CAD Standards User's Guide
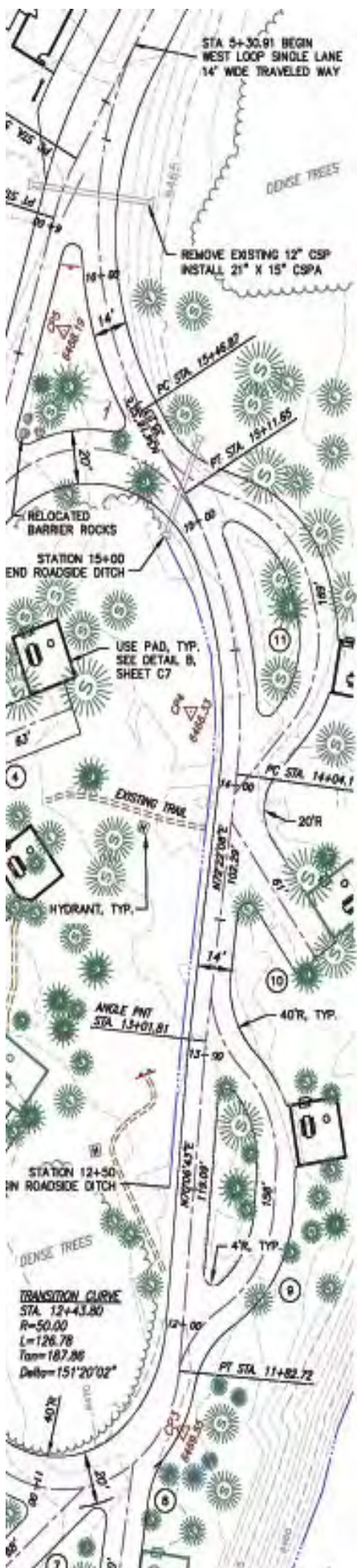
May 2005

VERSION 3.0

Introduction

The following AutoCAD User's guide was compiled by the Regional Office - Center for Design and Interpretation (CDI) and represents a collaborated effort by the AutoCAD standards committee members (see Contributor/Reference page near back of document). These standards are intended for Forest Service employees throughout the region, as well as architectural and engineering (A&E) contractors for the use in the preparation of Computer Aided Design (CAD) construction and design drawings for the Forest Service.

The purpose of this document is to establish standards, which will result in the preparation of consistent and compatible AutoCAD files. It is intended to guide users in the overall CAD system, operations, and to establish standards and procedures that will avoid duplication of effort and maintain uniformity of work. Drawings that do not meet these requirements will be considered unacceptable. If special conditions make it impractical or impossible to conform to any of these requirements, the problem should be referred to the Project Manager and/or the Center for Design and Interpretation.

This manual also contains operational guidelines for users of the AutoCAD system located at the Regional Office in document management, file backup and restoration procedures, archiving, publishing electronic files (pdfs), and plotting.

Suggestions for improvement are strongly encouraged and welcomed so that subsequent updates will reflect the needs and input of the users. Recommendations or suggestions should be emailed to:

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An electronic version of this document [.pdf] may be requested from CDI.

Visit the CDI website: http://fsweb.r2.fs.fed.us/eng/cdi
A/E Contractors and outside the Forest Service: Contact CDI (303) 275-5177

Table of Contents

Appendix E - Keyboard Aliases and Add-On Commands

Appendix F - Troubleshooting, Tips and Tricks

Appendix G – FS AutoCAD Customization

Contributor/References

Index

Chapter 1

General Standards

General Standards

These general standards are intended to include the fundamental requirements for the efficient use of the AutoCAD system within Region 2. Some of these standards will be repeated and further explained in other more specific chapters.

The following are the basic standards for the Forest Service / Region 2.

> All CAD drawings will be done in AutoCAD or AutoDesk related software release 2000 or better.
>
> All drawings will be drawn at true scale and true coordinates in model space.
>
> All plots will be made from paper space at 1:1 (full size), and 1:2 (half size).
>
> All externally referenced (xref) drawings will be attached (overlaid) into the subsheet at 0,0,0. See Drawing Setup section in Chapter 2.
>
> All colors used in drawing files will comply with the Plot Style Table (.ctb) standards set for the Forest Service. See Chapter 3.
>
> All line work and text lettering to be *'color bylayer'*.
>
> All drawings will contain a date stamp that includes the latest date modified, name of last person to save drawing, AutoCAD release number, the drawing pathname and file name, and names of all attached xrefs.
>
> No changes or additions will be made to any 'base' sheet by disciplines using this base as an external reference (xref).
>
> Layer names will conform to Region 2 CAD standards and all drawing elements will be drawn on the appropriate layer.
>
> One single drawing file may contain multiple subsheets (layout tabs), although it is recommended that the number of subsheets be kept to a minimum in order to make working on the drawings more efficient between users.
>
> All text will be in CAPITAL letters. Standard text height will be .130" (RomanS font) or 1/8" (Architectural font).   Minimum text size is .100" (3/32") for full size drawings. See Chapter 3.
>
> The paper size used for plotting will be 22"x34" (full-size) and 11"x17" (half-size).   Border sheets are inserted at full size into drawing.
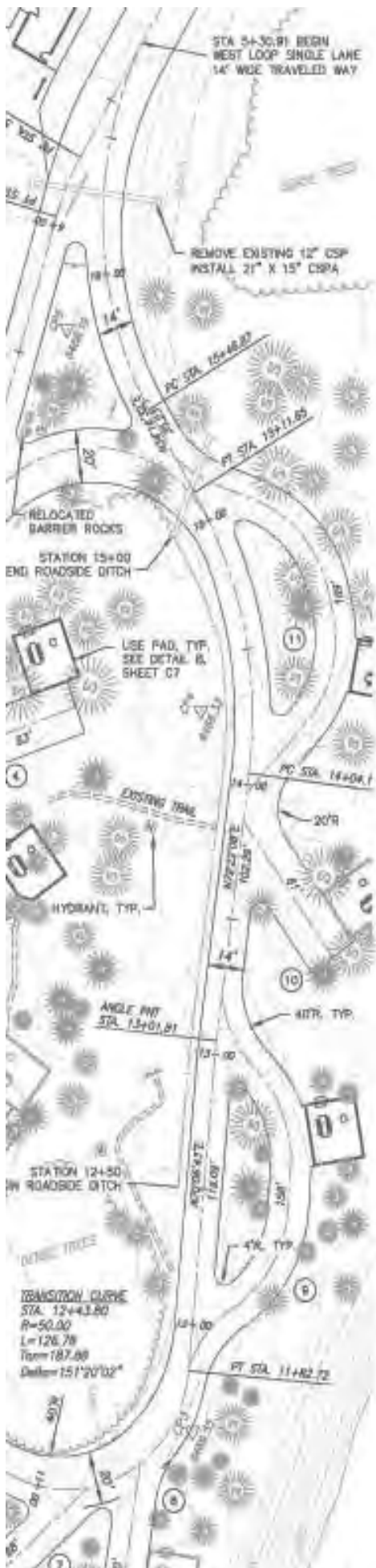
Chapter 2

Drawing Format and Setup

Drawing Format

Standard Sheets

Standard 22"x34" (full-size) and 11"x17" (half-size) Forest Service drawings sheets are used for design and construction drawings. See Figure 2-1 for our standard sheet border, which also shows the location of date stamp and required paper margins. See Figure 2-2 for the standard plan and profile sheet border.
Figure 2-3 shows a typical cover or title sheet configuration.

Standard sheets include:

- **Second Sheet** - Standard Forest Service border sheet.
- **Plan and Profile Sheets** - These are standard second sheet borders with grids for a plan and profile sheet. (p/p option: profiles created with AutoDesk Civil Design have a grid already and user may use standard Second Sheet with profile view-port).
- **Cover Sheet** - Standard cover sheet with vicinity map, site map and index.
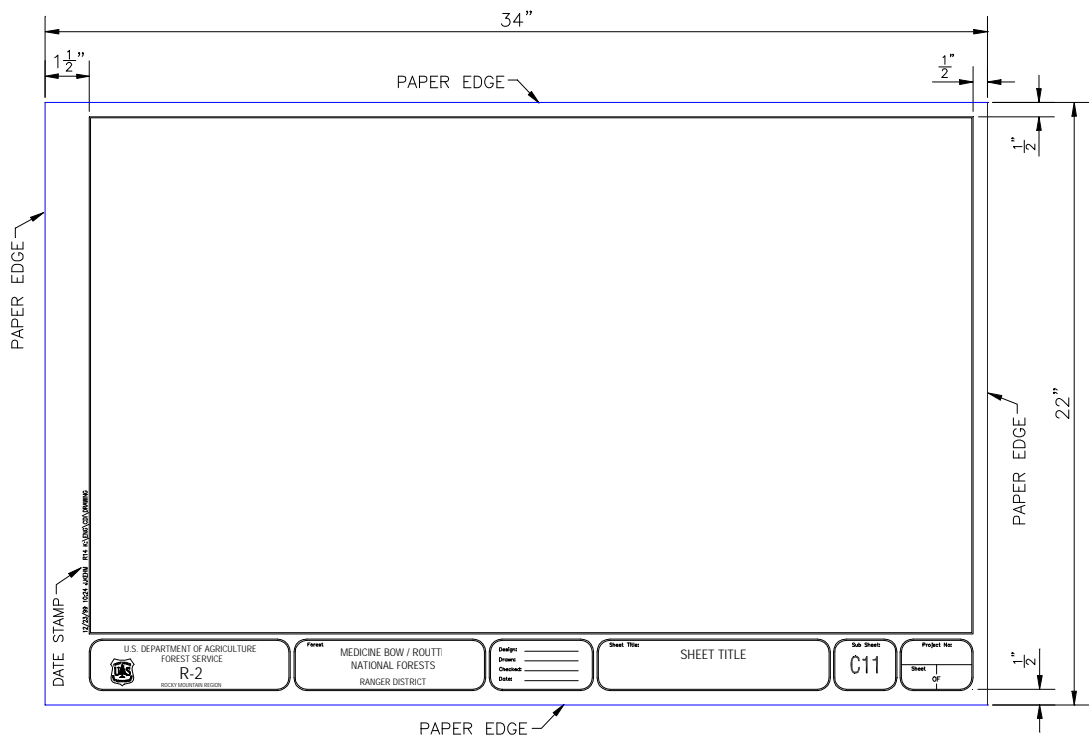
Standard Sheet Border
Figure 2-1
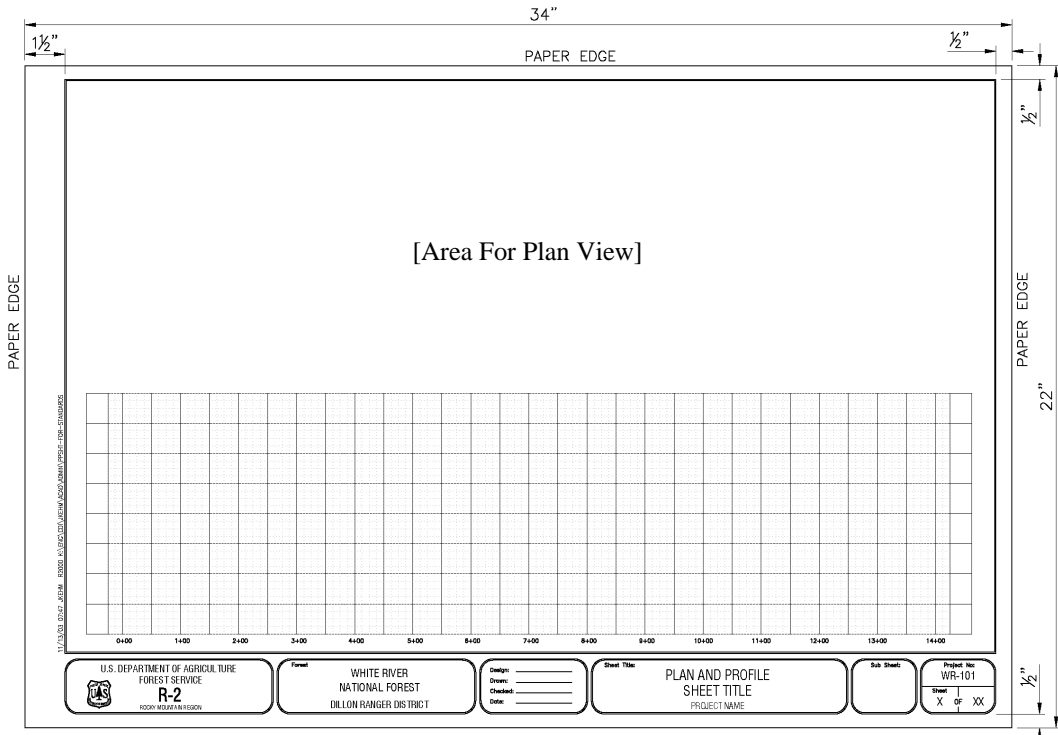
Standard Plan and Profile Sheet Border
Figure 2-2
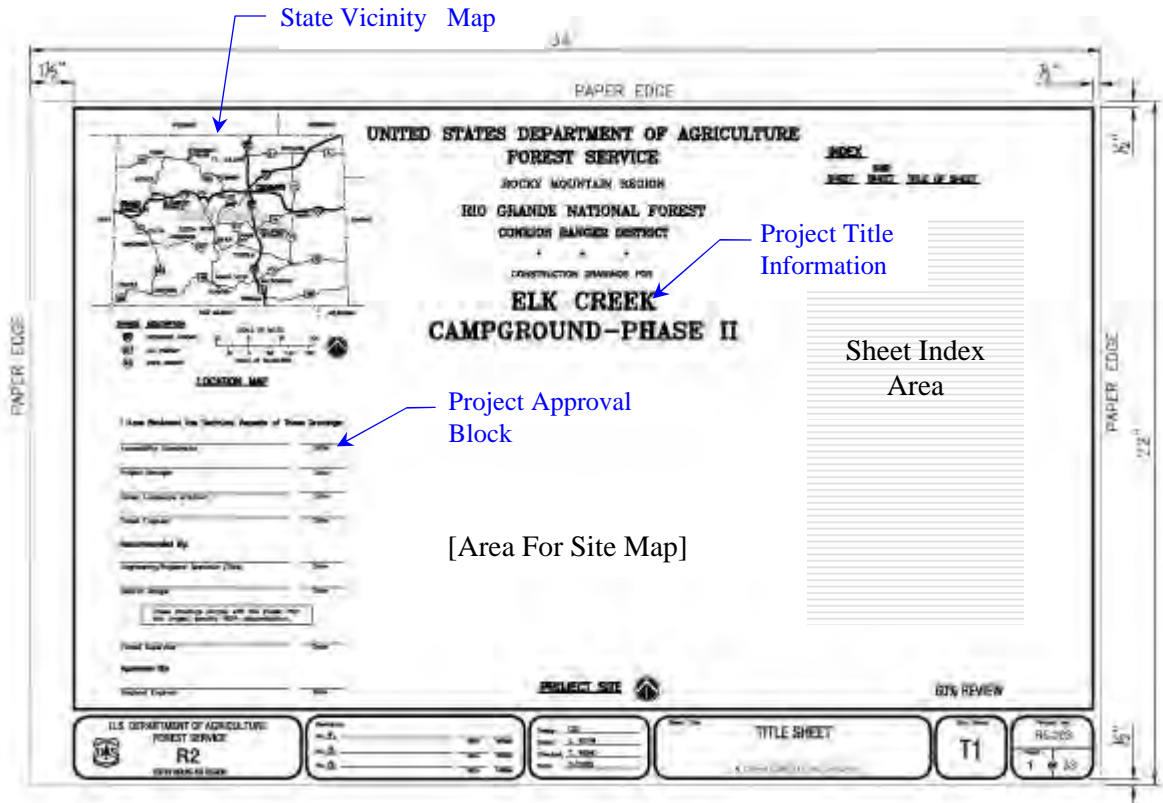
Typical Cover Sheet Configuration
Figure 2-3

Title Blocks

The title blocks on a standard sheet (rectangular bubbles located on the bottom of the border sheet) includes the following information: drawing title; project name; project number; name of forest(s); ranger district; designer, drafter, and reviewer's name; date; sub-sheet number as well as sheet number and total sheets. See Figure 2-4 for an example of a completed typical title block. The far left rectangular bubble contains the Forest Service Regional identification and the Forest Service shield. Generally this information is not changed and thereby unable to be edited.
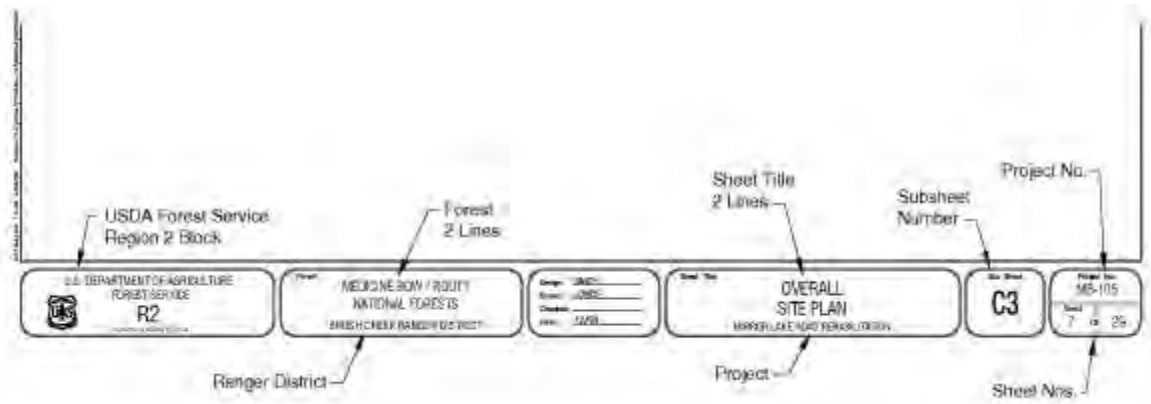
Standard Border Sheet Title Block
Figure 2-4

Title blocks on a cover (or title) sheet are somewhat similar to that of the standard sheet. The exception is the bubble that contains the Forest and Ranger District name is replaced with a project revision block (see Figure 2-5) since the Forest and Ranger District information is identified in the *project title* of the cover sheet (refer back to Figure 2-3 to see project title).

Project Revision Block
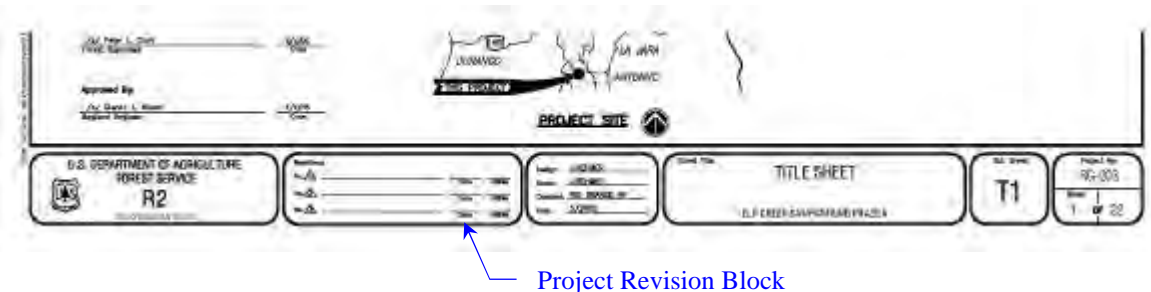
Standard Cover Sheet Title Block
Figure 2-5

Approval and Revision Blocks

Approval Blocks – The project approval block is located on the cover sheet of all design and construction drawing sets. Refer back to Figure 2-3 to see the location of the approval block in relation to the cover (title) sheet. See Figure 2-6 for an example of the approval block to be used on the cover sheet of all construction-drawing sets.

I Have Reviewed the Technical Aspects of These Drawings:

_____   _____
Accessibility Coordinator   Date

_____   _____
Project Manager   Date

_____   _____
Forest Landscape Architect   Date

_____   _____
Forest Engineer   Date

Recommended By:

_____   _____
Engineering/Regional Specialist (Insert Title)   Date

_____   _____
District Ranger   Date

These drawings comply with the Forest Plan
and project specific NEPA documentation.

_____   _____
Forest Supervisor   Date

Approved By:

_____   _____
Regional Engineer   Date

Cover Sheet Signature Block
Figure 2-6

Revision Block - A revision block is required when changes are made to construction drawings, which have been issued for bid and therefore are official contract documents. See figure 2-7 for completion of revision block typical on the FS cover sheet.

Revision Date

Initials of Person Responsible for Revisions

List All Sheets Affected by Revision

Completed Revision Block
Figure 2-7

With each revision to the set of construction drawings, a revision triangle should appear where any changes have occurred within the set. For example, on every sheet (including the cover sheet) where there has been a drawing amendment to the site, layout information, details, or annotation, etc…a revision triangle with the appropriate number should be appear next to the change. To help draw attention to the revision on a busy sheet, a revision cloud around the detail should also be included. Figure 2-8 depicts a change to a detail and the annotation. The number 1 in the revision triangle refers to the initial amendment to the drawing set. Subsequent amendments would have a 2, or 3, etc., in the triangle.
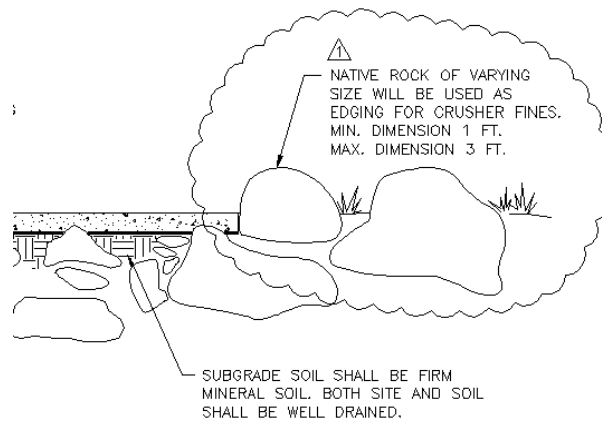
Revision Example
Figure 2-8

Date Stamp

Each drawing needs to contain a date stamp that includes the latest date and time drawing was last modified, name of drafter, AutoCAD release number, and the drawing pathname with the drawing filename (including any external references). It is to be located vertically, on the left side of the border sheet, outside the border. This date stamp is written into the customization of our border sheet drawings and when using our 2nd sheet borders, the date stamp will automatically be updated each time the drawing is saved. To insert this date stamp on existing drawings, you can access the "auto stamp" icon from the icon menu. Figure 2-9 below shows samples of the date stamp…. Figure 2-10 indicates the location relevant to the border sheet.

Examples:

3/1/03 15:03 MCONNORS R2000 K:\PROJECTS\WHRI\TRAPPERS-LAKE\DWGS\L3-SITELAYOUT

6/18/03 8:03 GFRANCE R2005 K:\PROJECTS\PKSI\WILKERSON\PS-214\DWGS\C5-RDPROFILES

Automatic Date Stamp Typical Information
Figure 2-9

Date Stamp Location:
 * Vertical on left side of border sheet
 * Text Height = 0.10"
 * '000' Pen (.008")
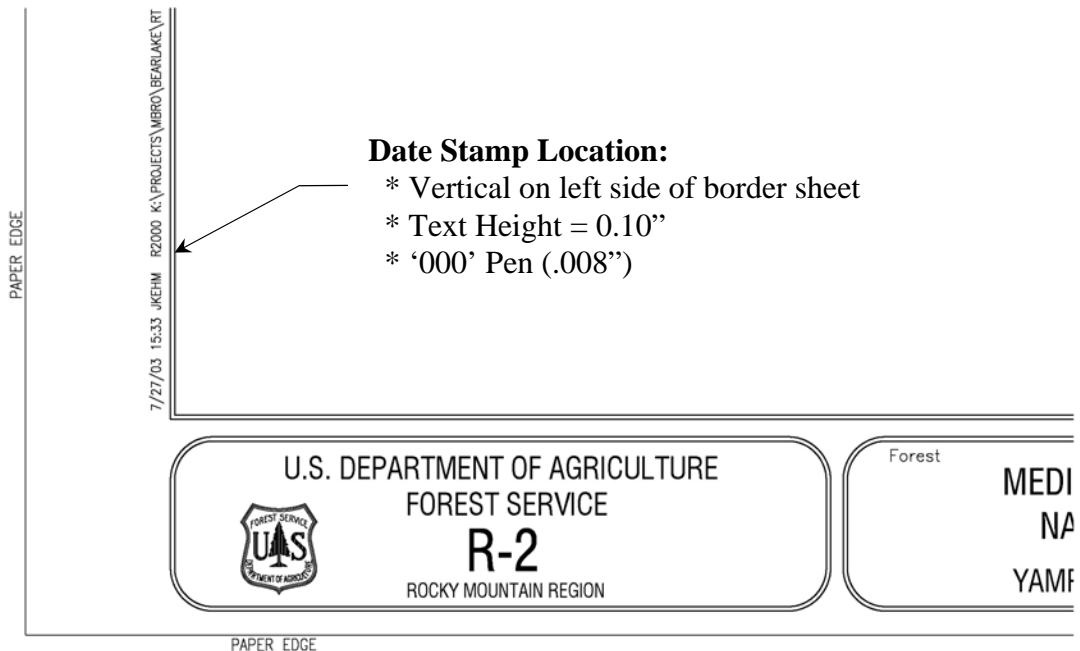
Automatic Date Stamp Location
Figure 2-10

Drawing Setup Guide

The following is a quick guide to setting up your drawings.

All the standard sheets referenced in this chapter are accessible from the General Toolbar available on the FS AutoCAD Customization Disk. Additional symbols are also available from this toolbar such as scale bars and north arrows (See Appendix G for complete Forest Service AutoCAD Customization). These customization tools are available to download from the CDI website. (http://fsweb.r2.fs.fed.us/eng/cdi)

Double click on the border sheet icon on the General Toolbar (Figure 2-11). The FS Icon Menu (Figure 2-11) will pop onto the screen. To insert a border sheet, double click on the Std 2nd Sheet image (or your sheet choice) on the Icon Menu.

Scale Bars

Miscellaneous
Border Sheets

North Arrows

General Toolbar
Figure 2-11

Double click on the image of the border sheet to insert
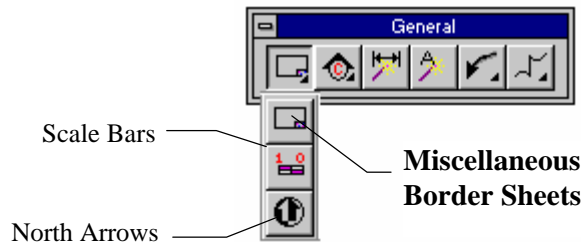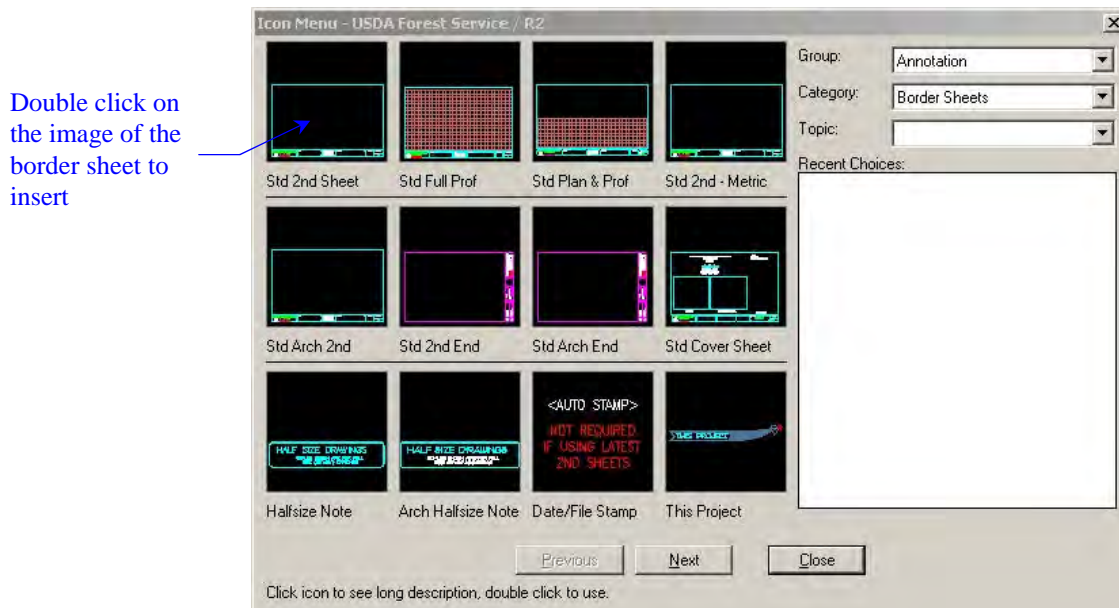
FS Icon Menu
Figure 2-12

Insert Border Sheet

Insert a FS border (second sheet) into the drawing in **paperspace** at (0,0,0) and scale factor 1 (both x and y)…the border is full size 22"x34":

> The FS border sheet is setup with attributes that allow the drafter to fill in all the appropriate title block information, and the dialog box immediately pops up once inserted. Important: **DO NOT** explode the border sheet, as this will lose the functionality to edit the title blocks with the attribute edit command (ddatte).

> Also incorporated within the FS border sheet is a drawing date stamp. This date stamp will automatically update all the appropriate information about the drawing location, date last modified, drafter, and any attached xrefs.

If the inserted FS border sheet is not properly aligned in the paperspace environment or sized incorrectly with what appears to be the designated paper edge (black rectangular area) on the screen, then the user must correct the settings in the 'page setup' dialog box (see Page Setup in Chapter 6). Figure 2-13 shows a border sheet properly aligned with the paperspace environment.

Gray Paper Space Environment

Inserted Border Sheet Into Paperspace
Figure 2-13

Setting Up Viewports

Before creating any viewport, be sure to create a new layer for them in the layer dialog box to better manage the display and printing options of the viewports. If you don't want the frame of the viewport to print, be sure to set the print option to noplot for your newly created viewport layer or set the pen color to 254 (noplot pen). Another option is to create the viewport on the *defpoints* layer, which automatically does not plot.

To create a viewport(s) simply type **'mview'** in the command line and create your viewport by clicking in the lower left of the border working area, stretching your rectangular box and clicking on the upper right. Once the viewport is created, you will immediately see the modelspace environment appear within your viewport window.

The next step is to scale and/or rotate the modelspace view to accurately fit the border sheet.

To Scale:
Type in **'mvsetup'** in the command line and select the *Scale viewports* option by typing **'s'**.

1. Select the viewport by clicking on the viewport box (the lines should dash after selecting) and hitting the enter key to complete the selection.

2. The command line will prompt you for the paperspace units (default = 1.0)…hit enter.

3. Next the command line prompts you for the modelspace units (again default = 1.0), but here type in the scale desired for the drawing. For a drawing that is 1"=40'…type in 40, for 1"=100'…type in 100, for ¼"=1'-0"…type in 48, for ½"=1'-0"...type in 24, etc. Note: Scale Factors will depend on what units (inches or feet) the drawing is set to.

If the desired area disappears from the screen, you may need to pan or zoom in through the modelspace window to the area prior to starting these steps.

Another alternative to scaling a viewport is to simply click on the **paper** button just below the command line, which initiates the *floating modelspace* option (you will see the button now reads **model**, and your cross hairs operate within the viewport only and not the entire screen. Type in **'z'** for the *zoom* command and **'s'** for scale, or click the ***zoom scale*** icon under the zoom flyout menu. Follow the scale input in step number three above, and enter 1 over your scale factor with **'xp'** immediately following the number. (i.e 1/40xp for 40 scale, 1/100xp for 100 scale, 1/24xp for ½" scale, etc.) Both methods will provide an accurate viewport scale.

Be careful when working through the *floating modelspace* window to not zoom in and out as this will change the viewport scale. Locking your viewport will prevent this from happening.

To Determine Viewport Scale:
If you wish to inquire what a viewport scale might be, type in **'vpsc'** in the command line and select the viewport in question. The viewport scale will appear in the command line.

To Rotate:
Again type **'mvsetup'** in the command line and select the A*lign* option by typing **'a'**, and then select the *Rotate view* option by typing in **'r'**.

1. Type in 0,0 as the viewport basepoint and hit enter.

2. Determine the specified viewport angle by typing in the desired angle relative to 0 being straight up. For a 30-degree rotation counterclockwise, type in 30. For a 45 degree rotation clockwise, type in –45. All angles ccw are positive, and cw are negative, see Figure 2-14.
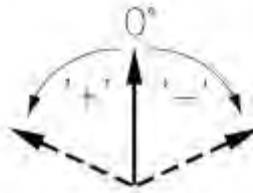
Viewport Angle Rotation Orientation
Figure 2-14

Note
If, for example, you type in a rotation angle of 30 degrees and after viewing the results you determine that the rotation would be better if 5 more degrees were added to the angle, repeat the steps again and input '35' this time for the new angle. Do not simply type in '5' thinking it will rotate another 5 degrees from the current angle showing. Treat each rotation input as if you were starting over from top '0' and calculating the angle left or right.

After setting a rotation in the selected viewport, you will note that your crosshairs are no longer horizontal and vertical in the *floating modelspace* window, but rather angled to match the rotation. If you click the *modelspace* tab you will discover that the actual 'real world' model space is still the same orientation it has always been, it is just the view in paperspace that has been rotated to accommodate the border sheet space. Despite the viewport rotation, the horizontal/vertical orientation or coordinate system has not been changed in the actual model space.

Text Input on Rotated Viewport

As you work through the newly rotated viewport window you discover that any text or ortho line work that you attempt to put is subject to the rotation angle established by the rotated viewport. You want text that is horizontal on the drawing but is coming in angled since the crosshairs are angled. See figure 2-15.

Viewport With Actual Modelspace Orientation
Figure 2-15

A simple solution:
Type the **'ucs'** command in the command line and type the option **'v'** for view. The crosshairs in the viewport now will change to horizontal/vertical and any text you add to the drawing is horizontal. See figure 2-16. Looking in the actual model space you will see angled text, but in the paperspace viewport, it is horizontal. To return the crosshairs back to its original state, type in the **'ucs'** command again and hit the return button twice (default = world). The crosshairs once again return to their correct orientation in modelspace.
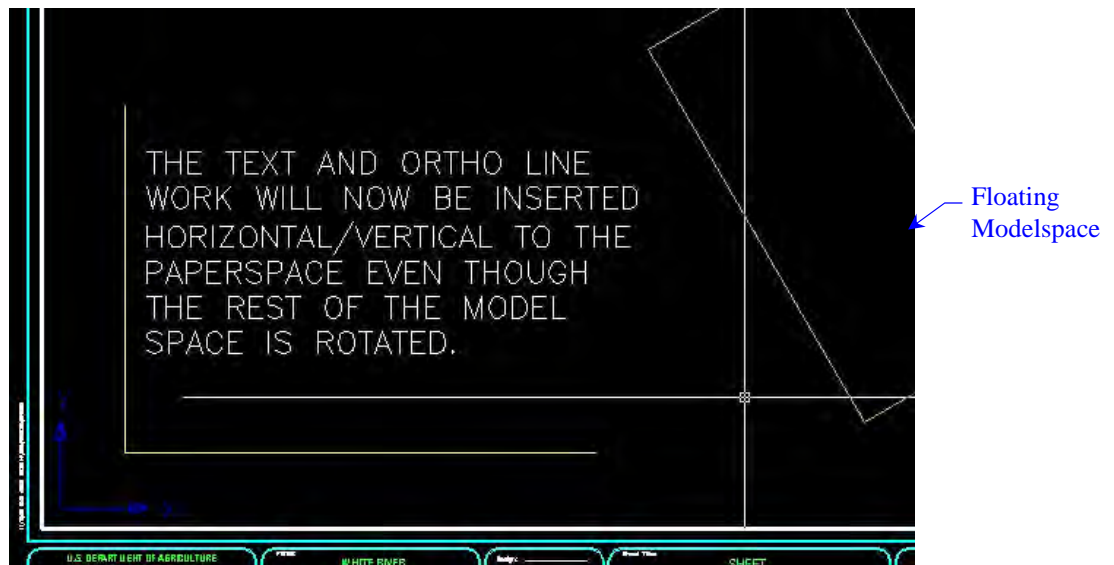
Viewport With Corrected Crosshairs - Changed with UCS
Figure 2-16

Xrefs

All xrefs should be inserted at (0,0) as 'overlays' rather than 'attached'. Select **Relative Path** in the Path type box (Figure 2-17). By selecting this option, the drawing tag on the left side of your border sheet simply identifies the name of the xrefs rather than the entire path and name of the xrefs. (This will keep your drawing tag from shooting up off the page on the left side of your border sheet). Another option is to select *'No Path'* this allows users from other districts/forests to share drawings from another server in an entirely different office. The xref manager will look to the user's local drives to load the xref drawing rather than trying to directly access a foreign drive that is hard coded into the attachment.

Attach as Overlay

Select:
'Relative Path'
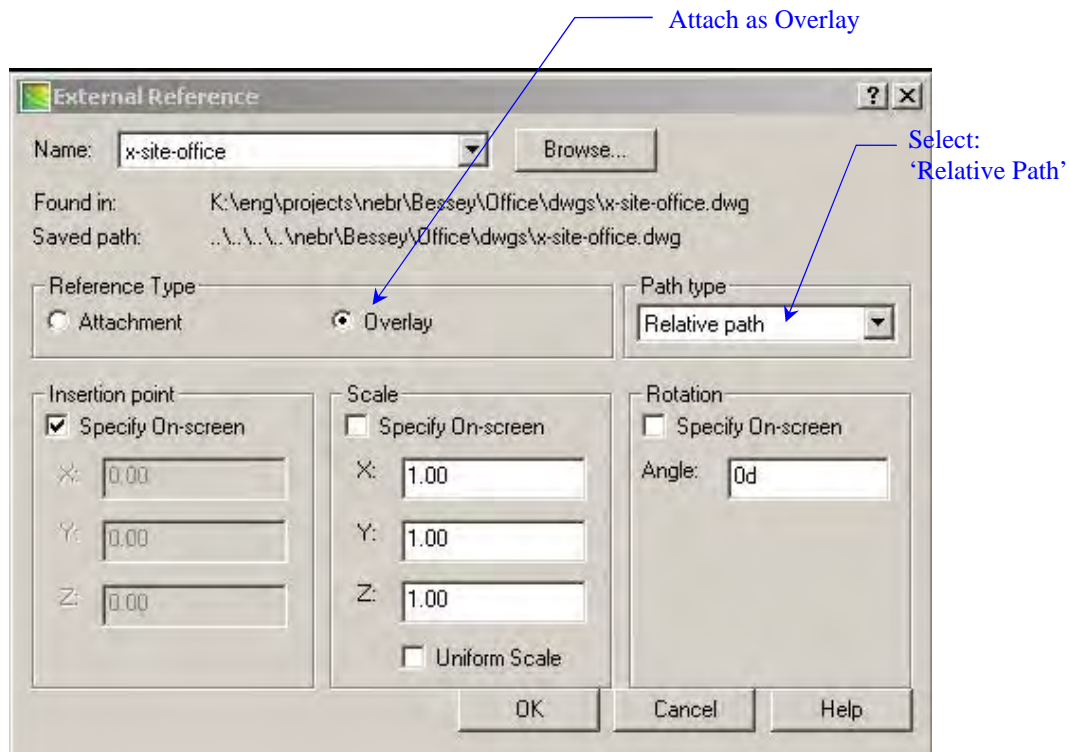
Xref Manager Attachment Box
Figure 2-17

As good practice: It is recommended that a new layer called **xref** be created and set current prior to inserting xref dwgs. This allows the cad user working in that particular drawing to turn off or freeze the <u>entire</u> xref by selecting the newly created xref layer…rather than freezing/turning off each individual layer associated with a particular xref. If several xrefs are inserted, layer names can have identifiers added such as: xref-site…. xref-utility..…xref-topo, etc..

Important Setting in AutoCAD When Working With XREFs

Navigate to the *'Tools'* pull-down menu and click on *'Options'* at the bottom of the menu. The 'Options' dialog box should pop on the screen and after clicking on the

'Open and Save' tab, the user should see the box shown in Figure 2-18.   Under the External References section in this box, be sure to change the Demand Load Xrefs option by clicking on the right arrow and selecting **'Enable with Copy'**.   By doing this, other users will be able to successfully load project drawings that have also xrefed in the same base drawing.   If you don't select this option, you lock any xref drawings that load along with your AutoCAD file, and other users will not load or even view those drawings while you are in that particular file.
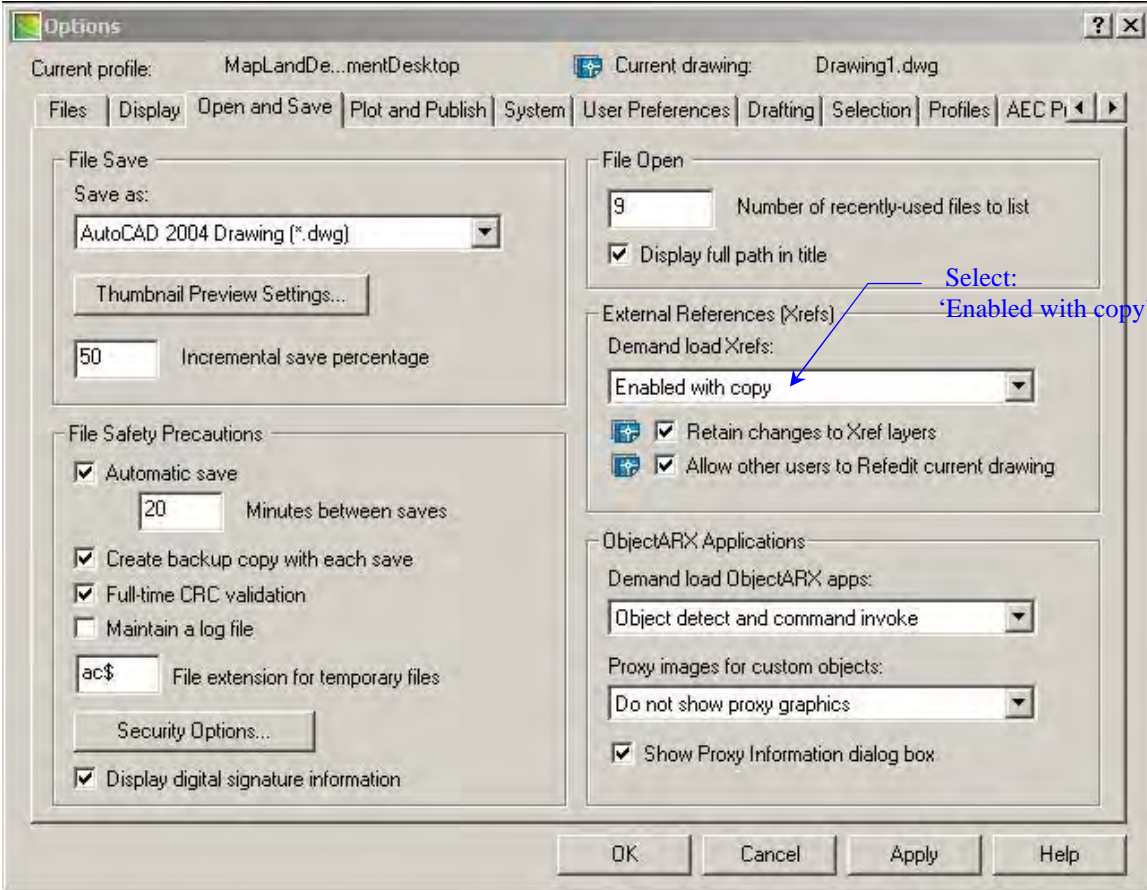
Options Dialog Box – Open and Save Tab
Figure 2-18

Chapter 3

Drafting Practices

Drafting Practices

All FS construction drawings are issued to prospective bidders as nominal half size prints whether in hard copy or electronic format (pdf). All drawings must be capable of being reproduced as clear and legible half-size prints. Line quality and adequate lettering size are essential to meet these requirements. By following the recommended line weights, lettering height requirements, and the standard Plot Style Table (Figure 3-3)*,* all drawing files will be able to be reproduced as clear and legible half size drawings.

> To assure consistency throughout the region it is strongly recommended that all AutoCAD users adopt the following pen and line weight standards as indicated in this user's guide, especially with multi-forest contributions to a particular project.

Each Forest may determine their own unique Plot Style Table file (.ctb) and line weights. If so, it is important that ALL offices within that Forest adopt their respective pen standards and faithfully follow its format. Each Forest is required to distribute a copy of their pen configuration file(s) to all other Forests in Region 2, as well as the Regional Office.

See Appendix-E for Plot Style Tables per Forest.

Line Weights

Varying line widths on drawings substantially improve their readability. Any new work should be easily distinguishable from other information shown on the drawings. Show new work at 100% (unscreened) and show existing site conditions screened at 40%. Existing conditions on details may be screened but leadered text to the existing portion of the detail should still be 100% and indicate the words 'EXIST' or '(E)' in the annotation.

Existing topographic contours are typically screened at 40% for better clarity. Toned-back background contours on a complex drawing make the proposed design work stand out better, making for a drawing that is more understandable. (Intermediate contours should be a dash line type; Index contours should be heavier pen weight with a slighter longer dashed line type and annotation). See Chapter 5 for further Survey and topographic standard requirements.

New topographic (final grading) contours are shown with a solid 100% line complete with contour elevation labels on each line.

The line widths shown in Figure 3-2 have been established as the standard line widths for FS AutoCAD drawings. This chart only represents the 9 Standard Colors that are available for 'quick- toggle' on the top row of the Select Color dialog box (Figure 3-1), and including color 30 (orange). All 255 colors are available for use and mapped to a pen weight for maximum flexibility with color choices (see Plot Style Table, Figure 3-3).

All line work in a drawing should <u>always</u> be set to *'color bylayer'*.

Standard Color Bar
(See table below)

Other 240 Colors
Mapped to Various Pen
Weights per Plot Style
Table (Figure 3-3).
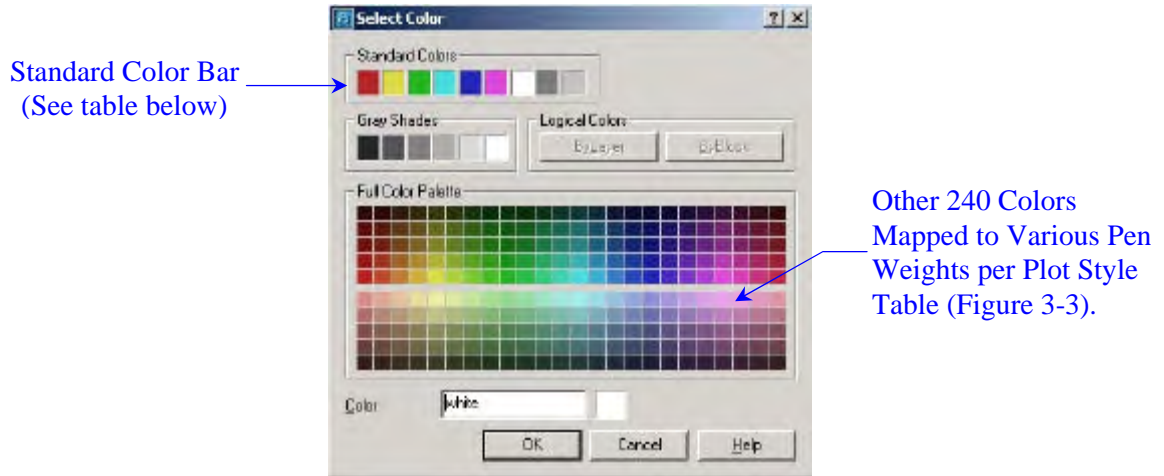
Figure 3-1

AutoCAD 10 Standard Colors and Line Weights

Color	Color Number	11" x 17" Line Weight when Plotted	22" x 34" Line Weight, when Plotted	Example	Equivalent LEROY® Or Rapido Pen
Red	(1)	0.002"	0.004"		0000
Yellow	(2)	0.004"	0.008"		000
Magenta	(6)	0.006"	0.012"		00
White	(7)	0.008"	0.016"		0
Cyan	(4)	0.011"	0.021"		1
Green	(3)	0.013"	0.026"		2
Blue	(5)	0.017"	0.033"		3
Orange	(30)	0.025"	0.050"		5
Dk Gray	(8) 40%	0.006"	0.012"	(Screened background info)	00
Gray	(9) 40%	0.008"	0.016"	(Screened background info)	0

Figure 3-2

PLOT STYLE TABLE / PEN COLORS

| Line Width (inches)	% Screen		Color Numbers		LEROY® or Rapido
.004	100	red	1, 28,50,71,92,113,134,155,176,197,218,239		0000
.008	100	yellow	2, 29,51,72,93,114,135,156,177,198,219,240		000
.026	100	green	3, 31,52,73,94,115,136,157,178,199,220,241		2
.021	100	cyan	4, 32,53,74,95,116,137,158,179,200,221,242		1
.033	100	blue	5, 33,54,75,96,117,138,159,180,201,222,243		3
.012	100	magenta	6, 34,55,76,97,118,139,160,181,202,223,244		00
.016	100	white	7, 35,56,77,98,119,140,161,182,203,224,245		0
.012	40	dk. gray	8 *(screened or background info)*		00
.016	40	gray	9 *(screened or background info)*		0
.004	100		11, 36,57,78,99,120,141,162,183,204,225		0000
.008	100		12, 37,58,79,100,121,142,163,184,205,226		000
.026	100		13, 38,59,80,101,122,143,164,185,206,227		2
.021	100		14, 39,60,81,102,123,144,165,186,207,228		1
.033	100		15, 40,61,82,103,124,145,166,187,208,229		3
.012	100		16, 41,62,83,104,125,146,167,188,209,230		00
.016	100		17, 42,63,84,105,126,147,168,189,210,231		0
.004	40		21, 43,64,85,106,127,148,169,190,211,232		0000
.008	40		22, 44,65,86,107,128,149,170,191,212,233		000
.026	40		23, 45,66,87,108,129,150,171,192,213,234		2
.021	40		24, 46,67,88,109,130,151,172,193,214,235		1
.033	40		25, 47,68,89,110,131,152,173,194,215,236		3
.012	40		26, 48,69,90,111,132,153,174,195,216,237		00
.016	40		27, 49,70,91,112,133,154,175,196,217,238		0
.050	40		10		5
.050	40		20		5
.050	100	orange	30		5
.008	40	dk. gray	250,251	*(minor contours)*	000
.012	40	gray	252,253	*(major contours)*	00
No Plot	-	lt. gray	254		
.008	50		255	*(date stamp)*	

Forest Service Plot Style Table
Figure 3-3

Pen Colors

Colors relate to pen weights (line widths) that are mapped to the plotters. The AutoCAD Color Wheel (Figure 3-4) displays all the 255 colors and shades available. Multi-digit color numbers ending in 8 or 9 (i.e. 19, 58, 99, 128, etc.) are <u>NOT</u> recommended for use since they are difficult to see on a black background screen.   Note: If you use a background screen color other than black, there may be other colors that do not display well.

Pen '254' has been designated as 'No-Plot' pen. Although you would see the light gray color on your screen, the color does not plot.
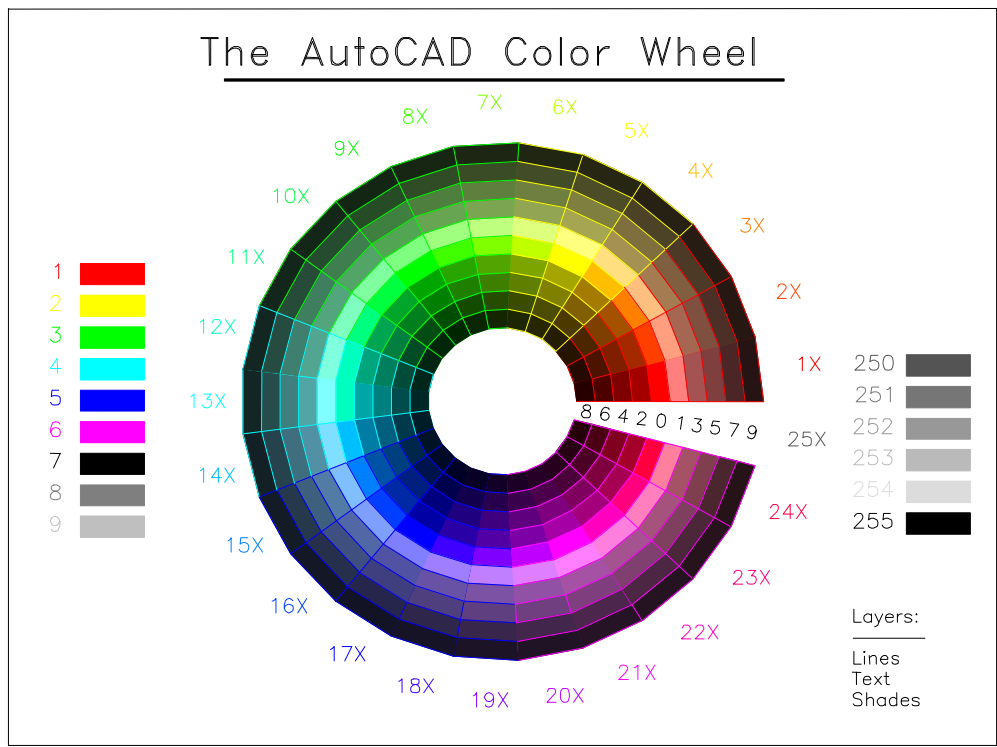
AutoCAD Color Wheel
Figure 3-4

All drawings will be generated using the FS Plot Style Table (Figure 3-3, previous page). Plot Style Table files (.ctb) are available for both half size drawings **(2005-fs-half.ctb)** and full size drawings **(2005-fs-full.ctb)**. When plotting, all colors plot in black or grayshades depending on their configuration (exception: pen 254 does not plot). Screen percentages available include 100% and 40%. Drawings with very thin 40% screen pens should limit their use to non-critical background information, as they do not plot with much clarity.

Lettering Text Height

The following pen and lettering sizes are recommended for full size drawings so that text will be easily readable after drawings are reduced to half-size.

Standard text height is .130" (1/8" for Architectural fonts) and should be maintained for most drawing annotation. A minimum lettering height of .100" is acceptable (3/32" for architectural fonts), when used for special purposes such as symboling, stacked fractions, or limited on space. Text this small should be used sparingly.

Standard lettering sizes, pen width (LEROY® or Rapido Pen), and recommendations for use:

Standard Lettering (RomanS)

.100 text height - .012"   (Pen00) - <u>minimum</u> text height

.130 text height - .016"   (Pen 0) - standard text and dimensioning

.150 text height - .021"   (Pen1)   - sub-titles, schedule headings

.175 text height - .026"   (Pen2)   - plan titles, detail titles, section
                                         titles, section or detail callouts, etc.

Architectural Lettering (Architxt)

3/32" text height - .002" (Pen0000) - schedules and charts

1/8"   text height - .004" (Pen000) - standard text and dimensioning

3/16" text height - .016" (Pen0)   - titles for legends, notes, and lists

1/4"   text height - .026" (Pen2)   - plan titles, detail titles,
                                          section titles, section or detail
                                          callouts, etc.

All text heights indicated here are for full size drawings (22"x34"). It's important to not go below the FS minimum for text height, especially when producing half-size drawings as the text can get difficult to read. All text should <u>always</u> be in capital letters.

Text Styles

Standard text fonts (styles) to be used on all FS drawings are Roman Simplex **(romans.shx)**, or for architectural drawings **(architxt.shx, archquik.shx, archtitl.shx)**.   See Figure 3-5 for examples of the lettering styles.   The romans.shx font provides the maximum readability and transportability of text entities between CAD drawings. The clarity of this font provides the ability to plot readable text at height of 0.100 inches (FS minimum).

The family of architectural fonts are not standard AutoCAD fonts, but have been approved as an option for architectural style text. They are available to all R2 CAD users and filed on the Regional Office server under **k:\eng\cadd\support\fonts** directory. For users outside of the Regional Office or Forest Service, the architectural fonts can be obtained through the CDI web page or by contacting CDI directly (303-275-5177).

Lettering Styles

	LINE WIDTH
ROMANS @ .130"	(.016")
ROMANS @ .150"	(.021")
ROMANS @ .175"	(.026")
ROMANS @ .250"	(.050")

ARCHQUIK @ 1/8"
ARCHITXT @ 5/32"
ARCHTITL @ 3/16"
ARCHTITL @ 1/4"

Sample Lettering
Figure 3-5

Text Setup

TWIZ - An AutoCAD command that has been created at CDI to simplify text setup within an AutoCAD drawing. 'TWIZ' (Text Wizard) configures your text styles based on user-selected options. The command can be entered at the AutoCAD command prompt or selected from the FS General Toolbar (Figure 3-6).

Dimension Setup

DWIZ - Another AutoCAD command created at CDI for dimension setup. "DWIZ" (Dimension Wizard) configures your dimension styles based on user-selected options. This command can also be entered at the AutoCAD command prompt or selected from the FS General Toolbar (Figure 3-6).

Both **TWIZ** and **DWIZ** are bonus tools included with the FS AutoCAD Customization available through the CDI web page.
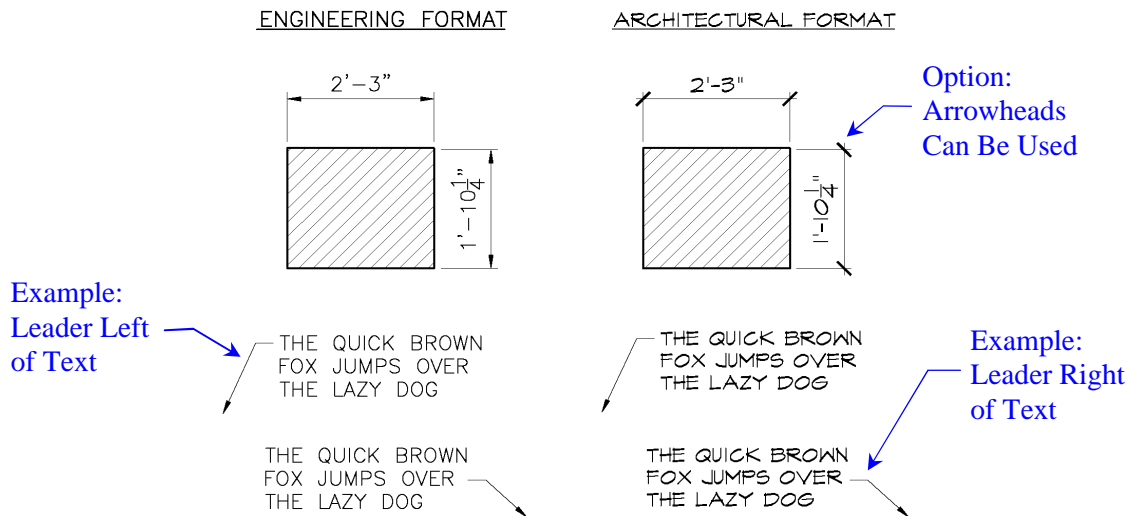

Dimension Wizard   Text Wizard
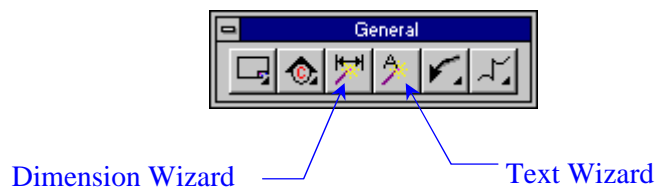
FS General Tool Bar
Figure 3-6

Click on either wizard tool, and popup dialog boxes will prompt you for discipline, scale of drawing, units (imperial or metric), and style (architectural or engineering). Select your choice(s) and click on the *'next'* button to proceed to the next prompt. You can always go back on any dialog box if you make a mistake. Once you have made all your choices, click on the *'finish'* button and that's it! The wizards will have set up the text style or dimension styles you requested and also create their appropriate layers in the layer manager too. (See image to the right).

Layer Created

Scale of Drawing
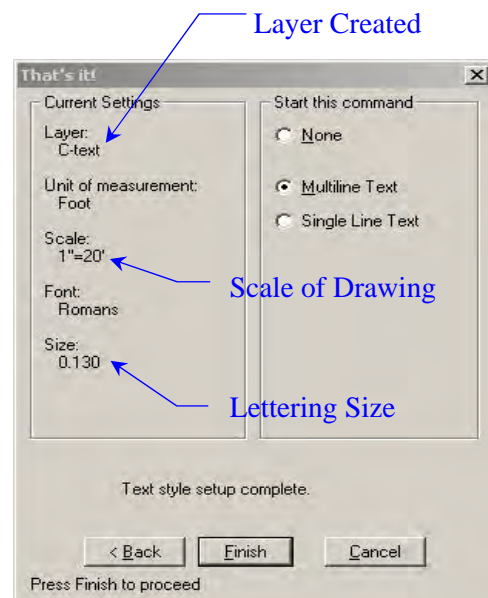
Lettering Size

Dimension and Leaders

Forest Service standards for dimension and leader annotation use arrowheads or ticks depending on the drawing discipline. Engineering format utilizes RomanS lettering with 1/8" arrowheads for both dimensioning and text leaders. Architectural format utilizes architectural fonts with 1/8" ticks (or optional 1/8" arrowheads) for dimensioning, and arrowheads for text leaders. If the Architect chooses to use ticks for dimensioning, then the entire set of Architectural drawings should follow that format. Examples of dimensioning and leader notes are shown in Figure 3-7 below. Never explode dimension lines to edit.

ENGINEERING FORMAT   **ARCHITECTURAL FORMAT**

2'-3"   2'-3"

Option:
Arrowheads
Can Be Used

1'-10¼"   1'-10¼"

Example:
Leader Left
of Text

THE QUICK BROWN
FOX JUMPS OVER
THE LAZY DOG

THE QUICK BROWN
FOX JUMPS OVER
THE LAZY DOG

Example:
Leader Right
of Text

THE QUICK BROWN
FOX JUMPS OVER
THE LAZY DOG

THE QUICK BROWN
FOX JUMPS OVER
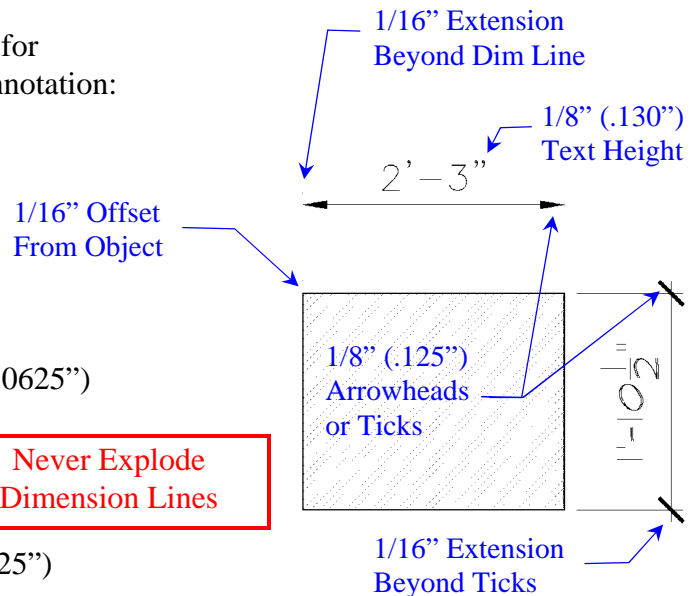THE LAZY DOG

Dimension and Leader Examples
Figure 3-7

The following setup values are to be used for consistency in dimensioning and leader annotation:

Arrowheads = Closed Fill
Arrowhead Size = 1/8" (.125")
Tick = Architectural Tick
Tick Size = 1/8" (.125")

Extend beyond dim lines = 1/16" (.0625")
Extend beyond tics (Arch Only) = 1/16" (.0625")
Offset from Object = 1/16" (.0625")

Text Above Dim Line
Text Height = 1/8" (.130")
Text Offset Above Dim Line = 1/16" (.0625")

1/16" Extension
Beyond Dim Line

1/8" (.130")
Text Height

1/16" Offset
From Object

2'-3"

1/8" (.125")
Arrowheads
or Ticks

2'-0"

Never Explode
Dimension Lines

1/16" Extension
Beyond Ticks

Detail Titles

Drawing details are titled with a bubbled title bar (See examples Figure 3-10). Included in the FS AutoCAD Customization there is a fly-out on the General Toolbar (Figure 3-9) for insertion of Detail Title Bars, Section Cuts, etc. Clicking on the **Detail Title** icon will run a lisp routine that prompts the user for insertion scale, title information, sheet number, and scale; and inserts the title bar automatically. The user also has a choice between RomanS or Architectural fonts depending on their particular discipline. This title bar can also be edited using the attribute editing command (dda, or ddatte) or double-clicking on the title bar.
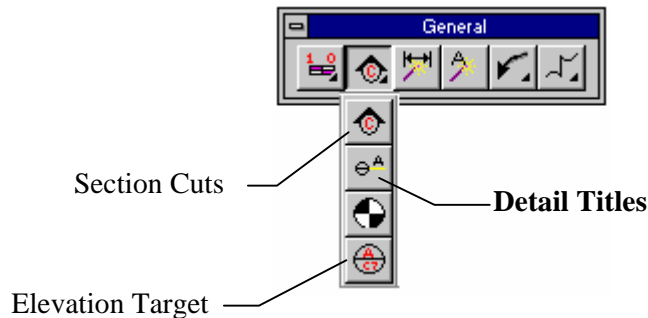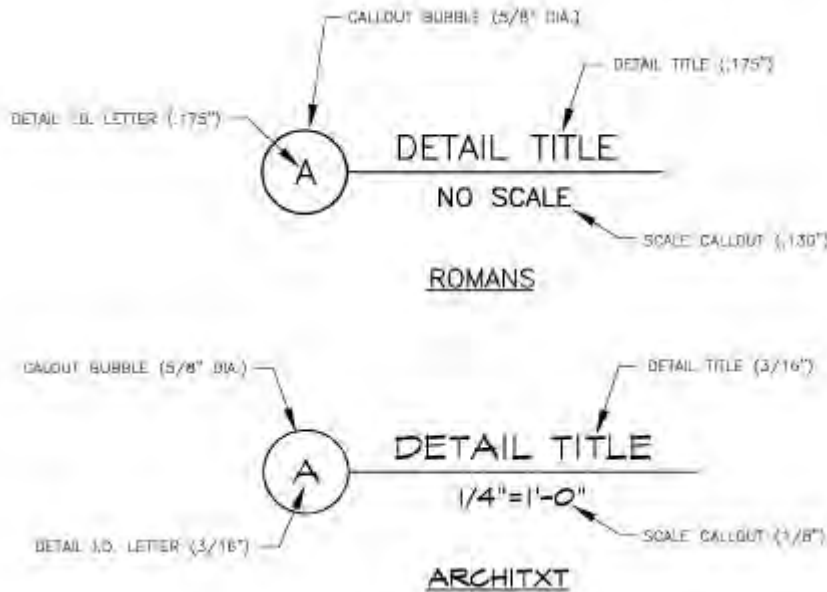
Section Cuts ——

Detail Titles

Elevation Target ——

Figure 3-9

Detail Title Examples
Figure 3-10

Symbols

Icon Menu

The graphic symbols to be used on FS construction drawings can best be accessed through the icon menus by selecting the icon menu icon from the discipline specific toolbars. The icon menu can also be accessed by typing "**IM**" at the command prompt and selecting the descriptive group, category and topic (in that order) that the symbol would be found under. When group, category and topic are selected, the icon menu will then display the related symbols.
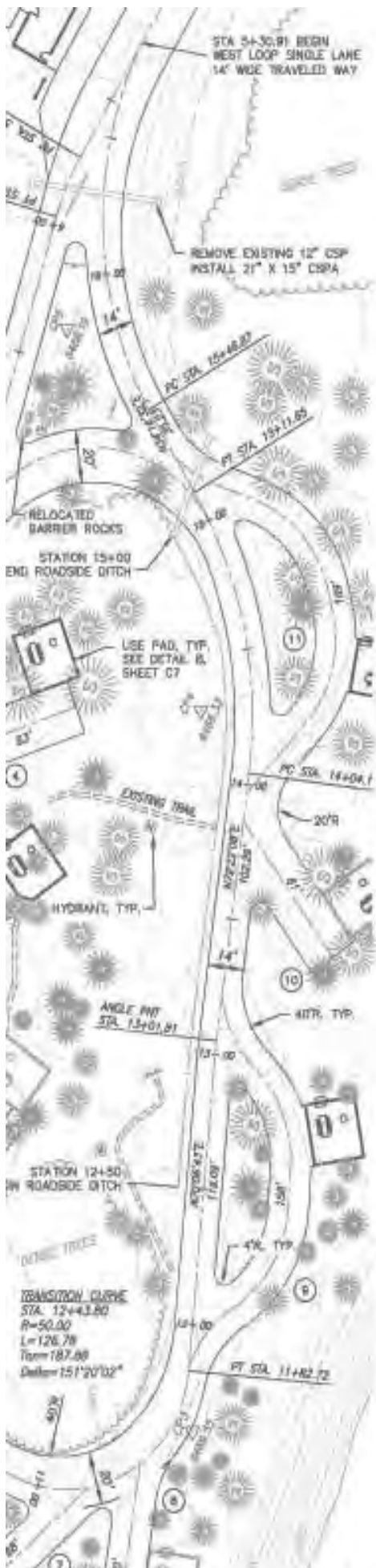
Figure 3-11 is an example of the symbol icon menu. In this case, the group is "Annotation", the category is "Border Sheets".
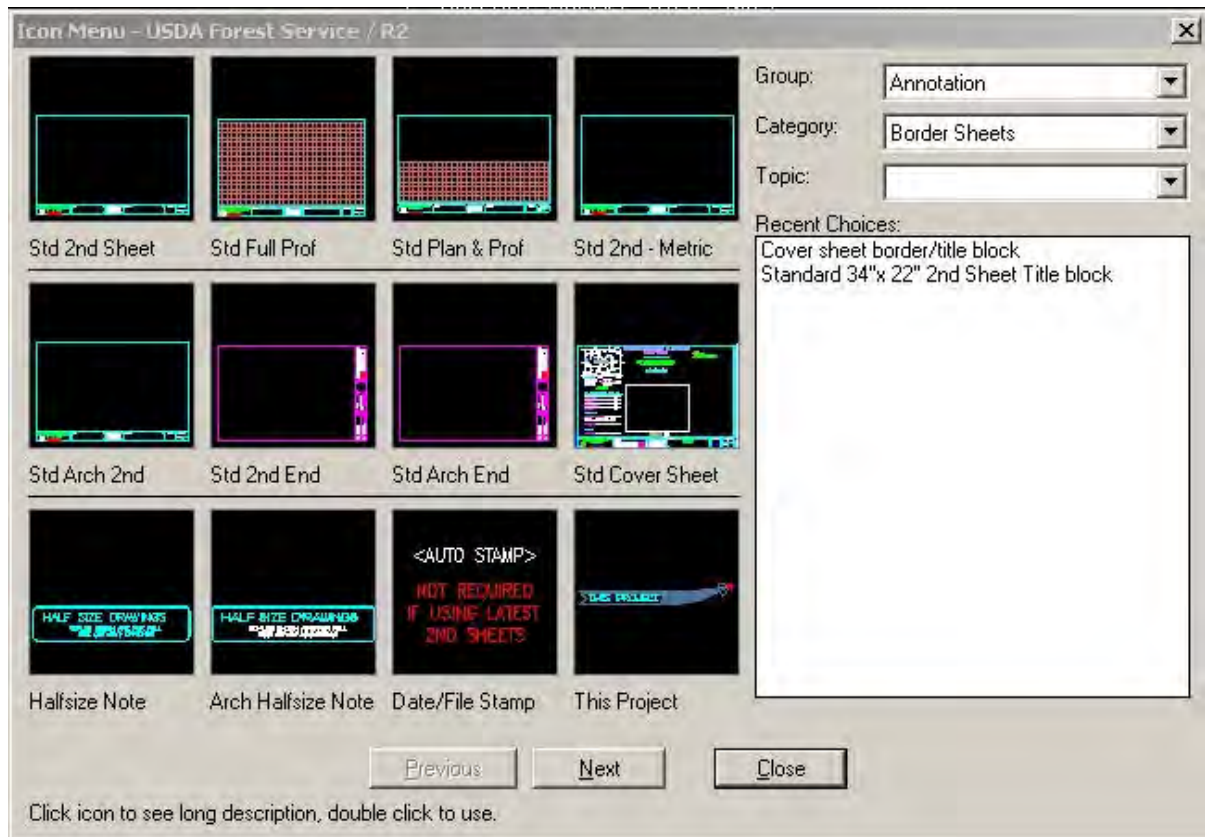
FS Symbols Icon Menu
Figure 3-11

Below each symbol on the icon menu is a short description of the individual symbol. For a more detailed description, click on the icon once. A longer description will appear on the lower left corner of the icon menu. To access the symbol for placement on a drawing, double click on the symbol. Once a symbol has been selected, the user will be prompted for placement specifics, such as units, scale, insertion point, rotation angle and attributes. The prompts will vary depending on the individual symbol and its common use. On the right hand side of the icon menu, there is a "Recent Choices" box. This box will list the symbols that have been most recently accessed. Double clicking on a symbol description in this list can also access symbols.

Some FS standard symbols produce graphics using a series of commands (lisp routines) based on user input, such as border sheets, section cuts, title and detail callouts and some discipline specific symbols. These are also accessible from the icon menu.

Chapter 4
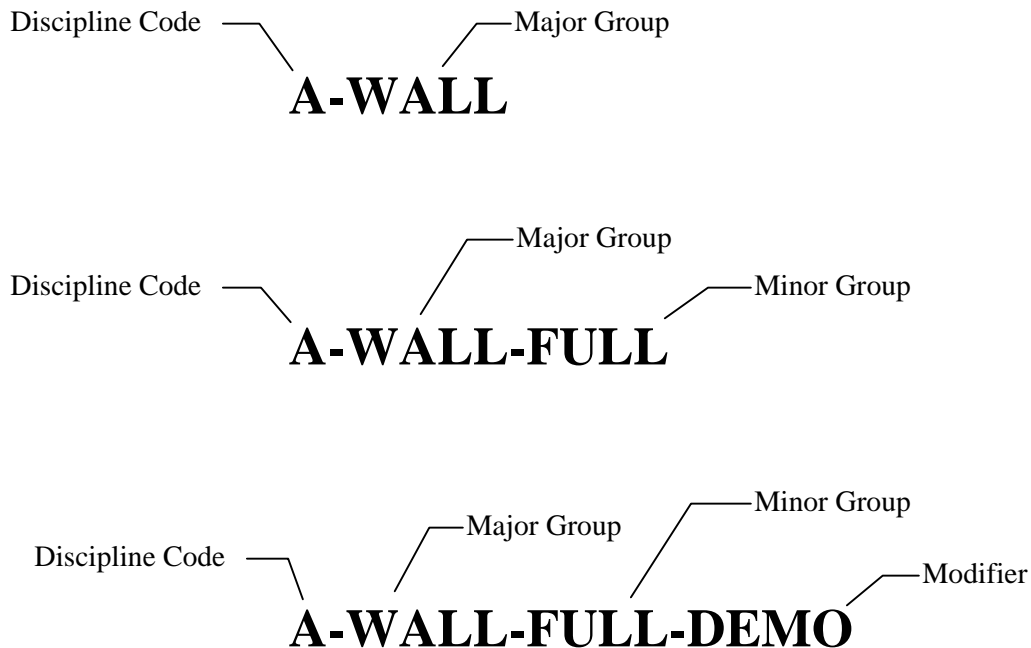
Layer Formats and File Naming

Layer Formats

The layering standards to be used on FS CAD drawings follow, in general, the AIA CAD Layer Guidelines, prepared by the AIA Task Force on Cad Layer Guidelines.

The AIA CAD Layer Guidelines give two methods for sharing graphic information. The single file approach, in which individual drawings are created by turning various layers on and off, is **not** to be used on FS drawings.

The second method, **which is to be used on FS drawings,** is the multiple file approach. This allows a drawing to be created by using external reference files (xrefs). This method allows for a total team approach and easier file sharing.

Layer Formats

Cad layer guidelines are organized using a hierarchical structure that provides for flexibility and expandability. Each layer utilizes the appropriate discipline code, major and minor groups, and modifiers. (See Figure 4-1)

Discipline Code ——   ——Major Group

A-WALL

          ——Major Group

Discipline Code ——   ——Minor Group

A-WALL-FULL

          ——Minor Group

          ——Major Group

Discipline Code ——   ——Modifier

A-WALL-FULL-DEMO

Layer Hierarchy Example
Figure 4-1

Discipline Code Designation

The first level of the hierarchy is the discipline code. A letter indicating discipline code shall precede all layer names. Discipline codes correspond to the traditional discipline designations used in construction drawing sub-sheet numbering. (AIA Modified)

Major Group Designations:
G	General
D	Demolition
C	Civil/Site
L	Landscape Architecture
U	Utility (Site)
A	Architecture
S	Structural
M	Mechanical (HVAC/Plumbing/Fire Protection)
E	Electrical
Z	General Symbols*, Drafter Information *(see Common Layers)

Major and Minor Groups

The second and third levels of the hierarchy utilize major and minor group designations. Major group layer names are alphanumeric and use easy-to-remember abbreviations such as A-DOOR for architectural doors, A-WALL for architectural walls, L-IRRG for landscape irrigation, and C-BLDG for proposed site buildings

Layer names can be further extended with a Minor Group designation.   Minor group designation is an optional field used for sub-categories such as A-WALL-HEAD for door headers, C-ROAD-CL, for roadway centerline, and M-HVAC-DUCT for exhaust system ductwork.

Modifier Field

The modifier field is used to further categorize the layer and again is optional for the drafter. Common modifiers are status codes that differentiate construction modes, condition, materials, or phases.   Typical modifiers are –EXIST (existing), -DEMO (to be demolished), -PHASE1 (phase 1 work), –NIC (not in contract), or –RELO (relocated).

Layer names shall be limited to 25 characters.   Hyphens are used to separate major group designation letter and layer description to improve readability.

Standard Details

In continuing with our efforts to keep layers at a minimum, our layering standard for details will incorporate only the necessary layers needed for editing the details easily. The list below defines the needs that should be met to insure compatibility with Forest Service AutoCAD detail drawings.

- All details shall be drawn full size in model space
- Any details that are non-scaleable should be drawn at actual plot size (i.e.: mview 1xp)
- All details are drawn **color by layer**
- All details to be drawn using the FS Plot Style Table (Figure 3-3)
- All details to use standard Forest Service text styles.
- Dimension styles should be associative
- Hatch should be associative
- Details should be drawn following standards identified in this guideline to insure compatibility and half-size reproducibility.
- Drawings should be for 22"x34" format and scaled to half size, if required, at printer/plotter.
- Bar scales should be included when a scale is indicated.
- All details are drawn utilizing the following minimum layering guidelines.

As discussed previously in this chapter, CAD layer guidelines are organized using a hierarchical structure of discipline codes, major and minor group, and modifiers. A letter indicating discipline code shall precede all detail layer names.

- Architectural detail layers would then start with an **'a-'**
- LA detail layers would start with an **'l-'**
- Mechanical detail layers would begin with an **'m-',**
- Electrical detail layers would begin with an **'e-',** etc.

Typical standard layers for detail drawings are shown on the next page. Example shown is for a Civil detail drawing with **'c'** indicating discipline code. The major group here is **'detl'** for details, and the minor groups are the line work, text, hatch, dimensioning, etc.

Layer Name	Description
c-detl-hvy	- heavy line weight for objects and anything other than text and hatching
c-detl-med	- medium line weight for detail object
c-detl-lt	- thin line weight or hidden lines for detail object
c-detl-text	- for text and leaders
c-detl-dim	- for dimensioning
c-detl-hatch	- for hatch patterns
c-detl-legend	- legends and schedules
c-detl-exist	- existing features (usually screened)
z-noplot	- for user information

Modifiers can added to the minor groups to better identify detail layers.
(i.e. c-detl-hatch-**concrete**, c-detl-hatch-**backfill,** c-detl-hatch-**wood,** etc.)

Drafter shall use the 'z-noplot' layer for user information such as plot scale, etc.   (Place a note below the detail on this z-noplot layer indicating vport scale, scale of the annotation, or any information helpful to others who may have to continue work on the drawing or plot, etc.)

File Naming

File names will consist of a <u>maximum</u> of twenty (24) characters, including hyphens and/or underscores. The file name should try to best describe the design content of each specific drawing sheet without typing out a small sentence. When naming files, it is advised to precede the name with the sub-sheet number(s). This is helpful in quickly locating the file for revision or plotting in a directory full of project drawings.

Examples:

L3-GRADING_PLAN.DWG
G2-SITE_DEMO.DWG
Sub-Sheet → **M1-**FIRSTFLR_HVAC.DWG
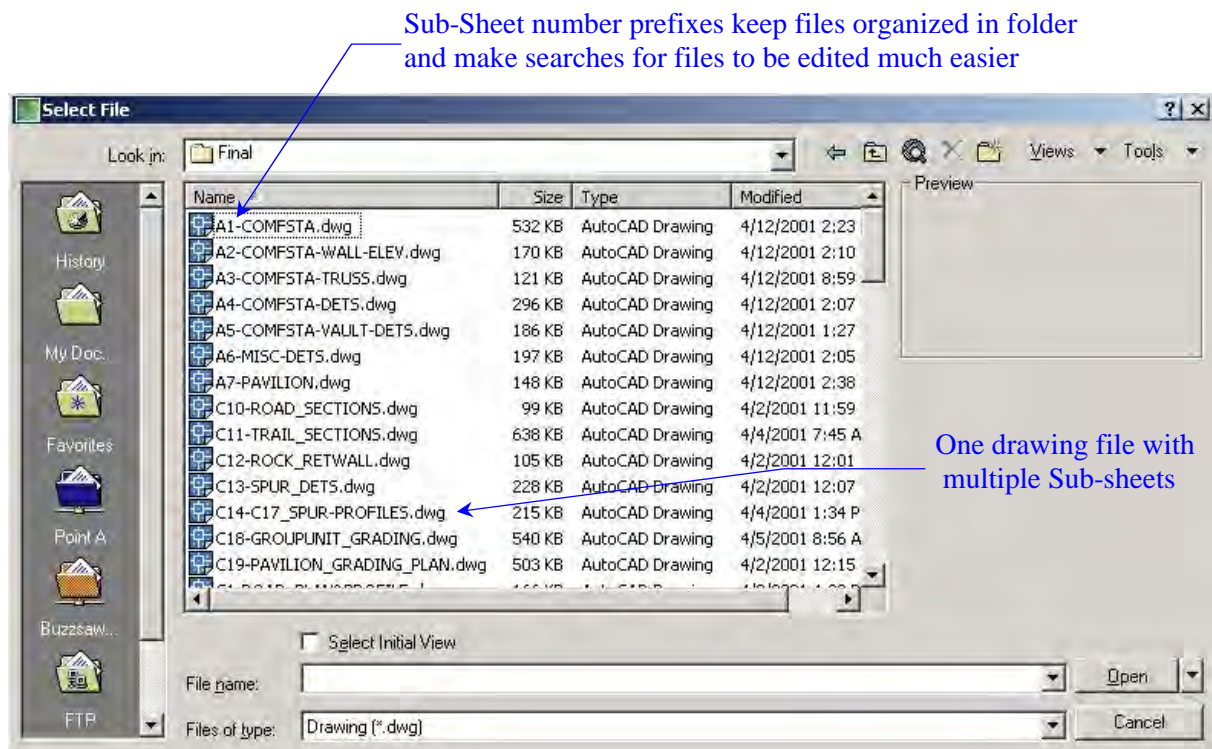**Number** **E1-E3**_PANELBOARD_SCHEDS.DWG

Do not use 'spaces' or 'special characters' (examples: @ # % , ! " & + = ?) in file naming**. <u>Only use letters, numbers, hyphens, and underscores.</u>** It is never a good idea to use spaces or special characters when naming a file, whether in AutoCAD or any application. These are invalid characters in a Unix system and can cause problems with file backups and general server maintenance.

Sub-Sheet Designation

Sub-sheet designations organize the construction package by discipline with each grouped together for easier referencing. Using a sub-sheet number prefix when naming a file keeps like-discipline files grouped together when searching through Window Explorer or scrolling through the Select File popup box when opening a file. Multiple sub-sheets prefixes can be used also for drawings where more than one sheet is in the AutoCAD file. (See Figure 4-2 for an example)

Typical Sub-Sheet Designations & Sequence:

G	General	(General Site Information, Legends, Schedules)
D	Demolition	(Demo Work)
C	Civil/Site	(Civil Details, Road Plan/Profiles)
L	Landscape Arch	(Site Details, Planting Plans)
U	Utility	(Water/Sewer/Elec/Gas/Communications, Details)
A	Architecture	(Floor Plans, Exterior Elevations, Details)
S	Structural	(Bridge Design, Details)
M	Mechanical	(HVAC/Plumbing/Fire Protection)
E	Electrical	(Electrical Site Plan, Details)

Sub-Sheet number prefixes keep files organized in folder and make searches for files to be edited much easier

One drawing file with multiple Sub-sheets

AutoCAD Select File Dialog Box
Figure 4-2

Base Drawing File Naming

In naming base drawings to be used as external references (xrefs), all files should begin with an "x", to distinguish it as an xref. Architectural base sheets shall begin with a xa, Civil base sheets shall begin with an xc, Electrical base sheets shall begin with a xe, etc. The remaining digits should be as descriptive as possible in describing the content of the base sheet. Naming base drawings this way will generate consistency and organization within the final drawing, as well as provide better documentation management.

Examples:

XA-FLRPLAN.DWG	(Architectural Base)
XC-UTILITY-SITE.DWG	(Civil/Utility Base)
XE-EXCOND.DWG	(Electrical Base)
X-TOPO	(Survey/Existing Conditions)

Base drawings should contain only the necessary information needed for use by other disciplines, but not the information specific to the original discipline. This way, base drawings can be utilized immediately without the need to analyze and manipulate.

IMPORTANT:
Any base drawing to be used as an xref shall have all objects created **color by layer** only. This allows for easier pen weight and color modifications, when necessary.
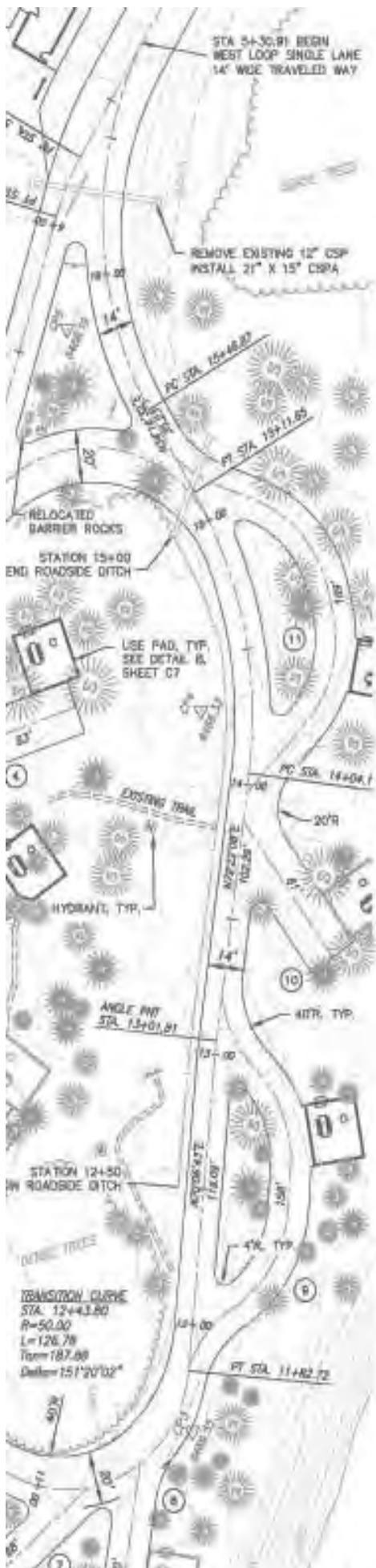
Chapter 5

Topographic Survey Standards

Topographic Survey Standards

An accurate topographic survey is the essential building block for any project. Without it, the project is in jeopardy of design layout inaccuracies or quantity takeoff errors that can add additional construction costs to the overall project. The following are the standards for all topographic survey files in the Forest Service / Region 2.

All survey base drawings are to be in digital format.

The drawings are to be in AutoCAD release 2000 or better, or Land Development Desktop (LDD) 2002 or better format. DWG files are preferred, but DXF files will be accepted if the surveyor cannot convert the file to DWG.

All survey drawings will be drawn at true scale and true coordinates in model space.

All survey drawings will indicate a north arrow, a legend of symbols and abbreviations, a drawing title, date and name of the surveyor, and grid ticks.

All survey drawings will show in table form all survey control points including marker name, northing and easting, elevation, and description of marker. Control points should be shown on drawing on separate 'control' layer.

All text in survey drawing will be in CAPITAL letters.

All survey files will include the TIN (Triangular Irregular Network) surface and all break/fault lines, boundaries used to create the TIN. The ASCII point file will also be delivered along with the survey drawing.

All survey drawings will provide the datum and projection information whether it is assumed starting coordinates or state plane coordinate system, etc.

Survey drawings developed from aerial photography must include the Orthographic photo with the drawing. Photo should be an inserted image on layer '0-photo' (zero-photo).

Layer names will conform to Region 2 CAD standards and all drawing elements will be drawn on the appropriate layer. All line work and text lettering to be *'color bylayer',* and screened back to 40% and 50% line weights. (See Figure 5-1, next page).

Layer Name	Description	Color	Linetype
CONT-I	Index Contours with Elevation Labels	252	Dashed
CONT-N	Intermediate (Normal) Contours	251	Dashed
CONTROL	Control Markers and Points	42	Continuous
ASPHALT	Existing Asphalt Pavement	23	Dashed2
BLDG	Existing Buildings/Sheds	41	Continuous
CONCRETE	Existing Concrete Areas	62	Continuous
DRAIN	Existing Drainage/Ditches/Culverts	151	Divide
FENCE	Existing Fence lines	22	Fence line
GRAVEL	Existing Gravel areas, Shoulders	12	Hidden2
RECREATION	Existing Fire-rings/Tables/ Dumpsters, Tent-Pads	22	Continuous
SIGNS	Existing Signage	11	Continuous
TRAILS	Existing Trail ways	193	Long Dash
TREES	Existing Vegetation/Trees	85	Continuous
UTIL-WATER	Water Lines	150	Solid Line w/ W
UTIL-WATER-HYD	Water Hydrants	154	Continuous
UTIL-WATER-SYM	Water Valves/Meters	153	Continuous
UTIL-ELEC-UE	Underground Electrical Lines	235	Solid Line w/ UE
UTIL-ELEC-OE	Overhead Electrical Lines	235	Solid Line w/ OE
UTIL-ELEC-SYM	Electrical Pedestals/Power Poles	22	Continuous
UTIL-GAS	Gas Lines	193	Dashed w/ G
UTIL-SEWER	Sewer Lines	171	Center w/ S
UTIL-TELE	Telecommunication Lines	175	Dashed w/ T
WATER	Lake/Stream Water Edge	151	Divide
GRID	Grid Ticks	11	Continuous
PROPOSED	Proposed Improvements As Flagged	8	Continuous
BOUNDARIES	Property/Land Boundaries	131	Phantom
SNOTES	Surveyor Info/Legends and Control Tables	White	Continuous
TOPO-PTS	All Points (Except Control Points)	White	Continuous
TEXT	Survey Text, Annotation	254	Continuous
TIN-BDRY	Tin Boundary	Cyan	Continuous
TIN-FLT	Tin Fault/Break Lines	Red	Continuous
TIN-VIEW	Tin Model	White	Continuous

Colors shown in table are recommended
and defined in the FS Plot Style Table covered back in Chapter 3

Standard Survey Layers
Figure 5-1

General Survey Requirements

Survey and indicate on the map:

- All roads, drives, walks, trails, campground spurs, fences, walls, ledges, ditches, culverts, catch-basins, water courses, hydrants, lamp posts, fire rings, tables, kiosks, fee stations, interpretive signs, and utility poles.

- Give minimum dimensions of all culverts.

- Outlines of all structures on site, showing steps, porches, belonging to them. Indicate the finished floor elevation, porches and landings, including steps to/from grade and record elevations thereof to the nearest 0.01 feet:

- Spot elevations at all corners.

- Locate and label recorded easements, rights-of-way, and Forest boundaries.

LOCATING TREES AND FOLIAGE

- Indicate on the map the approximate extent of overhang of branches of dense masses of trees, and of high bushes.

- Locate accurately and show on map all isolated trees over six inches in diameter.

- Unless otherwise directed, the kind of every tree so located is to be indicated on the map by letters forming abbreviations of their common names. Identify trees common name and diameter breast height (d.b.h.) using point description or symbology.

UTILITIES

- Locate and size all utilities on site or adjacent to, including gas, electric, sewer, water, and telephone. Locate all valves, meters and utility pedestals. If site is not served by a utility, try to locate nearest line or potential connection.

- Indicate invert elevation of sewers, storm drains, manholes, and catch basins.

- Indicate location and characteristics of power and communications systems above and below grade.

TOPOGRAPHY

- Show contours at 1 or 2-foot intervals, with spot elevations at peaks and low points, and at key points where existing roadways meet proposed alignments. Display contours as dashed lines with Index contours (5 or 10 foot) labeled with appropriate elevation.

- Provide spot elevations at street intersections and at 20-foot intervals along the edges of walkways and at top and bottom of curbs.

Deliverables

In house surveyors and contracted surveyors will provide the following:

1. CD-ROM
    Preferred format, as it is also our archiving media. CD to include survey drawing, ASCII point file, and all TIN information, TIN boundaries, break lines, faults, and shape or font files used. Also include any orthographic photos images utilized.

2. Hard Copy
    Full size (22"x34") hard copy drawing.
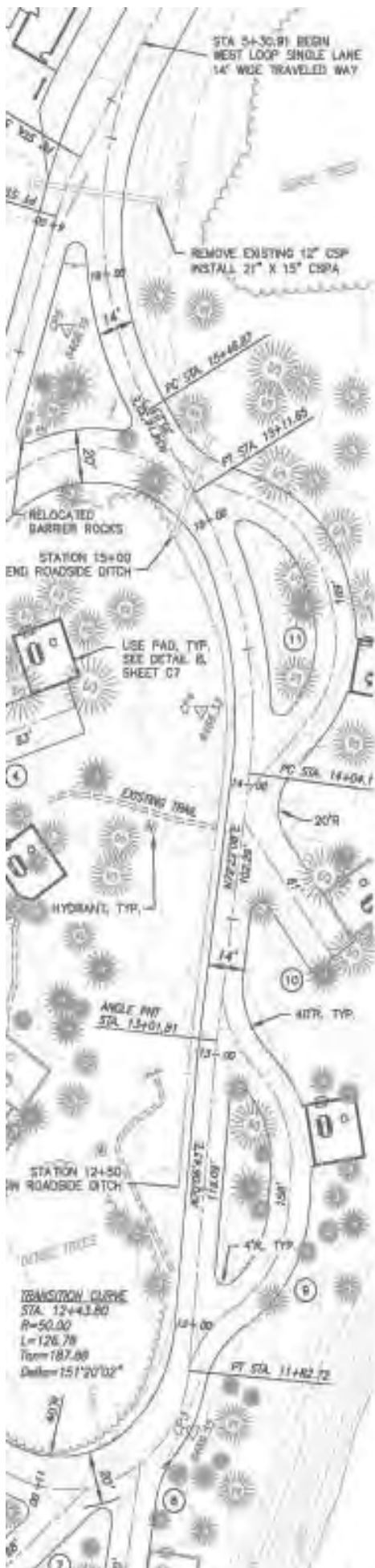
Chapter 6

Page Setting, Plotting, and PDFs

Setup for Plotting

There are three basic tasks to complete in order to plot a successful AutoCAD drawing. This chapter gives a general description of these three steps:

Options

The Option settings customize the AutoCAD plotting parameters. Click on the **Tools** pulldown menu located on the AutoCAD menu bar at the top of the screen. Click on **Options** at the very bottom of this flyout menu and the Options dialog box will pop onto the screen (Figure 6-1). Select the Plotting tab and check the indicated options as shown:

Preferred Plot Device
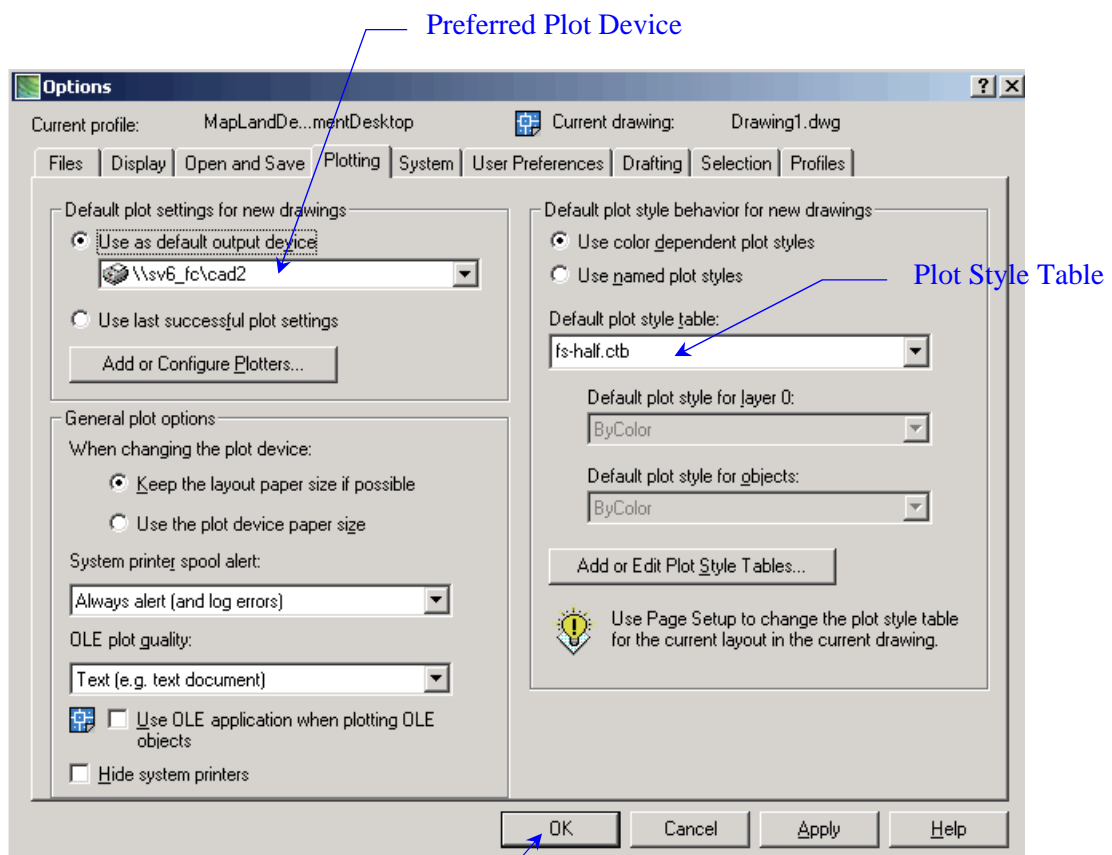
Plot Style Table

Click OK When All
Shown Options Are Set

AutoCAD Plotting Options
Figure 6-1

This set up only needs to be done once in AutoCAD. The Plot Style table (.ctb) is defined in Chapter 3 or per Forest (Appendix D). These tables need to reside in the *Plot Styles* folder under the AutoCAD folder to order to be selected.

Page Setup

Prior to printing an AutoCAD drawing the user needs to setup the page definitions, which include selecting the plot device, plot table, paper size, and orientation. As with the Option setup, once the Page Setup is completed, AutoCAD remembers those settings and saves them with the drawing.

> Page Setup or Plot Setups will have to be changed if the user needs to make changes to specific plot parameters such as plot devices, paper size, drawing scale, or layout orientation per drawing.

The page setup options can be set by clicking on the *Page Setup* menu under the AutoCAD *File* pull down menu, or by switching to the 'space' to print from, whether Model Space or one of the Layout tabs (Paper Space), and right clicking on the tab and choosing Page Setup (See Figure 6-2).
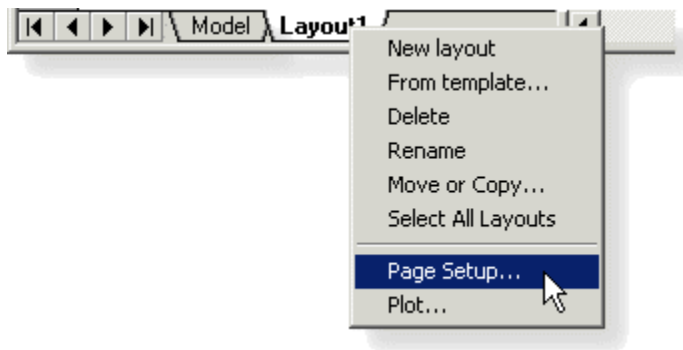
Figure 6-2

Once Page Setup is selected, the Page Setup dialog box will pop onto the screen. (See Figure 6-3). In the Plot Device tab the user will select the plot device and plot style table (.ctb). If the Options setup was completed prior to the Page Setup, the user's preferred plot device and plot style table will automatically appear. The user can make changes to these plot parameters at any time.
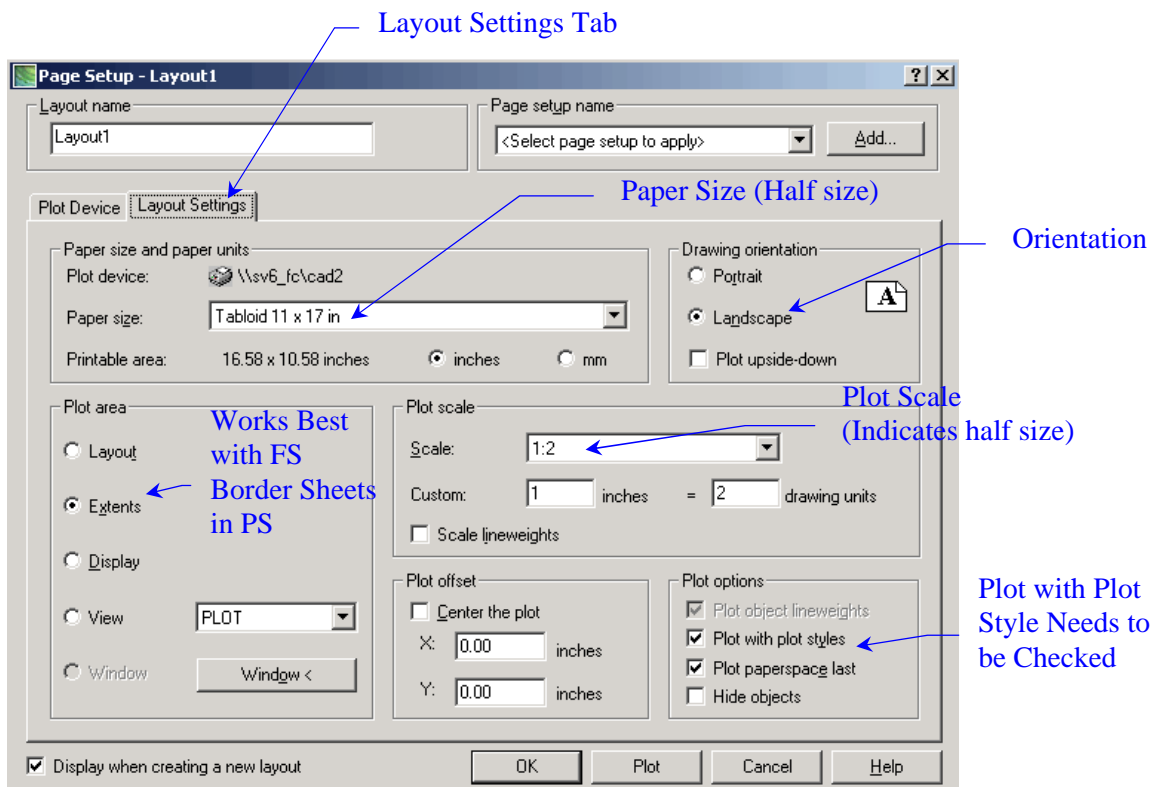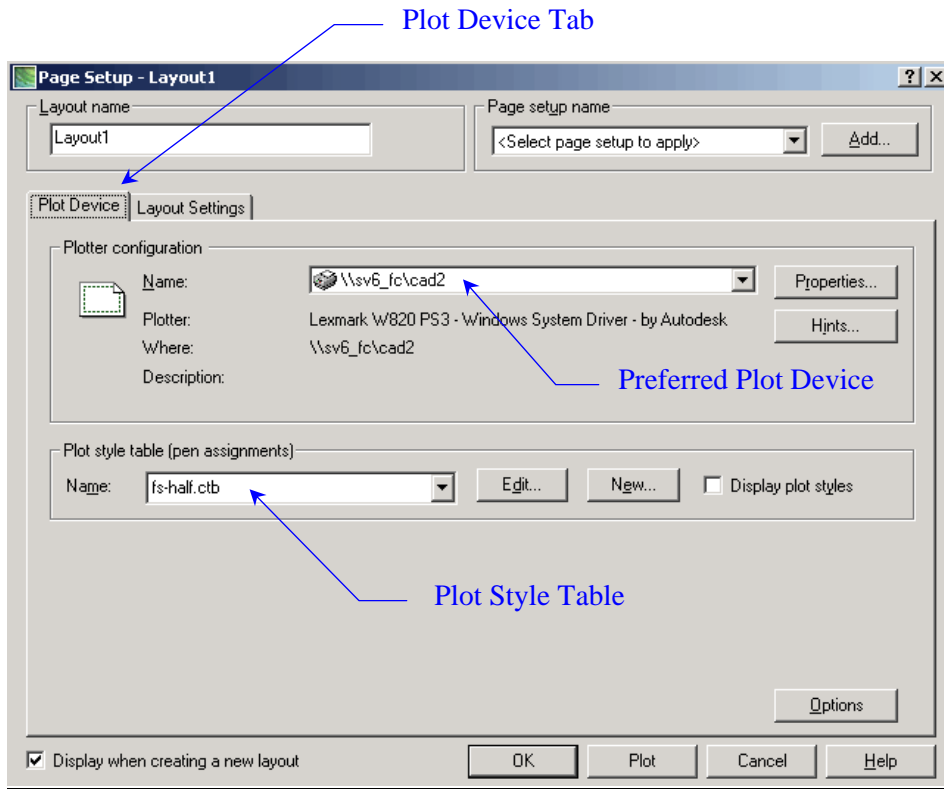
AutoCAD Page Setup Dialog Box
Figure 6-3

The user may <u>also</u> set the Page Setup options in the *Plot* menu, again located under the AutoCAD *File* pull down menu, provided the user is ready to send for plot. If the options are set and the plot is not sent, AutoCAD will not remember the settings for that particular drawing. By setting up the page setup prior to plotting, the drawing retains the entire page and plotting information until the user makes changes to any specific plot parameters. Page Setup also helps place the inserted border sheet onto the desired paper size (only in Paper Space).

CTB Files

Color-dependent plot style tables (.ctb) use an object's color to determine characteristics such as line weight. Every 'red' object in a drawing is plotted the same way, every 'cyan' object is plotted the same way, and so on. Each color (plot style) can be edited in a color-dependent plot style table, however no color can be added or deleted. There are 256 plot styles in a color-dependent plot style table, one for each AutoCAD color. Drawings will not plot the proper pen widths, colors, or units unless the appropriate plot configuration (.ctb) file has been applied to the plot.

The following .ctb files are located in the k:\eng\cadd\support\plot\ folder at the RO or available through the CDI website.

    2005-fs-half.ctb   HP and Lexmark Printers - half size prints (11"x17")
                                   100%, 40%, and No Plot
                                   Pen widths will plot at half-size

    2005-fs-fullsize.ctb   HP Plotters – full size (22"x34") plots
                                   100%, 40% and No Plot
                                   Pen widths will plot at a full-size

    fs-color.ctb   HP Plotters - full size (22"x34") plots
                                   Pens plot all 256 colors at a set width of .015"

AutoCAD Printing

Plotting and printing is done through AutoCAD using the print function within the AutoCAD software. When plotting through AutoCAD, the software controls the final output through the use of the .ctb files and the Plot Dialog Setup. To print, simply click on the 'printer' icon located on the Standard Tool bar at the top of the screen (See Figure 6-4), or by clicking on the **Plot** Menu under the **File** pull down.

File Pull Down Menu

Print Icon
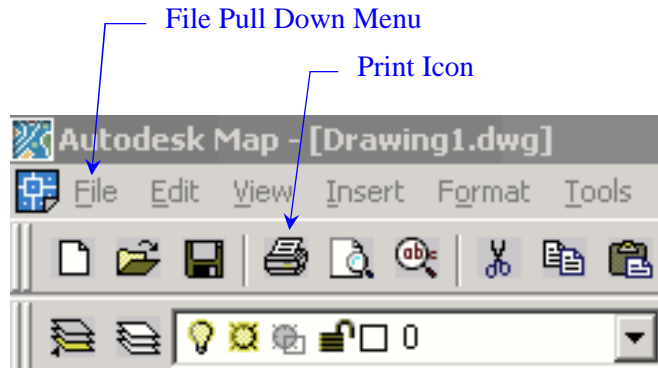
AutoCAD Standard Toolbar
Figure 6-4

A full preview option is available at the bottom of the Layout Settings tab in the Plot dialog box. This preview will appear with black line work on a white paper background, just as the print should look coming out of the printer (color prints will appear as colored lines on a white paper background). It is recommended that the user preview the print here rather than be surprised at the hard copy error coming out of the printer. See Figure 6-5.
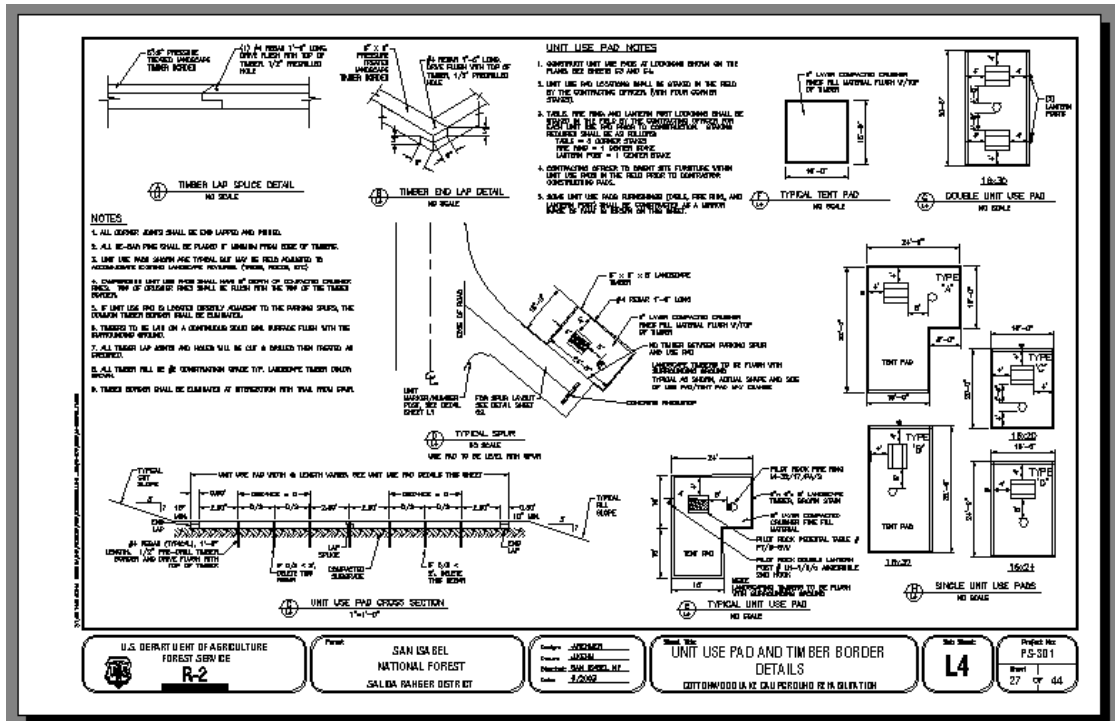
AutoCAD Plot Full Preview
Figure 6-5

PDFs

As of January 2002, all projects submitted to contracts in the Forest Service are required to be electronic format for posting on FedBizOpps. The electronic format that has been standardized by the FS is Portable Document Format (.pdf). Adobe Acrobat is the software also standardized by the FS to create PDFs.

Adobe Acrobat

Adobe Acrobat can be used to publish any AutoCAD drawing in PDF format. The files are relatively small in file size (100-400 KB) depending on the line detail of the AutoCAD drawing. A free PDF reader is available by logging on the Adobe website (www.adobe.com) and downloading the file. However, a licensed copy of the actual Acrobat Writer is required to create a PDF. Corporate licensed copies are available for personnel in Region 2 for approximately $75/copy.

If Adobe Acrobat has just been installed on a PC or there is a machine with Acrobat already loaded, the following two system printers will be indicated:

> Adobe PDF Writer
> Adobe PDF Distiller

Check for this by clicking the **Start > Settings > Printers.** (See Figure 6-6)
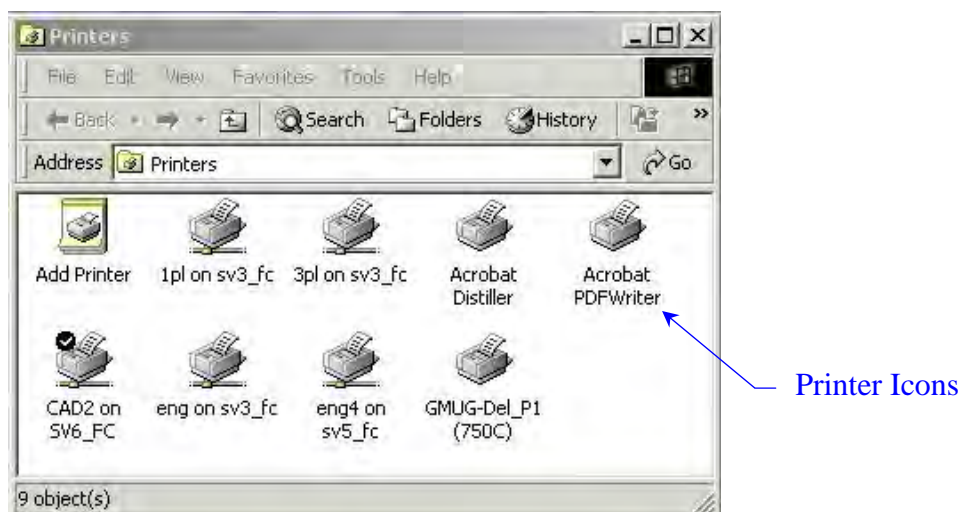
Figure 6-6

Adobe Acrobat Setup

The Adobe Acrobat Writer will need to be set up for AutoCAD drawings if it has not been already. To do so, right click on the Acrobat PDF Writer icon (shown in Figure 6-6). Select *properties* on the bottom of the flyout menu and then select the *printing preferences* button located in the General Tab. The preference box shown in Figure 6-7 will pop on the screen.
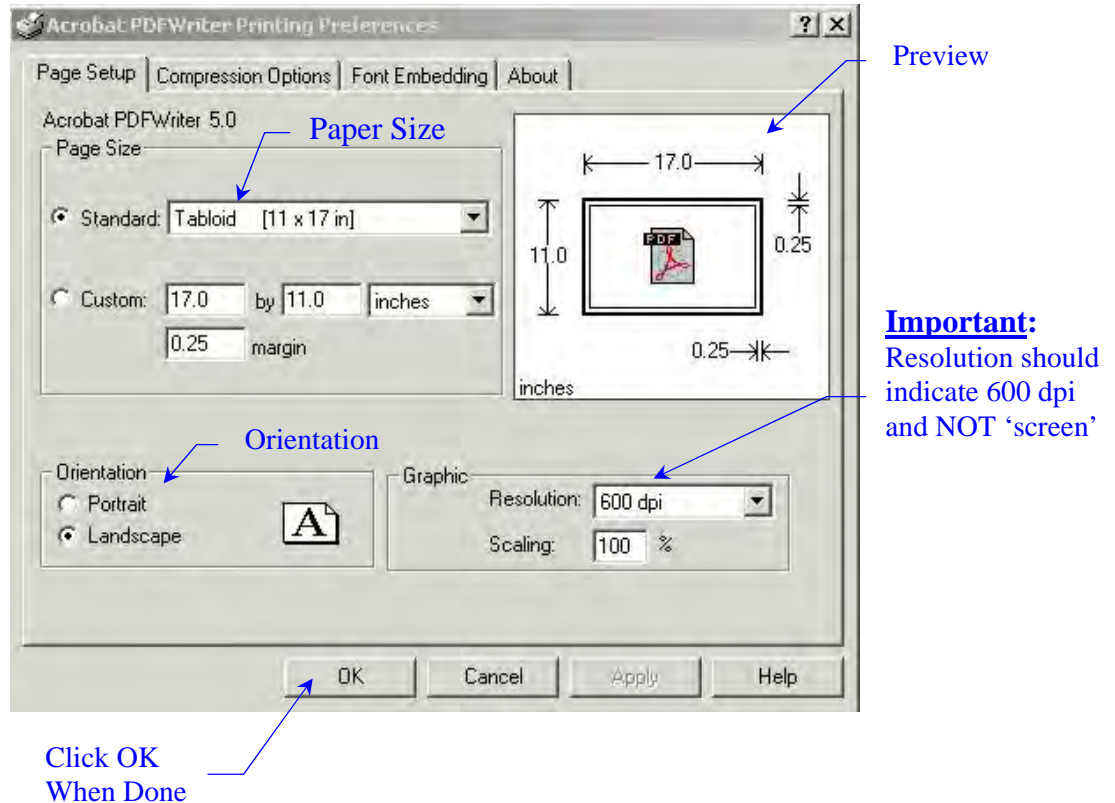
Adobe Printing Preferences
Figure 6-7

If the Paper Size pull down does not offer the particular printing size wanted, click the Custom Toggle and manually set the required size and margins. Settings for full size (22"x34") can also be selected

Most printers print between 300 to 600 dpi. By selecting 600 dpi in the Resolution selection, the best possible image will be created. Leaving the resolution set to '**screen'** will result in PDFs with a very poor quality and are virtually unreadable.

Drawing Requirements

Prior to creating any PDF, the following requirements for AutoCAD drawings need to be followed:

A. Obtain ALL third party fonts, line types, and shape files
All third party fonts, line types, shape files must be acquired from the original drafter (A/E or Region) in order that all symbols, line appearance, and text fonts print properly. This is especially important when working with surveyed files where unique symbols may be used when generating topographic base drawings.

B. Lettering
Standard lettering should be 1/8" (.130") height on a full-size sheet (22"x34") and use a pen width no greater than .016" (0 pen). Minimum height readable on a PDF is .100" (full size). Use the FS standard romans font as often as possible. Architectural fonts may require pen weight to be thinner to make font more readable.

C. Scale Bar
Be sure to place a scale bar on scaled drawings to indicate 1" in full size plots. Do not print out a PDF file with 'plot to fit page' as this results in an incorrect, non-scaled drawing.

D. Put no text or objects outside of border
Plotting in paper space with 'extents' is the easiest way to plot AutoCAD drawings. The border sheet frame becomes the extents of the drawing provided there is nothing outside. If the plot is windowed in model space or set by view, this will not apply.

E. Plot Style Table (.ctb)
The original color-pen file (.ctb) will be needed from the original drafter or A/E firm. The .ctb file is critical to creating PDFs correctly. By obtaining the drafter's .ctb file, all 100% line work, as well as all screened line work, will appear as the drafter had intended. It is also important to have the correct .ctb file for full size (22"x34") and half size (11"x17") PDFs. Creating an 11"x17" PDF using a full size pen file will make lettering and line work difficult to read.

If the appropriate plot style table is not available to the PDF creator, use the standard monochrome (monochrome.ctb) plot table as a last resort. This monochrome plot style will produce a plot with line work that is uniformly the same. Every line (both screened and non-screened) will have a consistent width of .010" and print 100%.

Make sure the AutoCAD drawing PLOTS EXACTLY like you want it.

If you haven't already seen a final plot of the drawing before attempting to create the PDF, run a test plot to the printer. Check the following:

- ✓ Do hatch patterns and screened line types appear okay?
- ✓ Is the lettering readable and is textmask or wipeout functioning correctly?
- ✓ Are all attached xref drawings present in drawing?
- ✓ Are all fonts, symbols, and line types represented correctly?
- ✓ Is the drawing orientation (landscape) correct?
- ✓ Is the border aligned with paper with proper margins and no edges cut-off?

If everything looks as it should, you are ready to create PDFs.

Creating AutoCAD Drawing PDFs

Creating PDFs is essentially printing the AutoCAD drawing without getting a hardcopy out of the printer. Instead, an electronic file is created and saved by the user into a folder. Most of the steps to create a PDF include the plotting instructions covered earlier in this chapter.

With the AutoCAD drawing loaded on the screen, simply click on the print icon or select the **Plot** menu from the **File** pull down menu. (Refer back to Figure 6-4). As before, the Plot Dialog box will pop on the screen. (Figure 6-8).
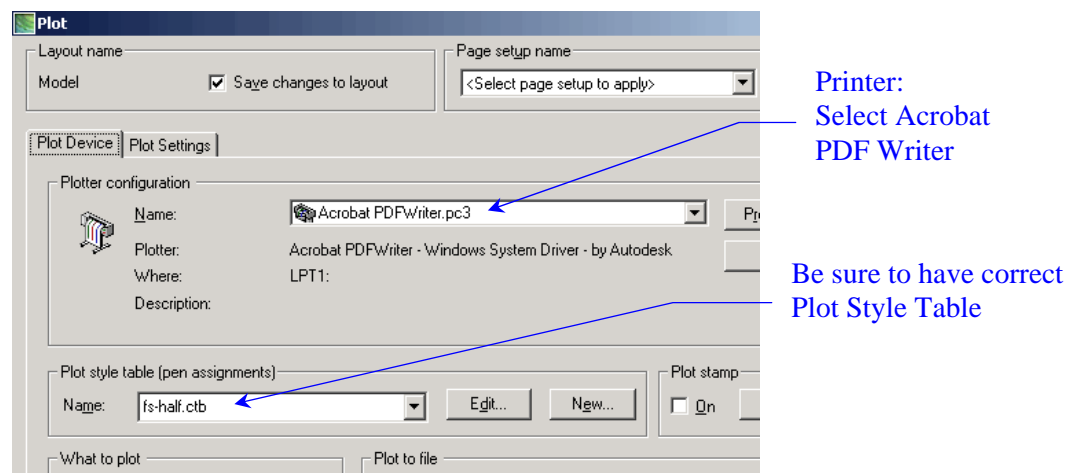
Figure 6-8

Double-check the other settings under the Plot Settings Tab for scale, orientation, paper size, etc. (Figure 6-9). View Full Preview to make sure PDF looks correct before clicking the 'OK' button.

Plot Settings Tab
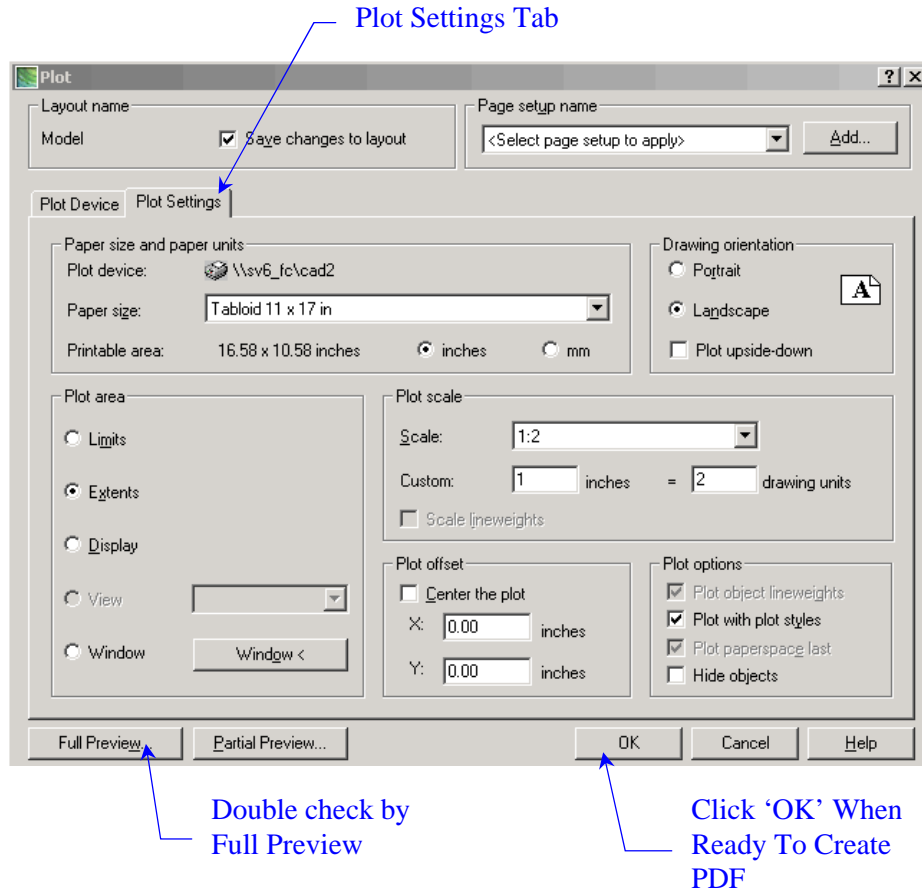
AutoCAD Plot Dialog Box
Figure 6-9

Saving PDFs

Once the 'OK' button has been clicked in the Plot Dialog Box, the **Save PDF File As** box will pop onto the screen prompting the user to name the file and direct the location to be stored. It is recommended that the user create a PDF folder in your project location to save the collected AutoCAD PDFs. (See Figure 6-10)

PDF Folder
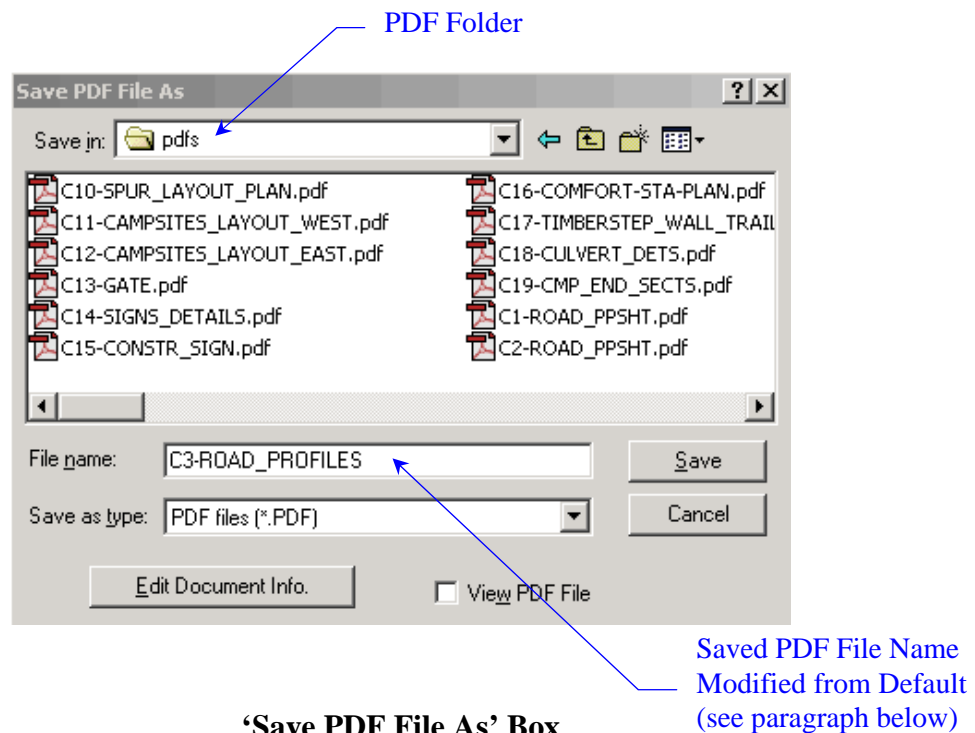
'Save PDF File As' Box
Figure 6-10

Saved PDF File Name
Modified from Default
(see paragraph below)

A default PDF file name will automatically appear in the File Name input bar. Adobe Acrobat picks up the name of the AutoCAD drawing, plus includes the name of the layout tab the PDF is created from. (See examples below Figure 6-11). The default name can remain as is or modified if the user prefers. In some cases (multiple sub-sheet layouts) the name is best modified to reflect the actual sub-sheet drawing name.

Layout Tab
Names

AutoCAD File
Names

C5-Road_Sections-**layout1.**pdf
E2-Electrical_Site_Plan-**model.**pdf

Layout Tab
Names
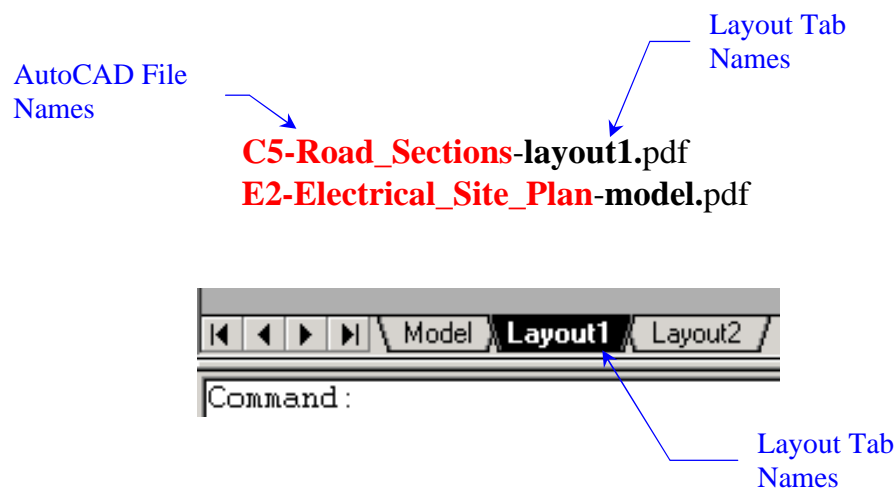
PDF Naming Examples
Figure 6-11

Viewing PDFs

After the PDF is created and saved, the file should be opened in Adobe Acrobat for viewing the finished product. This is the user's final check to be sure the drawing is legible and correct. A printed PDF file should look as good as the original printed AutoCAD drawing. If something doesn't look right, the user should make sure all the steps outlined in this chapter were followed correctly and repeat the procedure.

Compile PDFs

To compile several individual AutoCAD PDFs together under one PDF to submit to contracts, follow these steps:

- Open or double click in Windows Explorer, on the first drawing file (Usually the Title Sheet or Index)

- Go to the Document pull down menu in Acrobat and click on Insert Pages (See Figure 6-12)
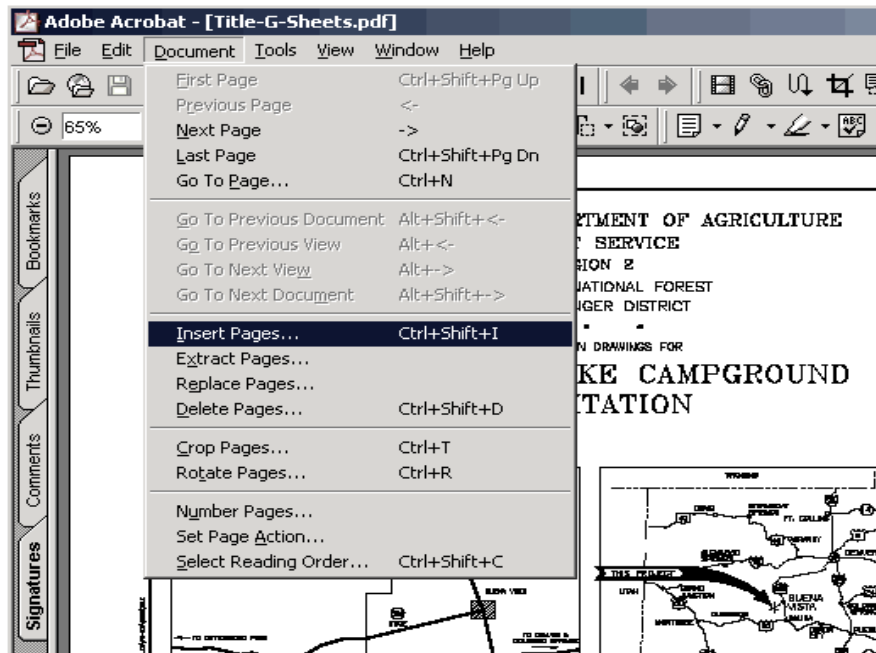
Acrobat Document Insertion
Figure 6-12

- Select files to insert into original PDF from the File Explorer window. <u>Note:</u> If you wish to keep drawings in order by sub-sheet numbers, select only three at a time. More than three files selected will jumble the files as they are inserted. (See figure 6-13)

Select no more than 3 files at a time
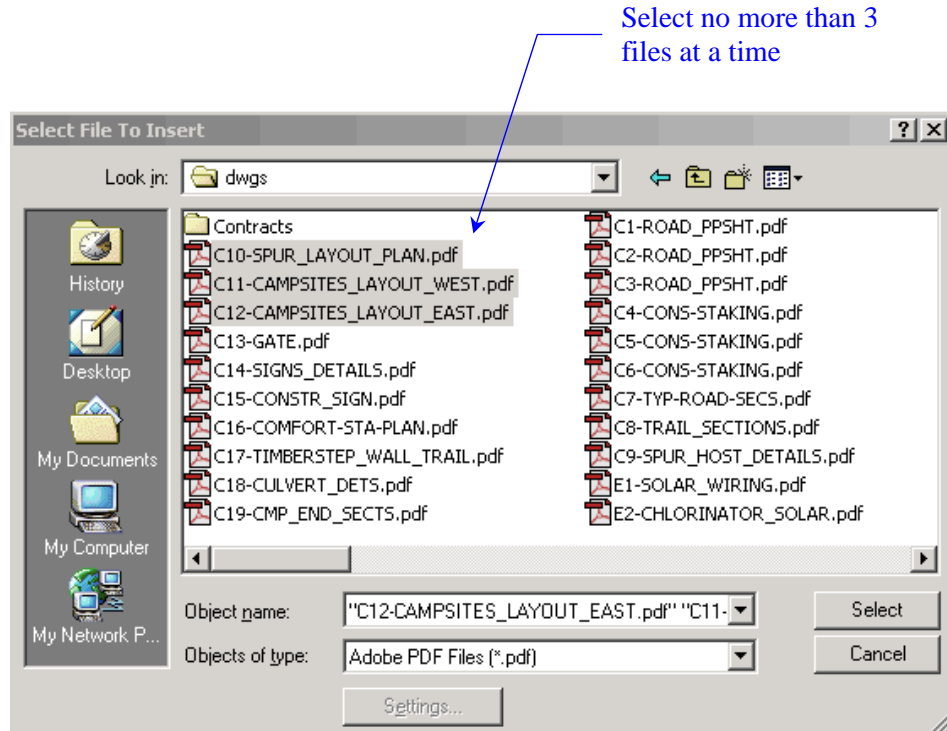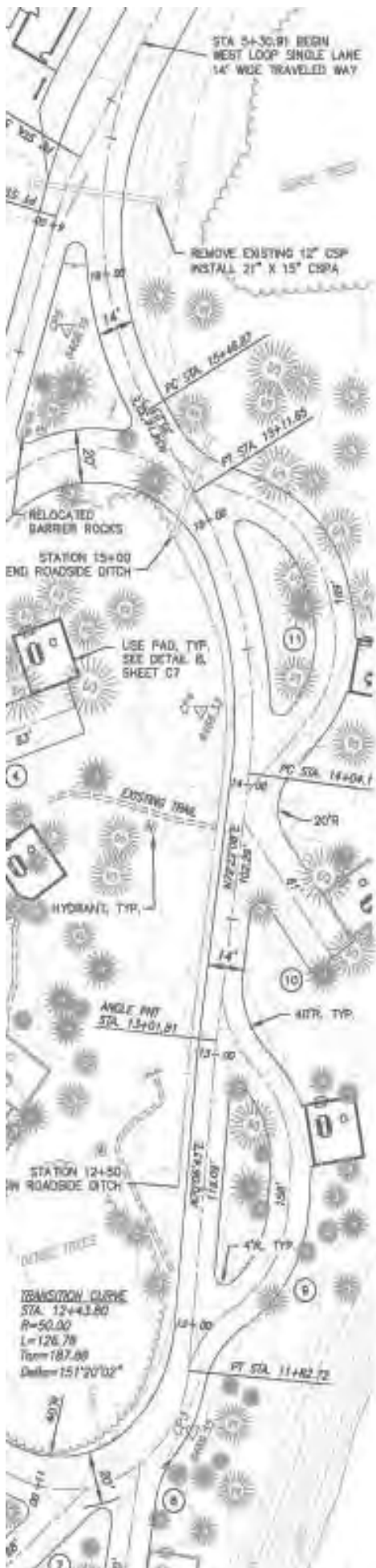
Figure 6-13

- As each set of files is inserted into the one PDF, be sure the toggle **'insert after LAST'** is on. This will insert all sequential sets of files after the last file in your compiled PDF.

- After all files are inserted, save the file using the **SAVE AS** command under a new name. (i.e. bear-lake-cg-dwgs.pdf)

Contracting has set a size limit for files posted on FedBizOpps at 4MB per file. Compiled AutoCAD PDF files may have to be broken up into sections based on their disciplines to keep file size under this limit.

Chapter 7

Deliverables, Data Exchange, and Archiving

Deliverables and Data Exchange

The need to exchange electronic drawing files between the Forests, CDI, and the A/E community, as well as the need to maintain consistency necessary for archival and retrieval of electronic drawings necessitates certain requirements that must be met on all projects. The following information can be used as a checklist of pertinent items before submitting work for approval.

Delivery Media

Acceptable media, in preference order is:

1. CD-ROM
   Preferred format, as it is also our archiving media. FS folder and file naming structure is to be maintained.

2. DVD
   FS folder and file naming structure is to be maintained.

✓ All disks need to be checked for complete information prior to submitting, to insure all electronic data is accessible.

✓ All media must be certified to be free of known viruses.

✓ A/E's shall retain copies of all electronic data for a period of 90 days as a precautionary measure.

When exchanging electronic media, an external label should contain, at a minimum, the following information:

- Project Description and current date.
- The sequence number in the following format:

  Disk **N** of **T**
  where **N** = disk sequence number
  and **T** = the total number of disks.

- AutoCAD version number.

Format

All files should be directly readable by AutoCAD 2000 or 2004 versions. Before a file is placed on the delivery media the following steps should be performed:

- Remove all extraneous graphics and drawing entities existing outside the drawing border.
- Zoom the drawing to the extents of the drawing area.
- Ensure that the only font type used in the drawing is RomanS.shx or Architxt.shx, Archquik.shx, or Archtitl.shx
- Ensure that the pens are mapped to the FS Plot Style Table.
- Ensure that the folder structure and file naming conventions comply with the FS requirements.
- Date stamp with pathnames for the electronic file (including external references) must be legible outside the left hand border.
- Ensure that the drawing can be plotted using the extents plot routine, without the need for additional manipulation. This includes maintaining the layer state used in all submitted plots.

> Note: If it was agreed upon that the contractor for a particular project could use their own special symbols, fonts, or plot style table…a copy of those files must accompany the drawings on the delivery media.

Hard Copy

A minimum of one reproducible paper copy of drawings is to be provided for each review submittal and a final copy at the completion of the project.

Archiving

The archiving procedures discussed in this section primarily apply to the Regional Office, but could certainly be implemented in all Forests' Offices. All projects in the R.O., past and present, are filed on the server under the *projects* directory located on the 'k:' drive. All files associated with any particular project are accessible by all users, and are backed up nightly on tape for security.

The following archiving standards will be implemented in the Regional Office upon completion of any project:

When Project Design is Completed:

All 'design-in-progress' projects that are 100% completed and ready to submit to contracts.

♦ Project folder should be cleaned out of all junk files and anything non-essential to the project.

♦ A project notebook should be compiled with hardcopies of all the drawings, specifications, etc. and <u>include</u> a CD of all files pertinent to the project. Notebook should be stored in the Project Library for reference.

♦ A duplicate project CD should be created and either kept by the Project Manager or sent to the Forest / District Office for their records.

When Project Reaches Final Construction:

♦ Project Manager should once again review folder and delete any non-essential files to the project.

♦ If project notebooks in Reference Library needs to be updated (amendments to package), Project Manager should burn a new CD and add hardcopies of all revised drawings/specs to notebook.

♦ Once everything is completed, project should be placed in *'archive'* status by contacting the End User's Support Center (EUSC) at 888-426-3872. Project Manager should request project be changed to 'READ ONLY' and for that particular project folder (and all its subfolders) to be compressed. Compressing the folder saves space on the server.

This archiving procedure will provide all designers the project information or drawings they need for similar projects, additional project phases or even new projects. And at the same time, provide a means for storing and safeguarding all Regional work for future reference.

Appendix A

Drawing Management

Appendix A
Project Drawing Management

To ensure accessibility of all drawing files and external references during ongoing design and construction efforts; a *Projects Directory* has been established under the **'eng'** folder on the **'k:'** drive. For archival and retrieval purposes, the following standard folder structure has been established and is currently maintained under this projects directory.

By stacking folders, the user can distinguish between forest, project, project number, file type, and the specific filenames. All CAD users in the R.O. shall follow the specified folder structure and directory naming conventions as shown in Figure A-1.
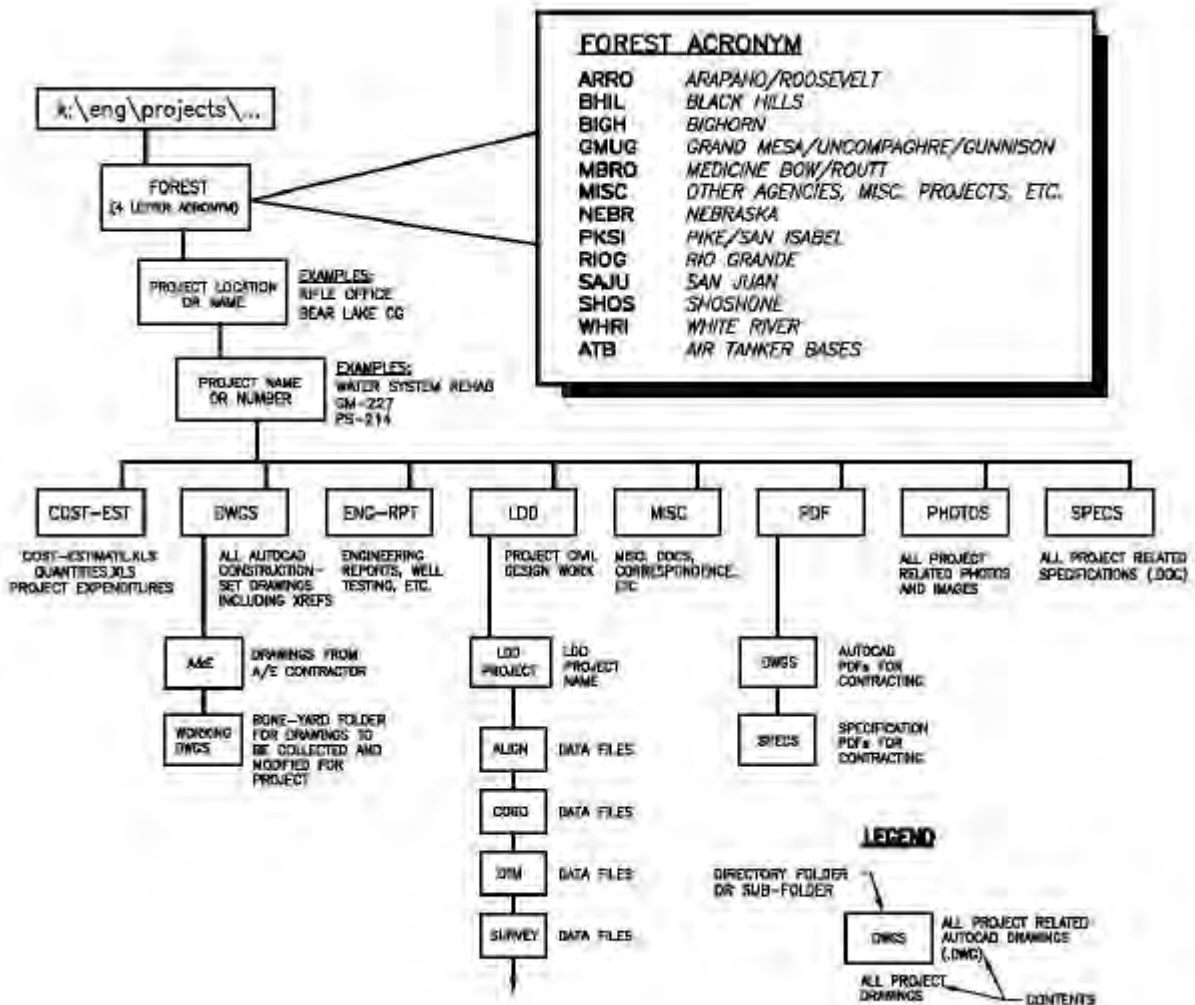
Figure A-1

The folder structure schematic shown in Figure A-1 breaks down to the following folder designation:

k:\eng\projects	**R.O. Projects Folder**
Forest Acronym\	4 Letter Forest Designation
Project Name\	Project Name or Location
Project Number\	Project Name or Number (i.e. MB-105)
Folders and Sub-Folders\	PDF, Dwgs*, Misc, Photos, LDD, etc.
File Name	AutoCAD Drawing or File Name

Forest Acronym ───┐   ┌─── Project Number or Name

Examples: k:\projects\mbro\mirrorlake\mb-105\dwgs\siteplan.dwg
k:\projects\pksi\cottonwood-cg\water-systems\cost-est\estimate.xls

└─── Folder/Sub Folder

Project Location ───┘
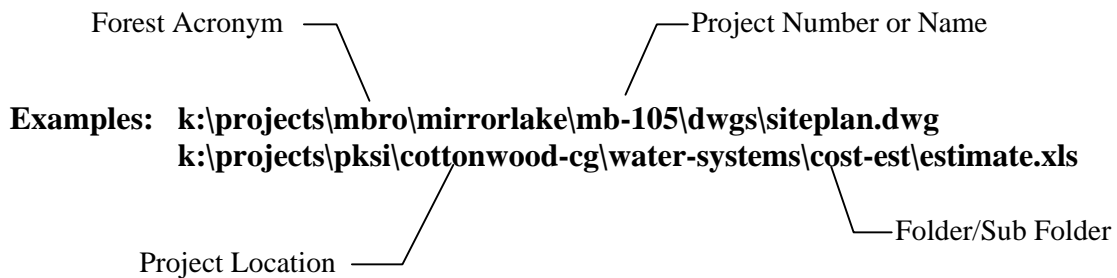
Figure A-2

❖ Sub-folders may be created under the *Dwgs* folder to organize different phases of the project or to keep contracted A/E drawings separate from those drawings completed in house. An **Archive** folder may also be established to organize project files ready for copying and removal from the network.

The *Projects* directory is open to all project managers, designers, and AutoCAD users in the Regional Office engineering group, as well as, occasional individuals with access outside the Regional Office.

To maintain a healthy network here in the RO, it is <u>recommended</u> that all users with access to the projects directory keep the various folders cleaned up. Delete all unnecessary files, junk drawings, and unused project files.

Project Folders on the Network

The Regional Office file servers, intended for the storage and file sharing of active project drawings, are located and maintained in the Information Resources Management (IRM) Program Center, on the third floor.

All project folders are accessible to CAD users through **k:\eng\projects** (RO Projects Folder). The folder structure shown earlier in this appendix is to be followed by all users for storing and retrieving project files. Only project related files (i.e. AutoCAD drawing files, graphics files, report documents, etc.) should be stored in the projects folder.

All AutoCAD drawing files should be stored on the network file servers for ease of use, file sharing, and to ensure proper backup procedures can be done. Storing project drawings on a local hard drive is not recommended, as local drives are not backed up.

Backup Services

IRM is responsible for backups on all files stored on the network file servers at the Regional Office.

System Backups - System backups are performed nightly, and record everything currently on the DFS drives to tape. These files are archived for a period of 6 months.

Restore Procedures

When files have been lost or corrupted, they can be restored from the latest backup. The CADD user should always check the latest AutoCAD backup file (.bak) or AutoSave file (.sv$) first in their effort to restore a good file. If both do not produce a means to getting a workable file then the CADD user can request their file to be read back.

File Restore

File restore requests should be conducted by contacting the End Users Support Center (EUSC) 1-888-426-3872 or logging into the EUSC web page. The body of the message should contain the complete path where the file can be found, as well as the date the requester wishes the file to be retrieved from. They will restore the original file to the original location. It is the user's responsibility to rename any file with the same filename prior to their restore request.

Any file with the same name in the folder they are restoring to will be overwritten.

CADD Directory

Another directory accessible to AutoCAD users is the k**:**\eng\cadd\ directory, which stores all support files, including standard symbols, details, and template drawings, fonts, and any customization done to aid the user in creating drawings.

The standard folders on the k:\eng\cadd\ directory are set up as follows:

…\cad-stds-docs\	Cad Users Guide
…\std-dwgs\	Library of standard details, symbols
…\support\	Customization, production tools, plot style tables, font/shape files, lisp routines, templates, and the latest AutoCAD service packs and object enablers.
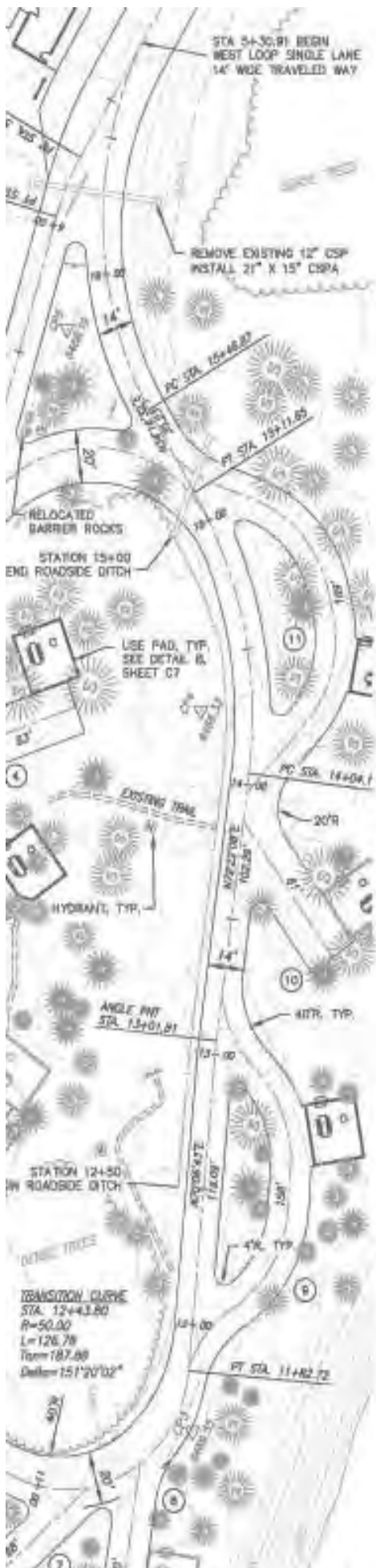
Appendix B

Text Height
vs.
Plotting Height

Appendix B
Text Height vs. Plotting Height
(Relative to Model Space)

Model Space Drawing Unit = Inch (Architectural)

		Text Height:					
Plot Scale	**PS Zoom XP**	**3/32"**	**1/8"**	**5/32"**	**3/16"**	**1/4"**	**Multiplier**
Full	1	.094	.125	.157	.187	.250	1.00
Half	1/2	.187	.250	.313	.350	.500	2.00
3"=1'	1/4	.375	.500	.625	.750	1.00	4.00
1 1/2"=1'	1/8	.750	1.00	1.25	1.50	2.00	8.00
1"=1'	1/12	1.12	1.50	1.87	2.25	3.00	12.0
3/4"=1'	1/16	1.50	2.00	2.50	3.00	4.00	16.0
1/2"=1'	1/24	2.25	3.00	3.75	4.50	6.00	24.0
3/8"=1'	1/32	3.00	4.00	5.00	6.00	8.00	32.0
1/4"=1'	1/48	4.50	6.00	7.50	9.00	12.00	48.0
3/16"=1'	1/64	6.00	8.00	10.00	12.00	16.00	64.0
1/8"=1'	1/96	9.00	12.00	15.00	18.00	24.00	96.0
3/32"=1'	1/128	12.0	16.00	20.00	24.00	32.00	128
1/16"=1'	1/192	18.0	24.00	30.00	36.00	48.00	192

Model Space Drawing Unit = Foot (Engineering, Decimal)

		Text Height:					
Plot Scale	**PS Zoom XP**	**.100**	**.130**	**.150**	**.175**	**.250**	**Multiplier**
Full	12	.0083	.0108	.0125	.0146	.021	.0833
Half	6	.0167	.0217	.0250	.0292	.042	.1667
1"=10'	1/10	1	1.3	1.5	1.75	2.50	10
1"=20'	1/20	2	2.6	3.0	3.5	5.0	20
1"=25'	1/25	2.5	3.25	3.75	4.375	6.25	25
1"=30'	1/30	3	3.9	4.5	5.25	7.5	30
1"=40'	1/40	4	5.2	6.0	7	10.0	40
1"=50'	1/50	5	6.5	7.5	8.75	12.5	50
1"=60'	1/60	6	7.8	9.0	1.5	15.0	60
1"=100'	1/100	10	13	15	17.5	25	100

Metric

Model Space Drawing Unit = Meters
Paper Space Drawing Unit = Millimeters

		Text Height:					
Plot Scale	**PS Zoom XP**	**2mm**	**3mm**	**4mm**	**5mm**	**6mm**	**Imperial Scale**
Full	1000	.002	.003	.004	.005	.006	1:1
1:5	200	.01	.015	.02	.025	.03	3"=1'-0"
1:10	100	.02	.03	.04	.05	.06	1"=1'-0"
1:25	40	.05	.075	.1	.125	.15	1/2"=1'-0", 3/8"=1'-0"
1:50	20	.1	.15	.2	.25	.3	1/4"=1'-0"
1:100	10	.2	.3	.4	.5	.6	1/8"=1'-0"
1:125	8	.25	.375	.5	.625	.75	1"=10'
1:250	4	.5	.75	1	1.25	1.5	1"=20'
1:500	2	1	1.5	2	2.5	3	1"=40', 1"=50'
1:1000	1	2	3	4	5	6	1"=60'
1:2000	.5	4	6	8	10	12	1"=100'
1:2500	.4	5	7.5	10	12.5	15	1"=200'

Appendix C

Project Setup

Appendix C
Project Setup

In order to create consistency between projects, this appendix offers a guideline for setting up project drawing sets. Sub-sheet designations organize the construction package by discipline with each grouped together for easier referencing.

Drawing Set Sequence

Typical Sub-Sheet Designations and Sequential Order in Drawing Set

Sub Sheet	(*Discipline*)	Generally Includes:
-	Title Sheet	Location Maps, Index, Signature Block.
G	(*General*)	Overall Development Plan, Sheet Orientation, General Notes/Legend, Survey Control. Can also include Index if package is very large.
D	(*Demolition*)	Demo Work if required.
C	(*Civil/Site*)	Road Plan/Profiles, Spur Layout Plans, Typical Cross-Sections, Details.
L	(*Landscape Architecture*)	Site Plan, Details, Planting Plans.
U	(*Utility*)	Water/Sewer/Elec/Gas/Communications Plan, Details.
A	(*Architecture*)	Floor Plans, Exterior Elevations, Details.
S	(*Structural*)	Foundation/Framing Design, Details.
M	(*Mechanical*)	HVAC/Plumbing/Fire Protection Floor Plan, Details.
E	(*Electrical*)	Electrical Site Plan, Electrical Floor Plan, Details.

Appendix D

Plot Style Tables Per Forest

Appendix D
Plot Style Tables
By Forest

Grand Mesa, Uncompahgre, Gunnison National Forest
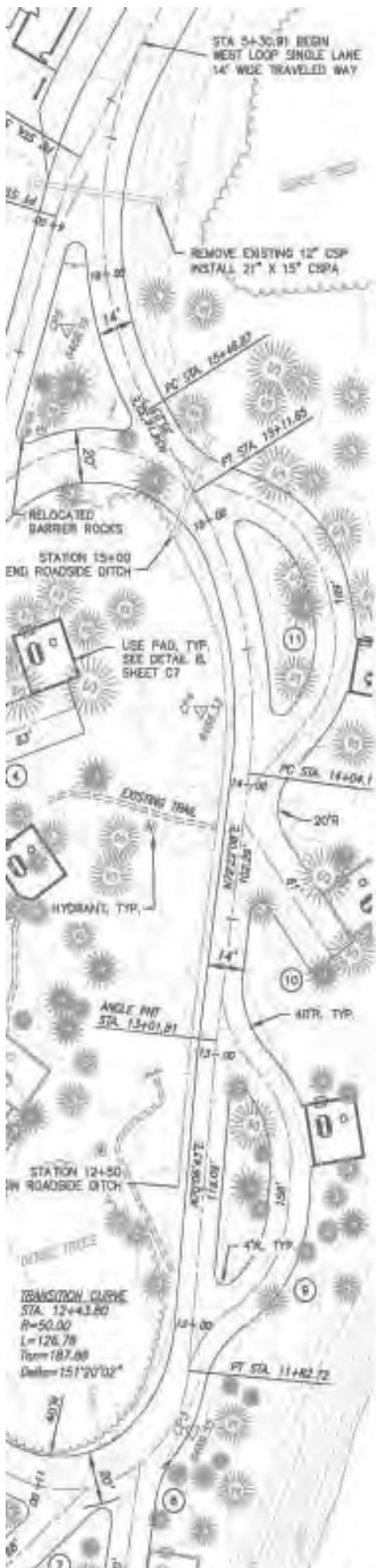
File Name: (gmug.ctb)

AutoCAD Standard Colors and Line Weights

Color	Color Number	11" x 17" Line Weight when Plotted	22" x 34" Line Weight, when Plotted	Example	Equivalent LEROY® Lettering Set Pen
Yellow	(2)	0.003"	0.006"		0000
White	(7)	0.006"	0.012"		000
Orange	(30)	0.007"	0.014"		00
Blue	(5)	0.009"	0.018"		0
Red	(1)	0.009	0.018		0
Cyan	(4)	0.011"	0.022"		1
Green	(3)	0.013"	0.026"		2
Magenta	(6)	0.017"	0.033"		3
Dk Gray	(8)	No Plot	0.012"	(Screened background info)	00
Gray	(9)	0.008"	0.016"	(Screened background info)	0

50% add 10 to Color Number (i.e. 11-17)
30% add 20 to Color Number (i.e. 21-27)

San Juan National Forest

File Name: (2000i_11x17.ctb)

AutoCAD Standard Colors and Line Weights

Color	Color Number	11" x 17" Line Weight when Plotted	22" x 34" Line Weight, when Plotted	Example	Equivalent LEROY® Lettering Set Pen
Red	(1)	0.003"	0.007"		0000
Yellow	(2)	0.005"	0.010"		000
Magenta	(6)	0.006"	0.012"		00
White	(7)	0.007"	0.014"		0
Cyan	(4)	0.010"	0.020"		1
Green	(3)	0.012"	0.024"		2
Tan	(33)	0.014"	0.028"		2.5
Blue	(5)	0.016"	0.031"		3
Dk Gray	(8)	No Plot			
Gray	(9) 50%	0.007"	0.014"	(Screened background info)	0
Gray	(251) 50%	0.006"	0.012"	(Screened background info)	00
Gray	(253) 50%	0.010	0.020"	(Screened background info)	1

Regional Office Plot/Pen Table (before 2005 version)

File Name: (fs-half.ctb)

Line Width (inches)	% Screen		Color Numbers		LEROY® or Rapido
.004	100	red	1, 28,50,71,92,113,134,155,176,197,218,239		0000
.008	100	yellow	2, 29,51,72,93,114,135,156,177,198,219,240		000
.026	100	green	3, 31,52,73,94,115,136,157,178,199,220,241		2
.021	100	cyan	4, 32,53,74,95,116,137,158,179,200,221,242		1
.033	100	blue	5, 33,54,75,96,117,138,159,180,201,222,243		3
.012	100	magenta	6, 34,55,76,97,118,139,160,181,202,223,244		00
.016	100	white	7, 35,56,77,98,119,140,161,182,203,224,245		0
.012	40	dk. gray	8	*(screened or background info)*	00
.016	40	gray	9	*(screened or background info)*	0
.004	50		11, 36,57,78,99,120,141,162,183,204,225		0000
.008	50		12, 37,58,79,100,121,142,163,184,205,226		000
.026	50		13, 38,59,80,101,122,143,164,185,206,227		2
.021	50		14, 39,60,81,102,123,144,165,186,207,228		1
.033	50		15, 40,61,82,103,124,145,166,187,208,229		3
.012	50		16, 41,62,83,104,125,146,167,188,209,230		00
.016	50		17, 42,63,84,105,126,147,168,189,210,231		0
.004	40		21, 43,64,85,106,127,148,169,190,211,232		0000
.008	40		22, 44,65,86,107,128,149,170,191,212,233		000
.026	40		23, 45,66,87,108,129,150,171,192,213,234		2
.021	40		24, 46,67,88,109,130,151,172,193,214,235		1
.033	40		25, 47,68,89,110,131,152,173,194,215,236		3
.012	40		26, 48,69,90,111,132,153,174,195,216,237		00
.016	40		27, 49,70,91,112,133,154,175,196,217,238		0
.050	40		10		5
.050	50		20		5
.050	100	orange	30		5
.008	40	dk. gray	250,251	*(minor contours)*	000
.012	40	gray	252,253	*(major contours)*	00
No Plot	-	lt. gray	254		
.008	50		255	*(date stamp)*	

Appendix E

Keyboard Aliases and Add-on Commands

Appendix E
Keyboard Aliases

Command	Alias	Command	Alias	Accelerator Keys	
ALIGN	AL	**LAYER**	LA	F1	AutoCAD Help Window
ARC	A			F2	Text Window
AREA	AA	*More layer stuff*:		F3	*Object Snap Toggle
ARRAY	AR	SET (by pick)	LS	F4	Osnap settings
BLOCK	B	ON	LO	F5	Intersection snap
		OFF (by pick)	LF	F6	Midpoint object snap
Contruction lines:		LOCK (by pick)	LL	F7	*Grid toggle
Erase	CE	UNLOCK (pick)	LU	F8	*Ortho toggle
X axis	CX	LAYER OFF		F9	*Snap toggle
Y axis	CY	(by pick)	LOFF	F10	*Tablet toggle
X & Y axis	CXY	LAYER FREEZE		F11	Nearest object snap
		(by pick)	LFRZ	F12	Perpendicular snap
CHAMFER	CHA				
CHANGE	CH	LEADER	LE	* Indicates Acad for Windows default.	
CIRCLE	C	LENGTHEN	LEN		
COLOR	CL	**LINE**	L		
COPY	CP	LINEWEIGHT	LW	Other AutoCAD Hot Keys	
DDATTE	DDA	LINETYPE	LT	Ctrl+A	Group on/off
DDCHANGE	DDC	LIST	LI	Ctrl+B	Snap to grid on/off
DDEDIT	DDE	MEASURE	ME	Ctrl+C	Copy to clipboard
DDINSERT	DDI	**MOVE**	M	Ctrl+D	Coords toggle
DDLTYPE	DDL	MIRROR	MI	Ctrl+E	Isoplane toggle
DDMODIFY	DDM	**MSPACE**	MS	Ctrl+G	Grid on/off
DDSTYLE	DDS	**MTEXT**	MT	Ctrl+L	Ortho on/off
DISTANCE	DS	**OFFSET**	O	Ctrl+N	New drawing
DRAWORDER	DR	**PAN**	'P	Ctrl+O	Open drawing
DTEXT	DT	**PLINE**	PL	Ctrl+P	Plot drawing
DVIEW	DV	**PSPACE**	PS	Ctrl+R	Change viewports
ERASE	E	**QSAVE**	S	Ctrl+S	Qsave
ERASE LAST	EL	RECTANGLE	RE	Ctrl+T	Tablet on/off
		REDRAW	'R	Ctrl+V	Paste to clipboard
EXPLODE	X	REGENALL	RG	Ctrl+X	Cut to clipboard
EXTRUDE	EXT	**ROTATE**	RO	Ctrl+Z	Undo
EXTEND	EX	**SCALE**	SC		
FILLET	F	SELECT BY LAYER	'SL		
FILLET RAD. 0	F0	SELECT BY ENTITY	'SE		
GROUP	G	STRETCH	ST		
HATCH	-H	**TEXT**	T		
HATC EDIT	HE	TILEMODE	TM		
HIDE	HI	**TRIM**	TR		
IMAGE	IM	VIEW RESTORE	VR		
INSERT	I	XLINE	XL		
		ZOOM	Z		
		ZOOM P	ZP		
		ZOOM VMAX	ZV		

FS Add-On Commands

The helpful AutoCAD keyboard commands listed below are FS add-on commands and can be typed in on the command line. Some of these are now available through the AutoCAD Express Tools pull-down menu or incorporated in newer versions of AutoCAD (2004/2005/2006).

Commands Add-ons

angle	- Returns an angle by picking a vertex and beginning and ending angle
arctxt	- Draws text around an arc or circle object
atext	- Draws text around an arc or circle object
ba	- Macro to break an object in two at a single point
batt	- Draws batt insulation using a polyline
bextend	- Extends objects to nested objects within blocks or xrefs
bolt	- Draws a bolt based on user input
btrim	- Trims to entities nested in blocks or xrefs
burst	- Explodes blocks, but retains attribute contents
chlayer	- Changes the layer of objects. Creates the layer if it does not exist.
chline	- Globally change properties of line objects
chtexth	- Globally change text height of text or mtext
ddsc	- Inserts scale markers
ddwelds	- Inserts weld symbols
dets	- Inserts detail titles
dtid	- Inserts detail reference ID's as shown on page 3-8.
dwiz	- Dimension Wizard will set up Dimension Styles for you
explore	- (NT4.0 and Win2000 only) - Starts Windows Explorer in the current folder
f0	- (That's "F" and a Zero) - Fillet radius zero
fr	- Inserts stacked fractions

fullscreen   - Toggles FULLSCREEN mode

gatte   - Globally changes attribute values

glr   - Returns the layer of a selected object, esp. useful within a block or xref

gridline   - Inserts grid lines and grid marks

gridmark   - Inserts grid marks

iconmenu   - Insert FS symbols, 2nd sheets, details etc. from an icon driven menu

keynote   - Inserts keyed notes in your drawing

laycur   - Changes the layer of selected object to current layer

laydel   - Permanently deletes layer from drawing

layfrz   - Freezes layers of selected entities

layiso   - Isolates layer of selected objects by turning all other layers off

layoff   - Turns off layers of selected objects

layon   - Turns on ALL layers in drawing

laythw   - Thaws ALL layers in drawing

ldr   - Creates an arc leader line

leo   - "Layer Exclusive On" turns all layers off except those you specify by name or by picking objects

leu   - "Layer Exclusive Unlock" locks all layers except those you specify by name or by picking objects

lldr   - Creates an arc style loop leader line

llist   - Creates a text file listing the current drawing's layer settings

llock   - Lock layers by name or by picking objects

lon   - Macro to turn on all layers

lql   - Quick leader - loop. Also offers leader options through a dialogue box.

lthaw   - Macro to thaw all layers

lunlock	- Unlock layers by name or by picking layers
mpedit	- PEDIT for multiple lines
ncopy	- Copies entities nested inside blocks and xrefs
nut	- Draws a nut based on user input
pen	- Set your current layer, color, linetype to those properties of a selected object
perpdoff	- Set crosshairs (snapang) to zero
perpdon	- Set crosshairs (snapang) to angle of a selected line
plrev	- Reverse a polyline's start/end
sect	- Inserts section cuts
textfit	- Fits text between specified points
textmask	- Masks entities behind text
tldr	- Creates an arc style leader pointing to an area
tmenu	- A text only replacement for the Iconmenu command. Useful when your screen resolution is too low to run Iconmenu.
topoly	- Joins polylines, lines and arcs into continuous polylines. Faster then using Pedit/Join.
tql	- Quick leader into an area. Also offers leader options through a dialogue box
tset	- Reports text style, height, and layer text resides by clicking on text
txtexp	- Explodes text or mtext objects into polylines
twiz	- Text Wizard will set up Text Styles for you
vpsc	- Reports a viewport's scale (i.e. 48.00 to 1.) after selecting viewport.
websec	- Draws cross section of common steel shapes
wipeout	- Hides selected area of drawing
wpoints	- Write point coordinate data to a text file

Appendix F

Troubleshooting, Tips, & Tricks

Appendix F
Common Trouble Shooting

This appendix offers a few solutions to some of the common, everyday problems experienced by AutoCAD users in Region 2.

Quick Troubleshooting Index

General Problems

Printing Problems

Display Problems

Miscellaneous Problems

Initiating AutoCAD

Problem: AutoCAD is not initializing after selecting icon and a 'FLEXlm License Finder' error message pops onto screen. (Network License -Regional Office Only)

Solution: Contact the CAD coordinator for assistance or re-establish the license connection by following these steps:

1. Toggle the 'Specify the License File' button and click 'next' (Figure F-1 below).

Figure F-1

2. Navigate to My Network Places in the Explorer window and select 'Computers Near Me' (Figure F-2).
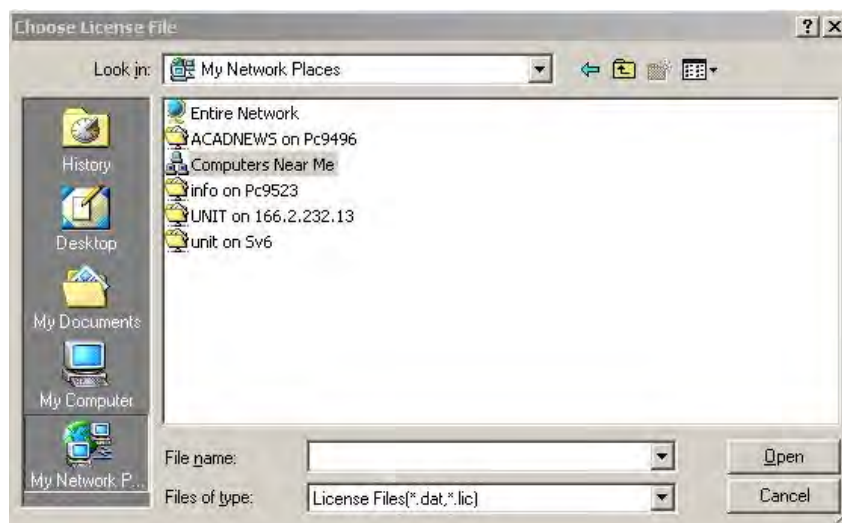
Figure F-2

3. Select Pc9496 (Figure F-3)
4. Go into **AutoDesk License Manager > License** …and select the license.lic file to open.
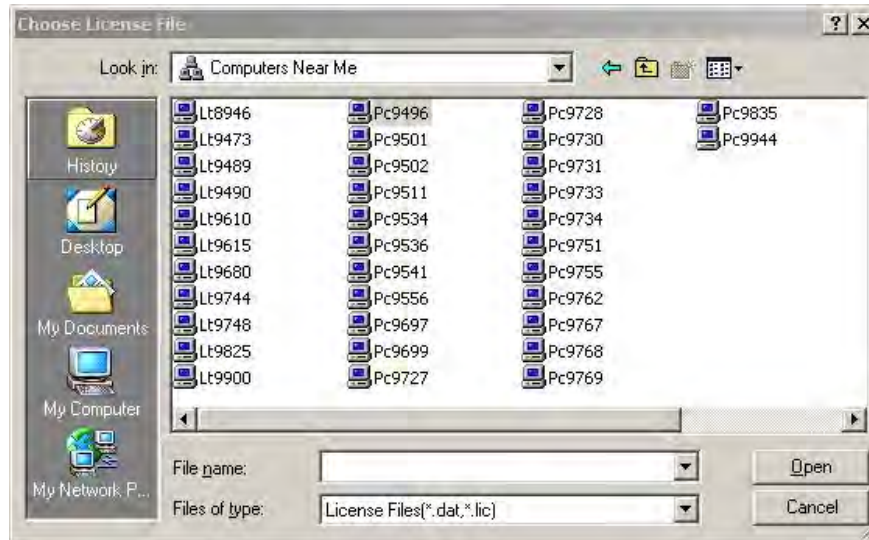
Figure F-3

The license has been re-established and AutoCAD should automatically fire up. You won't have to do this again as long as the AutoDesk license manager stays on-line or there isn't a system shutdown.

❖

Selection Problem

Problem: AutoCAD only allows user to select (highlighted by dashed line) one entity at a time. Each sequential selection unhighlights the previous selection.

Solution: The shift-to-select toggle is checked. Go to the *Tools* pull-down menu and click on *Options*. Under the *Selection* tab, uncheck the 'Use Shift to Add to Section' toggle (see Figure F-4).

Make sure this is **UNCHECKED**
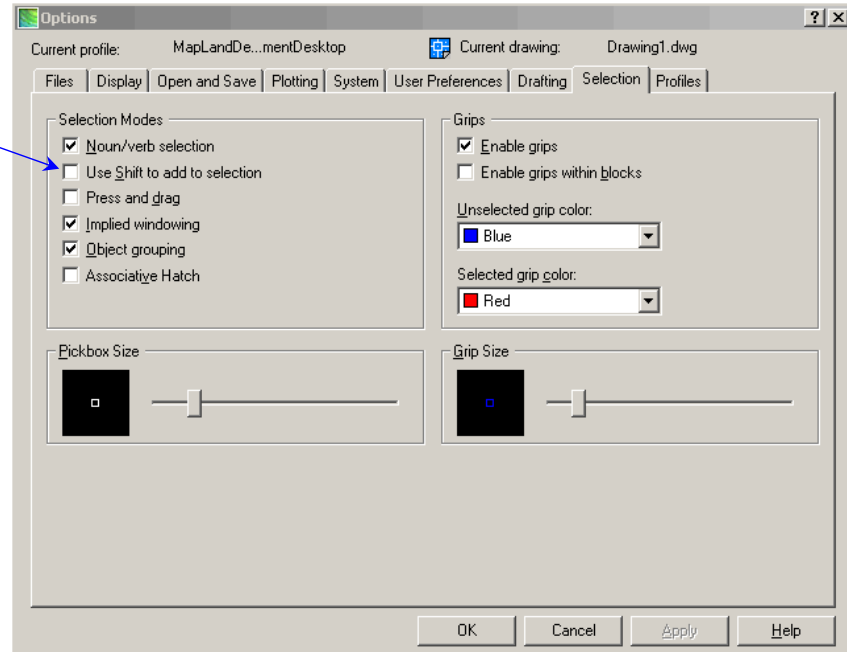
Figure F-4

❖

Drawing Loading as Read-Only Problem

Problem: Trying to load an AutoCAD drawing indicates that the drawing is loaded by another user and available as read only (a normal safeguarding issue). However, after checking around the office, you find no one with that particular drawing open. Why wont the drawing open?

Solution: Again there could be other things responsible, however more than likely two or more users are working on their own drawings that load in the same xref drawings (such as a topo base, site plan, or floor plan). If one or more of these users have the Demand Load XREF '**enabled'**, they are locking out other users from loading any drawing that also utilizes that particular xref. Navigate to *Tools>Options>Open and Save* and '**disable'** the Demand Load Xref option. Refer back to Chapter 2 – Drawing Setup Guide.

Moved Objects Not Moving Correctly Problem

Problem: Trying to move text or an object and the user sees the moved item in two places…both its original location and the new location as well. After doing a regen, the original image disappears, but the moved object is not exactly where it should be. See figure F-5 below.

Original text location (which still shows on the display after it is moved)

Moved text - new location by user (which may shift slightly after a regen)

DITCH TO DRAIN—
25' RADIUS AROUND
SPRING BOX

DITCH TO DRAIN—
25' RADIUS AROUND
SPRING BOX
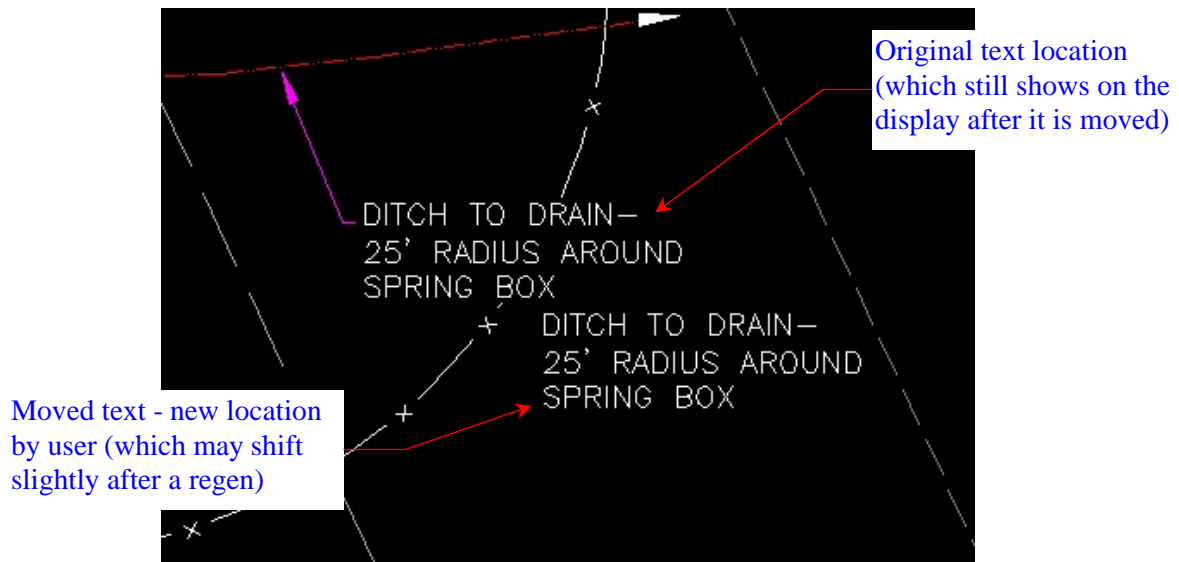
Figure F-5

Solution: Type *pickstyle* in the command line. More than likely it is set to '**1**'. Change the setting to '**0**' (zero).

❖

Moving Objects From Paperspace to Modelspace

Problem: Do you want a quick way to move objects in paperspace to modelspace without having to copy and paste?

Solution: Go to the Express Tools pulldown menu and select **Layout Tools > Change Space**. The user will be prompted to select the item(s) in paperpsace to move into modelspace (hit return key when finished selecting). Next …hit return again to send into model. That's it. All items will be at the correct scale and orientation for the viewport.

Printing Problems

Problem: The text in the Forest Service border-sheet title block prints as outlined letters instead of solid.

Solution: Type **'textfill'** in the command line and turn on the textfill by typing in **'1'** (for on).

❖

Problem: Plot preview indicates AutoCAD 11x17 print is cutoff at top or side.

Solution: Although you may have selected 11x17 paper size, you need to look at the 'printable area' size indicated in the plot dialog box. The printable area required for FS border sheets is 16.58 x 10.58 inches. To change your printable area, click on the *'properties'* button to the right of the plotter selection and select the **Modify Standard Paper Sizes [Printable Area]** and select Tabloid 11x17 or (Ledger depending on your printer) to modify. See Figure F-6.
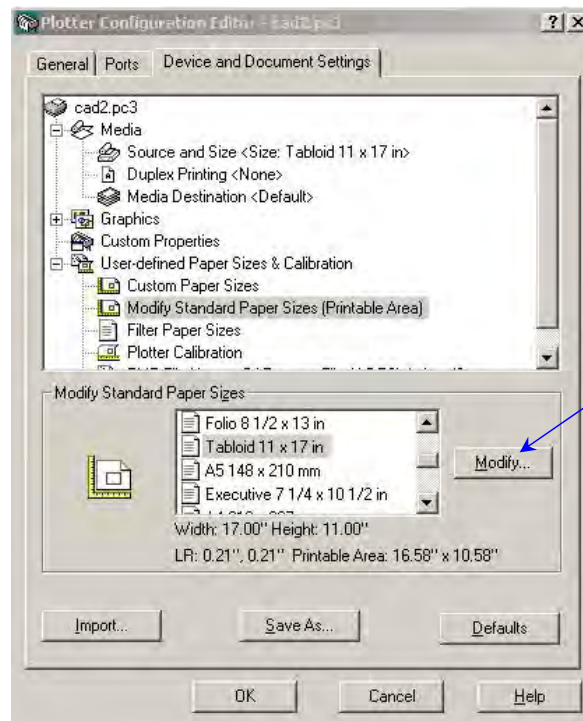
Figure F-6

The next dialog box to appear will be the printable area adjustment (Figure F-7). Modify all the values to **0.21** select next and save. The plot will now print exactly within the 11x17 paper with all the proper margins. The new plotter name will now have the extension .pc3.
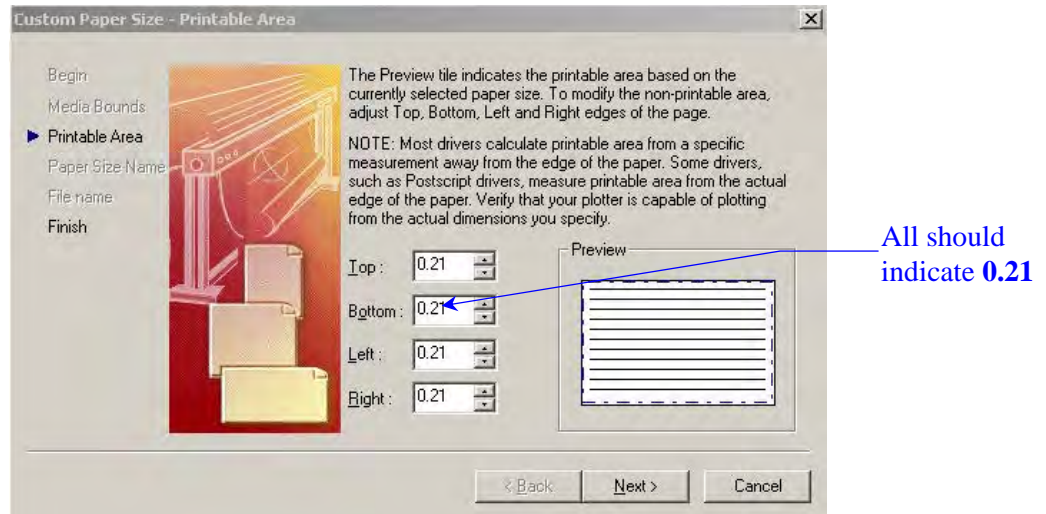
Figure F-7

❖

Problem: Plotted line work is very light or very heavy.

Solution: Double check the plot file (.ctb) you are using in the plot dialog box. Too heavy is most likely the full-size plot file being used for half-size plots. Too light might indicate that you might be using one of the screened plot files or possibly the acad.ctb file, which tries to plot colors in black and white. (The color yellow would plot very, very light in this mode).

❖

Problem: Text masking or wipeout areas plot as black boxes.

Solution: This usually is an indication that you need another printer driver or an upgraded driver. Contact EUSC and request an upgraded driver.

Problem: There are only .stb plot files (named plot style files) available to pick from in the plot dialog box. What happened to my color-dependent (.ctb) plot files? See figure F-8 below.
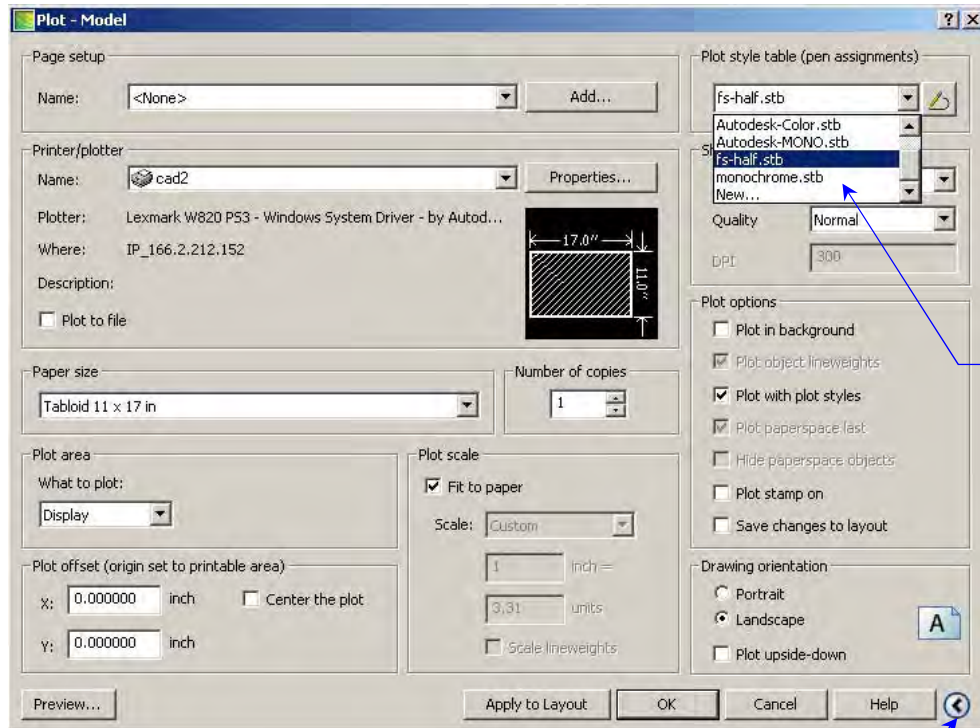
Figure F-8

Solution: In the command line type **convertpstyles**. This will reset the plot style tables back to .ctb files.

Users: If you are not seeing the right side of the plot dialog box as shown in the figure above, click on the circled arrow in the lower right of the box to extend the dialog box. This is only applicable in AutoCAD 2005 and newer versions).

Display Problems

Problem: Little tic marks appear on your AutoCAD work area every time you click the mouse on the screen, whether drawing a line, or selecting an entity, and only go away if the window is panned or regen.

Solution: Type **'blipmode'** in the command line and turn off the blipmode by typing in *off*.

❖

Problem: Opened drawing in AutoCAD containing surveyed contours created in Land Development Desktop (LDD) shows no contours on screen.

Solution: Contours are LDD AECC contour entities and not recognized in basic AutoCAD. User needs to load Object Enabler available free from AutoDesk. Visit the AutoDesk web page: www.autodesk.com to download enabler.
<u>Note</u>: **You will need temporary administrative rights to load the enablers to your computer.**

❖

Problem: When I 'zoom extents' my drawing in modelspace, it disappears from my screen.

Solution: Actually the drawing has not disappeared from the screen, but more than likely is a very small dot somewhere on the screen. What has happened is there is an object (i.e. a line, block, or possibly a sting of text) somewhere way outside the area you were primarily working in. Since you did perform a zoom extents, the drawing <u>and</u> your stray object are on the screen (in opposite corners most likely).
Get back to your original area of work by windowing in on the dot where your work is or undo to get back where you were before you did zoom extents. Type in the '**erase**' command in the command line and type in '**all**' when prompted for select objects (everything will be selected in modelspace). Type in '**r**' (to remove) and select everything in your drawing area by windowing the objects. Hit 'enter'…and all the stray objects should disappear. Try zoom extents again.

Problem: Text masks or wipeouts have been applied to the drawing and were working when first put in the drawing, but now the line work behind them is showing through…even after a regen.

Solution: There is a small programming bug with AutoCAD and wipeout (text mask too) that creates this problem. The solution is to go to the *Tools* pull-down menu and click on *Options*. Under the *System* tab, check the 'Regen when switching layouts' toggle (see Figure F-9).
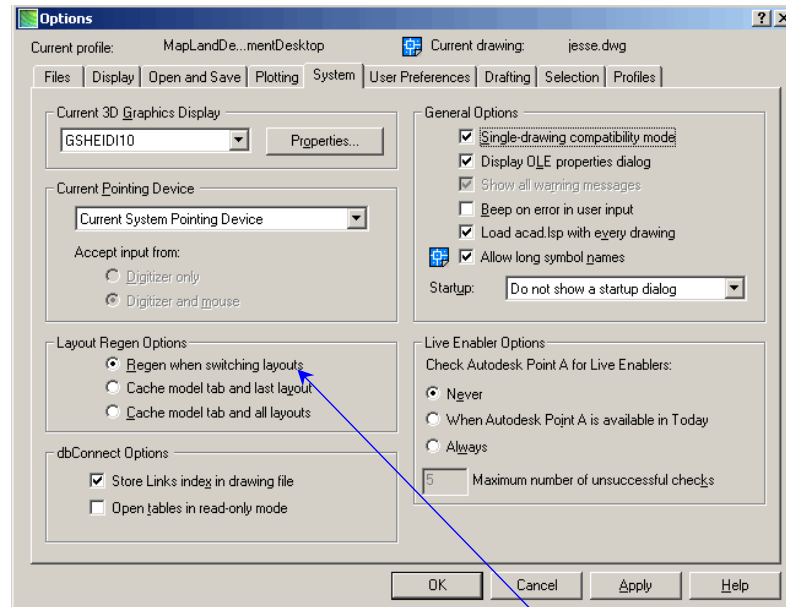
Figure F-9

Make sure this is CHECKED

❖

Problem: A wipeout has been applied to hide background behind a legend or chart, and the chart/legend also disappears.

Solution: The wipeout frame is in front of the object and thus masking the chart or legend as well. The solution is to go to the *Tools* pull-down menu and click on *Display Order > Bring to Front.* Select by boxing in the area the chart or legend should be and make sure all components of the object are selected. Hit return and the object should move to the front of the wipeout frame and be visible.

Problem: What should be a dashed line on the screen does not look dashed.

Solution: Several things could be the culprits here. If you are familiar with line scales and are sure it's not that, then most likely the line is skewed in 3D. List the line or go to the Properties and look at the end elevations of the line. More than likely one end is at '0' and the other end is at some elevation (i.e. '1000.00'). See Figure F-10.
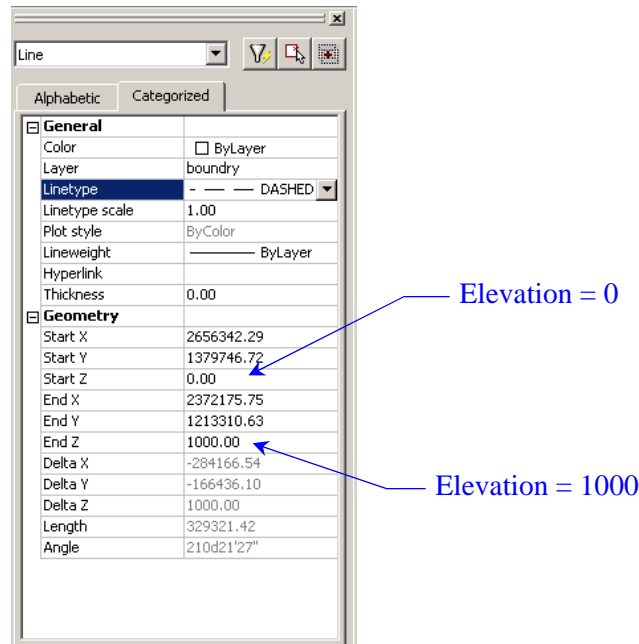
Figure F-10

Change the 1000 elevation to 0 and the dashed line should correctly appear provided your scale is correct.

Scale issues to double-check:

✓ LTSCALE should be set to the drawing scale (i.e. 40 for 1"=40'). This is a global variable that will effect the entire drawing, so if there are line types on the screen that appear correct, changing the LTSCALE will also change those lines.

✓ Change the individual object line-type scale up or down until the line appears correct.

Still no dashed line? One last thing to double-check is that there are not two lines on top of one another…. one solid, one dashed.

J,K,L Drives are Missing

Solution: The user needs to remap to these drives by following these steps:

1. Double-click on **FS Neighborhood** icon on your desktop (this should be a little tree symbol icon).

2. Click on the server listed in the dialog box (should highlight blue) and click on the **Connect** button.

3. Scroll down the list of folders and files in the new dialog box and locate the **unit** folder. Right-click on this folder and the dialog box in the figure below will pop onto the screen. Select **Map Network Drive**.
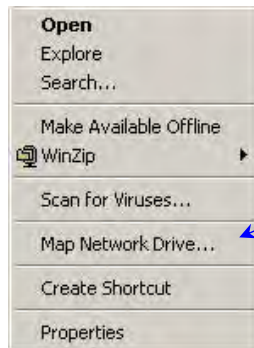
Select Map Network Drive…

4. Scroll down the list of folders and files in the new dialog box and locate the **'unit'** folder. Right-click on this folder and the dialog box in the figure below will pop onto the screen. Select **Map Network Drive**.

5. In the next dialog box, click on the scroll down arrow and navigate to the k: drive designation (see figure below). Click on **Finish** when done.
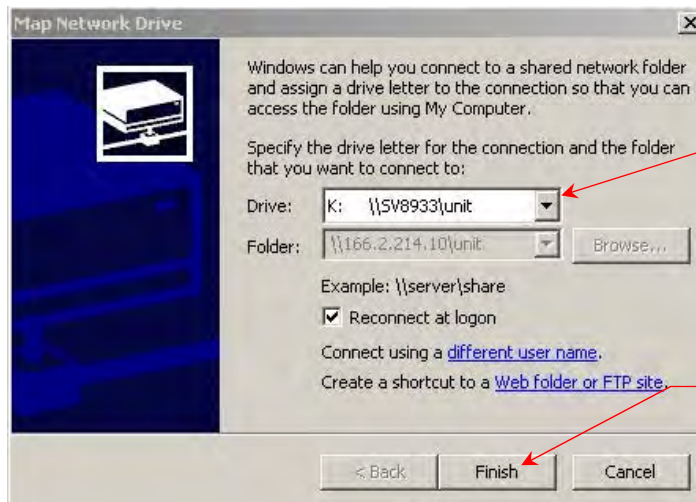
Scroll to find the k: drive designation

Click **Finish** when done

That's it….
It is not necessary to map the J: and L: drives. Mapping the K: drive will gain you access to the project folders, cadd folders, and most of what you'll need to get to. However to map these drives as well, simply repeat steps 4-5 again but right-click on the **dfsroot** folder for the J**:** drive, and right-click on the **home** folder for the **L:** drive.

AutoCAD Tips

Some recommended basic guidelines to running a more efficient AutoCAD program:

Options Dialog Box – Open and Save
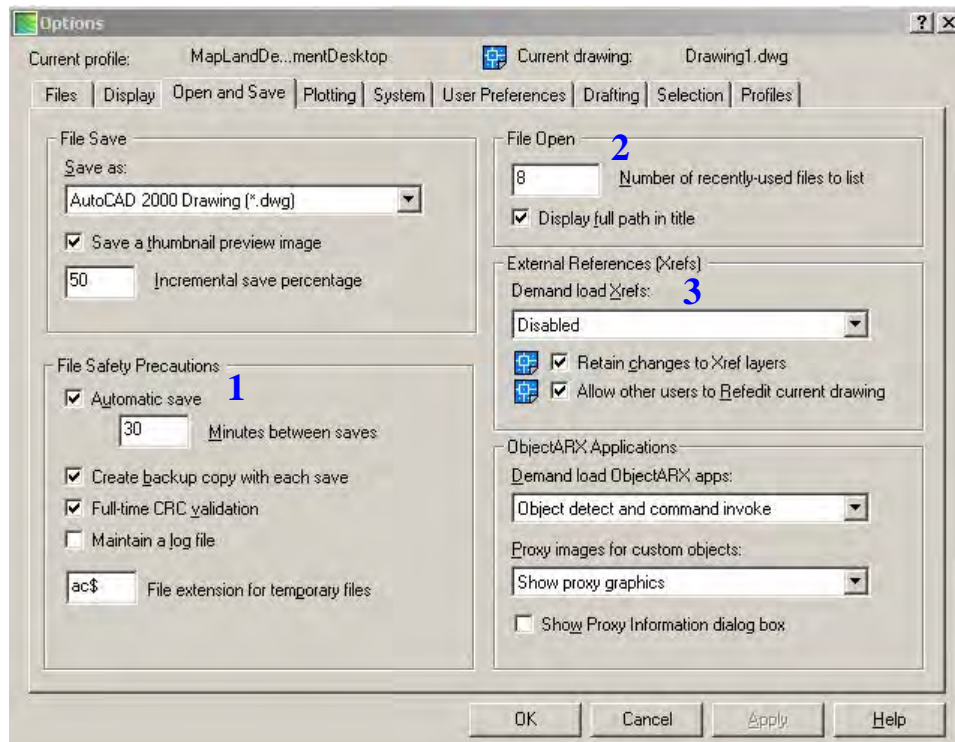
1. **File Safety Precautions**
    - ✓ Make sure Automatic Saves are occurring at intervals you can live with for losing work. AutoCAD default is 2 hours (120 minutes). Recommend time between auto-saves set to 20-30 minutes.
    - ✓ Backup copies should be created with each save.
    - ✓ Full-time CRC validation needs to be checked to maintain cleaner, error-free drawings.

2. **File Open**
    - ✓ Set number of 'recently used files to list' to a number greater than 4 (default). If you frequently jump in and out of several drawings during a normal AutoCAD session, this will prevent you from having to go into Windows Explorer to load a drawing you were in just 5 drawings ago.

3. **External References (Xrefs)**
    - ✓ Disable the Demand Load Xrefs (or Enable with copy). This allows other users to load drawings that commonly use similar xrefs.

Options Dialog Box – System
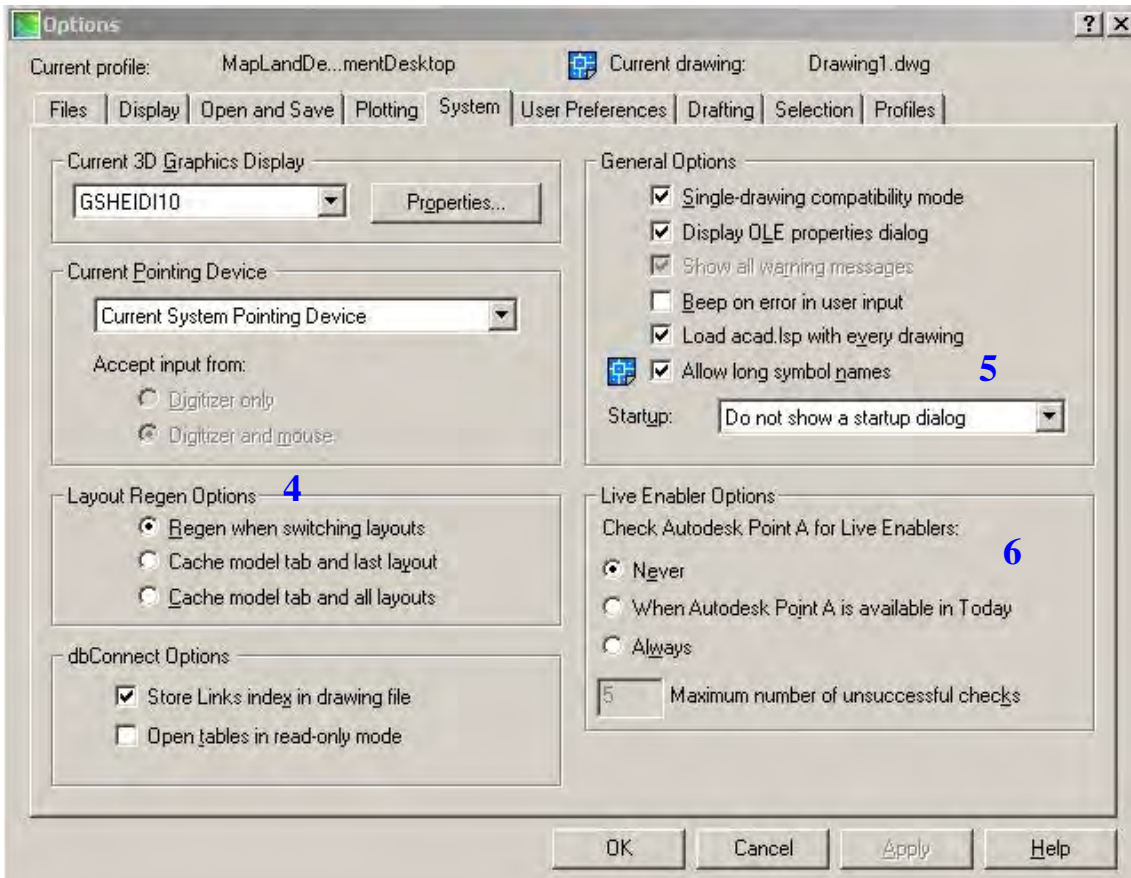
4. **Layout Regen Options**
   - ✓ Select 'Regen when switching layouts'. Helps regenerate backgrounds when layers colors are not showing on the screen correctly and wipeout /text masking errors.

5. **General Options**
   - ✓ Single drawing compatibility mode is recommended since having multiple drawings open ties up drawings other users may need access to.
   - ✓ Select 'Do not show startup dialog' if you are tired of the pop up dialog box that shows on the screen every time AutoCAD is fired up.

6. **Live Enablers Options**
   - ✓ Toggle 'Never' for Check AutoDesk Live Enablers. This will keep your AutoCAD from hitting the Internet for updates that may slow down your computer.

Backup Saves

It is late afternoon and your drawing is suddenly lost or corrupt. The last time you saved was early that morning and your .bak file does not have the changes or addition you made since then. You know you've got your AutoSave parameter set to 30 minutes and wonder where your saved drawing is or even what your AutoSave file is called?   Here is a tip to keep your options open when needing to recover a saved file:

On your C: drive, create a new folder called **'acad-saves'.**   Open the **Tools** pulldown menu and navigate to **Options** and the **Files** tab (See Figure F-11 below). Click the plus (+) symbol next to *Automatic Save File Location* and double-click on the path shown to redefine the path location. Type in c: \acad-saves and click 'apply' at the bottom.

Depending on the parameter set for your Automatic Saves (see tip- previous page), an **.sv$** file is stored every time a save is automatically implemented by AutoCAD. You will find these autosaves now in the newly created 'acad-saves' folder for easy access.
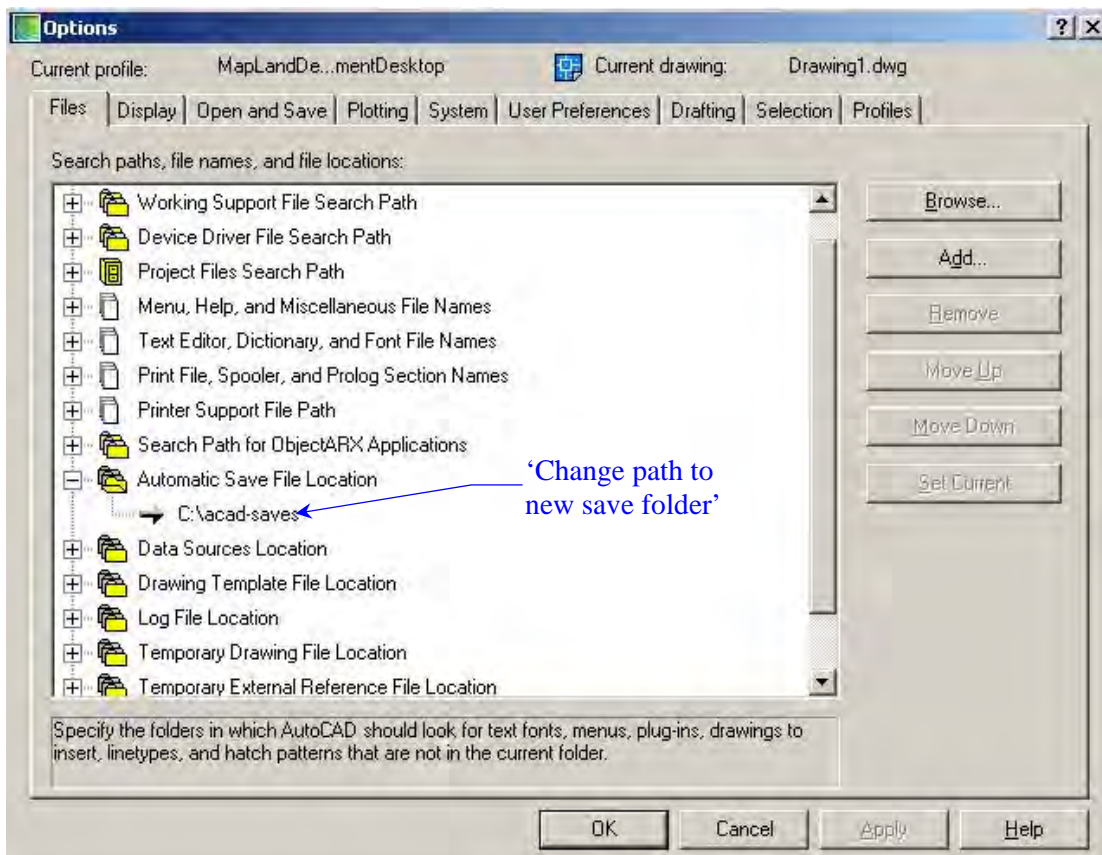
Figure F-11

Appendix G

FS AutoCAD Customization

Appendix G
FS AutoCAD Customization

This appendix is designed to give information on AutoCAD customization that has been developed for the Forest Service. Repetitively used setups, commands and symbols have been customized and made available to users to add additional functionality to the AutoCAD program, specific to the needs of the design and construction program.

If you're on the Regional Office network you'll see the FS pull-down menu at the top of your AutoCAD screen, which indicates that you have the customization files loaded. If you're not on the RO network, you can install the AutoCAD customization on your PC. This customization is available on CD-ROM (request a copy from CDI) or you can download the files from the CDI web site.

The FS Pull-down Menu

The FS pull-down menu, located on the AutoCAD menu bar at the top of your screen, contains access to customized commands and toolbars created for Region 2 use. The FS pull-down menu offers three options:

- Command Add-ons - A list of custom commands
- Toolbars   - Discipline specific toolbars
- Web Links   - Direct access to R2/CDI support sites

Command Add-ons

The Command Add-ons menu selection brings up a dialogue box listing all custom commands available to the user and a general description of each commands function. Instructions are contained in the dialogue box, which allow the user to browse the list of commands, select a command for use, or generate a more detailed description of the selected command functionality.
See Appendix F for a list of the FS specific commands.

Custom Toolbars

The AutoCAD customization developed for the Forest Service contains several toolbars for various disciplines. Each toolbar will be shown with a description of the tools capability. In some cases, the toolbar will have additional tools that can be accessed from the fly-outs off of the main toolbar or from individual toolbars that are grouped by function (look for the downward black corner on the lower right of the icon to indicate menu fly-outs).   To access the tools in AutoCAD, click on the icon ion the desired toolbar and follow the prompts.

Main Toolbar
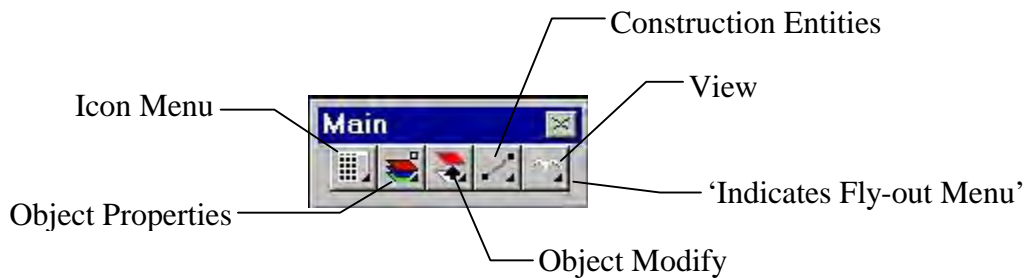
The tools available from the flyouts on the Main Toolbar have also been incorporated into individual toolbars, as shown below.

Main/Tools
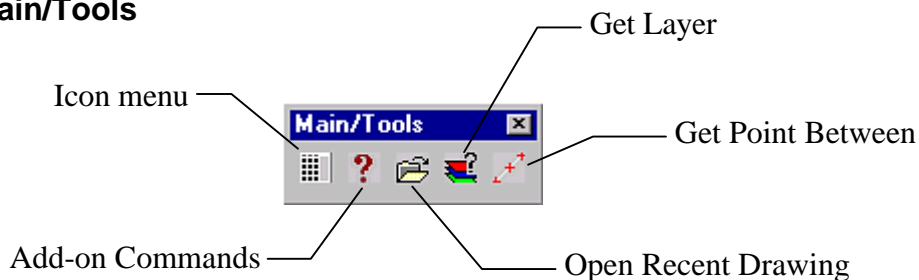
Icon Menu	- Will take the user directly to the icon menu for selection of symbols
Add-on Commands	- Custom commands developed for R2 use
Open Recent Drawing	- Displays a list of recently opened drawings for user selection
Get Layer	- Displays the layer of user-selected object
Get Point Between	- Allows user to find midpoint of 2 selected points while in a command

Main/Object Properties

All Layers On ——————

Layer Off ——————

Set Layer/Color/Ltype ——————

Text Set ——————

Main/Object Properties

Layer Set ——————

Thaw All Layers ——————

Layer Freeze ——————

Layer Lock ——————

Layer Unlock ——————
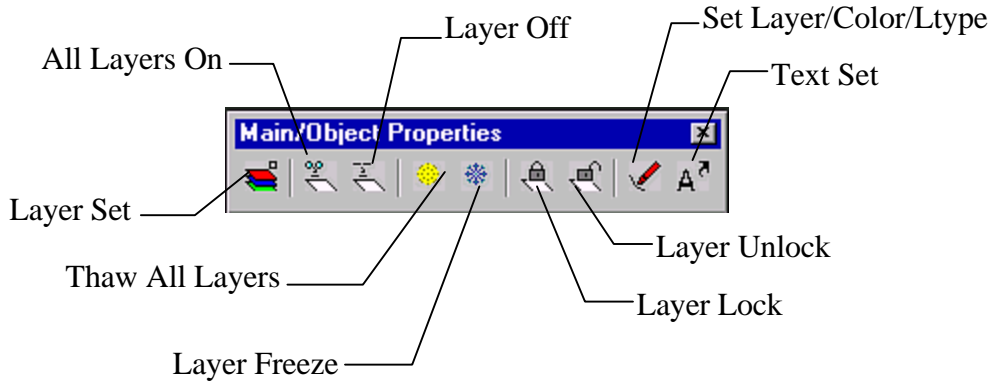
Layer Set	- Set Current Layer
All Layers On	- Turns on all layers
Layer Off	- Turns off selected layers
Thaw All Layers	- Thaws all layers
Layer Freeze	- Freezes selected layers
Layer Lock	- Locks selected layers
Layer Unlock	- Unlocks selected layers
Set Layer/Color/Ltype	- Sets layer, color and/or linetype to match existing objects
Text Set	- Select text to match attributes

Main/Modify Objects

Change Layer ——————

Main/Modify

Copy Properties ——————
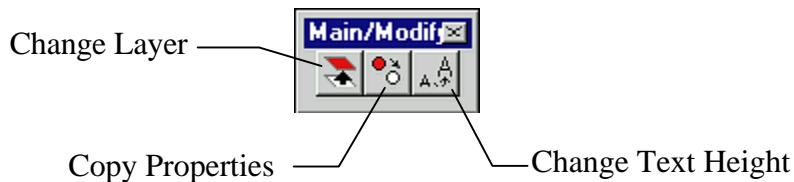
Change Text Height ——————

Change Layer	- Changes the layer of objects
Copy Properties	- Changes properties to match selected objects
Change Text Height	- Changes text height of selected

Main/Construction Entities

Freestyle Construction —— **Main/Construction Entiti⊠** —— Erase Construction Entities

X-Axis
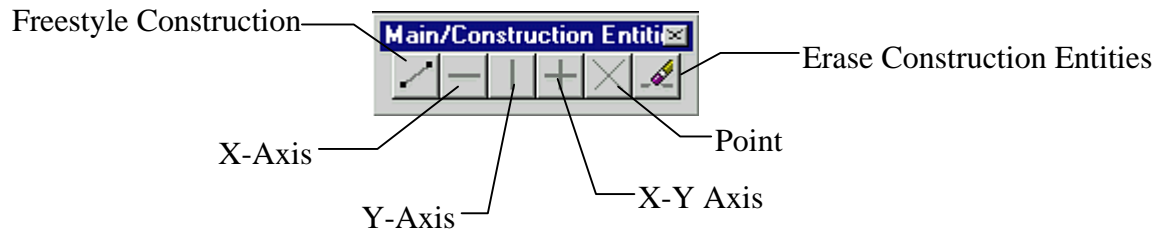
Point

Y-Axis

X-Y Axis

Freestyle Construction Line	- Construction line drawn in no-plot pen
X-axis	- Draws construction line across x-axis at point specified
Y-axis	- Draws construction line across y-axis at point specified
X-Y axis	- Draws construction line across x and y axis at point specified
Point	- Places a point (node) at user specified location (no plot)
Erase Construction Entities	- Erases selected construction entities

General Toolbar

The General Toolbar was developed for use by all disciplines. It contains the standard drawing sheet symbols for Region 2 drawings and is divided into four flyouts and two 'wizard' selections.

Section Cuts
Leaders
Border Sheets
Break Lines
Dimension Wizard
Text Wizard
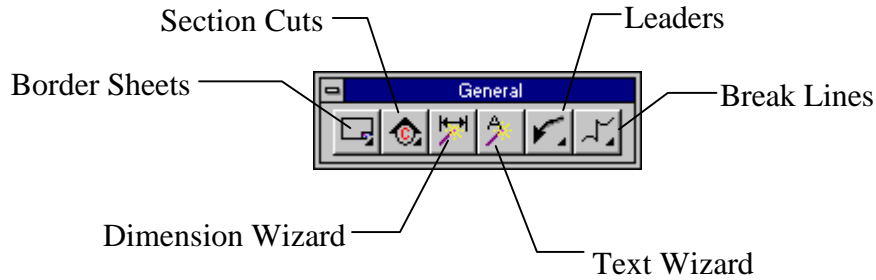
Insert Border Sheet — takes user to the icon menu for border sheet selection
Scale Markers — takes user to a dialogue box for selecting scale options
North Arrow — standard north arrow

General Toolbar Flyouts

Miscellaneous
Border Sheets
Scale Markers
North Arrow

Section Cuts
Detail Titles
Elevation Target
Detail Identification Symbols

Leader 1
Loop Leader 1
Leader 2
Loop Leader 2
Into Leader 1
Into Leader 2

Break Line (arc)
Phase Symbol
Line End Break
Pipe Break
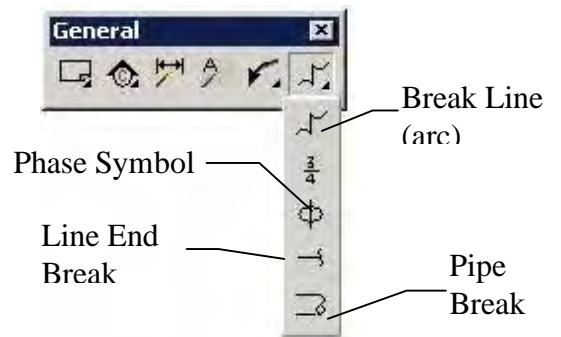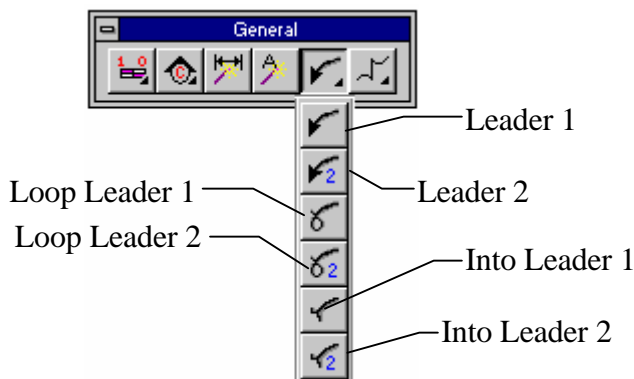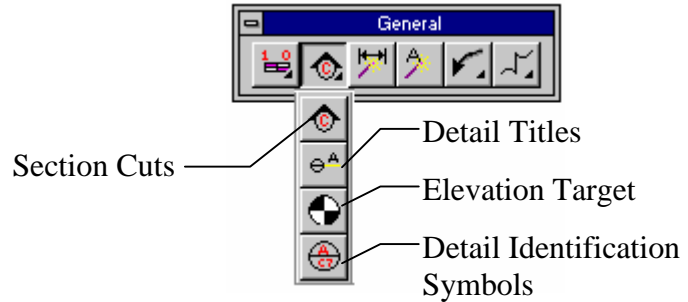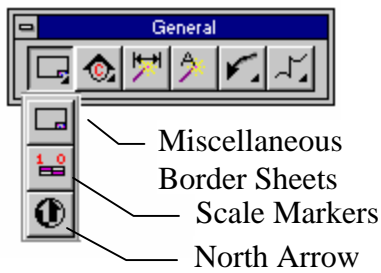
Wizards

The Text Wizard and Dimension Wizard were developed to simplify the setup process for creating standard text styles and dimension styles. The 'wizards' are accessed by selecting the icon from the General Toolbar. A dialogue box will appear prompting for user-selected settings.

Text Wizard   **Dimension Wizard**

Architectural Toolbar

The Architectural Toolbar below has been created to support the architectural design features.

Architectural Toolbar

Architectural Plumbing Fixtures ———— Door Swing

Architectural Labels
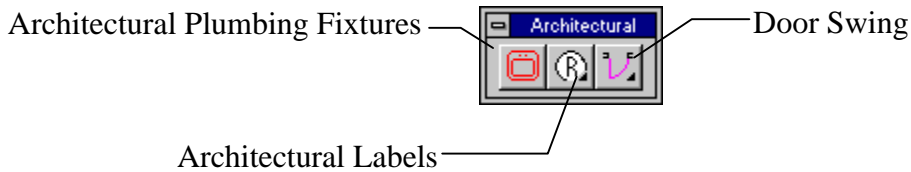
The first icon on the Architectural Toolbar will take the user to an icon menu, which will offer a variety of architectural plumbing symbols. The second icon offers door, wall and window labels, accessible from a flyout. The third icon offers two routines - one for creating door swings, and the other for creating batt insulation.

Architectural Toolbar Flyouts

Door Label – Romans font
Door Label – Arch. font ———— Room Label- Romans font

Wall Label-Romans font ———— Room Label – Arch. font
Wall Label – Arch. font

Window Label – Romans font

Room elevation bubble ———— Window Label – Arch. font

Door Swing
Batt Insulation
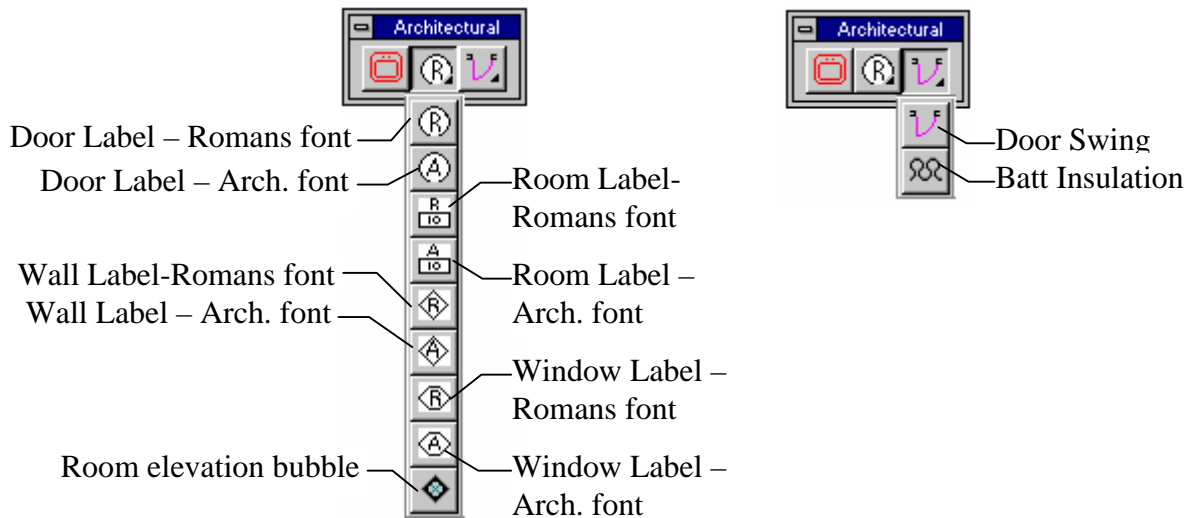
Civil Toolbar

The Civil Toolbar is divided into four flyouts, which encompass civil symbols, linetypes, hatch patterns and standard details. Each flyout takes the user to an icon menu for selection of individual symbols.

Civil Symbols ——— [Civil toolbar] ——— Hatch Patterns

Linetypes ———

Civil Toolbar Flyouts

General Symbols ——— [Civil symbols flyout] ——— Drainage symbols

Sewer Symbols ———

——— Water Symbols

Piping Symbols ———

General Linetypes ——— [Civil linetypes flyout] ——— Engineering Linetypes

——— Work Limits

Hatch Patterns ——— [Civil hatch patterns flyout]
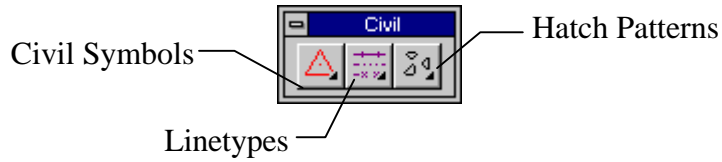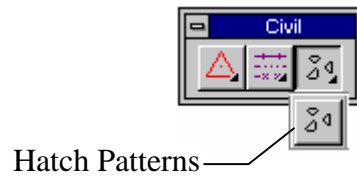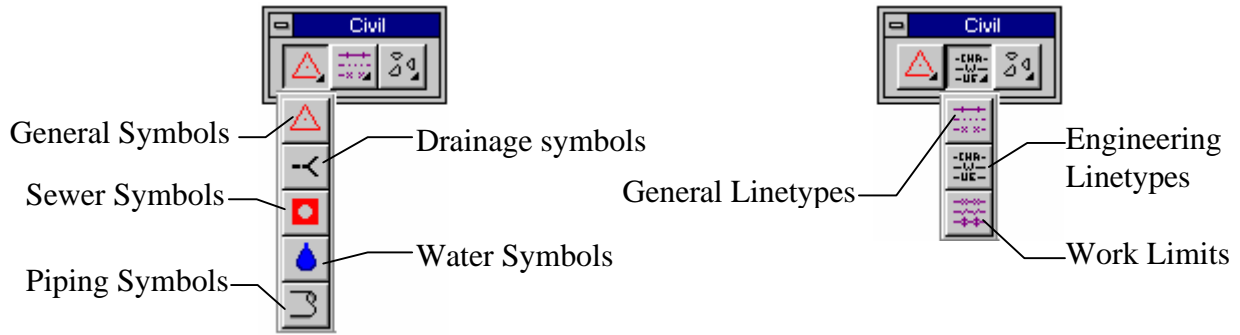
Electrical Toolbar

The Electrical Toolbar offers the users tools that can be accessed from flyouts off the main electrical toolbar or from individual toolbars that have been grouped by function. The electrical tools have been grouped into three categories - power, lighting and controls.

Electrical Main Toolbar

Electrical Power ———————— |Electrical| X | ———— Electrical Controls

Electrical Lighting ————
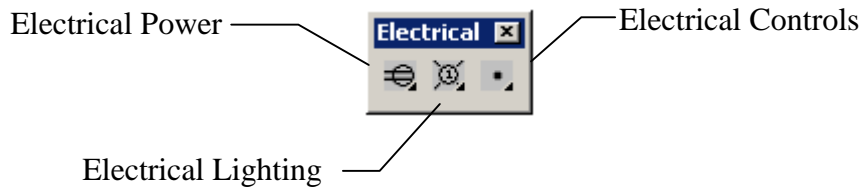
The individual toolbars created for power, lighting and controls offer users immediate access to the most often used graphic symbols for each function. The last icon on each toolbar takes the user to the icon menu for additional symbols.

Elec/Power

Duplex Receptacle ———— Elec/Power ———— Icon Menu

Telephone Outlet ————
Single Pole Switch ————
Unit Type Switch ————
Meter ————
Pullbox ————
————Fire Detector
————Intrusion Detector
————Junction Box
————Thermostat

Elec/Lighting

Elec/Lighting ———— Icon Menu

Light ————
Wall Light ————
————Icon Menu
————Fluorescent

Elec/Controls

Connection ———— Electrical Controls ———— Icon Menu

Elec. Device ————
Ground ————
————Meter Instrument
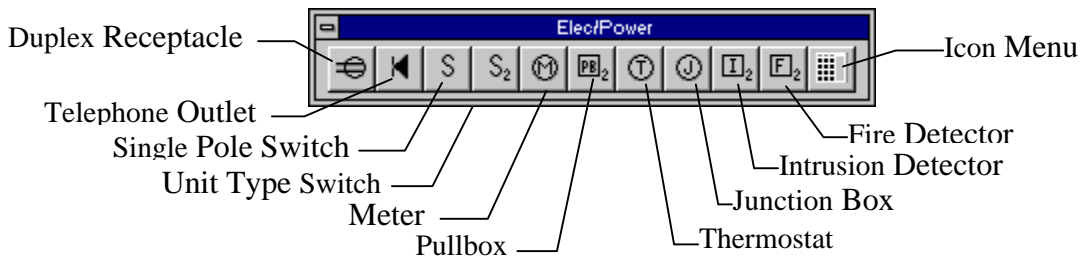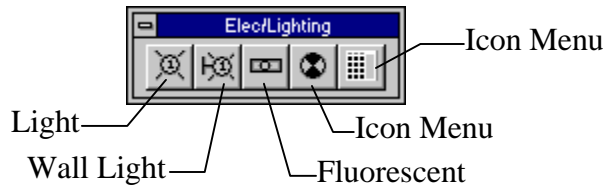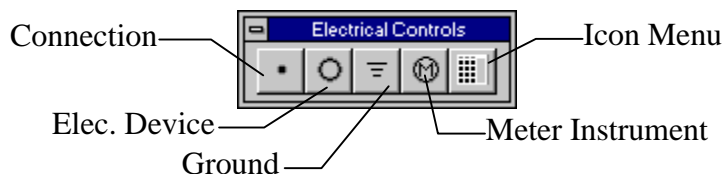
Mechanical Toolbar

The Mechanical Toolbar offers the users tools that can be accessed from flyouts off the main mechanical toolbar or from individual toolbars that have been grouped by function. The mechanical tools have been grouped into three categories - HVAC, Piping and Fire Sprinkler systems.

Mechanical Main Toolbar

Mechanical/HVAC

Mechanical/Fire Sprinkler
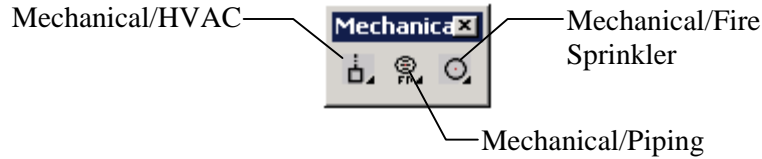
Mechanical/Piping

The individual toolbars created for HVAC, piping and fire sprinkler systems offer users immediate access to the most often used graphic symbols.

Mechanical / HVAC Toolbar

Thermostat

Auto. Damper

Icon Menu

Volume Damper

Fire Damper

Flex. Duct Connector
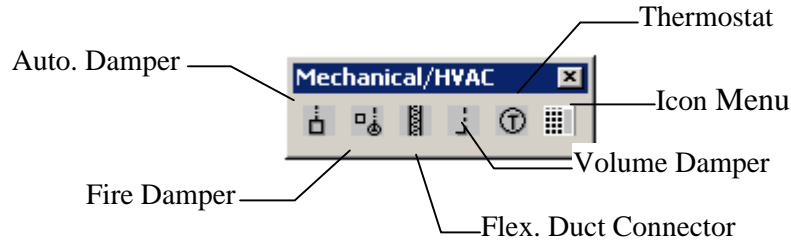
Mechanical/Piping Toolbar

Pressure Gauge

Linetypes

Floor Drain

Icon Menu

Single Line Tee

Thermometer

Clean Out

Ball Valve

Union

Globe Valve

Cap

Check Valve

Gate Valve
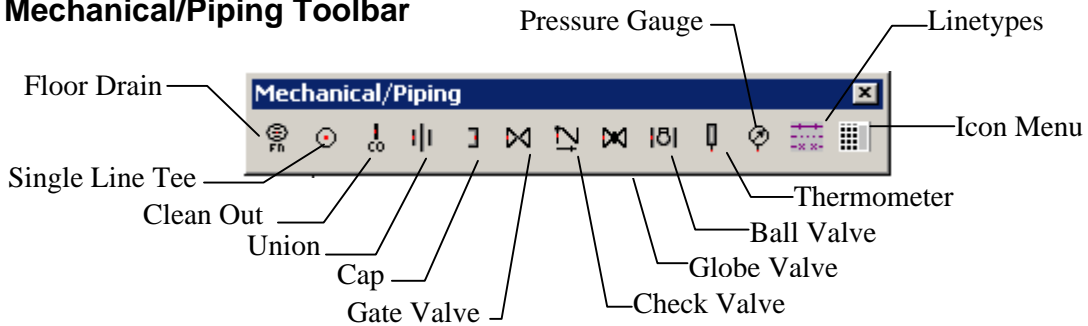
Mechanical/Fire Sprinkler Toolbar

Upright Sprinkler

Fire Dept. Connection

Pendant Sprinkler

Sprinkler Guard

Dry Pipe Valve

Alarm Check Valve

Dry Pendant Sprinkler

Side Wall Sprinkler
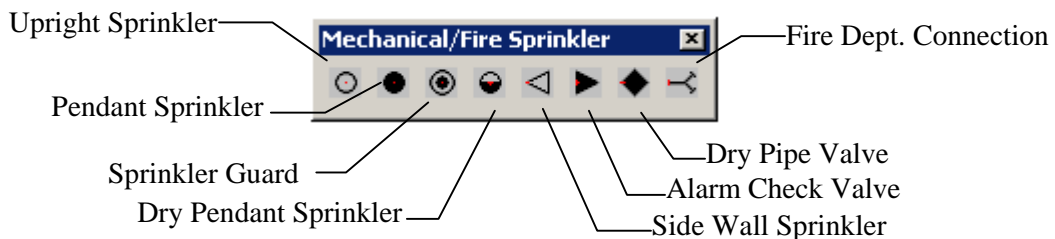
Structural Toolbar

The Structural Toolbar was developed to aid in the design and representation of structural elements throughout the design and construction documents.

DD Welds
Graph f$_{(x)}$
Steel Sections
Gridline
Bolt-Nut
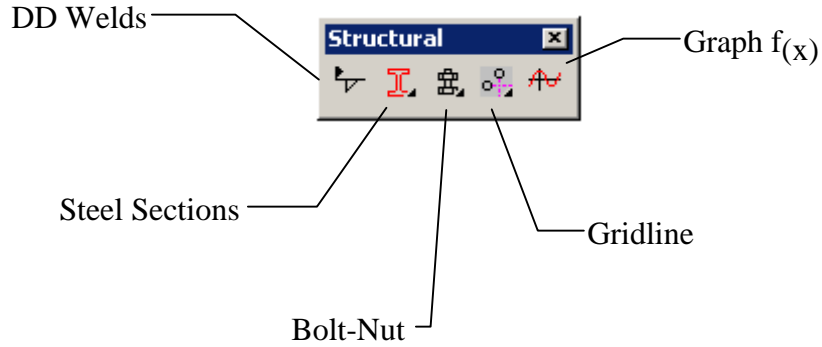
The individual flyout toolbars created for Structural design. They offer users immediate access to the most often used graphic symbols.

Structural Toolbar Flyouts

W Section
L Section
TS Section
C Section
S Section
AISC Shape Database

Bolt
Nut
Grid Lines
Grid Bubble
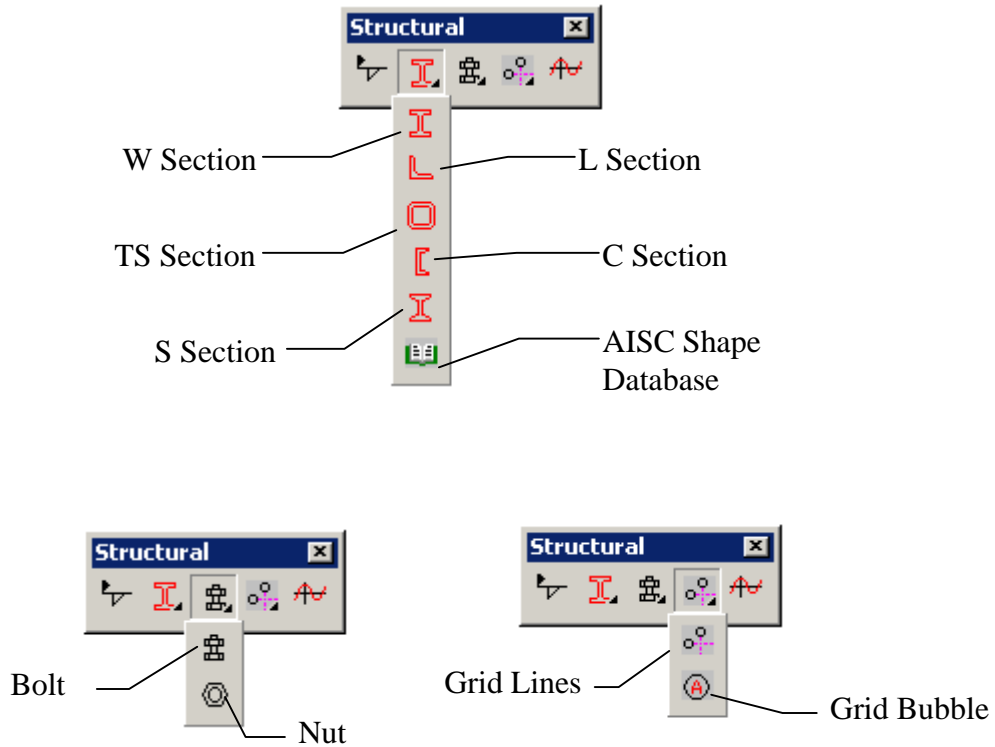
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Index

e

f

g

h

i

k

l

t

V

W

X