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Note: Revisions for October 2014 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 to begin and end in a Microstation design file. Check with ODOT Bridge Engineering Headquarters for current version being used.

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 from the Bridge Data system (BDS) and calculation book numbers from headquarters Bridge Section in Salem.
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 11" x 17" paper prints to the Office of Pre-Letting in Salem headquarters.
6. Office of Pre-Letting will the send 11" x 17" paper prints 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 scanned images to Bridge Engineering Headquarters, 4040 Fairview Industrial Drive, Salem, Oregon 97302-3407
8. Bridge Engineering Section Headquarters will load scanned images into the Bridge Data System (BDS).

2.1.3.1 Drawings Start to Finish – (continued)

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 are added by either Option 1 or 2, see BDDM 2.7.11.1 for As-Constructed procedures.

11. Once as-constructed comments are completed, new tif images are created and uploaded into BDS. Original mylars are returned to Bridge Headquarters in Salem for final filing.

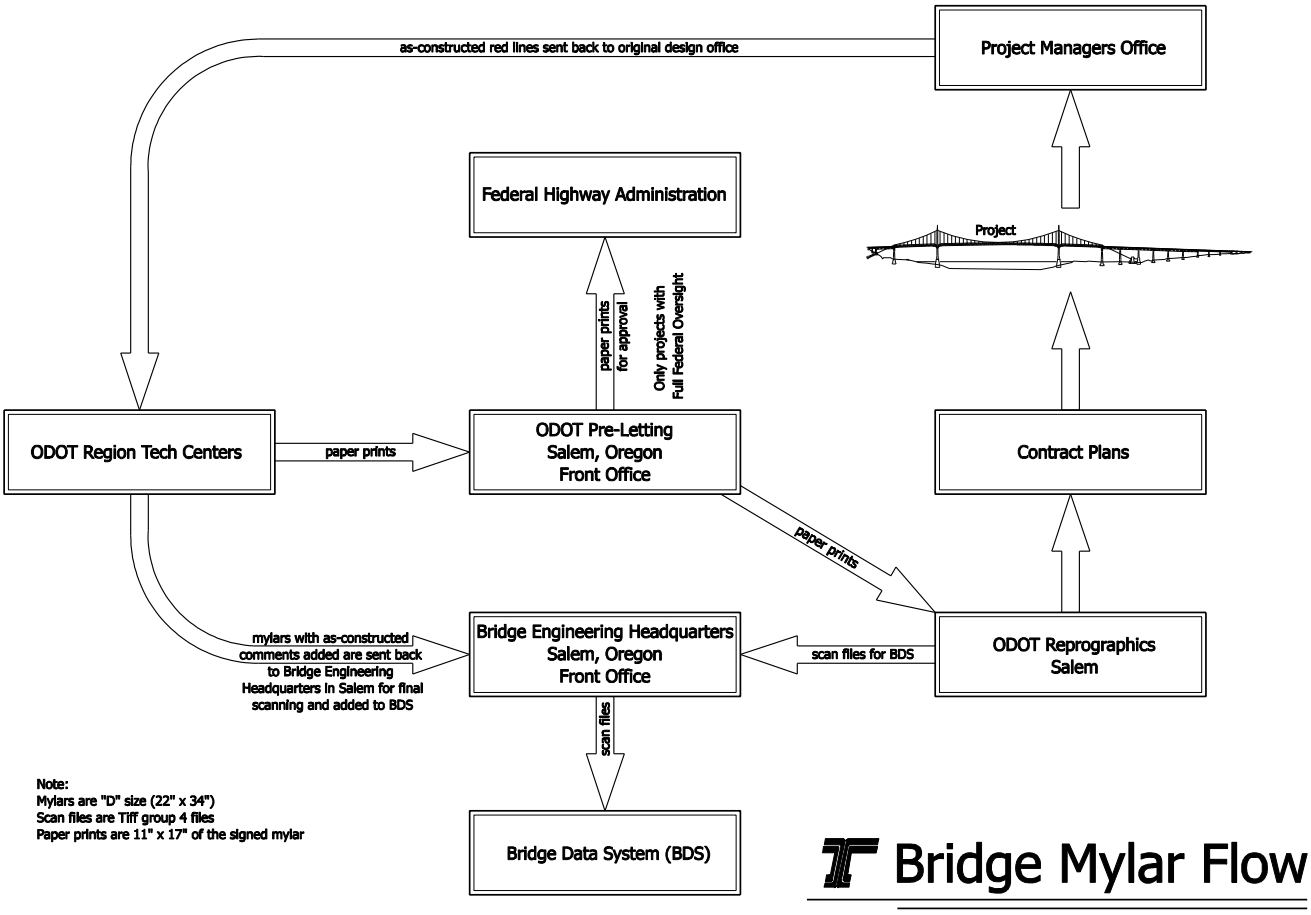


Figure 2.1.3.1A

2.1.3.2 What Bridge Headquarters Needs At Completion of a Design Project

State Owned Structures

- 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.
- Original Mylars will be held by Original design office until completion of project (Mylars can be sent in after bid is awarded, if as-constructed comments will be done electronically. See BDDM 2.7.11.1.
- See BDDM 2.7.11.1 As-Constructed Drawings for complete information on completing this task.
- 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.

Other State and Local Agency Structures

- 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.
- Original Mylars may be kept by owner of the structure.
- See BDDM 2.7.11.1 As-Constructed Drawings for complete information on completing this task. A PDF of drawings with as-constructed comments added sent to ODOT Bridge Headquarters in Salem.
- Load rating of as-constructed bridge per Load Rating Guidelines.

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 BDDM 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. A new project title block replaces the standard detail title block. A new drawing number is required for this drawing and Engineer of Record is responsible for details used. 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	Shear Lug
Work Bridge Details	Rail Details	

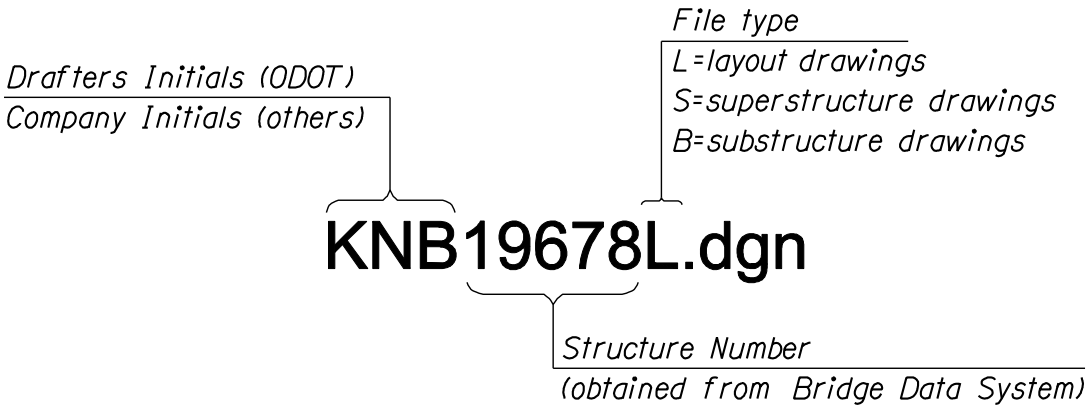


Figure 2.1.3.4A

2.1.3.5 Microstation Models

Place each drawing in its own model within the three files that the Bridge Sections stores their drawings. Existing Bridge model will have any existing information necessary for the project.

The following drawings will be place in each of the models listed below as needed.

"L" file	**"S" file**	**"B" file**
Layout and Index sheet model	Deck Plan model	Footing Plan model
Plan and Elevation model	Deck Section model	Plan and Elevation–Bent 1 model
General Notes model	Framing Layout model	Bent Details – Bent 1 model
Foundation Data Sheet model	Longitudinal Girder Elevation	Bearing Details – Bent 1 model
Stage Construction model	Camber Diagram model	Wingwall - A Details model
Miscellaneous Details model	Post-tensioning sheets model	Shear Lug model
Work Bridge Details model	Rail Details model	
Existing model		

2.1.4 Cell Libraries

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

<u>Bridge Section Standard Cell Library</u>

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

<u>Personal Cell Library</u>

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

<u>Registration Seal Cell Library</u>

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\ USERCFG\Cell\Registration Seals Library Name.cel

2.1.5 Menus

- <u>Custom Tasks</u> - A Task or tool can be created can be created in Microstation using tools provided in Microstation.

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.** (Example: Scale ¼" = 1'-0")

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 .

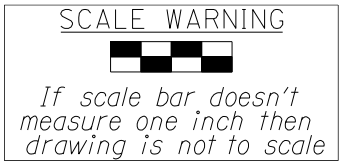


Figure 2.1.8A

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
1-1/2" = 1'-0"	8
1" = 1'-0"	12
3/4" = 1'-0"	16
1/2" = 1'-0"	24
3/8" = 1'-0"	32
1/4" = 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	120	180	240	360	480	600	720	128	96	64	48	32	24	16	12	8	4
10	1.00	1.5	2.00	3.00	4.00	5.00	6.00	1.0667	0.8000	0.5333	0.4000	0.2667	0.2000	0.1333	0.1000	0.0667	0.0333
15	0.6667	1.00	1.3333	2.00	2.6667	3.3333	4.00	0.7111	0.5333	0.3556	0.2667	0.1778	0.1333	0.0889	0.0667	0.0444	0.0222
20	0.5000	0.7500	1.00	1.5000	2.00	2.5000	3.00	0.5333	0.4000	0.2667	0.2000	0.1333	0.1000	0.0667	0.0500	0.0333	0.0167
30	0.3333	0.5000	0.6667	1.00	1.3333	1.6667	2.00	0.3556	0.2667	0.1778	0.1333	0.0889	0.0667	0.0400	0.0333	0.0222	0.0111
40	0.2500	0.3750	0.5000	0.7500	1.00	1.2500	1.50	0.2667	0.2000	0.1333	0.1000	0.0667	0.0500	0.0300	0.0250	0.0167	0.0083
50	0.2000	0.3600	0.4000	0.6000	0.8000	1.000	1.20	0.2133	0.1600	0.1067	0.0800	0.0533	0.0400	0.0267	0.0200	0.0133	0.0067
60	0.1600	0.2500	0.3333	0.5000	0.6667	0.8333	1.00	0.1178	0.1333	0.0889	0.0667	0.0444	0.0300	0.0222	0.0167	0.0111	0.0056
3/32"	0.9375	1.4063	1.8750	2.8125	3.7500	4.6875	5.6250	1.00	0.7500	0.5000	0.3750	0.2500	0.1875	0.1250	0.0938	0.0625	0.0313
1/8"	1.2500	1.8750	2.5000	3.7500	5.0000	6.2500	7.50	1.3333	1.00	0.6667	0.5000	0.3333	0.2500	0.1667	0.1250	0.0833	0.0417
3/16"	1.8750	2.8125	3.7500	5.6250	7.5000	9.3750	11.25	2.00	1.50	1.00	0.7500	0.5000	0.3750	0.2500	0.1875	0.1250	0.0625
1/4"	2.5000	3.75	5.0000	7.5000	10.00	12.5000	15.00	2.6667	2.00	1.3333	1.00	0.6667	0.5000	0.3333	0.2500	0.1667	0.0833
3/8"	3.7500	5.6250	7.5000	11.2500	15.00	18.750	22.50	4.00	3.00	2.00	1.50	1.00	0.7500	0.5000	0.3750	0.2500	0.1250
1/2"	5.00	7.50	10.00	15.00	20.00	25.00	30.00	5.3333	4.00	2.6667	2.00	1.3333	1.00	0.6667	0.5000	0.3333	0.1667
3/4"	7.5000	11.25	15.00	22.5000	30.00	37.5000	45.00	8.00	6.00	4.00	3.00	2.00	1.50	1.00	0.7500	0.5000	0.2500
1"	10.00	15.00	20.00	30.00	40.00	50.00	60.00	10.6667	8.00	5.3333	4.00	2.6667	2.00	1.3333	1.00	0.6667	0.3333
1 1/2"	15.00	22.50	30.00	45.00	60.00	75.00	90.00	16.00	12.00	8.00	6.00	4.00	3.00	2.00	1.50	1.00	0.5000
3"	30.00	45.00	60.00	90.00	120.00	150.00	180.00	32.00	24.00	16.00	12.00	8.00	6.00	4.00	3.00	2.00	1.00

SCALE FOR DETAIL

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:

ODOT Bridge General - text – 5/32” font 24, wt=2
ODOT Bridge Heading - 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

For abbreviations to use see Appendix BDDM 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 BDDM 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.

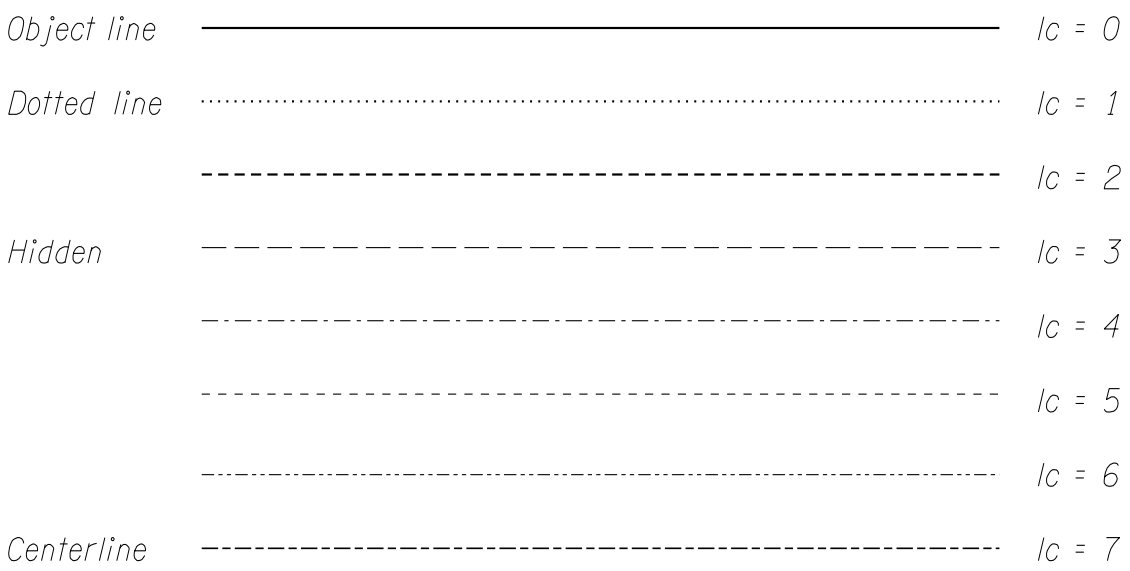


Figure 2.2.2A

See BDDM Appendix 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.

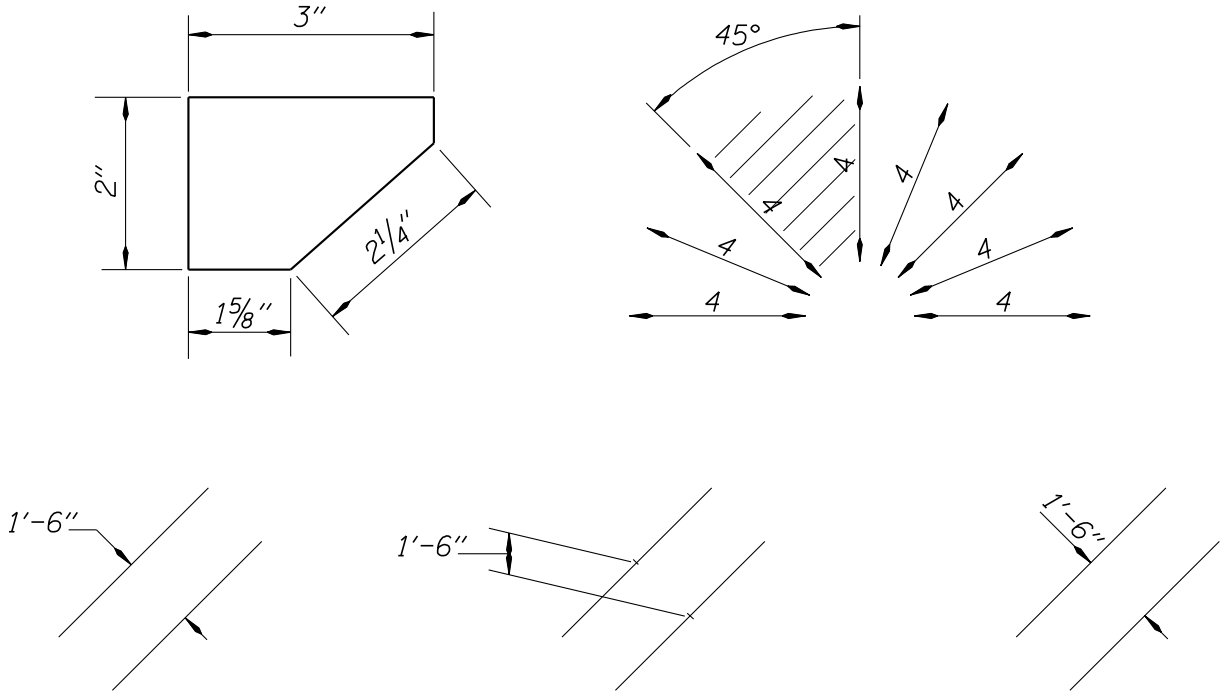


Figure 2.2.3A

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.

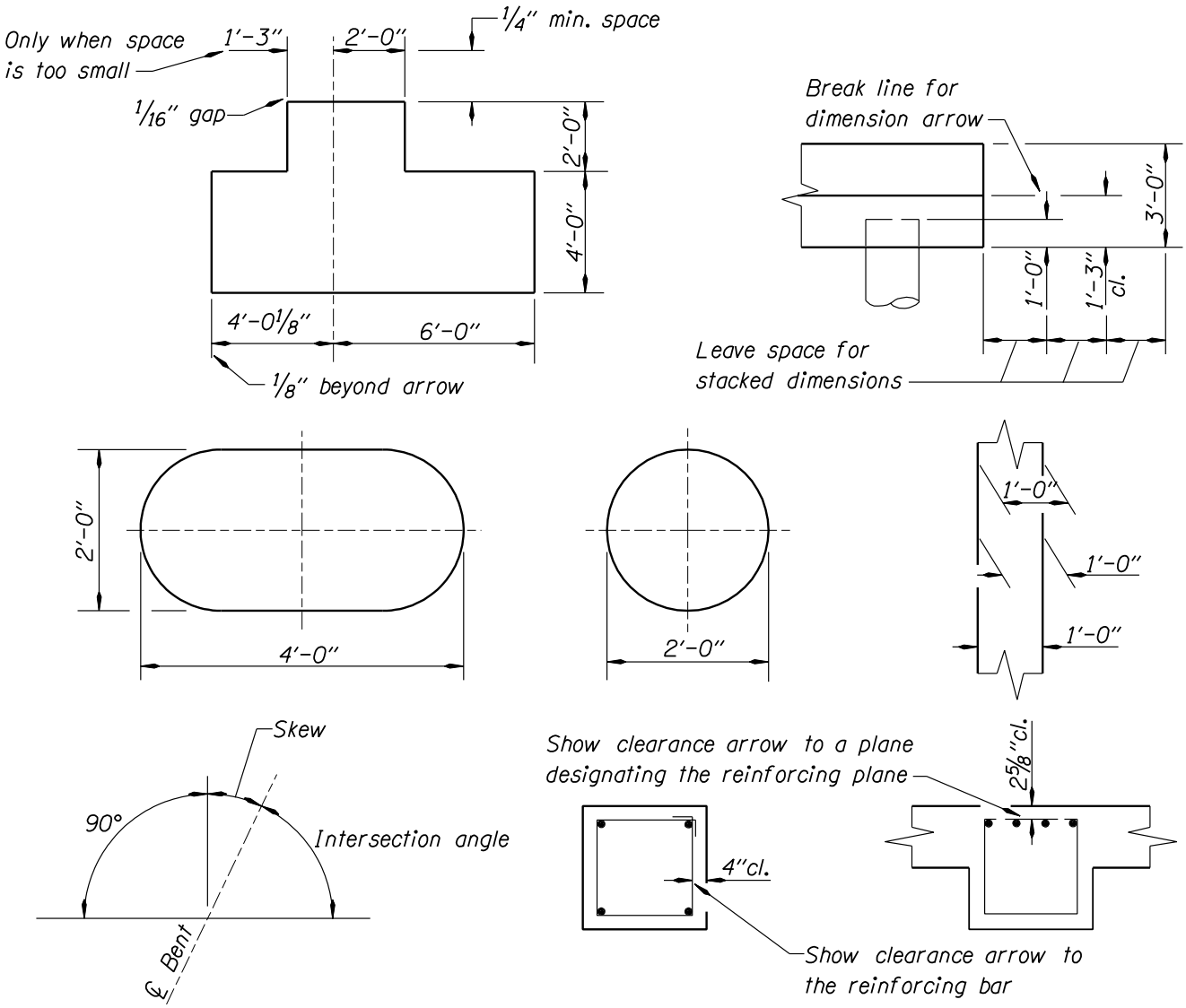


Figure 2.2.3B

2.2.4 Concrete

A typical crossbeam section is shown below.

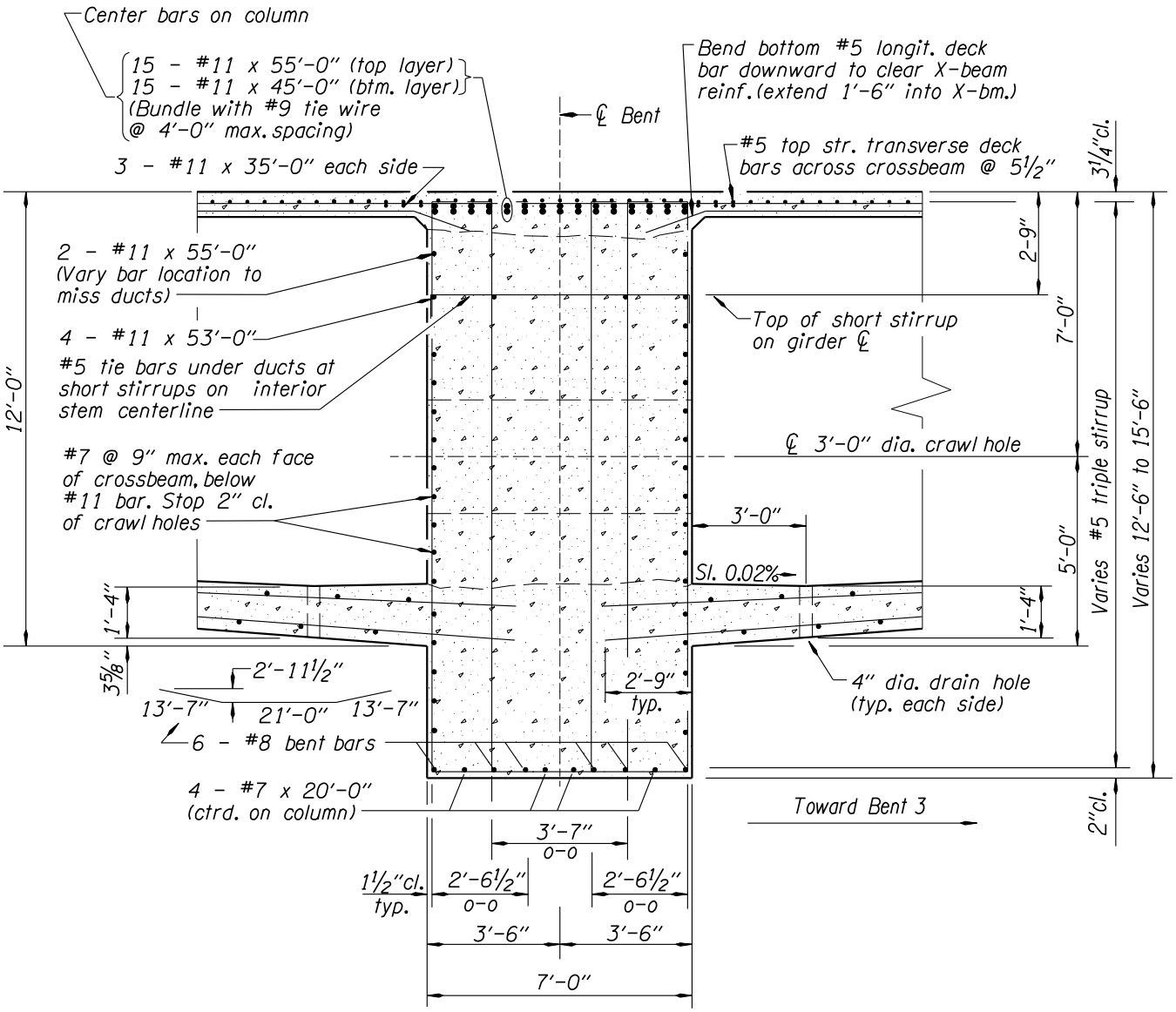


Figure 2.2.4A

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:

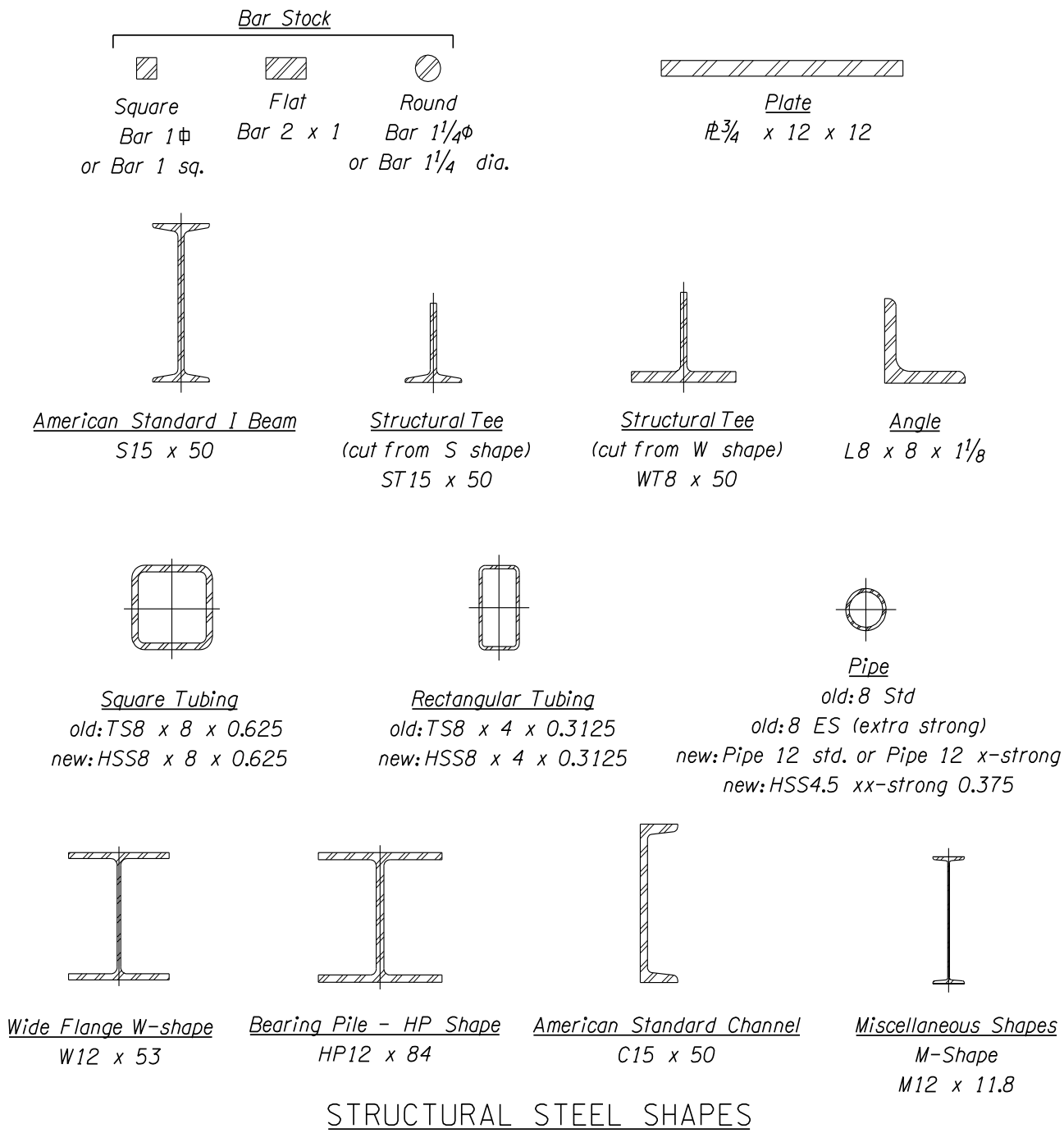


Figure 2.2.5A

2.2.5 Structural Steel – (continued)

Fillet Welds
See example of fillet welds in Figure 2.3.5B.

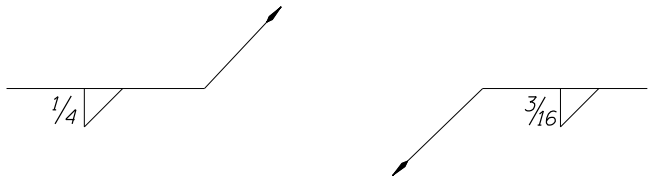


Figure 2.2.5B

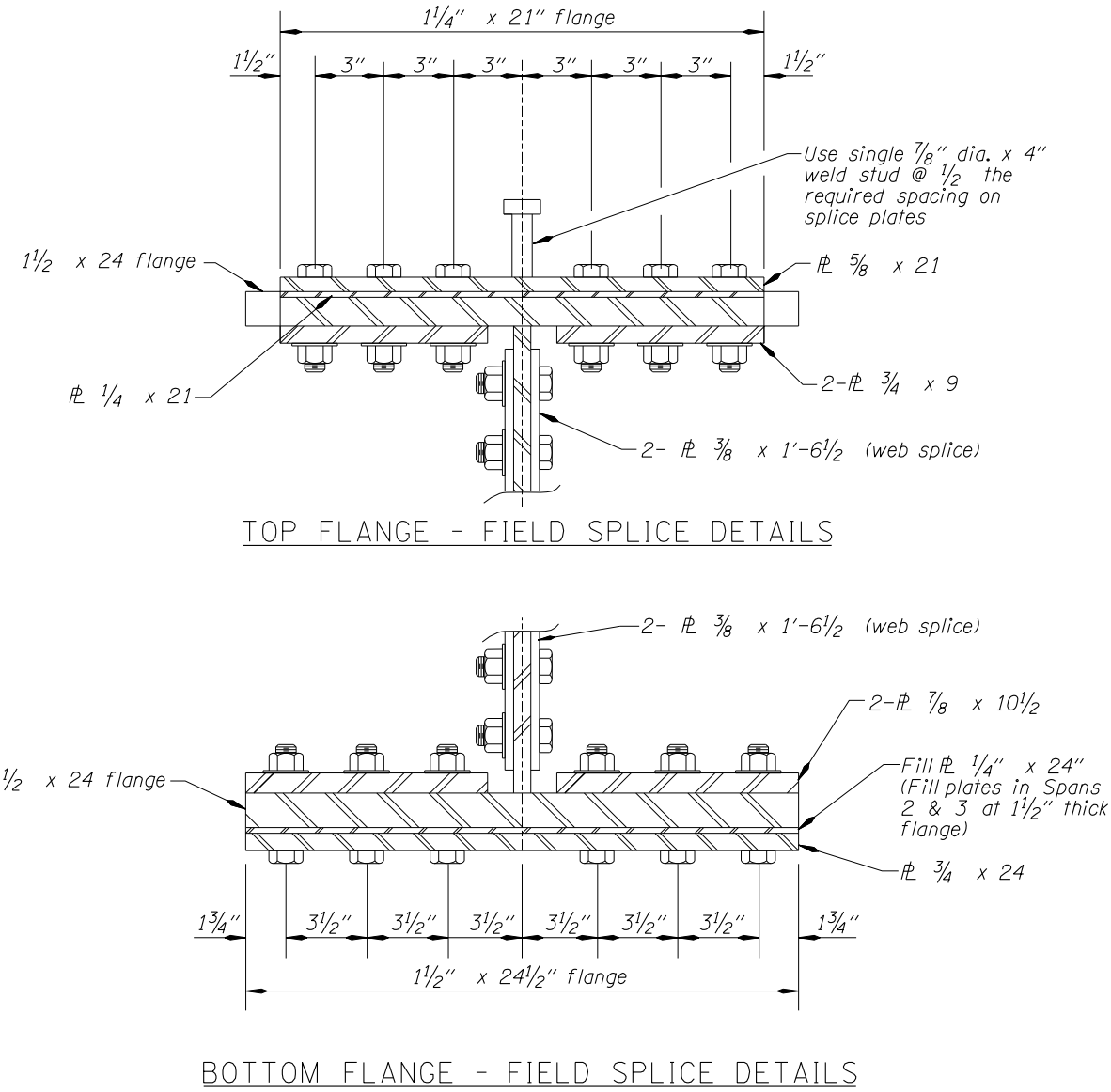


Figure 2.2.5C

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.

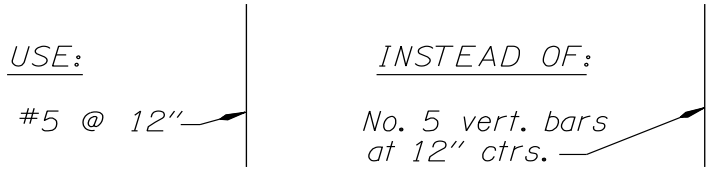


Figure 2.2.6A

2.2.7 Bar Length Labeling

To avoid excessive bar lengths (greater than stock lengths indicated in BDDM 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.

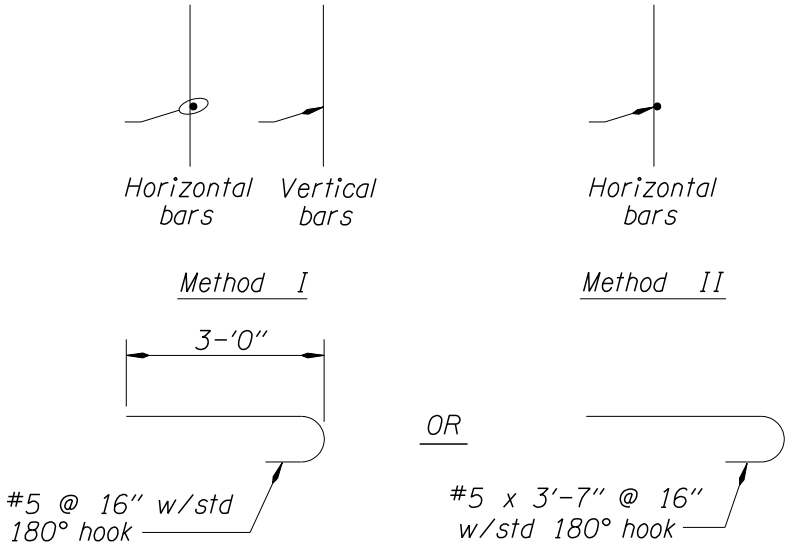


Figure 2.2.7A

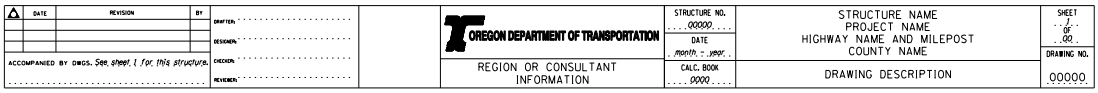
2.3 DRAWING BORDERS

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

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 BDDM 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.

Reminder: Once you have requested drawing numbers don't forget that the Bridge Section requires a minimum of a pdf of the as-constructed plans to add to the Bridge Data System**.**

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

2.4.2 Title Block

Revision Box:
See BDDM 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.
Engineer of record name may be printed and sign their registration seal. It is necessary for their name to be printed on the designer line, since the registration seal will be removed at the as-constructed phase of the project.
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).

2.4.2 Title Block – (continued)

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.

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 BDDM 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 standalone set of plans. **Do not show one set of plans with multiple structure numbers**, even if they are identical.

Structure number not required on non-public pedestrian structures.

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 BDDM 3.10

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 BDDM Appendix A2.3 for example.

2.4.2 Title Block – (continued)

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 BDDM 2.4.1 Request for drawing numbers.

Drawing numbers not required on non-public pedestrian structures.

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.

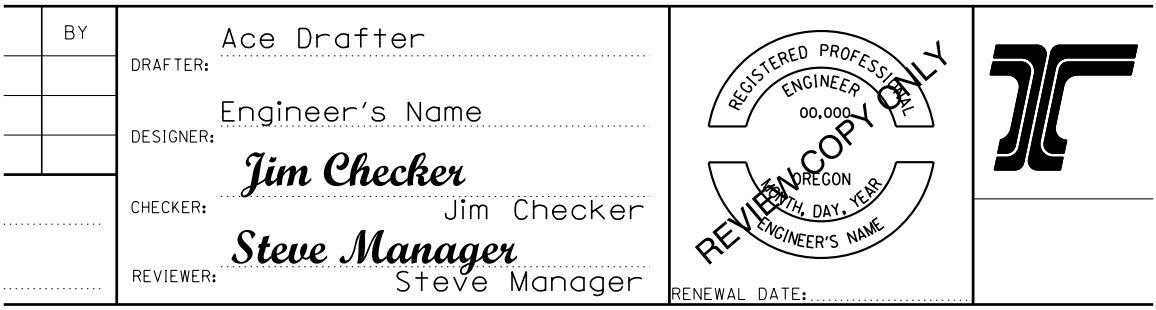
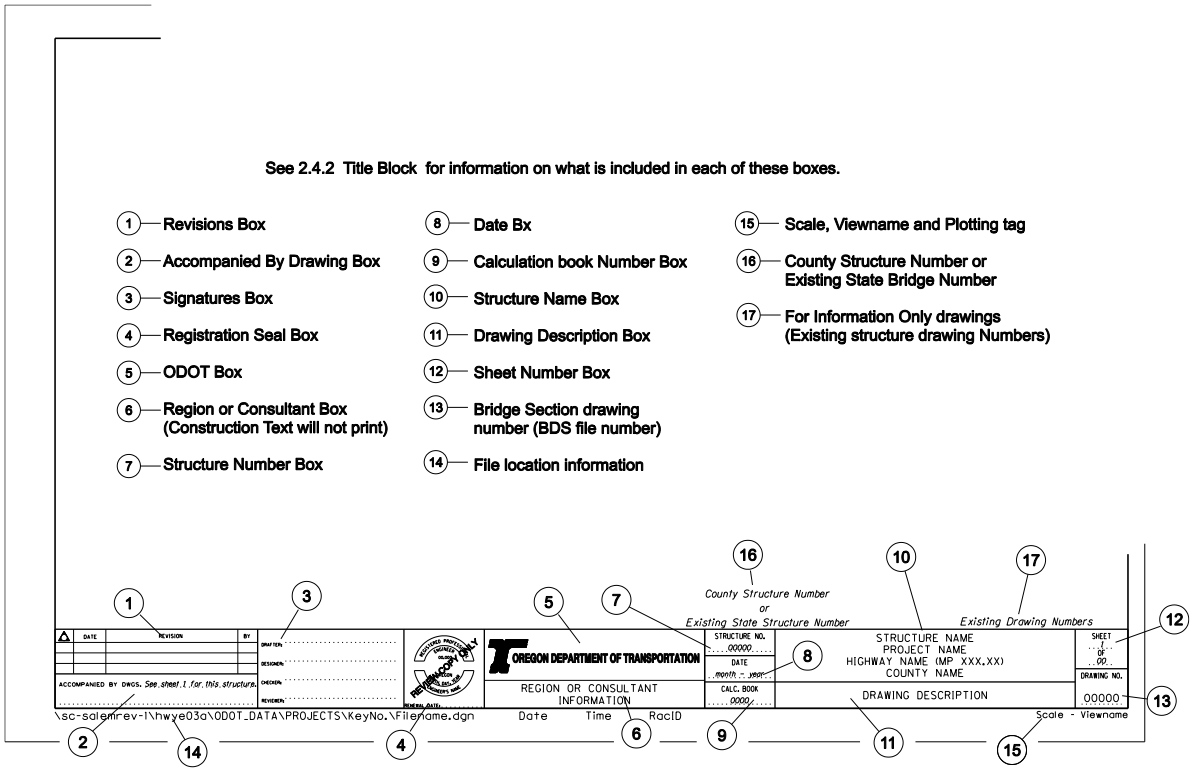


Figure 2.4.2A

2.4.2 Title Block – (continued)

EXAMPLE TITLE BLOCK



BRIDGE TITLE BLOCK

Figure 2.4.2B

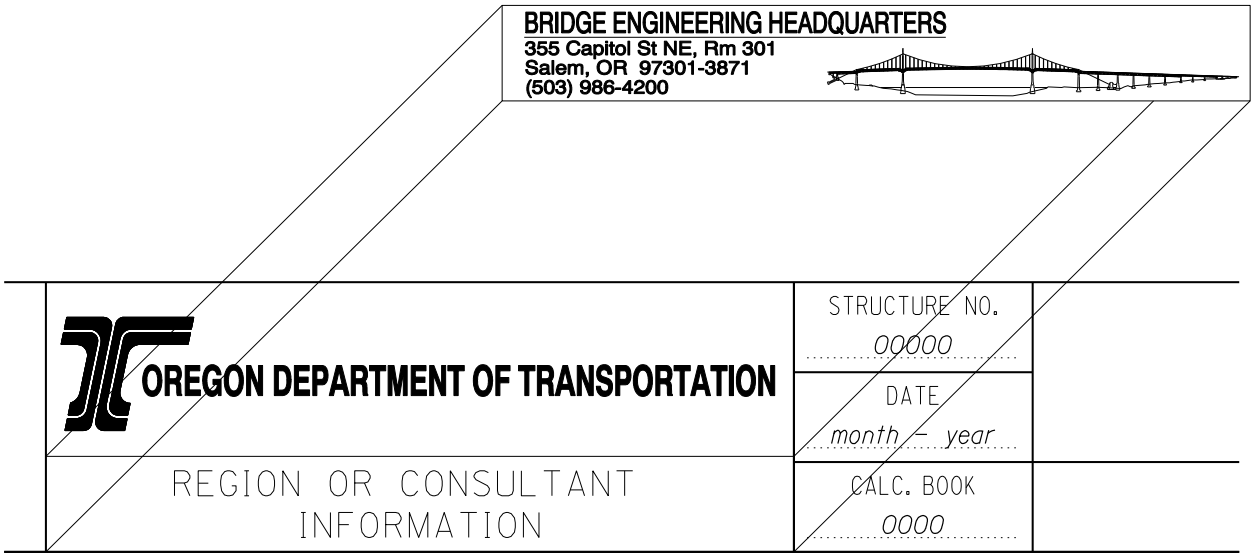


Figure 2.4.2C

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 BDDM 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.

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.

2.6.1 Plan – (continued)

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’ or 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 these 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.

2.6.2 Location Map – (continued)

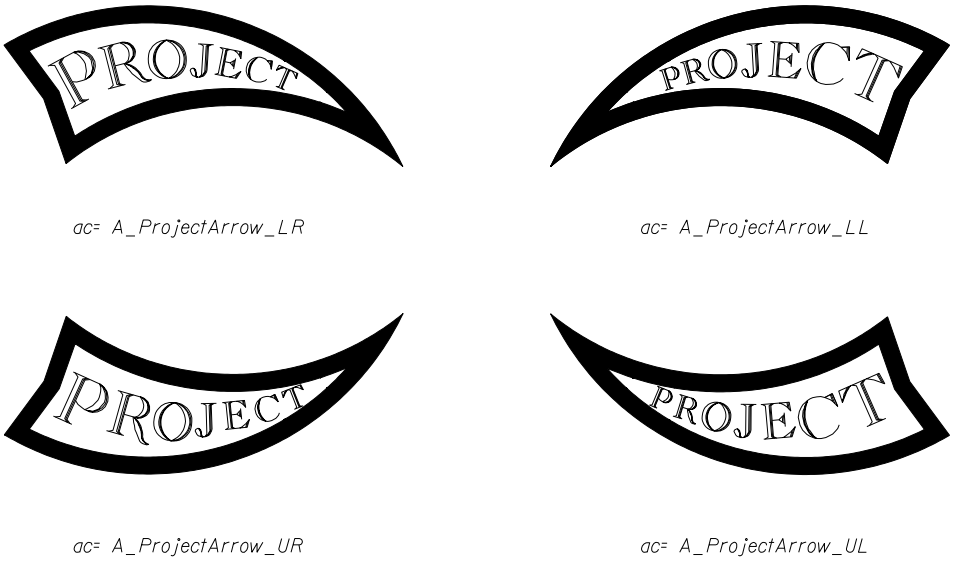


Figure 2.6.2B

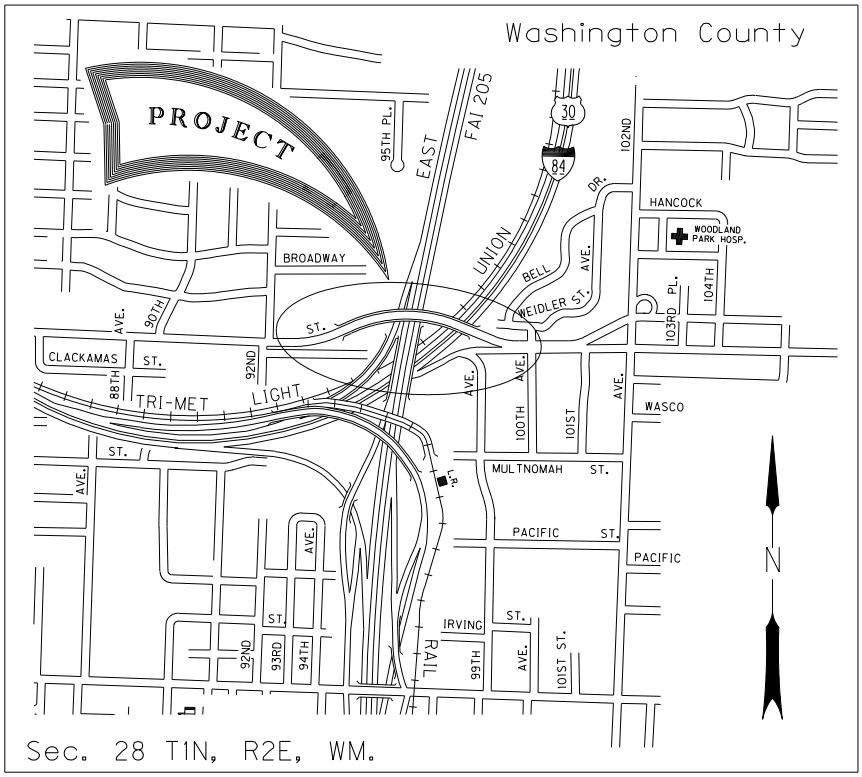


Figure 2.6.2A

2.6.3 Clearance Diagrams

Show vertical clearances at the critical points over railroads, streets, roads and/or highways. Where construction are 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 BDDM 3.14.11.3.

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 BDDM 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 BDDM 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 drawing)
    - 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 require 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 BDDM 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.

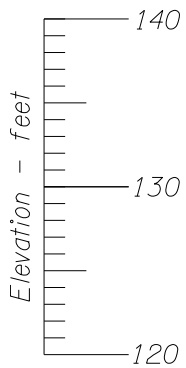


Figure 2.7.3.2A

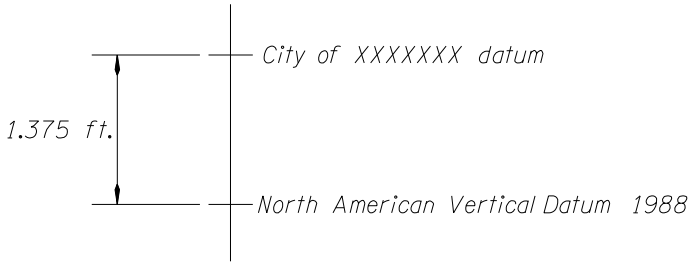


Figure 2.7.3.2B

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			
SCOUR ELEVATION	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 BDDM Appendix 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 super elevation 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**).

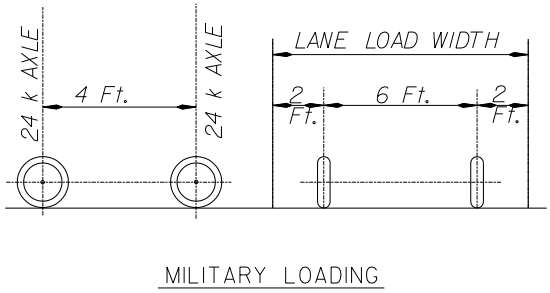


Figure 2.7.3.6A

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 BDDM 3.14.4.2.

If required, show collision posts or crash walls, on the plans and specify in the Special Provisions. Requirements are referred to in BDDM 3.14.4.2.

2.7.3.8 Railroad Clearance Diagram – (continued)

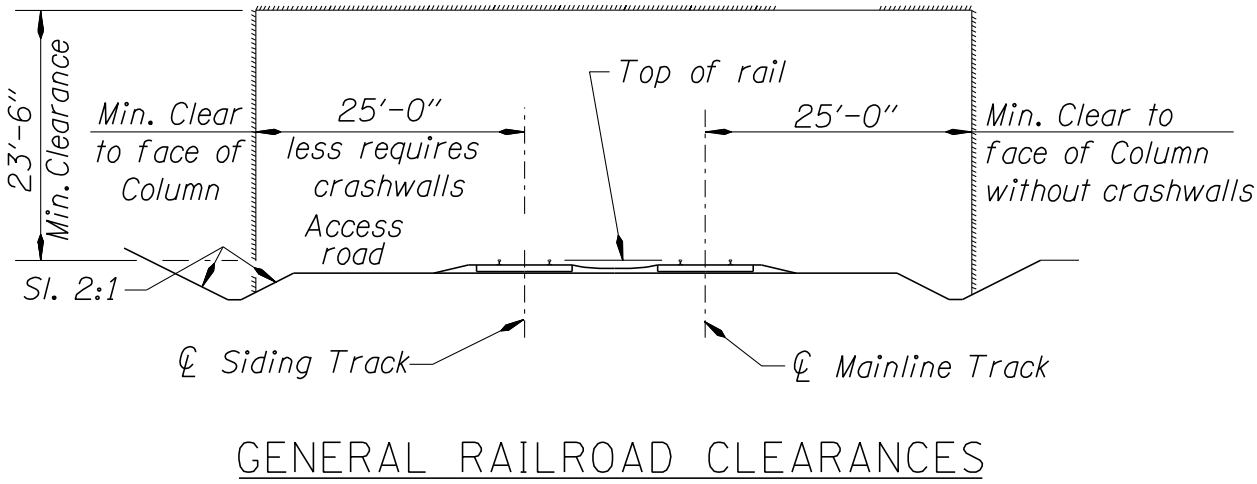


Figure 2.7.3.8A

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 BDDM 3.14.4.2.

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 BDDM 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-Environmental for sub surface drawings.

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

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

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

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.

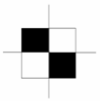
Show and label the alignment to be used for construction of the bridge (usually centerline of roadway), with sufficient stationing for orientation. Orient stationing from left to right wherever possible. All alignments lending reference to the bridge should be shown and labeled. If borings are stationed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

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-sections A – A, B – B, etc. as appropriate for reference to the Elevation View.

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, pressure meter 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.

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'**.

Show a North Arrow.

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)

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.

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

Label this view; ”Foundation Data”.

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.

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.

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

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.

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.

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)

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).

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

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

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

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

The information in the title block should be in the following order:

Bridge Name
Project Name (Section)
Highway and Milepost
County

Provide the Structure Number and date the drawing was completed.

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).

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.

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.

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).

Calculation book number shall have a line drawn through it as shown in Figure 2.7.4.3F.

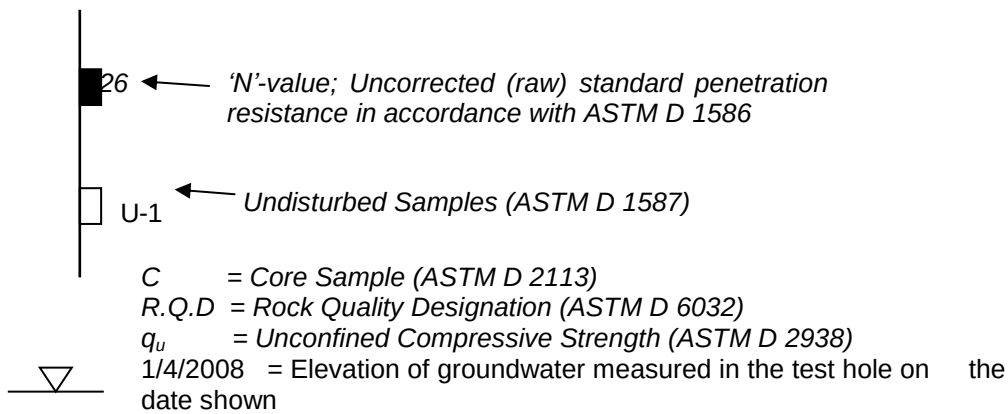
2.7.4.3 Standard Legends, Symbols & Notes

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:

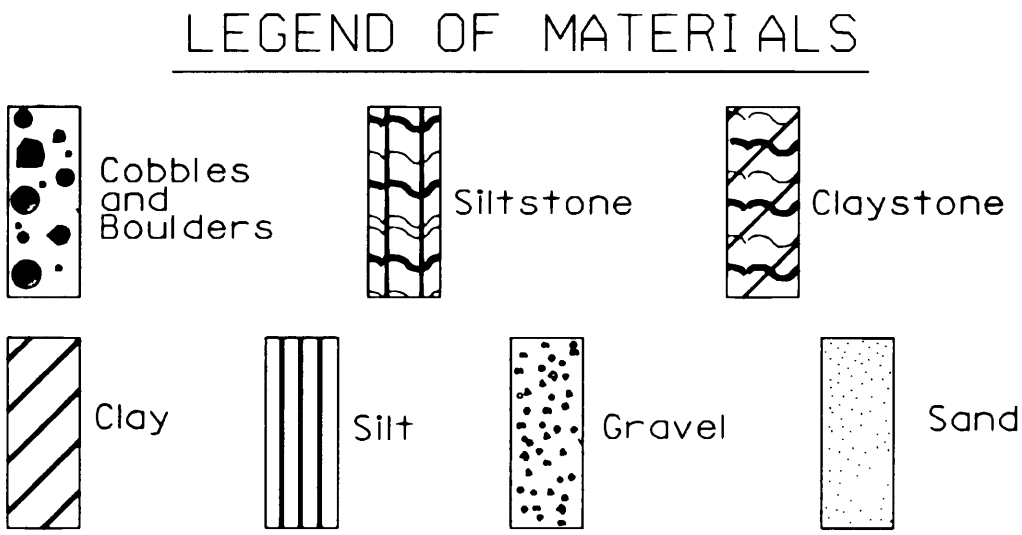
SPT Test Number	Raw Test Data	Reported “N” Value
N-1	3-3-4	7
N-2	1/1.5’	1/18”
N-3	50 for 5”	50/1st 5”
N-4	6-50/2”	50/2”
N-5	1/12”–2	3/18”
N-6	2/6”-1/12”	1

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)

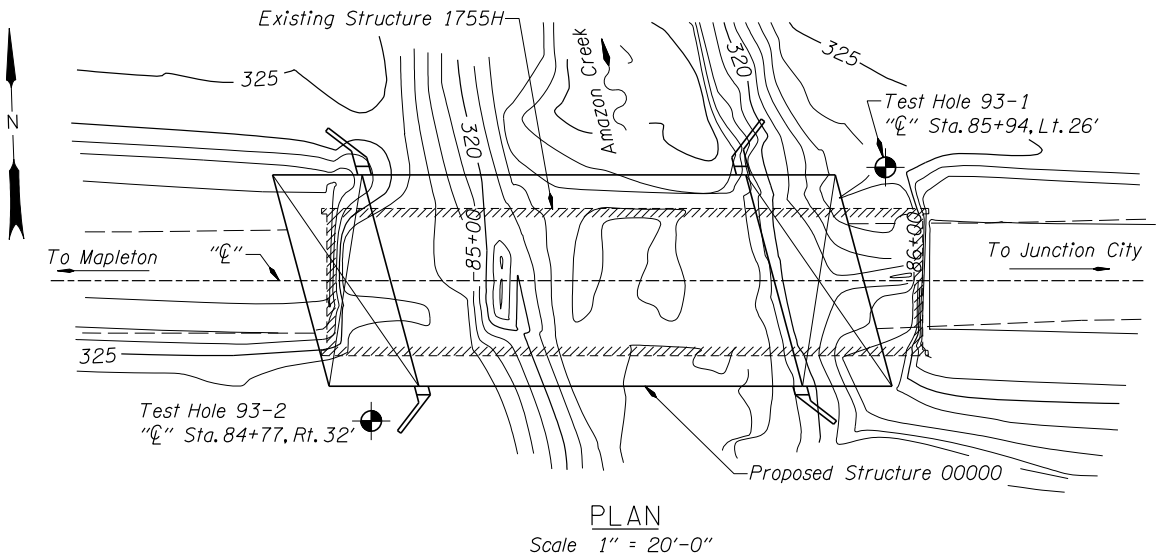
Geotechnical data shown on this drawing are a consolidation of information and/or revision in terminology from the drill logs. The drill logs and any other exploration data used in compiling this drawing are available upon request. Contractor shall refer to Geotechnical Reports and drill logs and the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

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

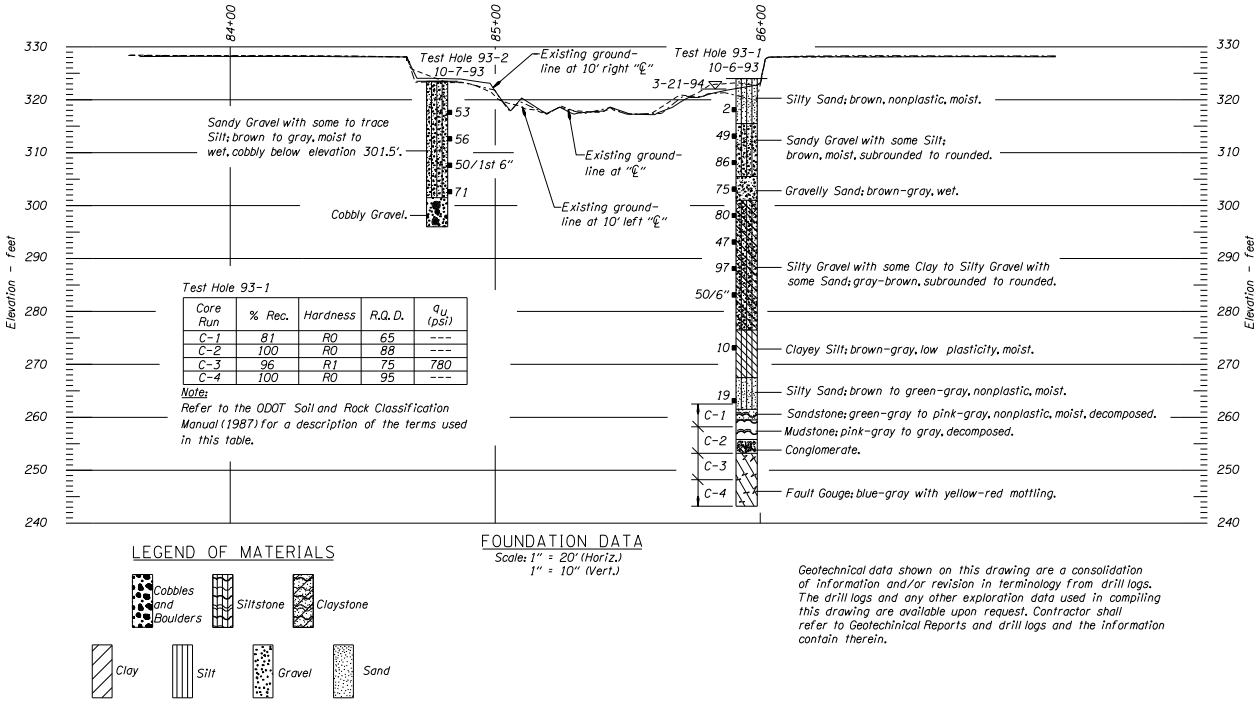
STRUCTURE NO. 00332A	ROGUE RIVER + HWY 271 (ROCK POINT) OR234: ROGUE RIVER BRIDGE (ROCK POINT) REHAB SAMS VALLEY HIGHWAY (MP 0.09) JACKSON COUNTY	SHEET 2 OF 27	
DATE April 2009		DRAWING NO.	
CALC. BOOK -----	FOUNDATION DATA	81038	

TITLE BLOCK EXAMPLE
Figure 2.7.4.3F

2.7.4.4 Foundation Data Sheet Example Sections

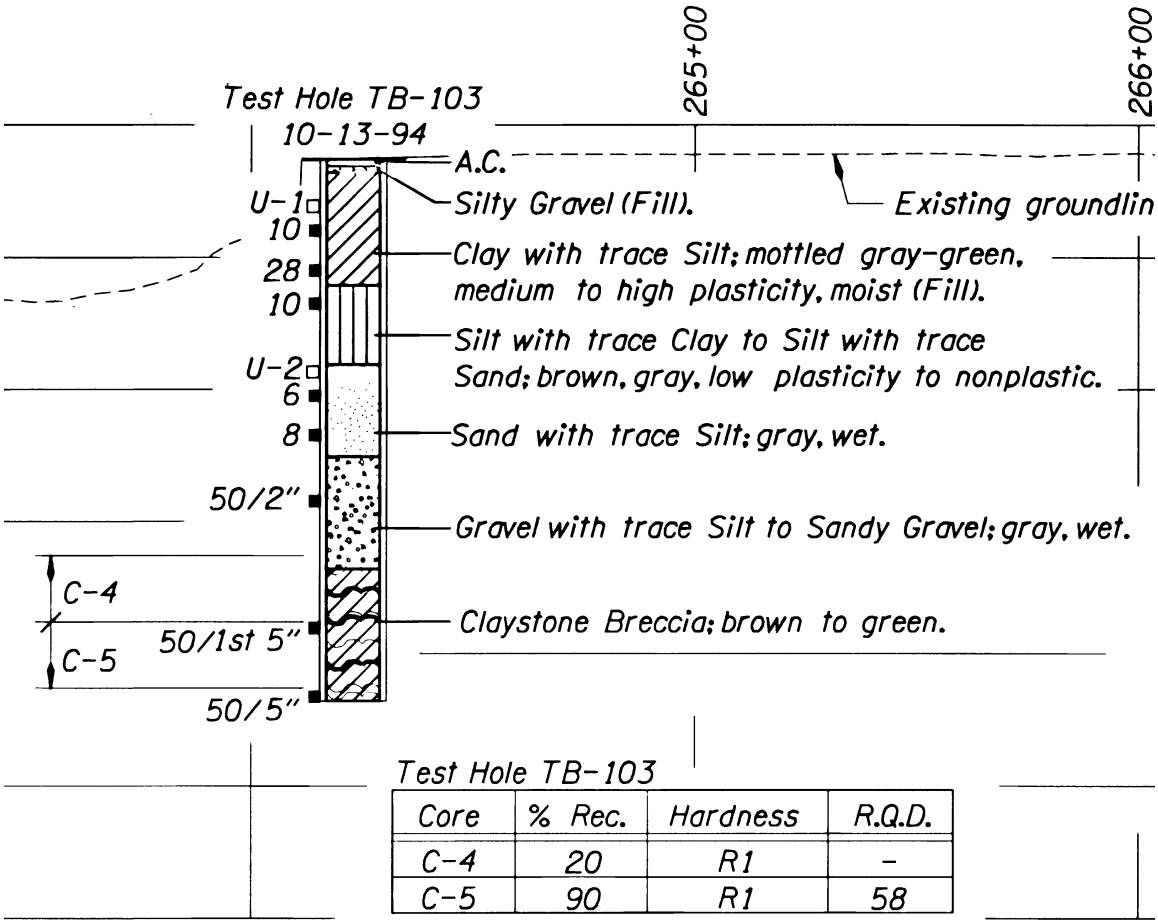


EXAMPLE OF TYPICAL "PLAN" VIEW LAYOUT
Figure 2.7.4.3G



EXAMPLE OF TYPICAL
"ELEVATION VIEW (FOUNDATION DATA)" VIEW LAYOUT
Figure 2.7.4.3H

2.7.4.4 Foundation Data Sheet Example Sections – (continued)



Test Hole TB-103

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.

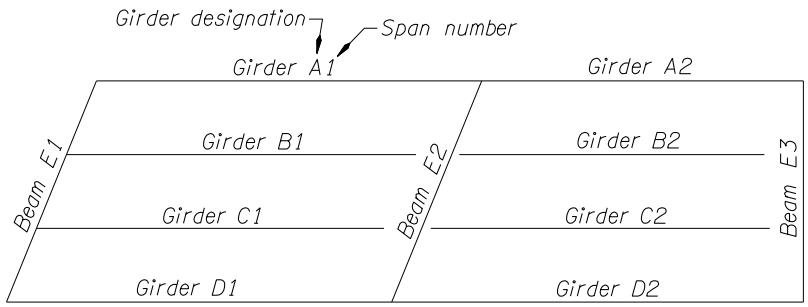


Figure 2.7.5A

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 BDDM Appendix 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_3Pts

- 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, crossbeams 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
- Location of Bridge ID Marker

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 crossbeam details.

2.7.7.2 Superstructure Sections

A "Typical Deck Section" is a transverse cross-section of the superstructure showing the deck, girders, curbs and railing 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 and clearances.

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 Crossbeam 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 crossbeams 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, 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 crossbeams 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 drawings. 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 BDDM 2.8.3 for more on BDS**.**

2.7.11 Revisions to Drawings

Note any Revisions to drawings under the following conditions:

- Final drawings which have been sent to prospective bidders (generally, any time after the Engineer of Record has signed them).
- Final drawings which are part of an active construction project (i.e., a construction project that is under contract)
- "As Constructed" prints that are returned at the completion of a project.

For final drawings, line out notes and details that require revision (never delete these notes or details), and write in the notes and details that are required (See Figure 2.7.11.1D). Where revisions are such that they cannot be made feasibly by lining out, include the revision note ("redrawn") next to the description of the change.

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.

For as-constructed drawings see BDDM 2.7.11.1.

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

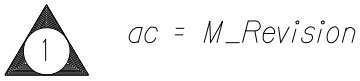


Figure 2.7.11A

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

	DATE	REVISION	BY
1	8-21-79	Change note	RNM
2	10-11-79	Added detail	TWL
3	10-19-81	As Constructed	RNM

Figure 2.7.11B

2.7.11.1 As-Constructed Drawings

General Information
All changes will be reviewed and have the Engineer of Record initials. See Figure 2.7.11.1A.

All as-constructed revisions on one sheet should have the same revision number, consecutive with previous revisions on that sheet (See Figure 2.7.11.1A). If there are no as-constructed revisions, add the date and "As Constructed" with no triangle or revision number (See Figure 2.7.11.1B).

△	DATE	REVISION	BY
1	8-21-79	Change note	RNM
2	10-11-79	Added detail	RNM
3	10-19-81	As Constructed	RNM

Figure 2.7.11.1A

△	DATE	REVISION	BY
	8-21-79	As Constructed	RNM

Figure 2.7.11.1B

Show the name of the Project Manager on the Plan and Elevation sheet (See Figure 2.7.11.1C).

Project Manager - Joe Overworked

STRUCTURE NO. 00000	YOUNGS BAY, HWY 9 (NEW YOUNGS BAY) US101: YOUNGS BAY BRIDGE SECTION OREGON COAST HIGHWAY (MP 4.91) CLATSOP COUNTY	SHEET 1 OF 10
DATE July 2010		DRAWING NO.
CALC. BOOK 0000	PLAN AND ELEVATION	00000

Figure 2.7.11.1C

Project Managers office will send as-constructed mark-ups to the design office where the design was created within six months after second notice (Second Notification is the actual date on which the Agency determines that all On-Site Work, including Change Order Work and Extra Work, has been satisfactorily completed).

Send completed as-constructed comments from original design office using either Option 1 or 2 within six months after receiving mark-ups from the Project Manager to Headquarters in Salem. See what is required in the last section “At completion of As-Constructed Process” for more details.

Never delete, always cross out notes and details that were not used. (See Figure 2.7.11.1D)

Bridge Inspectors are required to complete the first structure inspection within 90 days after second notice.

MicroStation files & original design mylars will reside in design office until completion of as-constructed comments.

Option 1 (Recommended)
Design office adds as-constructed comments to the original CAD file. Include a revision mark shown next to the change. Place all as-constructed comments on levels “E_ODOT_AsConstruct_General” and “E_ODOT_AsConstruct”_Tx”. Symbology for as-constructed lines will be the same as original line work for a given element, except that the color will be CO=31 (RGB: 54, 255, 255)

2.7.11.1 As-Constructed Drawings – (continued)

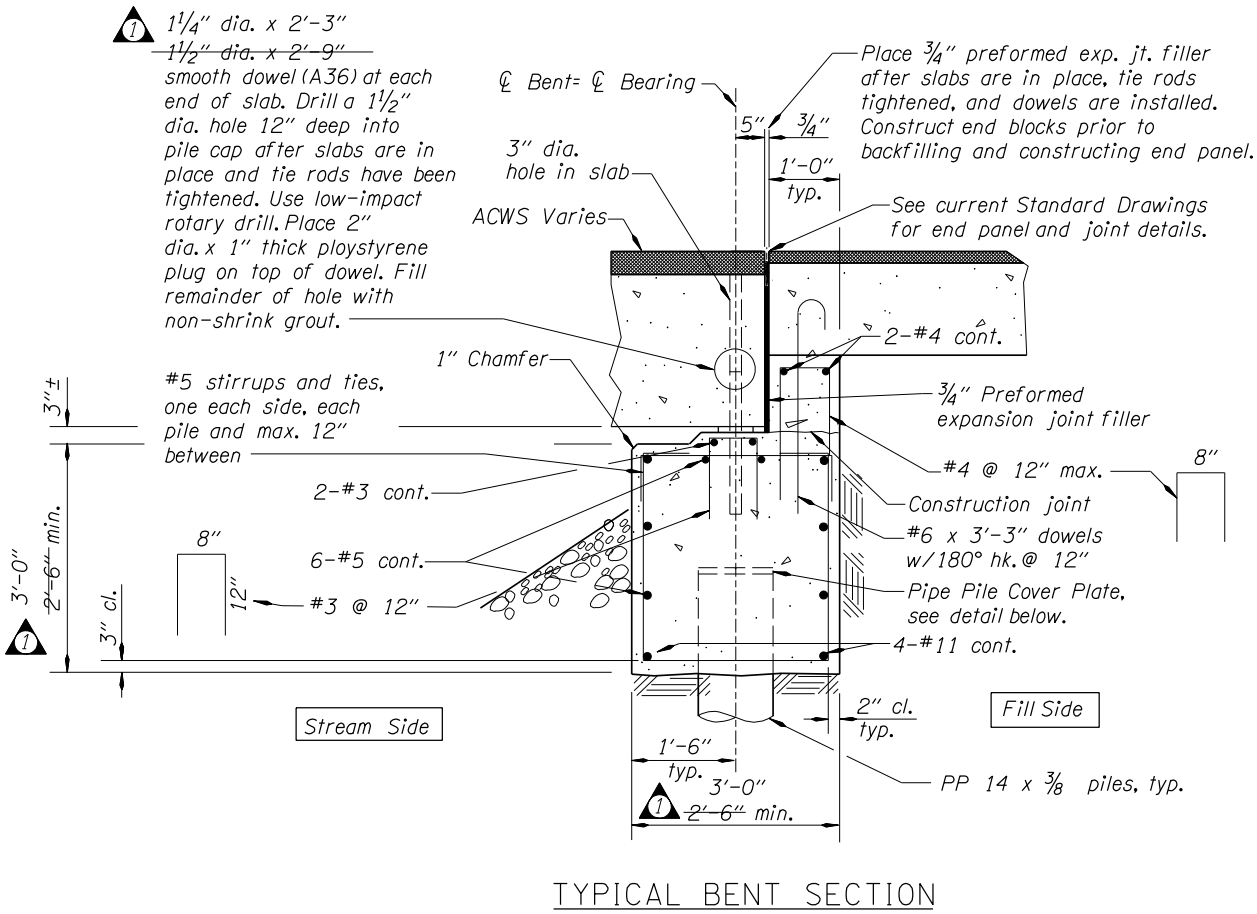
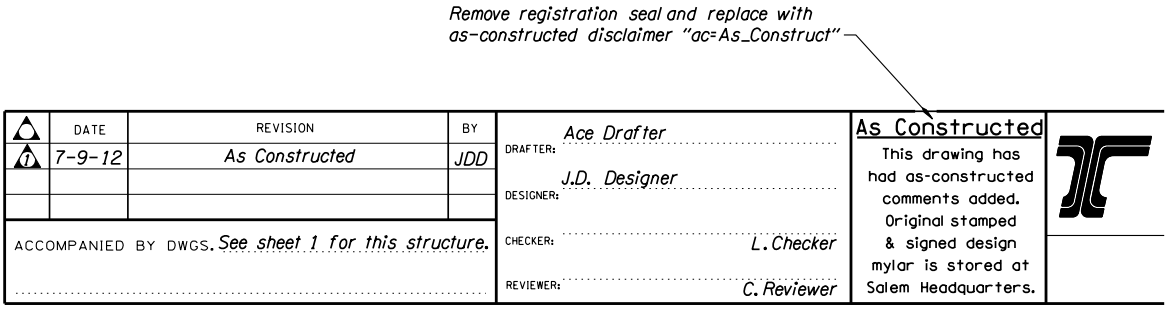


Figure 2.7.11.1D

Remove the Engineering Registration seal and add the cell “AC=T_AsConstruct” in its place, see Figure 2.7.11E



2.7.11.1E

At completion of adding as-constructed comments to the MicroStation files, create a PDF of the drawing. Once you have the PDF, then create a tiff file from this. For those with access to BDS, replace the design image in BDS with the new as-constructed image. For those without access, send the PDF file to the Region Bridge office where the project was located and the senior bridge drafter will add the as-constructed images to BDS.

2.7.11.1 As-Constructed Drawings – (continued)

Create files for BDS in 400 dpi Tiff Group 4 compressed.

Option 1 (Recommended) – continued

Use drawing number as file name. Example “drawing number filename.tif “
Note: BDS will only allow one “f” in the tif extension used for BDS.

Once V8i is upgraded on all the workstations, then you will be able to create a tiff file straight from MicroStation by using a new print driver called “BDS_tiff_400dpi_G4.pltcfg”.

Once as-constructed comments are complete, then Region office will send original signed design mylars to Headquarters in Salem. Also, Region Bridge office will upload a new tiff file into Bridge Data System (BDS). Microstation files will be archived in the Engineering archives by the Region office.

Tiff file sizes should be under or around 1mb.

<u>Option 2</u>
“As-Constructed” revisions are made by hand to the original signed mylar and not made to the electronic cad files.

Once as-constructed comments are added to mylar, then a new scanned image is created.

Create files for BDS in 400 dpi Tiff Group 4 compressed.

Use drawing number as file name. Example “drawing number filename.tif “
Note: BDS will only allow one “f” in the tif extension used for BDS.

For those with access to BDS, replace the design image in BDS with the new as-constructed image. For those without access, send the PDF file to the Region Bridge office where the project was located and the senior bridge drafter will add the as-constructed images to BDS.

<u>At Completion of As-Constructed Process</u>
Once BDS has been updated, send an email to Region Bridge inspector stating that the files have been updated for given structure.

Bridge Section Headquarters in Salem is where stamped and signed design mylars will be kept once as-constructed comments have been added.

Tiff files of the as-constructed drawings will be stored in Bridge Data System for easy access.

MicroStation design files with MicroStation as-constructed comments will be archived by Region office and sent to the ODOT Engineering Archives.

Consultants send MicroStation files, mylars and tiff images to Region office they are working for.

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 22" x 34") - 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 Print Organizer

See Microstation V8i Users Guide for all questions about Print Organizer.

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 BDDM 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.2.8.3 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 BDDM 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

A2.1.3 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

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
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
VMS Bridge	ITS & Bridge	Yes	ITS	Yes	11x17
Monotube Sign Cantilever	Traffic & Bridge	Yes	Traffic	Yes	11x17
Monotube VMS Cantilever	ITS & Bridge	Yes	ITS	Yes	11x17
Sign Butterfly	Traffic & Bridge	Yes	Traffic	Yes	11x17
VMS Butterfly	ITS & Bridge	Yes	ITS	Yes	11x17
High Mast	Traffic & Bridge	Yes	Traffic	Yes	11x17
Camera Pole	ITS & Bridge	Yes	ITS	Yes	11x17
Structures Mounted to a Bridge: [1]					
Camera, signs, Illumination, 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[13]	22x34
Highway Retaining Wall	Geo/Hydro & Bridge	Yes	Geo/Hydro	Yes[13]	11x17
Minor Retaining Wall	Roadway	------	Roadway	------[13]	11x17
Sound Walls[10]	Geo/Hydro & Bridge	Yes	Geo/Hydro	Yes	11x17
Material Source	Geo/Hydro	------	Roadway	------	11x17
Landslide Correction [11]	Geo/Hydro	------	Roadway	------	11x17

A2.1.3.1 Contract Plans Sheet Development Guide – (continued)

Earthwork [12]	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 practice.
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. The terms "Sound Wall" and "Noise Barrier" are interchangeable.
11. This includes buttresses and horizontal drains and any associated ground improvements.
12. This includes cut slopes, embankments, fill foundations, rockslopes and any associated ground improvements.
13. 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.

A2.2.1 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.

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.

Abbreviations – (continued)

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, millimeter	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

A2.2.2 LINEWORK AND LEVELS

Existing Levels

Level Name	Level Description	Color	Linestyle	Weight
E_BR_ALL_Patterns	All patterns used on bridge drawings	0	1	0
E_BR_SUB_General	Bridge substructure features	0	2	0
E_BR_SUB_Footing	Footings	1	2	0
E_BR_SUB_Tx	Bridge substructure text	4	0	2
E_BR_SUPER_General	Bridge superstructure features	1	2	0
E_BR_SUPER_Beams	Girders or beams	1	2	0
E_BR_SUPER_Tx	Bridge superstructure text	4	0	2
E_ODOT_ASCONSTRUCT_GENERAL	As-constructed lines	**	**	**
E_ODOT_ASCONSTRUCT_Tx	As-constructed text	**	**	**
	**Match symbolgy of what your recreating, only thing that changes is level			

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

A2.2.2 LINEWORK AND LEVELS – (continued)

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
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_WingWall	Wingwall object lines	6	0	3
P_BR_SUB_WingWallHidden	Wingwall hidden lines	6	3	1
P_BR_SUB_WingWallCL	Wingwall center lines	6	7	0
P_BR_SUB_WingWallTx	Wingwall text	22	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	19	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

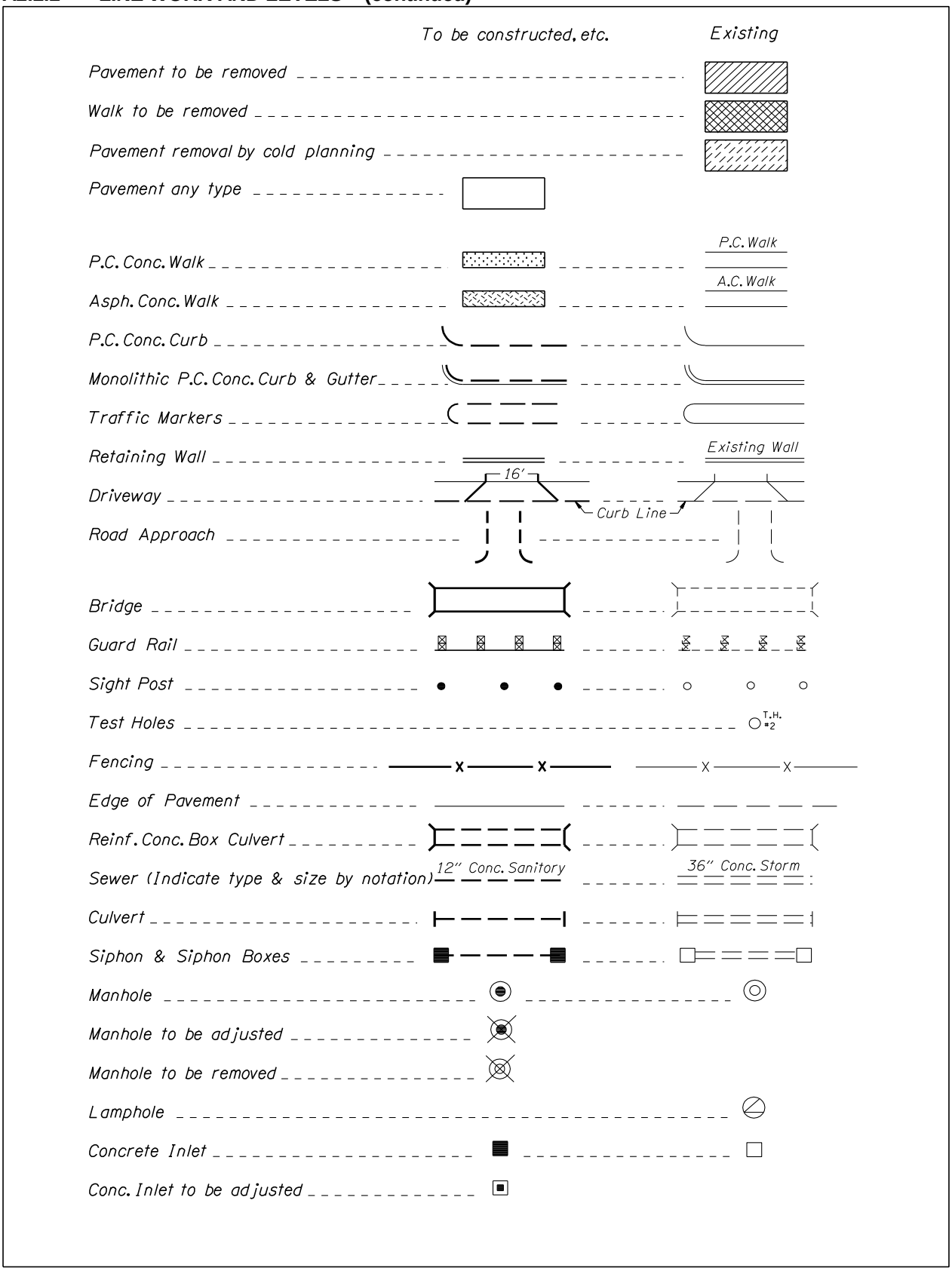
Level Name	Level Description	Color	Linestyle	Weight
P_BR_SUB_General	General Substructure	0-253	0-7	0-3
P_BR_SUPER_General	General Superstructure	0-253	0-7	0-3

A2.2.2 LINE WORK AND LEVELS – (continued)

MATERIALS PATTERNS

Linear Pattern Name	Material	Area Pattern Name
P_L_Ground	Earth	———
P_L_Rock	Rock	———
P_L_Sand	Sand	P_A_Sand
P_L_Gravel	Gravel	P_A_Gravel
———	Concrete	P_A_Concrete
———	Masonry	P_A_Hatch
———	Structural Steel	P_A_Steel
———	Bronze, Brass or Copper	P_A_Bronze
———	Aluminum	P_A_Aluminum
———	Water	P_A_Water
———	Joint Filler	Opaque Fill
———	Elastomeric concrete nosing	———
———	Structural Concrete Overlays Silica Fume Concrete (SFC) Latex Modified Concrete (LMC)	P_A_Sand
———	Non-Structural Overlays Polyester Polymer Concrete (PPC) Thin Polymer Concrete (TPC) Polyester Methyl Methacrylate High molecular weight Methacrylate Epoxy Urethane	P_A_Hatch aa=90°
———	Asphalt concrete wearing surface	P_A_Xhatch aa=45°

A2.2.2 LINE WORK AND LEVELS – (continued)



A2.2.2 LINE WORK AND LEVELS – (continued)

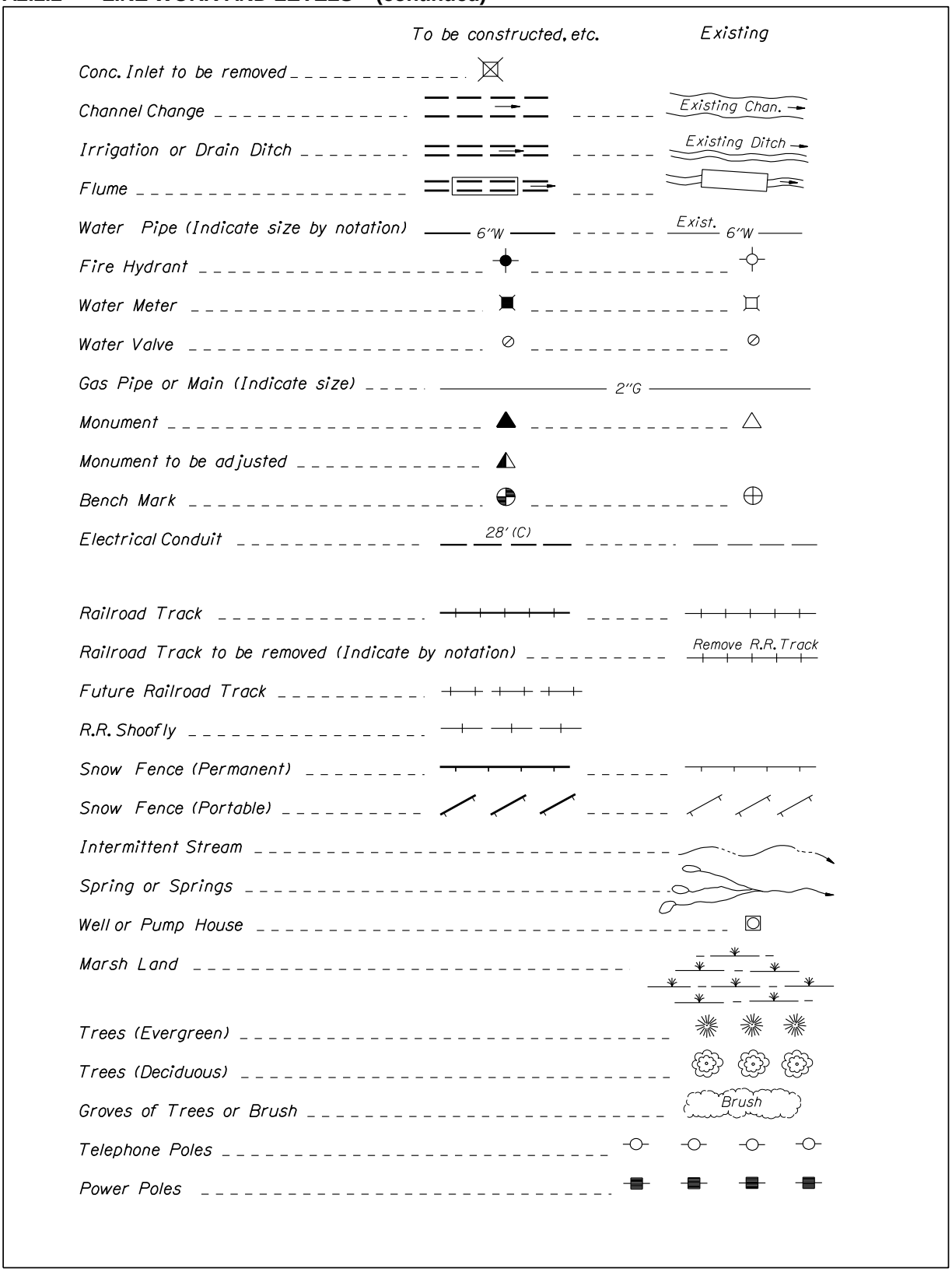


Figure A2.2.2C

A2.2.2 LINE WORK AND LEVELS – (continued)

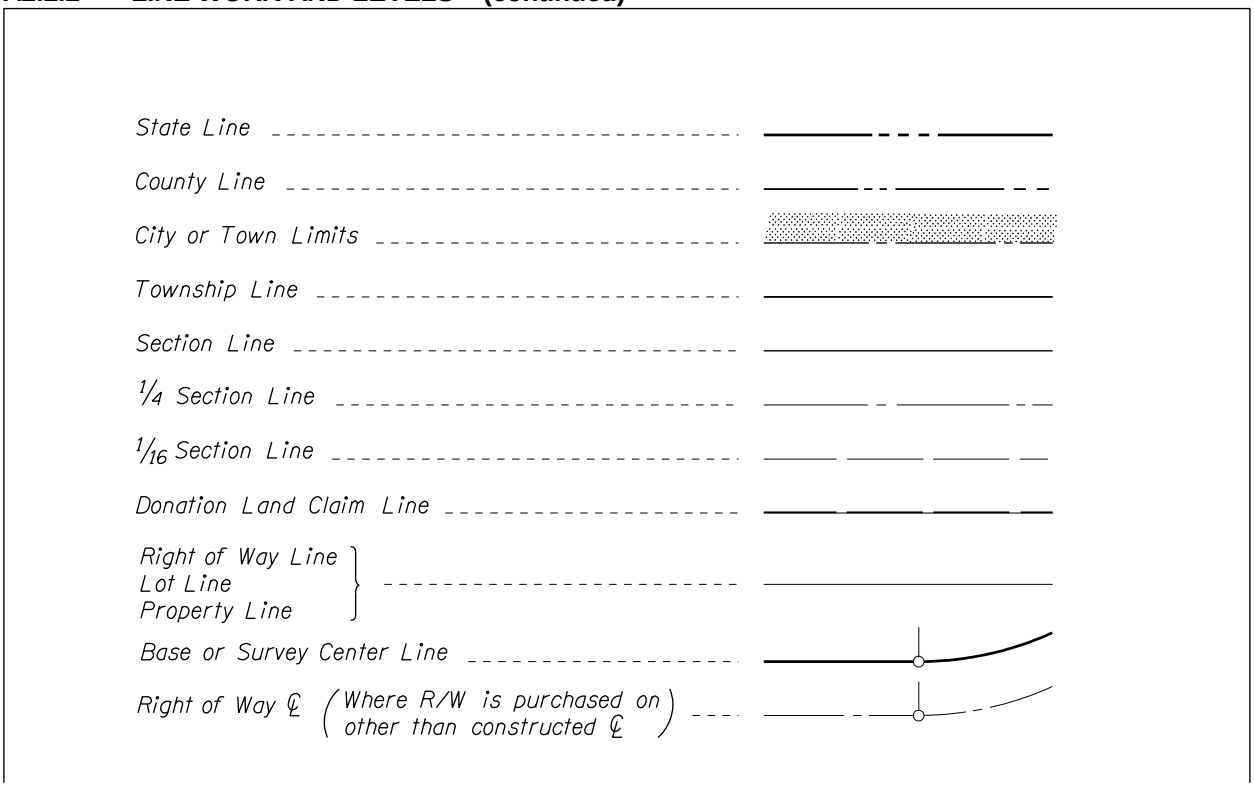


Figure A2.2.2D

A2.3 DRAWING BORDER

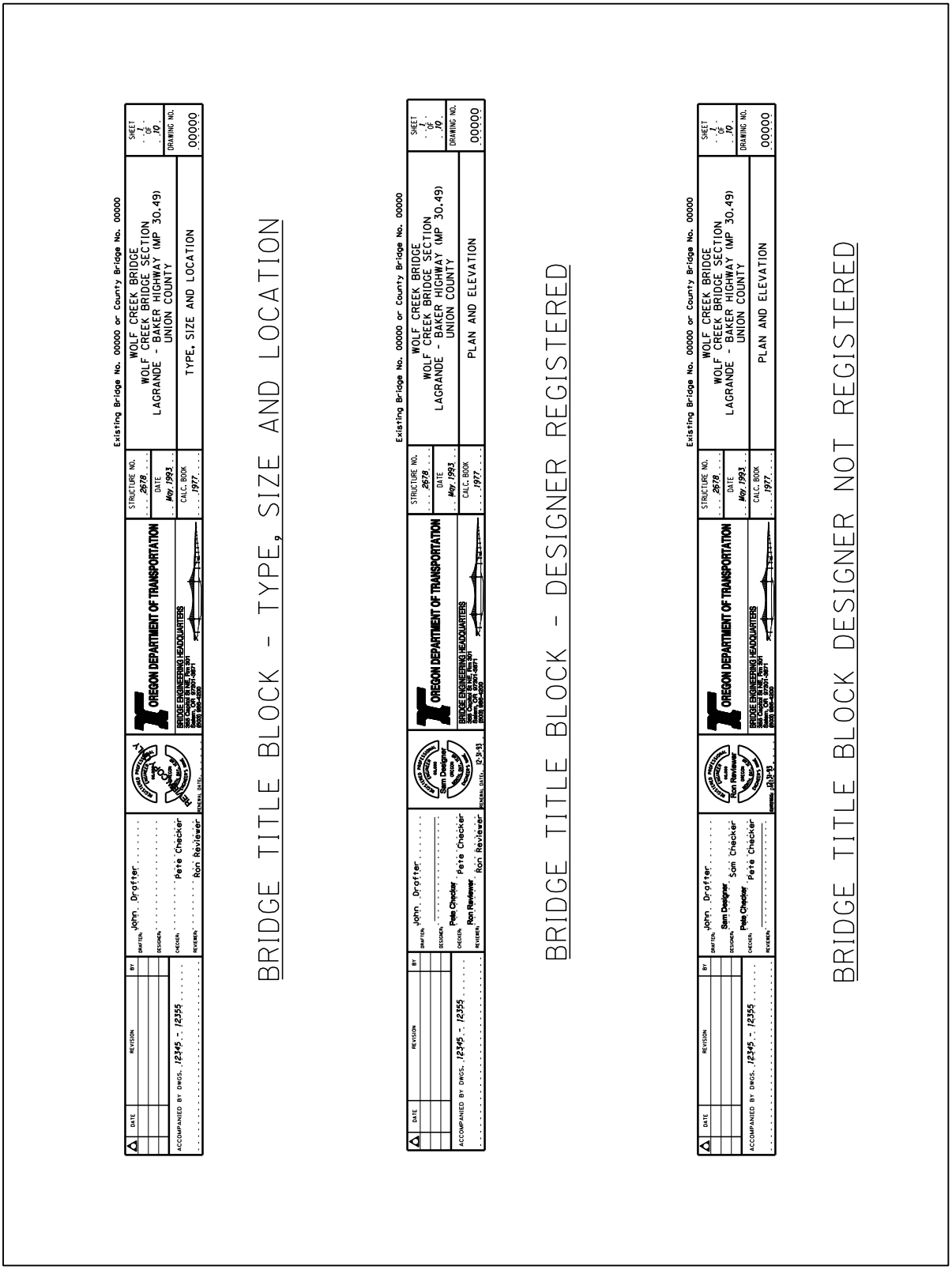


Figure A2.4A

A2.6 BRIDGE DRAFTER QC CHECKLIST FOR TSL PLAN & ELEVATION SHEET

Project Name:			
Key#:			
Region:			
Drafter Name:			
	Yes	No	n/a
PLAN & ELEVATION DRAWING(S)			
• Alignment Data	☐	☐	☐
• Roadway Width	☐	☐	☐
• Intersection Stations & Angles	☐	☐	☐
• Span Lengths & Numbers	☐	☐	☐
• Angles between Bents & Centerlines	☐	☐	☐
• 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, OHW, & Scour Elevations	☐	☐	☐
• Proposed Ground Lines	☐	☐	☐
• End Slope & Protection	☐	☐	☐
• Hydraulic Data	☐	☐	☐
• Grade Lines	☐	☐	☐
• Typical Bent Section	☐	☐	☐
• Roadway Clearances	☐	☐	☐
• Railroad Final & Construction Clearances	☐	☐	☐
• Guardrail Transitions	☐	☐	☐
• Footing Elevations & Pile Types	☐	☐	☐
• Title Block w/ MP location, & Bridge Number	☐	☐	☐
Signatures			
Drafter:			
Bridge Reviewer:			

A2.6 BRIDGE DRAFTER QC CHECKLIST FOR ADVANCE PLANS (95%) PLAN SHEETS

Project Name:	
Key#:	
Region:	
Drafter Name:	

	Yes	No	n/a
PLAN & ELEVATION DRAWING(S)			
• Footing Plan shown	☐	☐	☐
• Alignment & Bearing shown	☐	☐	☐
• Skew Angles shown	☐	☐	☐
• Bent Fixity (free, exp, hinge, etc.) shown	☐	☐	☐
• Slope Paving shown	☐	☐	☐
• Footing Elevations	☐	☐	☐
• Pile Bearing or min. Tip Elevation shown	☐	☐	☐
• Drainage provided	☐	☐	☐
• Military Loading noted and shown	☐	☐	☐
• Stationing shown	☐	☐	☐
• Railroad Clearances shown	☐	☐	☐
• Navigation Clearances shown	☐	☐	☐
• Highway Clearances shown	☐	☐	☐
• Minimum Construction Clearances shown	☐	☐	☐
• Bridge Rail Ends shown	☐	☐	☐
• Location Map shown	☐	☐	☐
• Detour shown	☐	☐	☐
• Existing Structure shown	☐	☐	☐
• Utilities shown & located	☐	☐	☐
• Grade Line Diagrams shown	☐	☐	☐
• Elevation Datum shown	☐	☐	☐
• General Notes complete	☐	☐	☐
• Accompanying Drawings shown correctly	☐	☐	☐
• North Arrow shown	☐	☐	☐
• Hydraulic Data, High Water, & Scour Elevations shown	☐	☐	☐
• Bridge ID Paddles located	☐	☐	☐
SUPERSTRUCTURE DETAILS			
• Deck Elevation shown	☐	☐	☐
• Bearing Devices shown & detailed	☐	☐	☐
• # of Bearing Devices given	☐	☐	☐
• Expansion Allowances shown	☐	☐	☐
• Camber Diagram shown	☐	☐	☐
• Joints shown & detailed	☐	☐	☐
• Stage Construction detailed	☐	☐	☐
• Pour Schedule shown	☐	☐	☐
• Concrete Finish sketch shown	☐	☐	☐
• Skew Deck / Bot. Slab Transverse Bar Orientation shown or noted	☐	☐	☐

A2.6 Bridge Drafter QC Checklist for Advance Plans (95%) Plan Sheets – (continued)

BEAM DETAILS			
• Beams located & dimensioned	☐	☐	☐
• Beam Cross-sections shown	☐	☐	☐
• Prestressed Beam Details shown	☐	☐	☐
• Interim Bars shown @ top of stem	☐	☐	☐
• Bar Extensions adequate	☐	☐	☐
• End Anchorages of Longitudinal Bars sufficient	☐	☐	☐
• Post-Tensioning Details/Data included	☐	☐	☐
BENT DETAILS			
• Column Steel properly dimensioned w/ splices	☐	☐	☐
• Negative Moment at X-Beam Reinforcement	☐	☐	☐
• Footing Elevations shown	☐	☐	☐
• Skew Angles shown	☐	☐	☐
• Utility Holes shown & noted	☐	☐	☐
• Hinges shown & detailed	☐	☐	☐
• Seismic Restraints shown & noted	☐	☐	☐
• Guardrail Connection at End Bents	☐	☐	☐
• Concrete Finish shown	☐	☐	☐

Signatures	
Drafter:	
Bridge Reviewer:	

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 utility 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. 10305 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 — Bridge ID Marker

82 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 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 seismic design of the bridge]:

[New Seismic Designs ----- Multi-Span Bridges]:
Seismic design is performed by the multi-mode (single-mode) analysis in accordance with the “AASHTO Guide Specifications for LRFD Seismic Bridge Design” (“AASHTO LRFD Bridge Design Specifications") as modified by the “ODOT Bridge Design & Drafting Manual”. The 2002 USGS Seismic Hazard Maps (Site-Specific Ground Motion Response Analysis) have been used to collect the Seismic Hazard Values for the bridge site with Latitude 00.0000N and Longitude 000.0000W:

Seismic Performance Criteria	Earthquake Return Period (yrs.)	Mapped Hazard Values			Site Class	Design Hazard Values			Seismic Design Category
		PGA	S_s	S_1		A_s	S_{DS}	S_{D1}	
Life Safety	1000	0.000	0.000	0.000	X	0.000	0.000	0.000	X
Operational	500	0.000	0.000	0.000	X	0.000	0.000	0.000	X

(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 Guide Specifications for LRFD Seismic Bridge Design” (“AASHTO LRFD Bridge Design Specifications") 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 (*Fpga*) of ___.

[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 Guide Specifications for LRFD Seismic Bridge Design” (“AASHTO LRFD Bridge Design Specifications") as modified by

A2.7.3 General Notes - (continued)

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 00.0000N and Longitude 000.0000W:

[Insert the Seismic Data Table here]

[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 Guide Specifications for LRFD Seismic Bridge Design” (“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 00.0000N and Longitude 000.0000W:

[Insert the Seismic Data Table here]

[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 (*Fpga*) 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.

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]

A2.7.3 General Notes - (continued)

[Use the following notes for FRP strengthening project]

FRP Strengthening Notes:
Provide Fiber-Reinforced Polymer (FRP) products from the QPL, Section___.

FRP material properties used for the design:
[Specify section properties]
Ultimate tensile strength = __ ksi
Design tensile strength = __ ksi
Tensile modulus of elasticity = __ ksi
Ultimate strain = __in./in.

Existing material properties of the strengthened elements used for the design:
Concrete, f'c = __ksi
Reinforcing steel, fy = __ksi
Environmental reduction factor, CE = __

Design and construct FRP strengthening according to Special Provision Section ____.

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) or (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)).

A2.7.3 General Notes - (continued)

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).

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.
Produce the finish coat on all girders according 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. Provide steel in top and bottom flanges according to ASTM A709, Grade 50W.
6. Provide steel in web according to ASTM A709, Grade XXXXX
7. Provide all other steel according to AASHTO M270, 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:
Produce welds according to the latest edition of AWS D 1.5.

BOLTING NOTES:
Tighten all high strength bolts 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 M 164 (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 according 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.

A2.8.3 BRIDGE DATA SYSTEM – STRUCTURE AND DRAWING NUMBER REQUEST FORM

Please check appropriate box or boxes ☐ Structure Number Request ☐ Drawing Number Request

Structure Number: Status: Owner:

Structure Name:

Year Built: Type: Subtype:

Region: District: Existing Structure #

City: County:

Highway: Route:

Mile point: Direction:

	Degrees	Minutes	Seconds
Lattitude:			
Longitude:			

Township: Range: Section:

Configuration:

# of Spans:

Overall Length: Curb to Curb Width:

Out to 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		