with bore dia.	
10.31	Pneumatic Power Point with bore dia.	

11. Facilities Database CAD Standardisation Criteria

Although the ABTT Ground Plan Library welcomes any venue Groundplans and Sections made available for the use of others. It operates an approval system in order to grades the quality of the information on record.

A drawing which is deemed to conform to the ABTT Standards by the originating draftsperson can be deemed unclassified (see 11.01).

If the drawing has been checked and found to conform by an ABTT approved examiner, but does not contain, or contains an incomplete key measurements file then it can be approved as Class B (see f ~.02).

If the drawing satisfies Class B requirements and contains a complete key measurements file then it can be approved by an ABTT approved examiner as Class A (see 11.03).

11.01 Drawing Unchecked

If the drawing has not been checked by an ABTT approved examiner, but conforms with the ABTT Standards contained in this document, the drawing should also carry the phrase:

Class C

The information contained is: unclassified

11.02 Drawing Checked (incomplete measurements)

If the drawing has been checked by an ABTT approved examiner and certified a class B information, the drawing should also carry the phrase:

Class B

Please Check that this is current issue with: ABTT CAD web master

11.03 Drawing checked (complete measurements)

If the drawing has been checked by an ABTT approved examiner and certified as class A information (defined section), the drawing may also carry the phrase:

Class A

The list of key measurements was surveyed and checked correct at the time of the last issue. Please check that this is a current issue with: ABTT CAD web master

11.04 Unknown classification

If a drawing contains none, or more than one of the phrases in 11.01, 11.02 or 11.03, it should be deemed to belong to category 11.01 - unclassified - until its classification can be verified.