



# CADD Manual

January 2011

## Contents

<b>Preface</b> .....	<b>4</b>
The Need for Management Standards .....	5
Adherence to the Standards .....	5
Modifications to the Standards .....	6
Use of Existing Files .....	6
<b>Chapter 1</b> .....	<b>7</b>
A&E CADD Directory Structure Diagram .....	8
File and Sheet Naming .....	8
Sheet Numbering Convention.....	9
File and Sheet Naming Sketches .....	11
Addenda .....	11
Bulletins.....	11
<b>Chapter 2</b> .....	<b>12</b>
Creating a New Drawing.....	13
Template Files .....	13
Standard Layouts from Sheet Template Files.....	13
Format Drawings.....	14
Accessing an SCA Titleblock via Layouts .....	14
Standard Title Sheets .....	15
Drawing Organization .....	17
Drawing Setup .....	17
Project Title Blocks .....	17
<b>Chapter 3</b> .....	<b>18</b>
Layer Standard .....	19
Discipline Codes.....	19
Status Codes .....	20
Annotative Dimension Styles.....	20
Text Styles .....	23
Text Style Names .....	23
Drawing Scale vs. Text Height.....	24
Mutli-Leader Styles .....	25
Tags.....	25
Capacity Projects .....	26
CIP Projects.....	27
Recommended Scale Variable Settings .....	28
Linetypes.....	29
<b>Appendix A</b> .....	<b>31</b>
Standard Layers.....	31
Standard Layer Naming Format.....	31
Architectural Layers.....	31
Structural Layers .....	34
Electrical Layers.....	36
Fire Protection Layers .....	37
Mechanical Layers .....	38
Piping Layers .....	41

<b>Appendix B</b> .....	<b>42</b>
Pen Assignments (per SCA-FULL.ctb) .....	42
Colors Used (By Weight).....	42
Colors Used (By ACI Color Index).....	43
<b>Appendix C</b> .....	<b>44</b>
Shortcuts and LISP Routines Library.....	44
SCA AutoLISP Library.....	44
<b>Appendix D</b> .....	<b>50</b>
AutoCAD Express Tools .....	50
Express Tool Commands .....	50

## Preface

This document represents the CADD management and other standards for the A&E Department. The standards and procedures discussed are based on AutoCAD Release 2010 and other software used by the Authority. It will need to be revisited as our agency adopts new versions of the software. Please keep this document handy. It is intended to answer your day-to-day questions regarding the use of computers in our office. Note that this document is not intended to be a training manual; rather, it is intended solely as a guide to how we use and manage CADD and other software here.

This chapter includes the following sections:

- The Need for CADD Management Standards
- Adherence to the Standards
- Modifications to the Standards
- Use of Existing Files

## The Need for Management Standards

The most costly and time-consuming activity of designing schools is project documentation. Projects are not going to be built without it and over the years the amount of that documentation and the speed with which it has to be produced has constantly increased. It is incumbent upon us as architects, engineers and designers to make this process as efficient as possible while still producing quality documents.

Having standards:

- Improves the organization of the documentation and lends an agency-wide consistency (including consultant's projects) to the deliverables we produce;
- Flattens the learning curve for new staff members as they come on board and for current staff members moving from project to project;
- Helps make project organization more predictable; and
- Mitigates the tendency to "reinvent the wheel" for each new project and to free up time to devote to the design and technical issues encountered while working on our projects.

## Adherence to the Standards

By adhering to the CADD and other standards and procedures contained in this manual you contribute to developing a uniform character throughout the documents issued by our agency, and in making the most efficient use of project time. This uniformity allows information to be correctly keyed, added, displayed and plotted at any point in the project cycle.

Everyone shares responsibility in helping to make these standards work for all of us.

## Modifications to the Standards

Modifications to the standards and procedures in this manual may be necessary for specific situations. Requests for project specific modifications to the CADD standards should be made through the CADD Unit and implemented upon approval by the V. P. of A&E. All modifications are to be documented by bulletins and communicated to the entire A&E team including consultants. Do not make arbitrary changes to the CADD standards without prior approval.

This standards manual is intended to be an evolving document. Toward that end, please submit suggestions for permanent changes or additions to the CADD Unit, for review and possible inclusion.

Your request should document:

- Why a change or addition is needed;
- What the proposed change or addition should be; and
- How it would improve the CADD standards or procedures and overall productivity.

## Use of Existing Files

The most efficient use of AutoCAD is not necessarily in the initial creation of a file, but in the ability to reuse the file or any part of the file at a future date. The true meaning of CADD productivity is embodied in not having to do the old job again, rather than simply doing the old job faster. As an example, the use of "Template Files" can be a very efficient use of project time and resources. On a broad scale this can be very productive; however, the reuse process must not end here. Each user must continually examine the reusability of any information in a current file. Over time, our symbols will be gathered together in appropriate libraries.

## Chapter 1

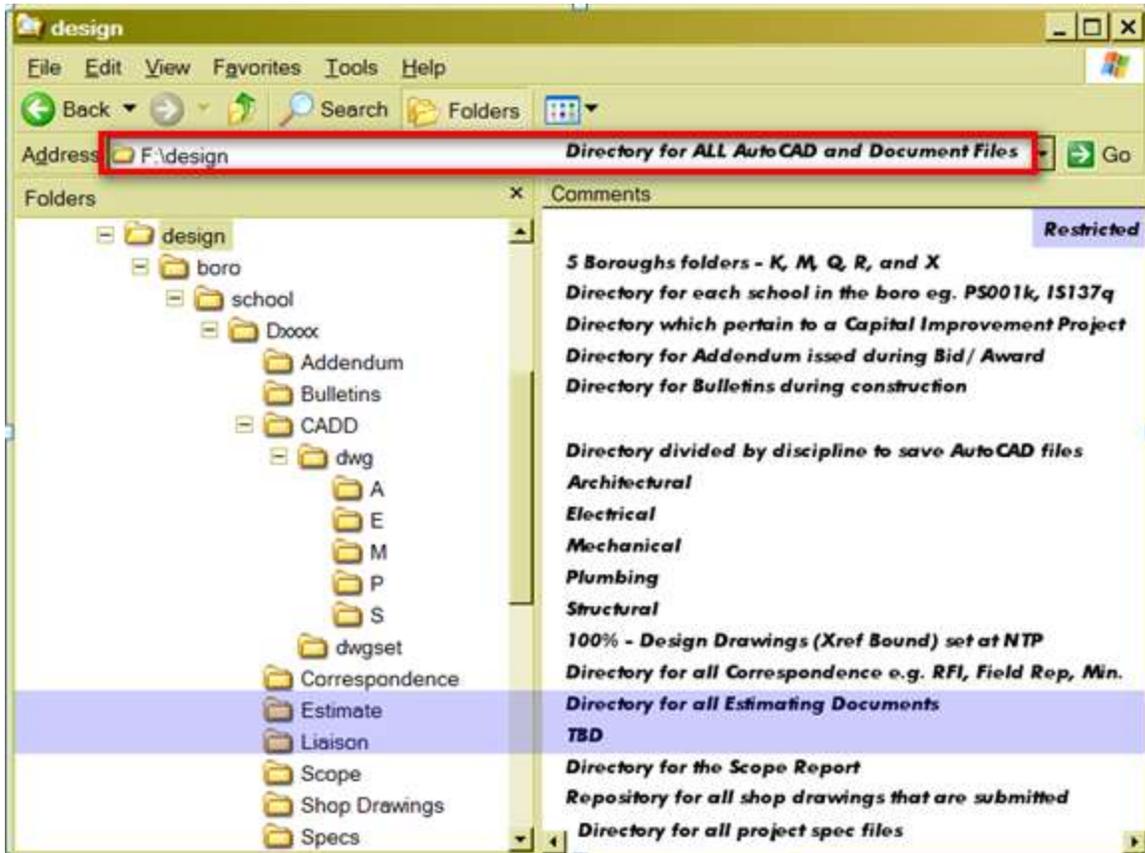
### File and Sheet Naming

This chapter describes the office standard project directory structure on the file server. This chapter also describes the office standard for naming project documents. The following topics appear in this chapter:

- A&E CADD Directory Structure Diagram
- File and Sheet Naming for Sketches

## A&E CADD Directory Structure Diagram

F:\DESIGN\BORO\SCHOOL\DXXXX\CADD



## File and Sheet Naming

All Capacity and CIP project drawing files prepared for the NYC School Construction Authority shall follow the Authority's Sheet Numbering Convention as described in Design Requirement 1.1.1.02 - Drawing Number Convention: Sheet files shall be named using the sheet number. For example, the drawing file for sheet A201 shall be named A201.dwg. What is shown below is only a small sample - refer to Design Requirement 1.1.1.02 for latest information.

### Description/ Approach

The intention of this "group numbering" system is to allocate numbers to specific groups of drawings within a discipline i.e. architectural plan, elevations, etc.

A drawing number starts with a one or two letter Discipline Code (e.g. "A" for Architectural, "FP" for Fire Protection) followed by a three-digit numeric Group Code. Note that there is no hyphen between Discipline and Group codes. The Group Code numbers are either sequentially numbered starting at "001" and are used for general notes, symbols and legends, and general clarification drawings or they are batched in series by hundred (i.e. 101,

201, 301) corresponding to a Group Code description, such the 101 series for floor plans, the 201 series for elevations, the 301 series for wall sections, the 401 series for details and the 901 series for schedules, etc. Group

Codes vary for each discipline code. The sheet numbering convention for Discipline and Group Codes are shown in the following table.

**Example format sheet names:**

M002 is a sheet of HVAC Schedules

A101 is the first floor plan in a series

**Note:** Filenames shall have at most one “.” character in the filename, separating the drawing name from the windows files extension, for example “dwg” for an AutoCAD drawing file.

### Sheet Numbering Convention

Code	Description	Drawing Number	Description	Sample Drawing Number
T	Cover & General Notes Drawings	001	Project Title, School Name	T001.00
Z	Zoning Drawings	001	Zoning Data & Diagrams	Z001.00
FPP	Fire Protection Plan Drawings	001	Floor Plans, Areas, and Schedules, and Occupant Egress Calculations	FPP001.00
EN	Energy Code Compliance Drawings	001	Computer printouts from energy calculation or if proscriptive, comparison of NYCECC values to provided values,	EN001.00
PA	Place of Assembly Drawings	101	Place of Assembly for Auditorium, Cafeteria, Multi-purpose room, Gymnasium, & Gymnasium. Floor Plans and Travel Distances, Door Capacity, Occupancy Loads, Etc.	PA101.00
BPP	Builders Pavement Plan Drawings	101	Builder Pavement Plans, General Notes, Waivers, etc.	BPP101.00
G	Site Surveys	101	Site Survey	G101.00

Code	Description	Drawing Number	Description	Sample Drawing Number
H	Environmental Remediation/Asbestos Drawings	001	Symbols & Legends, General Notes, Abbreviations	H001.00
DM	Demolition Drawings	001	General Notes	DM001.00
R	Reference Drawings	001	Drawings of existing buildings, etc., photographs, etc	R001.00
FF	Furniture & Furnishings and Room Layouts	101	Cellar, First, Second, Third, Fourth Floor – Furniture Plans	FF101.00
SOE	Excavation/Underpinning/ Soil Support Drawings	101	Schematic Underpinning/Shoring Plans and Details	SOE101
FO	Foundation Drawings	001	Foundation Symbols, Abbreviations & Notes	FO001.00
F	Fire Suppression Systems Drawings	001	Fire Suppression Symbols, Abbreviations, and Notes	F001.00
P	Plumbing Drawings	001	P&D Symbols, Abbreviations, Notes,	P001.00
		101	Floor Plans (Full & Part Plans)	P101.00
FA	Fire Alarm Drawings	001	Fire Alarm System Symbols, Abbreviations, Notes	FA001.00
		101	Fire Alarm System Floor Plans	FA101.00

Note: The above is a sample - refer to Design Requirement 1.1.1.02 for latest information.

## File and Sheet Naming Sketches

In this context, sketches refer to formal drawings prepared in support of addenda and bulletins.

### Addenda

Supporting drawing files addenda are named such that the first two characters indicate the drawing is an addendum “AD” followed by the addendum number, an underscore “\_” character and the drawing sequence number.

**Example format for addendum file and sheet names:**

AD1.1 is Addendum 1 Sheet 1	(AD1_1.dwg)
AD12.2 is Addendum 12 Sheet 2	(AD12_2.dwg)

### Bulletins

Supporting drawing files and sheets for bulletins are named such that the first two characters indicate the drawing is a bulletin “BU” followed by the addendum number, an underscore “\_” character and the drawing sequence number.

**Example format for bulletin file and sheet names:**

BU3.2 is Bulletin 3 Sheet 2	(BU3_2.dwg)
BU9.4 is Bulletin 9 Sheet 4	(BU9_4.dwg)

## Chapter 2

### Drawing Management

This section discusses how drawings are organized in the following sections:

- Creating a new drawing
- Template files
- Format Drawings – Titleblock
- Drawing Organization
- Drawing Setup
- Layer Standards

## Creating a New Drawing

### Template Files

Template files are used to begin new drawings. They establish drawing units, text styles, dimension styles, system variables and the layer standard and many other things. They are used when beginning a new drawing to simplify the startup procedure. The pre-established settings in the template files are intended to represent the office standard and should not be changed.

The default installations at the SCA provides the template files “SCA Model (AEC Ctb).dwt” and “SCA Model (AECB Ctb).dwt” for AutoCAD Architecture 2010 and AutoCAD MEP 2010 respectively, set as the QNEW file used to start new drawings. If you launch the software using the desktop shortcut, one of the standard SCA template files is automatically used when you start a new drawing. If the software has already been launched, you will start a new drawing by using the “QNEW” button located on the AutoCAD Quick-Access Toolbar, on the upper left hand side of the display. Additional SCA standard template files, located in T:\winapps\acad2010\Templates and T:\winapps\acad2010\Templates\SheetSets are also provided for your use.

The template files are set up to plot to the CADPLOT-FULL.PC3 plot device using the SCA-FULL.ctb plot style table. When using the A-size and B-size template files it will be necessary to change the plot device to your local plotter and adjust page size accordingly.

Also provided are the SCA Sheet (AEC Ctb).dwt & SCA Sheet (AECB Ctb).dwt file which hold the standard layouts for configuring sheet files.

### Standard Layouts from Sheet Template Files

Name	Paper Designation	Paper Size
sht-a	A-size (portrait)	8.5"x11"
sht-a-wide	A-size (landscape)	11"x8.5"
sht-b	B-size (portrait)	11"x17"
sht-b-wide	B-size (landscape)	17"x11"
sht-d-bt	D-size (bottom text)	36"x24"
sht-d-st	D-size (side text)	36"x24"
sht-e-bt	E-size (bottom text)	48"x36"
sht-e-st	E-size (side text)	48"x36"

## Format Drawings

### Accessing an SCA Titleblock via Layouts

Office standard format drawings have been created for each sheet size that can be used. The standard formats are at a scale of 1:1. For example the format sheet for our office standard 36-inch by 24-inch page is actually drawn at 36 inches by 24 inches in a paper space layout. Each SCA job should have its own format sheet created from a copy of the office standard (where) that has been placed in the project folder located in F:\design\... The project specific format sheet is attached as an external reference to the issue drawing in paper space at the coordinate 0,0 at one to one scale. The standard formats are located on the network at T:\sca\_stds\std\_sht. They are named according to sheet size and titleblock alignment. Each titleblock sheet is paired with an attribute drawing used to insert the sheet specific data. This drawing is inserted as a block at the coordinate 0,0. In the attribute dialogue box that appears, type in the requested sheet specific information. Each format sheet includes an AutoCAD rtext object that displays the drawing name, date and time on plots. If the rtext object does not display properly, activate it by typing rtext at the command line and canceling the command.

#### Example format sheet names:

sht-e-st is an E-size sheet with a Side Titleblock  
sht-d-bt is a D-size sheet with a Bottom Titleblock

#### Example attribute drawing names:

sht-e-st-txt is attributes for an E-size sheet with a Side Titleblock  
sht-d-bt-txt is attributes for a D-size sheet with a Bottom Titleblock

**Standard Title Sheets**

Figure 1- Capital Improvement Projects (C.I.P.) – Side Alignment- D-size – 24” x 36”

This figure shows a standard title sheet for Capital Improvement Projects (C.I.P.) with side alignment. The sheet is oriented vertically and contains a large blank area for drawings on the left and a detailed title block on the right. The title block includes the SCA logo, project name, location, and various administrative fields.

Figure 2 - Capital Improvement Projects (C.I.P.) – Bottom Alignment- D- size – 24”x 36”

This figure shows a standard title sheet for Capital Improvement Projects (C.I.P.) with bottom alignment. The sheet is oriented vertically and contains a large blank area for drawings on the left and a detailed title block at the bottom. The title block includes the SCA logo, project name, location, and various administrative fields.

Figure 3 – Capacity Projects – Side Alignment- E- size- 36” x 48”

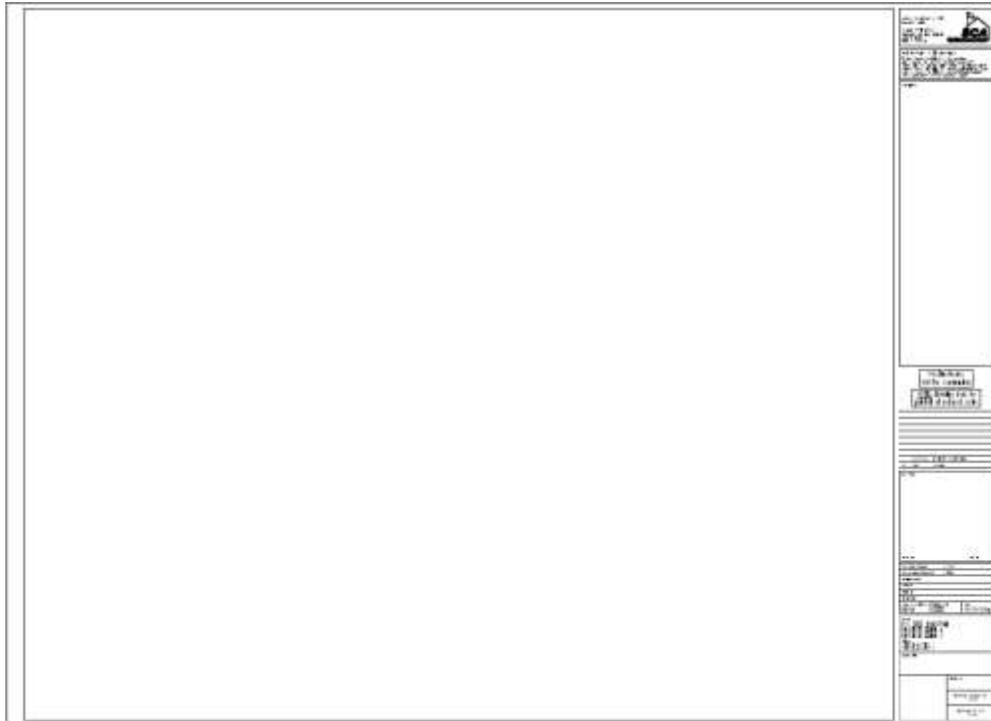
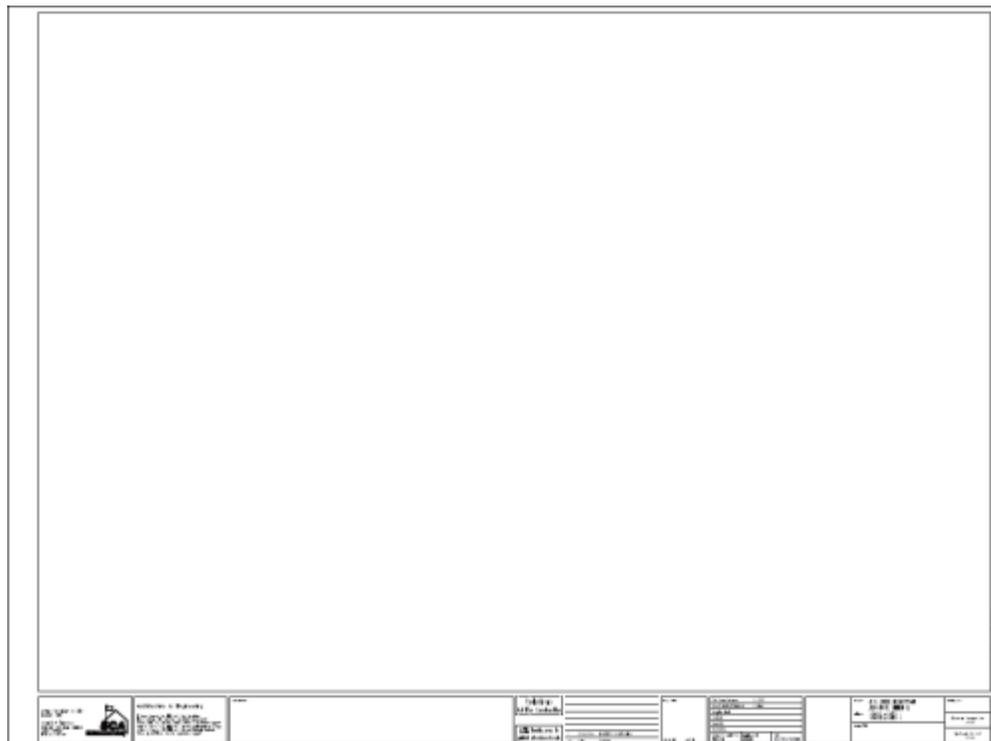


Figure 4 – Capacity Projects – Bottom Alignment- E- size- 36” x 48”



## Drawing Organization

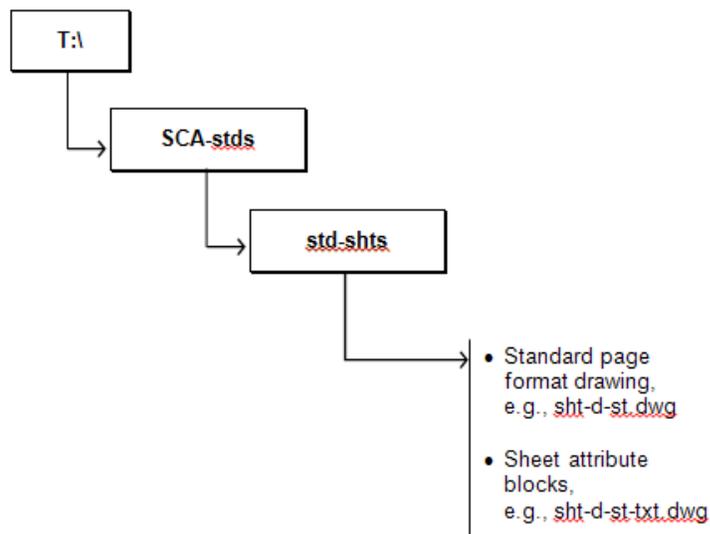
Each drawing file should contain only one drawing. Verify the sheet size with project requirements. CIP projects use D-size sheets (36"x24") and CAP projects use E-size sheets (48"x36").

All building graphics shall be created in model using actual (real world) size. Scaling of the final product is performed in paper space viewports and plotted at full scale (1:1). The standard format sheet used will depend on the output scale. Sizing text and tags may be automatically determined where "Annotative" styles are used, however where standard styles are utilized the operator must still consider the scale of the plotted drawing. For these cases refer to the chapter on graphic conventions for text scale factors. In general, General notes, legends and schedules should be placed in the paper space of their respective drawings. At this writing, schedules generated using ADT cannot follow this convention therefore schedules generated in ADT will be placed in model space.

## Drawing Setup

### Project Title Blocks

- XREF Titleblock for Project: T:\SCA-stds\std-sht
- Insert Blocks with Attributes: T:\SCA-stds\std-sht



Note to Design Consultants:

SCA Standard Title block can be found on the SCA website, under the Architecture & Engineering Page, on the Download tab.

## Chapter 3

### Drawing Project Standards

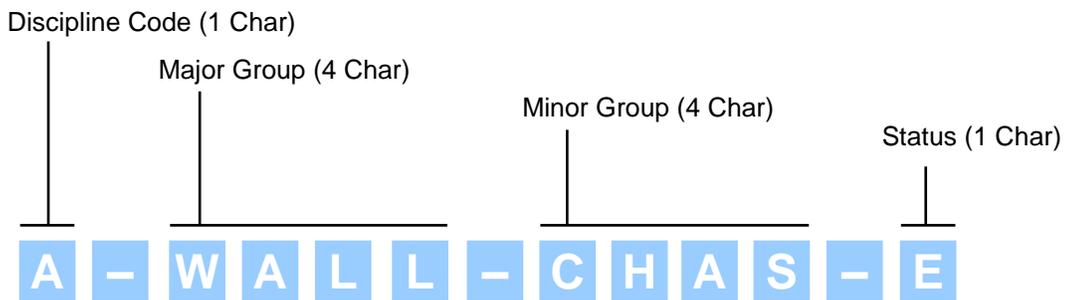
In order for our drawings to have a professional appearance it is important that we use a consistent set of graphic conventions. This chapter concerns itself with the graphic standards that we use here. The following sections are included:

- Layer Standard
- Dimension Styles
- Text Styles
- Multi-Leader Styles
- Lines and Linetypes

## Layer Standard

Our layer naming convention consists of four parts. Part one is the discipline which is a single letter followed by a hyphen. The available discipline codes are found below in the section titled Discipline Codes. Part two is a Major Group code consisting of four characters in length. The third (optional) part is the Minor Group code that further refines the purpose of the layer. The Minor Group codes will be four characters in length when used. The fourth and final part, which is also optional, is the Status code. These single character codes are listed in the section titled status codes below. Layers with no status character are assumed to be proposed/new items, therefore such redundant designations are not necessary, and should be avoided.

The following is a typical layer name:



In this layer name, the Discipline Code is 'A', the Major Group is 'Wall,' the Minor sub-category is 'Chas' and the status is "E". This layer would be suitable for depicting existing chase wall construction on architectural plans.

## Discipline Codes

Discipline codes serve to distinguish between layers belonging to the building chassis from those relating to the fit out of the space. Should it become necessary, additional codes can be added with the approval of the project manager, to accommodate special situations. All efforts should be made to use designations conforming with the National Cad Standards, should this need arise.

Code	Discipline
A	Architectural
E	Electrical
F	Fire Protection
M	Mechanical
P	Piping
S	Structural

## Status Codes

Status codes are used to distinguish between objects belonging to different aspects or phases of the work. Should it become necessary, additional codes can be added with the approval of the project manager in order to accommodate special situations.

Code	Discipline
E	Existing to Remain
D	Demolition
F	Future
T	Temporary
M	Items to be Moved
X	Not In Contract
1-9	Phase Numbers

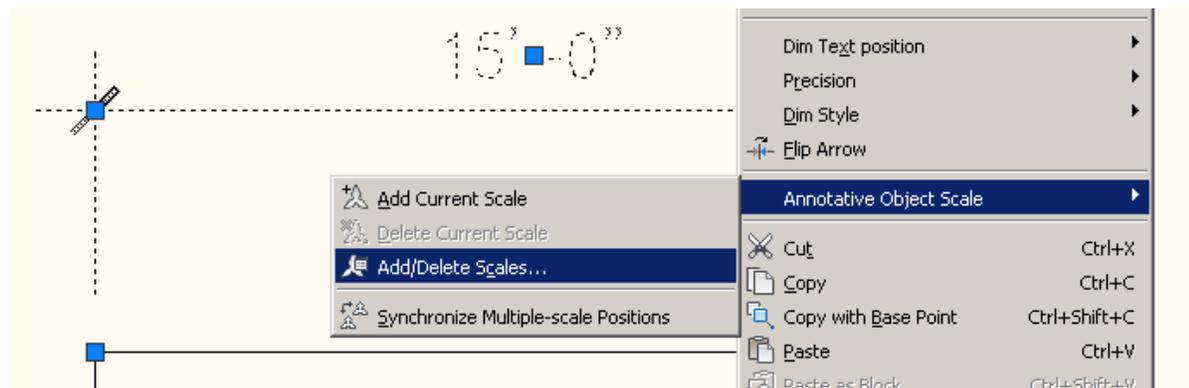
See “Appendix A” for the list of standard layers.

Note: The uses of colors 1-9 are reserved; Layers other than “DETL” major category layers shall not use these colors.

## Dimension Styles

### Annotative Dimension Styles

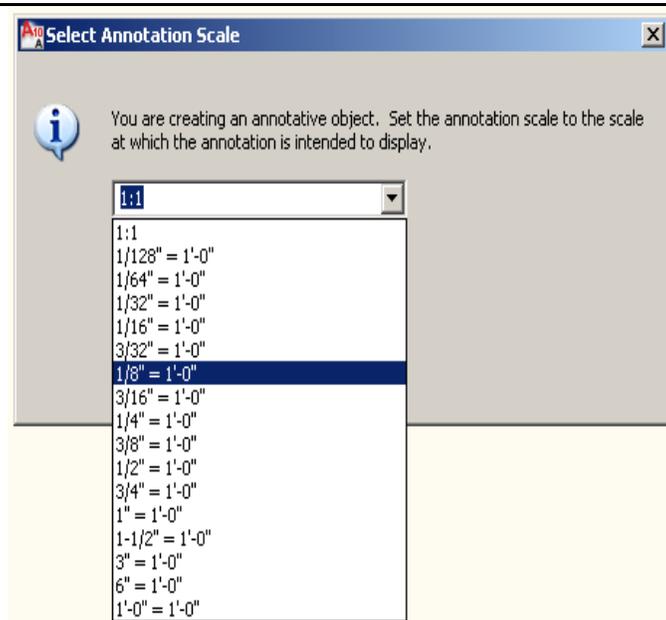
Architectural units appropriate for the particular project are to be used when dimensioning. SCA projects should specify the dimension style “SCA”, an “Annotative”, “Associative” dimension style to allow for the ease of editing and dynamic updating provide by these features. Drawings must be drawn accurately and to scale prior to dimensioning so that all dimensioning functions work properly. An initial “Annotative Scale” should be selected prior to the creation of any dimensions. Never explode dimensions and do not override the default dimension text unless required by the specific instance such as “5 EQ SPACES”. The “SCA” dimension style may be loaded via the “Design Center” from the SCA standard drawing templates.



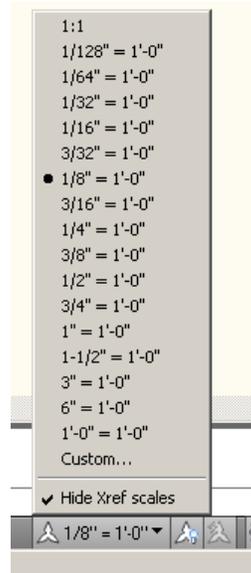
The Authority uses one dimension style, "SCA", which is an annotative style. To change a dimension string from one scale to another (to make the text and ticks larger or smaller), begin by adding the appropriate scale representation to annotative dimensions in the drawing. Using the annotative scale list, located in the AutoCAD status bar, select the desired scale and all annotative features with the selected representation applied will automatically update. To effect this change in paper space, continue by settings the viewport's annotative scale to one of the values applied to the model space entities. The value of "ANNOALLVISABLE" is set to "0" in paper space layouts by default; this will cause entities which do not have the selected representation applied to be hidden from view.

### Dimensioning

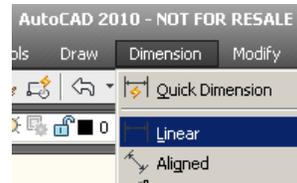
The first time that an annotative function is used in an AutoCAD session, the application will prompt for an annotation scale to be selected.



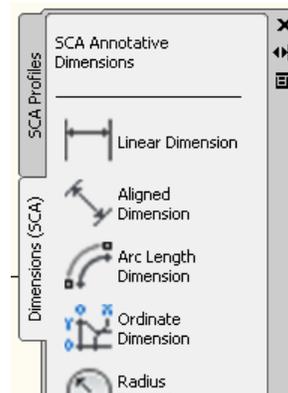
Alternatively the current annotative scale in the drawing “CANNOSCALE” can be set at any time from the annotation scale control in the application status bar at the lower right hand side of the drawing window.



There are numerous ways that you can use to place dimensions in the drawing. However, provided that the “SCA” annotative dimension style is used, they will automatically be placed in the drawing at the correct scale and if inserted from a tool palette on the correct layer as well.



OR



## Text Styles

Text styles are configured in the SCA template drawings. The text styles intended for general use are based on the font romans.shx. These styles support annotation scaling and are based on a plotted paper text height of 3/32" or 3/16". They will automatically be scaled correctly based on the current annotative scale selected. The 3/16" plotted text height is provided to support sheet titles, table heading/titles and are nested within certain block etc... Text of this height is not intended for general annotation. All annotation produced should be created in the "SCA\_3-32" text style (3/32" tall). The styles that do not support annotation scaling are defined with the height set to 0; this allows the height to be established by the TEXTSIZE variable on placement in the drawing.

## Text Style Names

Style	Font	Description
SCA_3-32	Romans.shx	General Notation (Annotative)
SCA_3-16	Romans.shx	Headings, Titles etc.. (Annotative)
SCA-TBLK	Romans.shx	Title Block Text
SCA-TBLK_Complex	Romanc.shx	Title Block
STAMP	Romand.shx	Title Block Preliminary Stamp
Standard	Romans.shx	

The following table lists the appropriate text height for non-annotative drafted text and is provided solely as a historic reference. The “TEXTSIZE” variable need no longer be altered for annotative text styles.

### Drawing Scale vs. Text Height

Dwg Scale	Scale Factor	3/32"	1/8"	3/16"	1/4"
1" = 50'	600	56.25	75	112.5	150
1" = 20'	240	22.5	30	45	60
1/16"	192	18	24	36	48
3/32"	128	12	16	24	32
1/8"	96	9	12	18	24
3/16"	64	6	8	12	16
1/4"	48	4.5	6	9	12
3/8"	32	3	4	6	8
1/2"	24	2.25	3	4.5	6
1"	12	1.125	1.5	2.25	3
3/4"	16	1.5	2	3	4
1-1/2"	8	0.75	1	1.5	2
3"	4	0.375	0.5	0.75	1
FULL	1	0.09375	0.125	0.1875	0.25

Fig- Drawing Scale with appropriate Text Height Suggestions

### Understanding the Calculation

The architectural scale of 1/8"=1'-0" can also be stated as 1"=8'-0" (check your scale). Therefore, one foot on your drawing is 8"x12" per foot which equals 96'. Thus, the scale factor for 1/8"=1'-0" scale is 1/96. To find the required model space text height, multiply the desired plotted height by the inverse of the scale factor. For example: if you want a plotted text height of 1/8" multiple that by 96 to get 12", which is the correct height for the model space text.

## Mutli-Leader Styles

### Tags

Tags are notational symbols that are used to label and identify specific parts of a drawing. Since they do not have an intrinsic physical size like a door or a merchandising fixture, they are scaled to be legible when plotted, independently of drawing scale. Most tags include attributes, which can be left blank and edited at a later time or filled in at the time of insertion.

Most tags will come from the SCA design content using DesignCenter.

#### **Example tag:**

For room labels use the SCA-Room Tag.

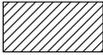
## Hatching

Hatching can be used to represent architectural materials. Hatching should be kept to a large enough scale to represent the material without overloading the drawing database. Hatching can make a drawing very large, use it sparingly.

Following below are two groups of hatch patterns. The first group applies to Capacity Projects and the second group applies to CIP projects.

### Capacity Projects

#### SCA Custom Hatch Patterns for Capacity Projects

	Application	Pattern	Angle	Scale*
	Brick	ANSI 31	0	12
	Structural Glaze Faced Tile	ANSI 31	45	36
	Concrete Block	NET	45	48
	Stone Concrete	AR-CONC	0	3
	Earth	EARTH	45	36
	Broken Stone or Gravel	AR-CONC	0	2
	Finished Wood	WOOD2	225	48
	Wood Blocking	n.a.	n.a.	n.a.
	Ceramic Tile (on concrete block)	LINE	0	12
	Steel	STEEL	0	36
	Aluminium	NET	45	24
	Bronze	LINE	45	12
	Rigid Insulation	NET	0	24
	Batt Insulation	n.a.	Battling linetype (adjust celtscale)	n.a.
	Caulking	n.a.	n.a.	n.a.

Scale based on  $\frac{1}{8}'' = 1'-0''$  plot scale.

**CIP Projects**

**SCA Custom Hatch Patterns for CIP Projects**

	PARAPET/MASONRY REMOVAL		CONCRETE COPING REPLACEMENT		BRICK
	PARAPET/MASONRY REPLACEMENT		LIMESTONE COPING REPLACEMENT		STRUCTURAL GLAZE FACED TILE (SGFT)
	FACE BRICK REPLACEMENT		TERRA COTTA COPING REPLACEMENT		CONCRETE BLOCK
	BRICK POINTING		COPING STONE REMOVAL AND RESETTING		STONE CONCRETE
	TERRA COTTA/LIMESTONE POINTING		COPPER CORNICE		EARTH
	MASONRY PINNING		SLATE SHINGLES		BROKEN STONE (OR) GRAVEL
	BRICK POINTING AND PINNING		CONC. SCREED CONC. FILL		FINISHED WOOD
	MASONRY CLEANING		ROOFING STRIP REPLACEMENT		CERAMIC TILE AND CONCRETE BLOCK
	PAINT REMOVAL		WOOD BLOCKING		ALUMINUM
	ANTI-GRAFFITI COATING		RIGID INSULATION		RIGID INSULATION
	MASONRY CLEANING AND ANTI-GRAFFITI COATING		BATT INSULATION		BRONZE
	WEATHERPROOFING		STUCCO/PLASTER		CAULKING
	REPLACEMENT OF LINTEL AND SOLDER BRICKS		STEEL		

## Lines

Different linetypes should be used to clearly express the information needed for construction. The scale of linetypes is established by the system variables LTSCALE, PS LTSCALE and MSLTSCALE. If adjustments are necessary beyond the base scale of the linetype selected, use the current entity scale, to modify the line pattern by the scale factor assigned. Please note the CELTSCALE variable is displayed when an entity is selected on the AutoCAD properties palette as "Linetype Scale". Use standard AutoCAD linetypes unless otherwise approved by the CADD manager.

Varied line weights are used to properly express the information needed in a drawing for construction. The Authority configures AutoCAD uses colors to determine plotted line weights, reference Appendix "B" for pen assignments and line weights.

### Recommended Scale Variable Settings

Variable	Value
LTSCALE	1
PSLTSCALE	1
MSLTSCALE	1

#### Example CELTSCALE:

For the HIDDEN linetype (1/4" Line, 1/8" Gap)



CELTSCALE value of 0.5 results in a pattern of (1/8" Line, 1/16" Gap)

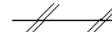
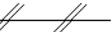


CELTSCALE value of 2 results in a pattern of (1/2" Line, 1/4" Gap)





Linetypes cont...

	CA		COMPRESSED AIR
	LS		LAWN SPRINKLER SUPPLY ; LS
	VAC		VACUUM
	LSP		LIQUID SOAP PIPING
			EXISTING TO BE REMOVED
			NEW CONNECTION TO EXISTING
			FLOW-IN DIRECTION OF ARROW

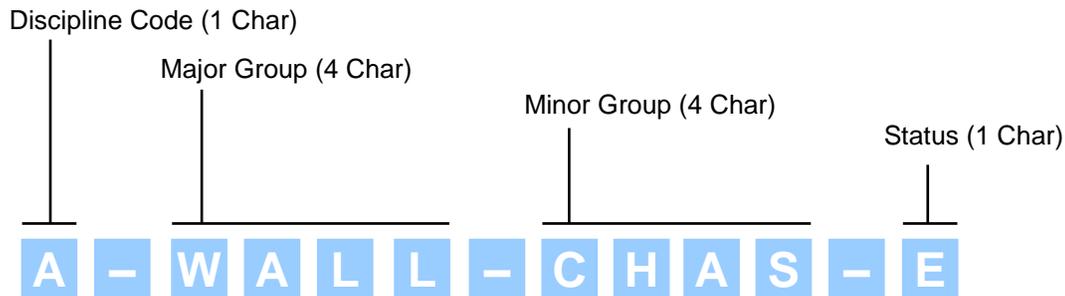
## Appendix A

### Standard Layers

The SCA has chosen to adopt the layer naming convention promulgated by the American Institute of Architects (AIA). The AIA provides both a format for naming layers and a prescribed list of layers. Where possible the SCA will use the listed layer names. Should the need arise to create additional layer names, the AIA layer naming format will be used. All AutoCAD drawings will contain a "0" layer and most drawings will contain a "Defpoints" layer. These layers are maintained by AutoCAD and do not appear on the lists as standard layers.

### Standard Layer Naming Format

The following diagram (below) outlines the basic layer name format as defined by the AIA Guidelines. The layer list, complete with color and linetype values are outlined on the next several pages.



### Architectural Layers

Name	Description	Color	Lineweight	Linetype
0		7	0.0240"	Continuous
DEFPOINTS		240	0.0020"	Continuous
A-ANNO-DIMS	Dimensions	221	0.0100"	Continuous
A-ANNO-LEGN	Legend	171	0.0020"	Continuous
A-ANNO-NOTE	Notes & Leaders	211	0.0130"	Continuous
A-ANNO-NPLT	Non-printing	7	0.0240"	Continuous
A-ANNO-REVS	Revisions Marks	213	0.0130"	Continuous
A-ANNO-SYMB	Annotation/Section Marks	111	0.0130"	Continuous
A-ANNO-TTLB	Titleblock	111	0.0130"	Continuous
A-AREA	Area	173	0.0020"	Continuous
A-AREA-BDRY	Boundary	140	0.0100"	Continuous
A-AREA-GRPS	Groups	203	0.0100"	Continuous
A-AREA-GRPS- IDEN	Group Tags	211	0.0130"	Continuous
A-AREA-IDEN	Area Tags	131	0.0130"	Continuous
A-AREA-SPCE	Area Space	34	0.0130"	Continuous
A-BEAM	Beams	80	0.0100"	Continuous

Name	Description	Color	Lineweight	Linetype
A-BEAM IDEN	Beam Tags	81	0.0100"	Continuous
A-CLNG	Ceiling Objects	150	0.0050"	Continuous
A-CLNG-GRID	Ceiling Grid	232	0.0050"	Continuous
A-CLNG-GYPM	Ceiling Gypsum	97	0.0080"	Continuous
A-CLNG-IDEN	Ceiling Tags	11	0.0130"	Continuous
A-COLS	Columns	110	0.0130"	Continuous
A-COLS-BRCE	Column Bracing	92	0.0080"	DASHED
A-COLS-BRCE-IDEN	Column Bracing Tags	103	0.0100"	Continuous
A-COLS-IDEN	Column Tags	101	0.0100"	Continuous
A-COMM	Communication	150	0.0050"	Continuous
A-CTRL-DEVC	Control Devices	152	0.0050"	Continuous
A-DEMO	Demolition	191	0.0050"	HIDDEN
A-DETL-HIDE	Detail Lines Hidden	1	0.0020"	HIDDEN
A-DETL-PATT	Hatch Pattern	1	0.0020"	Continuous
A-DETL-XLIT	Detail Lines Extra Light	1	0.0020"	Continuous
A-DETL-LITE	Detail Lines Light	2	0.0100"	Continuous
A-DETL-MEDM	Detail Lines Medium	3	0.0130"	Continuous
A-DETL-HEVY	Detail Lines Heavy	5	0.0170"	Continuous
A-DETL-XHVY	Detail Lines Extra Heavy	6	0.0200"	Continuous
A-DETL-IDEN	Detail Tags	111	0.0130"	Continuous
A-DOOR	Doors	150	0.0050"	Continuous
A-DOOR-D	Demolition Doors	191	0.0050"	HIDDEN
A-DOOR-E	Existing Doors	150	0.0050"	Continuous
A-DOOR-IDEN	Door Tags	13	0.0100"	Continuous
A-ELEV	Elevations	140	0.0100"	Continuous
A-ELEV-IDEN	Elevation Tags	143	0.0100"	Continuous
A-ELEV-SYMB	Elevation Symbols	190	0.0050"	Continuous
A-EQPM	Equipment	90	0.0080"	Continuous
A-EQPM-IDEN	Equipment Tags	23	0.0150"	Continuous
A-FLOR-APPL	Appliances	150	0.0050"	Continuous
A-FLOR-CASE	Casework	34	0.0130"	Continuous
A-FLOR-CASE-IDEN	Casework Tags	11	0.0130"	Continuous
A-FLOR-EVTR	Elevators	232	0.0050"	Continuous
A-FLOR-HRAL	Handrails	242	0.0020"	Continuous
A-FLOR-IDEN	Finish Tags	11	0.0130"	Continuous
A-FLOR-PFIX	Plumbing Fixtures	72	0.0130"	Continuous
A-FLOR-PFIX-D	Plumbing Fixtures	191	0.0050"	Continuous
A-FLOR-PFIX-E	Existing Plumbing Fixtures	240	0.0020"	Continuous
A-FLOR-PFIX-LGHT	Plumbing Fixture, Light	140	0.0100"	Continuous
A-FLOR-PVRS	Pavers	181	0.0020"	Continuous
A-FLOR-SPCL	Specialties	190	0.0050"	Continuous
A-FLOR-STRS	Stairs	12	0.0130"	Continuous
A-FLOR-STRS-ABOV	Stairs Above	161	0.0020"	HIDDEN2
A-FLOR-STRS-D	Demolition Stairs	191	0.0050"	HIDDEN
A-FLOR-STRS-E	Existing Stairs	240	0.0020"	Continuous
A-FURN	Furniture	10	0.0130"	Continuous

Name	Description	Color	Lineweight	Linetype
A-FURN-D	Demolition Furniture	191	0.0050"	HIDDEN
A-FURN-E	Existing Furniture	240	0.0020"	Continuous
A-FURN-IDEN	Furniture Tags	11	0.0130"	Continuous
A-FURN-PLNT	Plants - Indoor	92	0.0080"	Continuous
A-GLAZ	Windows	92	0.0080"	Continuous
A-GLAZ-ASSM	Window Assemblies	102	0.0100"	Continuous
A-GLAZ-CURT	Curtain wall layouts	130	0.0130"	Continuous
A-GLAZ-D	Demolition Windows	191	0.0050"	HIDDEN
A-GLAZ-E	Existing Windows	92	0.0080"	Continuous
A-GLAZ-IDEN	Window Tags	91	0.0080"	Continuous
A-GLAZ-UNIT	Curtain Wall Units	112	0.0130"	Continuous
A-GRID	Column Grids	173	0.0020"	CENTER2
A-GRID-IDEN	Column Grid Tags	91	0.0080"	CENTER2
A-GRID-LAYO	Layout grids	193	0.0050"	DASHED2
A-MASS	Massing Elements	210	0.0130"	Continuous
A-MASS-GRPS	Massing Groups	130	0.0130"	Continuous
A-MASS-SLCE	Massing Slices	240	0.0020"	DASHED2
A-PKNG	Parking Symbol	190	0.0050"	Continuous
A-PKNG-CARS	Vehicles	242	0.0020"	Continuous
A-PLNT	Plants, Outdoor	82	0.0100"	Continuous
A-POLY	AecPolygons	180	0.0020"	Continuous
A-ROOF	Roofs	20	0.0150"	Continuous
A-ROOF-SLAB	Roof Slabs	22	0.0150"	Continuous
A-SECT	Sections	240	0.0020"	Continuous
A-SECT-IDEN	Section Marks	243	0.0020"	Continuous
A-SITE	Site	20	0.0150"	Continuous
A-SITE-UTIL	Site Utilities	190	0.0050"	Continuous
A-SLAB	Toilet Partition	162	0.0020"	Continuous
A-STRM	Drainage	190	0.0050"	Continuous
A-TOIL-PART	Toilet Partitions	150	0.0050"	Continuous
A-WALL	Walls	50	0.0240"	Continuous
A-WALL-CHAS	Chase Walls	32	0.0130"	Continuous
A-WALL-D	Demolition Walls	191	0.0050"	HIDDEN
A-WALL-E	Existing Walls	136	0.0150"	Continuous
A-WALL-FIRE	Fire Walls	14	0.0100"	Continuous
A-WALL-IDEN	Wall Tags	213	0.0130"	Continuous
A-WALL-INTR	Wall, Interior	136	0.0150"	Continuous
A-WALL-OPEN	Wall Opening	172	0.0020"	Continuous

## Structural Layers

Name	Description	Color	Lineweight	Linetype
0		7	0.0240"	Continuous
DEFPOINTS		240	0.0020"	Continuous
S-ANNO-DIMS	Dimensions	231	0.0050"	Continuous
S-ANNO-LEGN	Schedule	171	0.0020"	Continuous
S-ANNO-NOTE	Notes & Leaders	136	0.0150"	Continuous
S-ANNO-REVS	Revisions Marks	213	0.0130"	Continuous
S-ANNO-SYMB	Annotation/Section Marks	111	0.0130"	Continuous
S-ANNO-TTLB	Titleblock	111	0.0130"	Continuous
S-BOLT	Bolts	151	0.0050"	Continuous
S-BRCE-PLAN	Brace Plan	7	0.0240"	HIDDEN
S-BRKS	Brakes	221	0.0100"	Continuous
S-BRNG	Borings	129	0.0170"	Continuous
S-CONC	Concrete	72	0.0130"	Continuous
S-DETL-HIDE	Detail Lines Hidden	1	0.0020"	HIDDEN
S-DETL-PATT	Hatch Pattern	1	0.0020"	Continuous
S-DETL-XLIT	Detail Lines Extra Light	1	0.0020"	Continuous
S-DETL-LITE	Detail Lines Light	2	0.0100"	Continuous
S-DETL-MEDM	Detail Lines Medium	3	0.0130"	Continuous
S-DETL-HEVY	Detail Lines Heavy	5	0.0170"	Continuous
S-DETL-XHVV	Detail Lines Extra Heavy	6	0.0200"	Continuous
S-DPRS	Depression	240	0.0020"	Continuous
S-ELEV	Elevations	140	0.0100"	Continuous
S-ELEV-IDEN	Elevation marks	143	0.0100"	Continuous
S-EQPM	Equipment	90	0.0080"	Continuous
S-FLOR-CONC-PADS	Concrete pads	240	0.0020"	Continuous
S-FLOR-FENC	Fencing	80	0.0100"	FENCELINE2
S-FNSH-LINE	Finish Line	240	0.0020"	ACAD_ISO12W100
S-FPRF	Fireproofing	240	0.0020"	Continuous
S-FTNG-PLAN	Footing Plan	129	0.0170"	Continuous
S-GRAD-BEAM	Grade Beam	136	0.0150"	HIDDEN2
S-GRID	Column grids	173	0.0020"	CENTER2
S-GRID-IDEN	Column grid tags	101	0.0100"	Continuous
S-HNGR-SPRT	Hanger Support	220	0.0200"	Continuous
S-HTCH	Hatch	240	0.0020"	Continuous
S-HTCH-BRCK	Hatch Brick	240	0.0020"	Continuous
S-HTCH-CONC	Hatch Concrete	240	0.0020"	Continuous
S-HTCH-ERTH	Hatch Earth	240	0.0020"	Continuous
S-HTCH-GRUT	Hatch Grout	240	0.0020"	Continuous
S-HTCH-GRVL	Hatch Gravel	240	0.0020"	Continuous
S-HTCH-INSL	Hatch insulation	240	0.0020"	Continuous
S-HTCH-MSNR	Hatch Masonry	240	0.0020"	Continuous
S-HTCH-STEL	Hatch Steel	240	0.0020"	Continuous

Name	Description	Color	Lineweight	Linetype
S-MECH-OPNG	Mechanical Opening	30	0.0130"	Continuous
S-METL-DECK	Metal Deck Section	150	0.0050"	Continuous
S-METL-DECK-PLAN	Metal Deck Plan	51	0.0100"	Continuous
S-MISC	Miscellaneous	240	0.0020"	Continuous
S-OPNG	Opening	12	0.0130"	Continuous
S-PILE-CAPS-PLAN	Pile Caps Plans	12	0.0130"	Continuous
S-PILE-CAPS-SECT	Pile Caps Section	12	0.0130"	Continuous
S-PNTR	Penetration	12	0.0130"	Continuous
S-PRTY-LINE	Property-Line	12	0.0130"	PHANTOM2
S-RFNG	Reinforcing	12	0.0130"	Continuous
S-ROOF	Roofs	20	0.0150"	Continuous
S-ROOF-CPNG	Roof, Coping	21	0.0150"	Continuous
S-ROOF-CRNC	Roof, Cornice	219	0.0130"	Continuous
S-ROOF-SLAB	Roof Slabs	22	0.0150"	Continuous
S-SCHD	Schedule	12	0.0130"	Continuous
S-SCHD-INFO	Schedule, Information	12	0.0130"	Continuous
S-SCHD-LOAD	Schedule, Load	12	0.0130"	Continuous
S-SCHD-TEXT	Schedule, Text	12	0.0130"	Continuous
S-SECT-IDEN	Section marks	243	0.0020"	Continuous
S-SLAB-EDGE-PLAN	Slab Edge Plan	72	0.0130"	Continuous
S-SLAB-SECT	Slab Sections	30	0.0130"	Continuous
S-STEL-PLAN	New Steel Plans	220	0.0200"	Continuous
S-STEL-SECT	New Steel Sections	136	0.0150"	Continuous
S-STUD	Studs	150	0.0050"	Continuous
S-TTLE	Title Text	136	0.0150"	Continuous
S-WALL	Walls	50	0.0240"	Continuous
S-WALL-CHAS	Wall Chases	32	0.0130"	Continuous
S-WALL-D	Walls, Demolition	82	0.0100"	DASHED
S-WALL-E	Walls, Existing	136	0.0150"	Continuous
S-WALL-FIRE	Fire Wall Pattern	14	0.0100"	Continuous
S-WALL-IDEN	Wall tags	201	0.0100"	Continuous
S-WALL-OPEN	Wall openings	172	0.0020"	Continuous
S-WALL-PLAN	Wall Plans	72	0.0130"	Continuous
S-WALL-SECT	Wall Section	51	0.0100"	Continuous
S-WMSH	Wiremesh	72	0.0130"	MESH
S-WPRF	Waterproofing	240	0.0020"	Continuous

## Electrical Layers

Name	Description	Color	Lineweight	Linetype
0		7	0.0240"	Continuous
DEFPOINTS		240	0.0020"	Continuous
E-ALRM	Fire Alarm	136	0.0150"	Continuous
E-ALRM-BELL	Fire Alarm Device, Bell	136	0.0150"	Continuous
E-ALRM-DEVC	Fire Alarm Device	136	0.0150"	Continuous
E-ALRM-HORN	Fire Alarm Device, Horn	136	0.0150"	Continuous
E-ALRM-PANL	Fire Alarm Device, Panel Board	136	0.0150"	Continuous
E-ALRM-PULS	Fire Alarm Device, Pullstation	136	0.0150"	Continuous
E-ALRM-SMOK	Fire Alarm Device, Smoke Detector and/or Heat Sensor	136	0.0150"	Continuous
E-ALRM-STRB	Fire Alarm Device, Strobe Light	136	0.0150"	Continuous
E-ANNO-LABL	Label	231	0.0050"	Continuous
E-ANNO-NOTE	Notes	72	0.0130"	Continuous
E-CABL	Cable Trays	30	0.0130"	Continuous
E-CABL-FTNG	Cable tray fittings	30	0.0130"	Continuous
E-CNDT	Conduit	30	0.0130"	Continuous
E-CNDT-FTNG	Conduit fitting	30	0.0130"	Continuous
E-DETL-HIDE	Detail Lines Hidden	1	0.0020"	HIDDEN
E-DETL-PATT	Hatch Pattern	1	0.0020"	Continuous
E-DETL-XLIT	Detail Lines Extra Light	1	0.0020"	Continuous
E-DETL-LITE	Detail Lines Light	2	0.0100"	Continuous
E-DETL-MEDM	Detail Lines Medium	3	0.0130"	Continuous
E-DETL-HEVY	Detail Lines Heavy	5	0.0170"	Continuous
E-DETL-XHVV	Detail Lines Extra Heavy	6	0.0200"	Continuous
E-DEVC	Electrical Device	22	0.0150"	Continuous
E-DEVC-AUXL	Electrical Device, Auxiliary	242	0.0020"	Continuous
E-DEVC-CAMR	Electrical Device, Camera	72	0.0130"	Continuous
E-DEVC-FRSC	Electrical Device, Fire Rescue	242	0.0020"	Continuous
E-LITE	Electric	140	0.0100"	Continuous
E-LITE-CLNG	Ceiling Lighting	120	0.0170"	Continuous
E-LITE-IDEN	Electrical tags	141	0.0100"	Continuous
E-LITE-SWCH	Electrical switches	140	0.0100"	Continuous
E-LITE-WALL	Wall lighting	142	0.0100"	Continuous
E-LVEL	Electrical Line, Low Voltage	114	0.0130"	Continuous
E-LVEL-AUXL	Electrical Line, Low Voltage, Auxiliary	10	0.0130"	Continuous
E-LVEL-CAMR	Electrical Line, Low Voltage, Camera	72	0.0130"	Continuous
E-LVEL-FRSC	Electrical Line, Low Voltage, Fire Rescue	15	0.0130"	Continuous
E-LVEL-INTR	Electrical Line, Low Voltage, Intrusion	74	0.0130"	Continuous
E-LVEL-PADD	Electrical Line, Low Voltage, Public Address System	30	0.0130"	Continuous
E-LVEL-TELE	Electrical Line, Low Voltage, Telephone	39	0.0130"	Continuous
E-POWR	Power	32	0.0130"	Continuous
E-POWR-EQPM	Electrical Equipment	22	0.0150"	Continuous

Name	Description	Color	Lineweight	Linetype
E-POWR-JBOX	Junction box	22	0.0150"	Continuous
E-POWR-PANL	Panel board	22	0.0150"	Continuous
E-POWR-SWBD	Switch board	22	0.0150"	Continuous
E-POWR-WALL	Electrical power	130	0.0130"	Continuous
E-PROT-EQPM	Fire system equipment	90	0.0080"	Continuous
E-SCHM	Schematic	42	0.0170"	Continuous
E-SCHM-SYMB	Schematic symbol	122	0.0170"	Continuous
E-SECT-IDEN	Section Marks	72	0.0130"	Continuous
E-WIRE	Electrical Wire	30	0.0130"	Continuous

### Fire Protection Layers

Name	Description	Color	Lineweight	Linetype
0		7	0.0240"	Continuous
DEFPOINTS		240	0.0020"	Continuous
F-CO2S	CO2 System	212	0.0100"	Continuous
F-DETL-HIDE	Detail Lines Hidden	1	0.0020"	HIDDEN
F-DETL-PATT	Hatch Pattern	1	0.0020"	Continuous
F-DETL-XLIT	Detail Lines Extra Light	1	0.0020"	Continuous
F-DETL-LITE	Detail Lines Light	2	0.0100"	Continuous
F-DETL-MEDM	Detail Lines Medium	3	0.0130"	Continuous
F-DETL-HEVY	Detail Lines Heavy	5	0.0170"	Continuous
F-DETL-XHVY	Detail Lines Extra Heavy	6	0.0200"	Continuous
F-HALN	Halon System	212	0.0100"	Continuous
F-IGAS	Inert Gas System	212	0.0100"	Continuous
F-PROT	Fire Protection System	212	0.0100"	Continuous
F-SPRN	Fire Protection Sprinkler System	212	0.0100"	Continuous

## Mechanical Layers

Name	Description	Color	Lineweight	Linetype
0		7	0.0240"	Continuous
DEFPOINTS		240	0.0020"	Continuous
M-ACID	Industrial waste piping system	200	0.0100"	Continuous
M-AFFS	Aqueous film forming foam system	200	0.0100"	Continuous
M-ANNO-DIMS	Dimensions and Leaders	221	0.0100"	Continuous
M-ANNO-LEGN	Legend	171	0.0020"	Continuous
M-ANNO-NOTE	Notes & Text	136	0.0150"	Continuous
M-ANNO-REVS	Revisions Marks	213	0.0130"	Continuous
M-ANNO-SYMB	Annotation/Section Marks	111	0.0130"	Continuous
M-ANNO-TEXT	Schedule, Text	136	0.0150"	Continuous
M-ANNO-TTLB	Titleblock	111	0.0130"	Continuous
M-BKGD	Backgrounds	253	0.0150"	Continuous
M-BOIL-FEED	Boiler Feed Pipe	220	0.0200"	Continuous
M-BRIN	Brine system	200	0.0100"	Continuous
M-CMPA	compressed air system	200	0.0100"	Continuous
M-CMPH	High pressure compressed air system	200	0.0100"	Continuous
M-CMPL	Low pressure steam system	200	0.0100"	Continuous
M-CNDW	Condense water system	200	0.0100"	Continuous
M-CNDW-EQPM	Cooling towers	200	0.0100"	Continuous
M-CNDW-PIPE	Condense water piping	132	0.0130"	Continuous
M-CONC	Concrete Pads	51	0.0100"	Continuous
M-CWTR	Chilled water system	200	0.0100"	Continuous
M-CWTR-EQPM	Chilled water equipment	200	0.0100"	Continuous
M-CWTR-PIPE	Chilled water piping	132	0.0130"	Continuous
M-DENT	Dental system	200	0.0100"	Continuous
M-DETL-HIDE	Detail Lines Hidden	1	0.0020"	HIDDEN
M-DETL-PATT	Hatch Pattern	1	0.0020"	Continuous
M-DETL-XLIT	Detail Lines Extra Light	1	0.0020"	Continuous
M-DETL-LITE	Detail Lines Light	2	0.0100"	Continuous
M-DETL-MEDM	Detail Lines Medium	3	0.0130"	Continuous
M-DETL-HEVY	Detail Lines Heavy	5	0.0170"	Continuous
M-DETL-XHVV	Detail Lines Extra Heavy	6	0.0200"	Continuous
M-DETL-IDEN	Detail Marks	213	0.0130"	Continuous
M-DUAL	Dual Temperature system	200	0.0100"	Continuous
M-DUST	Dust and fume collection system	200	0.0100"	Continuous
M-EQPM-PIPE	Fuel system	220	0.0200"	Continuous
M-EXHS	Exhaust system	200	0.0100"	Continuous
M-EXPJ-JONT	Expansion joint	51	0.0100"	Continuous

Name	Description	Color	Lineweight	Linetype
M-FUEL	Fuel system	200	0.0100"	Continuous
M-FUME	Fume system	200	0.0100"	Continuous
M-HOTW	Hot water heating system	200	0.0100"	Continuous
M-HOTW-PIPE	Hot water piping	132	0.0130"	Continuous
M-HVAC	HVAC system	200	0.0100"	Continuous
M-HVAC-BRCH	HVAC Breeching	72	0.0130"	DASHED2
M-HVAC-CONT	HVAC	214	0.0130"	Continuous
M-HVAC-EQPM	HVAC Equipment	72	0.0130"	Continuous
M-HVAC-LINR	HVAC Liner	23	0.0150"	Continuous
M-HVAC-RTRN	HVAC Return Duct	7	0.0240"	Continuous
M-HVAC-SPLY	HVAC Supply Duct	7	0.0240"	Continuous
M-HYDR	Hydraulic System	200	0.0100"	Continuous
M-INEX	Industrial exhaust system	200	0.0100"	Continuous
M-INSL	Insulating transformer oil system	200	0.0100"	Continuous
M-LGAS	Laboratory gas system	200	0.0100"	Continuous
M-LUBE	Lubricating oil system	200	0.0100"	Continuous
M-MDGS	Medical gas system	200	0.0100"	Continuous
M-MKUP	Make-Up air system	200	0.0100"	Continuous
M-NGAS	Natural gas system	200	0.0100"	Continuous
M-PIPE-VALV	Pipe Valve	220	0.0200"	Continuous
M-PLUM-PIPE	Plumbing Pipe	193	0.0050"	Continuous
M-RAIR	Relief air system	200	0.0100"	Continuous
M-RCOV-PIPE	Energy Recovery piping	132	0.0130"	Continuous
M-REFG	Refrigeration System	200	0.0100"	Continuous
M-REFG-PIPE	Refrigeration System Piping	132	0.0130"	Continuous
M-RWTR	Ram Water System	200	0.0100"	Continuous
M-SMOK	Smoke Extraction System	200	0.0100"	Continuous
M-SPCL	Special System	200	0.0100"	Continuous
M-STDN	Station Drainage System	200	0.0100"	Continuous
M-STEM	Steam System	220	0.0200"	Continuous
M-STND-DUCT-FLEX	HVAC Duct Flex	112	0.0130"	Continuous
M-STND-DUCT-FTNG	HVAC Duct Custom Fitting	112	0.0130"	Continuous
M-STND-EQPM-ACOL	HVAC Air Coolers	100	0.0100"	Continuous
M-STND-EQPM-AHUN	HVAC Air handling Units	100	0.0100"	Continuous
M-STND-EQPM-COIL	HVAC Coils	100	0.0100"	Continuous
M-STND-EQPM-COLL	HVAC Collectors	100	0.0100"	Continuous
M-STND-EQPM-COND	Piping Condensers	132	0.0130"	Continuous
M-STND-EQPM-DAMP	HVAC Dampers	100	0.0100"	Continuous
M-STND-EQPM-DHUM	HVAC Dehumidifiers	100	0.0100"	Continuous

Name	Description	Color	Lineweight	Linetype
M-STND-EQPM-ECON	HVAC Economizer	100	0.0100"	Continuous
M-STND-EQPM-FANS	HVAC Fans	100	0.0100"	Continuous
M-STND-EQPM-FILT	HVAC Filters	100	0.0100"	Continuous
M-STND-EQPM-FURN	HVAC Furnace	100	0.0100"	Continuous
M-STND-EQPM-HTPM	HVAC Heat Pumps	100	0.0100"	Continuous
M-STND-EQPM-HTRS	HVAC Unit Heaters	100	0.0100"	Continuous
M-STND-EQPM-HUMD	HVAC Humidifiers	100	0.0100"	Continuous
M-STND-EQPM-LVRS	HVAC Louvers	100	0.0100"	Continuous
M-STND-EQPM-TERM	HVAC Terminals	100	0.0100"	Continuous
M-STND-EQPM-VVAT	HVAC Variable Volume Air Terminals	100	0.0100"	Continuous

## Piping Layers

Name	Description	Color	Lineweight	Linetype
0		7	0.0240"	Continuous
DEFPOINTS		240	0.0020"	Continuous
P-ACID-VNTS	Acid, Alkaline, Oil, Waste Piping, Vents	132	0.0130"	Continuous
P-ANNO-DIMS	Dimensions	240	0.0020"	Continuous
P-ANNO-NOTE	Notes	136	0.0150"	Continuous
P-AREA-DETL	Area Detail	72	0.0130"	Continuous
P-DETL-HIDE	Detail Lines Hidden	1	0.0020"	HIDDEN
P-DETL-PATT	Hatch Pattern	1	0.0020"	Continuous
P-DETL-XLIT	Detail Lines Extra Light	1	0.0020"	Continuous
P-DETL-LITE	Detail Lines Light	2	0.0100"	Continuous
P-DETL-MEDM	Detail Lines Medium	3	0.0130"	Continuous
P-DETL-HEVY	Detail Lines Heavy	5	0.0170"	Continuous
P-DETL-XHVV	Detail Lines Extra Heavy	6	0.0200"	Continuous
P-DOMW	Domestic Cold Water	136	0.0150"	DCW
P-DRAN	Drain	220	0.0200"	Continuous
P-EQPM	Domestic Cold Water - Equipment	12	0.0130"	Continuous
P-FIXT	Fixtures	136	0.0150"	Continuous
P-OUTL	Blow-up Details	136	0.0150"	DASHED
P-PIPE	Piping	132	0.0130"	Continuous
P-PIPE-FTNG	Pipe Custom Fitting	132	0.0130"	Continuous
P-PIPE-GAS	Piping, Gas	129	0.0170"	Continuous
P-PIPE-HOTW	Piping, Hot Water	220	0.0200"	DHW
P-PIPE-HTWC	Piping, Hot Water, Circulation	220	0.0200"	DHWC
P-PIPE-MISC	Miscellaneous	136	0.0150"	Continuous
P-SANR	Sanitary System	240	0.0020"	Continuous
P-SANR-STRM	Sanitary System, Storm Drain Piping	220	0.0200"	Continuous
P-SANR-UNDR	Sanitary System, Underground Piping	49	0.0260"	DASHED
P-SANR-WAST	Sanitary System, Waste Piping	240	0.0020"	Continuous
P-STRM	Storm System	220	0.0200"	Continuous
P-UPDN	Up/Down Fittings	136	0.0150"	Continuous
P-VALV	Valves	136	0.0150"	Continuous
P-VENT	Vents	220	0.0200"	VENT
P-XREF	X-reference	7	0.0240"	Continuous

## Appendix B

### Pen Assignments (per SCA-FULL.ctb)

#### Colors Used (By Weight)

Color	Lineweight
1	0.0020"
161	0.0020"
162	0.0020"
171	0.0020"
172	0.0020"
173	0.0020"
180	0.0020"
181	0.0020"
240	0.0020"
242	0.0020"
243	0.0020"
150	0.0050"
151	0.0050"
152	0.0050"
190	0.0050"
191	0.0050"
193	0.0050"
231	0.0050"
232	0.0050"
90	0.0080"
91	0.0080"
92	0.0080"
97	0.0080"
2	0.0100"
13	0.0100"
14	0.0100"
51	0.0100"
80	0.0100"
81	0.0100"
82	0.0100"
100	0.0100"

Color	Lineweight
101	0.0100"
102	0.0100"
103	0.0100"
140	0.0100"
141	0.0100"
142	0.0100"
143	0.0100"
200	0.0100"
201	0.0100"
203	0.0100"
212	0.0100"
221	0.0100"
3	0.0130"
10	0.0130"
11	0.0130"
12	0.0130"
15	0.0130"
30	0.0130"
32	0.0130"
34	0.0130"
39	0.0130"
72	0.0130"
74	0.0130"
110	0.0130"
111	0.0130"
112	0.0130"
114	0.0130"
130	0.0130"
131	0.0130"
132	0.0130"
210	0.0130"

Color	Lineweight
211	0.0130"
213	0.0130"
214	0.0130"
219	0.0130"
20	0.0150"
21	0.0150"
22	0.0150"
23	0.0150"
136	0.0150"
250	0.0150"
251	0.0150"
252	0.0150"
253	0.0150"
254	0.0150"
255	0.0150"
5	0.0170"
42	0.0170"
120	0.0170"
122	0.0170"
129	0.0170"
6	0.0200"
220	0.0200"
7	0.0240"
50	0.0240"
49	0.0260"

**Colors Used (By ACI Color Index)**

Color	Lineweight	Screen
1	0.0020"	100%
2	0.0100"	100%
3	0.0130"	100%
5	0.0170"	100%
6	0.0200"	100%
7	0.0240"	100%
10	0.0130"	100%
11	0.0130"	100%
12	0.0130"	100%
13	0.0100"	100%
14	0.0100"	100%
15	0.0130"	100%
20	0.0150"	100%
21	0.0150"	100%
22	0.0150"	100%
23	0.0150"	100%
30	0.0130"	100%
32	0.0130"	100%
34	0.0130"	100%
39	0.0130"	100%
42	0.0170"	100%
49	0.0260"	100%
50	0.0240"	100%
51	0.0100"	100%
72	0.0130"	100%
74	0.0130"	100%
80	0.0100"	100%
81	0.0100"	100%
82	0.0100"	100%
90	0.0080"	100%
91	0.0080"	100%

Color	Lineweight	Screen
92	0.0080"	100%
97	0.0080"	100%
100	0.0100"	100%
101	0.0100"	100%
102	0.0100"	100%
103	0.0100"	100%
110	0.0130"	100%
111	0.0130"	100%
112	0.0130"	100%
114	0.0130"	100%
120	0.0170"	100%
122	0.0170"	100%
129	0.0170"	100%
130	0.0130"	100%
131	0.0130"	100%
132	0.0130"	100%
136	0.0150"	100%
140	0.0100"	100%
141	0.0100"	100%
142	0.0100"	100%
143	0.0100"	100%
150	0.0050"	100%
151	0.0050"	100%
152	0.0050"	100%
161	0.0020"	100%
162	0.0020"	100%
171	0.0020"	100%
172	0.0020"	100%
173	0.0020"	100%
180	0.0020"	100%
181	0.0020"	100%

Color	Lineweight	Screen
190	0.0050"	100%
191	0.0050"	100%
193	0.0050"	100%
200	0.0100"	100%
201	0.0100"	100%
203	0.0100"	100%
210	0.0130"	100%
211	0.0130"	100%
212	0.0100"	100%
213	0.0130"	100%
214	0.0130"	100%
219	0.0130"	100%
220	0.0200"	100%
221	0.0100"	100%
231	0.0050"	100%
232	0.0050"	100%
240	0.0020"	100%
242	0.0020"	100%
243	0.0020"	100%
250	0.0150"	80%
251	0.0150"	65%
252	0.0150"	50%
253	0.0150"	35%
254	0.0150"	20%
255	0.0150"	5%

\*shown only for used colors

## Appendix C

### Shortcuts and LISP Routines Library

The purpose of this in-house Library Documentation Manual is to establish a consistent method of access to specific in-house related CAD customization. Please note the following LISP Commands have been depreciated. Contact the CADD Unit for more information.

#### SCA AutoLISP Library

LISP COMMAND	AutoCAD COMMAND	Description Of Lisp Function
3DARRAY	3DARRAY	Creates a rectangular or polar array around a user specified axis
ATTREDEF		This program allows you to redefine a Block and update the Attributes associated with any previous insertions of that Block. All new Attributes are added to the old Blocks and given their default values. All old Attributes with equal tag values to the new Attributes are redefined but retain their old value. And all old Attributes not included in the new Block are deleted.
ANNOT		Annotate a line with angle and distance.
ARCDOT		Creates an Arc dimension leader line with Dot pointer.
ARCLDR		Creates an Arc Dimension leader line with Arrow pointer.
AUTONUM		Consecutive number generator with distance and angle.
BRACKET		Draws a curved, round or square bracket by entering two endpoints and a radius.
BU		Creates a bubble with text leader and knee point.
CASECHG		Converts text from Lower case to Upper case or Upper to Lower
CHGJUST	JUSTIFYTEXT	Changes the justification of existing text.
CHGSIZE		This allows you to select text and change its style properties, Width etc.
CHT		Text processor operating in a global manner on all text entities that the user selects; e.g., the Height, Justification, Location, Rotation, Style, Text, and Width can be changed globally or individually.
CL		Creates center lines for circles
CLIP		This lisp will clip out a part of the drawing like a cookie cutter
CLOUD	REVCLOUD	Creates a revision cloud.
CONXT		Continues text paragraphs by selecting last string of text.
COPYRT	MOCORO	Creates a copy then rotates.
DDMEDIT		Multiple text edits. (Also see "qe")
DLINE	MLIN	General purpose " double-line/arc" generator. It performs automatic corner intersection cleanups, as well as a number of other features.
DWG-LABLE		Creates a drawing tag to insert User ID, Date and Filename.

LISP COMMAND	AutoCAD COMMAND	Description Of Lisp Function
ELHALF		Creates a half ellipse
IDEN		Identifies a point and inserts a text string showing coordinate location.
IDLYR		This routine repeatedly prompts you for an entity, and reports the layer each entity is on. If the entity is part of a Block or Xref, the layer the Block or Xref is on is reported as well. A null pick or <return> ends the routine.
ISLY	LAYISO	Isolates a layer by selecting an entity on the layer to be selected.
LEXPLODE		Explodes and copies to replace exploded entity.
MCI		Places and increments columns of text at a specified spacing and increment.
MCV1		English units to metric unit conversion.
MCV2		Metric units to English unit conversion.
MEXT	EXTEND	Multiple extends
MLEAD		Dimension leader line with multiple lines of text
MOVERT	MOCORO	Moves selection set then rotates.
MVP		Makes a Viewport on Layer Defpoints within Paperspace
PGB	PURGE	Purge all BLOCKS from drawing file.
PLUD	PEDIT	Allows users to toggle the selected polylines between the two modes of linetype generation, either generation between the vertices or the new method, along the completed polyline.
PPHATCH		Pick Points hatch.
PREFIX		If you need to precede (prefix) several text strings with a prefix, this routine allows you to do so. You would be prompted for what you would want to put in front of these strings, and then select the text.
PVIEW		Creates a perspective view.
PW	MPEDIT	Changes the width of multiple polylines
QA		Attribute Edit (Quick Attribute Edit)
QE		Multiple text edit (Quick Edit)(Also see "ddmedit")
RGA	REGENALL	Regen All Viewports.
RTCOPY	MOCORO	Creates a Copy by first rotating.
RTMOVE	MOCORO	Rotates selection set then moves.
SETLYR		Sets current layer by picking an entity on the desired layer.
SIZE		This is used to scale blocks that have already been inserted, and their scale needs to be changed. It will prompt to select objects, ask what is the name of the block to change, and ask for the scale factor. It will then scan the selected objects and if blocks are found under the given name, they will be scaled to the user's scale factor entered. All blocks under the given name will scale , BUT their insertion point will remain the same.
TP		Allows various text to be selected and automatically rejustified along the Y position of the Selected point

LISP COMMAND	AutoCAD COMMAND	Description Of Lisp Function
T1	LAYOUT TAB	Toggles Tilemode to 1
T0	LAYOUT TAB	Toggles Tilemode to 0
TCHANGE		Changes multiple text string properties characteristics
UNDSR		Updates text strings with underlines
VR		View Restore alias.
VS		View Save alias.

## Keyboard Shortcuts

Shortcut	Command
3A	3DARRAY
3DMIRROR	MIRROR3D
3DNavigate	3DWALK
3DO	3DORBIT
3DP	3DPRINT
3DPLOT	3DPRINT
3DW	3DWALK
3F	3DFACE
3M	3DMOVE
3P	3DPOLY
3R	3DROTATE
3S	3DSCALE
A	ARC
AC	BACTION
ADC	ADCENTER
AECTOACAD	ExportToAutoCAD
AA	AREA
AL	ALIGN
3AL	3DALIGN
AP	APPLOAD
APLAY	ALLPLAY
AR	ARRAY
ARR	ACTRECORD
ARM	ACTUSERMESSAGE
ARU	ACTUSERINPUT
ARS	ACTSTOP
ATI	ATTIPEDIT
ATT	ATTDEF

Shortcut	Command
ATE	ATTEDIT
B	BLOCK
BC	BCLOSE
BE	BEDIT
BH	HATCH
BO	BOUNDARY
BR	BREAK
BS	BSAVE
BVS	BVSTATE
C	CIRCLE
CAM	CAMERA
CBAR	CONSTRAINTBAR
CH	PROPERTIES
CHA	CHAMFER
CHK	CHECKSTANDARDS
CLI	COMMANDLINE
COL	COLOR
COLOUR	COLOR
CO	COPY
CP	COPY
CPARAM	BCPARAMETER
CREASE	MESHCREASE
CSETTINGS	CONSTRAINTSETTINGS
CT	CTABLESTYLE
CUBE	NAVVCUBE
CYL	CYLINDER
D	DIMSTYLE
DAL	DIMALIGNED

Shortcut	Command
DAN	DIMANGULAR
DAR	DIMARC
JOG	DIMJOGGED
DBA	DIMBASELINE
DBC	DBCONNECT
DC	ADCENTER
DCE	DIMCENTER
DCENTER	ADCENTER
DCO	DIMCONTINUE
DCON	DIMCONSTRAINT
DDA	DIMDISASSOCIATE
DDI	DIMDIAMETER
DED	DIMEDIT
DELCON	DELCONSTRAINT
DI	DIST
DIV	DIVIDE
DJL	DIMJOGLINE
DJO	DIMJOGGED
DL	DATALINK
DLI	DIMLINEAR
DLU	DATALINKUPDATE
DO	DONUT
DOR	DIMORDINATE
DOV	DIMOVERRIDE
DR	DRAWORDER
DRA	DIMRADIUS
DRE	DIMREASSOCIATE
DRM	DRAWINGRECOVERY
DS	DSETTINGS
DST	DIMSTYLE
DT	TEXT
DV	DVIEW
DX	DATAEXTRACTION
E	ERASE
ED	DDEDIT
EL	ELLIPSE
ER	EXTERNALREFERENCES
ESHOT	EDITSHOT
EX	EXTEND
EXIT	QUIT

Shortcut	Command
EXP	EXPORT
EXT	EXTRUDE
F	FILLET
FI	FILTER
FREPOINT	POINTLIGHT
FSHOT	FLATSHOT
G	GROUP
-G	GROUP
GCON	GEOMCONSTRAINT
GD	GRADIENT
GENERATESECTION	SECTIONPLANETOBLOCK
GEO	GEOGRAPHICLOCATION
GR	DDGRIPS
H	HATCH
-H	HATCH
HE	HATCHEDIT
HI	HIDE
I	INSERT
IAD	IMAGEADJUST
IAT	IMAGEATTACH
ICL	IMAGECLIP
IM	IMAGE
IMP	IMPORT
IN	INTERSECT
INF	INTERFERE
IO	INSERTOBJ
QVD	QVDRAWING
QVDC	QVDRAWINGCLOSE
QVL	QVLAYOUT
QVLC	QVLAYOUTCLOSE
J	JOIN
JOGSECTION	SECTIONPLANEJOG
L	LINE
LA	LAYER
LAS	LAYERSTATE
LE	QLEADER
LEN	LENGTHEN
LESS	MESHSMOOTHLESS
LI	LIST
LINEWEIGHT	LWEIGHT

Shortcut	Command
LMAN	LAYERSTATE
LS	LIST
LT	LINETYPE
LTYPE	LINETYPE
LTS	LTSCALE
LW	LWEIGHT
M	MOVE
MA	MATCHPROP
MAT	MATERIALS
ME	MEASURE
MEA	MEASUREGEOM
MI	MIRROR
ML	MLINE
MLA	MLEADERALIGN
MLC	MLEADERCOLLECT
MLD	MLEADER
MLE	MLEADEREDIT
MLS	MLEADERSTYLE
MO	PROPERTIES
MORE	MESHSMOOTHMORE
MOTION	NAVSMOTION
MOTIONCLS	NAVSMOTIONCLOSE
MS	MSPACE
MSM	MARKUP
MT	MTEXT
MV	MVIEW
NORTH	GEOGRAPHICLOCATION
NORTHDIR	GEOGRAPHICLOCATION
NSHOT	NEWSHOT
NVIEW	NEWVIEW
O	OFFSET
OP	OPTIONS
ORBIT	3DORBIT
OS	OSNAP
P	PAN
PA	PASTESPEC
RAPIDPROTOTYPE	3DPRINT
PAR	PARAMETERS
PARAM	BPARAMETER
PARTIALOPEN	PARTIALOPEN

Shortcut	Command
PE	PEDIT
PL	PLINE
PO	POINT
POFF	HIDEPALETTES
POL	POLYGON
PON	SHOWPALETTES
PR	PROPERTIES
PRCLOSE	PROPERTIESCLOSE
PROPS	PROPERTIES
PRE	PREVIEW
PRINT	PLOT
PS	PSPACE
PSOLID	POLYSOLID
PTW	PUBLISHTOWEB
PU	PURGE
PYR	PYRAMID
QC	QUICKCALC
QCUI	QUICKCUI
R	REDRAW
RA	REDRAWALL
RC	RENDERCROP
RE	REGEN
REA	REGENALL
REC	RECTANG
REFINE	MESHREFINE
REG	REGION
REN	RENAME
REV	REVOLVE
RO	ROTATE
RP	RENDERPRESETS
RPR	RPREF
RR	RENDER
RW	RENDERWIN
S	STRETCH
SC	SCALE
SCR	SCRIPT
SE	DSETTINGS
SEC	SECTION
SET	SETVAR
SHA	SHADEMODE

Shortcut	Command
SL	SLICE
SMOOTH	MESHSMOOTH
SN	SNAP
SO	SOLID
SP	SPELL
SPL	SPLINE
SPLANE	SECTIONPLANE
SPLAY	SEQUENCEPLAY
SPLIT	MESHPLIT
SPE	SPLINEDIT
SSM	SHEETSET
ST	STYLE
STA	STANDARDS
SU	SUBTRACT
T	MTEXT
TA	TABLET
TB	TABLE
TEDIT	TEXTEDIT
TH	THICKNESS
TI	TILEMODE
TO	TOOLBAR
TOL	TOLERANCE
TOR	TORUS
TP	TOOLPALETTES
TR	TRIM
TS	TABLESTYLE
UC	UCSMAN
UN	UNITS
UNCREASE	MESHUNCREASE
UNI	UNION
V	VIEW
VGO	VIEWGO
VPLAY	VIEWPLAY
-V	VIEW
VP	DDVPOINT
-VP	VPOINT
VS	VSCURRENT
VSM	VISUALSTYLES
-VSM	VISUALSTYLES
W	WBLOCK

Shortcut	Command
WE	WEDGE
WHEEL	NAVSWHEEL
X	EXPLODE
XA	XATTACH
XB	XBIND
-XB	XBIND
XC	XCLIP
XL	XLINE
XR	XREF
-XR	XREF
Z	ZOOM

## Appendix D

### AutoCAD Express Tools

The AutoCAD Express Tools are a library of productivity tools designed to help you extend the power of AutoCAD. They cover a wide range of AutoCAD functions, including: layer management, dimensioning, drawing, object selection, and object modification.

#### Express Tool Commands

NAME	CLI Command	Description
<b>Command Alias Editor...</b>	ALIASEDIT	Launches an editor for aliases stored in the acad.pgp file
<b>Align Space</b>	ALIGNSPACE	Aligns model space objects in different viewports with each other or with objects in paper space
<b>Arc-Aligned Text</b>	ARCTEXT	Creates text following a selected arc
<b>Import Attribute Information</b>	ATTIN	Inserts attribute information into the drawing
<b>Export Attribute Information</b>	ATTOUT	Extracts attribute information from the drawing
<b>Extend to Nested Objects</b>	BEXTEND	Extends to objects nested in blocks and external references
<b>Replace block with another block</b>	BLOCKREPLACE	Replaces all inserts of one block with inserts of another
<b>Convert block to xref</b>	BLOCKTOXREF	Converts a specified block and all of its inserts to an xref
<b>Break-line Symbol</b>	BREAKLINE	Creates polylines and inserts break-line symbol

NAME	CLI Command	Description
<b>Trim to Nested Objects</b>	BTRIM	Trims to objects nested in blocks and external references
<b>Explode Attributes to Text</b>	BURST	Explodes block and converts attributes to text
<b>DrawOrder by color</b>	CDORDER	Arranges draw order of objects based on color
<b>Change URLs</b>	CHURLS	Modifies URL addresses
<b>Extended Clip</b>	CLIPIT	Adds arc, circle, and polyline capability to XCLIP
<b>Close All Drawings</b>	CLOSEALL	Closes all open drawings
<b>Multiple Copy</b>	COPYM	Copies objects multiple times with options to repeat, divide, measure, and array
<b>Dimstyle Export...</b>	DIMEX	Saves dimension styles to a file
<b>Dimstyle Import...</b>	DIMIM	Imports dimension styles saved to a file using DIMEX
<b>Reset Dim Text Value</b>	DIMREASSOC	Re-associates dimensions
<b>Dwg Editing Time</b>	EDITTIME	Tracks total active editing time in drawing
<b>Extended Offset</b>	EXOFFSET	Enhances OFFSET
<b>Extended Plan</b>	EXPLAN	Enhances PLAN
<b>Flatten objects</b>	FLATTEN	Converts 3D geometry to 2D
<b>Fast Select</b>	FS	Selects objects that touch a specified object
<b>Get Selection Set</b>	GETSEL	Selects specific types of objects
<b>Edit Image</b>	IMAGEEDIT	Launches an image editor application for editing a selected image
<b>Merge Layout</b>	LAYOUTMERGE	Merges the objects from other layouts into one layout and saves corresponding views
<b>Make Linetype</b>	MKLTYPE	Creates a linetype based on selected objects

NAME	CLI Command	Description
<b>Make Shape</b>	MKSHAPE	Creates a shape based on selected objects
<b>Move/Copy/Rotate</b>	MOCORO	Moves, copies, rotates, and scales objects
<b>Move Backup Files</b>	MOVEBAK	Moves saved AutoCAD backup files to a directory
<b>Multiple Object Stretch</b>	MSTRETCH	Stretches objects with multiple selection windows
<b>Copy Nested Objects</b>	NCOPY	Copies objects nested inside blocks and external references
<b>Delete duplicate objects</b>	OVERKILL	Cleans up overlapping geometry by removing duplicated and/or unneeded objects
<b>Convert PLT to DWG</b>	PLT2DWG	Imports HP-GL files into the current drawing session
<b>Update Drawing Property Data</b>	PROPULATE	Updates, lists, and clears drawing property information
<b>Attach Leader to Annotation</b>	QLATTACH	Associates a leader to an annotation object
<b>Global Attach Leader to Annotation</b>	QLATTACHSET	Associates selected leaders with a likely annotation
<b>Detach Leaders from Annotation</b>	QLDETACHSET	Disassociates selected leaders from an annotation
<b>Quick Exit</b>	QQUIT	Closes all drawings and exits
<b>Redefine Path</b>	REDIR	Redefines the paths in external references, images, shapes, and fonts
<b>Find and Replace URLs</b>	REPURLS	Replaces URL addresses with others
<b>Revert to Original</b>	REVERT	Closes the current drawing and re-opens the original version
<b>Remote Text</b>	RTEXT	Inserts or edits a remote text object

NAME	CLI Command	Description
<b>Real-Time UCS</b>	RTUCS	Changes the UCS in real time
<b>Save All Drawings</b>	SAVEALL	Saves all open drawings
<b>Show URLs</b>	SHOWURLS	Shows the location of embedded URL addresses
<b>Convert Shape to Block</b>	SHP2BLK	Converts from a shape definition to a block definition
<b>Super Hatch...</b>	SUPERHATCH	Uses images, blocks, external references, or wipeouts as hatch patterns
<b>System Variable Editor...</b>	SYSVDLG	Launches an editor for system variables
<b>Change Text Case</b>	TCASE	Changes the case of selected text
<b>Enclose Text with Object</b>	TCIRCLE	Surrounds text or multiline text with circles, slots, or rectangles
<b>Automatic Text Numbering</b>	TCOUNT	Adds sequential numbering to text objects
<b>Text Fit</b>	TEXTFIT	Fits text between specified points
<b>Text Mask</b>	TEXTMASK	Places a mask behind selected text
<b>Unmask Text</b>	TEXTUNMASK	Removes a mask from behind selected text
<b>Toggle Frames</b>	TFRAMES	Toggles frames for images and wipeouts
<b>Justify Text</b>	TJUST	Justifies text created with MTEXT and ATTDEF
<b>Rotate Text</b>	TORIENT	Rotates text, multiline text, and block attribute objects to new orientation
<b>Convert Text to Mtext</b>	TXT2MTXT	Converts text created with TEXT or DTEXT to multiline text
<b>Explode Text</b>	TXTEXP	Explodes text into polylines
<b>List Viewport Scale</b>	VPSCALE	Lists the scale of a selected viewport

NAME	CLI Command	Description
<b>Synchronize Viewports</b>	VPSYNC	Synchronizes one or more viewports with a master viewport
<b>Attach Xdata</b>	XDATA	Attaches extended object data (xdata) to an object
<b>List Object Xdata</b>	XDLIST	Lists the extended object data (xdata) attached to an object
<b>List Xref/Block Properties</b>	XLIST	Displays properties of objects nested in blocks and external references
<b>Express Tools Web site</b>		Launches web browser and loads the AutoCAD Express Tools Web site
<b>Express Tools Newsgroup</b>		Launches a news reader and displays the AutoCAD Express Tools newsgroup
<b>Autodesk Products and Support Website</b>		Launches a web browser and displays the Autodesk Products website
<b>Express Tools FAQ</b>		Displays an FAQ for AutoCAD Express Tools
<b>Help</b>		Displays Help for the AutoCAD Express Tools

**NOTES:**