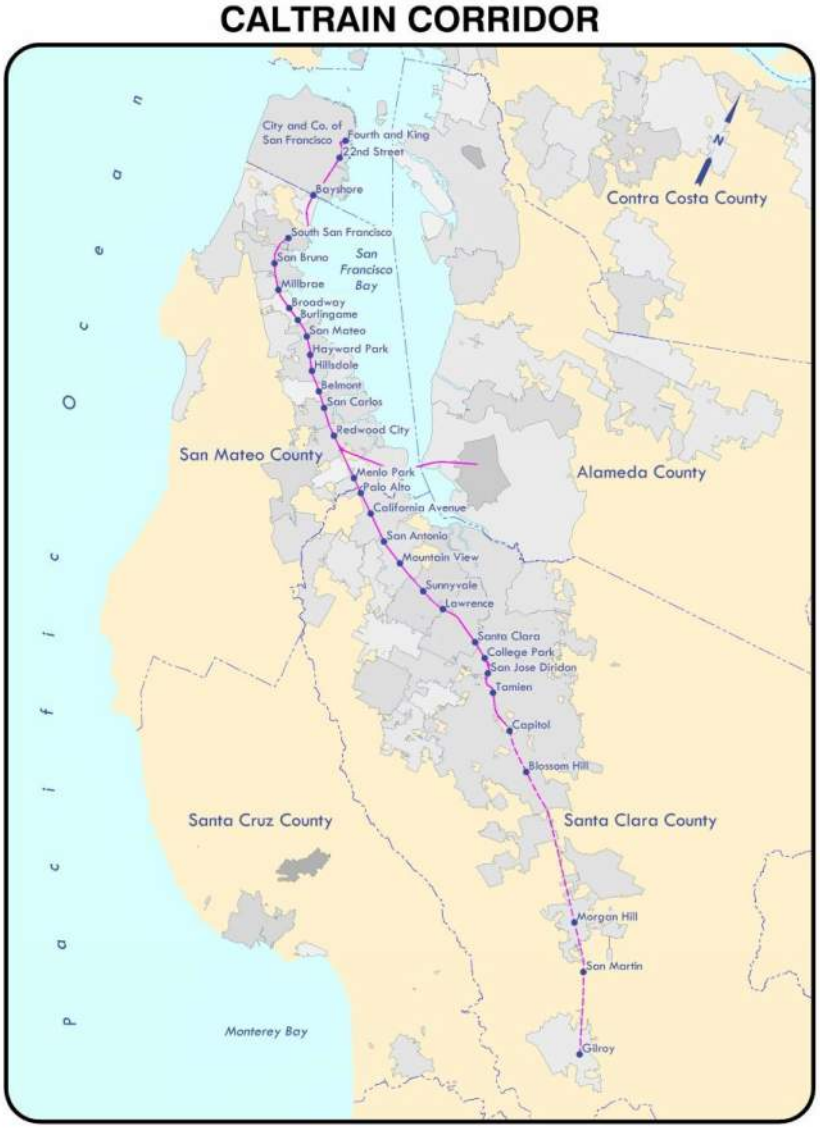

PENINSULA CORRIDOR JOINT POWERS BOARD (PCJPB) CADD MANUAL

Issue Date: January 1, 2024

CADD Manual

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SECTION 1
INTRODUCTION

1.1 GENERAL

This Manual contains the general drafting standards and Computer Aided Design and Drafting (CADD) requirements established for the preparation of all drawings to be used in the planning, design and construction of Peninsula Corridor Joint Powers Board (PCJPB) facilities.* Its purpose is to promote for all PCJPB construction projects the production of uniform, clean and logically structured CADD files and drawing sets that are uniform in appearance and organization and easy to read. All those preparing design and construction drawings required for PCJPB projects shall adhere to the standards and requirements contained in this Manual. All interested parties, therefore—PCJPB staff, design consultants, construction contractors and others involved in the design and construction or oversight of PCJPB projects—shall familiarize themselves with and follow the guidelines in this Manual. Design consultants shall ensure as well that any sub-consultants they retain for work on PCJPB projects know and adhere to the standards set forth in this Manual.

As of this writing, PCJPB uses Autodesk's AutoCAD software, version 2019. To avoid the problems often occurring when converting drawing files from one CADD software format to another, designers shall create and submit all project CADD files (Except Signal Drawings, which are currently created using Bentley's MicroStation software.) in native AutoCAD, version 2019. Autodesk's Civil 3D, version 2019 shall be used to prepare civil drawings.

This Manual is a living document and is therefore subject to revision. Please bring any errors, omissions or suggestions for improvement to the attention of the PCJPB CADD Manager.

CADD Manager
PCJPB-Caltrain Engineering Department
1250 San Carlos Avenue
P.O. Box 3006
San Carlos, CA 94070-1306

1.2 MANUAL DISTRIBUTION

Designers and other interested parties may download a copy of PCJPB's CADD Manual in PDF format from Caltrain's website. To download the Manual, go to www.Caltrain.com and proceed as follows:

Place cursor over "About Caltrain", the right-most menu tab on the website's home page.

Select "Doing Business" from the drop-down menu.

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* The standards and requirements set forth in this Manual shall also be followed when preparing design and construction drawings for the San Mateo County Transit District (SMCTD).

Under the title “Doing Business” in red letters, select the “Engineering” hyperlink located about half-way down the page.

Click on the “Engineering Standards and Design References” hyperlink and scroll down the page to the “Caltrain CADD Manual” hyperlink.

Click on this link to open the CADD Manual PDF file and then save a copy of the file to your computer.

END OF SECTION 1

SECTION 2
DRAWING FORMAT

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SECTION 2
DRAWING FORMAT

2.1 SHEET SIZES

Two sheet sizes shall be used for plotting PCJPB project drawings, ANSI* sizes B and D. Interim project drawings submitted for design review (drawings in a 35% submittal package, for example) shall be plotted to PDF files at half-size on size B sheets (17" x 11"). Project drawings issued for construction shall be plotted on paper at full-size and trimmed to size D (34" x 22"). Special purpose drawings—conceptual and presentation drawings, exhibits and sketches, for example—may be plotted on other sized sheets as necessary. See **Section 10**.

2.2 TEMPLATE FILES

To facilitate project drawing creation, PCJPB has created the following two template files: SOURCE_FILE_FEET.dwg and SOURCE_FILE_INCHES.dwg. These files include PCJPB's text styles, template dimension and multi-leader styles and the general-purpose layers typically found in project drawing files created for PCJPB. Project drawing files may be created using these files, which PCJPB will provide upon request. See also **Subsection 6.3**.

2.3 DRAWING TYPES

2.3.1 Dimensional

Dimensional drawings depict objects to scale and portray accurately their size and the spatial relationships between them. These drawings shall be prepared using accurately drawn and proportioned CADD models created at full-size in Model Space. Scale shall be indicated on dimensional drawings in accordance with **Sections 4** and **7**.

2.3.2 Nondimensional

Nondimensional drawings commonly depict size and spatial relationships inaccurately. Design elements are not drawn to scale or are not shown at a standard scale. Other nondimensional drawings treat their subject matter diagrammatically. Still another example of this type are those drawings containing purely tabular or textual information. The scale for these drawings shall be indicated by the terms "Not to Scale" (NTS) or "None" as appropriate. See **Sections 4** and **7**.

2.3.3 Track Charts

PCJPB maintains a master Track Chart depicting its entire system. The Track Chart shows the various track alignments within the PCJPB system in diagrammatic form. In these diagrams, track alignments are represented as straight lines with distances along them shown to a set scale, which is true only

***** American National Standards Institute, www.ansi.org

along these lines. The diagrams show information pertaining to the alignments, such as: track geometry, track composition, switches, control points, signals and so forth. Other features depicted include utility alignments, culverts, bridges, stations and so on.

2.4 REFERENCE SYSTEMS

Dimensional CADD models depicting plan views of existing and proposed installations shall be positioned horizontally in Model Space with reference to the California State Plane Coordinate System, Zone 3, North American Datum, 1983 (NAD83). Elevations shall be referenced to the North American Vertical Datum, 1988 (NAVD88).

SECTION 3
LAYOUTS, DRAWING NUMBERS, CADD FILE NAMES CADD FILE ELEMENTS AND PLOTTING

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SECTION 3
LAYOUTS, DRAWING NUMBERS, CADD FILE NAMES, CADD FILE ELEMENTS AND PLOTTING

3.1 CADD FILE LAYOUTS

In this Manual the term “layout” may refer to either a layout in a CADD drawing file or to the drawing it contains. “Drawing” may refer to either a drawing in a CADD file layout or to a plotted drawing. The terms “drawing” and “sheet” are used interchangeably. All project drawings shall be created in AutoCAD using layouts. Each layout shall contain one drawing only, and each drawing shall be set up at full-size in its layout. Each layout tab shall display the number of the project drawing its layout contains. Layouts shall be used for plotting project drawings in all cases. The project drawing border file (see **Section 4**) shall be externally referenced into each layout. It shall **NOT** be inserted as a block. Note that a few project drawing files containing multiple layouts are more efficient to manage and edit than many drawing files containing single layouts.

3.2 PROJECT DRAWING NUMBERS

The numbers of all project drawings submitted to PCJPB shall follow the numbering convention given below. Project drawing numbers shall consist of from four to six characters. The first character of each project drawing number shall be a discipline character matching that in the name of the file containing the drawing. Following the discipline character shall be a drawing serial number of from three to five digits. See *Figure 3.1*.

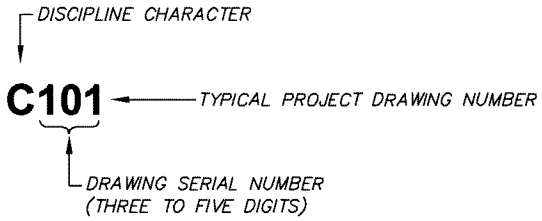


FIGURE 3.1 – PROJECT DRAWING NUMBER FORMAT

3.3 PROJECT DRAWING CADD FILE NAMES

3.3.1 General

The names of all project drawing CADD files submitted to PCJPB shall follow the naming convention given below. Project drawing CADD file names shall consist of from seven to twelve characters (not including the hyphen) and the required three-character drawing file extension. All letters in the file names, except those making up the drawing file extension, shall be upper case. Project drawing CADD file names shall be formatted as shown in *Figure 3.2.*

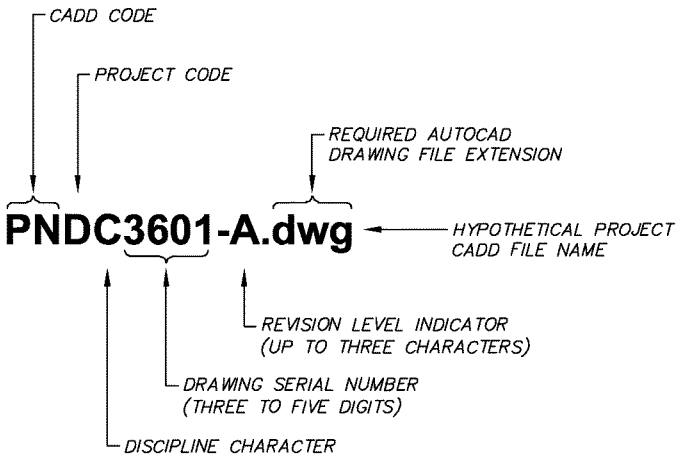


FIGURE 3.2 – FORMAT FOR PROJECT DRAWING CADD FILE NAMES

Note that project drawing CADD file names contain a drawing number. In *Figure 3.2*, for example, the drawing number is C3601. For a project drawing CADD file containing a single layout, the drawing number in its name shall be that of the drawing it contains. For a project drawing CADD file containing multiple layouts, the drawing number in its name shall be that of the first drawing in the series of drawings it contains.

Following the naming format shown above will ensure that project drawing CADD files arrange themselves in an orderly fashion in project file directories, making it easy to find and access desired files.

3.3.2 CADD and Project Codes

CADD and Project Codes shall be chosen for each project in coordination with the PCJPB CADD Manager. The CADD Code characters shall occupy the first two places in the names of all a project's project drawing CADD files. The Project Code character shall occupy the third place. For larger projects having multiple phases or modules, each phase or module in a project shall be assigned its own project code. All files pertaining to a particular phase or module in such projects shall have that phase's or module's project code in their names. These CADD and Project Codes uniquely identify the CADD files of a particular project and its phases/modules, allowing CADD personnel and others to distinguish them and find them more easily.

3.3.3 Discipline Character

A discipline character shall be chosen in accordance with **Appendix 1** and the file's subject matter. It shall be inserted in the fourth place of the file name. Civil files, for example, shall be identified with a "C," Structural files with an "S" and so on.

3.3.4 Serial Number

Serial numbers in project drawing CADD file names may range from 001 to 99999.

3.3.5 Revision Level

Up to three characters placed at the end of a file's name shall be used to indicate its revision level. A hyphen shall be placed between these characters and the main file name. See **Section 9**.

3.4 REFERENCE FILES

Project reference files shall conform to the standards for layer, color, text, line type and so forth established in this Manual. Externally referenced files shall be placed on appropriately named layers within the host file, as layers named B-ANNO-XREF, B-ANNO-XREF-TOPO, B-ANNO-XREF-IMGE and so on. They shall never be placed on Layer Zero (0). Unless noted otherwise in this Manual, the reference type shall always be set to "Overlay." Spatially extensive reference files shall be clipped as necessary using the XCLIP command to limit the display of their detail to only that which is relevant to the host file's area of concern. The use of directly referenced files is preferred. Except as discussed in **Subsection 4.13**, the use of nested reference files shall be avoided.

Except as specified elsewhere in this manual, project reference file names shall consist of up to ten characters and the three-character drawing file extension. All letters in reference file names shall be capitalized. The first character in a reference file's name shall be an "X" to signify that the file is a reference file intended for external referencing. The second character shall be a discipline character chosen as appropriate from the list in **Appendix 1**. A descriptor of up to eight characters indicating the type of information generally contained in the file shall come after the discipline character. No blank spaces or special characters other than dashes or underscores shall be used in project reference file names.

3.5 CADD FILE LAYERS

Careful thought shall be put into naming the layers in each project CADD file. Each layer name shall be chosen such that it is part of a logical, easily understood layer naming scheme. Layer names shall be chosen so that related layers fall together in the Layer Manager. The content and significance of each layer shall be readily apparent from its name and from its position in the list of layers. Layer names shall be formatted as shown in **Appendix 3**.

Each graphic entity contained in project drawing and reference files shall be placed on an appropriate layer. No drawing objects of any kind shall ever reside on Layer Zero (0) in project CADD files submitted to PCJPB.

PCJPB's topographic reference files follow their own layer naming standard. See **Appendix 5**.

3.6 ENTITY COLOR

The color of all graphic entities in project CADD files shall be set to "ByLayer." (The objects in PCJPB supplied files and blocks are exempt from this requirement.) Additional layers shall be freely created as necessary to satisfy this requirement. Drawing objects in project drawings created for PCJPB shall plot in black and shades of grey only. Only colors 1 through 9 and 250 through 254 on the AutoCAD Color Index (ACI) palette, therefore, shall be used for color assignments to layers in project CADD files. The map detail on PCJPB's cover sheet, detail in project track charts and objects making up company logos may plot in color and are exempt from this requirement. See **Appendix 4** and PCJPB's **Pen Mapping/Color Chart** at the end of this Manual.

3.7 LINE TYPES

The line type of all graphic entities in project CADD files shall be set to "ByLayer." Additional layers shall be freely created as necessary to satisfy this requirement. All line types used in a set of project drawings shall be shown on the set's project symbols sheet(s). See **Subsection 6.5**.

PCJPB's AutoCAD line type file, PCJPB.lin, contains line types created for use in PCJPB project drawings. The line types provided in PCJPB.lin shall be used wherever they apply. Should a drawing require a line type which is not included in either the PCJPB.lin file or the standard AutoCAD line type file, ACAD.lin, a request for the new line type shall be submitted to the PCJPB CADD Manager. Upon receipt of the request, the PCJPB CADD manager will add the line type to the PCJPB.lin file. See **Appendix 6**.

Line type scales shall not be assigned directly to individual drawing objects. Line type scales shall be set in project drawing and reference files using the AutoCAD system variables LTSCALE, CELTSCALE and PSLTSCALE, which shall all be assigned the value one (1).

3.8 TEXT

3.8.1 General

Text shall be formatted such that it is of the type, height, width and weight specified herein. PCJPB will not accept the use of stick-on type or hand drawn text on its project drawings. When using mtext, its AutoStacking feature shall be disabled. All fractions, therefore, shall be formatted as shown in the following examples: 3/4, 1 3/8. The overprinting of text and line work shall be avoided. In those cases where overprinting is unavoidable, line work shall be interrupted for the text. All text pertaining to drawing detail shall be set in Model Space. Sheet notes may be placed in Paper Space.

3.8.2 Styles and Fonts

PCJPB specifies four text styles for use in the preparation of its project drawings: ROMANS, ROMANS_ITALIC, MONO and BOLD. Only these styles shall be used in the preparation of project drawings for PCJPB. The ROMANS and ROMANS_ITALIC styles are created using the romans.shx font. To form the ROMANS_ITALIC style, the value in the Oblique Angle field in the Text Style dialog box shall be set to ten (10). ROMANS shall be used for all text except as

follows. ROMANS_ITALIC shall be used to label hydrographic features. The MONO style is based on the msimplex.shx font and shall be used wherever equally spaced characters are desirable, as in tables or for page and drawing numbers on index of drawings sheets. See *Figure 3.3*. The BOLD style is formed using the Swis721 BT font with the Font Style option in the Text Style dialog box set to "Bold." The BOLD style shall be employed wherever the use of boldface text is desirable.

Text in older PCJPB project drawing files may be styled using the PCJPB text style. This style is based on the pcjpb.shx font. Should it be encountered, this style, although superseded, is acceptable as well for use in project drawings created for PCJPB.

3.8.3 Height

A text string's height shall depend in most cases on its application. See *Figure 3.3.* See also *Tables 3.1* and *3.2*. The minimum character height shall be 1/8" (0.125") on full-size plots or 1/16" (0.0625") on half-size plots.

Text heights other than zero (0) shall never be assigned to nonannotative text styles in the Text Style dialogue box. The value of the Height field in the Text Style dialogue box shall always be set to zero (0). It is unnecessary to create text styles with assigned heights other than zero (0), and the use of such styles can cause problems in certain situations. The height of characters in a text string, therefore, shall be specified at the time the text string is created.

3.8.4 Width

The Width Factor for text shall be set to one (1). But see also **Subsection 4.1**.

3.8.5 Weight

The weight of text in any of the ROMANS, ROMANS_ITALIC or MONO styles (and the PCJPB style) shall depend on its application and be controlled by the color assigned to the layer it is placed on. See *Figure 3.3.* See also the **Pen Mapping/Color Chart** at the end of this Manual.

3.8.6 Orientation

Those text strings aligned with features in a drawing—roads or track centerlines, for example—shall read as shown in *Figure 3.4*. Any text string not aligned with a particular feature in a drawing shall be oriented horizontally.

3.8.7 Case

All text shall be set in uppercase letters.

TEXT APPLICATIONS AND SPECIFICATIONS		
APPLICATION	HEIGHT	WEIGHT
DIMENSIONS	1/8" (0.1250")	0.15mm
DRAWING ANNOTATION	1/8" (0.1250")	0.35mm
STATIONING	1/8" (0.1250")	0.50mm
SHEET IDENTIFICATION AND SUBHEADINGS	9/64" (0.1406")	0.50mm
SUBTITLES	3/16" (0.1875")	0.70mm
TITLES	1/4" (0.25")	0.90mm

FIGURE 3.3 – TEXT APPLICATIONS AND SPECIFICATIONS: ROMANS, ROMANS ITALIC AND MONO TEXT STYLES (ROMANS TEXT STYLE SHOWN)

3.9 BLOCKS, SYMBOLS AND ABBREVIATIONS

PCJPB has created a number of AutoCAD files for use as blocks in its project CADD files. These blocks shall be used wherever they apply to generate the various general and discipline specific symbols occurring in PCJPB project drawings. **These blocks shall not be substituted, modified or exploded.** See **Section 7**, **Appendix 8** and the **Quick Reference Sheet** at the end of this Manual. PCJPB's blocks will be provided upon request.

Should it be necessary to create a block in a project CADD file, the block's components shall all reside on Layer Zero (0) at the time they are selected and defined collectively as a block. The color and line type values of all the block's component objects shall be set to "ByLayer."

When choosing symbols and abbreviations for use in PCJPB's project drawings, they shall be chosen first from those shown on PCJPB's general symbols and abbreviations sheets and then, as necessary, from standard industry reference sources. All symbols

and abbreviations used in a set of project drawings shall be shown on the set's project symbols and abbreviations sheets. See **Subsections 6.5** and **6.6**.

3.10 PLOTTING

3.10.1 General

To promote efficiency in plotting and uniformity in appearance of plotted drawings, the following standards and procedures shall be adhered to in the preparation of project drawings for PCJPB.

3.10.2 Line Weights

The weight of plotted objects shall be controlled by their color in accordance with **Appendix 4**. The color and line weight of all lines and other graphic entities in project CADD files shall be set to "ByLayer." In the Layer Properties Manager, the line weight of all layers shall be set to "Default." The Color-dependent Plot Style Table file PCJPB.ctb shall be used for the plotting of PCJPB's project drawings in all cases. To create lines of weight greater than 0.90mm, AutoCAD 2D polylines of the desired weight shall be used. Line weights on half-size plots shall be one-half those on full-size plots. See PCJPB's **Pen Mapping/Color Chart** at the end of this Manual.

3.10.3 Backgrounds

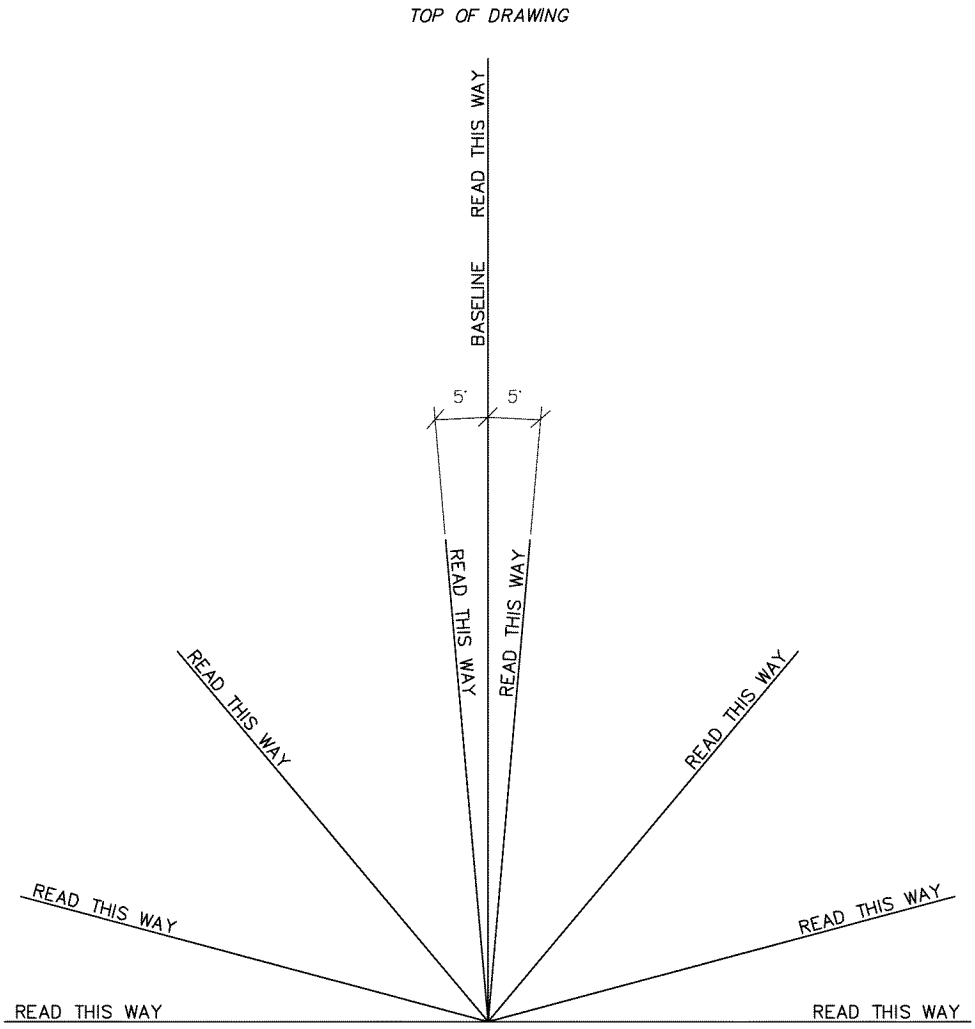
Often designers want background detail (topography, for example) on project drawings to appear muted (that is, as if screened) when the drawings are plotted. To achieve this effect in PCJPB's project drawings, any one of colors 8, 9 and 250 through 254 shall be assigned as desired to each of the CADD file layers containing background detail to be so treated.

3.10.4 Drawing Plots

Plot sets shall be plotted on the media specified in **Section 10**.

3.10.5 Page Setups

To increase the efficiency of layout setup and plotting, PCJPB recommends the placement of standard, commonly used page setups in a "Page Setup" file accessible to all project design team members. Team members may then easily import page setups from this file into their drawing files to set up layouts for plotting. Ideally, the names of the page setups would conform to a standardized format providing all the information needed to make an appropriate selection.



NOTE:
THE TEXT ORIENTATIONS SHOWN WITHIN THE 5° BOUNDARIES ARE PREFERRED. CONSISTENCY OF TEXT ORIENTATION WITHIN THE DRAWING, HOWEVER, IS OF PRIMARY IMPORTANCE.

FIGURE 3.4 - TEXT ORIENTATION

Desired Height of Text on Full-size Plots:		1/8" (0.1250")	9/64" (0.1406")	3/16" (0.1875")	1/4" (0.2500")
Scale of View:	**Multiply Desired Height by:**	**To Determine Corresponding Height of Model Space Text in Inches:**			
FULL SIZE	**1**	0.1250	0.1406	0.1875	0.2500
6"=1'-0"	**2**	0.2500	0.2812	0.3750	0.5000
3"=1'-0"	**4**	0.5000	0.5624	0.7500	1
1 1/2"=1'-0"	**8**	1	1.1248	1.5000	2
1"=1'-0"	**12**	1.5000	1.6872	2.2500	3
3/4"=1'-0"	**16**	2	2.2496	3	4
1/2"=1'-0"	**24**	3	3.3744	4.5000	6
3/8"=1'-0"	**32**	4	4.4992	6	8
1/4"=1'-0"	**48**	6	6.7488	9	12
3/16"=1'-0"	**64**	8	8.9984	12	16
1/8" = 1'-0"	**96**	12	13.4976	18	24
1"=10'	**120**	15	16.8720	22.5000	30
3/32"=1'-0"	**128**	16	17.9968	24	32
1/16"=1'-0"	**192**	24	26.9952	36	48
1"=20'	**240**	30	33.7440	45	60
1"=40'	**480**	60	67.4880	90	120
1"=50'	**600**	75	84.3600	112.5000	150
1"=100'	**1200**	150	168.7200	225	300
For use in AutoCAD files with linear units set to type architectural and the insertion scale variable set to inches. (AutoCAD unit for length represents the inch.)					

Multiply the desired height of plotted text by the appropriate scale factor to get the corresponding text height in model space.

TABLE 3.1 - SELECTED SCALES, SCALE FACTORS AND TEXT HEIGHTS

Desired Height of Text on Full-size Plots:		1/8” (0.1250")	9/64” (0.1406")	1/8” (0.1875")	1/4" (0.2500")
Scale of View	**Multiply Desired Height by:**	**To Determine Corresponding Height of Model Space Text in Feet:**			
FULL SIZE	**1/12**	0.0104	0.0117	0.0156	0.0208
6”=1’-0”	**1/6**	0.0208	0.0234	0.0313	0.0417
3”=1’-0”	**1/3**	0.0417	0.0469	0.0625	0.0833
1 1/2”=1’-0”	**2/3**	0.0833	0.0937	0.1250	0.1667
1"=1'-0"	**1**	0.1250	0.1406	0.1875	0.2500
3/4"=1'-0"	**4/3**	0.1667	0.1875	0.2500	0.3333
1/2"=1'-0"	**2**	0.2500	0.2812	0.3750	0.5000
3/8"=1'-0"	**8/3**	0.3333	0.3749	0.5000	0.6667
1/4"=1'-0"	**4**	0.5000	0.5624	0.7500	1
3/16"=1'-0"	**16/3**	0.6667	0.7499	1	1.3333
1/8" = 1'-0"	**8**	1	1.1248	1.5000	2
1”=10’	**10**	1.2500	1.4060	1.8750	2.5000
3/32”=1’-0”	**32/3**	1.3333	1.4997	2	2.6667
1/16”=1’-0”	**16**	2	2.2496	3	4
1”=20’	**20**	2.500	2.8120	3.7500	5
1”=40’	**40**	5	5.6240	7.5000	10
1”=50’	**50**	6.2500	7.0300	9.3750	12.5000
1”=100’	**100**	12.5000	14.0600	18.7500	25
For use in AutoCAD files with linear units set to type decimal and the insertion scale variable set to feet. (AutoCAD unit for length represents the International Foot.)					

Multiply the desired height of plotted text by the appropriate scale factor to get the corresponding text height in model space.

TABLE 3.2 - SELECTED SCALES, SCALE FACTORS AND TEXT HEIGHTS (CONTINUED)

END OF SECTION 3

SECTION 4
DRAWING BORDER
AND MARGINAL INFORMATION

CONTENTS

FIGURES

FIGURES (CONTINUED)

SECTION 4
DRAWING BORDER AND MARGINAL INFORMATION

4.1 BORDER FILES

Except for cover sheets, all project drawings shall display PCJPB's drawing border populated with the marginal information specified herein. The PCJPB file XB-BRDR-PCJPB.dwg shall be used to create project drawing border files in all cases.* PCJPB's file JPBTTX.dwg, an attributed block, shall be used to generate the marginal information. These files will be provided upon request. Except for the modifications discussed in this Section, the border and marginal information files shall not be altered in any way.

For each project, XB-BRDR-PCJPB.dwg shall be copied and renamed as necessary to create a uniquely named project drawing border file for each design professional signing and sealing drawings for that project. Following this practice will save drafting time and reduce the possibility of one designer's border file overwriting another's. The copies of XB-BRDR-PCJPB.dwg shall be renamed using the format shown in *Figure 4.1* by replacing the placeholders AB, C, ACORP and XYZ with entries appropriate for the project, project phase or module, consulting firm and designer, respectively.

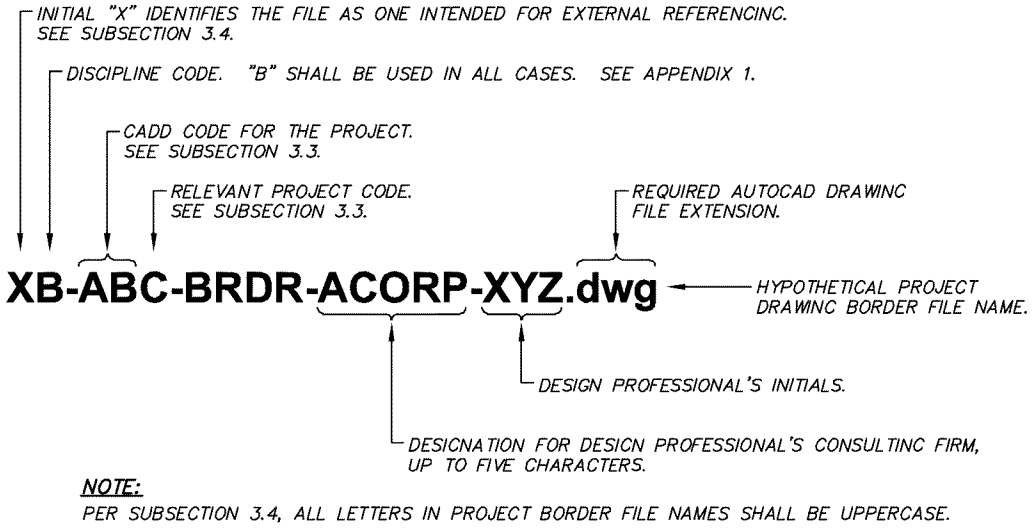


FIGURE 4.1 – FORMAT FOR PROJECT DRAWING BORDER FILE NAMES

A copy of JPBTTX.dwg is inserted in XB-BRDR-PCJPB.dwg and will therefore be found in each designer's project drawing border file as well. Each designer shall make entries

***** For SMCTD project drawings the file XB-BRDR-SMCTD.dwg shall be used.

in his or her border file's copy of JPBTTX for any marginal information that will remain constant—the project name, for example—for all the project drawings he or she will sign and seal. Entries for marginal information that will vary from drawing to drawing—drawing file names, CADD dates and the like—shall be made in a copy of JPBTTX.dwg inserted as a block into each project drawing layout. Marginal information shall be entered completely for each project drawing as described in this Section. All entries shall be in made in uppercase letters. Should an entry be too wide for its box, the width of the text shall be adjusted to make it fit.

Project drawing border files shall be externally referenced into drawing layouts with their insertion points at the origin, a uniform scale of one (1) and a rotation of zero (0) degrees. (Note: Use a scale of twelve (12) if referencing them into files with the unit for length set to Feet.) The Reference Type for project border files shall be set to "Overlay" in all cases. The file JPBTTX.dwg shall be inserted as a block into each drawing layout with its insertion point at the origin, with a uniform scale of one (1) (See note above.) and a rotation of zero (0) degrees. Project border files and the block JPBTTX shall be placed on layers created and named expressly for them in the project drawing files as follows: B-ANNO-XREF-BRDR and B-ANNO-XREF-BRDR-TEXT.

4.2 TITLE BOX

See *Figures 4.3* and *4.4*. Each project drawing's title shall include up to five lines of text as follows:

The first line shall give the name of the contract under which the work is being done, as ELECTRIFICATION or CENTRALIZED TRAFFIC CONTROL.

The second line shall indicate the project name, type or location, as REDWOOD CITY STATION, BRIDGE IMPROVEMENTS or LINDEN AVENUE GRADE CROSSING.

The third line shall indicate the type of information displayed in the drawing, as SITE LAYOUT, PLAN AND PROFILE, MT-2 or STRUCTURAL DETAILS.

If needed, the fourth line shall provide more detail about the information shown on the sheet. For example, on a Plan and Profile sheet this line might show the limiting stations 541+00 to 552+00.

If needed, the fifth line shall indicate a sheet's position within a particular series of sheets, as SHEET 1 OF 5.

4.3 CADD FILE NAME BOX

The name of the CADD file containing the drawing's layout shall be entered in this box. See *Figures 4.3* and *4.4*. See also **Section 3**.

4.4 CADD DATE BOX

Whenever the drawing is revised, the entry in its CADD Date Box shall be updated to reflect the date on which the drawing was revised. The date shall consist of eight numerals giving the month, day and year (MMDDYYYY). For example, March 11, 2021,

would be expressed as 03112021. Dates shall be typed in manually. A date field shall not be employed as the default value for this attribute. See *Figures 4.3* and *4.4*.

4.5 DRAWING SCALE BOX

The scale or scales used in the drawing shall be entered in this box per **Subsection 7.3**. See *Figures 4.3* and *4.4*.

4.6 MILEPOST BOX

If applicable, a specific milepost shall be entered here. Otherwise, “N/A” shall be entered. The entry shall indicate the milepost of a station, grade crossing, siding, control point or other key feature shown in the drawing. See *Figures 4.3* and *4.4*.

4.7 CONTRACT NUMBER BOX

PCJPB will provide the contract number for the project. It shall be entered here. See *Figures 4.3* and *4.4*.

4.8 DRAWING NUMBER BOX

The sheet’s drawing number shall be entered here in accordance with **Subsection 3.2**. See *Figures 4.3* and *4.4*.

4.9 DRAWING REVISION LEVEL BOX

The sheet’s revision level shall be entered here. See **Section 9** and *Figures 4.3* and *4.4*.

4.10 PAGE NUMBER BOX

When formally issuing a project drawing plot set, its sheets shall be paginated. When a set of interim design drawings is plotted to paper, each drawing’s page number shall be written with pen or pencil in its Page Number box. Page numbers for drawings in such plot sets shall be assigned consecutively starting with the first Index of Drawings sheet, which shall be assigned the page number two (2). For issued for bid (IFB,) conformed and construction drawing plot sets, the page number shall also be written with pen or pencil in each sheet’s Page Number box. When creating record drawings, page numbers shall be entered with the keyboard into each layout’s copy of JPBTTX. IFB, conformed, construction and Record Drawing sheets shall be paginated consecutively starting with the first Index of Drawings sheet, which shall be assigned the page number two (2). See *Figures 4.3* and *4.4*.

4.11 PCJPB PROJECT OVERSIGHT BOXES

For each project, PCJPB will provide the names of the PCJPB personnel overseeing that project. Those names shall be entered in these boxes. The first initial and last name of each person shall be entered in the appropriate box as discussed in **Subsection 4.14**. See *Figures 4.3* and *4.5*.

4.12 CONSULTANT/SUB-CONSULTANT BOX

The company logo of the consulting or sub-consulting firm that issues the drawing shall be displayed in this box, and the firm's project manager for the project shall sign the drawing on the line provided. The company logo file may be either externally referenced or inserted as a block into the firm's project drawing border file(s). If the project manager is signing the drawings electronically, his or her signature file shall only be externally referenced into the company's border file(s). It shall **NOT** be externally referenced or inserted as a block into project drawing file layouts. The Reference Type for the company logo and project manager signature files shall be set to "Attachment" in all cases, and they shall reside on layers created and named expressly for them in the border file as follows: B-ANNO-XREF-BRDR-LOGO-CPNY and B-ANNO-XREF-BRDR-SIGN. The files shall be named as shown in *Figure 4.2*. See also *Figures 4.3* and *4.5*.

4.13 PROFESSIONAL SIGNATURE AND SEAL BOX

Designers shall sign and seal the project drawings they author. Any person authoring project drawings for PCJPB shall be a California registered or licensed design professional. A design professional wet stamping his or her project drawings shall place an impression of his or her seal in this box. He or she shall then sign the drawings over the seal and indicate the expiration date of his or her license. The name and registration number on the seal shall be clearly visible and legible. Quick drying non-smudging ink shall be used.

If signing and sealing drawings electronically, design professionals shall externally reference their signature and seal files into their respective project drawing border files. Professional signature and seal files shall **NOT** be externally referenced or inserted as blocks into project drawing layouts. (For an exception to this, see **Subsubsection 9.4.3**.) Professional signature and seal files shall be placed on the layers named B-ANNO-XREF-BRDR-SIGN and B-ANNO-XREF-BRDR-SEAL provided expressly for them in each designer's project drawing border file. The Reference Type for these files shall be set to "Attachment" in all cases. Treating professional signature and seal files in this way will make it easier to control their distribution and help prevent them from getting into the hands of parties unauthorized to have them. Design professionals shall name their signature and seal files according to the format shown in *Figure 4.2*. See also *Figures 4.3* and *4.5*.

4.14 DESIGNED, DRAWN, CHECKED AND IN CHARGE BOXES

The names of the persons involved in the creation of the drawing as described below shall be placed in these boxes:

DESIGNED
The name of the person who did most of the design work.

DRAWN
The name of the person who did most of the drafting.

CHECKED
The name of the person who did most of the checking.

IN CHARGE
The name of the project manager or design professional in responsible charge.

Only the first initial and last name of each individual shall be entered. Should any of these individuals have identical first initials and last names, however, their middle initials shall be entered as well. See *Figures 4.3* and *4.5*.

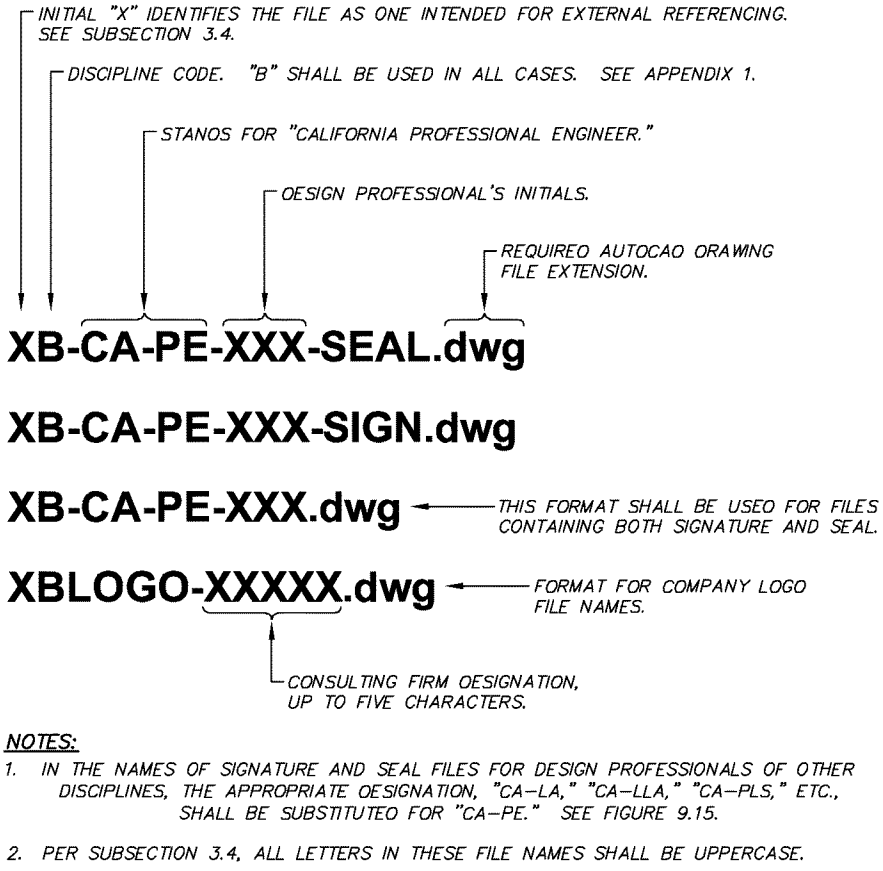


FIGURE 4.2 – FORMATS FOR COMPANY LOGO AND PROFESSIONAL SIGNATURE AND SEAL FILE NAMES

4.15 DATE OF APPROVAL BOX

The date on which the project manager or design professional in responsible charge approves the drawing shall be entered in this box. The date shall consist of eight numerals giving the month, day and year (MMDDYYYY). For example, March 11, 2021, would be expressed as 03112021. Dates shall be typed in manually. A date field shall not be employed as the default value for this attribute. See *Figures 4.3* and *4.5*.

4.16 REVISION INFORMATION BOXES

Project drawing revision information shall be entered in these boxes using PCJPB's AutoCAD files, JPBREV.dwg and JPBRVT.dwg. These files shall be inserted as

attributed blocks in each layout as necessary and populated with the information listed below. See *Figures 4.3* and *4.6* and **Section 9**.

REV (Revision)
Characters indicating the drawing's revision level shall be entered in this box.

DATE
The date of approval for the submittal or revision shall be entered in this box. Six numeral (MMDDYY) dates shall be used.

BY
The first and last initials of the person responsible for the submittal or revision shall be entered in this box.

SUB (Submitted)
The first and last initials of the person who reviewed, checked and submitted the submittal or revision shall be entered in this box.

APP (Approved)
The first and last initials of the person who approved the submittal or revision shall be entered in this box. The person approving the drawing shall be a California Registered Professional Engineer, California Licensed Architect or other California licensed design professional as appropriate.

DESCRIPTION
A description of the submittal or revision shall be entered in this box.

4.17 PROJECT LOCATION BOXES

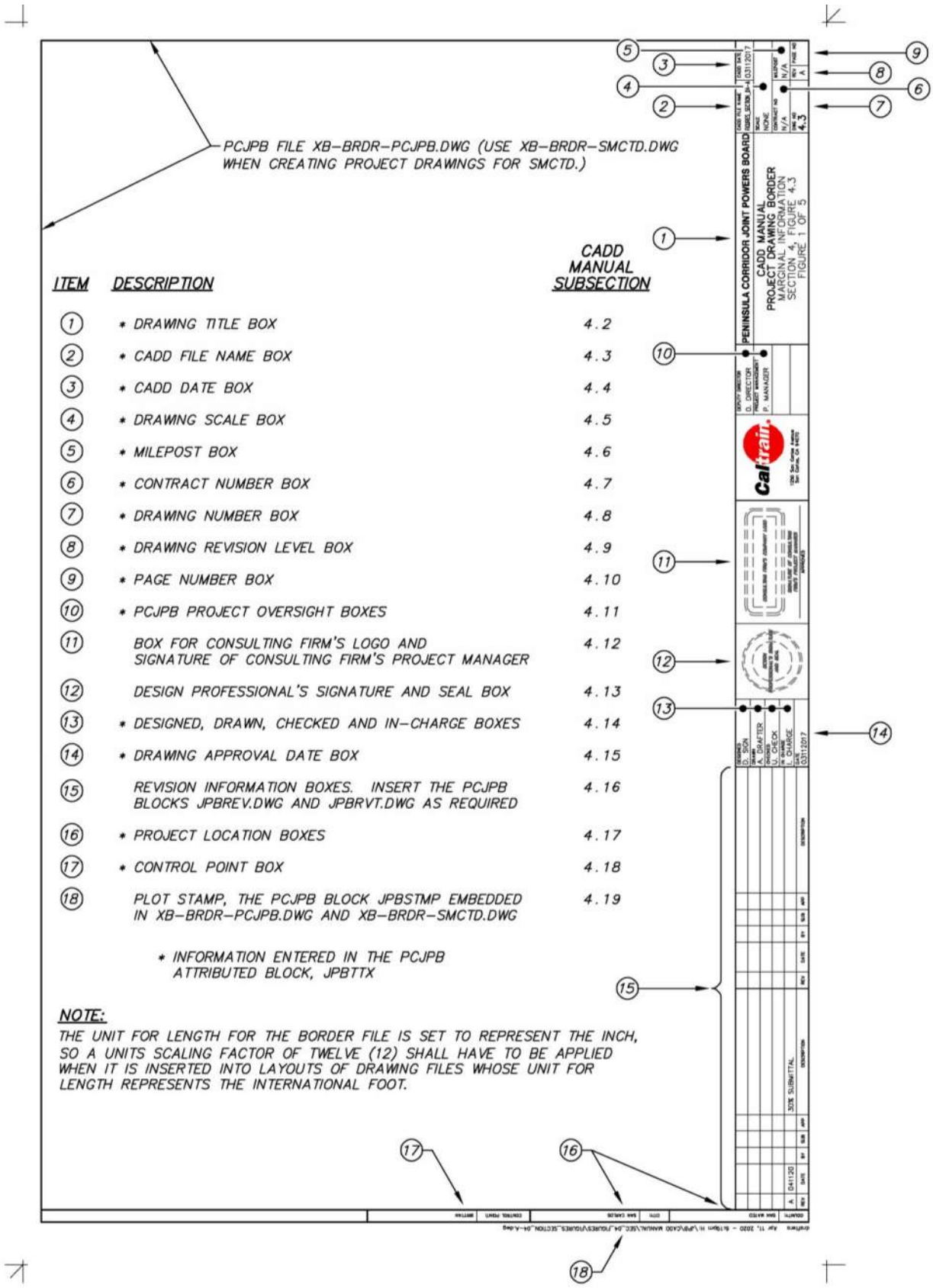
The names of the county and city in which the proposed work or work area depicted in the drawing is located shall be entered in these boxes. Local jurisdictional information shall be provided to identify the authors of local codes potentially impacting a project. See *Figures 4.3* and *4.7*.

4.18 CONTROL POINT BOX

If the work area portrayed in the drawing is located within or near a control point along PCJPB's right-of-way—CP Army, for example—the name of that control point shall be entered in this box. Otherwise, "N/A" or "NOT APPLICABLE" shall be entered. See *Figures 4.3* and *4.7*.

4.19 PLOT STAMP

Each drawing in all submitted plot sets shall have a plot stamp showing when the drawing was plotted, the path to the source file and the user login name current at the time the plot command was executed. XB-BRDR-PCJPB.dwg has embedded in it the block JPBSTMP, which generates the required plot stamp. JPBSTMP updates automatically each time a layout it is present in is plotted. See *Figures 4.3* and *4.7*.



ITEM	DESCRIPTION	CADD MANUAL SUBSECTION
1	* DRAWING TITLE BOX	4.2
2	* CADD FILE NAME BOX	4.3
3	* CADD DATE BOX	4.4
4	* DRAWING SCALE BOX	4.5
5	* MILEPOST BOX	4.6
6	* CONTRACT NUMBER BOX	4.7
7	* DRAWING NUMBER BOX	4.8
8	* DRAWING REVISION LEVEL BOX	4.9
9	* PAGE NUMBER BOX	4.10
10	* PCJPB PROJECT OVERSIGHT BOXES	4.11
11	BOX FOR CONSULTING FIRM'S LOGO AND SIGNATURE OF CONSULTING FIRM'S PROJECT MANAGER	4.12
12	DESIGN PROFESSIONAL'S SIGNATURE AND SEAL BOX	4.13
13	* DESIGNED, DRAWN, CHECKED AND IN-CHARGE BOXES	4.14
14	* DRAWING APPROVAL DATE BOX	4.15
15	REVISION INFORMATION BOXES. INSERT THE PCJPB BLOCKS JPBREV.DWG AND JPBRVT.DWG AS REQUIRED	4.16
16	* PROJECT LOCATION BOXES	4.17
17	* CONTROL POINT BOX	4.18
18	PLOT STAMP, THE PCJPB BLOCK JPBSTMP EMBEDDED IN XB-BRDR-PCJPB.DWG AND XB-BRDR-SMCTD.DWG	4.19

* INFORMATION ENTERED IN THE PCJPB ATTRIBUTED BLOCK, JPBTTX

FIGURE 4.3 – PROJECT DRAWING BORDER FILE, TITLE AND REVISION BLOCKS

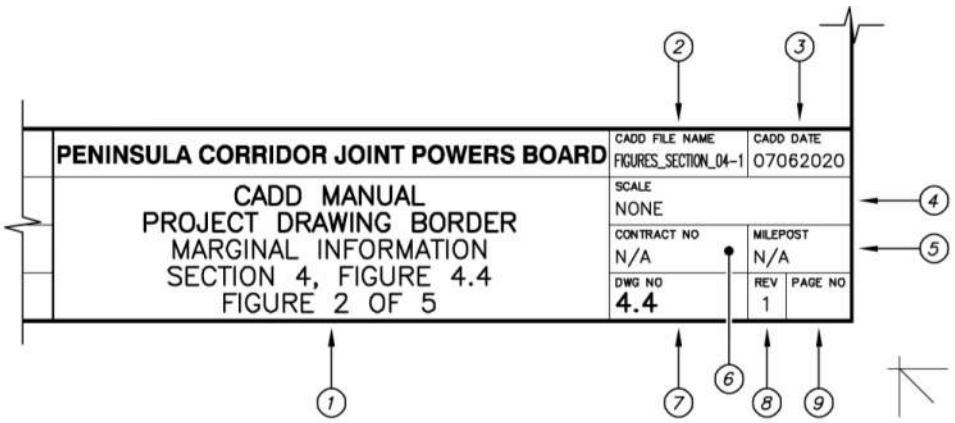


FIGURE 4.4 – DRAWING BORDER DETAIL: TITLE BLOCK

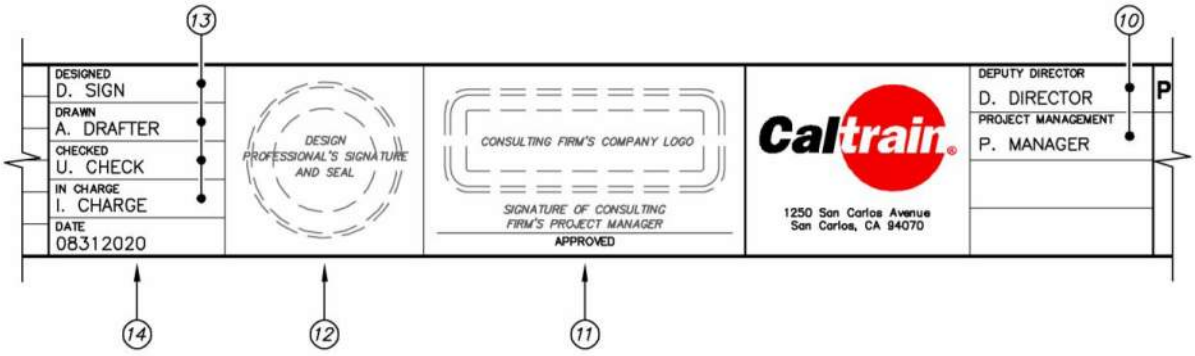


**FIGURE 4.5 – DRAWING BORDER DETAIL:
CONSULTANT AND PROJECT OVERSIGHT INFORMATION**

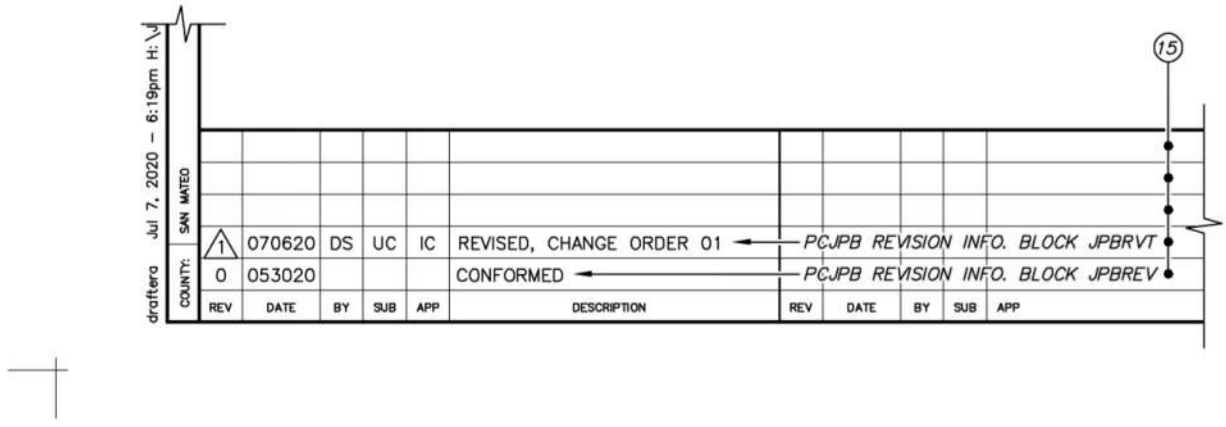


**FIGURE 4.6 – DRAWING BORDER DETAIL: REVISION INFORMATION BOXES,
PCJPB REVISION BLOCKS JPBRVT AND JPBREV**

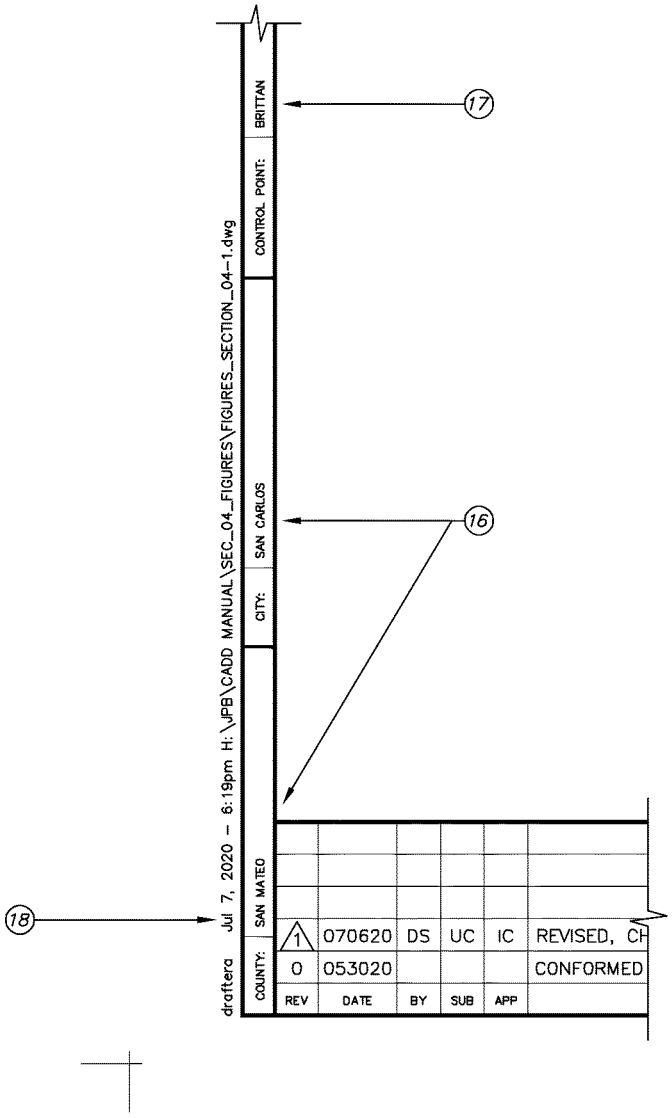


FIGURE 4.7 – DRAWING BORDER DETAIL: PROJECT LOCATION BOXES, CONTROL POINT BOX AND PLOT STAMP

END OF SECTION 4

SECTION 5

Not used.

SECTION 6
DRAWING TYPES

CONTENTS

FIGURES

SECTION 6
DRAWING TYPES

6.1 GENERAL

This Section lists the types of drawings that typically make up a PCJPB project drawing set. These include, but are not limited to, the following:

- Cover sheets
- Index of Drawings sheets
- General Notes sheets
- Abbreviations sheets
- Symbols sheets
- Plan sheets
- Plan and Profile sheets
- Profile sheets
- Detail sheets
- Section sheets
- Elevation, Diagram and Schedule sheets
- Standard Drawing sheets

Any of the PCJPB files and standard drawings mentioned in this Section will be provided upon request. Text sizes specified in this Section are as measured on full-size sheets. Colors noted herein shall be those found on the AutoCAD Color Index (ACI) palette.

6.2 COVER SHEETS

Each project drawing set shall have a Cover Sheet. To create cover sheets, PCPB's attributed block, JPBCVR, shall be inserted into a blank drawing file and the project name and other information entered as required into its attribute fields. JPBCVR shall be placed on a layer named B-ANNO-COVR. It shall be inserted at the origin with a uniform scale of one (1) and a rotation of zero (0) degrees. (Note: Use a scale of twelve (12) if inserting JPBCVR into a file with the unit for length set to Feet.) Only the attributes provided in JPBCVR shall be used to enter information on the cover sheet. No additional graphics, such as signature lines, consultant company logos, contract numbers, lists, etc., shall appear on project drawing set cover sheets. The attributes in JPBCVR shall not be repositioned on the sheet. Cover sheets shall display the map of Caltrain's service area contained in the image file attached to JPBCVR. The location(s) of the project's work area(s) on the Caltrain corridor shall be clearly indicated on this map. See *Figure 6.7* for an illustration of a cover sheet for a hypothetical project.

6.3 INDEX OF DRAWINGS SHEETS

Each project drawing set shall include an Index of Drawings. The index of drawings sheet(s) shall list all the drawings in the set by page number in order of assembly. Project drawing sets shall be assembled as discussed in **Section 8**. Text on index sheets shall conform to the specifications given in *Figure 3.4*.

PCJPB's template file, JPBINDX.dwg, shall be used to create index of drawings sheets. The block, JPBINDX-HEAD-MAIN, embedded in JPBINDX.dwg, shall be used for the index of drawings column headings without modification. Per JPBINDX-HEAD-MAIN, the main heading of each index of drawings sheet shall be composed of 1/4" (0.25") high ROMANS style text. On each index of drawings sheet, the body of the index shall be composed of up to four equally spaced columns. These columns shall themselves consist of four columns of text provided with headings from left to right as follows: PAGE NO, DWG NO, REV LVL (Revision Level) and TITLE. Each entry in the index shall have these four pieces of information. Per JPBINDX-HEAD-MAIN, these headings shall be composed of 9/64" (0.1406") high ROMANS style text. Should the entries on an index sheet make up three or fewer columns, the columns shall be shifted to the right on the sheet so that the last column lies under the sheet's right-most group of column headings. An illustration of an index of drawings sheet for a hypothetical project is shown in *Figure 6.5*.

Each index entry shall be composed of single spaced 1/8" (0.125") high text, with a blank line between it and adjacent entries. Entries in the PAGE NO, DWG NO and REV LVL columns shall be composed of text in the MONO style. Entries in the TITLE column shall be set in ROMANS style text. The title in each entry shall duplicate word for word and have the same formatting as the title displayed in the title block of the drawing corresponding to that entry. If a drawing's title consists of three lines of text, for example, then the title shown in the index entry for that drawing shall consist also of the same three lines of text. Any redundant title information, however, shall be omitted from index entries.

Index entries shall be organized by discipline or by work area and discipline. Sections of the index such as these shall be provided with headings set in 1/4" (0.25") high ROMANS style text. Subsections of sections shall be provided with headings set in 3/16" (0.1875") high ROMANS style text. PCJPB recommends the use of its attributed blocks, JPBINDX-HEAD-1, JPBINDX-HEAD-2 and JPBINDX-ENTRY, to generate index headings and entries. The use of an application such as Excellink by CAD Studio***** will expedite the population and editing of the attribute fields in these blocks. The AutoCAD commands ATTOUT and ATTIN may be used as well for this purpose. See *Figures 6.1, 6.2* and *6.3*.

A 5/8" (0.625") space shall be provided between the body of the index and the sheet's column headings. A 1/2" (0.50") space shall be provided between adjacent headings. A space of 3/8" (0.375") shall be provided between a heading and the index entry immediately following it. A one (1) inch space shall be provided between the last entry in a section or subsection and the heading of the next section or subsection. See *Figure 6.4* for a detail of an index of drawings sheet for a hypothetical project.

6.4 GENERAL NOTES SHEETS

PCJPB may provide a General Notes sheet for inclusion in a set of project drawings. General notes sheets shall be incorporated into project drawing sets as outlined in **Section 8**.

***** www.cadstudio.cz

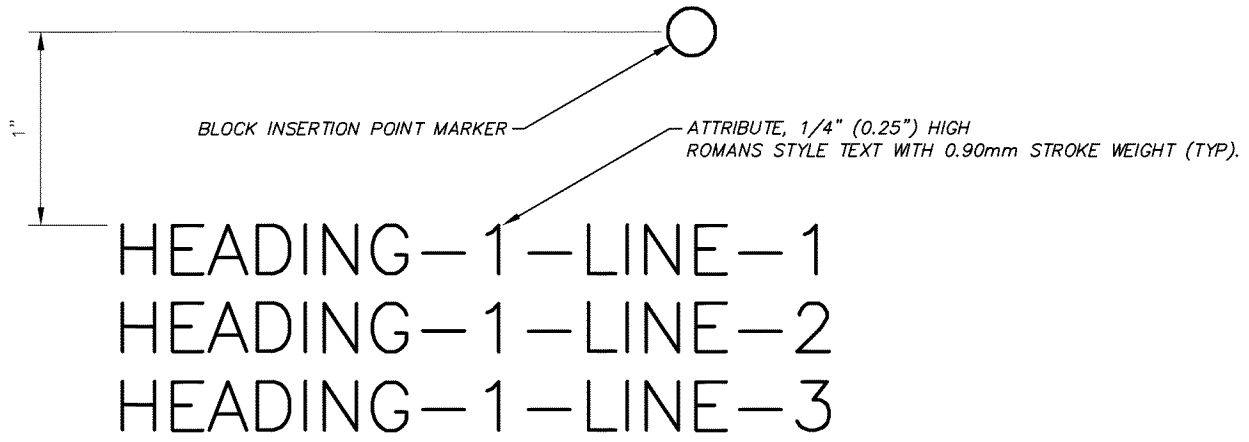


FIGURE 6.1 – JPBINDX-HEAD-1

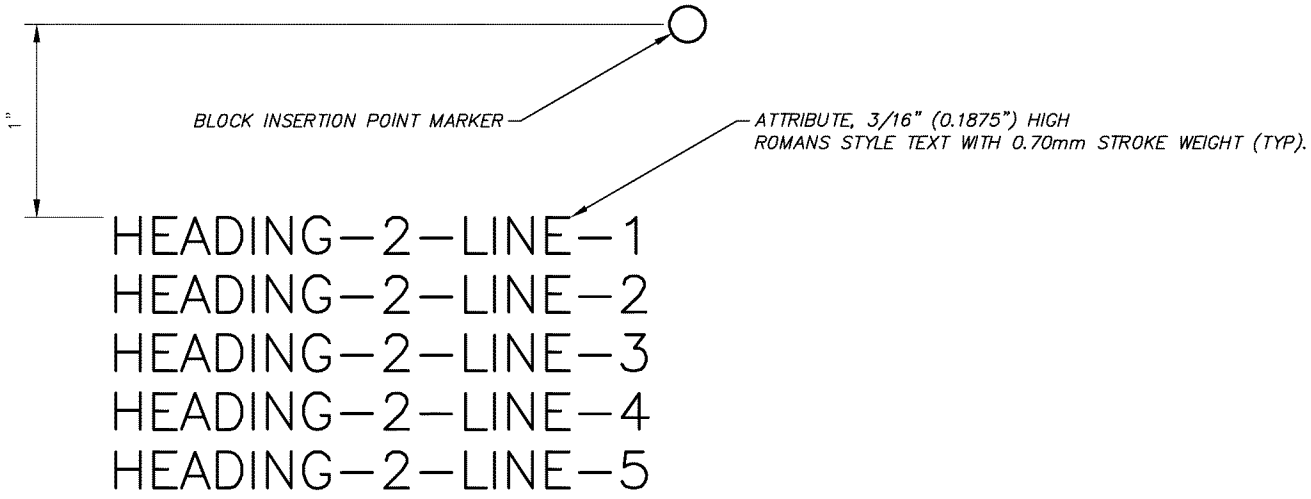


FIGURE 6.2 – JPBINDX-HEAD-2

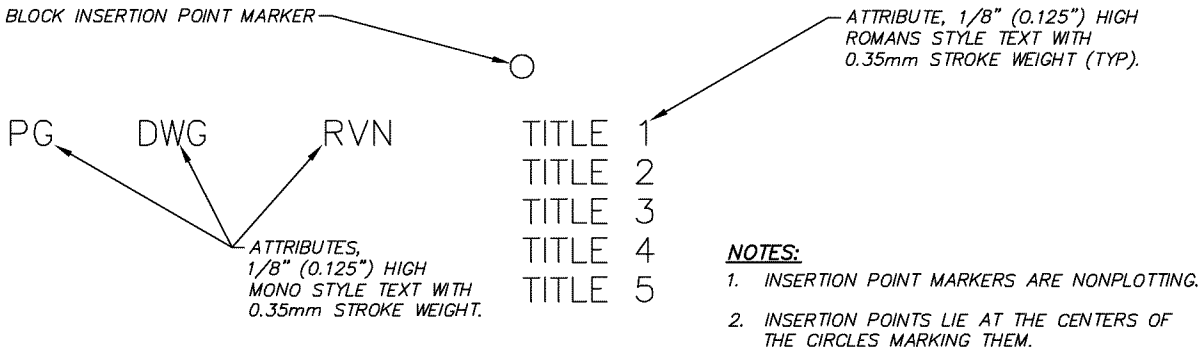


FIGURE 6.3 – JPBINDX-ENTRY

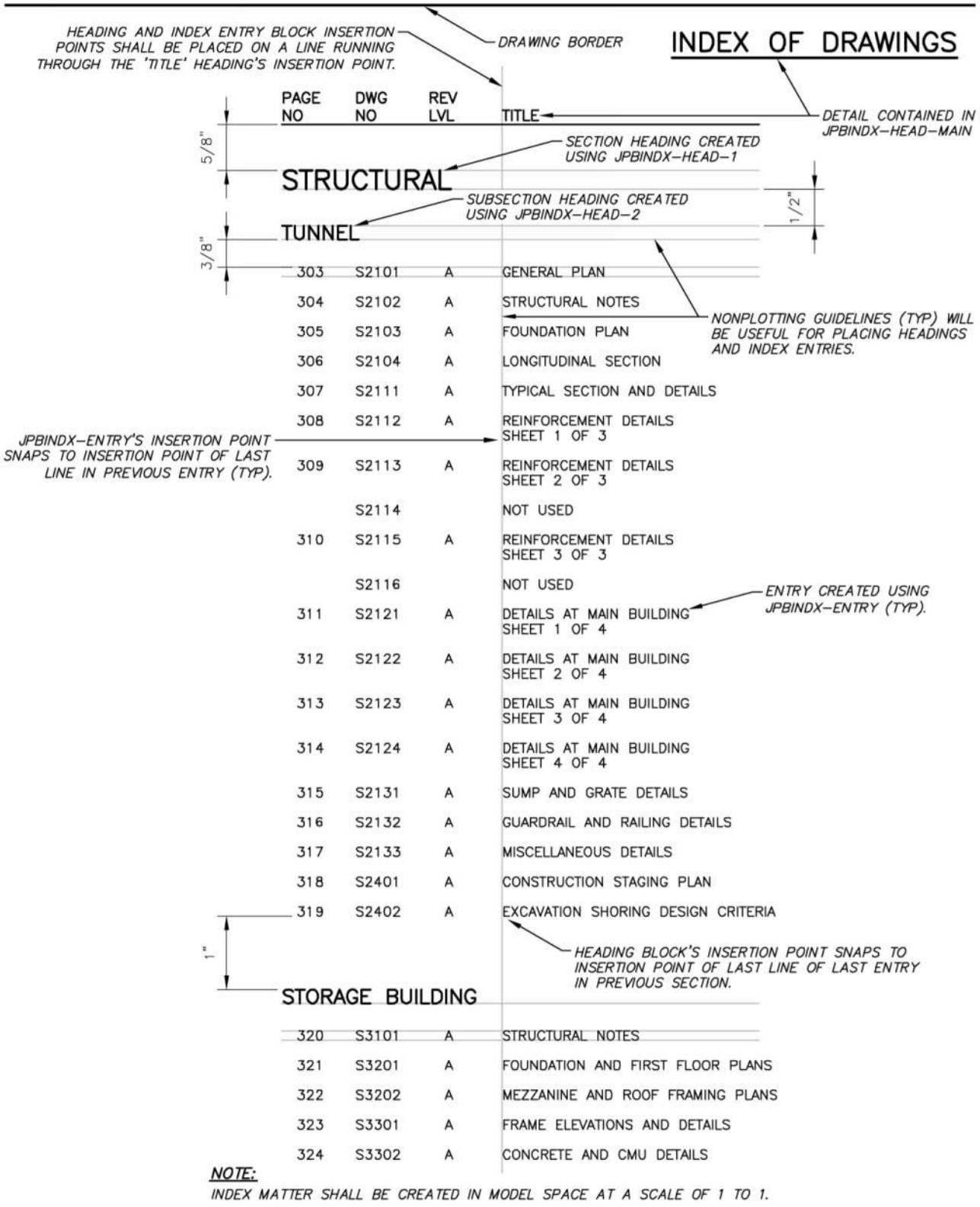


FIGURE 6.4 - DETAIL OF AN INDEX OF DRAWINGS SHEET FOR A HYPOTHETICAL PROJECT

If additional general notes are required, they shall be listed on an Additional General Notes sheet. The text on Additional General Notes sheets shall be set in equally spaced columns starting in the upper left-hand corner of each sheet. Should the notes occupy less than the whole drawing space, however, they shall be placed so that they occupy the right-most portion of the drawing. Headings shall be provided as appropriate. Notes and headings on these sheets shall be formatted as specified in **Subsection 7.4**. A 1/2" (0.50") space shall be provided between the end of a section of notes and the heading of the next section of notes and between any adjacent headings.

As discussed below, If space permits, additional general notes may be shown together with additional project abbreviations and symbols on one sheet.

6.5 ABBREVIATIONS SHEETS

PCJPB's General Abbreviations sheets (SD-1101 – SD-1103) list the abbreviations PCJPB specifies for use in preparation of its project drawings. The abbreviations shown on these sheets shall be used wherever they apply. Abbreviations sheets shall be incorporated into project drawing sets as outlined in **Section 8**.

If abbreviations not listed on any of PCJPB's General Abbreviations sheets occur on drawings in a project drawing set, those abbreviations shall be listed on an Additional Abbreviations sheet. The entries on Additional Abbreviations sheets shall be formatted as those found on PCJPB's General Abbreviations sheets. Entries shall be single spaced and composed of 1/8" (0.125") high ROMANS style text placed on a layer assigned either of the colors green or white. Two blank lines shall separate each alphabetical section. Headings shall be provided as appropriate and formatted as discussed in **Subsection 7.4**. A 1/2" (0.50") space shall be provided between the end of a section of abbreviations and the heading of the next section of abbreviations and between any adjacent headings.

Should the list of additional abbreviations occupy less than the whole drawing space on a sheet, it shall be placed so that it occupies the right-most portion of the drawing. If both will fit, the lists of additional project abbreviations and additional project symbols may be shown together on one sheet.

6.6 SYMBOLS SHEETS

PCJPB's General Symbols sheets (SD-1201 – SD-1205) show the symbols PCJPB specifies for use in preparation of its project drawings. These symbols shall be used wherever they apply. Symbols sheets shall be incorporated into project drawing sets as outlined in **Section 8**.

If symbols not shown on any of PCJPB's General Symbols sheets occur on drawings in a project drawing set, those symbols shall be listed on an Additional Symbols sheet. As shown on SD-1201, the symbols and text on Additional Symbols sheets shall be arranged in equally spaced columns set off by vertical lines placed on a layer assigned the color blue. The explanation accompanying each symbol shall be composed of 1/8" (0.125") high ROMANS style text placed on a layer assigned either of the colors green or white. Also as shown on SD-1201, headings set in 9/64" (0.1406") high ROMANS style text and placed on a layer assigned the color cyan shall be provided as appropriate.

Should the symbols and accompanying text take up less than the whole drawing space on a sheet, they shall be placed so that they occupy the right-most portion of the drawing. If both will fit, the lists of additional project symbols and additional project abbreviations may be shown together on one sheet.

6.7 PLAN SHEETS

See **Section 8** for the content of plan sheets for each discipline.

6.8 PROFILE SHEETS

Section 8 outlines the requirements for profile sheets. See **Section 7** for information on calling out and identifying utility line profiles.

6.9 DETAIL SHEETS

Detail sheets shall be set up using a grid to divide the drawing space into equal sections. A sheet might be divided, for example, into twelve sections, four across and three down. Where practical, details shall be developed and organized within these sections. Larger spaces shall be made up of the basic section. A large detail, for instance, might occupy a space of two by three grid sections. On each sheet, details shall be numbered from top to bottom and left to right. Detail titles shall be aligned with each other both vertically and horizontally. See **Section 7** for information on calling out and identifying details. See *Figure 6.6* for an illustration of a detail sheet for a hypothetical project.

6.10 SECTION SHEETS

Section 8 specifies the content of section sheets by discipline. See **Section 7** for information on cutting and identifying sections.

6.11 ELEVATION, DIAGRAM AND SCHEDULE SHEETS

Section 8 specifies the content of elevation, diagram and schedule sheets by discipline. See **Section 7** for information on calling out and identifying elevations.

6.12 STANDARD DRAWINGS

PCJPB maintains a set of standard drawings. Standard drawings, whether those of PCJPB, Caltrans, local jurisdictions or others, shall be used as much as possible and included in project drawing sets as appropriate.

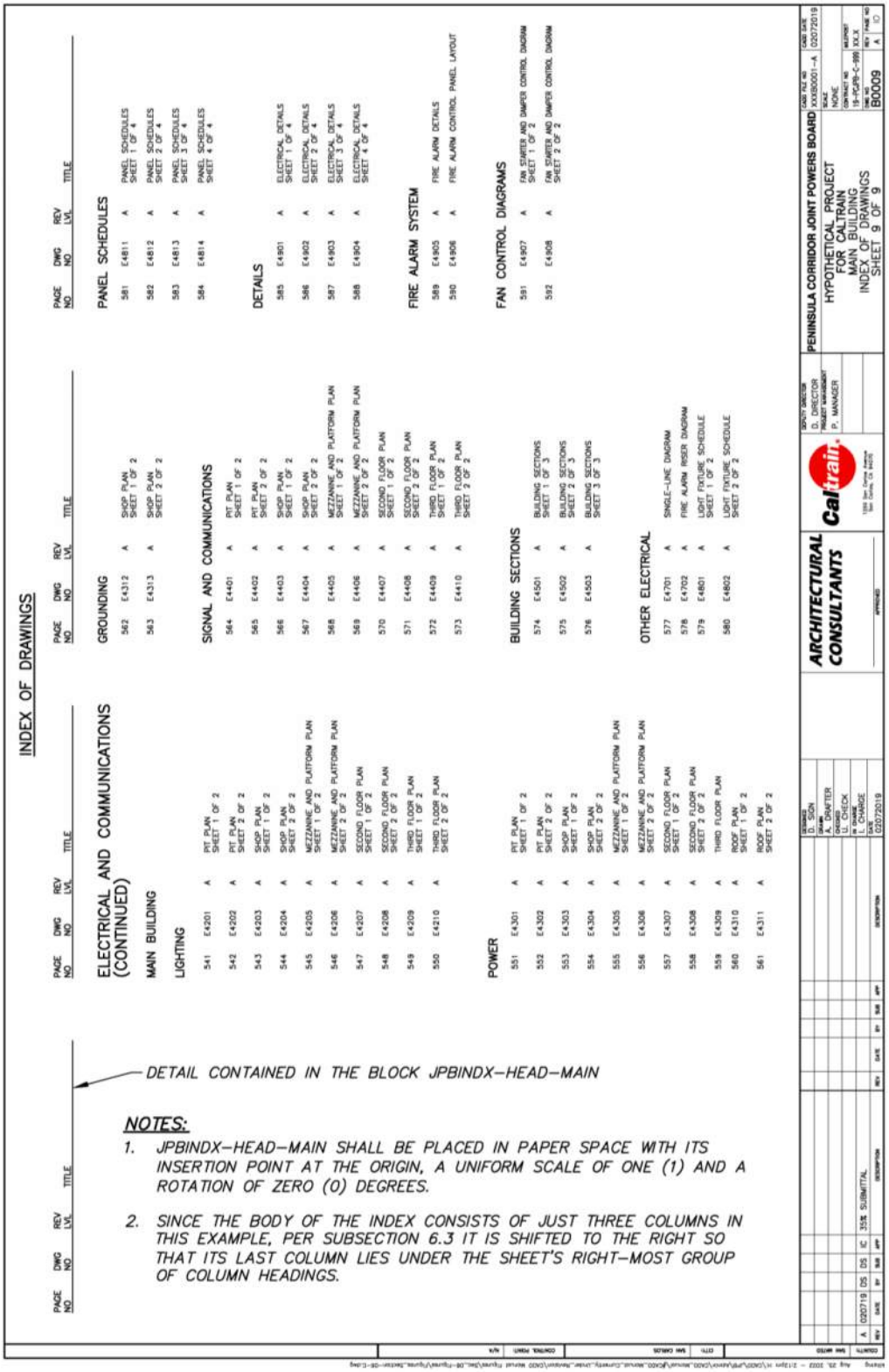


FIGURE 6.5 – INDEX OF DRAWINGS SHEET FOR A HYPOTHETICAL PROJECT

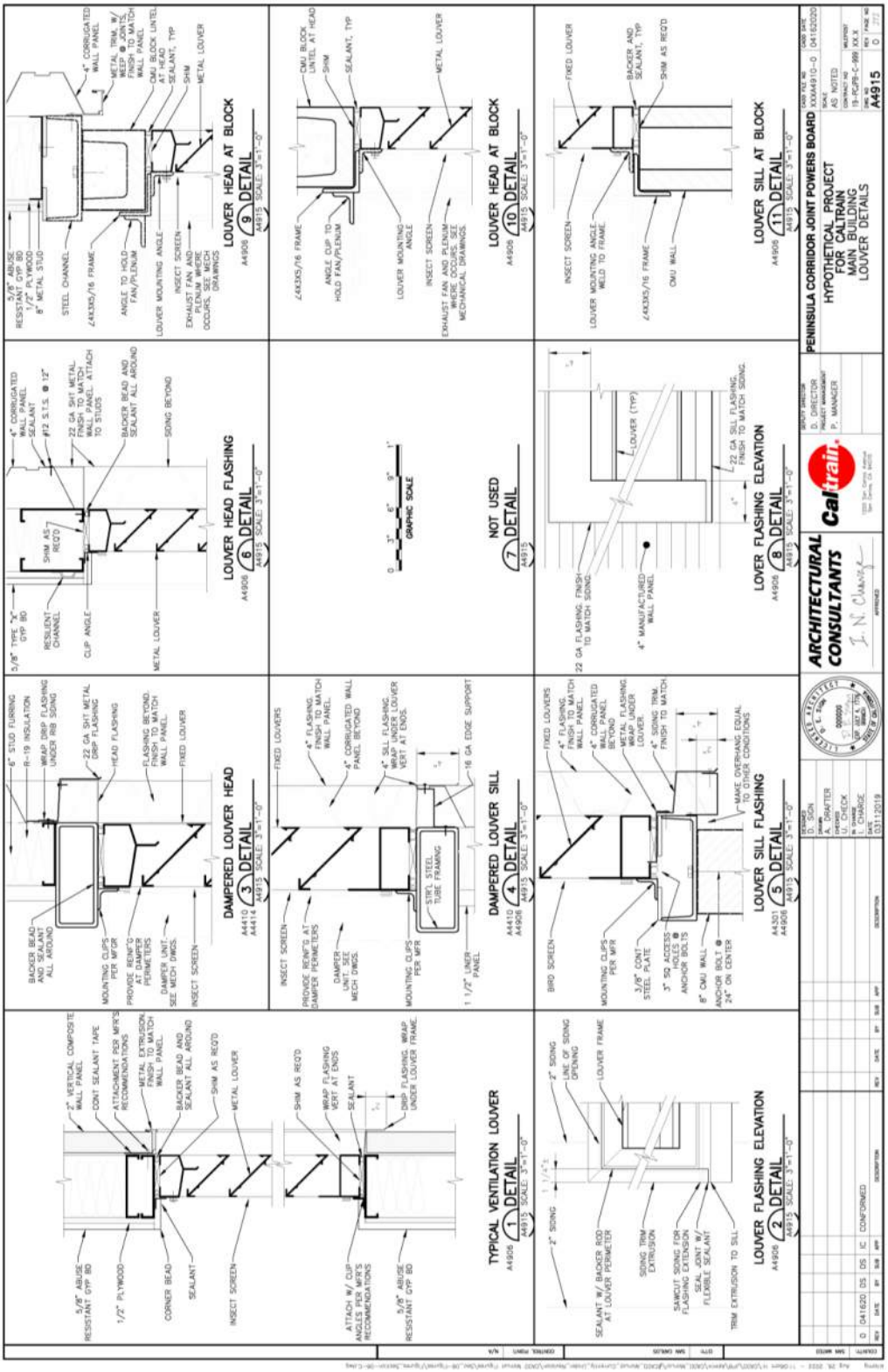


FIGURE 6.6 – DETAIL SHEET FOR A HYPOTHETICAL PROJECT

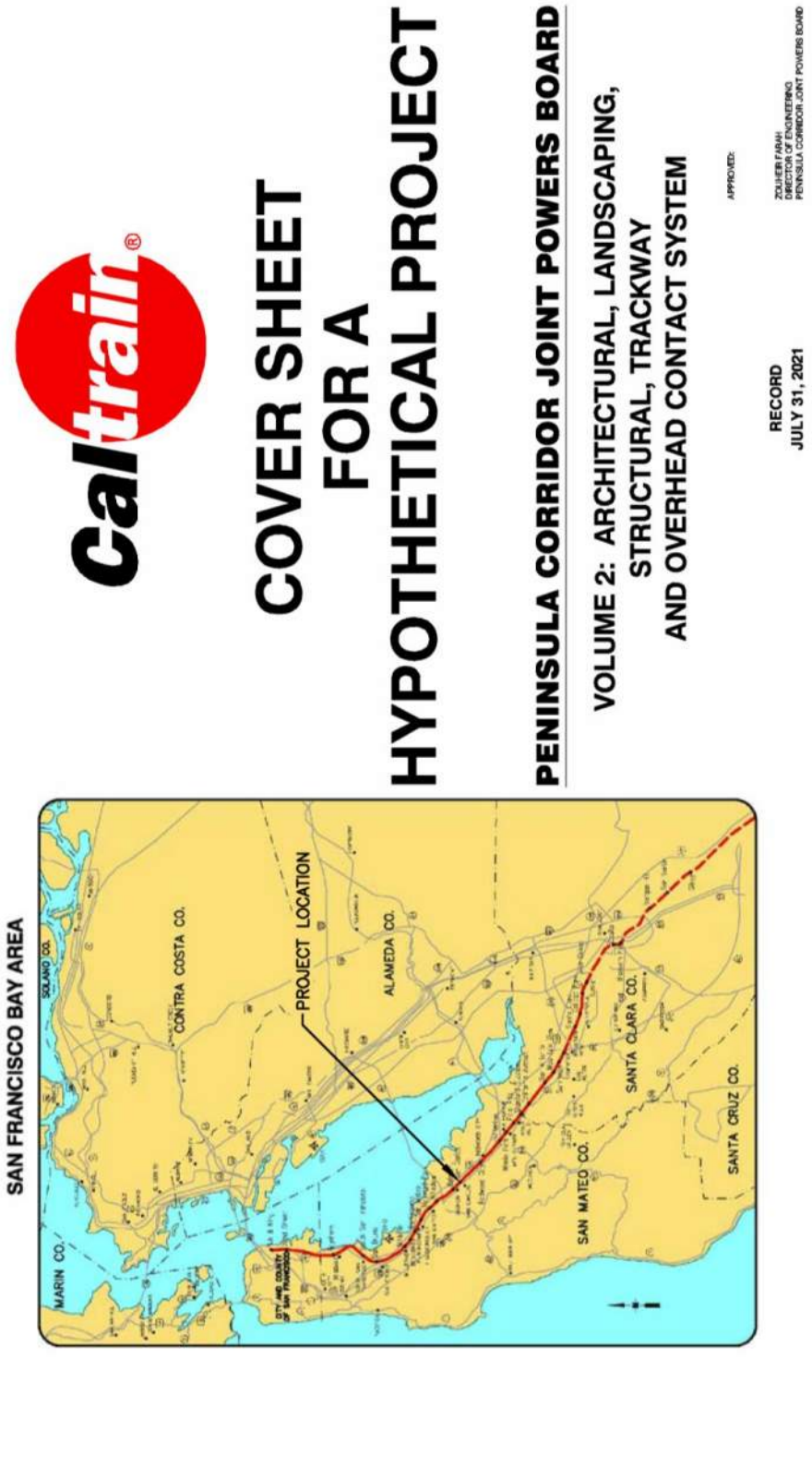


FIGURE 6.7 – COVER SHEET FOR A HYPOTHETICAL PROJECT

E N D O F S E C T I O N 6

SECTION 7
DRAFTING RULES

CONTENTS

FIGURES

FIGURES (CONTINUED)

FIGURES (CONTINUED)

TABLES

SECTION 7
DRAFTING RULES

7.1 GENERAL

Project drawings shall include all information necessary for the procurement, construction, installation, maintenance and repair of all equipment and installations they depict. All project drawings shall comply with the requirements specified in this Section. The dimensions of text and symbols specified herein are given as measured on full-size sheets. Colors noted herein shall be those found on the AutoCAD Color Index (ACI) palette.

Project drawings shall be revised digitally. Sketches, diagrams, responses to Requests for Information, Change Order notices and so on attached to plotted sheets shall not constitute revisions to project drawings. Manual drafting changes to plotted project drawings will not be accepted. All revisions to a project design shall be made digitally using Autodesk's AutoCAD software. Project CADD files submitted to PCJPB shall incorporate, and their associated plots shall show, all revisions to the project design current at the time of submittal.

CADD files for PCJPB projects shall be created with future users in mind. The goal shall be to produce project CADD files that exhibit predictable, normally expected behaviors and that are easy to understand and efficient to use. Project CADD files shall be set up such that someone unfamiliar with them can open them up at some future date and immediately begin to use them productively without confusion, without surprises and without rework. To this end, therefore, submitted project files shall be fully compliant with this Manual, logically structured, clean and uniform.

Drawing objects functioning identically and occurring throughout a set of project CADD files shall be treated the same way in every file in which they occur in that set of files. Viewports, for example, shall be placed on a layer having the same name and color assignment in every file in which they occur in a project file set. The same shall hold true for all other drawing objects—dimensions, annotation, scale bars, detail callouts, titles and so on. If copying objects from the CADD files of other projects for incorporation into project files being prepared for PCJPB, all such objects shall be made compliant in every way with the criteria in this Manual and their properties consistent with those already established (layer placement, layer names, layer colors, text and dimension styles, line types and so forth) for the files they are brought into.

To maximize flexibility and ease of editing, all drawing object properties in project CADD files prepared for PCJPB shall be assigned globally. No drawing object properties shall be assigned to drawing objects individually. Except as specified in this Manual, object colors and line types shall be assigned using "ByLayer" assignments only. Any objects to which styles may be applied shall be formatted solely by using styles. Layers and styles shall be freely created to satisfy these requirements. Style overrides shall not be used. The only exceptions to this last requirement shall be the suppression of a dimension extension line or the use of a dimension text override.

Designers shall create and develop project designs at full-size in Model Space. All project design elements—stations, track alignments, storage and maintenance yards, buildings and so on—shall be positioned in the CADD model at locations which correspond to their intended locations on Caltrain's property when finally constructed. When the design effort is complete, it shall be possible to overlay all a project's plan files and view the entire design with all its elements shown in their correct locations and in correct relationship with each other and with features of the surrounding terrain.

The drawing units specified in the Drawing Units dialog box in each project drawing and project reference file submitted to PCJPB shall be appropriate to that file's subject matter. Except as noted elsewhere in this Manual, all drawing objects, whether dimensional or nondimensional, shall be placed in Model Space. All drawing objects shall be drawn at full-size. All dimensioning and annotation shall be done in Model Space.

7.2 DRAWING ORIENTATION

7.2.1 Plan Sheets

Project baselines shall be oriented in plan drawings with baseline stationing progressing from left to right across each sheet. Most, if not all, disciplines preparing design drawings for a project will prepare plan sheets. In setting up these plan sheets, the project area shall be tiled into a number of contiguous plan views. Thus, the plan views of corresponding plan drawings, as those for drawings CX05, UX05, AX05, LX05, SX05, MX05 and EX05 in *Figure 7.1*, shall all depict the same area of work and have the same scale, orientation and match lines. See also **Subsection 7.7**.

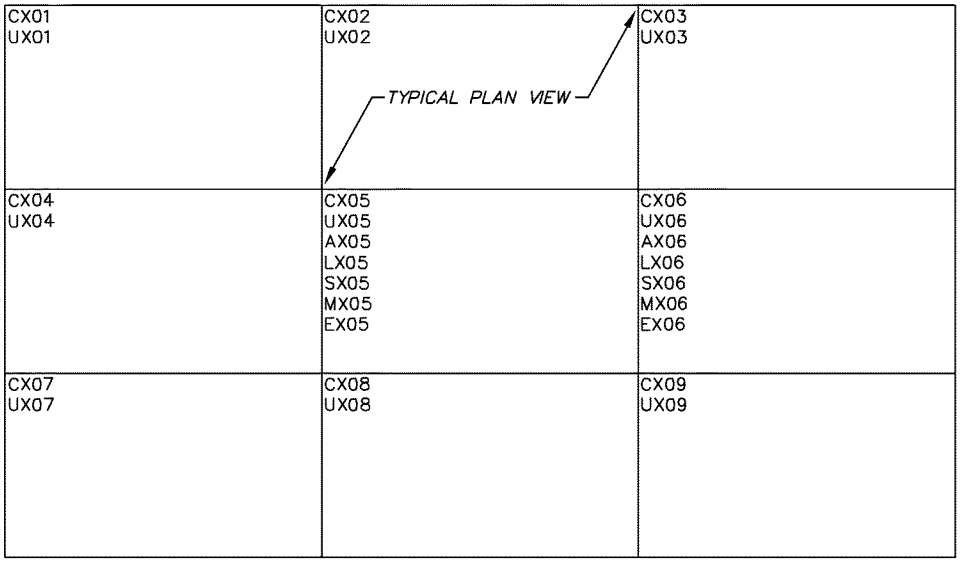


FIGURE 7.1 - TILING SCHEME FOR PLAN VIEWS OF A HYPOTHETICAL PROJECT

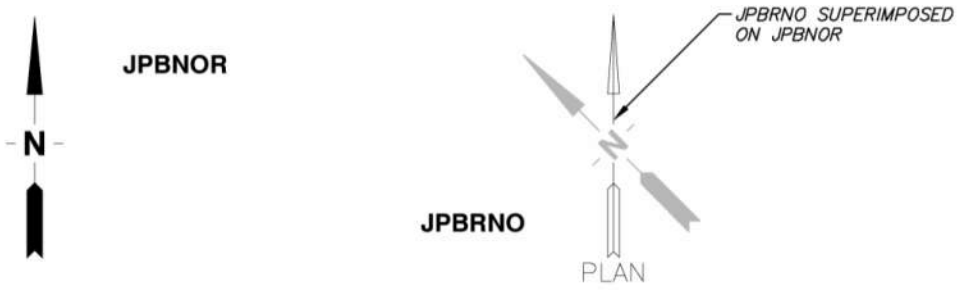


FIGURE 7.2 - NORTH ARROWS

7.2.2 North Arrows

PCJPB's North Arrow block (JPBNOR) shall be used to indicate north on plans. It shall be oriented so that it aligns with Grid North. Each plan view on a sheet shall have its own North Arrow, positioned preferably in the upper right-hand corner of the view. Some drawings may also require the indication of Plan North. PCJPB's Plan North Arrow block (JPBRNO) shall be used for this purpose. It shall be oriented by drawing and superimposed over the standard North Arrow. See *Figure 7.2*.

7.2.3 Details

Objects depicted in the drawing of a detail shall have the same orientation in the detail as they have in the drawing the detail is called out in.

7.2.4 Cross Sections

Cross sections of track or roadway alignments shall be shown such that they are viewed as though looking ahead along the alignment in the direction of increasing stationing. When a series of cross sections is shown on a sheet, the cross sections shall be arranged so that the section stations increase from bottom to top and from left to right.

7.2.5 Sections

Architectural and engineering sections shall, whenever possible, be taken looking to the left or up relative to the drawing they are taken in or in the direction of increasing stationing.

7.3 SCALE, UNITS OF MEASURE AND DIMENSIONING

7.3.1 Scale

See **Section 8** for scales to use in the preparation of project drawings for PCJPB. The scale used in each drawing shall be noted in its Border Scale Box. If the vertical scale is different from the horizontal scale, both scales shall be noted, as 1"=40' H; 1"=4' V. If the detail making up a drawing is not drawn to scale or is not shown at a common scale, the scale shall be noted as "NOT TO SCALE" or "NTS." For a drawing with no scale, an index of drawings sheet, for example, the term "NONE" shall be used. On a sheet containing multiple

drawings shown at different scales, as a detail sheet, the scale of each drawing shall be noted underneath the drawing's title, and the entry in the Border Scale Box shall read "AS NOTED."

Graphic scales shall be provided on all sheets depicting elements of a design at scale. For all such sheets, a graphic scale corresponding to each stated scale on a sheet shall be displayed on that sheet. The preferred location for graphic scales is just below titles or in the lower right-hand corner of the drawing just above the Title Block. PCJPB has created a number of graphic scale blocks for use in its project drawings. See *Figure 7.3*.

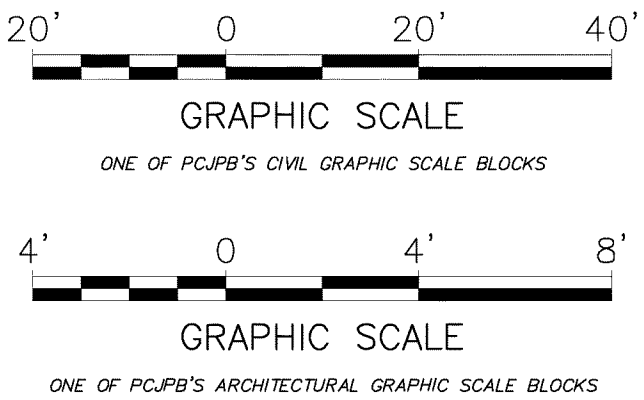


FIGURE 7.3 - REPRESENTATIVE GRAPHIC SCALES

7.3.2 Units of Measure

Unless PCJPB directs otherwise, the English system of units (foot-pound-second) shall be used. The US Survey Foot is used for setting survey control and for construction staking. The International Foot shall be used for design. Angles and bearings shall be expressed in degrees, minutes and seconds.

Usually, what the AutoCAD drawing unit for length represents in project drawing and reference files shall be set as follows. In files containing architectural, electrical, mechanical, structural and track-work subject matter, it shall be set to represent the inch. In files containing civil, track alignment and utility subject matter, it shall be set to represent the International Foot.

As indicated above, what real world units the AutoCAD drawing units represent in each project CADD file shall be specified in accordance with the type of subject matter the file will contain. The Drawing Units dialog box (invoked using the UNITS command) shall be used to specify what the drawing units represent in each file. The settings in the dialog box shall be chosen as follows. If the AutoCAD drawing unit for length is to represent the Inch, the format for Length shall be set to Type Architectural and the Insertion scale units to Inches. If the AutoCAD drawing unit for length is to represent the International Foot, the format for Length shall be set to Type Decimal and the Insertion scale units to Feet.

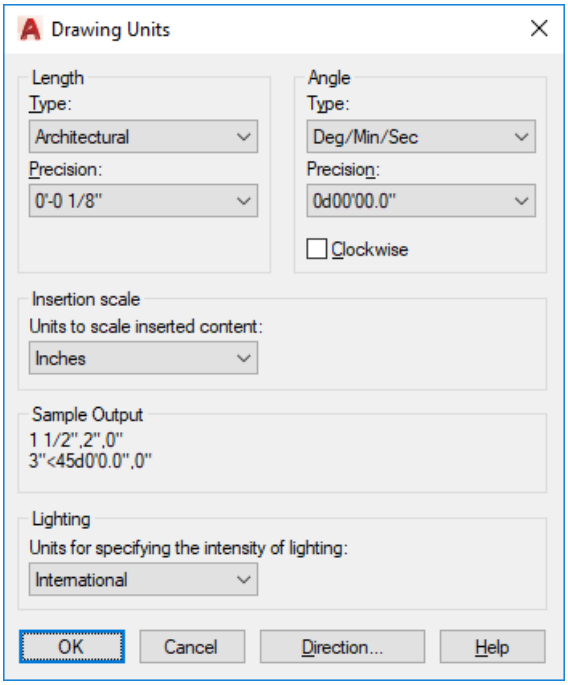


**FIGURE 7.4 - DRAWING UNITS DIALOG BOX,
AUTOCAD DRAWING UNIT FOR LENGTH REPRESENTS THE INCH**

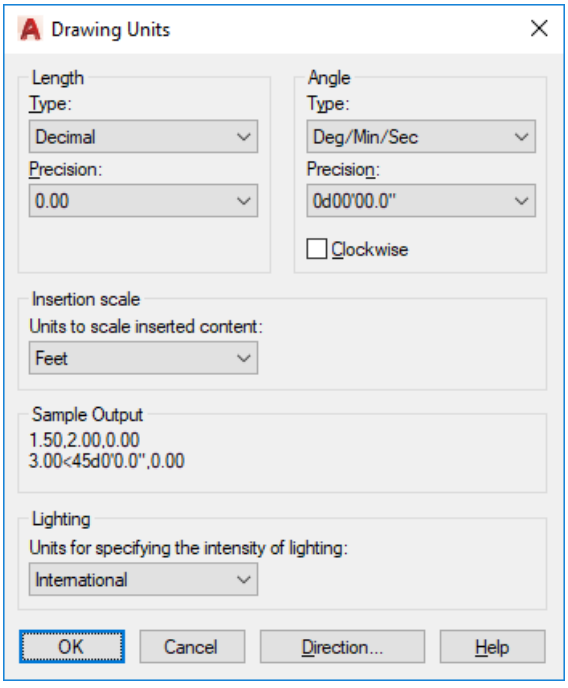


**FIGURE 7.5 - DRAWING UNITS DIALOG BOX,
AUTOCAD DRAWING UNIT FOR LENGTH REPRESENTS THE INTERNATIONAL FOOT**

The Insertion scale units shall never be set to Unitless. For the angular drawing unit, the Clockwise box shall remain unchecked and the format for Angle set to Type Deg/Min/Sec in all cases. The settings for Lighting and Direction shall be left unchanged at their default values. Precision shall be set as discussed in **Subsubsection 7.3.3**. See *Figures 7.4* and *7.5*.

Note that in each project CADD file, the settings listed as current for the file per the -DWGUNITS command should match the corresponding settings shown in the Drawing Units dialog box. Should they conflict, AutoCAD may produce unexpected results when inserting blocks and attaching externally referenced files.

7.3.3 Precision

All quantities shall be expressed with an appropriate level of precision. For the quantities discussed here, their precision, unless greater precision is required, shall be set as follows. Distances and dimensions expressed in feet and inches shall be given to the nearest 1/8” (0.125”). Hypsometric elevations and distances and dimensions expressed in decimal feet shall be given to two decimal places. Horizontal coordinates (northings and eastings) shall be expressed in decimal feet to three decimal places. Angles and bearings shall be given to the nearest tenth of a second of arc. See the examples below:

Distance	36’-9 5/8” (Architectural); 36.80’ (Decimal Feet)
Elevation	98.54’
Coordinate pair	(2044643.712, 6016950.302)
Angle	47°15’32.0”
Bearing	N 70°35'32.5” E

7.3.4 Dimensioning Systems

In general, architectural, electrical, mechanical, structural and track work drawings shall be dimensioned using Architectural Dimensioning (feet and inches), and civil, track alignment and utility drawings shall be dimensioned using Decimal Feet Dimensioning. Civil, track alignment and utility details, elevations, profiles and sections, however, may be dimensioned using either Decimal Feet Dimensioning or Architectural Dimensioning. Whichever of the two systems is deemed most suitable for use in each case shall be used. Hypsometric elevations shall be expressed in decimal feet in all cases.

7.3.5 Dimensioning Guidelines

Dimensions shall conform to the following guidelines. Inclusion of a complete listing of dimensioning guidelines is beyond the scope of this Manual. Only selected ones are listed here. Refer to other sources for more comprehensive listings and guidance on dimensioning.

All dimensioning shall be done in Model Space.

Dimensions shall be AutoCAD Associative Dimensions (the value of the DIMASSOC variable shall be set to two (2) in each file).

Adequate space shall be allowed for dimensioning to avoid crowding.

Each design element, object, piece of equipment, assembly, etc. depicted in a set of drawings shall be dimensioned once and only once in that set. Once it has been dimensioned, should it appear on other drawings in the set, a reference shall be provided on those drawings to the sheet(s) on which its dimensions are shown.

Dimensions shall not be duplicated. Each feature of an object shall be dimensioned only once. Nor shall the same dimensional information be presented in two or more different ways.

Each feature of an object shall be dimensioned so that the object's size and shape are completely described. Sufficient dimensions shall be provided so that it is unnecessary for the reader to calculate, measure off or assume any dimension or angle.

It shall be unnecessary, however, to provide a dimension if the reader can calculate that dimension by means of simple addition or subtraction.

Objects shall be dimensioned in those views that best show their true shape.

Each dimension shall be placed such that it can be interpreted in only one way.

Dimensions shall be selected and arranged to avoid an accumulation of tolerances that might result in a manufactured part being larger or smaller than intended. If required, except for reference dimensions, tolerances shall be given for each dimension. Tolerances shall be applied directly to each dimension or indicated by a general tolerance note on the drawing.

Dimensions shall be placed outside the figure of the object being dimensioned.

Extension lines, leader lines or other dimension lines shall not cross a dimension line.

Extension lines and leader lines shall not be broken for object lines, other leader lines or other extension lines (the DIMBREAK command shall not be used).

Where applicable, centerlines shall serve as extension lines (coincident extension lines shall be turned off in such cases).

Dimensioning to hidden lines shall be avoided.

Holes shall be located using their centerlines.

Circles shall be dimensioned with their diameters. Arcs shall be dimensioned with their radii.

7.3.5 Dimension Features

The sizes and distances specified here are for dimensions as shown on full-size plots. The “ByLayer” assignment shall be used for the color, line type and line weight of all dimension features in all cases. Dimension feature properties and settings not discussed here shall be set as shown In *Figures 7.6* through *7.17* and as is appropriate for the particular style being created. See also *Figures 7.18* and *7.19*.

Extension lines shall extend 1/8” (0.125”) beyond dimension lines. A gap of 1/16” (0.0625”) shall separate each extension line from the object line it extends to.

Dimensions shall be offset from the figures they dimension by at least 3/4” (0.75”). If dimensions are stacked, the second dimension string shall be offset above the first by 5/8” (0.625”). The third shall be offset above the second by 5/8” (0.625”) and so on.

Dimension lines shall end in closed filled arrowheads. Arrowheads shall be 3/16” (0.1875”) in length.

Circles and larger arcs shall be provided with center marks. The size of center marks shall be 3/32” (0.09375”).

Dimension text shall be set in the ROMANS text style and shall plot at 1/8” (0.125”) high.

Dimension text shall be placed 5/32” (0.15625”) above, centered on and in alignment with the dimension line.

For dimensions expressed in decimal feet, leading and trailing zeros shall be kept, as: 100.30’ and 0.56’.

For dimensions expressed in feet and inches, fractions of an inch shall not be stacked. A slash shall separate the numerator and denominator, as: 5’-7 3/8”.

For dimensions expressed in feet and inches, zero feet (0’) shall be omitted, zero inches (-0”) kept. Thus, zero feet (0’-) shall not precede dimensions of less than one foot, and for dimensions equaling some integral value in feet, zero inches (-0”) shall follow said value. Examples: 9”, 5 1/4”, 7/8” and 37’-0”.

When the unit format is set to Architectural (feet and inches), for dimensions greater than a foot, if the inches component of a dimension is less than an inch, AutoCAD will automatically place a zero (0) before the fraction, as 5’-0 3/8” and 3’-0 3/4".

For angular dimensions, leading and trailing zeros shall be kept, as: 38° 20’ 2.0”, 15° 30’ 0.7” and 0° 11’ 7.0”.

Steel reinforcement bar spacing shall be specified without the inches (”) symbol. For example, write #4@18, not #4@18”.

Dimensions for structural steel shall be given without the inches (”) symbol, as HSS2-1/2x2-1/2x3/16.

7.3.6 Dimension Styles

Dimensions shall be formatted using styles only. PCJPB’s template drawing files (see **Subsection 2.2**) include template dimension styles set up in accordance with the criteria given in this Section. The template dimension styles currently defined are discussed below.

The civil template dimension styles listed below shall be used for creating dimension styles in project files where the AutoCAD drawing unit for length represents the International Foot.

CIVIL FEET (Civil Decimal Feet)
CIVIL F AND I (Civil Feet and Inches)

Figures 7.6 through *7.9* show the settings common to all CIVIL styles. *Figures 7.10* and *7.11* show the Primary Units settings for CIVIL FEET styles and CIVIL F AND I styles, respectively.

The following architectural template dimension styles shall be used for creating dimension styles in project files where the AutoCAD drawing unit for length represents the inch.

ARCH FEET (Architectural Decimal Feet)
ARCH F AND I (Architectural Feet and Inches)

Figures 7.12 through *7.15* show the settings common to all ARCHITECTURAL styles. *Figures 7.16* and *7.17* show the primary units settings for ARCH FEET styles and ARCH F AND I styles, respectively.

In every project drawing file a dimension style shall be created for each scale at which dimensioned objects are to appear in the drawings of that file. Designers shall derive all dimension styles used in their drawings from PCJPB’s four template dimension styles. To do so, starting off with the appropriate template style, they shall create and name each new style and adjust the setting in the Scale for Dimension Features box located on the Fit tab in the Modify Dimension Style dialog box as appropriate. None of the other settings shall change.

See *Tables 7.1* through *7.4* for style names to use and overall scale factors to apply in the creation of selected project drawing dimension styles. Styles for scales not appearing in the tables shall be named in a similar fashion. See *Figures 7.18* and *7.19* for illustrations of PCJPB project drawing dimensions.

PCJPB usually does not require the use of alternate units and tolerances in the dimensioning of its project drawings. The Alternate Units and Tolerances tabs in the Modify Dimension Style dialog box may usually be ignored. PCJPB’s feet and inches styles shall be used when dimensioning angles. Should the decimal feet styles be used for angular dimensions, AutoCAD will put an additional tick behind all seconds of arc ticks.

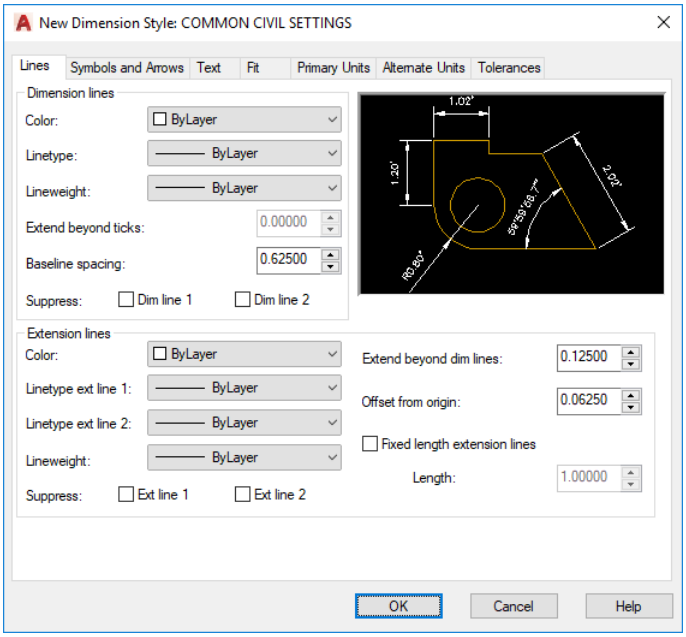


FIGURE 7.6 - SETTINGS COMMON TO ALL CIVIL DIMENSION STYLES LINES TAB

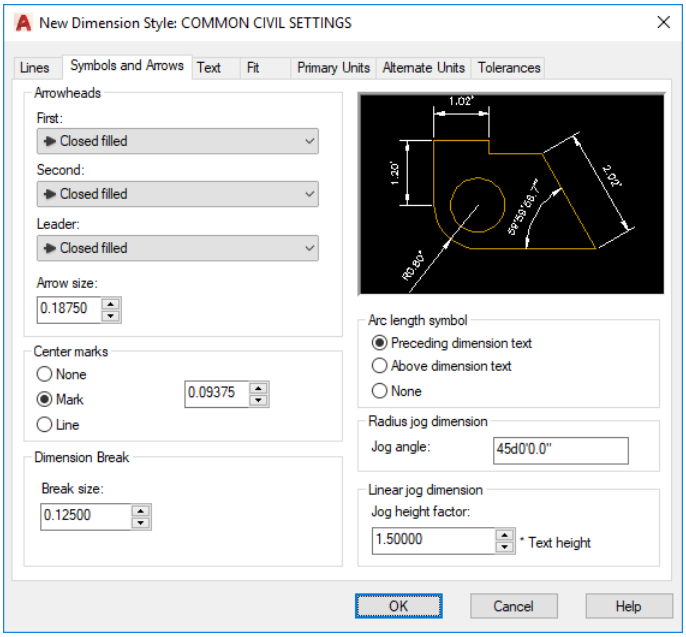


FIGURE 7.7 - SETTINGS COMMON TO ALL CIVIL DIMENSION STYLES SYMBOLS AND ARROWS TAB

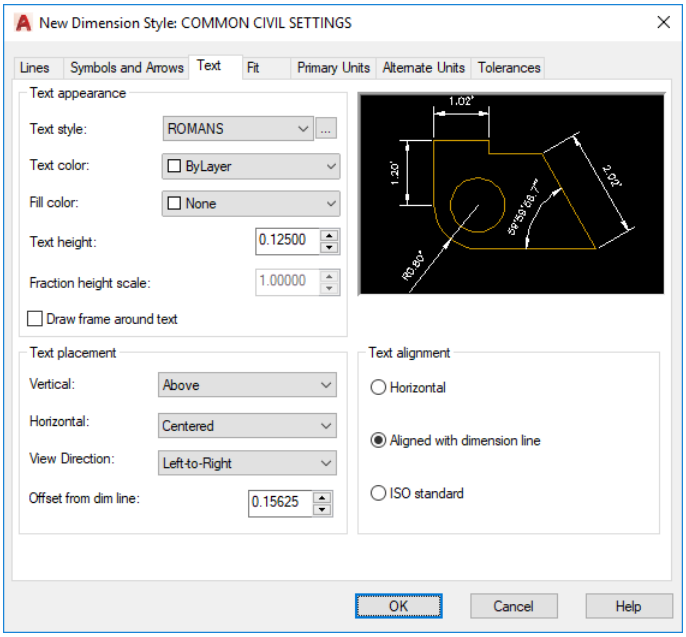


FIGURE 7.8 - SETTINGS COMMON TO ALL CIVIL DIMENSION STYLES TEXT TAB

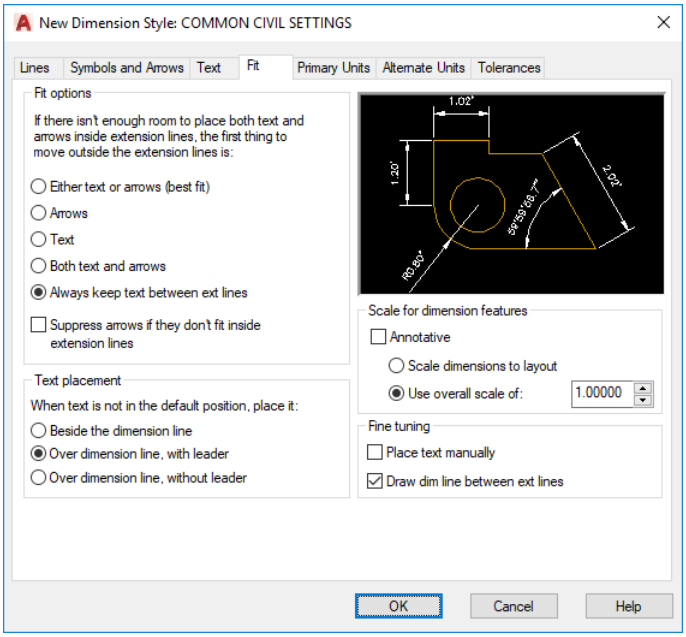


FIGURE 7.9 - SETTINGS COMMON TO ALL CIVIL DIMENSION STYLES FIT TAB

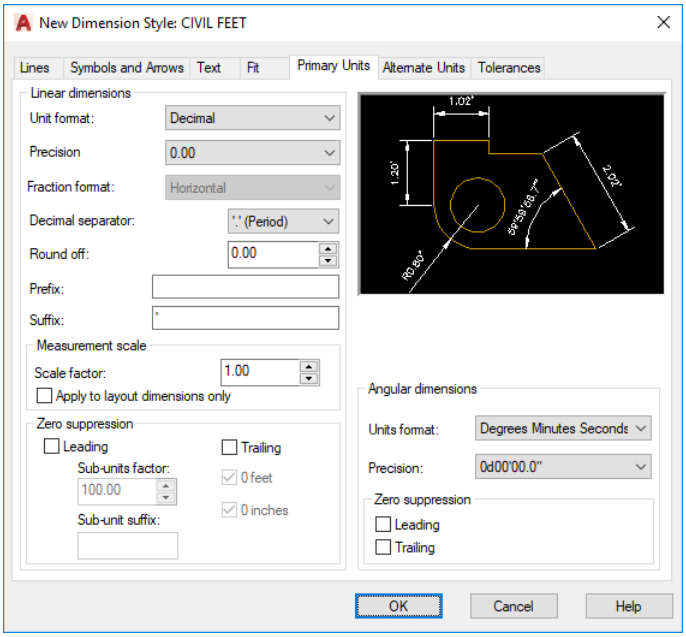


FIGURE 7.10 - CIVIL FEET DIMENSION STYLE SETTINGS PRIMARY UNITS TAB

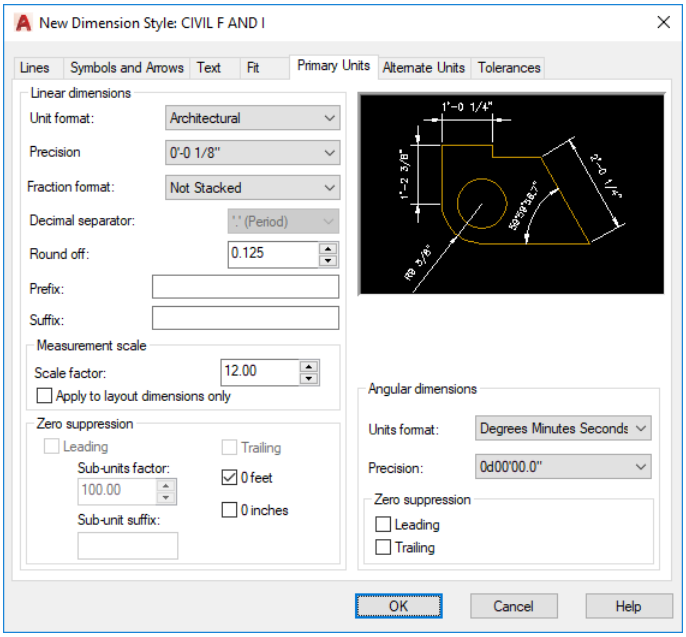


FIGURE 7.11 - CIVIL FEET AND INCHES DIMENSION STYLE SETTINGS PRIMARY UNITS TAB

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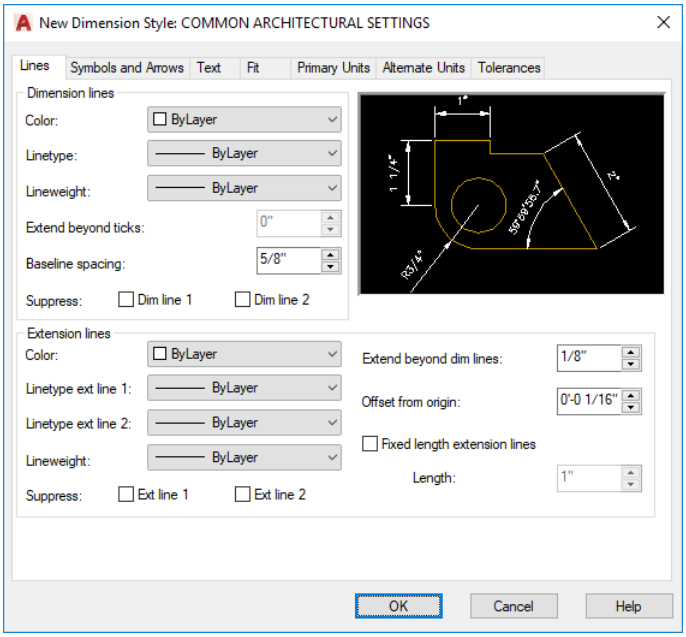

FIGURE 7.12 - SETTINGS COMMON TO ALL ARCHITECTURAL DIMENSION STYLES LINES TAB

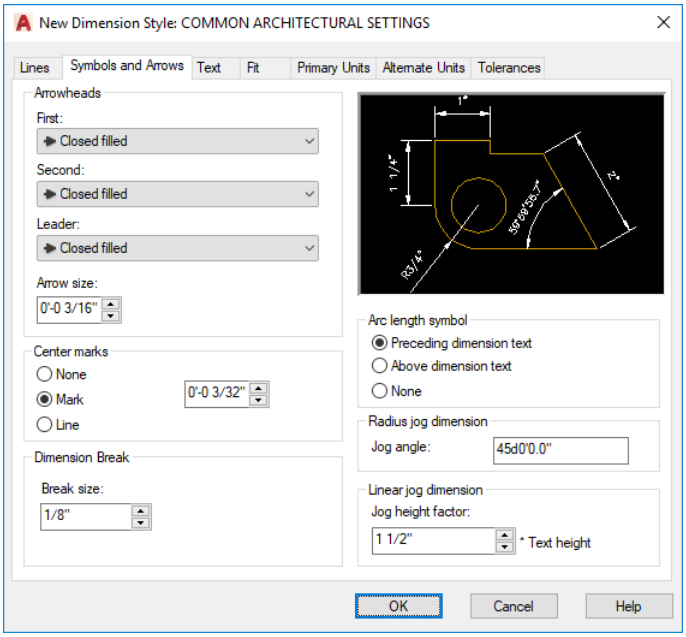

FIGURE 7.13 - SETTINGS COMMON TO ALL ARCHITECTURAL DIMENSION STYLES SYMBOLS AND ARROWS TAB

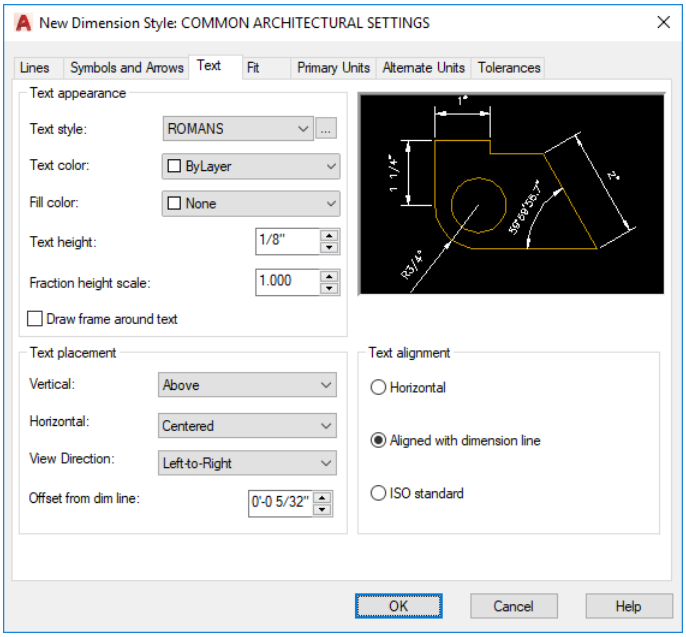

FIGURE 7.14 - SETTINGS COMMON TO ALL ARCHITECTURAL DIMENSION STYLES TEXT TAB

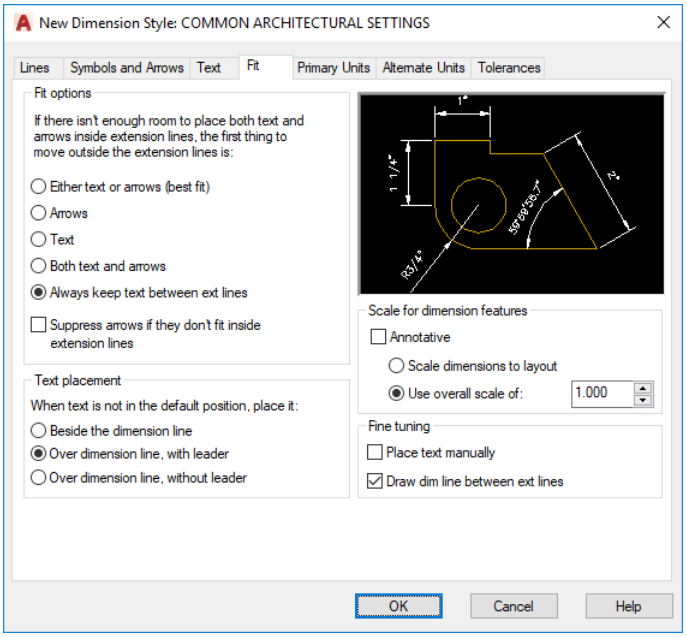

FIGURE 7.15 - SETTINGS COMMON TO ALL ARCHITECTURAL DIMENSION STYLES FIT TAB

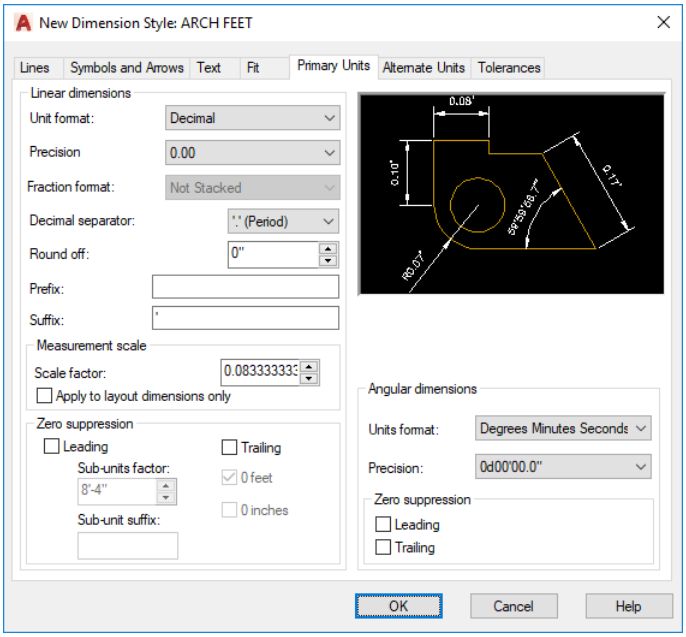

FIGURE 7.16 - ARCHITECTURAL FEET DIMENSION STYLE PRIMARY UNITS TAB

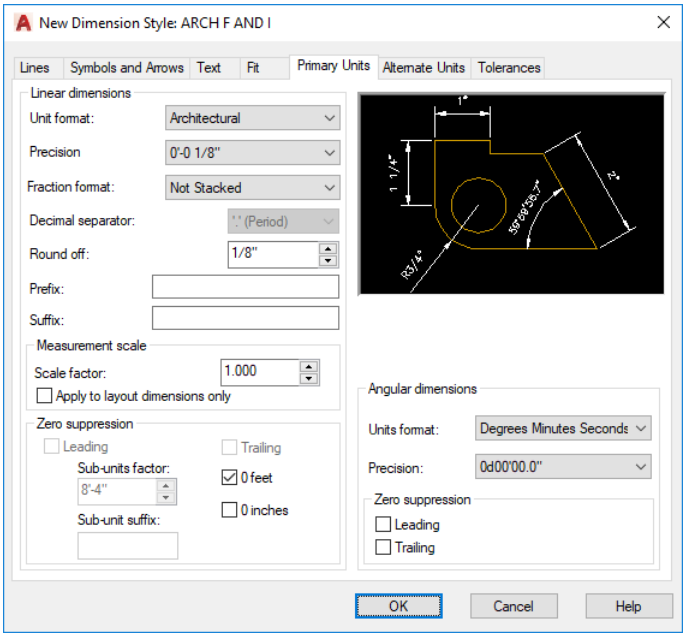

FIGURE 7.17 - ARCHITECTURAL FEET AND INCHES DIMENSION STYLE PRIMARY UNITS TAB

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Scale	Dimension Style	Scale for Dimension Features	Associated Zoom Scale Factor
		Use overall scale of:	
FULL SIZE	FS CIVIL FEET	1/12	12 XP
6"=1’	6 CIVIL FEET	1/6	6 XP
3"=1'	3 CIVIL FEET	1/3	3 XP
1 1/2"=1’	3-2 CIVIL FEET	2/3	3/2 XP
1"=1'	1 CIVIL FEET	1	1 XP
3/4"=1'	3-4 CIVIL FEET	4/3	3/4 XP
1/2"=1'	1-2 CIVIL FEET	2	1/2 XP
3/8"=1'	3-8 CIVIL FEET	8/3	3/8 XP
1/4"=1'	1-4 CIVIL FEET	4	1/4 XP
3/16"=1'	3-16 CIVIL FEET	16/3	3/16 XP
1/8"=1'	1-8 CIVIL FEET	8	1/8 XP
1"=10'	10 CIVIL FEET	10	1/10 XP
3/32”=1’	3-32 CIVIL FEET	32/3	3/32 XP
1/16"=1'	1-16 CIVIL FEET	16	1/16 XP
1"=20'	20 CIVIL FEET	20	1/20 XP
1"=40'	40 CIVIL FEET	40	1/40 XP
1"=50'	50 CIVIL FEET	50	1/50 XP
1”=60’	60 CIVIL FEET	60	1/60 XP
1”=80’	80 CIVIL FEET	80	1/80 XP
1"=100'	100 CIVIL FEET	100	1/100 XP
1"=200'	200 CIVIL FEET	200	1/200 XP
1"=500'	500 CIVIL FEET	500	1/500 XP
1"=1,000'	1000 CIVIL FEET	1,000	1/1,000 XP

Note: These styles to be used in files where the AutoCAD unit for length represents the International Foot.

TABLE 7.1 - DIMENSION STYLES DERIVED FROM THE CIVIL DECIMAL FEET TEMPLATE STYLE

Scale	Dimension Style	Scale for Dimension Features	Associated Zoom Scale Factor
		Use overall scale of:	
FULL SIZE	FS CIVIL F AND I	1/12	12 XP
6"=1'-0"	6 CIVIL F AND I	1/6	6 XP
3"=1'-0"	3 CIVIL F AND I	1/3	3 XP
1 1/2"=1'-0"	3-2 CIVIL F AND I	2/3	3/2 XP
1"=1'-0"	1 CIVIL F AND I	1	1 XP
3/4"=1'-0"	3-4 CIVIL F AND I	4/3	3/4 XP
1/2"=1'-0"	1-2 CIVIL F AND I	2	1/2 XP
3/8"=1'-0"	3-8 CIVIL F AND I	8/3	3/8 XP
1/4"=1'-0"	1-4 CIVIL F AND I	4	1/4 XP
3/16"=1'-0"	3-16 CIVIL F AND I	16/3	3/16 XP
1/8"=1'-0"	1-8 CIVIL F AND I	8	1/8 XP
1"=10'-0”	10 CIVIL F AND I	10	1/10 XP
3/32”=1’-0”	3-32 CIVIL F AND I	32/3	3/32 XP
1/16"=1'-0"	1-16 CIVIL F AND I	16	1/16 XP
1"=20'-0”	20 CIVIL F AND I	20	1/20 XP
1"=40'-0”	40 CIVIL F AND I	40	1/40 XP
1"=50'-0”	50 CIVIL F AND I	50	1/50 XP
1”=60’-0”	60 CIVIL F AND I	60	1/60 XP
1”=80’-0”	80 CIVIL F AND I	80	1/80 XP
1"=100'-0”	100 CIVIL F AND I	100	1/100 XP
1"=200'-0”	200 CIVIL F AND I	200	1/200 XP
1"=500'-0”	500 CIVIL F AND I	500	1/500XP
1"=1,000'-0”	1000 CIVIL F AND I	1,000	1/1,000 XP

Note: These styles to be used in files where the AutoCAD unit for length represents the International Foot.

TABLE 7.2 - DIMENSION STYLES DERIVED FROM THE CIVIL FEET AND INCHES TEMPLATE STYLE

Scale	Dimension Style	Scale for Dimension Features	Associated Zoom Scale Factor
		Use overall scale of:	
FULL SIZE	FS ARCH FEET	1	1 XP
6"=1'	6 ARCH FEET	2	1/2 XP
3"=1'	3 ARCH FEET	4	1/4XP
1 1/2"=1'	3-2 ARCH FEET	8	1/8 XP
1"=1'	1 ARCH FEET	12	1/12 XP
3/4"=1'	3-4 ARCH FEET	16	1/16 XP
1/2"=1'	1-2 ARCH FEET	24	1/24 XP
3/8"=1'	3-8 ARCH FEET	32	1/32 XP
1/4"=1'	1-4 ARCH FEET	48	1/48 XP
3/16"=1'	3-16 ARCH FEET	64	1/64 XP
1/8"=1'	1-8 ARCH FEET	96	1/96 XP
1"=10'	10 ARCH FEET	120	1/120 XP
3/32”=1’	3-32 ARCH FEET	128	1/128 XP
1/16"=1'	1-16 ARCH FEET	192	1/192 XP
1"=20'	20 ARCH FEET	240	1/240 XP
1"=40'	40 ARCH FEET	480	1/480 XP
1”=50’	50 ARCH FEET	600	1/600 XP
1”=60’	60 ARCH FEET	720	1/720 XP
1”=80’	80 ARCH FEET	960	1/960 XP
1”=100’	100 ARCH FEET	1,200	1/1,200 XP
1”=200’	200 ARCH FEET	2,400	1/2,400 XP
1”=500’	500 ARCH FEET	6,000	1/6,000 XP
1”=1,000’	1000 ARCH FEET	12,000	1/12,000 XP

Note: These styles to be used in files where the AutoCAD unit for length represents the inch.

TABLE 7.3 - DIMENSION STYLES DERIVED FROM THE ARCHITECTURAL DECIMAL FEET TEMPLATE STYLE

Scale	Dimension Style	Scale for Dimension Features	Associated Zoom Scale Factor
		Use overall scale of:	
FULL SIZE	FS ARCH F AND I	1	1 XP
6"=1'-0"	6 ARCH F AND I	2	1/2 XP
3"=1'-0"	3 ARCH F AND I	4	1/4XP
1 1/2"=1'-0"	3-2 ARCH F AND I	8	1/8 XP
1"=1'-0"	1 ARCH F AND I	12	1/12 XP
3/4"=1'-0"	3-4 ARCH F AND I	16	1/16 XP
1/2"=1'-0"	1-2 ARCH F AND I	24	1/24 XP
3/8"=1'-0"	3-8 ARCH F AND I	32	1/32 XP
1/4"=1'-0"	1-4 ARCH F AND I	48	1/48 XP
3/16"=1'-0"	3-16 ARCH F AND I	64	1/64 XP
1/8"=1'-0"	1-8 ARCH F AND I	96	1/96 XP
1"=10'-0”	10 ARCH F AND I	120	1/120 XP
3/32”=1’-0”	3-32 ARCH F AND I	128	1/128 XP
1/16"=1'-0"	1-16 ARCH F AND I	192	1/192 XP
1"=20'-0”	20 ARCH F AND I	240	1/240 XP
1"=40'-0”	40 ARCH F AND I	480	1/480 XP
1”=50’-0”	50 ARCH F AND I	600	1/600 XP
1”=60’-0”	60 ARCH F AND I	720	1/720 XP
1”=80’-0”	80 ARCH F AND I	960	1/960 XP
1”=100’-0”	100 ARCH F AND I	1,200	1/1,200 XP
1”=200’-0”	200 ARCH F AND I	2,400	1/2,400 XP
1”=500’-0”	500 ARCH F AND I	6,000	1/6,000 XP
1”=1,000’-0”	1000 ARCH F AND I	12,000	1/12,000 XP

Note: These styles to be used in files where the AutoCAD unit for length represents the inch.

TABLE 7.4 - DIMENSION STYLES DERIVED FROM THE ARCHITECTURAL FEET AND INCHES TEMPLATE STYLE

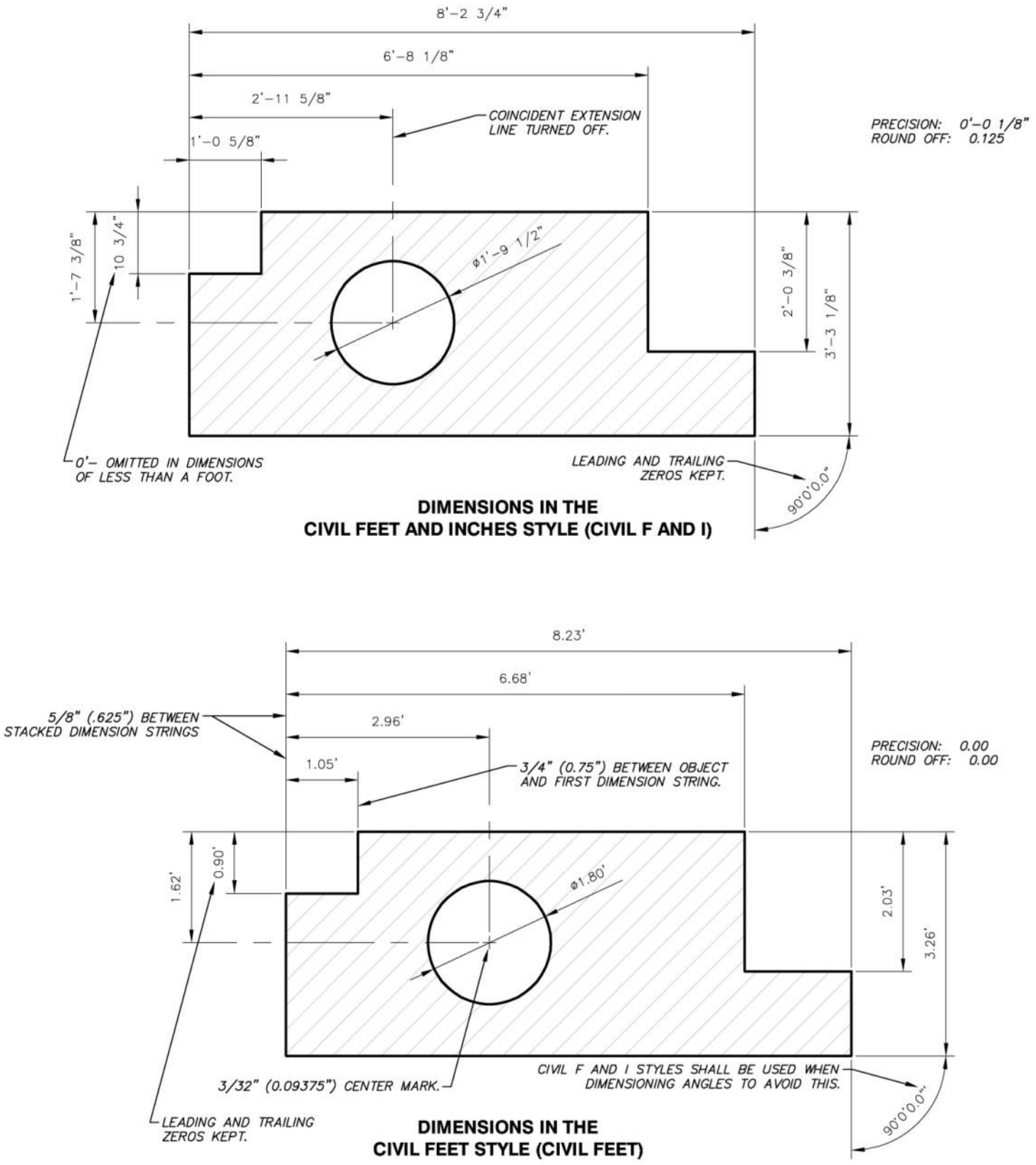


FIGURE 7.18 - ILLUSTRATIONS OF PCJPB'S CIVIL DIMENSION STYLES

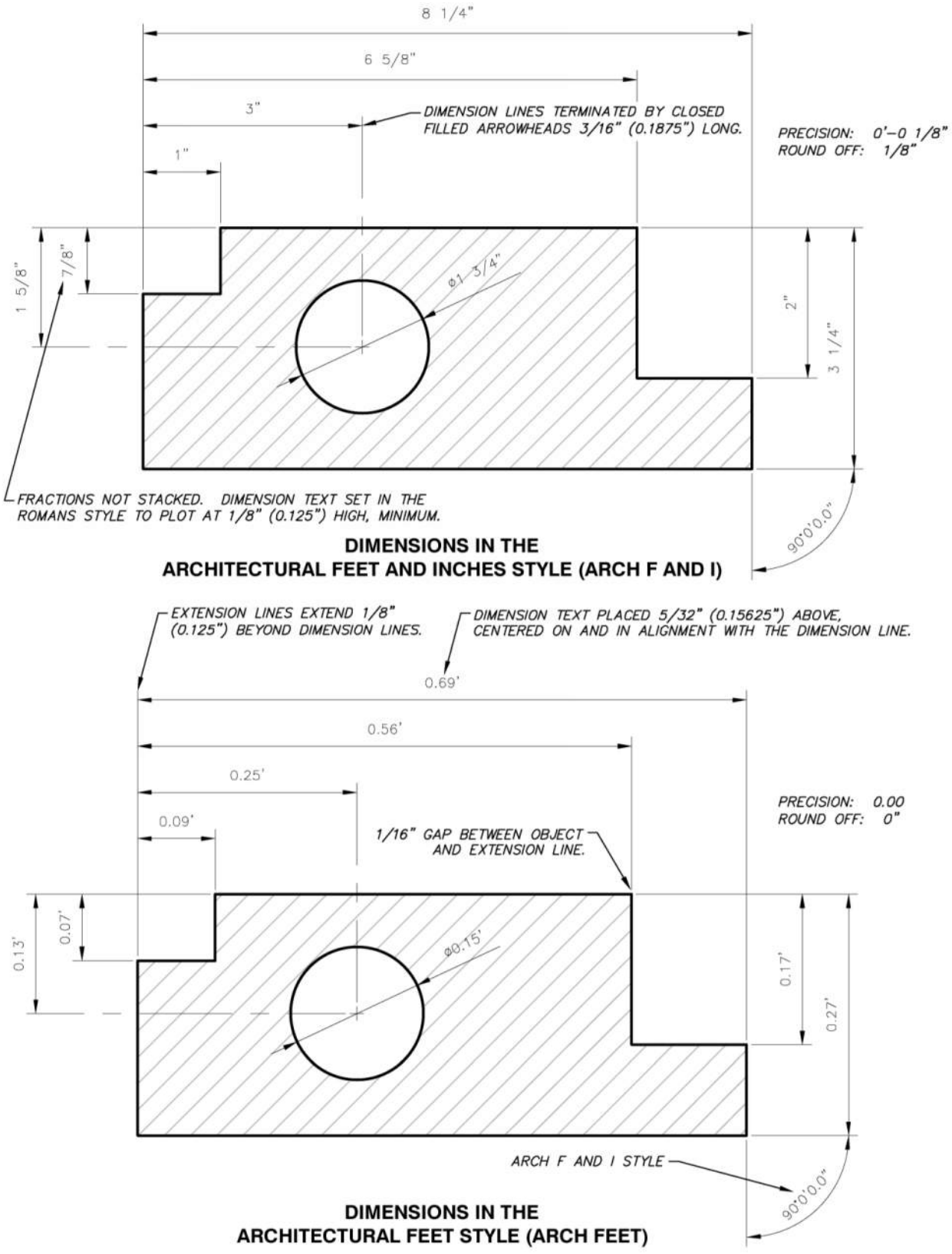


FIGURE 7.19 - ILLUSTRATIONS OF PCJPB'S ARCHITECTURAL DIMENSION STYLES

7.4 SHEET NOTES

Where possible, sheet notes (notes applicable to a whole drawing) shall be placed in the upper right-hand corner of the drawing space. Mtext shall be used for composing these notes. Each note shall be composed of single-spaced ROMANS style text 1/8" (0.125") high. A blank line shall separate each note in a column of notes from the notes immediately before and after it. Sheet notes text shall be assigned the color "ByLayer" and placed on a layer assigned either of the colors green or white. If needed, additional columns may be used for notes with the information always reading starting from the left most column and proceeding to the right. Multiple notes shall be numbered using Arabic numerals. Each numbered note shall be set off from its number using a 3/8" (0.375") hanging indent. Solitary notes shall not be numbered.

The heading "NOTES:" in 9/64" (0.1406") high underlined ROMANS style text shall be placed left justified and 0.150" above a column of notes. In similar fashion, the heading "NOTE:" shall be placed above solitary sheet notes. Single line text shall be used to create these headings. Sheet Note headings shall be assigned the color "ByLayer" and placed on a layer assigned the color cyan. Where multiple columns of notes occur, the heading "NOTES:" shall appear above the left-most column only. See *Figure 7.20*. See also *Figure 3.3* for ROMANS text style specifications.

7.5 LOCAL NOTES AND LABELS

Notes and labels applicable to just part of a drawing shall be placed near that part to which they apply. Text for local notes and labels shall be set in the ROMANS style, shall plot at 1/8" (0.125") high, be assigned the color "ByLayer" and be placed on a layer assigned either of the colors green or white. Single line text shall be used for short, single-line labels and for labels aligned with linear features such as track alignments, roads, streams and so forth. Multiline notes and labels without leaders attached shall be created using mtext. If appropriate, the heading "NOTE:" shall be placed over such multiline notes as described in **Subsection 7.4**. In all cases, notes and labels with leaders attached shall be multileader objects.

7.6 LEADERS AND MULTILEADERS

7.6.1 General

All leadered notes and labels shall be multileader objects created using the MLEADER command. No other AutoCAD commands for creating leaders shall be used.

Leaders shall be straight in all cases. Leaders shall preferably be drawn at an angle to the objects they point to. Leader angles shall be chosen in fifteen degree (15°) increments relative to the bottom edge of the drawing. As much as possible, leaders in a drawing shall be drawn parallel to each other.

A leader's landing distance shall equal the height of the mtext it is attached to. The landing gap shall be one-half the height of the mtext the leader is attached to. No landing gap shall exist between leaders and attached blocks, and the landing distance of a leader attached to a block shall equal one and one-half times the height of the text contained in the block. Leaders in multi-leaders shall have the same (ByLayer) color assignments as the mtext or blocks they are

attached to. Thus, a leader's line weight shall be the same as the stroke weight of the mtext or line weight of the block it is attached to. For leaders with line weights greater than 0.35mm, their terminator sizes shall increase from the corresponding standard multileader terminator sizes as the ratio of their line weights to the standard multileader line weight (0.35mm) increases. See *Figures 7.27* and *7.28*.

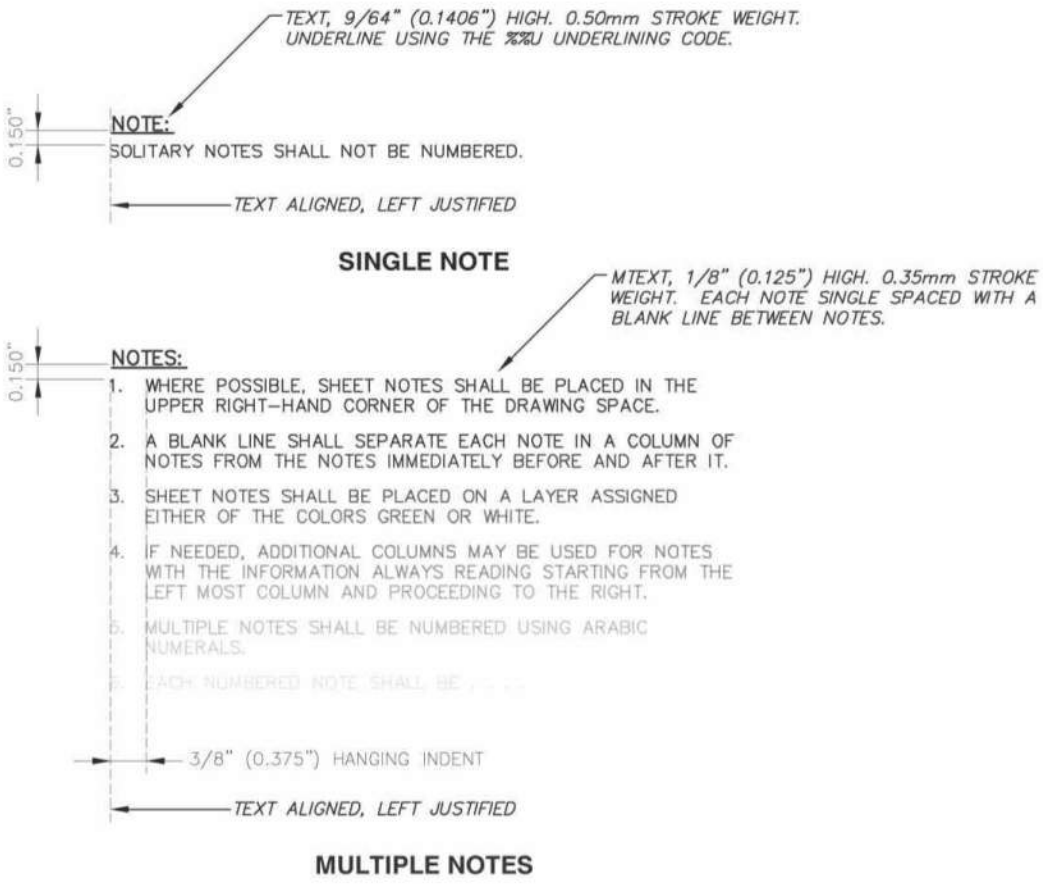


FIGURE 7.20 – FORMAT FOR SHEET NOTES

7.6.2 Multileader Styles

All multileaders shall be formatted using styles only. Formatting shall never be applied to multileader objects individually using the Properties palette or by any other means. PCJPB's template drawing files (see **Subsection 2.2**) include template multileader styles set up in accordance with the criteria given in this Section. The discussion regarding the creation of dimension styles in **Subsubsection 7.3.6** applies to multileader styles as well. Starting with the appropriate template style, a new style shall be created and named and the scale set on the Leader Structure tab in the Modify Multileader Style dialog box. None of the other settings shall change. In the style names listed below, "TXTS" stands for "small text" (1/8" (0.125") high, stroke weight 0.35mm), "TXTM" stands

for “medium text” (9/64” (0.1406”) high, stroke weight 0.50 mm), “TXTL” stands for “large text” (3/16” (0.1875”) high, stroke weight 0.70mm) and “TXTLX” stands for “extra-large text” (1/4” (0.25”) high and larger, stroke weight 0.90mm). See *Figure 3.3*.

7.6.3 Standard Multileaders

Standard multileaders, the type usually used for drawing annotation, shall be placed on annotation layers assigned either of the colors green or white. The standard multileader shall employ ROMANS style text 1/8” (0.125”) high. Standard multileader text shall be assigned the color “ByLayer.” Per the discussion in **Subsubsection 7.6.1**, the leader’s landing distance shall be 1/8” (0.125”) and the landing gap 1/16” (0.0625”). Leaders in standard multileaders shall be assigned the color “ByLayer” and shall thus have a line weight of 0.35mm. For standard multileaders, arrow terminators shall be closed filled arrows 3/16” (0.1875”) in length. Dot terminators shall be 5/32” (0.15625”) in diameter. Integral terminators shall be 3/16” (0.1875”) in length. And loop terminators shall be 3/16” (0.1875”) in length. The size of loop terminators, however, may vary as needed. A style shall be created for each variation. The standard multileader template styles currently defined in PCJPB’s template drawing files are listed below:

TXTS ARROW, TXTS DOT, TXTS INTEGRAL and TXTS LOOP

See *Figures 7.21* through *7.26* for settings to use for standard multi-leader styles. See *Tables 7.6* and *7.7* for style names and scale factors to use in creating standard multileader styles.

7.6.4 Nonstandard Multileaders

Nonstandard multileaders shall be those employing a block or text other than 1/8” (0.125”) high ROMANS style text. Nonstandard multileader styles shall be named in a fashion similar to the styles listed in *Tables 7.6* and *7.7* by using TXTM, TXTL, TXTLX or some other designation as appropriate in the style name. The non-standard multileader template styles currently defined in PCJPB’s template drawing files are listed below:

TXTM ARROW, TXTM DOT, TXTM INTEGRAL and TXTM LOOP

TXTL ARROW, TXTL DOT, TXTL INTEGRAL and TXTL LOOP

TXTLX ARROW, TXTLX DOT, TXTLX INTEGRAL and TXTLX LOOP

Per **Subsubsection 7.6.1**, the leaders of nonstandard multileaders shall be formatted based on the height and stroke weight of the mtext they are attached to. For nonstandard multileaders employing a block, their leaders shall be formatted based on the line weight of the block and the height of the text contained in the block.

For example, consider a multileader styled using the TXTM ARROW style. Per *Figure 3.3* the multileader’s text height is 9/64” (0.1406”). Thus, as discussed

earlier, its leader shall have a landing length of 9/64” (0.1406”) and a landing gap of 9/128” (0.0703”).

Continuing with the example above, per *Figure 3.3*, the stroke and line weights of the multileader are 0.50mm. For line weights of 0.35mm or less, the Standard Multileader arrowhead size of 3/16” (0.1875”) yields a range of acceptable proportions between the weight of the leader line and the size of its arrowhead, with the proportion corresponding to a line weight of 0.35mm being optimal. In this example, then, to preserve this proportion, the size of the arrowhead for the leader must increase in proportion to the increase in its leader’s line weight over 0.35mm. Thus, the arrowhead’s size shall increase by a factor of 0.50mm/0.35mm or approximately 1.4286. Applying this factor to the standard arrowhead size gives a size of 0.2679” for the arrowhead. Using this method, the appropriate terminator size for any nonstandard multileader can be determined. See *Table 7.5* for the proportionality factors and terminator sizes used for PCJPB’s currently defined nonstandard multileader styles. See also *Figures 7.27* and *7.28*.

Line/Stroke Weight (mm)	Proportionality Factor	Terminator Size			
		Arrow	Dot	Integral	Loop
0.50 (TXTM)	1.4286	0.2679”	0.2232”	0.2679”	0.2679”
0.70 (TXTL)	2.0000	0.3750”	0.3125”	0.3750”	0.3750”
0.90 (TXTLX)	2.5714	0.4821”	0.4018”	0.4821”	0.4821”

TABLE 7.5 – NONSTANDARD MULTILEADER TERMINATOR SIZES

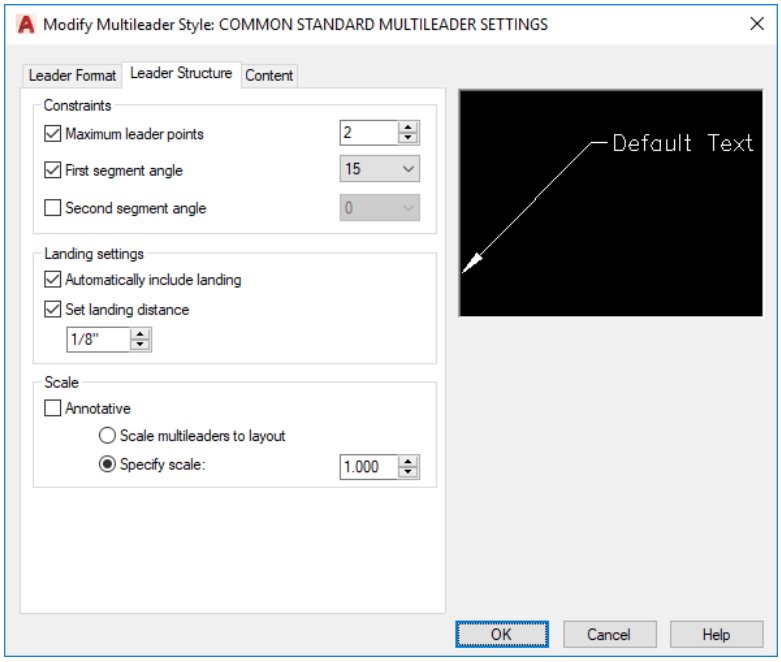


FIGURE 7.21 - SETTINGS COMMON TO ALL STANDARD MULTILEADER STYLES LEADER STRUCTURE TAB

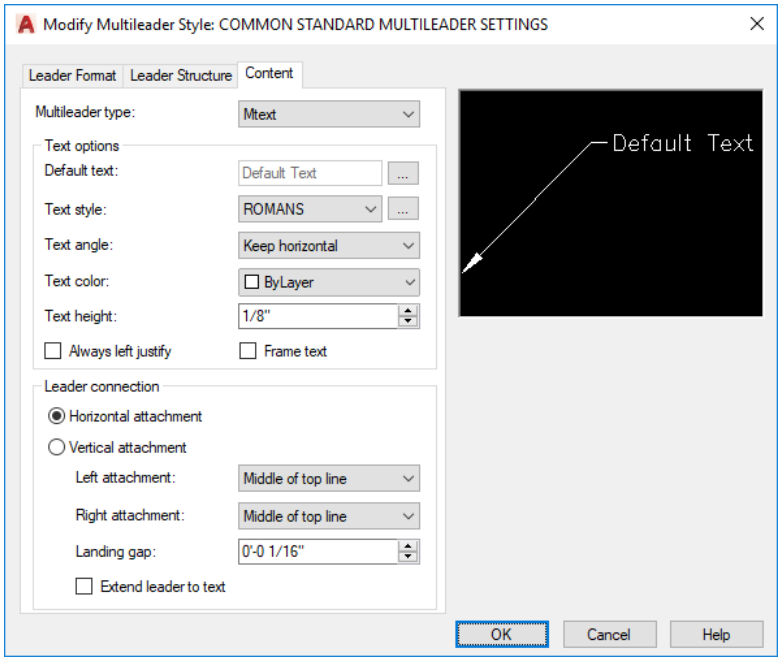


FIGURE 7.22 - SETTINGS COMMON TO ALL STANDARD MULTILEADER STYLES CONTENT TAB

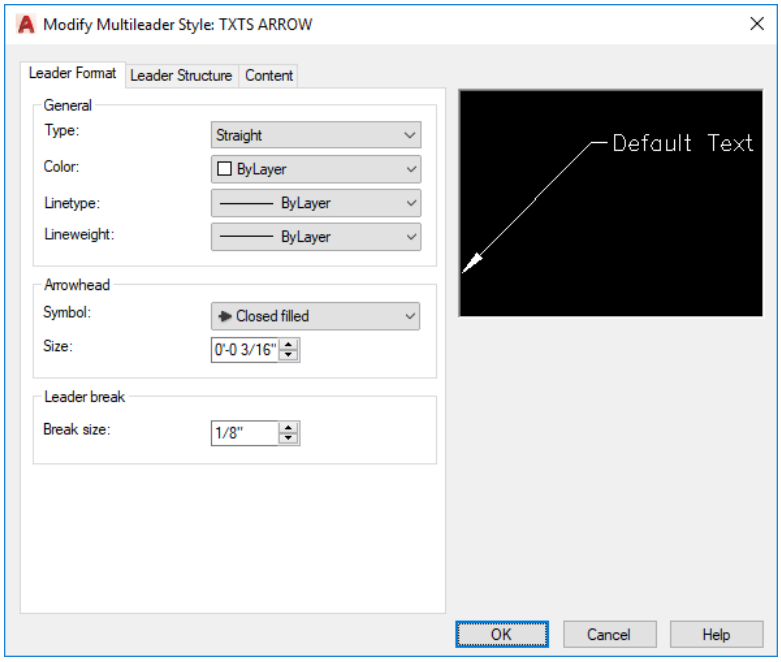


FIGURE 7.23 - TXTS ARROW MULTILEADER STYLE SETTINGS LEADER FORMAT TAB

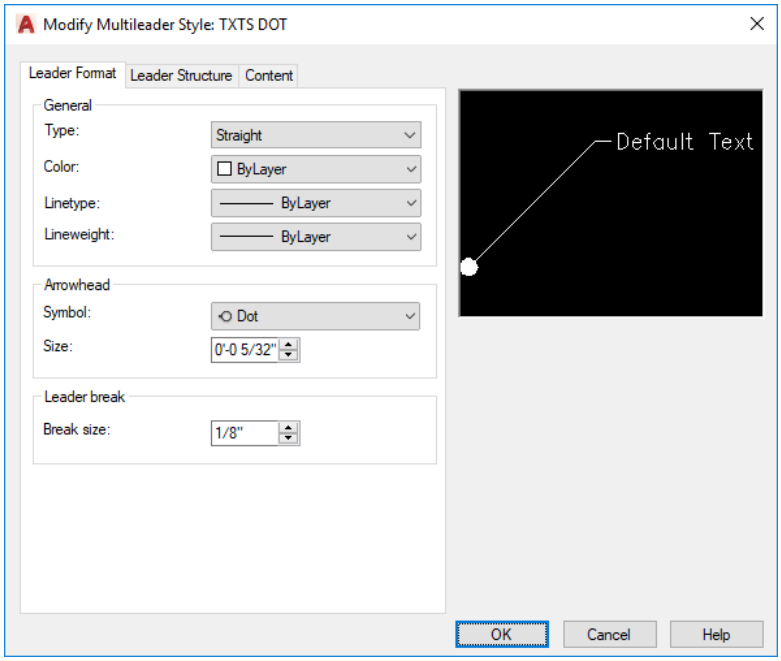


FIGURE 7.24 - TXTS DOT MULTILEADER STYLE SETTINGS LEADER FORMAT TAB

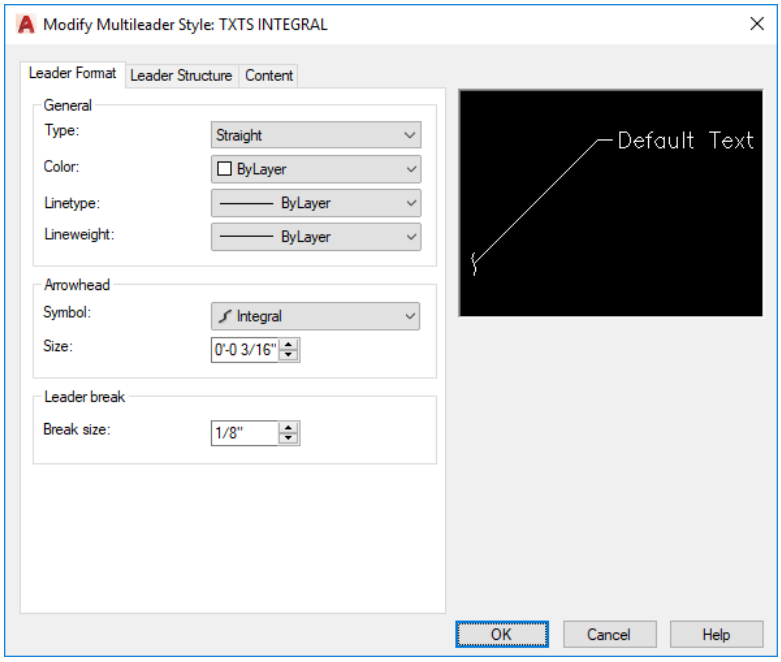


FIGURE 7.25 - TXTS INTEGRAL MULTILEADER STYLE SETTINGS LEADER FORMAT TAB

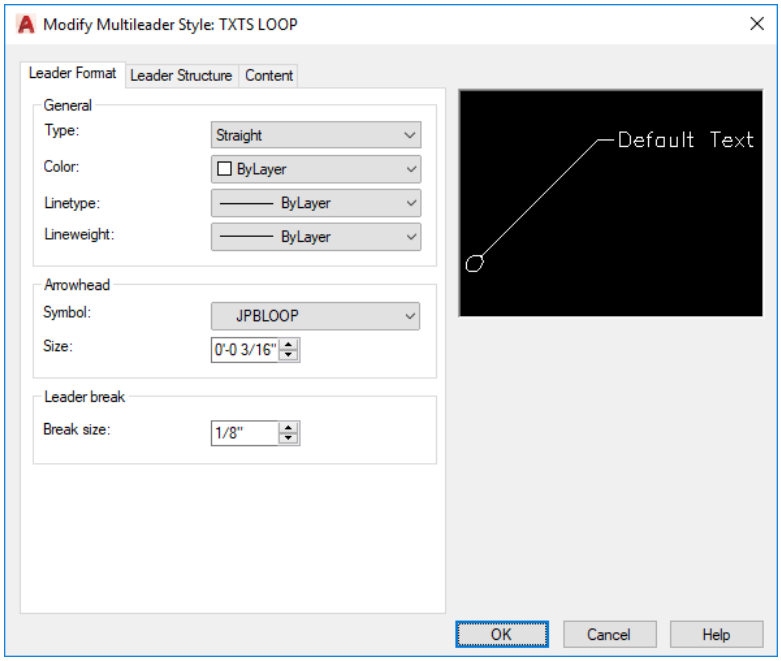


FIGURE 7.26 - TXTS LOOP MULTILEADER STYLE SETTINGS LEADER FORMAT TAB

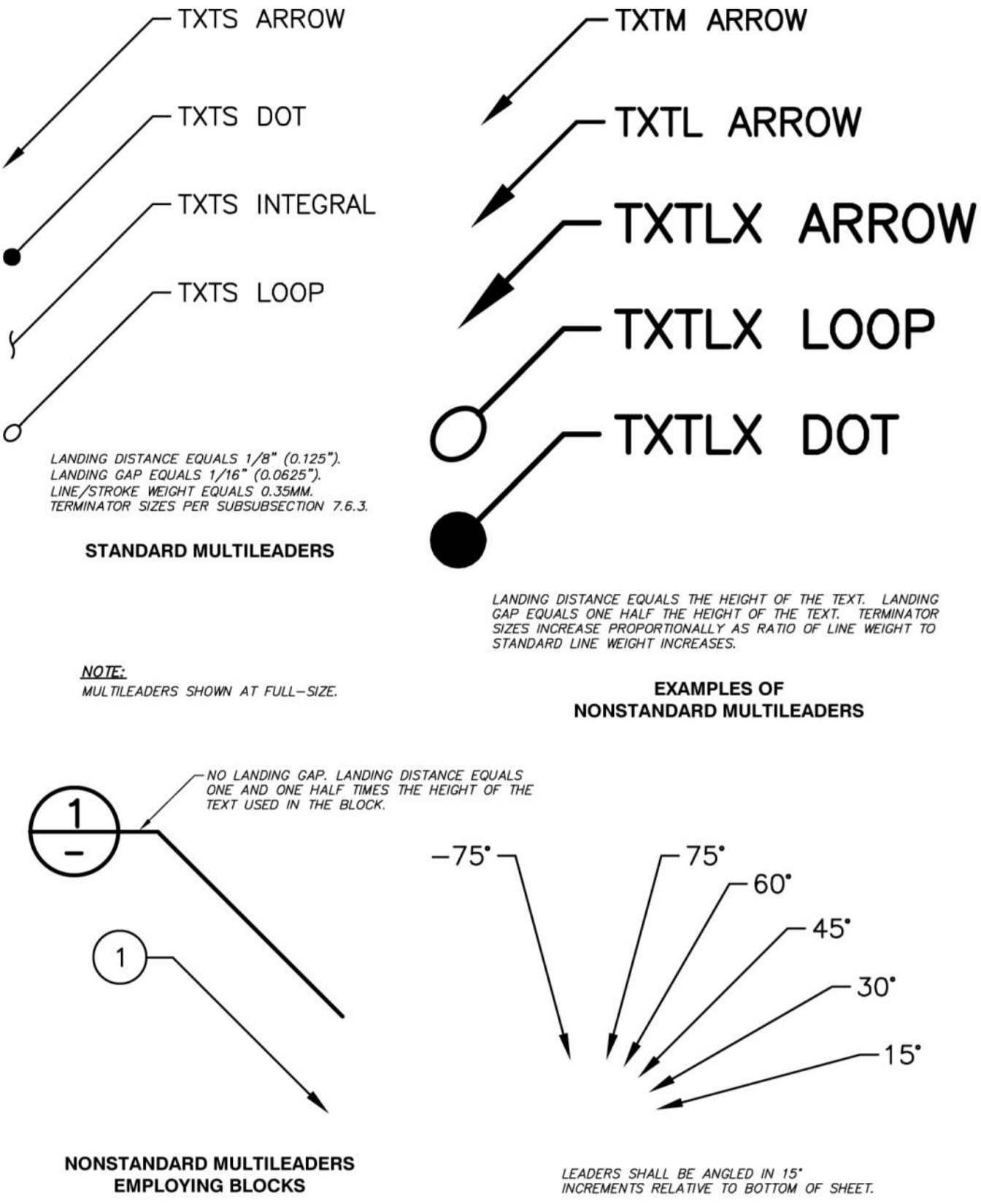


FIGURE 7.27 – ILLUSTRATIONS OF MULTILEADERS

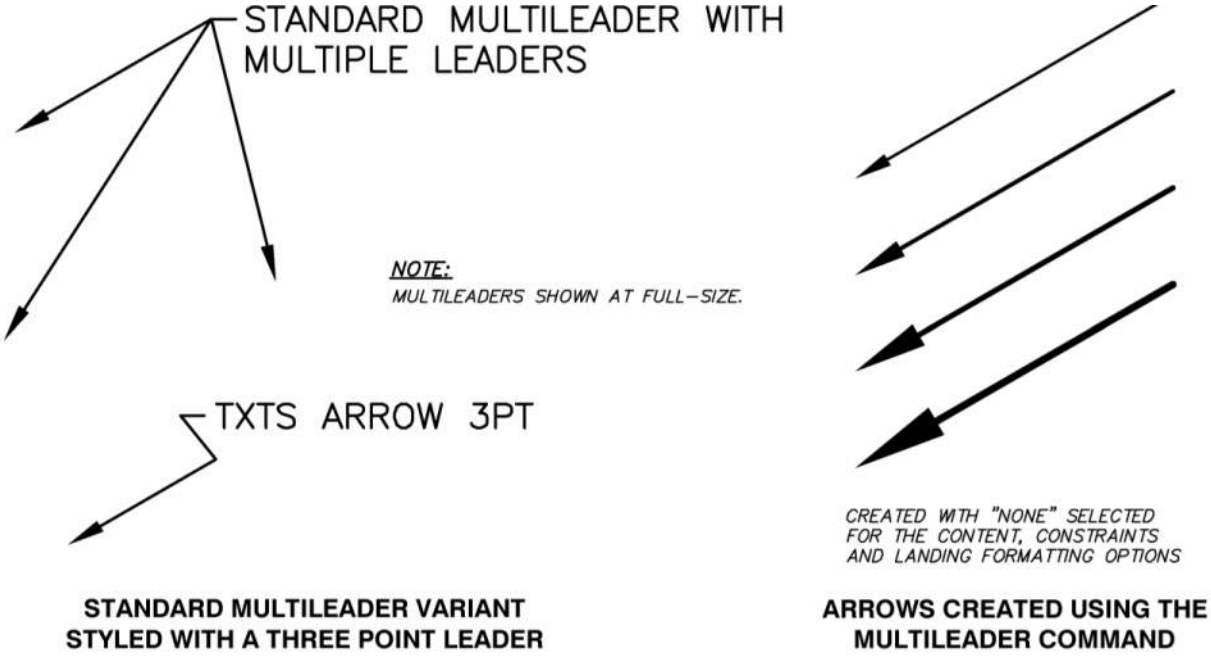


FIGURE 7.28 – MORE ILLUSTRATIONS OF MULTILEADERS

Scale	Multileader Style	Scale Specified on the Leader Structure Tab	Associated Zoom Scale Factor
FULL SIZE	FS TXTS ARROW	1/12	12 XP
6”=1’	6 TXTS ARROW	1/6	6 XP
3”=1’	3 TXTS ARROW	1/3	3 XP
1 1/2”=1’	3-2 TXTS ARROW	2/3	3/2 XP
1”=1’	1 TXTS ARROW	1	1 XP
3/4"=1’	3-4 TXTS ARROW	4/3	3/4 XP
1/2"=1’	1-2 TXTS ARROW	2	1/2 XP
3/8”=1’	3-8 TXTS ARROW	8/3	3/8 XP
1/4"=1’	1-4 TXTS ARROW	4	1/4 XP
3/16”=1’	3-16 TXTS ARROW	16/3	3/16 XP
1/8”=1’	1-8 TXTS ARROW	8	1/8 XP
1”=10’	10 TXTS ARROW	10	1/10 XP
3/32”=1’	3-32 TXTS ARROW	32/3	3/32 XP
1/16”=1’	1-16 TXTS ARROW	16	1/16 XP
1”=20’	20 TXTS ARROW	20	1/20 XP
1”=40’	40 TXTS ARROW	40	1/40 XP
1”=50’	50 TXTS ARROW	50	1/50 XP
1”=60’	60 TXTS ARROW	60	1/60 XP
1”=80’	80 TXTS ARROW	80	1/80 XP
1”=100’	100 TXTS ARROW	100	1/100 XP
1”=200’	200 TXTS ARROW	200	1/200 XP
1”=500’	500 TXTS ARROW	500	1/500 XP
1”=1,000’	1000 TXTS ARROW	1,000	1/1,000 XP

Notes: Styles based on the TXTS ARROW template style shown.
AutoCAD unit for length represents the International Foot.

TABLE 7.6 - SELECTED STANDARD MULTILEADER STYLES
UNIT FOR LENGTH REPRESENTS THE INTERNATIONAL FOOT

Scale	Multileader Style	Scale Specified on the Leader Structure Tab	Associated Zoom Scale Factor
FULL SIZE	FS TXTS ARROW	1	1 XP
6’=1’-0”	6 TXTS ARROW	2	1/2 XP
3”=1’-0”	3 TXTS ARROW	4	1/4 XP
1 1/2"=1’-0”	3-2 TXTS ARROW	8	1/8 XP
1”=1’-0”	1 TXTS ARROW	12	1/12 XP
3/4"=1’-0”	3-4 TXTS ARROW	16	1/16 XP
1/2"=1’-0”	1-2 TXTS ARROW	24	1/24 XP
3/8”=1’-0”	3-8 TXTS ARROW	32	1/32 XP
1/4"=1’-0”	1-4 TXTS ARROW	48	1/48 XP
3/16”=1’-0”	3-16 TXTS ARROW	64	1/64 XP
1/8”=1’-0”	1-8 TXTS ARROW	96	1/96 XP
1”=10’-0”	10 TXTS ARROW	120	1/120 XP
3/32”=1’-0”	3-32 TXTS ARROW	128	1/128 XP
1/16”=1’-0”	1-16 TXTS ARROW	192	1/192 XP
1”=20’-0”	20 TXTS ARROW	240	1/240 XP
1”=40’-0”	40 TXTS ARROW	480	1/480 XP
1”=50’-0”	50 TXTS ARROW	600	1/600 XP
1”=60’-0”	60 TXTS ARROW	720	1/720 XP
1”=80’-0”	80 TXTS ARROW	960	1/960 XP
1”=100’-0”	100 TXTS ARROW	1,200	1/1,200 XP
1”=200’-0”	200 TXTS ARROW	2,400	1/2,400 XP
1”=500’-0”	500 TXTS ARROW	6,000	1/6,000 XP
1”=1,000’-0”	1000 TXTS ARROW	12,000	1/12,000 XP

Notes: Styles based on the TXTS ARROW template style shown.
AutoCAD unit for length represents the inch.

TABLE 7.7 - SELECTED STANDARD MULTILEADER STYLES
UNIT FOR LENGTH REPRESENTS THE INCH

7.7 MATCH LINES

Drawing detail, because of its extent and the scale at which it is shown, is often presented in a succession of two or more contiguous views. These are adjoining views in which the detail in each succeeding view continues from where it ended in the previous view. Wherever this occurs, match lines shall be provided at the abutting edges of such views.

Match lines shall be drawn in Paper Space coincident with the abutting edges of viewports displaying contiguous views. Match lines shall be labeled as in the following example: “MATCH LINE, SEE DWG C107.” The drawing a match line label refers to shall be that sheet displaying the adjoining contiguous view. Or, should detail continue on the same sheet in another contiguous view, the label shall read as “MATCH LINE, SEE ABOVE RIGHT” or “MATCH LINE, SEE BELOW LEFT” or else as appropriate. Match line labels shall be shown parallel to the match line and on the side opposite of drawing detail. Match line label text shall be set in the ROMANS style and be 1/4” (0.25”) high. Match lines and their labels shall be placed on a layer assigned the color magenta and the line type “Match.” This line type may be found in PCJPB’s line type file, PCJPB.lin. (See **Appendix 6**.)

On plans that display an alignment in contiguous views, the viewport edges cutting that alignment and their coincident match lines shall intersect the subject alignment at either half (XXX+50) or full (XXX+00) stations and such that they are perpendicular to tangents and radial to arcs and spirals of that alignment. In such cases, match line labels shall include the alignment’s name and it’s stationing at the point where the match line intersects it, as “MATCH LINE, MT-1, STA 221+00, DWG T107.” See *Figure 7.29*.

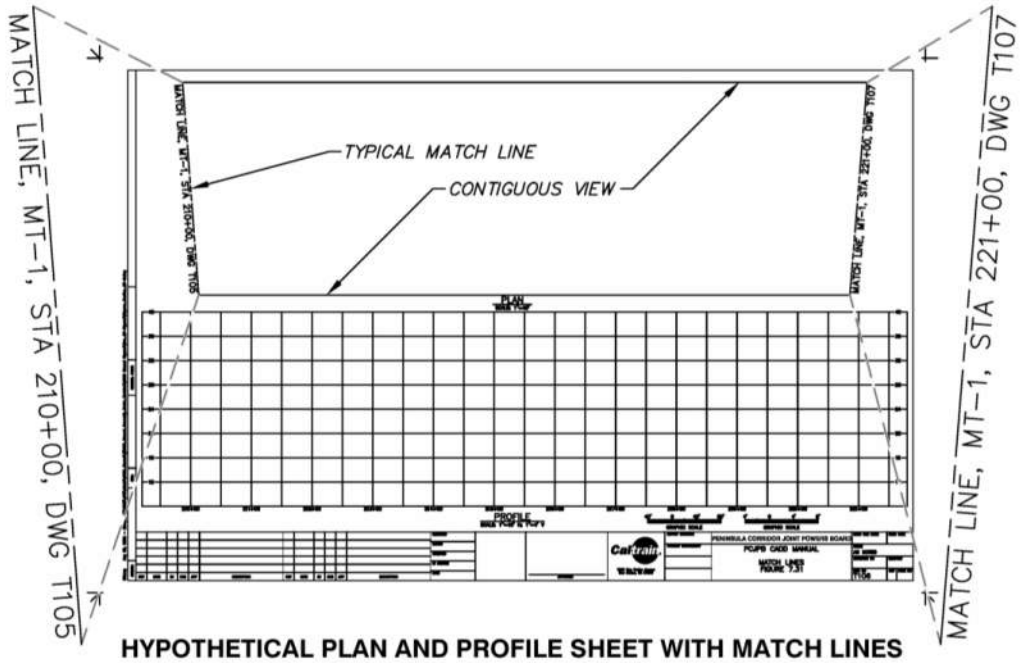


FIGURE 7.29 - MATCH LINES

7.8 IDENTIFYING PLANS, DETAILS, ELEVATIONS, PROFILES AND SECTIONS

7.8.1 General

All plans, details, elevations, etc. in a set of project drawings shall be clearly identified with titles and callouts. Titles and callouts shall be provided with backward and forward sheet references, respectively, to allow those using a set of drawings to navigate easily through the set. PCJPB has created a number of blocks to facilitate the creation of titles and callouts. These blocks and their use are described and illustrated in more detail below. See *Figures 7.30* and *7.31*.

7.8.2 Titles

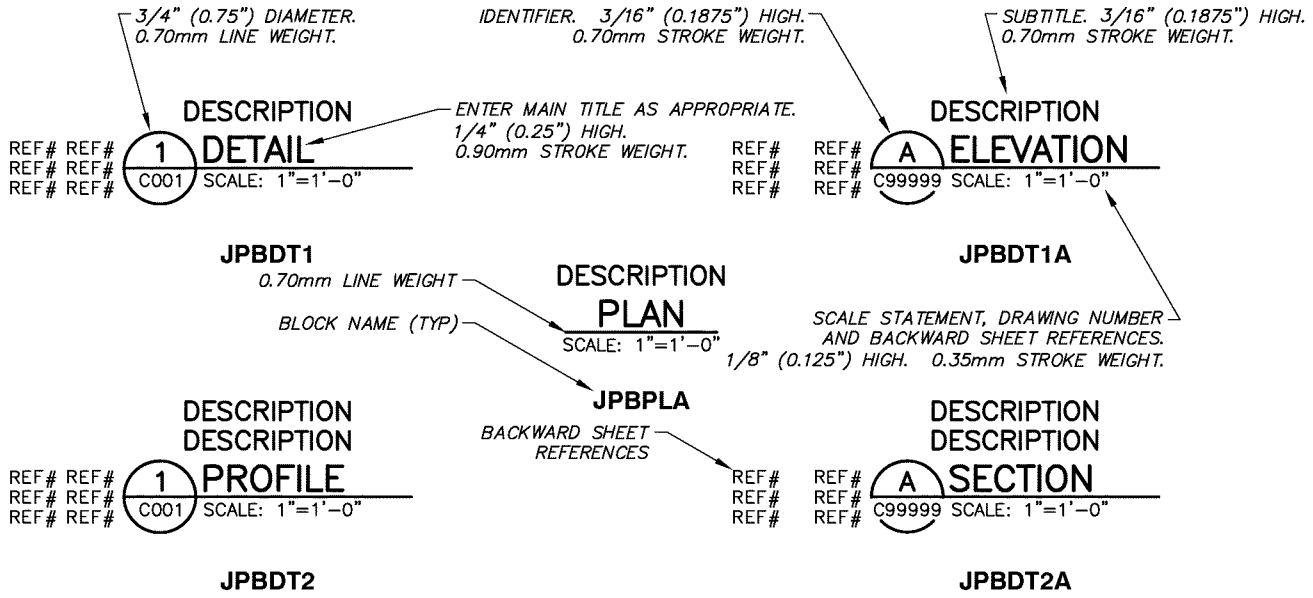
A title shall be provided under each part or sub-part of a drawing. Titles shall be set in ROMANS style text. Main titles shall be underlined with a line placed on a layer assigned the color blue. The underline shall span the length of the title, including any scale notation. Titles of cross sections cutting alignments shall include as a subtitle the name of the controlling alignment and the station along that alignment at which they are taken, as “MT-1, 200+00.”

7.8.3 Details

Details shall be identified with numerals. The drawing number(s) of the drawing(s) on which a particular detail is called out shall be shown on the left-hand side of its title. Should a detail be called out and shown in one and only one drawing, a hyphen shall replace the drawing number in both the callout and title. Objects or areas to be shown in detail shall be enclosed, where appropriate, with a reference bubble. Reference bubbles shall be placed on a layer assigned the color blue and the line type DASHED2. This line type may be found in AutoCAD’s line type file, acad.lin. The bubble shall be connected to its corresponding detail callout with a leader line placed on a layer assigned the color blue and line type CONTINUOUS. See *Figure 7.32* for illustrations of how to call out and identify details.

7.8.4 Elevations

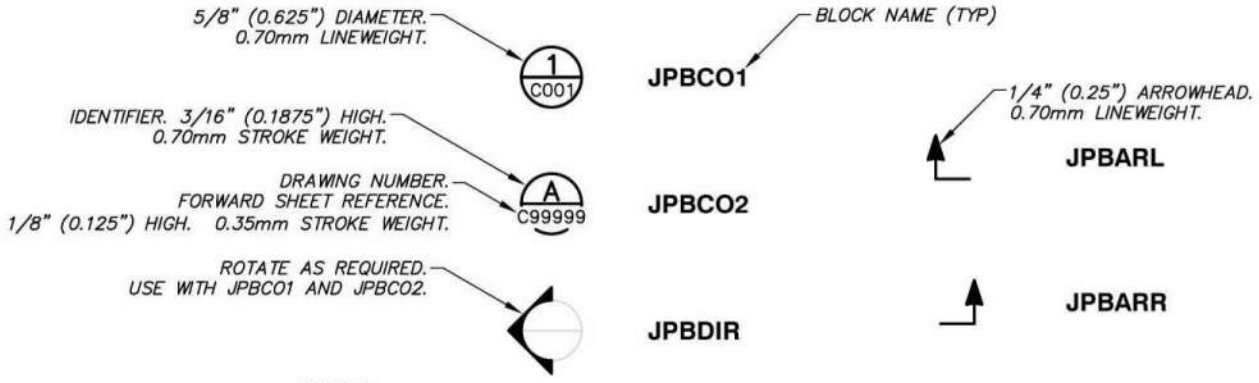
In many instances, elevations are treated in a fashion similar to details and sections. In such cases, elevations shall be identified with letters and shall be called out in alphabetical order from left to right and from top to bottom in a drawing. The drawing number(s) of the drawing(s) on which such an elevation is called out shall be shown on the left-hand side of its title. Should such an elevation be called out and shown on one and only one drawing, a hyphen shall replace the drawing number in both the callout and title. The discussion below for similar sections also applies to similar elevations. *Figure 7.33* gives examples of the treatment of elevations.



NOTES:

1. THE TEXT HEIGHTS, DIMENSIONS AND WEIGHTS SHOWN ARE TYPICAL OF ALL THE BLOCKS ILLUSTRATED IN THIS FIGURE. BLOCKS ARE SHOWN AT HALF-SIZE.
2. USE JPBDT1A AND JPBDT2A TO ENTITLE DETAILS, ELEVATIONS, ETC. SHOWN ON SHEETS WITH LONGER DRAWING NUMBERS OF FIVE TO SIX CHARACTERS.
3. THE UNIT FOR LENGTH FOR THESE BLOCKS IS SET TO REPRESENT THE INCH, SO A UNITS SCALING FACTOR OF TWELVE (12) SHALL HAVE TO BE APPLIED IN COMBINATION WITH ANY VIEWPORT SCALING FACTOR WHEN THEY ARE INSERTED INTO DRAWING FILES WHOSE UNIT FOR LENGTH REPRESENTS THE INTERNATIONAL FOOT.

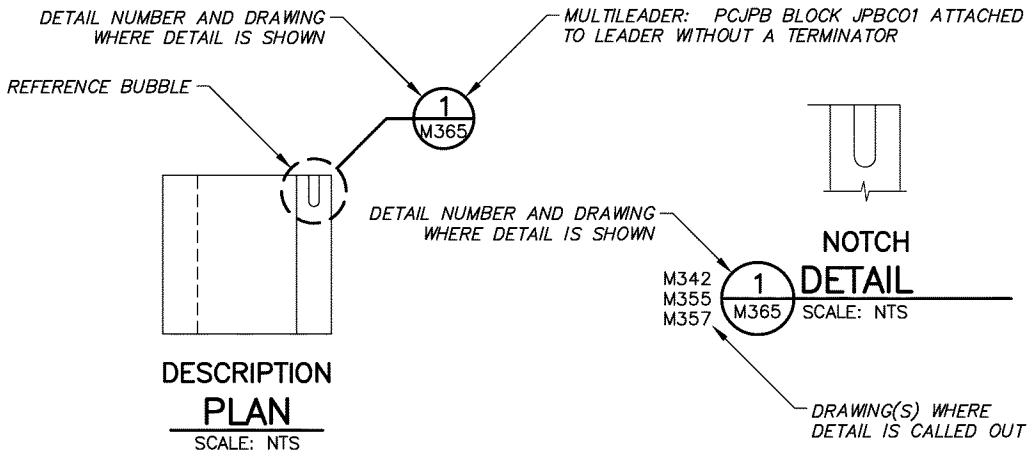
FIGURE 7.30 - BLOCKS FOR CREATING TITLES



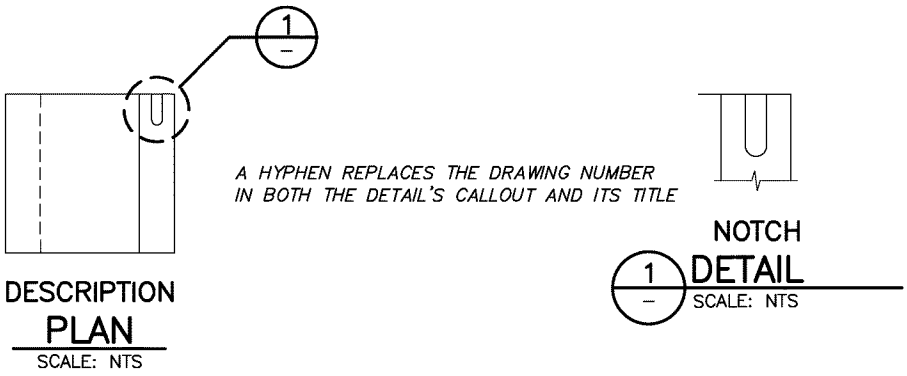
NOTES:

1. TEXT HEIGHTS, DIMENSIONS AND WEIGHTS SHOWN ARE TYPICAL. BLOCKS ARE SHOWN AT HALF-SIZE.
2. USE JPBCO2 TO CALL OUT DETAILS, ELEVATIONS, ETC. SHOWN ON SHEETS WITH LONGER DRAWING NUMBERS OF FIVE TO SIX CHARACTERS.
3. NOTE 3 IN FIGURE 7.32 APPLIES TO THESE BLOCKS AS WELL.

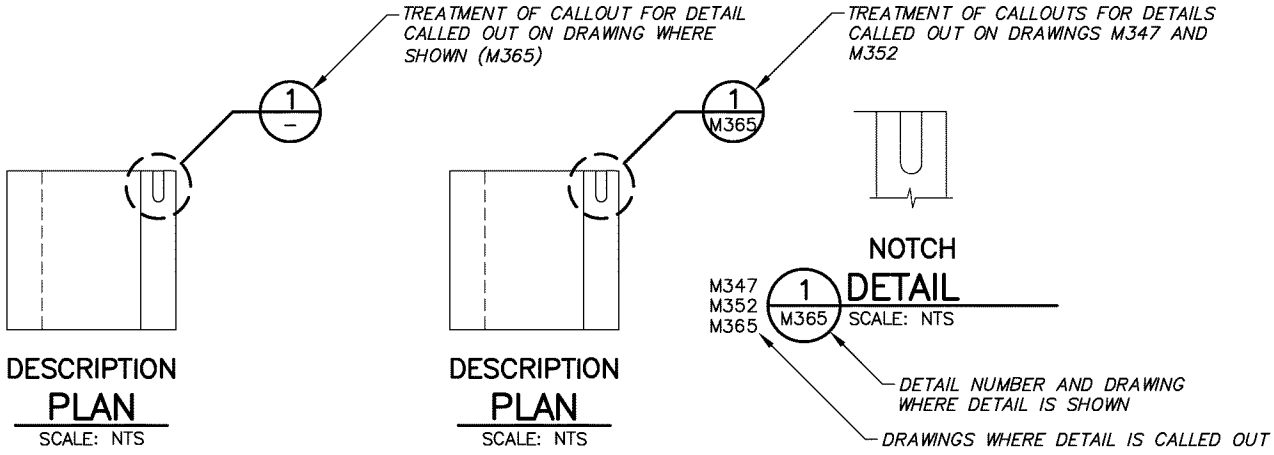
FIGURE 7.31 - BLOCKS FOR CALLING OUT DETAILS, ELEVATIONS AND PROFILES AND FOR CUTTING SECTIONS



TYPICAL DETAIL



DETAIL CALLED OUT AND SHOWN ON ONE AND ONLY ONE DRAWING



DETAIL CALLED OUT ON MULTIPLE DRAWINGS INCLUDING THE ONE WHERE SHOWN

FIGURE 7.32 - DETAIL EXAMPLES

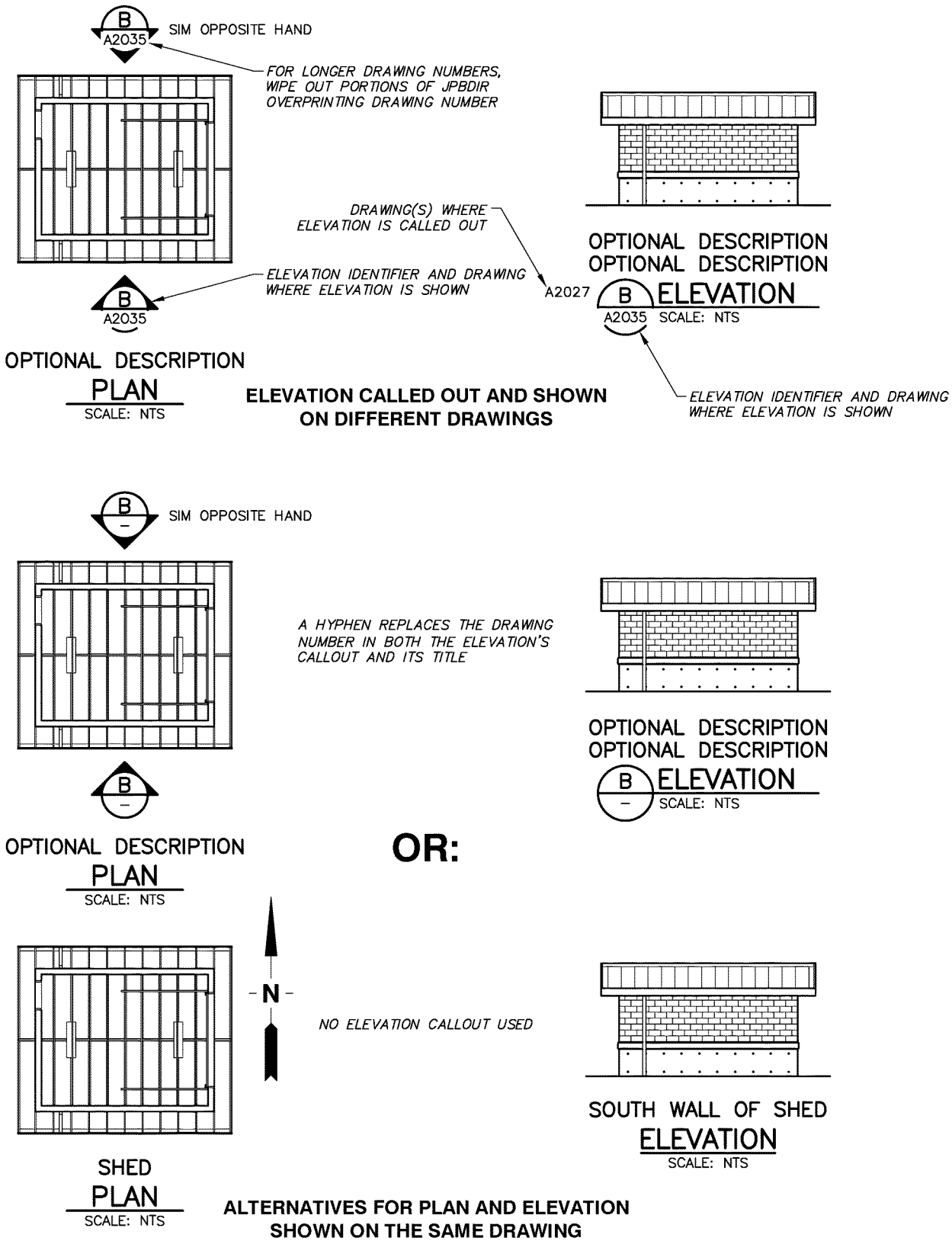


FIGURE 7.33 - ELEVATION EXAMPLES

7.8.5 Profiles

Utility lines and their profiles shall be identified with numerals. Utility line profiles shall be called out in numerical order from left to right and from top to bottom in a drawing. The drawing number(s) of the drawing(s) on which a particular profile is called out shall be shown on the left-hand side of its title. Should a profile be called out and shown in one and only one drawing, a hyphen shall replace the drawing number in both its callout and title. See *Figure 7.34* for an example of the treatment of profiles.

7.8.6 Sections

Sections shall be identified with letters. Sections shall be called out in alphabetical order from left to right and from top to bottom in a drawing. The drawing number(s) of the drawing(s) on which a particular section is cut shall be shown on the left-hand side of its title. Should a section be taken and shown in one and only one drawing, a hyphen shall replace the drawing number in both its callout and title. *Figure 7.35* illustrates the treatment of sections.

If a section is similar to one already shown, the similar section's callout shall refer to the existing section and be marked with the label "SIM" to indicate that the sections are similar. Another drawing showing the similar section would not then be required. A brief explanation of how the sections differ, such as "OPP HAND" or "EXCEPT AS NOTED," shall also be provided. The word "SAME" shall not be used. See *Figure 7.35*.

7.8.7 Track Segment Cross Sections

Track segment cross sections cut at regular intervals for use in earthwork calculations and definition of limits of construction shall not be identified on plan sheets.

7.9 IDENTIFYING COMPONENTS

The components of equipment, fixtures and so on shown in a drawing shall be labeled as required using the same terminology as in the manufacturer's technical specification. If abbreviations are used, they shall be the same as those shown on the abbreviations sheets.

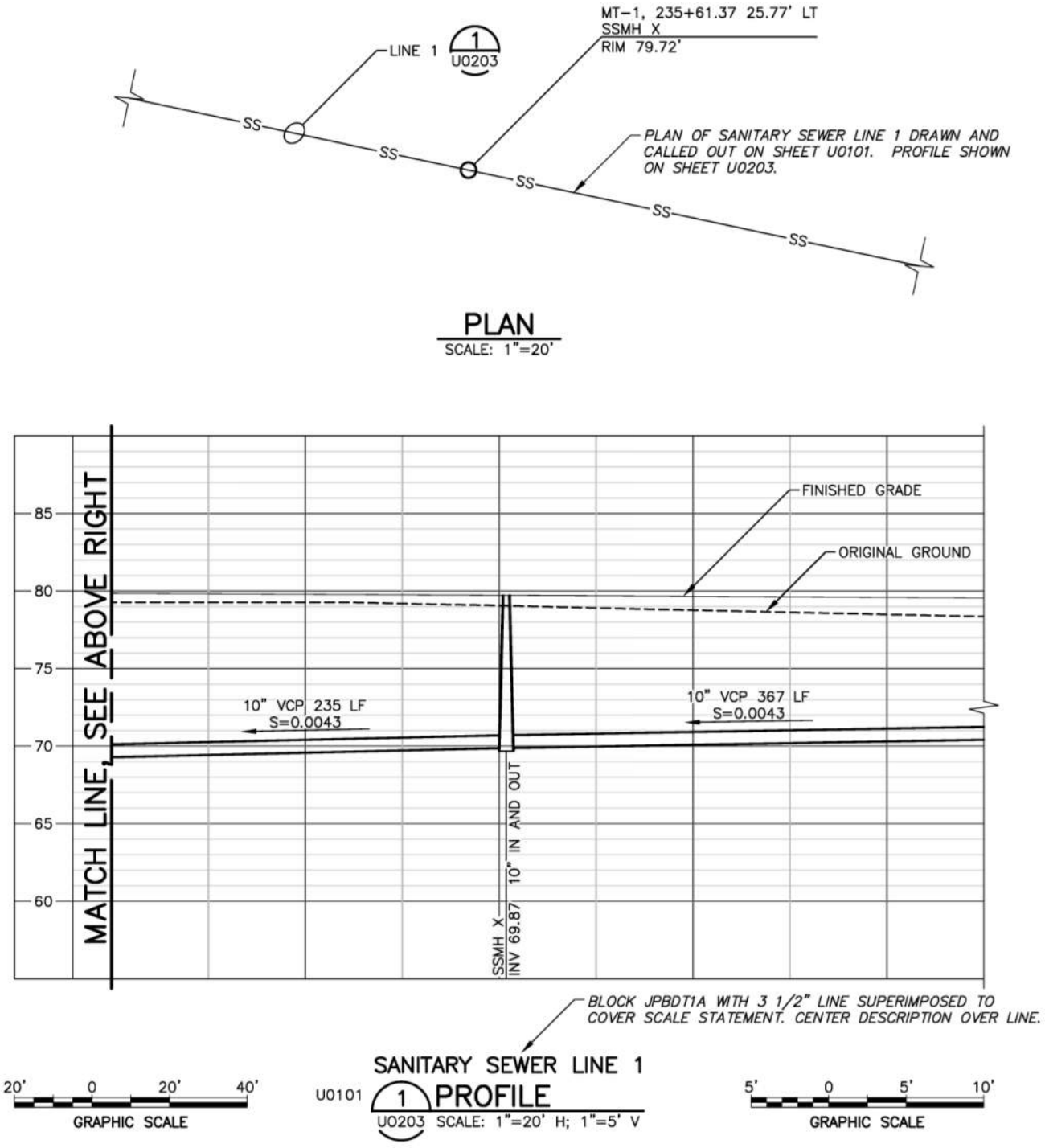


FIGURE 7.34 - PROFILE EXAMPLE

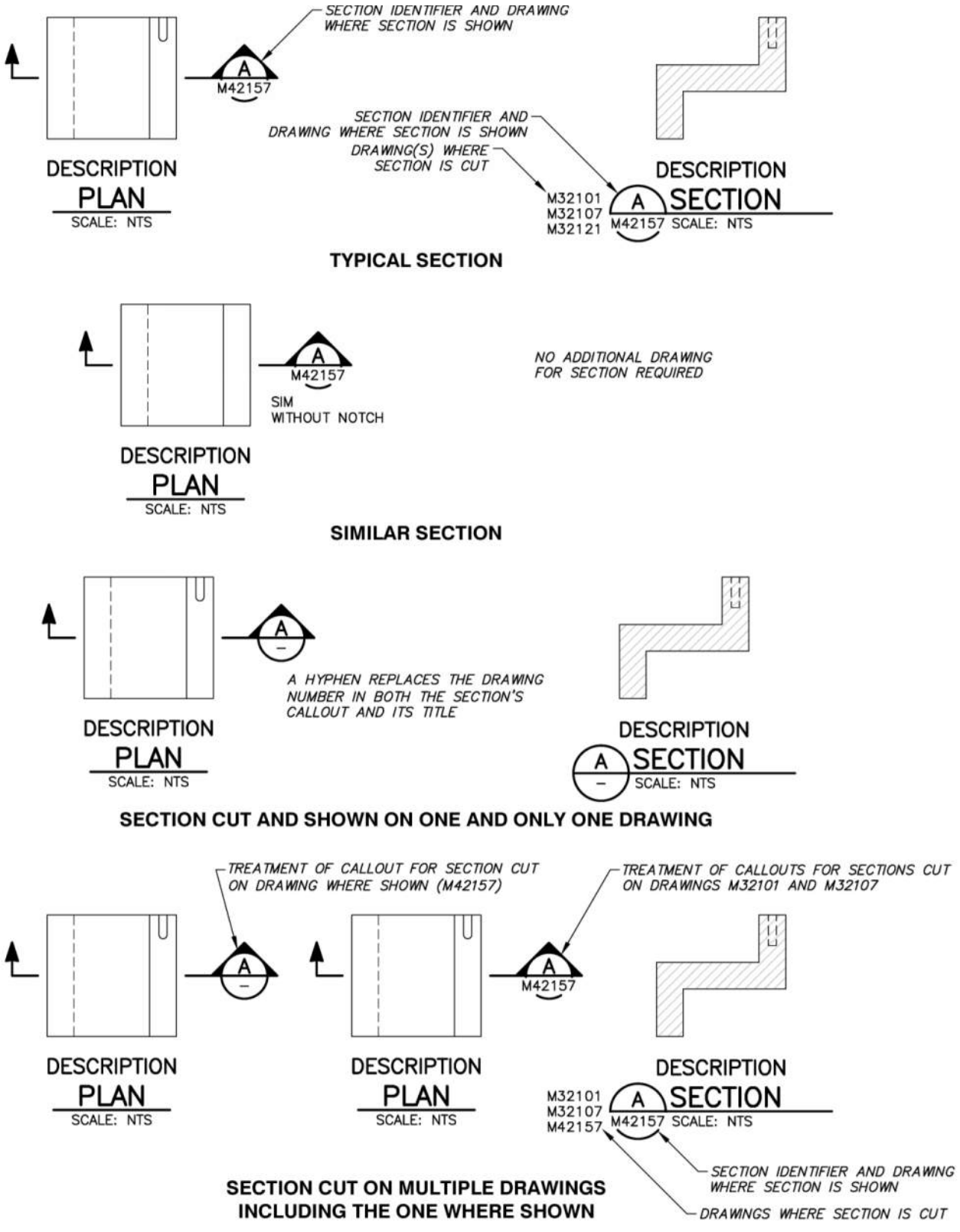


FIGURE 7.35 - SECTION EXAMPLES

END OF SECTION 7

SECTION 8
DRAWING ORGANIZATION AND DESIGN GUIDELINES

CONTENTS

FIGURES

SECTION 8
DRAWING ORGANIZATION AND DESIGN GUIDELINES

8.1 GENERAL

When preparing designs for PCJPB, designers shall adhere to the standards and best practices customary for their disciplines. When choosing architectural and engineering scales, they shall keep in mind that project drawings, except those comprising construction drawing sets, will typically be submitted, distributed and reviewed on 17" x 11" sheets.

Subsection 8.2 lists the overall assembly order for PCJPB project drawings. Each project is different. Some projects may involve many disciplines, others only a few. For a larger project, work may be split up into modules, each module involving a different location or aspect of the project. Therefore, the submittal package(s) for each project or module will be unique. Usually, not all disciplines and drawing types will be represented in each package. For all projects, however, submitted drawings shall be assembled in the same general order given below. When a project involves multiple locations along Caltrain's right-of-way, PCJPB recommends that the project drawings be assembled by location, that is, that all drawings of the various disciplines pertaining to each locale be kept together and assembled in the order given in **Subsection 8.2**.

Subsequent subsections discuss the order of assembly, content and scale for drawings within each discipline. These requirements shall apply to all project design, IFB, construction and record drawing submittals.

8.2 ORDER OF ASSEMBLY FOR PROJECT DRAWINGS

Drawings common to all disciplines, such as index of drawings sheets, standard abbreviations sheets and so on, shall come first. Drawings for each discipline shall come next as listed below followed by any reference drawings.

Common Drawings:

- Cover/Title Sheet
- Index of Drawings Sheet(s)
- PCJPB General Notes Sheet (Provided by PCJPB)
- PCJPB Standard Abbreviations Sheet (Provided by PCJPB)
- PCJPB Standard Symbols Sheet (Provided by PCJPB)
- General Plan and Sheet Index Drawing
- Track Chart Drawings

Discipline Drawings:

- Civil and Track Alignment
- Utility

- Architectural
- Landscape
- Structural
- Mechanical
- Electrical
- Traction
- Overhead Contact System (OCS)
- Communications
- Fare Collection
- Supervisory Control and Data Acquisition (SCADA)
- Train Control
- Corrosion Control
- Rolling Stock

A typical example of civil drawings assembled for submittal is shown in **Appendix 2**.

8.3 COMMON DRAWINGS

8.3.2 Cover/Title Sheet

As discussed in **Section 6**, each set of submitted project drawings shall have a Cover/Title sheet. See *Figure 6.7* for an example.

8.3.3 Index of Drawings

Requirements for Index of Drawings sheets are discussed in detail in **Section 6**. See *Figures 6.1* through *6.5*.

8.3.4 PCJPB General Notes Sheet

This sheet contains notes applicable to the entire project. See **Section 6**.

8.3.5 PCJPB Standard Abbreviations Sheets

PCJPB has developed several abbreviations sheets. They contain standard abbreviations that shall be used in all project drawings. See **Section 6**.

8.3.6 PCJPB Standard Symbols Sheets

PCJPB has also developed several symbols sheets. They contain standard symbols that shall be used in all project drawings. See **Section 6**.

8.3.7 General Plan and Sheet Index Drawing

The General Plan and Sheet Index drawing shall be drawn on a single sheet, if possible. It shall provide an overview of the whole project area, showing the limits of construction and the area covered by each plan sheet. Each indexed sheet shall be clearly identified with its drawing number. This drawing shall also show alignments within the project limits. Any major structures to be built or modified as part of the project and their

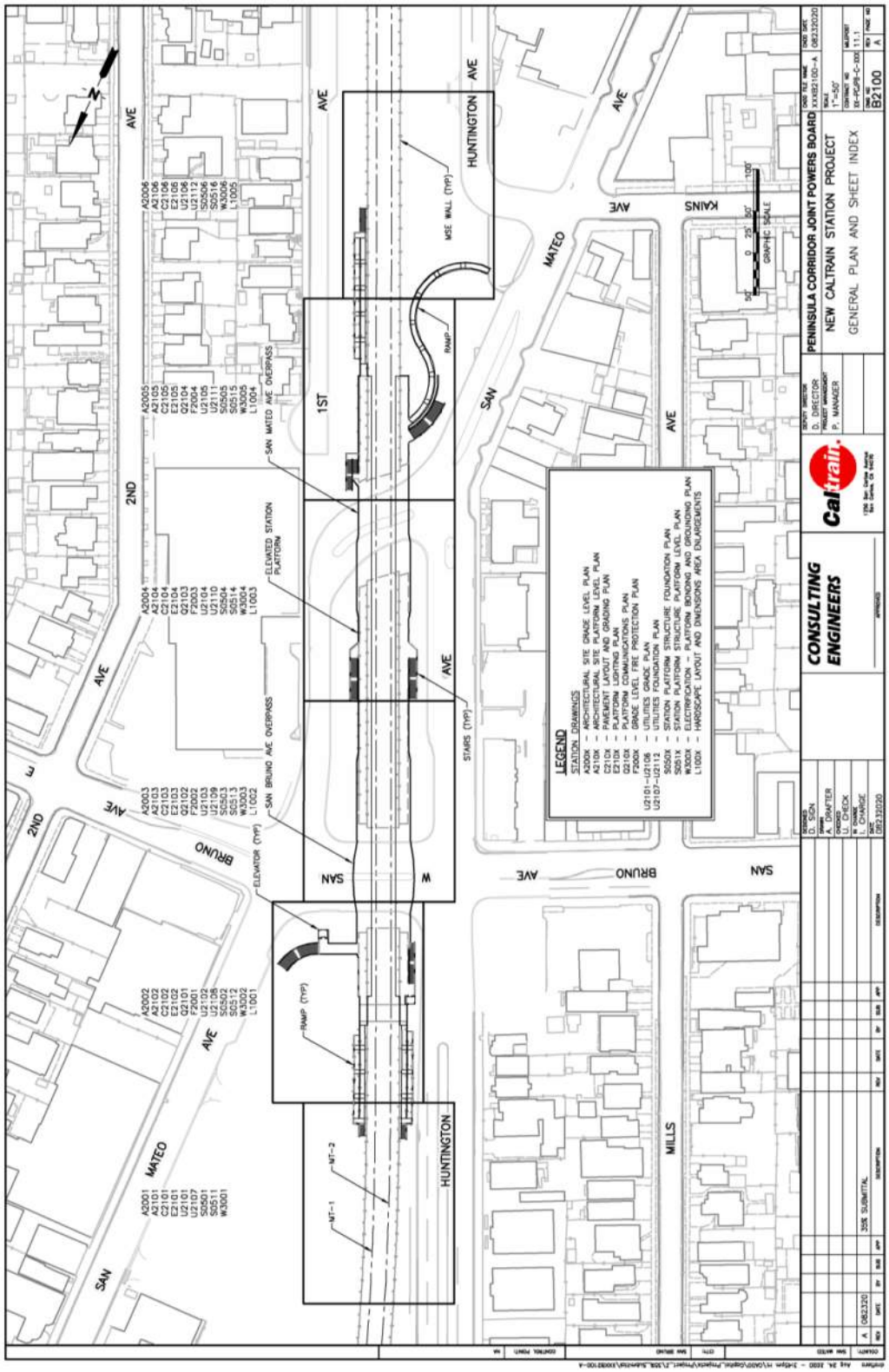


FIGURE 8.1 - GENERAL PLAN AND SHEET INDEX DRAWING

respective plan sheet numbers shall be shown as well. If space allows, survey control information may also be included on this sheet. The engineer in charge shall sign and seal this drawing. See *Figure 8.1*.

8.3.8 Track Chart Drawings

For each construction project, as part of the design effort, the design consultant shall modify sections of PCJPB's Master Track Chart as required to show changes implementation of the design will make to the Caltrain corridor. PCJPB will provide the consultant with a copy of those sections of the Master Track Chart to be so modified. The engineer in charge shall sign and seal this drawing. See also **Subsection 2.3**.

8.4 CIVIL AND TRACK ALIGNMENT DRAWINGS

8.4.1 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The civil engineer(s) of record shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- Civil and Track Alignment General Notes Sheet
- Civil and Track Alignment Abbreviations and Symbols Sheet
- Existing Conditions/Demolition Plans
- Site Plans
- Survey Control Data Sheet
- Drawings of Mobilization, Construction and Maintenance-of-way Areas
- Alignment Data and Tables
- Plan and Profile Drawings
- Typical Cross Sections Drawings
- Typical Details Drawings
- Grading and Paving Plans
- Drainage Plan and Profile and Details Drawings
- Details and Sections Drawings
- Construction Staging Plans
- Traffic Maintenance Plans
- Signage and Pavement Marking Plans
- Signage and Pavement Marking Details Drawings
- Traffic Signal Plans

8.4.2 Civil and Track Alignment General Notes Sheet

This sheet shall include notes pertaining to the civil and track alignment engineering work and other applicable references specific to the project.

8.4.3 Civil and Track Alignment Abbreviations and Symbols Sheet

This sheet shall show additional civil and track alignment abbreviations and symbols specific to the project not shown on the PCJPB abbreviations and symbols sheets.

8.4.4 Existing Conditions Drawings and Site Demolition Plans

These plans shall indicate the project site topography and conditions prior to the beginning of construction. The various buildings and other installations to be demolished, removed and transported off-site or otherwise disposed of shall be indicated on these drawings. Scale: 1”=40’ or as required for clarity.

Aerial mapping done specifically for the project may form the base detail for these drawings. Otherwise, PCJPB’s current set of topographic base map files shall be used. Caltrain track centerlines, right-of-way lines, milepost markers, street names and city, county and other jurisdictional lines shall be included on these drawings.

8.4.5 Site Plans

Site Plans shall show existing and proposed track alignments, roads, structures and other facilities. Points of change in track geometry, point of switch locations, point of turnout intersection locations, switch designations and stationing of the control tracks or baselines shall be shown. Full stationing shall be indicated every 500 feet with intermediate ticks every 100 feet. Curve and tangent data for each alignment shall be shown on the plans. Scale: 1”=100’ or as required for clarity. For additional information, see **Subsubsection 8.4.9**.

8.4.6 Survey Control Data Drawing

This drawing shall show the locations and coordinates of primary benchmark and bearing control survey monuments within the project area. All new work shall have a tie to the survey control network delineated on this plan. Scale: As required for legibility. If space allows, survey control information may be included on the General Plan and Sheet Index drawing.

8.4.7 Drawings of Mobilization, Construction and Maintenance of Way Areas

These drawings shall show plans and schedules for setting up and subsequently dismantling any temporary facilities necessary for the construction of a project. They shall be prepared on an orthophoto or topographic background. Scale: 1”=100’ or as required for clarity.

Drawings of mobilization areas shall show the location of these areas relative to the project site and their general arrangement.

Plans of construction areas shall show their location relative to the project site, identifying each area and showing its general arrangement. The

plans shall show construction site offices, material storage areas, staging areas, loading and unloading facilities and so on. They shall show generally the arrangements made for the receiving, unloading and storage of welded rail along with details of the rail welding area. They shall also show any provisions made for maintaining access necessary for Caltrain operations and the public.

Drawings depicting maintenance-of-way areas required for Caltrain's maintenance crews shall show their general arrangement and location relative to the project site.

8.4.8 Track Alignment Plans and Track Alignment Data Table Drawings

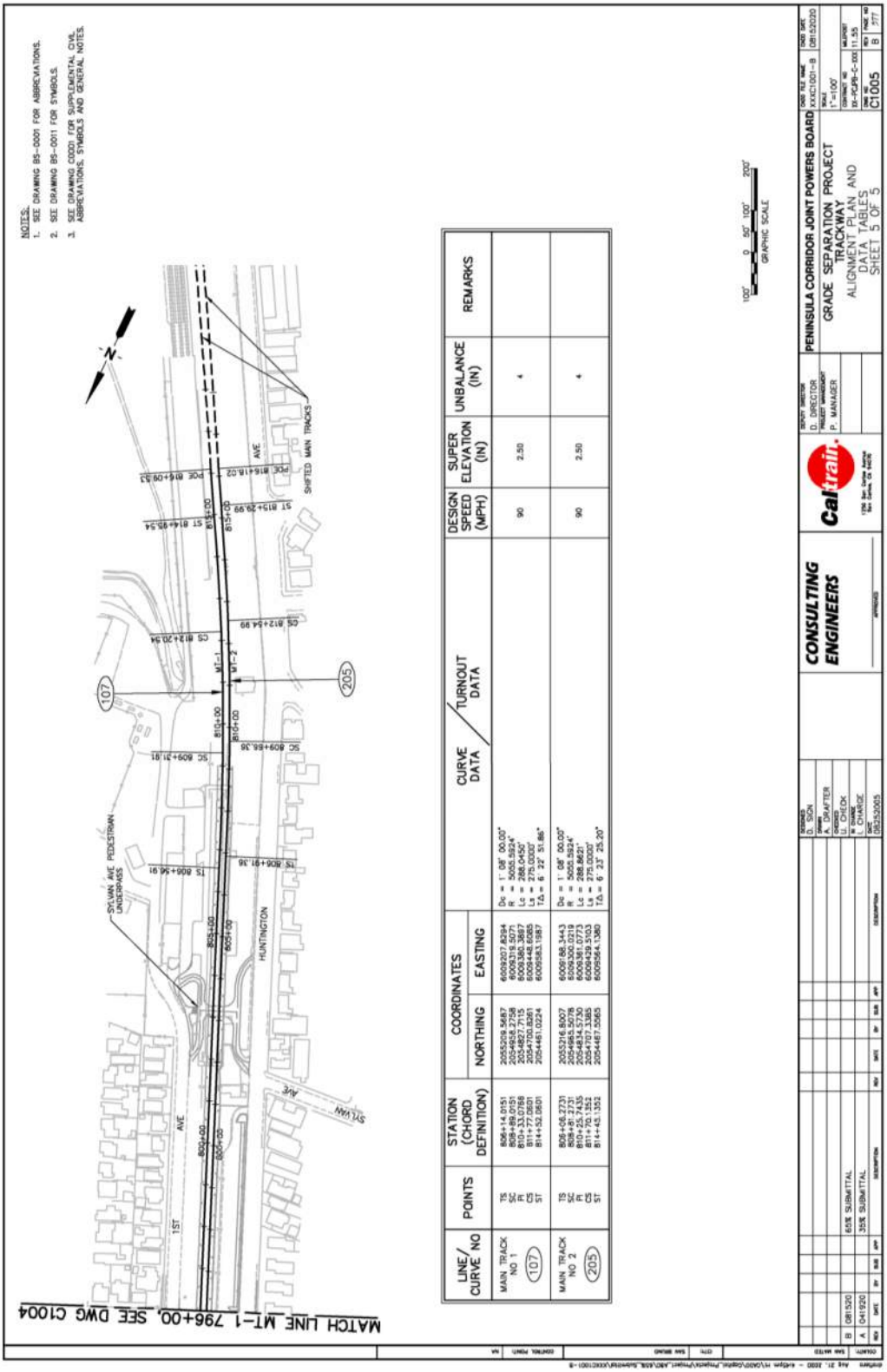
Track alignments shall be designed using AutoCAD Civil 3D. Alignment plan sheets shall show the horizontal geometry of the track alignments to be modified or constructed as part of a project. Alignment data table sheets shall display a table or tables listing the curve and tangent data for the centerline segments of those track alignments. If space allows, an alignment plan and its corresponding alignment data table may be shown together on one sheet. See *Figure 8.2*. The alignment plan and alignment data table drawings together with the plan and profile drawings shall provide all the information needed to layout and construct the proposed tracks.

PCJPB will provide designers with the coordinates of the starting point for each proposed alignment and the elevation, bearing, etc. of the existing track at that point. PCJPB will also provide coordinates and existing track information for those points at which project alignments will tie back into existing track.

The alignment plan shall show stationing along alignment centerlines and points of change in track geometry. Other information shown shall include track numbers—MT-1 and MT-2, for example—point of switch locations, point of turnout intersection locations, the size or number of switches (no. 10 switch, for example) and their type (power, electric lock or hand thrown). Each curve and tangent on the plan shall be labeled with a number to provide a cross-reference to its listing in its alignment's data table. Curve and tangent data shall also be shown on the alignment plan. Alignment plans shall be drawn at a scale of 1"=100'.

Information shown in alignment data tables shall include alignment names, curve and tangent numbers, point of intersection stations, lengths and bearings of tangents and the curve and spiral information listed below. The size of turnouts and locations (stationing, northings and eastings) for points of switches and points of intersection shall also be included in alignment data tables. See *Figure 8.3*.

Circular curve data shall include: Degree of curve, radius, delta, length, tangent length, chord length and coordinates for beginning and end of curve and radius point.



LINE/ CURVE NO	POINTS	STATION (CHORD DEFINITION)	COORDINATES NORTHING	COORDINATES EASTING	CURVE DATA / TURNOUT DATA	DESIGN SPEED (MPH)	SUPER ELEVATION (IN)	UNBALANCE (IN)	REMARKS
MAIN TRACK NO 1 (107)	TS	808+14.0151	2055208.5687	6009207.8094	Dc = 1° 08' 00.00"	90	2.50	4	
	SC	808+68.0151	2055163.2738	6009238.5577	R = 5055.5924'				
	PC	810+33.0788	2054827.7115	6009380.3887	Ls = 288.0450'				
	CS	811+77.0601	2054700.8261	6009448.6085	Ls = 275.0000'				
	ST	814+52.0601	2054481.0224	6009583.1987	Ta = 6° 22' 51.85"				
MAIN TRACK NO 2 (205)	TS	808+46.2731	2055216.6907	6009168.3443	Dc = 1° 08' 00.00"	90	2.50	4	
	SC	808+91.2731	2055165.5078	6009300.0319	R = 5055.5924'				
	PC	810+25.7435	2054834.5730	6009361.0773	Ls = 288.8621'				
	CS	811+70.1552	2054707.3365	6009429.3103	Ls = 275.0000'				
	ST	814+45.1552	2054487.2565	6009564.1380	Ta = 6° 23' 25.20"				

FIGURE 8.2 - TRACK ALIGNMENT PLAN AND ALIGNMENT DATA TABLE DRAWING

Spiral curve data shall include: Length of spiral, radius, coordinates for beginning and end of spiral, theta and all spiral data listed in *Figure 8.3*.

8.4.9 Track Alignment Plan and Profile Drawings

Track alignment plans shall be prepared on a topographic base map (see **Subsubsection 8.3.4**) at a scale of 1”=40’. They shall include the information listed below:

- Existing PCJPB right-of-way and easements.
- Proposed track alignment(s) with stationing included for all tracks; point of switch locations; labeled turnouts; power, electric lock and hand thrown switches and the beginning and end points of curves.
- Proposed easements or right-of-way acquisitions needed to construct the proposed track and other elements of the project, if any.
- Other proposed improvements (roadways, parking lots, structures, etc.) and, where appropriate, utilities.
- Milepost information.
- Street names.

Track profiles shall be generated from the horizontal track alignments using AutoCAD Civil 3D and shall be provided for all track alignments to be modified or constructed. For each alignment, the profile of the top of rail of the lower of the two rails at any point along the alignment shall be used to generate its profile. Existing and proposed elevations for the alignment shall be shown at a minimum of every 50 feet. A track profile (preferably that of MT-1) shall serve as the base elevation reference for any structures located along the alignments. All grade crossings, overpasses, underpasses, culverts and utilities crossing the alignments shall be depicted on track profiles. Scale: Horizontal, 1”=40’; vertical, 1”=4’. See *Figure 8.4*.

8.4.10 Typical Cross Sections Drawings

These drawings shall show typical cross sections taken at appropriate locations along the track alignment. Cross sections shall include the trackway, roadway and other details with vertical and horizontal dimensions.

All trackway drainage elements and system wide facilities including but not limited to track work, traction power, train control, communications and any other PCJPB facilities shall be included. Items to be installed or constructed as a part of other contracts shall be identified as well.

Contract drawings for typical cross sections included in project bid packages shall be used as a guide. The drawings shall be revised as required to conform to the detailed design.

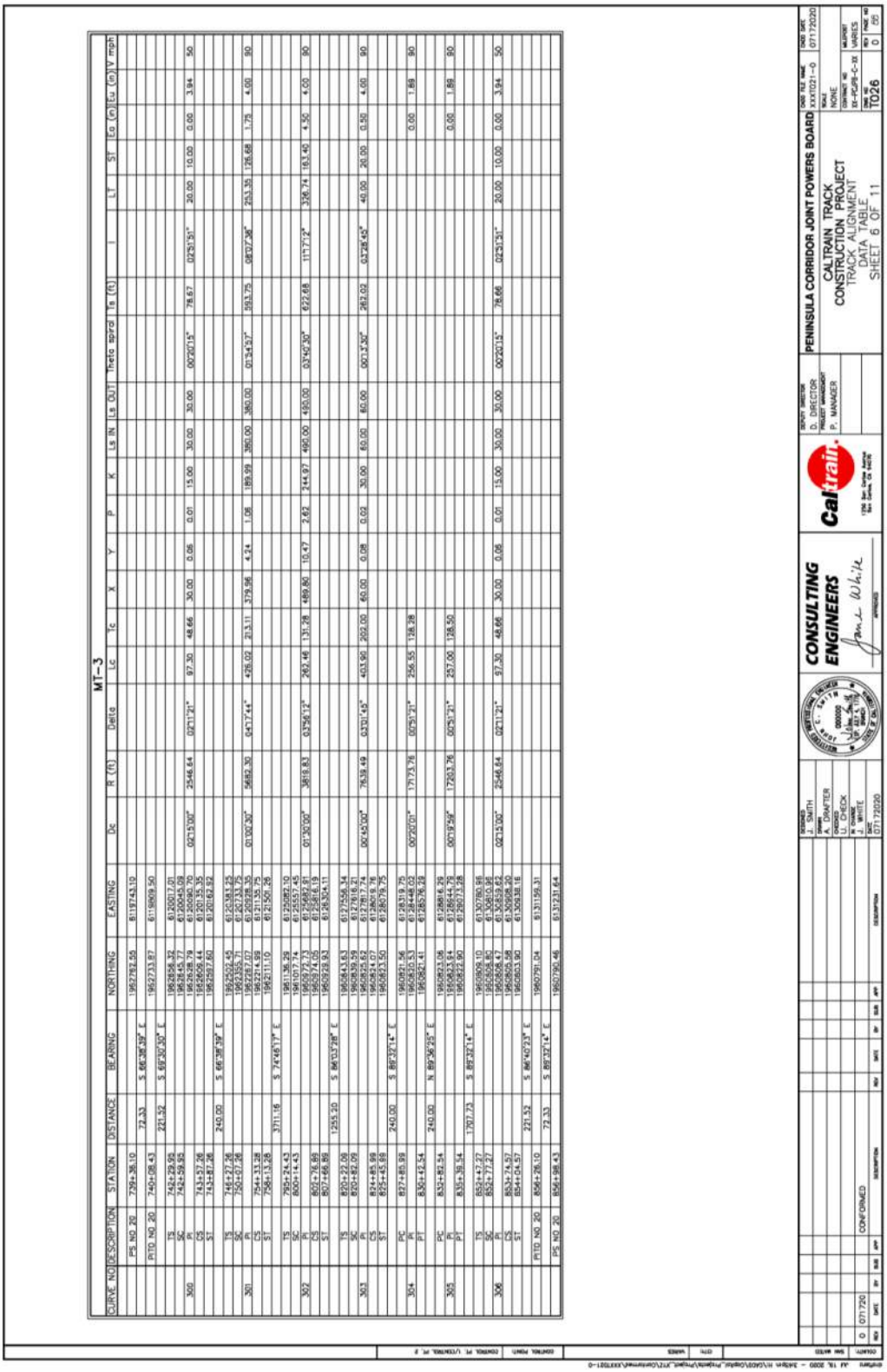


FIGURE 8.3 - TRACK ALIGNMENT DATA TABLE DRAWING

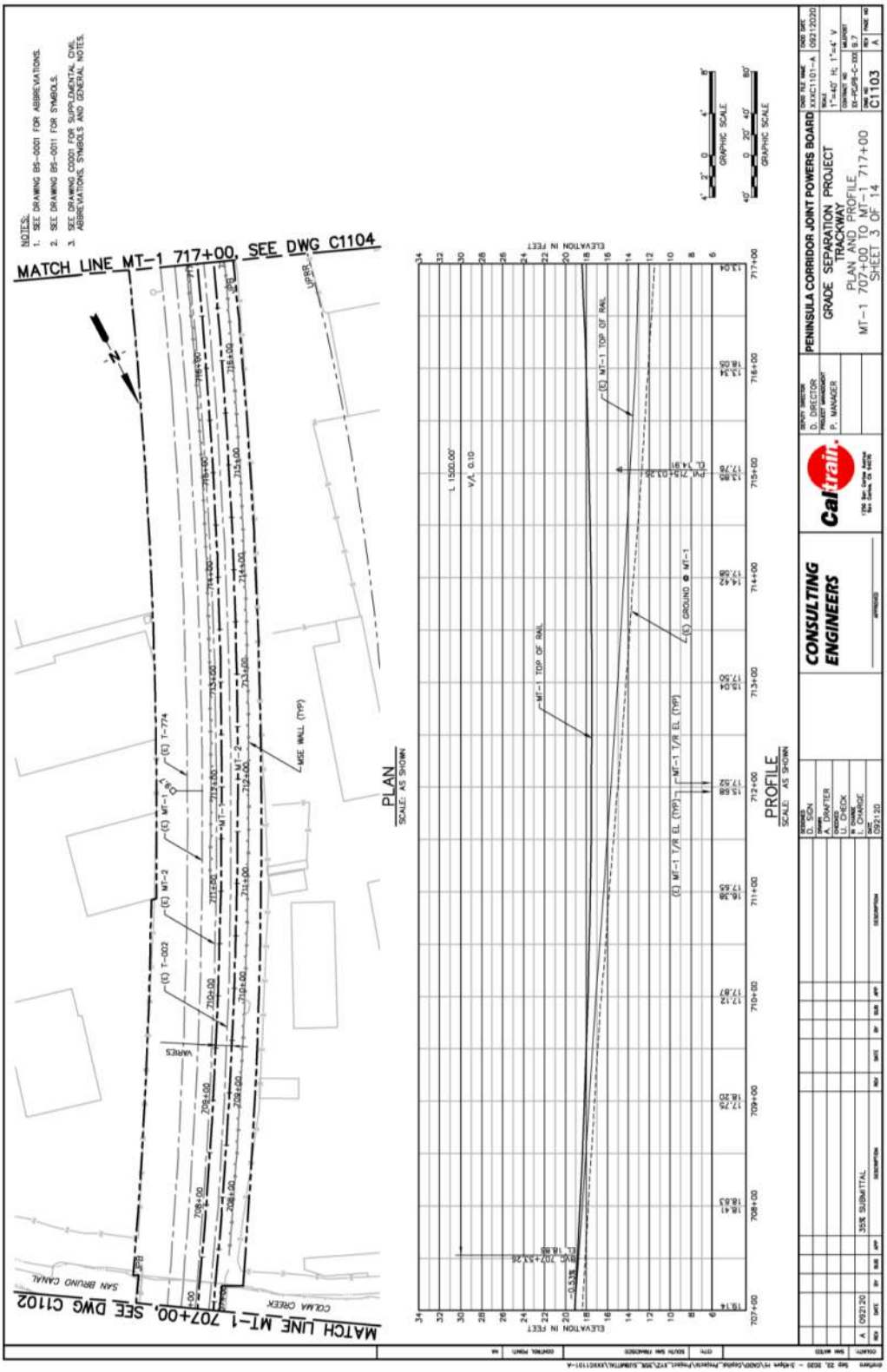


FIGURE 8.4 - TRACK PLAN AND PROFILE DRAWING

8.4.11 Typical Details Drawings

These sheets shall show typical details that clearly illustrate specific elements of construction. They may include trackway, roadway, station, site and other miscellaneous civil details. See **Section 7** for more information about details.

8.4.12 Grading and Paving Plans

Grading and paving plans shall depict proposed work along the trackway and at parking lots, access roads, city and county streets and highways adjacent to the rail line. These drawings shall be prepared for the construction of new facilities and for the restoration of existing facilities. They shall show all vertical information necessary to perform the work. Scale: 1”=40’ or as required for clarity.

The base drawing for grading and paving plans shall be a topographic background showing existing conditions as discussed in **Subsubsection 8.3.4**. Backgrounds shall be muted as discussed in **Subsubsection 3.10.3**. Existing contours and spot elevations shall be shown. Proposed contours shall be provided as required to adequately define graded and paved surfaces. The contour interval shall be selected to portray relief details clearly. Tops, depressions, ditches, swales, slopes, grade breaks, curbs and gutters, etc. shall be readily apparent from the contours. Contours defining finished surfaces shall be shown with solid lines, with index contours drawn using a heavier line weight. Each index contour shall be labeled at least once on each sheet.

Spot elevations shall be provided as required to adequately define finished graded and paved surfaces. In areas to be graded, elevations shall be indicated along grade breaks, edges of restoration, centerlines of ditches and channels, within areas to be warped, in depressions and at high points. The grades and flow lines of any swales shall also be indicated. For areas to be paved, the elevations of existing street surfaces at conforms shall be indicated. Control elevations shall be given at the tangent points of street corners or fillets, at points to be matched and as required for construction. Unless profiles and typical sections adequately define finished pavement surfaces, spot elevations shall be provided as needed on centerlines, edges of pavement, gutter lines, faces of curbs, backs of sidewalks and along grade breaks. The top of curb and flow line elevations of any proposed nonstandard curbs shall also be included.

Plans shall include right-of-way lines, property lines, permanent and temporary easements, structure outlines, street lines, walls, paved areas, sidewalks, curbs, alleys, catch basins, manholes, fences, guard rails and any other surface features to be constructed or affected by the construction. As necessary, callouts with references to details on other sheets shall be provided. The plans shall identify trees and landscaping to be protected, unless they have already been so identified on the landscaping plans.

Drawings showing details, typical sections, cross sections, cross section information and type of pavement shall be prepared in addition to the grading and paving plans.

If combined plans would be difficult to read because of the amount of detail on the drawings, separate grading and paving plans shall be prepared.

8.4.13 Drainage Plan and Profile and Detail Drawings

Drainage plans shall include detailed layouts for all proposed and relocated above and below ground drainage facilities. Proposed drainage facilities shall match and conform to existing facilities and conditions at project boundaries. The base detail for drainage plans shall be a topographic background showing existing conditions as discussed in **Subsubsection 8.3.4**. The plans shall provide references to profiles and details on other drawings as necessary. For some projects it may be possible to include the drainage plan on the Grading and Paving Plan. Scale shall be 1"=40' or shall match that of the Grading and Paving Plan.

The horizontal alignments of major proposed storm pipes shall be designed using AutoCAD Civil 3D. Stationing for these alignments shall be shown on the plans. The plan shall show all manholes; catch basins, inlets and area drains; cleanouts; the alignment, size and material of pipes; types of channels and gutters; owners of facilities and so on. Coordinates (northings and eastings) shall be given for the center of each structure. Or, alternatively, structures may be located using stations and offsets from control lines or baselines established for the project.

Profiles of major storm sewer pipes shall be generated using AutoCAD Civil 3D from their horizontal alignments. Drainage profiles shall show pipe slope, diameter and material; structures and their rim and invert elevations and the existing and proposed ground surfaces at pipe centerlines. Utilities crossing proposed pipe alignments shall be shown in their correct position relative to the alignments and the clearances between them indicated. See also **Section 7**.

Detail drawings shall include typical and any special details. Typical details shall be developed using either Caltrans standard details, those of the local municipality in which a project is located or details found in PCJPB's set of standard drawings. See also **Section 7**.

8.4.14 Details and Sections Drawings

Profiles and miscellaneous sections and details supplementing information shown on grading and paving and drainage plans shall be shown on separate details and sections drawings.

8.4.15 Construction Staging Plans

These plans shall show a project's proposed program of construction. They shall give a general outline of planned project activities and their

sequence, dividing the work into stages. They shall identify a project's elements, such as, proposed buildings, track alignments, roads, and so on, showing their location and when during the project they are to be constructed. They shall also outline other project tasks, such as demolition, grading, landscaping, traffic control, public information measures, etc., and the sequence in which they are to occur. The scale of these plans shall be as required for clarity.

8.4.16 Signage and Pavement Marking Plans

Signage and pavement marking plans shall be prepared in accordance with PCJPB's criteria for PCJPB facilities and per the requirements of Caltrans, county or local city jurisdictions for their facilities.

8.4.17 Signage and Pavement Marking Detail Drawings

These drawings shall provide details and dimensioning sufficient for the procurement, fabrication and installation of the signage and pavement markings depicted on the signage and pavement marking plans.

8.4.18 Traffic Signal Plans

Plans for temporary and permanent traffic signals shall be prepared in accordance with PCJPB's criteria for PCJPB facilities and per the requirements of Caltrans, county or local city jurisdictions for their facilities.

8.5 UTILITY DRAWINGS

8.5.1 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The civil engineer of record shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- Utility General Notes Sheet
- Utility Abbreviations and Symbols Sheet
- Composite Plans of Existing Utilities
- Composite Plans of Utility Relocations
- Utility Relocation Plan and Profile and Details Drawings

8.5.2 Utility General Notes Sheet

This sheet shall contain notes and references pertaining to the utility work and other applicable references specific to the project.

8.5.3 Utility Abbreviations and Symbols Sheet

This sheet shall contain those utility abbreviations and symbols specific to a project not included on PCJPB's abbreviations and symbols sheets.

8.5.4 Composite Plans of Existing Utilities

Composite plans of existing utilities shall show the interrelationship of existing utilities and streets in the project area. The following types of utilities and their associated installations shall be shown:

- Overhead and underground electrical facilities
- Water mains
- Sanitary, storm and combined sewers
- Overhead and underground telephone facilities
- Fiber optic cable lines
- Gas mains
- Overhead and underground cable television facilities
- Pipeline company pressure mains
- Overhead and underground telegraph facilities
- Overhead and underground street lighting and traffic signal facilities
- Railroad communication and signal cables
- Emergency services communication cables
- Any other utilities as necessary

For utility lines 18” or more in diameter, their diameters shall be drafted accurately to scale. For utility lines less than 18” in diameter, only their centerlines shall be drawn. Scale: 1”=20’ or as required for clarity. Minimum scale: 1”=40’.

Each Utility shall be drawn and labeled using the symbols and abbreviations shown on the general and project specific utility abbreviations and symbols sheets. Each utility shall be labeled as either existing or abandoned and its type, size and material indicated. Labels identifying utilities shall be placed next to and in alignment with the line representing the utility they identify. Text labeling a specific utility structure shall be placed directly above the symbol representing that structure. In graphically congested areas, however, multileaders may be used as necessary to call out and identify utility lines and structures.

8.5.5 Composite Utility Relocation Plans

Composite plans for utility relocation shall show existing installations along with all proposed temporary and permanent relocations. These plans shall show the utilities listed in **Subsubsection 8.4.4**. Those preparing these drawings shall ensure that no conflicts exist between proposed and existing utilities and that adequate space is available for the relocations and proposed installations. Plans shall provide information sufficient to identify each utility line and its associated structures. Each manhole, catch basin, valve, etc. shall be identified only once on the plans. Descriptive information, such as the elevation of an inlet or invert, for example, shall also be provided only once on the plans. Composite plans for utility relocation shall be prepared at the same scale as the composite plans of existing utilities and shall use those plans for

their background detail. The background detail shall be muted (see **Subsection 3.10**).

8.5.6 Utility Relocation Plan and Profile and Detail Drawings

Utility relocation plan and profile and detail drawings shall be provided for the construction of proposed utilities and the restoration or relocation of existing utilities. They shall be prepared as authorized by PCJPB in coordination with and by agreement with utility owners. In addition to utility work to be done by the project contractor, they shall show any work to be done by the utility owners or others within the project area. In areas affected by construction, utilities relocation plan and profile and detail drawings shall be prepared for the utilities listed in **Subsubsection 8.5.4**.

Each utility relocation drawing shall show only that work pertaining to the utility or utilities indicated in its title. If scale allows, utility relocation plans shall preferably be prepared using the composite plans of existing utilities for their backgrounds, which shall be muted as discussed in **Subsection 3.10**. Utilities shown shall be drawn and labeled as discussed in **Subsubsections 8.4.4 and 8.4.5**. Proposed utility lines shall be depicted with solid lines placed on a layer assigned the color blue as found on the AutoCAD Color Index (ACI) palette to plot at a width of 0.70mm.

The scale of the plan drawings shall match that of the composite plans of existing utilities. Scale: 1”=20’ (1”=40’, minimum). The preferred scales for profile drawings are: 1”=20’, horizontal and 1”=5’, vertical, but other scales may be used as required for clarity. Details typically shall be prepared at scales of: 1”=1’-0”, 3/4"=1’-0”, 1/2"-1’-0”, 1/4"=1’-0”, 1”=5’ and 1”=10’.

8.6 ARCHITECTURAL DRAWINGS

8.6.1 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The architect of record shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- Architectural General Notes Sheet
- Architectural Abbreviations and Symbols Sheet
- Site Plans
- Floor Plans and Roof Plans
- Reflected Ceiling Plans
- Longitudinal and Transverse Sections Drawings
- Exterior Elevations Drawings
- Interior Elevations Drawings
- Door, Hardware and Finish Schedules
- Detailed Plans, Section and Elevation Drawings
- Detail Drawings

8.6.2 Architectural General Notes Sheet

This sheet shall contain notes pertaining to the architectural work, building codes, planning codes and other references specific to the project.

8.6.3 Architectural Abbreviations and Symbol Sheet

This sheet shall contain additional architectural abbreviations and symbols specific to the project not found on PCJPB's abbreviations and symbols sheets.

8.6.4 Site Plans

Site plans shall identify the location and boundaries of the project site. The scale of a site plan shall be that engineering scale at which the site can be most clearly shown. A scale of 1"=100' shall normally be used for these plans, but larger scales of 1"=40' or 1"=20' may be used for partial plans or smaller sites.

8.6.5 Floor Plans and Roof Plans

Floor plans shall show the configuration of all levels of proposed structures complete with dimensions, material callouts, references to details and any other pertinent information. They shall identify rooms and other spaces and their uses, the sizes and types of partitions, doors, windows, vertical circulation elements and any other elements of the layout. Scale: 1/8"=1'-0" or 1/4"=1'-0".

Roof plans shall show the layout of roof slopes, roof drainage systems, the locations of mechanical and electrical equipment complete with dimensions, material callouts, references to details and any other pertinent information. Scale: 1/8"=1'-0" or 1/4"=1'-0".

8.6.6 Reflected Ceiling Plans

Reflected ceiling plans shall indicate locations and sizes of all ceiling fixtures, including the exposed ceiling grid and any mechanical and electrical information, complete with dimensions, material callouts, references to details and any other pertinent information. Scale: 1/8"=1'-0" or 1/4"=1'-0".

8.6.7 Longitudinal and Transverse Section Drawings

Drawings of longitudinal and transverse sections shall include all relevant dimensions, material call outs, references to details and any other pertinent information. Scale: 1/8"=1'-0" or 1/4"=1'-0".

8.6.8 Exterior Elevation Drawings

Exterior elevations drawings shall show all exterior views of the facility complete with dimensions, material call outs, references to details and any other pertinent information. Scale: 1/8"=1'-0" or 1/4"=1'-0".

8.6.9 Interior Elevation Drawings

Interior elevations drawings shall show dimensions, material call outs, references to details and any other pertinent information which cannot be shown clearly on the plans. Scale: 1/8”=1’-0” or 1/4"=1’-0”.

8.6.10 Door, Hardware and Finish Schedules

Door schedules shall list for each door its number together with its size, type, fire resistance rating, hardware specifications and references to its head, jamb and sill details. Hardware schedules shall provide all the information necessary to procure and install hardware required by the design. Finish schedules shall identify for each room the material and finish for its floor, walls and ceiling. Dimensions shall be included where required.

8.6.11 Detail Plans and Sections and Elevations Drawings

Elements of a design depicted on detail plans and sections (including wall sections) and elevations drawings shall be drawn at scales appropriate for the information presented. They shall include all relevant dimensions, material call outs and any other pertinent information. Scales: 1/4”=1’-0” or 1/2"=1’-0”.

8.6.12 Detail Drawings

Details shall be provided in sufficient number to clearly convey the facility’s design and construction. They shall include all relevant dimensions, material call outs and any other pertinent information. Scales: 1/2"=1’-0”, 3/4"=1’-0”, 1”=1’-0”, 1 1/2"=1’-0” and 3”=1’-0”.

8.7 LANDSCAPE DRAWINGS

8.7.1 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The landscape architect of record shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- Landscape General Notes Sheet
- Landscape Abbreviations and Symbols Sheet
- Layout Drawings
- Planting Drawings
- Irrigation Drawings
- Miscellaneous Drawings

8.7.2 Landscape General Notes Sheet

This sheet shall contain notes pertaining to the landscape work and other applicable references specific to the project.

8.7.3 Landscape Abbreviations and Symbols Sheet

This sheet shall contain additional landscape abbreviations and symbols specific to the project not included on PCJPB's abbreviations and symbols sheets.

8.7.4 Layout Plans

Landscape layout plans shall be based upon the project's civil drawings. As necessary, areas to be landscaped shown on these plans shall be enlarged for clarity. Plans shall show special paving, horizontal expansion joints, benches, fences, bollards, other furniture and provide references to details. A scale of 1"=100' shall normally be used for these plans, but larger scales of 1"=40' or 1"=20' may be used for partial plans or smaller sites.

8.7.5 Planting Plans

Planting plans shall indicate the areas to be planted. Plans shall show locations of trees, lawn areas and shrub and ground cover spacing. Plants shall be identified by their botanical name, and the size and quantity required of each type shall be indicated. Plans shall include explanatory notes, detail references and any other pertinent information. Planting details shall provide installation directions and any applicable construction details.

Planting plans shall be prepared at the same scale as the project's civil drawings. A scale of 1"=40' is desirable, 1"=20' for smaller areas or to show more detail or 1"=100' if an overall plan is needed. Accompanying details shall be drawn at scales of 3/4"=1'-0", 1 1/2"=1'-0" or 3"=1'-0" as appropriate.

8.7.6 Irrigation Plans

Irrigation plans shall indicate the areas to be irrigated. The different irrigation zones shall be identified along with their respective head types, controller locations, vacuum breakers and electrical connections. The main water service connection, meters, backflow preventers and pressure-reducing valves, if required, shall also be shown. Plans shall include explanatory notes, detail references and any other pertinent information. Drawings shall provide all data required for construction and installation. Scales to use shall be as discussed in **Subsubsection 8.7.5**.

8.7.7 Miscellaneous Drawings

Additional drawings, as required, shall include both plan and detail drawings. The plans shall show the location and extent of features such as special walking finishes. They shall show the locations of bollards, benches, landscape lighting, bicycle racks, etc. and include references to the detail drawings. Drawings shall provide all data required for construction and installation. Scales to use shall be as discussed in **Subsubsection 8.7.5**.

8.8 STRUCTURAL DRAWINGS

8.8.1 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The structural engineer of record shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- Structural General Notes Sheet
- Structural Abbreviations and Symbols Sheet
- Location Plan and Logs of Borings Drawings
- Construction Structures Drawings
- Underpinning Shoring and Protection Drawings
- Structural General Arrangement Drawings
- Above Grade and Below Grade Structure Control Schedules
- Structural Standard Drawings
- Structural Plans
- Structural Elevations, Sections and Details Drawings
- Structural Steel Framing Plans
- Structural Steel Schedules and Details Drawings
- Appurtenant Structures Drawings
- Special Structures Drawings
- Miscellaneous Iron and Steel Drawings

8.8.2 Structural General Notes Sheet

This sheet shall contain notes that pertain to the structural design work and references specific to the project.

8.8.3 Structural Abbreviations and Symbols Sheet

This sheet shall contain additional structural abbreviations and symbols specific to the project not found on PCJPB's abbreviations and symbols sheets.

8.8.4 Boreholes Location Plans and Logs of Borings Drawings

Boreholes shall be located and numbered on plan sheets according to the soils report prepared by the geotechnical consultant. The logs of borings shall be shown on separate drawings prepared by the geotechnical consultant. Background information on the plan sheets shall include streets, major buildings and the outline of track structures. These plans shall be prepared at a scale of 1"=40'.

8.8.5 Construction Structures Drawings

These sheets shall be for the contractor's use in designing and arranging temporary decking and support systems. They shall include criteria for decking loads; sheeting and bracing loads; analysis and design information on lateral pressures caused by soil, water and surcharge;

tiebacks; excavation and bracing procedures; allowable bearing values; observation installations and cofferdam arrangements.

8.8.6 Underpinning Shoring and Protection Drawings

These drawings shall be complete in detail and shall clearly indicate and describe the method of underpinning to be used or the protection wall systems that might be required. Loads on existing columns and walls to be underpinned shall be shown. The scale of these drawings shall be selected to depict the structure being underpinned clearly and adequately.

8.8.7 Structural General Arrangement Drawings

On the plans, the outline of the structure shall be superimposed on a simple outline of the street system. On the profiles, the ground surface at the centerline of structure, the outline of structure and the track profile grade line shall be shown. If the profile grade lines of adjacent tracks are not the same, profiles of each track shall be shown. On these profiles, the top of rail elevation of the low running rail of each track shall be shown to the nearest one-hundredth of a foot at significant locations.

Plans shall be prepared at a scale of 1”=40’ (preferred) or 1”=20’. For the profiles, scales shall be 1”=40’ horizontal and 1”=10’ vertical or 1”=20’ horizontal and 1”=5’ vertical.

8.8.8 Above Grade, Below Grade Structure Control Schedules

These drawings shall show in tabular form the basic data for construction. The general consultant shall provide standard forms with headings and instructions for their use.

8.8.9 Structural Standard Drawings

These drawings shall include standard structures and standard structural elements. The general consultant shall provide detailed information presented in tabular form with required plans, sections, etc.

8.8.10 Structural Plans

These drawings shall show the concrete outline and reinforcing details necessary to supplement those shown on elevations, sections and details. They shall show clearance dimensions, tie-ins, joints, openings, rooms, etc. Drawings shall be arranged in sequence starting with lowest level, the foundation or track level plan, for example, and progressing to roof level. In some instances, structures might be represented by a combination of plans, elevations, sections and details on the same drawing. Scales used shall typically be 1/8”=1’-0” or 1/4"=1’-0”.

8.8.11 Structural Elevations, Sections and Details Drawings

Views on these drawings shall be referenced on the structural plans and shall show concrete and reinforcing information adequate for the detailing of the reinforcing steel. Scales vary from 1/4"=1’-0” to 1”=1’-0”.

8.8.12 Structural Steel Framing Plan Drawings

These drawings shall show the plan of columns, girders and beams; framing relationships and designations of the structural steel members. Scale: 1/8”=1’-0”.

8.8.13 Structural Steel Schedules and Detail Drawings

These sheets shall include schedules for columns, girders and beams and details for joints and splices, end bearings and connections, stiffeners, anchor bolts, studs, base plates, bolting and welding, etc. Typical scales for detail drawings: 1/4"=1’-0” to 1/2"=1’-0”.

8.8.14 Appurtenant Structures Drawings

These drawings shall depict structures of secondary importance related or adjunct to the primary structures of a project. Such structures would include, for example, entrances, ventilation shafts and fan rooms, emergency exits, pump stations and so on. If multiple sheets are required for an appurtenant structure, its plan, elevation, section and detail sheets shall be assembled in the order outlined above. Scales range from 1/8”=1’-0” to 1-1/2”=1’-0”.

8.8.14 Special Structure Drawings

These shall contain drawings for overpasses, underpasses, nonstandard retaining walls, drainage structures, substations, utility structures and other miscellaneous structures not otherwise categorized. Scales range from 1/8”=1’-0” to 1-1/2”=1’-0”.

8.8.14 Miscellaneous Iron and Steel Drawings

These drawings shall show details for doors and frames; railings, handrail gratings and support members; ladders and stairs; anchor bolts and inserts; etc. Scales range from 1/4”=1’-0” to 3”=1’-0”.

8.9 MECHANICAL DRAWINGS

8.9.1 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The mechanical engineer of record shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- Mechanical General Notes Sheet
- Mechanical Abbreviations and Symbols Sheet
- Site Plans

- Heating, Ventilation and Air Conditioning (HVAC) Plans
- HVAC Equipment Room Layouts
- HVAC Control Systems and Instrumentation Drawings
- HVAC Flow Diagrams
- HVAC Schedules
- Plumbing and Drainage Plans
- Plumbing and Drainage Equipment Room Layouts
- Plumbing and Drainage Riser Diagrams
- Miscellaneous Piping Systems Drawings
- Plumbing and Drainage Schedules
- Fire Protection Plans
- Fire Protection Equipment Room Layout

8.9.2 Mechanical General Notes Sheet

This sheet shall contain notes that pertain to the mechanical design work and other applicable references specific to the project.

8.9.3 Mechanical Abbreviations and Symbols Sheet

This sheet shall show additional mechanical abbreviations and symbols specific to the project not included on PCJPB's abbreviations and symbols sheets.

8.9.4 Site Plans

These plans shall depict those portions of the project site relevant to the mechanical work—structures, parking lots and so on—to show utility connection points, equipment room locations, areas to be irrigated with sprinklers, etc. Scale: 1"=100' or as required for clarity.

8.9.5 HVAC Plans

These plans shall show the general arrangement of heating, ventilation and air conditioning duct routing on muted architectural backgrounds (see **Subsubsection 3.10.3**) with any irrelevant text omitted. Scale: 1/8"=1'-0" or as required for clarity.

8.9.6 HVAC Equipment Room Layouts

These drawings shall show the general arrangement of the air-handling equipment, including spaces allocated for component replacement and equipment maintenance. Scale: 1/4"=1'-0", minimum.

8.9.7 HVAC Control Systems and Instrumentation Diagrams

These drawings shall show diagrammatically the control system, instrumentation devices, interconnecting piping and tubing and interfaces with other systems. Diagrams shall be drawn at sizes adequate to show the intent of the design.

8.9.8 HVAC Flow Diagrams

These drawings shall provide a schematic portrayal of air movement from the air-handling equipment to conditioned spaces or areas and its return or dispersal, including make-up air, and the arrangement of the system's components. Diagrams shall be drawn at sizes adequate to show the intent of the design.

8.9.9 HVAC Schedules

These schedules shall list the HVAC equipment and devices to be installed, showing all pertinent information used for the design or the system's minimum requirements, including fan capacity and filter efficiency.

8.9.10 Plumbing and Drainage Plans

These plans shall show the general arrangement of plumbing and drainage piping. They shall be drawn on muted architectural backgrounds with all irrelevant text omitted. Scale: 1/8"=1'-0" or as required for clarity.

8.9.11 Plumbing and Drainage Equipment Room Layouts

These drawings shall show the general arrangement of plumbing and drainage equipment, including toilets, water heaters, circulating pumps, sump pumps and sewage ejectors. Scale: 1/4"=1'-0", minimum.

8.9.12 Plumbing and Drainage Riser Diagrams

These drawings shall show schematically plumbing and drainage piping systems, showing the sequential arrangement of their fixtures and devices. Diagrams shall be drawn at sizes adequate to show the intent of the design.

8.9.13 Miscellaneous Piping System Drawings

These drawings shall show the general arrangement of any miscellaneous piping systems (the lines for a compressed air system, for example). This information shall be drawn on muted architectural backgrounds with any irrelevant text omitted. For complex systems, a flow diagram for each system riser diagram and equipment installation details shall be provided.

8.9.14 Plumbing and Drainage Schedules

These schedules shall list plumbing and drainage fixtures and devices to be installed, showing pertinent information to be used for the design or minimum requirements, including supply, trap and vent sizes.

8.9.15 Fire Protection Plan Drawings

The general arrangement of wet standpipe piping shall be shown on these drawings. The information shall be shown on muted architectural

backgrounds with any irrelevant text omitted. Scale: 1/8”=1’-0” or as required for clarity.

8.9.16 Fire Protection Equipment Room Layout

This drawing shall show the general arrangement of fire protection supply piping and devices and their interfaces with other systems, including backflow preventers, pumps and risers. Scale: 1/4"=1’-0”, minimum.

8.10 ELECTRICAL DRAWINGS

8.10.1 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The electrical engineer of record shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- Electrical General Notes Sheet
- Electrical Abbreviations and Symbols Sheet
- Line Elements Drawings
- Site Plans
- Power Distribution One-Line Diagrams
- Exterior Lighting Plans
- Interior Lighting Plans
- Power and Grounding Plans
- Communications Raceway Plans
- Equipment Room Layouts
- Communication Riser Diagrams
- Control Diagrams
- Detail Drawings
- Section Drawings
- Various Required Schedules

8.10.2 Electrical General Notes Sheet

This drawing shall contain notes pertaining to the electrical design work and other applicable references specific to the project.

8.10.3 Electrical Abbreviations and Symbols Sheet

This drawing shall contain additional electrical abbreviations and symbols specific to the project not found on PCJPB’s abbreviations and symbols sheets.

8.10.4 Line Element Drawings

The content of these drawings is the same as that required for stations. Many drawing types, however, may not be needed, and multiple drawings may be placed the same sheet to reduce the number of sheets required. Also, line elements shall be by individual element, compatible with the order of the structural drawings.

8.10.5 Site Plans

Site plans shall provide a general depiction of the electrical components to be installed or modified as part of the project. The plans shall identify all electrical utility connection points, all major rooms and structures for electrical equipment and provide an overall layout showing the power and emergency power systems. The base drawing shall be a muted site plan. (See **Subsubsection 3.10.3.**) Scale: 1"=40'.

8.10.6 Power Distribution One Line Diagrams

These drawings shall provide diagrammatic representations of the electrical power distribution system from both normal and standby sources of supply down to the panel board level. They shall show equipment normal voltage, current and short-circuit bracing ratings; metering, relaying, transformer connections and circuit breaker trip settings.

8.10.7 Exterior Lighting Plans

Exterior lighting plans, which shall include branch circuit wiring for parking lots, shall locate and designate all light poles, fixtures and illuminated signage, all of which shall meet the site program and design criteria.

8.10.8 Interior Lighting Plans

Lighting plans for interiors shall locate and identify all fixtures and illuminated graphics. Symbols, fixture designation and branch circuit wiring shall meet the design criteria and shall conform to the Standard Drawings. The interior lighting plan may be combined with the auxiliary power plan if this can be done without sacrificing clarity.

8.10.9 Power and Grounding Plan Drawings

These drawings shall locate all equipment served by multiple circuit breakers and show feeder routing. Grounding routing between equipment rooms shall be shown, and grounding details shall be shown as well on equipment room layouts. Equipment designations and symbols shall meet the design criteria and shall conform to the Standard Drawings.

8.10.10 Communications Raceway Plans

These plans shall show the layout of public telephone, fire alarm systems, the raceway systems for closed-circuit television (CCTV) and CALTRAIN telephone systems (PABX, emergency, courtesy and maintenance telephones). Symbols shall meet the design criteria and conform to the Standard Drawings.

8.10.11 Equipment Room Layouts

These layouts shall show the general arrangement of power generation, distribution, public telephone, control and fire alarm equipment in

switchboard, generator, main electrical equipment and auxiliary electrical equipment rooms. Ground test stations and grounding shall also be shown on these layouts. Equipment room layout drawings shall include wall elevations of auxiliary electric rooms and train control rooms where needed to position equipment or components within a limited area. Scale: 1/4"=1'-0", minimum.

8.10.12 Communication Riser Diagrams

These diagrams shall show general equipment interconnection and system interfaces with other subsystems covering supervisory control, alarms, annunciation, public address, closed-circuit TV, telephone system and system wide cable network components and devices.

8.10.13 Control Diagrams

These drawings shall depict site specific control circuit diagrams developed from the Standard Drawings. The terminal numbering scheme shown on Standard Drawings shall be followed to develop project drawings.

8.10.14 Detail Drawings

Detail drawings shall show methods of installation, equipment configuration and fixture mounting. Drawing scales shall be appropriate for information to be shown.

8.10.15 Section Drawings

Section views and details, shown at larger scales, shall be prepared by the contractor to clearly illustrate conduit arrangement and details necessary for installation.

8.10.16 Various Required Schedules

Required schedules shall include those for conduits, cables, the motor control center and lighting. Distribution panel board schedules shall be formatted as illustrated on Standard Drawings.

Conduit Schedules
A schedule, which shall separate the auxiliary electrical, communications, train control, fare collection and traction power raceway requirements, shall be included with drawings. Format shall follow the Standard Drawings.

Panel Board Schedules
A panel board schedule shall be prepared for all main and subpanel boards. Format shall follow the Standard Drawings.

8.11 TRACTION POWER FACILITY DRAWINGS

8.11.1 Drawing Numbers

Drawing numbers shall be allocated by drawing subject matter. Allocations shall include spare numbers for future use. The designer shall finalize drawing numbers with PCJPB prior to commencement of design development activities.

8.11.2 Drawing Scales

Design drawings of similar type shall use uniform scales. The designer shall finalize drawing scales with PCJPB prior to commencement of design development activities. Examples of scales for consideration by drawing type include:

Introductory Drawings, Diagrams, Schematics, etc. – None.
Site Plans (For example: Grading and Paving, Drainage) – 1”=40’.
Equipment Plans (For example: Arrangement, Grounding) – 1”=20’.

8.11.3 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The electrical engineer in charge shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- Introductory Drawings
- Single-Line Diagrams
- Meter and Relay Single Line Diagrams
- Auxiliary/House Power Single Line Diagrams
- Circuit Breaker Control Schematic Drawings
- Civil Design Drawings per **Subsection 8.4** above
- Traction Power Facility Site Access Plans
- Utility Design Drawings per **Subsection 8.5** above
- Landscaping Design Drawings per **Subsection 8.7** above
- Traction Power Facility Equipment Arrangement Plans and Elevations Drawings
- Structural Steel Design Drawings per **Subsection 8.8** above
- Equipment and Structural Steel Foundation Plans and Sections Drawings
- Traction Power Facility Grounding Grid Plans
- Various Required Schedules
- Typical Installation Details Drawings

8.11.4 Introductory Drawings

General Notes Sheet: This sheet shall contain notes that pertain to traction power facility design and other applicable references specific to the project.

Abbreviations and Symbols Sheet: This sheet shall contain additional traction power abbreviations and symbols specific to the project not included on PCJPB's abbreviations and symbols sheets.

Device Lists Sheet: All alphabetic, numeric and alphanumeric designators used to identify traction power equipment and devices used in the design drawings shall be shown on the device lists.

8.11.5 Single-Line Diagrams

The power system for each substation, paralleling station and switching station shown on the master single-line diagram shall be depicted on a separate single-line diagram.

8.11.6 Meter and Relay Single Line Diagrams

The metering and relay requirements for each substation, paralleling station and switching station shown on the master single-line diagram shall be depicted on a separate meter and relay single-line diagram.

8.11.7 Auxiliary/House Power Single Line Diagrams

The auxiliary/house low voltage power requirements for each substation, paralleling station and switching station shown on the master single-line diagram shall be depicted on separate 480/277 V and 120 V single-line diagrams.

8.11.8 Control Schematic Drawings

Control schematic drawings shall be prepared for all equipment and devices installed in traction power facilities, including traction power substations, paralleling stations and switching stations. Symbols, device numbers, location abbreviations and terminology shall match those provided by PCJPB, and if none is provided, then the standard Institute of Electrical and Electronics Engineers (IEEE) convention shall be employed. Devices and all their functional components, such as termination points, contacts, coils and switch positions, shall be properly and uniquely labeled. Control schematic drawings shall show all relaying, control, communications and indication functions of the involved equipment and devices. Overall arrangement and scale of the drawings shall be such that they remain legible and convenient for use when reduced to one-half size.

8.11.9 Traction Power Facility Site Access Plans

These plans shall show required site access roads and hard standing for parking at each traction power facility location. Roadway connections to existing city, county or state road networks shall be shown. These drawings shall include plans for grading and drainage. This information shall be placed over muted backgrounds. (See **Subsubsection 3.10.3**.)

8.11.10 Traction Power Facility Equipment Arrangement Plans and Elevations Drawings

These drawings shall show the layouts of substations, paralleling stations and switching stations. This information shall be placed over muted backgrounds.

8.11.11 Equipment and Structural Steel Foundation Plans and Sections Drawings

These drawings shall be prepared for all equipment, structural steel and perimeter barrier foundations at each traction power facility location.

8.11.12 Traction Power Facility Grounding Grid Plans

These plans shall show the grounding grid at each traction power facility. Connections to the grounding grid for all structural elements, such as fencing, termination structures and buildings and power equipment at each power facility location shall be detailed.

8.11.13 Various Required Schedules

Required schedules shall include, but not be limited to, those for manholes, conduits, cables and power panels. Power panel schedules shall be formatted as illustrated on Standard Drawings.

Manhole Schedules
A manhole schedule listing all manholes shall be prepared.

Conduit and Cable Schedules
Each conduit and cable shown on traction power facility layout drawings shall be assigned a unique number. In these schedules, conduits and cables shall be listed by their assigned numbers along with their type, size and routing. Conduit contents shall be clearly identified. Conduit and cable lengths shall be determined and shown, either in the conduit and cable schedules or on the drawings. Their format shall follow the Standard Drawings.

Panel Board Schedules
A panel board schedule shall be prepared for all main and subpanel boards. Their format shall follow the Standard Drawings.

8.11.14 Installation Details Drawings

These drawings shall show methods of installation, equipment configuration and fixture mounting. Drawing scale shall be appropriate for information to be shown.

8.12 OVERHEAD CONTACT SYSTEM (OCS) DRAWINGS

8.12.1 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The electrical engineer in charge shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- OCS General Notes Sheet
- OCS Abbreviations and Symbols Sheet
- OCS Sectionalizing Diagrams
- OCS Tension Length Diagrams
- OCS Technical Sheets
- OCS General Arrangement Drawings
- OCS Assemblies Drawings
- OCS Wiring Layouts
- OCS Conductor, Cable and Conduit Schedules

8.12.2 OCS General Notes Sheet

This sheet shall contain notes that pertain to OCS design and other applicable references specific to the project.

8.12.3 OCS Abbreviations and Symbols Sheet

This sheet shall contain additional OCS abbreviations and symbols specific to the project not included in the PCJPB abbreviations and symbols sheets.

8.12.4 OCS Sectionalizing Diagrams

The electrical sectionalizing of the traction power distribution system shall be depicted in Sectionalizing Diagrams overlaid on PCJPB's Track Charts in a separate single-line representation.

8.12.5 OCS Tension Length Diagrams

PCJPB's Track Charts shall be used as the base drawing for depicting the master OCS tension length diagrams, which shall identify the locations of all overlaps, balance weight and fixed termination anchors and mid-point anchors. These diagrams shall facilitate construction planning.

8.12.6 OCS Technical Sheets

OCS technical sheets shall provide details of the required conductors, wires and cables. Design and installation data shall be shown, including structure spacing, wire tensions, conductor loading, hanger lengths and pantograph clearance envelopes.

8.12.7 OCS General Arrangement Drawings

OCS general arrangement drawings shall provide information on typical tension lengths, insulated and uninsulated overlaps, phase break, side pole and headspan power feeding arrangements, section insulators and disconnect switches, bridge and tunnel arrangements, crossovers and turn-outs and typical sections throughout the right-of-way.

8.12.8 OCS Assemblies Drawings

OCS assembly drawings shall depict typical details of foundations, poles, structures and wiring assemblies, from cantilevers and headspans through hangers and jumpers. Material allocation references shall be shown against each assembly.

8.12.9 OCS Wiring Layouts

OCS wiring layouts shall be overlaid on the track alignment drawings for the entire route. The track alignment centerlines shall be shown. For simple open route sections, the OCS conductor staggers shall be stated numerically. For complex track configurations, the OCS wiring shall be depicted both graphically and numerically. OCS support structures, comprising steel poles and cantilever bracket arms for simple single-track applications and multi-track support structures, such as steel portal frames or headspans in complex areas, shall be shown. Site specific materials allocation by assembly reference shall be given, together with installation dimensions and data sufficient to define the required catenary configuration.

8.12.10 OCS Conductor, Cable and Conduit Schedules

Each OCS conductor, cable and conduit, as shown in the OCS wiring layout drawings, shall be assigned a unique number. In these schedules, OCS conductors, cables and conduits shall be listed by their assigned numbers along with their type, size and routing. Conduit contents shall be clearly identified. Conductor, cable and conduit lengths shall be determined and shown, either in the conductor, cable and conduit schedules or on the drawings.

8.13 COMMUNICATIONS DRAWINGS

8.13.1 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The electrical engineer of record shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to.

- Communications General Notes Sheet
- Communications Abbreviations and Symbols Sheet
- Subsystem Block Diagrams
- Functional Block Diagrams
- Riser Diagrams

- Equipment Arrangement Plans
- Facility Layout Plans
- Installation Detail Drawings
- Conduit and Cable Schedules

8.13.2 Communications General Notes Sheet

This sheet shall contain notes that pertain to the communications design work and other applicable references specific to the project.

8.13.3 Communications Abbreviations and Symbols Sheet

This sheet shall contain additional communications abbreviations and symbols specific to the project not included in the PCJPB abbreviations and symbols sheets.

8.13.4 Subsystem Block Diagrams

Block diagrams shall be prepared for each of the communications subsystems, showing the system configuration and identifying the major components at each location. Interconnection detail and relationship to the transmission circuits need not be shown.

8.13.5 Functional Block Diagrams

Functional block diagrams shall show the relationship of the functions for a subsystem installation within a facility. Functions shall be shown as blocks and the information flow shall be depicted. Location of the blocks by cabinets may be shown.

Typical locations of repeater and splice boxes, base radio enclosures and antenna installed along the wayside shall be shown.

8.13.6 Riser Diagrams

Riser diagrams shall show the general interface with other subsystems covering supervisory control, alarms, annunciation, public address, visual messaging, closed-circuit TV, the telephone system and system wide cable network components and devices.

8.13.7 Equipment Arrangement Plans

Equipment arrangement drawings shall show the physical location of communications and related equipment. Communications cabinets and racks, train control cabinets, cable trays, termination and interface cabinets, batteries and dedicated power distribution equipment in train control and communications rooms shall be shown.

8.13.8 Facility Layout Plans

Layouts on these drawings shall include grounding, raceways, power systems and lighting for each specific site. The information shall be placed over muted backgrounds.

8.13.9 Installation Detail Drawings

These drawings shall show typical mounting details for installing the communications equipment depicted. Mounting heights, method of fastening, dimensions and other pertinent information shall be included. Bills of material shall be included as well.

8.13.10 Conduit and Cable Schedules

These schedules shall tabulate the communication systems cables routed between facilities. The routing of each cable via conduit and wireway shall be identified.

8.14 FARE COLLECTION

8.14.1 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The electrical engineer of record shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- Fare Collection General Notes Sheet
- Fare Collection Abbreviations and Symbols Sheet
- Subsystem Block Diagrams
- Equipment Arrangement Plans
- AFC Equipment Layouts
- Installation Detail Drawings
- Conduit and Cable Schedules

8.14.2 Fare Collection General Notes Sheet

This sheet shall contain notes that pertain to the fare collection design work and other applicable references specific to the project.

8.14.3 Fare Collection Abbreviations and Symbols Sheet

This sheet shall contain additional fare collection abbreviations and symbols specific to the project not included in the PCJPB abbreviations and symbols sheets.

8.14.4 Subsystem Block Diagrams

These drawings shall show block diagrams for the automatic fare collection (AFC) and data acquisition systems (DAS) subsystems. They shall show the subsystems' configuration. Major components shall be identified.

8.14.5 Equipment Arrangement Plans

These plans shall show the arrangement of AFC equipment in plan and elevation views complete with the locations of all devices and display legends.

8.14.6 AFC Equipment Layouts

These drawings shall show the layouts of areas with AFC equipment. The layout of under floor duct systems, including power cabling, pneumatic lines and control wiring shall be shown. Conduits with power and cabling for other machines shall be included. This information shall be drawn on muted background plans.

8.14.7 Installation Detail Drawings

Details on these drawings shall show the bases of all AFC equipment complete with anchor bolt and conduit stub-up locations. Details of anchor bolt, conduit stub-up and pneumatic line locations shall be shown in specific installation detail drawings.

8.14.8 Conduit and Cable Schedules

These schedules shall tabulate the AFC and DAS cables routed between pieces of equipment. The routing of each cable via conduit and wireway shall be identified.

8.15 SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) DRAWINGS

8.15.1 Drawing Numbers

Drawing numbers shall be allocated by drawing subject matter. Allocations shall include spare numbers for future use. The designer shall finalize drawing numbers with PCJPB prior to commencement of design development activities.

8.15.2 Drawing Scales

Design drawings of similar type shall use uniform scales. The designer shall finalize drawing scales with PCJPB prior to commencement of design development activities. Examples of scales for consideration by drawing topic follow:

Introductory Drawings, Diagrams and Schedules: None.
Equipment Plans: 1”=20’.

8.15.3 Drawing Order

Project drawing sets will not necessarily include all the sheets listed below. The electrical engineer in charge shall sign and seal all drawings. When assembling drawings for submittal, the following order shall be adhered to:

- Introductory Drawings
- Block Diagrams
- Communications System Interface Diagram
- SCADA Equipment Arrangement Plans and Elevations Drawings
- SCADA Interface Cabinet Wiring Diagrams
- Local User Interface Drawings

- Various Required Schedules
- Typical Installation Detail Drawings

8.15.4 Introductory Drawings

General Notes Sheet: This sheet shall contain notes that pertain to SCADA facility design and other applicable references specific to the project.

Abbreviations and Symbols Sheet: This sheet shall contain additional SCADA abbreviations and symbols specific to the project not included in the PCJPB abbreviations and symbols sheets.

Device Lists Sheet: All alphabetic, numeric and alphanumeric designators used to identify SCADA equipment and devices used in the design drawings shall be shown in the device lists.

8.15.5 Block Diagrams

System Architectural Block Diagrams
Block diagrams shall be prepared showing the system architecture and identifying the major components at each location. Interconnection detail and relationship to the transmission circuits need not be shown.

Functional Block Diagrams
Functional block diagrams shall show the relationship of the functions for a system installation within a facility. Functions shall be shown as blocks and the information flow shall be depicted. Location of the blocks by cabinets may be shown.

8.15.6 Communications System Interface Diagrams

Drawings shall depict riser diagrams showing general interface with other subsystems including, but not limited to, the following: communications and fire detection subsystems.

8.15.7 Equipment Arrangement Plans and Elevations Drawings

These drawings shall be prepared for substations, paralleling stations and switching stations. Plans shall be drawn on muted backgrounds.

8.15.8 Interface Cabinet Wiring Diagrams

These diagrams shall depict the wiring termination points and monitoring and control functions for all applicable equipment and shall be prepared for each substation, paralleling station, switching station, wayside equipment enclosure, etc.

8.15.9 Local User Interface Drawings

These drawings shall depict user interfaces and their associated control and monitoring displays and shall be prepared for each substation, paralleling station and switching station.

8.15.10 Various Required Schedules

Required schedules shall include, but not be limited to, the following:

Manhole Schedules
A manhole schedule listing all manholes shall be prepared.

Conduit and Cable Schedules
Conduits and cables shown on traction power facility layout drawings shall be assigned unique numbers. Conduit and cable schedules shall be prepared, listing conduits and cables by their assigned numbers along with their type, size and routing. Conduit contents shall be clearly identified. Conduit and cable lengths shall be determined and shown, either in the conduit and cable schedules or on the drawings. Format shall follow that of the Standard Drawings.

8.15.11 Installation Detail Drawings

Installation detail drawings shall show methods of installation, equipment configuration and fixture mounting. Drawing scale shall be appropriate for information to be shown.

8.16 TRAIN CONTROL SYSTEM DRAWINGS

To be included in a later revision of the CADD Manual.

8.17 CORROSION CONTROL DRAWINGS

To be included in a later revision of the CADD Manual.

8.18 ROLLING STOCK DRAWINGS

To be included in a later revision of the CADD Manual.

END OF SECTION 8

SECTION 9
DRAWING DEVELOPMENT AND REVISION

CONTENTS

FIGURES

FIGURES (CONTINUED)

SECTION 9
DRAWING DEVELOPMENT AND REVISION

9.1 GENERAL

This Section outlines the process by which design and construction drawings for PCJPB projects are developed. PCJPB furnished AutoCAD reference files, blocks, contract drawings and standard drawings are not developed as part of projects and are not subject to this process. Only PCJPB revises these files.

Designers shall create, develop and revise project drawings during several project phases as discussed below. During these phases, project drawings shall be submitted periodically along with their source CADD files for review and archiving. PCJPB's engineering staff will review the submitted drawings for design, and the CADD Department will review the drawings and CADD files for conformance to the CADD criteria set out in this Manual.

9.2 DRAWING DEVELOPMENT MILESTONES

9.2.1 Design Phase

Work performed during this phase results in approved design drawings. As drawings are developed in this phase, they go through several revisions. When a revision is completed, the drawings and their source CADD files shall be submitted to PCJPB for review and comment. These submittals are known as interim or percentage submittals (for example, 15%, 35%, 65%, etc.).

9.2.2 Issued for Bid (IFB) Phase

During the Issued for Bid phase, approved design drawings go out to contractors so that they can bid on the construction work. During the bid period, additional design work is sometimes needed. The resulting revisions during this phase are called Addenda. Designers shall submit IFB design drawings and their source CADD files to PCJPB.

9.2.3 Conformed Phase (Issued for Construction)

During this phase PCJPB awards contracts to successful bidders. Conformed contract document packages include design drawings approved for use in construction. These conformed construction drawings incorporate the revisions made during the IFB phase. Designers shall submit conformed construction drawings and their source CADD files to PCJPB and sets of conformed construction drawings shall be issued to the firm awarded the contract to build the project.

9.2.4 Construction Phase (Project Records)

After construction begins, designers must often provide clarifications or revise the design. They revise the relevant drawings and reissue them to the contractor. In some cases, revisions may require designers to create new drawing files and issue entirely new drawings for incorporation into the construction drawing set. In other cases, questions arise in the field, and the contractor sends PCJPB a Request for Information (RFI), to which PCJPB responds, giving the contractor direction on how to proceed. To track all these revisions and changes, the contractor shall maintain one full-size set of construction drawings as the Daily Project Record Set (Red Line Set.)

9.2.5 Project Record Set Preparation Phase

The Final Daily Project Record Set shall be used in combination with the Final Construction File Set to create the Project Record Set, which shall form a permanent record of the project. See *Figure 9.1*.

9.3 REVISION PROCEDURES

9.3.1 General

This Subsection outlines specific revision procedures for each project phase. Project drawing revision levels shall be controlled and assigned by the design professional "in responsible charge". Generally, a new revision level shall be assigned to a set of drawings whenever warranted.

Throughout a project, the current revision level of each project drawing file and its drawing(s) shall be indicated as discussed below. To track project drawing file revision levels, revision level indicators shall be appended to project drawing file names and kept up to date throughout the project. Revision information shall also be provided and kept up to date in the border of each project drawing. See **Subsection 3.3.5** and **Sections 4.9** and **4.16** for more information. A project's drawing index shall be updated as well throughout all project phases and reissued as necessary so that those involved in the project always have before them a complete and current listing of the project's drawings and their revision levels. Properly followed, these revision tracking procedures will minimize confusion and help ensure that everyone involved in a project will be able to determine whether he or she is working with the most current project drawing files and drawings.

Revision clouds and triangles shall be used during a project's IFB and construction phases to highlight project drawing revisions. Revision clouds shall be drawn as scalloped lines (REVCLOUD command) and placed on a layer assigned the color cyan as found on the AutoCAD Color Index (ACI) palette. Revision clouds shall enclose the revised portions of project drawings and be labeled with revision triangles (PCJPB's block, JPBTRI, see *Figure 9.3*), which shall touch the clouds and indicate the level at which each revision was made. Should IFB and construction

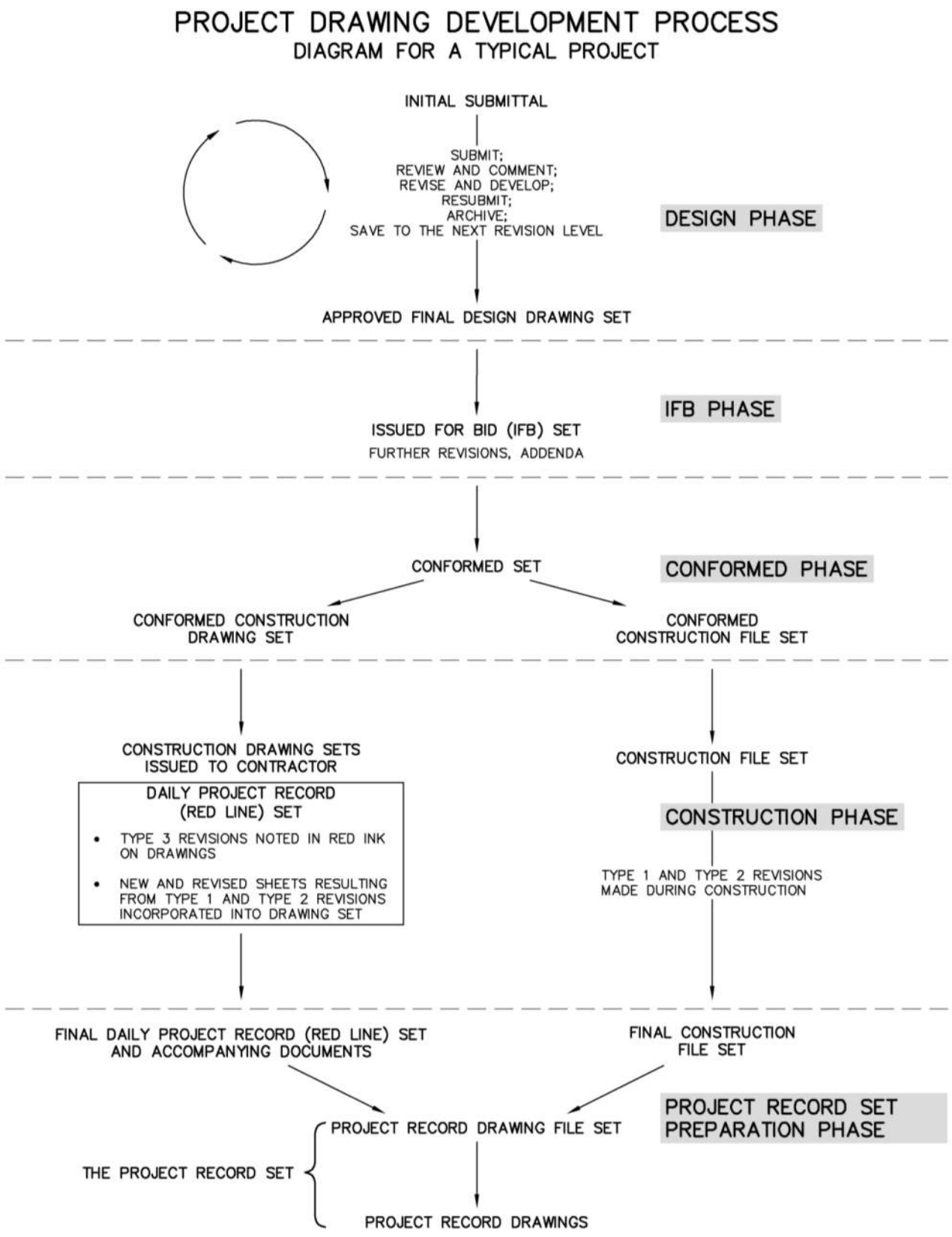


FIGURE 9.1 - PROJECT DRAWING DEVELOPMENT PROCESS

drawings go through multiple revisions, the revision clouds and triangles highlighting previous revisions shall be retained on the drawings.

Revision clouds and triangles may also be used during a project's design phase at the option of the project's designers or the project's manager at PCJPB. If used during the design phase, when project drawings move to the next revision level, all revision clouds associated with the previous level shall be removed from the drawings. Revision triangles identifying the revisions of prior revision levels, however, shall remain.

9.3.2 Interim Design Files and Drawings

Letters of the alphabet shall be used during the design phase to denote revision levels. Letters denoting revision levels shall be appended with a dash to the file names of project drawing files. In project drawing borders, the drawing file names entered in the CADD File Name boxes **(Subsection 4.3)** shall also display the parent file's current revision level indicator. The current revision level of each drawing shall be indicated as well in the Drawing Revision Level box **(Subsection 4.9)**. Revision information blocks (JPBREV, see *Figure 9.3*) appropriately populated shall be inserted into the Revision Information boxes **(Subsection 4.16)** as design work proceeds to indicate the current revision information for each drawing.

When design work begins, the initial project drawing files shall be assigned the revision level "A". Project drawings, when they are first created, shall also be assigned the level "A". After each interim submittal, a project's drawing files shall be archived and copies of them saved to the next revision level. For example, project drawing files making up an initial 15% submittal, level "A" files, after submittal to PCJPB for review and comment, shall be archived and copies of them saved to level "B", the 35% revision level, say. A "-B" shall be appended to the names of files in the new set, replacing the "-A" of the 15% revision level. The revision level of the drawings in these files shall also be incremented to "B".

Design work shall then continue, using the newly created 35% file set. The project drawing files and drawings in the 35% set shall be revised to reflect the comments PCJPB's staff made in their review of the 15% set. And as well new files and drawings shall be created and added to those created for the 15% submittal as the design is further developed and refined. Note that any new files created at the 35% level shall be assigned the revision level "B", but the new drawings they contain shall be assigned the level "A".

This process shall continue throughout the design phase. Project drawing file and drawing revision levels shall be assigned and incremented as the design work progresses through the various revision levels until the design is finalized and approved. See *Figures 9.1, 9.2* and *9.3*. See also *Figures 4.3*, *4.4* and *4.6*.

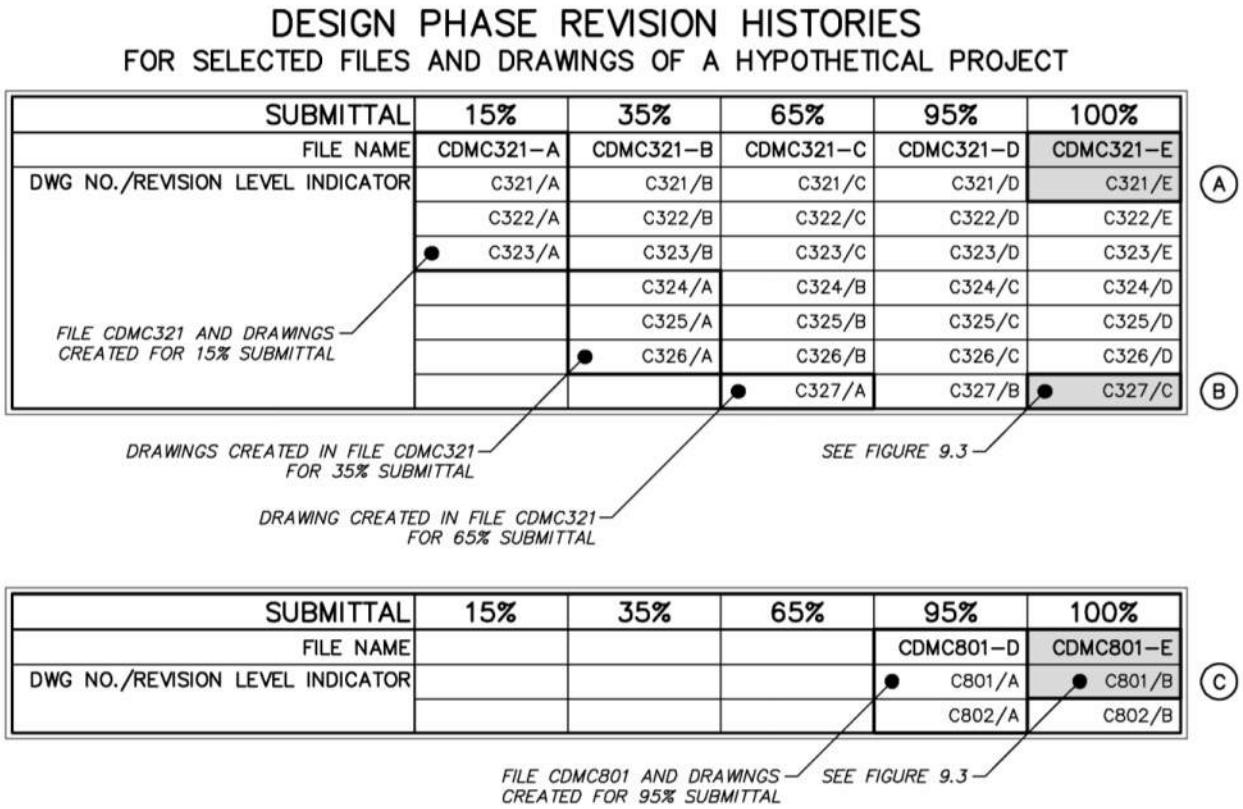
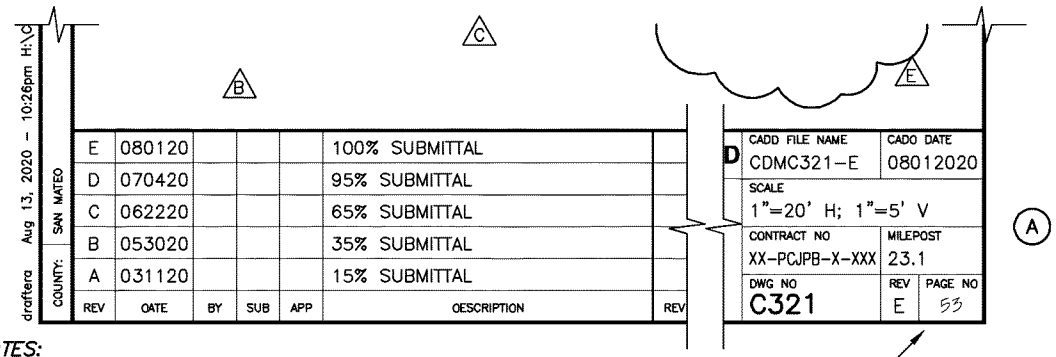


FIGURE 9.2 - FILE AND DRAWING REVISION HISTORIES, DESIGN PHASE

9.3.3 Issued for Bid (IFB) Files and Drawings

After a design is finalized and approved, the approved set of interim project drawing files shall be archived and copies of them made to form the new IFB set. The revision level indicator "-B0" (-B zero) shall be appended to the names of project drawing files that initially make up the IFB set, and all design phase revision clouds and triangles shall be removed from the drawings they contain. In the drawing borders, file names in CADD File Name boxes shall be updated by eliminating revision level indicators from the design phase and appending "-B0" to the ends of the file names. The values in Drawing Revision Level boxes shall be set to "0". Design phase revision blocks shall be removed from the drawing borders, and new revision information blocks (JPBREV) shall be inserted into the Revision Information boxes. The revision level in the revision blocks shall be set to "0" and the revision description to "ISSUED FOR BID."

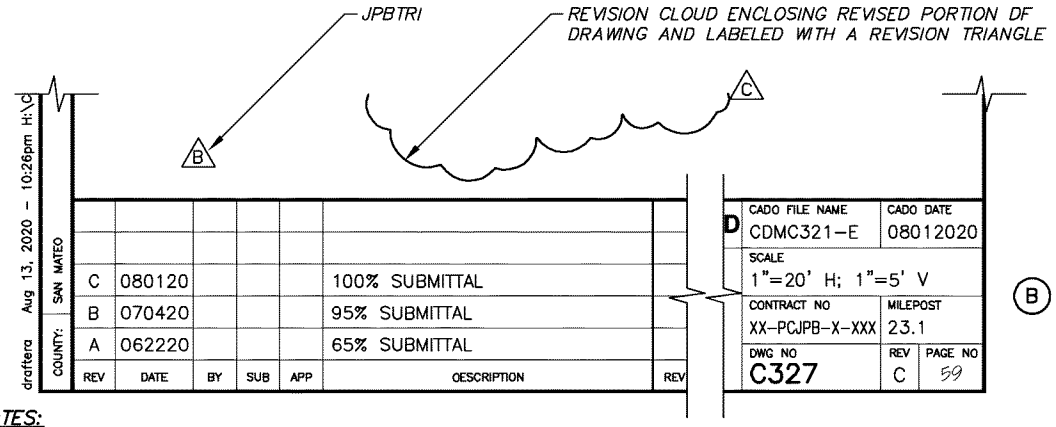
Should revisions be necessary after project drawings are issued for bid, designers shall save each project drawing file to be revised to a new file. For the first revision, the "-B0" in the new file's name shall increment to "-B1". For the second, the "-B1" shall increment to "-B2" and so on. In the drawing borders, file names in CADD File Name boxes and Drawing Revision Level box values shall be updated as necessary. Additional



NOTES:

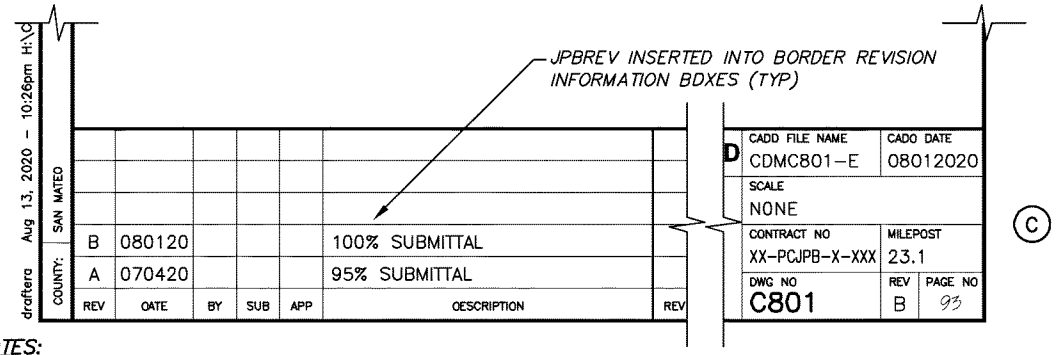
1. PER FIGURE 9.2, DESIGN FILE CDMC321 AND ITS DRAWING C321 FIRST CREATED FOR THE 15% INTERIM SUBMITTAL.
2. AS INDICATED BY THE REVISIDN TRIANGLES, DRAWING C321 REVISED FDR THE 35%, 65% AND 100% INTERIM SUBMITTALS.

PAGE NUMBERS ENTERED MANUALLY ON DRAWINGS PLOTTED TO PAPER DURING THE DESIGN PHASE PER SUBSECTIDN 4.1D



NOTES:

1. PER FIGURE 9.2, DRAWING C327 IN DESIGN FILE CDMC321 FIRST CREATED FDR THE 65% INTERIM SUBMITTAL.
2. DRAWING C327 REVISED FDR THE 95% AND 1DD% INTERIM SUBMITTALS.



NOTES:

1. PER FIGURE 9.2, DESIGN FILE CDMC8D1 AND ITS DRAWING C8D1 FIRST CREATED FDR THE 95% INTERIM SUBMITTAL.
2. ND SUBSEQUENT REVISIDNS MADE TD DRAWING C8D1 IN THE DESIGN PHASE.

FIGURE 9.3 - DRAWING BORDER REVISION INFORMATION EXAMPLES, END OF DESIGN PHASE

revision information blocks (JPBRVT, see *Figure 9.5*) populated with appropriate revision level indicators and descriptions shall be inserted into the Revision Information Boxes of revised drawings above the initial "ISSUED FOR BID" revision information block as necessary. Revision clouds and triangles highlighting the revisions shall be added to the drawings as discussed earlier.

For project drawing files newly created in the IFB Phase, file names shall initially display the revision level indicator "-B1". In the drawing borders, a "-B1" shall be appended to the ends of file names in the CADD File Name boxes, and a "0" shall be placed in the Drawing Revision Level boxes. Revision information blocks (JPBRVT) with revision level set to "0" and appropriate descriptive information shall be placed in the revision information boxes. Should such a file require further revision in the IFB Phase, it shall be saved to a new file. The file name revision level indicator in the new file's name shall be incremented to "-B2", and the file shall be revised, the revision information in its drawing border(s) updated and revision clouds and triangles added as discussed earlier.

Issued for bid project drawings shall be signed and sealed by those project design professionals "in responsible charge" in accordance with **Sections 4** and **10**. See *Figures 9.1* and *9.4* through *9.6*. See also *Figures 4.3* through *4.6*.

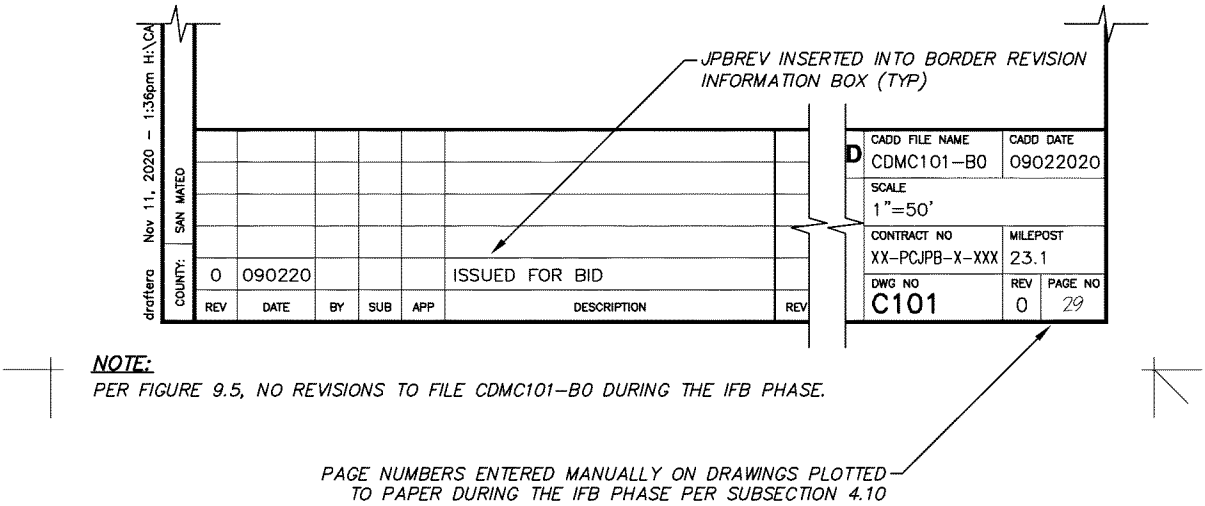


FIGURE 9.4 - DRAWING BORDER REVISION INFORMATION FOR AN ISSUED FOR BID DRAWING

9.3.4 Conformed Files and Drawings

At the close of the IFB Phase, the final IFB files shall be archived and then copied to form the conformed project drawing file set. All revision clouds and triangles from the IFB phase shall be removed from the conformed drawings. The revision level indicator "-0" (-zero) shall be

ISSUED FOR BID PHASE REVISION HISTORIES
FOR SELECTED FILES AND DRAWINGS OF A HYPOTHETICAL PROJECT

IFB PHASE ADDENDA	IFB	A1	A2	A3	A4
FILE NAME	CDMC101–B0	CDMC101–B0	CDMC101–B0	CDMC101–B0	CDMC101–B0
DWG NO./REVISION LEVEL INDICATOR	C101/0	C101/0	C101/0	C101/0	C101/0
	C102/0	C102/0	C102/0	C102/0	C102/0
	C103/0	C103/0	C103/0	C103/0	C103/0

FILE AND DRAWINGS AT THE BEGINNING OF THE IFB PHASE (TYP)

NO REVISIONS TO FILE DURING THE IFB PHASE. SEE FIGURE 9.4.

IFB PHASE ADDENDA	IFB	A1	A2	A3	A4
FILE NAME	CDMC201–B0	CDMC201–B0	CDMC201–B1	CDMC201–B1	CDMC201–B1
DWG NO./REVISION LEVEL INDICATOR	C201/0	C201/0	C201/0	C201/0	C201/0
	C202/0	C202/0	C202/1	C202/1	C202/1 (A)
	C203/0	C203/0	C203/0	C203/0	C203/0

FILE REVISED PER ADDENDUM 2. SEE FIGURE 9.6.

IFB PHASE ADDENDA	IFB	A1	A2	A3	A4
FILE NAME	CDMC231–B0	CDMC231–B1	CDMC231–B1	CDMC231–B2	CDMC231–B2
DWG NO./REVISION LEVEL INDICATOR	C231/0	C231/0	C231/0	C231/0	C231/0
	C232/0	C232/1	C232/1	C232/2	C232/2 (B)
	C233/0	C233/0	C233/0	C233/0	C233/0

FILE REVISED PER ADDENDA 1 AND 3. SEE FIGURE 9.6.

IFB PHASE ADDENDA	IFB	A1	A2	A3	A4
FILE NAME	CDMC701–B0	CDMC701–B1	CDMC701–B2	CDMC701–B3	CDMC701–B4
DWG NO./REVISION LEVEL INDICATOR	C701/0	C701/1	C701/1	C701/2	C701/3
	C702/0	C702/0	C702/1	C702/2	C702/2
	C703/0	C703/0	C703/0	C703/1	C703/1

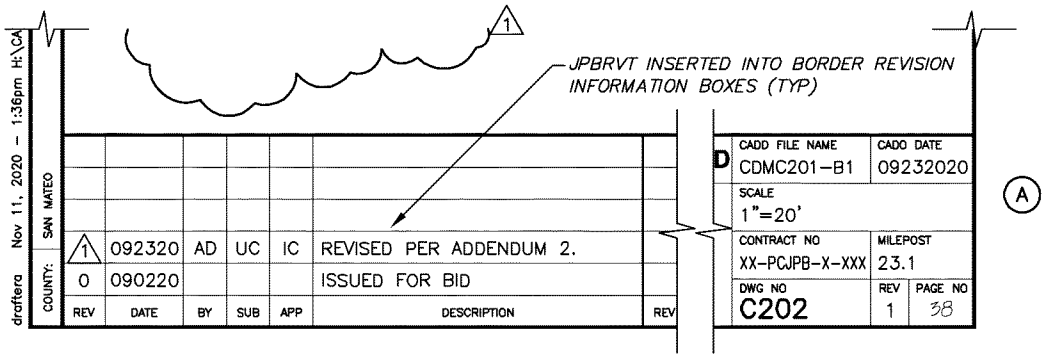
FILE REVISED PER ALL ADDENDA.

IFB PHASE ADDENDA	IFB	A1	A2	A3	A4
FILE NAME			CDMC901–B1	CDMC901–B2	CDMC901–B2
DWG NO./REVISION LEVEL INDICATOR			C901/0	C901/1	C901/1 (C)

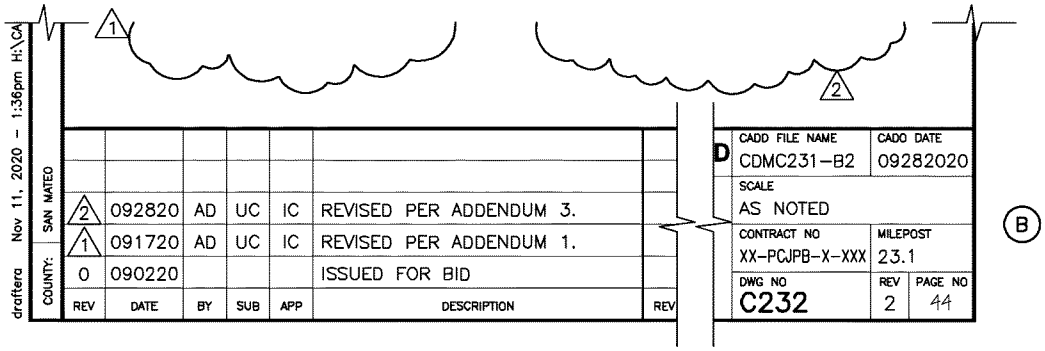
NEW FILE AND DRAWING CREATED PER ADDENDUM 2.

FILE REVISED PER ADDENDUM 3. SEE FIGURE 9.6.

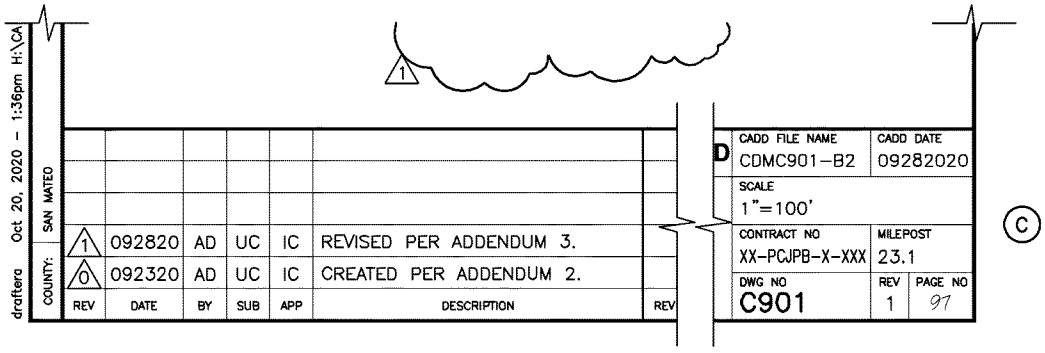
FIGURE 9.5 - FILE AND DRAWING REVISION HISTORIES, ISSUED FOR BID PHASE



NOTE:
PER FIGURE 9.5, DRAWING C202 IN FILE CDMC201-B1 REVISED PER ADDENDUM 2.



NOTES:
1. *PER FIGURE 9.5, DRAWING C232 IN FILE CDMC231-B2 REVISED PER ADDENDA 1 AND 3.*
2. *REVISION CLOUDS AND TRIANGLES OF EARLIER REVISIONS RETAINED.*



NOTE:
PER FIGURE 9.5, FILE CDMC901-B2 CREATED PER ADDENDUM 2 AND REVISED PER ADDENDUM 3.

FIGURE 9.6 - DRAWING BORDER REVISION INFORMATION EXAMPLES, END OF ISSUED FOR BID PHASE

appended to the names of project drawing files in the conformed set. In the drawing borders, file names in the CADD File Name boxes shall be updated by replacing any revision level designators from the IFB phase with "-0". As necessary, the value in Drawing Revision Level boxes shall revert to "0". All revision information blocks from the IFB phase shall be removed from the drawing borders, and new revision information blocks (JPBREV.dwg) shall be inserted into the revision information boxes with the revision level set to "0" and the description reading "CONFORMED".

As with issued for bid drawings, conformed drawings shall be signed and sealed by the registered professional engineer or licensed architect "in responsible charge". See *Figure 9.7* and *Figures 4.3* through *4.6*.

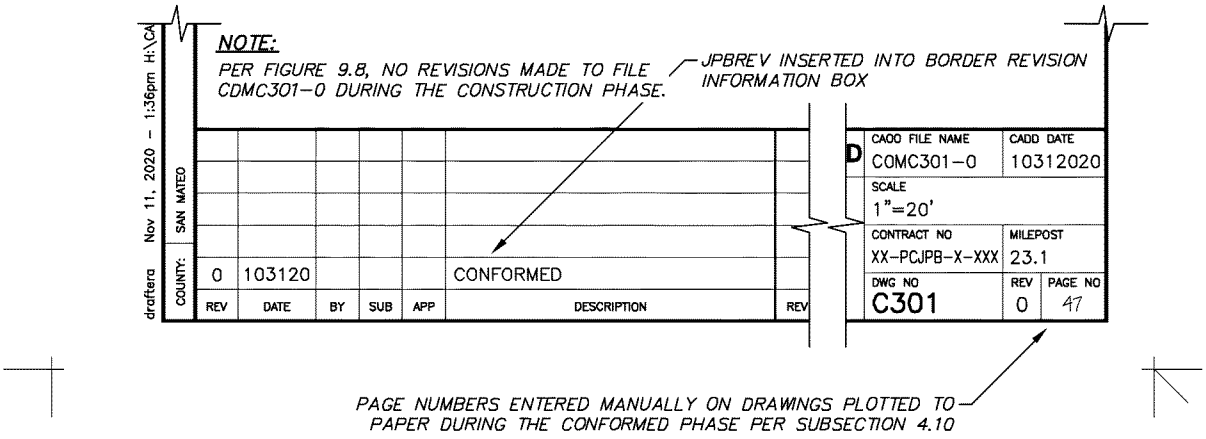


FIGURE 9.7 - DRAWING BORDER REVISION INFORMATION FOR A CONFORMED DRAWING

9.3.5 Construction Files and Drawings

After the contract has been awarded, the conformed project drawing file set shall be archived and then copied to form the construction file set. Sets of full-size construction drawings shall be plotted and delivered to the contractor for use in building the project. One of these drawing sets the contractor shall set aside for use as the Daily Project Record Set. The project design team shall retain the construction file set in case further revisions to the project drawings during construction are necessary.

For Type 1 and Type 2 revisions (**Subsubsection 9.4.2**), revision information blocks, clouds and triangles shall be employed and CADD file names and drawing border revision information updated as in the earlier drawing development phases. Numerals shall indicate the revision levels of construction drawing files and drawings. Files to be revised shall be saved to a new file. For the first revision, a "-1" shall replace "-0" in the names of revised construction drawing files. For the second revision, "-2" shall replace "-1" and so on. Drawing file names in the CADD File Name

boxes and Drawing Revision Level box values shall be updated as well. Appropriately populated revision information blocks (JPBRVT.dwg) shall be inserted as necessary in the Revision Information boxes above the initial “CONFORMED” revision information block. The description in the revision block shall refer to the PCJPB document authorizing the revision. Revision clouds and triangles shall be used to highlight revisions. Revised construction drawings shall be plotted and provided to the contractor for incorporation into the construction drawing and daily project record sets.

For project drawing files newly created in the construction phase, file names shall initially have a “-1” appended to them. In the border CADD File Name boxes, a “-1” shall be appended to the end of the file name, and a “0” shall be placed in the Drawing Revision Level boxes. Revision information blocks (JPBRVT) with revision level set to “0” and appropriate descriptive information shall be placed in the border revision information boxes. Should the drawings in such files require revision, the files shall be saved to a new files and revision indicators incremented to “-2”. Revision clouds and triangles shall highlight revisions, and border revision information shall be updated as discussed above. Newly created construction drawings shall be plotted and provided to the contractor for incorporation into the construction drawing and daily project record sets.

As with conformed drawings, newly created construction drawings shall be signed and sealed by the registered professional engineer or licensed architect “in responsible charge.” Design professionals responsible for Type 2 revisions shall sign and seal the drawings they revise per **Subsubsection 9.4.3**.

See *Figures 9.1*, *9.8* and *9.9*. See also *Figures 4.3* through *4.6*.

9.3.6 Project Records

At the end of the construction phase, a project’s Construction File Set shall reflect any Type 1 and Type 2 revisions made during construction. It shall include the original conformed files with any revisions thereto and any new files added during construction. The project design team shall submit this Final Construction File Set to PCJPB or to whomever PCJPB will designate. It shall be prepared for submittal as outlined in **Section 10** prior to delivery.

The Daily Project Record Set shall consist of construction drawings plotted on full-size (D size) sheets. At the close of construction, it shall comprise the original conformed drawings set with any revisions thereto and any drawings newly created during construction. It shall have recorded on its sheets, using red ink, any Type 3 revisions (**Subsection 9.4**). For each revision, the contractor shall highlight the revised area(s), provide a reference to the RFI(s) or other document(s) authorizing and describing the revision and, additionally, if possible, draft in the revision. This set shall be used to create the Final Daily Project Record set once construction is complete.

CONSTRUCTION PHASE REVISION HISTORIES
FOR SELECTED FILES AND DRAWINGS OF A HYPOTHETICAL PROJECT

CONS. PHASE REVISIONS	CONFORMED	CHG. ORDER 1	CHG. ORDER 2	CHG. ORDER 3	CHG. ORDER 4
FILE NAME	CDMC301–0	CDMC301–0	CDMC301–0	CDMC301–0	CDMC301–0
DWG NO./REVISION LEVEL INDICATOR	C301/0	C301/0	C301/0	C301/0	C301/0
	C302/0	C302/0	C302/0	C302/0	C302/0

CONFORMED FILE AND DRAWINGS AT THE BEGINNING OF THE CONSTRUCTION PHASE (TYP)

NO REVISIONS TO FILE DURING THE CONSTRUCTION PHASE. SEE FIGURE 9.7.

CONS. PHASE REVISIONS	CONFORMED	CHG. ORDER 1	CHG. ORDER 2	CHG. ORDER 3	CHG. ORDER 4
FILE NAME	CDMC331–0	CDMC331–0	CDMC331–1	CDMC331–1	CDMC331–1
DWG NO./REVISION LEVEL INDICATOR	C331/0	C331/0	C331/0	C331/0	C331/0
	C332/0	C332/0	C332/1	C332/1	C332/1
			C333/0	C333/0	C333/0

(A)

DRAWING C333 ADDED PER CHANGE ORDER 2.

DRAWING C332 REVISED PER CHANGE ORDER 2. SEE FIGURE 9.9.

CONS. PHASE REVISIONS	CONFORMED	CHG. ORDER 1	CHG. ORDER 2	CHG. ORDER 3	CHG. ORDER 4
FILE NAME			CDMC351–1	CDMC351–2	CDMC351–2
DWG NO./REVISION LEVEL INDICATOR			C351/0	C351/1	C351/1

(B)

NEW FILE CREATED PER CHANGE ORDER 2.

DRAWING REVISED PER CHANGE ORDER 3. SEE FIGURE 9.9.

CONS. PHASE REVISIONS	CONFORMED	CHG. ORDER 1	CHG. ORDER 2	CHG. ORDER 3	CHG. ORDER 4
FILE NAME	CDMC401–0	CDMC401–1	CDMC401–2	CDMC401–3	CDMC401–4
DWG NO./REVISION LEVEL INDICATOR	C401/0	C401/1	C401/2	C401/3	C401/4
	C402/0	C402/1	C402/1	C402/2	C402/2
	C403/0	C403/1	C403/1	C403/2	C403/3

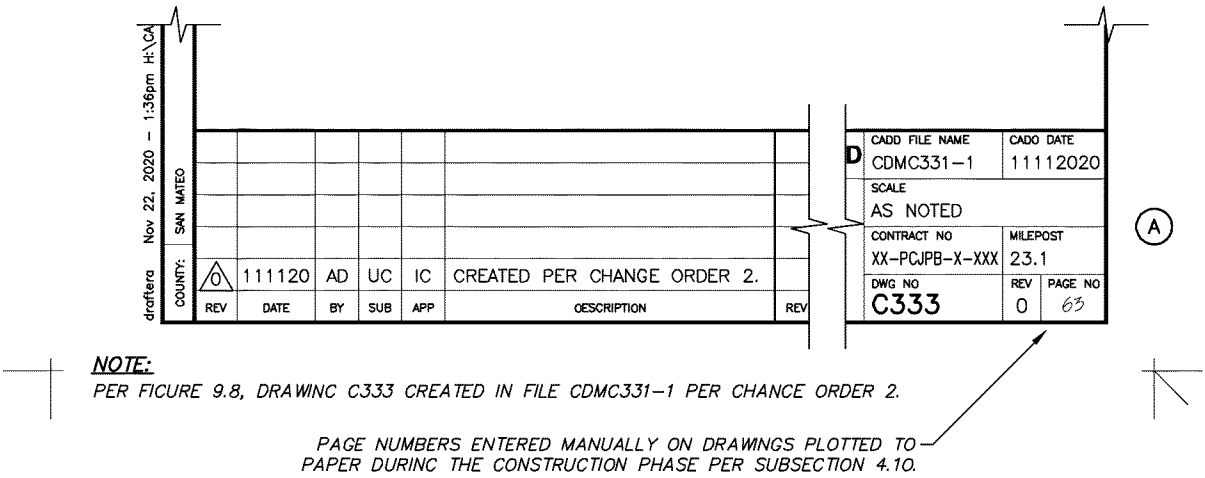
(C)

FILE REVISED PER ALL CHANGE ORDERS. SEE FIGURE 9.9.

CONS. PHASE REVISIONS	CONFORMED	CHG. ORDER 1	CHG. ORDER 2	CHG. ORDER 3	CHG. ORDER 4
FILE NAME	CDMC501–0	CDMC501–1	CDMC501–1	CDMC501–2	CDMC501–2
DWG NO./REVISION LEVEL INDICATOR	C501/0	C501/1	C501/1	C501/2	C501/2
	C502/0	C502/0	C502/0	C502/1	C502/1
	C503/0	C503/0	C503/0	C503/0	C503/0

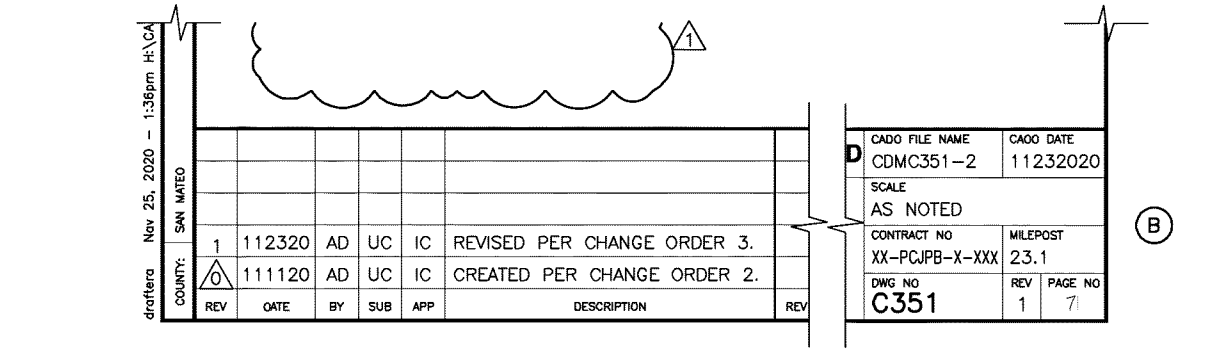
FILE REVISED PER CHANGE ORDERS 1 AND 3.

FIGURE 9.8 - FILE AND DRAWING REVISION HISTORIES, CONSTRUCTION PHASE

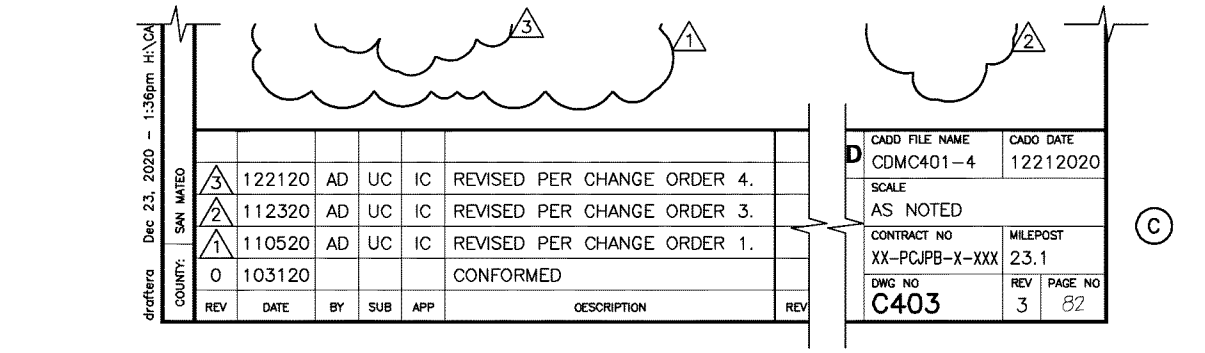


NOTE:
PER FIGURE 9.8, DRAWING C333 CREATED IN FILE CDMC331-1 PER CHANGE ORDER 2.

PAGE NUMBERS ENTERED MANUALLY ON DRAWINGS PLOTTED TO PAPER DURING THE CONSTRUCTION PHASE PER SUBSECTION 4.10.



NOTES:
1. *PER FIGURE 9.8, FILE CDMC351-2 CREATED PER CHANGE ORDER 2.*
2. *PER FIGURE 9.8, DRAWING C351 REVISED PER CHANGE ORDER 3.*



NOTE:
PER FIGURE 9.8, DRAWING C403 REVISED PER CHANGE ORDERS 1, 3 AND 4.

FIGURE 9.9 - DRAWING BORDER REVISION INFORMATION EXAMPLES, END OF CONSTRUCTION PHASE

To create the Final Daily Project Record Set, the contractor shall transfer, using red ink, all changes noted on the Daily Project Record Set to a new, clean, reproducible, full-size set of the project's final construction drawings. Any documents related to revisions shown on the Daily Project Record Set, such as responses to Requests for Information (RFIs,) sketches and the like shall be a part of and accompany the Final Daily Project Record Set. These shall be organized as hardcopy in binders or as digital files on a disc or thumb drive. **No documents of any kind shall be glued, taped, stapled, paper clipped or otherwise affixed to the sheets comprising the Daily or Final Daily Project Record sets.** The contractor shall submit the Final Daily Project Record Set and accompanying documents to PCJPB or to whomever PCJPB will designate.

9.4 PROJECT RECORD SET PREPARATION

9.4.1 General

The Final Construction File Set and the Final Daily Project Record Set shall show where and how the project as constructed differs from the project as originally designed, in other words, how it was actually constructed. They shall be used in combination to create record files and drawings for the project, the Project Record Set. A copy of the Final Construction File Set shall be archived before creating the Project Record Set. Unless PCJPB directs otherwise, the PCJPB CADD Department will be responsible for creating the Project Record Set.

9.4.2 Project Record Set Creation

All revision level indicators shall be deleted from the names of CADD files in the Project Record Drawing File Set. In the borders of record drawings, any construction phase revision level indicators appended to file names in the CADD File Name Boxes and any entries in the Drawing Revision Level Boxes shall be deleted. Any revision information blocks from the construction phase shall be deleted, and new revision information blocks (JPBREV) without any revision level indication and with the description "RECORD DRAWING" shall be inserted in the Revision Information Boxes. Per **Subsection 4.10**, page numbers shall be entered digitally in border Page Number boxes. Plot stamps shall be omitted from record drawings. See *Figure 9.10*. Each Record Drawing shall display the PCJPB block, JPB-REC. See *Figure 9.16*. JPB-REC shall be positioned in one of two locations in drawing layouts as shown in *Figures 9.11* and *9.12*. It shall be positioned so that it does not obscure any drawing detail and be placed on a layer named B-ANNO-XREF-BRDR-RCRD-STMP.

When creating the Project Record set, the treatment of revisions made during construction shall depend on their origin. Revisions to a project's construction drawings are of three types as discussed below.

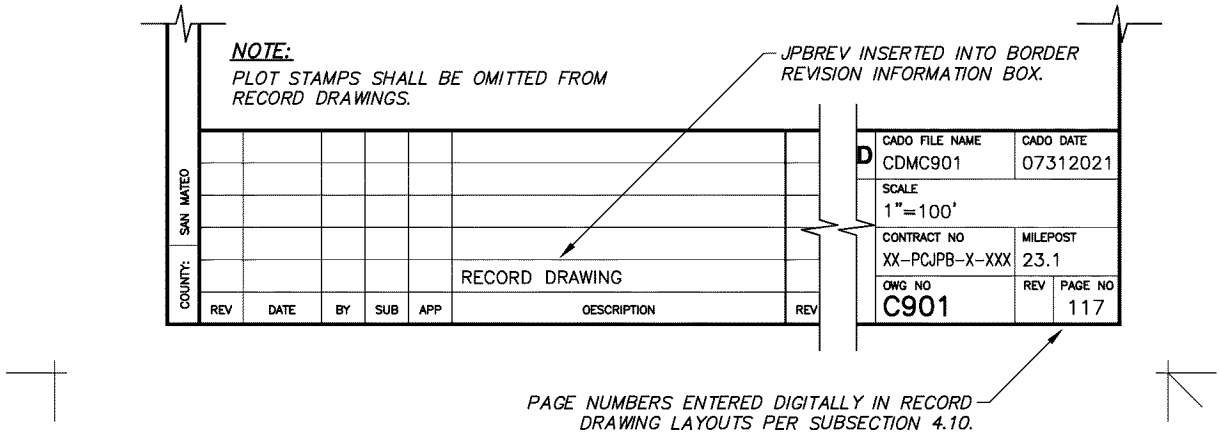


FIGURE 9.10 - DRAWING BORDER REVISION INFORMATION FOR A RECORD DRAWING

Type 1 Revisions: These are revisions to construction drawings made by the original project designers whose signatures and seals are on the conformed drawing set. These revisions are incorporated using CADD drafting techniques into the construction file set, and new or revised construction drawings with clouds and revision triangles highlighting the revisions are plotted and provided to the contractor.

Type 2 Revisions: These are revisions made to construction drawings under the supervision of design professionals who were not members of the original design team and whose signatures and seals are not on the conformed drawing set. These revisions are also incorporated using CADD drafting techniques into the construction file set, and new or revised construction drawings with clouds and revision triangles highlighting the revisions are plotted and provided to the contractor. Should a designer of the original design team revise a drawing signed and sealed by another member of the original design team, the revision shall be treated as a Type 2 revision.

Type 3 Revisions: These are revisions to the original design made in the field during construction and noted in red on the drawings of the Daily Project Record set. Insufficient or confusing information on construction drawings or conflicts between actual field conditions and those as depicted on the drawings often necessitate these revisions. When a contractor needs more information or discovers a conflict, he issues a Request for Information (RFI), to which PCJPB responds, giving the contractor guidance on how to proceed. Type 3 revisions are incorporated digitally into the Project Record Drawing File set only after construction of the project has been completed.

When creating the Project Record Set, all revision clouds and triangles highlighting Type 1 revisions shall be removed from the drawings. Revision clouds and triangles highlighting Type 2 revisions shall be

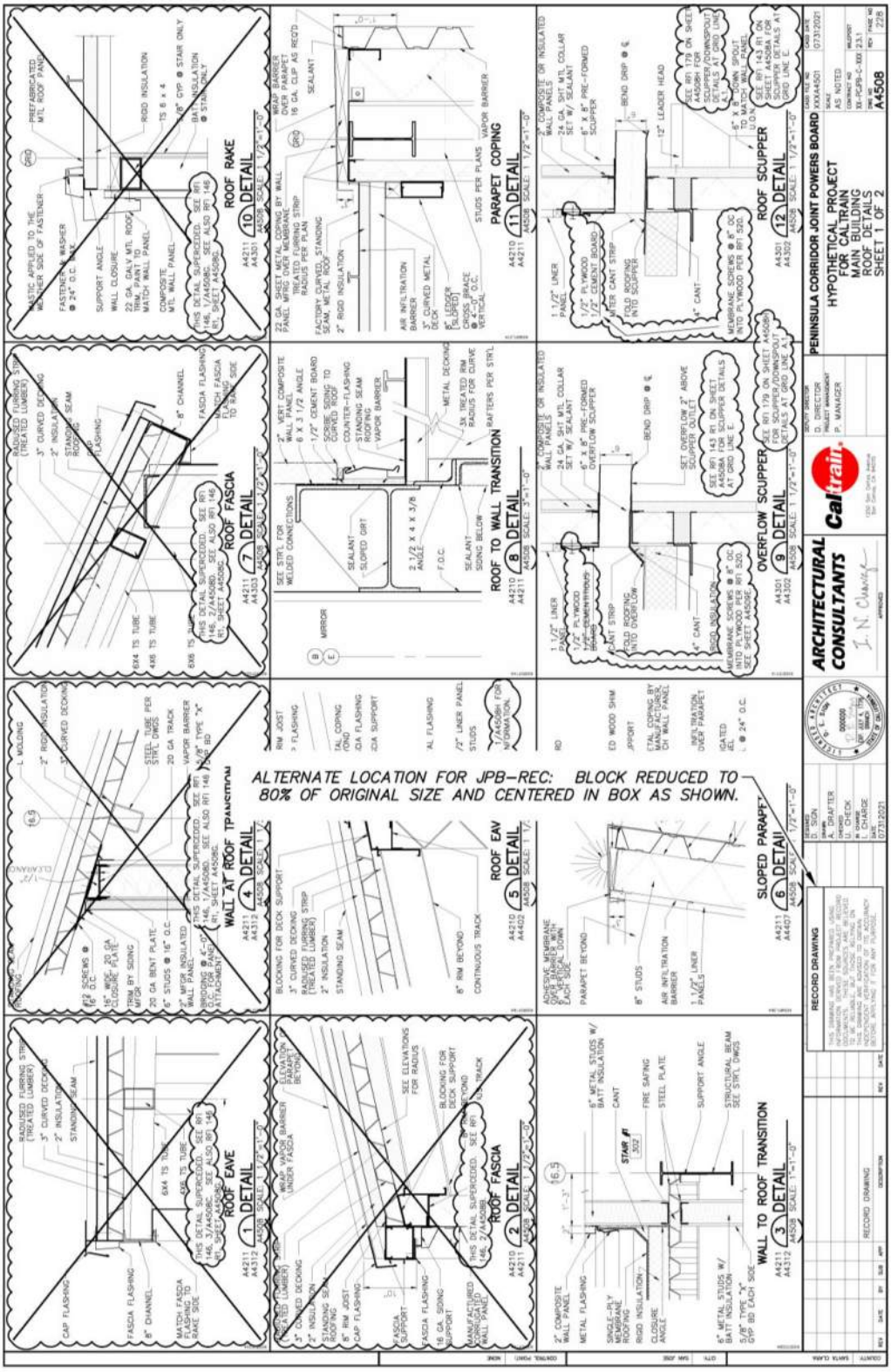


FIGURE 9.11 - ARCHITECTURAL RECORD DRAWING A4508 WITH TYPE 3 REVISIONS NOTED

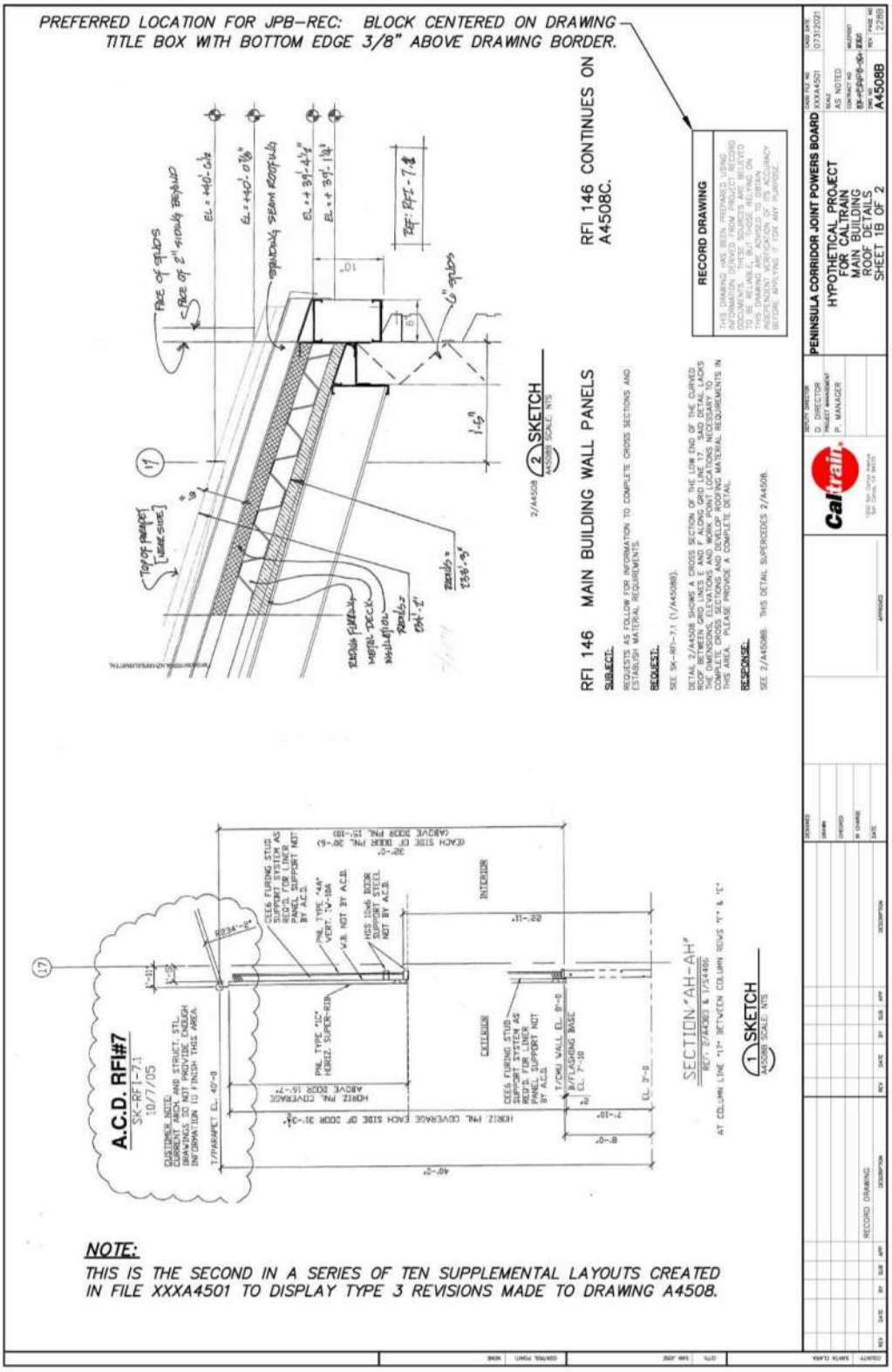


FIGURE 9.12 - SUPPLEMENTAL ARCHITECTURAL RECORD DRAWING A4508B DISPLAYING A TYPE 3 REVISION TO DRAWING A4508

retained. Type 3 revisions shall be treated using either of two methods as discussed below.

The first method of treating Type 3 revisions shall be to incorporate them into the Project Record Drawing File set using CADD drafting techniques. As an example, consider a utility line realigned during construction because of a conflict. The line work and symbols representing the utility line would be drafted in along with any pertinent annotation, and the line work and symbols representing the utility line as originally designed would then be crossed out or deleted. The revision would be clouded and a reference to the RFI or other document authorizing the change provided.

Drafting in every Type 3 revision as described above, however, is usually infeasible because of time, budget and other constraints. Usually, therefore, Type 3 revisions shall be treated using a second method. For example, as illustrated in *Figures 9.11* and *9.12*, consider a revised architectural detail. Using the second method, the CADD person would take scans of the pertinent documents (sketches and written directions issued in response to an RFI, for example) and insert them into a new layout created for them in the file containing the original detail. He or she would then cross out and cloud the superseded detail and provide a note specifying the governing RFI and directing readers to the inserted scans in the new layout.

9.4.3 Professional Signatures and Seals on Record Drawings

Record drawings shall display the signatures and seals of those members of the original design team who signed and sealed the conformed drawings. Record Drawings with Type 2 revisions shall also display the signatures and seals of the design professionals responsible for those revisions. Those individuals responsible for Type 3 revisions can be identified by referring to the relevant project documents.

Signature and seal files belonging to members of the original design team shall have already been externally referenced into each design professional's border file during the IFB phase as described in **Subsection 4.13**. Signature and seal files of those design professionals responsible for Type 2 revisions shall have already been externally referenced into the layouts of drawings they revised during the construction phase. These signature and seal files, if not already placed on them, shall be placed, respectively, on layers named as follows:

B-ANNO-REVN-TYP2-XREF-SIGN and
B-ANNO-REVN-TYP2-XREF-SEAL.

PCJPB's attributed blocks JPB-PE, JPB-LA, JPB-LLA and JPB-PLS shall be used as appropriate in conjunction with signature and seal files certifying Type 2 revisions. The appropriate block shall be inserted into each layout as needed and placed on a layer named B-ANNO-REVN-TYP2. See *Figures 9.13* and *9.15*.

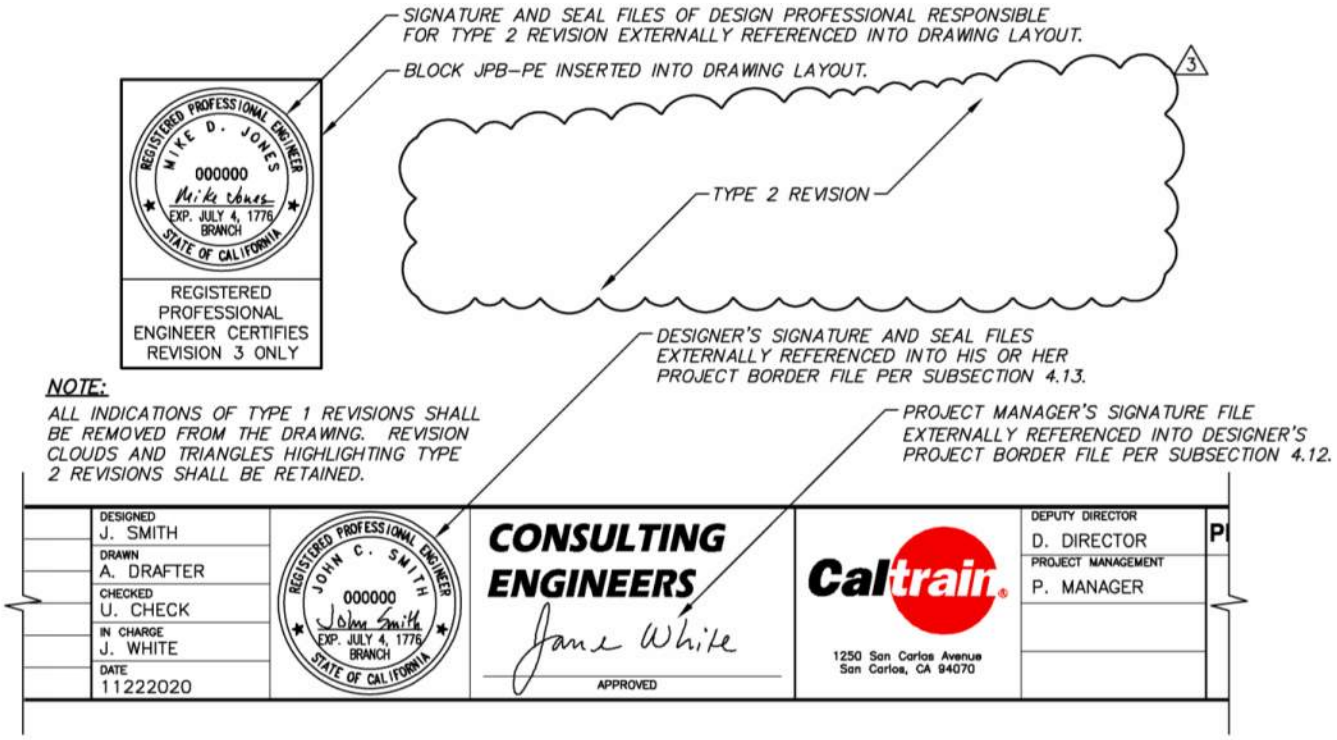


FIGURE 9.13 - TREATMENT OF DESIGN PROFESSIONAL INFORMATION, SIGNATURE AND SEAL FILES PRESENT

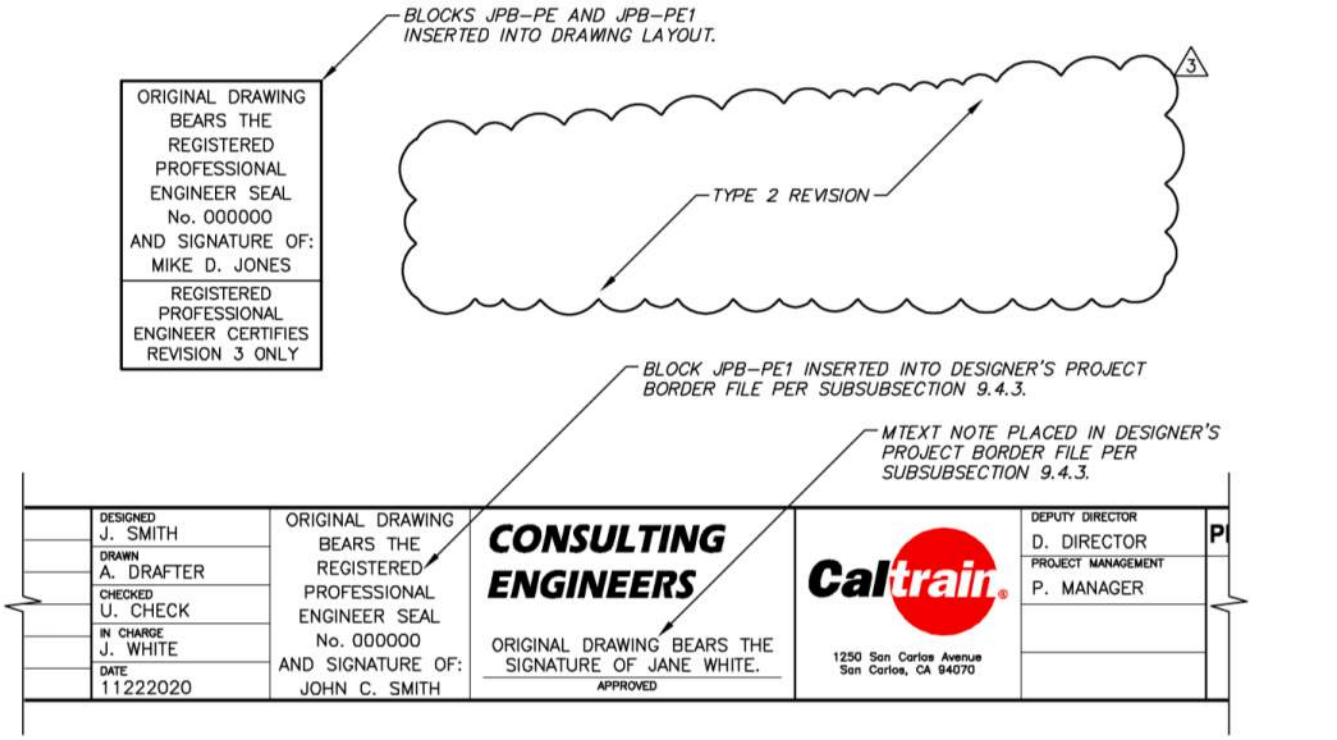


FIGURE 9.14 - TREATMENT OF DESIGN PROFESSIONAL INFORMATION, SIGNATURE AND SEAL FILES WITHHELD

Often, however, designers withhold signature and seal files from their submittals. In such cases, when creating record drawings, PCJPB's attributed blocks JPB-PE1, JPB-LA1, JPB-LLA1 and JPB-PLS1, shown in *Figure 9.15*, shall be used as appropriate to identify the design professionals who signed and sealed the drawings. If the project manager's signature file has also been withheld, an mtext note stating: "Original drawing bears the signature of (insert the name of the consulting firm's project manager)" shall be placed in the drawing border's consultant logo and project manager signature box. These blocks and the mtext note shall be placed on layers created for them in each designer's project drawing border file. The layers shall be named:

B-ANNO-XREF-BRDR-SIGN-ORIG-PJCT-MNGR and
B-ANNO-XREF-BRDR-SIGN-SEAL-ORIG.

JPB-PE1, JPB-LA1, JPB-LLA1 and JPB-PLS1 shall also substitute for the missing signature and seal files of designers responsible for Type 2 revisions. The substitute file shall be inserted as a block along with one of the blocks JPB-PE, JPB-LA, JPB-LLA or JPB-PLS as appropriate into those layouts with Type 2 revisions. The files shall be placed respectively on layers named:

B-ANNO-REVN-TYP2-SIGN-SEAL-ORIG and
B-ANNO-REVN-TYP2.

See *Figures 9.14* and *9.15* and *Figures 4.3 and 4.5*.

9.4.4 Record Drawing Completion

Once all the revisions have been incorporated into the Project Record Drawing File Set, the marginal information in each drawing has been updated and any other work completed, the Project Record Drawings shall be plotted to PDF files. These shall be assembled into a volume (a multipage PDF file) or multiple volumes, depending on the size of the project. See *Figure 6.10* for a sample coversheet for such a volume.

Should an entity other than PCJPB create the Project Record Set, its CADD files and PDFed drawings, the Final Daily Project Record Set and all its accompanying documents shall be submitted to PCJPB for review, comment and archiving. Prior to submittal, the Project Record Set shall be assembled, checked and prepared for delivery per the requirements laid out in **Subsubsection 9.3.6** and **Section 10**.

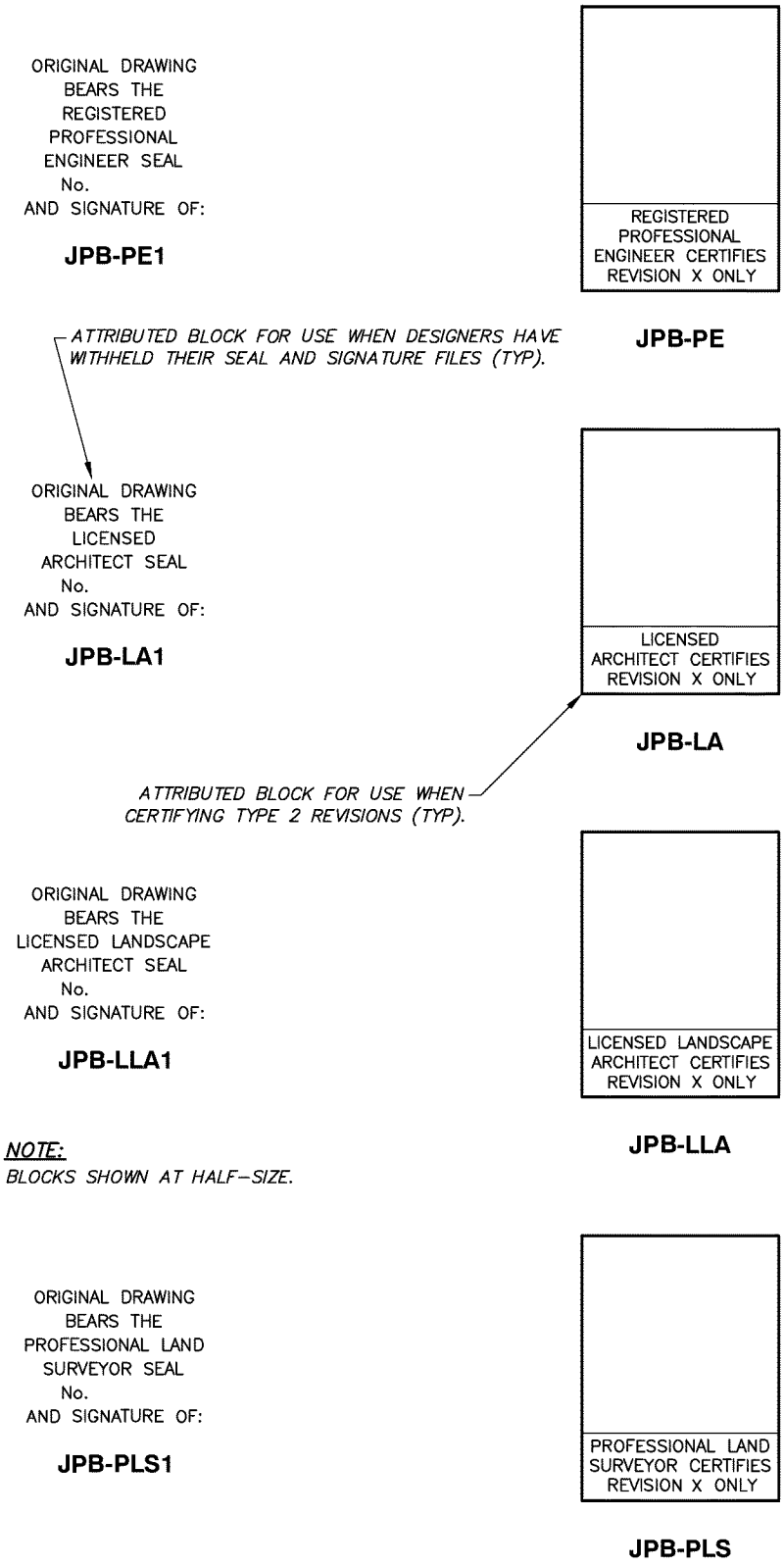


FIGURE 9.15 - BLOCKS USED AS SUBSTITUTES FOR PROFESSIONAL SIGNATURES AND SEALS AND FOR CERTIFYING TYPE 2 REVISIONS

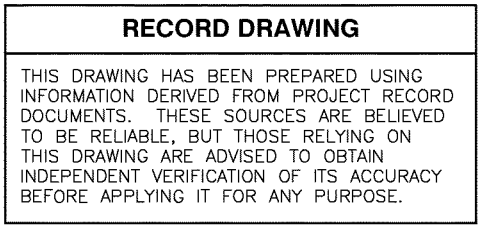


FIGURE 9.16 - JPB-REC, PCJPB'S RECORD DRAWING STAMP

END OF SECTION 9

SECTION 10
PROJECT DRAWING SUBMITTALS

CONTENTS

FIGURES

SECTION 10
PROJECT DRAWING SUBMITTALS

10.1 GENERAL

Designers shall periodically submit project drawings and their source CADD files to PCJPB per **Section 9**. The deliverables of all project drawing submittals shall conform to and be delivered per the requirements outlined in this Section.

10.2 CADD FILE PREPARATION

Prior to submittal, project CADD files shall be put in standard form as follows. In the Layer Manager, layer zero (0) shall be set as the current layer, and the layer filter "All" shall be selected. Layer line weight values shall all be set to default. Files shall be submitted with layers either frozen or thawed. All layers shall be turned on. No layers shall be turned off. Layers shall be toggled to the "off" state only when using the LAYISO command to temporarily isolate selected layers.

Any graphic entities not pertinent to the drawings shall be eliminated from the files. In each file, the color, linetype and line weight controls shall all be set to ByLayer, and text, dimension, table and multileader styles shall all be set to Standard. CADD files shall then be purged of all unused blocks, layers, styles and so on. The value of the LAYEREVAL variable shall be set to zero (0). Any anonymous blocks (those having names of the A$C* variety, for example) and any other entities having nonsensical names shall be assigned meaningful names. Layout tabs shall be named appropriately, and any unused or nonproject drawing layouts in the files shall be deleted.

Externally referenced files, shall be referenced using the Reference Type "Overlay." Reference files shall not be bound to the referencing file. All irrelevant reference files, images and underlays (unreferenced, unloaded files or files with drawing detail not appearing in any of the host files' layouts) shall be detached from project drawing files prior to submittal. Any issues with "Not Found" reference files shall be resolved prior to submittal. Any cases in which drawing detail in a file "disappears" when the ZOOM EXTENTS command is executed shall be dealt with and eliminated prior to submittal. Reference file path names shall be set to "No Path" or "Relative Path" depending on whether the CADD files are to be submitted, respectively, in a single directory or in multiple directories. For issued for bid, conformed and record drawing submittals, professional seals and signatures shall be treated as discussed in **Subsection 4.13** and **Subsubsection 9.4.3**.

Autodesk's CAD Standards checking tool used in conjunction with PCJPB's drawing standards files (CIVL_UNITS.dws and ARCH_UNITS.dws) can assist in preparing project CADD files for submittal. This tool may be used to check the files for compliance with PCJPB's CADD criteria. It is limited, however, to verifying dimension styles, text styles and line types only. The drawing standards file CIVL_UNITS.dws shall be used for checking drawing files with units for length

set to type decimal and the insertion scale variable set to feet. The ARCH_UNITS.dws shall be used for checking drawing files with units for length set to type architectural and the insertion scale variable set to inches. These drawing standards files are available upon request.

10.3 PROJECT DELIVERABLES

10.3.1 Electronic Deliverables

CADD files shall be submitted in their native AutoCAD drawing file format (.dwg format). No zipped files of any kind will be accepted. All required subsidiary files (font files, for example) shall be included along with the project CADD files. Use of AutoCAD's ETRANSMIT tool is the easiest way to assemble all these files for submittal. See *Figure 10.1*.

In addition to the project CADD files, a PDF file created for each volume of project drawings shall also be submitted. Plots of all the drawings belonging to a particular volume shall be assembled in that volume's PDF file. PDFed drawings shall be arranged in their volumes as listed in the index of drawings and shall all be rotated to the landscape orientation. Drawings shall be plotted to PDF files from the project CADD files at a resolution of 300 dots per inch (DPI) and at half-size (17" x 11", ANSI B size). If trim marks appear on the plots, they are not at half size and must be replotted. Project drawing PDF files shall contain **NO** CADD layer information. If wet stamped drawings are to be submitted, they shall be scanned at 300 DPI to PDF files, which shall then be assembled as discussed above into volumes for submittal.

Only those CADD files necessary to generate the submitted project drawings shall be included in project drawing submittals. Submitted project CADD and PDF files shall be delivered on compact discs or DVDs. Submittals shall be delivered on CD-Rs or DVD-Rs only, not on rewritable discs (CDRWs, DVDRWs). CADD files shall preferably be placed in a single directory. The files of larger projects, however, may be organized in multiple directories. Discs shall be delivered in standard jewel cases and shall be labeled using either a permanent marker or a printed CD/DVD label. They shall be clearly marked with the following information: project name, contract number, submittal, date of submittal and the name of the consultant making the submittal. See *Figures 10.2* and *10.3*.

10.3.2 Hard Copy Deliverables

Full-size project drawings—those in construction drawing sets or drawings to be wet stamped, for example—shall be plotted from project CADD files on 20 lb. bond or better and trimmed to 34" x 22" (ANSI D size). At times, half-size project drawing sets plotted to paper may be required for distribution and review. Such half-size drawing sets shall be plotted on 17" x 11" (ANSI B size) sheets of 20 lb. bond or better. All hard copy plot sets shall be punched and bound using Chicago screws prior to submittal. As discussed above, CADD source files and PDF files,

whether plotted from the CADD source files or generated by scanning, shall accompany any drawings submitted as hard copy.

10.4 DISPOSITION OF PROJECT DELIVERABLES

Upon receipt of submittals, project managers shall deliver discs containing the project CADD and PDF files to PCJPB's CADD Department. The CADD Department shall deliver copies of the project PDF files to the Document Control Department. Project managers shall deliver any documentation accompanying the submittal (a letter of transmittal, for example) to the Document Control Department. If the submittal is a project record set submittal, in addition to the foregoing, the CADD Department shall receive the Final Daily Project Record Set, and the Document Control Department shall receive any accompanying documents, as discussed in **Subsubsection 9.3.6,** that are a part of the Final Daily Project Record Set. Construction drawing sets shall be delivered directly to contractors.

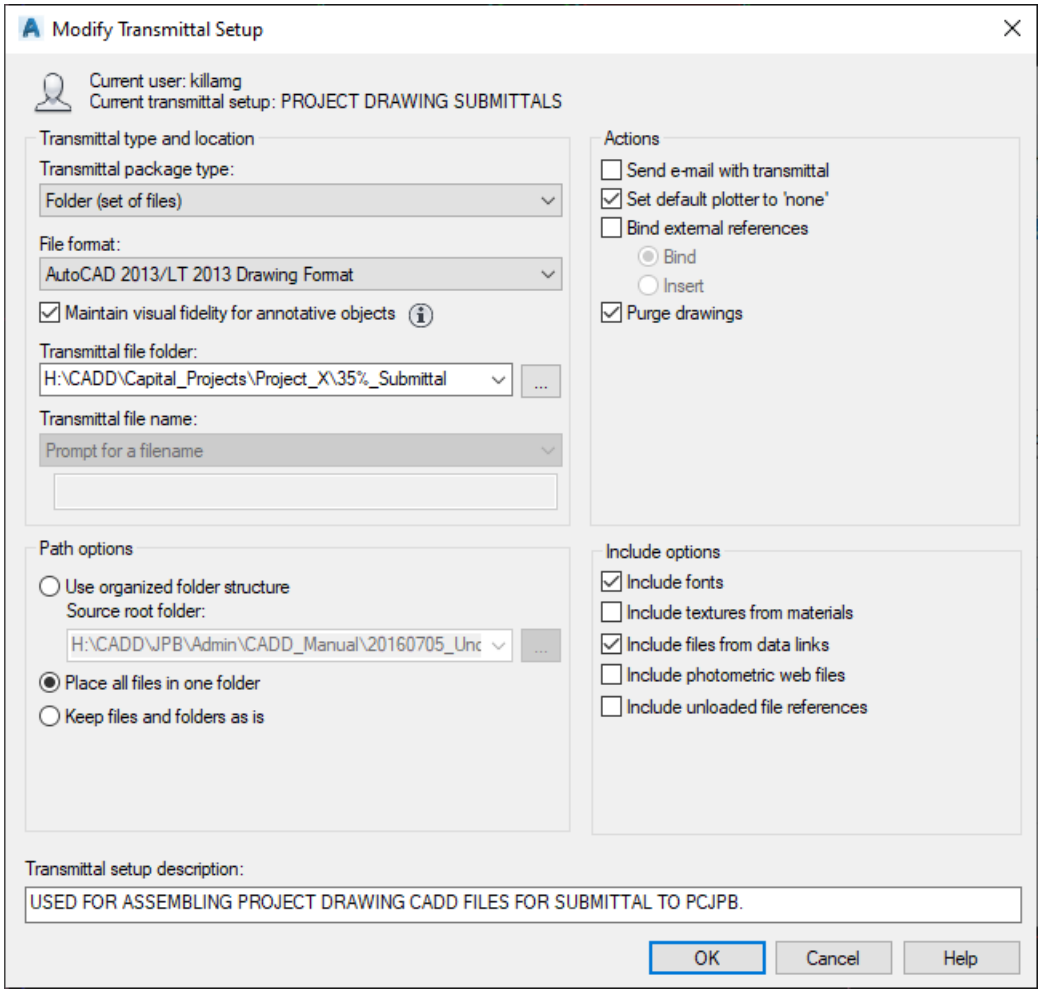


FIGURE 10.1 - AUTOCAD'S ETRANSMIT TOOL DIALOG BOX WITH REQUIRED SETTINGS

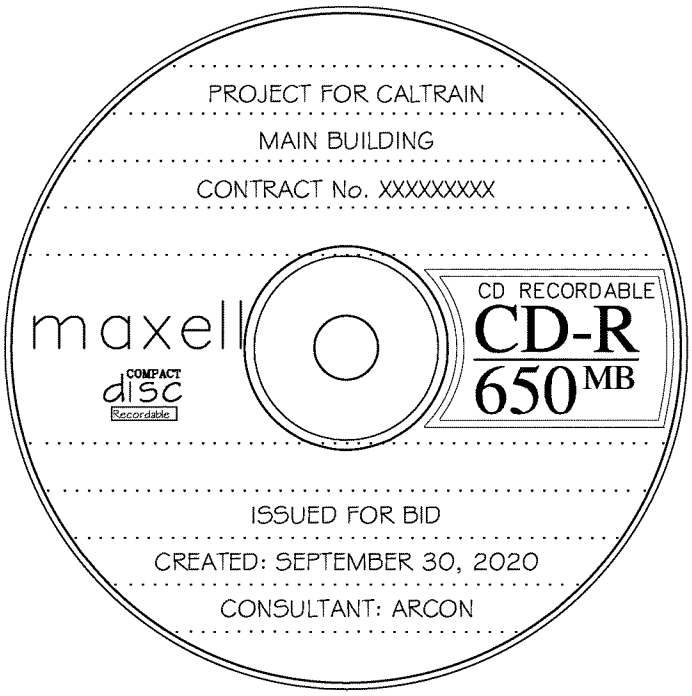


FIGURE 10.2 - DISC LABELED WITH A PERMANENT MARKER

FIGURE 10.3 - DISC WITH A PRINTED CD/DVD LABEL

END OF SECTION 10

APPENDIX 1
DISCIPLINE CHARACTERS

A	**ARCHITECTURAL**
B	**GENERAL**
C	**CIVIL**
E	**ELECTRICAL**
F	**FIRE PROTECTION**
G	**GEOTECHNICAL**
J	**STANDARD BLOCKS**
L	**LANDSCAPE**
M	**MECHANICAL**
P	**PLUMBING**
Q	**COMMUNICATIONS**
S	**STRUCTURAL**
T	**TRACK WORK**
U	**UTILITIES**
V	**SURVEY**
W	**OVERHEAD CONTACT SYSTEM**
Y	**TRACTION POWER**
Z	**SYSTEM GENERAL**

APPENDIX 2
CIVIL DRAWING ORGANIZATION FOR A HYPOTHETICAL PROJECT

The organization shown assumes that all drawings were developed during one design phase and submitted to PCJPB in one package for construction in one construction phase.

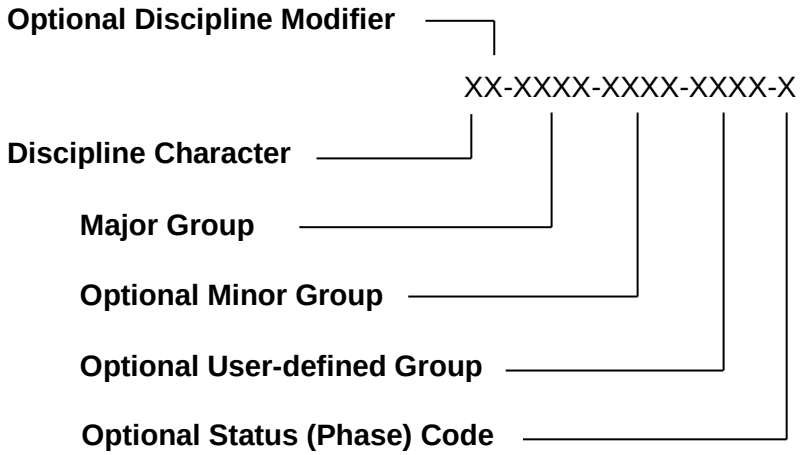
Typical Project Drawings

- General Civil Notes, Symbols and Abbreviations
- Existing Conditions/Demolition Plans
- Site Plans
- Utility Plans
- Grading and Drainage
- Pavement Plans
- Construction Staging
- Signing and Marking
- Traffic Signal
- Details, Cross Sections, Misc. Information

APPENDIX 3
LAYER NAMES

Layer names shall conform to the format given in the *U. S. National CAD Standard*. Exceptions to this requirement are the AutoCAD Civil 3D and legacy Land Development Desktop generated alignment and profile layer names. See the layer name examples in the table below. For more information, go to the National CAD Standard website at www.nationalcadstandard.org.

The general National CAD Standard layer name format is shown below. Layer names shall be in capital letters. For PCJPB's discipline characters, refer to **Appendix 1**. Minor and user-defined group abbreviations are interchangeable. Only applicable layers shall be used. Empty layers shall be purged from all project drawing files before submittal.



LAYER NAME EXAMPLES

LAYER	APPLICATION/MEANING
CIVIL	
C-TOPO-MINR	Topography: minor contours
C-TOPO-MAJR	Topography: major contours
C-PROP-LINE	Property boundary: property lines, survey benchmarks, property corners
C-BLDG	Buildings and primary structures
C-SITE	Key plan (site plan)
C-PVMT-CONC	Pavement: concrete
C-RAIL-XXXX-TRAK	Railroad: track (XXXX = the track's designation (MT-1, MT-2, MT-3, etc.))

LAYER	APPLICATION/MEANING
C-RAIL-XXXX-PBASE	Railroad: XXXX track profile grid base
C-RAIL-XXXX-PEGC	Railroad: XXXX track profile existing ground centerline
C-RAIL-XXXX-PEGCT	Railroad: XXXX track profile existing ground centerline station text
C-RAIL-XXXX-PEGL	Railroad: XXXX track profile existing ground offset left
C-RAIL-XXXX-PEGLT	Railroad: XXXX track profile existing ground left station text
C-RAIL-XXXX-PEGR	Railroad: XXXX track profile existing ground offset right
C-RAIL-XXXX-PEGRT	Railroad: XXXX track profile existing ground right station text
C-RAIL-XXXX-PFGL	Railroad: XXXX track profile finish grade offset left
C-RAIL-XXXX-PFGR	Railroad: XXXX track profile finish grade offset right
C-RAIL-XXXX-PFGC	Railroad: XXXX track profile finish grade centerline
C-RAIL-XXXX-PFGCT	Railroad: XXXX track profile finish grade centerline text
C-RAIL-XXXX-PGRID	Railroad: XXXX track profile grid
C-RAIL-XXXX-PGRIDT	Railroad: XXXX track profile grid text
C-RAIL-XXXX-STAEQU	Railroad: XXXX track station equations
C-RAIL-XXXX-STALBL	Railroad: XXXX track station labels
C-RAIL-XXXX-STAPTS	Railroad: XXXX track station points
C-RAIL-XXXX-PVGRID	Railroad: XXXX track profile vertical grid base
STRUCTURAL	
S-FNDN-DETL	Foundation: detail view
S-BLDG-FMNG	Buildings and primary structures: framing
ARCHITECTURAL	
A-GLAZ	Glazing
A-ANNO-DIMS	Annotation: dimensions
A-FLOR-OTLN	Floor: outline
A-WALL-FIRE	Wall: fire
AD-WALL	Architectural demolition: walls
ELECTRICAL	
E-LITE	Lighting
E-GRND-CIRC	Ground system: circuits
E-SITE-UNDR	Site: underground lines
E-LEGN	Legend of symbols

APPENDIX 4
PCJPB PEN MAPPING

Consultants are solely responsible for the production and appearance of their hardcopy submittals. The Color-dependent Plot Style Table file PCJPB.ctb is provided to support the consistent plotting of PCJPB project drawings. It shall be used for the plotting of PCJPB project drawings in all cases. The pen assignments it contains are shown in the table below.

All entity color and line type values in project CADD files shall be set to "ByLayer". Note that, in addition to colors 250 through 254, colors 8 and 9 may be assigned to layers when it is desired that the detail on them appear muted (that is, as if screened). Colors 8 and 9 produce true screened blacks as opposed to grays and may give better results when drawings are copied to paper or scanned and the scans plotted. See PCJPB's Pen Mapping/Color Chart at the end of this Manual.

PCJPB Pen Mapping			
AutoCAD Color Name (Screen Color)	**Plotter Output:**		
	Line Weight (mm)	**% Fill**	**Color**
1 (red)	0.15	100	7 (black)
2 (yellow)	0.25	100	7 (black)
3 (green)	0.35	100	7 (black)
4 (cyan)	0.50	100	7 (black)
5 (blue)	0.70	100	7 (black)
6 (magenta)	0.90	100	7 (black)
7 (black/white)	0.35	100	7 (black)
8	0.25	40	7 (black)
9	0.35	40	7 (black)
10	0.15	100	1 (red)
11	0.25	100	7 (black)
12	0.35	100	3 (green)
13	0.50	100	4 (cyan)
14	0.70	100	5 (blue)
15	0.90	100	6 (magenta)

PCJPB Pen Mapping			
AutoCAD Color Name (Screen Color)	Plotter Output:		
	Line Weight (mm)	% Fill	Color
16	Default	100	16
17	0.50	100	17
18	Default	100	18
19	Default	100	19
20	0.50	100	1 (red)
21	Default	100	21
22	Default	100	22
23	Default	100	23
24	Default	100	24
25	Default	100	25
26	Default	100	26
27	0.70	100	17
28	Default	100	28
29	Default	100	29
30	0.50	100	30
31	0.80	100	30
32	1.00	100	30
33	Default	100	33
34	Default	100	34
35	Default	100	35
36	1.00	100	17
37	1.40	100	17
38	Default	100	38
39	Default	100	39
40	0.80	100	40
41	Default	100	41
42	1.00	100	40
43	1.40	100	40
44	0.50	100	40
45	Default	100	45
46	Default	100	46

PCJPB Pen Mapping			
AutoCAD Color Name (Screen Color)	Plotter Output:		
	Line Weight (mm)	% Fill	Color
47	Default	100	47
48	Default	100	48
49	Default	100	49
50	0.80	100	2 (yellow)
51	1.00	100	2 (yellow)
52	0.50	100	2 (yellow)
53	1.40	100	2 (yellow)
54	Default	100	54
55	Default	100	55
56	Default	100	56
57	Default	100	57
58	Default	100	58
59	Default	100	59
60	2.00	100	255
61	0.90	100	255
62	Default	100	62
63	Default	100	63
64	Default	100	64
65	1.58	100	255
66	Default	100	66
67	Default	100	67
68	Default	100	68
69	Default	100	69
70	Default	100	70
71	Default	100	71
72	Default	100	72
73	Default	100	73
74	Default	100	74
75	Default	100	75
76	Default	100	76
77	Default	100	77

PCJPB Pen Mapping			
AutoCAD Color Name (Screen Color)	Plotter Output:		
	Line Weight (mm)	% Fill	Color
78	Default	100	78
79	Default	100	79
80	0.50	100	3 (green)
81	Default	100	81
82	0.70	100	3 (green)
83	Default	100	83
84	Default	100	84
85	Default	100	85
86	0.50	100	94
87	Default	100	87
88	Default	100	88
89	Default	100	89
90	1.00	100	3 (green)
91	Default	100	91
92	Default	100	92
93	Default	100	93
94	0.70	100	94
95	Default	100	95
96	1.00	100	94
97	Default	100	97
98	Default	100	98
99	Default	100	99
100	1.40	100	3 (green)
101	Default	100	101
102	Default	100	102
103	Default	100	103
104	Default	100	104
105	Default	100	105
106	1.40	100	94
107	Default	100	107
108	Default	100	108

PCJPB Pen Mapping			
AutoCAD Color Name (Screen Color)	Plotter Output:		
	Line Weight (mm)	% Fill	Color
109	Default	100	109
110	Default	100	110
111	0.50	100	111
112	Default	100	112
113	0.80	100	111
114	Default	100	114
115	Default	100	115
116	Default	100	116
117	Default	100	117
118	Default	100	118
119	Default	100	119
120	Default	100	120
121	Default	100	121
122	Default	100	122
123	1.00	100	111
124	Default	100	124
125	1.40	100	111
126	Default	100	126
127	Default	100	127
128	Default	100	128
129	Default	100	129
130	0.70	100	4 (cyan)
131	0.50	100	131
132	1.00	100	4 (cyan)
133	1.00	100	131
134	0.50	100	4 (cyan)
135	Default	100	135
136	Default	100	136
137	Default	100	137
138	Default	100	138
139	Default	100	139

PCJPB Pen Mapping			
AutoCAD Color Name (Screen Color)	Plotter Output:		
	Line Weight (mm)	% Fill	Color
140	1.40	100	4 (cyan)
141	1.00	100	131
142	Default	100	142
143	1.40	100	131
144	0.70	100	5 (blue)
145	Default	100	145
146	Default	100	146
147	Default	100	147
148	Default	100	148
149	Default	100	149
150	0.50	100	5 (blue)
151	Default	100	151
152	1.00	100	5 (blue)
153	Default	100	153
154	Default	100	154
155	Default	100	155
156	Default	100	156
157	Default	100	157
158	Default	100	158
159	Default	100	159
160	1.40	100	5 (blue)
161	Default	100	161
162	Default	100	162
163	Default	100	163
164	Default	100	164
165	Default	100	165
166	Default	100	166
167	Default	100	167
168	Default	100	168
169	Default	100	169
170	Default	100	170

PCJPB Pen Mapping			
AutoCAD Color Name (Screen Color)	Plotter Output:		
	Line Weight (mm)	% Fill	Color
171	Default	100	171
172	Default	100	172
173	Default	100	173
174	Default	100	174
175	Default	100	175
176	Default	100	176
177	Default	100	177
178	Default	100	178
179	Default	100	179
180	Default	100	180
181	0.50	100	181
182	Default	100	182
183	0.70	100	181
184	Default	100	184
185	1.00	100	181
186	Default	100	186
187	1.40	100	181
188	Default	100	188
189	Default	100	189
190	0.50	100	190
191	Default	100	191
192	0.70	100	190
193	Default	100	193
194	Default	100	194
195	Default	100	195
196	Default	100	196
197	Default	100	197
198	Default	100	198
199	Default	100	199
200	1.00	100	6 (magenta)
201	Default	100	201

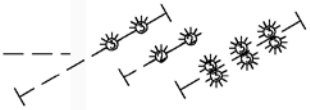
PCJPB Pen Mapping			
AutoCAD Color Name (Screen Color)	Plotter Output:		
	Line Weight (mm)	% Fill	Color
202	1.00	100	190
203	Default	100	203
204	1.40	100	190
205	Default	100	205
206	Default	100	206
207	Default	100	207
208	Default	100	208
209	Default	100	209
210	0.70	100	6 (magenta)
211	Default	100	211
212	1.40	100	6 (magenta)
213	Default	100	213
214	Default	100	214
215	Default	100	215
216	Default	100	216
217	Default	100	217
218	Default	100	218
219	Default	100	219
220	1.00	100	1 (red)
221	Default	100	221
222	0.50	100	6 (magenta)
223	Default	100	223
224	Default	100	224
225	Default	100	225
226	Default	100	226
227	Default	100	227
228	Default	100	228
229	Default	100	229
230	1.40	100	1 (red)
231	Default	100	231
232	Default	100	232

PCJPB Pen Mapping			
AutoCAD Color Name (Screen Color)	Plotter Output:		
	Line Weight (mm)	% Fill	Color
233	Default	100	233
234	Default	100	234
235	Default	100	235
236	Default	100	236
237	Default	100	237
238	Default	100	238
239	Default	100	239
240	0.80	100	1 (red)
241	Default	100	241
242	Default	100	242
243	Default	100	243
244	Default	100	244
245	Default	100	245
246	Default	100	246
247	Default	100	247
248	Default	100	248
249	Default	100	249
250	0.40	100	250
251	0.40	100	251
252	0.40	100	252
253	0.40	100	253
254	0.40	100	254
255	0.40	100	255

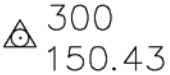
APPENDIX 5
PCJPB'S TOPOGRAPHIC FILES

Periodically, PCJPB contracts to have the Caltrain Corridor flown and mapped. The resulting map consists of a number of AutoCAD drawing files. Each of these topographic files (or tiles) covers an area of 4,000 by 4,000 feet on the ground and is named for the northing and easting of its insertion point. They are intended for use as backgrounds for PCJPB design drawings. This Appendix gives layer, block and line type information for these files. In the following list, (ATT) denotes an attributed block.

Layer	Description	Line Type	Block(s)/Symbol(s)
100	Curbed Road	Continuous	
105	Uncurbed Road	D6	
110	Unpaved Road	D4	
125	Curb, Off Road	Continuous	
130	Pavement, Off Road	D3	
135	Pavement Joint	D3	
140	Passenger Platform	D2	
145	Limits, Graded Area	D4	
160	Bridge	Continuous	
190	Road/Street Names	Continuous	
200	Fence	FENCE FTICK	
205	Median Wall	Continuous	
210	Retaining Wall	RET WALL	
212	Retaining Wall with Fence	RETWALL FENCE	
215	Guard Rail	FENCE GUARD RAIL	
220	Bicycle Locker	Continuous	
222	Street Furniture, Misc.	Continuous	
225	Headwall	Continuous	
230	Swimming Pool	D1	
240	Post	Continuous	POST
245	Pole	Continuous	POLE
260	Sign	Continuous	SIGN1
262	Large Sign	Continuous	SIGN2
264	Billboard	Continuous	

Layer	Description	Line Type	Block(s)/Symbol(s)
265	Commercial Sign	Continuous	SIGN3
270	Pipeline	D2	
275	Pile (dirt, debris, riprap, stockpile, etc.)	D0	
280	Flagpole	Continuous	FPOLE
299	Plan Annotation	Continuous	
300	Building	Continuous	
305	Deck/Patio	Continuous	
310	Awning	Continuous	
315	Foundation	D3	
325	Tank	Continuous	
400	Rails (typically frozen)	Continuous	
415	Railroad Signal Bridge/ Cantilever	D1	
430	Railroad Crossing Signal	Continuous	RRLT JPBCANT
440	Railroad Switch	Continuous	RRSW JPBSWE JPBSWH JPBSWP DPDERAIL
450	Railroad Crossing Gate	Continuous	JPBXINGSB (ATT) JPBXINGNB (ATT) RRARM1
460	Railroad Box (utility)	Continuous	RRBOX
470	No Left Turn Sign	Continuous	JPBNLT
490	Railroad Names	Continuous	
500	Manhole	Continuous	MH
501	Vault	Continuous	
502		Continuous	
504	Utility	Continuous	MISC

Layer	Description	Line Type	Block(s)/Symbol(s)
506	Utility Box	Continuous	BOX
515	Satellite Dish	Continuous	DISH
516	Antenna	Continuous	JPBATCS
517	Bumping Post	Continuous	JPBBUMP
532	Catch Basin	Continuous	CB
544	Pylon	Continuous	POLE
545	Electric Pole	Continuous	EPOLE
565	Hydrant	Continuous	HYDR
570	Traffic Signal	Continuous	TSP
574	Traffic Signal with Arm	Continuous	TSIG
580	Light Pole	Continuous	LTP
584	Electrolier	Continuous	ELT
586	Double Electrolier	Continuous	ELTDBL ELTFDBL
587	Signal Mast	Continuous	JPBSIG (ATT) JPBSIGNB (ATT) JPBSIGSB (ATT) LTRW RRSIG
588	Signal House	Continuous	JPBSIGHOUSE
591	Grade Crossing	Continuous	
600	Water Body Edge (lake, pond, estuary, double line stream, etc.)	DRAIN FLOW LINE	
602	Water Body Edge, Hidden	DRAIN FLOW LINE	
610	Flow Line	DRAIN FLOW LINE	
620	Ditch Flow Line	DRAIN FLOW LINE	
630	Break Line Along Top Edge of Ditch	D2	
690	Hydrographic Names	Continuous	
700	Tree Line	Continuous	
702	Dense Tree Line	Continuous	
704	Single Tree	Continuous	TREE1

Layer	Description	Line Type	Block(s)/Symbol(s)
706	Palm Tree	Continuous	PALM 
710	Brush Line	Continuous	
740	Marsh Symbol	Continuous	MARSH 
799	Vegetation Annotation	Continuous	
800	Index Contour	Continuous	
802	Index, Hidden (building)	Continuous	
804	Index, Obscured (vegetation)	D4	
810	Depression Index Contour	DEPTICK	
812	Depression Index, Hidden (building)	Continuous	
814	Depression Index, Obscured (vegetation)	D4	
820	Intermediate Contour	Continuous	
822	Intermediate, Hidden (building)	Continuous	
824	Intermediate, Obscured (vegetation)	D6	
830	Depression Intermediate, Contour	DEPTICK	
832	Depression Intermediate, Hidden (building)	Continuous	
834	Depression Intermediate, Obscured (vegetation)	D3	
840	Spot Elevation	Continuous	SPOT1 (ATT) 0.0 SPOT2 (ATT) x 12.3
850	Index Contour Labels	Continuous	
950	Photo Center	Continuous	PC (ATT) 
960	Surveyed Photo Control Point	Continuous	HVC (ATT) 
1065	Track Alignment Centerline	RR100	
1065A	Track Alignment Centerline	RR100	
1070	Street Centerline	Continuous	
32001	Grid Neatline	Continuous	

Layer	Description	Line Type	Block(s)/Symbol(s)
32003	Grid Tick	Continuous	CROSS, TICK
32004	Grid Text	Continuous	
32010	Sheet Match Notes	Continuous	

Do not modify PCJPB's aerial topography files. Specifically, do not re-map the layer colors, change line types, etc. within the files themselves. Instead, use the AutoCAD XR command to attach them to host files with the overlay option as required. Then re-map the colors, change line types, etc. as desired in the host files using the Layer Properties Manager.

APPENDIX 6
PCJPB LINE TYPES

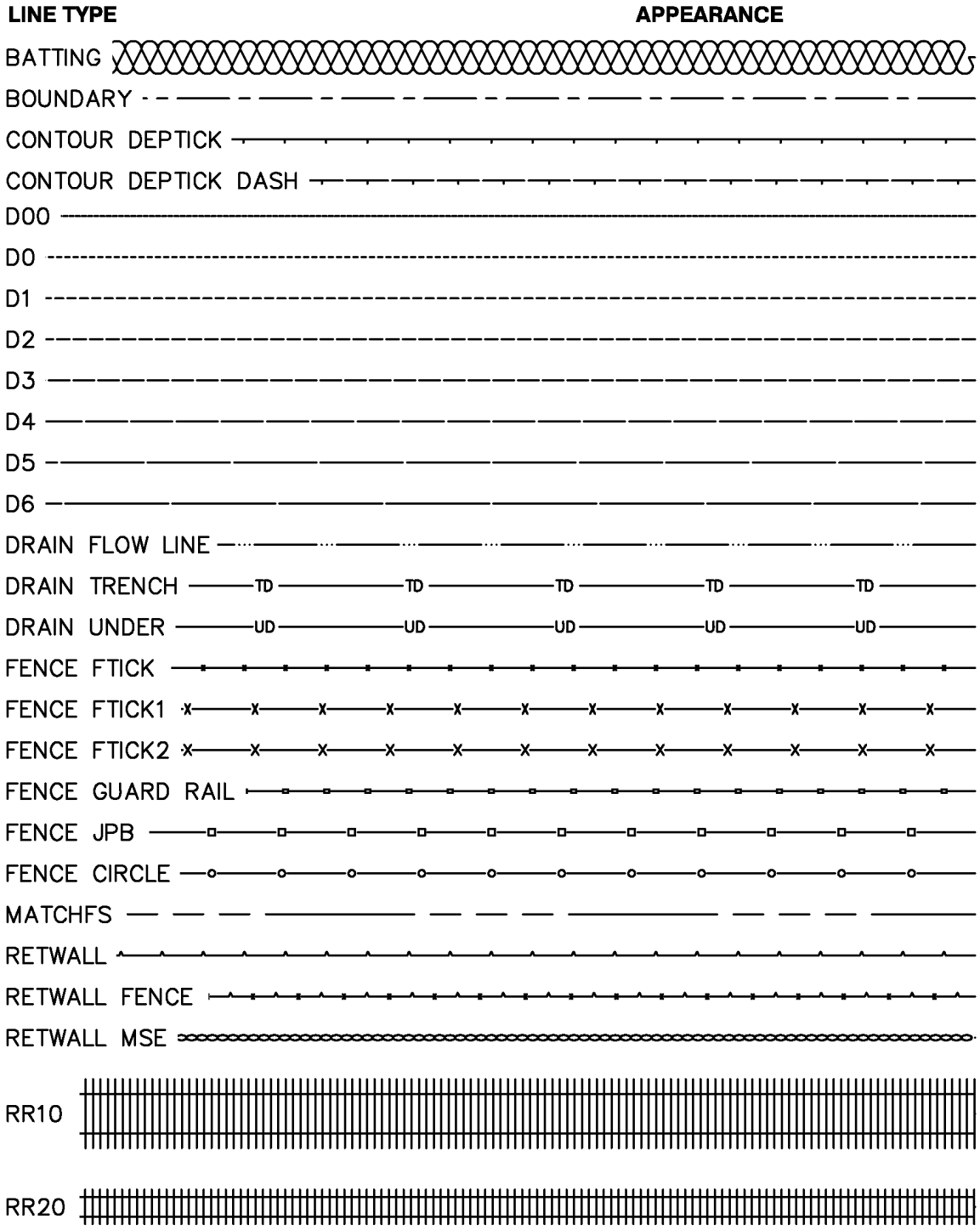


FIGURE A6.1 - LINE TYPES CONTAINED IN THE FILE PCJPB.LIN

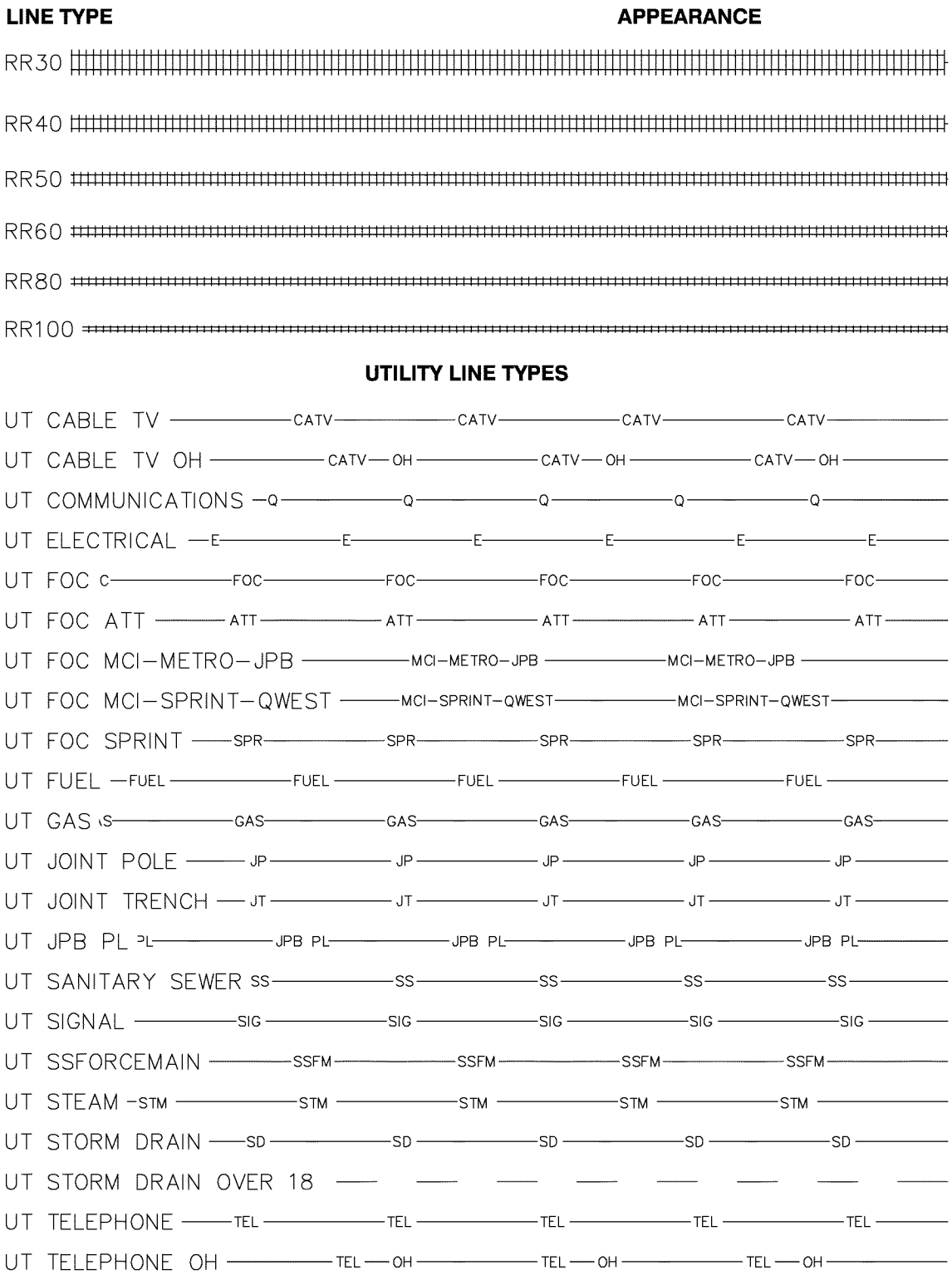


FIGURE A6.2 - LINE TYPES CONTAINED IN THE FILE PCJPB.LIN (CONTINUED)

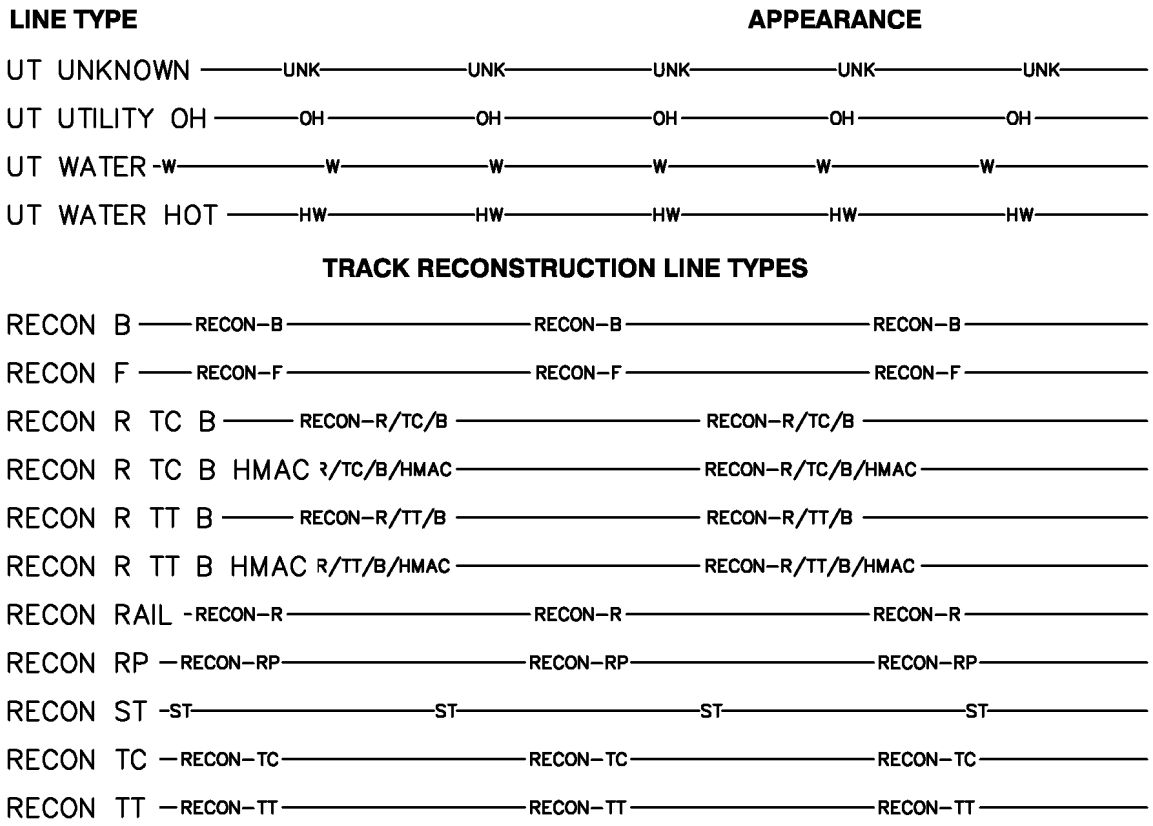


FIGURE A6.3 - LINE TYPES CONTAINED IN THE FILE PCJPB.LIN (CONTINUED)

About PCJPB Linetypes

Certain PCJPB line types contained in the file PCJPB.lin are based on shapes contained in the file PCJPB2.shx. This file must be present for AutoCAD to display lines of these types correctly. FENCE JPB is used to symbolize PCJPB inter-track and station fencing. MATCHFS is used to draw match lines when the CADD file line type scale is set to one (1). PCJPB.lin also contains the line types MATCH10, MATCH20, MATCH40, MATCH50 AND MATCH100, which are for use in CADD files should their linetype scales ever be set to 10, 20, 40, etc. "OH" stands for "OVERHEAD". The "PL" in "JPB PL" stands for "PIPELINE".

Compound Line Types

The line types illustrated in *Figures A6.4* and *A6.5* below are not contained in the PCJPB.lin file and must be created. To symbolize a storm drain over 18" in diameter, a polyline of line type UT STORM DRAIN OVER 18 shall be used as a fill in conjunction with a casing of two parallel lines. The width of the compound line in model space shall equal the diameter of the storm drain it symbolizes. To create the others, lines of the

indicated type shall be superimposed over a line of type RR10, RR20, etc. as appropriate. The track symbol shall be gray and the superimposed lines black.

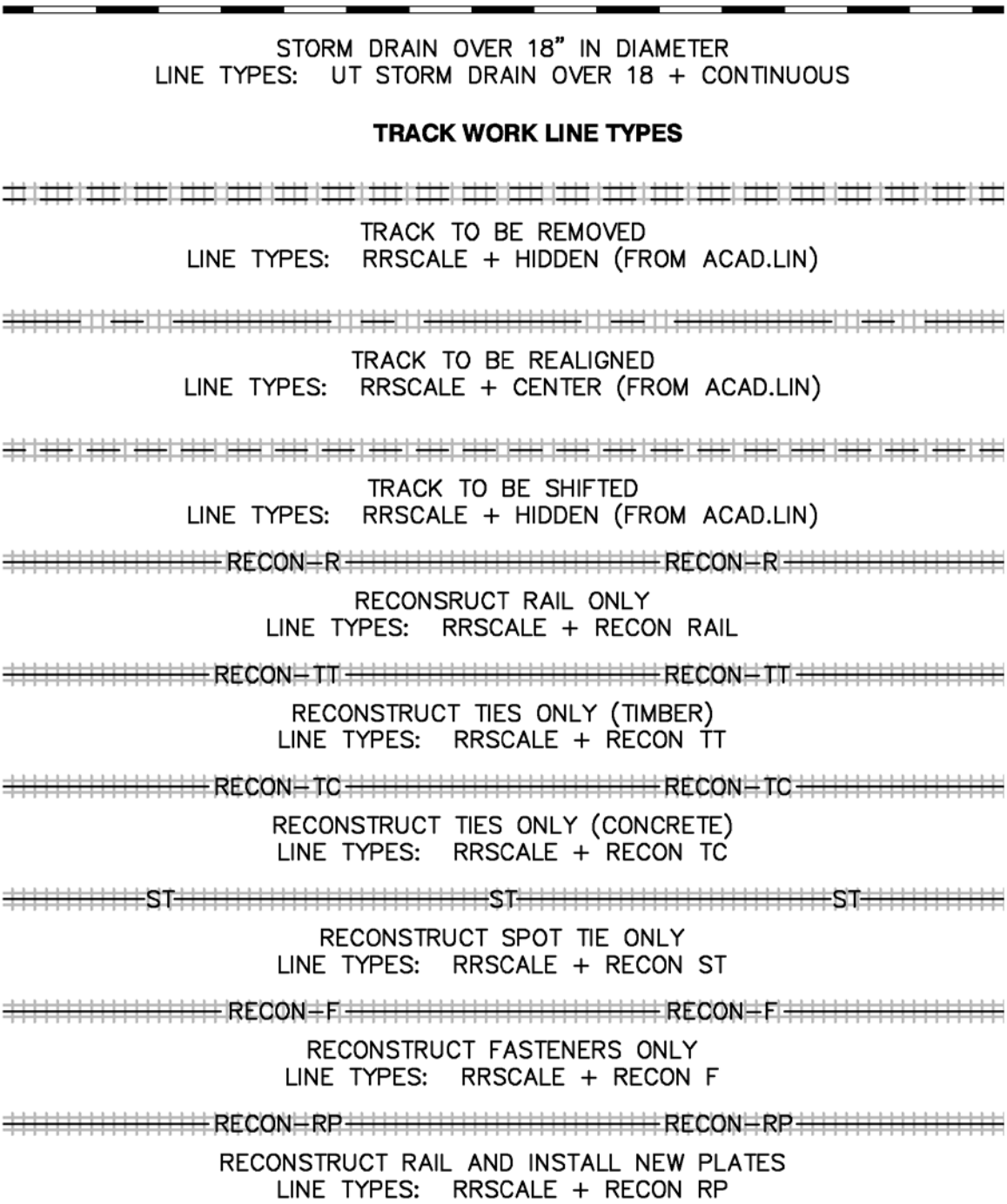


FIGURE A6.4 - COMPOUND LINE TYPES

TRACK WORK LINE TYPES (CONTINUED)

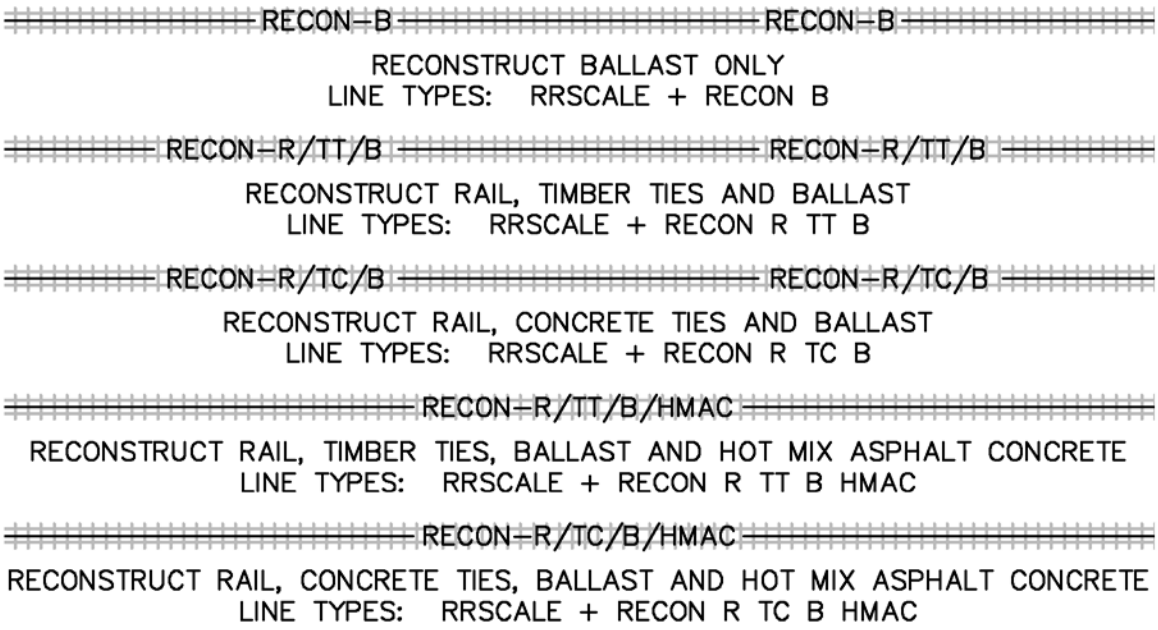


FIGURE A6.5 - COMPOUND LINE TYPES (CONTINUED)

APPENDIX 7

NOT USED

APPENDIX 8
BLOCK LIBRARY

PENDING

APPENDIX 9
METRIC DRAWINGS

The following information may be helpful should a PCJPB project ever involve metric drawings.

Since paper space units are in millimeters in metric drawings, PCJPB AutoCAD files/blocks (for example, XB-BRDR-PCJPB.dwg) must be scaled by a factor of 25.40 (there are 25.40 millimeters to the inch) when inserting or referencing them into the layouts of metric CADD files. Doing this converts their dimensions into millimeters.

Sizing Text in Metric Drawings

For any text size, multiply the desired height of plotted text by the appropriate scale factor given in the following table to get the corresponding text height in model space.

Desired Height of Text on Full-size Plots:		**3.17500 mm (1/8")**	**3.57188 mm (9/64")**	**4.76250 mm (3/16")**	**6.35000 mm (1/4")**
Scale of View	**Scale Factor to Apply**	**Height of Text in Model Space in Meters**	**Height of Text in Model Space in Meters**	**Height of Text in Model Space in Meters**	**Height of Text in Model Space in Meters**
1:100	**0.1**	0.31750	0.35719	0.47625	0.63500
1:200	**0.2**	0.63500	0.71438	0.95250	1.27000
1:250	**0.25**	0.79375	0.89297	1.19063	1.58750
1:500	**0.5**	1.58750	1.78594	2.38125	3.17500
1:1,000	**1**	3.17500	3.57188	4.76250	6.35000
1:2,000	**2**	6.35000	7.14376	9.52500	12.70000
1:5,000	**5**	15.87500	17.85940	23.81250	31.75000
1:6,000	**6**	19.05000	21.43128	28.57500	38.10000
For use in AutoCAD files with linear units set to type decimal and the insertion scale variable set to meters.					

TABLE A9.1 – SELECTED METRIC SCALES, SCALE FACTORS AND TEXT HEIGHTS

Scaling Views in Metric AutoCAD Drawings

When scaling views in metric AutoCAD drawings, keep in mind that the paper space unit is millimeters and the model space unit is meters. Remembering this, scale factors are then easy to calculate. A couple of examples follow to illustrate.

When using the zoom/scale command to scale detail in a viewport, AutoCAD asks for the desired ratio of paper space units to model space units, or:

Paper Space units / Model Space units xp

For a scale of 1:100 using the zoom/scale command:

Paper Space units Model Space units

1:100

1 millimeter : 100 millimeters

1 mm : 0.10 m

1 / 1/10 xp

10 xp

Or ten paper space units to one model space unit (10 millimeters to one meter.)

For a scale of 1:2,000:

Paper Space units Model Space units

1:2,000

1 millimeter : 2,000 millimeters

1 mm : 2.000 m

1/2 xp

Or one paper space unit to two model space units (1 millimeter to 2 meters.)

Metric Scales

When choosing metric scales, the table below may be used to find the metric scale that will produce a plot approximating in appearance the plot of a drawing drawn and plotted to the listed common English civil engineering scale.

Common English Civil Engineering Scale to Approximate	Scale of Metric Drawing Viewport/Plot	Metric Drawing Viewport's/Plot's Scale in English Units
1"= 10'	1:100	1"= 8.33'
---	1:200	1"= 16.67'
1"= 20'	1:250	1"= 20.83'
1"= 40'	1:500	1"= 41.67'
1"= 80'	1:1,000	1"= 83.33'
---	1:2,000	1"= 166.67'
1"= 400'	1:5,000	1"= 416.66'
1"= 500'	1:6,000	1"= 500.00'

TABLE A9.2 – METRIC/ENGLISH PLOTTING SCALE COMPARISON CHART

Dimensioning Metric Drawings Created for PCJPB

See *Figures A9.1* through *A9.5* below for the settings to use when setting up dimension styles in metric drawings created for PCJPB. See *Table A9.3* for style names to use and overall scale factors to apply in the creation of these styles.

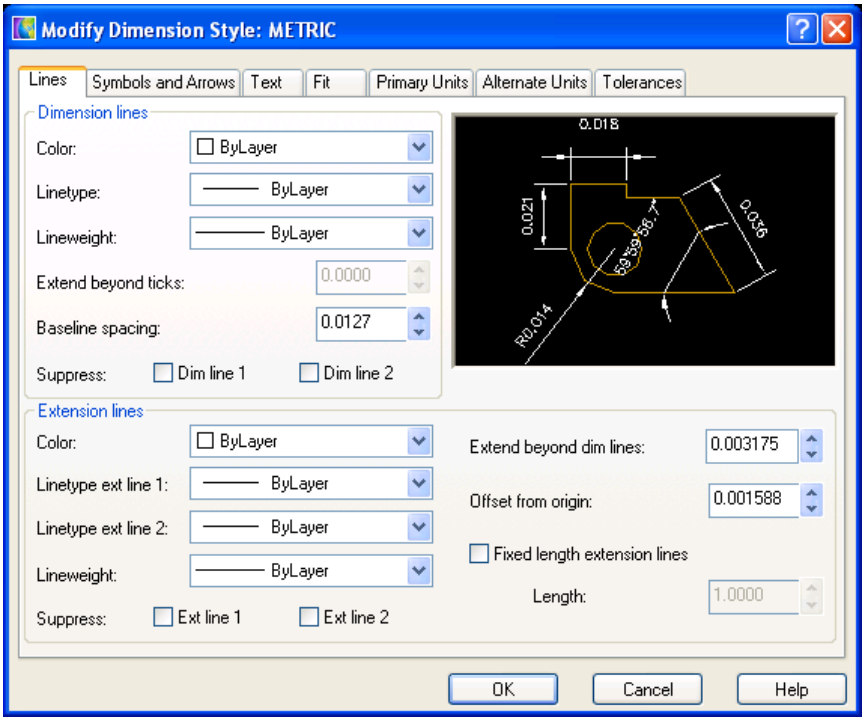


FIGURE A9.1 – METRIC DIMENSION STYLE SETTINGS LINES

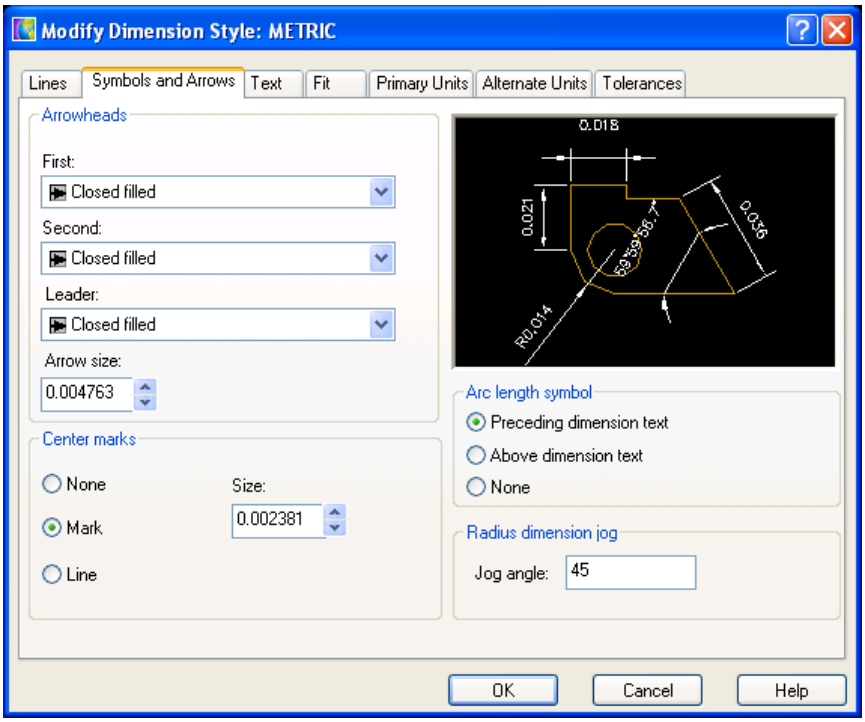


FIGURE A9.2 – METRIC DIMENSION STYLE SETTINGS SYMBOLS AND ARROWS

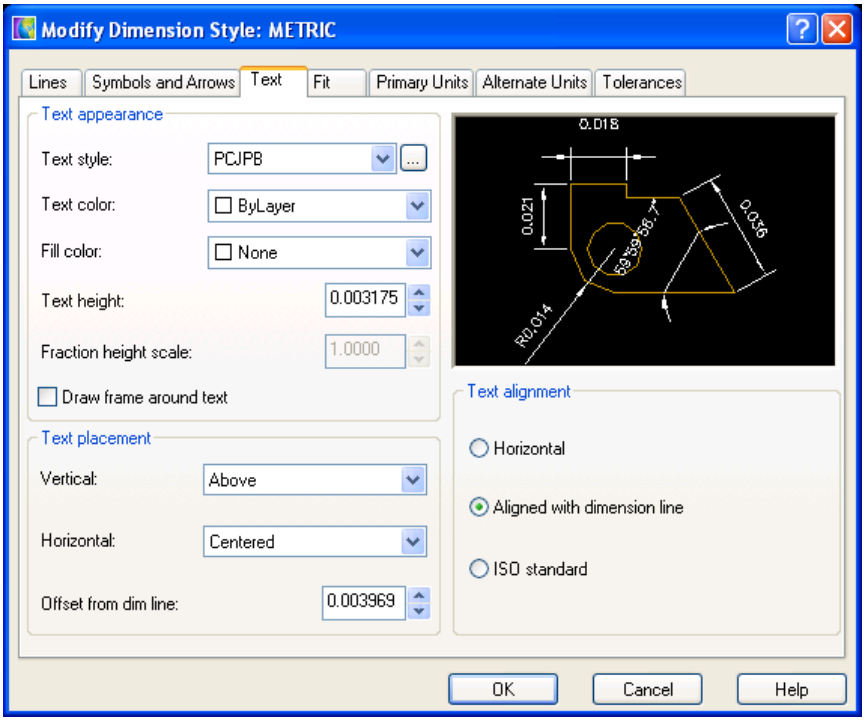


FIGURE A9.3 – METRIC DIMENSION STYLE SETTINGS TEXT

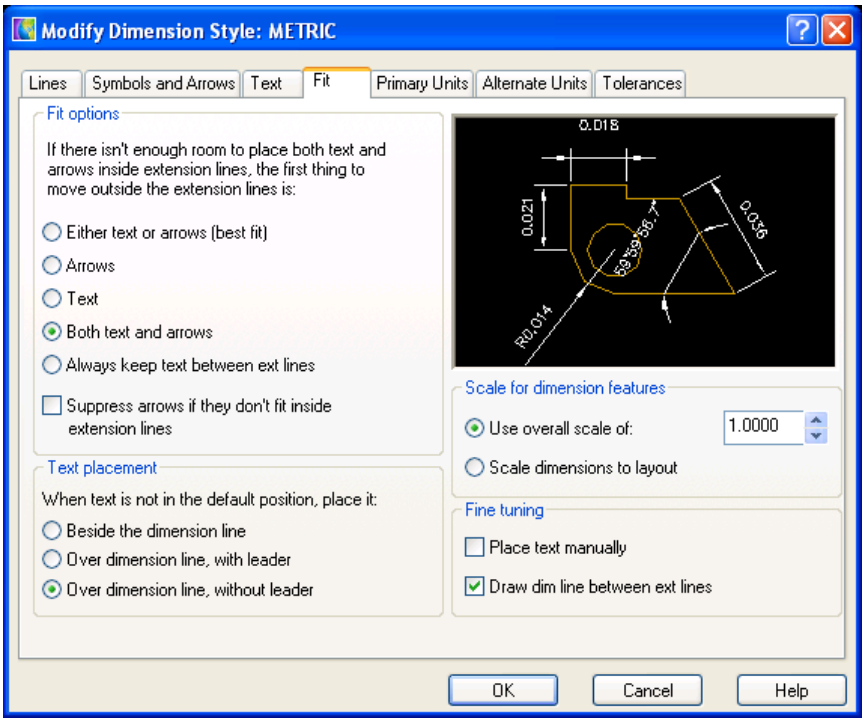


FIGURE A9.4 – METRIC DIMENSION STYLE SETTINGS FIT

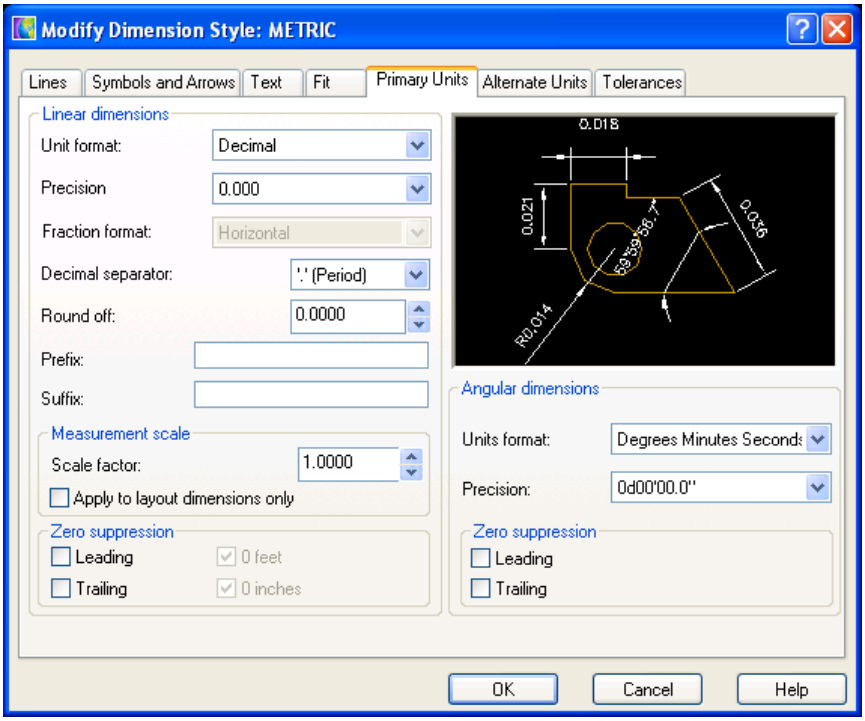


FIGURE A9.5 - METRIC DIMENSION STYLE SETTINGS PRIMARY UNITS

Scale	Dimension Style	Scale for Dimension Features
		Use overall scale of:
1:100	100 METRIC	100
1:200	200 METRIC	200
1:250	250 METRIC	250
1:500	500 METRIC	500
1:1,000	1000 METRIC	1,000
1:2,000	2000 METRIC	2,000
1:5,000	5000 METRIC	5,000
1:6,000	6000 METRIC	6,000

TABLE A9.3 - DIMENSION STYLES DERIVED FROM THE METRIC STYLE

APPENDIX 10

PCJPB CADD REQUIREMENTS FOR SIGNAL DRAWINGS

GENERAL

Signal drawing CADD files are living documents that must be properly maintained in order to comply with FRA CFR 49 part 234.201 and CFR 49 part 236.1. Bentley's MicroStation CADD software shall be used to produce and revise PCJPB's signal drawing CADD files. These files shall be in MicroStation's 2-dimensional format in all cases. Signal drawing CADD files shall not be duplicated without the authorization of PCJPB's Manager-Engineering, Signals and Crossings (Signal Manager).

At the start of a project, the PCJPB project manager assigned to that project will provide a general description of the project to PCJPB's Signal Manager and request the files required to perform the signal design work. The Signal Design Consultant (SDC) will furnish a border file (JPBBRDRRFC), a cell library containing the symbols utilized on PCJPB signal drawings and any TYPICAL and/or REFERENCE files relevant to the project.

As a project design progresses, the Project Signal Design Contractor shall periodically submit copies of the project's current signal design CADD files and a PDF file containing drawings plotted from those files to PCJPB's Signal Manager. These submittals shall occur at three (3) month intervals and/or at every project design milestone (35%, 65% and so on). The contractor shall include in the submittal an itemized list of the files provided. The list shall categorize files as NEW FILES, MODIFIED FILES and DELETED FILES.

If the Project Signal Design Contractor is required to furnish Project Record files, the contractor shall submit to the PCJPB's Signal Manager the source CADD files for the drawings that were distributed for construction (the Conformed Set) and the corrected Record CADD files produced from the Conformed Set upon completion of the project. A PDF file containing drawings plotted from these Record files shall be submitted as well. These Record files and drawings shall then be forwarded to the SDC.

Drawings, borders and cells shall not be scaled up or down. New cells shall not be created without the authorization of PCJPB's Signal Manager. Where designs are created for "Bid Documents" the contractor's border shall be scaled to equal the JPBBRDR.RFC border. The "X=OUT/0=IN" convention shall be used on contract drawings. Contractor border files shall be "REFERENCED ATTACHED" to facilitate their removal. Construction drawings created for PCJPB maintenance forces shall utilize the "RED=IN/YELLOW=OUT" color convention.

File names shall be eight (8) characters long followed by a three (3) character extension. (EXAMPLE: CT029_20.C01 and CT029_20.M02 would be the file names for sheet 1 and sheet 2 depicting a location at Milepost 29.20.) The "C" in the file extension indicates that the drawing contains CONSTRUCTION elements; an "M" file extension

indicates that the file is a MAINTENANCE plan; a “B” file extension indicates the file has FIELD VERIFY elements; and a “T” file extension indicates the file is TEMPORARY and will be deleted upon completion of construction.

EXAMPLES:

CT003_30.C09	Construction Drawing
CT041_00.M04	Maintenance Drawing
CT011_20.T03	Temporary Drawing
CT021_00.B01	Field Verification Required

FORMAT REQUIREMENTS

Contractors shall comply with the FORMAT REQUIREMENTS listed below. Contractors shall reimburse PCJPB for all costs associated with correcting any noncompliant files. The following drawing conventions shall be used for ALL signal design files:

1. TYPICAL files shall be used if available. The SDC will furnish appropriate TYPICAL files.

2. All new design files shall be SINGLE sheet, with lower left corner starting at X,Y=0,0 (the GLOBAL ORIGIN.)

3. All drawings plotted at full-size (100%), whether to paper or to a PDF file, shall measure 11” x 17” (ANSI size B). (Note: If trim marks are visible on a drawing plot, the drawing has not been plotted at 100% and must be replotted.)

4. All graphics will be placed on the appropriate levels as follows:

LEVEL	DESCRIPTION
1	Circuits
2	Black Boxes and shapes (no fill)
3	Yellow shapes filled solid
4-7	Reserved for future use
8	Wire size
9	Rack location number
10	Wire nomenclature
11	Relay qualifier
12-13	Not used
14	Relay contact qualifier
15	Contact number
16	Crossing DOT number
17-25	Not used
26	Title block
27-63	Reserved

5. SAVE SETTINGS as follows:

   a) Levels 1-39 ON / Levels 40-63 OFF
   b) ENTER DATA FIELDS turned off (all views)

c) SNAP and GRID locks ON, LEVEL lock OFF
d) TX=0.08 (Text Size)
e) FT=0 (Font)
f) Justification=CC
g) LINE SPACING=0.05
h) WT=1 (Line Weight)
i) LV=1 (Active Level)
j) AS=1 (Active Scale)
k) AA=0 (Active Angle)
l) CO=0 (Color)
m) Left screen (view #5) – view of complete drawing
n) Right screen (view #1) – view of title block area

6. The design file name shall be placed in the lower left-hand corner of the design file border. EXAMPLE: **CT029_00.B01**

7. On SHEET 1 of each drawing set the track layout shall be shown. Signal block circuits and other circuits extending to adjacent locations shall be placed on this sheet and the "TOADJ" cell used on each end of the sheet to reference the adjoining circuit drawing and sheet number (See example provided.)

8. Standard street width = 1 inch.

9. Distance between rails = 2/10 inch.

10. Distance between tracks = 7/10 inch center to center.

11. Track WT=5 LV=1

12. Circuits WT=2 LV=1

13. Black boxes (shapes) WT=3 LV=2

14. Wire nomenclature LV=10

15. Relay nomenclature (use appropriate cell and data fields)

16. Legend (provided on front cover reference file)

17. Revision notes (use JBNOTE cell)

18. Relay contact numbering (use contact cells and fill in enter data fields)

19. Relay information (use relay cells and fill in enter data fields)

20. Font=0 WT-1 TX=0.08 Justification=CC Line Spacing=0.05

21. All old SPTC references shall be drawn out on new CADD files.

22. All NEW circuits shall be in RED LV=1

23. All circuits to be removed shall be BLACK LV=1 with YELLOW shape LV=3

24. Existing circuits shall be BLACK LV=1

25. The following identifiers shall be placed directly above the items they identify:

    Street Names (required)
    DOT Number (required)
    CPUC Number (optional)
    Engineering Stations (optional)

26. Primary Title Block Names are as follows:

    Signal Circuit Plan
    Crossing Circuit Plan
    Gate Circuit Plan
    Program Options Plan
    Cable Sheet
    Control Point sheets shall be named for their contents.

27. The FRONT COVER SHEET shall contain an index of the drawings included in the drawing set. The index shall indicate the sheet number and corresponding title block name. The cover sheet shall indicate the drawing set name such as:

    WHIPPLE AVENUE
    CT 24.86

DRAWING DISTRIBUTION:

Construction drawing sets shall be distributed to PCJPB forces as follows:

PDF file to PCJPB's Manager-Engineering, Signals and Crossings or designer
PDF file to PCJPB's Contract Operator's C & S Department
PDF file to PCJPB's Contract Operator for Construction (where applicable)

E N D O F A P P E N D I C E S

PCJPB COLOR ASSIGNMENTS AND LINE WEIGHTS FOR SELECTED AUTOCAD COLORS (PCJPB.CTB FILE)

AUTOCAD COLOR NAME (SCREEN COLOR)		COLOR ASSIGNED AND PLOTTED USING PCJPB.CTB		LINE WEIGHT
BLACK LINES	Color 1	7	(black)	0.15 mm
	Color 2	7	(black)	0.25 mm
	Color 3	7	(black)	0.35 mm
	Color 4	7	(black)	0.50 mm
	Color 5	7	(black)	0.70 mm
	Color 6	7	(black)	0.90 mm
	Color 7	7	(black)	0.35 mm
	Color 8	8	(grey)	0.25 mm
	Color 9	9	(light grey)	0.35 mm
	Color 10	1	(red)	0.15 mm
	Color 11	7	(black)	0.25 mm
	Color 12	3	(green)	0.35 mm
	Color 13	4	(cyan)	0.50 mm
	Color 14	5	(blue)	0.70 mm
	Color 15	6	(magenta)	0.90 mm
	Color 60	knockout	255	2.00 mm
	Color 61	knockout	255	0.90 mm
	Color 65	knockout	255	1.58 mm
GREY LINES	Color 250	250		0.40 mm
	Color 251	251		0.40 mm
	Color 252	252		0.40 mm
	Color 253	253		0.40 mm
	Color 254	254		0.40 mm

PERCENTAGE SUBMITTAL

JPBSUB

THIS DRAWING REDUCED HALF SIZE

JPBHLF

JPBTRI

DESCRIPTION
REF. NO. 1 DWG# PROFILE
REF. NO. SCALE: 1"=1'-0"
REF. NO.

JPBDT1

DESCRIPTION
PLAN
SCALE: 1"=1'-0"

JPBPLA

DESCRIPTION
DESCRIPTION
REF. NO. 2 DWG# DETAIL
REF. NO. SCALE: 1"=1'-0"
REF. NO.

JPBDT2

RECORD DRAWING

THIS DRAWING HAS BEEN PREPARED USING INFORMATION DERIVED FROM PROJECT RECORD DOCUMENTS. THESE SOURCES ARE BELIEVED TO BE RELIABLE, BUT THOSE RELYING ON THIS DRAWING ARE ADVISED TO OBTAIN INDEPENDENT VERIFICATION OF ITS ACCURACY BEFORE APPLYING IT FOR ANY PURPOSE.

JPBREC

DESCRIPTION
REF. NO. A DWG# SECTION
REF. NO. SCALE: 1"=1'-0"
REF. NO.

JPBDT1A

DESCRIPTION
DESCRIPTION
REF. NO. B DWG# ELEVATION
REF. NO. SCALE: 1"=1'-0"
REF. NO.

JPBDT2A

4' 0 4' 8'
GRAPHIC SCALE

JPB_A-1-16	1/16" = 1'-0"	JPB_A-1-2	1/2" = 1'-0"
JPB_A-3-32	3/32" = 1'-0"	JPB_A-3-4	3/4" = 1'-0"
JPB_A-1-8	1/8" = 1'-0"	JPB_A-1	1" = 1'-0"
JPB_A-3-16	3/16" = 1'=0"	JPB_A-3-2	1-1/2" = 1'-0"
JPB_A-1-4	1/4" = 1'-0"	JPB_A-3	3" = 1'-0"
JPB_A-3-8	3/8" = 1'-0"	JPB_A-FS	1" = 1"

GRAPHIC SCALES: ARCHITECTURAL

100' 0 100' 200'
GRAPHIC SCALE

JPB_0005	1" = 5'	JPB_0200	1" = 200'
JPB_0010	1" = 10'	JPB_0300	1" = 300'
JPB_0020	1" = 20'	JPB_0400	1" = 400'
JPB_0030	1" = 30'	JPB_0500	1" = 500'
JPB_0040	1" = 40'	JPB_0600	1" = 600'
JPB_0050	1" = 50'	JPB_0800	1" = 800'
JPB_0060	1" = 60'	JPB_1000	1" = 1000'
JPB_0080	1" = 80'	JPB_2640	1" = 2640'
JPB_0100	1" = 100'	JPB_5280	1" = 5280'

GRAPHIC SCALES: CIVIL

DISCIPLINE CHARACTERS

A – ARCHITECTURAL
B – GENERAL
C – CIVIL
E – ELECTRICAL
F – FIRE PROTECTION
G – GEOTECHNICAL
J – STANDARD BLOCKS
L – LANDSCAPE
M – MECHANICAL
P – PLUMBING
Q – COMMUNICATIONS
S – STRUCTURAL
T – TRACKWORK
U – UTILITIES
V – SURVEY
W – OVERHEAD CONTACT SYSTEM
Y – TRACTION POWER
Z – SYSTEM GENERAL

CADD FILE NAMES

PN D C 101 –A
- PN: CADD Code / Project Code
- D: Discipline Character
- C: Discipline Character
- 101: Serial No. (3 to 5 char.)
- –A: Revision Level (1 to 3 char.)

JPBNOR

PLAN

JPBRNO

JPBC01

JPBC02

JPBARL

JPBARR

ROTATE AS REQUIRED

JPBDIR

REFERENCE FILE NAMES

For example: XCALIGNMNT.dwg

X C ALIGNMNT
- X: Reference File Designator
- C: Discipline Character
- ALIGNMNT: Content Descriptor (up to 8 char.)

U.S. NATIONAL CADD STANDARD LAYER NAME FORMAT

Discipline Modifier (optional)

XX–XXXX–XXXX–XXXX–X
- XX: Discipline Code
- XXXX: Major Group
- XXXX: Minor Group (optional)
- XXXX: User-defined Group (optional)
- X: Status (Phase) Code (optional)

Minor and user-defined group abbreviations are interchangeable.

DRAWING MARKUP COLORS

Use of these colors for marking plots should make the drawing editing and correction process more efficient. Hopefully, their use will minimize ambiguous notations on drawings marked up for revision or correction.

RED PENCIL OR PEN	DESIGN PROFESSIONAL'S CHANGES (TO BE ADDED OR REVISED)
	GRAPHIC SYMBOL, MEANING "TO BE REMOVED"
YELLOW MARKER	DESIGN PROFESSIONAL'S CHANGES (TO BE DELETED OR RETIRED)
LIGHT BLUE HI-LITER	CADD WORK (REVISIONS) COMPLETED
BLUE PEN	DESIGN PROFESSIONAL'S COMMENTS
BLUE PENCIL	CADD OPERATOR'S COMMENTS
GREEN PENCIL OR MARKER	PLAN CHECKER'S COMMENTS
BROWN PENCIL OR MARKER	OTHER COMMENTS OR INSTRUCTIONS TO THE CADD OPERATOR (NOT TO BE SHOWN ON THE FINISHED DRAWING)

SELECTED ABBREVIATIONS FOR USE IN LAYER NAMES

ABBR	DESCRIPTION
ABLT	Anchor Bolts
ABUT	Abutment
ACID	Acid Waste Systems
ACCS	Access
ALRM	Alarm Systems
ANNO	Annotation
AREA	Area
ASPH	Asphalt
AUXL	Auxiliary Systems
BEAM	Beams
BELL	Bell Systems
BLDG	Building
BLIN	Baseline
BMRK	Benchmark
BNDY	Boundary
BORE	Test Borings
BOTB	Bottom of Bank
BRAC	Bracing
BRDG	Bridges
BRDR	Drawing Border and Title Block
BRKL	Breaklines/Fault Lines
BRNG	Bearing and Distance Labels
BUSW	Busways
CABL	Cable
CATV	Cable TV
CCTV	Closed-circuit Television
CIRC	Circuits
CLNG	Ceiling
CMPA	Compressed/Processed Air Systems
CNDW	Condenser Water Systems
CNTR	Centerline
COLS	Columns
COMM	Communications Systems
CONC	Concrete
CONP	Condensate Piping
CONT	Controls and Instrumentation
CTRL	Control Points
CURB	Curb
CWTR	Chilled Water Systems
DATA	Data Outlets
DECK	Deck
DETL	Details
DIMS	Dimensions
DOMW	Domestic Water Systems
DOOR	Doors
DRAN	Drainage Systems or Indication
DRIV	Driveway
DTCH	Ditches or Washes
DUCT	Ductwork
DUST	Dust and Fume Collection Systems
ELEC	Electrical Systems
ELEV	Interior and Exterior Elevations
EMER	Emergency
ENER	Energy Management Systems
EQPM	Equipment
EROS	Erosion and Sediment Control
ESMT	Easements
EVTR	Elevator Equipment
EXHS	Exhaust Systems
EXIT	Exit
FENC	Fencing
FIRE	Fire Protection
FIXT	Fixtures
FLDR	Floor Drains
FLOR	Floor
FNDN	Foundation
FNSH	Finishes
FUEL	Fuel Systems
FURN	Furniture
GLAZ	Glazing
GRID	Column Grid
GRND	Ground
GRVL	Gravel
HALN	Halon Systems
HOTW	Water Heating Systems
HRAL	Handrail
HPIP	High-pressure Piping
HVAC	HVAC Systems
IDEN	Identification
INST	Instrumentation
INTC	Intercom Systems
IRRG	Irrigation
JNTS	Joints
JOIS	Joists
LITE	Lighting Fixtures
LOCN	Limits of Construction
LOGO	Consultant or Project Logo
MACH	Machine Shop Equipment
MAJR	Major Contours
MHOL	Manholes
MINR	Minor Contours
MRKG	Pavement Markings
MTCH	Matchline
NICN	Not-in-contract
NODE	Survey Points
NOTE	Notes, Call Outs and Keynotes
NPLT	Non-plotting Information and Construction Lines
NUMB	Numbering For Systems, Circuits and Branches
OTLN	Outline
OVHD	Overhead
PANL	Panel or Equipment Boards
PEQP	Process Equipment
PHON	Telephone Systems
PILE	Piles or Drilled Piers
PIPE	Pipe
PLAN	Key Plan
PLNT	Plant and Landscape
POLE	Pole
POND	Ponds
POWR	Power
PRCH	Porch
PRKG	Parking
PROC	Process Systems
PROP	Property
PROT	Protection Systems (Fire, etc.)
PTTN	Pattern (Hatching, etc.)
PVMT	Pavement
RAIL	Railroad
RBAR	Reinforcing Bars
RDME	Read-me Layer (Not Plotted)
REFG	Refrigerator or Refrigeration System
REFR	Reference, External Files
REMV	Remove
REVC	Revision Cloud
RFDR	Roof Drains
RISR	Riser
ROAD	Roads
ROOF	Roof
RRAP	Riprap
RWAY	Right-of-way
RTWL	Retaining Wall
SANR	Sanitary Drainage
SCHD	Schedules
SECT	Sections
SIGN	Signage
SILL	Window Sills
SITE	Site Plan
SLAB	Slab
SMOK	Smoke
SOIL	Soils
SOUN	Sound or Public Address Systems
SPCL	Special
SPOT	Spot Elevations
SSWR	Sanitary Sewer
SSYS	Security Systems
STEM	Steam Systems
STRC	Structures
STRM	Storm Drainage Systems
STRS	Stairs
SURV	Survey
SWBD	Switch Boards
SWCH	Switches
SWLK	Sidewalk
SYMB	Symbols
TABL	Data Tables
TEST	Test Equipment
TITL	Drawing or Detail Titles
TOPB	Top of Bank
TOPO	Topography
TRAK	Track
TREE	Tree
TRUS	Trusses
TTLB	Border and Title Block
TURF	Lawn Area
TVAN	Television Antenna
TXTL	Large Text
TXTM	Medium Text
TXTS	Small Text
UNDR	Underground
UNID	Unidentified Site Objects
URAC	Underfloor Raceways
VWPT	Viewport
VIEW	View
WALK	Walkways
WALL	Walls
WATR	Water
WETL	Wetlands

XB–BRDR–PCJPB–XXX

JPBTTX

REV	DATE	BY	SUB	APP	DESCRIPTION
?	DATE	BY	SUB	APP	DESCRIPTION ← JPBRVT
?	DATE	BY	SUB	APP	DESCRIPTION ← JPBREV

DESIGNED D. SIGN
DRAWN A. DRAFTER
CHECKED U. CHECK
IN CHARGE I. CHARGE
DATE DATE

Engineer's or Architect's Seal and Signature

Submitter's or Contractor's Logo

APPROVED

Caltrain
1250 San Carlos Avenue
San Carlos, CA 94070

DEPUTY DIRECTOR D. DIRECTOR
PROJECT MANAGEMENT P. MANAGER

PENINSULA CORRIDOR JOINT POWERS BOARD

SPECIFIC CONTRACT IDENTIFICATION TYPE
DETAILED DESCRIPTION
DETAILED DESCRIPTION
SHEET ? OF ?

CADD FILE NAME	PCJPB_REF_SHT_202211
CADD DATE	11042022
SCALE	1"=?
CONTRACT NO	CONTRACT
MILEPOST	MILEPOST
DWG NO	DWG NO.
REV	?
PAGE NO	?

COUNTY:
CITY:
CONTROL POINT:
CONTROL POINT

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COLOR NO.	COLOR PLOTTED	PEN NO.	WEIGHT(mm)
1		7	0.15
2		7	0.25
3		7	0.35
4		7	0.50
5		7	0.70
6		7	0.90
7		7	0.35
8		8	0.25
9		9	0.35
10		1	0.15
11		7	0.25
12		3	0.35
13		4	0.50
14		5	0.70
15		6	0.90
16		16	X
17		17	0.50
18		18	X
19		19	X
20		1	0.50
21		21	X
22		22	X
23		23	X
24		24	X
25		25	X
26		26	X
27		17	0.70
28		28	X
29		29	X
30		30	0.50
31		30	0.80
32		30	1.00
33		33	X
34		34	X
35		35	X
36		17	1.00
37		17	1.40
38		38	X
39		39	X
40		40	0.80
41		41	X
42		40	1.00
43		40	1.40
44		40	0.50
45		45	X
46		46	X
47		47	X
48		48	X
49		49	X
50		2	0.80
51		2	1.00
52		2	0.50
53		2	1.40
54		54	X
55		55	X
56		56	X
57		57	X
58		58	X
59		59	X
60	KNOCKOUT	255	2.00
61	KNOCKOUT	255	0.90
62		62	X
63		63	X
64		64	X
65	KNOCKOUT	255	1.58

PEN ASSIGNMENT
PRIMARY PEN
PCJPB

COLOR NO.	COLOR PLOTTED	PEN NO.	WEIGHT(mm)
66		66	X
67		67	X
68		68	X
69		69	X
70		70	X
71		71	0.50
72		72	0.70
73		73	1.00
74		74	1.40
75		75	X
76		76	X
77		77	X
78		78	X
79		79	X
80		3	0.50
81		81	X
82		3	0.70
83		83	X
84		84	X
85		85	X
86		94	0.50
87		87	X
88		88	X
89		89	X
90		3	1.00
91		91	X
92		92	X
93		93	X
94		94	0.70
95		95	X
96		94	1.00
97		97	X
98		98	X
99		99	X
100		3	1.40
101		101	X
102		102	X
103		103	X
104		104	X
105		105	X
106		94	1.40
107		107	X
108		108	X
109		109	X
110		110	X
111		111	0.50
112		112	X
113		111	0.80
114		114	X
115		115	X
116		116	X
117		117	X
118		118	X
119		119	X
120		120	X
121		121	X
122		122	X
123		111	1.00
124		124	X
125		111	1.40
126		126	X
127		127	X
128		128	X
129		129	X
130		4	0.70

COLOR NO.	COLOR PLOTTED	PEN NO.	WEIGHT(mm)
131		131	0.50
132		4	1.00
133		131	1.00
134		4	0.50
135		135	X
136		136	X
137		137	X
138		138	X
139		139	X
140		4	1.40
141		131	1.00
142		142	X
143		131	1.40
144		5	0.70
145		145	X
146		146	X
147		147	X
148		148	X
149		149	X
150		5	0.50
151		151	X
152		5	1.00
153		153	X
154		154	X
155		155	X
156		156	X
157		157	X
158		158	X
159		159	X
160		5	1.40
161		161	X
162		162	X
163		163	X
164		164	X
165		165	X
166		166	X
167		167	X
168		168	X
169		169	X
170		170	X
171		171	X
172		172	X
173		173	X
174		174	X
175		175	X
176		176	X
177		177	X
178		178	X
179		179	X
180		180	X
181		181	0.50
182		182	X
183		181	0.70
184		184	X
185		181	1.00
186		186	X
187		181	1.40
188		188	X
189		189	X
190		190	0.50
191		191	X
192		190	0.70
193		193	X
194		194	X
195		195	X

COLOR NO.	COLOR PLOTTED	PEN NO.	WEIGHT(mm)
196		196	X
197		197	X
198		198	X
199		199	X
200		6	1.00
201		201	X
202		190	1.00
203		203	X
204		190	1.40
205		205	X
206		206	X
207		207	X
208		208	X
209		209	X
210		6	0.70
211		211	X
212		6	1.40
213		213	X
214		214	X
215		215	X
216		216	X
217		217	X
218		218	X
219		219	X
220		1	1.00
221		221	X
222		6	0.50
223		223	X
224		224	X
225		225	X
226		226	X
227		227	X
228		228	X
229		229	X
230		1	1.40
231		231	X
232		232	X
233		233	X
234		234	X
235		235	X
236		236	X
237		237	X
238		238	X
239		239	X
240		1	0.80
241		241	X
242		242	X
243		243	X
244		244	X
245		245	X
246		246	X
247		247	X
248		248	X
249		249	X
250		250	0.40
251		251	0.40
252		252	0.40
253		253	0.40
254		254	0.40
255		255	0.40

TEXT KNOCKOUT

61	KNOCKOUT	255	0.90
65	KNOCKOUT	255	1.58
60	KNOCKOUT	255	2.00

COLOR NO.	COLOR PLOTTED	PEN NO.	WEIGHT(mm)
	RED		
10		1	0.15
20		1	0.50
240		1	0.80
220		1	1.00
230		1	1.40
	NAVY BLUE		
150		5	0.50
144		5	0.70
152		5	1.00
160		5	1.40
	LIGHT BLUE		
131		131	0.50
133		131	0.70
141		131	1.00
143		131	1.40
	CYAN		
134		4	0.50
130		4	0.70
132		4	1.00
140		4	1.40
	AQUA		
111		111	0.50
113		111	0.80
123		111	1.00
125		111	1.40
	GREEN		
12		3	0.35
80		3	0.50
82		3	0.70
90		3	1.00
100		3	1.40
	DARK GREEN		
86		94	0.50
94		94	0.70
96		94	1.00
106		94	1.40
	LIME GREEN		
70		70	0.25
71		70	0.50
72		70	0.70
73		70	1.00
74		70	1.40

COLOR NO.	COLOR PLOTTED	PEN NO.	WEIGHT(mm)
	BROWN		
17		17	0.50
27		17	0.70
36		17	1.00
37		17	1.40
	ORANGE		
30		30	0.50
31		30	0.80
32		30	1.00
	MAGENTA		
222		6	0.50
210		6	0.70
200		6	1.00
212		6	1.40
	PURPLE		
190		190	0.50
192		190	0.70
202		190	1.00
204		190	1.40
	LT PURPLE		
181		190	0.50
183		190	0.70
185		190	1.00
187		190	1.40
	MUSTARD		
44		40	0.50
40		40	0.80
42		40	1.00
43		40	1.40
	YELLOW		
52		2	0.50
50		2	0.80
51		2	1.00
53		2	1.40

CONTROL POINT:
CITY:
COUNTY:

REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED
DRAWN
CHECKED
IN CHARGE
DATE

APPROVED

Caltrain
1250 San Carlos Avenue
San Carlos, CA 94070

DEPUTY DIRECTOR
PROJECT MANAGEMENT

PENINSULA CORRIDOR JOINT POWERS BOARD

CADD MANUAL
PEN MAPPING/COLOR CHART

PCJPB.CTB FILE
APPENDIX 4

CADD FILE NAME	CADD DATE
PCJPB_COLOR_CHART	09132022
SCALE: NONE	
CONTRACT NO	MILEPOST
DWG NO	REV / PAGE NO

killamg Nov 04, 2022 - 12:03pm H:\CADD\JPB\Admin\CADD_Manual\CADD_Manual_Revised_20220831\CADD Manual Figures\Color_Chart\PCJPB_COLOR_CHART.dwg