

MNDOT BRIDGE OFFICE



Guidelines for Checking Final Design Bridge Plans

Edited by the MnDOT Bridge Office ES-ESS Committee

February 2018

Disclaimer: This document is meant to be used as a checklist for the production and checking of final design bridge plans. It applies to typical deck on beam type bridges, slab type bridges, and box culverts that meet the definition of a bridge. Use it as a guide only and do not assume it to be all encompassing. MnDOT is not responsible for any missing content. Designers and drafters are expected to use good engineering judgment regarding the correct content to include in final bridge plans.

Guidelines for Checking Final Design Bridge Plans

Bridge No.:		Reviewer:		Date:	
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GENERAL PLAN AND ELEVATION SHEET

General Plan

	Label plan view as "GENERAL PLAN".
	Show north arrow.
	Show and label working points, working line, and centerlines. Provide Geopak chain names in parentheses (e.g. - TH 28 (INPTH 28)).
	Show location of inplace bridge or substructures. Provide type of structure, length, and width of bridge.
	Provide stations and elevations along centerline of survey at ends of bridge and centerline of all substructures.
	Provide azimuth of roadway CL or working line (e.g. - AZ 152° 02' 13.4").
	Show intersection of bridge roadway centerline with roadway centerlines below. Provide station, angle between centerlines, and XY coordinates of intersections. Show channel or railroad below. Provide name and location of roadway alignments.
	Tie bridge dimensions to working points.
	Show type and extent of slope protection.
	Define tapers with stations, and define rate of taper.
	Show inplace utilities and pipes which affect the bridge construction.
	For stream crossings, provide name of stream and show direction of flow.
	Show and label horizontal PC or PT points that affect the structure.
	Show and label centerline of abutment bearings and centerline of piers.
	Show location of deck drains and centerline & station of light standards.
	Show stage construction limits, if applicable.
	Define bridge length along centerline. (End of deck to centerline of abutment bearing to centerline of pier to centerline of abutment bearing to end of deck and overall length.)
	Show traffic direction for each traffic lane.
	Dimension roadway, barrier/parapet, sidewalk, and median widths.
	Show angles between the working line and centerlines.
	Show location of bridge nameplate (on all bridges).
	Label radius and/or degree of curve (provide same labels as shown in preliminary bridge plan) for all horizontal curves.
	Show and label minimum horizontal clearance to substructure units, if applicable.
	For retaining walls adjoining to abutments, provide wall name and Geopak name, and tie in with station and coordinates.
	For twin bridges, show outline of other bridge and provide distance between centerlines.
	Show abutment wingwalls. For wingwalls parallel to roadway, provide stations at inside face of wingwall ends.
	Provide grading notes, current standard construction notes, and sheet list for the plan.
	Show temporary shoring (sheet piling) requirements.
	For bridges with variable width, provide gutter-to-gutter width at points where begin bridge and end bridge intersect with centerline of survey.

General Elevation

	Label as "GENERAL ELEVATION".
	Show and label abutments, piers, spans, slope protection, and piling, if applicable.
	Show and label location of minimum vertical clearance point for each roadway under the bridge.
	If given in Preliminary Plan, show and label toe of slope, distance, station, and elevation.
	Show extent of slope protection, including identifying slopes graphically, not as 1:2.
	Show existing ground lines with key from Preliminary Plan.
	Show limits of excavation with hatching and provide associated note.
	Provide bottom of substructure footing elevations.
	Show beam, slab, barrier, and railing.
	Provide vertical curve data: Includes PVI station, PVI elevation, approach grade, departure grade, and curve length. Also show VPT and/or VPC and give station & elevation if located on the bridge.
	If no vertical curve data, provide slope/grade of bridge.
	Label bearings as fixed, expansion, or integral.
	For all critical vertical clearance points, provide dimension from bottom of beam to top of roadway or top of railroad track.
	Label centerline(s) of roadway below. Show finished grade and profile grade location(s). Provide Geopak name in parentheses.
	Label standard 1V:10H berm if applicable: Dimension low beam to top of berm (2'-0") and front face of abutment to top of slope paving (2'-6").
	Show aesthetics, if applicable.
	Provide distance between divided roadways below, if applicable.
	Define entire section of roadway below. Provide lane, shoulder, and berm widths. Provide side slopes on berm and roadway. Label curbs, gutters, and show slopes, if possible.
	Provide horizontal clearance dimension from both left and right edge of all roadways to the edge of nearest obstruction (i.e. - nearest substructure or toe of side slope). If clearance varies, provide actual minimum horizontal clearance.

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GENERAL PLAN AND ELEVATION SHEET (CONT'D)	
General Elevation (cont'd)	

For railroad bridges:	
	Label railroad crash walls.
	Show elevation and label railroad ditch/slope control points & elevations. Provide ditch width and depth.
For stream crossings:	
	Show and label channel bottom width, low member elevation, 100 year headwater elevation, and approximate flowline elevation.
	If needed, add "EXTEND RIPRAP TO EL. _____" note. (Extend 1'-0" above 100 year elevation headwater elevation, as required.)
	Show existing ground lines.

Design Data Block	
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	Provide design data, including design specifications, design method, design live load, design material properties, and future wearing course weight assumed in design.
	Provide deck area, projected ADT and ADTT (for steel bridges), design speed over and under, and bridge LRFR operating rating factor to 2 decimal places.

Title Block & Information Bar	
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	Provide federal project number. For state funds only projects, delete "FEDERAL PROJ. NO." and label as "STATE FUNDS".
	Fill in list of sheets. See LRFD Bridge Design Manual Section 2.4.2 for plan order.
	Provide job number.
	Provide design unit.
	Provide structure number and location of bridge.
	Provide span lengths (to nearest foot), type of beam, skew, roadway width, and type of barrier/rail.
	Provide bridge ID number. (See LRFD Bridge Design Manual Appendix 2-A for number.)
	Fill in section, T_N, R_W, township or city, and county.
	Provide state project number.
	Provide T.H. number.

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TRANSVERSE SECTION AND SCHEDULE OF QUANTITIES SHEET

Transverse Section

	Label as "TRANSVERSE SECTION". Label per span, if more than one.
	Provide transverse bridge dimensions. Include roadway width, lane widths, out-to-out of deck, sidewalk, barrier, and median widths.
	Label '/ft slopes. Refer to superelevation sheet, if applicable.
	Provide height of median or sidewalk at gutter line.
	Show and label type of barrier and/or metal railing.
	Label sides of transverse section (e.g. - "SOUTH SIDE", etc.).
	Show and label deck or slab thickness and wearing course thickness, if applicable.
	Show and label beam type and size.
	Provide beam spacing for all spans.
	Provide location of profile grade with Geopak name in parenthesis (e.g. - TH 28 (INPTH 28)).
	Label centerline(s) of roadway and working line with Geopak name in parentheses.
	Label cross slope on sidewalks and medians.
	Show stage construction limits if applicable. Add note "SEE SHEET NO. ___ FOR STAGE CONSTRUCTION."

Schedule of Quantities

	Show the schedule in tabular form. Provide a column for each stage of stage construction.
	Provide circle notes if necessary for pay items (e.g. - "INCLUDES XX SQ. FT. FOR APPROACH PANELS").
	Provide plan quantity items (P).
	List pay item numbers in numerical order, pay items, units, and quantities per the Trns*port list.
	Provide totals for plans with multiple bridges, if applicable.

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BRIDGE LAYOUT SHEET

	Show north arrow.
	Identify working line and provide azimuth (e.g. - AZ 152° 02' 13.4").
	Show and label centerline of roadway. (If curved, show offsets at substructures.)
	Provide angle of intersection of working line and substructures (e.g. - 39° 59' 23.0" (TYP)).
	Show and label centerline of piers and centerline of bearing for abutments.
	Identify fascia beam lines or gutterline, if applicable.
	Identify control point and provide coordinates & intersection angle.
	Show and label working points.
	Tie working points to control point with dimensions given in decimal feet to two decimals (0.01').
	Provide stations and coordinates for all working points in "DIMENSION BETWEEN WORKING POINTS" table. See LRFD Bridge Design Manual Figure 2.4.2.4.1.
	Provide distances between working points in decimal feet to two decimals (0.01').
	Provide drops in "TOP OF ROADWAY TO BRIDGE SEAT" table. Include slab thickness, stool height, beam height, and bearing height in inches. Also provide total drop height in both inches and decimal feet to two decimals (0.01'). If the total drop height varies between beams at a given substructure, provide a value for each beam line.
	Provide top of slab elevations, total height drop, and bridge seat elevations for working points in "DIMENSION BETWEEN WORKING POINTS" table.
	Provide notes for steel beam bridges, if necessary.
	For bridges with sidewalks, provide section showing working point location and elevation.

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STAGING PLAN SHEET

	Show inplace, interim, and final transverse sections. Tie in new centerline to old centerline, if applicable.
	Show temporary and permanent barriers. For anchored temporary barriers, use B-Detail B920.
	For temporary barriers, dimension minimum distance from edge of deck to back of barrier per LRFD Bridge Design Manual Memo to Designers (2011-03).
	Provide location of profile grade with Geopak name in parentheses (e.g. - TH 28 (INPTH 28)).
	Label centerline. Add Geopak name in parentheses (e.g. - TH 28 (INPTH 28)).
	Show cut lines.
	Show and label arrows for direction of traffic.
	Show and label traffic stages.
	Show and label construction stages.
	Show and label sheet piling, if any.
	Label sides of transverse sections (e.g. - "SOUTH SIDE", etc.).
	Provide notes to explain work and pay items for removals, if necessary.

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ABUTMENT REMOVAL SHEETS	
	Abutment Removal Sheets (Widening, etc.)
	Show cut lines.
	Show extent of removals. Provide angles and dimensions.
	Show reinforcement and identify what is to be done with existing reinforcement.
	Hatch removal areas.
	Provide notes to explain removals and pay items for removals.
	Show and label removal stages.
	Label sides of plan and elevation views (e.g. - "SOUTH SIDE", etc.).
	Label plan, elevation, and section(s).
	Label corners as needed (e.g. - "SOUTHEAST", etc.).

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ABUTMENT GEOMETRY SHEETS

Footing Plan Sheet

Label "FOOTING PLAN".
Label ends of plan (e.g. - "SOUTH", etc.) and label corner details.
Show and label centerlines of roadway and working line.
Provide angle between working line and centerline of bearing.
Provide angle between centerline of roadway and centerline of bearing.
Show and label working points and provide spacing.
Provide limits of keyway.
Tie footing dimensions to working points and centerline of bearing.
Dimension corner of footing perpendicular to working points and along footing.
If on spread footings, see Foundation Recommendations to determine if aggregate backfill is needed.
For integral abutments, orient H-piling with weak axis normal to centerline of bearing unless directed otherwise.
Identify direction of pile batter.
Tie pile spacing to working points and centerline of bearing (including wingwall piles).
Identify and number the test piles.
Label centerline of bearing and centerline of piles (e.g. - back row piles, front row piles, etc.).
Provide "SUMMARY OF QUANTITIES" and notes for abutments.
Provide load tables for applicable foundations (spread footing or piling). (See LRFD Bridge Design Manual Appendix 2-C.)
Provide "PILE NOTES" that are applicable for the type of piles and load tables.
Fill in computed pile loads and required pile resistance or spread footing load data in load tables.

Plan View

Label "PLAN".
Show and label working points.
Show and label centerline of bearing.
Show and label centerline of roadway & working line.
Label angle between centerline of roadway and centerline of bearing.
Tie abutment and wingwall dimensions, including front face and corners of fillets, to working points and centerline of bearing.
Provide beam and working point spacing.
Provide Summary of Quantities and applicable notes for abutment.
Label ends of plan view (e.g. - "SOUTH", etc.) or corners.
Show and label 2'-0" x 2'-0" corner fillet on the back face of the wingwall/abutment connection, where applicable.
Show and label location of membrane waterproofing system.
Provide concrete pedestal spacing.
Show and label construction joints and identify the nominal size of keyways.
Show and label contraction joints, if applicable.
Provide construction joint or contraction joint spacing.
Show conduit through abutment parapet, if applicable. Dimension off working point.
Show anchor rods, dimension anchor rod spacing, and include anchor rod template note, if applicable.
Show centerline of beams and wingwall angles.
Include large scale corner details for highly skewed bridges and for complex corners.
Label gutterline, edge of deck, and centerline of the fascia beam in corner details.
Show shear blocks and details, if needed for bridge.
Show drainage system (Bridge Standard Details Part I, B910).

Elevation

Label "ELEVATION".
Provide top of parapet slope (e.g.: uniform slope, etc.).
Show conduit through parapet, if applicable. Dimension off the bridge seat.
Show and label construction joints and size of keyway.
Show and label contraction joints, if applicable.
Show piling.
Provide footing elevation, bearing concrete pedestal elevation, and top of parapet elevations.
Show and label aesthetics if applicable.
Show and label approximate ground line with elevations (e.g. - 977.46±).
Provide limits of aesthetics (e.g. - 2'-0" below ground line, etc.).
Label location of corner detail if not on same sheet as plan view.
Provide necessary plan notes. (See LRFD Bridge Design Manual Appendix 2-C.)
Show and label utility blockouts.
Show and label section through elevation.

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ABUTMENT GEOMETRY SHEETS (CONT'D)

Section

Show and dimension abutment footing, bridge seat, parapet, and end block.
Label types of concrete for each part of section.
Show and label construction joints and size of keyways.
Show and label permissible construction joint between seat and parapet.
Show and dimension pile cutoff.
Show piling and identify slope of battered piles (i.e. - $\frac{3}{12}$).
Provide pile spacing.
Show concrete pedestal and dimension at least 2" from front face of abutment.
Provide shortest concrete pedestal height at 3" to accommodate possible field adjustment. Absolute minimum dimensions are 2" at front of pad and 1" at back of pad.
Slope bridge seat between concrete pedestals.
Label aesthetics, including architectural treatment thickness and type.
Show and label aggregate backfill, if needed for spread footing.
Minimum depth of end block is 1'-4".
Show and label membrane waterproofing system.
Show and label centerline of bearing.
Label section (e.g. - Section A-A).
Show drainage pipe and label drainage system. See Bridge Standard Details Part I, B910.

Wingwall Plan

Label "_____ WINGWALL PLAN".
Show north arrow, if applicable.
Show and label centerline of fascia beam, working point, gutterline, and centerline of bearing.
Label angle of centerline of bearing and centerline of fascia beam.
Show and label membrane waterproofing system.
Label edge of coping, front face of wingwall, and back face of wingwall.
Tie wingwall dimensions to working point.
Dimension length and thickness of wingwall.
Show and label construction joint(s) and size(s) of keyway(s).

Wingwall Elevation

Label "_____ WINGWALL ELEVATION".
Dimension height of wingwall at both ends. Provide 2" minimum clear between tops of maskwalls and bottom of deck, if applicable.
Dimension length of barrier on wingwall, if applicable.
Show section(s) through elevation.
Provide footing elevation and top of wingwall elevation.
Show approximate ground line and provide elevations.
Show piles.
Show and label aesthetic treatments, including architectural treatment.
Show and label limits of aesthetics (e.g. - 2'-0" below groundline, etc.).
Show and label construction joints(s) and size of keyway(s).

Wingwall Sections

Label "SECTION _____".
Label types of concrete.
Label front face and back face.
Provide all dimensions of footing and wall.
Show and label membrane waterproofing system, if applicable.
Show and label construction joint(s) and size(s) of keyway(s).
Show and label aesthetics, including architectural rustication thickness and type.
Show piling and identify slope of battered piles (i.e. - $\frac{3}{12}$).
Show and dimension pile cutoff.
Show and label aggregate backfill, if needed for spread footing.
Show railing using dashed line style and identify how it is paid for.
Provide notes that apply to sheet.

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ABUTMENT REINFORCEMENT SHEETS

Footing Plan

	Label "FOOTING PLAN".
	Label ends or corners of plan view (e.g.: "SOUTH END", etc.).
	Show and label working points and centerline of bearing.
	Enlarge corners of footing, if needed, to show dowel placement.
	Provide 3" cover for reinforcement.
	Show and label reinforcement bars.
	Show piles using dashed line style, line weight 0 or 1, and remove batter arrow.
	Show and label centerline of roadway and working line.
	Tie footing dowel bar spacing to working points and centerline of bearing.
	Dimension transverse spacing and lap splice lengths.
	Provide notes that apply to sheet.

Plan View and Elevation

	Label "PLAN" or "ELEVATION".
	Label ends of plan view (e.g. - "SOUTH END", etc.).
	Show and label working points, centerline of bearing, and centerline of beam.
	Show and label end post barrier anchorage reinforcement bars (if separate end post is used).
	Provide pedestal tie spacing either on plan view or separate detail, if applicable.
	Show shear blocks, if needed, and detail reinforcement in large detail.
	Show and label centerline of roadway and working line.
	Show and label construction joint(s).
	Show projection of reinforcement bars from construction joint(s).
	Dimension reinforcement spacing and lap splice lengths in plan view.
	Space vertical bars with footing dowels.
	Show and identify vertical and horizontal reinforcement bars.
	Show and label section through elevation.
	For integral abutments, show and label ties & stirrups between piles.
	Provide construction joint tie bars at vertical construction joints.

Abutment Section

	Label "SECTION _____".
	Show 0" clear for reinforcement to top of piles.
	Show and dimension footing reinforcement bars at bottom of footing.
	Show projection of footing dowels into bridge seat and dimension lap splice lengths.
	Show and dimension embedment of front face parapet vertical bar into bridge seat.
	Show and dimension projection of dowel bar from parapet into end block.
	Provide spacing of horizontal reinforcement in bridge seat and parapet.
	Show and label vertical and horizontal reinforcement bars.
	Show and dimension projection of back face vertical bar from bridge seat into parapet if applicable.
	Dimension horizontal bars and clear distance to vertical bars.
	Show and label pedestal ties, if applicable.
	Label front face and back face.
	If abutment is on a spread footing, show 5" clear to bottom reinforcement.
	Label 3" clear to top and side of footing and 2" clear in bridge seat and parapet for reinforcement bars. Dimensions may vary with architectural treatment. See LRFD Bridge Design Manual 5.2.1.
	Label clearance from architectural treatment to front face vertical reinforcement bar, if applicable.
	Tabulate reinforcement in "BILL OF REINFORCEMENT FOR _____ ABUTMENT" chart.
	For integral abutments, show and label ties & stirrups.
	Show and label centerline of bearing.
	For integral and semi-integral abutments, show and label diaphragm to approach panel connection bar. For new bridges, use stainless steel bar. For repair projects, use epoxy coated bar.

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ABUTMENT REINFORCEMENT SHEETS (CONT'D)	
Abutment Wingwall	
	Label "WINGWALL PLAN" and "WINGWALL ELEVATION" and "SECTION _____".
	Dimension reinforcement bars along wingwall.
	Show and label vertical and horizontal reinforcement bars.
	Show piling in elevation view unless on a spread footing.
	Show section(s) through elevation view.
	Show and label construction joints.
	If abutment is on a spread footing, show 5" clear to bottom reinforcement.
	Label 3" clear to top and side of footing and 2" clear in wingwall for reinforcement bars. Dimensions may vary with architectural treatment. See LRFD Bridge Design Manual 5.2.1.
	Show and label working point(s) and centerline of bearing.
	Label front face and back face.
	Show and dimension horizontal reinforcement at section view.
	Show and dimension wingwall-to-barrier tie bar projection on section view.
	Show number of wingwall-to-barrier tie bars on elevation view.

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PIER REMOVAL SHEETS

	Show and label cut lines.
	Show extent of removals, giving angles and dimensions.
	Hatch removal areas.
	Show reinforcement and label what is to be done with reinforcement.
	Provide notes to explain removals and pay items for removals.
	Show and label removal stages.
	Label ends of plan and elevation views. (e.g. - "SOUTH END", etc.).
	Label plan, elevation, and section(s).

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PIER GEOMETRY SHEETS

Footing Plan

Label "FOOTING PLAN".
Label ends of pier (e.g. - "SOUTH END", etc.).
Show and label centerline of pier and working points.
Show and label centerline of roadway and working line.
See Foundation Recommendations to determine if aggregate backfill is needed for spread footings.
Provide angle between centerline of roadway and centerline of pier.
Provide angle between working line and centerline of pier.
Provide working point spacing.
Indicate direction of pile batter.
Tie pile spacing to work points and centerline of roadway.
Locate and number the test piles.
Tie footing dimensions to working point and centerline of pier.
Show and fill in Summary of Quantities. Provide notes for pier that are applicable to summary.
Provide load tables for applicable foundations (spread footing or piling). (See LRFD Bridge Design Manual Appendix 2-C.)
Provide "PILE NOTES" that are applicable for the type of piles and load tables.
Fill in computed pile loads and required pile resistance or spread footing load data in tables.

Elevation

Label "ELEVATION".
Provide bottom of footing elevation.
Show piles in footing.
Show and dimension pile cutoff.
Show and label construction joint(s) and size(s) of keyway(s).
Show sections through column(s) and cap. Multiple sections may be needed.
Show section through pier crash strut, if needed.
Provide smallest concrete pedestal height at 3" to accommodate possible field adjustment. Absolute minimum pedestal height is 1".
For pile bent piers, provide pile spacing at bottom of cap or wall.
Provide elevations at concrete pedestals or steps and at ends of cap, if sloped.
Label centerline of columns.
Dimension column spacing and dimension from centerline of column to end of cap.
Dimension pier from top of cap to bottom of footing.
Dimension pier crash strut, if needed.
Show and label architectural treatment, including thickness and type.
Show conduit location, type and size.
Label 3/4" V at bottom of pier cap.

Plan

Label "PIER PLAN".
Label ends of plan (e.g. - "SOUTH END", etc.).
Show and label working points.
Show and label centerline of pier, bearings and roadway.
Provide concrete pedestal spacing and dimensions.
Set back concrete pedestals 1 1/2" minimum from edge of pier cap.
Provide dimensions from centerlines of beams, bearings, and pier for anchor rod layout.
Show anchor rods, dimension anchor rod spacing, and include anchor rod template note, if applicable.
Provide angle between centerline of roadway and centerline of pier, and at beams if different.
Provide angle between working line and centerline of pier.
Tie dimensions to working points, centerline of pier, and centerline of bearing.
Label working line and centerline of beams.
Provide working point and beam spacing.
Show and label construction joints and keyways, if applicable.

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PIER GEOMETRY SHEETS (CONT'D)	
End Elevation	
	Label "END ELEVATION".
	Show pile spacing.
	Provide slope of battered piles.
	Show and label architectural treatment, including thickness and type.
	Label sections and anchor rod layout.
	Provide concrete types for footing and columns and pier cap.
	Provide dimensions for footings, columns, and cap.
Sections	
	Show and label construction joints and keyways.
	Provide dimensions at sections.

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PIER REINFORCEMENT SHEETS

Footing Plan

- Label "FOOTING PLAN".
- Label ends of plan view. (e.g. - "SOUTH END", etc.).
- Tie footing dowel bar spacing to working points and centerline of pier.
- Show dowel bars inside column verticals unless otherwise directed by engineer.
- Show piles (dashed line style, weight 0, and remove batter arrows & test pile designations).
- Show and label centerline of roadway and working line.
- Show and label working points and centerline of pier.
- Dimension transverse and longitudinal bar spacing and lap splice lengths.
- Provide 3" cover for reinforcement.
- Label reinforcement bars.
- Provide notes that apply to sheet.
- Show keyway.

Elevation

- Label "ELEVATION".
- Show piles and footing reinforcement.
- Show crash strut reinforcement, if applicable.
- Label reinforcement bars.
- Dimension column and cap reinforcement spacing and lap splice lengths.
- If needed, show typical pedestal detail for tie bars.
- Provide reinforcement projections and minimum lap splices.

Pier Cap Plan

- Label "PIER CAP PLAN".
- Show and label centerline of roadway and working line.
- Label ends of plan view (e.g.: "SOUTH END", etc.).
- Dimension cap reinforcement.
- Label reinforcement bars.
- Show longitudinal bars inside of end tie bar.
- If needed, show typical pedestal detail for tie bars.
- Show anchor rods. Verify clearances of reinforcement in pedestal and cap to anchor rods.
- Provide reinforcement projections and minimum lap splices.

End Elevation (if used)

- Label "END ELEVATION".
- Show piles and footing reinforcement and dimension dowel bar projections.
- Label clearance of reinforcement to top of piles (0" clear).

Sections

- Label "SECTION _____".
- Show sections through columns, strut and pier cap.
- Dimension all reinforcement in section.
- Tabulate reinforcement in "BILL OF REINFORCEMENT FOR PIER _____" chart.
- Label clearances to reinforcement.
- Label reinforcement bars.
- Verify 6" minimum opening in top of pier cap reinforcement to accommodate tremie.

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SUPERSTRUCTURE SHEETS

Framing Plan

	Label "FRAMING PLAN".
	Show north arrow.
	Show and label working points and working point spacing.
	Provide beam spacing and types of beams.
	Show and label fascia beams, centerline of bearings, and centerline of pier(s).
	Label beams (B1, B2, etc).
	Provide dimensions of beams off of centerline of roadway or working line.
	If prestressed concrete beams project past centerline of pier, add detail for polystyrene on corners of top flange.
	Show and label centerline roadway and working line.
	Provide angle between centerline of roadway and centerline of pier(s) and centerline of bearing at abutments.
	Identify bearing type at each location in circle (e.g.: $\textcircled{F1}$).
	Label "X" end of beams.
	Show and label end and intermediate diaphragm spacing, including any additional fascia bay diaphragms required over oncoming traffic lanes to protect against bridge hits.
	Dimension angle of diaphragms relative to beam centerline.
	Dimension distance to centerline of bearings normal to centerline of pier, and along centerline of beams.
	Show and label field splice for steel beam bridges.
	Show polystyrene details for integral abutments. (May be shown on other superstructure sheet, if necessary.)

Prestressed Concrete Beam Sheet

	Fill in "Y" distances and number of strands in strand table.
	Fill in camber diagram detail.
	Fill in approximate weight of beam in tons.
	Box out and cross-hatch diaphragm details that are not applicable.
	Fill in beam labels (e.g. - Beams B1-B4).
	Remove unused strands in "Section At Centerline Span" and "End View". Confirm strand locations with engineer.
	Dimension shear reinforcement spacing in beam elevation.
	Fill in calculated prestress losses, minimum concrete strengths, and prestressing strand diameter boxes.
	Fill in dimensions for centerline to centerline of bearing, out to out of beam, hold-down location, and initial prestress force.
	Provide dimensions along slope if needed.
	Check notes to see if all are applicable.
	Fill in sheet title block with approximate beam length.
	Remove "Designer Notes".
	Fill in dimensions for threaded inserts.

Steel Beam Elevation Sheet

	Label "BEAM ELEVATION".
	Dimension along beam.
	Dimension shear stud spacing along beam.
	Label plate sizes, area "A", and bearing stiffeners.
	Show and label field splices and sole plate sizes.
	Show tapered sole plate details, if applicable.
	Provide beam size for rolled beam sections.
	Label centerline of abutment bearing, piers, and field splices.
	Provide field splice elevations in a chart.
	Show shear connector detail(s).
	Provide intermediate stiffener(s) size(s) and location(s).
	Show weld between flange and web for plate girders.
	Show flange transition details.
	Use table(s) when beams vary.
	Show transverse shear stud spacing on section through beam.

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SUPERSTRUCTURE SHEETS (CONT'D)	
Structural Steel Details	
	Label angles, plates, and W beams.
	Show shear stud spacing on end diaphragm if B402 is not used.
	Show weld locations, if applicable.
	Show details, if needed, for plates and spacing.
	Show plan view of end diaphragms, if applicable.
	Show field splice details if B400 is not used.
	Label "TOP SPLICE PLATE", "FIELD SPLICE ELEVATION", and "BOTTOM SPLICE PLATE".
	Label centerline of field splice(s) and beam.
	Show section through field splice.
	Label sizes and lengths of plates in field splice.
	Label hole sizes.
	Label diameter and type of bolts.
Steel Beam Camber Diagram	
	Label "CAMBER DIAGRAM".
	Show span lengths.
	Show centerline of abutment bearings, pier, and field splices.
	Show camber in fractions of an inch.
	Show and label horizontal line, chord line, contraflexure points, and camber curve.
	Show maximum camber locations and beam segments spacing.
	Fill in dimensions, horizontal distance, and camber tables.
	Provide applicable standard notes.
	See LRFD Bridge Design Manual Figure 6.3.4.1 for details of a camber diagram.
Steel Beam Deflection Diagram	
	Label "DEFLECTION DIAGRAM".
	Provide span lengths and overall length.
	Divide span(s) in 10 equal spaces.
	Show deflection diagram for beams.
	Label centerline of bearing at abutment, centerline of pier, and baseline.
	Show beam deflections in decimals of a foot to 3 decimal points (0.001') for self-weight including diaphragms and additional dead load (except future wearing course).
	Provide applicable standard notes.
Deck Plan	
	Label "DECK PLAN".
	Show north arrow.
	Show working points.
	Label centerline of bearing at abutments and centerline of piers.
	Label all substructure centerline labels uniformly placed, preferably at bottom of view.
	Provide angle between centerline of roadway (working line) and substructures.
	Dimension deck width. Include roadway, barrier, sidewalk, and median widths, as applicable.
	If skewed, show details for corners.
	Show expansion joint openings with dimensions and temperature.
	Show longitudinal reinforcement.
	Provide span lengths and out-to-out of deck dimensions.
	Show and label working line and centerline of roadway.
	Label gutter lines.
	Show dimension from end of deck to working point.
	Show transverse reinforcement bars, top and bottom.
	Dimension transverse reinforcement spacing along edge of deck.
	Provide reinforcement lap splices. Alternate lap locations where possible.
	Show and label additional reinforcement over piers in stagger detail and in plan.
	Show section cut locations at ends of bridge and at piers.
	Show reinforcement and geometry in one plan view if able; otherwise, show on separate plan views.
	Show "SUMMARY OF QUANTITIES FOR SUPERSTRUCTURE" with pay items, units, quantities, and applicable notes.
	Include note stating temperature that dimensions are based on.
	Show and label conduit systems, if applicable.
	Show light blisters and include stationing, if applicable.

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SUPERSTRUCTURE SHEETS (CONT'D)

Longitudinal Section

Label "SECTION _____".
Show and label centerlines of abutment bearings, bearings at pier(s), and end diaphragm.
Show expansion joint opening with dimensions and temperatures, if applicable.
Provide dimensions of end block and paving bracket.
For skewed bridges, note which dimensions are normal to centerline of substructure.
Provide deck thickness.
Provide wearing course thickness.
For prestressed beams, show saw cut in deck at pier. Reference Figure 9.2.1.10 in the LRFD Bridge Design Manual.
Label waterproof expansion device type.
For integral abutments, reference Figure 11.1.1.2 in the LRFD Bridge Design Manual.
For semi-integral abutments, reference Figure 11.1.2.1 in the LRFD Bridge Design Manual.
Provide transverse reinforcement spacing at end of deck and end block.
Show and label diaphragms.
Provide "BILL OF REINFORCEMENT FOR SUPERSTRUCTURE".
Show and label top and bottom longitudinal reinforcement.
Show and label end block dowel bar and end block tie bar.

Transverse Section

Label "TRANSVERSE SECTION" or "SECTION A-A", "SECTION B-B", etc.
Label sides of section (e.g. - "SOUTH SIDE", etc.).
Label 'FT cross-slopes. Refer to superelevation sheet, if applicable.
Show beam spacing and dimensions to edge of deck.
Show and label beam type.
Show and label barrier & railing type(s).
Show and dimension sidewalk and median depths, widths, and slopes.
Show and label diaphragms.
Provide reinforcement spacing over pier. (Show additional reinforcement as hollow.)
Show and label conduits, if applicable.
Provide transverse bridge dimensions. Include roadway lane widths, shoulder widths, and out to out of deck dimensions.
Provide deck thickness and wearing course thickness, if applicable.
Show transverse section looking upstation.
Dimension top and bottom longitudinal reinforcement.
Provide clear dimensions to top and bottom transverse reinforcement.
Show and label centerline of roadway and working line.
Show and label profile grade.
Show sidewalk reinforcement, if applicable.
Provide barrier and slab concrete types.
Provide edge of deck and sidewalk thicknesses.
Label reinforcement.
Show and label barrier reinforcement into deck.
Show ½" V drip at deck edge.
Show top of deck finish under railing.
Provide reinforcement clearances at edge of deck.
Show bottom of deck sloping to first beam under sidewalk. Show bottom of deck level between beams that are entirely under the sidewalk. See Figure 9.2.1.4 and 9.2.1.5 in the LRFD Bridge Design Manual.
Show bottom of deck level under deck crown.

Concrete End Diaphragms for Integral Abutments

Label "PLAN", "ELEVATION", and "SECTION _____".
Dimension reinforcement.
Provide clearances in sections.
Provide dimensions for holes in beams for reinforcement bars. Cross check with beam sheet.
Show and label bearing pads and polystyrene at abutments.
Show section between beams.
Show section at beam.
Label centerline of bearing and beams.
Label reinforcement bars.
Show bit. felt (size and location).
Show and label abutment reinforcement that projects into end diaphragm.
Show and label reinforcement from end diaphragm into approach slab as a stainless steel rebar.

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SUPERSTRUCTURE SHEETS (CONT'D)	
Concrete End Diaphragms for Integral Abutments (cont'd)	
	Show and label membrane waterproofing system and construction joint and keyway.
	Provide dimensions of end diaphragm.
	Provide dimensions of fillet between beams.
	Show plan detail at bearing.
	See LRFD Bridge Design Manual Figures 11.1.1.2, 11.1.1.3, and 11.1.1.4 for more details.
Concrete Barrier/Parapet Elevation Sheet	
	Label longitudinal reinforcement and minimum lap lengths.
	Provide control joint spacing. Place control joint at all pier centerline/gutterline intersections.
	Show and label centerline of substructures.
	Label barrier regions located on wingwall/approach panel and bridge deck.
	Label ends of barriers (e.g. - "WEST END", etc.).
Concrete Barrier/Parapet Sheet (With or Without a Metal Railing/Fence)	
	Select correct barrier/parapet and/or metal railing/fence standard sheet for project.
	Block out and cross-hatch details on standard sheet that are not applicable.
	Show details if a guardrail connection is needed.
	Show details of barrier rustication, if used.
	Label reinforcement bars.
	Fill in "BILL OF REINFORCEMENT" for barrier.
Waterproof Expansion Device Sheet	
	Select correct standard details for expansion sheet to match type of barrier.
	Label ends of Section B-B (e.g. - "SOUTH END", etc.).
	Add waterproof expansion device snow plow protection sheet, if needed. Label locations of shoulders and lanes to prevent snow plow protection devices from being placed in wheel paths.
	For curved device, show length of curved portion along centerline of device.
	Fill in Section B-B dimensions and elevations at cross slope break points and centerline of roadway.
	Block out and cross-hatch details on standard sheet that are not applicable.
Conduit System Sheet	
	Show plan view of deck with conduit and light standards labeled.
	Use standard conduit system sheet 5-397.406 for lighting, if applicable.
	Use applicable details from standard conduit system sheet 5-397.402 for hanging utilities.
	Show stations of light standards.
	Show sections and details that are applicable for the system.
Slope Protection Sheet	
	Select correct slope protection standard sheet for bridge.
	Block out and cross-hatch details on standard sheet that are not applicable.

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DETAIL SHEETS

Standard Details

See <http://www.dot.state.mn.us/bridge/bridgedetails1.html> for latest versions of B-details.

Arrange B-Details in numerical order with the lower detail number on the left side of the plan sheet. For single B-details, place on right side of plan sheet.

- | |
|-----------------------------------------------------------------|
| Bridge Nameplate (B101 or B102) |
| Pile Splice (B201 or B202) |
| Sole Plate (B303) |
| Elastomeric Fixed Bearing Assembly (B304) |
| Elastomeric Bearing Pad (B305) |
| Tapered Bearing Plate Assembly (B309) |
| Curved Plate Bearing Assembly (B310, B311, B354, and/or B355) |
| Pot Type Bearing Assembly (B312, B313, B314, B315, and/or B316) |
| Splices for Steel Beams (B400) |
| Bolted Diaphragms for Steel Beams (B402) |
| Steel Intermediate Diaphragm (B403) |
| Cross Frame Intermediate Diaphragms (B407 or B408). |
| Bolted Flange to Stiffener Detail (B410) |
| Stiffener Details (B411) |
| Steel Intermediate Bolted Diaphragm (B412) |
| Protection Plate (B553) |
| Bridge Floor Drain (B701 or B702) |
| Bridge Offset Floor Drain (B705 or B706) |
| Contraction Joint (B801) |
| Concrete End Diaphragm (B814 or B816) |
| Concrete Railing (B830) |
| Concrete Parapet Railing (B831) |
| Concrete Relief Joint Detail (B850) |
| Median Sign Post Anchor (B901) |
| Fence Post Anchorage (B905 or B906) |
| Drainage System (B910) |
| Temporary Portable Precast Concrete Barrier Anchorage (B920) |
| Triple Beam Guardrail (B935) |
| Inspection Door (B942) |
| Anchor Bolt Cluster (B950) |

As-Built Bridge Data (5-397.900). Do not put initials on the as-built bridge data sheet.

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BRIDGE SURVEY SHEETS	
Bridge Survey	
	Make sure hydraulic engineer's recommendation notes are filled in and complete.
	Add additional survey sheets – topography, utilities, etc. which are applicable for the bridge plan.
Borings	
	Show outline of abutment and pier footings with test piles (if applicable) in both plan and elevation views.
	Label test pile numbers (if applicable) in plan view, numbering sequentially from top to bottom, left to right (upstation).
	Label test pile numbers (if applicable) in elevation view.
	Label substructures (e.g. - NORTH ABUTMENT, etc.).
	Leave SP number from preliminary on the sheet for correlation to roadway project numbers.

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BOX CULVERT

General Plan and Elevation

	Label "GENERAL PLAN".
	Show north arrow.
	Label control point station.
	Show transverse dimensions.
	Show reference point, if required by District.
	Label "SIDE ELEVATION".
	Label control point elevation.
	Label floor slab and centerline of roadway.
	Show drop wall height.
	Show schedule of quantities for entire culvert. No need to include item numbers.
	Show barrel and apron lengths.
	Show angle from centerline of culvert to centerline of roadway.
	Label end of aprons, end of barrel, and centerlines of roadway and culvert.
	Dimension approximate overfill.
	Show culvert end of apron and end of barrel at top of floor slab.
	Label "END ELEVATION".
	Show inside dimensions of culvert.
	Show construction notes for culvert.
	Show list of sheets.
	Label roadway and shoulder widths.

Design Data Block

	Show design data for design specifications, design method, inside height and width, height of wingwall, depth of dropwall, maximum and minimum fill depths, skew angle, and angle of internal friction.
	Show design material properties.

Title Block

	Give bridge number and location of culvert.
	Show control point station.
	Show bridge I.D. number (see LRFD Bridge Design Manual Appendix 2-A for number).
	Fill in sec., T_N, R_W, township and county.

Additional Culvert Sheets

	Select barrel detail sheet.
	Fill in chart of barrel sheet from precast concrete box culvert tables.
	Provide size and minimum and maximum fill heights from District's request form.
	Provide state project number, trunk highway number, and station on each sheet.
	Provide certification information and initials on barrel details sheet only.
	Select end section sheet(s) for the culvert.
	Include alternate dropwalls for box culverts and embankment protection for box culvert sheets, if applicable.

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ADDITIONAL GUIDELINES

Order of Sheets

The plan order should typically follow this list:

- General Plan and Elevation
- Cross Section and Pay Items
- Staging Plan
- Working Point Layout
- Removal Details
- Abutment Details and Reinforcement
- Pier Details and Reinforcement
- Framing Plan
- Beam Details
- Superstructure Details and Reinforcement
- Plan Standard Sheets (Railing, Expansion Joint, Slope Paving, Conduit, etc. Does not include beam information.)
- B-Details
- As-Built Bridge Data
- Surveys, etc.

Accepted Abbreviations

See LRFD Bridge Design Manual Appendix 2-B.

See Technical Manual 5-292.620 for utilities.

For All Sheets

Follow "Summary of Recommended Drafting Standards" for drafting sheets.

Fill in certification box with engineer's name and license number.

Fill in designer and drafter boxes with initials. Add design check and drafting check initials when complete.

Enter sheet title and bridge number.

Enter sheet numbers and total number of sheets.

Include all applicable notes. Edit standard notes as needed.

Rounding guidelines:

- For alignment and profile data that are given in the preliminary bridge plan (i.e., P.C. stations and coordinates, V.P.I. stations and coordinates and elevations), retain the number of decimal places when carried over to the final bridge plan.
- For stations and elevations computed during final design, round to nearest 0.01.
- For coordinates computed during final design, round to nearest 0.001.
- Round angles and azimuths to nearest 0.1 second.
- Round dimensions to nearest 1/8".

Show minimum lap splice lengths, if applicable.

All reinforcement bars are epoxy coated except those that are entirely embedded in footings (plain bars) and the dowels that connect approach slabs to integral or semi-integral abutments (stainless steel).

Bills of reinforcement have the following columns: Bar, number, length, shape, and location. A column for series bars can be added if necessary.

Detail bent reinforcement bars using out-to-out dimensions. Show slope of bends if applicable.

Dimension keyways when used. Keyway widths are typically approximately 1/3 of the concrete width.

When modifying standards, block out and cross-hatch unused details rather than deleting them. Add "MODIFIED" to the figure or detail number. Add a box that indicates the nature of the modification from the standard.

Avoid using scales smaller than 3/8" for substructure details.

Locate quantity summaries for bridge components (piers, superstructure, etc.) in upper right hand corner of plan sheets.