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**Remarks and Instructions**

The complete manual, revision packages, and individual chapters can be accessed at [www.wsdot.wa.gov/publications/manuals/m23-50.htm](http://www.wsdot.wa.gov/publications/manuals/m23-50.htm).

Please contact Joe Fahoum at 360-705-7193 or [fahoumj@wsdot.wa.gov](mailto:fahoumj@wsdot.wa.gov) with comments, questions, or suggestions for improvement to the manual.

For updating printed manuals, page numbers indicating portions of the manual that are to be removed and replaced are shown below.

Chapter	Remove Pages	Insert Pages
Title Page	i-ii	i-ii
Chapter 11 Detailing Practice	11.1-7 – 11.1-10 11.1-15 – 11.1-16	11.1-7 – 11.1-10 11.1-15 – 11.1-16

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Approved By

Signature





**Washington State  
Department of Transportation**

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# **Bridge Design Manual (LRFD)**

M 23-50.09

January 2012

**Engineering and Regional Operations**

Bridge and Structures Office

## **Americans with Disabilities Act (ADA) Information**

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## **Title VI Notice to the Public**

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- The spacing for reinforcement shall be on a dimension line with extension lines. Do not point to a single bar and call out the spacing. Reinforcement spacing callouts shall include a distance. If the distance is an unusual number, give a maximum spacing. Do not use “equal spaces” as in, “23 equal spaces = 18'-9” ” (the steel workers should not have to calculate the spacing). Also, never use the word “about” as in, “23 spaces @ about 10” = 18'-9” ”(this is open to too much interpretation). Instead these should read, “23 spaces @ 10” max. = 18'-9”.”
- Reinforcement geometry shall be clear in plan details. Congested areas, oddly bent bars, etc. can be clarified with additional views/details/sections or adjacent bending diagrams. In bending diagrams, reinforcement dimensions are given out-to-out. It may be necessary to show edges of reinforcement with two parallel edge lines to clearly show working points and dimensions.
- Reinforcement lengths, angles, etc. need not be called out when they can be determined from structural member sizes, cover requirements, etc. Anchorage, embedment and extension lengths of reinforcement shall be dimensioned in the plans.
- Standard hooks per AASHTO LRFD 5.10.2.1 need not be dimensioned or called out, but shall be drawn with the proper angle (90°, 135° or 180°). Seismic hooks per AASHTO LRFD 5.10.2.2 (used for transverse reinforcement in regions of expected plastic hinges) shall be called out on the plans whenever they are used.
- Splices in reinforcement are required when reinforcement lengths exceed the fabrication lengths in BDM 5.1.2.F. They may also be necessary in other locations such as construction joints, etc. The location, length and stagger of lap splices shall be shown on the plan sheets. Tables of applicable lap splice lengths are acceptable with associated stagger requirements. Type, location and stagger of mechanical and welded splices of reinforcement shall be shown.
- Where concrete cover requirements differ from those given in the standard notes or *Standard Specification* 6-02.3(24)C, they shall be shown in the plans. It shall be clear whether the cover requirement refers to ties and stirrups or the main longitudinal bars.
- Bar list sheets shall be prepared for plan sets including bridges. They shall be included at the end of each bridge plan set. They are not stamped. They are provided in the plans as a convenience for the Contractor and are to be used at their own risk. Despite this warning, Contractors sometimes use the bar list directly to fabricate reinforcement without confirming details from the plans. Designers should therefore strive for accuracy in the bar list. An accurate bar list also serves as a checking mechanism and a way to calculate reinforcement quantities.
- The reinforcing for some structural members such as approach slabs, shafts, piles, barrier, retaining walls, bridge grate inlets, sign structure foundations, precast SIP deck panels and precast girders are not shown in the bar list at the end of the bridge plan set but may include their own bar list on their plan sheets. These components typically have shop plans, include steel reinforcement within their unit costs and/or are constructed by separate sub-contractors.
- Other reinforcement detailing references include ACI 315-99 “Details and Detailing of Concrete Reinforcement”, ACI 318-08 “Building Code Requirements for Structural Concrete”, and CRSI “Manual of Standard Practice” May 2003.

### 11.1.2 Bridge Office Standard Drawings and Office Examples

#### A. General

- The Bridge Office provides standard drawings and example sheets of various common bridge elements.

#### B. Use of Standards

- The Standard Drawings are to be considered as nothing more than **examples** of items like girders or traffic barriers which are often used and are very similar from job to job.
- They are to be **copied** to a structure project and **modified to fit** the particular aspects of the structure. They are not intended to be included in a contract plan set without close scrutiny for applicability to the job.

#### C. Changes to Standards

- New standard drawings and revisions to existing drawings shall be approved by the Bridge Design Engineer and shall be made according to the same office practices as contract plan sheets.

### 11.1.3 Plan Sheets

Plan sheets should be assembled in the **order of construction** and include the items listed below. Phasing or large-scale projects may require more than one sheet to properly detail plan items.

- Layout
- General Notes/Construction Sequence
- Footing/Foundation Layout
- Piles/Shafts
- Abutment
- Intermediate Piers/Bents
- Bearing Details
- Framing Plan
- Typical Section
- Girders/Diaphragms
- Bridge Deck Reinforcement (Plan and transverse section)
- Expansion Joints (if needed)
- Traffic Barrier
- Bridge Approach Slab
- Barlist

#### A. Layout

- The Layout sheet shall contain, but is not limited to:
  - Plan View with ascending stations from left to right
  - Elevation View shown as an outside view of the bridge and shall be visually aligned with the plan view.
- The original preliminary plan will be copied to create the final layout. Views, data, and notes may be repositioned to improve the final product.
- Items on the preliminary plan, which should **not** appear on the final layout are as follows:
  - Typical roadway sections.
  - Vertical curve, Superelevation and curve data for other than the main line.
  - Other information that was preliminary or that will be found elsewhere in the plans.

- Items not normally found on the preliminary plan, which should be **added**:
  - **Test hole locations** (designated by  $\frac{3}{16}$  inch circles, quartered) to plan view.
  - Elevation view of **footings, seals, piles**, etc. Show elevation at Bottom of footing and, if applicable, the type and size of piling.
  - **General notes** above legend on right hand side, usually in place of the typical section.
  - Title “LAYOUT” in the title block and sheet number in the space provided.
  - Other features, such as lighting, conduit, signs, excavation, riprap, etc. as determined by the designer.
- The preliminary plan checklist in [Appendix A](#), Chapter 2 can be used for reference.

## B. General Notes/Construction Sequence

## C. Footing/Foundation Layout

- An abutment with a **spread footing** has a Footing Layout. An abutment with piles and pile cap has a Foundation Layout.
- The Footing Layout is a plan of the bridge whose details are limited to those needed to **locate the footings**. The intent of the footing layout is to minimize the possibility of error at this initial stage of construction.
- The Foundation Layout is a plan of the bridge whose details are limited to those needed to **locate the shafts or piles**. The intent of the Foundation layout is to minimize the possibility of error at this initial stage of construction.
- Other related information and/or details such as pedestal sizes, and column sizes are considered part of the pier drawing and **should not be included** in the footing layout.
- The Footing Layout should be shown on the layout sheet if space allows. It need not be in the same scale. When the general notes and footing layout cannot be included on the first (layout) sheet, the footing layout should be included on the second sheet.
- Longitudinally, footings should be located using the **survey line** to reference such items as the footing, centerline pier, centerline column, or centerline bearing, etc.
- When **seals** are required, their locations and sizes should be clearly indicated on the footing layout.
- The Wall Foundation Plan for retaining walls is similar to the Footing Plan for bridges except that it also shows dimensions to the front face of wall.
- [Appendix 11.1-A4](#) is an example of a footing layout showing:
  - The basic information needed.
  - The method of detailing from the survey line.

## D. Piles/Shafts

## E. Abutment

- Bridge elements that have not yet been built will not be shown. For example, the superstructure is not to be shown, dashed or not, on any substructure details.
- Elevation information for seals and piles or shafts may be shown on the abutment or pier sheets.
- Views are to be oriented so that they represent what the contractor or inspector would most likely see on the ground. Pier 1 elevation is often shown looking back on stationing. A note should be added under the Elevation Pier 1 title saying “Shown looking back on stationing”.

## F. Intermediate Piers/Bents

- Each pier shall be detailed separately as a general rule. If the intermediate piers are identical except for height, then they can be shown together.

## G. Bearing Details

## H. Framing Plan

- Girder Lines must be identified in the plan view (Gir. A, Gir. B, etc.).

## I. Typical Section

- Girder spacing, which is tied to the bridge construction baseline
- Roadway slab thickness, as well as web and bottom slab thicknesses for box girders
- “A” dimension
- Limits of pigmented sealer
- Profile grade and pivot point and cross slopes
- Utility locations
- Curb to curb roadway width
- Soffit and drip groove geometry

## J. Girders/Diaphragms

- Prestressed girder sheets can be copied from the Bridge Office library but they must be modified to match the project requirements.

## K. Bridge Deck Reinforcement

- Plan and transverse section views

## L. Expansion Joints

## M. Traffic Barrier

- Traffic barrier sheets can be copied from the Bridge Office library but they must be modified to match the project requirements.

## N. Bridge Approach Slab

- Approach slab sheets can be copied from the Bridge Office library and modified as necessary for the project.

## O. Barlist

- The barlist sheets do not require stamping because they are not officially part of the contract plan set.

### 11.1.4 Electronic Plan Sharing Policy

The following procedure describes the Bridge Design Office or WSDOT consultants’ electronic plan sharing policy with other WSDOT offices, consultants, contractors and other agencies:

Plan sheets prepared by the Bridge Design Office or WSDOT consultants may be electronically sent out to other WSDOT offices, consultants, contractors and other agencies in DWG format only if all of the following steps are taken:

1. Entire information in the title block is removed from the plan sheet.
2. A disclaimer reading “FOR INFORMATION ONLY” is printed diagonally across each plan sheet; and
3. A letter of disclaimer is sent as a cover or an attachment to the plan sheet(s), indicating that attached plans are for information only and that WSDOT has no responsibility for accuracy of the contents.

Bridge Office plan sheets may also be electronically shared if requested in PDF format. PDF files need to only include the disclaimer noted in Step 2 above. Examples of bridge plan sheets modified for electronic sharing are shown for clarity. Time spent modifying and submitting electronic plan sheets shall be charged to the job number provided by the construction PE’s office.

This policy applies only to current projects under design or under contract. Historical or as-built plan sheets may only be shared in PDF format, and only if condition #3 is followed, as described above.

**F**

Fahrenheit	F
far face	F.F.
far side	F.S.
feet (foot)	FT. or '
feet per foot	FT./FT. or ' / ' or ' /FT.
field splice	F.S.
figure, figures	FIG., FIGS.
flat head	F.H.
foot kips	FT-KIPS
foot pounds	FT-LB
footing	FTG.
forward	FWD.
freeway	FWY.

**G**

gallon(s)	GAL.
galvanized	GALV.
galvanized steel pipe	GSP
gauge	GA.
General Special Provisions	GSP
girder	GIR.
ground	GR.
guard railing	GR

**H**

hanger	HGR.
height	HT.
height (retaining wall)	H
hexagonal	HEX.
high strength	H.S.
high water	H.W.
high water mark	H.W.M.
highway	HWY.
horizontal	HORIZ.
hot mix asphalt	HMA
hour(s)	HR.
hundred(s)	HUND.

**I**

included, including	INCL.
<u>inch(es)</u>	IN. or “
inside diameter	I.D.
inside face	I.F.
interior	INT.
intermediate	INTERM.
interstate	I
invert	INV.

**J**

joint	JT.
junction	JCT.

**K**

kilometer(s)	KM.
kilopounds	KIPS, K.

<b>L</b>		
layout		LO
left		LT.
length of curve		L.C.
linear feet		L.F.
longitudinal		LONGIT.
lump sum		L.S.
<b>M</b>		
maintenance		MAINT.
malleable		MALL.
manhole		MH
manufacturer		MFR.
maximum		MAX.
mean high water		MHW
mean higher high water		MHHW
mean low water		MLW
mean lower low water		MLLW
meters		M.
mile(s)		MI.
miles per hour		MPH
millimeters		MM.
minimum		MIN.
minute(s)		MIN. or ‘
miscellaneous		MISC.
modified		MOD.
monument		MON.
<b>N</b>		
National Geodetic Vertical Datum 1929		NGVD 29
near face		N.F.
near side		N.S.
North		N.
North American Vertical Datum 1988		NAVD 88
Northbound		NB
not to scale		NTS
number; numbers		#, NO., NOS.
<b>O</b>		
or		/
original ground		O.G.
ounce(s)		OZ.
outside diameter		O.D.
outside face		O.F.
out to out		O to O
overcrossing		O-XING
overhead		OH
<b>P</b>		
page; pages		P.; PP.
pavement		PAV'T
pedestrian		PED.
per cent		%
pivot point		PP
Plans, Specifications and Estimates		PS&E
plate		ℙ or PL