PORT OF PORTLAND

CAD & BIM Standards Manual

2015

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Introduction

This manual is a guide for consultants performing, or desiring to perform, engineering design and/or drafting services for the Port of Portland. Guidelines and examples presented in this manual will help consultants produce drawings that are consistent with the Port's format, appearance, and professional standard. These standards are to be met in accordance with the requirements of the contract.

The purpose of this CAD and BIM standard is to standardize drawing information and improve electronic data sharing between disciplines at the Port and from consultants working for the Port.

This manual should not be considered a substitute for good communication between the team members involved. Effective communication between the consultant's staff and the Port's engineering project manager, Project Engineer, the CAD/BIM manager, and the technical reference center manager, will help ensure production of concise, accurate, and complete drawings – on schedule.

Prior to initiating any drawing production work, the engineering project manager or Project Engineer will usually schedule a meeting with the consultant's team to discuss the specifics of the project. At this meeting, the Port's CAD/BIM manager will discuss the Port's drawing standards and drawing preparation process.

It is recognized that some work performed for the Port may need to be submitted to other governmental agencies. Those submittals will need to conform to both the Port standards and the agencies' standards. Where standards conflict, consultants must work with their Project Engineer to determine the best course of action to reconcile the conflict. Please work with the Project Engineer or project surveyor to ensure you are complying with all appropriate standards.

The Port's goal is for the Project Team to provide the desired product within scope, schedule, and budget. Consequently, the consultant is always encouraged to contact the Project Engineer, or CAD/BIM manager when any question arises, or when any clarification or direction is needed, no matter how small the issue.

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Project Standards

The following project standards are applicable to the documentation for the majority of Port projects, regardless of scale or budget. These standards form the baseline from which project deliverables should be developed. Not all conditions that may be encountered on a Port project are described and teams should utilize their Project Manager or Project Engineer to resolve any unique conditions that may arise over the course of the project.

Quality Assurance/Quality Control

As a long term owner of public property, the Port will utilize project documents for long term operations and maintenance of the facility and as a starting point for future projects. As a result, the Port expects a high level of accuracy in the documents with a robust QA/QC process used to ensure product quality.

At this time, the Port expects to utilize 2D drawing formats for procurement of construction services until the industry is better able to utilize Building Information Model (BIM) outputs. Therefore, all drawings generated utilizing BIM technologies must also be thoroughly checked using a reliable QA/QC process prior to delivering drawings and models to the Port.

CAD Projects Quality Assurance

Thoroughly check all drawings using a reliable QA/QC process prior to delivering them to the Port. The drawings are typically checked to verify geometric accuracy such that all curves are tangent, elements are drawn on proper layers and on the correct coordinate system, and that additional requirements covered in this manual are met.

The consultant shall provide sample electronic drawings to the Port at various stages in the design process.

Milestones for CAD file QA review by the Port:

1. When one of the first drawings is set up that represents how all the drawings will be provided, send the sample drawing to the CAD manager. This allows the Port to provide feedback at the start of the project to get the crucial setups correct from the beginning.
2. At 30 percent and each subsequent submittal prior to the bid stage, submit sample electronic drawings from each discipline, and from each sub-consultant, to both the CAD manager and the TRC manager to ensure that all CAD and reprographic standards are being met.

BIM Projects Quality Assurance

BIM projects shall submit drawings and models to the Port that have been thoroughly checked using a reliable QA/QC process appropriate for BIM work flows. Models shall be checked for:

1. Geometric accuracy of modeled components
2. Locational accuracy in the horizontal and vertical dimensions
3. Conformance with the BIM Standards identified in these standards.

Drawings and models components are to be displayed accurately based on the Level of Design at the phase of drawing/model submission identified in the *Milestone Deliverable Requirements.*

Design Documentation Project Phases

The following describes the typical procedures and requirements for each phase of document generation on Port projects.

Pre-Drawing/Design

During the pre-drawing/design phase, the Project Engineer typically schedules a kickoff meeting with the consultant and managers from technical reference center and CAD. During the meeting, design requirements for the project are discussed, including specific CAD standards and file compatibility.

Review (Pre-Bid)

Drawing reviews will take place during project progress meetings between the consultant and the Port's Project Engineering staff. Hard copy drawings and the sample electronic file will typically be reviewed early in the design process to confirm that Port standards are being met. The Port may request additional specific reviews when judged appropriate. Temporary revision notes may be used in the review period to indicate drawing issue dates and intermediate review completion percentages. When temporary revision notes are used, use a letter in place of a number to indicate the revision is temporary.

Final in-house review of drawings and specifications will be at 100 percent of contract drawing completion (or as defined by the Project Engineer). Revision notes and deltas shall be removed for the final review process. Drawings shall be plotted full sized. Drawing signatures will not be required at this time unless otherwise requested by the technical support manager or Project Engineer. Place the "Not for Construction" stamp in the Project Engineer's box in the title block. See the Reprographics section for further requirements.

Advertisement (Bid)

The Bid Set

The "bid set" is the set of drawings that will be issued for advertisement. The consultant will be responsible for preparing the bid set as follows:

- The drawings shall incorporate all corrections from the review process.
- The bid set will not include any revision notes or deltas when issued. Any drawings containing revision notes and deltas will not be accepted and the consultant will be required to resubmit the drawings.
- All drawings shall be plotted full size, stamped, and wet signed. Note: All drawing stamps and signatures must comply with OAR and ORS requirements.
- The drawings shall meet the CAD and printing standards described in this manual.
- See the Reprographics section for further requirements.

Addenda

Addendum changes affecting drawings occur during the advertising/bidding period and may be done by text, reissuing the drawing, issuing a sketch, or by adding new drawings as described below.

Revised or Reissued Drawings

If the drawing change is described by text, the AutoCAD drawing still needs to be corrected to reflect the change and the title block should reflect that it has been changed by addendum. Revisions to drawings are shown as addendum number changes. In the drawing, indicate revisions made by addendum with the revision number in delta and a drawing cloud around each change. Next to the revision number in the title block, indicate the date the revision is made to the drawing, the initials of the person making the change, and the statement, "REVISED BY ADDENDUM # ____." If drawing revisions are so extensive that clouding is not practical, replace the clouding with the revision block statement, "SHEET REISSUED BY ADDENDUM # ____."

If subsequent addendum changes are made to a drawing, remove the previous clouding and revision delta within the drawing. Then make the changes, cloud and add revision delta, and add another delta in the title block. Do not remove the first revision delta and note from the title block. See the Revisions section later in this manual for additional requirements.

Sketches

Whenever possible, use an 8.5" x 11" sketch with clouds to illustrate revisions to a specific drawing detail rather than reissuing the entire sheet. Label each sketch sequentially (e.g., Sketch A, Sketch B, etc.) and show the number of the detail being revised as well as the addendum number. Do not use sketches for addenda changes if more than one is needed for a particular detail or if a verbal description is needed in addition to the sketch to indicate all the changes. In those cases, the entire drawing should be reissued.

New Drawings

In rare cases a new sheet is added to the drawing set by addendum. In these instances the added sheet should have an alpha character after the page number & discipline number so that subsequent sheets do not need to be renumbered. For instance, if a new civil drawing needed to be inserted between Sheet C-16 and Sheet C-17, the new sheet would be numbered C-16A. An exception to this is if the new drawing is the last sheet in the discipline, in which case the alpha character does not need to be added to the discipline number. The revision block in the new sheet should have a statement that reads, "SHEET ADDED BY ADDENDUM # ____."

Addenda Deliverables

Once the necessary revisions have been incorporated or new drawings are complete, plot the drawing sheets and send them to the Project Engineer. Submit drawing sheets in full size and with the consultant's stamp and original signature. Submit sketches in PDF format.

Pre-Construction (As Bid, As Proposed, or As Negotiated)

Addenda changes issued during the solicitation period will be incorporated into the construction drawing set. The date shown on the construction documents (cover and sheets) will remain as it was on the bid or proposal set.

As-bid, as-proposed, or as-negotiated drawings are circulated, along with the specifications, after a consultant has been selected. Immediately after bid opening (or after completion of negotiations if the solicitation is an RFP), the consultant will be responsible for preparing the as-bid (or as-proposed or as-negotiated) drawings as follows:

- Remove all references on the drawing to previous revisions made by addendum (except in the revision title block). This includes clouds and deltas in the body of the drawing.
- Existing revision block information is to remain. This includes any addendum notations made during the solicitation process, including changes that had been issued by sketches. Add the note "AS BID" (or "AS PROPOSED" or "AS NEGOTIATED" if the solicitation was an RFP) and corresponding deltas numbers to all drawings.
- All drawings shall be re-plotted, stamped and wet signed. See Reprographics for further requirements.
- An AutoCAD data transfer of drawings is required at this time. AutoCAD files will reflect the as-bid (or as-proposed or as-negotiated) conditions. See File Transfer section for further requirements.

Contract Changes

Revisions to contract drawings required by contract changes (CCs) occurring during the construction period should be performed as follows:

- Show drawing revisions by placing a cloud around the revision and adding a revision delta with a number matching the current revision next to the clouded area. In the revision block, add a delta sequence number and the words, "REVISED BY CC # ____", or "REISSUED BY CC#____" as applicable.
- Follow the same procedure for each additional CC issued. When a new revision is added, erase the clouding around previous revisions before noting the new. Existing title block revision information is to remain.
- If a new drawing is created by a CC, the first delta in the title block should read, "SHEET ADDED BY CC#____." Leave the page number blank, and assign it the next discipline number (e.g., if C-14 was the last civil number, it would be assigned C-15). The only exception to this is if the drawing is an expansion of an existing sheet (e.g., if a detail needed to be added to C-7 but there is no more room on the sheet, then it may be given an "A" number and called C-7A).
- RFIs that change a drawing are indicated in the same manner as described above except "CC" should be replaced with "RFI."
- If a drawing is reissued, revised or added during construction, that drawing will need to be re-plotted full size, stamped and signed, and submitted to the Project Engineer.

New project/drawing number

Occasionally, a fully defined project effort will be moved forward through a CC to another project. The guidelines below are in accordance with our existing standards.

- The PM/PE assigned to new project effort will maintain responsibility.
- A project schedule will be developed by the PM/PE for the CC.
- Drawings: A new drawing number is issued. All current Port drawing standards apply with the following clarifications:
    - The CC will use the initial project's EAN.
    - The CC will use a new project number.
    - The CC's drawing date will be the date the "Pricing Set" was issued.
    - A "Pricing Set" will be used to get a quote for the work. At this stage, the design drawings will not require the PE stamp and signatures. When the drawing set does not use a PE stamp, and is unsigned, use a "Not for Construction" stamp.
    - Port TRC will create "Pricing Set" and "Construction" cover sheets.
    - The first line on the revision block will say "Set Added by CC#___"
    - When the CC is approved, a final completed hard copy design drawing set is required (stamped and wet-signed).
    - TRC will provide pdf of final documents and any repro required.
- Specification changes may be required:
    - With CC: Update Spec Drawing Index (Document 000115) w/Additional Drawing Number.
    - Additional Spec Sections will be issued.
- Construction will route documents to the initial project PE. The initial project PE will forward the documents to the PE assigned to the CC'd project for review/approval.
- All documents (MT, OM, SD, and CA) will be filed under the initial project's EAN Number.

Record Drawing (As-Construct)

The consultant will be responsible for developing the record drawings. The Port expects the drawings to include all changes made during the construction process. The drawings, along with the shop drawings and as-construct surveys (if applicable), shall stand alone as a complete record of the "as built" condition. Questions or clarifications during the record drawing process should be directed to the Project Engineer or technical reference center manager.

- The Port will provide the consultant redlines with any additional information as necessary to the consultant for the creation of the record drawings. These shall be returned to the Port with the record drawings.
- New sheets may need to be added to the original set to include additional plans or details. They will be added to the end of the record drawing set repeating the same discipline order as the original drawings. The sequential number will begin one number higher than the last number in the record drawing set (that is, if the set's last number is 120/120, the new sheet number will begin with 121/120).
- "A" sheets may only be added if they are an expansion of an existing sheet. For example, an additional detail that would not fit on page 5 (C-4) may be added on an additional page as 5A (C-4A).
- Verify that all CC's, RFI's, etc., have been incorporated and the CC# (and date) are listed in the title block on the affected sheets.
- Remove all deltas and clouds from the body of the drawings, but leave all references in the revision block. The last delta in the revision block should read, "Record Drawing."
- When a detail or an entire sheet has been removed from the project, draw a large "X" over the detail or sheet, and type "N.I.C." along the X.
- All drawings shall be re-plotted full size.
- Do not stamp or sign the record drawings. The consultant will be required to hand initial (not use AutoCAD) in the first "Approved by" box in the title block next to "Record Drawing," indicating that the consultant has reviewed that sheet. The remaining two boxes are reserved for Port use.

An AutoCAD data transfer of drawings is required at this time. AutoCAD files shall reflect the record drawing condition. See File Transfer section for further requirements.

General Requirements

General Requirements

General requirements apply to *all* Port projects.

Software - CAD

The Port uses the following CAD and GIS software products:

- AutoCAD
- AutoCAD Map 3D
- AutoCAD Civil 3D
- AutoCAD Raster Design
- Terramodel
- Trimble Business Center
- AeroTurn Pro
- Autodesk Storm and Sanitary Analysis
- AutoCAD Utility Design
- Autodesk Infrastructure Modeler
- Autodesk Revit Structure
- Autodesk Navisworks
- Autodesk 3DS Max Design
- ESRI ArcGIS

Software - BIM

The Port uses the following BIM software products:

- AutoDesk Revit Architecture
- AutoDesk Revit Structure
- AutoDesk Revit MEP
- AutoDesk Navisworks Manage and Freedom

Please Note:

Actual software version used by the Port internally will change from time to time. Verify the version currently in use by the Port.

CAD: Files that create proxy objects or other entities which cannot be fully manipulated using the aforementioned software will not be accepted.

BIM: The Port will endeavor to utilize the most current version of the software listed. Notify the Port prior to upgrading software versions.

Drawing Sheet Size

For design/construction documents, use the 22" x 34" sheet size. A larger sheet size may be used only with prior approval from the Project Engineer and technical reference center manager. See Table 1 for the plot size and stamp requirements of each project phase in the Reprographic section at the end of the book.

Facility Codes:

The Port has established the following facility codes for use in naming drawings and folders in all projects:

ATC	AirTrans Center	SI	Swan Island
CR	Columbia River	T2	Terminal 2
GT	General Terminals	T4	Terminal 4
GVBP	Gresham Vista Business Park	T5	Terminal 5
HI	Hayden Island	T6	Terminal 6
HIO	Hillsboro Airport	TRIP	Troutdale Reynolds Industrial Park
NAVD	Navigation Division		
PDX	Portland International Airport	TTD	Troutdale Airport
PIC	Portland International Center	WR	Willamette River
RG	Rivergate Industrial Park		

Abbreviations

With few exceptions the Port does not approve the use of symbols to replace text. Abbreviations shall only be used to reduce time and space, or where appropriate to improve clarity. When possible, use the following approved abbreviations and symbols. If an abbreviation you want to use is not on the list, the use of an abbreviation that is universally recognized in the construction industry may be allowed. If there is a possibility of ambiguity or confusion, the Port may, at its discretion, require the word or term to be spelled completely.

Please note that common English language terms have not been included. Examples are “afternoon” (PM) and “Pacific Standard Time” (PST).

Abbreviation Guidelines

Do not abbreviate words in titles.

Periods, as shown, shall not be omitted so that the reader can be certain that the abbreviation is intentional and not a misspelled word.

Do not abbreviate words of five letters or fewer unless they are contained in the abbreviations list below.

Avoid the use of abbreviations with more than one meaning.

Abbreviation List

And	&	Concrete Masonry Unit	CMU
Centerline	℄	Concrete Sewer Pipe	CSP
Degrees	°	Corrugated Metal Pipe	CMP
Feet	‘	**D**	
Inches	“	Dilute Deicing	DDEI
A		Distance	DIST
Abandoned	ABAND.	Deicing	DEI
Airplane Fuel	AF	Diameter	DIA
Asphalt Concrete	AC	Ductile Iron Pipe	DIP
C			
Cast Iron Pipe	CIP		
Catch Basin	CB		
Communications	COM		
Concentrate Deicing	CDEI		
Concrete	CONC.		

E	
Each	EA
East	E
Easting	E:
Electrical	ELEC.
Electrical (utility designation)	E
Elevation	ELEV.
Equal (as in equal spaces)	EQ.
Existing	EXIST.
F	
Federal Aviation Administration	FAA
Fiber Optic	FO
G	
Galvanized	GALV.
H	
Hand hole	HH
High Density Polyethylene	HDPE
Horizontal	HORIZ.
I	
Identification	ID
Inside Diameter	I.D.
Invert Elevation	IE
K	
Kips	K
Kips per square foot	KSF
Kips per square inch	KSI
L	
Left	LT
M	
Manhole	MH
Manhole Catch basin	MH/CB
Maximum	MAX.
Minimum	MIN.
Miscellaneous	MISC.
N	
Natural Gas (utility designation)	G
Not in Contract	N.I.C.
North	N
Northing	N:
Northeast	NE
Northwest	NW
Not to scale	N.T.S.
O	
Offset	OFF.
Ordinary High Water	OHW
Outside Diameter	O.D.
Overhead Power	OP
P	
Pavement	PVMT.
Portland International Airport	PDX
Perforated Pipe	PRF
Point of tangency	PT
Point of vertical intersection	PVI
Point of curvature	PC
Point of intersection	PI
Polyvinyl chloride pipe	PVC
Portland Cement Concrete	PCC
Professional Engineer	P.E.
R	
Radius	R
Remove	REM.
Right	RT
Right of way	R.O.W.
S	
Sanitary Sewer	SS
Storm Sewer	STS
South	S
Southeast	SE
Southwest	SW
Spaced	SP.
Station	STA.
T	
Temporary	TEMP.
Typical	TYP.
V	
Vertical	VERT.
W	
Water	W
Fire Protection Water	WF
West	W

Graphic Standards

Graphic & Sheet Standards

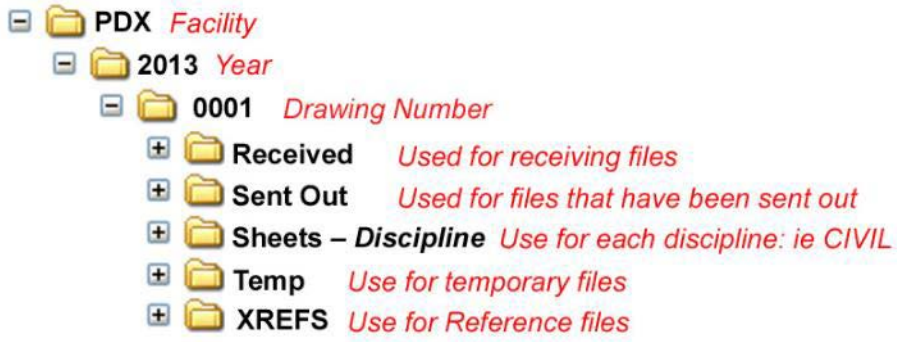
The Graphic Standards utilized by the Port are intended to provide common and familiar documents for use by the Port for the life of the asset. These Graphic & Sheet Standards apply to *all* Port projects regardless of discipline.

Drawing Number

The drawing number is assigned by the technical reference center manager in the Port's Technical Reference Center (TRC). The Port's Project Engineer will supply the consultant with a drawing number at the beginning of the project.

Default Folder Structure

The Port has adopted the following folder structure for all design projects. This structure is based on the drawing number assigned by the TRC. Additional folders may be required by other disciplines and will be shown later in this chapter. (Sheet name must be unique.)



Sheet Numbering and Naming– Civil Disciplines

Each drawing sheet is numbered with the sheet of total sheets number as well as a discipline sheet number.

The sheet of total sheets number shall be consecutively numbered starting with sheet 1. The cover sheet is not included in the sheet count. The sheet number will continue through each discipline. This shall be formatted with the sheet number, a back slash, and the total number of sheets in the set. For example, sheet number **36 of 250** total sheets will look like this: **36/250**.

The discipline sheet numbers are consecutively numbered starting with 1 for each discipline. For Civil design led projects, the Port does not utilize decimal numbering for the discipline numbers. The format for discipline sheet number includes the letter designating the discipline, a hyphen, and then the number of the sheet, starting with 1 for each designation. So the fourth sheet in the civil section will be numbered like this: C-4. Note: see appendix examples for Port allowed disciplines and discipline order.

Sheet Numbering and Naming– Architectural Disciplines

Each drawing sheet is numbered with the sheet of total sheets number as well as a discipline sheet number.

The sheet of total sheets number shall be consecutively numbered starting with sheet 1. The cover sheet is not included in the sheet count. The sheet number will continue through each discipline. This shall be formatted with the sheet number, a back slash, and the total number of sheets in the set. For example, sheet number **36 of 250** total sheets will look like this: **36/250**.

Note: see appendix examples for Port allowed disciplines.

For Architectural led projects, the drawing discipline sheet number is numbered with a prefix and followed by a number that refers to a type of drawing, and finally a decimal number that refers to the drawing order. For sheets added after AS-BID, see the section on contract changes earlier in the manual.

Numbering Series	Description
A0.01	Index, Symbols, Abbreviations, Notes, Location Maps
A1.01	Demolition, Site Plan, Temporary Work
A2.01	Plans, Room Finish Schedule, Door Schedule, Key Drawings
A3.01	Sections, Exterior Elevations
A4.01	Detailed Floor Plans
A5.01	Interior Elevations
A6.01	Reflected Ceiling Plan
A7.01	Vertical circulation, Stairs, Elevators, Escalators
A8.01	Exterior Details
A9.01	Interior Details

Sheet Naming

Sheet names must be unique. You may add a number to the name if required. For example “DETAILS 1” and “DETAILS 2”. Sheet naming for sheets that have a generic name should use location first with descriptor second. For example STA. 0+00 TO STA. 50+00 PLAN AND PROFILE, or ENPLANING – PLAN.

Cover Sheet and Drawing Index

The Port will provide the cover sheet for all drawing sets containing 4 or more sheets. The consultant is expected to provide a drawing index if the set contains 20 or more sheets. The index will consist of three columns. The first two columns will contain the sheet number and the discipline sheet number respectively and will be labeled with one title: “SHEET NUMBER.” The third column will be labeled “DESCRIPTION.” Each section of drawings will be separated and titled. An example is “GENERAL INFORMATION SHEETS.” The section title shall have a height of 0.165" and be underlined. All other text shall have a height of 0.125". Care should be taken to allow for proper spacing between columns and rows.

CAD Reference: The Port typically uses a table defined in AutoCAD with a cell height of 0.400". The first column is 0.875" wide. The second column is 0.75" wide. The third column is typically is 4.75" wide, however the width may be increased as required. The layout should look like the example below.

GENERAL INFORMATION SHEETS

SHEET NUMBER		DESCRIPTION
1	GI-1	SHEET INDEX
2	GI-2	GENERAL LEGEND
3	GI-3	SITE PLAN AND VICINITY MAP
4	GI-4	SURVEY CONTROL PLAN
5	GI-5	STAGING SITES AND HAUL ROUTE PLAN
6	GI-6	PHASE 1
7	GI-7	PHASE 1 - ACTIVE WORK AREA PLAN

Figure 1

General Layout of Drawing Sheets

Consider plan scales and layout organization before the drawing process begins. When laying out drawings, keep in mind that details and sections should be on sheets separate from the plan views. Also, plan sheets should be placed in the front of the drawing set and details and sections in the back. Lay out the details and sections so they are not crowded together. Use additional sheets if necessary; clarity is more important than sheet count.

Title Blocks

Standardized title block information ensures the uniformity of Port drawings, and aids subsequent drawing storage and retrieval efforts. The Port utilizes standard blocks for all title blocks. These blocks shall be used on all projects. Titles shall consist of the facility name and project title as shown on the project schedule. The project title of the drawings should also be exactly the same as the title on the accompanying specifications. Check with the Port Project Engineer if there is any doubt about the proper name of the project. See Appendix 1 for additional information.

Acceptable Scales

The following is a list of acceptable scales for Port projects. Note that if a drawing has multiple scales, please use the term "AS SHOWN" in the title block's SCALE. For drawings that are not drawn to scale (details for example) use the term N.T.S. or NOT TO SCALE in the title block's SCALE. For drawings that would not have a scale (e.g., sheet index, general notes) use the term "NONE" in the title block's SCALE. If the sheet has only one scale, enter that scale in the title block.

If another scale is to be used, you must obtain prior approval from the Port.

Engineering Scales	Architectural Scales	Typical uses
1" = 1000'	---	Site Plans
1" = 800'	---	Site Plans
1" = 600'	---	Site Plans
1" = 500'	---	Site Plans
1" = 400'	---	Site Plans
1" = 300'	---	Site Plans
1" = 200'	---	Site Plans
1" = 100'	---	Site Plans, Civil plans, Topographic surveys of ground only
1" = 50'	---	Geometry Plans, Plan and Profiles, Utility Maps, Topographic Surveys, As built Surveys
1" = 30'	3/32" = 1'-0", 1/16" = 1'-0"	Floor plans, Exterior Elevations, Details
1" = 20'	3/16" = 1'-0"	Floor plans, Exterior Elevations, Details, Enlarged Utility Plans, Topographic Surveys, As built Surveys, Paving grid
1" = 10'	1/8" = 1'-0"	Floor plans, Exterior Elevations, Details
1" = 5'	1/4" = 1'-0"	Floor plans, Exterior Elevations, Details
---	3/8" = 1'-0"	Interior Elevations
1" = 2'	1/2" = 1'-0" 3/4" = 1'-0"	Enlarged Floor plans, Wall Sections, Details
1" = 1'	1" = 1'-0" 1-1/2" = 1'-0"	Wall Sections, Foundation, Footing, Details
---	3" = 1'-0"	Door & Window details, Cabinet details
---	Half Size	Door & Window details, Cabinet details
---	Full Size	Door & Window details, Cabinet details

Bar Scales

The Port has a standard block for the bar scale. This block will be used for all projects requiring a bar scale. In general, the proper placement of the bar scale is directly beneath the north arrow. If the bar scale is used when there is not a north arrow, or if there are separate scales for horizontal and vertical, place the bar scales as close as possible to the detail title.

CAD Reference: Bar scales shall be inserted on the ANNO-SHEET-INFO layer in AutoCAD drawings.

North Arrow

The Port has a standard block for the north arrow. This block will be used for all projects requiring a north arrow. The north arrow should be in the upper left of the view it is used on. If there is more than one plan view in a drawing, use a separate north arrow for each view. As much as possible, north is to be towards the top of the sheet. Avoid pointing north towards the bottom of the page.

CAD Reference: North arrows shall be inserted on the ANNO-SHEET-INFO layer in AutoCAD drawings.

Key Plans

When key plans are required, place them in the lower right corner of the drawing area.

CAD Reference: Key plans shall be inserted on the ANNO-SHEET-INFO layer in AutoCAD drawings.

Notes, Tables, and Legends

Drawing note text should be kept to a minimum. Detailed written information should be reserved for the specifications. Overly detailed notes may obscure the drawings and increase the possibility of inconsistencies and duplications. Drawings and specifications are complementary parts of the same set of contract documents and including references from one to another is not recommended. However, it is acceptable to refer to a specific specification section. Example: "Provide fire stopping at wall penetration – see specification Section 078400."

The Port uses several different types of notes.

- General discipline notes - apply to all sheets within a discipline and are located on the first sheet in the discipline. A legend, index or other items may also appear on this page.
- Sheet notes - apply to the entire sheet, and shall be generally located along the right-hand side of that page, numerically numbered and titled "NOTES:" or "NOTE:" Single notes do not have to be numbered.
- Detail notes - apply to only that detail and shall have the same formatting as sheet notes, except they shall be located above the detail title.
- Key notes - formatted similar to notes, see key notes section for additional information.

Notes, tables, and legends are typically located along the right side of the drawing area, above the key plan.

CAD Reference: Notes, tables and legends shall be placed on the ANNO-NOTES layer in AutoCAD drawings.

Text Style and Orientation

To maintain consistency in the appearance of drawings from multiple disciplines, the Port uses the Windows True Type font Swiss 721 Lt Bt for normal text and **Swiss 721 Bt** for bold text.

The font shall be 100% width. Reduced widths are ***not*** allowed.

When plotted full size the standard text size is 0.125" for normal type, 0.165" for large type.

Capital letters are required for all text.

Stacked fractions are not allowed.

Background masks are allowed and may be required to maintain text legibility.

All text should be plan readable. See the figure at the right for properly oriented text.

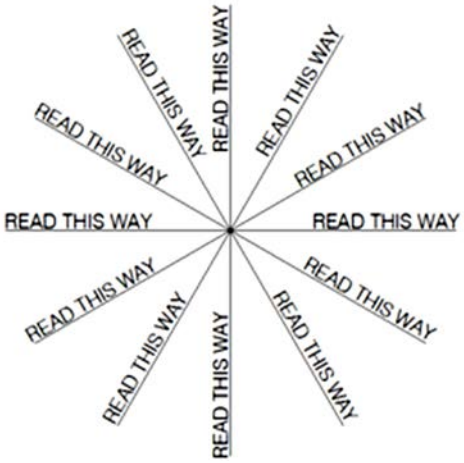


Figure 2

Notes

When creating notes in the drawing, the word "NOTES:" shall be left justified, have a height of 0.165 and be underlined. Do not extend the underline past the word "NOTES:" The remaining text shall be left justified, and have a height of 0.125. If there is only one note, a number is not required, see **Figure** 3.

These are examples of properly formatted notes:

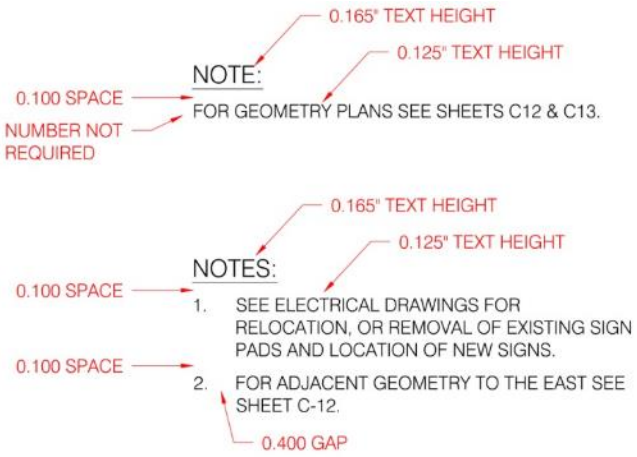


Figure 3

CAD Reference: To properly format the notes, access the Paragraph dialog box through Line Spacing found in the text editor ribbon in AutoCAD and set the first tab stop to 0.4000, the left indent Hanging to 0.4000, and the Paragraph Spacing After to 0.1000 as shown in Figure 4:

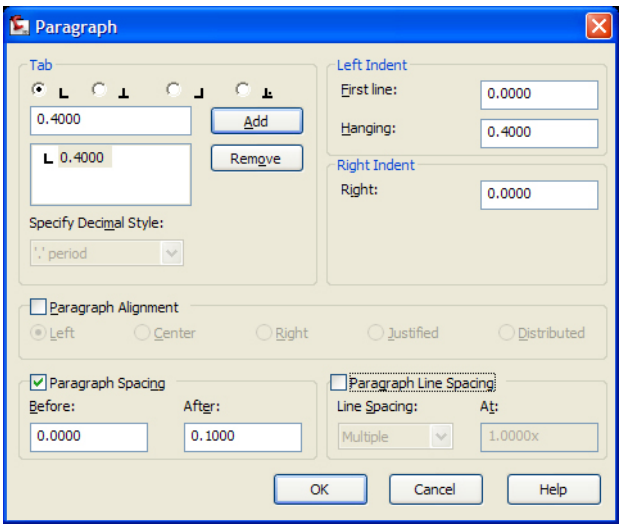


Figure 4

Access the Paragraph dialog box through Line Spacing found on the text editor ribbon in AutoCAD.

BIM Reference: Where Notes occur on multiple sheets, annotation families or Revit generated schedules are to be utilized. Text boxes copied between sheets are not acceptable.

Key Notes

The Port uses key notes to simplify the notation process in complex drawings. The key note identifier is a circle with a number centered in it and typically has a leader with an arrow pointing to the item described in the key notes. It is acceptable to place only the circle with number adjacent to the item described in the key notes when space is limited. Keynote numbers shall start over on each sheet, so that key note 8 on one sheet may not be the same as key note 8 on another sheet.

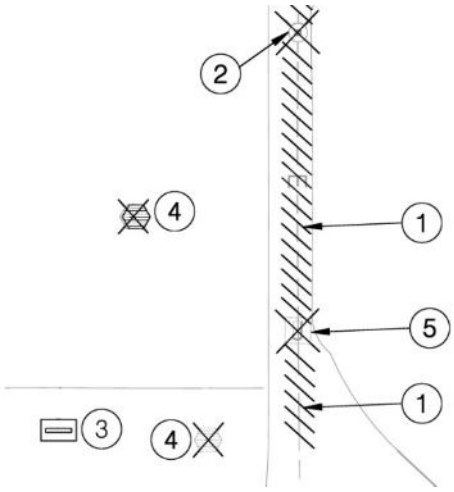
Some drawings may require the use of more than one symbol for key notes. For example, a drawing depicting work that may be performed by more than one entity, like the Port and the Railroad will show each work requirement with different symbology to assist with the readability of the drawing. When cases like this occur, use the circle first, hexagon second, and if required, a square third. If more symbols are still needed, check with the Project Engineer for acceptable symbols. Note that triangles may not be used. Triangles are strictly reserved for revisions.

Following the same formatting as notes, when key notes apply to the entire sheet they shall generally be located along the right hand side of that page and shall be titled "KEY NOTES:" Beneath the title, each note shall be preceded with the key note symbol (circle and number).

CAD Reference: The Port utilizes an AutoCAD table to line up the identifier and note so they are easier to manipulate in the drawing. For an example, see below.

BIM Reference: Where used for keynotes, Revit Noteblocks with software generated schedules shall be used.

When more than one key note applies to an object, it is preferred to link the key note identifiers in sequence and share one leader.

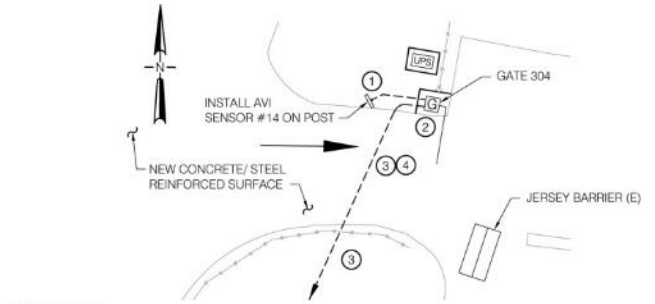


KEY NOTES:

1. AT POINT INDICATED IS AN EXISTING 2" PVC CONTAINING 5KV #8 AIRFIELD LIGHTING CONDUCTORS WITH NUMBER OF CONDUCTORS VARYING FROM 2 TO 6. REMOVE AND DISPOSE OF THE CONDUIT AND THE CONDUCTORS OFF PORT PROPERTY.
2. AT POINT INDICATED IS AN EXISTING ELEVATED TAXIWAY EDGE LIGHT. REMOVE THE LIGHT AND TURN IT OVER TO THE PORT. REMOVE AND DISPOSE OF BASE CAN, EXTENSION, FLANGE RING, AND ISOLATION TRANSFORMER OFF PORT PROPERTY.
3. AT POINT INDICATED IS AN EXISTING AIRCRAFT GUIDANCE SIGN. REMOVE THE SIGN AND TURN IT OVER TO THE PORT. REMOVE AND DISPOSE OF THE FOUNDATION, BASE CAN AND ISOLATION TRANSFORMER OFF PORT PROPERTY. BACK FILL AND REPAIR TO MATCH EXISTING PAVEMENT SECTION AND FINAL SURFACE CONDITION.
4. AT POINT INDICATED ARE EXISTING GROUNDING POINTS. REMOVE AND DISPOSE OF GROUND ROD OFF PORT PROPERTY.
5. AT POINT INDICATED IS AN EXISTING L-867 24" DEEP BASE CAN. REMOVE COVER PLATE AND TURN IT OVER TO THE PORT. REMOVE AND DISPOSE OF THE BASE CAN AND EXTENSION OFF PORT PROPERTY.

Figure 4

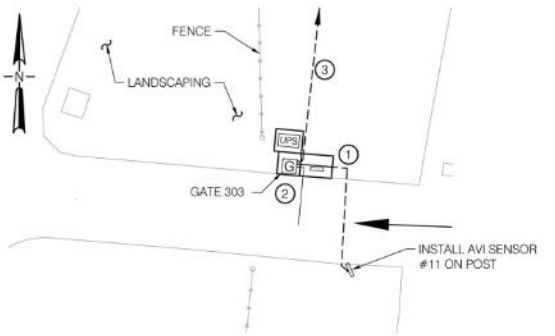
When key notes apply to specific details on the same sheet, the key notes should be located near the detail title. When multiple details on the same sheet have key notes, the numbering shall start with 1 in each detail. See **Figure** 5.



KEY NOTES:

1. INSTALL AVI SENSOR. EXTEND 1" RIGID CONDUIT WITH (1) CAT 6, 2#14 (LV), & 2#18 (RELAY OUTPUT) FROM SENSOR, UNDERGROUND AND THEN INTO SIDE OF GATE 304 OPERATOR HOUSING.
2. INSIDE THE GATE 304 HOUSING, INSTALL A 120V POWER STRIP INTO EXISTING RECEPTACLE, INSTALL THE AVI POWER SUPPLY, INSTALL A FIBER OPTIC DISTRIBUTION UNIT (FODU), INSTALL A FIBER MEDIA CONVERTER (FMC), AND TERMINATE THE AVI RELAY OUTPUT SIGNAL CONDUCTORS ON THE "OPEN" INPUT TERMINALS OF THE GATE CONTROLLER.
3. INSTALL (1) 4-STRAND SM FIBER IN NEW 1-1/4" BETWEEN GATE 304 AND THE NEW RED LOT AVI ENCLOSURE NEAR CAMERAS 563 AND 564. TERMINATE FIBER ON A NEW FODU INSIDE THE GATE 304 HOUSING AND INSIDE THE NEW RED LOT AVI ENCLOSURE. PROVIDE A FIBER MEDIA CONVERTER FOR EACH END.
4. BORE CONDUIT UNDER ROADWAY.

4 DETAIL - GATE 304 - AVI-14
SCALE: 1" = 10'



KEY NOTES:

1. INSTALL AVI SENSOR. EXTEND 1" RIGID CONDUIT WITH (1) CAT 6, 2#14 (LV), & 2#18 (RELAY OUTPUT) FROM SENSOR, UNDERGROUND AND THEN SURFACE MOUNTED INTO SIDE OF GATE 303 OPERATOR HOUSING.
2. INSIDE THE GATE 303 HOUSING, INSTALL A 120V POWER STRIP INTO THE EXISTING RECEPTACLE, INSTALL THE AVI POWER SUPPLY, INSTALL A FIBER OPTIC DISTRIBUTION UNIT (FODU), INSTALL A FIBER MEDIA CONVERTER (FMC), AND TERMINATE THE AVI RELAY OUTPUT SIGNAL CONDUCTORS ON THE "OPEN" INPUT TERMINALS OF THE GATE CONTROLLER.
3. INSTALL (1) 4-STRAND SM FIBER BETWEEN GATE 303 AND THE NEW RED LOT AVI ENCLOSURE NEAR CAMERAS 563 AND 564. TERMINATE FIBER ON A NEW FODU INSIDE THE GATE 303 HOUSING AND INSIDE THE NEW RED LOT AVI ENCLOSURE. PROVIDE A FIBER MEDIA CONVERTER FOR EACH END.

5 DETAIL - GATE 30 - AVI-11
SCALE: 1" = 10'

Figure 5

Dimensioning

Horizontal, vertical and aligned dimensions should be above the dimension line (see **Figure** 6).

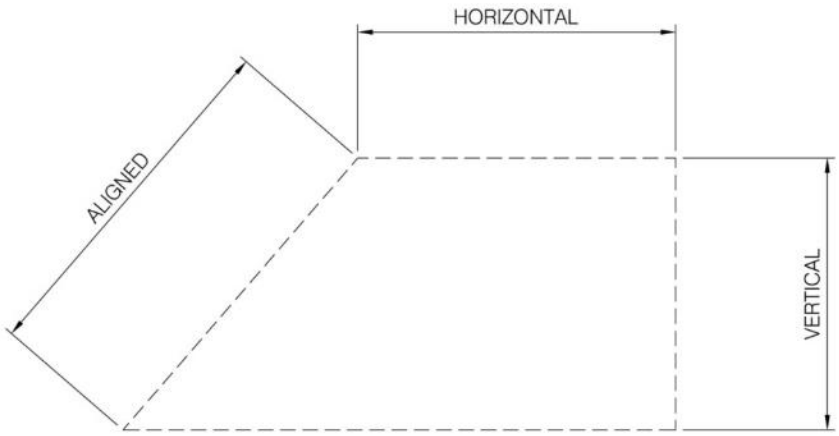


Figure 6

The Port prefers the use of multileaders in AutoCAD. A POP-Callout multileader style can be found in the Port's template drawing. Leaders from callouts are typically placed by the very beginning word to the left, or by the final word to the right (see **Figure** 7). If it is not practical to place the leader hook at the beginning word to the left or at the final word to the right, it is acceptable to place the leader in the most convenient place available. Text height 0.125"; text justification = top left; arrow head size = 0.125", with an aspect ratio of 1:3.

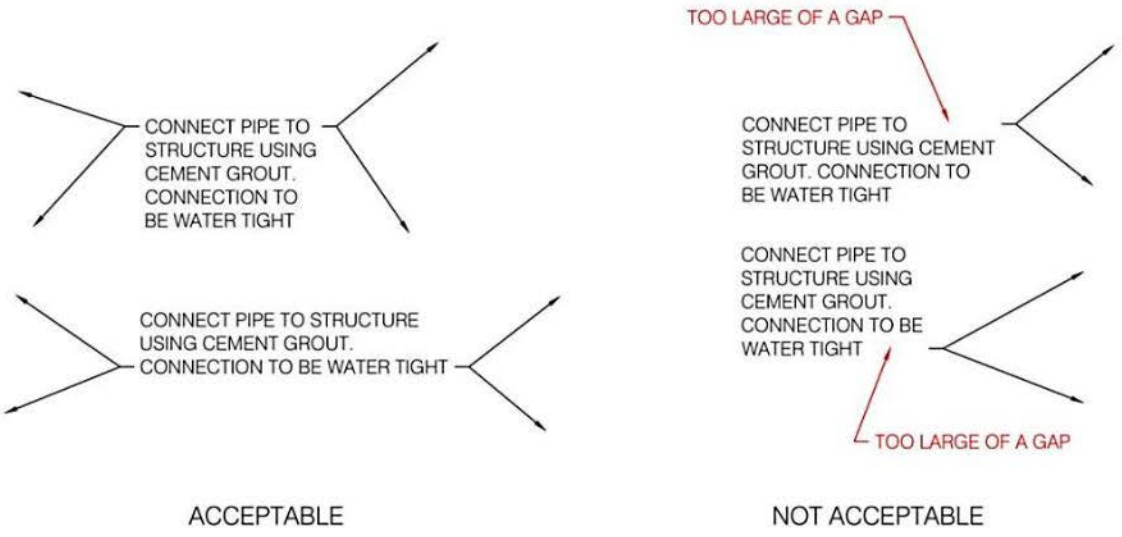


Figure 7

Detail Titles

The Port utilizes a block for the detail title. Use of this block is required on all projects. This block consists of a Detail title, scale and detail balloon and is centered under each plan, detail, section, etc., unless there is only one view in the drawing, in which case a detail title is not required. Number details and sections on each sheet starting with sequence number "1". Then follow a left-to-right, top-to-bottom numbering convention throughout the drawing. For details not drawn to scale, use "N.T.S." Below is an example of a typical detail title.

Figure 8

Detail Callouts

To reference another detail, either on the same sheet or another sheet, draw a circle or rectangle around the area to be detailed with a medium weight dashed line. Call the detail out with a straight line and a detail bubble block supplied by the Port. Use of this block is required on all projects. The upper half of the bubble shall contain the detail number. The lower half shall contain the sheet number where the detail resides. See the example to the right:

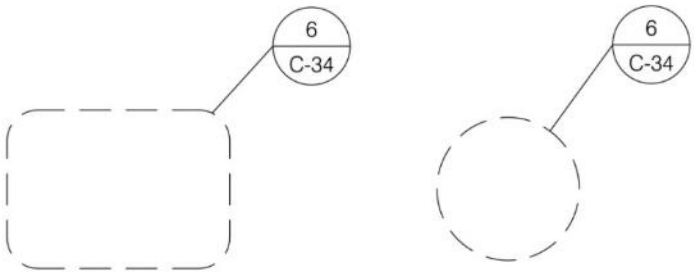


Figure 9

Section Callouts

To show cross sections, the Port utilizes two blocks. Use of these blocks is required on all projects. The first contains the bubble, line, and direction arrows. The second is the text that is placed inside the bubble. The text shall always be read horizontally, regardless of the orientation of the section marker. The upper half of the bubble shall contain the section number. The lower half shall contain the sheet number where the section resides.

See the example to the right:

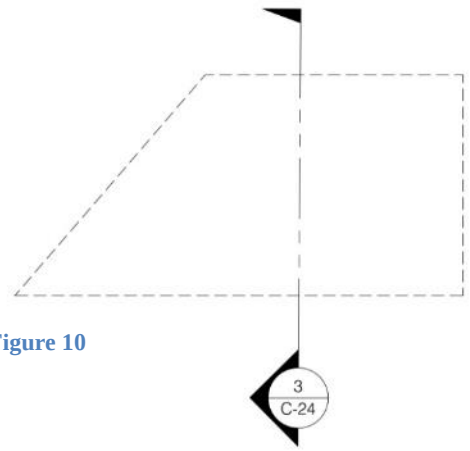


Figure 10

Match lines

When used, match lines should be placed on the appropriate layer defined with a phantom line and a 0.025 width. Place text along the line indicating the match. This text should be 0.165 in height.

Revisions

Revisions made during the design process are not noted in the title block or treated in any special way. Revisions made after the project has been advertised for bid are specifically identified in the following ways:

* Addendum (changes prior to bid opening)
* As bid (with incorporation of addendum changes up to award of contract)
* Contract changes (changes during construction)
* Record drawings (incorporating all design changes)

All changes shall be made in AutoCAD or Revit; hand changes will not be accepted. Record the first revision number starting in the bottom row of the right hand side of the revision block. Subsequent revision numbers are placed above previous revision numbers. Place the revision number in a delta (Port-provided AutoCAD block). The number used for each revision reflects the sequential number of all revisions (beginning with 1) on each sheet (see example below). Place initials in the CK'D box for the current revision. All previous revisions shall have the initials typed in.

CAD Reference: Cloud all changes for the current revision, and delete clouds for previous revisions.

BIM Reference: Manage all revisions with the revisions schedule built into to the software. Revise the status to 'Issued' and show 'Tag' only once the revision has been published.

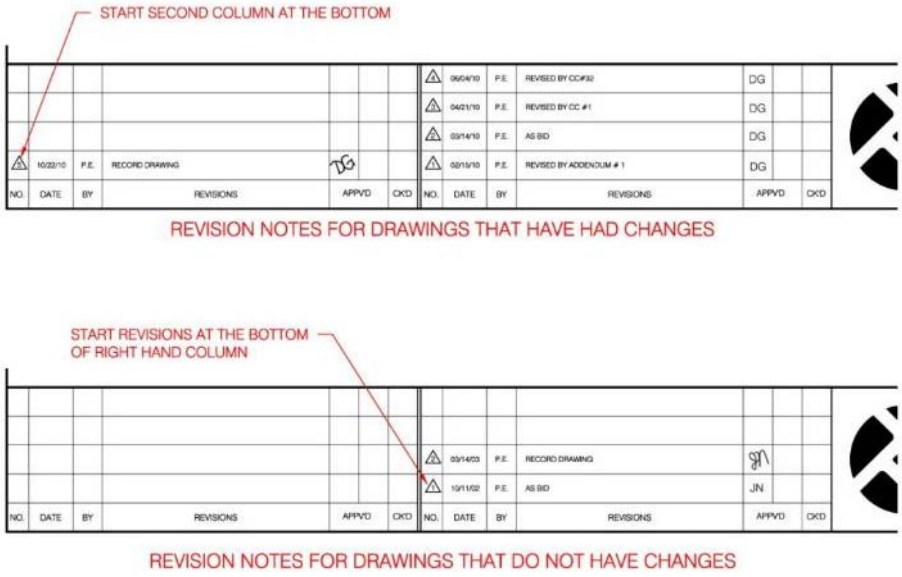


Figure 11

Removing a detail

When removing a detail or a plan view from a sheet, draw a diagonal line through the view, and type "N.I.C." or the words "NOT USED" along the top side of the line.

Additional Architectural, Structural, Mechanical, and Electrical (Architectural) Standards

To maintain consistency between different disciplines, all of the standards listed previously in the previous section are applicable. Prior to starting a project with the Port, it is recommended that the consultant visits the Port's Technical Reference Center to view sample drawings from previous projects that may be similar to the one the consultant has been hired for to ensure that all standards are being followed.

General Information Sheets

General information sheets include the site plan, sheet indexes, survey control plans, phasing drawings, and work area drawings and details.

Project Site Plan and Vicinity Map

Site plans are used to show the contract work area, haul route, staging area, construction access route, survey datum information, monuments, conversions to other references, etc. Because of the dense image on an aerial, the text and line work being added shall be bold. All major streets, rivers and pertinent building names shall be noted. In addition, a Port-provided vicinity map showing the larger area outside the construction site is inset onto the aerial typically in the upper right corner. For small construction projects with no aerial image, vicinity maps shall be placed on Sheet 1. In both cases, place the vicinity map in a 6"x 6.5" box, typically in the upper right corner of the first sheet. For clarity, however, the vicinity map can be placed in the lower right, upper left, or lower left (in order of preference). Circle the project area and label, "PROJECT SITE." Use the Port standard north arrow. The label on the title shall be "VICINITY MAP," and the scale shall say, "N.T.S." See the appendices for more information.

Work Area Plans and Phasing Plans

Work area plans show the project work areas, staging areas, haul routes, flagging requirements, signage requirements, barricade locations and types, and various other information required to work in the area under construction. Use of the Port's line types and symbology is required.

Survey Control

The survey control drawings show the location of the project, and the control points that will be used for the project. See the section for more information.

Design Sheets

Each section of sheets shall conform to the national standards set by the AIA or the National CAD or National BIM Standards. Any deviation from the Port standards or the national standards shall be submitted to the Port for prior approval. Please direct any questions to the CAD/BIM manager or Project Engineer.

Layer and Symbology Guidelines

Layer naming and symbology shall conform to the national standards set by the AIA or the National CAD or National BIM Standards. Any deviation from the Port standards or the national standards shall be submitted to the Port for prior approval. The Port does not maintain specific blocks for these disciplines. Please direct any questions to the CAD/BIM manager or Project Engineer.

Communication Protocols & Reference Standards

File Transfers to the Port

During the project design phase, it is acceptable to transfer electronic information to the Port by e-mail or through the Port's ePort site. The Port may approve other methods on an individual project basis. The Port will create an ePort site for each project. At the as-bid and record drawing phase, however, files must be transferred on a read-only CD (CDR). At that time, make sure all files associated with the project are transmitted. This includes external references (Xrefs), images, custom line types, non-standard fonts, and .stb and .ctb files. Xrefs should not be bound or inserted into the drawing, but should be attached using AutoCAD's relative path or project name. Contact the CAD manager for questions or assistance concerning file transfers.

CAD Reference: The Port requires an AutoCAD .dwg file format that can be read by the Port's current version of AutoCAD, and all support files that create the drawing set including Civil 3D files for surveys, surfaces, plan and profiles, cross sections, etc. All drawings should be purged of unused blocks, line types, fonts, proxy graphics, or similar elements and audited, with layers in the correct state for publishing (frozen/thawed) prior to delivery to the Port. All ASCII files shall be comma delineated. Consultants using other software are responsible for confirming, prior to distribution that all CAD files comply with Port standards. The consultant should also scan files with the latest anti-virus detection software to ensure clean file transfers. Documentation is expected to accompany all file transfers. Include project name, number, EAN, drawing number, engineering project manager, and Project Engineer on both hard copy documentation and CD.

Reprographics

The Port endeavors to minimize printing of documents to the greatest extent possible. However, consultants will be required to coordinate the printing and distribution of documents required to meet the requirements of the project which cannot be accomplished by other means.

Printing Services

The Port maintains a contract with a vendor who supplies all required reprographic services. Project-related reprographic services, whether required by the consultant or the Port, shall be provided under the Port reprographic contract. Consequently, the consultant should coordinate all project-related reprographic needs through the technical reference center manager. Specific instructions for drawing reproduction will be discussed during the pre-drawing meeting and adjusted as necessary to meet project requirements.

Drawing Requirements

The Technical Reference Center (TRC) will quality check each drawing set submitted to ensure that all Port standards are met. Drawings that do not meet the standards will be returned for corrections.

All drawings shall be plotted from AutoCAD. If an alternative method is used it must be of equal print quality.

All drawings shall be plotted full sized (22" x 34") on bond paper. 24# bright white (92 or better) is preferred.

The technical reference center manager may determine that a plotter's output does not adequately show halftone and solid line definition. If so, the technical reference center manager will direct the consultant to use the Port's reprographic vendor for plotting services.

Please check your drawings for print quality and standards prior to submitting them to the Port.

Common errors found are:

- Line weights, font, or text size not per standard.

- Lines going through numbers or text - difficult to read.
- Not using wipeouts behind text over backgrounds or grids.
- Plotting from a PDF version of the drawing degrades the quality, changes line weights, or changes screening.
- Wrong EAN, project number, drawing number, etc.
- Scales do not match (check that the scale bar, title block and detail titles all match).
- The title on each sheet should match the title on the index sheet.
- Items not brought in on the correct layer or layers are turned off, causing a print error.
- Airplane screening issues – all appearing black, etc.
- Sheet formatting issues – note formatting, detail order, etc.
- Misuse of "A" sheets.
- Not indicating the CC# in the revision block of changed sheets.
- Not using the Port provided blocks when appropriate. (ie: North arrows, detail titles, section call outs, etc.)

Stamp and Signature Requirements

The engineering stamp and signature must comply with ORS (Oregon Revised Statues) and OAR (Oregon Administrative Rules).

Reproductions

In general, all full sized drawing sets are plotted full size then reduced to half size for the printing process.

Prior to advertisement, a limited number of half-sized copies are ordered for Port and consultant use. Additional copies or full-sized copies can be purchased via the Port's online bidding system, PlanetBids.

Prior to construction, a limited number of full- and half-sied as-bid copies are purchased for Port, consultant, and consultant use. Additional copies can be ordered at the cost of reproduction.

Quick Reference for Drawing Plot Size and Signature Requirements

	Half-Size Plot	Full-Size Plot	Not for Construction Stamp	Professional Stamp and Signature	AutoCAD Files
Review	X*	X	X		
Bid		X		X	
Addenda		X		X	
As-Bid		X		X	X
Record Drawing		X			X

*For preliminary reviews (e.g., 30%, 60%, etc.), a half-size original set may be acceptable. Check with the technical reference center manager.

Table 1

General CAD Standards

Drawing Setup

The Port utilizes the drawing setups below for *all* CAD projects. The Port *will not accept* drawings with alternate symbols, Civil3D styles, text height, font style, layer names and settings, or other deviations from the standards described in this manual *without prior approval* from the CAD manager and/or the technical reference center manager.

The Port drawing template is available on the Port's web site. Visit www.portofportland.com, click on Business Opportunities, then click on Master Specification and Standards detail found on the left hand side. There you will find the link to the CAD templates, blocks and CAD Standards. All new projects must use the latest version of the drawing template. The template includes all layer names with their settings, text styles and dimension styles. Also included are the Port survey code list, Port survey code book file, Port survey description key file, LISP routines, standard Port blocks, Port custom line types, and standard Port-named plot styles for both full-size and half-size plots. Additional information such as background files and GIS base map information for specific projects will not be on the web site, but is available upon request.

All civil drawings need to be on either the Port's local coordinate system, or on Oregon State Plane North 1983 International Feet coordinate system. Architectural drawings and BIM models should be able to reference the Oregon State Plane North 1983 International Feet coordinate system.

Default File Naming Structure

The Port has adopted the following file naming convention for all projects.

- Sheet files:

[NNNN.dwg]

Where NNNN is a general description, such as Plan and Profile.dwg or Pavement Layout.dwg

- Reference files:

[BA-NNNN.dwg]

Where Ba stands for Base and NNNN is a general description of the drawing such as

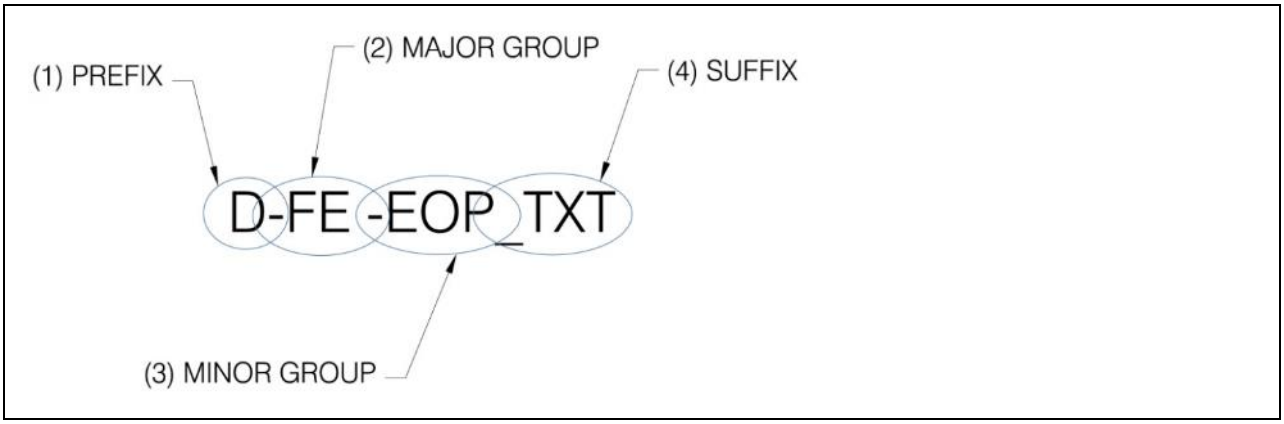
Ba-Existing Utilities.dwg or Ba-Design Utilities.dwg.

Sheet Set Manager

The Sheet Set Manager is a dialog that will allow you to open a sheet set and work with all of the sheets in that set. Sheet Set Manager allows you to link all of your sheet information to all of your sheets so you will only have to make changes in one place. The Sheet Set Manager dialog is able to be used by the entire design team, and the changes will be reflected automatically. The Port utilizes Sheet Set Manager for all drawing sets with more than one sheet. The attributed blocks supplied by the Port are designed to work with Sheet Set Manager. Use of the Sheet Set Manager by the consultant is recommended but not required.

Port AutoCAD Layering Guide

The Port's AutoCAD Layering Guide is meant to be flexible and adaptable, and was created to help users separate like types of information in CAD. There are four main categories to a layer name. However, not every layer requires the use of all four. For layer name examples, see end of the layer listing. For questions, contact the CAD manager.



(1) PREFIX

The PREFIX category ***is not*** required for all layer names. However, a possible use for the PREFIX is to separate like types of information in one CAD file, such as *design* from *existing*. A hyphen (-) is used to separate the PREFIX and the next category, the MAJOR GROUP.

(2) MAJOR GROUP (Required for all layer names)

The MAJOR GROUP category ***is*** required for all layer names. A hyphen (-) is used to separate the MAJOR GROUP from the MINOR GROUP category.

(3) MINOR GROUP (Required for all layer names)

The MINOR GROUP category ***is*** required for all layer names. An underscore (_) is used to separate the MINOR GROUP from the SUFFIX (if required). For flexibility, the MINOR GROUP layer name list can be amended as the CAD user finds necessary.

(4) SUFFIX

The SUFFIX category is only needed when a layer requires additional clarification (i.e., text, wipeout, etc.). Two or more suffixes can be strung together when necessary (i.e., screened text = **_txt _sc**), separated with an underscore (_). When a SUFFIX is used in a layer name, its plot style supersedes the MINOR GROUP plot style.

Layer Color, Line Type and Pen Weight

On the following pages, the specified color and line type in the "Minor Group" or "Suffix" listings should be followed whenever possible. A few exceptions to the rule are denoted at the end of the layering guide. When "varies" is listed, the CAD technician has room for flexibility and may choose color, line type, and plot style weight to suit his or her needs. The pen weight is the plotter "pen" thickness. However, the

listed weight is nominal. When necessary, increase weight to show greater contrast between new and existing features. For new features, use the black pen (i.e., Black 0.015). For existing features, use the dark screen (i.e., Dk Screen 0.010).

PREFIX	
Code	**Description**
D-	Design
X-	Existing
F-	Future
0-[1]	Reference Files

[1]Place reference files on a layer with 0- Logical Name for each file (e.g., 0-Exist Features)

MAJOR GROUP	
Group	**Description**
CG-	Coordinate Geom.
CDA-	Civil Design Area
FE-	Features
PR-	Properties
ANNO-	Text, Dimensions, Sheet Borders
PROF-	Profiles
XSEC-	Cross Sections
SRF-	Surfaces
UT-	Utilities
MISC-	Miscellaneous

MINOR GROUP – Annotation (ANNO)				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
ANNO-BORDER	Varies	Cont.	Varies	Plan sheet border: title block, revision cloud and delta
ANNO-DIMS	Varies	Cont.	0.010	Dimensions and leaders
ANNO-LEGEND	Varies	Varies	Varies	Legend
ANNO-MATCHLINE	Varies	Phant.	0.025	Match lines
ANNO-NOTES	Varies	Cont.	0.010	General note for detail, on sheet, profile/cross section
ANNO-SHEET-INFO	Varies	Cont.	Varies	Misc. sheet info.: Title block info., north arrow & revision note
ANNO-REVISIONS	21	Cont.	Varies	Revision clouds and deltas
ANNO-VIEWPORT	150	Cont.	Normal	Viewport border (leave layer on, turn plotting icon off)

MINOR GROUP – Civil Design Area (CDA)				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
CDA-GRAD-LIMITS	Varies	Phant.	0.020	Site grading limits for non-typical area
CDA-PAVE-LIMITS	Varies	Dashed	0.020	Paving limits for non-typical area
CDA-PAVE-MILL	Varies	Hidden	0.015	Pavement milling boundary
CDA-PAVE-REMOVAL	Varies	Cont.	0.025	Pavement removal boundary
CDA-SURF-PREP	Varies	Hidden	0.010	Surface preparation boundary and hatching
CDA-WORK-AREA	Magenta	Cont.	0.020	Work area limit

MINOR GROUP – Coordinate Geometry (CG)				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
CG-CNTRL-CHECK_PT	Varies	Cont.	Varies	Point for survey control back-sight check
CG-CNTRL-FND	Varies	Cont.	Varies	Point for found monument
CG-CNTRL-PRIM	Varies	Cont.	Varies	Primary Survey Control: brass cap, monument and point
CG-CNTRL-TEMP	Varies	Cont.	Varies	Temp. Survey Control: hub & tack, pk nail, iron rod & iron pipe
CG-GRID	Varies	Cont.	Varies	Grid tick, station and offset information
CG-HORIZALIGN	Varies	Center	Varies	Horizontal and centerline alignment
CG-HORIZALIGN-TICK	Varies	Cont.	Varies	Centerline stationing tick
CG-STRUCTURAL-EDGE	Varies	Cont.	Varies	Runway & taxiway structural edge geometry
MINOR GROUP – Features (FE)				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
FE-BLDG	Cyan	Cont.	0.015	Building footprint
FE-BLDG-PBB	Cyan	Cont.	0.010	Passenger Boarding Bridges
FE-BLDG-TUNNEL	135	Hidden	0.010	Terminal building tunnels
FE-BORE	Varies	Cont.	0.010	Soil boring & test location
FE-CURB	White	Cont.	0.010	Top back of curb
FE-CURB-LOWER-ROADWAY	Varies	Cont.	0.010	Curb for lower roadway at PDX terminal
FE-CURB-UPPER-ROADWAY	Varies	Cont.	0.010	Curb for upper roadway at PDX terminal
FE-DETAIL	Varies	Cont.	Varies	Detail line work
FE-DITCH-OUTL	Varies	Phant.	0.010	Ditch outline
FE-DOCK	Varies	Cont.	0.010	Dock outline
FE-FENCE	Varies	Fence	0.010	Fence line and gate
FE-FENDER	Varies	Cont.	0.015	Dock fender
FE-GRAVEL	Varies	Hidden	0.010	Edge of gravel
FE-MISC	Varies	Cont.	0.010	Sign, berm, piling, dike, dredge pipe casing, sidewalk, driveway, bollard, flag post, guard rail
FE-MONITORING-WELL	Cyan	Cont.	0.010	Monitoring well
FE-PAVE-AC-PAD	Red	Cont.	0.010	AC erosion pad
FE-PAVE-CONC-PAD	White	Cont.	0.010	Concrete pad, sign pad, concrete erosion pad
FE-PAVE-EDGE-AC	Red	Cont.	0.015	Edge of pavement line: road, parking lot – gutter line at bottom of curb
FE-PAVE-EDGE-AC-ANG	14	Cont.	0.015	Edge of pavement for Air National Guard base
FE-PAVE-EDGE-CONC	White	Cont.	0.015	Edge of concrete pavement lines for runways, taxiways, and aprons
FE-PAVE-EDGE-CONC-LOWER-ROADWAY	Red	Cont.	0.015	Edge of concrete for lower roadway at PDX terminal.
FE-PAVE-EDGE-CONC-UPPER-ROADWAY	Red	Cont.	0.015	Edge of concrete for upper roadway at PDX terminal
FE-PAVE-EDGE-RWTW	Red	Cont.	0.015	Edge of pavement lines for runways, taxiways & aprons
FE-PAVE-JOINT	Varies	Cont.	0.010	Pavement joints
FE-RAIL	30	Cont.	0.015	Rail and crane track
FE-RAIL-CL	30	Rail	0.010	Centerline of railroad tracks
FE-STRIPE-AIRPARK	Yellow	Cont.	0.010	Aircraft parking stripe

MINOR GROUP – Features (FE) cont.				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
FE-STRIPE-AIRPARK-LEADIN	Yellow	Cont.	0.010	Aircraft parking lead in striping
FE-STRIPE-AIRPARK-STOP-BAR_TXT	Yellow	Cont.	0.010	Aircraft parking nose wheel stop bar text
FE-STRIPE-MISC	51	Cont.	0.010	Miscellaneous striping
FE-STRIPE-NON-MOVEMENT-FAA	Yellow	Cont.	0.010	FAA-required non-movement stripe
FE-STRIPE-NON-MOVEMENT-PORT	White	Cont.	0.010	Port's non-movement stripe
FE-STRIPE-PARKING-LOT	Yellow	Cont.	0.010	Parking lot striping
FE-STRIPE-ROAD	Yellow	Cont.	0.010	Road striping
FE-STRIPE-ROAD-CL	Yellow	Cont.	0.010	Road centerline striping
FE-STRIPE-ROAD-FOG	White	Cont.	0.015	Road fog stripe
FE-STRIPE-ROAD-LOWER	Yellow	Cont.	0.010	Striping for lower roadway at PDX terminal
FE-STRIPE-ROAD-NON-MVMT-FAA	Yellow	Cont.	0.010	FAA non-movement boundary striping
FE-STRIPE-ROAD-NON-MVMT-PORT	White	Cont.	0.010	Port non-movement boundary striping
FE-STRIPE-ROAD-STOP	White	Cont.	0.010	Stop bar striping
FE-STRIPE-ROAD-UPPER	Yellow	Cont.	0.010	Striping for upper roadway at PDX terminal
FE-STRIPE-ROAD-ZIP	White	Cont.	0.010	Zipper striping
FE-STRIPE-RW-CL	White	Cont.	0.010	Runway stripe – centerline
FE-STRIPE-RW-EDGE	White	Cont.	0.010	Runway stripe – edge stripes
FE-STRIPE-RW-MARKING	White	Cont.	0.010	Runway stripe – marking
FE-STRIPE-TW-CL	Yellow	Cont.	0.015	Taxiway centerline stripe
FE-STRIPE-TW-EDGE	Yellow	Cont.	0.010	Taxiway edge stripe
FE-STRIPE-TW-HOLD	Yellow	Cont.	0.010	Airfield hold bar striping
FE-STRIPE-TW-SHOULDER	Yellow	Cont.	0.015	Taxiway shoulder and island striping
FE-STRIPE-VEHICLE-PARKING	Yellow	Cont.	0.010	Vehicle parking stripe
FE-STRIPE-WALKWAY	Varies	Cont.	0.010	Pedestrian walkway stripe
FE-UIC-WELL	Varies	Cont.	0.010	Underground injection well
FE-VEG	Green	Cont.	0.010	Vegetation: tree, shrub, and vegetation outline
FE-VEG-LAWNEDGE	Green	Cont.	0.015	Lawn boundary
FE-WETLAND	Blue	Cont.	0.010	Wetland outline
FE-WTR-EDGE	Blue	Cont.	0.015	Body of water

MINOR GROUP – Properties (PR)				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
PR-EASEMENT	Varies	Dashed	0.015	Easement line
PR-HARBOR	Varies	Phant.	0.020	Harbor line
PR-LEASE	Magenta	Cont.	0.020	Lease line
PR-LOT	Red	Cont.	0.020	Lot boundary line
PR-PORTPROP	Red	Phant.	0.020	POP property boundary
PR-ROW	Red	Hidden	0.020	Right-of-way line
PR-SECTLINES	Green	Phant.	0.010	Section lines with assoc. text
PR-SURVDIMS	Varies	Cont.	0.010	Survey dimensioning: curve data, bearing and distance

MINOR GROUP - Profiles and Cross Sections (PROF)&(XSEC)				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
PROF-GRID-MAJ	10	Dot2	0.020	Major grid line
PROF-GRID-MIN	253	Dot2	0.010	Minor grid line (LTSCALE for Dot2 set to 0.5)
PROF-GRND-DESIGN	Green	Cont.	0.020	Design surface ground line
PROF-GRND-EXIST	Brown	Hidden	0.010	Existing surface ground line
PROF-GRND-FUTURE	Blue	Dashed	0.025	Future surface ground line
XSEC-GRID-MAJ	10	Dot2	0.020	Major grid line
XSEC-GRID-MIN	253	Dot2	0.010	Minor grid line (LTSCALE for Dot2 set to 0.5)
XSEC-GRND-DESIGN	Green	Cont.	0.020	Design surface ground line
XSEC-GRND-EXIST	Brown	Hidden	0.010	Existing surface ground line
XSEC-GRND-FUTURE	Blue	Dashed	0.025	Future surface ground line

MINOR GROUP - Surfaces (SRF)				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
SRF-BOUNDARIES	30	Cont.	Varies	DTM boundaries
SRF-BREAK-3D-POLY	Varies	Cont.	Varies	3D polyline as break-line
SRF-BREAK-CONSTRUCTION	Varies	Cont.	Varies	Drawn break-lines to create design surfaces
SRF-BREAK-PROXIMITY	Varies	Cont.	Varies	Proximity break-line
SRF-CHECK-PT	Varies	Cont.	Varies	Point for surface verification check shot
SRF-CONT-CONSTRUCTION	Varies	Cont.	Varies	Drawn contours to create design surfaces
SRF-CONT-MAJ[2]	Red	Cont.	0.025	Major contour line (generic)
SRF-CONT-MIN[2]	Magenta	Cont.	0.015	Minor contour line (generic)
SRF-CONT-GRAD-MAJ	Varies	Hidden	0.025	Major grading contour
SRF-CONT-GRAD-MIN	Varies	Hidden	0.015	Minor grading contour
SRF-CONT-PAV-MAJ	Varies	Cont.	0.025	Major paving contour
SRF-CONT-PAV-MIN	Varies	Cont.	0.015	Minor paving contour
SRF-SURFSHOT	Varies	Cont.	Varies	Point for shot on AC, conc., ground, gutter, riprap, rock
SRF-TIN	Green	Cont.	Varies	Triangulation network
SRF-TOE	Varies	Cont.	Varies	Point for toe of slope shot
SRF-TOP	Varies	Cont.	Varies	Point for top of slope shot

MINOR GROUP – Utilities (UT)				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
UT-AF	Yellow	Cont.	0.010	Aircraft fuel features and lines
UT-COM	30	Cont.	0.010	Communication features and lines
UT-COM-CONC	40	Cont.	0.010	Concrete outlines for utility
UT-COM-FO	Varies	Cont.	0.010	Fiber optic communication line
UT-DUCT	Red	Cont.	0.010	Duct marker, duct outline
UT-ELEC	Red	Varies	0.010	Electrical features and lines
UT-ELEC-CIRC	Red	Hidden	0.010	Airfield power circuit conductor
UT-ELEC-CONC	12	Cont.	0.010	Concrete outlines for utility, guidance sign foundations
UT-ELEC-LINE-IMC	Red	Cont.	0.010	IMC conduit line
UT-ELEC-LTS	Red	Hidden	0.010	Runway and taxiway light
UT-ELEC-OP	Red	Hidden	0.010	Overhead power
UT-ELEC-SL	Red	Hidden	0.010	Street lighting features and lines

MINOR GROUP – Utilities (UT) cont.				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
UT-FAA	Cyan	Hidden	0.010	All Fed. Aviation Admin. Features and lines
UT-FAA-CONC	144	Cont.	0.010	Concrete outlines for utility
UT-NAT-GAS	Yellow	Cont.	0.010	Natural gas line, pipe size and block
UT-GEN	White	Cont.	0.010	General utility info. i.e. utility tunnel, multiple use manhole
UT-SS	Green	Cont.	0.010	Sanitary sewer line, pipe size and block
UT-SS-CONC	90	Cont.	0.010	Concrete outlines for utility
UT-STS	Magenta	Cont.	0.010	Storm sewer features and lines
UT-STS-BASIN	211	Cont.	0.020	Storm sewer drainage basin boundary
UT-STS-CONC	188	Cont.	0.010	Concrete outlines for utility
UT-STS-DEICE	191	Cont.	0.010	STS deicing line
UT-STS-DEICE-CONCENTRATE	222	Cont.	0.010	STS deicing concentrate line
UT-STS-DEICE-DILUTE	211	Cont.	0.010	STS deicing dilute line
UT-STS-DITCH	Magenta	Phant.	0.010	Ditch flow line
UT-STS-FLOW	Magenta	Cont.	0.010	Storm sewer flow direction arrows
UT-STS-UNDER-DRAIN	Magenta	Hidden	0.010	Storm sewer perf pipe (under drains)
UT-UNKNOWN	White	Cont.	0.010	Unidentified utility
UT-WTR	Blue	Cont.	0.010	Generic water
UT-WTR-COMBINED	Blue	Cont.	0.010	Potable and non-potable water service and PFB line, irrigation, ballast water, pipe size and type, and block
UT-WTR-CONC	138	Cont.	0.010	Concrete outlines for utility
UT-WTR-DOMESTIC	Blue	Cont.	0.010	Potable water service line, pipe size and type, and block
UT-WTR-FIRE-PROTECTION	Blue	Cont.	0.010	Fire service line, pipe size and type, and block
UT-WTR-IRRIGATION	Blue	Dashed	0.010	Irrigation line, pipe size and block
UT-WTR-NONPOTABLE	Blue	Cont.	0.010	Non-Potable water service line, pipe size and type, and block

MINOR GROUP – Misc. (MISC)				
Layer Name	**Color**	**Line Type**	**Pen Weight**	**Description**
MISC-RADIUS[3]	Varies	Cont.	Varies	Terramodel created radius point
MISC-SEE-NOTE[3]	Varies	Cont.	Varies	Points for misc. survey item (see survey notes)

[3]These layers are for use on survey drawings only.

SUFFIX[4]				
Abbreviation	Color	Line Type	Pen Weight	Description
_AB	Varies	Cont.	0.010	Abandoned utility
_H	Varies	Cont.	Varies	Hatching
_LBL	Varies	Cont.	0.010	Labels used in Civil 3d alignments, etc.
_LS	Varies	Cont.	Lt Screen 0.010	Light screen
_PT	Varies	Cont.	0.008	Survey point
_REM	Varies	Cont.	Varies	Items to be removed
_SC	Varies	Cont.	Dk Screen 0.010	Dark screen
_TXT	Varies	Cont.	0.008	Text & assoc. leader
_UG	Varies	Varies	Varies	Underground utilities
_W	Varies	Cont.	Blank 0.010	Wipeout

[4]Suffixes can be used to define different line types, line weights, and drawings scales. Use three or four characters to define, for example:

_CEN = center line type

_HID = hidden line type

_PHAN = phantom line type

_0.025 = 0.025 line weight

_50SC = 50 scale

Layer Name Examples:

FE-BLDG_TXT……..Text associated with building feature

D-PROF-GRND…….....Design ground line profile

ANNO-SHEET-INFO_SC_TXT……Dark screened text information

SRF-CONT-MAJ…….Major contour line

ANNO-DIM_SC……..Dark screened dimension

UT-STS_UG……Underground storm sewer piping

Policy on Model Space and Paper Space

AutoCAD has two separate "spaces" for drawing information to reside: Model space and paper space. Model space is where the geometric model is drawn in a three-dimensional coordinate system at actual size. Paper space is a two-dimensional coordinate system used for sheet layouts. The Port allows the use of both spaces and multiple tabs in each dwg file. To help differentiate which elements may be in paper space vs. model space, see the Layer Guide later in this manual.

The Port utilizes the following guidelines as to what information resides in each space.

Design and Details

- All design and detail objects will be in model space at actual scale, on an appropriate layer and when appropriate on the correct coordinate system.

Dimensions and Text

- Place in model space when dimensions and text that needs to be shown on several paper space tabs or when there will only be one paper space tab in the file.
- Place in paper space when dimensions and text do not carry over from sheet to sheet, or when you have multiple paper space tabs.
- Coordinate call outs need to remain in model space.

Sheet Information

- The following are examples that should be placed in paper space:
    - North Arrow
    - Match lines and associated text
    - Revision clouds, and deltas
    - Revision notes
    - Title blocks
    - Tables
    - Notes
    - Legends
    - Location plans
    - Professional stamps
    - Dimensions
    - Detail titles

Policy on External References

All external references (XREF's) shall be inserted on a layer with a 0- prefix. See the layer guide section for details.

All XREF drawings shall be inserted as overlays and set to relative path. The use of XREF's as attachments and or full path will not be accepted.

If an XREF is not required in a drawing, properly detach the XREF in the External Reference Manager; do not simply delete the XREF in the drawing.

Plot Styles

The Port uses AutoCAD's named plot styles, not color-dependent plot styles. Named plot styles were introduced in AutoCAD 2000. The named style allows the user to create a pen style and give it a unique name. Once that pen has been created, the user may apply that pen style to any layer or object he chooses. This allows the use of the same color on different layers, and still allows the layers to plot differently. For example, if a drawing has two utilities that are the same color (e.g., storm sewer and FAA lines are both magenta), the user can plot them differently by selecting different pen styles. While the Port prefers the use of our pen tables, we will accept files from consultants with their own pen tables. If the consultant chooses to use its own pen table, he must supply the Port with either the .stb file, or the .ctb file.

The Port maintains two pen tables, POP Full Size.stb and POP Half Size.stb. The pens included plot different levels of screening a layer's color, black, dark screen (dark grey for existing information), light screen (light grey for solid area fills), bylayer pens for plotting different widths of the layer's color, and a set of "blank" pens which give the effect of plotting a line or fill white. Each pen is listed with the weight of the line the pen will plot. Use the 0.005 weight for very fine lines, and the 0.045 pen weight for very heavy lines. The POP Half Size.stb is used to plot half size plots. The pen names are identical to the full size, however, the pens are designed to plot half the weight listed. Therefore a pen weight of 0.020 will plot at 0.010. The table at the right lists the predefined pens.

Prior to submitting plots to the Port for reproduction, the consultant shall send in a plot, or several plots, of drawings that are representative of the type of plot styles used for the entire set. These plots should be full size and plotted on the plotter's best setting. The plots will be evaluated by the Port's reprographic department for reproducible quality. Plot style adjustments to the original may be required to achieve an acceptable reproduction. You do not need to wait until an official review period to send in a sample plot. It is recommended that these sample plots be submitted with ample time to make adjustments if required.

Port of Portland Standard Pen Table for NAMED Plot style drawings: (POP Full Size.stb)

PEN	Plotted Color
15% Screen	Layer's color, 15% screened
30% Screen	Layer's color, 30% screened
50% Screen	Layer's color, 50% screened
Black 0.005	Black
Black 0.008	Black
Black 0.010	Black
Black 0.015	Black
Black 0.020	Black
Black 0.025	Black
Black 0.031	Black
Black 0.045	Black
DK Screen 0.005	Dark Screen (Dark Grey)
DK Screen 0.010	Dark Screen (Dark Grey)
DK Screen 0.015	Dark Screen (Dark Grey)
DK Screen 0.020	Dark Screen (Dark Grey)
DK Screen 0.025	Dark Screen (Dark Grey)
DK Screen 0.031	Dark Screen (Dark Grey)
DK Screen 0.045	Dark Screen (Dark Grey)
LT Screen 0.005	Light Screen (Light Grey)
LT Screen 0.010	Light Screen (Light Grey)
LT Screen 0.015	Light Screen (Light Grey)
LT Screen 0.020	Light Screen (Light Grey)
LT Screen 0.025	Light Screen (Light Grey)
LT Screen 0.031	Light Screen (Light Grey)
LT Screen 0.045	Light Screen (Light Grey)
Bylayer 0.005	The Layer's color
Bylayer 0.008	The Layer's color
Bylayer 0.010	The Layer's color
Bylayer 0.015	The Layer's color
Bylayer 0.020	The Layer's color
Bylayer 0.025	The Layer's color
Bylayer 0.031	The Layer's color
Bylayer 0.045	The Layer's color
Blank 0.005	Blank - NO COLOR
Blank 0.010	Blank - NO COLOR
Blank 0.015	Blank - NO COLOR
Blank 0.020	Blank - NO COLOR
Blank 0.025	Blank - NO COLOR
Blank 0.031	Blank - NO COLOR
Blank 0.045	Blank - NO COLOR

Figure 12

Note for REVIT:
Since Revit does not use pen tables for plotting, use the guidelines found in the tables in figures 13 and 14 to set line weights appropriately.

Pen/Color Settings

The pen widths shown below apply to drawings that are plotted full size, typically 22" x 34" for Port standards. Use the Port Full Size pen tables to plot these drawings. When producing reduced size drawings (11" x 17" half size prints) use the Port Half Size pen tables.

OBJECT	NAMED PLOT STYLE	PEN WIDTH
Object Line (New Design or Survey Info)	Black 0.015	0.015
Screened Line (Existing or Background Info)	Dk Screen 0.010	0.010
Dimension/Leaders/Text/Hidden & Center Line	Black 0.008	0.008
Extra Fine Line	Black 0.005	0.005
Heavy Medium Line	Black 0.020	0.020
Extra Bold Line	Black 0.045	0.045
Title Block (Line weight is controlled by Plines)	Black 0.008	0.008
Light Screened (Highlighted or filled areas)	Lt Screen 0.010	0.010
Major Contour Line (New)	Black 0.025	0.025
Minor Contour Line (New)	Black 0.015	0.015
Major Contour Line (Existing)	Dk Screen 0.020	0.020
Minor Contour Line (Existing)	Dk Screen 0.008	0.008

Figure 13

Line Weights and Line Types

Line weights available in AutoCAD may be by entity (versus bylayer). Line color, line style, and plot style shall be “bylayer.” The Port does not use line types that have text on them. Rather, text is manually placed on the line. The Port has created LISP routines to assist with this process, which can be found on the Port’s website.

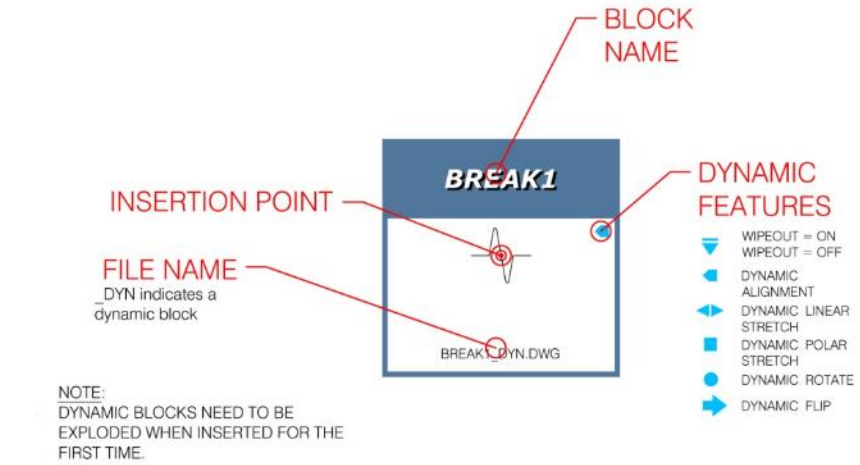
PEN WEIGHT CLASSIFICATION

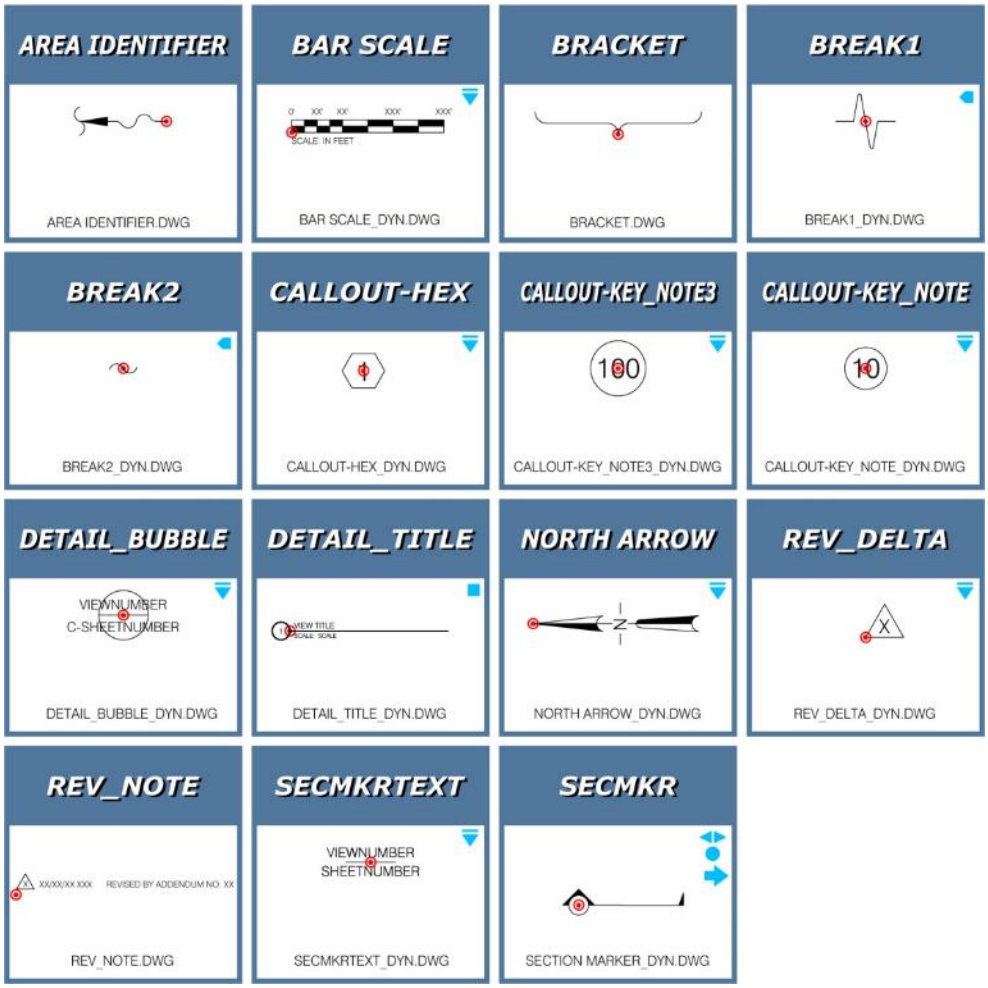
CLASSIFICATION	EXAMPLE	PEN WEIGHT
Extra Fine		0.005
Fine		0.008
Standard		0.010
Medium		0.015
Heavy Medium		0.020
Light Bold		0.025
Bold		0.031
Extra Bold		0.045

Figure 14

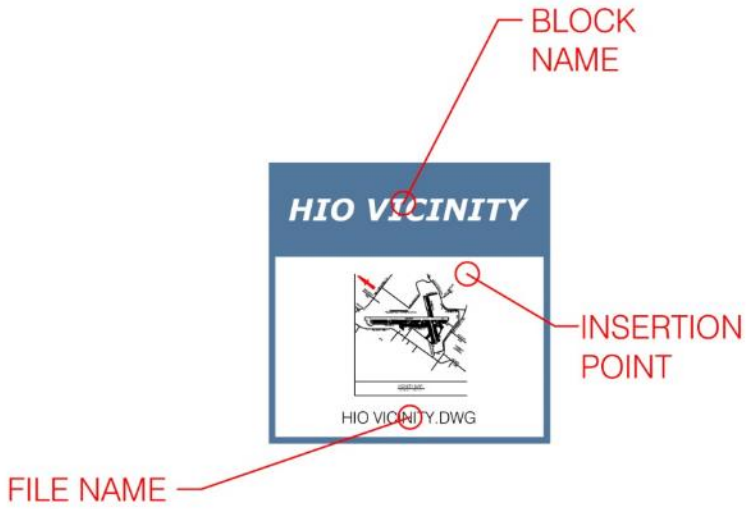
Symbology – Sheet Information

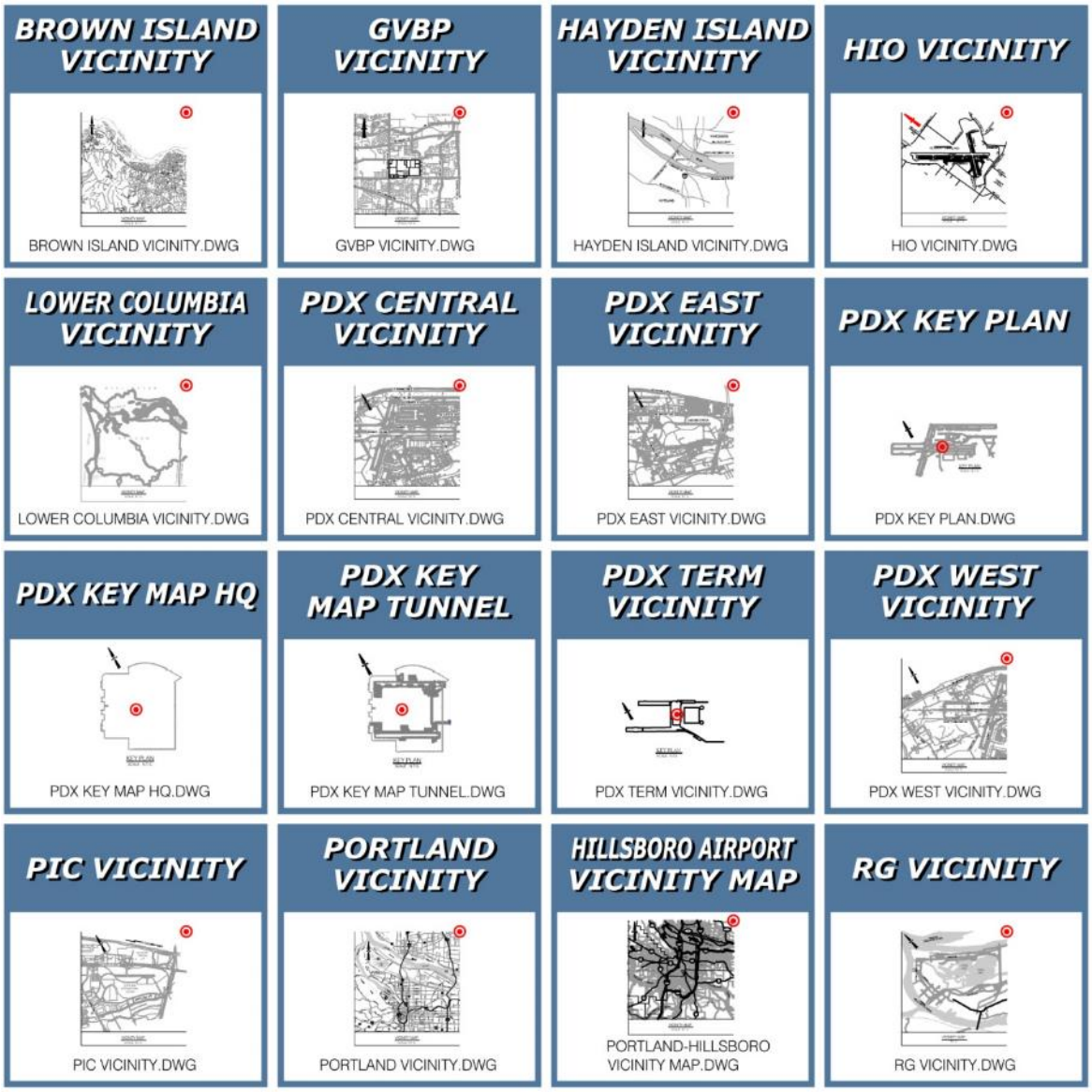
The Port's symbols for sheet information shall be used on all projects. See the discipline sections later in this chapter for specific symbols required for each discipline.





Symbology - Vicinity Maps





RICE ISLAND VICINITY
RICE ISLAND VICINITY.DWG
T4 VICINITY
T4 VICINITY.DWG
TTD AND TRIP VICINITY
TTD AND TRIP VICINITY.DWG

Civil & Railway CAD Standards

Civil Design Graphical Standards

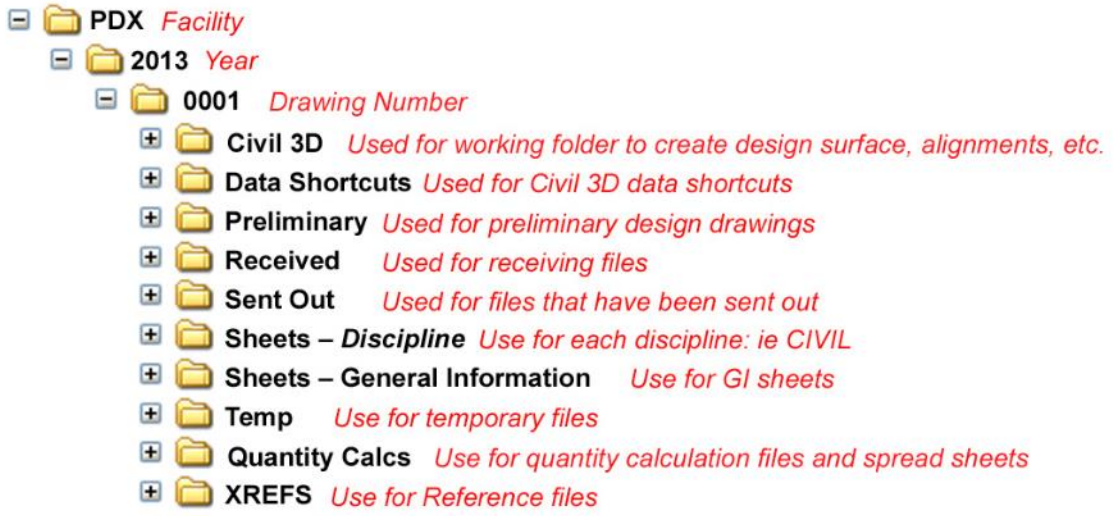
This section describes the Port's standards for civil design projects. All of the standards listed in drawing setup are applicable to civil projects. Below is specific information used to create and submit civil design plans to the Port. Whenever possible, use the Port created Civil 3D styles in all drawings.

Electronic File Submittal

Default Folder Structure

The Port has adopted the following folder structure for all civil projects.

Civil Design Data



AutoCAD drawings which publish design for horizontal alignments, profiles, cross sections, contours, and paving grid points should be submitted in an AutoCAD Civil3D, or LandXML format. Data submitted will be compared with the published drawings issued for construction to check for an exact match. The locations of objects in the AutoCAD drawing should match the values on the published drawing. There should not be any discrepancies between the published data and the electronic data.

Design Contours and Surfaces

All design contours should have corresponding electronically created surface(s). All components which were used to build the surface – break lines, contours, points, boundaries, etc. – should be submitted as well. Submitted surfaces will be used to regenerate contours at the published interval and checked with the published contours for an exact match.

Paving Grid Points

All paving grid points should be generated from the design surface. Points will be compared with the design surface for any discrepancies in elevation.

General Requirements - Civil Projects

Cover Sheet

The Port creates the cover sheet for all projects. A cover sheet is required for all drawing sets with four sheets or more. For drawing sets less than 20 sheets, the index is placed on the cover sheet.

General Information Sheets

General information sheets include the site plan, sheet indexes, survey control plans, legends, phasing drawings, and work area drawings and details.

Index Sheet

An index sheet is required on drawing sets of 20 sheets or more. See Cover Sheet and Drawing Index in the Drawing Setup section.

Site Plan and Vicinity Map

Site plans are used to show the project work area, haul route, staging area, construction access route, survey datum information, monuments, conversions to other references, etc. Because of the dense image on an aerial, the text and line work being added should be bold. All major streets, rivers and pertinent building names should be noted. In addition, a Port-provided vicinity map showing the larger area outside the construction site is inset onto the aerial typically in the upper right corner. For small construction projects with no aerial image, vicinity maps should be placed on Sheet 1. In both cases, place the vicinity map in a 6"x 6.5" box, typically in the upper right corner of the first sheet. For clarity, however, the vicinity map can be placed in the lower right, upper left, or lower left (in order of preference). Circle the project area and label, "PROJECT SITE." Use the Port standard north arrow. The label on the title should be "VICINITY MAP," and the scale should say, "N.T.S."

Work Area Plans and Phasing Plans

Work area plans show the project work areas, staging areas, haul routes, flagging requirements, signage requirements, barricade locations and types, and various other information required to work in the area under construction. Phasing plans show which work area(s) are active during different phases of the same project. Use of the Port's line types and symbology is required.

Survey Control

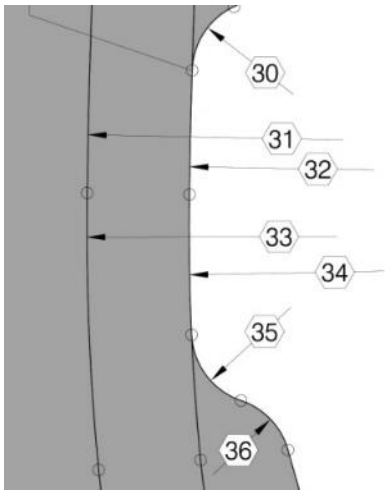
Survey control drawings show the location of the project, and the control points that will be used for the project. See the *Survey* section later in this chapter for more information.

Civil Sheets

The civil sheets will follow the general information sheets. Start the discipline numbering with (C-1). Each civil project may contain unique subsets that are not covered in this manual. Prior to starting a project with the Port, it is recommended that the consultant visits the Port's Technical Reference Center to view sample drawings from previous projects that may be similar to the one the consultant has been hired for to ensure that all standards are being followed and to research existing conditions.

Geometry Plans

Geometry plans show the physical geometry of the project. Use the appropriate Civil 3D style provided by the Port for labeling station and offset. For curve labels, use the hex callout block on a leader line with an extension. See the sample at the right.



Sample curve labels used on geometry plans

Figure 15

Curve Tables

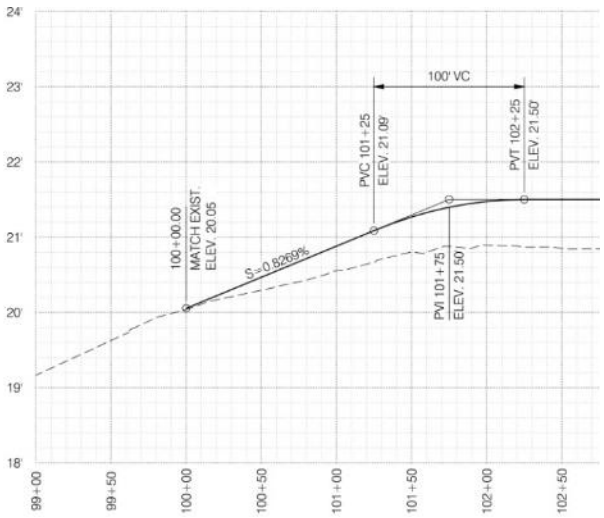
Curve tables will include the curve number, radius, delta, tangent, length and radius points in station and offset to the appropriate alignment.

CURVE TABLE						
CURVE	RADIUS	DELTA	TANGENT	LENGTH	RADIUS POINT STATION	RADIUS POINT OFFSET
⟨1⟩	150.00	90° 00' 00"	150.00	235.62	99+72.25	150.00' LT
⟨2⟩	200.00	6° 26' 04"	11.24	22.46	99+61.10	353.30' LT
⟨3⟩	25.00	90° 00' 00"	25.00	39.27	101+50.75	116.30' LT
⟨4⟩	25.00	90° 00' 00"	25.00	39.27	102+24.75	116.30' LT

Figure 16

Plan and Profile Drawings

Keep plans and profiles on the same sheet, with the plan on the top half and profile on the bottom. Acceptable scales of plan sheets: 1" = 20', 1" = 50' and 1" = 100'. Profiles will always have the same horizontal scale as the plan. Typically, the vertical scale will be exaggerated and will either be 1" = 2' at 1" = 100' horizontal scale or 1" = 1' at 1" = 50' horizontal scale. Use the Port-provided styles for profile views, the grid, and label styles.



Sample of profile grid and label style

Figure 17

Paving and Site Grading Plans

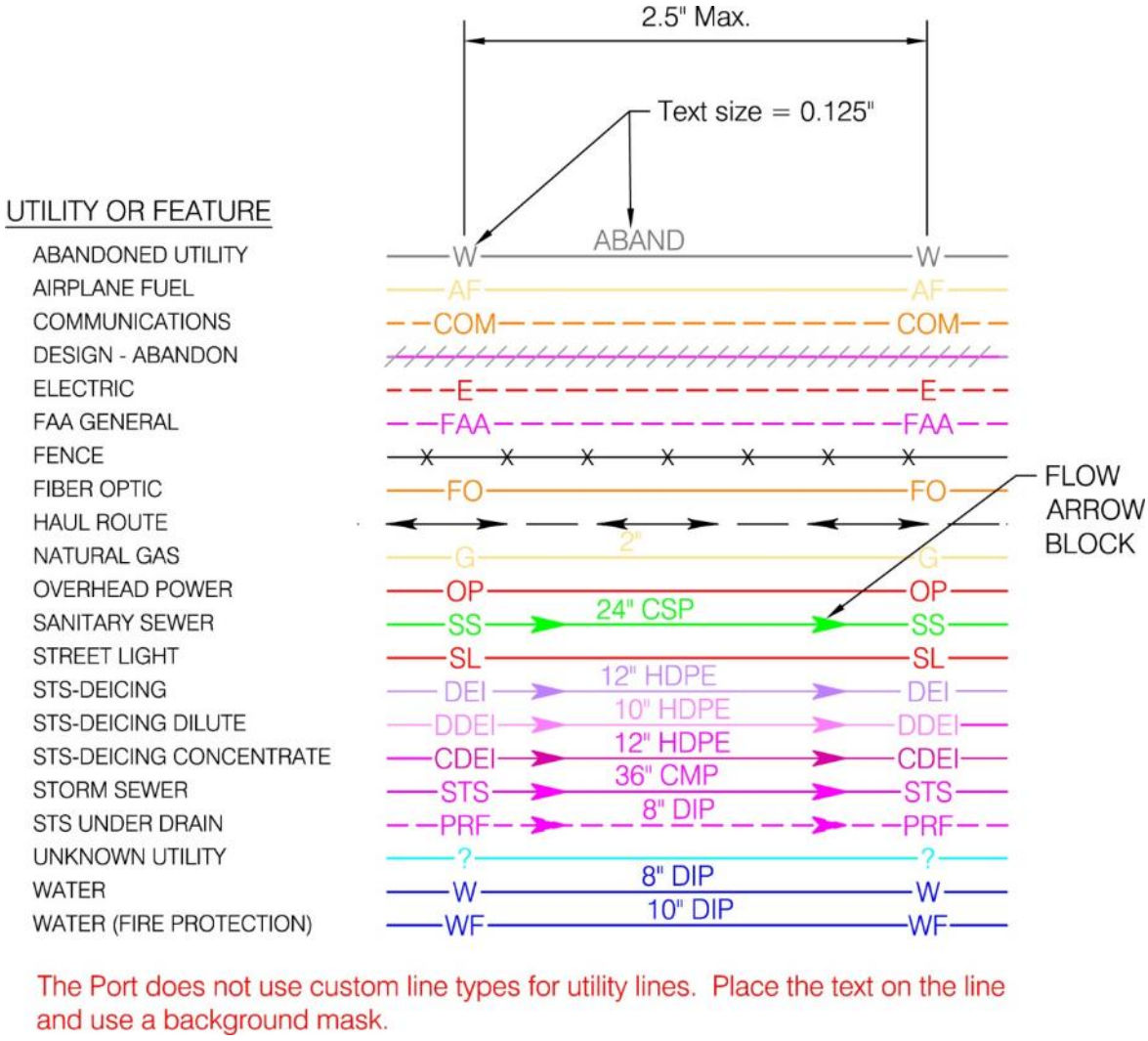
When showing both paving and site grading on a sheet, the Port has adopted the use of two separate styles to depict each. Design site grading should be shown with dashed lines, and design paving should be shown with continuous lines. Existing contour lines shall be shown with a line type of DOT2 and the ltscale set on the line of 0.5 to start. Due to different printer anomalies, prior to submitting final plots to the Port for reproduction, a sample full size plot should be sent in to verify the line work is sufficient for reproduction. For airfield work, a contour interval should be set to 0.2' for minor contours, and 1' for major. Other types of projects may require a different contour interval, check with the Port for more information. Use the Port-provided styles for all contour lines and labels.

Civil Utility Adjustment Plans and Confined Space ID numbers

The Port typically creates a set of plans known as civil utility adjustment plans. These plans show both existing and design utility features that will be adjusted or removed during the project. In a table, document the utility asset ID, existing elevation, design elevation and additional remarks. For design features, the asset ID will be assigned by the Port and will become the *confined space id number*. Please contact the Port to receive asset id numbers prior to creating the bid set documents.

Utility Lines

Port line types depicting utilities are unbroken lines with text utilizing background masks placed on top of the line. If the consultant uses custom line types, he must supply the line type and document what the line should visually look like. See the layer guide earlier in this chapter for layer names and colors. See below for utility line type examples.



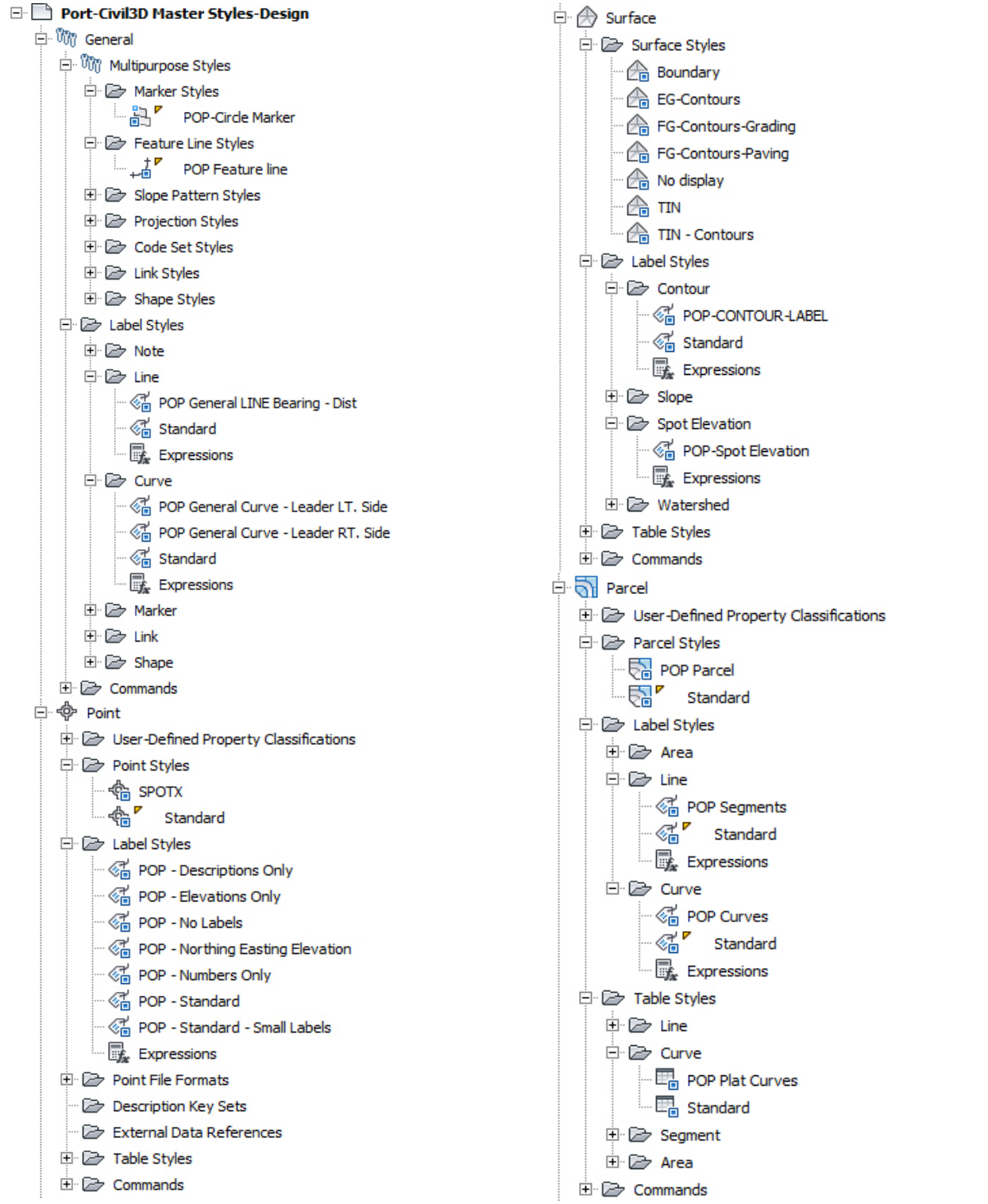
The Port does not use custom line types for utility lines. Place the text on the line and use a background mask.

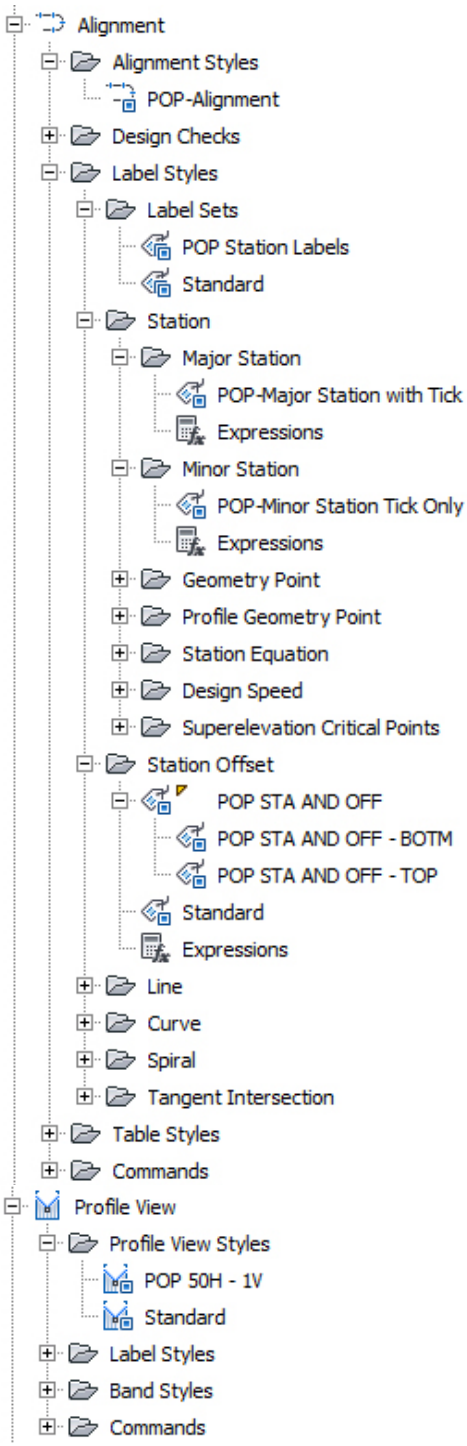
Figure 18

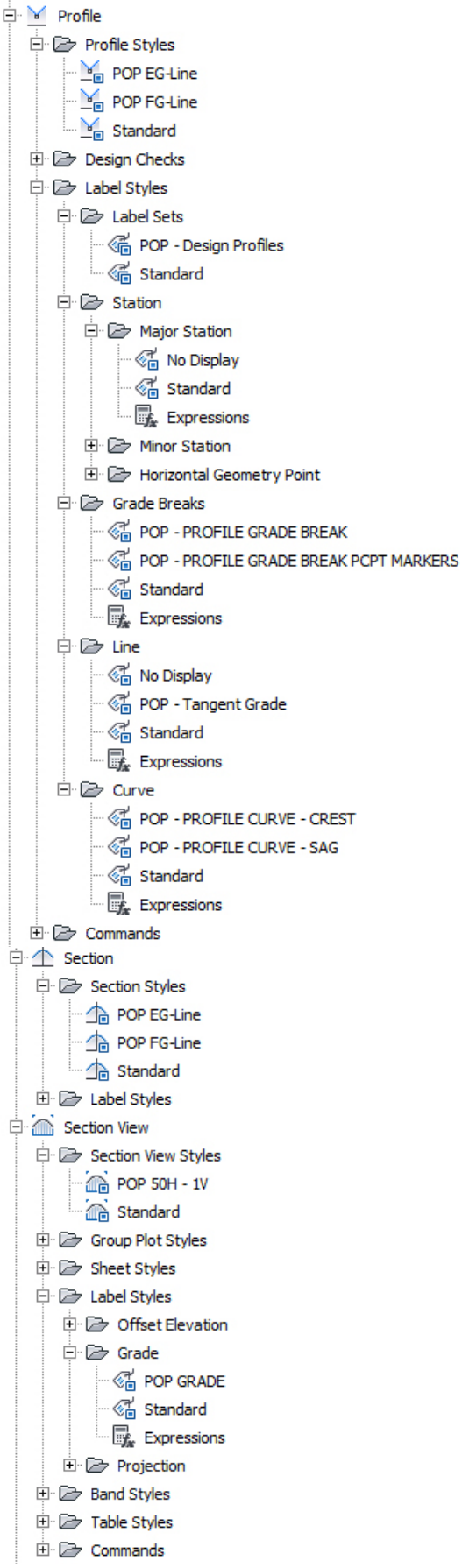
Lines types are shown in color only for clarity. Final plotting will be in black and gray.

Civil 3D Styles

The Port maintains the following Civil 3D styles. Some styles may need to be modified for specific situations by the user. As new styles are created, or updates to existing styles are made, they will be updated on the web site. If a new style needs to be created where none existed before, every effort must be made to maintain the look of Port standards. The following list is the current styles for the Port at the time of this printing.



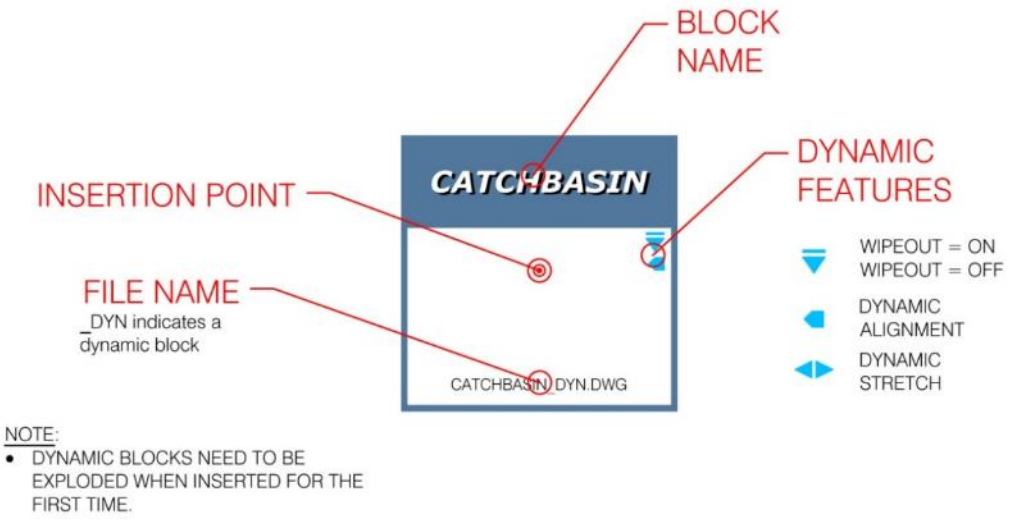

Alignment
Alignment Styles
POP-Alignment
Design Checks
Label Styles
Label Sets
POP Station Labels
Standard
Station
Major Station
POP-Major Station with Tick
Expressions
Minor Station
POP-Minor Station Tick Only
Expressions
Geometry Point
Profile Geometry Point
Station Equation
Design Speed
Superelevation Critical Points
Station Offset
POP STA AND OFF
POP STA AND OFF - BOTM
POP STA AND OFF - TOP
Standard
Expressions
Line
Curve
Spiral
Tangent Intersection
Table Styles
Commands
Profile View
Profile View Styles
POP 50H - 1V
Standard
Label Styles
Band Styles
Commands

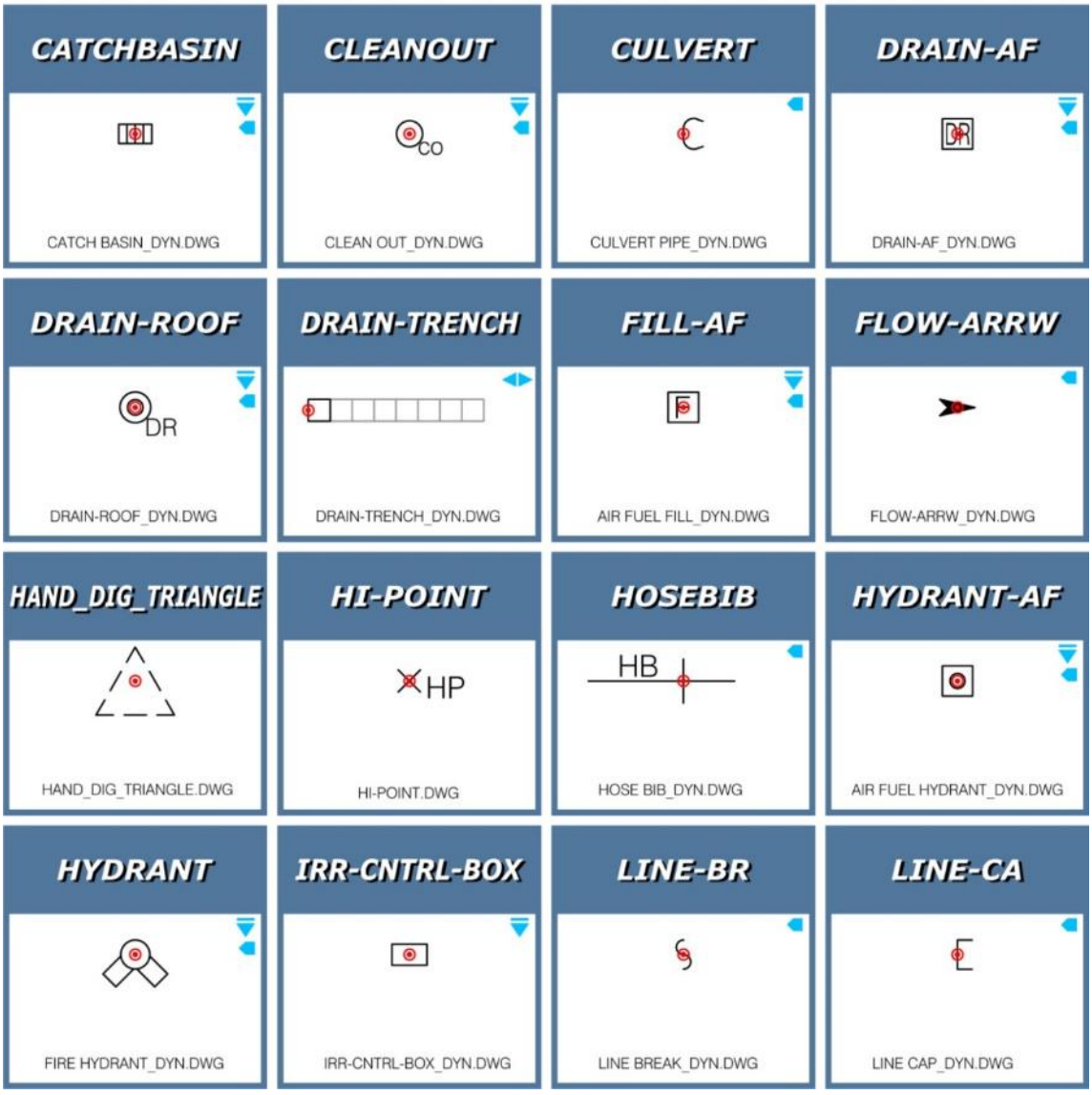

Profile
Profile Styles
POP EG-Line
POP FG-Line
Standard
Design Checks
Label Styles
Label Sets
POP - Design Profiles
Standard
Station
Major Station
No Display
Standard
Expressions
Minor Station
Horizontal Geometry Point
Grade Breaks
POP - PROFILE GRADE BREAK
POP - PROFILE GRADE BREAK PCPT MARKERS
Standard
Expressions
Line
No Display
POP - Tangent Grade
Standard
Expressions
Curve
POP - PROFILE CURVE - CREST
POP - PROFILE CURVE - SAG
Standard
Expressions
Commands
Section
Section Styles
POP EG-Line
POP FG-Line
Standard
Label Styles
Section View
Section View Styles
POP 50H - 1V
Standard
Group Plot Styles
Sheet Styles
Label Styles
Offset Elevation
Grade
POP GRADE
Standard
Expressions
Projection
Band Styles
Table Styles
Commands

Civil & Railway Symbology

The Port's symbols (blocks in AutoCAD) for civil design, electrical and communication utilities, airfield lighting, civil features, railroad, and vicinity maps shall be used on all projects as required. If a block is not supplied by the Port, obtain approval from the Port's Project Engineer and CAD manager prior to creating a new block.

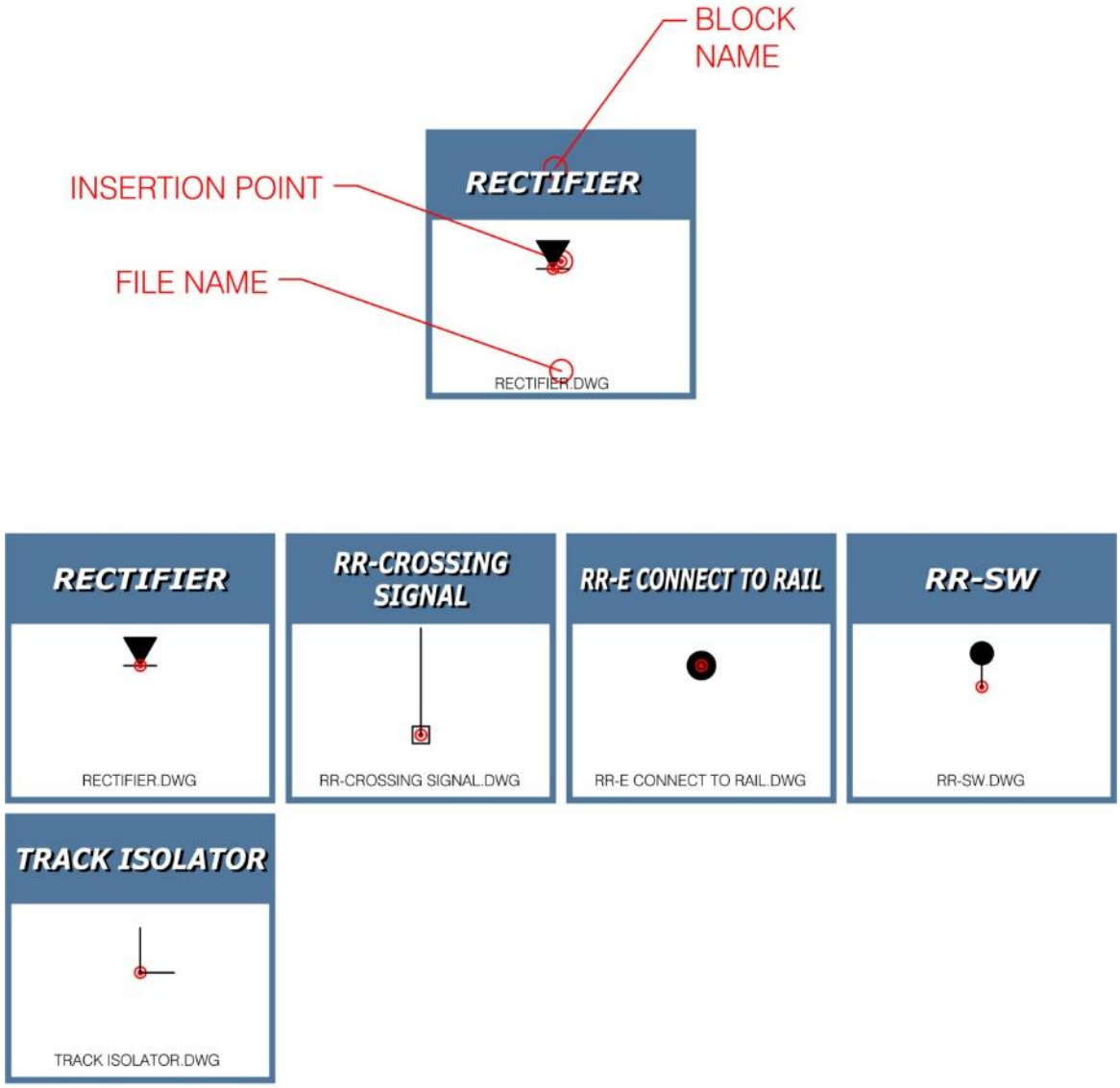
For sheet information blocks, see the section earlier in this book.


BLOCK NAME
CATCHBASIN
INSERTION POINT
DYNAMIC FEATURES
WIPEOUT = ON
WIPEOUT = OFF
DYNAMIC ALIGNMENT
DYNAMIC STRETCH
FILE NAME
_DYN indicates a dynamic block
CATCHBASIN_DYN.DWG
NOTE:
• DYNAMIC BLOCKS NEED TO BE EXPLODED WHEN INSERTED FOR THE FIRST TIME.


CATCHBASIN
CATCH BASIN_DYN.DWG
CLEANOUT
CO
CLEAN OUT_DYN.DWG
CULVERT
CULVERT PIPE_DYN.DWG
DRAIN-AF
DRAIN-AF_DYN.DWG
DRAIN-ROOF
DR
DRAIN-ROOF_DYN.DWG
DRAIN-TRENCH
DRAIN-TRENCH_DYN.DWG
FILL-AF
AIR FUEL FILL_DYN.DWG
FLOW-ARRW
FLOW-ARRW_DYN.DWG
HAND_DIG_TRIANGLE
HAND_DIG_TRIANGLE.DWG
HI-POINT
HP
HI-POINT.DWG
HOSEBIB
HB
HOSE BIB_DYN.DWG
HYDRANT-AF
AIR FUEL HYDRANT_DYN.DWG
HYDRANT
FIRE HYDRANT_DYN.DWG
IRR-CNTRL-BOX
IRR-CNTRL-BOX_DYN.DWG
LINE-BR
LINE BREAK_DYN.DWG
LINE-CA
LINE CAP_DYN.DWG

LIFTSTA
LIFTSTA_DYN.DWG
LO-POINT
LP
LO-POINT.DWG
MANHOLE
MANHOLE_DYN.DWG
MANHOLE-CB
MANHOLE-CB_DYN.DWG
MANHOLE-WQ
WQ
MANHOLE-WQ_DYN.DWG
METER
M
METER_DYN.DWG
OUTFALL
OUTFALL_DYN.DWG
OW-SEP
OW
OW-SEP_DYN.DWG
PUMPSTA
PUMPSTA_DYN.DWG
SHP-CON
SHIP CONNECTION_DYN.DWG
VALVE
VALVE_DYN.DWG
VALVE-AIR
AV
AIR VALVE_DYN.DWG
VALVE-BACK FLOW
BF
BACK FLOW PREVENTION VALVE_DYN.DWG
VALVE-BLOWOFF
BLOW OFF VALVE_DYN.DWG
VALVE-PIV
PIV
PIV VALVE_DYN.DWG
VALVE-PRV
PRV
PRV VALVE_DYN.DWG
VAULT-LID
VAULT-LID_DYN.DWG
WELL-MON
MW
WELL-MON_DYN.DWG
WELL-UIC
UIC
WELL-UIC_DYN.DWG
WELL-WTR
WELL-WTR_DYN.DWG
WF-FDC
FIRE DEPT CONN_DYN.DWG

Symbology - Railroad



Airfield Electrical Design CAD Standards

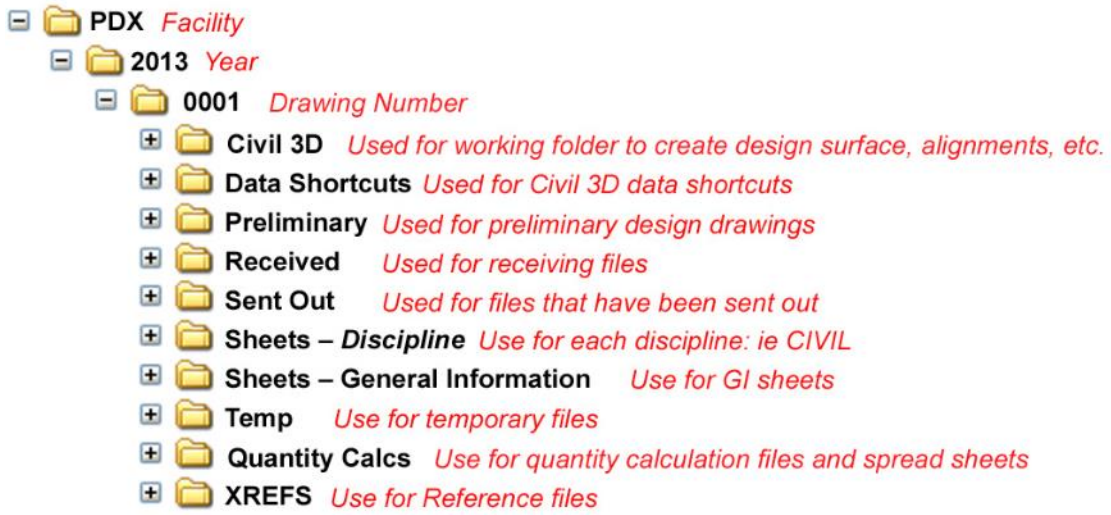
Airfield Electrical Design Graphical Standards

This section describes the Port's standards for electrical design projects. All of the standards listed in drawing setup are applicable to electrical projects. Prior to starting a project with the Port, it is recommended that the consultant visits the Port's Technical Reference Center to view sample drawings from previous projects that may be similar to the one the consultant has been hired for to ensure that all standards are being followed. Below is specific information used to create and submit electrical design plans to the Port.

Electronic File Submittal

Default Folder Structure

The Port has adopted the following folder structure for all electrical projects that are part of a civil design project. For projects that are not part of a civil design project, see the folder structure described under the drawing setup section.



General Requirements – Electrical Projects

This section describes the Port's standards for electrical projects. All of the standards listed in drawing setup are applicable to electrical projects. Below is specific information used to create and submit electrical design plans to the Port.

Cover Sheet

The Port creates the cover sheet for all projects. A cover sheet is required for all drawing sets with four sheets or more. For drawing sets less than 20 sheets, the index is placed on the cover sheet.

General Information Sheets

General information sheets include the site plan, sheet indexes, survey control plans, phasing drawings, and work area drawings and details.

Index Sheet

An index sheet is required on drawing sets of 20 sheets or more. See Cover Sheet and Drawing Index in the Drawing Setup section

Project Site Plan and Vicinity Map

Site plans are used to show the contract work area, haul route, staging area, construction access route, survey datum information, monuments, conversions to other references, etc. Because of the dense image on an aerial, the text and line work being added should be bold. All major streets, rivers and pertinent building names should be noted. In addition, a Port-provided vicinity map showing the larger area outside the construction site is inset onto the aerial typically in the upper right corner. For small construction projects with no aerial image, vicinity maps should be placed on Sheet 1. In both cases, place the vicinity map in a 6"x 6.5" box, typically in the upper right corner of the first sheet. For clarity, however, the vicinity map can be placed in the lower right, upper left, or lower left (in order of preference). Circle the project area and label, "PROJECT SITE." Use the Port standard north arrow. The label on the title should be "VICINITY MAP," and the scale should say, "N.T.S."

Work Area Plans and Phasing Plans

Work area plans show the project work areas, staging areas, haul routes, flagging requirements, signage requirements, barricade locations and types, and various other information required to work in the area under construction. Use of the Port's line types and symbology is required.

Survey Control

The survey control drawings show the location of the project, and the control points that will be used for the project. See the Survey section later in this chapter for more information.

Conductor Designators for Airfield Lighting Circuits

The Port has adopted the following format for conductor labeling for airfield lighting circuits in design files:

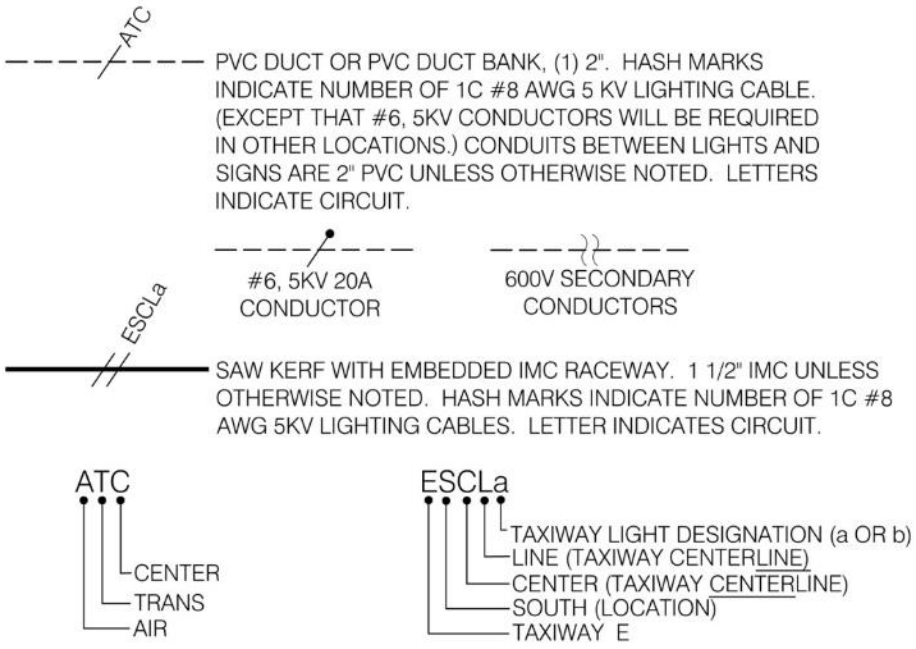


Figure 19

Circuit Designation

The Port has adopted the following format for designating circuits in design files:

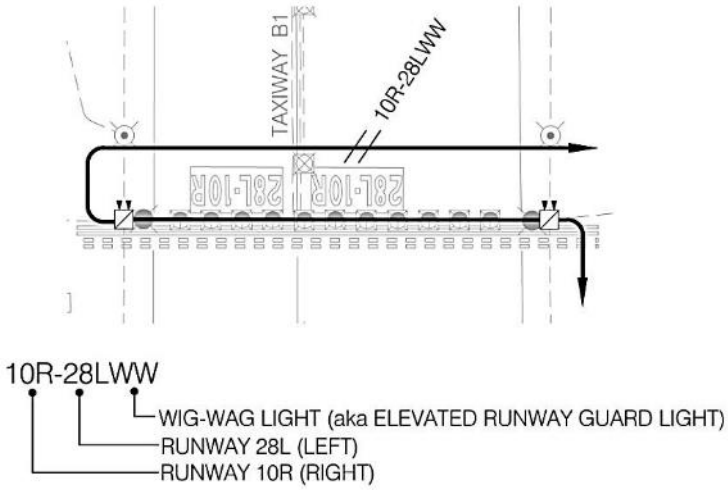
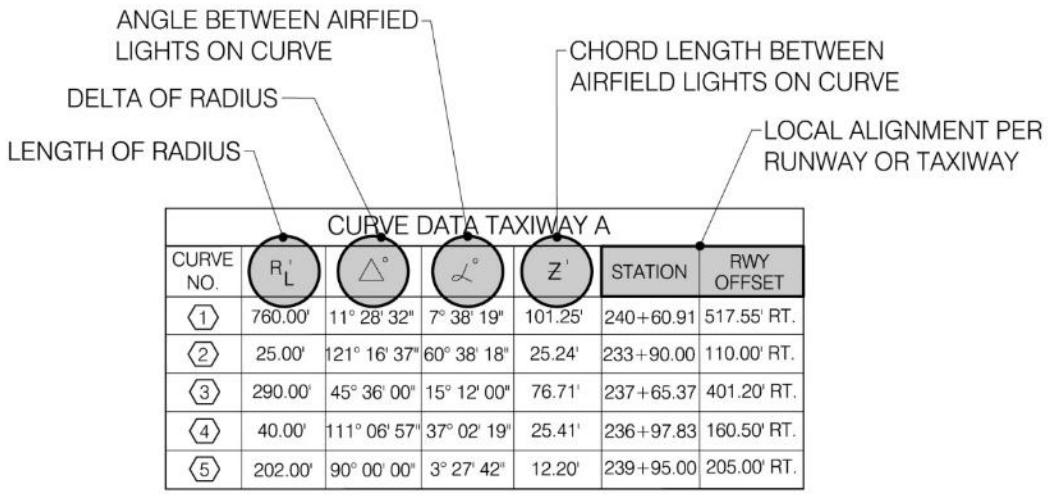


Figure 20

Airfield Lighting Geometry Data

The Port has adopted the following format for curve data tables defining curves on taxiway lighting layout:



CURVE NO.	R_L'	$\Delta°$	$\measuredangle°$	Z'	STATION	RWY OFFSET
1	760.00'	11° 28' 32"	7° 38' 19"	101.25'	240+60.91	517.55' RT.
2	25.00'	121° 16' 37"	60° 38' 18"	25.24'	233+90.00	110.00' RT.
3	290.00'	45° 36' 00"	15° 12' 00"	76.71'	237+65.37	401.20' RT.
4	40.00'	111° 06' 57"	37° 02' 19"	25.41'	236+97.83	160.50' RT.
5	202.00'	90° 00' 00"	3° 27' 42"	12.20'	239+95.00	205.00' RT.

Figure 21

Airfield Lighting Data and Installation Chart

The Port has adopted the following format for airfield lighting data tables:

RUNWAY 10L-28R EDGE LIGHTS

NEW, RELOCATED OR EXTENDED AS SHOWN ON PLAN SHEETS

DESIGNATION	APPROX. OVERLAY THICKNESS FT. SEE NOTE②	EXISTING SEE NOTE ③				PORT FURNISHED EXT.	LENS COLOR ④	ACTUAL OVERLAY THICKNESS FT. SEE NOTE ①	INSTALLED SEE NOTE ①		
		1ST EXT.	2ND EXT.	FLANGE RING	SHIM				EXT.	FLANGE RING	SHIM
RE10L-80	0.134						Y-C		3"	3/4"	7/8"
RE10L-81	0.107						Y-C		2 3/4"	3/4"	1"
RE10L-82	0.232						Y-C		3"	3/4"	5/8"
RE10L-83	0.472						Y-C		3"	3/4"	-
RE10L-84	-0.58						Y-C		3"	3/4"	-
RE10L-85							Y-C		3"	3/4"	-
RE10L-86							Y-C		3"	3/4"	-
RE10L-87							Y-C		3"	3/4"	-
RE10L-88							Y-C		3"	3/4"	-
RE10L-89											
RE10L-90											
RE10L-91											
RE10L-92											

NOTE:

1. SCREENED TEXT INDICATES LIGHTS TO BE PLACED IN THE FUTURE.

RE10L-80

- RUNWAY EDGE LIGHT NUMBER
- RUNWAY DESIGNATION (10 LEFT)
- EDGE
- RUNWAY

LEGEND:

RD,R = RED
G = GREEN
Y = YELLOW LENS
Y-C = YELLOW, CLEAR
W,C = CLEAR LENS
* = NEW OR RELOCATED LIGHTS
B = BLUE
BK = BLANK
NAR = NO ADJUSTMENT REQUIRED

KEY NOTES:

① AS CONSTRUCTED INFORMATION TO BE RECORDED BY CONTRACTOR.

② THE 'APPROXIMATE OVERLAY THICKNESS' REPRESENTS THE ESTIMATED DIFFERENCE IN ELEVATION BETWEEN THE EXISTING PAVEMENT FINISH GRADE AND THE SPECIFIED NEW GRADE FOLLOWING OVERLAY. VARIANCES IN THE BASE CAN INSTALLATION ELEVATION AND THE AMOUNT OF SURFACE PLANING (GRINDING) PRIOR TO OVERLAY WILL REQUIRE CONTRACTOR TO ADJUST THIS FIGURE UPWARD TO COMPENSATE FOR THOSE VARIABLES. NORMALLY THAT INCREASE CAN BE EXPECTED TO BE 0.050'+.

③ SURVEY AND RECORD EXISTING EXTENSIONS AND SHIMS IF APPLICABLE.

④ THIS NOTES DETERMINES WHICH DIRECTION A PARTICULAR LENS COLOR SHALL BE VIEWED FROM.

Figure 224

Guidance Sign Schedule

The Port has adopted the following format for airfield guidance sign schedules:

AIRCRAFT GUIDANCE SIGN SCHEDULE (STATIONING AND OFFSET IS RUNWAY 10L - 28R)

SIGN NUMBER	SIDE	EXISTING SIGN MESSAGE	REPLACE EXISTING SIGN PANEL WITH PF PANEL TO REVISE MESSAGE TO READ:	APPROXIMATE SIGN LENGTH (INCHES)	PROVIDE AND INSTALL NEW FOUNDATION	DEMOLISH EXISTING FOUNDATION	PROVIDE NEW EROSION PAD	CIRCUIT FROM	INSTALL PF SIGN, BASE CAN, AND PF XFMR	RELOCATE SIGN, BASE CAN AND ISOLATION XMFR	RELOCATE EXISTING FOUNDATION	DEMOLISH EXISTING EROSION PAD	SIDE	SIGN COLOR	NOTE	STATION	OFFSET	SIGN FOUNDATION ELEVATION
A1-1	A	A1 A →		84"	X	X		GSA		X		X	A	YEL ON BLK BLK ON YEL		318+10.00	280' RT	
A1-2	A	A1 28R		97"	X	X		GS10L		X		X	A	YEL ON BLK WHT ON RED		315+58.69	280' RT	
A1-3	A	A1 →		85.5"	X	X	X	GSA		X		X	A	BLK ON YEL				
A2-1	A	← A2		85"	X	X	X	GSA		X		X	A	BLK ON YEL		297+65.00	130' RT	
A2-10	A	A A2 →		127.5"			X	GSA		X	X		A	YEL ON BLK BLK ON YEL		249+10.59	305' RT	
A3-10	A	A2 →		85"	X	X	X	GSA		X		X	A	BLK ON YEL		292+53.5	130' RT	
A4-1	A	← A4		85"	X	X	X	GSA		X		X	A	BLK ON YEL		280+41.50	130' RT	
A4-11	A	A4 10L-28R		170"	X	X	X	GS10L		X		X	A	YEL ON BLK WHT ON RED				
A4-12	A	A4 →		85"	X	X	X	GSA		X		X	A	BLK ON YEL		276+47.28	130.59' RT	
	B	↘ A5											B	BLK ON YEL				
A5-2	A	↙ A A5 A ↗		125"	X	X	X	GSA		X		X	A	BLK ON YEL YEL ON BLK BLK ON YEL		268+44.90	288.00' RT	
A7-2	A	← A7		85"	X	X	X	GSA		X		X	A	BLK ON YEL				
A7-5	A	A E ↙ A7 →	A A7 →	167.5"										YEL ON BLK BLK ON YEL	①			

KEY NOTE:

① COORDINATE WITH PORT MAINTENANCE THROUGH PORT INSPECTOR FOR REPLACEMENT SIGN PANELS. VERIFY SIGN DIMENSIONS AND PROVIDE DIMENSIONS TO PORT MAINTENANCE FOR PANEL FABRICATION.

Figure 23

Electrical Utility Adjustment Schedule

The Port has adopted the following format for electrical utility adjustment tables:

ADJUSTMENT SCHEDULE

NO.	STRUCT ID #	DESCRIPTION	EXISTING ELEV.	FINISH ELEV.	REMARKS
1		H-20 PULL BOX	22.590	20.110	-2.48
2		H-20 PULL BOX	22.305	21.089	-1.22
3		H-20 PULL BOX	22.146	21.520	
4		H-20 PULL BOX	22.290	20.718	
5		H-20 PULL BOX	21.985	20.905	
6		H-20 PULL BOX	22.164	20.948	
7		H-20 PULL BOX	21.839	23.620	1.78
8		H-20 PULL BOX	22.617	21.686	-0.93
9		H-20 PULL BOX	22.437	22.222	-0.22
10		183-KIP PULL BOX	22.249	23.792	1.54
11		CONCRETE DUCT MARKER #CM-1	21.776	21.809	0.03

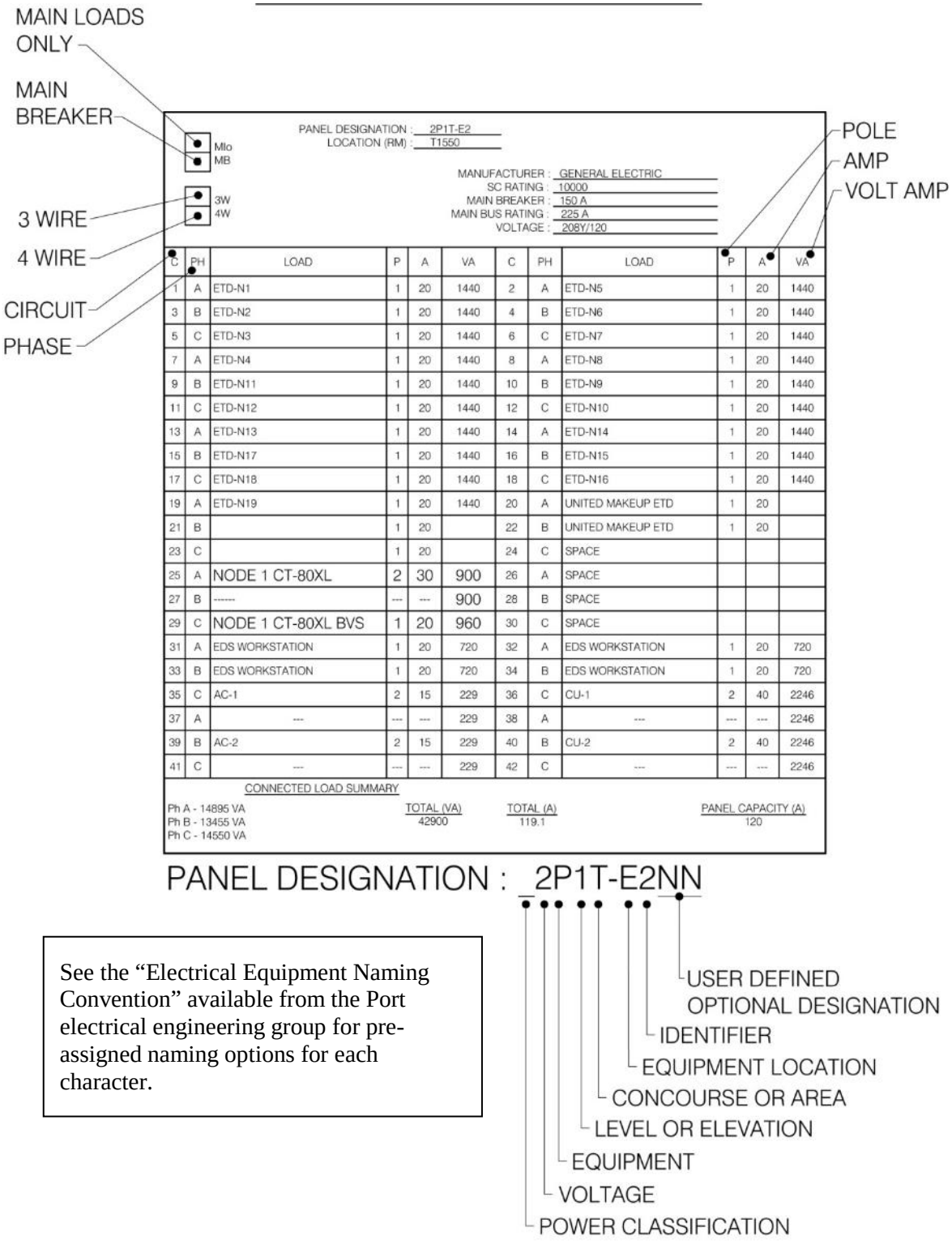
NOTE:

1. NAR =NO ADJUSTMENT REQUIRED

Figure 24

Panel Schedule Format

The Port has adopted the following format for panel schedule tables:

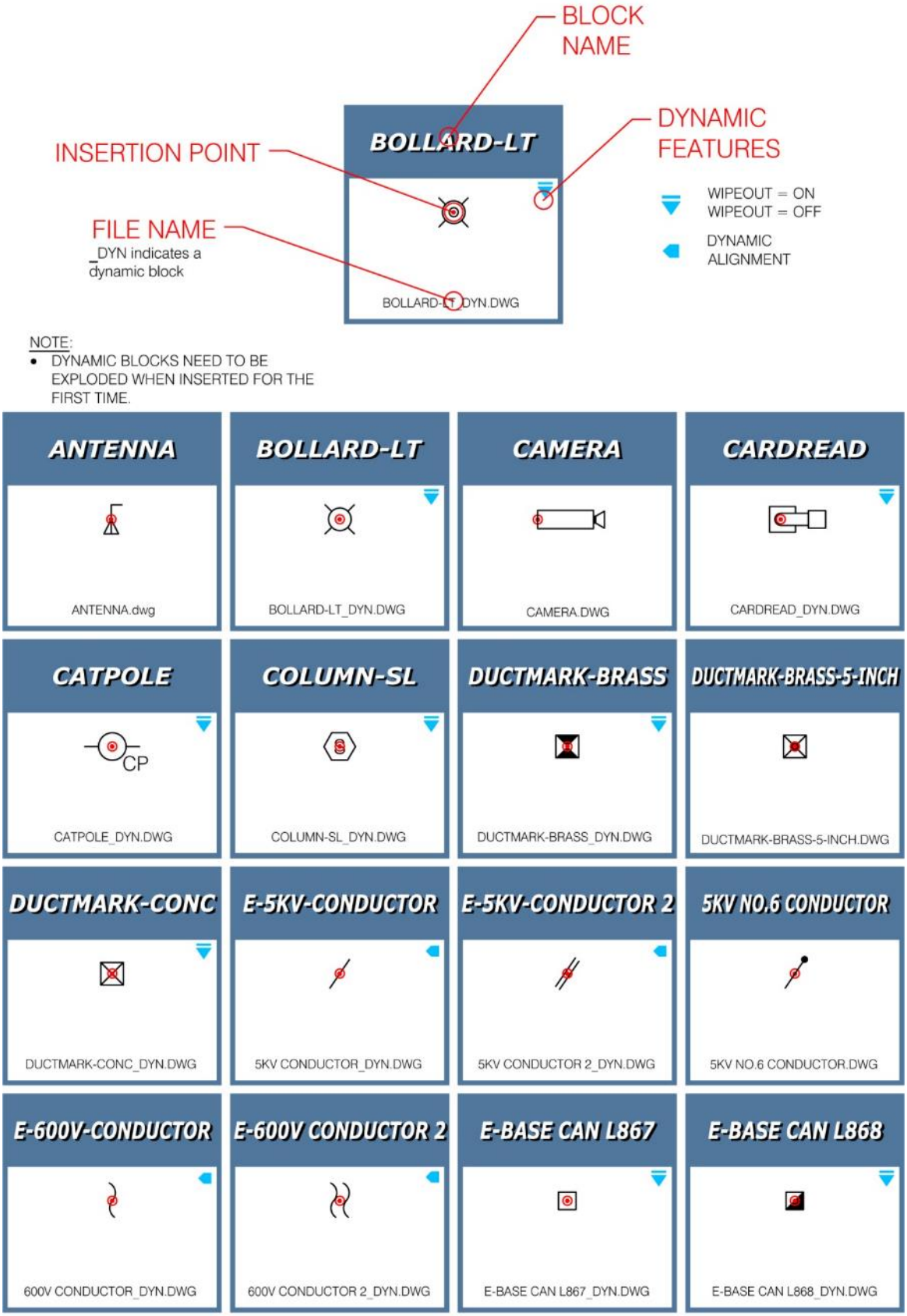


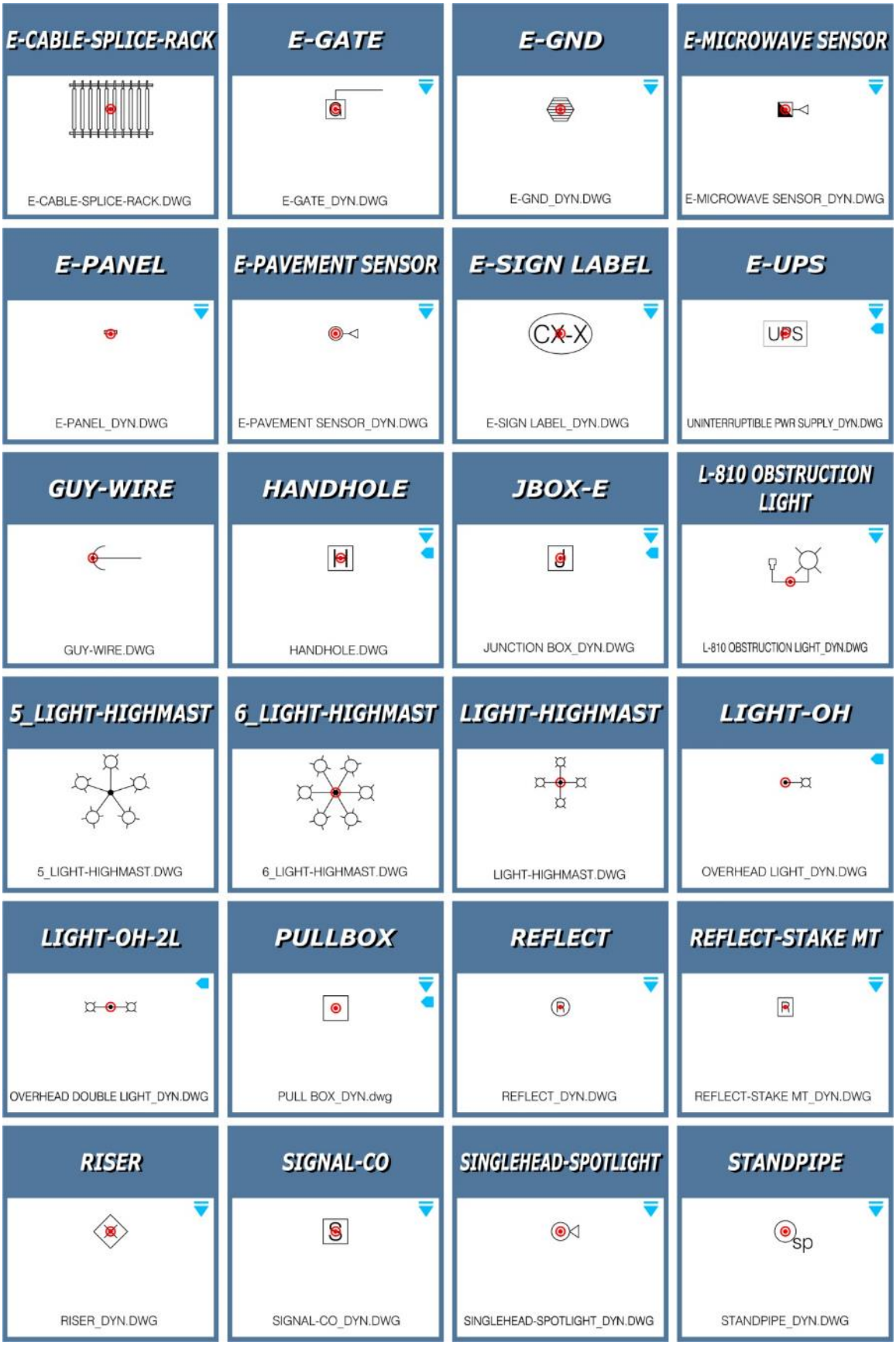
C	PH	LOAD	P	A	VA	C	PH	LOAD	P	A	VA
1	A	ETD-N1	1	20	1440	2	A	ETD-N5	1	20	1440
3	B	ETD-N2	1	20	1440	4	B	ETD-N6	1	20	1440
5	C	ETD-N3	1	20	1440	6	C	ETD-N7	1	20	1440
7	A	ETD-N4	1	20	1440	8	A	ETD-N8	1	20	1440
9	B	ETD-N11	1	20	1440	10	B	ETD-N9	1	20	1440
11	C	ETD-N12	1	20	1440	12	C	ETD-N10	1	20	1440
13	A	ETD-N13	1	20	1440	14	A	ETD-N14	1	20	1440
15	B	ETD-N17	1	20	1440	16	B	ETD-N15	1	20	1440
17	C	ETD-N18	1	20	1440	18	C	ETD-N16	1	20	1440
19	A	ETD-N19	1	20	1440	20	A	UNITED MAKEUP ETD	1	20	
21	B		1	20		22	B	UNITED MAKEUP ETD	1	20	
23	C		1	20		24	C	SPACE			
25	A	NODE 1 CT-80XL	2	30	900	26	A	SPACE			
27	B	------	---	---	900	28	B	SPACE			
29	C	NODE 1 CT-80XL BVS	1	20	960	30	C	SPACE			
31	A	EDS WORKSTATION	1	20	720	32	A	EDS WORKSTATION	1	20	720
33	B	EDS WORKSTATION	1	20	720	34	B	EDS WORKSTATION	1	20	720
35	C	AC-1	2	15	229	36	C	CU-1	2	40	2246
37	A	---	---	---	229	38	A	---	---	---	2246
39	B	AC-2	2	15	229	40	B	CU-2	2	40	2246
41	C	---	---	---	229	42	C	---	---	---	2246

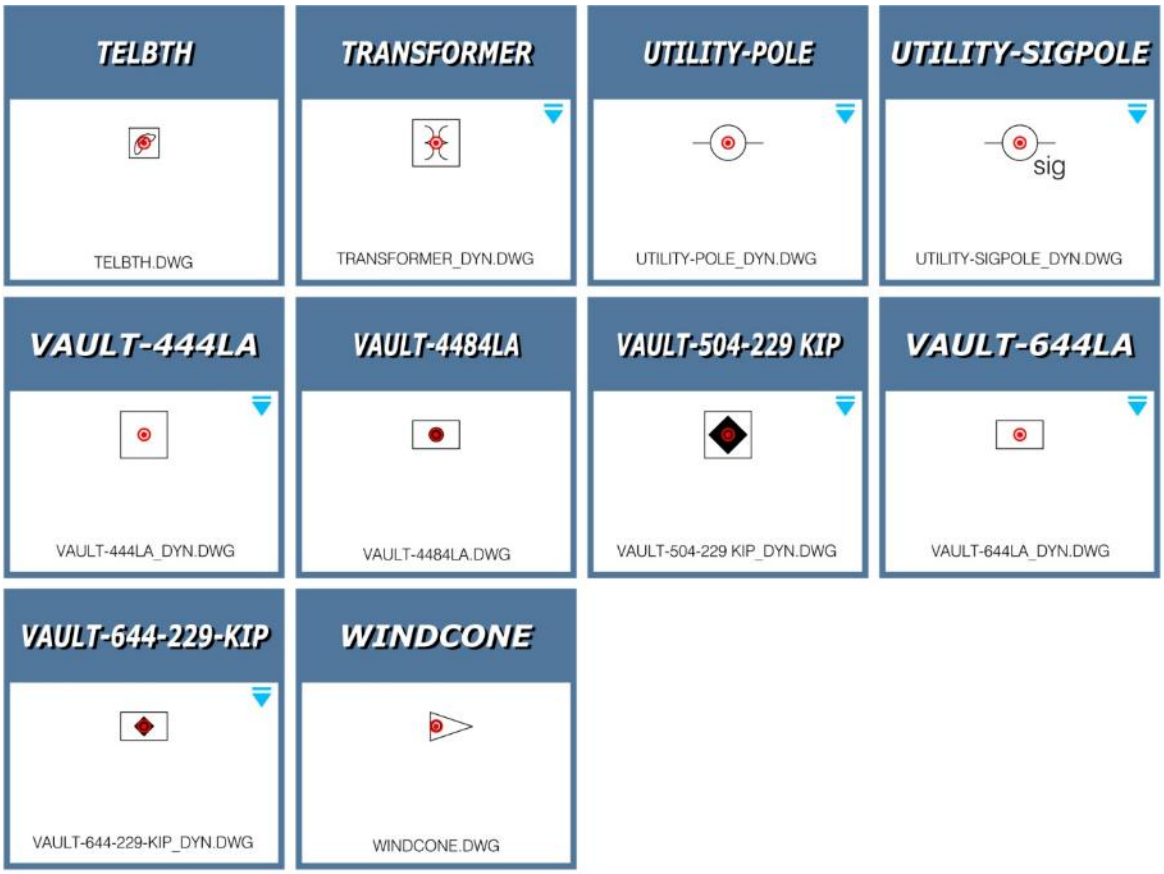
> See the "Electrical Equipment Naming Convention" available from the Port electrical engineering group for pre-assigned naming options for each character.

Figure 25

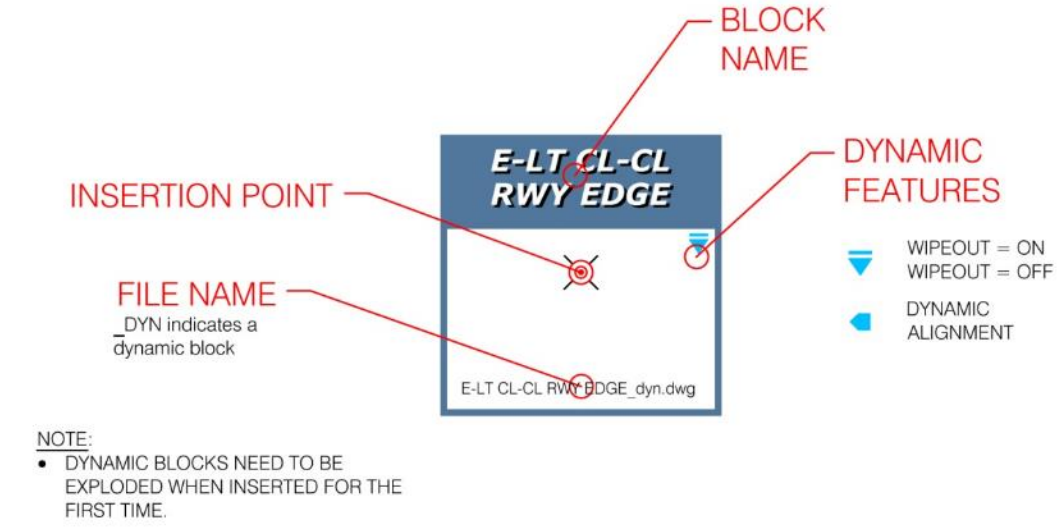
Symbology – Electrical and Communication Utilities



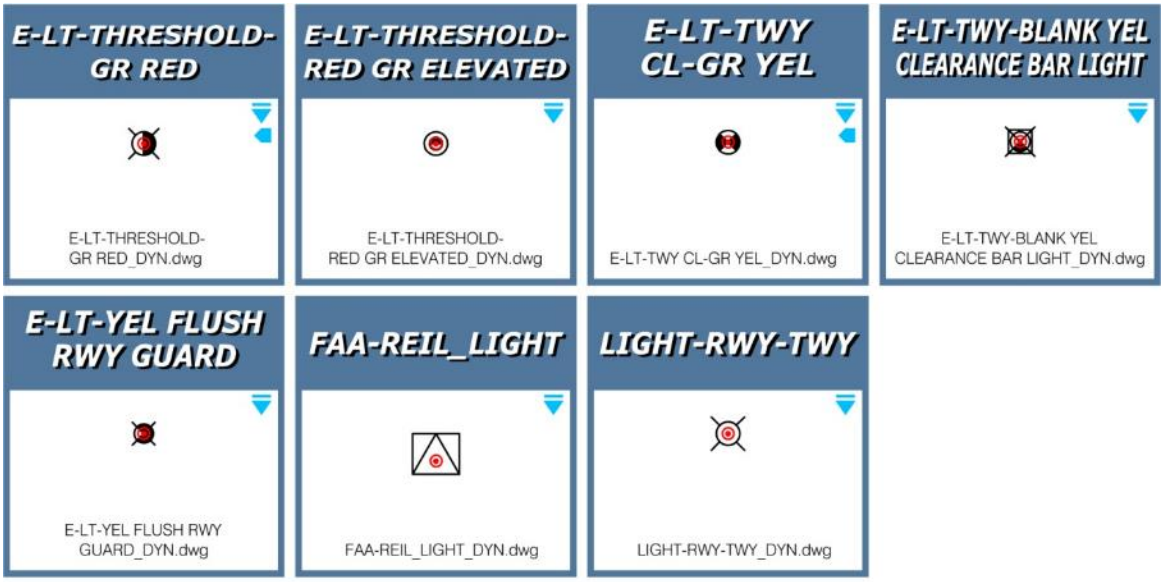

E-CABLE-SPLICE-RACK
E-CABLE-SPLICE-RACK.DWG
E-GATE
E-GATE_DYN.DWG
E-GND
E-GND_DYN.DWG
E-MICROWAVE SENSOR
E-MICROWAVE SENSOR_DYN.DWG
E-PANEL
E-PANEL_DYN.DWG
E-PAVEMENT SENSOR
E-PAVEMENT SENSOR_DYN.DWG
E-SIGN LABEL
E-SIGN LABEL_DYN.DWG
E-UPS
UPS
UNINTERRUPTIBLE PWR SUPPLY_DYN.DWG
GUY-WIRE
GUY-WIRE.DWG
HANDHOLE
HANDHOLE.DWG
JBOX-E
JUNCTION BOX_DYN.DWG
L-810 OBSTRUCTION LIGHT
L-810 OBSTRUCTION LIGHT_DYN.DWG
5_LIGHT-HIGHMAST
5_LIGHT-HIGHMAST.DWG
6_LIGHT-HIGHMAST
6_LIGHT-HIGHMAST.DWG
LIGHT-HIGHMAST
LIGHT-HIGHMAST.DWG
LIGHT-OH
OVERHEAD LIGHT_DYN.DWG
LIGHT-OH-2L
OVERHEAD DOUBLE LIGHT_DYN.DWG
PULLBOX
PULL BOX_DYN.dwg
REFLECT
REFLECT_DYN.DWG
REFLECT-STAKE MT
REFLECT-STAKE MT_DYN.DWG
RISER
RISER_DYN.DWG
SIGNAL-CO
SIGNAL-CO_DYN.DWG
SINGLEHEAD-SPOTLIGHT
SINGLEHEAD-SPOTLIGHT_DYN.DWG
STANDPIPE
SP
STANDPIPE_DYN.DWG


TELBTH
TELBTH.DWG
TRANSFORMER
TRANSFORMER_DYN.DWG
UTILITY-POLE
UTILITY-POLE_DYN.DWG
UTILITY-SIGPOLE
sig
UTILITY-SIGPOLE_DYN.DWG
VAULT-444LA
VAULT-444LA_DYN.DWG
VAULT-4484LA
VAULT-4484LA.DWG
VAULT-504-229 KIP
VAULT-504-229 KIP_DYN.DWG
VAULT-644LA
VAULT-644LA_DYN.DWG
VAULT-644-229-KIP
VAULT-644-229-KIP_DYN.DWG
WINDCONE
WINDCONE.DWG

Symbology - Airfield Lighting



NOTE:
- DYNAMIC BLOCKS NEED TO BE EXPLODED WHEN INSERTED FOR THE FIRST TIME.


E-LT-THRESHOLD-GR RED
E-LT-THRESHOLD-GR RED_DYN.dwg
E-LT-THRESHOLD-RED GR ELEVATED
E-LT-THRESHOLD-RED GR ELEVATED_DYN.dwg
E-LT-TWY CL-GR YEL
E-LT-TWY CL-GR YEL_DYN.dwg
E-LT-TWY-BLANK YEL CLEARANCE BAR LIGHT
E-LT-TWY-BLANK YEL CLEARANCE BAR LIGHT_DYN.dwg
E-LT-YEL FLUSH RWY GUARD
E-LT-YEL FLUSH RWY GUARD_DYN.dwg
FAA-REIL_LIGHT
FAA-REIL_LIGHT_DYN.dwg
LIGHT-RWY-TWY
LIGHT-RWY-TWY_DYN.dwg

Survey CAD Standards

Survey Graphical Standards

This section describes the Port's standards for survey projects. All of the standards listed in drawing setup are applicable to survey projects. Below is specific information used to create and submit survey plans to the Port. Whenever possible, use the Port created Civil 3D styles in all drawings. Prior to starting a project with the Port, it is recommended that the consultant visits the Port's Technical Reference Center to view sample drawings from previous projects that may be similar to the one the consultant has been hired for to ensure that all standards are being followed.

Survey File Transfers to the Port

File transfer requirements are described earlier in this manual.

Survey File Naming Structure

The Port has adopted the following file naming convention for all survey projects.

[TT FFF YYYY NNNN XXX.dwg]

TT is the drawing type

FFF is the Port's Facility Code

YYYY is the year

NNNN is a general description of the drawing

XXX is the file number (if multiple CAD files) example: 1OF2

DWG is the ACAD file type.

Drawing Types:

- BS Boundary Survey
- CD AS Contract Drawing As-Constructed Survey
- EP Exhibit Plat
- GS General Survey
- HS Hydrographic Survey
- MD Maintainable Drawing
- PD Proposal Drawing
- TS Topographic Survey

Example file names:

EP RG 40-MILE TRAIL.DWG.....Exhibit plan file copy drawing

TS PDX 2009 SOUTH RUNWAY REHAB.DWG.....A topographic survey file copy drawing.

CD AS HIO AIRFIELD IMPROV.DWG.....An as-constructed survey file copy drawing

Background files are named as *FFF*-BACKGROUND.DWG where *FFF* is the Port's facility code.

Example files names:

RG-Background.dwg

PDX-Background.dwg

HIO-Background.dwg

Merging Surfaces from multiple projects: The file to merge the project's Topographic Survey (TS***.dwg) surface with files from other projects' surfaces should be named MergedSurfaces-ProjectDescription.dwg

General Requirements

At a minimum, survey drawings shall include a Port title block, vicinity map, north arrow, and scale bar. The Port surveyor will provide the information required to complete the title block. Do not modify the title block or its attributes without permission from the Port surveyor. Also provide a narrative or notes explaining the purpose of the survey, basis of bearings, and equipment used. For congested areas, provide details. An Oregon Registered Professional Land Surveyor stamp (or a Washington Registered Land Surveyor stamp if property is in Washington) and signature is required on all survey drawings. Preferred Port drawing scales for topographic and as-built surveys are 1" = 50' and 1" = 20'. Use the appropriate scale to achieve the most clarity on the drawing; contact the Port surveyor if a different scale size is necessary. Submit electronic AutoCAD files of all surveys and MS Word files of accompanying documentation in a format approved by the Port.

The following types of surveys have special requirements in addition to the requirements above:

Contract Drawing As-Constructed Surveys (CD AS)

Refer to the survey control of the contract drawing set unless new control was set where the control should be shown on the key plan. The drawing number and set title will be the same as the contract drawing set. These sheets are attached to the end of the contract drawing set, therefore you must obtain the proper sheet numbering from the Port's project surveyor.

Exhibit Plats (EP)

Exhibit plats shall be done on Port 17" x 22" or 22" x 34" title block. The drawing scale shall be large enough to depict the site. Provide a complete list of all survey and deed references used to accomplish the survey project. Do not place grid ticks on exhibit drawings. Place the legal description on the same sheet as the item to be described or place it on a separate sheet if there is insufficient room. Provide an original signed and stamped hard copy of the legal description.

Hydrographic Surveys (HS)

All surveys shall be based on North American Datum of 1983/1998 adjustment (NAD 83(98)). Vertical datum shall be based upon Columbia River Datum (CRD). Show all survey control points within the plan view on all sheets. The point number, northing, easting, elevation, and description can be shown within a table or on the plan view. In addition to the CRD survey control point elevation, provide an equivalent North American Vertical Datum 1988 (NAVD 88). Show grid tick marks on drawings at an interval of 250' (the grid maybe tighter if the area is not wide enough). Provide a complete legend on plan view sheets if space allows. Use a 22" x 34" title block.

Topographic Surveys (TS)

Within the narrative/notes, note that the horizontal datum is based on Port local projection (international fleet) and the vertical datum is based on NAVD 88. Also indicate what benchmarks were held, contour interval, how utility data was collected (locates, field observed, GIS, or maps), the types of survey equipment and procedures used, and software for processing. Use the grid tick block GRID-TICK-ATTRIBUTED at intervals of 250' for a 50 scale drawing in areas that don't interfere with the drawing content. Start with the survey notes block provided by the Port for proper formatting of the survey notes.

Record of Surveys and Subdivision Plats

Maps shall be done on Port 18" x 24" title blocks designed for submittal to Multnomah County. Trim the map to 18" x 24" in accordance with county and city requirements. The drawing scale shall be large enough to depict the site. Drawings shall be in accordance with Oregon Revised Statutes, Chapters 92 and 209. The Port prefers 0.125" text height when using all uppercase lettering, but will accept 0.100" when space is limited.

AutoCAD Drawing Template for Survey

A standard Port AutoCAD survey drawing template is available to the consultant, as well as the Port survey code list, Port survey code book file, Port survey description key file, sample CAD survey drawings, and other useful applications.

Utility Callouts

The Port standard for calling out utility features is to use a multileader (or the Port's Civil3D general note style located in the Port's Survey Template), with text listing the utility and feature on the first line, the location (such as RIM) elevation on the second line, and the invert elevations showing pipe size and direction on individual lines thereafter. See the figure below for more information.

Utility Callout Standards

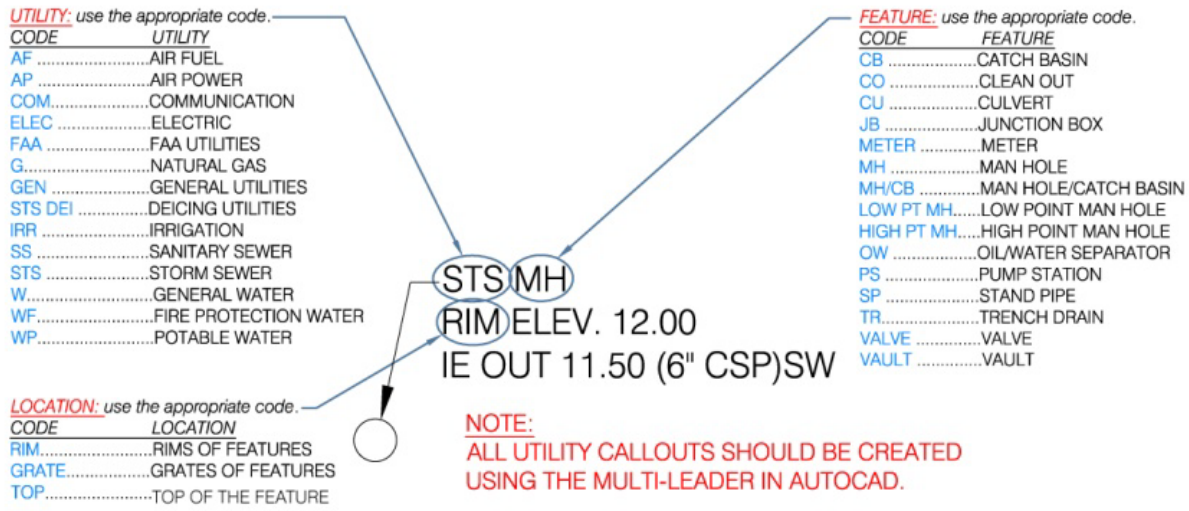
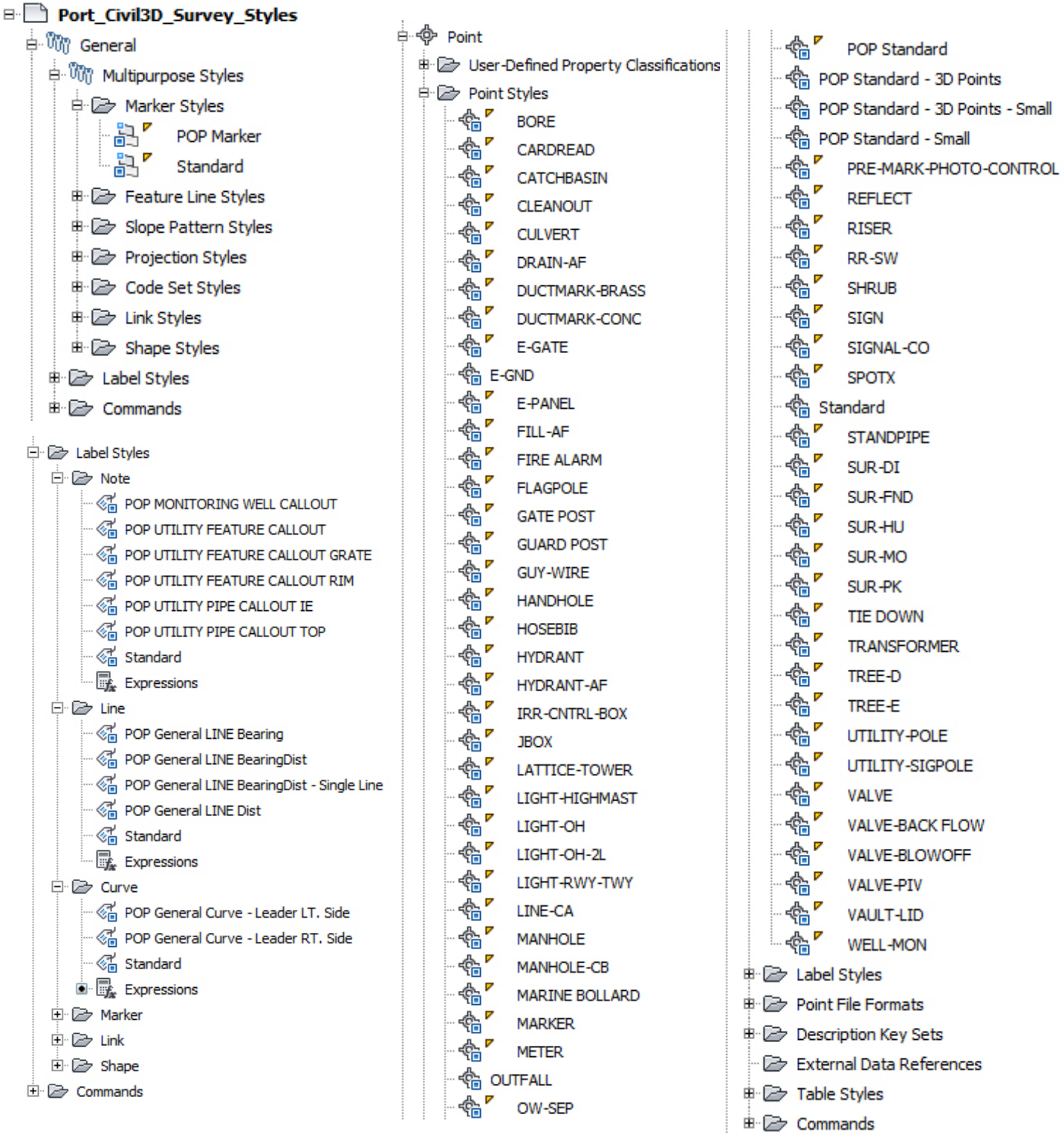
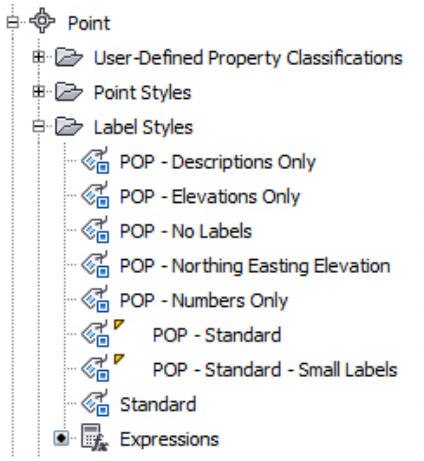


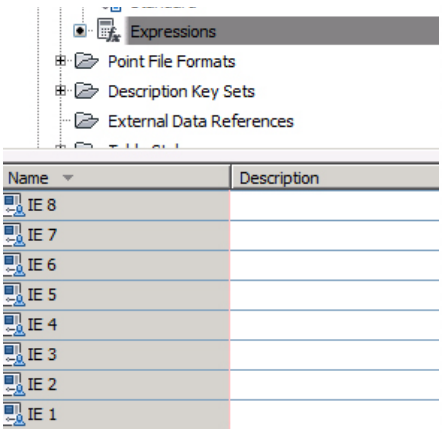
Figure 26

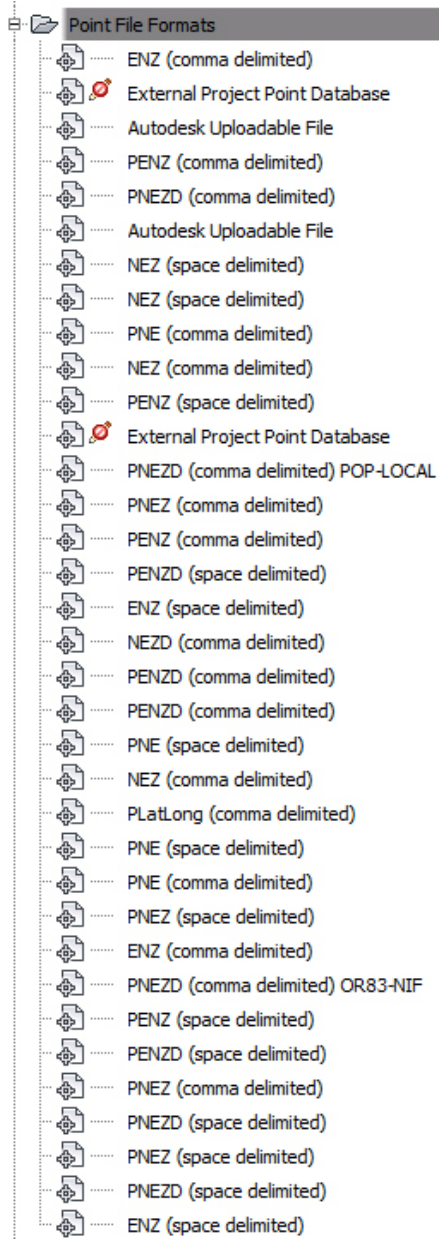
Survey Civil 3d Styles

The Port maintains the following Civil 3D styles specifically for Survey. Some styles may need to be modified for specific situations by the user. As new styles are created, or updates to existing styles are made, they will be updated on the web site. If a new style needs to be created where none existed before, every effort must be made to maintain the look of Port standards. The following list is the current styles for the Port survey at the time of this printing.




Point
User-Defined Property Classifications
Point Styles
Label Styles
POP - Descriptions Only
POP - Elevations Only
POP - No Labels
POP - Northing Easting Elevation
POP - Numbers Only
POP - Standard
POP - Standard - Small Labels
Standard
Expressions


Expressions
Point File Formats
Description Key Sets
External Data References
Name
Description
IE 8
IE 7
IE 6
IE 5
IE 4
IE 3
IE 2
IE 1


Point File Formats
ENZ (comma delimited)
External Project Point Database
Autodesk Uploadable File
PENZ (comma delimited)
PNEZD (comma delimited)
Autodesk Uploadable File
NEZ (space delimited)
NEZ (space delimited)
PNE (comma delimited)
NEZ (comma delimited)
PENZ (space delimited)
External Project Point Database
PNEZD (comma delimited) POP-LOCAL
PNEZ (comma delimited)
PENZ (comma delimited)
PENZD (space delimited)
ENZ (space delimited)
NEZD (comma delimited)
PENZD (comma delimited)
PENZD (comma delimited)
PNE (space delimited)
NEZ (comma delimited)
PLatLong (comma delimited)
PNE (space delimited)
PNE (comma delimited)
PNEZ (space delimited)
ENZ (comma delimited)
PNEZD (comma delimited) OR83-NIF
PENZ (space delimited)
PENZD (space delimited)
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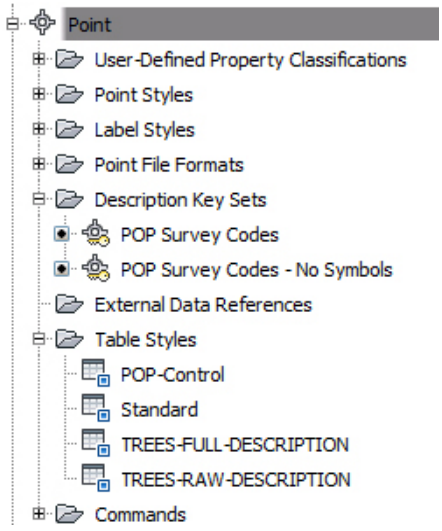
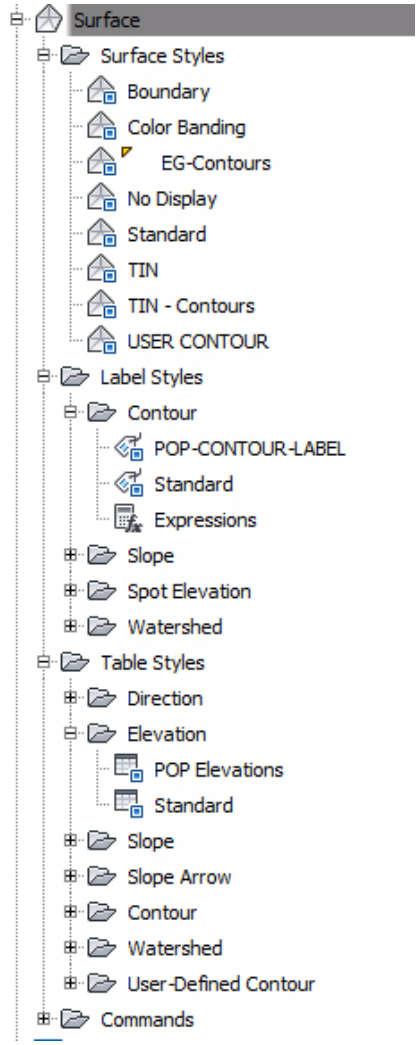
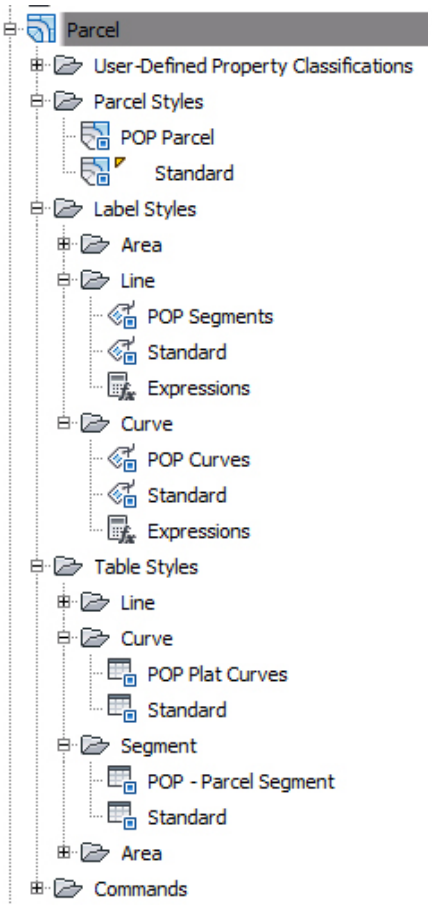
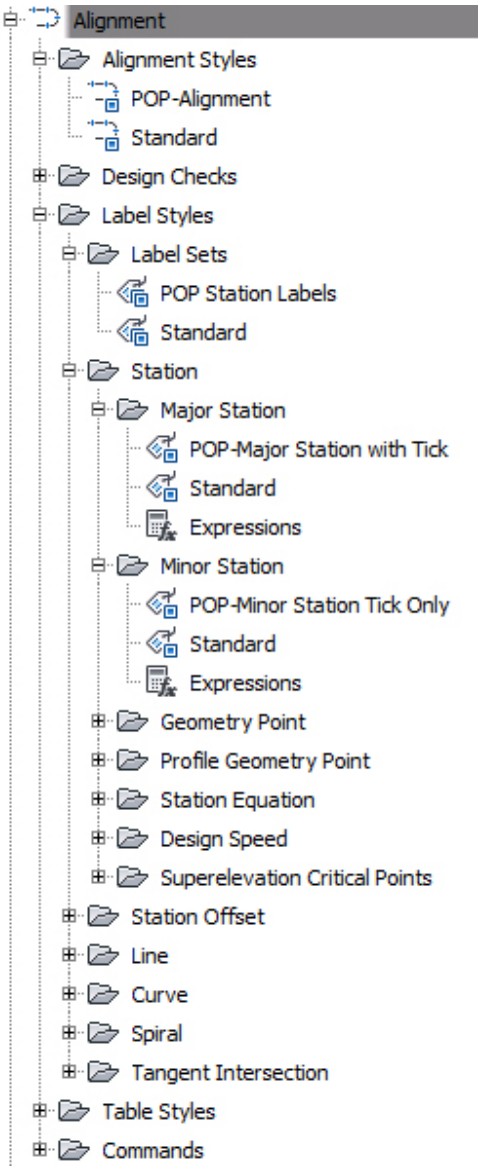
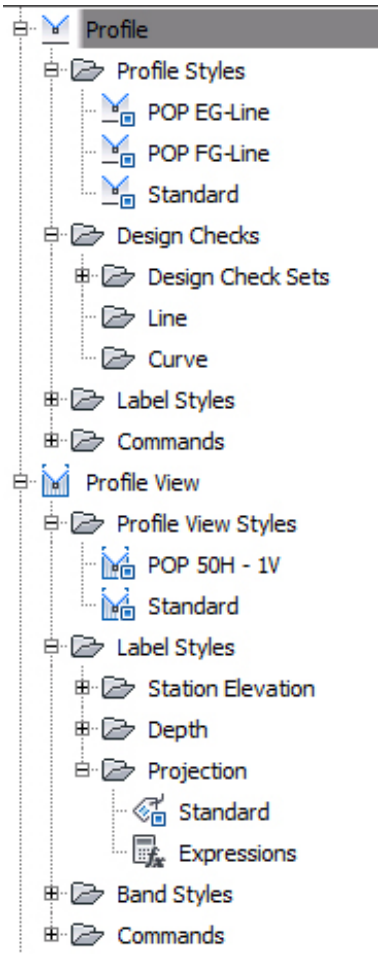
PNEZ (space delimited)
PNEZD (space delimited)
ENZ (space delimited)

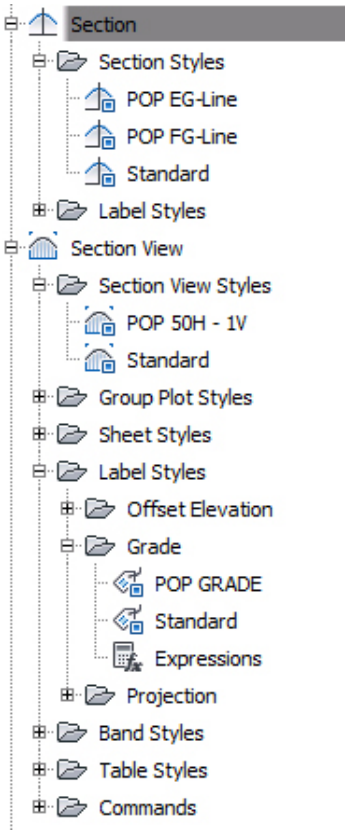

Point
User-Defined Property Classifications
Point Styles
Label Styles
Point File Formats
Description Key Sets
POP Survey Codes
POP Survey Codes - No Symbols
External Data References
Table Styles
POP-Control
Standard
TREES-FULL-DESCRIPTION
TREES-RAW-DESCRIPTION
Commands


Surface
Surface Styles
Boundary
Color Banding
EG-Contours
No Display
Standard
TIN
TIN - Contours
USER CONTOUR
Label Styles
Contour
POP-CONTOUR-LABEL
Standard
Expressions
Slope
Spot Elevation
Watershed
Table Styles
Direction
Elevation
POP Elevations
Standard
Slope
Slope Arrow
Contour
Watershed
User-Defined Contour
Commands

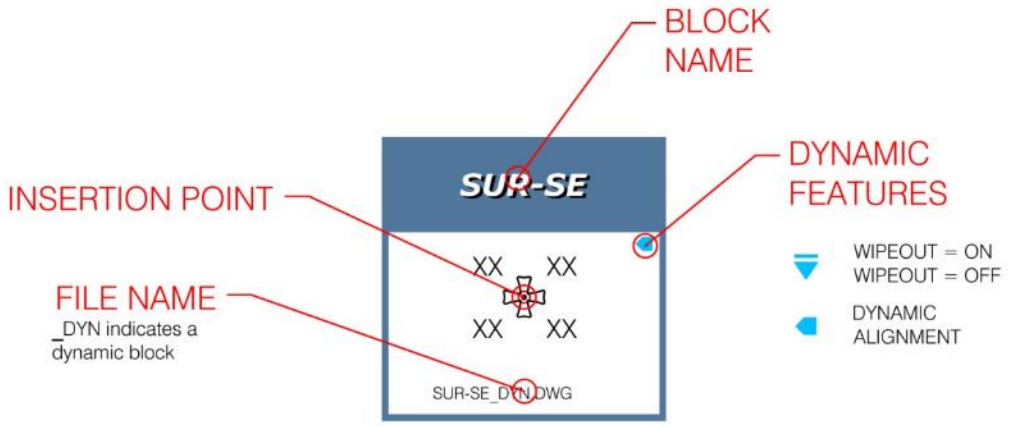

Parcel
User-Defined Property Classifications
Parcel Styles
POP Parcel
Standard
Label Styles
Area
Line
POP Segments
Standard
Expressions
Curve
POP Curves
Standard
Expressions
Table Styles
Line
Curve
POP Plat Curves
Standard
Segment
POP - Parcel Segment
Standard
Area
Commands


Alignment
Alignment Styles
POP-Alignment
Standard
Design Checks
Label Styles
Label Sets
POP Station Labels
Standard
Station
Major Station
POP-Major Station with Tick
Standard
Expressions
Minor Station
POP-Minor Station Tick Only
Standard
Expressions
Geometry Point
Profile Geometry Point
Station Equation
Design Speed
Superelevation Critical Points
Station Offset
Line
Curve
Spiral
Tangent Intersection
Table Styles
Commands

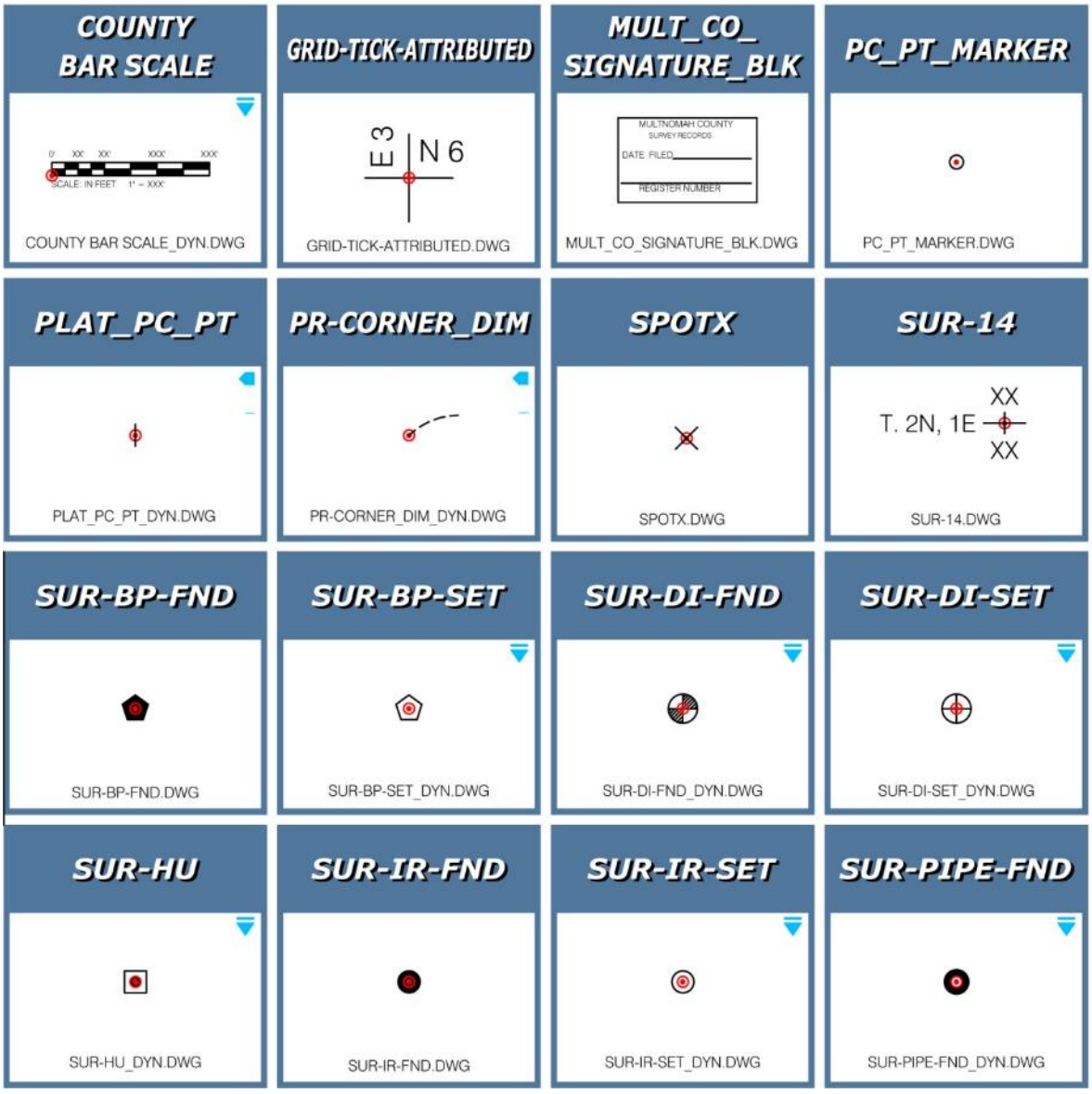

Profile
Profile Styles
POP EG-Line
POP FG-Line
Standard
Design Checks
Design Check Sets
Line
Curve
Label Styles
Commands
Profile View
Profile View Styles
POP 50H - 1V
Standard
Label Styles
Station Elevation
Depth
Projection
Standard
Expressions
Band Styles
Commands

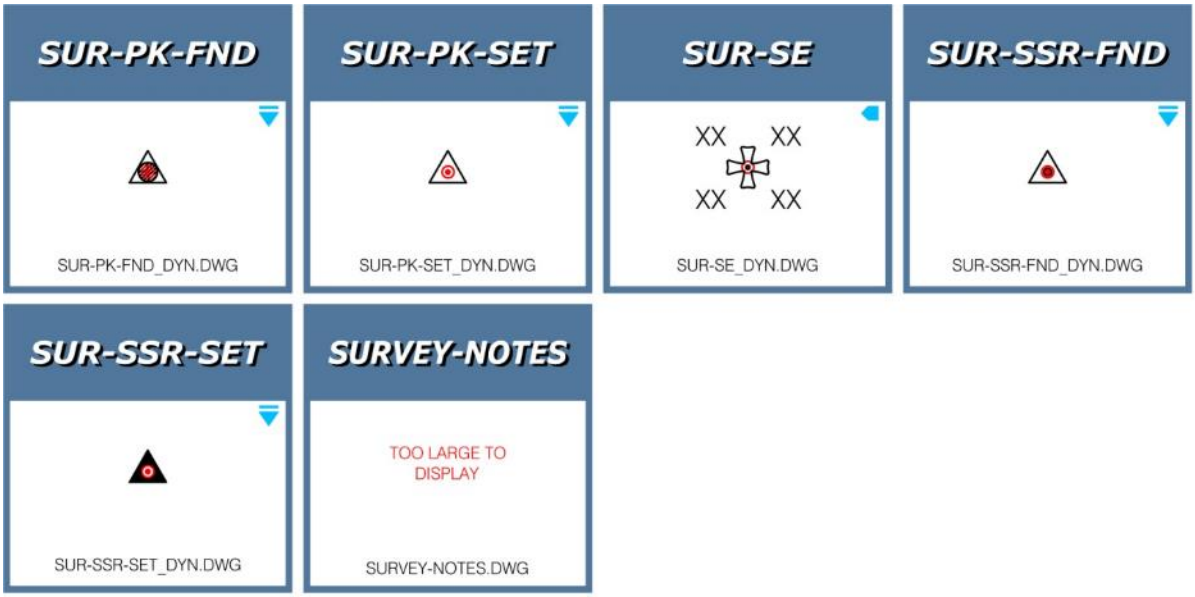

Section
Section Styles
POP EG-Line
POP FG-Line
Standard
Label Styles
Section View
Section View Styles
POP 50H - 1V
Standard
Group Plot Styles
Sheet Styles
Label Styles
Offset Elevation
Grade
POP GRADE
Standard
Expressions
Projection
Band Styles
Table Styles
Commands

Symbology – Survey



NOTE:
DYNAMIC BLOCKS NEED TO BE EXPLODED WHEN INSERTED FOR THE FIRST TIME.




SUR-PK-FND
SUR-PK-FND_DYN.DWG
SUR-PK-SET
SUR-PK-SET_DYN.DWG
SUR-SE
XX XX
XX XX
SUR-SE_DYN.DWG
SUR-SSR-FND
SUR-SSR-FND_DYN.DWG
SUR-SSR-SET
SUR-SSR-SET_DYN.DWG
SURVEY-NOTES
TOO LARGE TO DISPLAY
SURVEY-NOTES.DWG

BIM Standards

BIM Overview

The Port sees the utilization of Building Information Modeling (BIM) becoming the industry standard for design and construction. In order to attain the benefits of this emerging technology, the Port encourages teams to utilize BIM to the greatest extent practical on Port projects. The following BIM standards are base level requirements and guidance for project teams to utilize in the design and construction of Port projects. .

BIM Definitions

Aggregate Model	A Model consisting of linked but distinct component Models, drawings derived from models, text, and/or other data sources.
Building Information Model(s):	A digital representation of the physical and functional characteristics of the Project. Also may be referred to as the "Model(s),". This term may be used to describe a Model Element, a single Model or multiple Models used as the aggregate project Model.
Building Information Modeling (BIM):	The process and technology used to create the Model.
Construction Coordination Model	A Model managed by the General Consultant during later design stages where subconsultant models can begin to replace portions of the Design Model. The main purpose of this model is to aid in the coordination and the detection of interferences between building components.
Construction Model	A Model managed by the General Consultant after the end of Construction Documents. The construction model will be an evolution from the Construction Coordination Model with additional information added by the GC as it relates to constructability.
Design Model	A Model created by the architecture and engineering disciplines to establish the general design of the project. 2D record and submittal drawings will be extracted from the design model.
Level of Development / Level of Detail (LOD):	Describes the level of completeness to which a Model Element is developed.
Model Element:	A portion of the Building Information Model representing a component, system or assembly within a building or building site.
Model User:	Refers to any individual or entity authorized to use the Model on the Project, such as for analysis, estimating or scheduling.

BIM Implementation Plan Requirements

Each BIM project will be evaluated by the Port Project Team to determine if a BIM Implementation Plan will be required. This evaluation is based on project complexity, not contract value. If required by the Port, provide a BIM Implementation Plan that addresses the following minimum criteria:

- Project overview and goals.
- Responsibilities of each consultant and the deliverables each is to provide.
- Proposed model management protocols including proposed clash detection process(es).
- Compliance and Quality Control processes needed to meet the requirements of these standards.
- Proposed deviations from these standards.
- Level of Development by discipline with hand-off points identified.
- Model list with identification of responsible party. List is to include models used for design and/or construction.
- Change tracking methodology.
- Proposed model sharing methodology.

General Model Requirements

The Port expects project teams to utilize their professional discretion in determining how to best document project information. The Port also realizes that the technology is continually developing and new opportunities may arise over the course of a project that, if implemented, can be advantageous to the project team and/or the Port. Should these opportunities present themselves, contact Port Project Engineer to obtain approval before moving forward with major changes.

The Port expects to maintain licenses for the most current version of the software identified. Notify the Port prior to implementing new software upgrades to verify the Port is able to accept upgraded deliverables.

Guiding Principles for Modeling vs. Detailing

The Port understands that not all information in a project will be captured via model elements. In order to achieve the benefits of BIM, the Port expects the project team, via the BIM Implementation Plan (or via separate document per agreement with the Port) to clearly identify the methodologies that will be used to maximize the usefulness of the BIM tools. Over-modeling (the creation of elements beyond the required level of design) and under-modeling (the creation of elements below the required level of design) is to be avoided. Coordinate with your Port Project Team to determine the appropriate level of design for each deliverable.

Rule of thumb: If it needs to be coordinated, it is to be modeled to the appropriate level of detail required to help identify any conflicts.

Utilize detail components to supplement the graphic quality of model elements in 2D representations of construction components. Detail components are to *supplement*, not *substitute* for model elements. Utilize the same level of care when using detail components, maintaining document accuracy and clarity as exercised for model components.

SEED Model Guidelines and Requirements

As Port's existing inventory of CAD documentation is transitioned to BIM, project teams shall develop SEED models, i.e. generic models that establish origin points (tied to survey datum's), grid systems, and floor levels that will be utilized by future teams if an existing SEED model doesn't exist.

SEED files shall only contain the following information:

- Project Origin Point tied to survey datum. The Origin Point will be provided by the Port CAD/BIM Manager.
- Floor level identifiers
- Grids
- Accurate rotation of Project North versus True North
- Property or Assumed Property lines (if applicable to the site)

At project start-up, the SEED file shall be utilized by the entire project team to accurately establish the facilities location in space and allow quick linking of files without the need for additional model manipulation.

In existing facilities, grid systems and levels shall match previously used systems in those facilities. Where existing facilities do not utilize a grid or level system, work with the Port CAD/BIM Manager to determine what system and naming should be utilized.

In new facilities, work with the Port CAD/BIM Manager to create the SEED model meeting the criteria identified above.

Main Model Guidelines and Requirements

Main models shall be generated using the SEED model to establish the project's location in space. The Main model is considered the primary model for each discipline where project documentation is generated. Main models shall include the following information:

- All 2D project sheet documents. Sheets shall NOT be located in separate models.
- All 3D models for a project shall be linked into Main models. Exceptions may be requested for projects utilizing 3D CAD models.

CAD Model Guidelines and Requirements

Projects that utilize 3D CAD formats are required to meet the same location in space criteria as BIM projects. Project teams utilizing 3D CAD formats shall work with their project team to accurately establish the facilities location in space and allow quick linking of files without the need for additional model manipulation.

Model Naming Requirements

The Port requires models to be named utilizing the Port system described below that allows for easy identification of the project. This system utilizes a sequence of codes that allow reasonable length names to be provided which are consistent with existing conventions used by the Port.

Facility Codes

The Port has established facility codes for use in naming models, drawings and folders in all projects. Reference *General Requirements*

Discipline Codes

The Port has established the following Discipline codes for use in naming models for all projects:

Demolition	DEMO	Plumbing	PLMB
Civil	CIV	Electrical	ELEC
Landscape	LSCP	Fire Protection	FIRE
Architectural	ARCH	Telecom/Data	TCOM
Interiors	INT	Fire Alarm	FALRM
Structural	STR	Construction	CONST
Mechanical HVAC	mHVAC	Equipment	EQUIP
Mechanical Piping	mPIPE	Other	*

*Contact CAD/BIM Manager if you have a specialty model not listed

Model Types

The Port has established the following Model type codes for use in naming models for all projects:

Main	Primary model where all 2D documents will be compiled
Site	Site specialty model
Envelope	Envelope specialty model
Context	Large massing of surrounding structures not utilized for documentation
Other	*

*Contact (responsible party here) if you have a specialty model not listed

The Port assumes most projects will only need one Main model to execute a project. However, larger, more complex projects may be subdivided in order to improve workflow. Contact your Port Project Engineer if you have a special instance not listed.

Revit Model Naming Sequence

Utilize the following naming sequence for all **Revit** based files

Facility Code-Port Project Number - Discipline Code - Model Type.rvt

For example, Autodesk Revit models being used for a project at the Portland Airport would be named:

- PDX-22222-ARCH-Main.rvt
- PDX-22222-ARCH-Envelope.rvt
- PDX-22222-STR-Main.rvt

CAD Model Naming Sequence

Where 3D CAD software is utilized and will be used in clash detection, the following naming sequence for all **3D CAD** based files

Facility Code-Port Project Number - Abbreviated Model Discipline – Floor Level/Location.dwg

For example, Autodesk AutoCAD models being used for a project at the Portland airport would be named:

- PDX-22222-mPIPE-LEVEL2.dwg
- PDX-22222-PLUMB-LEVEL3-NE.dwg

Note: All documents generated with CAD based software are to comply with the Port's CAD Standards.

Revit Model Component Naming Requirements

The Port expects a high degree of coordination between the components used to build up the overall model with the specifications for a project. With this in mind, model components or Families shall be named utilizing the Construction Specifications Institute, Master Format (CSIMF#) numbering system to the greatest extent possible.

For Autodesk Revit Projects, model components are typically comprised of either single component Families or composite Families. Naming shall follow the following guidelines to the greatest extent practical.

Revit Single Component Naming:

Single component families such as toilets, mechanical equipment, or bike racks shall be named using the following format

CSIMF#-description.rfa

Examples

- 055100-Metal Stair.rfa
- 142000-Elevator1.rfa

Revit Composite Component Naming

For components assembled from multiple construction systems such as walls or floors, the same naming protocol used for Single components shall be utilized with the CSI designation utilizing the primary element in the system as the prefix. The Port recognizes there is a wide variety of sequences possible for naming composite elements and they will vary by project. Consultants shall present their proposed naming to the CAD/BIM Manager to verify naming protocols are being met.

Utilize the following guidelines:

CSIMF#-description.rfa

Examples

- 055100-Metal Stair.rfa
- 142000-Elevator1.rfa
- 237000-AHU1.rfa

Revit Detail & Symbol Component Naming Requirements

Detail and symbol component families used in drafting views to supplement model data shall be named using the following format

CSIMF#-description.rfa

Examples

- ANNO-Breakline.rfa*
- TAG-Wall.rfa*
- 061000-WD Blocking.rfa
- 092116-Gypsum Wall Board–5/8”.rfa

Revit Non CSI Naming Codes

The Port has established the following naming codes for use in naming Detail and Symbol components not covered by CSI numbering conventions:

ANNO	Annotations
TAG	Identification tags
TITLE	Titles for views
Other	*

*Contact CAD/BIM Manager if you have a specialty component not listed

Worksets

The Port requires that all projects utilize worksets (Revit) to facilitate coordination and optimize model performance. However, the use of worksets shall be limited to controlling model visibility when utilizing visibility graphics is not practical. Minimizing the use of worksets is necessary to reduce the risk of model elements inadvertently being placed on the wrong workset and adversely impacting team workflows.

Workset Naming Sequence

Utilize the following naming sequence for all **Revit** worksets

Discipline Code – Workset Description.rvt

For example, Autodesk Revit worksets would be named:

- mHVAC-Equipment
- mMVAC-Model Elements

All linked files are to be placed on the appropriate workset. Utilize the following naming sequence for all linked files:

- Linked-RVT
- Linked-CAD
- Linked-Images
- Linked-DWF
- Linked-Point Cloud

Best Practices

Project teams are expected to utilize modeling the best practices they have developed to ensure model accuracy and product quality. At a minimum, the following are Port expected best practices:

- Only families, detail and model components, noteblocks etc. applicable to the project are to be included in the model.
- Only one Detail or Model Component per element is used in the model. For example, only one metal stud detail component is in the model.
- In-place families are limited in use and are named to match the Component Naming Requirements.
- Components or Revit Families downloaded from the internet and directly inserted into a model are not acceptable unless they match the product to be installed in the project.
- All model elements, regardless of their origin, shall meet the requirements of this BIM Standard.
- Exploded CAD details in the model are NOT acceptable.
- Model elements should have product information consistent with the level of design imbedded in the element and should be tagged (keynoted) in lieu of using text notes to minimize callout errors.
- Detail components should be used in lieu of filled regions or simple line-work in detail drawings to allow tagging of elements.
- Architectural Models are to include 'no fly zone' elements (in place component or model components) that identify areas where routing of MEPF components cannot be accommodated.
- Architectural Models shall NOT use composite system walls that include structural elements.
- Architectural Models shall NOT include structural or MEPF elements.
- MEPF models shall have equipment labeled with 3D text specific to that piece of equipment and which matches the equipment schedule. Show this text on the equipment in a location easily seen when viewing clash coordination models.
- All MEPF piping requiring insulation shall modeled with insulation shown and enabled for clash detection.

Clash Model Guidelines and Requirements

At the beginning of all BIM projects, one contracted entity will be tasked with running model clashing efforts. The Port reserves the right to transition this work scope within the project team should it be necessary and/or advantageous to the Port to do so.

The Port will defer to the project team to determine the best strategies for implementation of the clash review process. This clash review strategy shall be thoroughly articulated in the BIM Implementation Plan.

Clashing models shall utilize the following color standards for visualization exports:

Demolition	Typically Not Shown	Plumb waste/vent**	Light Purple
Civil	Brown	Plumb supply**	Light Green
Landscape	Dark Green	Plumb return**	Dark Purple
Architectural	Light Grey	Plumb Equipment/	Light Purple
Interiors	Light Grey	Electrical (inc. Equip)	Yellow
Structural	Dark Grey	Fire Protection	Red
HVAC – Supply air**	Light Blue	Telecom/Data	Yellow
HVAC – Return air**	Light Orange	Fire Alarm	Yellow
HVAC – Equipment**	Cyan	Construction	Pink
Mech Piping – Supply**	Dark Blue	Equipment	Cyan
Mech Piping – Return**	Dark Orange	Other	*

*Contact the CAD/BIM Manager if you have a specialty not listed

**Insulation modeled shall utilize the same color as the system identified

After each clash run, distribute copies of the clashed model and resulting clash reports to all project team members identified in the BIM Implementation Plan as well as the Port.

Milestone Deliverable Requirements

For each milestone through design and construction the Port requires the following deliverables unless modified by the project contract:

1. Electronic 2D documents (drawings and specifications) in PDF format, non-archive format.
2. BIM models in native Revit and/or CAD formats.
3. Copies of all Clash Model reports since the last submission.
4. Other deliverables per contract requirements.

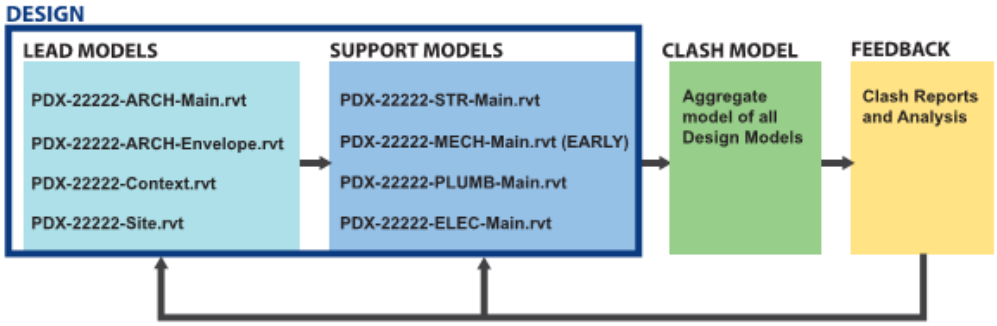
Close-Out Model Requirements

At project close-out, the Port requires the following deliverables unless modified by the project contract:

1. Electronic 2D documents (drawings and specifications) in PDF format, non-archive format.
2. Native BIM models in Revit and/or CAD formats with construction revisions incorporated.
3. Copies of all Clash Model reports not previously submitted.
4. Other deliverables per contract requirements.
5. A Full Building Clash model with all clashes resolved or identified as to why the clash was ignored.

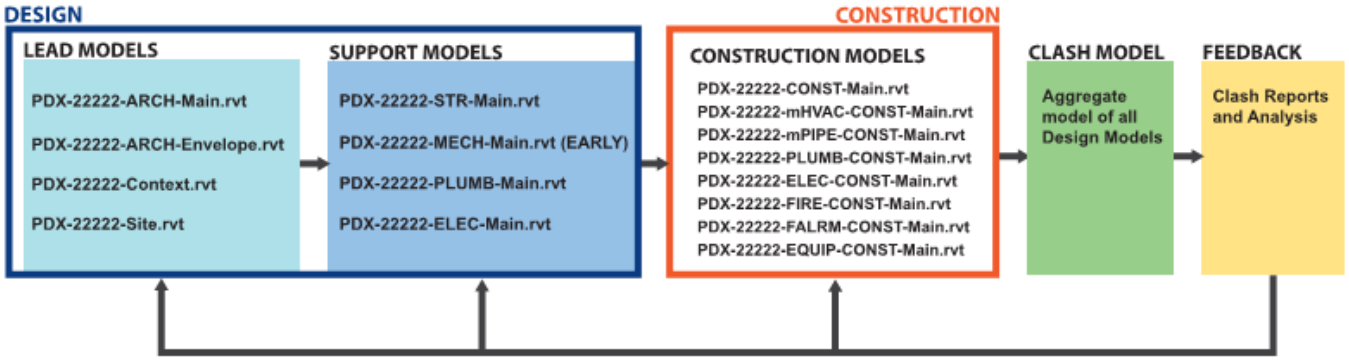
SAMPLE MODEL LINKAGE STRUCTURE AND WORKFLOW:

EARLY DESIGN



SAMPLE MODEL LINKAGE STRUCTURE AND WORKFLOW :

DESIGN DEVELOPMENT, TRADE COORDINATION, CONSTRUCTION



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Appendix

STANDARD TITLE BLOCK INFORMATION

(A) FACILITY NAME: Port operating facility name where the project is located.

(B) PROJECT NAME: This line is used for the official project name. Coordinate with the Port's Specifications group to obtain the official title.

(C) SHEET TITLE: This area is for the sheet title. There are options for multiple lines and single line titles. (The project name and sheet title should be centered in the box.)

(D) SUBMITTED BY: Provide the full name of the individual submitting the drawing above the line. i.e. ROBERT SMITH

(E) Below the line, provide the title of the individual submitting the drawing. ie PROJECT ENGINEER, PROJECT SURVEYOR, PROJECT MANAGER

(F) DRAWING TYPE: Enter the type of drawing. Choose from the following list:

- CD= Contract Drawing
- EP = Exhibit Plat
- LP = Lease Plat
- BS = Boundary Survey
- GS= General Survey
- HS = Hydrographic Survey
- TS = Topographic Survey
- PD = Proposal Drawing
- MD= Maintainable Drawing

(G) DRAWING NUMBER: A four part project drawing number must appear on each drawing. The Technical Reference Center Manager will provide the consultants with the appropriate project drawing number information. The drawing consists of the following parts:

PDX 2015-500

- PDX: Project Operating Facility acronym
- 2015: Current Year
- 500: Next successive number assignment in Port numbering system. Assigned by Technical Reference Center Manager*

*1-499 indicates a Port design project, 500 series indicates a consultant design project, 1000 series indicates tenant drawings, and 3000 series indicate a Port maintainable drawing number.

(H) SHEET NUMBER: Consecutive number starting with sheet 1. The cover sheet is not numbered.

(I) TOTAL SHEETS: This is the total number of sheets in the drawing set. The cover sheet is not included.

(J) DISCIPLINE SHEET NUMBER: The discipline sheet number is formatted with a letter designating the discipline, a hyphen and then a sequential number for that discipline. See page 9 for sheet numbering. See the list for approved discipline abbreviations. This list is shown in the order the drawings should appear in a drawing set. If an abbreviation is not found on the list, please contact the technical reference center manager for an appropriate designation.

- GI = General Information
- C = Civil
- A = Architectural
- S = Structural
- M = Mechanical
- P = Plumbing
- F = Fire protection
- E = Electrical
- Q = Equipment
- G = Signage and graphics
- L = Landsacping/Irrigation/Planting
- I = Instrumentation
- SU = Survey

(K) DESIGNED BY: First initial and last name of the designer. D. DESIGNER

(L) DRAWN BY: First initial and last name of the drafter. D. DRAFTER

(M) CHECKED BY: First initial and last name of the checker. C. CHECKER

(N) DATE: Provide the month and year the drawing set advertises for bid. The month should either be spelled out completely or use a 3 or 4 letter designation. Numbers are not allowed. The year needs to include all four numbers. The day of the month is not used. Every sheet in the set is required to have the same format and the same month and year.

(O) SCALE: As described earlier in the manual, place the scale information here.

(P) DESIGN NUMBER: This is the engineering assignment number and will be provided by the Port's project engineer.

(Q) PROJECT NUMBER: This is the Port's project number for the project and will be provided by the Port's project engineer. Sometimes more than one project number are assigned to the same project. All project numbers should be listed here, separated by a comma.

(R) PROFESSIONAL STAMP BOX: Provide the professional stamp with renewal date in this box. Project sheets submitted prior to Bid and Construction are to show a "Preliminary - Not For Construction" stamp.

(S) CENTER BOX: The center box has a variety of uses. The primary use for consultants will be to place their company logo here.Some projects may require signature lines here. When that is the case, the consultant shall place their logo as close to the lower right corner of the drawing area as possible.

(T) REPROGRAPHIC QUALITY INDICATOR AND DISCLAIMER: The three graphic indicators are included to ensure that all drawing reproductions, both in hard copy format and digital format, are rendered faithfully and correctly depict all shaded areas.

(U) REPROGRAPHIC REFERENCE ONLY SCALE BAR: This is a non-editable scale bar that is used for post-production reference of the printed scale of the drawing.

GRAPHIC SCALE - FOR REFERENCE ONLY
0 1/4" 1/2" 1" 2"

CAN YOU SEE THE AIRPLANES? THE ADJACENT SAMPLES SHOW THREE DIFFERENT LEVELS OF SHADING. SETTINGS FOR VIEWING AND PRINTING DRAWING CONTENT ARE OPTIMIZED WHEN ALL THREE PLANES ARE VISIBLE. THIS GUIDANCE IS PROVIDED FOR REFERENCE ONLY.

light gray | dark gray | black

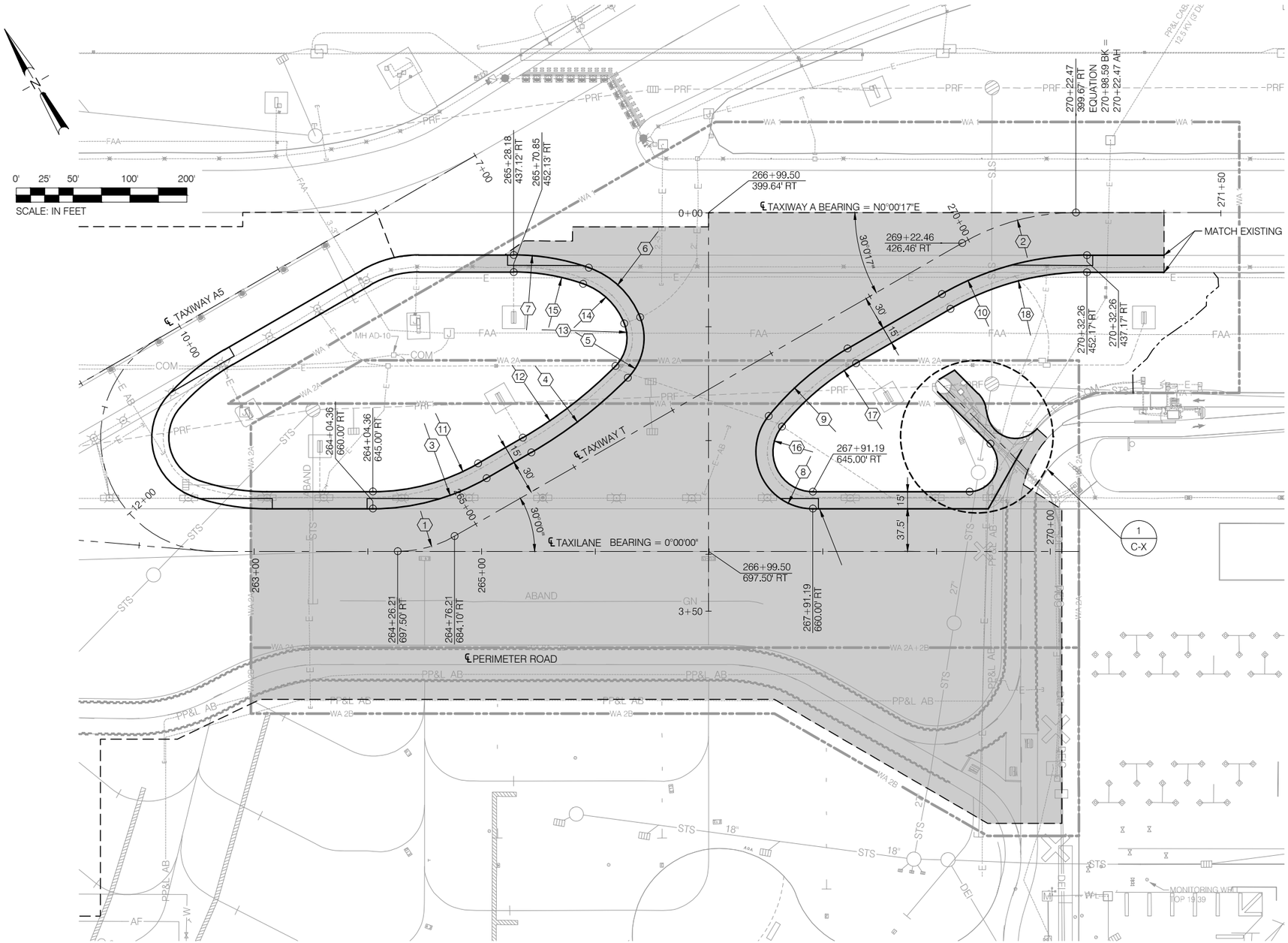
NO.	DATE	BY	REVISIONS	APPVD	CK'D

PORT OF PORTLAND
PORTLAND, OREGON

P: 2015-XXX (DESIGN NUMBER) S Q: XX-XXX (PROJECT NUMBER) R

DESIGNED BY DESIGNER (K)
DRAWN BY DRAFTER (L)
CHECKED BY CHECKER (M)
DATE MON YEAR (N)
SCALE SCALE (O)

A FACILITY NAME
B PROJECT NAME
C SHEET TITLE LINE ONE
SHEET TITLE LINE TWO
E SUBMITTED BY
D PROJECT ENGINEER
F
G TYPE: CD | DRAWING NO.: FAC-2015-XXX | I SHEET NO.: X/XXX | J DISC. SHT. NO.: X-X



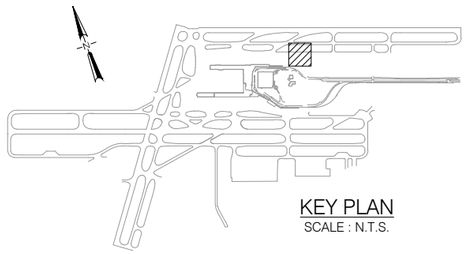
CURVE TABLE RUNWAY 10L-28R CENTERLINE COORDINATES						
CURVE	R	DELTA	T	L	RADIUS POINT STATION	RADIUS POINT OFFSET
⟨1⟩	100.00	30°00'00"	26.79	52.36	264+26.21	597.50' RT.
⟨2⟩	200.00	30°00'17"	53.60	104.74	270+22.46	599.67' RT.
⟨3⟩	200.00	30°00'00"	53.59	104.72	264+04.36	460.00' RT.
⟨4⟩	400.00	15°22'36"	54.00	107.35	263+43.58	264.15' RT.
⟨5⟩	50.00	65°58'31"	32.46	57.57	265+92.69	510.01' RT.
⟨6⟩	75.00	49°23'36"	34.49	64.66	265+69.40	519.11' RT.
⟨7⟩	200.00	19°15'16"	33.93	67.21	265+28.18	637.12' RT.
⟨8⟩	50.00	128°58'17"	104.76	112.55	267+91.20	610.00' RT.
⟨9⟩	250.00	21°01'43"	46.40	91.75	269+46.69	735.79' RT.
⟨10⟩	255.00	30°00'17"	68.34	133.54	270+32.24	692.17' RT.
⟨11⟩	185.00	30°00'00"	49.57	96.87	264+04.36	460.00' RT.
⟨12⟩	385.00	15°22'36"	51.97	103.32	263+43.58	264.15' RT.
⟨13⟩	35.00	65°58'31"	22.72	40.30	265+92.69	510.01' RT.
⟨14⟩	60.00	49°23'36"	27.59	51.72	265+69.40	519.11' RT.
⟨15⟩	185.00	19°15'16"	31.38	62.17	265+28.18	637.12' RT.
⟨16⟩	35.00	128°58'17"	73.33	78.78	267+91.20	610.00' RT.
⟨17⟩	235.00	21°01'43"	43.62	86.25	269+46.69	735.79' RT.
⟨18⟩	240.00	30°00'17"	64.32	125.68	270+32.24	692.17' RT.

LEGEND:

- LIMITS OF PAVING
- HERBICIDE, SITE GRADING, AND SEEDING LIMITS
- MILLING LIMITS
- TAXIWAY SAFETY AREA BOUNDARY
- WORK AREA LIMITS
- OBJECT FREE AREA LIMITS

NOTES:

1. SEE ELECTRICAL DRAWINGS FOR RELOCATION, OR REMOVAL OF EXISTING SIGN PADS AND LOCATION OF NEW SIGN PADS.
2. FOR ADJACENT GEOMETRY TO THE EAST SEE SHEET C-X.



KEY PLAN
SCALE : N.T.S.

CAN YOU SEE THE AIRPLANES? THE ADJACENT SAMPLES SHOW THREE DIFFERENT LEVELS OF SHADING. SETTINGS FOR VIEWING AND PRINTING DRAWING CONTENT ARE OPTIMIZED WHEN ALL THREE PLANES ARE VISIBLE. THIS GUIDANCE IS PROVIDED FOR REFERENCE ONLY.

NO.	DATE	BY	REVISIONS	APP'D	CK'D

PORT OF PORTLAND
PORTLAND, OREGON

2013ZGEN DESIGN NUMBER | 101245 PROJECT NUMBER

DESIGNED BY D. DESIGNER
DRAWN BY D. DRAFTER
CHECKED BY C. CHECKER
DATE MAY 2013
SCALE 1" = 50'

PORT OF PORTLAND

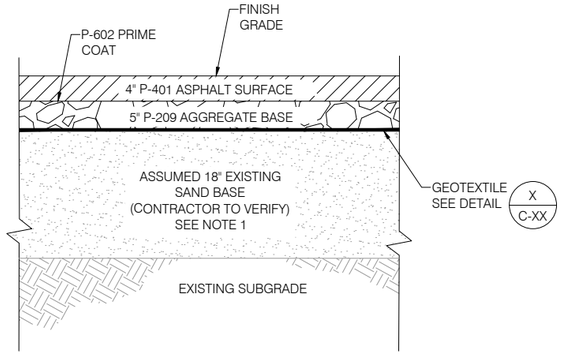
CAD STANDARDS MANUAL
EXAMPLE PLAN VIEW DRAWING

SUBMITTED BY PAT EBERT, CAD MANAGER | TYPE CD | DRAWING NO. PDX 2013-XXX | SHEET NO. 1/1 | DISC. SHT. NO. C-1

PRINTED: 6/30/2015 1:38:29 PM EBERTP x:\pop_standards\cad standards - current\appendix 2.dwg

APPENDIX 2

DRAWING SCALE IS REDUCED 50% WHEN SHEET SIZE IS 11" x 17".

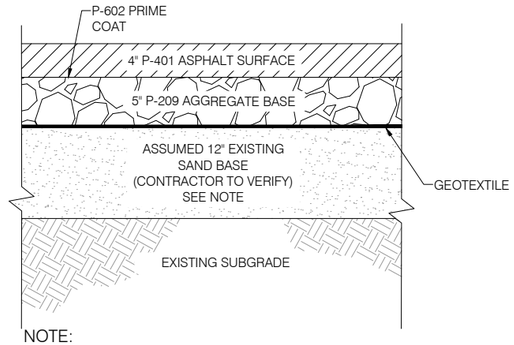


NOTE:

1. CONTRACTOR TO VERIFY DEPTH OF EXISTING SAND BASE PRIOR TO INSTALLING GEOTEXTILE.

1 TAXIWAY E SHOULDER
SCALE: N.T.S.

THE NUMBER IS USED ON THIS NOTE AS AN EXAMPLE. IF MULTIPLE INSTANCES OCCUR IN THE DRAWING SET THAT CONTAIN A SINGLE NOTE, USE CONSISTENT FORMATTING. EITHER NUMBER /OR DON'T NUMBER, NOT BOTH.

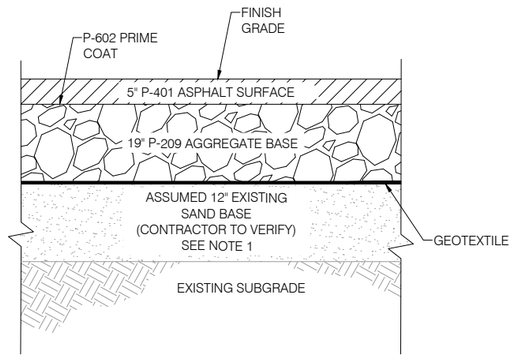


NOTE:

CONTRACTOR TO VERIFY DEPTH OF EXISTING SAND BASE PRIOR TO INSTALLING GEOTEXTILE.

2 TAXILANE ATC SHOULDER
SCALE: N.T.S.

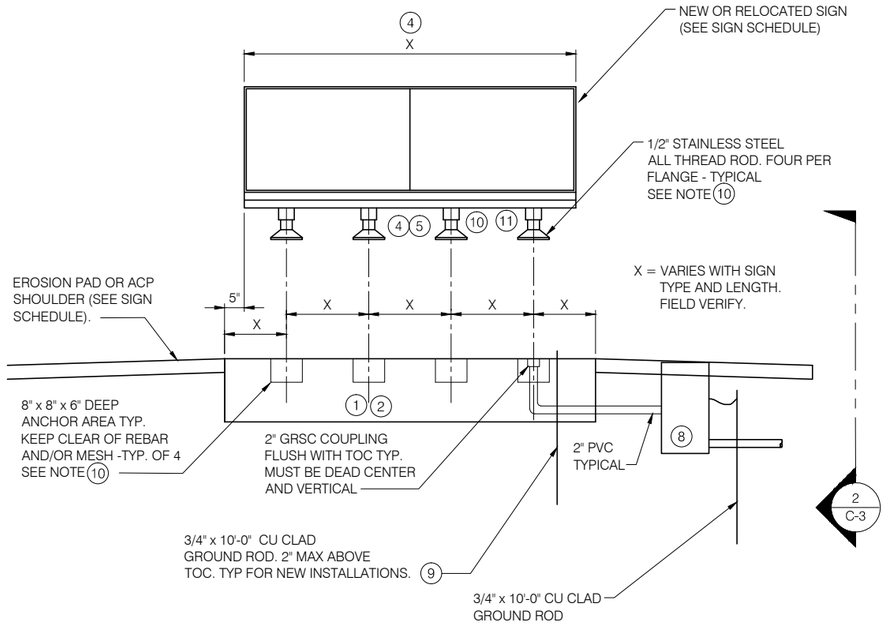
THE NUMBER IS NOT USED ON THIS NOTE AS AN EXAMPLE. IF MULTIPLE INSTANCES OCCUR IN THE DRAWING SET THAT CONTAIN A SINGLE NOTE, USE CONSISTENT FORMATTING. EITHER NUMBER /OR DON'T NUMBER, NOT BOTH.



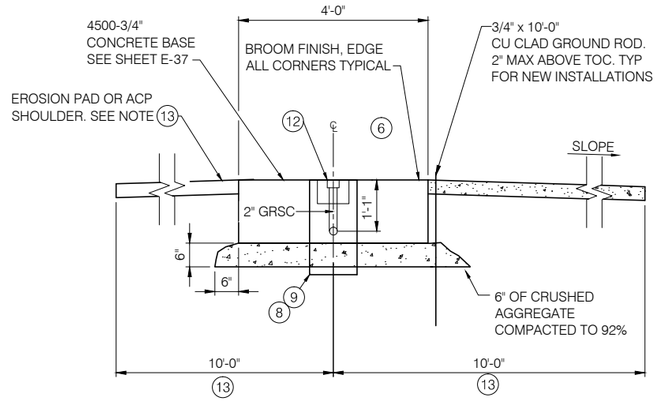
NOTES:

1. CONTRACTOR TO VERIFY DEPTH OF EXISTING SAND BASE PRIOR TO INSTALLING GEOTEXTILE.
2. APPLY 5" P-401 ASPHALT SURFACE WITHIN 2 HOURS OF APPLYING THE PRIME COAT.

3 TAXIWAY F SHOULDER
SCALE: N.T.S.



4 FOUNDATION FOR SINGLE AIRCRAFT GUIDANCE
SCALE: N.T.S.



5 TYPICAL SIGN SECTION
SCALE: N.T.S.

KEY NOTES:

1. FOUNDATION DETAILS ARE PROVIDED FOR CONTRACTOR INFORMATION ONLY. THEY REPRESENT THE ESTABLISHED PORT STANDARD DESIGNS FOR THE AIRCRAFT GUIDANCE SIGN TYPE IN USE AT PORTLAND INTERNATIONAL AIRPORT.
2. CAREFULLY MEASURE EACH EXISTING SIGN TO BE RELOCATED AND APPLY THOSE DIMENSIONS TO DETAIL 1, AS REQUIRED. THE WIDTH AND DEPTH SHOWN ARE MINIMUMS. THE LENGTH MUST BE DETERMINED USING THE SIGN LENGTH PLUS THE DIMENSION GIVEN.
3. NEW SIGNS TO BE INSTALLED SHOULD BE CONSIDERED TYPICAL AS SHOWN IN DETAIL 1, FOR THE PURPOSES OF FOUNDATION AND EROSION PAD SIZING. MEASUREMENT ADJUSTMENTS MAY BE REQUIRED DEPENDING UPON SIGN MANUFACTURER.
4. CONFIRM THE ACTUAL MEASUREMENTS AND CONFIGURATION OF EACH NEW SIGN AND APPLY THOSE DIMENSIONS TO DETAIL 1. THE WIDTH AND DEPTH SHOWN ARE MINIMUMS. FOR EXAMPLE, THE FOUNDATION LENGTH WILL BE DETERMINED USING THE SIGN LENGTH PLUS THE DIMENSIONS GIVEN. THE CONCRETE FOUNDATIONS SHALL EXTEND BOTH LONGITUDINAL DIRECTIONS 5-INCHES BEYOND THE SIGN LENGTH.
5. EACH FOUNDATION SHALL HAVE A MINIMUM OF TWO 3/4 INCH, HEAVY-DUTY, EMBEDDED LIFTING INSERTS RATED BY A FACTOR OF TWO TO THE CALCULATED LOAD AND INSTALLED FOR OPTIMUM WEIGHT DISTRIBUTION.
6. SURVEY AND STAKE EACH SIGN LOCATION. THE DIMENSIONS PROVIDED IDENTIFY THE FOUNDATION CENTER AT THE END OF THE FOUNDATION NEAREST THE ACTIVE PAVEMENT. UNLESS OTHERWISE INDICATED, EACH SIGN CENTERLINE SHALL BE SET PERPENDICULAR TO THE TAXIWAY OR RUNWAY CENTERLINE WITH THE FOUNDATION NO FURTHER THAN 55 FEET SETBACK FROM THE PAINTED STRUCTURAL EDGE OF THE ACTIVE PAVEMENT. EXCEPTION: DISTANCE REMAINING SIGNS WILL BE 75 FEET.
7. PRIOR TO EXCAVATION AT EACH SIGN LOCATION, THE CONTRACTOR SHALL CAREFULLY OBSERVE AND NOTE THE EXISTING SITE ELEVATION AND GRADE. MAINTAINING THE EXISTING DRAINAGE, ESTABLISH THE FOUNDATION ELEVATION BASED UPON THE EROSION PAD STARTING FLUSH WITH THE TOP OF FOUNDATION AND SLOPING A MAXIMUM OF 3% IN ALL DIRECTIONS. THE EDGES OF THE EROSION PAD SHALL FINISH 1-1/2 INCH ABOVE GRADE TO ALLOW FOR TURF BUILD-UP.
8. NEW OR RELOCATED L-867 JUNCTION CAN SHALL BE LOCATED CLEAR OF THE FOUNDATION AND FLUSH WITH THE EROSION PAD FINISH GRADE. WHEREVER POSSIBLE, IT SHALL BE PLACED NEAR THE END OF THE SIGN CLOSEST TO THE ACTIVE PAVEMENT. THE BASE CAN SHALL BE SET AT THE HIGHEST ADJACENT PAVEMENT ELEVATION. NO LOW SPOTS IN ASPHALT WILL BE ALLOWED. CONVENIENCE WILL NOT BE A FACTOR IN PLACING JUNCTION CANS OR ROUTING DUCTS.
9. EACH JUNCTION CAN, THROUGH AN EXTERNAL GROUND LUG ON THE JUNCTION CAN, SHALL BE GROUNDED TO A 3/4" x 10'-0" COPPER CLAD GROUND ROD. THE SIGN SHALL BE SOLIDLY GROUNDED USING THE SIGN GROUND LUG, TO A THERMAL WELD OR HIGH-PRESS CONNECTION ON A SEPARATE GROUND ROD. FURNISH AND INSTALL ALL THERMAL WELD OR HIGH- PRESS MATERIALS AND TOOLS, EACH OF WHICH SHALL BE COORDINATED AND SPECIFICALLY DESIGNED FOR THE USE.
10. EACH BASE FLANGE SHALL BE ATTACHED WITH FOUR, 1/2 INCH STAINLESS STEEL ALL THREAD RODS, NUTS AND WASHERS. CONNECT #6 BARE OR GREEN INSULATED COPPER CONDUCTOR WITH LOCK NUTS BETWEEN SIGN HOUSING & GROUND ROD. SEE DETAIL 2, SHEET E-36.
11. EACH SIGN SHALL BE PROTECTED BY TWO CABLE TETHERS, ONE AT EACH END. SOLIDLY ATTACH EXISTING OR CONTRACTOR FURNISHED TETHERS BETWEEN THE SIGN AND THE NEAREST FLANGE ANCHOR. UNLESS SPECIFICALLY APPROVED OTHERWISE BY THE ENGINEER, ON A CASE BY CASE BASIS, THE TETHER USED SHALL BE SPECIFICALLY DESIGNED FOR THE PURPOSE BY AN AIRCRAFT GUIDANCE SIGN MANUFACTURER.
12. FOR INSTALLATION OF SECONDARY CONDUCTORS AT POINT INDICATED, SEE DETAIL 3, SHEET E-36.
13. SEE SIGN SCHEDULE AND PLANS FOR APPLICATION OF ASPHALT EROSION PAD.

CAN YOU SEE THE AIRPLANES? THE ADJACENT SAMPLES SHOW THREE DIFFERENT LEVELS OF SHADING. SETTINGS FOR VIEWING AND PRINTING DRAWING CONTENT ARE OPTIMIZED WHEN ALL THREE PLANES ARE VISIBLE. THIS GUIDANCE IS PROVIDED FOR REFERENCE ONLY.

NO.	DATE	BY	REVISIONS	APPVD	CK'D

NO.	DATE	BY	REVISIONS	APPVD	CK'D

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PORTLAND, OREGON

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PORTLAND INTERNATIONAL AIRPORT

CAD STANDARDS MANUAL
EXAMPLE DETAIL DRAWING

SUBMITTED BY	TYPE	DRAWING NO.	SHEET NO.	DISC. SHT. NO.
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