



Bridge Design Updates

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A Little History

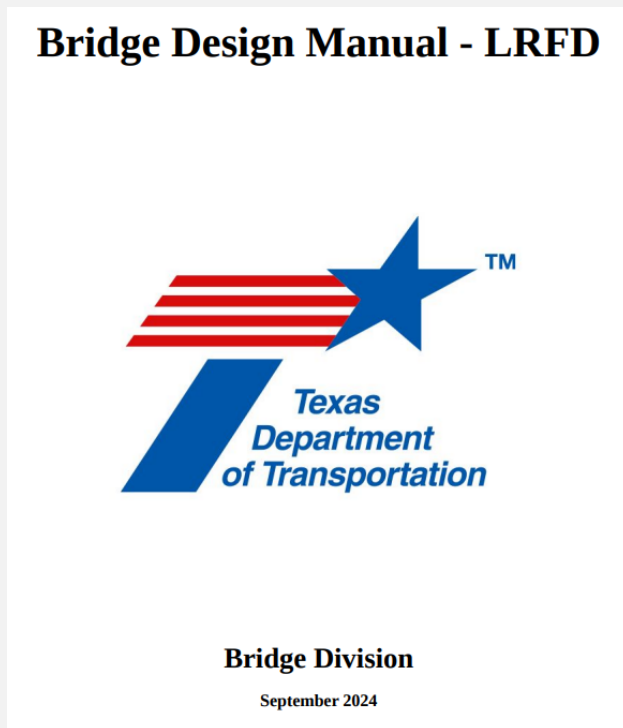
- 2001 – last BDM prior to adopting LRFD - 428 pages
 - Included a lot of historical context and general discussion.
- 2007 – Load and Resistance Factor Design (LRFD) – 55 pages
 - All the historical context and general discussion removed.
 - Some was move to website

A Little History cont.

- 2018 – Bridge Design Guide (BDG) – 92 pages
 - Much of the information was pulled off the website
 - Guidance memo's
 - Intended to be companion document to the BDM.
- 2018 – BDM
 - Grown to 88 pages

Last Versions

- BDM – September 2024 – 106 pages
- BDG – January 2023 – 141 pages



Why updating?

- New AASTHO LRFD

(AASHTO LRFD Bridge Design Specifications, 2024, 10th Edition)

- Combined Bridge Design Manual – LRFD (BDM) and Bridge Design Guide (BDG)
- Added ancillary structures (sign supports, poles, etc.)
- Achieved digital accessibility

Title Change - BSD



Bridge and Structures Design Manual

July 2026

Combining BDM and BDG

Not as easy as it sounds.

EXISTING showing how Guide and Manual fit together					
Chapter	Section	Manual	Chapter	Section	Guide
1		About this Manual	1		About this Guide
	1	Introduction	1	1	Introduction
2		Limit States and Loads	2		Load and Resistance Factor Design
	1	Limit States	2	1	Load Factors
	2	Loads	2	2	Loads
3		Superstructure Design	3		Superstructure Design Guidelines
	1	Overview	3	1	General Recommendations
			5	5	Expansion Joints
	2	Concrete Deck Slabs on Spread Beams	3	4	Concrete Deck Slab on Stringers
			3	5	Concrete Deck Slab on U-beams
			5	6	Bridge Width Considerations

Does the organization make sense?

Reorganized (1 thru 3)

Chapter	Chapter Name	Description
1	About this Manual	Introductory information on the purpose and organization of the manual.
2	Bridge Design Project Requirements	Information on 3D bridge modeling, load rating new bridges, archiving design notes, and quality control and assurance.
3	Limit States and Loads	General information on limit states and load factors.

Reorganized (4 and 5)

Chapter	Chapter Name	Description
4	General Requirements	Design guidelines for bridge geometry, width, vertical clearance, lateral restraint, phasing, widenings, elastomeric bearings, strut-and-tie method, corrosion protection, joints, non-contact lap splices, and vehicle collision.
5	Superstructure Design	Policy on design of specific bridge superstructure components.

Reorganized (6 thru 8)

Chapter	Chapter Name	Description
6	Substructure Design	Policy on design of specific bridge substructure components.
7	Concrete Culverts	Policy on design of concrete culverts.
8	Ancillary Structures	Policy on structural design of ancillary structures, including sign supports, high mast illumination poles, roadway illumination poles, and traffic signal poles.

Reorganized (Appendices)

Appendix	Title
A	TxGirder Haunch Design Guide
B	X Beam Design Guide
C	Steel Twin Tub Girder System Redundancy Simplified Method Guide
D	Lean-On Bracing Design Guide

Changes - General

- All references to AASTHO LRFD now in brackets < >
- All references to fracture critical replaced with non-redundant tension steel members (NSTMs)
- Clearly defined when lightweight concrete can be used.
 - Decks, only
 - All other use normal weight

New Sections

- 2.2 3D Modelling – required starting June 1, 2022.
- 3.7 Wind Loads - The load combinations in <Table 5.12.3.3-1> require the owner to specify them. <5.12.5.3.4a> requires the owner to specify the wind speeds for segmental.

More New Sections

- 4.2 Bridge Geometry and as paragraphs in other sections – covers how to orient and frame beams.
- 5.3.1 Pretensioned Concrete Beams – applies to all pretensioned concrete beam types (TxGirders, slab beams, box beams, etc.). Combined all the repeated information into one section. Removed this information from 5.3.1 thru 5.3.6.

Even More New Sections, cont.

- 5.6.3 Trapezoidal Box Girders – System Redundancy Evaluation is now under this section. System redundancy section was rewritten to eliminate duplicate information.
- The use of steel tub girders requires Bridge Division approval.

Even More New Sections

- 6.4 Footings
- 6.7.2 Semi-integral Abutments

New Chapter 8 Ancillary Structures

8.1 Overview

8.2 Materials

8.3 Geometric Constraints

8.4 Structural Analysis

8.5 Design Criteria

8.6 Detailing

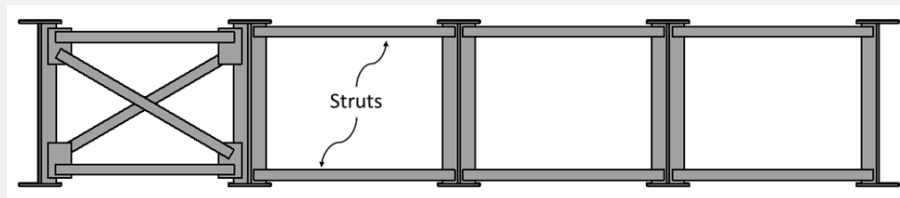
8.7 Appropriate Use of Standards

8.7.1 Overhead Sign Structures

8.7.2 Traffic Signal Pole Structures

New Appendix

- Appendix D – Lean-on Bracing Guide



Changes – 2.4 Archiving Design Notes

- 2.4.1 General
 - These procedures must be followed... and updated based on any requests for information or change orders that occur during construction.
- 2.4.4 Electronic Submittal of Bridge Design Notes
 - Bridge design note must be treated as confidential documents and transmitted using secure, encrypted methods.

Changes - 2.6 Alternate Designs

- Policy change and expanded.
 - The allowance for post-letting alternatives must be explicitly stated in the project general notes and/or on plan sheets.
 - Acceptance or denial of an alternate is at the sole discretion of TxDOT.
 - Clarified contractor responsibilities with respect to time and costs.

Changes – 2.6, cont.

- Allowing precast alternates is only intended for individual components, such as the exterior beam or bent cap. Not for entire bridge redesigns that alter span depth or arrangement.
- Includes sections on concrete, steel, bent caps, and abutments.
- The cap to column connection must meet the corrosion protection level originally shown in the plans.

Changes – 3.4 Foundations

- Refers back to the TxDOT Geotechnical Manual instead of describing what load cases should be used.

3.4 Foundations

Determine design loads and combinations for bridges as described by TxDOT's Geotechnical Manual – LRFD.

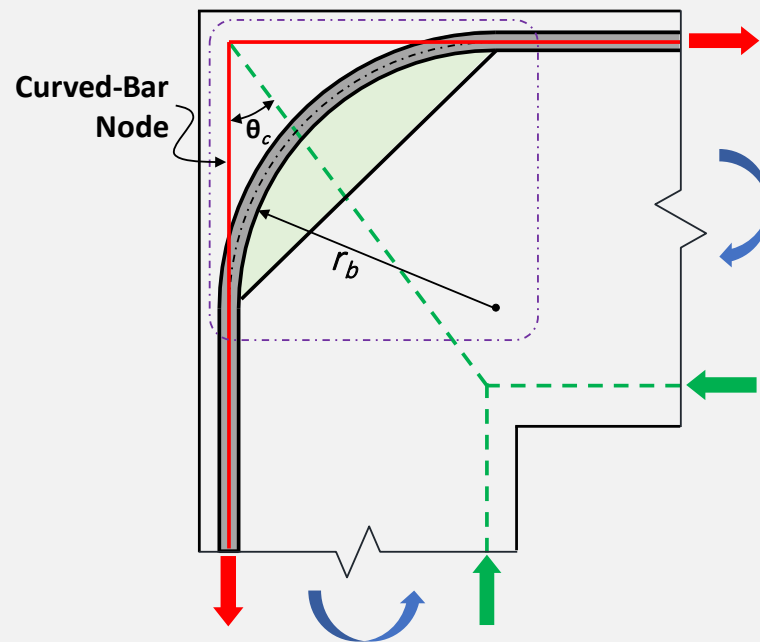
For foundation loads on typical multi-column bents and abutments, distribute the live load equally to all supporting foundations, assuming all lanes are loaded. Use the multiple presence factor, m , per <Article 3.6.1.1.2>.

Changes – Chapter 4 General Requirements

- 4.5 Lateral Restraint of Bridge Superstructures on Substructure – shear keys are now called Lateral Restraint (LR) Shear Keys.
- 4.8 Approach Slabs – rewritten to condense
- 4.12 Steel-Reinforced Elastomeric Bearings – added
 - Disregard the minimum edge cover for the steel reinforcement in <Article 14.7.6.1>. Provide 1/8-inch to 1/4-inch minimum edge cover.

Changes – Chapter 4, cont.

- 4.13 Strut-and-Tie Method - Added
 - Use strut bearing lengths proportional to the amount of load carried by the strut at a node <Figure C5.8.2.2-4>.
 - curved bar nodes



Changes – Chapter 5 Superstructure

- Pretensioned Beams - Initial compression stress up to $0.65f'_{ci}$ (ksi) is allowed. $0.7f'_{ci}$ (ksi) is not allowed.
- Box beams – removed the transverse post-tensioning information.
- U beams – The use of U-beams requires Bridge Division approval.
- Segmental – rewrote based on American Segmental Bridge Institute (ASBI) comments. Added much on durability and inspectability.

Changes – Chapter 5 Superstructure, cont.

- Spliced girders –
 - clarified 1.5” clear cover for precast elements and 2” for cast-in-place elements.
 - Diaphragms are required.
 - Based on recent research not yet published.

Changes – Chapter 5, cont.

- Steel Girders - AASHTO now has provisions for half-round stiffeners and sets the minimum thickness as $3/8"$ so this was added to reflect the SGMD standard.
 - Minimum split-pipe (half-round) stiffener thickness is 0.625 inches for rolled plate and 0.50 inches for round hollow structural sections (HSS).
- Steel Girders – AASHTO now has provisions for designing diaphragms and cross frames. Requirements have been revised and expanded on.

Changes - Chapter 6 - Substructure

- 6.5 – Columns –
 - If these conditions are not met, column design and analysis, including second order effects and stiffness reduction from cracked concrete, is required.
 - Account for global stability of columns subject to second order effects. Ultimate moment, M_u including secondary effects should not exceed $1.25M_u$ due to first-order effects.
 - Replaced

Account for second-order effects, with the structural model accounting for reduced stiffness from a cracked section.

Changes – Chapter 6, cont.

- Aggregate size
 - When calculating spacing requirements per <Article 5.10.3.1> use the absolute maximum aggregate size, the smallest sieve with 100% passing, not the maximum nominal size of the aggregate per Item 421, “Hydraulic Cement Concrete”. If smaller reinforcing spacing is required, limit the sizes of aggregate in the material notes on the plan sheet. Contact Bridge Division for guidance.

Changes – Chapter 6, still.

- Aggregate size

Table 4
Coarse Aggregate Gradation Chart

Aggregate Grade No. ¹	Maximum Nominal Size	Percent Passing on Each Sieve								
		2-1/2"	2"	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#8
1	2"	100	80–100	50–85	–	20–40	–	–	0–10	–
2	1-1/2"	–	100	95–100	–	35–70	–	10–30	0–10	–
3	1-1/2"	–	100	95–100	–	60–90	25–60	–	0–10	–
4 (57)	1"	–	–	100	95–100	–	25–60	–	0–10	0–5
5 (67)	3/4"	–	–	–	100	90–100	–	20–55	0–10	0–5
6 (7)	1/2"	–	–	–	–	100	90–100	40–70	0–15	0–5
7	3/8"	–	–	–	–	–	100	70–95	0–25	–
8	3/8"	–	–	–	–	–	100	95–100	20–65	0–10

1. Corresponding ASTM C33 gradation shown in parentheses.

Changes – Chapter 6, one more

- Live load reactions
 - Distribute the live load to the beams assuming the slab hinged at each beam except the outside beam.
 - Do not use PGSuper live load beam reactions.

Changes – Chapter 7 Culverts

- Use an at-rest lateral earth pressure coefficient, k_o , of 0.33 to compute lateral earth pressure. Instead of Rankine's active earth pressure
- For your information - Live load model for culvert design changed in AASTHO.

Changes – Appendices

- Appendix B – rewritten to be X-beams
- Appendix C – System redundancy section was rewritten to eliminate duplicate information.

Deleted Sections

- BDM – retired beam types
 - Prestensioned Decked Slab Beams
 - Prestensioned Concrete Spread Slab Beams
 - Cast-in-Place Concrete Slab and Girder Spans (Pan Forms)
- BDG
 - Frequently Asked Questions and Concrete Deck Slab on U-beams



Bridge and Structures Design Manual

July 2026

Bridge and Structures Design Manual (BSD)

Published July 29, 2026

(307 pages)

Direct questions to BRG_Design@txdot.gov

Also updated,

Bent Protection Guide

Quality Control and Quality Assurance Guide