PORT OF PORTLAND

CAD Standards Manual

2023

Contents

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 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 and a separate technical staff kickoff meeting intended for technical staff only. At this meeting, the Port's CAD/BIM manager and a representative from the Port's Digital Center will discuss the Port's drawing standards and drawing preparation process with technical staff from the consultant and their sub consultants.

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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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
- Solidworks

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.

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 initial setups (File Naming for PDF's, drawing layers, font, dimension styles, Civil 3D styles and data shortcuts, coordinate system) 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.

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 Our Business, then select Vendors and Contractors. Scroll down to Project Design and Construction and select Learn More. On this page you will find tabs for design standards, specification masters, drawing templates and construction services. The CAD templates are located in the drawing template tab. 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 and standard blocks used by the Port. 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, however it 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

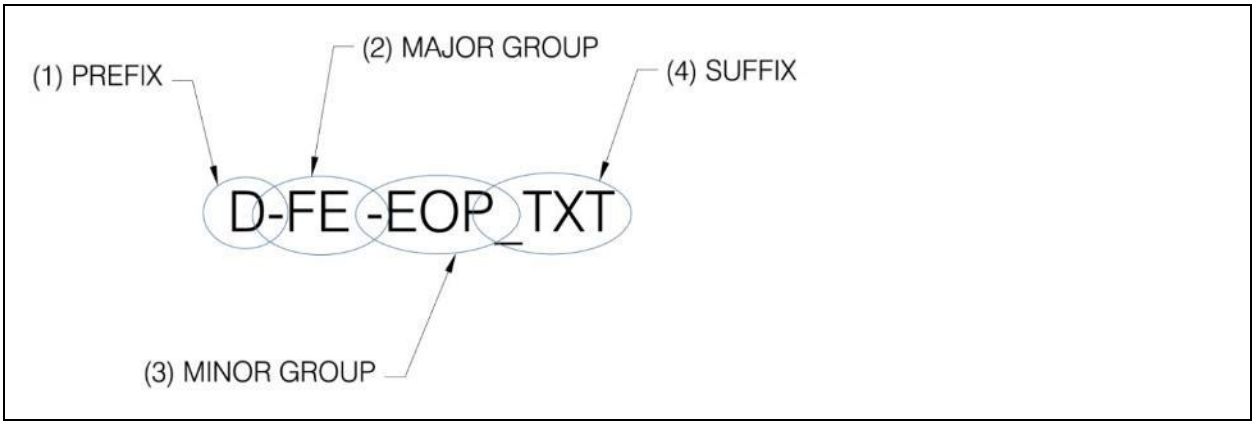
Ba-Existing Utilities.dwg or Ba-Design Utilities.dwg.

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……..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 13

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 14

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.”

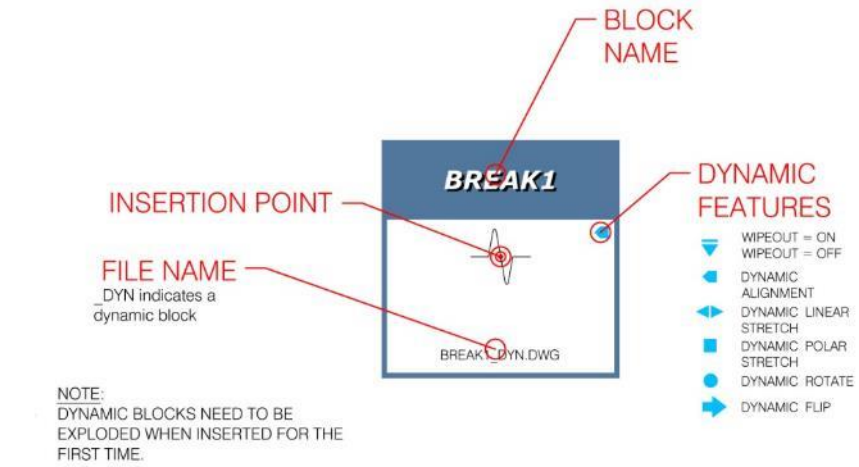
PEN WEIGHT CLASSIFICATION

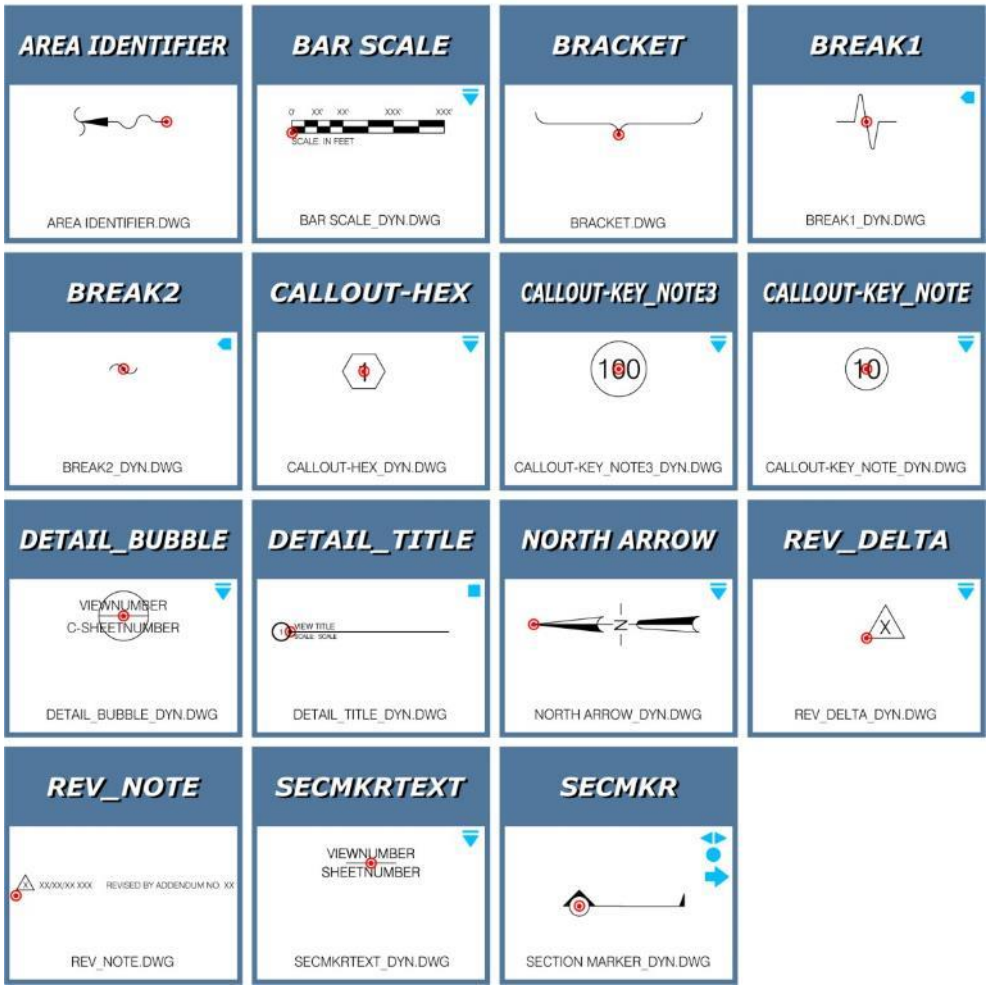
CLASSIFICATION	EXAMPLE	PEN WEIGHT
Extra Fine		0.005
Fine		0.008
Standard		0.010
Medium		0.015
Heavy Medium		0.020
Light Bold		0.025
Bold		0.031
Extra Bold		0.045

Figure 15

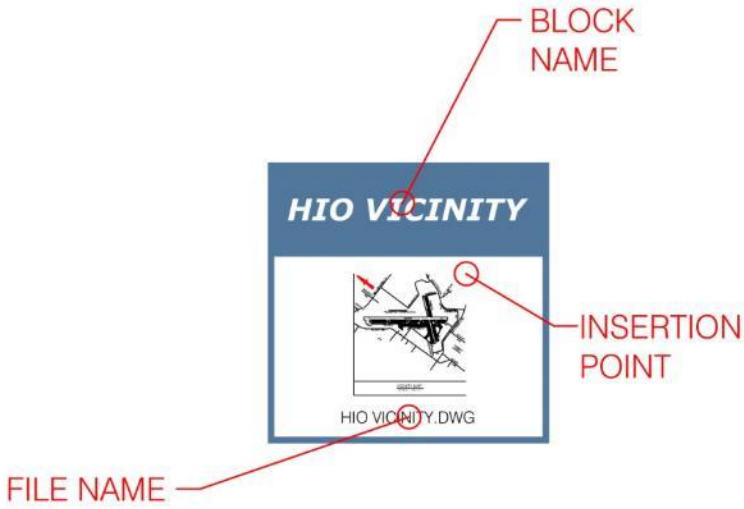
Symbology – Sheet Information

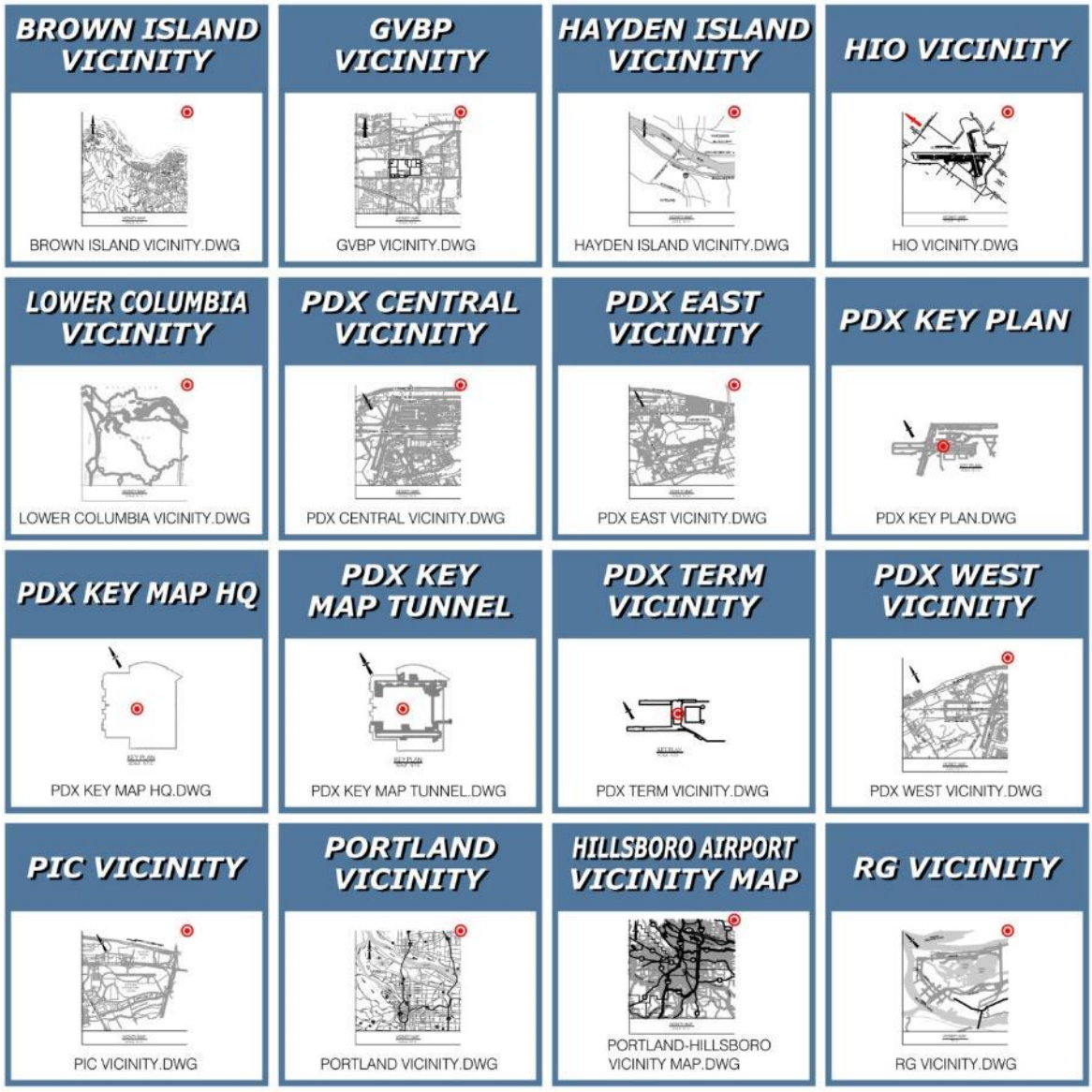
The Port's symbols for sheet information shall be used on all projects. See the discipline sections later in this chapter for specific symbols required for each discipline.





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

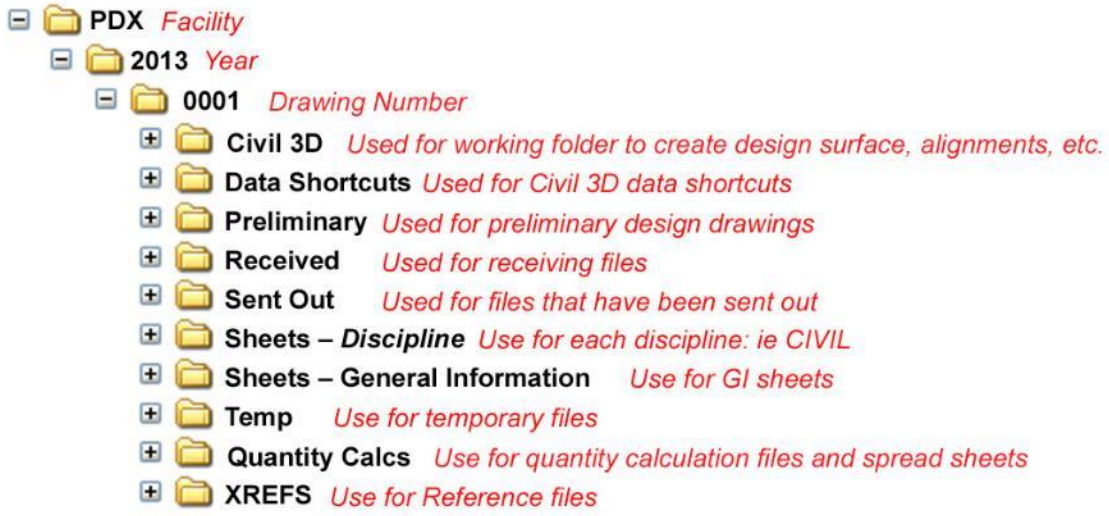
This section describes the Port's standards for civil design projects. All of the standards listed in drawing setup are applicable to civil projects. Below is specific information used to create and submit civil design plans to the Port. Whenever possible, use the Port created Civil 3D styles in all 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 contract work area, haul route, staging area, construction access route, survey datum information, monuments, conversions to other references, etc. Aerial images are not accepted for use as a site plan. The Port provides an acceptable site plan for your use. In addition, a Port-provided vicinity map showing the larger area outside the construction site is inset onto the sheet typically in the upper right corner. For small construction projects without a site plan, 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, ***do not scale*** the vicinity map. You may place the vicinity map block in the lower right, upper left, or lower left (in order of preference). Circle the project area and label, "PROJECT SITE." See the appendices for an example.

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

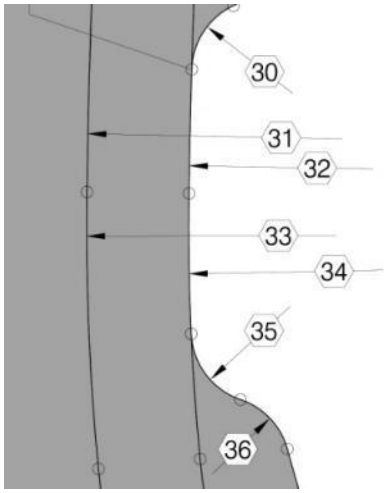
Survey control drawings show the location of the project, and the control points that will be used for the project. See the *Survey* section later in this chapter for more information.

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 16

Curve Tables

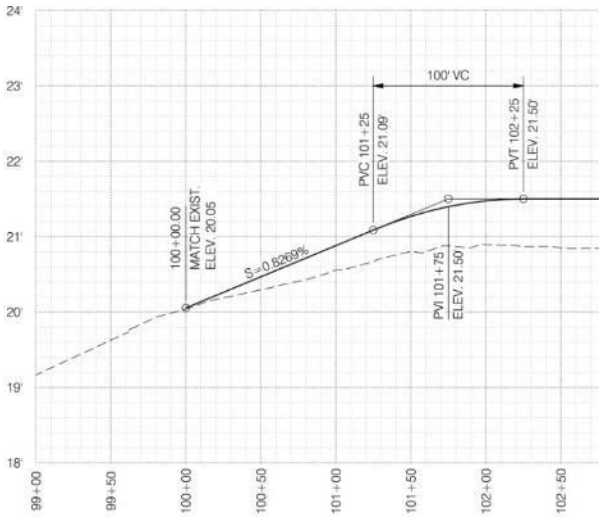
Curve tables will include the curve number, radius, delta, tangent, length and radius points in station and offset to the appropriate alignment.

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 17

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 18

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.

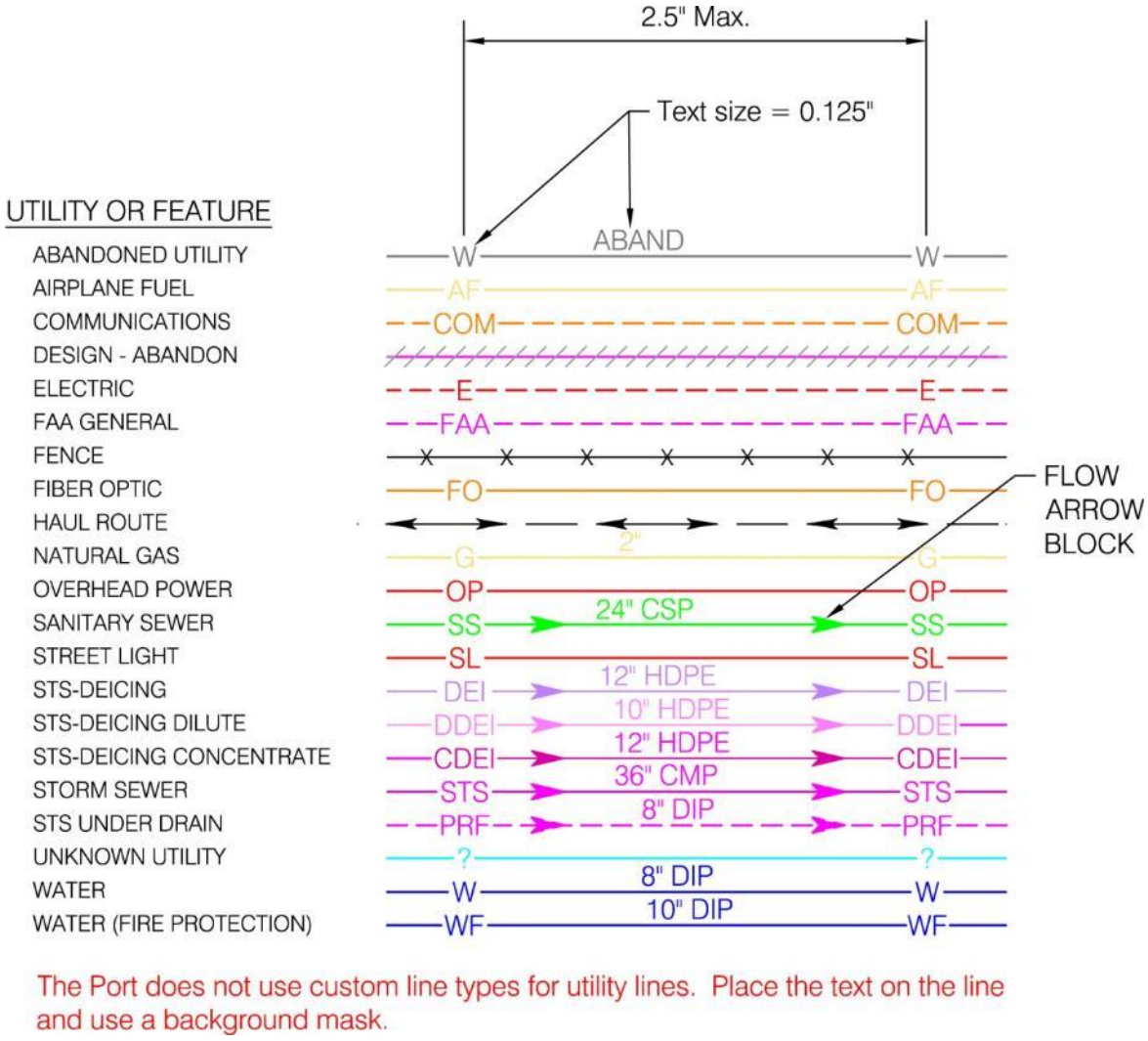


Figure 19

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

Civil 3D Styles

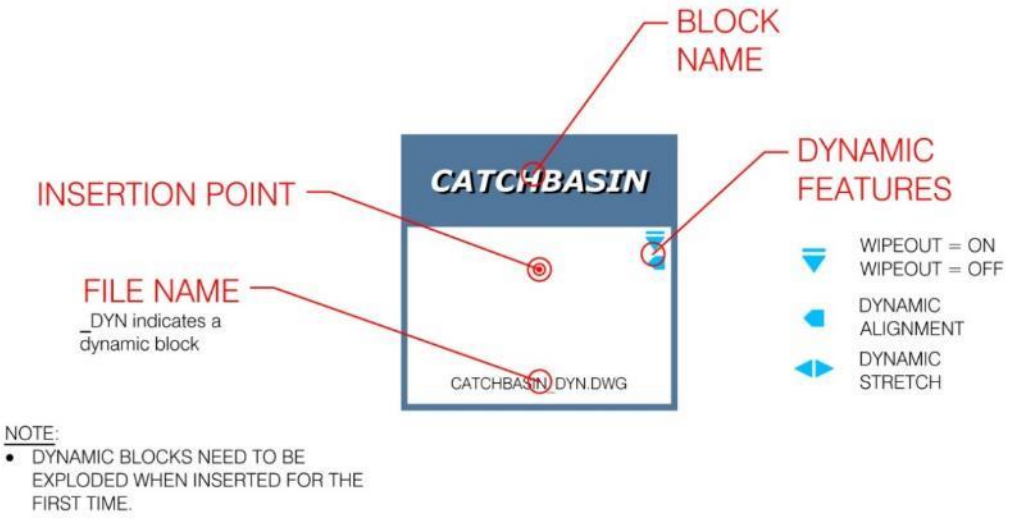
The Port maintains a set of Civil 3D styles typically used on Port civil projects. Some styles may need to be modified for specific situations by the user. As new styles are created, or updates to existing styles are made, they will be updated on the web site. If a new style needs to be created where none existed before, every effort must be made to maintain the look of Port standards. It is best practice to download the Port-Civil3D Master Styles Design.dwg before staring a project to ensure you have the latest styles created by the Port.

Civil & Railway Symbology

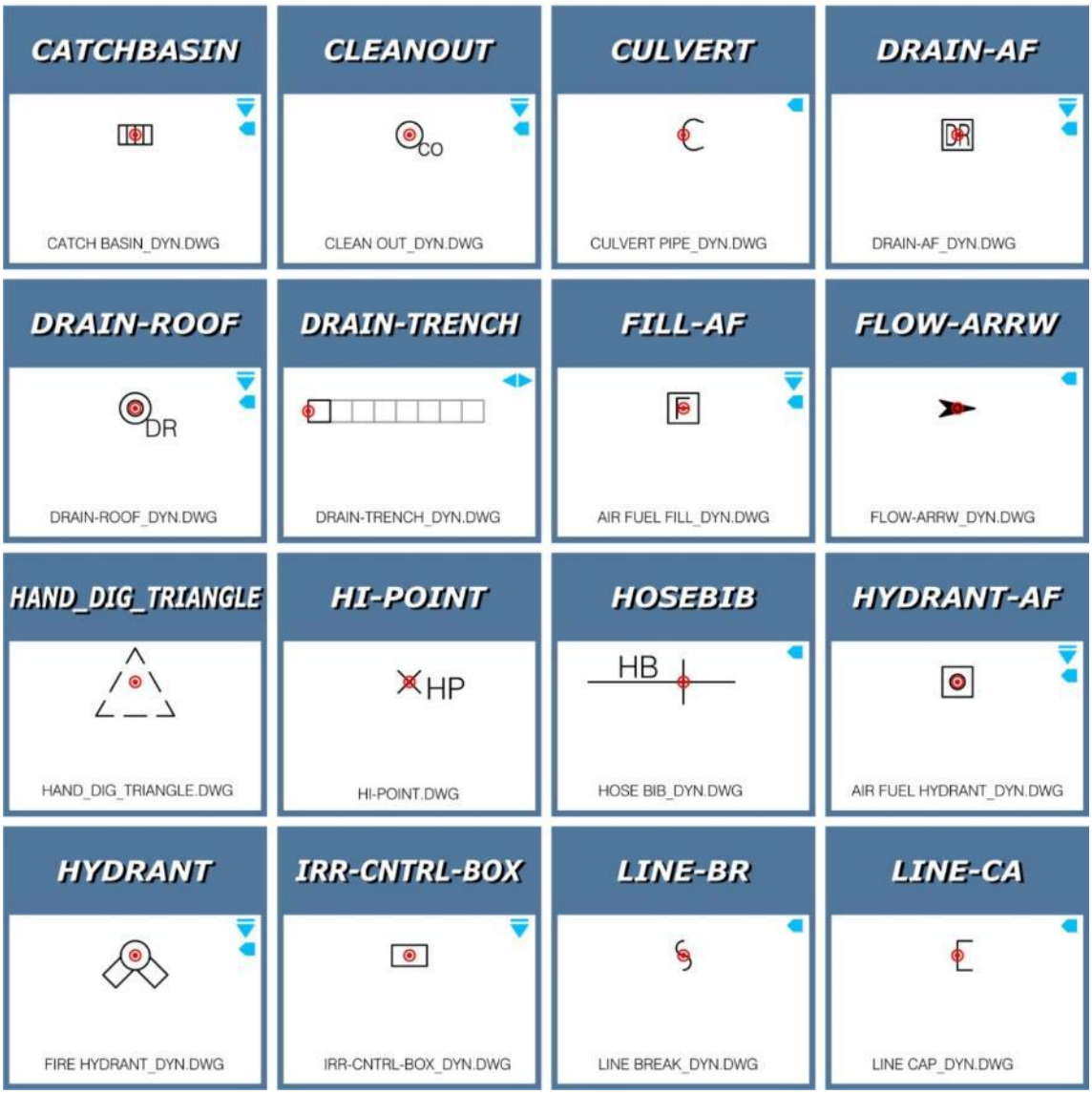
The Port's symbols (blocks in AutoCAD) for civil design, electrical and communication utilities, airfield lighting, civil features, railroad, and vicinity maps shall be used on all projects as required. If a block is not supplied by the Port, obtain approval from the Port's Project Engineer and CAD manager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

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

Symbology – Civil Design

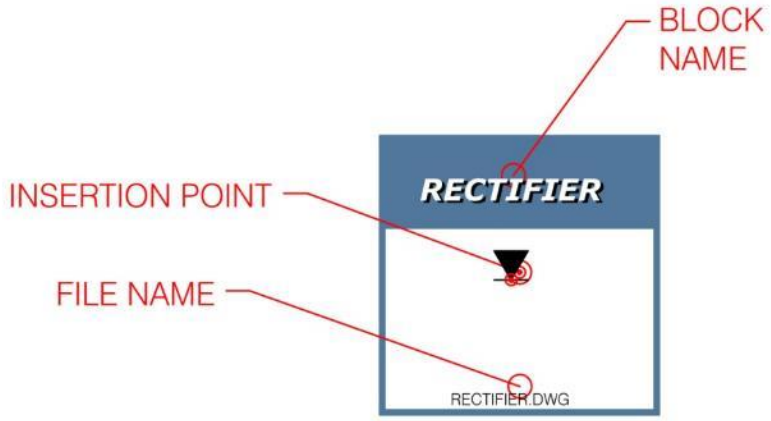


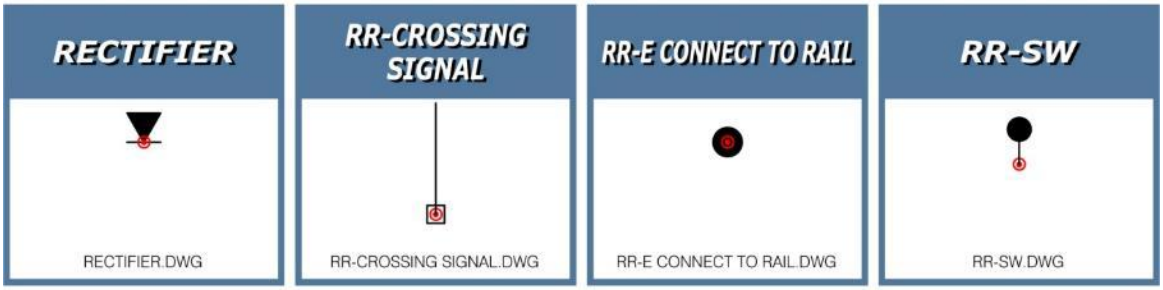
NOTE:
- DYNAMIC BLOCKS NEED TO BE EXPLODED WHEN INSERTED FOR THE FIRST TIME.




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

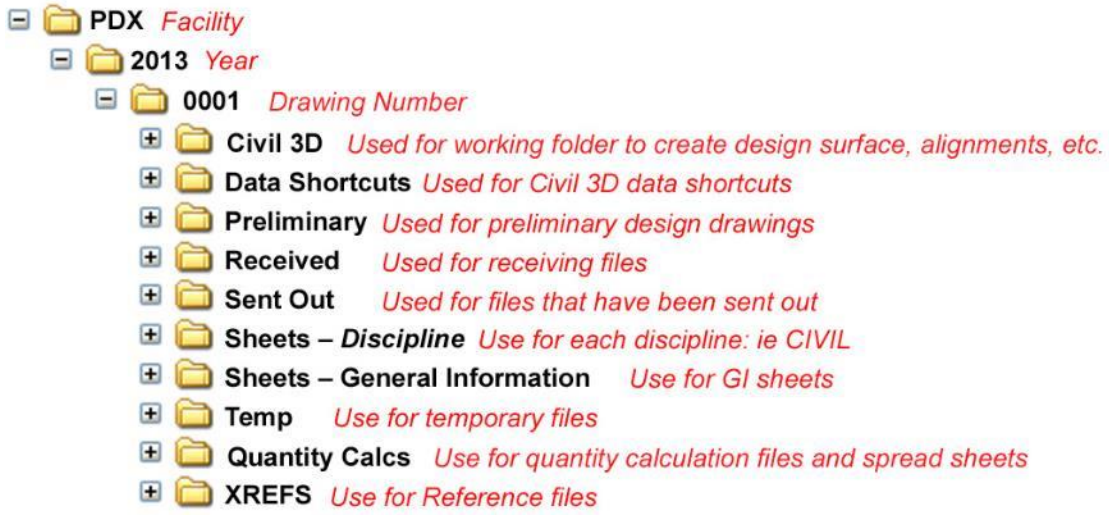
Airfield Electrical Design Graphical Standards

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:

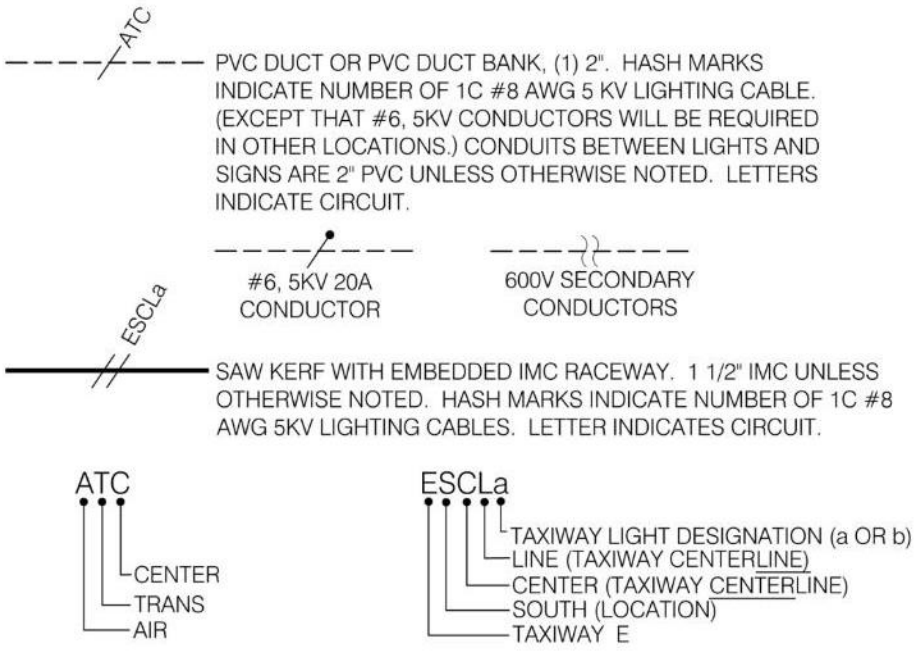


Figure 20

Circuit Designation

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

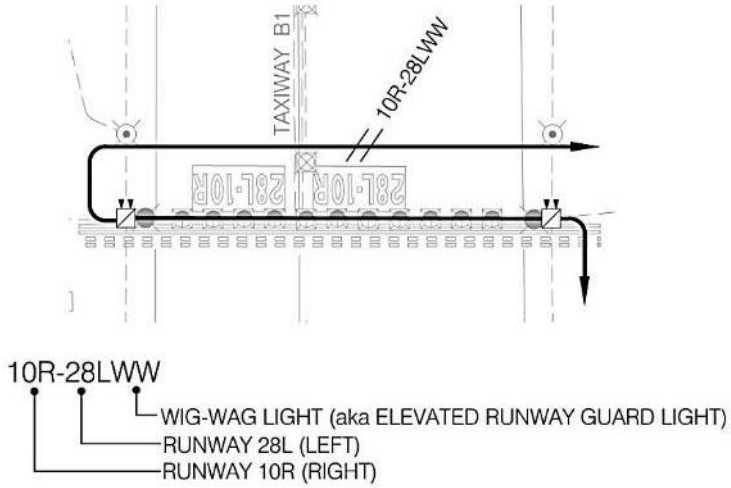
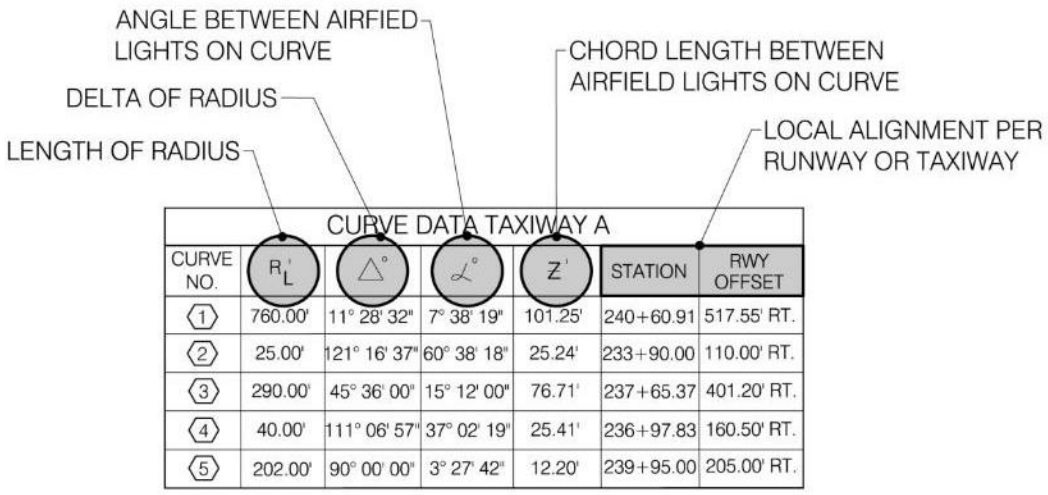


Figure 21

Airfield Lighting Geometry Data

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

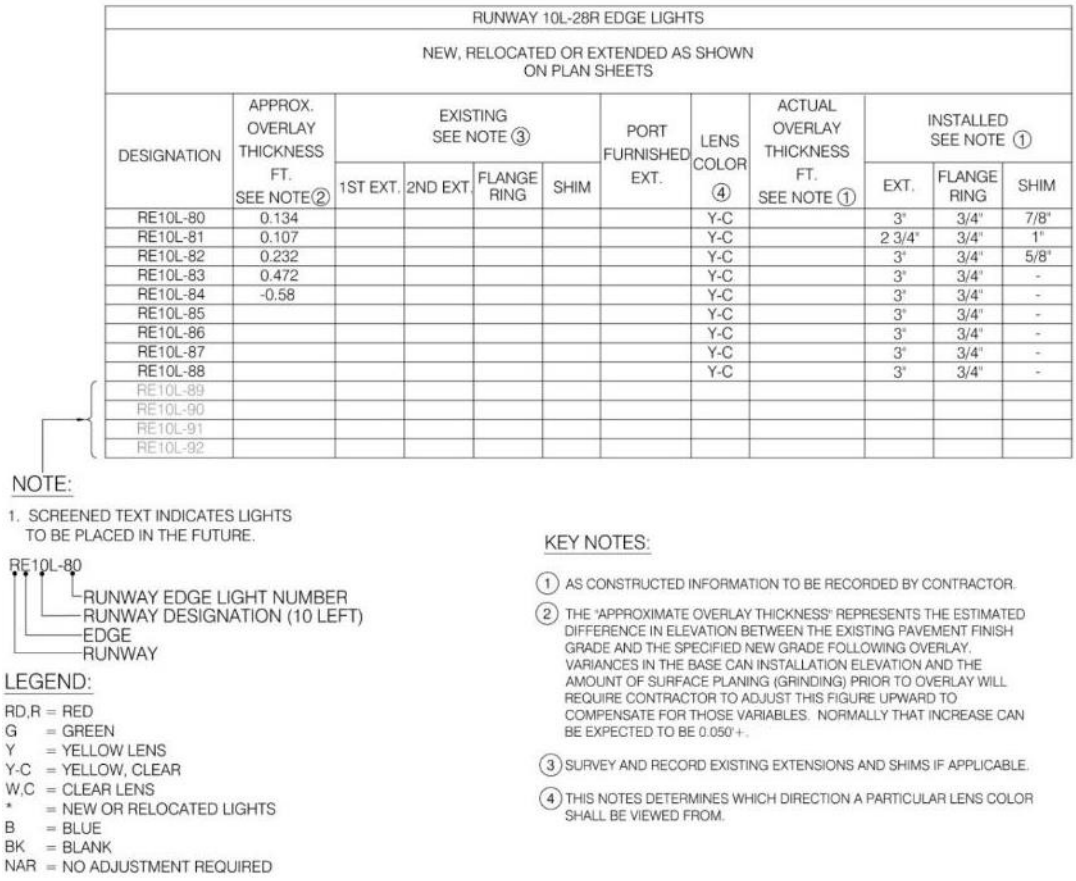


CURVE NO.	R_L'	$\Delta°$	$\measuredangle°$	Z'	STATION	RWY OFFSET
1	760.00'	11° 28' 32"	7° 38' 19"	101.25'	240+60.91	517.55' RT.
2	25.00'	121° 16' 37"	60° 38' 18"	25.24'	233+90.00	110.00' RT.
3	290.00'	45° 36' 00"	15° 12' 00"	76.71'	237+65.37	401.20' RT.
4	40.00'	111° 06' 57"	37° 02' 19"	25.41'	236+97.83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

Figure 22

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 NOTE ②	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 234

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 24

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

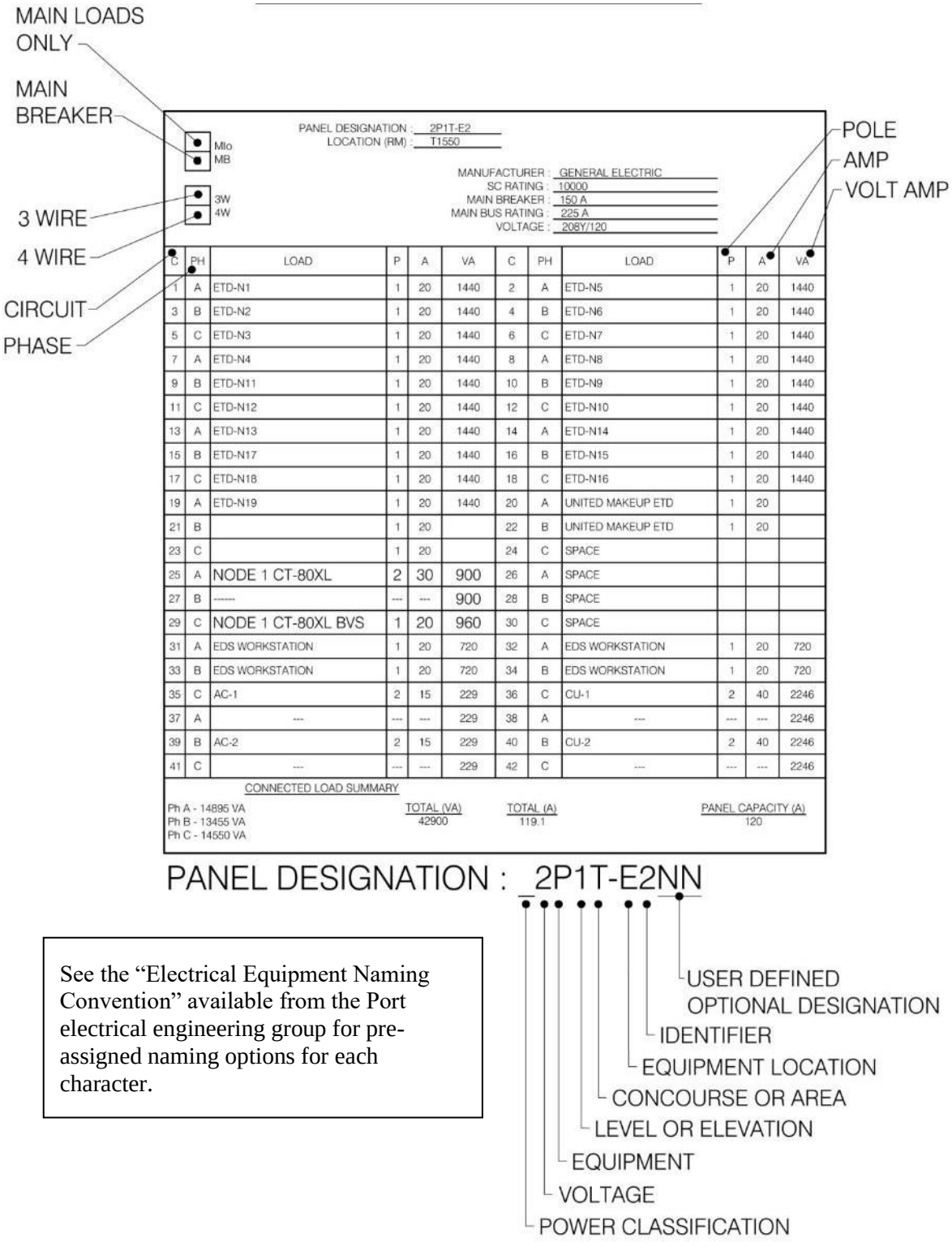
NOTE:

1. NAR =NO ADJUSTMENT REQUIRED

Figure 25

Panel Schedule Format

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

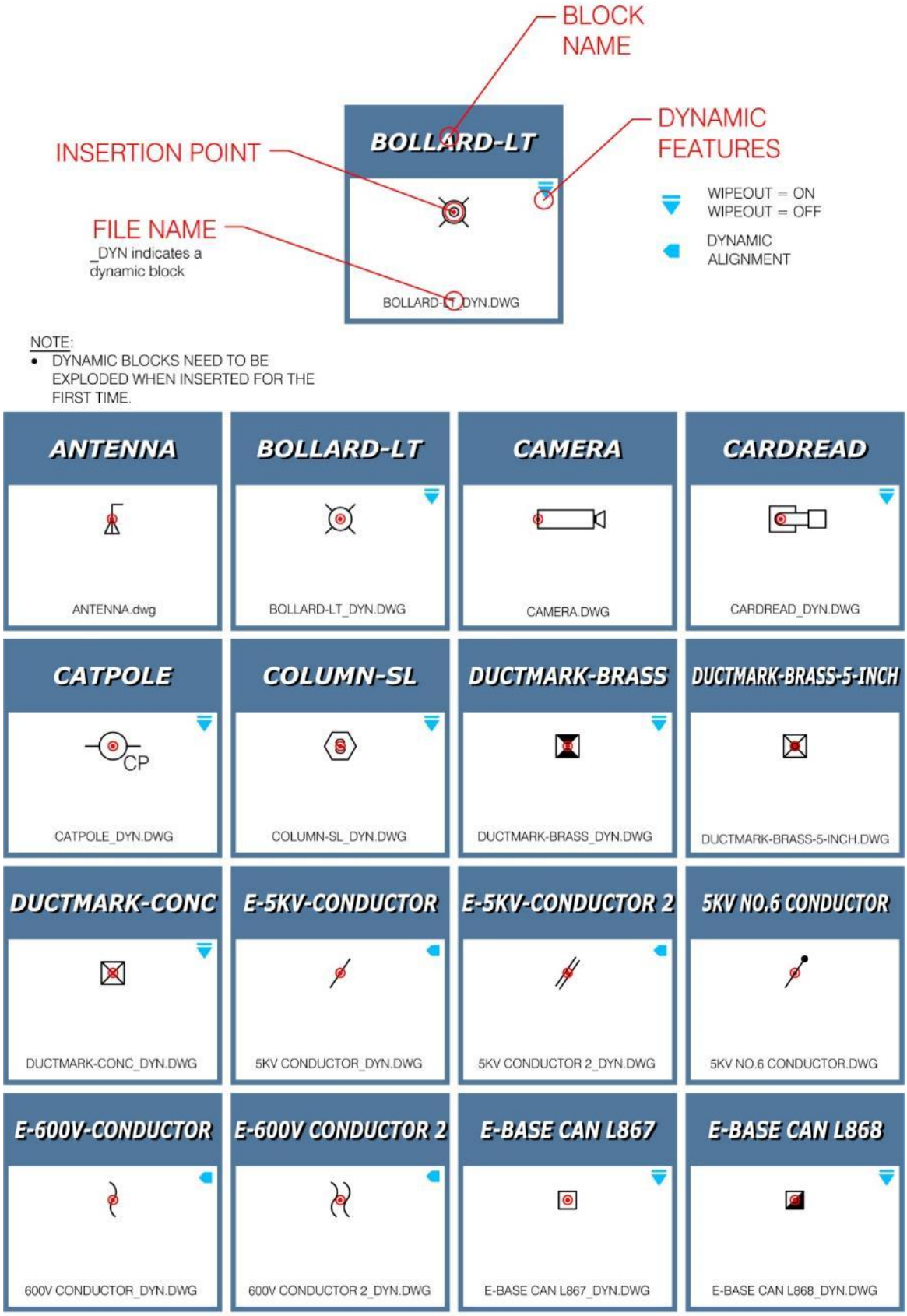


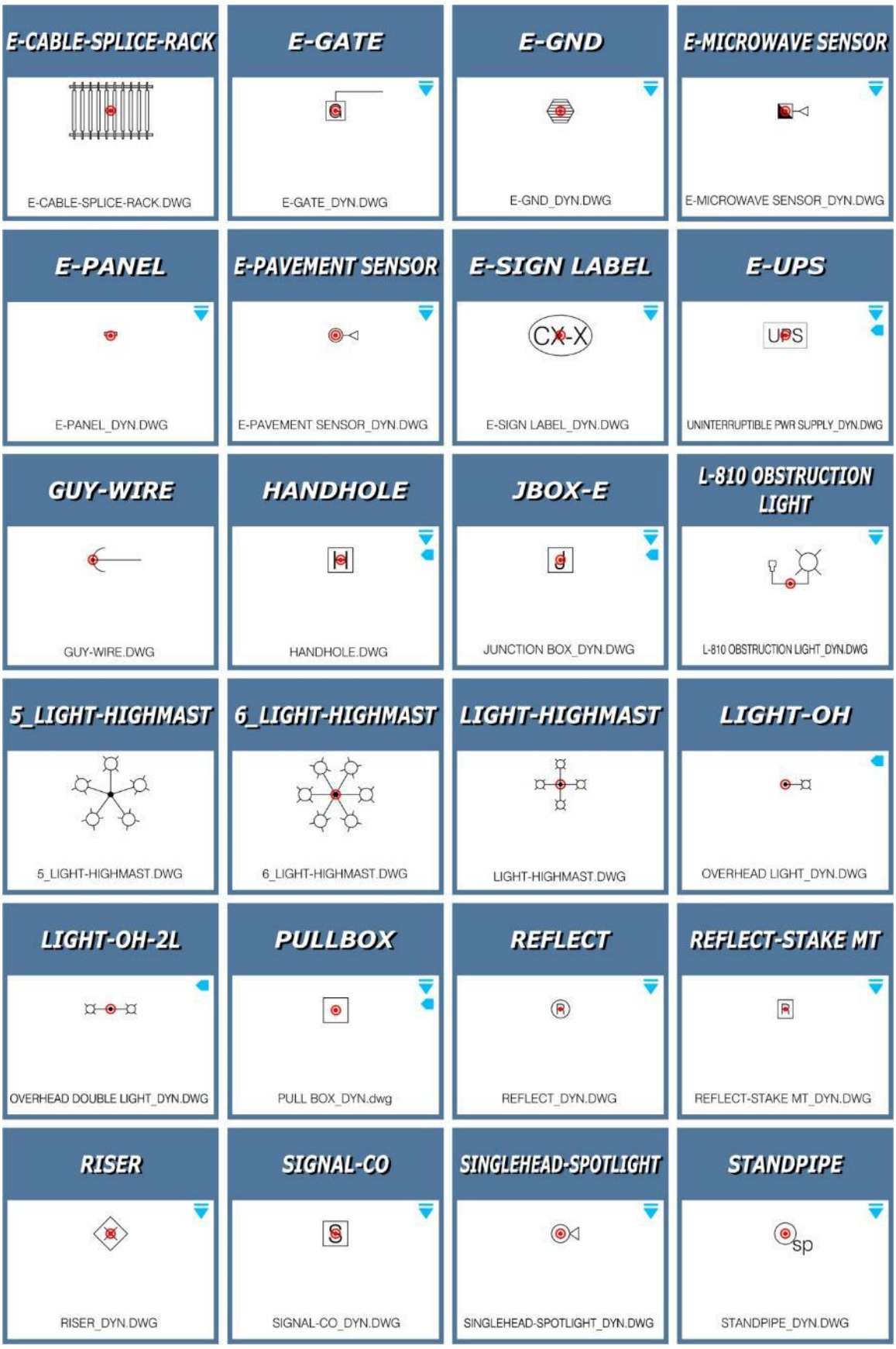
C	PH	LOAD	P	A	VA	C	PH	LOAD	P	A	VA
1	A	ETD-N1	1	20	1440	2	A	ETD-N5	1	20	1440
3	B	ETD-N2	1	20	1440	4	B	ETD-N6	1	20	1440
5	C	ETD-N3	1	20	1440	6	C	ETD-N7	1	20	1440
7	A	ETD-N4	1	20	1440	8	A	ETD-N8	1	20	1440
9	B	ETD-N11	1	20	1440	10	B	ETD-N9	1	20	1440
11	C	ETD-N12	1	20	1440	12	C	ETD-N10	1	20	1440
13	A	ETD-N13	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

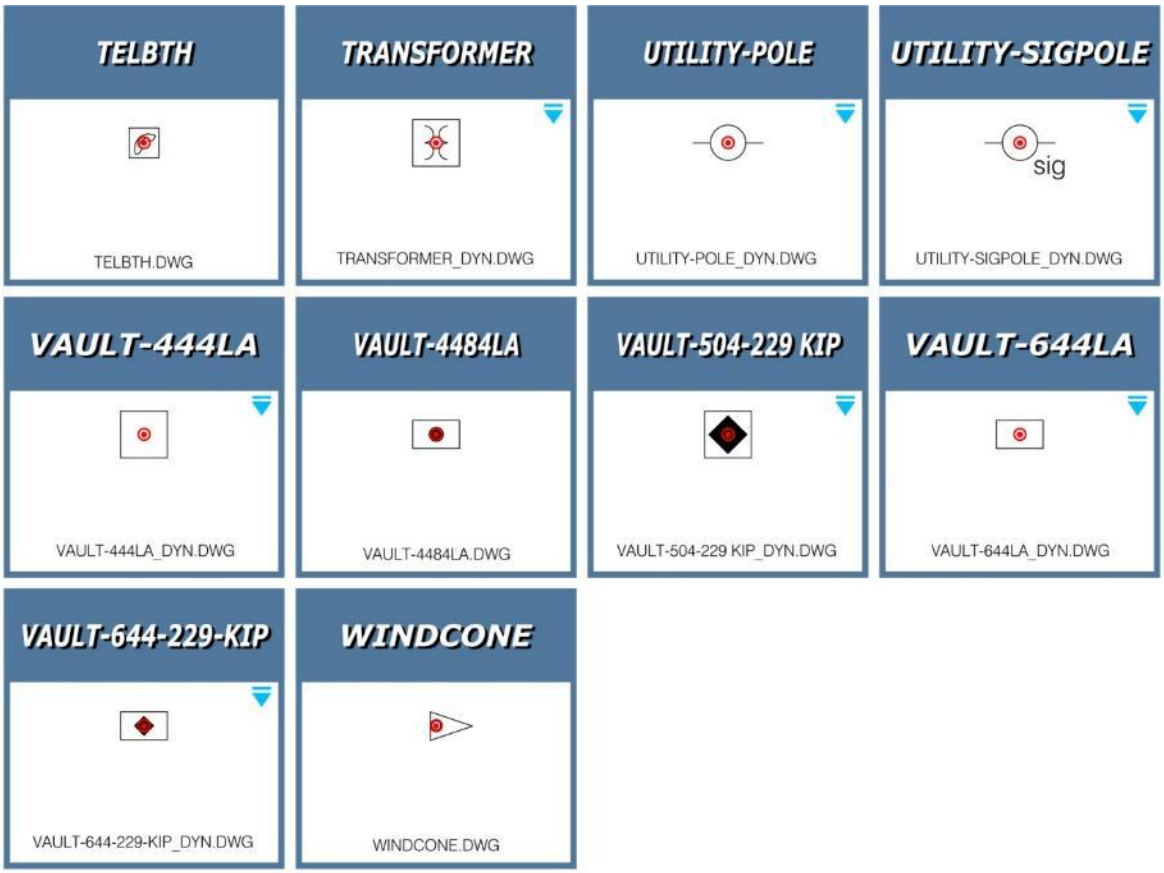
See the "Electrical Equipment Naming Convention" available from the Port electrical engineering group for pre-assigned naming options for each character.

Figure 26

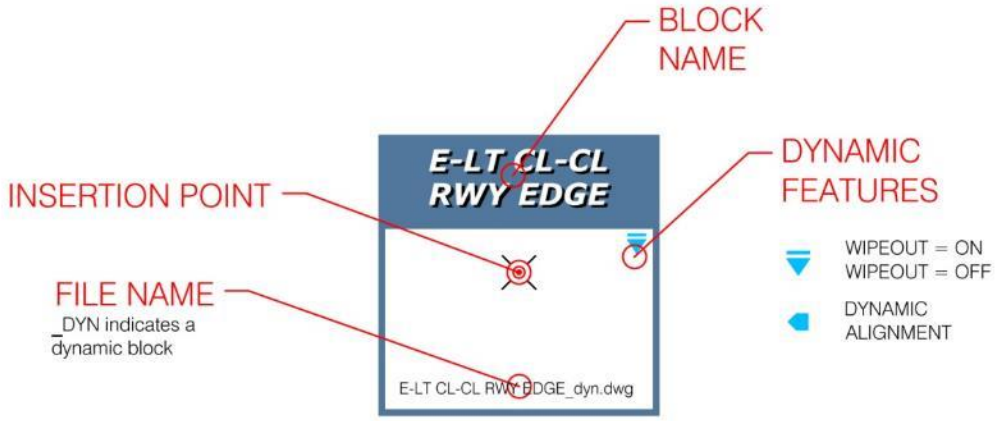
Symbology – Electrical and Communication Utilities



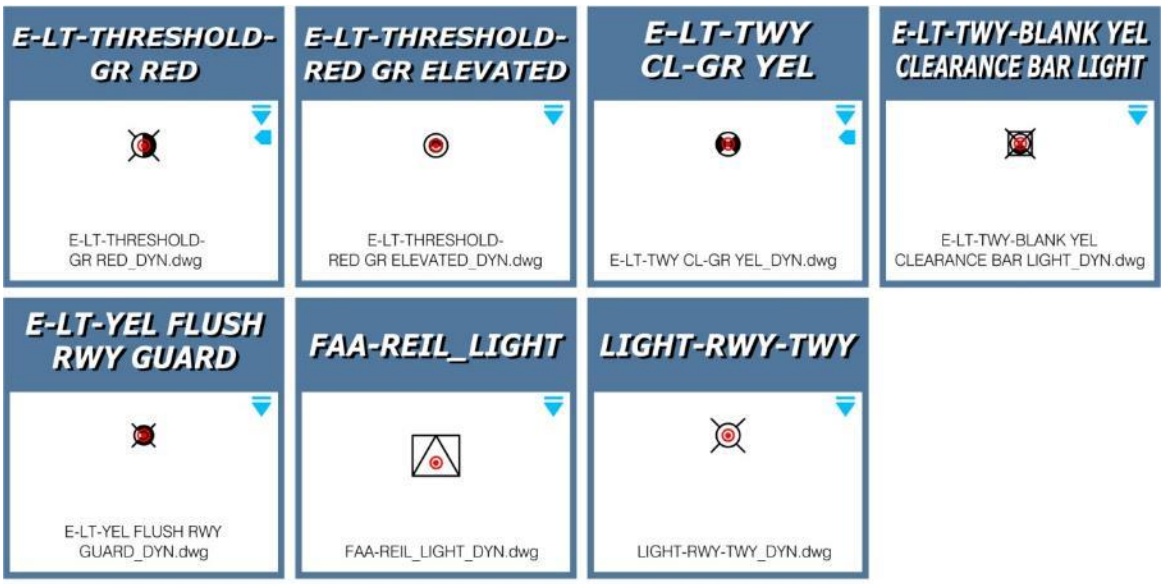

E-CABLE-SPLICE-RACK
E-CABLE-SPLICE-RACK.DWG
E-GATE
E-GATE_DYN.DWG
E-GND
E-GND_DYN.DWG
E-MICROWAVE SENSOR
E-MICROWAVE SENSOR_DYN.DWG
E-PANEL
E-PANEL_DYN.DWG
E-PAVEMENT SENSOR
E-PAVEMENT SENSOR_DYN.DWG
E-SIGN LABEL
E-SIGN LABEL_DYN.DWG
E-UPS
UPS
UNINTERRUPTIBLE PWR SUPPLY_DYN.DWG
GUY-WIRE
GUY-WIRE.DWG
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.

Common mistakes with survey drawings for the Port

It is strongly recommended that all survey drawings for the Port of Portland begin by using the **Port Survey Civil 3D template drawing**. There are dozens of styles already set up in the template for use. Once the drawing is all labeled, the unused styles can be purged from the drawing.

A few of the most common mistakes are:

- Beginning drawings using the consultant's own or custom description key set where the consultant keeps their own codes and maps them to the Port's layer, symbol, etc. This is problematic when the Port begins to work with these points and adding our own points into the mix.
- Blocks are inserted into the drawing as separate objects. If there is an error in the survey code, it involves two steps, one for editing the descriptor, and one for updating or replacing the block or putting the block on the correct layer. If the block (style) is part of the cogo point (which it should be), then editing the descriptor and then applying the description key automatically updates the style to be the correct symbol and on the correct layer.
    - Solution for both:
        - Set up a **consultant to POP survey code description key set**. See *Consultant Guide for own Codes to Port of Portland Alpha Codes as the Raw Descriptor in AutoCAD Civil 3D* for detailed explanation.
- Use of Mtext and leaders for callouts. There is too much manipulation of the objects, of which there are two solutions:
    - Solution:
        - Use the POP-Callout multileader style
          OR the quicker and preferred method:
        - Use Civil 3D's note labels. The Port's survey template has several styles for callouts based on the the point's description, note and elevation. See pages 7-8 from the Port of Portland Survey Data to Civil 3D 2013 S.O.P. for more detail.

Survey File Transfers to the Port

File transfer requirements are described earlier in this manual. CAD deliverables to the Port with points should have raw descriptions with the Port's numeric or alpha survey codes along with the notes field populated with the field note data.

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

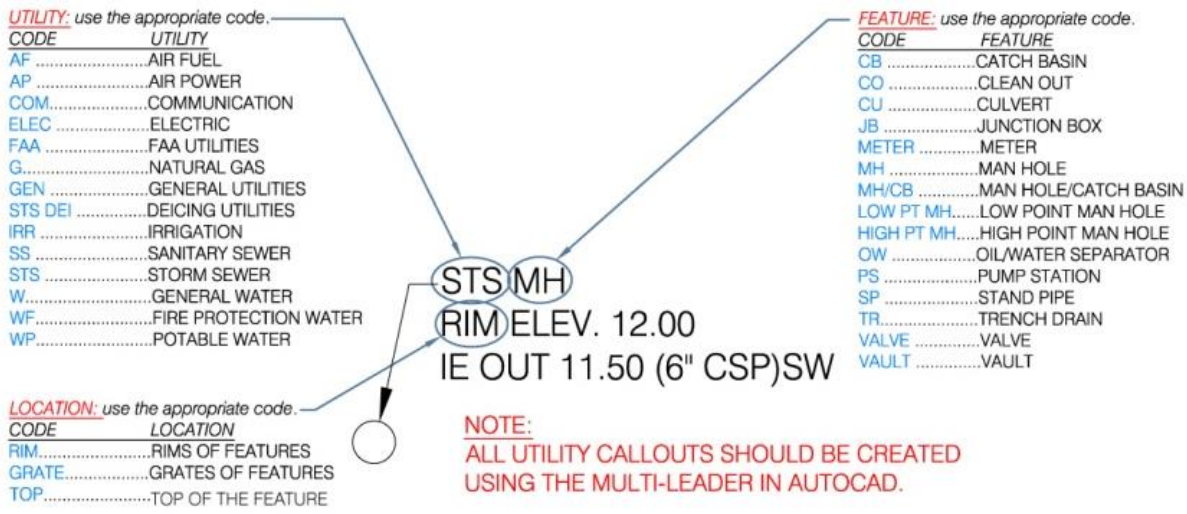
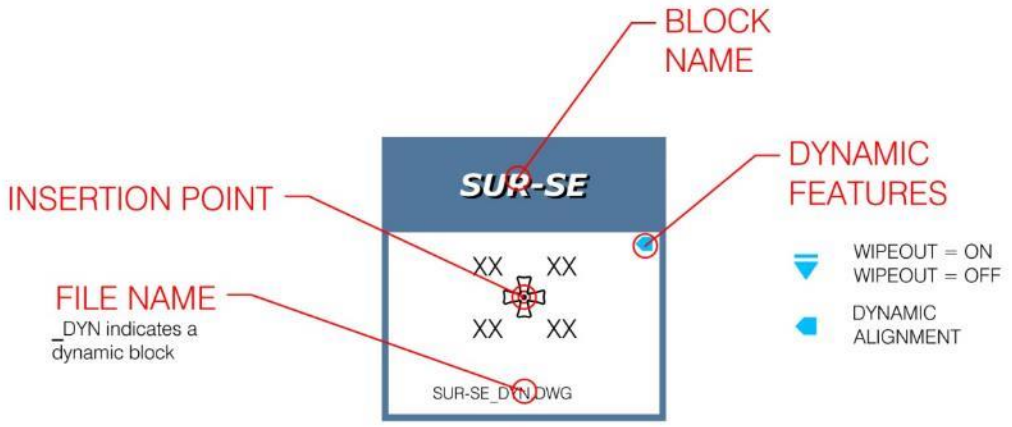


Figure 27

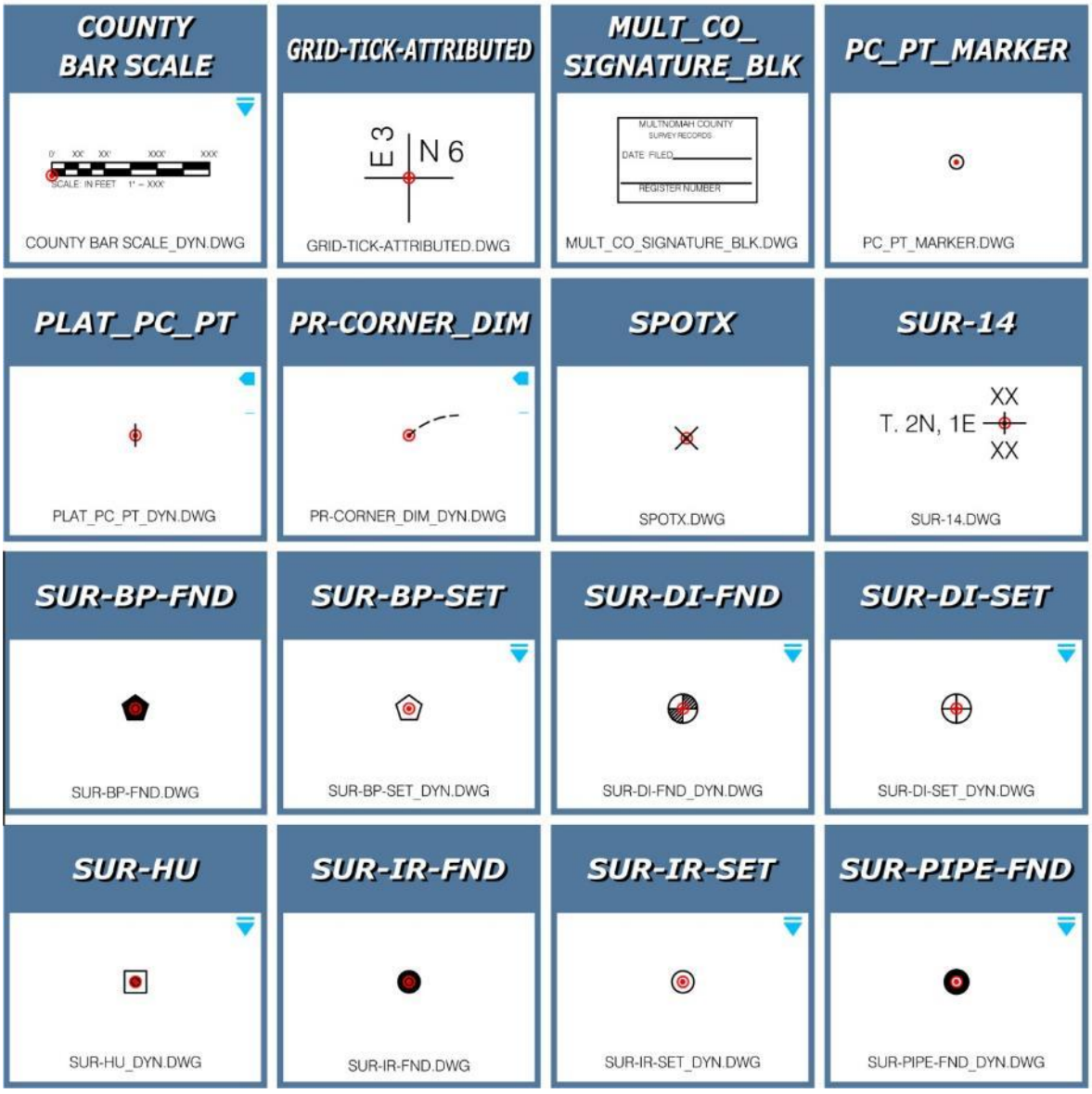
Survey Civil 3d Styles

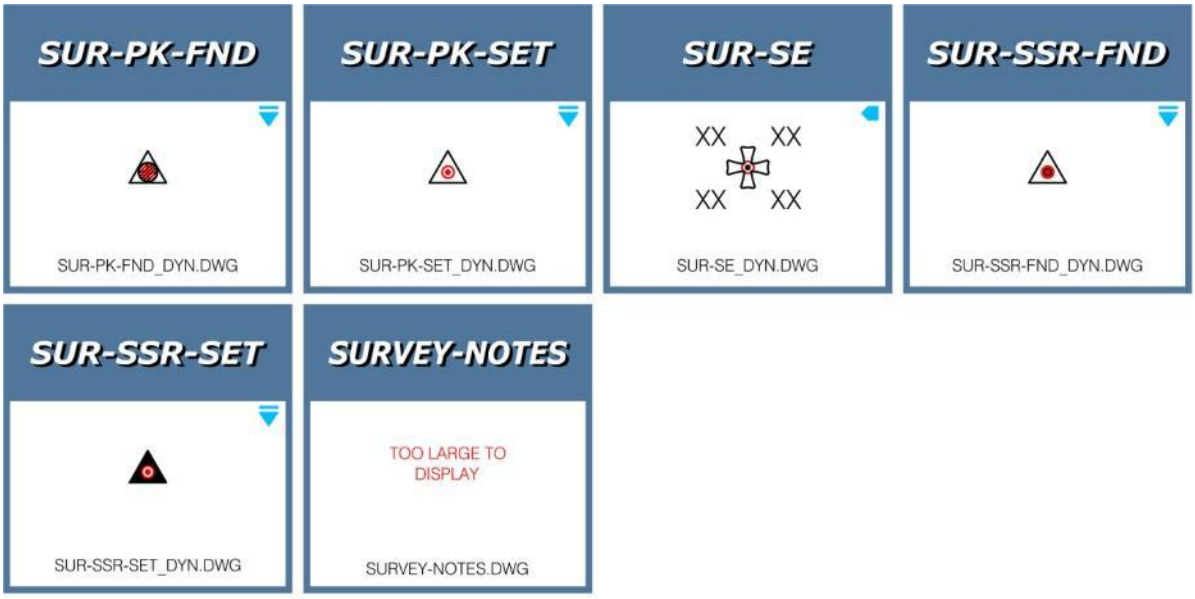
The Port maintains a set of Civil 3D styles typically used on Port survey projects. Some styles may need to be modified for specific situations by the user. As new styles are created, or updates to existing styles are made, they will be updated on the web site. If a new style needs to be created where none existed before, every effort must be made to maintain the look of Port standards. It is best practice to download the Port_Civil3D_Survey_Styles.dwt before staring a project to ensure you have the latest styles created by the Port

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