Note: Revisions for October 2009 are marked in yellow highlight. A short yellow highlight indicates deleted text.

SECTION 2: DRAFTING PRACTICES

2.1 COMPUTER AIDED DRAFTING (CAD)

2.1.1 Standard File Format

The standard file format for submission of electronic CAD files to the Bridge Section is in a Microstation design file. Currently Bridge Section uses Microstation Version 8.1.

2.1.2 Directory Setup

Every XP Workstation has been set up with a similar directory diagram. This will enable any user to find information on another workstation efficiently. Project files **will be stored on the server under F:\ODOT_DATA\Projects\key #.** Every Workstation has a c:\share" directory. This will allow Drafters to share details freely.

Use Serval software when copying or moving a file from another workstation, rename the file to avoid multiple copies of one file.

Bridge Standard Drawings files can be found in dgn and pdf format at:

http://egov.oregon.gov/ODOT/HWY/ENGSERVICES/bridge_drawings.shtml

2.1.3 Cad Files

2.1.3.1 Drawings Start to Finish

1. CAD files created.
2. The design offices are responsible for obtaining the structure numbers, drawing numbers, and calc book numbers from the Bridge Data system (BDS) and headquarters Bridge Section.
3. "D" size (22" x 34") mylars are printed with appropriate bridge and drawings numbers.
4. 11" x 17" paper prints are created from the full sized stamped and signed bridge mylars.
5. Design office will provide "D" size bridge mylars and 11" x 17" paper prints to the Office of Pre-Letting in Salem headquarters.
6. Office of Pre-Letting will the send "D" size mylars to ODOT Reprographics for printing and scanning.
7. ODOT Reprographics is finished with scanning; they will send requested information back to the office of Pre-Letting. ODOT Reprographics will send Bridge Mylars and scanned images to Bridge Engineering Section front office in room 301 of the Transportation Building.

2.1.3.1 Drawings Start to Finish – (continued)

8. Bridge Engineering Section Headquarters will load scanned images into the Bridge Data System (BDS), log the Mylars into the tracking system, and then return the signed mylars to original design office.

9. At completion of construction, the Project manager will send as-constructed comments to the original design office for review by the Engineer of record.

10. Comments will then be placed by hand drafting on the original mylars.

11. Once as-constructed comments are completed, one new set of 11” x 17” paper prints will be provided to the Bridge Operations Engineer in Bridge Section Headquarters in Salem for data entry into PONTIS BMS.

12. Original as-constructed comments are returned to the Project Manager’s office. “D” size Mylars are returned to Bridge Section Headquarters, front office.

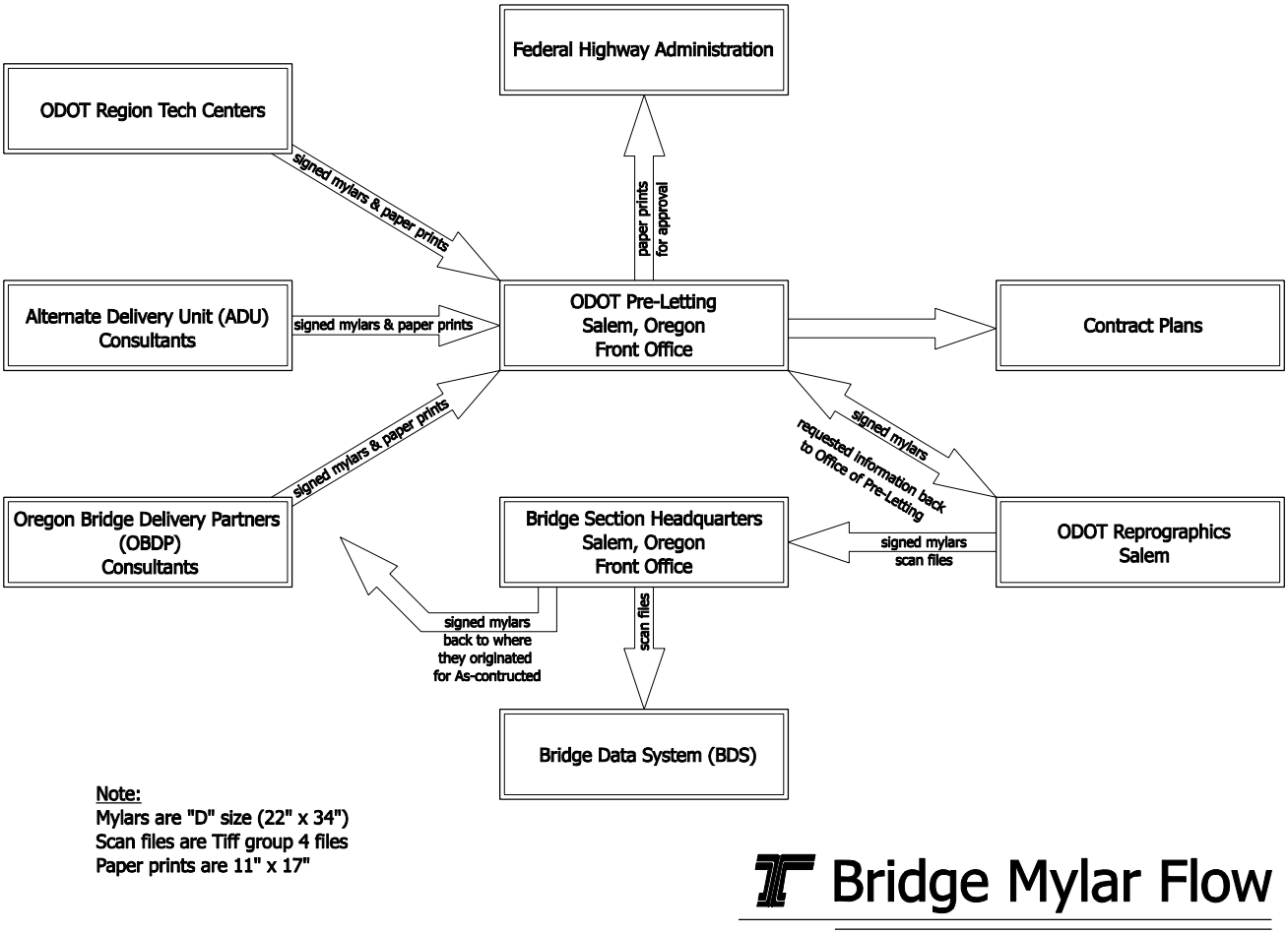


Figure 2.1.3.1A

2.1.3.2 What Bridge Headquarters Needs At Completion of a Design Project.

- "D" size mylars and 11" x 17" paper prints must be included as part of the PS&E submittal package provided to the ODOT Office of Pre-Letting. The 11" x 17" paper prints will be used for the project advertisement and bidding process.
- The submitted bridge mylars will be scanned and sent to the Bridge Engineering Section. The Bridge Section will return the mylars to original design office.
- After construction is completed, "D" size mylars should be sent to Bridge Engineering Section Headquarters in Salem with as-constructed comments hand drafted on them. Bridge Section will then place the as-constructed version in the Bridge Data System (BDS) and archive the mylars.
- Foundation Report.
- Hydraulics Report.
- All calculation books (Engineer of record and Checkers).
- Project Files to be archived per Records Retention Policy (Bridge will scan this information and then pass on to appropriate sections).
- Load rating of as-constructed bridge per Load Rating Guidelines.
- CAD Files in Microstation Format. All files need to be cleaned of excess information and only contain contract plans drawings. All drawings must be in the appropriate file as defined by the BDDM.
- Consultants – Files need to be handed off to Bridge Headquarters.
- ODOT Personnel – Files need to be archived in Engineering Archive site. See 2.10 Archiving CAD files for information.

2.1.3.3 Shared Details

2.1.3.3.1 Example Drawings

Example drawings of repair/retrofit and different structure types can be found at:

ODOT ftp site: ftp://ftp.odot.state.or.us/Bridge/BDDM/Example_Drawings/

For a complete list of Example drawings, see Appendix 2.1.3 CAD FILES.

2.1.3.3.2 Standard Details

Standard Details are a drawing that provides information about a given item; this drawing is un-stamped and made available only as details to help speed up the CAD process. Standard Details can be found at the following website:

http://egov.oregon.gov/ODOT/HWY/ENGSERVICES/details_bridge.shtml

2.1.3.4 File Naming Conventions

All structures have different drawings such as Layout and Index drawings, Deck Plans, Bents, but 95% of all structures have similar drawing types. They may have multiples of each of these drawings, so use the coinciding span number or Bent number in the view name, such as Span 2 or Bent 1.

Drafter Initials, Structure Number, File I.D., extension (.dgn)

File Identification
L = Layout & Title Drawings
S = Superstructure Drawings
B = Substructure Drawings

Layout & Title Drawings	Superstructure Drawings	Substructure Drawings
Layout and Index sheet	Deck Plan	Footing Plan
Plan and Elevation	Deck Section	Plan and Elevation–Bent 1
General Notes	Framing Layout	Bent Details – Bent 1
Foundation Data Sheet	Longitudinal Girder Elevation	Bearing Details – Bent 1
Stage Construction	Camber Diagram	Wingwall - A Details
Miscellaneous Details	Post-tensioning sheets	Shearlug
Work Bridge Details	Rail Details	

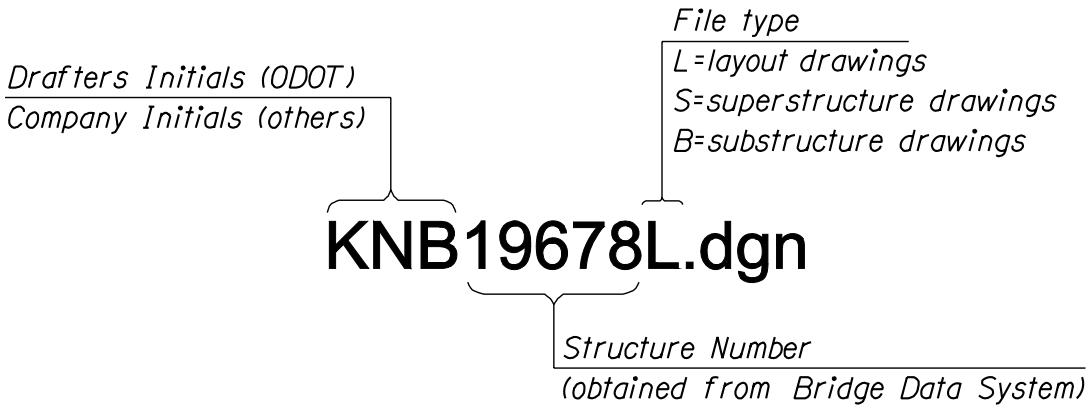


Figure 2.1.3.4A

2.1.3.5 Microstation Models

All Title and Layout files (see Section 2.1.3) will have Existing Bridge Model and Proposed Bridge Model. See Figure 2.1.3.4A.

Existing Bridge model will have any existing information necessary for the project.

Proposed Bridge model will have alignment information obtained from Roadway Designer with the new bridge shown in the coordinate correct location. This model will be shared with Geo/Hydro Section for their use.

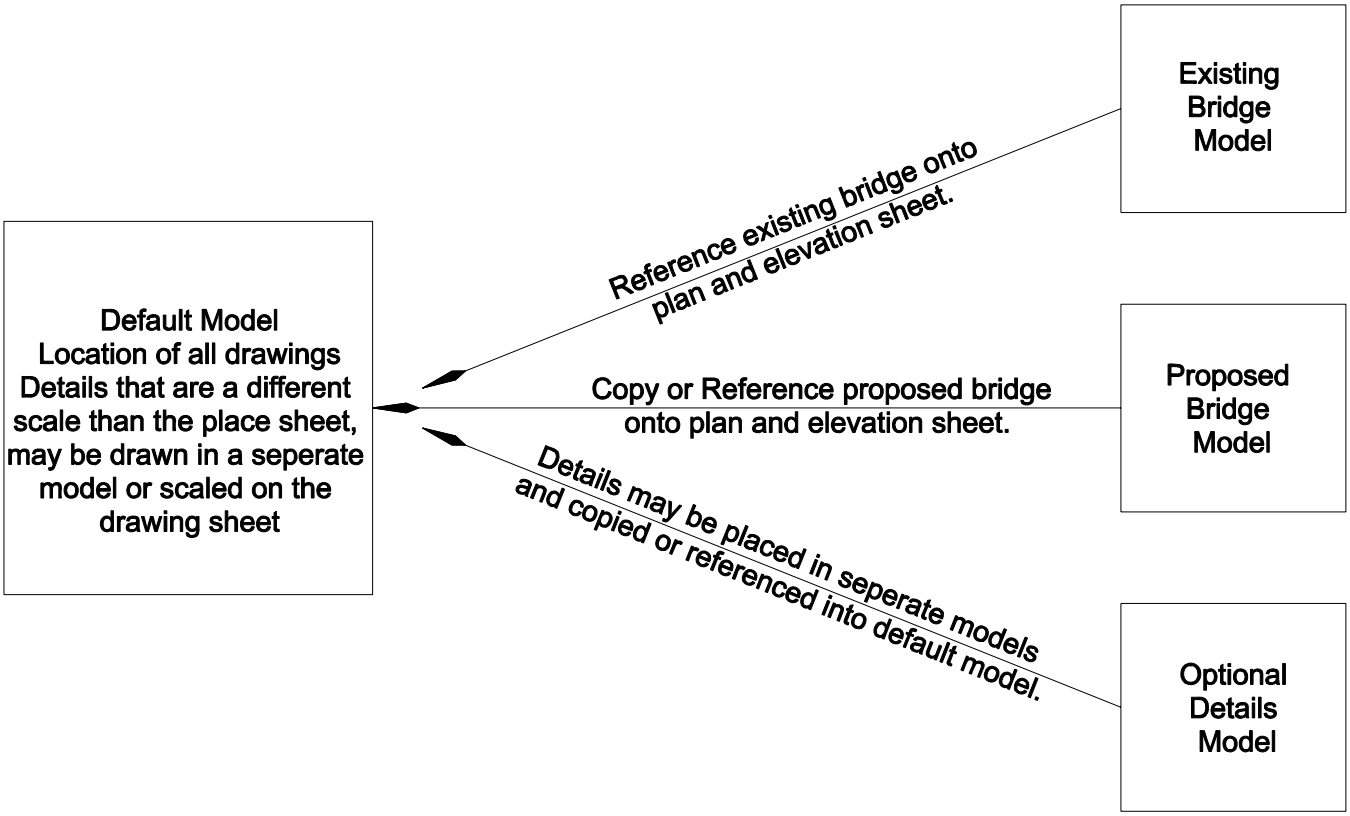


Figure 2.1.3.4B

2.1.4 Cell Libraries

All Microstation cell libraries reside on the server plus a personal cell library, for location see below.

Bridge Section Standard Cell Library

Location on server = ODOT_SPACE\Standards\Cell\Bridge.cel

For a paper copy of the cell library, see appendix A2.1.4

Personal Cell Library

Location on server = ODOT_DATA\ENG_APP\Cell\Personal Cell Library Name.cel

Registration Seal Cell Library

This Library shall be maintained by the Senior Bridge Drafter in each Region for their Professional Engineers. Place the file in:

Location on server = ODOT_DATA\ENG_APP\Cell\Registration Seals Library Name.cel

2.1.5 Menus

There are several types of menus that will be discussed below.

- Custom Palettes - A palette menu can be created in Microstation using Workspace>Customize. See Figure 2.1.5A.

- Function Key Menus - To set certain operations to function keys on your keyboard (F1, F2 ...), in Microstation use Workspace>Function Keys..., remember to save when finished. Each individual may have their own version of a function key menu.

- ODOT Menu - In Microstation, select the menu word ODOT and choose Menu from the drop down list. The ODOT Menu will open showing a greater then symbol ">". Click ">" to choose a menu from the drop down list containing Bridge, Construct, Existing, FDPlans, and others. See Figure 2.1.5B.

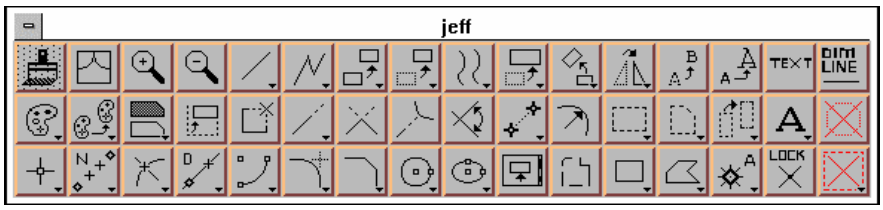


Figure 2.1.5A

Figure 2.1.5B

2.1.6 Seed Files

Seed files are the beginning of every file, when creating a new file, the system copies your seed file to create a new file. ODOT seed files are located:

ODOT_SPACE\Standards\Seed\Seed2d.dgn
Seed3d.dgn
SeedRW2d.dgn

2.1.7 Color Table

The Bridge Section color table allows bridge elements to be display in different colors. Corresponding text for a given element will be a slightly different shade of the same color. By following this color scheme it allows you to quickly visualize the different bridge components. See Figure 2.1.7.1A for RGB color values.

BRIDGE COLOR TABLE VALUES

	Color componets (RGB 0- 255)			
CO=	Red	Green	Blue	Microstation color name
0	255	255	255	White
1	92	209	255	Custom blue
2	0	255	1	Green
3	255	0	0	Red
4	255	255	0	Yellow
5	255	105	180	Hot Pink
6	255	123	255	Orange
7	179	0	255	Custom purple
8	255	0	255	Magenta
9	133	255	149	Custom green
10	255	215	0	Gold
11	154	205	50	Yellow green
12	244	164	96	Sandy brown
13	0	250	154	Medium green spring
14	210	105	30	Chocolate
15	255	228	196	Bisque
16	245	245	245	White smoke
17	140	190	255	Custom blue
18	0	179	25	Custom green
19	255	100	94	Custom red
20	255	255	132	Custom yellow
21	255	192	203	Pink
22	255	199	102	Custom tan
23	209	113	255	Custom light purple
24	255	161	255	Custom lilac
35	255	31	109	Custom pink
51	250	128	114	Salmon

Figure 2.1.7A

2.1.8 Scales

When selecting a scale, keep in mind that the drawing will be reduced to half size. For any given structure, all plans should, whenever possible, be drawn at the appropriate scale for the same details. Sections and views may be enlarged to show more detail, but the number of different scales used should be kept to a minimum. When scaling CAD details, use Figure 2.1.6A. (An enlarged version is available from Drafters.)

The scale listed under each detail should read **Scale xxx = xxx** where xxx is the appropriate scale. **The scale shown would appropriate when the drawing is "D" size.**

All drawings are drawn full size to a scale of 1:1. Only when they are plotted do they become the specified scale.

Place a Scale Warning on all drawings to make it clear whether or not the drawing is scaleable, since Bridge drawings are "D" size and then reduce to 11 x 17 drawings for contract plans. See Figure 2.1.8A .

Figure 2.1.8A

Common scales for bridge drawings:

- Plan & Elevation - Use an english scale and make the plan as large as possible. (Remember to save room for location map in the upper right corner and General Notes, if possible).
- Footing Plan - As large as possible
- Deck Plan - Use either a 1/8" = 1'-0" or 1" = 10'-0".
- Deck Section - Use either a 3/8" = 1'-0" or larger.
- Bents - The plan and elevation of Bents are drawn to 1/4" = 1'-0" or 3/16" = 1'-0".

The outlined guidelines are to be adhered to as standard practice, but may be subject to unique situation(s) when alternate method(s) are required to be utilized.

Should a unique situation arise sound logical drafting practice(s) shall apply.

Following are the scale factors for English scales that are used for bridge drawings.

Scale	Scale Factor
3" – 1'-0"	4
1 ½" = 1'-0"	8
1" = 1'-0"	12
¾" = 1'-0"	16
½" = 1'-0"	24
3/8" = 1'-0"	32
¼" = 1'-0"	48
3/16" = 1'-0"	64
1/8" = 1'-0"	96

Scale	Scale Factor
3/32" = 1'-0"	128
1" = 60'-0"	720
1" = 50'-0"	600
1" = 40'-0"	480
1" = 30'-0"	360
1" = 20'-0"	240
1" = 15'-0"	180
1" = 10'-0"	120

2.1.8 Scales – (continued)

PLOT SCALE 1" = n'	SCALE FACTOR (up)	SCALE FACTOR (down)	MICRO STA. PLOTING FULL SIZE	MICRO STA. PLOTING 1/2" SIZE
60	720	.00139	60:1	120:1
50	600	.00167	50:1	100:1
40	480	.0021	40:1	80:1
30	360	.0028	30:1	60:1
20	240	.0042	20:1	40:1
15	180	.0056	15:1	30:1
10	120	.00833	10:1	20:1
3/32"	128	.0078	10.667:1	21.333:1
1/8"	96	.0104	8:1	16:1
3/16"	64	.0156	5.333:1	10.667:1
1/4"	48	.0208	4:1	8:1
3/8"	32	.0313	2.667:1	5.333:1
1/2"	24	.04166	2:1	4
3/4"	16	.0625	1.333:1	2.667:1
1"	12	.0833	1:1	2:1
1 1/2"	8	.125	0.667:1	1.333:1
3"	4	.250	0.333:1	0.667:1

Scale \ Factor	4	8	12	16	24	32	48	64	96	128	180	240	360	480	600	720	180	240	360	480	600	720
	3"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	3/16"	1/8"	3/32"	10	15	20	30	40	50	60	3/32"	1/8"	3/16"	1/4"	3/8"
SCALE FOR DETAIL	3"	1 1/2"	1"	3/4"	1/2"	3/8"	1/4"	3/16"	1/8"	3/32"	10	15	20	30	40	50	60	3/32"	1/8"	3/16"	1/4"	3/8"
1.00	30.00	15.00	10.00	7.5000	5.00	3.7500	2.5000	1.8750	1.2500	0.9375	0.1600	0.2000	0.2500	0.3333	0.5000	0.6667	1.00	0.9375	1.2500	1.8750	2.5000	3.7500
1.5	45.00	22.50	15.00	11.25	7.50	5.6250	3.75	2.8125	1.8750	1.4063	0.2500	0.3600	0.3750	0.5000	0.7500	1.00	1.5	1.4063	1.8750	2.8125	3.75	5.6250
2.00	60.00	30.00	20.00	15.00	10.00	7.5000	5.0000	3.7500	2.5000	1.8750	0.3333	0.4000	0.5000	0.6667	1.00	1.3333	2.00	1.8750	2.5000	3.7500	5.0000	7.5000
3.00	90.00	45.00	30.00	22.5000	15.00	11.25	7.5000	5.6250	3.7500	2.8125	0.5000	0.6000	0.7500	1.00	1.5000	2.0000	3.00	2.8125	3.7500	5.6250	7.5000	11.2500
4.00	120.00	60.00	40.00	30.00	20.00	15.00	10.00	7.5000	5.0000	3.7500	0.6667	0.8000	1.00	1.3333	2.00	2.6667	4.00	3.7500	5.0000	7.5000	10.00	15.00
5.00	150.00	75.00	50.00	37.5000	25.00	18.750	12.5000	9.3750	6.2500	4.6875	0.8333	1.000	1.2500	1.6667	2.5000	3.3333	5.00	4.6875	6.2500	9.3750	12.5000	18.750
6.00	180.00	90.00	60.00	45.00	30.00	22.50	15.00	11.25	7.50	5.6250	1.00	1.20	1.50	2.00	3.00	4.00	6.00	5.6250	7.50	11.25	15.00	22.50
1.0667	32.00	16.00	10.6667	8.00	5.3333	4.00	2.6667	2.00	1.3333	1.00	0.1178	0.2133	0.2667	0.3556	0.5333	0.7111	1.0667	1.00	1.3333	2.00	2.6667	4.00
0.8000	24.00	12.00	8.00	6.00	4.00	3.00	2.00	1.50	1.00	0.7500	0.1333	0.1600	0.2000	0.2667	0.4000	0.5333	0.8000	0.7500	1.00	1.50	2.00	3.00
0.5333	16.00	8.00	5.3333	4.00	2.6667	2.00	1.3333	1.00	0.6667	0.5000	0.0889	0.1067	0.1333	0.1778	0.2667	0.3556	0.5333	0.5000	0.6667	1.00	1.3333	2.00
0.4000	12.00	6.00	4.00	3.00	2.00	1.50	1.00	0.7500	0.5000	0.3750	0.0667	0.0800	0.1000	0.1333	0.2000	0.2667	0.4000	0.3750	0.5000	0.7500	1.00	1.5000
0.2667	8.00	4.00	2.6667	2.00	1.3333	1.00	0.6667	0.5000	0.3333	0.2500	0.0444	0.0533	0.0667	0.0889	0.1333	0.1778	0.2667	0.2500	0.3333	0.5000	0.6667	1.000
0.2000	6.00	3.00	2.00	1.50	1.00	0.7500	0.5000	0.3750	0.2500	0.1875	0.0300	0.0400	0.0500	0.0667	0.1000	0.1333	0.2000	0.1875	0.2500	0.3750	0.5000	0.7500
0.1333	4.00	2.00	1.3333	1.00	0.6667	0.5000	0.3333	0.2500	0.1667	0.1250	0.0222	0.0267	0.0300	0.0400	0.0667	0.0889	0.1333	0.1250	0.1667	0.2500	0.3333	0.5000
0.1000	3.00	1.50	1.00	0.7500	0.5000	0.3750	0.2500	0.1875	0.1250	0.0938	0.0167	0.0200	0.0250	0.0333	0.0500	0.0667	0.1000	0.0938	0.1250	0.1875	0.2500	0.3750
0.0667	2.00	1.00	0.6667	0.5000	0.3333	0.2500	0.1667	0.1250	0.0833	0.0625	0.0111	0.0133	0.0167	0.0222	0.0333	0.0444	0.0667	0.0625	0.0833	0.1250	0.1667	0.2500
0.0333	1.00	0.5000	0.3333	0.2500	0.1667	0.1250	0.0833	0.0625	0.0417	0.0313	0.0056	0.0067	0.0083	0.0111	0.0167	0.0222	0.0333	0.0313	0.0417	0.0625	0.0833	0.1250

BORDER SIZE

Figure 2.1.8A

2.2 DETAILING

2.2.1 Text

Since all drafting is now done with the use of computers, use the following:

- General text – 5/32” font 24, wt=2
- Titles – 7/32” font 2, wt=3

Shortcut keys for special characters in font 24 are shown in Figure 2.2.1.

Shortcut Keys for Font 24

| = ±
{ = ℄
} = ∠
< = △
**** = ⊄
` = ϕ
^ = °

Figure 2.2.1A

Use ODOT Plans menu for setting text sizes, see Section 2.1.5 for information about Plans menu.

For abbreviations to use see Appendix Section A2.1.1.

Orient lettering to be read from the bottom or right edge of the sheet.

2.2.2 Line Work And Levels

All line work must be of sufficient size, weight and clarity so that it can be easily read from a print that has been reduced to one-half (1/2) the size of the original drawing. Similar lines denoting a structural outline, a centerline, etc., shall have the same line weight and style.

There are ten levels available in the ODOT workspace that the user has the ability to rename. When renaming the level please include your office name in the level name as shown below.

Example level name
P_BR_water_Office name

Office name = Region or Consultant changing to level name

See Appendix Section A2.2.2 for Levels and designated line weights. The ODOT plans menus sets the appropriate line symbology for given levels

Use line weight with appropriate gradations of width to give line contrast as shown in Figure 2.2.2A. Care shall be taken that the thin lines are dense enough to show clearly when reproduced.

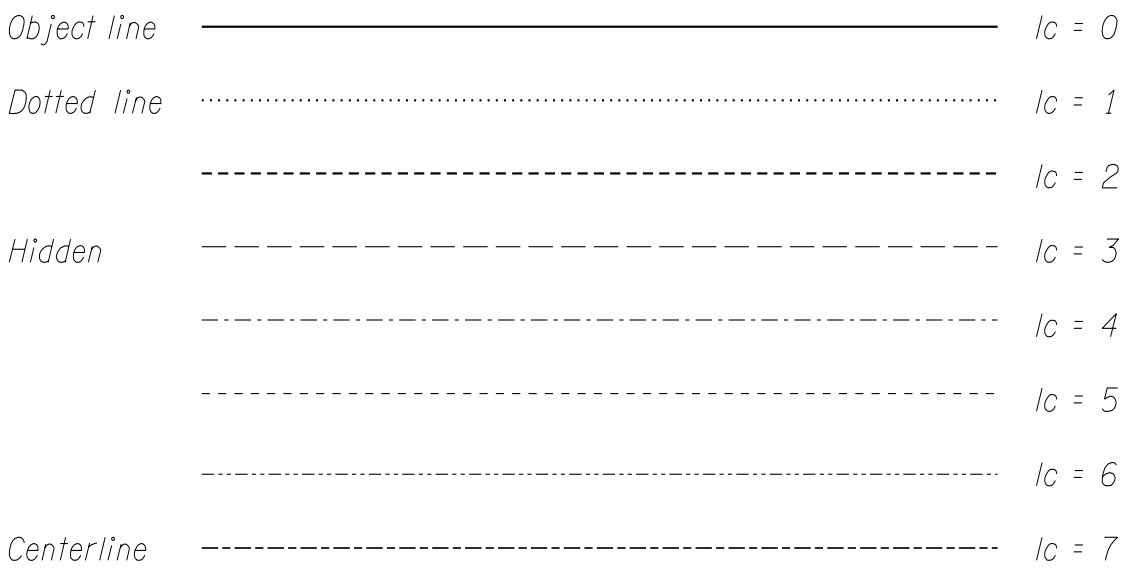


Figure 2.2.2A

See Appendix Section A2.2.2 for Standard Symbols.

2.2.3 Dimensioning

Avoid duplication and unnecessary dimensions. Place all dimension figures above the dimension line, so that they may be read from the bottom or the right edge of the sheet, as shown in Figure 2.2.3A.

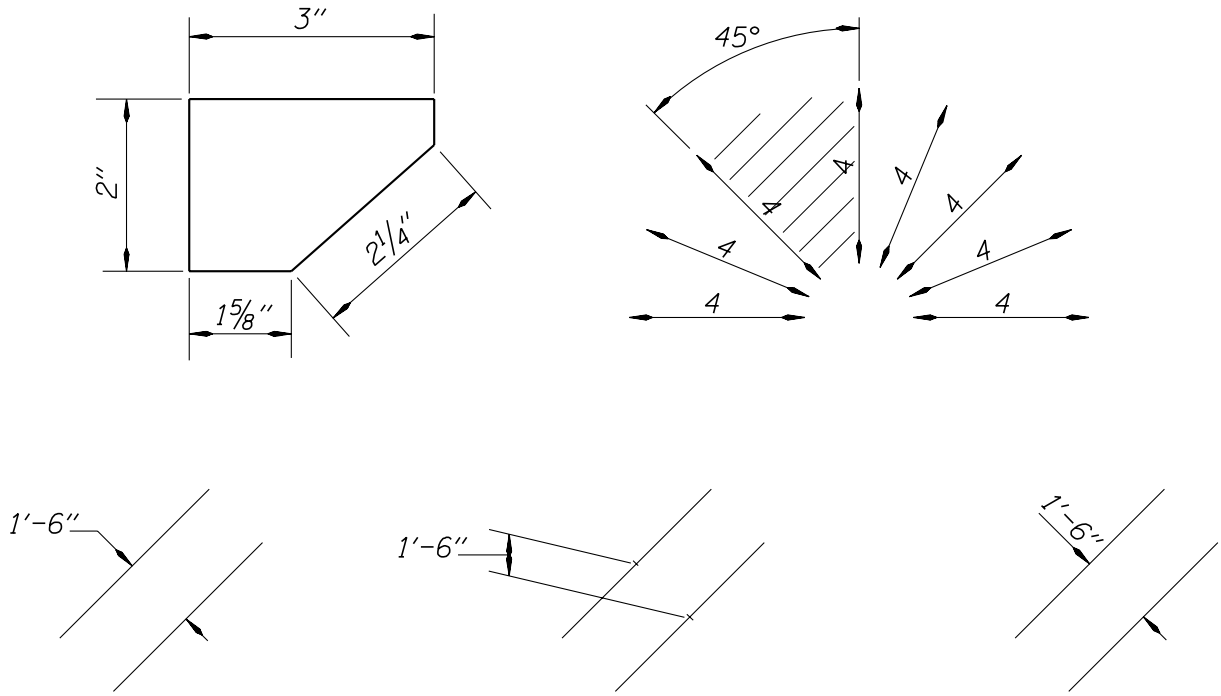


Figure 2.2.3A

In general, consider the precision of detail dimensions and the normal construction tolerances to which it is being constructed. General plan and detail dimensioning precision should not be more than the following:

- Structural Steel to 1/16”
- Welds to 1/16”
- Concrete to 1/8”
- Camber Diagrams to 1/8”
- If a series of dimensions (i.e. beam or rail post spacing) do not add up to the exact overall dimension, use a plus or minus (±) following the series dimension. (i.e. 25 spaces at 9’-3 1/8”± = 231’-7”)

2.2.3 DIMENSIONING – (continued)

Dimensions 12” or more are to be dimensioned in feet and inches, unless the item dimensioned is conventionally designated in inches (for example, 16” dia. pipe or #4 @ 18”).

In dimensions more than 1 ft, fractions less than 1” are to be proceeded by 0 (for example, 3’-0 1/8”).

Intersection angles should be dimensioned as the acute angles between centerlines of roadways or between centerline of roadway and centerline of bent. Where the intersection is on a curve, measure the angle from the local tangent to the curve at the point of intersection. For intersecting curves, give the angle and add the words “tan - tan”.

Placement of dimensions outside the view, preferably to the right or below, is desirable. However, in the interest of clarity and simplicity, it may be necessary to place them otherwise. Examples of dimensioning placement are shown in Figure 2.2.3B.

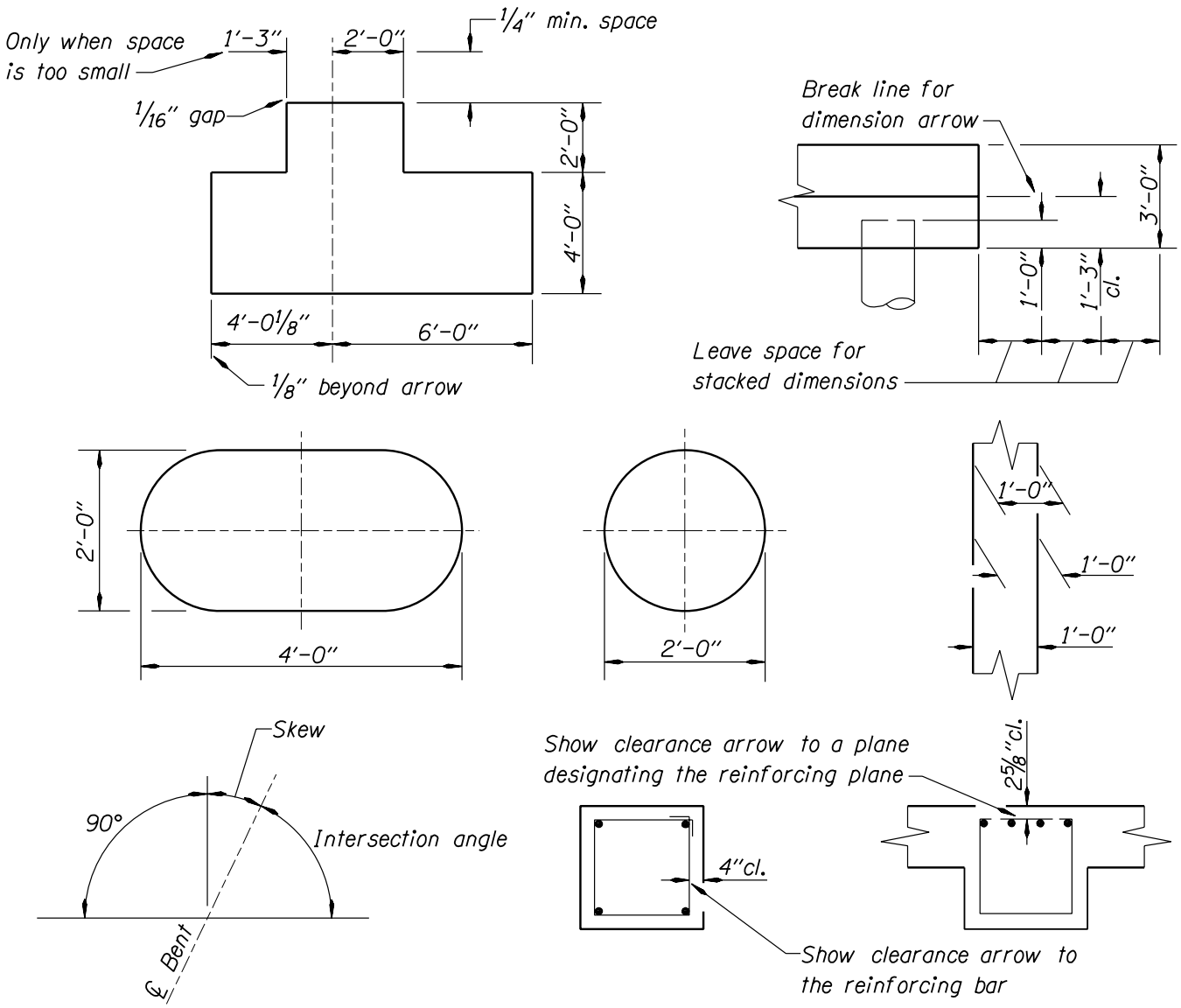
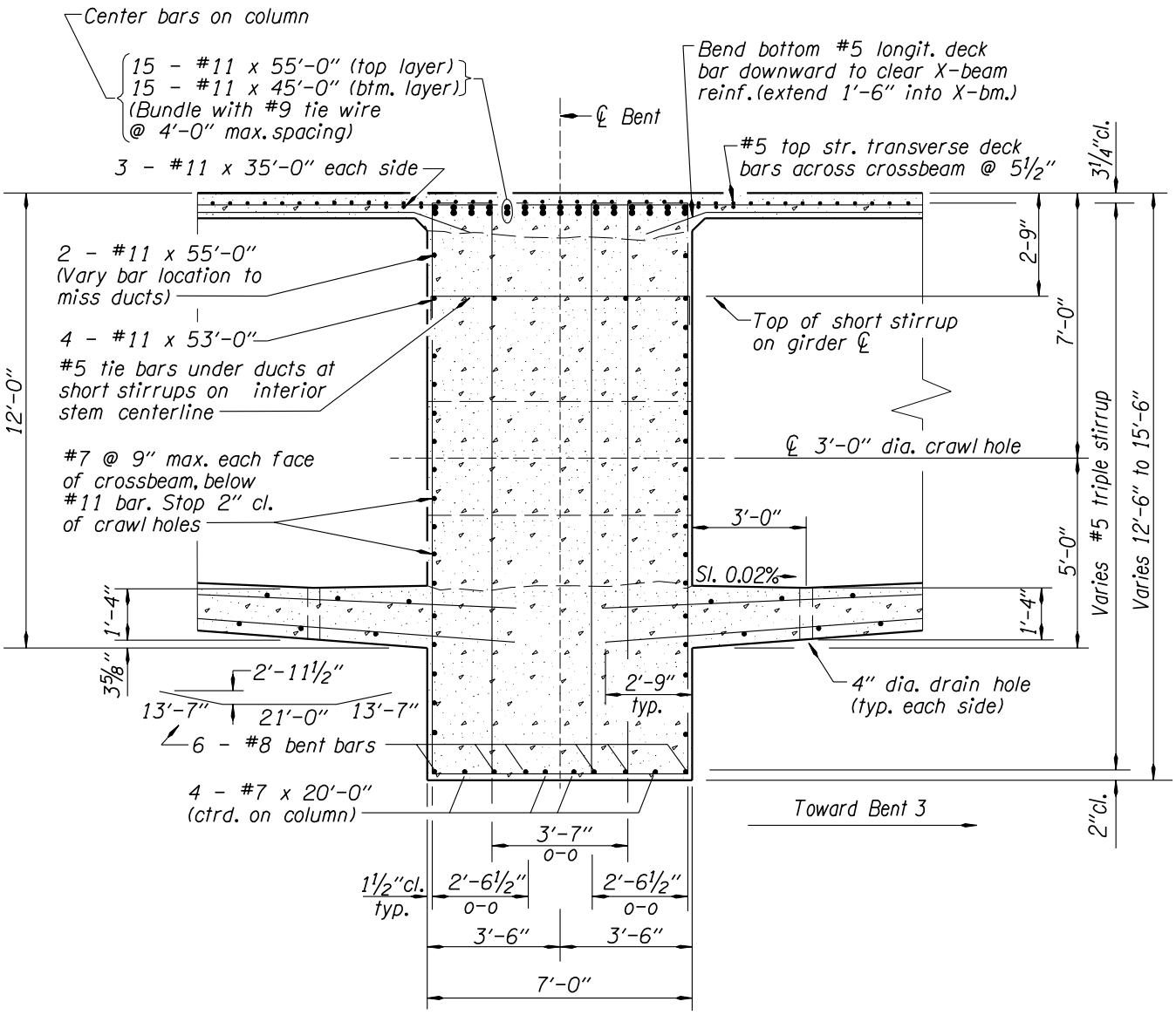


Figure 2.2.3B

2.2.4 Concrete

A typical crossbeam section is shown below.



TYPICAL SECTION CROSSBEAM - BENT 2 (BENT 4 SIMILAR)

Figure 2.2.4A

2.2.5 Structural Steel

Generally dimension marks are not used, except for length dimensions, for detailing structural steel shapes, plates and welds. Structural steel shall be placed on level: P_BR_All_StructuralSteel. See Figure 2.2.5A for an example. Steel callout examples include:

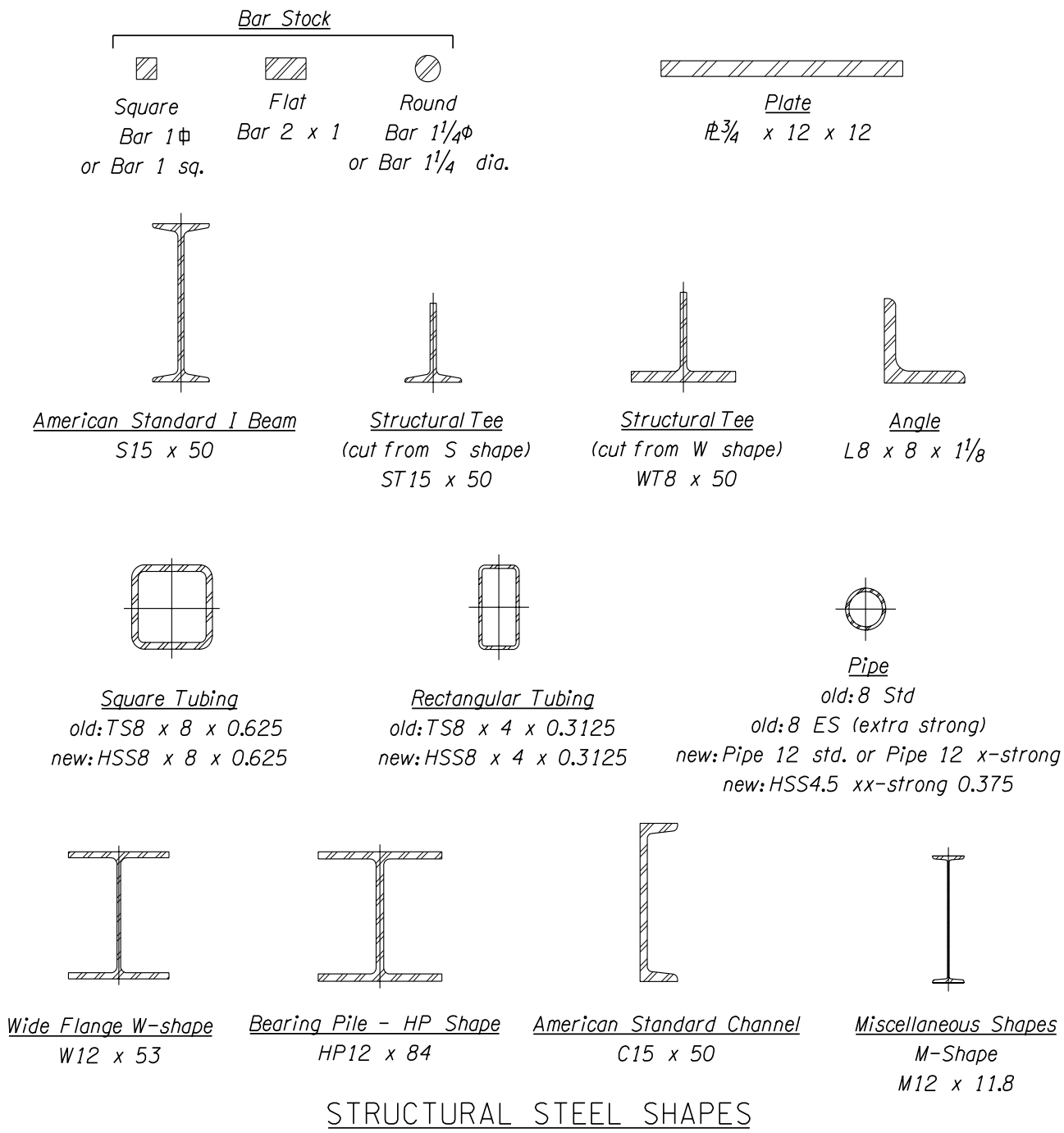


Figure 2.2.5A

2.2.5 Structural Steel – (continued)

Fillet Welds

See example of fillet welds in Figure 2.3.5B.

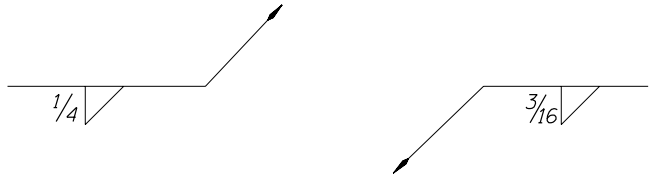


Figure 2.2.5B

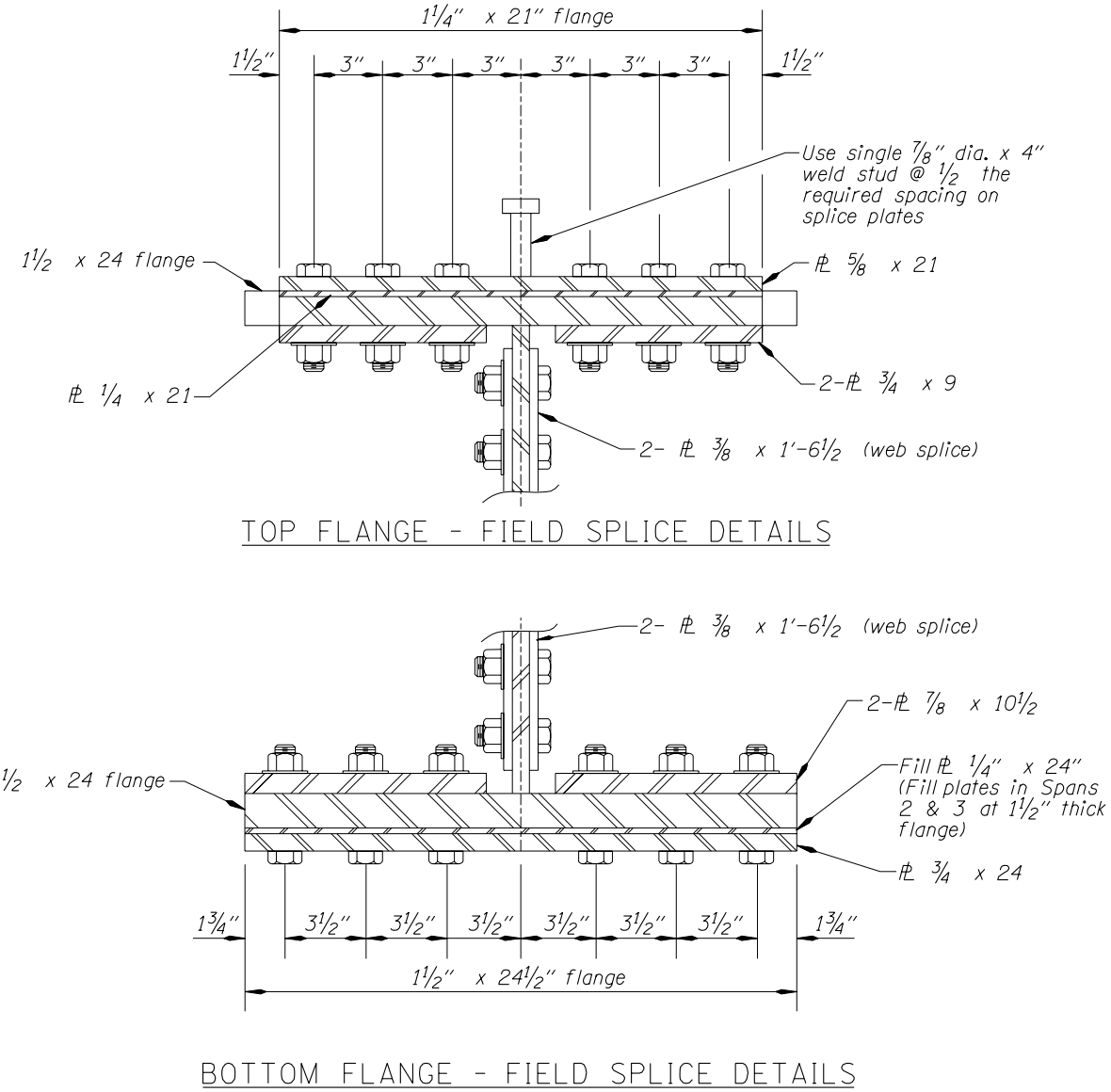


Figure 2.2.5C

2.2.6 Reinforcing Steel

Simplify labeling reinforcing steel as much as possible. Eliminate needless words like "no.", "bars", "ctrs", etc. See example in Figure 2.2.6A. All Reinforcing steel text will be placed on level: P_BR_All_RebarTx.

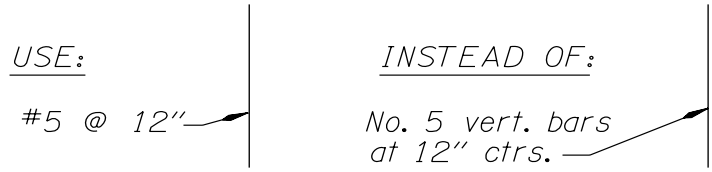


Figure 2.2.6A

2.2.7 Bar Length Labeling

To avoid excessive bar lengths (greater than stock lengths indicated in Section 1.2.11.2) and to avoid splices in the wrong places, label the main reinforcing steel lengths. Sketches may be necessary to show correct bar and splice location. See labeling methods in Figure 2.2.7A.

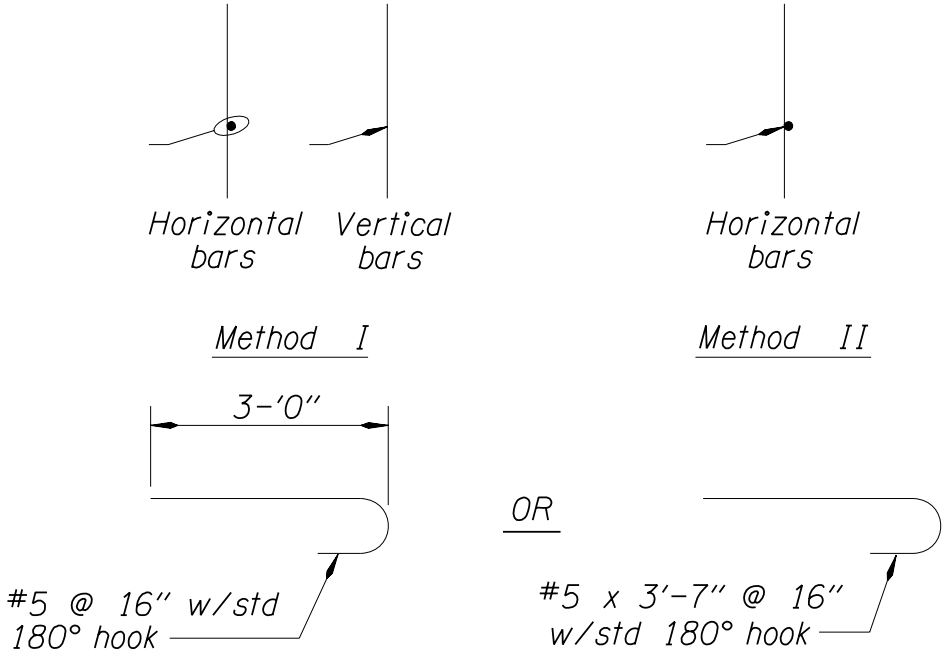


Figure 2.2.7A

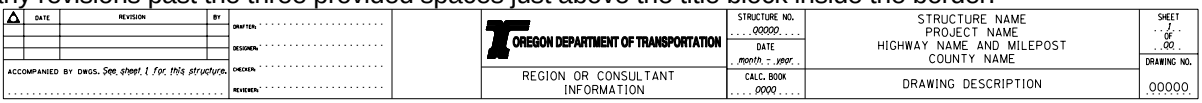
2.3 DRAWING BORDERS

Plot final drawings on mylar ("D" Size). There is one title block for bridge drawings as shown in Figure 2.3A. See Appendix Section A2.3 for enlarged example.

When the border is selected and placed in a graphics file, a file identification tag is placed horizontally across bottom, starting at the left corner just outside the border. See drawing identification tag in Section 2.3.1.

Do Not Modify Title block, it is intended to be the same throughout the entire state. The only area is the Region or consultant information box that can be changed.

Place any revisions past the three provided spaces just above the title block inside the border.



BRIDGE DRAWING TITLEBLOCK
This will cover all applications including
Title sheets, Details sheets and Foundation sheets

Figure 2.3A

While in a Microstation file, Plotypus will place the border in the appropriate layout location. See Plotypus plotting manual for layout grid.

2.3.1 Drawing Identification Tag

The drawing ID tag runs across the bottom of the drawing starting at the bottom left corner.

Example: Station ID: ##FILE NAME LOCATION WHILE PLOTTING## Date, Time, User Identification

File name location while plotting: This will plot the current file location during plotting.

Plotting Tag runs across the bottom starting at the lower right corner of the drawing. This will indicate the border scale and the view name (Scale – view name) for the drawing. Placing a descriptive name here will help find specific drawings within the graphics file, some examples are:

Drawing Description	View Name (vi=)
Layout and Index sheet	Layout
Plan and Elevation	Plan
General Notes	Notes
Foundation Data Sheet	Foundation
Stage Construction Details	Stage
Footing Plan	Footing
Deck Plan – Span 1	DeckPlan
Deck Section	DeckSection
Framing Layout	Frame
Longitudinal Girder Elevation	Girder
Camber Diagram	Camber
Post-tensioning sheets	Post-tensioning
Plan and Elevation – Bent 1	Bent1
Bent Details – Bent 1	BentDetails1
Bearing Details – Bent 1	Bearing 1
Shear Lugs	Lugs
Wingwall - A Details	Wingwall
Rail Details	Rail
Miscellaneous	Misc

Date: The date when the plot was made.

2.4 TITLE BLOCK INFORMATION

2.4.1 Request for Drawing Numbers

Request drawing numbers through project lead drafter and they will access Bridge Data System (BDS) for drawing numbers. See 2.8.3 for Bridge Data System (BDS). If project does not merit a lead drafter, then each drafter has access to obtain drawing numbers through the BDS system. On structures that have "D" size Foundation Data Sheets, the Bridge Drafter will get drawing numbers for the Foundation Data Sheets. This will hopefully keep drawing numbers consecutive for the structure although this is not always possible.

Structure name should reflect the information on the structure data sheet located in the Bridge Data System (The correct structure name can be found in the Bridge Log for existing structures)

For Structure Naming and Numbering Rules see:

http://egov.oregon.gov/ODOT/HWY/BRIDGE/standards_manuals.shtml

The Drafter should work with the Designer to make sure all areas are covered before requesting drawing numbers.

Many Consultants have access to BDS for acquiring structure numbers and drawing numbers. For those who don't, they will need to fill out the BDS request form located on ODOT's ftp site under \Bridge\BDDM\BDSRequest.xls and send it to the Senior Bridge Drafter located in the Region where the project is located.

To get access to BDS, contact Bridge Section Headquarters in Salem.

2.4.2 Title Block

Revision Box:
See Section 2.7.11 Revisions for information on how to fill out the Revision Box. (See Figures 2.7.11A and 2.7.11B)

Accompanied by Drawings Box:
For "Accompanied by", list the rest of the drawings for this structure (i.e., 37833 through 37846) followed by any Bridge standard drawings which show details common to this structure and other structures which are a part of the same contract and roadway standard drawings to which reference has been made anywhere in the plans for this structure. Accompanied by drawings are only shown on sheet one, all other sheets should have "See Sheet 1 for this structure".

Signatures Box:
Drafters may print or sign their first and last names.
Designers, Checkers and Reviewers sign their names (using full signature) above the dotted line and print their name below (see Figures 2.4.2A and 2.4.2B).

Registration Seal Box:
The Engineer of Record Engineering stamp goes here. Also the renewal date is place right beneath the seal on line provided. (This will be added by the Engineer when signature is placed) For all Plan distributions except for final mylar, place the words **"Review Copy Only"** across the Engineer's registration seal (**ac=T_ReviewCopyOnly**) (See Figure 2.4.2A). All final mylar drawings require Engineer's signature and renewal date.

ODOT Box:
Contains the ODOT flying "T" and the words "OREGON DEPARTMENT OF TRANSPORTATION"

only.

2.4.2 Title Block – (continued)

Region or Consultant Box:
The Region or Consultant Information Box will be for adding information about the office doing the design and drafting on the given set of plans. The box appears right below the Oregon Department of Transportation Logo located at the center of the title block. This will be the only location for design office information. Any other information shown on drawing will be considered advertising and plans will be returned for correction. (See Figure 2.4.2C).

Structure Number Box:
A structure number can be obtained by using Bridge Data System (BDS). See Section 2.8.3 Bridge Data System. See http://egov.oregon.gov/ODOT/HWY/BRIDGE/docs/BDDM/PDFs/brnumbering.pdf for structure numbering rules. For every structure number there will be one complete set of drawings. Treat every structure as a stand alone set of plans. **Do not show one set of plans with multiple structure numbers**, even if they are identical.

Date Box:
This shows the date that the mylars were signed. The format will be month and year. (Example: Feb. 2008)

Calculation Book Number Box:
See Section 1.1.2.12 Final Design of the Bridge Design and Drafting Manual.

Structure Name Box:
List the Title block information as follows:

STRUCTURE NAME
PROJECT OR SECTION NAME
HIGHWAY NAME (MP XXX.XX)
COUNTY NAME

See Bridge Section web page for Structure naming rules at:
http://egov.oregon.gov/ODOT/HWY/BRIDGE/docs/BrNaming.pdf

Identify structures on the State Highway System (Interstate, Primary and Secondary highways) in the title block of the sheet by mile point (MP) location. Show the mile point in parenthesis immediately after the highway name to the hundredth of a mile.

See Appendix Section A2.3 for example.

Drawing Description Box:
Be descriptive, for example do not call out “PARTIAL DECK PLAN” four times, instead use “DECK PLAN – Span 1”, “DECK PLAN – Span 2”, “DECK PLAN – Span 3”, “DECK PLAN – Span 4”. This way someone looking for a particular drawing in BDS will know which drawing at a glance.

Sheet Number Box:
For "No. of ", the Plan and Elevation sheet will be No. 1. The number of sheets will be the Plan and Elevation sheet and all of the detail sheets for the structure. Do not include “Accompanied by” standard drawings in the total.

Drawing Number (BDS File Number) Box:
The drawing number can be obtained from the BDS. See Section 2.4.1 Request for drawing numbers.

2.4.2 Title Block – (continued)

The County Structure No. is placed immediately above the STRUCTURE NO. to provide maintenance cross referencing. If the County Structure No. is not already cross- referenced in the job record or our files, it may be obtained from the Bridge Operations Managing Engineer.

Show existing structure number and existing drawing numbers just above the title block towards the right side.

Put "Information Only" notation above the title block at the right side of existing drawings.

Normally Standard Detail project specific fill-in sheets should have the standard detail title block changed to the Bridge title block and a new drawing number requested.

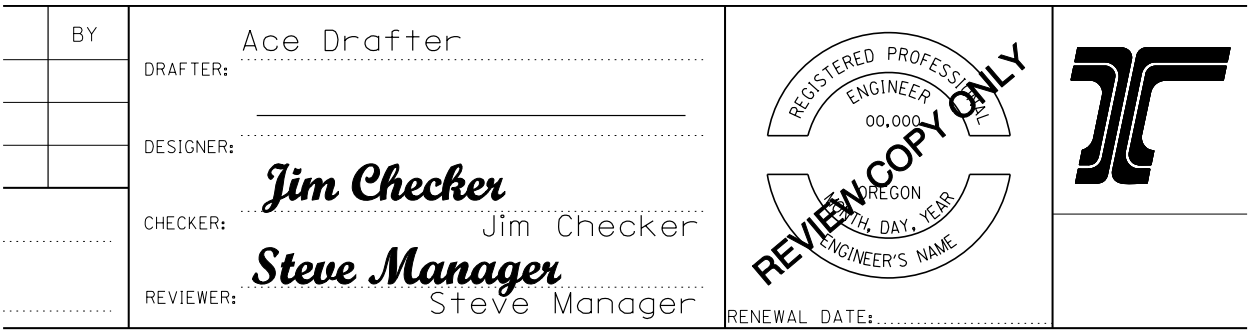


Figure 2.4.2A

2.4.2 Title Block – (continued)

EXAMPLE TITLE BLOCK

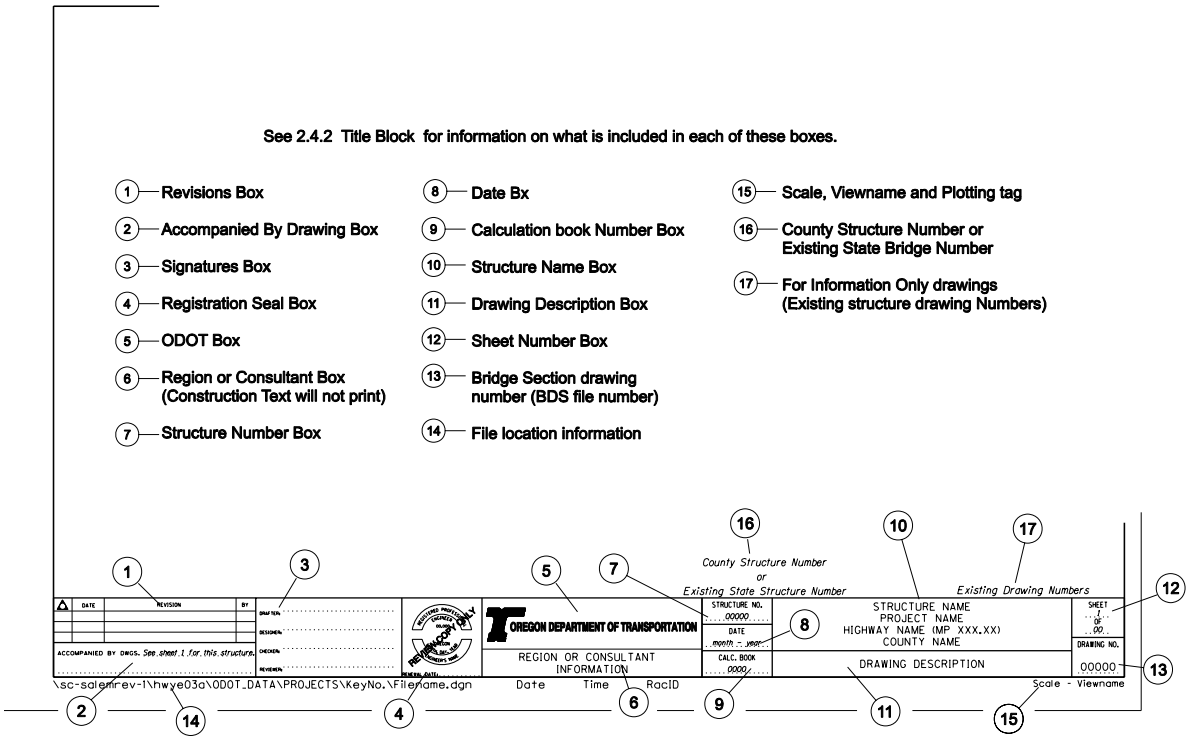


Figure 2.4.2B

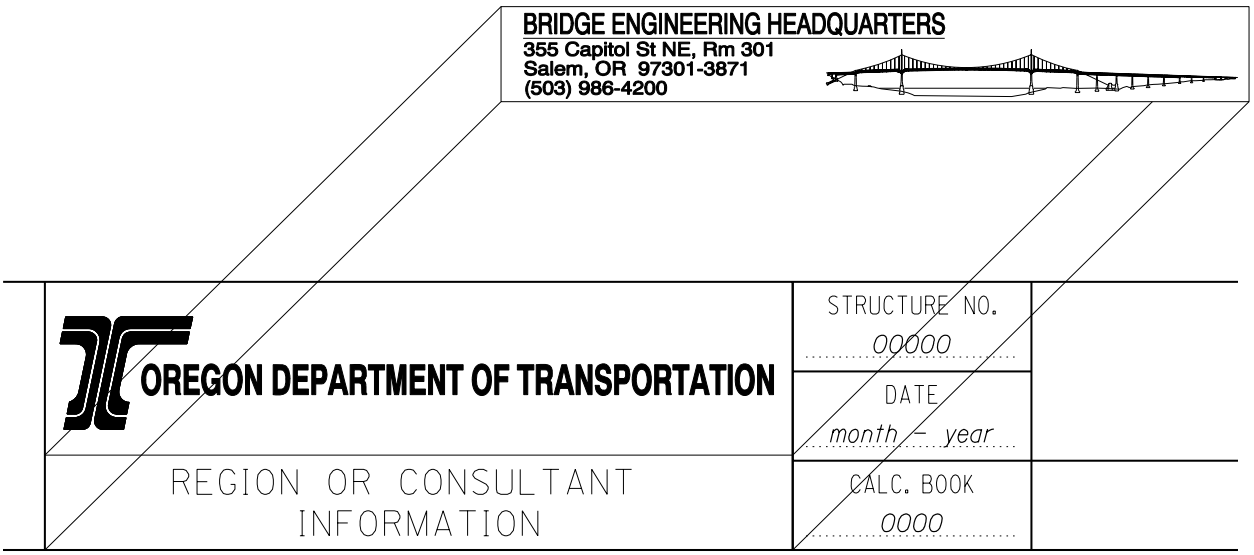


Figure 2.4.2C

2.5 LEAD DRAFTERS DUTIES ON LARGE PROJECTS

Large projects, with multiple or complex structures involving several designers and drafters, can often be completed more efficiently with one Designer and Drafter helping the Design Team Supervisor manage and organize the efforts of the design team. These Lead Drafters also benefit by gaining experience in project management and coordinating the efforts of other Designers and Drafters.

The following guidelines should be reviewed and agreed to by the designer and drafter.

- Get involved early to be knowledgeable about the overall project and deadline requirements.
- Make early estimates of time and number of sheets required.
- Be available to do TS&L sketches and drawings as needed.
- Coordinate and communicate with other Drafters.
- Monitor drafting progress and request help as needed to meet project deadlines.
- Review drafting for completeness and consistency.
- Maintain a current drawing file of all structures on the project.
- Attend project team meetings along with other Drafters involved.
- Stay informed of project status regarding schedules and deadlines.

2.6 TYPE, SIZE AND LOCATION PLAN & ELEVATION

The Type, Size and Location (TS&L) Plan and Elevation sheet is also used for the Final Plan and Elevation sheet.

See Appendix A2.6 for Type, Size and Location checklist for Designers and Drafters.

2.6.1 Plan

This is a plan view showing horizontal alignment and all major dimensions of the structure: total length, span lengths, rail pay limits, and numbers with type of construction (e.g., RCBG), bent numbers and stations (normally increasing from left to right), roadway width and out-to-out transverse dimensions. Show retaining walls, wingwalls, abutments, existing utilities, right-of-way lines, catch basins, drains and where they drain to, and access manholes for utilities on box girders.

Reference all dimensioning to the line described by the alignment data (e.g., "L" line or "C" line, etc.). Do not use a separate, "structure center line".

Show a North arrow on the Plan and Elevation sheet, Foundation Data Sheet and Footing Plan sheet. **(ac = A_North)**

To avoid confusion on multi-span structures, whether they are technically abutments, bents or piers, call all supports "bents" and number them consecutively.

2.6.1 Plan – (continued)

Show existing structures or other structures which will be in place during the construction of a structure and, if necessary, locate by dimensions. Note existing structures and utilities to be moved or relocated, and who is responsible for the work. Show temporary structures which are to be removed or used in the performance of the contract.

This sheet typically contains the following: (if possible, place Type, Size and Location information on one drawing. Place Staging and Typical Section on the second drawing, when two drawings are needed)

- Location map (upper right corner)
- Plan (location of existing structure if applicable) and Elevation
- Typical Section
- Proposed Loading (HL-93)
- Grade Line Diagram
- Vertical Elevation Diagram (including Datum information)
- Staging Details
- Hydraulic Data (if applicable)
- The TS&L Plan and Elevation sheet is normally drawn to a 1”=10’ and 1”=20’ scale.
- Railroad mile point and USDOT identification number (Use ac=T_RRMP) (See Figure 2.6.1A)

  Contact State Railroad Engineer for information or ODOT Rail Division.

Figure 2.6.1A

2.6.2 Location Map

A small-scale location map is required to enable prospective bidders to locate the project. The map should be about 6" square (on final mylar) and placed in the upper right-hand corner of the sheet, but it can be placed elsewhere on this sheet if necessary. In cities, show the name of the city and the names of important streets. In rural areas, show the section, township and range and the direction and distance to the nearest town. For railroad projects, show the section to the nearest 1/16 section. Show a north arrow on the location map (See Figure 2.6.2A). Identify the project location with a bold arrow as shown in Figures 2.6.2B.

State, County and City maps may be found on the server:

http://www.oregon.gov/ODOT/TD/TDATA/gis/dgnfiles.shtml

There are no longer separate city maps. With the change to Microstation Version 8, the city and county map features are level separated in the County file. So to create a city scale map, you would open the county map that the desired city resides in, turn off all of the county-only levels, and turn on all of the city-only levels. The naming conventions for theses levels should make it obvious enough as to which levels should be used for a particular kind of map. There are also saved views of each major city within county map file.

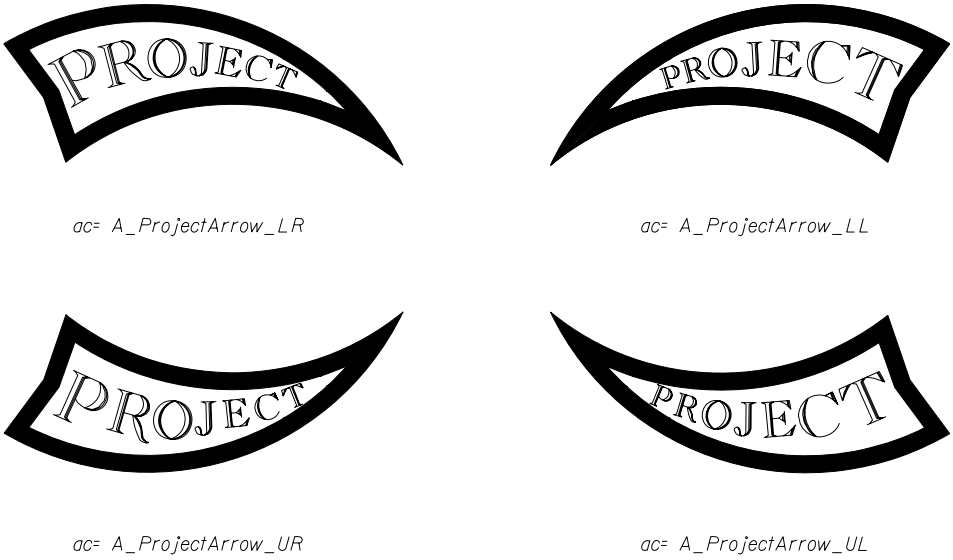


Figure 2.6.2B

2.6.2 Location Map - (continued)

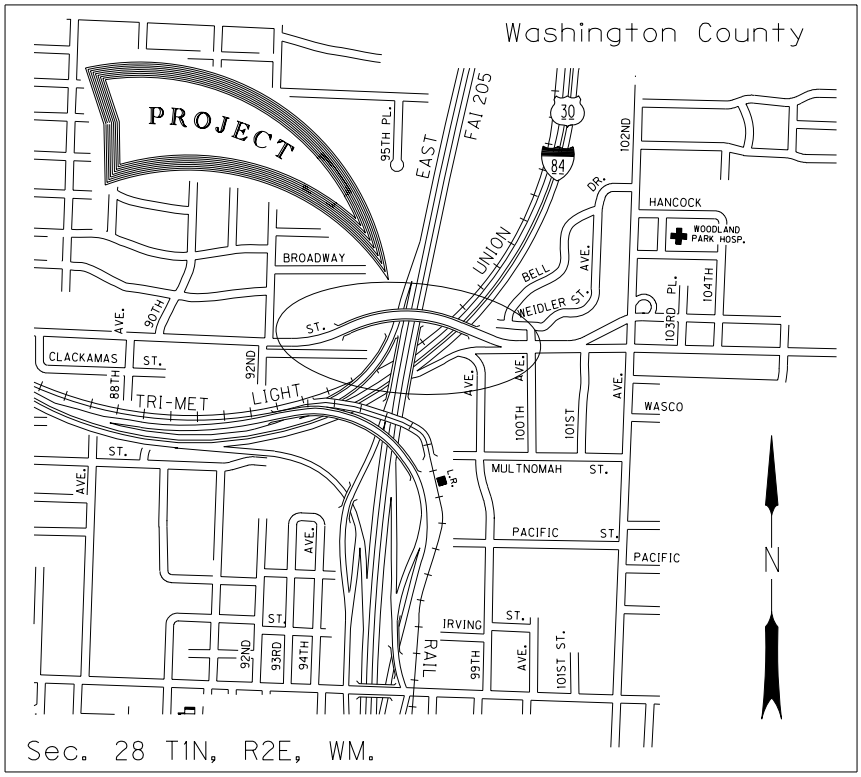


Figure 2.6.2A

2.6.3 Clearance Diagrams

Show vertical clearances at the critical points over railroads, streets, roads and/or highways. Where construction is to be over traffic and a railroad, show a construction clearance diagram indicating both horizontal and vertical minimum clearances.

Indicate the support condition at each end of each span, "fixed", "expansion", "pinned". Show existing and future ground lines at centerline, left and right. Show fill areas hatched and label as fill.

2.7 FINAL PLANS

2.7.1 Layout for Large Projects

An Index Sheet is usually provided where 30 or more sheets are required for a single structure or where several structures are to be built under the same contract. On this sheet, the structure drawings are listed with their drawing numbers and structure numbers (if more than one structure) followed by the standard drawings needed for the project.

The Index Sheet should give an overall layout of the entire project with each structure and the accompanied drawings being listed. The sheet number shall be 1 of 1.

Begin the sheet numbers for each structure with No. 1 for the Plan and Elevation Sheet of that structure. List the total number of sheets for each structure shall on the plans for that structure. List all of the standard drawings used for that structure in the accompanied by drawing area of the title block. Standard drawings **are not included** in the total number of sheets.

When construction requires excavation adjacent to a railroad, show a Railroad Shoring Requirement Diagram. Limits of excavation and shoring requirements are referenced in Section 1.5.8.2.

Details which are repeated several times or which require a note which is larger than can readily be placed close to the item detailed can be called out by a number in a circle. A corresponding number and circle along with the note can then be placed elsewhere on the sheet. Typical Detail references are shown in the Appendix Section A2.7.1.

2.7.2 Final Plans, General

A set of drawings for a structure should contain all the information necessary for the layout and construction of that structure. Clear and complete plans form the basis for fair bidding. Details not properly covered can lead to high bid prices or extra work orders and price agreements during construction.

See Appendix A2.6 for the Bridge Design Checklist, which includes Final Plans checklist for Designers and Drafters.

The use of notes, such as "Bent 3 similar", may be a good practice to save detailing, but use only if it is strictly true or if any differences are clearly noted.

Before detailing is begun, there needs to be good communication between the Designer and the Drafter to determine the number of sheets which will be required and what views and details are to be shown on each sheet. Lay out sheets to ensure sufficient room for unanticipated details, which may be required later. Take care at this time to ensure the information is presented in a clear and logical manner.

Do not make pencil changes to mylars. The only time for pencil changes is when doing “As Constructed” drawings. This will ensure that the electronic data is current.

2.7.2 Final Plans, General – (continued)

Sheet order

- General Layout and Index (Required only, if project has multiple structures)
- Live Load Design Criteria
- Plan and Elevation
  Location Map
    Hydraulic Data (If required)
- General Notes (if space does not allow them to be place on Plan and Elevation)
    Grade Line Diagram
    Super Elevation Diagram
    Clearance Diagrams
    Construction Sequence
    Railroad Data
- Foundation Data Sheet
- Stage Construction Details (if required)
- Footing Plan
    Pile Tip and/or Splice Details
- Deck Plans
    Detail Reference Numbers
- Typical Deck Sections
    Diaphragm Beam Details (If required)
- Steel Frame Details
- Longitudinal Girder Elevations
    Camber Diagram
    Post-tensioning Details
    Girder Schedule
- Bent - Plan, Elevation and Typical Section (Bents should be placed in numerical order)
    Spiral Splice / Termination Details
- Wingwall Details (Wingwall details follow bent required for, if both then place after last Bent)
- Miscellaneous Details
    Bearing Details
    Excavation and Backfill Details
    Pour Schedule
    Concrete Finish Diagram
    Special rail, fencing, etc. details
- Temporary Work Bridge Details

Each structure is unique and will required its own special details, so this is only a partial attempt at listing things that are required in a set of contract plans

Detailing practices will be discussed under the following headings:

- Plan and Elevation
- Foundation Data Sheet
- Stage Construction Details (if required)
- Footing Plan
- Deck Plan
- Superstructure Details
- Bent Details
- Miscellaneous Details
- Standard Drawings
- Plans For Information Only
- Revisions

2.7.3 Plan and Elevation

The Plan and Elevation sheet typically contains:

- Location Map
- Plan
- Elevation
- General Notes (see Appendix A2.7.3)
- Grade Line Diagram
- Hydraulic Data (if applicable)
- Loading Diagram (if applicable)
- Title Block
- Miscellaneous Additional Information

The plan, elevation and footing plan are normally drawn to the same scale and as large as possible.

2.7.3.1 Plan

This is a complete plan view showing horizontal alignment and all major dimensions of the structure: total length, span lengths, rail pay limits (only when there is no deck plan), traffic flow direction and numbers with type of construction (e.g., RCBG), bent numbers and stations (increasing from left to right), roadway, lane, shoulder, rail and median widths and out-to-out transverse dimensions. Show retaining walls, wingwalls, existing utilities, right-of-way lines, abutments, catch basins, drains.

Reference all dimensioning to the line described by the alignment data (e.g., "L" line or "C" line, etc.). Do not use a separate "structure center line".

Show a North arrow on the Plan and Elevation sheet, Foundation Data Sheet and Footing Plan sheet. **(ac = A_North)**

To avoid confusion on multi-span structures, whether they are technically abutments, bents or piers, call all supports, "bents" and number them consecutively.

Show existing structures or other structures which will be in place during the construction of a structure and, if necessary, locate by dimensions. Note existing structures and utilities to be moved or relocated, and indicate who is responsible for the work. Show temporary structures which are to be removed or used in the performance of the contract.

Show the location and type of detour structures as well as any information necessary to determine the responsibility for the construction and removal of these detours.

Space limitations on the Plan and Elevation sheet may require that the footing plan and/or the grade line diagrams, General Notes, and other miscellaneous information be located on the second or third sheet of the set. Placement closer to the front of the set is more desirable. **Do not place on Foundation Data Sheet.**

Show existing utilities, whether relocation is necessary, and the responsible entity for relocation.

2.7.3.2 Elevation

This is an overall elevation view showing the general appearance, grade and type of structure to be built. Number spans and bents to agree with the plan view. Indicate the support condition at each end of each span, "fixed", "expansion", "pinned". Show existing and future ground lines at centerline, left and right. Show fill areas hatched and label as fill. Reference structure rails, pedestrian rails, special rail end treatment and slope paving, using drawing numbers. Indicate the type of footings, bottom of footing elevations and type and size of piling, if any. For spread footings, state the maximum required soil bearing capacity for each footing.

Elevations based on the City of Portland Datum is 1.375 feet above the National Geodetic Vertical Datum (MSL = 0.0) and the Oregon Department of Transportation Datum.

Show an elevation bracket to the left of the structure such as shown in Figure 2.7.3.2A.

The Datum used to establish the elevations shown on the drawing should be indicated. Normally, this will be the North American Vertical Datum 1988 (MSL = 0.0) or the Oregon Department of Transportation Datum. Many ODOT structures were designed using the National Geodetic Vertical Datum, which has been superseded by the North American Vertical Datum 1988.

If a different datum is used, indicate the relationship between the datum as shown in Figure 2.7.3.2B.

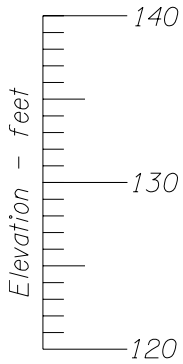


Figure 2.7.3.2A

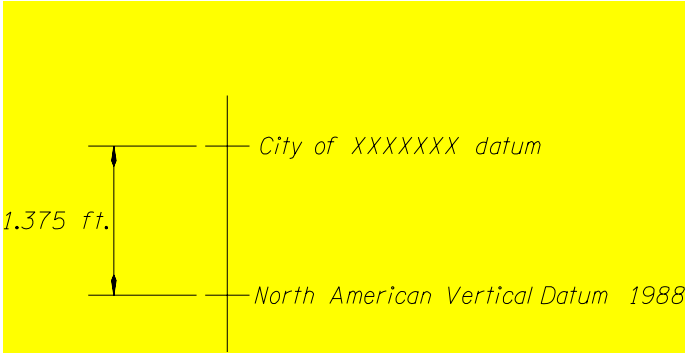


Figure 2.7.3.2B

2.7.3.3 Hydraulic Data

At stream crossings, show normal low water elevation and high water elevation with date of flood. Show low water channel width and channel change on both elevation and plan view. Show footing seals, riprap and navigation lights wherever applicable. Show Hydraulic data as shown in Figure 2.7.3.3A for all water crossings. Cell name for this chart is "**ac=D_HydraulicData**"

HYDRAULIC DATA				
ITEMS	UNITS	DESIGN FLOOD	BASE FLOOD	MAX. PROBABLE FLOOD
DISCHARGE	$ft.^3/s$			
RECURRENCE INTERVAL	years			
HIGH WATER ELEVATION AT UPSTREAM FACE OF BRIDGE ALONG EMBANKMENT	feet			
BACKWATER	feet			

Figure 2.7.3.3A

2.7.3.4 General Notes

General notes are normally located immediately below the location map, but may be located on sheet 2. See Appendix Section A2.7.3 for General Notes.

2.7.3.5 Gradeline and Superelevation Diagrams

Show grade line diagrams for the roadway carried by the structure and for all roads and/or railroads under the structure. Show the location of the structure by a dark heavy line on the structure grade line diagram. Also show the roadway cross-slope or superelevation information. Confirm the geometric controls match the Roadway Plans.

2.7.3.6 Military Loading

When a structure is designed for military loading, place the military loading diagram shown in Figure 2.7.3.6A on the Plan and Elevation sheet. A cell is available for placing this diagram (**ac = D_L_Military**).

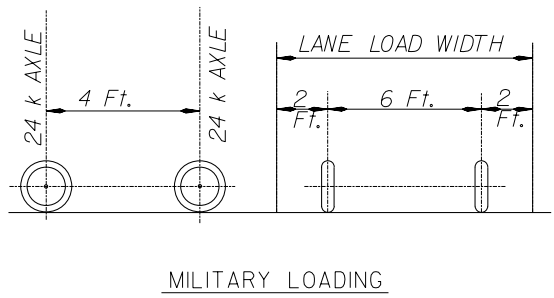


Figure 2.7.3.6A

2.7.3.7 Utilities and Right-of-Way

Show utilities located within the limits of the construction of the structure. Water lines, sewer lines, gas lines, power lines, telephone and telegraph lines are commonly encountered and should be indicated both in their existing and proposed locations. Show centerline of railroad tracks, existing streets and highways and private roads. Show right-of-way lines in the work area, along with any temporary or permanent easements. In all cases where the location of utilities is critical, locate by dimension and/or station. In all cases where utilities are to be moved or salvaged, note who is responsible for the work. Show underground utilities on the footing plan.

2.7.3.8 Railroad Clearance Diagram

For railroad overcrossing structures, a railroad clearance diagram is required. When the intersection angle is 90 degrees, it can often be shown on the Elevation view. Otherwise, a separate clearance diagram normal to the centerline of the tracks will be required. Where there will be construction over or adjacent to railroad tracks, show a construction clearance diagram (possibly on the same view as the final clearance diagram). Construction clearance diagrams are also required for railroad shoofly tracks if the clearances provided are less than those required for permanent construction. Construction clearance requirements are shown in Section 1.4.8.2 .

If required, show collision posts or crash walls, on the plans and specify in the Special Provisions. Requirements are referred to in Section 1.4.8.2 .

2.7.3.8 Railroad Clearance Diagram – (continued)

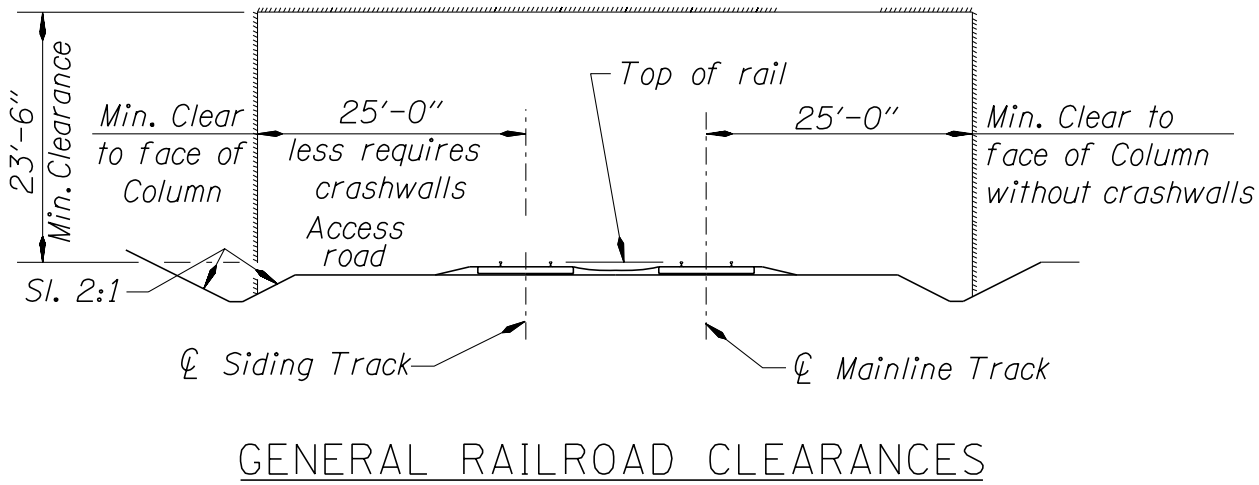


Figure 2.7.3.8A

2.7.3.9 Construction Clearance Diagram

When construction requires excavation adjacent to a railroad, show a Railroad Shoring Requirement Diagram. Limits of excavation and shoring requirements are referenced in Section 1.5.8.2.

2.7.4 Foundation Data Sheet

General

A Foundation Data Sheet will normally be part of each set of bridge construction plans where bridge foundation work is required and subsurface explorations have been completed. This sheet shows the location of the borings and/or other exploration work performed for the bridge and also the subsurface materials and conditions identified in the explorations. Foundation design details such as pile splicing, pile-footing connections etc. should typically not be shown on the Foundation Data Sheets.

The Foundation Data Sheet should usually follow the Plan and Elevation sheet (or the General Notes sheet if required). The typical Foundation Data sheet consists of a “Plan” view and an “Elevation” view (called Foundation Data). Typical example drawings are provided on the ODOT ftp site at: *ftp://ftp.odot.state.or.us/Bridge/BDDM/Example_Drawings/*. The drafting standards used for development of bridge plans, as described in the ODOT Bridge Design and Drafting Manual, should also be followed for the drafting of bridge Foundation Data Sheets. Lettering size, font and weight should be consistent with the bridge drawings. Foundation Data sheets are drawn on full size “D” sheets (22”x34”) to true scale using the same title block as used for the structure drawings (AC= B_Titleblock_Bridge). See Section 2.1.3.1 of the BDDM for procedures to follow after the drawing is created.

The Plan View should show the existing structure (if applicable), the proposed structure(s) and the locations of all borings or other explorations. If possible, the structure layout shown on the Plan View (orientation and scale) should be the same as that shown on the bridge Plan & Elevation sheet.

The Elevation View is normally a profile of the main roadway (or construction) centerline showing all the subsurface information. A three line ground surface profile is preferred, if available. Consider using cross sections to illustrate subsurface data in profiles transverse to the roadway centerline (such as along bent centerlines) for wide bridges and/or where subsurface materials and conditions are highly variable transverse to the roadway centerline. The subsurface information is displayed on the Elevation View for each boring or test pit using a graphic column with soil and rock material descriptions shown alongside the column. Groundwater elevations, sampling depths and in-situ test results are also shown alongside the graphic column. The Elevation View should show a clear and concise portrayal of all subsurface information.

Subsurface interpretation, other than the interpretation required to separate material units within a given boring or test pit, should generally not be shown. Interpreted lines connecting engineering geologic units may be shown when necessary to add clarity to a drawing or in order to provide specific information for a particular feature. There may be cases where subsurface information other than that obtained from subsurface explorations is available and important enough to be shown and described on the Foundation Data sheet. In such cases, this information should also be presented and described in the project Geotechnical Report.

Foundation Data Sheet will incorporate levels used by Geo-Enviromental for sub surface drawings.

2.7.4.1 Foundation Data Sheet Development Procedures

The information that should be included on a Foundation Data Sheet is listed below along with some additional guidelines and explanations. It is preferred to have the Plan View consistent in appearance with the Plan View of the structure drawn on the Bridge Plan and Elevation sheet.

2.7.4.1.1 Plan View

1. Label this portion of the drawing "Plan", and include the true drawing scale.

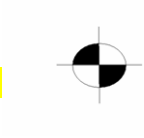
2. Show the existing bridge outline (if applicable) using dashed lines and other existing features that are pertinent to the project.

3. Show the proposed bridge outline (and all bridge retaining walls) using heavy solid lines. Include all bridge bent locations and numbers for multiple span bridges.

4. Show and label the alignment to be used for construction of the bridge (usually centerline of roadway), with sufficient stationing for orientation. Orient stationing from left to right wherever possible. All alignments lending reference to the bridge should be shown and labeled. If borings are stationed from one line and the bridge from another, both alignments should be shown.

5. Cross sections are sometimes necessary to depict subsurface conditions normal to the roadway centerline or along bridge bent alignments. This is true especially for wider bridges where borings are drilled on each end of the bent or at sites where subsurface conditions are highly variable along the bent line and the variability is important in the foundation construction. Where cross sections are required, show the orientation of the cross section(s) to roadway centerline including the stationing of the intersection of the cross section with centerline. Label the cross section A – A', B – B', etc. as appropriate for reference to the Elevation View.

6. Show the location of all boreholes, test pits, cone penetrometer tests or other subsurface explorations. These locations should be identified with unique symbols depending on the type of exploration performed. Use the following symbols and include the definitions of the symbols in the legend:



Boreholes

Cone Penetrometer Holes (CP-#)

Test Pits

Note: For cone penetrometer, pressuremeter and vane shear testing work usually only the locations of these tests are shown on the Plan View. In these cases a note should be provided on the data sheet stating that the results of these tests are available upon request.

7. Provide the survey location of each borehole (or other type exploration) directly adjacent to the borehole number. This survey information should include the Borehole Number, survey line identification, stationing of the hole and left or right offset distance. An example is as follows: **"L" Station 100+20, Lt. 15'**.

8. Show a North Arrow.

9. For waterway crossings show the outlines of creek or river banks (if applicable), the name of the river or creek and an arrow showing the direction of river or creek flow.

2.7.4.1.1 Plan View – (continued)

10. Contour lines are optional and may be shown if the clarity of the drawing is maintained. Label contour lines with elevations as necessary for orientation.

11. Do not include features or lines that are not necessary, add clutter, or distract from the purpose of the drawing.

2.7.4.1.2 Elevation View

1. Label this view; "Foundation Data".

2. Elevations should be shown on both sides of the elevation view. Extend elevation lines horizontally but not through any text or through the graphic columns, as this would infer soil unit breaks.

3. Show the true horizontal and vertical scales. When the stationing is along a curve do not include a horizontal scale. Use an exaggerated vertical scale as necessary to provide additional room for text alongside the graphic column. Adjust the drawing scale to provide a balance between readability and clarity using a reasonable number of sheets.

4. Show the stationing of the profile (usually along centerline) along the top or bottom of the profile view.

5. A three line profile of the existing channel or ground surface should be drawn when the information is available; however the centerline profile alone is acceptable. Label each ground surface profile. If cross sections are required, use the existing ground line of the cross section and show horizontal offset distances from the roadway centerline on the cross section view. If cross sections or profiles must be shown on separate sheets, provide a note referencing the plan view drawing that shows their location and orientation.

6. Show the locations and depths of all borings or other explorations using a graphic column. Each graphic column (boring) should be lined up vertically with the same boring shown in the Plan View. Use the standard graphic symbols for soil types shown in Figure 2, "Legend of Materials" in each column to represent the subsurface material units encountered. Provide additional graphic symbols as needed for other rock units or unique soil types. The standard soil symbols can be combined (overlaid) to represent common soil types (silty CLAY, sandy SILT, Gravelly SAND, etc.). If a soil description contains "some" or more of a particular constituent (i.e. "some silt", "some gravel") then include that material symbol in graphic column for that unit. The total graphic column length should equal the depth of the exploration. Individual soil and rock layers should be delineated to scale within the column.

7. Soil and rock unit descriptions should be placed immediately adjacent to the column of the boring, next to the corresponding graphic symbol for the material unit. The unit descriptions shown on the data sheet are typically summary descriptions described as "a consolidation of information and/or revision in terminology from the Soils and Geological Exploration Logs", see Figure 2.7.4.3E. The description should contain all information pertinent to the construction of the foundation. Draw lines connecting the unit descriptions to the corresponding graphical symbol/unit. If boreholes are located too close together to easily display the text next to the column then consider expanding the horizontal scale to provide sufficient room for the text or locating the borehole and description at a different location on the drawing with an arrow connecting it to its true location.

   Another option is to reference the graphic units in the column to a legend of material descriptions using the engineering geologic unit designation or similar link. If this format is used, always include the unit descriptions on any data sheets that have the graphic columns. Do not show just the graphic columns on individual sheets without any detailed unit descriptions.

2.7.4.1.2 Elevation View – (continued)

8. The following information should be shown on the profile for each boring:

   - Boring Number, (placed directly above each hole).
   - Date boring or test pit was completed.
   - SPT "N" values (N-1, N-2, etc., see Table 1 below for examples)
   - Undisturbed samples (U-1, U-2, etc.).
   - Groundwater levels and date(s) measured.
   - Rock core runs (C-1, C-2, etc.), percent recovery, R.Q.D., rock hardness (R0, R1, etc., according to ODOT standard of practice) and unconfined compressive strength test results (if applicable).

9. Show soil sample depths (SPT and Undisturbed Samples) on the graphic column using black squares and or brackets (see example drawings).

10. Show and label rock core locations at the depths at which they were taken on the graphic column of the borehole.

11. Summarize rock core information such as core number (C-1, C-2, etc.), percentage recovered, rock hardness and R.Q.D. in tabular form as shown in Figure 2.7.4.3D. Include unconfined compressive strength test results in the table if available. Do not combine point load test results with unconfined compressive strength test results; provide them in a separate column.

2.7.4.2 Drawing Border, Title Block And Stamping Procedures

1. Use the same drawing border and title block as the one used for the structural drawings described in Sections 2.3 and 2.4 of the BDDM for the Foundation Data Sheet. Do not modify the title block.

2. The information in the title block should be in the following order:
   - Bridge Name
   - Project Name (Section)
   - Highway and Milepost
   - County

3. Provide the Structure Number and date the drawing was completed.

4. Provide the drawing number. The Bridge Drafter will get drawing numbers for Foundation Data sheets trying to keep the drawing numbers in consecutive order for the structure (see BDDM 2.4.1).

5. Provide sheet number. The Foundation Data sheet is usually the second or third sheet in the bridge drawings. Be sure to check with the Bridge Drafter for the correct sheet number.

6. All Foundation Data sheets must be stamped by a Professional of Record. Only one stamp should be placed on the drawing. Either the foundation (geotechnical) designer or engineering geologist may stamp the drawing.

7. All Foundation Data sheets must be checked by an independent checker familiar with the project. The checker should sign the drawing in the space marked "checker". If the geotechnical engineer stamped the drawing, the checker may be either the project geologist or the engineer reviewing the foundation design. If the drawing is stamped by the Engineering Geologist the drawing should be checked by the project foundation designer (geotechnical engineer).

8. Calculation book number shall have a line drawn through it as shown in Figure 5.

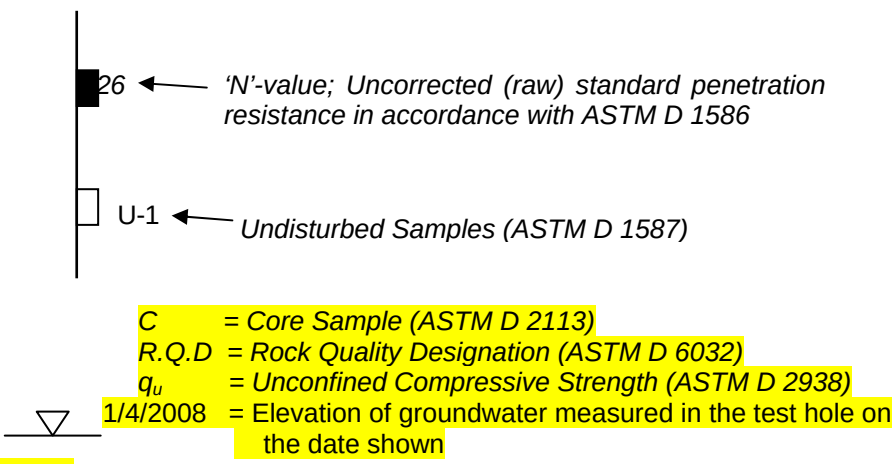
2.7.4.3 Standard Legends, Symbols & Notes

The following standards and examples are provided for use in developing Foundation Data Sheets. Refer to the data sheet examples on the Bridge Section ftp site for additional guidance.

Standard Penetration Test (“N” Values)
The Standard Penetration Test consists of driving a two inch diameter split spoon soil sampler 18 inches into the soil with a 140 lb. hammer. The number of hammer blows required to drive the sampler are recorded in 6 inch increments (3 – 6” increments total). The sum of the number of blows required for the second and third 6 inches of penetration is termed the "standard penetration resistance," or the "N” value. Typical examples encountered are shown in the table below:

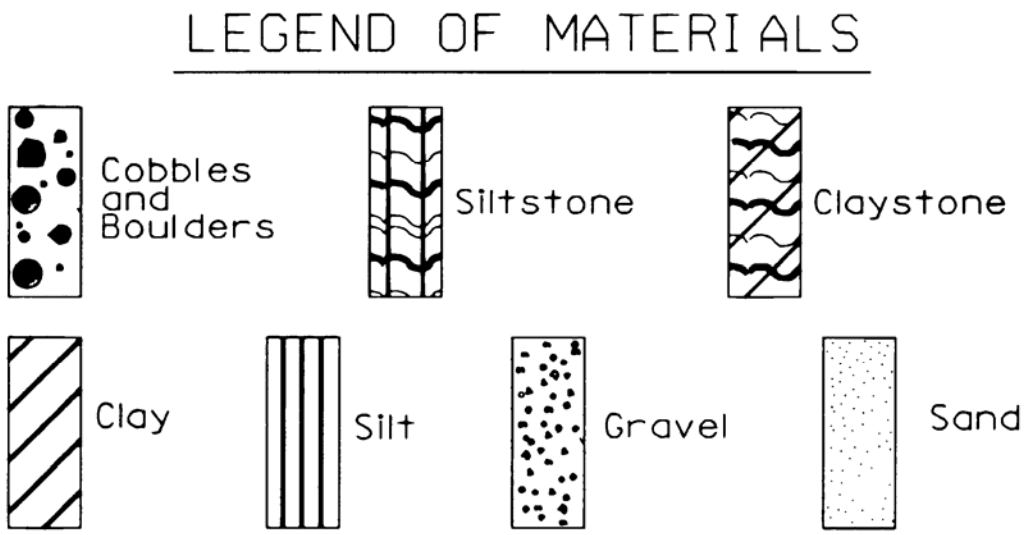
SPT Test Number	Raw Test Data	Reported “N” Value
N-1	3-3-4	7
N-2	1/1.5’	1/18”
N-3	50 for 5”	50/1st 5”
N-4	6-50/2”	50/2”
N-5	1/12”–2	3/18”
N-6	2/6”-1/12”	1

TABLE 1: “N” VALUE EXAMPLES
Figure 2.7.4.3A



STANDARD LEGEND
Figure 2.7.4.3B

2.7.4.3 Standard Legends, Symbols & Notes – (continued)



STANDARD LEGEND OF MATERIALS
Figure 2.7.4.3C

Test Boring	Core Run	% Rec.	Hardness	R.Q.D.	q_u (psi)
BH–1	C–1 C–2	100 100	R5 R5	65 88	X
BH–2	C–1 C–2	100 100	R5 R5	75 95	X

Note:
Refer to the ODOT Soil and Rock Classification Manual (1987) for a description of the terms used in this table.

STANDARD TABLE OF ROCK CORE (INCLUDE UNCONFINED COMPRESSIVE STRENGTH (q_u) TEST RESULTS IF AVAILABLE)
Figure 2.7.4.3D

2.7.4.3 Standard Legends, Symbols & Notes – (continued)

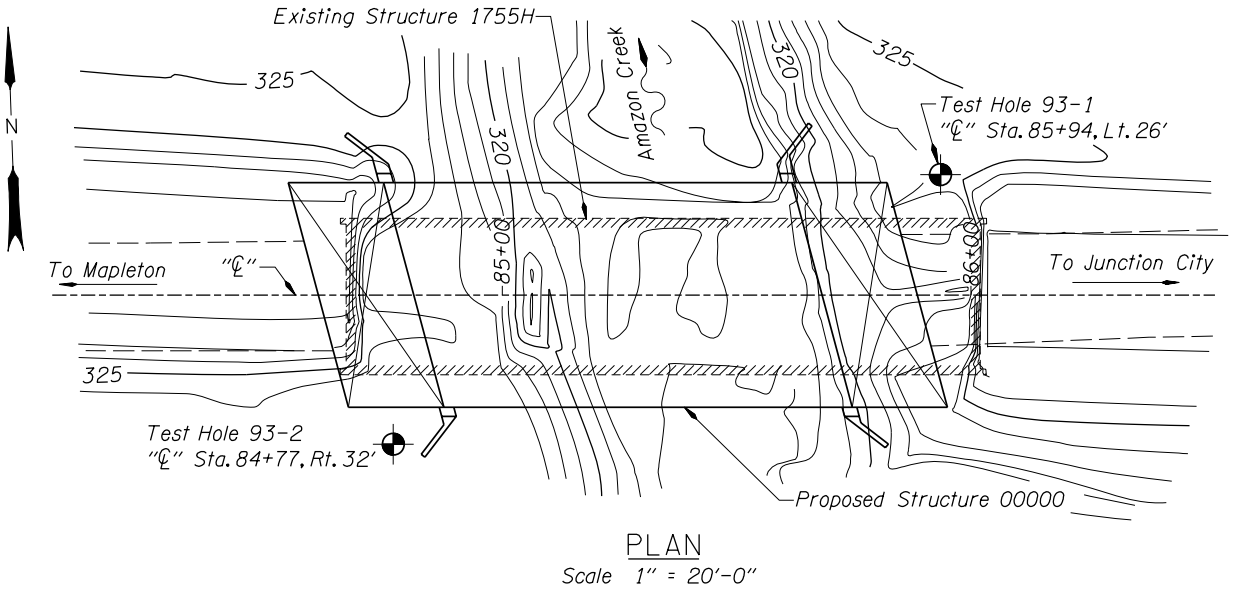
Geotechnical data shown on this drawing are a consolidation of information and/or revision in terminology from the drill logs. The drill logs and any other exploration data used in compiling this drawing are available upon request. Contractor shall refer to Geotechnical Reports and drill logs and the information contain therein.

STANDARD NOTE FOR
INCLUSION ON ALL FOUNDATION DATA SHEETS
Figure 2.7.4.3E

STRUCTURE NO. 00332A	ROGUE RIVER + HWY 271 (ROCK POINT) OR234: ROGUE RIVER BRIDGE (ROCK POINT) REHAB SAMS VALLEY HIGHWAY (MP 0.09) JACKSON COUNTY	SHEET 2 OF 27	
DATE April 2009		DRAWING NO.	
CALC. BOOK -----	FOUNDATION DATA	81038	

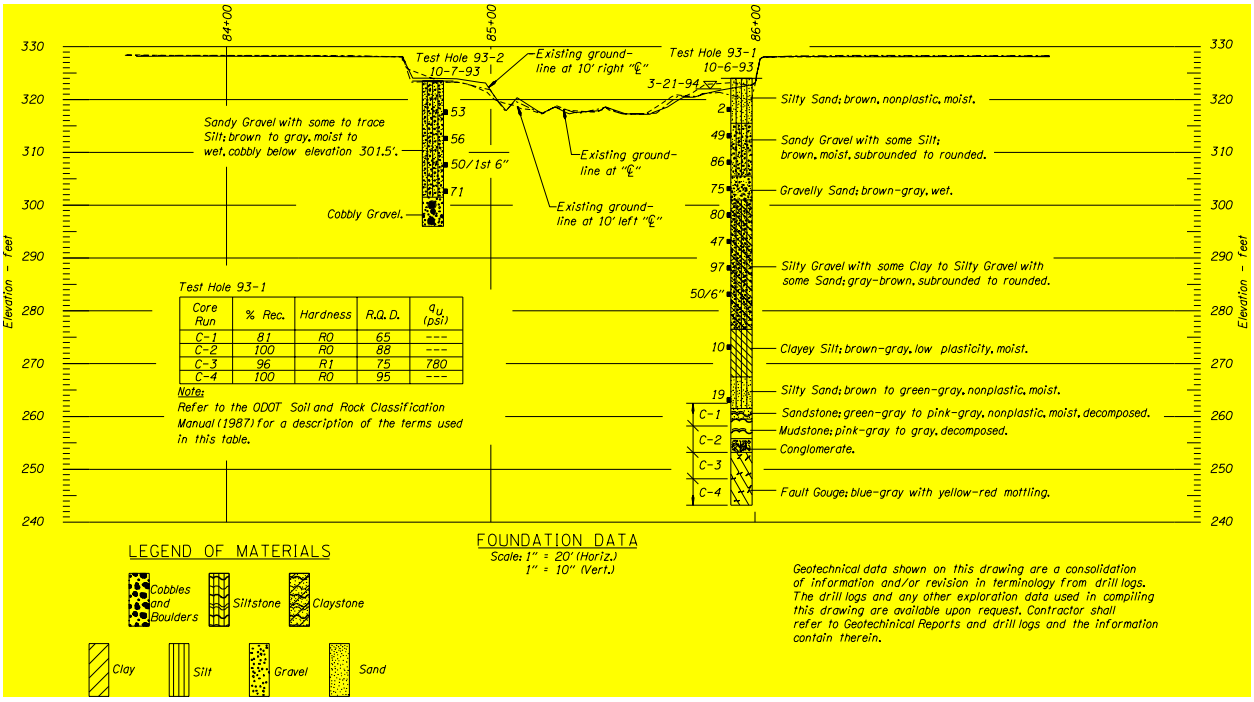
TITLE BLOCK EXAMPLE
Figure 2.7.4.3F

2.7.4.3 Foundation Data Sheet Example Sections



EXAMPLE OF TYPICAL "PLAN" VIEW LAYOUT

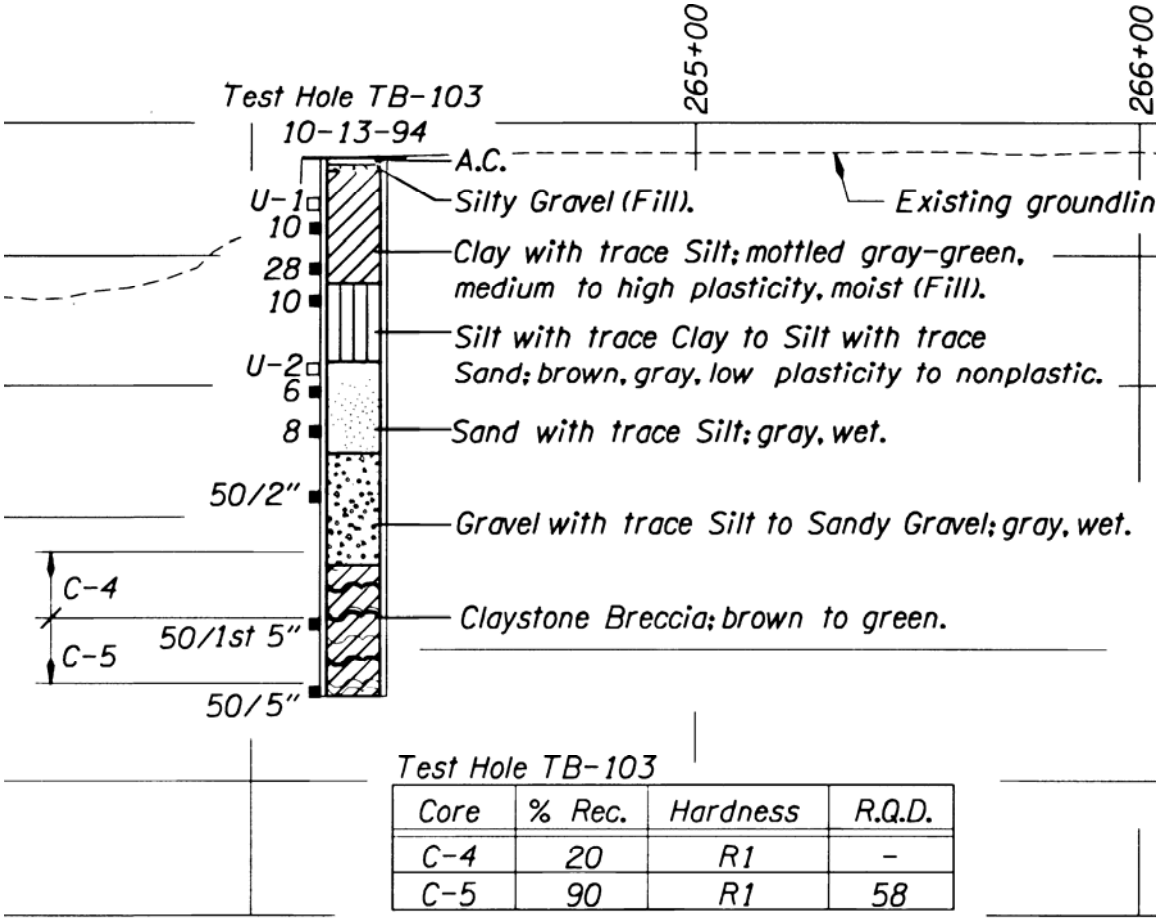
Figure 2.7.4.3G



EXAMPLE OF TYPICAL
"ELEVATION VIEW (FOUNDATION DATA)" VIEW LAYOUT

Figure 2.7.4.3H

2.7.4.3 Foundation Data Sheet Example Sections – (continued)



Core	% Rec.	Hardness	R.Q.D.
C-4	20	R1	-
C-5	90	R1	58

TYPICAL GRAPHIC COLUMN WITH SOIL/ROCK MATERIAL DESCRIPTIONS, SPT "N" VALUES, UNDISTURBED ("U") SAMPLES AND ROCK CORE RUNS

Figure 2.7.4.3J

2.7.5 Footing Plan

The purpose of the footing plan is to enable the footings to be laid out readily in the field. Provide the intersection station, the angle between each bent centerline, the alignment centerline and the distance from the intersection to each footing or pile.

For spread footings, show "Minimum Factored Bearing Resistance is __ psf." The value should be the factored bearing resistance as stated in the Foundation Report.

Show and label all underground utilities as well as existing footings on the footing plan.

The Footing Plan is a good location to show in water work zones that occur on all water crossings.

2.7.6 Deck Plan

If the plan view of the Plan and Elevation sheet is drawn to a scale of 1”=10’ or larger, a separate deck plan may not be necessary. When a deck plan is required, draw it to a scale of 1/8” = 1’-0”. Generally, draw a full deck plan. However, if a structure is symmetrical or has repetitious elements, it may be sufficient to draw only half or less of the total superstructure. In this case, the designer and drafter should study together how this can best be done so as to avoid confusion.

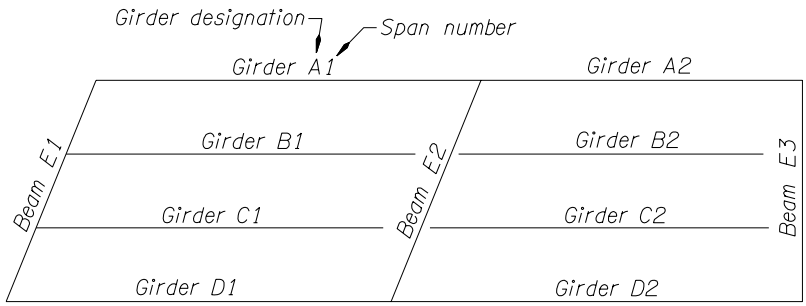


Figure 2.7.5A

Details normally shown on the deck plan include:

- Details which are repeated several times or which require a note larger than can readily be placed in Detail Reference Numbers and be called out by a number in a circle. A corresponding number and circle along with the note can then be placed elsewhere on the sheet. Typical Detail References are shown in the Appendix Section A2.7.1.

- The designated alignment line ("L" Line, "C" Line, etc.) to which all dimensions are tied. Show the bearing of this line if it is on tangent.

- Out-out widths of the structure.

- Bent centerline stations, numbers, and angles of intersection with the local tangent. Dimension the intersection angle as the acute angle between centerlines of roadways or between centerline of roadway and centerline of bent. Where the intersection is on a curve, measure the angle from the local tangent to the curve at the point of intersection. The skew angle, which determines placement of deck steel, should not be dimensioned.

- Span numbers and lengths.

- Deck elevations with a note, "elevations shown are finish grade top of concrete at centerline of bent" (if ACWS is to be placed elevations may be shown 2” below finish grade, if so noted). There are two elevation notes available in the bridge cell library, one for shed roof section and one for crown section.

  Shed roof section = T_ElevNote_2Pts
  Crown section = T_ElevNote_2Pts

- Drains, catch basins and drain pipes.

2.7.6 Deck Plan – (continued)

- Rail post spacing, rail splices and locations of preformed expansion joint filler in concrete curbs or parapets and rail pay limits.
- Light posts and electrical conduit and fixtures.
- Deck steel placement if not parallel to bents.
- The location of utility lines carried in the structure, pipe hangers, concrete deck inserts, and the name of the owner, who will furnish the materials, and who will do the work.
- Access manholes, crawl holes and drain holes in diaphragms. Drain holes and access holes in the bottom slabs of box girders. Vent holes in top of stems.
- The centerlines of all longitudinal girders, cross beams and diaphragms. The distances between the centerlines of longitudinal girders along the centerline of the bent are normally shown here. If this proves too involved to do on the deck plan, it can be done on a plan view of the bent, in which case it would appear with the bent details.
- Girders usually identified by a single letter and a span number for the girders that are not identical. See Figure 2.7.5A
- Lateral bracing for steel structures indicated by a single line. Its size may be called out here.
- The width of the stems of poured-in-place concrete girders. This may be done by a "cut away" view showing the typical dimensions of each type of girder used.
- Protective screening
- Earthquake restraint
- Expansion joints
- End panels

2.7.7 Superstructure Details

2.7.7.1 General

The superstructure is that portion of the structure that extends from the bottom of the longitudinal girders upward. Here are a few basic types of superstructure construction:

- Cast-in-Place Concrete
- Slab
- Rigid Frame
- Reinforced concrete deck girder
- Reinforced concrete box girder (RCBG)
- Post-tensioned concrete box girder (RCBG/PT)
- Precast prestressed concrete
- Girder
- Box girders
- Integral deck girder
- Channels (tubs)
- Segmental post-tensioned concrete - a structure combining elements of cast-in-place and precast prestressed concrete
- Steel structures
- Multi-girder, composite girder
- Through girder
- Truss
- Arch

Superstructure details for girder type structures consist primarily of longitudinal girder elevation views, superstructure sections, and diaphragm and cross beam details.

2.7.7.2 Superstructure Sections

A "Typical Deck Section" is a transverse cross-section of the superstructure showing the deck, girders and curbs or parapets, if any. Required dimensions include the out-out width of the structure, roadway width, girder spacing, the location of these with respect to the designated alignment centerline and the deck thickness, reinforcement bends and bar spacing.

2.7.7.2 Superstructure Sections – (continued)

Draw the deck section to a scale of not less than 3/8" = 1'-0". A separate deck section is required for each type of construction used. Additional sections may be required if the roadway width or number of size of girders changes. Half sections may be used for symmetrical superstructures. On wide superstructures with many identical girders at equal spaces, a portion of the width may be omitted to save space and detailing. The number, size and spacing of deck reinforcing bars should be listed adjacent to the deck section. A note should refer to rail drawing(s) for additional reinforcement at rails.

For conventionally reinforced continuous concrete structures, the location of the main longitudinal bars can be called out by letter on typical sections (or half-sections) of the superstructure at midspan and near interior supports. These bars can then be listed in a table showing the letter designation, number required, size and length, and the distance to some control point. These sections can also be used as typical deck sections (see above). Separate sections of individual girder stems are often shown to call out such details as the shape and dimensions of vertical stirrups and the location of temperature reinforcement.

2.7.7.3 Diaphragm and Cross-Beam Details

Diaphragm beams for concrete girder structures are usually shown in elevation on the typical deck section. Details required include reinforcing bars and the size and location of utility holes. Crawl holes and drain holes through the diaphragm must be shown for box girders. Show a section through the diaphragm beam showing dimensions and reinforcing bars on the same sheet.

Show cross beams and end beams for concrete structures on the bent drawings.

2.7.7.4 Longitudinal Girder Elevation Views

The elevation view of a cast-in-place concrete girder should show the total length, the lengths between centerlines of bents or bearings, the location of diaphragm beams, haunch dimensions (vertical), stirrup spacing, girder end condition and longitudinal reinforcing bar location.

For post-tensioned concrete box girders, place a diagram showing the path of the post-tensioning center of gravity above the longitudinal girder elevation.

For steel girders, standard precast prestressed concrete girders and the tensioning details of post-tensioned box girders, there are file drawings which can be completed to cover most of the required details. Use these if possible. If not, use them as patterns for the manner of presenting information.

For all structures which make use of prefabricated girders, provide a note saying, "All dimensions shown are horizontal and must be corrected for slope." This note appears on the standard steel girder and prestressed girder sheets and need not be repeated.

Plate diaphragms and cross beams for steel structures must be detailed separately.

So far as possible, girder details should be completed on each sheet for the spans shown there. Place notes referring to common details which appear on other sheets immediately above the title block.

Camber diagrams - required for all structures. Place a note by the camber diagram as to the assumptions on which it is based.

2.7.8 Bent Details

2.7.8.1 General

Show the following information, as applicable, for all bents. Where abutments are used, it is necessary to show the final ground elevation inside and outside the abutment. This may be shown on a side elevation of the abutment or on a separate sketch.

2.7.8.2 Plan View

Provide a plan view of a pier, bent or abutment, if it is necessary to tie down the arrangement of girders or to show features at the deck level which influence the details of the substructure. Show drains, special reinforcement at joints, et cetera, in this view. On some bents, a plan at the bearing level is necessary to show the arrangement of bearing devices and anchor bolts.

2.7.8.3 Elevation

Provide an elevation view showing the dimensions and reinforcement of columns, web walls, caps, crossbeams, etc. Indicate the location of utility holes. Show the vertical dimensions of the footings or pile caps, and the elevations of the bottoms of the footings or pile caps, on this view. If the footings or pile caps are sloped, show the elevations at each end.

2.7.8.4 Footing Plan

Provide a footing plan showing the size and reinforcement of footings (and seals) and the size and locations of piles, if any. Show the location of the footings with respect to the designated alignment line and the intersection angle of the footing centerline with that line. Show sectional views of columns or shafts with dimensions and reinforcement in this view or elsewhere on this sheet.

2.7.8.5 Details

Show reinforcing and dimensions of crossbeams, caps, wingwalls and web walls in cross-section views. Call out all reinforcing steel by size, length and spacing. Clarify stirrup and hoop details by separate diagrams, if necessary.

The following procedures which reduce the amount of detailing may be used if they do not reduce the clarity of the plans. Draw similar bents, footings or crossbeams only once and double dimension or make a table of varying dimensions.

If possible, bent details should be complete on any sheet for the bents shown there. Place notes referring to common details which appear on other sheets immediately above the title block, and reference individual details to their location.

2.7.9 Miscellaneous Details

Include in each set of drawings such miscellaneous details as are required for the completion of the project. These would include the following:

- Concrete pour schedules.
- Bearing devices – show details of bearing devices and their material called out. List the location and number required for each type or size of bearing.
- Steel girder details - framing and bracing, splices, etc.
- Deck joint details - armored corners, paving dams, joint seals, etc.
- Electrical and lighting details.
- Signing support details.
- Pile details - tip reinforcement, encasement, etc.
- Median details - barrier rail, longitudinal joint, etc.
- Shoring plan and Falsework diagram and lighting.
- Surface finish diagram.

2.7.10 Plans "For Information Only"

There are a couple of options when existing drawings need to be accessible to the Project Manager's office and Contractors working on a certain project.

When plans of an existing structure are to be included in a set of contract drawings, the designer or drafter should obtain the full-scale tracings. Place the following tag on each drawing in a manner that can be removed:

```
+----------------------------------------+
¦ FOR INFORMATION ONLY  ¦
+----------------------------------------+
```

These drawings should then be added to the contract tracings. When drawings are placed back into the file, the "For Information Only" tag should be removed.

The most commonly used practice is stating in the Special Provisions that existing plans are available from the Project Managers office.

Most drawings can be found and printed from the Bridge Data System (BDS). See Section 2.8.3 for more on BDS.

2.7.11 Revisions

Note any Revisions to drawings under the following conditions:

- Final drawings which have been sent to prospective bidders (generally, any time after the Bridge Engineer has signed them) or are a part of a job under contract.
- "As Constructed" prints that are returned at the completion of a project.

Normally, revised final drawings and "As constructed" drawings have the changed detail lined out, not erased. Where changes are such that they cannot be made feasibly by lining out, include the change note ("redrawn") next to the description of the change.

Note Revisions by a number in a triangle next to the change and in the title block.

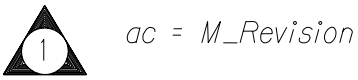


Figure 2.7.11A

Do not make Revisions on final drawings between the latest date that a letter of addendum can be sent out and the bid opening date. This generally means at least 10 days before the bid opening date. Failure to observe this could result in some bidders obtaining revised plans while others did not. After the bid opening, revisions can be made and sent out as a construction change.

Revisions to a project will have designer's initials shown. See Figure 2.7.11B.

△	DATE	REVISION	BY
1	8-21-79	Added temporary rail	RLM
2	8-21-79	change longitudinal joint	RLM
3	10-2-79	change post dimension	RLM
4	11-7-80	As Constructed	JLS

Figure 2.7.11B

2.7.11.1 As-Constructed Drawings

“As-constructed” changes will have the Drafters initials. See Figure 2.7.11B.

All "As-constructed" revisions on one sheet should have the same revision number, consecutive with previous revisions on that sheet. If there are no "As Constructed" revisions, add the date and "As Constructed" with no triangle or revision number. Show the name of the Project Manager on the Plan and Elevation sheet.

“As-Constructed” revisions are made by hand to the original signed mylar and **not made to the electronic cad files**.

Project Managers office will send As-constructed mark-ups to the design office where they were created. “As-constructed changes will be made and sent out. Original mark-ups go back to the Project Managers office. One half-size (11” x 17”) paper copy goes to each of the following, Region Bridge inspector and Bridge Operations Managing Engineer. The original signed mylars (22” x 34”) with as-constructed comments are returned to the Bridge Section Headquarters in Salem.

See Appendix A2.7.11.1 for As-constructed Example letter.

Once the Bridge Section has received mylars, and all “As Constructed” changes to the original mylar, a new scanned tiff file will be made and loaded into the Bridge Data System (BDS).

2.8 PLOTTING

2.8.1 Printers

For a list of printers in a certain area. Go to Start>Settings>Printers and Faxes and search for a list of printers.

During the design phase of a project there are different requirements as far as what kind of plot is ordered. The following are suggested guidelines.

- Check Prints - Use queue's for plotters located within your crew's room for half size paper prints
- Preliminary Plans - Same as "Check Prints"
- Advanced Plans - Use half size paper prints (sent with Roadway Plans)
- Final Plans ("D" size 24" x 36") - Mylar for full size prints (Printed on 4 mil minimum, single or double sided matte finish)
- Prints to Specification Writer are a half-size paper of the signed mylar

2.8.2 Bridge Plotting Using Plotypus

Most all contract plans plotting is with the use of Plotypus.

For help with Plotypus open and Microstation file and the go File>Plotypus. With Plotypus open the hit the help button for questions regarding Plotypus.

2.8.3 Bridge Data System (BDS)

2.8.3.1 What is Bridge Data System? (BDS)

There are two primary purposes of the Bridge Data System. First, is to provide Oregon Department of Transportation Drafters and Engineers and Oregon Department of Transportation's consultants a means of tracking and viewing all work past and present related to projects. Second, to provide a means of obtaining structure and drawing numbers for new work. See Bridge Data System Manual for complete instructions on its use. The BDS Manual can be located by going the Bridge Section web page.

http://www.oregon.gov/ODOT/HWY/BRIDGE/standards_manuals.shtml

See Appendix A2.8.3 for Bridge Data System – Structure and Drawing Number Request Form.

- **Structure Number**
  It is required to get a new structure number when replacing the existing structure or it is a new structure at this location. This includes structures that are having the super structure replaced.

  Any structure that will require ODOT for inspection,will require a structure number. All structures shown in BDS will have plans available for use for future work, when structure is under contract with ODOT.

  See Structure Numbering Rules at the following link:

  http://egov.oregon.gov/ODOT/HWY/BRIDGE/standards_manuals.shtml

  When rail replacement, overlay, deck rehab or widening work is being done, then the existing structure number is used.

- **Structure Work Number**
  Every time work is done on a particular structure, then a new structure work number is required.

- **Drawing Number (BDS Reference Number)**
  Each project that is completed on a given structure has its own drawings for construction. Each drawing will have a unique five-digit number assign to it. Drawing number is like a file number for future reference to the drawing.

***IMPORTANT* –** No block of numbers will be issued, request only number for completed mylars. It is a good idea to wait until two weeks before final mylars are to be printed to request drawing numbers.

For those without BDS access request can be made to the Region Bridge Drafter or they can send an email to Bridge@ODOT.state.or.us . For structure and drawing number request, see Appendix A.2.7.3 for a BDS Structure and Drawing Number Request Form. For request of copies of old drawings, please list structure number, structure name and/or drawing numbers needed.

2.8.3.2 Images Required at Signed Mylars and As-Constructed Milestones

When requesting half–size paper prints of your signed mylars, request that Reprographics scan the file and place it in the reprographics directory using the drawing number as the file name. Once these files have been placed in this directory, the Bridge Section will load the drawings into the Bridge Data System (BDS).

See Section 2.7.11 for As-Constructed drawing information.

2.9 TRANSFER OF ELECTRONIC FILES TO OUTSIDE OF ODOT

There are several ways to send files outside of ODOT. Using CD's, DVD's, electronic mail (this method is discouraged for large design files) and using the ftp site on the internet. The location of the ftp site is: **ftp on 'Salem - Rev. Bldg 5th Fl - FTP Server (S0442c).** There are both incoming and outgoing directories listed on this site, depending on whether you are sending or receiving information. The information at this site is only stored for a short period of time, and then deleted from the site.

The emailing of files is discouraged, because CAD file sizes can be quite large.

2.10 ARCHIVING CAD FILES

Once a project has been printed on mylar, the files should reside on F:\ODOT_DATA\Projects\Key# until shortly after the project has gone to bid before being archived.

The engineering archive directory is located at:
eng_arc on 'Salem-Rev. Bldg 5th Flr - VIRTUAL SCDATA2 Clustr (scdata)'

There are email forms in the above location for your archiving convenience.

The following information is required to archive a project. Information shown below in bold is required. Please archive the following project.

KEY NUMBER=
COUNTY=
SECTION=
HIGHWAY NAME=
HIGHWAY NUMBER=
ROUTE=
MILE POINT START=
MILE POINT END=
PHASE=
COMPUTER_NAME=
FILES_PATH=
FILES_NAMES=
USERNAME=
USERPHONE=
V NUMBER=
CONTRACT NUMBER=

It is the Structural Drafters responsibility to see that CAD files are archived in the proper directory. Remember to do this in a timely manner, so that everyone can find the files they need.

When files are retrieved from Archives directory for another project, remember to rename these files. (filename.ref)

SECTION 2 APPENDIX

A2.1 Text

Abbreviations:

GENERAL

1. Do not use abbreviations where the meaning may be in doubt. If there is a possibility of confusion, spell the term out.

2. Place a period after all abbreviations, except as listed below.

3. Apostrophes are usually not used. Exceptions: pav't., req'd.

4. Abbreviations for plurals are usually the same as the singular. Exceptions: figs., nos., ctrs., pp.

5. Avoid abbreviations in titles if possible.

List of Abbreviations Commonly Used on Bridge Plans

A

additional	add'l.
adjust, adjacent	adj.
alternate	alt.
ahead	ah.
American Society for Testing Materials	ASTM
American Association Of State Highway and Transportation Officials	AASHTO
Anchor Bolt	A.B.
and	&
approximate	approx.
approved	appd
asphalt concrete	AC
Asphalt Concrete Wearing Surface	ACWS
assembly	assy
at	@ (used only to label spacing or pricing, otherwise spell out.)
Avenue	Ave.
average	avg.

Abbreviations – (continued)

B

back	bk.
beam	Bm.
bearing	Brg.
begin vertical curve	BVC
bent	Bt.
between	btwn.
bottom	btm.
bottom of	B.O.
bridge	Br.
building	bldg.

C

cast-in-place	CIP
center, centers	ctr., ctrs.
centerline	CL or L
center of gravity	cg
center of gravity of strands	cgs
center to center	ctr-to-ctr or c-c
centered	ctrd.
clearance, clear	cl.
compression, compressive	comp.
column	col.
concrete	conc.
concrete pavement	PCC pav't.
connection	conn.
construction	const.
continuous	cont.
corrugated metal pipe	CMP
County	Co.
Creek	Cr.
crossbeam	X-Bm.
crossing	Xing
cross section	X-Sect
cubic feet, meters	ft^3 ,m^3
cubic in, millimeters	in^3 ,mm^3
culvert	culv.

D

degrees, angular	^{o} or deg.
degrees, thermal	^oC, ^oF
diagonal(s)	diag.
diameter	dia. or ø
diaphragm	diaph.
dimension	dim.
District	Dist.
double	dbl.
drawing, drawings	dwg., dwgs
drill and tap	D & T
Drive	Dr.

Abbreviations – (continued)

E

each	ea.
each face	EF
each way	EW
easement	ease.
East	E
edge of pavement	EP
edge of shoulder	ES
electric	elect.
elevation	El.
embankment	emb.
end vertical curve	EVC
Engineer	Engr.
estimate(d)	est.
excavation	exc.
excluding	excl.
expansion	exp.
existing	extg.
exterior	ext.

F

far face	FF
far side	FS
feet, foot	ft.
figure, figures	fig., figs.
flange	flg.
footing	ftg.
forward	fwd.
Freeway	Fwy.

G

galvanized	galv.
galvanized steel pipe	GSP
gauge	ga.
Grade	Gr.
ground	grd.

H

hanger	hgr.
height (retaining wall)	ht.
hexagonal	hex.
high strength	HS
high water	HW
high water mark	HWM
Highway	Hwy.
hook	hk.
horizontal	horiz.
hour(s)	hr.

Abbreviations – (continued)

I

included, including	incl.
inside diameter	ID
inside face	IF
inside radius	IR
interchange	intchge.
interior	int.
intermediate	interm.

J

joint	jt.
junction	jct.

K

Kilometer	km

L

left	lt.
length of curve	LC
longitudinal	longit.
long	LG
lump sum	L.S.

M

maintenance	maint.
manhole	MH
manufactured	mfd.
manufacturing	mfg.
material	mat'l.
maximum	max.
meter	m
mile	mi.
millimeter	mm
minimum	min.
minute(s)	min.
miscellaneous	misc.

N

National Geodetic Vertical Datum	NGVD
near face	NF
near side	NS
nominal	nom.
North	N
North American Vertical Datum 1988	NAVD 88
Northbound	NB
number, numbers	No., Nos., #

Abbreviations – (continued)

O

original ground	OG
outside diameter	OD
outside radius	OR
out to out	o-o
overcrossing	O'xing

P

page, pages	p. or pp.
pavement	pav't.
pedestrian	ped.
Plans, Specifications and Estimates	PS&E
plate	PL
point	pt.
point of compound curve	PCC
point of curvature	PC
point of intersection	PI
point of reverse curve	PRC
point of tangency	PT
point on vertical curve	PVC
point from tangent to spiral	PS
point from spiral to circular curve	PSC
point from circular curve to spiral	PCS
point on spiral	POS
point on horizontal curve	POC
point on tangent	POT
polyvinyl chloride	PVC
Portland Cement Concrete	PCC
prestressed	prest.
prestressed concrete pipe	PCP

Q

quantity	qty.

Abbreviations – (continued)

R

radius	R.
railroad	RR
Range	R.
reinforced, reinforcing	reinf.
reinforced concrete	RC
reinforced concrete box beam	RCBB
reinforced concrete box culvert	RCBC
reinforced concrete deck girder	RCDG
reinforced concrete box girder	RCBG
reinforced concrete pipe	RCP
required	req'd.
retaining wall	ret. wall
revised (date)	rev.
right	rt.
right of way	R/W
River	R.
Road	Rd.
roadway	rdwy.

S

seconds (angular)	“
seconds (time)	sec
Section (map location)	Sec.
Section (of drawing)	Sect.
sheet	sht.
shoulder	shldr. or sh.
sidewalk	SW or sdwk.
slope	sl.
South	S
Southbound	SB
spaces	spcs
spaced	spcd.
spacing	spcg.
splice	spl.
specification	spec.
square kilometer	km^2
square feet,meter	ft^2,m^2
square inch, milimeter	in^2 ,mm^2
standard	std.
Station	Sta.
stiffener	stiff.
stirrup	stirr.
Street	St.
structure, structural	str.
support	supp.
surface, surfacing	surf.
symmetrical	symm.

Abbreviations – (continued)

T

top & bottom	T & B
tangent	Tan. or T.
telephone	Tel.
temporary	temp.
test hole	T.H.
thick(ness)	thk.
township	T.
top of	T.O.
transportation	trans.
transverse	transv.
typical	typ.

U

ultimate	ult.
undercrossing	U'xing

V

variable, varies	var.
vertical	vert.
vertical curve	VC
volume	vol.

W

wearing surface	WS
weight	wt.
West	W
Willamette Meridian	WM
with	w/
without	w/o

A2.1.3 CAD Files

Retrofit / Repair Bridges

FRP Strengthening
- Plan-sheet 1 of 3
- Girder Elevation-sheet 2 of 3
- Girder Details-sheet 3 of 3

Crack Repair
- Crack Repair Details-sheet 1of 1

Internal Anchor Strengthening
- Plan-sheet 1 of 3
- Stage Construction Details-sheet 2 of 3
- Details sheet 3 of 3

Crossbeam Strengthening External PT
- Plan and Elevation sheet 1 of 3
- Top Bracket Details sheet 2 of 3
- Bottom Bracket Details sheet 3 of 3

Cap Beam Strengthening – Internal Shear Anchor
- Plan and Elevation sheet 1 of 2
- Internal Shear Anchor sheet 2 of 2

Retrofit / Repair Std. Details
- Access Hole Detail sheet 1 of 2
- Access Hole Detail sheet 2 of 2

Cap Beam – Concrete Encasement
- Concrete Encasement Details-sheet 1 of 1

Cap Beam Strengthening – Exposed External Stirrups
- Exposed External Stirrup Details

Barrier Replacement
- Plan and Stage Construction sheet 1 of 2
- Rail Details sheet 2 of 2

Drain Plug
- Details sheet 1 of 1

Rail Retrofit
- Thrie Beam Rail Retrofit 1 of 2
- Thrie Beam Rail Retrofit 2 of 2

A2.1.3 CAD Files – (continued)

Replacement Bridges

General Drawings – All Bridges

- TSL - Plan and Elevation
- TSL - Staging and Typical Section
- General Notes sheet 1 of 1
- Footing Plan sheet 1 of 1
- Foundation Data sheet 1 of 1

Piles / Drilled Shafts

- H-Pile Details sheet 1 of 1
- Pipe Pile Details sheet 1 of 1
- Drilled Shaft Details sheet 1 of 1

PS Girder Structure

- Plan and Elevation sheet 1 of 1
- Stage Construction sheet 1 of 2
- Stage Construction sheet 2 of 2
- End Bent Details sheet 1 of 2
- End Bent Details sheet 2 of 2
- Wingwall Details sheet 1 of 1
- Bent - Plan and Elevation sheet 1 of 2
- Bent Details sheet 2 of 2
- Deck Section sheet 1 of 1
- Diaphragm Beam Detail sheet 1 of 1
- Deck Plan sheet 1 of 1

Steel Plate Girder Structure

- Plan and Elevation sheet 1 of 1
- Construction Sequence sheet 1 of 1
- End Bent Details sheet 1 of 2
- End Bent Details sheet 2 of 2
- Wingwall details sheet 1 of 1
- Bent - Plan and Elevation sheet 1 of 2
- Bent Details sheet 2 of 2
- Typical Section sheet 1 of 1
- Deck Plan sheet 1 of 1
- Deck Pouring Sequence sheet 1 of 1
- Field Splice Details sheet 1 of 2

PS Slab Structure

- Plan and Elevation sheet 1 of 1
- Stage Construction sheet 1 of 1
- End Bent Details (short) sheet 1 of 2
- End Bent Details (tall) sheet 2 of 2
- Wingwall Details sheet 1 of 1
- Bent – Plan and Elevation sheet 1 of 2
- Bent Details sheet 2 of 2
- Deck Section sheet 1 of 1
- Deck Plan sheet 1 of 2

A2.1.3.1 Contract Plans Sheet Development Guide

Contract Plans Sheet Development Matrix

	Drawing #	CALC Book #	Border & Title Block	Structure # (1, 2)	Sheet Size
Critical Traffic Structures: [2,5]					
Sign Bridge	Traffic & Bridge	Yes	Traffic	Yes	11x17
Monotube Cantilever	Traffic & Bridge	Yes	Traffic	Yes	11x17
Butterfly	Traffic & Bridge	Yes	Traffic	Yes	11x17
High Mast	Traffic & Bridge	Yes	Traffic	Yes	11x17
Camera Pole	Traffic & Bridge	Yes	Traffic	Yes	11x17
Structures Mounted to a Bridge: [1]					
Camera, signs, Ilumination, etc.	Bridge	Yes	Bridge	Yes	22x34
Other Structures:					
Tanks, pump stations, etc	Bridge	Yes	Bridge	Yes	22x34
Signal Poles:					
Using a Standard drawing	Traffic	------	Traffic	------	11x17
Special Design	Traffic	Yes	Traffic	------	11x17
Illumination Poles:					
Using a Standard drawing	Traffic	------	Traffic	------	11x17
Special Design	Traffic	Yes	Traffic	------	11x17
Culverts [3,6,7]					
20' and larger [4]	Bridge	Yes	Bridge	Yes	22x34
6' and larger and less than 20'	Geo/Hydro & Bridge	------	Geo/Hydro	Yes	11x17
Less than 6' and larger than 4'	Geo/Hydro	------	Roadway	------	11x17
4' and smaller	Roadway	------	Roadway	------	11x17
Bridges[8]	Bridge	Yes	Bridge	Yes	22x34
Retaining Walls[9]					
Bridge Retaining Wall	Bridge	Yes	Bridge	Yes[12]	22x34
Highway Retaining Wall	Geo/Hydro & Bridge	Yes	Geo/Hydro	Yes[12]	11x17
Minor Retaining Wall	Roadway	------	Roadway	------[12]	11x17
Sound Wall	Bridge	Yes	Bridge	Yes	22x34
Material Source	Geo/Hydro	------	Roadway	------	11x17
Landslide Correction [10]	Geo/Hydro	------	Roadway	------	11x17
Earthwork [11]	Roadway	------	Roadway	------	11x17
Bank Protection	Geo/Hydro	------	Roadway	------	11x17

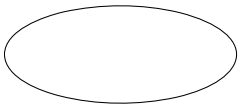
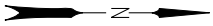
Erosion Control	Geo/Hydro	------	Roadway	------	11x17

Notes:

1. Any structure that is mounted to a bridge requires the use of the Standard Bridge drafting practices.
2. Bridge drawing numbers will be specified on the drawing as a reference number for use in the Bridge Data System except when the structure is mounted to a Bridge.
3. Bridge Span – as defined in the Bridge Design & Drafting Manual. Hydraulic Span – as defined in the Hydraulics Manual. For span determination of multiple barrel culverts refer to the Hydraulics Manual and NBI manual.
4. NBI Structure: All structures with a bridge span of 20 ft. or larger will be included in the NBI system/Database/Inspection/funding program.
5. Reference the most recent versions of the Traffic Structures Design Manual and the Bridge Design & Drafting Manual for additional information.
6. Wingwalls that accompany structures will appear on the same sheet size and border as the primary structure.
7. Assumes ODOT Standard Drawings are being used.
8. This includes Bridge Abutments, as defined in ODOT GDM Section 15.2.1, as well as any other walls, such as wing walls, that are of monolithic construction with the bridge.
9. Refer to the Wall Category definitions in ODOT GDM Section 15.2.1.
10. This includes buttresses and horizontal drains and any associated ground improvements.
11. This includes cut slopes, embankments, fill foundations, rockslopes and any associated ground improvements.

Refer to the Structure Number requirements in ODOT GDM Section 15.2.8.6 for guidance on determining which wall categories and configurations that require structure numbers.

A2.1.4 CELL LIBRARY: BRIDGE.CEL

A_Ah	A_DblAh	A_Ellipse 	A_North 
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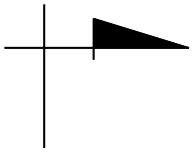
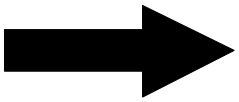
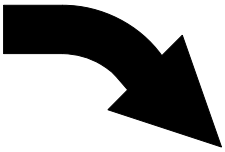
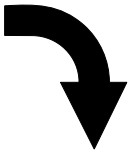
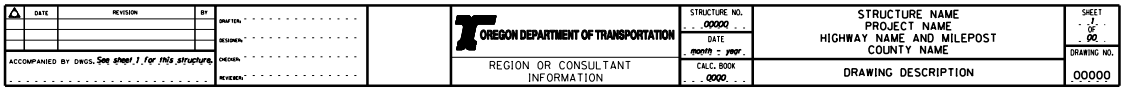
A_Section 	A_Traffic_0^ 	A_Traffic_45^ 	A_Traffic_90^ 

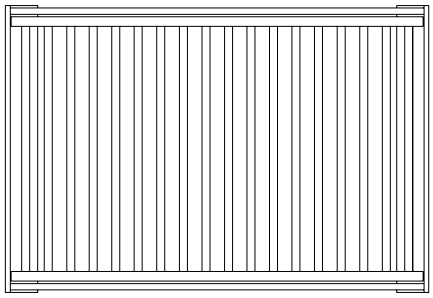
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: B_Titleblock_Bridge
Bridge All-in-One Titleblock for "D" size sheets

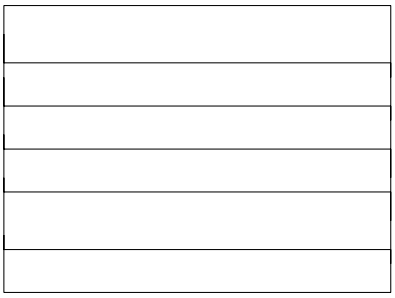


A2.1.4 CELL LIBRARY: BRIDGE.CEL

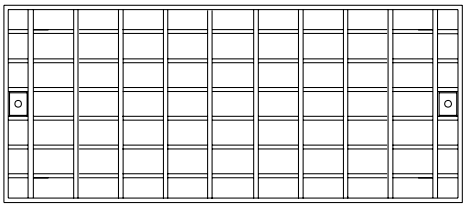
Cell Name: DR_27090
Deck Drain, dwg. 27090



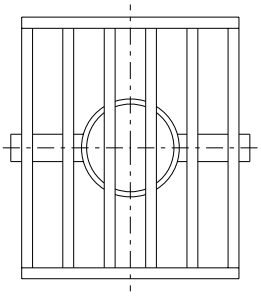
Cell Name: DR_DrainSymbol
Drain Inlet - Symbol



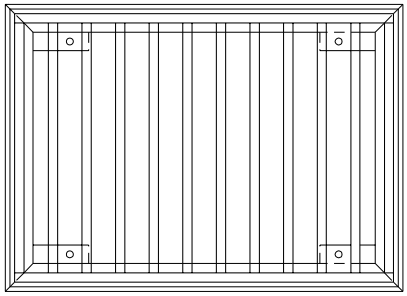
Cell Name: DR_RectangDrain
Rectangular Deck Drain - Plan



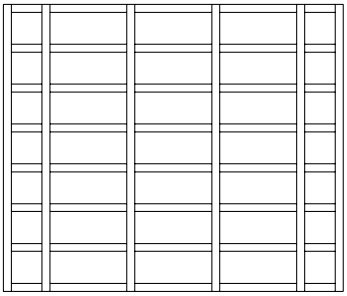
Cell Name: DR_S0083
Deck Drain, dwg. S83



Cell Name: DR_S226 Scale: 1.3545
Drain, dwg. S226



Cell Name: DR_SquareDrain
Square Deck Drain - Plan

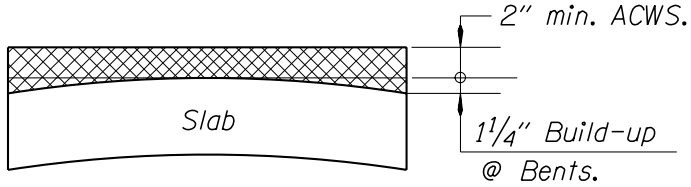


A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_ACWSBuildup
ACWS Build-up diagram

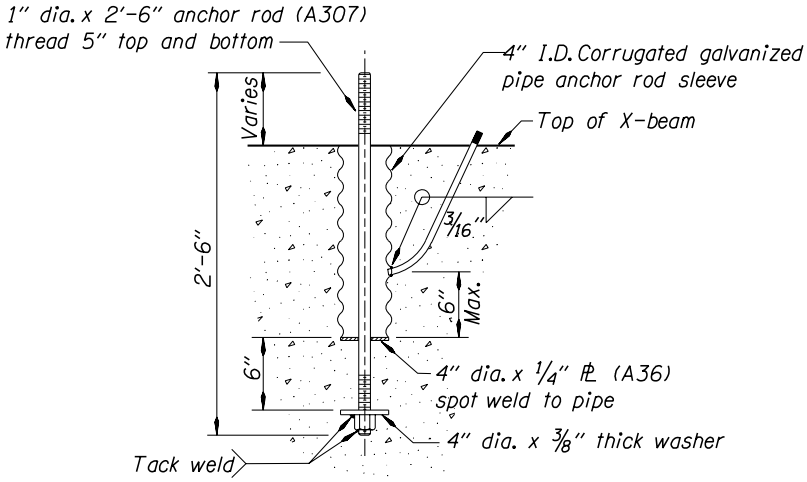
Note:
Deck elevations shown are top of concrete slab,
3¼" below finish grade as calculated below:

Min. ACWS---------- 2"
Anticipated camber @ 3 mos.------- 1¾"
Downward due to ACWS---------- -½"
Wearing surface thickness @ Bents--- 3¼"



ACWS BUILD - UP DETAIL

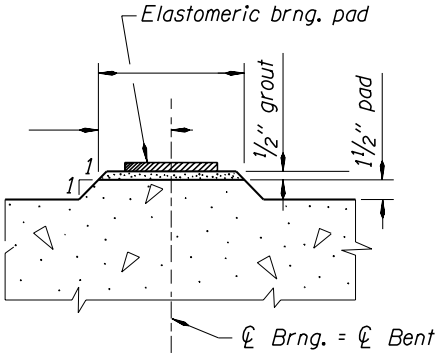
Cell Name: D_AnchorRod
Anchor Rod



ANCHOR ROD DETAIL
No Scale

A2.1.4 CELL LIBRARY: BRIDGE.CEL

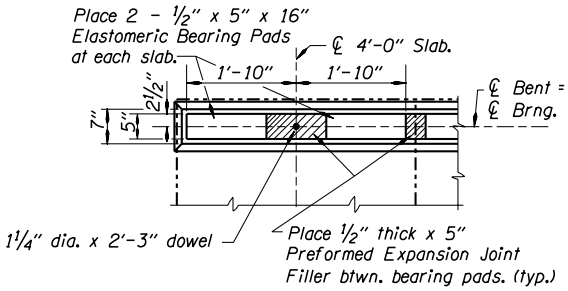
Cell Name: D_Brg_1Pad
Single Concrete Bearing Pad



CONCRETE PAD DETAIL

Form 1½" concrete pad integrally with supporting member. Place ½" grout layer immediately before placing slabs. Place elastomeric bearing pads, preformed exp. jt. filler and prestressed slabs before ½" grout is fully set to ensure uniform bearing across full width of slab. If uniform bearing is not achieved, lift slab and repeat procedure. Remove any excess grout protruding above bottom of bearing pads immediately after placing slabs.

Cell Name: D_Brg_1PadPlan
Single Concrete Bearing Pad - Plan

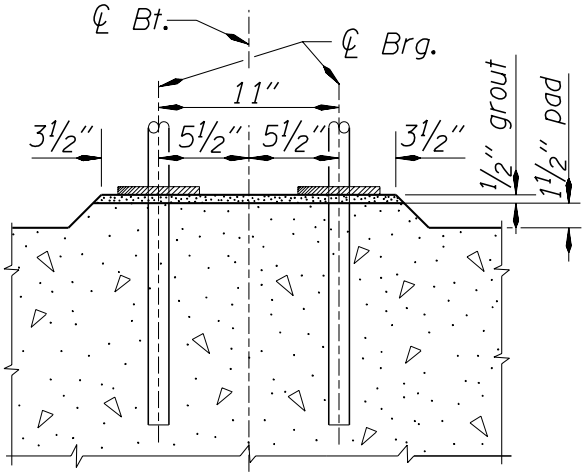


Place concrete pad to within ½" of top of pad. Wait a min. of 3 days to place remaining ½" layer. Place elastomeric bearing pad and prestressed slabs before top layer is fully set to insure uniform bearing across full width of slab. If uniform bearing is not achieved, lift slab and repeat procedure. Remove any excess concrete protruding above bottom of bearing pads immediately after placing slab.

BEARING DETAIL

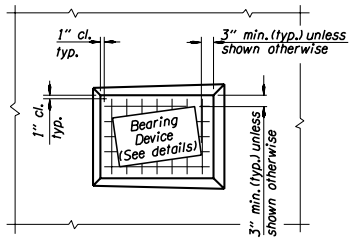
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_Brg_2Pad
Double Concrete Bearing Pad - Section

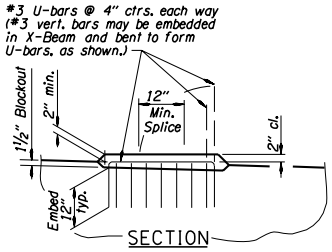


CONCRETE PAD DETAIL
(INTERIOR BENTS)

Cell Name: D_Brg_ConcretePad
Concrete Pad for Bearing Device - Plan and Elevation



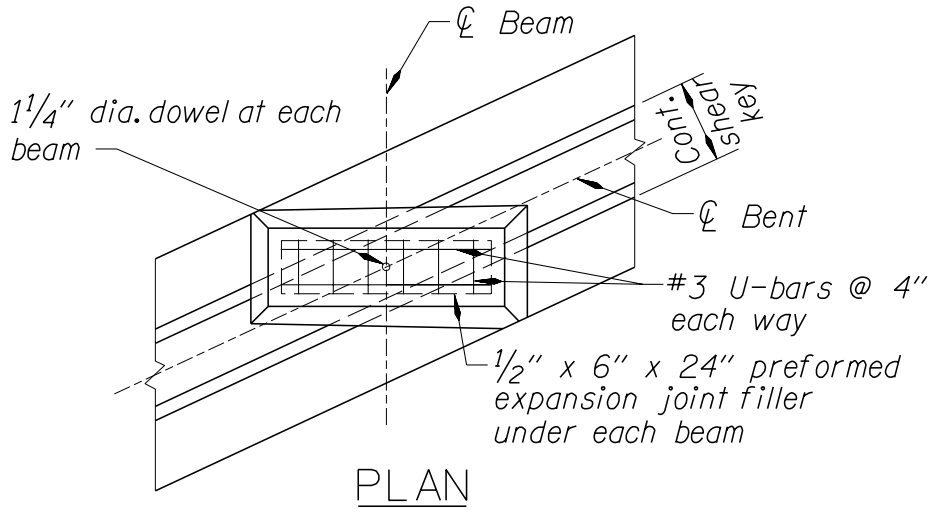
PLAN



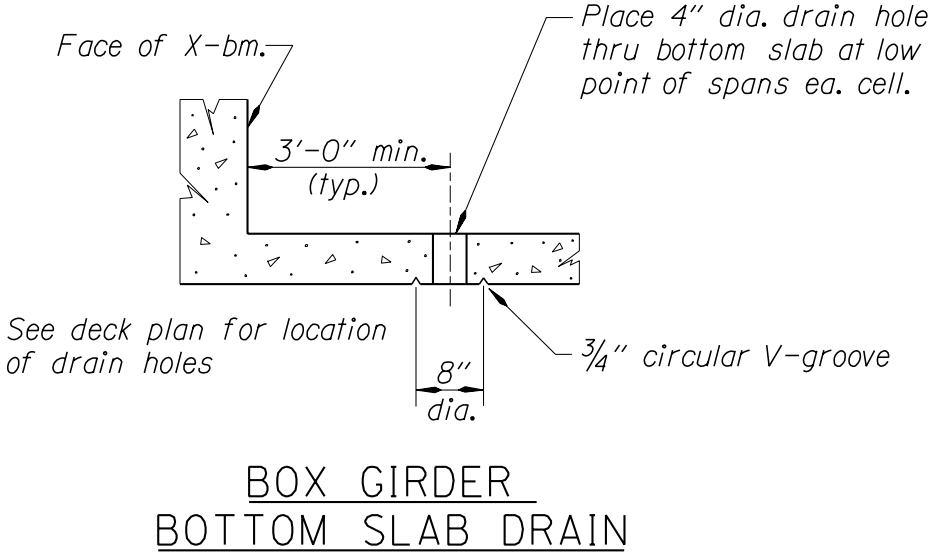
TYPICAL CONCRETE PAD

A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_Brg_PrecastBmPad
Concrete Pad for Precast Girders - Plan

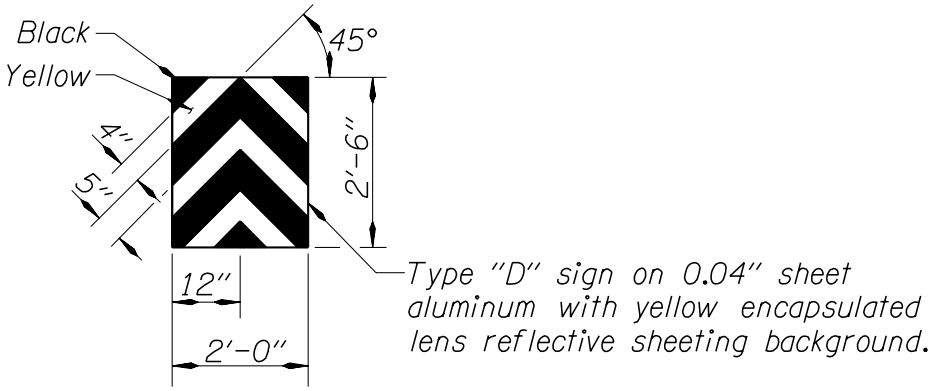


Cell Name: D_BtmSlabDrain
Bottom Slab Drain for Box Girder



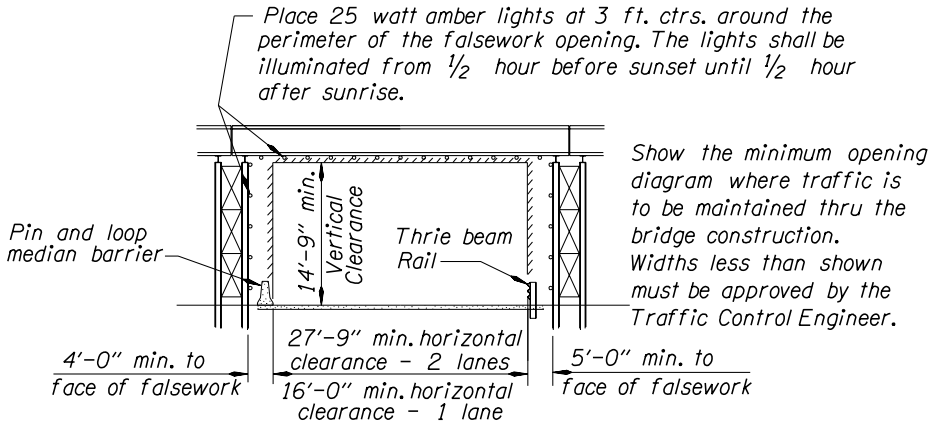
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_Chevron
Chevron Marker



CHEVRON OBSTRUCTION MARKER
No Scale

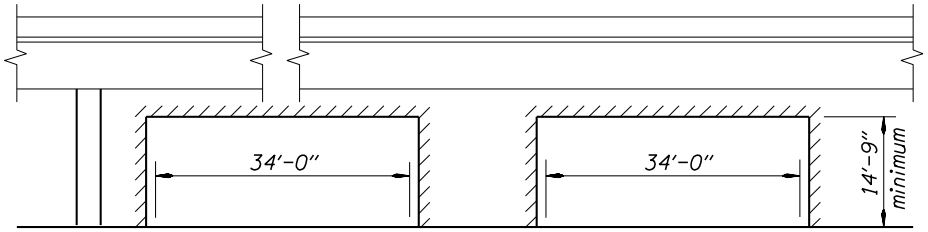
Cell Name: D_ClearanceDiagram1
Construction Clearance Diagram



TYPICAL CONSTRUCTION CLEARANCE DETAILS
No Scale

A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_ClearanceDiagram2
Clearance Diagram

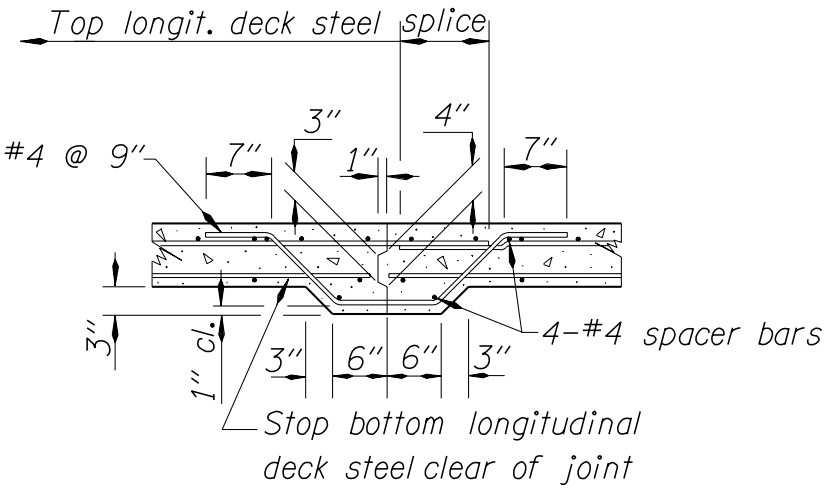


TYPICAL CONSTRUCTION CLEARANCE DETAILS

No Scale

Note:
All Construction horizontal clearances shown are between shoulder barriers and normal to roadway traffic. Place 25 Watt amber lights at 3'-0" ctrs. around perimeter of falsework openings facing oncoming traffic.

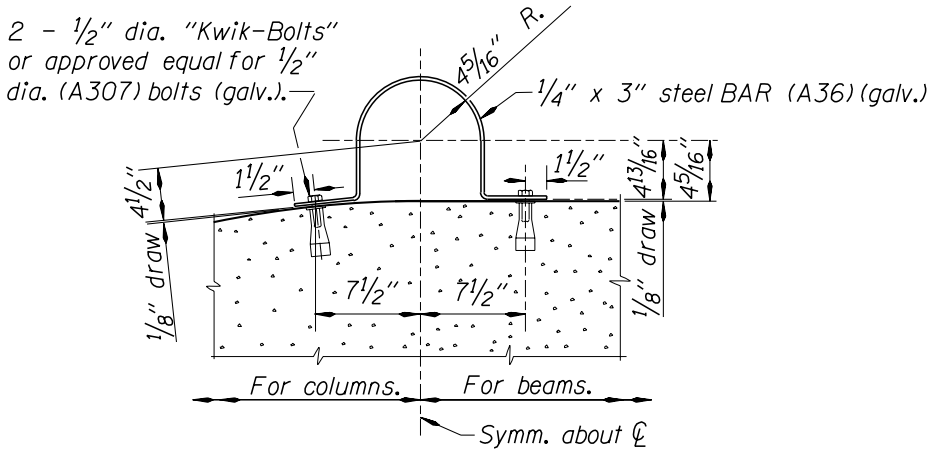
Cell Name: D_ConstructionJoint
Deck Construction Joint - Detail



DECK CONSTRUCTION JOINT

A2.1.4 CELL LIBRARY: BRIDGE.CEL

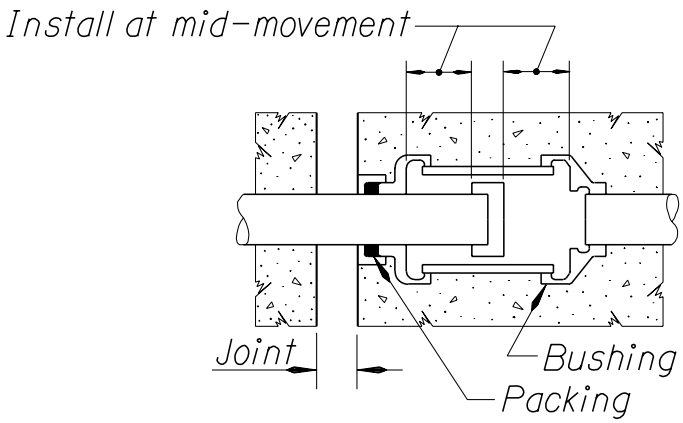
Cell Name: D_DrainClamp
Drain Pipe Clamp Detail



DRAIN CLAMP DETAIL

No Scale

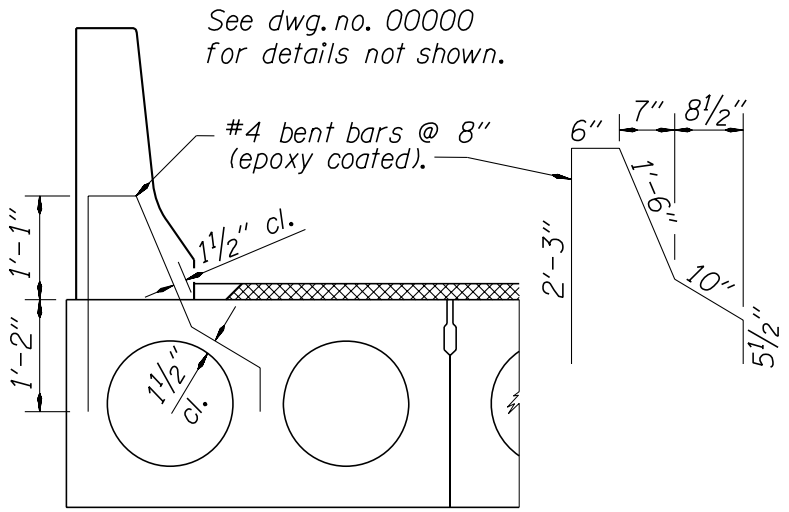
Cell Name: D_ElectricalExpansion
Electrical Expansion Joint



ELECTRICAL CONDUIT
EXPANSION JOINT

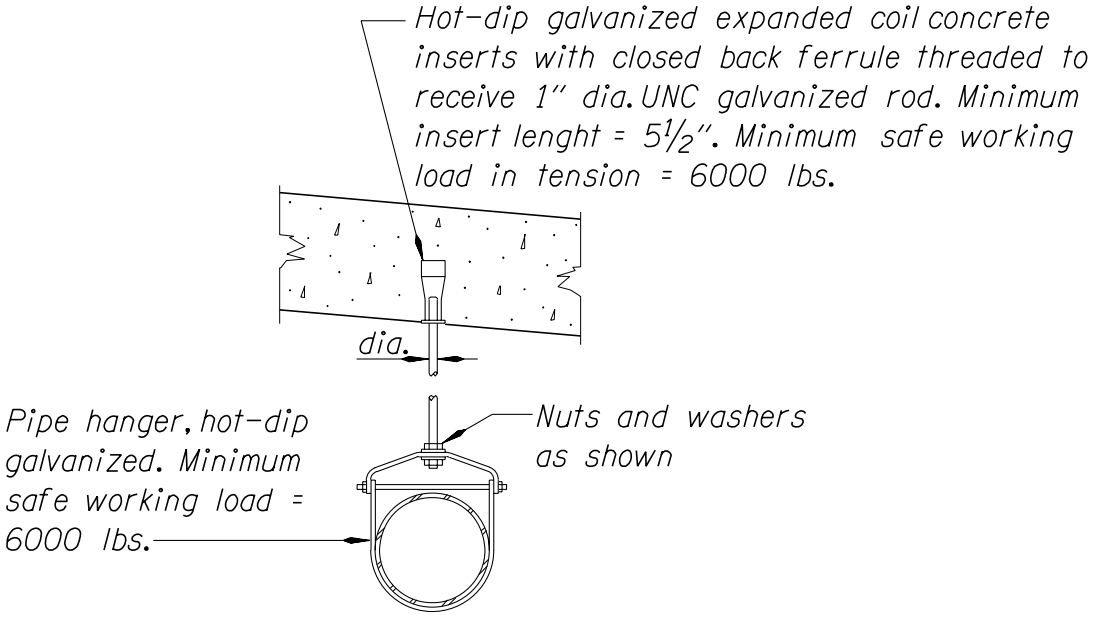
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_ExtSlabRail
26" Exterior Slab with Type F Rail - Section



EXTERIOR SLAB SECTION
No Scale

Cell Name: D_Hanger
Pipe Hanger Details



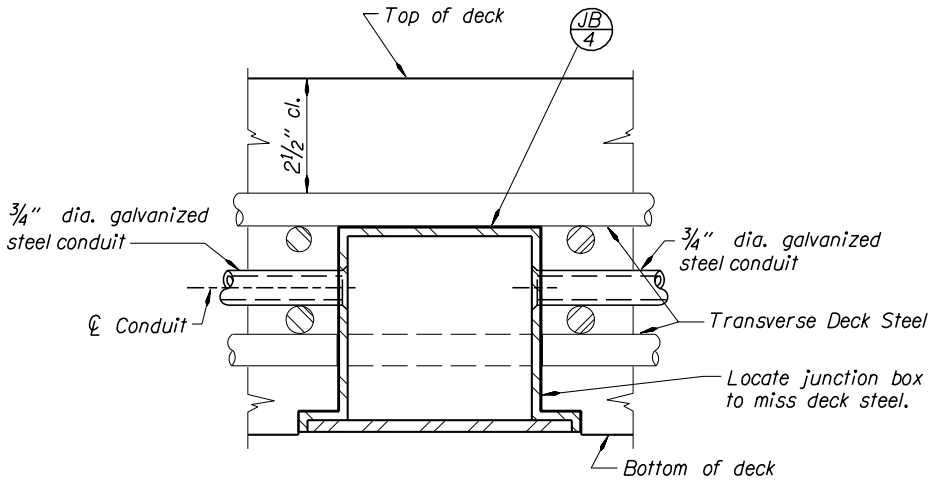
PIPE HANGER DETAIL
No Scale

A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_HydraulicData
Hydraulic Data Chart

HYDRAULIC DATA				
ITEMS	UNITS	DESIGN FLOOD	BASE FLOOD	MAX. PROBABLE FLOOD
DISCHARGE	$ft.^3/s$			
RECURRENCE INTERVAL	years			
HIGH WATER ELEVATION AT UPSTREAM FACE OF BRIDGE ALONG EMBANKMENT	feet			
BACKWATER	feet			

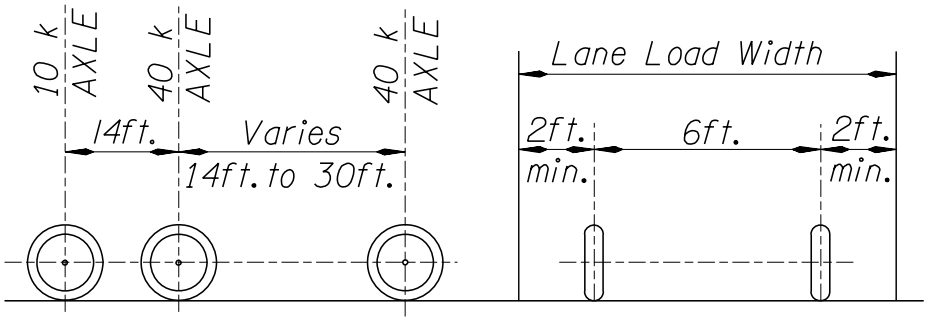
Cell Name: D_JunctionBox
Junction Box Detail



JUNCTION BOX DETAIL
No Scale

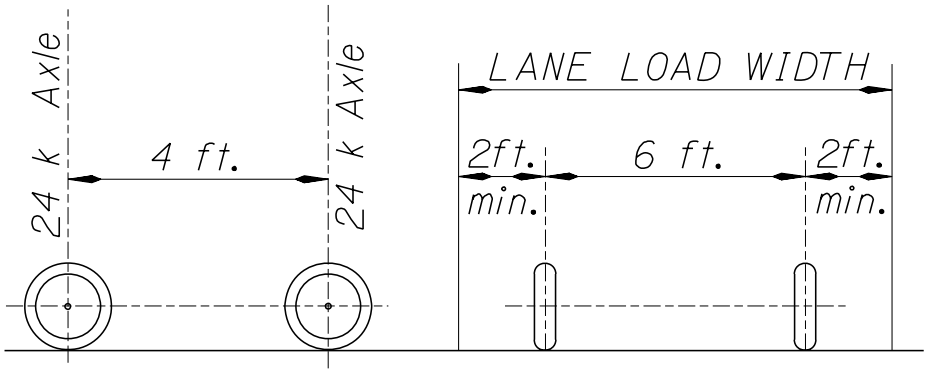
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_L_HS25
HS 25 Design Truck Loading Diagram



HS25 DESIGN TRUCK LOADING

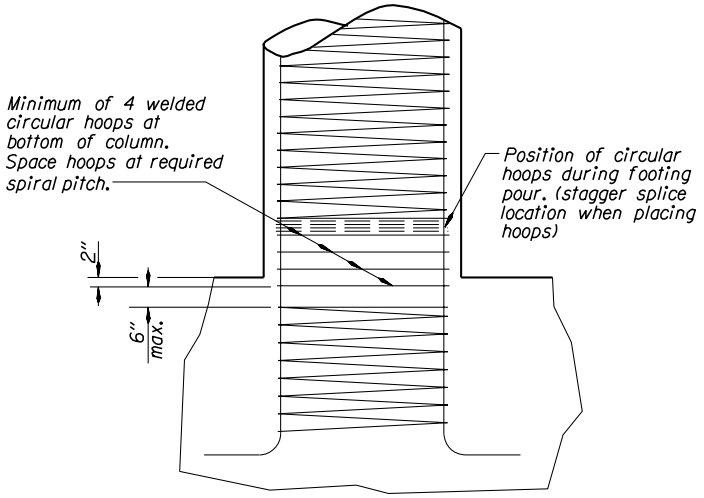
Cell Name: D_L_Military
Military Loading Diagram



MILITARY LOADING

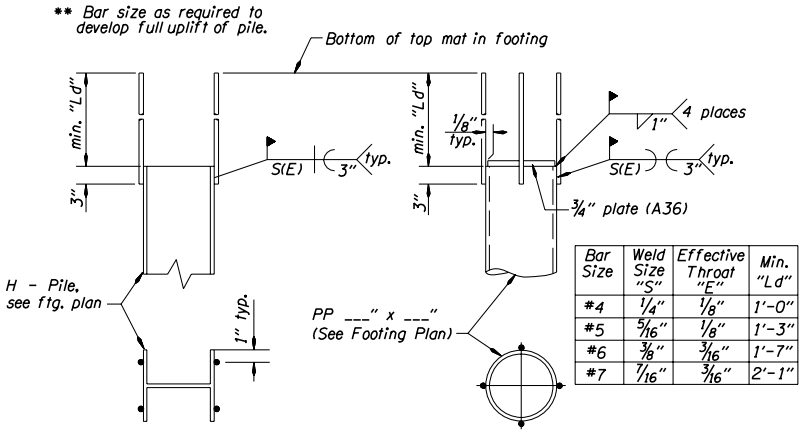
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_OptHoopDetails
Optional Hoop Details at Bottom of Column



OPTIONAL HOOP DETAIL AT BOTTOM OF COLUMN
No Scale

Cell Name: D_Pile_Anchor
Anchor Pile Details



Bar Size	Weld Size "S"	Effective Throat "E"	Min. "Ld"
#4	1/4"	1/8"	1'-0"
#5	5/16"	1/8"	1'-3"
#6	3/8"	3/16"	1'-7"
#7	7/16"	3/16"	2'-1"

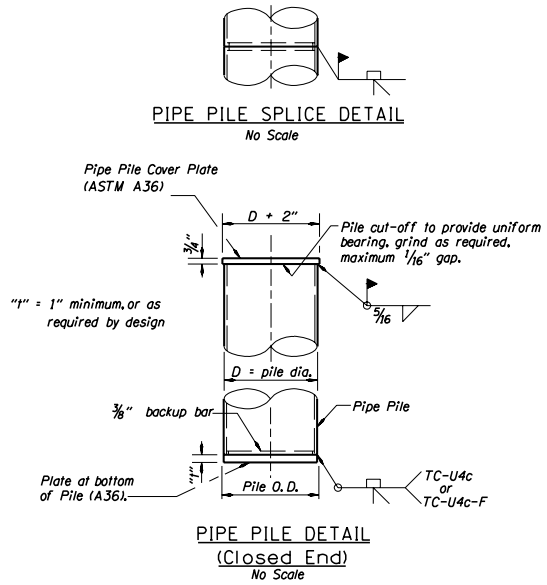
STEEL H-PILE STEEL PIPE PILE

* Provide ASTM A706, except ASTM A615 Grade 400 or ASTM A496 may be used if copies of the chemical composition analysis are submitted and approved as weldable by the engineer.

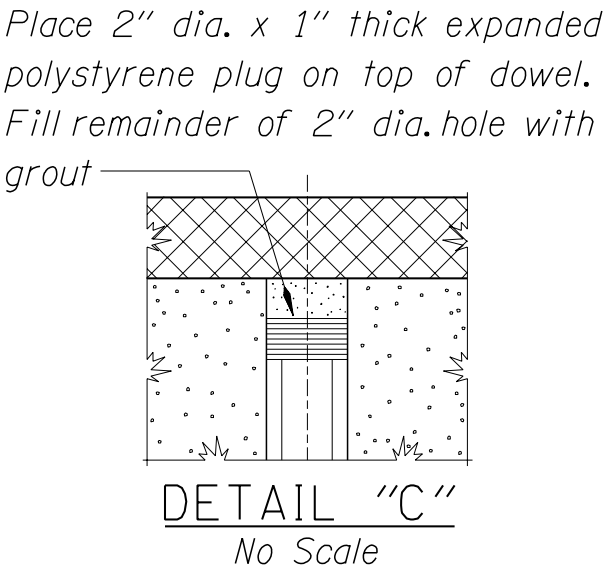
ANCHOR PILE DETAILS

A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_Pile_ClosedSplice
Pipe Pile Both Ends Closed with Splice Details

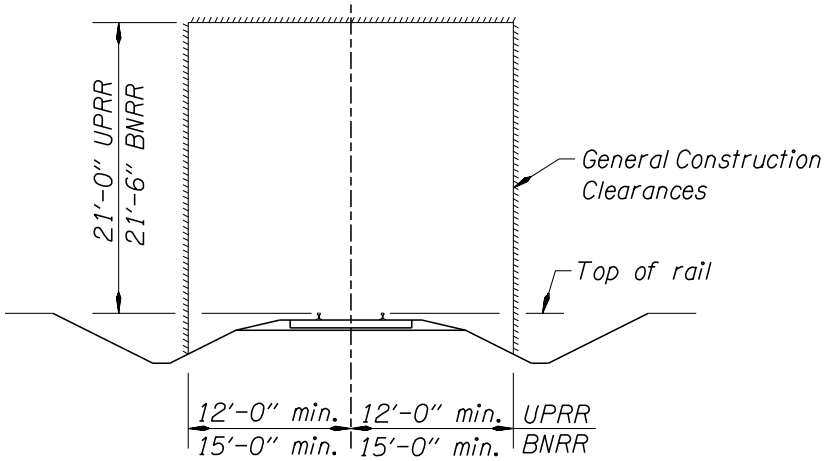


Cell Name: D_Plug
Polystyrene Plug on top of Dowel



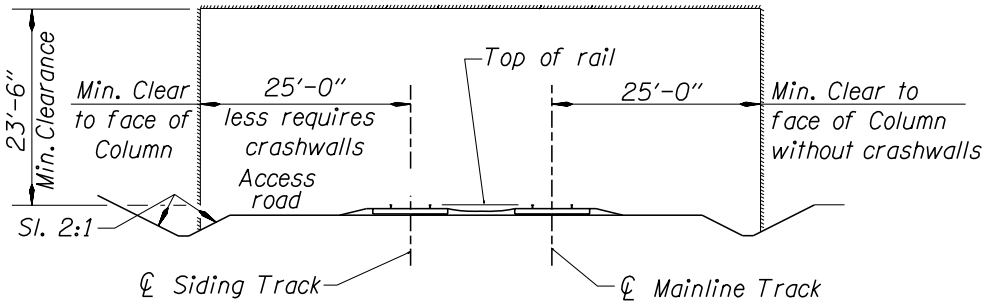
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_RRClear_1Track
Railroad Clearance Diagram - 1 Track



GENERAL RAILROAD CONSTRUCTION CLEARANCES
No Scale

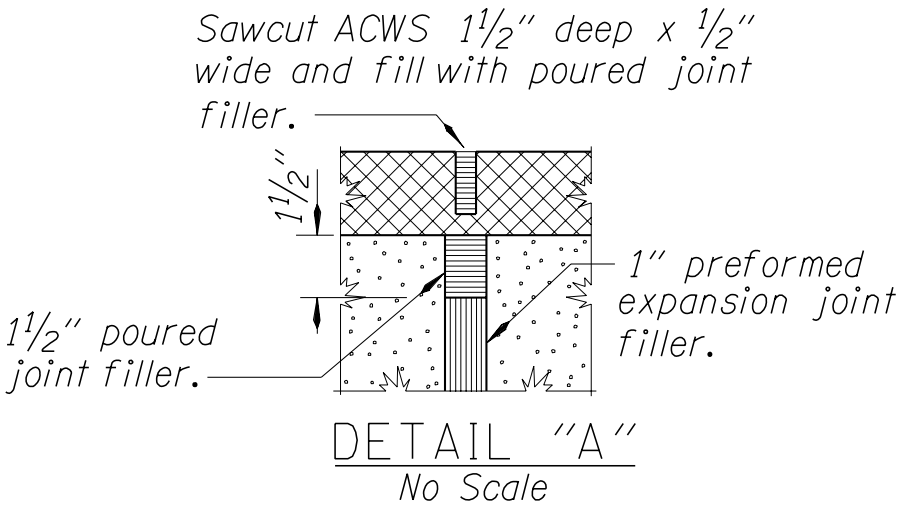
Cell Name: D_RRClear_2Tracks
Railroad Clearance Diagram - 2 Tracks



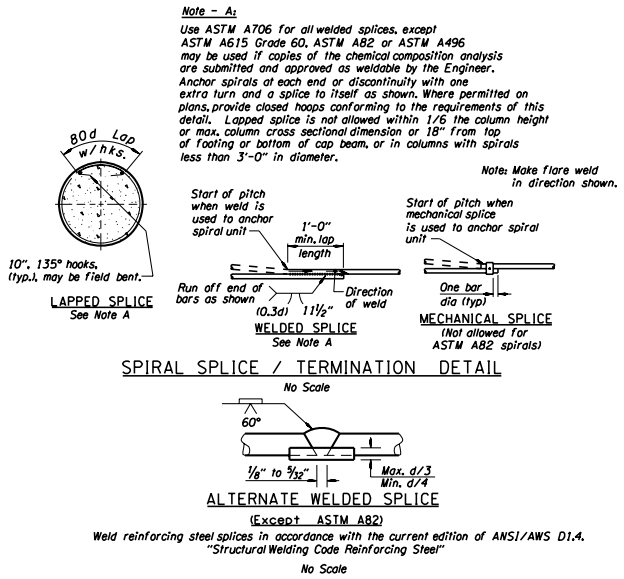
GENERAL RAILROAD CLEARANCES
No Scale

A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_Sawcut
Sawcut through ACWS

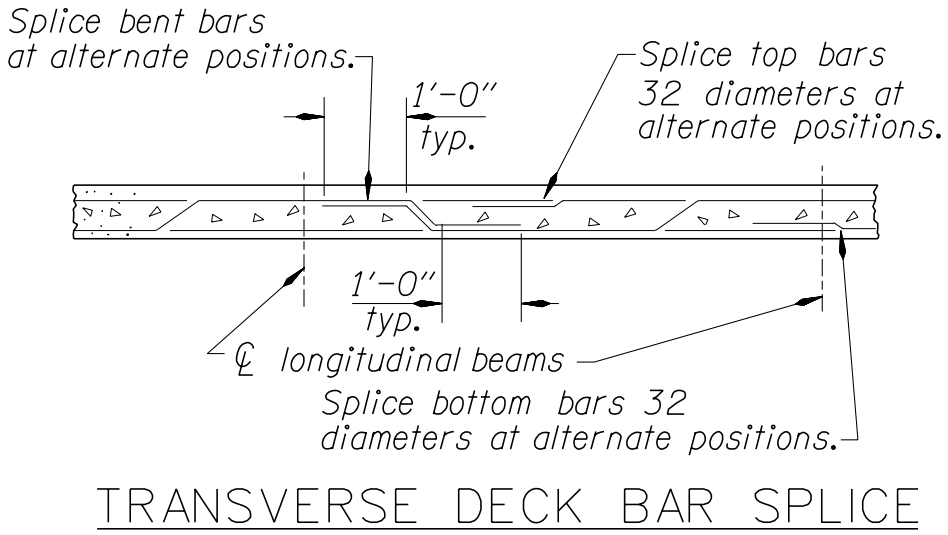


Cell Name: D_SpiralSplice
Spiral Splice and Termination Details



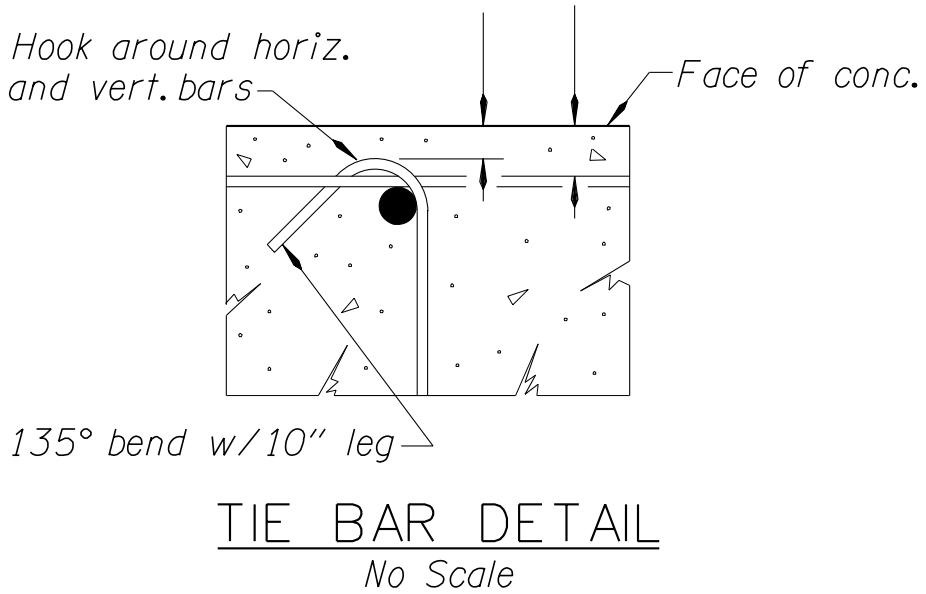
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_Splice
Deck Reinforcing Steel Splice Detail



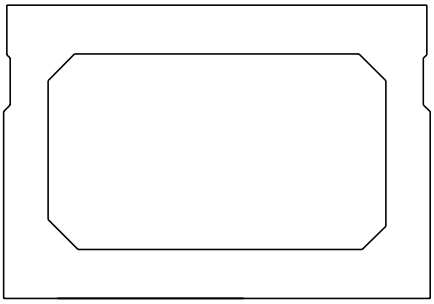
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: D_TieBar
Tie Bar Detail

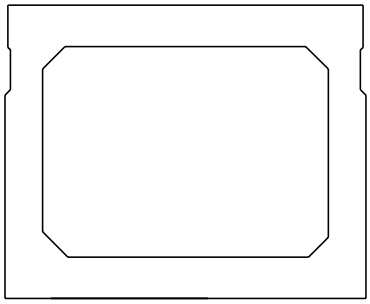


A2.1.4 CELL LIBRARY: BRIDGE.CEL

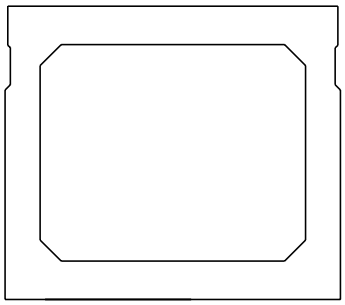
Cell Name: G_BB_33
33" Precast Concrete Box Girder - Section



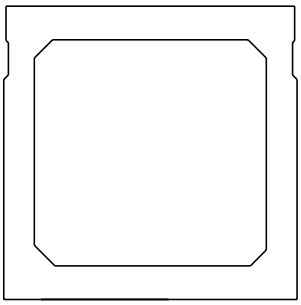
Cell Name: G_BB_39
39" Precast Concrete Box Girder - Section



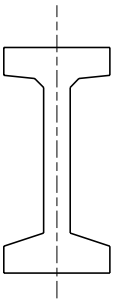
Cell Name: G_BB_42
42" Precast Concrete Box Girder - Section



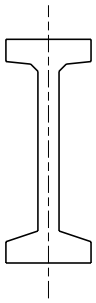
Cell Name: G_BB_48
48" Precast Concrete Box Girder - Section



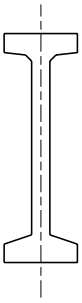
Cell Name: G_BI_51
51" Precast Concrete Bulb-I Girder - Section



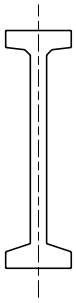
Cell Name: G_BI_63
63" Precast Concrete Bulb-I Girder - Section



Cell Name: G_BI_75
75" Precast Concrete Bulb-I Girder - Section

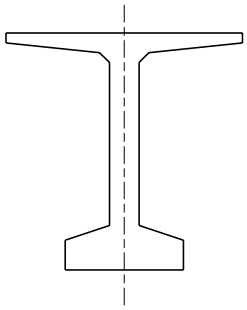


Cell Name: G_BI_87
87" Precast Concrete Bulb-I Girder - Section

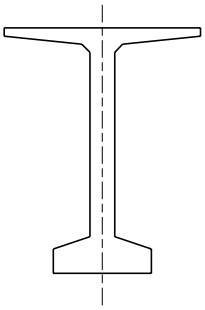


A2.1.4 CELL LIBRARY: BRIDGE.CEL

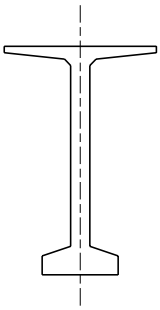
Cell Name: G_BT_48
48" Precast Concrete Bulb-T Girder - Section



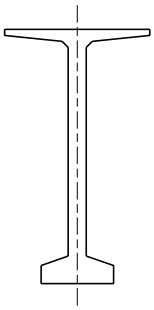
Cell Name: G_BT_60
60" Precast Concrete Bulb-T Girder - Section



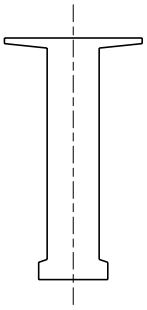
Cell Name: G_BT_72
72" Precast Concrete Bulb-T Girder - Section



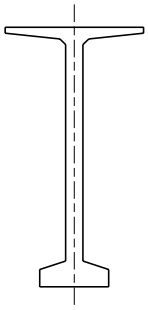
Cell Name: G_BT_84
84" Precast Concrete Bulb-T Girder - Section



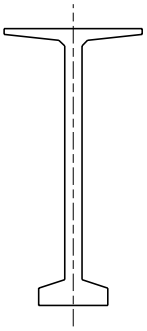
Cell Name: G_BT_84EB
84" Precast Concrete Bulb-T End Block - Section



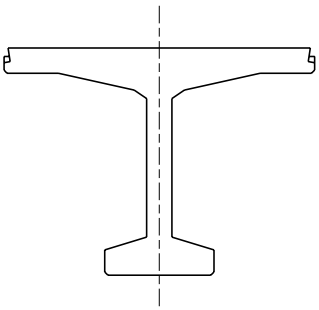
Cell Name: G_BT_90
90" Precast Concrete Bulb-T Girder - Section



Cell Name: G_BT_96
96" Precast Concrete Bulb-T Girder - Section



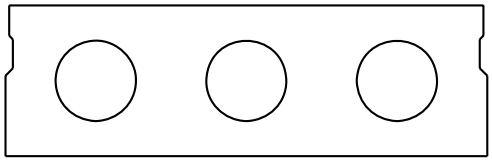
Cell Name: G_IDBT_IntergralBulbT
Intergral Deck Bulb-T Girder - Section



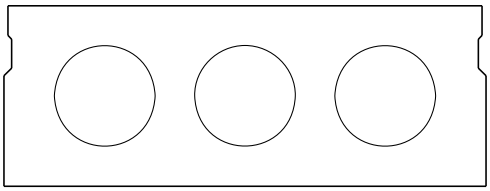
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: G_SLB_12
12" Precast Concrete Slab - Section

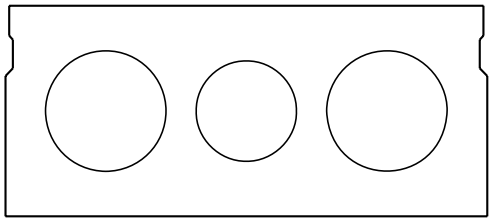
Cell Name: G_SLB_15
15" Precast Concrete Slab - Section



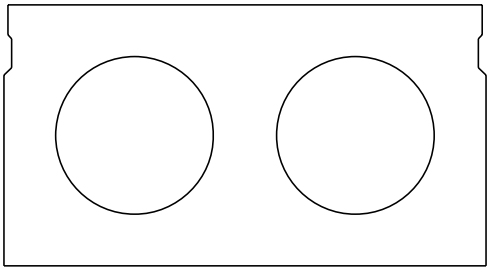
Cell Name: G_SLB_18
18" Precast Concrete Slab - Section



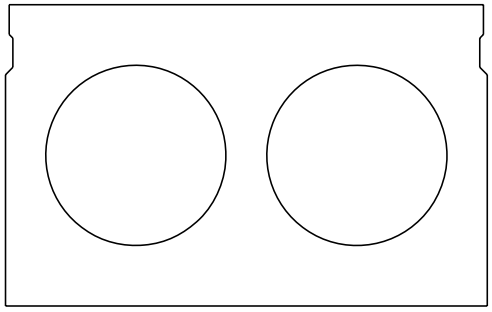
Cell Name: G_SLB_21
21" Precast Concrete Slab - Section



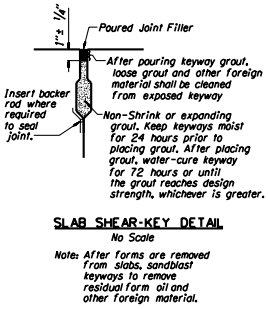
Cell Name: G_SLB_26
26" Precast Concrete Slab - Section



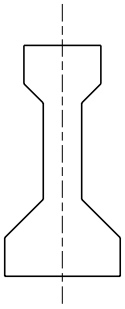
Cell Name: G_SLB_30
30" Precast Concrete Slab - Section



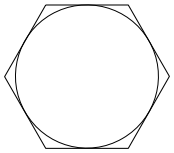
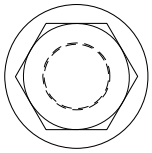
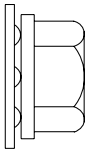
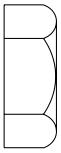
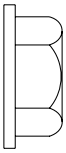
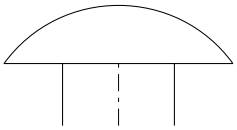
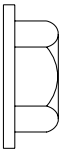
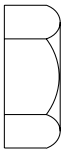
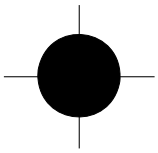
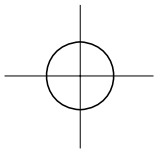
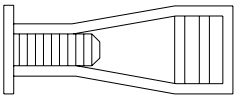
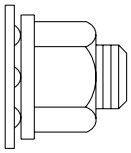
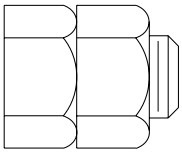
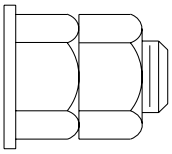
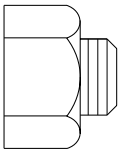
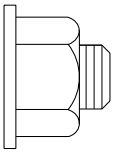
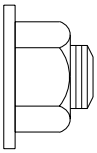
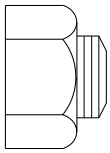
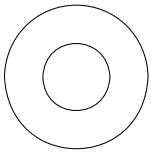
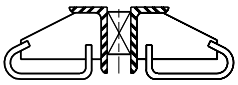
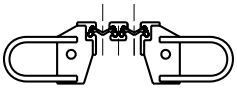
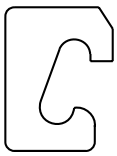
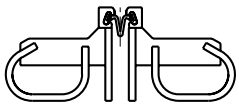
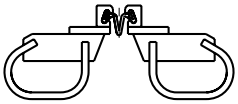
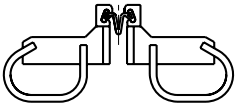
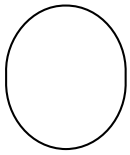
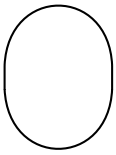
Cell Name: G_SLB_ShearKey
Precast Slab Shear Key



Cell Name: G_Type2
Type 2 AASHTO Girder - Section



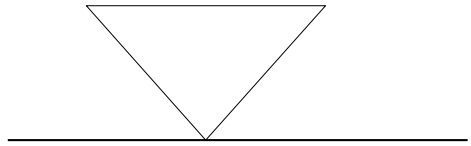
A2.1.4 CELL LIBRARY: BRIDGE.CEL

H_A_JBolt	H_A_Luminaire	H_A_ResinBonded	H_A_Wedge
H_B_BoltPlan 	H_B_BoltPlanW 	H_B_DTIBolt 	H_B_HHBolt 
H_B_HHBoltW 	H_B_RoundHead 	H_B_Std.BoltW 	H_B_StdBolt 
H_EQAssembly	H_Hole_FieldDrill 	H_Hole_ShopDrill 	H_Insert 
H_N_DTINut 	H_N_DoubleNut 	H_N_DoubleNutW 	H_N_HHNut 
H_N_HHNutW 	H_N_Std.NutW 	H_N_StdNut 	H_Washer 
J_ArmoredCorner 	J_DoubleExpansion 	J_Extrusion 	J_SingleStripSeal 
J_SingleStripSealA 	J_SingleStripSealB 	M_AccessHole1 	M_AccessHole2 

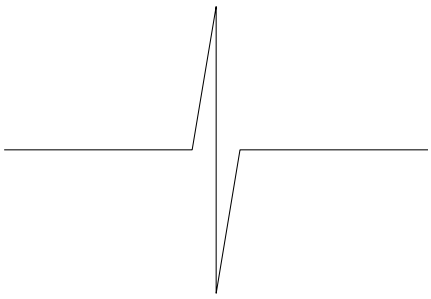
A2.1.4 CELL LIBRARY: BRIDGE.CEL

Cell Name: M_ElevationScale
Elevation Scale

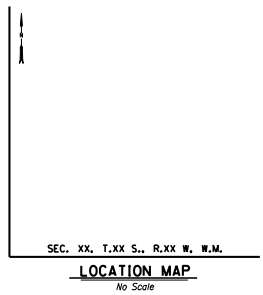
Cell Name: M_GroundWater
Ground Water Symbol



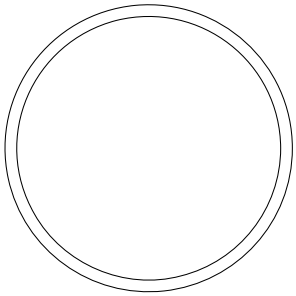
Cell Name: M_LineBreak
Line Break Symbol



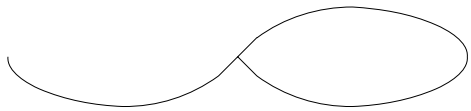
Cell Name: M_LocationMap
Location Map Border and Title



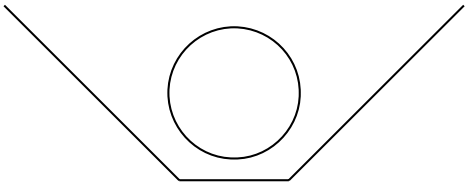
Cell Name: M_Pipe
Structural Steel Pipe - Section



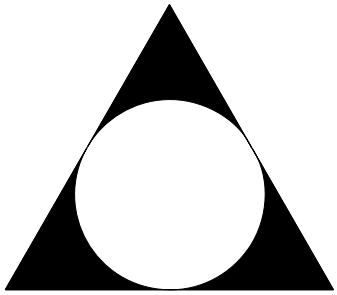
Cell Name: M_PipeBreak
Pipe Break Symbol



Cell Name: M_PoleBase
Structure Mount Luminaire Pole Base

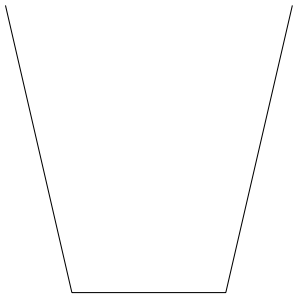


Cell Name: M_Revision
Revision Triangle

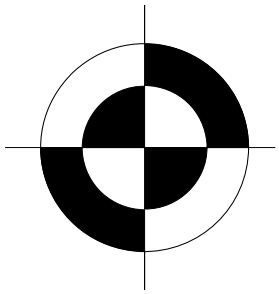


A2.1.4 CELL LIBRARY: BRIDGE.CEL

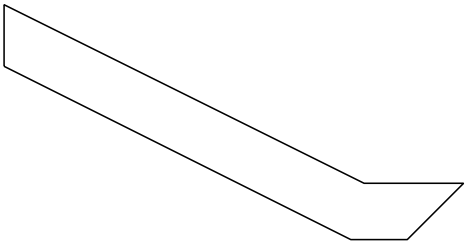
Cell Name: M_ShearKey
Shear Key - Section



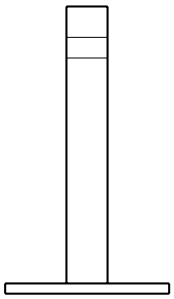
Cell Name: M_Target
Target Symbol



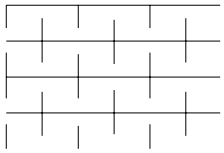
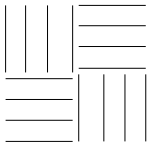
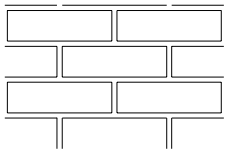
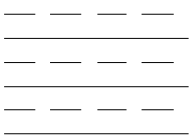
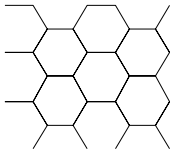
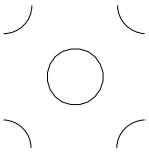
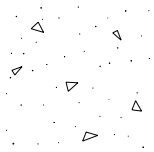
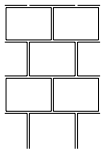
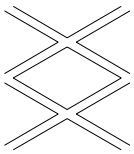
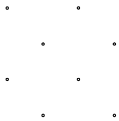
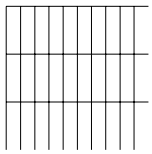
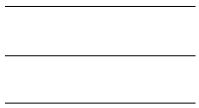
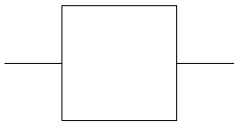
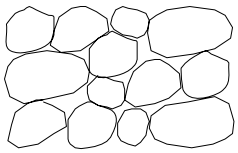
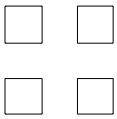
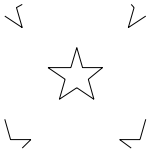
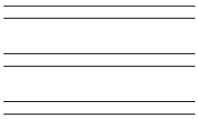
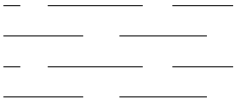
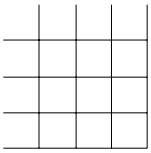
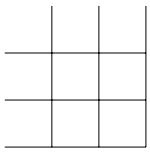
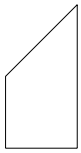
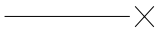
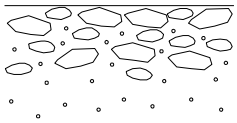
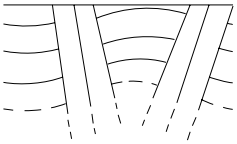
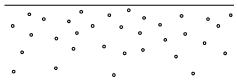
Cell Name: M_ToeTrench
Slope Riprap with Toe Trench



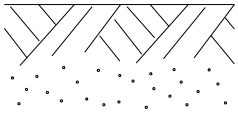
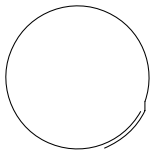
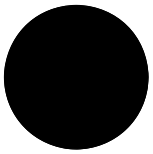
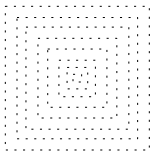
Cell Name: M_TubularMarker
Tubular Marker



A2.1.4 CELL LIBRARY: BRIDGE.CEL

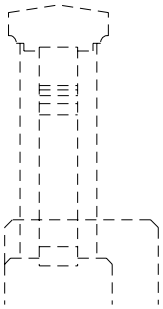
P_A_Aluminum 	P_A_Basket 	P_A_Brick 	P_A_Bronze 
P_A_ChickenWire 	P_A_Circle 	P_A_Concrete 	P_A_ConcreteBlock 
P_A_Diamond 	P_A_Dot 	P_A_Grate 	P_A_Gravel
P_A_Hatch 	P_A_MSE 	P_A_Riprap 	P_A_Sand
P_A_Square 	P_A_Star 	P_A_Steel 	P_A_Water 
P_A_WeldedWire 	P_A_XHatch 	P_Concrete 	P_L_Corrugated
P_L_Fence 	P_L_Gas	P_L_Gravel 	P_L_Ground
P_L_Rock 	P_L_RoughConcrete	P_L_Sand 	P_L_SheetPile

A2.1.4 CELL LIBRARY: BRIDGE.CEL

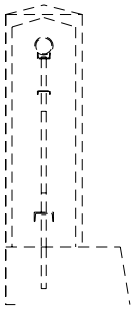
P_L_Soil 	P_L_Util_Electrical	P_L_Util_Railroad	P_L_Util_Sewer
P_L_Util_Telephone	P_L_Water	REINF_CircularHoop 	REINF_Rebar 
REINF_SquareBar 			

A2.1. CELL LIBRARY: BRIDGE.CEL

Cell Name: R_02010
Existing Concrete Baluster Rail

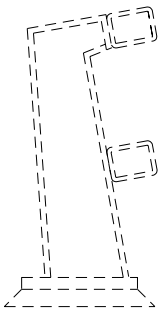


Cell Name: R_09233
Rail with Concrete Post and Metal Rail - Section



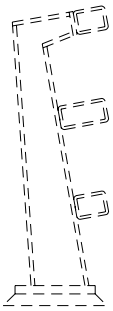
Cell Name: R_23603
Oblong 2-tube aluminum rail, dwg. 23603 - Section

Cell Name: R_23610
Square 2-tube aluminum rail, dwg. 23610 - Section

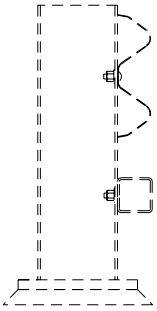


Cell Name: R_31754
Oblong 3-Tube Aluminum Rail, dwg. 31754 - Section

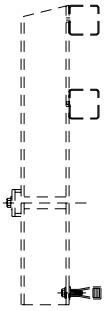
Cell Name: R_31755
Square 3-Tube Aluminum Rail, dwg. 31755 - Section



Cell Name: R_33258
W-Shape Rail with Tubing, dwg. 33258 - Section



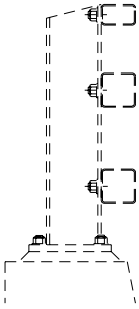
Cell Name: R_35268
2-Tube Side Mount Rail, dwg. 35268 - Section



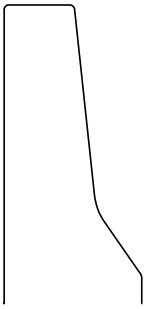
A2.1. CELL LIBRARY: BRIDGE.CEL

Cell Name: R_43444
Side Mounted W-Shape Rail, dwg. 43444 - Section

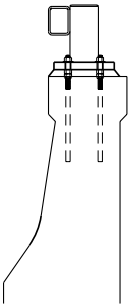
Cell Name: R_43498
3-Tube Curb Mount Rail, dwg 43498 - Section



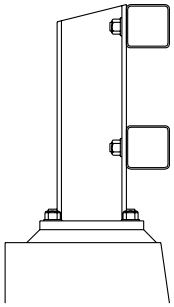
Cell Name: R_BR200
Type F Concrete Rail, dwg BR200 - Section



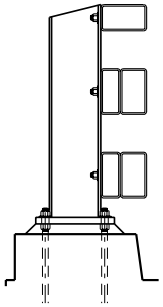
Cell Name: R_BR200Architectural
Architectural Type F Rail with Tube - Section



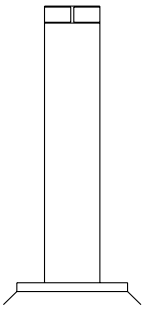
Cell Name: R_BR206
2-Tube Curb Mount Rail, dwg BR206 - Section



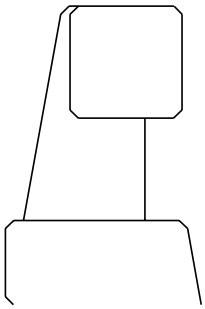
Cell Name: R_BR208
3-Tube Curb Mount Rail, dwg BR208 - Section



Cell Name: R_BR208B
3-Tube Curb Mount Rail -Backside of Rail

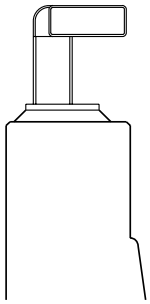


Cell Name: R_BR212
Concrete Post Bridge Rail

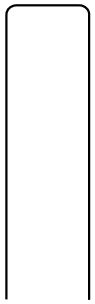


A2.1. CELL LIBRARY: BRIDGE.CEL

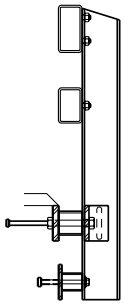
Cell Name: R_BR214
Concrete Parapet rail with steel tubing



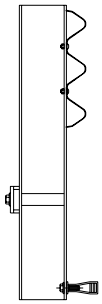
Cell Name: R_BR221
32" vertical parapet



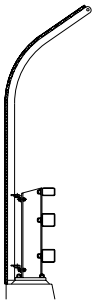
Cell Name: R_BR226
2-Tube Side Mount Rail, dwg. BR226 - Section



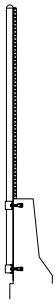
Cell Name: R_BR233
Side Mounted Thrie Beam Rail - Section



Cell Name: R_BR240TypeA
Protective Fence (Type A) with 3-Tube Rail - Section



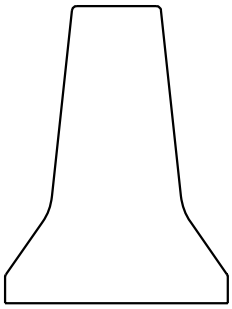
Cell Name: R_BR240TypeC
Protective Fence (Type C) with Type F Rail - Section



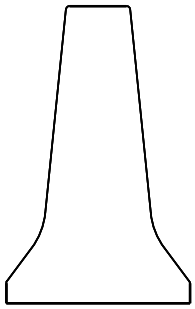
Cell Name: R_BR290
Type F Concrete Rail (42" high) - Section

A2.1. CELL LIBRARY: BRIDGE.CEL

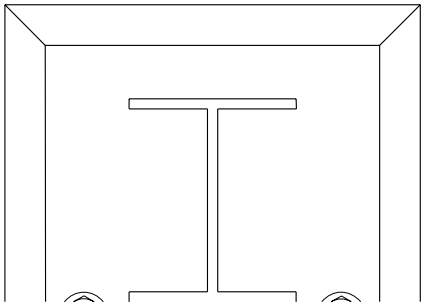
Cell Name: R_Median
Median Barrier - Section



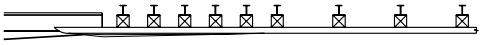
Cell Name: R_MedianTall
Tall Median Barrier, dwg. RD545 - Section



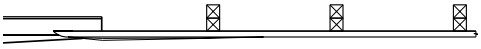
Cell Name: R_PostPlan
Steel Rail Post - Plan



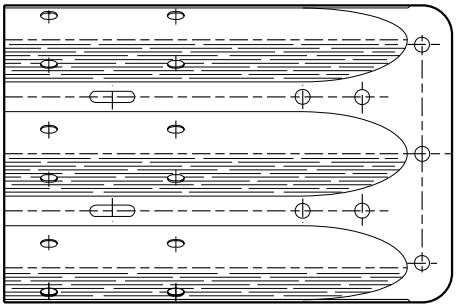
Cell Name: R_T_BR203
Guardrail Transition (Steel post & wood spacer), dwg BR203 - Plan



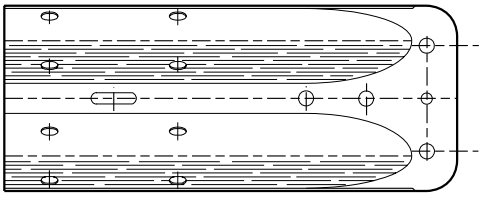
Cell Name: R_T_BR236
Trailing End Guardrail Transition - Plan



Cell Name: R_T_Terminal Conn
Thrie Beam Terminal Connector -Elevation



Cell Name: R_T_TerminalConn2
W-Shape Terminal Connector

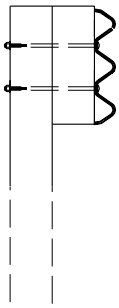


Cell Name: R_T_ThrieRail
Thrie Beam Transition without post - Front Elevation

A2.1. CELL LIBRARY: BRIDGE.CEL

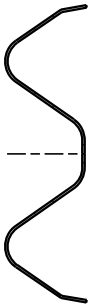
Cell Name: R_T_ThrieRailBack
Thrie Beam Transition without post - Back Elevation

Cell Name: R_T_ThrieRailSection
ThrieBeam Rail with Wood Post - Section

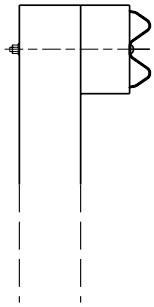


Cell Name: R_T_ThrieShape
Thrie Beam Rail - Section

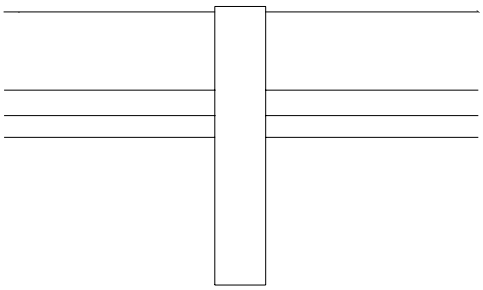
Cell Name: R_T_Wshape
W-Shape Rail - Section



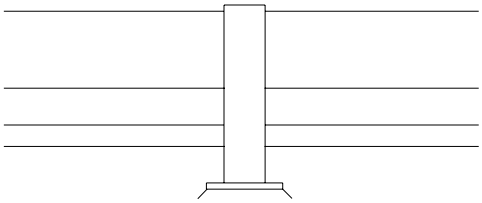
Cell Name: R_T_WshapePost
W-Shape Rail with Wood Post - Section



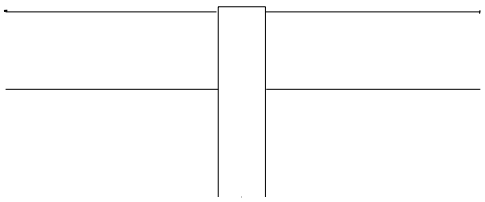
Cell Name: R_T_WshapeSM
W-Shape Rail and Tubing with Post - Side Mount - Elevation



Cell Name: R_T_WshapeTM
W-Shape Rail and Tubing with Post - Top Mount - Elevation

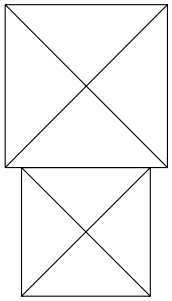


Cell Name: R_T_WshapeTransition
W-Shape Rail with Post - Elevation

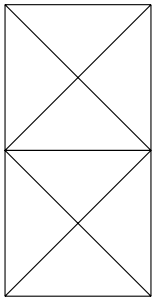


A2.1. CELL LIBRARY: BRIDGE.CEL

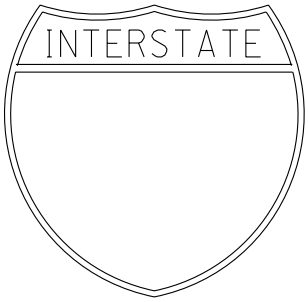
Cell Name: R_WoodPost10
10" Wood Post - Plan



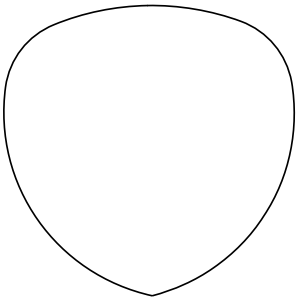
Cell Name: R_WoodPost8
8" Wood Post - Plan



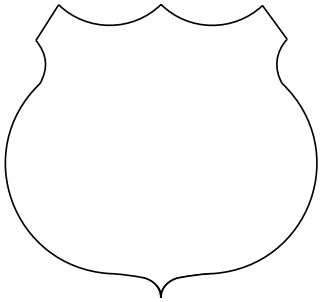
Cell Name: SHIELD_Interstate
Interstate Highway Sign



Cell Name: SHIELD_State
Oregon Highway Sign

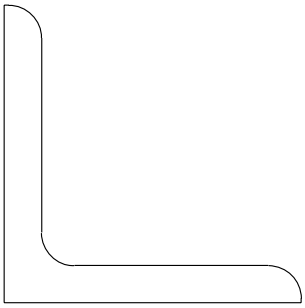


Cell Name: SHIELD_US
US Highway Sign

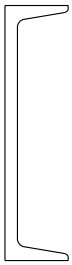


A2.1. CELL LIBRARY: BRIDGE.CEL

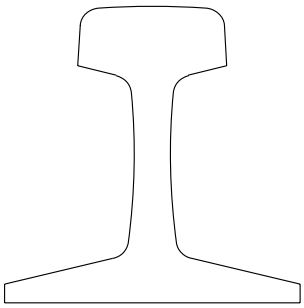
Cell Name: S_Angle
Structural Steel Angle - Section



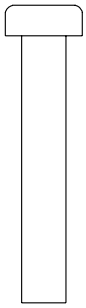
Cell Name: S_Channel
Structural Steel Channel - Section



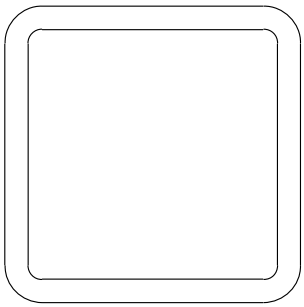
Cell Name: S_Railroad
Railroad Rail - Section



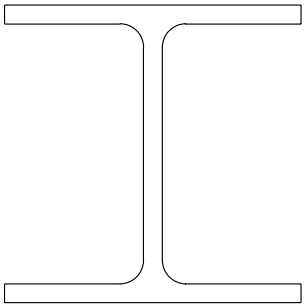
Cell Name: S_Stud
Welded Shear Stud - Elevation



Cell Name: S_Tube
Structural Steel Tube - Section



Cell Name: S_WideFlange
Structural Steel Wide Flange - Section



A2.1. CELL LIBRARY: BRIDGE.CEL

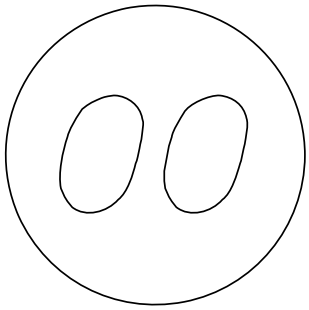
Cell Name: T_20ft EndPanel
Std. note for 20'-4" end panel

Std. 20'-4" Bridge End Panel,
see dwg. BR165 for details

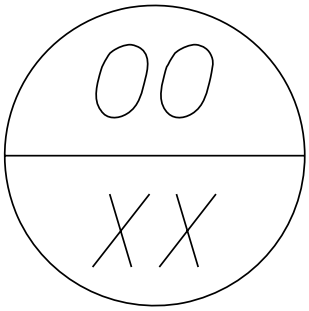
Cell Name: T_30ft EndPanel
Std. note for 30'-4" end panel

Std. 30'-4" Bridge End Panel,
see dwg. BR165 for details.

Cell Name: T_BubbleNote1
One Number Bubble Note



Cell Name: T_BubbleNote2
Two Number Bubble Note



Cell Name: T_Datum
Std. note for National Geodetic Vertical Datum

Note:
Elevations shown are based on National
Geodetic Vertical Datum (MSL=0.0)

Cell Name: T_DetailRef
Detail Reference Notes for Deck Plan

Cell Name: T_DetailTitle1
Title of Detail - 1 line

XXXX
Scale: 1 :XX

Cell Name: T_DetailTitle2
Title of Detail - 2 Lines

XXXX
XXXX
Scale: 1 :XX

A2.1. CELL LIBRARY: BRIDGE.CEL

Cell Name: T_Disclaimer
Disclaimer Note

THIS DRAWING IS AN UNSTAMPED AND UNSIGNED COPY PROVIDED IN ELECTRONIC FORMAT. THE DRAWING DETAILS MAY NOT BE DRAWN TO SCALE AND MAY NOT REFLECT THE MOST CURRENT INFORMATION. THE CURRENT ORIGINAL STAMPED AND SIGNED DRAWING IS ON FILE WITH THE OREGON DEPARTMENT OF TRANSPORTATION.

Cell Name: T_ElevNote_2Pts
Std. note for location of elevation on deck plan (shed roof)

Elevations shown are finish grade at top of concrete at gutter line and centerline of bent.

Cell Name: T_ElevNote_3Pts
Std. note for location of elevation on deck plan (crown)

Deck elevations shown are finish grade on centerline of structure and gutter line at centerline of bent.

Cell Name: T_RRMP
Railroad Mile Point

USDOT _____
Railroad Milepoint _____

Cell Name: T_FRail
Std note for Type "F" rail

Std. concrete rail Type "F", see dwg. BR200 for details

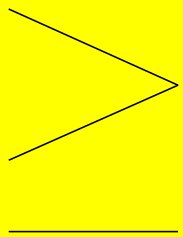
Cell Name: T_FRailTrailEnd
Std. note for trailing end guardrail transition

Std. trailing end guardrail transition, BR236 for details.

Cell Name: T_FRailTran
Std. note for Type "F" rail transition

Std. guardrail transition, see dwg. BR203 for details.

Cell Name: T_GreaterorEqual
Greater than or Equal



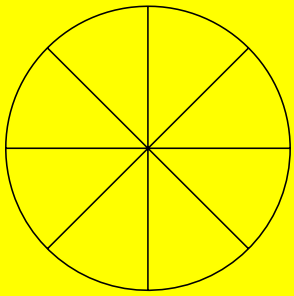
A2.1. CELL LIBRARY: BRIDGE.CEL

Cell Name: T_PayLimits
Structure Excavation and Backfill Pay Limits

Pay Limits of Structure Excavation

Pay Limits of Granular Structure Backfill

Cell Name: T_PlateSample
Locations that require flange sample - steel



Cell Name: T_ScaleWarning
Review Stamp for Plans

SCALE WARNING

If scale bar doesn't measure one inch then drawing is not to scale

Cell Name: T_ReviewCopyOnly
Review Copy Only stamp for TSL, Prelim. & Adv. Plans

REVIEW COPY ONLY

Cell Name: T_SpliceLengths3.3
Class "B" splice lengths f'c=3.3

REINFORCING SPLICE LENGTHS (CLASS B) GRADE 60 f'c = 3.3 ksi

Bar Size	#3	#4	#5	#6	#7	#8	#9	#10	#11	#14 & #18
Uncoated	1'-0"	1'-4"	1'-8"	2'-0"	2'-9"	3'-7"	4'-6"	5'-9"	7'-0"	Not Permitted
Coated (1)	1'-2"	1'-7"	2'-0"	2'-5"	3'-3"	4'-3"	5'-5"	6'-10"	8'-5"	Not Permitted
Coated (2)	1'-6"	2'-0"	2'-6"	3'-0"	4'-1"	5'-4"	6'-9"	8'-7"	10'-6"	Not Permitted

Use coated (1) for epoxy coated bars with cover at least $3*d_b$ and clear spacing between bars at least $6*d_b$.

Use coated (1) for epoxy coated bars with cover less than $3*d_b$ and clear spacing between bars less than $6*d_b$.

Increase all splice lengths 40% for horizontal or nearly horizontal bars so placed that more than 12" of fresh concrete is cast below the bar.

Cell Name: T_SpliceLengths4.0
Class "B" splice lengths f'c=4.0

REINFORCING SPLICE LENGTHS (CLASS B) GRADE 60 f'c = 4.0 ksi

Bar Size	#3	#4	#5	#6	#7	#8	#9	#10	#11	#14 & #18
Uncoated	1'-0"	1'-4"	1'-8"	2'-0"	2'-6"	3'-3"	4'-1"	5'-2"	6'-4"	Not Permitted
Coated (1)	1'-2"	1'-7"	2'-0"	2'-5"	3'-0"	3'-11"	4'-11"	6'-3"	7'-8"	Not Permitted
Coated (2)	1'-6"	2'-0"	2'-6"	3'-0"	3'-8"	4'-10"	6'-2"	7'-9"	9'-6"	Not Permitted

Use coated (1) for epoxy coated bars with cover at least $3*d_b$ and clear spacing between bars at least $6*d_b$.

Use coated (1) for epoxy coated bars with cover less than $3*d_b$ and clear spacing between bars less than $6*d_b$.

Increase all splice lengths 40% for horizontal or nearly horizontal bars so placed that more than 12" of fresh concrete is cast below the bar.

Cell Name: T_Wingwall
Std. note for wingwall

Wingwall, see dwg. 00000 for details

A2.2.2 LINEWORK AND LEVELS

Existing Levels

Level Name	Level Description	Color	Linestyle	Weight
E_BR_ALL_Patterns	All existing patterns used on bridge drawings	0	1	0
E_BR_SUB_General	Existing bridge substructure features	0	2	0
E_BR_SUB_Footing	Existing footings	1	2	0
E_BR_SUB_Tx	Existing bridge substructure text	4	0	2
E_BR_SUPER_General	Existing bridge superstructure features	1	2	0
E_BR_SUPER_Beams	Existing girders or beams	1	2	0
E_BR_SUPER_Tx	Existing bridge superstructure text	4	0	2

Superstructure Levels

Level Name	Level Description	Color	Linestyle	Weight
P_BR_SUPER_Girder	Girder (longitudinal) object lines	10	0	3
P_BR_SUPER_GirderHidden	Girder (longitudinal) hidden lines	10	3	0
P_BR_SUPER_GirderCL	Girder (longitudinal) center lines	10	7	0
P_BR_SUPER_Beam	Beam (transverse) object lines	4	0	3
P_BR_SUPER_BeamHidden	Beam (transverse) hidden lines	4	3	0
P_BR_SUPER_BeamCL	Beam (transverse) center lines	4	7	0
P_BR_SUPER_Girder/BeamTx	Girder and Beam text	20	0	2
P_BR_SUPER_Deck	Deck object lines	1	0	3
P_BR_SUPER_DeckHidden	Deck hidden lines	1	3	1
P_BR_SUPER_DeckCL	Deck center lines	1	7	2
P_BR_SUPER_DeckTx	Deck and End panel text	17	0	2
P_BR_SUPER_Rail	Rail object lines	2	0	3
P_BR_SUPER_RailHidden	Rail hidden lines	2	3	1
P_BR_SUPER_RailCL	Rail center lines	2	7	2
P_BR_SUPER_RailTx	Rail text	18	0	2
P_BR_SUPER_Fence	Fence object lines	2	0	3
P_BR_SUPER_FenceHidden	Fence hidden lines	2	3	1
P_BR_SUPER_FenceCL	Fence center lines	2	7	2
P_BR_SUPER_FenceTx	Fence Text	18	0	2
P_BR_SUPER_EndPanel	End Panel lines	1	0	1
P_BR_SUPER_EndPanelHidden	End Panel hidden lines	1	3	1

Substructure Levels

Level Name	Level Description	Color	Linestyle	Weight
P_BR_SUB_Footing	Footing object lines	5	0	3
P_BR_SUB_FootingHidden	Footing hidden lines	5	3	1
P_BR_SUB_FootingCL	Footing center lines	5	7	1

A2.2.2 LINEWORK AND LEVELS - continued

P_BR_SUB_FootingTx	Footing Text	21	0	2
P_BR_SUB_Pile	Pile object, hidden & center lines	5	0-7	1
P_BR_SUB_Wall	Retaining or wing wall (part of bridge) object lines	6	0	3
P_BR_SUB_WallHidden	Retaining or wing wall (part of bridge) hidden lines	6	3	1
P_BR_SUB_WallCL	Retaining or wing wall (part of bridge) center lines	6	7	0
P_BR_SUB_WallTx	Retaining or wing wall (part of bridge) text	6	0	2
P_BR_SUB_Bent	Bent object lines	7	0	3
P_BR_SUB_BentHidden	Bent hidden lines	7	3	1
P_BR_SUB_BentCL	Bent center lines	7	7	1
P_BR_SUB_BentTx	Bent text	23	0	2
P_BR_SUB_ShearLug	Shear Lug object, hidden or center lines	9	0-7	0-3
P_BR_SUB_Bearing	Bearing object, hidden or center lines	10	0-7	0-3

Miscellaneous Levels

Level Name	Level Description	Color	Linestyle	Weight
P_BR_ALL_Patterns	All patterns conrete, steel wood, etc…	8	0	0
P_BR_ALL_Dimensions	All dimension lines & arrowheads	0	0	1
P_BR_ALL_Tx	Text that is not assign to another level	4	0	2
P_BR_ALL_Rebar	Reinforcing steel	3	0	1
P_BR_ALL_RebarTransv	Transverse reinforcing steel	51	0	1
P_BR_ALL_RebarLongit	Longitudinal reinforcing steel	35	0	1
P_BR_ALL_RebarTx	All reinforcing steel text	10	0	2
P_BR_ALL_TempBr	All lines for temporary structure	8	0-7	0-3
P_BR_ALL_Electrical	Electrical schematics	0	0, 2 & 3	1
P_BR_ALL_StructuralSteel	Structural steel (such as angles, channels, etc…)	3	0, 2 & 3	0-3

General Information Levels

Level Name	Level Description	Color	Linestyle	Weight
P_BR_PLANS_General	General	0-253	0-7	0-3
P_BR_SUB_General	General Substructure	0-253	0-7	0-3
P_BR_SUPER_General	General Superstructure	0-253	0-7	0-3

Titleblock Levels

Level Name	Level Description	Color	Linestyle	Weight
P_BR_PLANS_Titleblock	Plan sheet: All lines for title block	0	0	2
P_BR_PLANS_TitleblockTx	Plan Sheet: Text inside title block	4	0	2
P_BR_PLANS_Detail	Plan sheet: Bridge details	0	0	2
P_BR_PLANS_DetailTx	Plan sheet: Bridge detail text	4	0	2
P_BR_PLANS_NotesTx	Bridge construction notes	4	0	2
P_BR_PLAN_ProfStamp	Registration seal	1	0	1
P_BR_PLAN_ProfStampTx	Registration seal text	4	0	1

A2.2.2 LINE WORK AND LEVELS

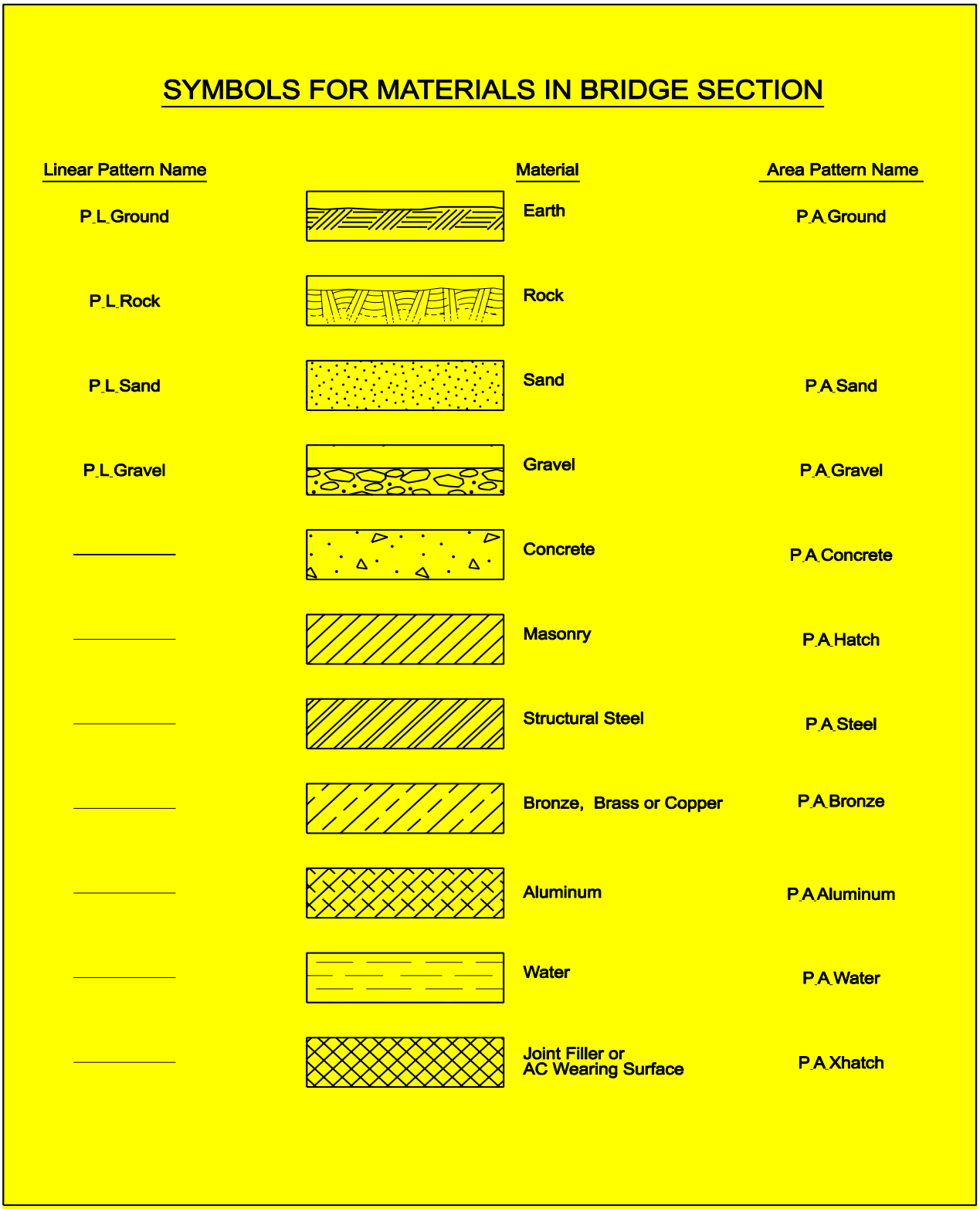
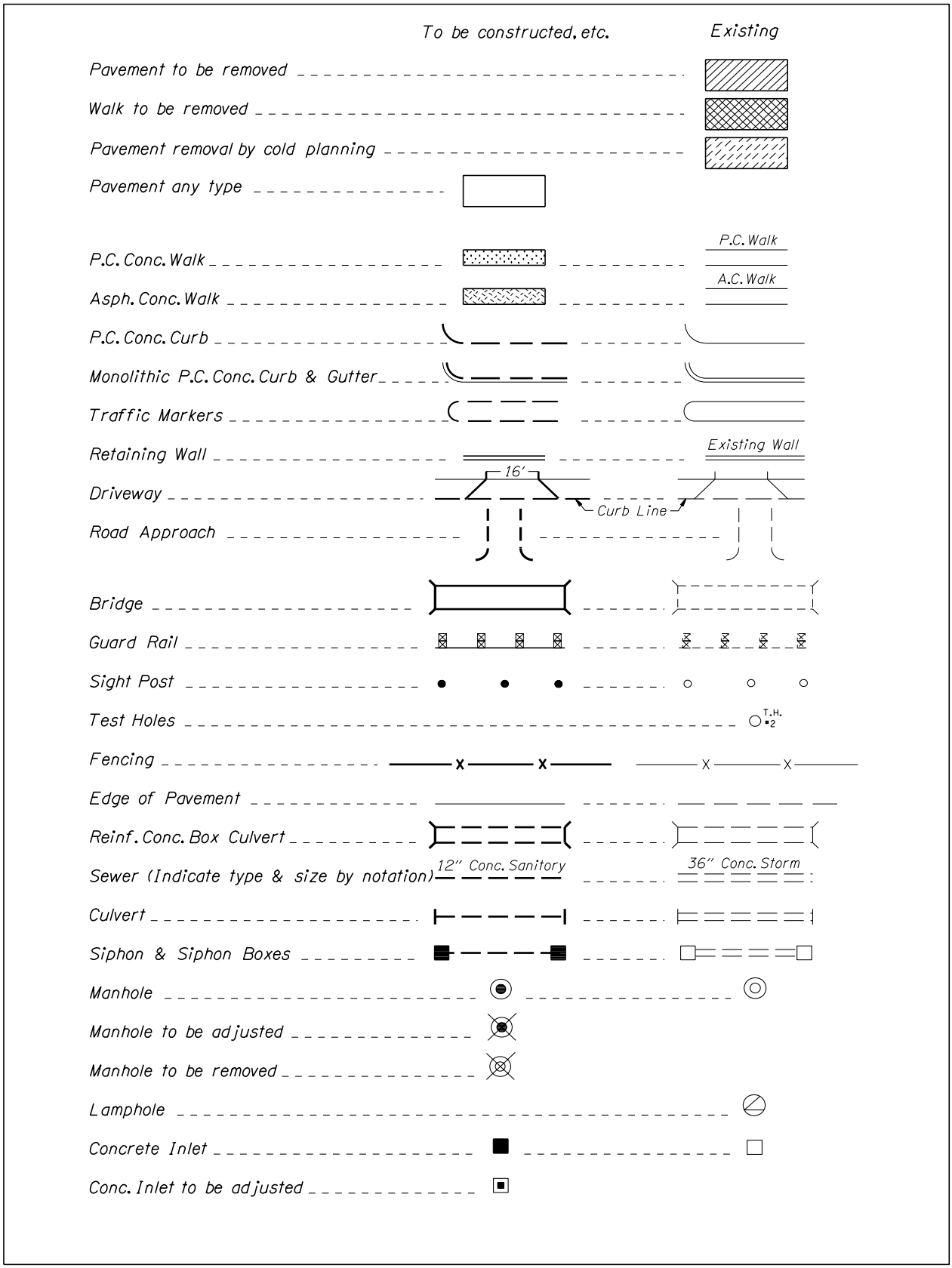


Figure A2.2.2A

A2.2.2 LINE WORK AND LEVELS



A2.2.2 LINE WORK AND LEVELS

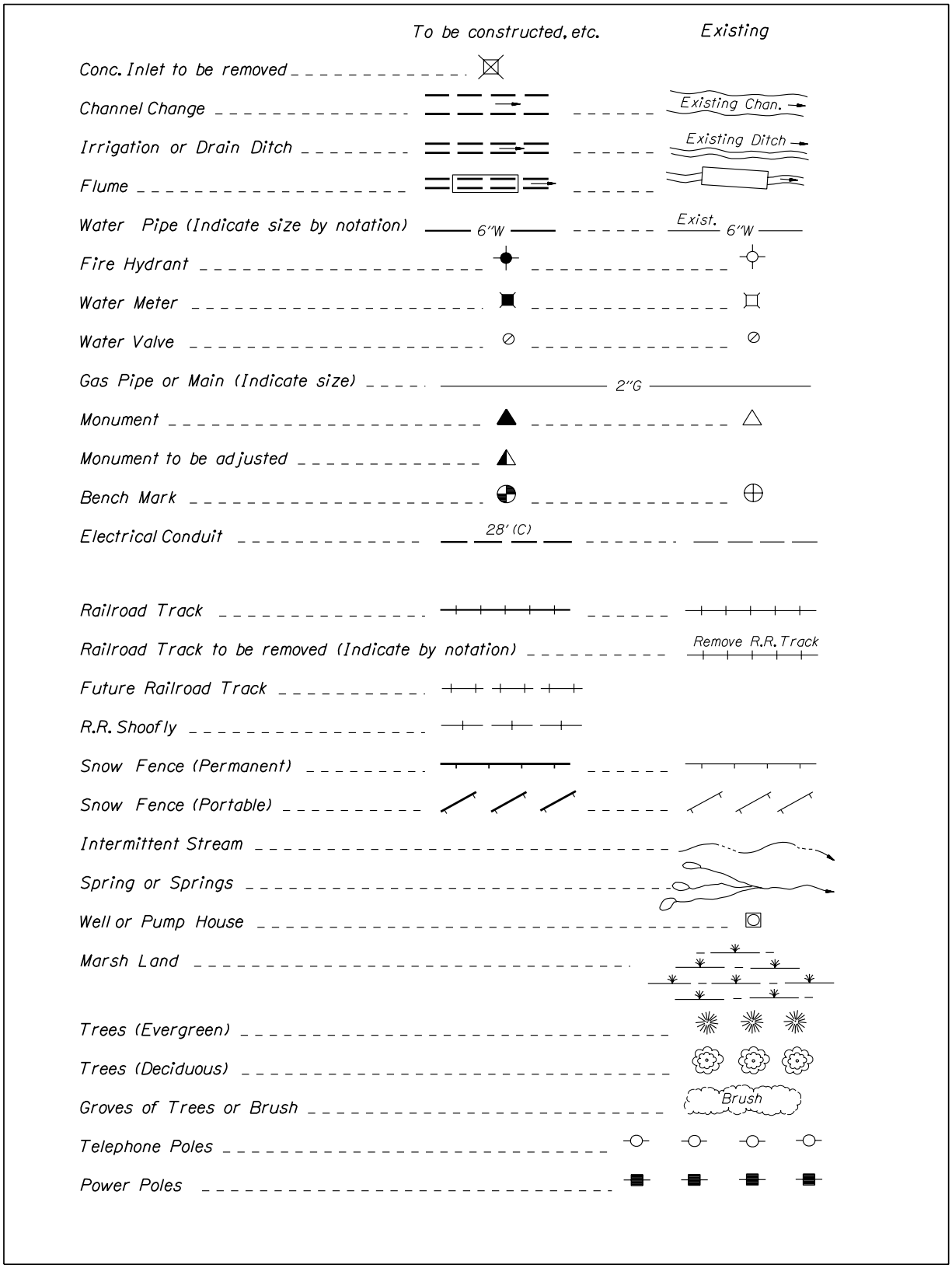


Figure A2.2.2C

A2.2.2 LINE WORK AND LEVELS

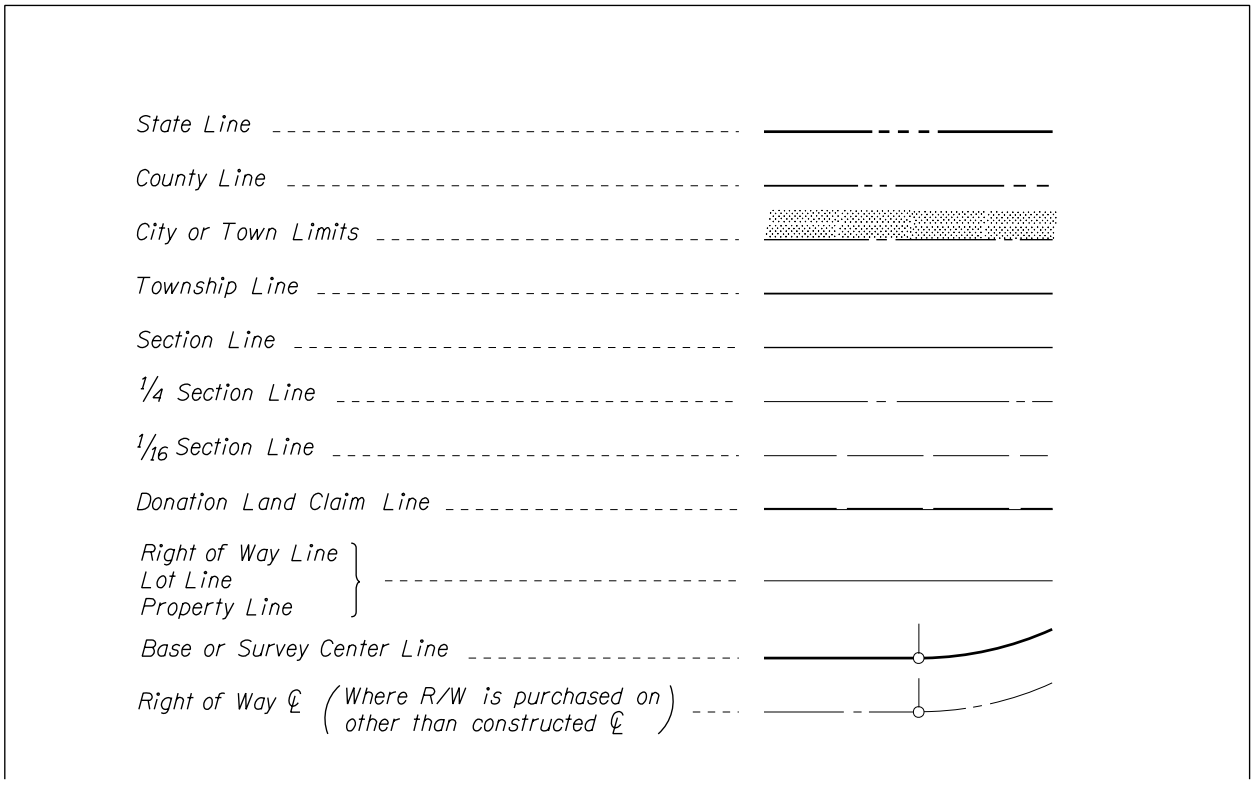


Figure A2.2.2D

A2.3 DRAWING BORDER

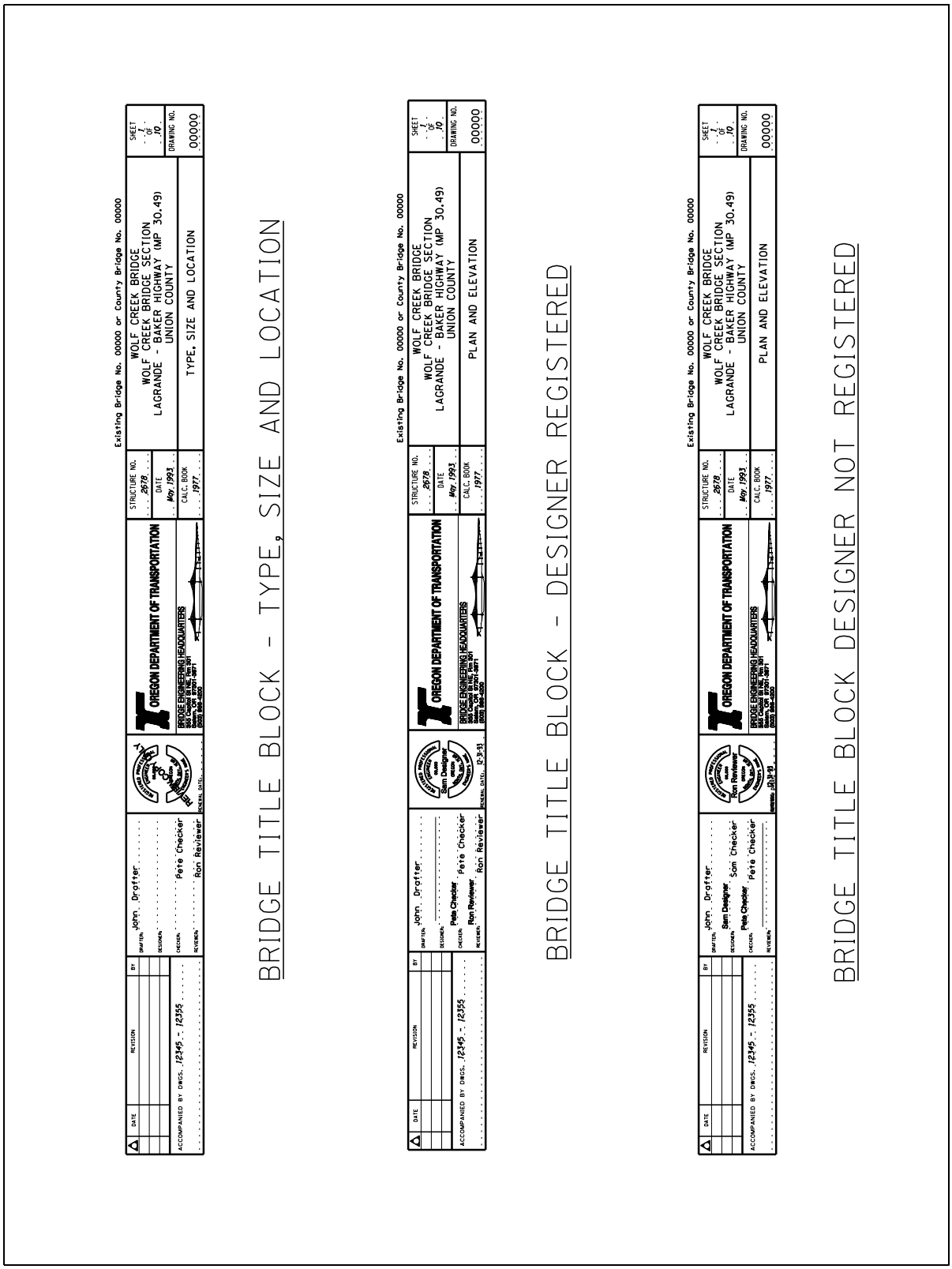


Figure A2.4A

A2.6 TYPE, SIZE AND LOCATION PLAN & ELEVATION

The bridge TS&L and Final Design Checklists have been combined into a single Bridge Design Checklist, which includes checklists for Class I and II Design Checks. The file is available as an Excel spreadsheet: br_design_checklist_rev01.xls

Bridge Design Checklist

10/26/2009
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❖ PROJECT INFORMATION

- Project Name:
- Bridge Name:
- Highway No.:
- Milepoint:
- Designer:
- Checker:
- Drafter:
- Reviewer:

- NOTE: Each Task, when applicable & completed, is Checked (Y, N, N/A), Dated and Initialized by the Designer, Checker and Reviewer.

TS&L Tasks	Y	N	N/A	Designer	DATE	Checker	DATE	Reviewer	DATE
Preliminary Data Collection									
• *Project Prospectus*									
• *Vicinity Map or Data*									
• *Foundation Report*									
• *Hydraulic Report*									
• *Grades & Alignments*									
• *Location Narrative*									
Plan & Elevation Drawing(s)									
• *Alignment Data*									
• *Roadway Width*									
• *Intersection Stations & Angles*									
• *Span Lengths & Numbers*									
• *Angles between Bents & Centerline*									
• *Existing Structures*									
• *Right-of-Way lines*									
• *Detours / Traffic Staging*									
• *Demolitions*									
• *Utilities*									
• *North Arrow*									
• *Location map (w/North Arrow, Project*									
• *Location Arrow and Nearest Town)*									
• *Live Load Loading (Sketch and note)*									
• *Type of bridge Rail*									
• *Expansion & Fixed joints*									
• *Elevation Datum*									
• *Existing Ground Line*									
• *High Water & O.H.W. Elevation*									
• *Proposed Ground Line*									
• *End Slope & Protection*									
• *Hydraulic Data*									
• *Grade Lines*									
• *Typical Bent Section*									
• *Roadway Clearances*									
• *Railroad final and Construction Clearance*									
• *Guardrail Transitions*									
• *Footing Elevations & Pile Types*									
• *Datum Elevation*									

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A2.6 TYPE, SIZE AND LOCATION PLAN & ELEVATION (Continued)

Bridge Design Checklist

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TS&L Tasks - Continued	Y	N	N/A	Designer	DATE	Checker	DATE	Reviewer	DATE
TS&L Estimate									
• *Title Block w/MP location, bridge number*									
• *Based on rough calcs per square foot*									
• *Account for tall abutments using projected quantities*									
TS&L Narrative Report									
• *General Background:*									
○ Project Development & justification									
○ Right-of- way restrictions									
○ Permits and restrictions									
○ Utility conflicts or restrictions									
○ Railroad Clearances & Restrictions									
• *Geometry and Lay-out:*									
○ Roadway Width, ADT, Grades & Alignment (exception for AASHTO as necessary)									
○ Sidewalks, bridge rails & protective screening									
• *Hydraulics:*									
○ Waterway openings, High water elevation, and Clearances									
○ Embankment or bent protection									
○ Floodway information, when appropriate									
• *Foundations:*									
○ Piling, drilled shafts, spread footings									
○ Fills, surcharges									
○ Settlement									
○ Lateral Earth, Seismic loads									
○ Liquefaction Potential									
• *Structure Features (discussion items):*									
○ Span length & span arrangements									
○ Type of superstructure									
○ Type of bents & location									
○ Alternate structure types considered and estimated costs									
○ Stage construction & detour requirements.									
• *Design Concepts (decision/ assumptions):*									
○ Building a new bridge vs. widening existing one									
○ Use a bridge vs. culvert									
○ Foundation support assumptions									
○ Assumed pile or drilled shaft bearing capacity loads									

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A2.6 TYPE, SIZE AND LOCATION PLAN & ELEVATION (Continued)

Bridge Design Checklist

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	Y	N	N/A	Designer	DATE	Checker	DATE	Reviewer	DATE
TS&L Narrative Report - Continued									
o Assumed lateral soil pressure against end bent									
o Seismic load assumptions									
• *Biological Assessment* Considerations (applies to many bridge replacements):									
o Project timing and chronology									
o In-Water Work Period									
o Bird Nesting									
o Bat Habitat									
o Alignment and size of the new bridge in relation to the existing (i.e., no. of spans, length)									
o Quantity of impervious bridge surface, existing vs. new									
o Type of new deck and construction methods									
o Type of new bridge railing and construction methods									
o Proposed treatment of the runoff									
o Number & sizes of bents/footings added for new bridge w/in OHWM and the wetted channel. Discuss construction of new footings, bents & piles.									
o Type of isolation methods used during construction (i.e., coffer dam)									
o If a detour bridge, working bridge or Falsework are required, discuss how many bents & types of temporary supports that may be within the OHWM and wetted channel. Discuss the construction & removal methods that might be used.									
o Extent and duration of in-water work (i.e., heavy machinery in wetted channel)									
o Amount or extend of fill or rip-rap									

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A2.6 TYPE, SIZE AND LOCATION PLAN & ELEVATION (Continued)

Bridge Design Checklist

10/26/2009
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FINAL DESIGN Tasks	Y	N	N/A	Designer	DATE	Checker	DATE	Reviewer	DATE
Plans									
• *Plan & Elevation Drawings*									
o Footing Plan shown									
o Alignment & Bearing shown									
o Skew angles shown									
o Bent Fixity (free, exp., hinge, etc.) shown									
o Slope Paving shown									
o Footing Elevations									
o Pile Bearing or min. Tip Elevation shown									
o Drainage provided for									
o Military Loading noted and shown									
o Stationing shown									
o Clearances shown									
• Railroad									
• Navigation									
• Highway									
o Minimum Construction Clearances shown									
o Bridge Rail Ends shown									
o Location Map shown									
o Detour shown									
o Existing Structure shown									
o Utilities shown & located									
o Grade Line Diagram shown									
o Elevation Datum shown									
o General Notes complete									
o Accompanying Drawings shown correctly									
o North Arrow shown									
o Hydraulic Data & High Water Mark shown									
• *Superstructure Details:*									
o Deck Elevation – Shown									
o Bearing Devices – Shown & Detailed									
o No. of Bearing Devices – Given									
o Expansion Allowances – Shown									
o Camber Diagram – Shown									
o Joints – Shown & Detailed									
o Stage Construction – Detailed									
o Pour Schedule – Shown									
o Concrete Finish Sketch – Shown									
• *Beam Details:*									
o Beams Located & Dimensioned									
o Beam Cross Sections – Shown									
o Prestressed Beam Details – Shown									
o Interim Bars – Shown @ Top of Stem									

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A2.6 TYPE, SIZE AND LOCATION PLAN & ELEVATION (Continued)

Bridge Design Checklist

10/26/2009
2:55 PM

	Y	N	N/A	Designer	DATE	Checker	DATE	Reviewer	DATE
Plans - Continued									
• *Beam Details* - Continued:									
o Bar Extensions – Adequate									
o End Anchorages of Longitudinal Bars – Sufficient									
o Post-tensioning Details/Data – Included									
• *Bent Details:*									
o Column Steel - properly dim. w/splices									
o Neg. moment at X-Beam - Reinforced									
o Footing Elevations – Shown									
o Skew Angles – Shown									
o Utility Holes – Shown & Noted									
o Hinges – Shown & Detailed									
o Seismic Restraints – Shown & Noted									
o Guardrail Connections at end bents									
o Concrete finish - Shown									
	Y	N	N/A	Designer	DATE	Checker	DATE	Reviewer	DATE
Specifications									
• Prepare & assembly:									
o Specifications									
o Supplemental Specifications									
o Special Provisions									
• Bid Let Item Names Check									
• Bid Let Item Quantities Check									
• Specials Verify & Review									
	Y	N	N/A	Designer	DATE	Checker	DATE	Reviewer	DATE
Estimates									
• Calculate quantities for all materials									
• Construction Time Estimate									
o Graph format									
o Critical stages shown									
• Cost for construction assistance									
	Y	N	N/A	Designer	DATE	Checker	DATE	Reviewer	DATE
Calculation Books - Design									
• Analysis & Design of bridge's structural components									
• Documentation of work with									
o Hand calculations									
o Computer output									
o Detailed notes									

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A2.6 TYPE, SIZE AND LOCATION PLAN & ELEVATION (Continued)

Bridge Design Checklist

10/26/2009
2:55 PM

DESIGN CHECKS	Y	N	N/A	Designer	DATE	Checker	DATE	Reviewer	DATE
Class I Check									
• *Class I Check is a comprehensive design review covering all aspects of the project. It'll be done primarily for:*									
o Major Complex Structures									
o Steel and post-tensioned bridges									
o Structures designed by an inexperienced Designer									
o Structures checked by an inexperienced Checker									
• *Checker's responsibilities:*									
o Review of location data and correspondence files									
o Review of construction time and seasonal requirements, permit applications, work-in-stream restrictions, and utility installations and conflicts									
o Review foundation and hydraulic requirements									
o Check of consistency of alignment and details with roadway plans									
o Thorough check of geometry, alignment, grades, clearances, and construction details									
o Verification of structure length, roadway width, structure type selection, aesthetic treatment, span arrangement, bent type and configuration, and bridge rail type									
o Complete independent structural analysis according to design specifications and current design practices									
o Make a quick long hand check of the most important structural elements before beginning a computer analysis of the design									
o Independent check of Final Estimate quantities & reconciliation of figures with Designer									
o									
o									

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A2.6 TYPE, SIZE AND LOCATION PLAN & ELEVATION (Continued)

Bridge Design Checklist

10/26/2009
2:55 PM

DESIGN CHECKS	Y	N	N/A	Designer	DATE	Checker	DATE	Reviewer	DATE
Class II Check									
• *Class II Check is a review of design concepts and construction details & does not necessarily include structural analysis. It will be done primarily for:*									
○ Minor Bridges designed by an experienced designer									
• *Checker's Responsibilities:*									
○ Review of correspondence, job files and design calculations									
○ Confirmation that foundation and hydraulic requirements are met									
○ Verification of geometry, alignment and structure type selection									
○ Confirmation with Designer that structural critical elements have been analyzed during final design									
○ Completeness of plans									
○ Check of construction details and Final Estimate quantities									
○									
○									

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A2.7.1 DECK PLAN

1 — Place 4" square drain hole through diaphragm beam at low point of each cell.

2 — Place 4" diameter drain hole through bottom slab at low end of spans, each cell.

3 — This dimension may be increased to accommodate the prestressing system used.

4 thru 7 — Utility hole through transverse beams, piers, walls, etc.

8 — Place concrete culvert pipe, or galvanized smooth steel pipe (1/4" min. wall thickness), or PVC pipe (sch. 80) under Standard Bridge End Panel at each uility hole both ends of bridge. Extend though hole in end beam to a point 5'-0" minimum beyond the end of the end of the end panel. An oversize hole (1" larger diameter than the pipe) should be formed into the backwall or end beam. When the pipe is installed, the void around the pipe should be filled with a compressible material.

9 thru 19 — Catch Basin Notes

20 thru 29 — Deck Drains

30 / C"x" — Install galvanized steel cabinets per T.E. dwg. 00000 & 00000.
Size = 24" (W) x 36" (H) x 8" (D) when x = 100
Size = 12" (W) x 18" (H) x 8" (D) when x = 200
Size = 8" (W) x 12" (H) x 6" (D) when x = 300
Size = 8" (W) x 12" (H) x 6" (D) when x = 400
Size = 8" (W) x 12" (H) x 6" (D) when x = 500
Size = 20" (W) x 20" (H) x 8" (D) when x = 600

30 / J"x" — Install galvanized cast iron junction boxes per T.E. dwg. 00000 & 00000.
Size = 4" x 4" x 4" when x = 4
Size = 6" x 6" x 4" when x = 6
Size = 8" x 8" x 6" when x = 8
Size = 12" x 10" x 8" when x = 12

31 / DX — Install hot-dip galvanized conduit Deflection/Expansion Fitting. (allows 3/4" movement from nominal in all directions)

31 / EX — Install hot-dip galvanized conduit Expansion Fitting. See dwg. BR970 for details.

31 / LX — Loop conduit to allow for movement. see T.E. I-0306 for details.

32 / L — Luminaire pole base. See dwg. BR970 for details.

32 / S — Provide 3" dia. hole in bottom slab for signal or future signal. See T.E. dwg. 0000 & 0000.

32 / U — 2'-4" outside diameter Underdeck Luminaire Mounting Ring. See dwg. BR970 for details.

35 / "x" — Galvanized steel electrical conduit for signals. "x" is conduit diameter.

Figure A2.7.1A

A2.7.1 DECK PLAN – (continued)

37 "x" — Galvanized steel electrical conduit for signals. "x" is conduit diameter.

38 — 3/8" elbow stubbout and flexible cord. See T.E. dwg. I0305 for details. (Typical at underdeck luminaires)

38 and 39 — Electrical Conduit

40 thru 49 — Steel Framing and Bracing Details.

50 — Standard Concrete Bridge Rail, Type "F", See dwg. 00000 for details.

51 — Standard Median Barrier, See dwg. 00000 for details.

52 thru 59 — Rail Details

60 — Deck expansion joint, See dwg. 00000.

61 — Place 1/4" preformed expansion joint filler through rail where shown, where shown, See dwg. 00000.

62 thru 69 — Deck Joint Details

70 — Standard Access hole, See dwg. BR135 and BR136.

71 thru 79 — Access hole details.

80 — Standard Bridge End Panel at bridge ends, See dwg. BR165.

81 thru 89 — Miscellaneous Details

90 — Structure mounted signs, see dwg. 00000 and 00000 for details.

Figure A2.7.1B

A2.7.3 Plan and Elevation

[Note: The following is only a guide for General Notes. Omit those sections, items and terms in parenthesis that are not applicable, except retain the parenthetical references to ASTM equivalents to AASHTO Specifications.]

General Notes:

Provide all materials and perform all work according to the Oregon Standard Specifications for Construction 2002 (2008).

Bridge(s) is(are) designed in accordance with the 20XX edition of the AASHTO LRFD Bridge Design Specifications (including 20XX thru 20XX interim revisions) with an allowance of (40 psf for present wearing surface) (and) (25psf) for future wearing surface and all of the following Live Loads :

Service and Strength I Limit States:

- HL-93: Design truck (or trucks per LRFD 3.6.1.3) or the design tandems and the design lane load.

Strength II Limit State:

- ODOT Type STP-5BW Permit truck
- ODOT Type STP-4E Permit truck

[Select one of the following notes depending on the methodology used in the design of the bridge foundations]:

[New Seismic Designs ----- Multi-Span Bridges]:
Seismic design is performed by the multi-mode (single-mode) analysis in accordance with the "AASHTO LRFD Bridge Design Specifications" ("AASHTO Guide Specifications for LRFD Seismic Bridge Design") as modified by the "ODOT Bridge Design & Drafting Manual". The 2002 USGS Seismic Hazard Maps have been used to collect the Seismic Hazard Values for the bridge site with Latitude _____ and Longitude _____:

1000 Year Return Period ("No Collapse" criteria)

- Horizontal Peak Ground Acceleration Coefficient, PGA=_____g
- Horizontal Response Spectral Acceleration Coefficients: S_S=____g, S_1=____g

500 Year Return Period ("Serviceable" criteria)

- Horizontal Peak Ground Acceleration Coefficient, PGA=_____g
- Horizontal Response Spectral Acceleration Coefficients: S_S=____g, S_1=____g

The bridge site is defined as a Site Class __ with Site Factors of: F_{pga}=___, F_a =___, and F_v=___.
The Response Modification factors used are: R=___ for column moments, R= 0.8 for abutment connections, and R= 1.0 for other components.

[New Seismic Designs -----Single-Span Bridges]:
Seismic design is performed in accordance with the "AASHTO LRFD Bridge Design Specifications" ("AASHTO Guide Specifications for LRFD Seismic Bridge Design") as modified by the "ODOT Bridge Design & Drafting Manual" for 500- and 1000-year criteria. The Horizontal Peak Ground Acceleration Coefficients (PGA) for the 500 year (Serviceable) and 1000 year (No Collapse) return periods are ___g and ___g respectively, based on 2002 USGS Seismic Hazard Maps. The bridge site is defined as a Site Class __ with Site Factor (F_{pga}) of ___.

A2.7.3 General Notes - (continued)

[Widenings which do not carry the existing structure]:
Seismic design for widening is performed by the single-mode (multi-mode) analysis, with Response Modification Factors, in accordance with the "AASHTO LRFD Bridge Design Specifications" as modified by the "ODOT Bridge Design & Drafting Manual". Seismic design is based on __ ft of superstructure width and is not designed to carry the seismic load of the existing structure. The 2002 USGS Seismic Hazard Maps have been used to collect the Seismic Hazard Values for the bridge site with Latitude _____ and Longitude _____:

1000 Year Return Period ("No Collapse" criteria)

- Horizontal Peak Ground Acceleration Coefficient, PGA=_____g
- Horizontal Response Spectral Acceleration Coefficients: S_S=____g, S_1=____g

500 Year Return Period ("Serviceable" criteria)

- Horizontal Peak Ground Acceleration Coefficient, PGA=_____g
- Horizontal Response Spectral Acceleration Coefficients: S_S=____g, S_1=____g

The bridge site is defined as a Site Class __ with Site Factors of: F_{pga}=___, F_a =___, and F_v=___.

[Widenings which do carry the existing structure]:
Seismic design for widening is performed by the single-mode (multi-mode) analysis, with Response Modification Factors, in accordance with the "AASHTO LRFD Bridge Design Specifications" as modified by the "ODOT Bridge Design & Drafting Manual". The widened structure is designed to resist the full seismic load including the existing structure. The 2002 USGS Seismic Hazard Maps have been used to collect the Seismic Hazard Values for the bridge site with Latitude _____ and Longitude _____:

1000 Year Return Period ("No Collapse" criteria)

- Horizontal Peak Ground Acceleration Coefficient, PGA=_____g
- Horizontal Response Spectral Acceleration Coefficients: S_S=____g, S_1=____g

500 Year Return Period ("Serviceable" criteria)

- Horizontal Peak Ground Acceleration Coefficient, PGA=_____g
- Horizontal Response Spectral Acceleration Coefficients: S_S=____g, S_1=____g

The bridge site is defined as a Site Class __ with Site Factors of: F_{pga}=___, F_a =___, and F_v=___.

[Phase 1 Seismic Retrofit Designs - select appropriate sections:]

Seismic retrofit design to prevent superstructure pull-off is based on a Horizontal Peak Ground Acceleration Coefficient (PGA) of ____g and a Site Factor (F_{pga}) of ____ for the Site Class __.

[Simple Span Support Connections:]

Longitudinal design forces:

Force to prevent pull-off by single-mode analysis, without substructure stiffness considered, with a maximum response not greater than 2.5 x PGA.

Transverse design forces:

Force equal to 2.5 x PGA x supported dead load.

[Continuous Span Series Support Connections:]

Longitudinal design forces:

"Plastic hinging" of columns and forces to prevent pull-off by single-mode analysis, considering substructure stiffness with column capacity limitation (strength), maximum response not greater than 2.5 x PGA.

A2.7.3 General Notes - (continued)

Transverse design forces:
"Plastic hinging" of column(s) (and x-beam frame).

[In-Span Hinges:]
Longitudinal design forces:
"Plastic hinging" of columns and forces to prevent pull-off by single-mode analysis, considering substructure stiffness with column capacity limitation (strength), maximum response not greater than 2.5 x PGA.

Transverse design forces:
Force equal to 2.5 x PGA x supported dead load.

Cable for seismic restraint devices will be furnished by the Department. See Section 00160.30 of the Special Provisions.

( ) indicates (Options), [ ] indicates [Instructions]

For pile foundations:

All Bent(s), Provide _____ [insert pile type & grade of steel*] piling (with reinforced tips) driven (open-ended or closed-ended) to a nominal resistance of _____ kips per pile.

* *example* ==> Pipe Pile ==> 12-¾ x 0.375, ASTM A252 (Grade 2)(Grade 3)

H-Pile ==> HP 10 x 42, ASTM A572, Grade 50

Pile tip elevation for minimum pile penetration at (All) Bent(s) (___) (is elevation _____ feet) (according to the Pile Penetration Table).

[Use one of the following as directed by the Foundation Designer]

Drive (Bent ___), (All) piling to the specified nominal resistance using driving criteria developed from a Wave Equation Analysis.

Drive (Bent ___), (All) piling to the specified nominal resistance using driving criteria developed from the FHWA Gates Equation.

Determine pile resistances from the results of Capwap Analysis and/or Dynamic Pile Load Tests as specified in the Special Provisions.

(If applicable)

Support all falsework on driven piles.

NOTE: If project plans have a separate footing plan sheet, place all foundation design notes on the footing plan sheet and reference them in the "General Notes"; "See Footing Plan for foundation design notes."

Provide spiral column reinforcement according to ASTM Specification A706, AASHTO Specifications M31 (ASTM A615) Grade 60, AASHTO M225 (ASTM A496), or AASHTO M32 (ASTM A82).

A2.7.3 General Notes - (continued)

Provide all (other) reinforcing steel according to ASTM Specification A706, or AASHTO M31 (ASTM A615) Grade 60. (Provide Field bent stirrups according to ASTM Specification A706.) Use the following splice lengths (unless shown otherwise):

[Use the following chart when the minimum concrete strength required is 3.3 ksi]

Reinforcing Splice Lengths (Class B) Grade 60 f'c = 3.3 ksi										
Bar Size	#3	#4	#5	#6	#7	#8	#9	#10	#11	#14 & #18
Uncoated	1'-0"	1'-4"	1'-8"	2'-0"	2'-9"	3'-7"	4'-6"	5'-9"	7'-0"	Not permitted
Coated (1)	1'-2"	1'-7"	2'-0"	2'-5"	3'-3"	4'-3"	5'-5"	6'-10"	8'-5"	Not permitted
Coated (2)	1'-6"	2'-0"	2'-6"	3'-0"	4'-1"	5'-4"	6'-9"	8'-7"	10'-6"	Not permitted

Use Coated (1) for epoxy coated bars with cover at least $3*d_b$ <u>and</u> clear spacing between bars at least $6*d_b$.

Use Coated (2) for epoxy coated bars with cover less than $3*d_b$ <u>or</u> clear spacing between bars less than $6*d_b$.

Increase all splice lengths 40% for horizontal or nearly horizontal bars so placed that more than 12" of fresh concrete is cast below the bar.

[Use the following chart when the minimum concrete strength required is 4.0 ksi]

Reinforcing Splice Lengths (Class B) Grade 60 f'c = 4.0 ksi										
Bar Size	#3	#4	#5	#6	#7	#8	#9	#10	#11	#14 & #18
Uncoated	1'-0"	1'-4"	1'-8"	2'-0"	2'-6"	3'-3"	4'-1"	5'-2"	6'-4"	Not permitted
Coated (1)	1'-2"	1'-7"	2'-0"	2'-2"	3'-0"	3'-11"	4'-11"	6'-3"	7'-8"	Not permitted
Coated (2)	1'-6"	2'-0"	2'-6"	3'-0"	3'-8"	4'-10"	6'-2"	7'-9"	9'-6"	Not permitted

Use Coated (1) for epoxy coated bars with cover at least $3*d_b$ <u>and</u> clear spacing between bars at least $6*d_b$.

Use Coated (2) for epoxy coated bars with cover less than $3*d_b$ <u>or</u> clear spacing between bars less than $6*d_b$.

Increase all splice lengths 40% for horizontal or nearly horizontal bars so placed that more than 12" of fresh concrete is cast below the bar.

Splice reinforcing steel at alternate bars, staggered at least one splice length or as far as possible, unless shown otherwise.

Support the bottom mat reinforcing steel from the forms with precast mortar blocks at 24" maximum centers each way. Support the top mat of reinforcing steel from the bottom mat of reinforcing steel with wire bar supports as shown in Chapter 3 of the CRSI Manual of Standard Practice (SBU, BBU, or CHCU). Place wire bar supports at 24" maximum centers.

Use (Stainless steel)(Epoxy coated)(uncoated) reinforcing steel in the deck (and bridge end panel). This includes top and bottom longitudinal bars, (and) top and bottom transverse bars, (and all bars extending into the (sidewalk)(curb)(parapet)).

Epoxy coat reinforcing steel, except prestressing steel, in precast (slabs), (boxes). This includes bars extending from the precast (slab) (box) into the (bridge rail) (curb) (sidewalk) (deck).

A2.7.3 General Notes - (continued)

Place bars 2” clear of the nearest face of concrete (unless shown otherwise). The top bends of stirrups extending from beam stems into the top slab may be shop or field bent (unless shown otherwise). The top bends of stirrups extending from prestressed precast units may be shop or field bent (unless shown otherwise).

Do not fabricate reinforcing steel for columns (and walls) until final footing elevations have been determined in the field.

Provide Class ____ - ___ concrete in post-tensioned box girder superstructure (prestressed-precast units) and as shown on detail plans. See dwg. _____.

Provide Class HPC4000 – 1 ½ , 1, or ¾ concrete in deck (except in prestressed or post-tensioned sections).

Provide Class ____ - 1 ½ , 1 or ¾ concrete in (columns, footings, etc.).

Provide Class 3300 (Seal Concrete) - 1 ½ , 1 or ¾ concrete in seals.

Provide Class 4000 – 3/8 concrete for all drilled shafts.

Provide Class HPC4000 – 1 ½ , 1, or ¾ concrete in reinforced concrete end panels.

Provide Class 3300 - 1 ½ , 1 or ¾ concrete for All (other) concrete.

Provide Class 3300 - 1 ½ , 1, ¾ or 3/8 concrete in walls with form liners.

Provide Class _____ - _____ concrete in precast prestressed (beams, boxes, slabs) according to detail plans. See dwg. _____. The minimum strength of concrete at transfer of prestress is ____ psi.

Provide prestressing steel according to detail plans.

Provide structural steel according to (AASHTO) [or] (ASTM) Specifications in accordance with detail plans.

("Galvanize-Control Silicon" – provided silicon content of the base metal in either of the ranges 0 to 0.04 percent, or 0.15 to 0.25 percent.)

A2.7.3 General Notes - (continued)

Structural Steel Notes:

Provide (7/8" diameter) (Type 3) high-strength fasteners at structural connections according to AASHTO Specification M164 (ASTM Specification A325) (unless shown otherwise).
See the Special Provisions for detailed coating and tightening requirements.

Note: Consult with the Steel Design Standards and Practice Engineer to review structural steel and painting General Notes.

Do not punch or drill holes in webs of interior girders for falsework.

Coat all girders as shown, in accordance with the Specifications.
The finish coat on all girders conform to Federal Color Standards
most closely matching steel rusted shade.
Submit rusted shade color to engineer for approval.

1. All longitudinal dimensions are on a horizontal line - adjust for superelevation and grade.
2. All stiffeners and beam ends are to be vertical in final erected position unless noted otherwise.
3. Web thickness shown may be increased up to 1/16 ".
4. Additional compression flange weld splices will be permitted at locations approved by the engineer.
5. Steel in top and bottom flanges shall conform to ASTM A709, Grade 50W.
6. Steel in web shall conform to ASTM A709, Grade XXXXX
7. All other steel shall conform to AASHTO M 270, Grade XXXXX (ASTM A709, Grade XXXXX).
8. Indicates check sample required from flange plates so marked, see Special Provisions.
9. For the purpose of charpy toughness testing and welding inspection/repair, etc., main load carrying members are Girders and Stiffeners.
10. Assumed design temperature is XXX F.

WELDING NOTES:
Welding shall conform to the latest edition of AWS D 1.5.
BOLTING NOTES:
All high strength bolts shall be tightened using the "Turn-of-Nut Tightening" method according to the 2008 Oregon Standard Specifications for Construction.
Provide 7/8 "diameter Type 3 high-strength fasteners at structural connections according to AASHTO Specification M164 (ASTM Specification A325) unless shown otherwise.

Provide Douglas Fir (non-laminated) timber conforming to _____ Grade [insert lumber grade] according to WCLIB rules.

Incise and treat sawn members with _____ [insert appropriate treatment from Section 02190] to a minimum retention level of _____ pcf [insert appropriate treatment level] in accordance with AWPA Specification C-2.

Provide all glued laminated timber members according to the requirements of the current American Institute of Timber Construction (AITC) Timber Construction Standards.

A2.7.3 General Notes - (continued)

Allowable stresses in glued laminated members are per the latest version of AITC Specification 117.

Provide [insert wood species] glued laminated stringers according to combination symbol _____. [insert combination symbol]

Provide [insert wood species] glued laminated deck panels and rail posts according to combination symbol 2. [insert combination symbol]

Mark glued laminated stringers "Top" on the top at both ends.

Incise and treat glued laminated timber members with _____ [insert appropriate material from Section 02190] to a minimum retention level of _____ pcf. [insert appropriate level of retention] Treat laminated members after laminating in accordance with AWPA Specification C-28.

Perform cutting and drilling of timber members before preservative treatment. No field cutting of treated material will be permitted unless absolutely necessary. In the event of injury, drilling or cutting of treated material, field treat according to AWPA Specification M-4.

Provide structural steel, dowels (etc.) according to ASTM Specification _____. [insert Specification number] Provide all bolts, lag nuts and drift pins shall conform to AASHTO Specification M314, Grade 35 (ASTM A307) and/or AASHTO M314 Grade 105 (ASTM A449) as shown on the detail plans. Hot-dip galvanize structural steel, dowels, miscellaneous metal, bolts, lag bolts and drift pins after fabrication.

2.8.3 Bridge Data System – Structure and Drawing Number Request Form

Bridge Data System
Structure and Drawing Number Request Form

Structure Number: Status: Owner:

Structure Name:

Year Built: Type: Subtype:

Region: District:

City: County:

Highway: Route:
Milepoint: Direction:

Township: Range: Section:

Configuration:
# of Spans:

Overall Length: Curb to Curb Width:
Out ot Out Width:

Comments:

Requestor's Company:

Requestor: ODOT Key #:

	Drawing Number	Drawing Description
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

BDSRequest.xls

A2.7.11.1 As-Constructed Drawings

Office Name
Office Phone: (000) 000-0000
Fax Phone: (000) 000-0000

September 1, 2005

File Code:

TO: Project Manager Name
Street address
City, State, Zip

FROM: Bridge Manager Name, P.E.
Title

SUBJECT: Bridge Name and Number
Project Name
Highway and Milepost
County Name

Attached are copies of "As-Constructed" plans for these structures for your reproduction and distribution. Please send one copy to the Region Bridge Inspector and one copy to the District Maintenance Manager. Any additional distributions may be made at your discretion.

Sender Initials:

Attachment:

cc: Region Bridge Inspector Name, Region ? Bridge Inspection /w/ 1 set 11" x 17" paper

bc: Gary Bowling, Bridge Operations Managing Engineer /w/ 1 set 11" x 17" paper