LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

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Project Development Division
Bridge Design Section
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XXXXXXXX = Revisions to Bridge Design and Evaluation Manual (BDEM) related to joints and bearings which were published after SCAN 17-03 meetings.

MEMORANDUM

TO: ALL CONSULTANTS
ALL BRIDGE DESIGNERS

FROM: PAUL FOSSIER, P.E.
BRIDGE DESIGN ENGINEER ADMINISTRATOR

SUBJECT: BRIDGE DESIGN TECHNICAL MEMORANDUM NO. 82 (BDTM.82)
PUBLICATION OF BDEM REV. 8 AND LG GIRDER, MISC. SPAN AND AASHTO GIRDER SPECIAL DETAILS

DATE: July 19, 2018

This BDTM includes the publication of following items:

1. BDEM Revision No. 8
2. LG Girder Special Details
3. Misc. Span Special Details
4. AASHTO Girder Special Details

Refer to Preface in the BDEM for implementation policy on revisions to BDEM. All special details shall be implemented for projects in preliminary plan stages. For projects in final plan stages, these special details shall be implemented if there is no impact to project schedule and budget.

1. BDEM REVISION NO. 8

BDEM Rev. 8 includes revisions or additions in the following chapters:

Part II Vol. 1 Chapter 5 - Concrete Structures
Part II Vol. 1 Chapter 14 - Joints and Bearings
Part II Vol. 4 Chapter 2 – Roadside and Median Barrier Design and Details
Part III Chapter 1 – LG Girder

The table below lists all pages that have been revised or added. The BDEM posted on Bridge Design Section Website has been updated to include these pages. All revisions and additions in Rev. 8 are shown in red for easy reference.

Page No.	Revision or Addition Description
Index-iii	Revised the title of Part III Chapter 1 to "LG Girder"
Revision History-i	Revised to include Revision No. 8
II.V1-Ch5-i, ii, 1-20	Revised BDEM Part II Vol. 1 Chapter 5 to include various revisions throughout the chapter. See Attachment 1 for detail revisions in each section.
II.V1-Ch14-i, 1-14	Added new provisions for BDEM Part II Vol. 1 Chapter 14 – Joints and Bearings. See Attachment 2 for detail additions in each section.
II.V4-Ch2-i, 7 &7a	Added new Section 2.2.1.1 in Part II Vol. 5 Chapter 2 - Roadside and Median Barrier Design and Details to address roadway side slopes for bridge replacement projects.
III.Ch1-i, ii, iii, 1-67	Revised the title of Part III Chapter 1 from "LG Girder Preliminary Design Charts" to "LG Girder"; combined existing Sections 1.1 to 1.4 under a new Section 1.1 – LG Girder Preliminary Design Charts; renumbered existing Sections 1.1 to 1.4 to Section 1.1.1 to 1.1.4 and made miscellaneous revisions to these sections; added new Section 1.2 – LG Girder Bearing Design Charts; added new Section 1.3 - LG Girder Special Details and Design Aids. See Attachment 3 for detail revisions and additions in each section.

Major provisions in each chapter are summarized here. Refer to Attachments 1 to 3 for detail revisions or additions in each section.

Major Provisions:

Part II Vol. 1 Chapter 5 - Concrete Structures

- Added a "Structural Concrete Classes Summary Table"
- Revised and clarified camber terminologies and added camber measurement requirements
- Implemented concrete seismic shear keys
- Implemented LG girders as the standard precast prestressed concrete girders
- Added efficiency comparison of LG girders and AASHTO girders
- Implemented new link slab and floating span concepts for concrete girder bridges

Part II Vol. 1 Chapter 14 - Joints and Bearings

- Added new riser policy
- Added selection matrices for expansion joints and bearings
- Added terminologies for joint movement
- Added requirements to include "Joint Data Table" to project plans

Part II Vol. 4 Chapter 2 – Roadside and Median Barrier Design and Details

- Added guidance on roadway side slopes for bridge replacement projects including guidance on determining guardrail length for roadway side slope steeper than 4:1.

Part III Chapter 1 – LG Girder

- Added nine LG girder standard bearing pads, design chart, and examples
- Added LG Girder Special Details and Design Aids

2. LG GIRDER SPECIAL DETAILS

The following LG Girder Special Details have been developed for LG-25 to LG-78. Refer to BDEM Part III Chapter 1 Section 1.3 for detailed discussions on LG Girder Special Details. These details, dated 7/19/2018, have been published in ProjectWise for implementation.

		BRIDGE STANDARDS INDEX NO.	SERIES	DESCRIPTION
COMMON DETAILS		BD.2.2.4.1.01	1 OF 11	INDEX, GENERAL NOTES AND DEFINITIONS
		BD.2.2.4.1.02	2 OF 11	DIMENSIONS AND STRAND TEMPLATES
		BD.2.2.4.1.03	3 OF 11	END OF GIRDERS
		BD.2.2.4.1.04	4 OF 11	END OF GIRDERS
		BD.2.2.4.1.05	5 OF 11	STANDARD STEEL-REINFORCED BEARING PADS
		BD.2.2.4.1.06	6 OF 11	NON-STANDARD STEEL-REINFORCED BEARING PADS
		BD.2.2.4.1.07	7 OF 11	EMBEDDED AND BEVELED PLATES - SQUARE END OF GIRDER
		BD.2.2.4.1.08	8 OF 11	EMBEDDED AND BEVELED PLATES - CLIPPED END OF GIRDER
		BD.2.2.4.1.09	9 OF 11	COIL INSERTS AND PREFORMED HOLES FOR DIAPHRAGMS
		BD.2.2.4.1.10	10 OF 11	CAMBER DETAILS
		BD.2.2.4.1.11	11 OF 11	MISC. LG DETAILS
SPECIFIC DETAILS	LG-25	BD.2.2.4.2.01	1 OF 2	LG-25 REINFORCEMENT DETAILS - CONVENTIONAL
		BD.2.2.4.2.02	2 OF 2	LG-25 REINFORCEMENT DETAILS - WWR
	LG-36	BD.2.2.4.3.01	1 OF 2	LG-36 REINFORCEMENT DETAILS - CONVENTIONAL
		BD.2.2.4.3.02	2 OF 2	LG-36 REINFORCEMENT DETAILS - WWR
	LG-45	BD.2.2.4.4.01	1 OF 2	LG-45 REINFORCEMENT DETAILS - CONVENTIONAL
		BD.2.2.4.4.02	2 OF 2	LG-45 REINFORCEMENT DETAILS - WWR
	LG-54	BD.2.2.4.5.01	1 OF 2	LG-54 REINFORCEMENT DETAILS - CONVENTIONAL
		BD.2.2.4.5.02	2 OF 2	LG-54 REINFORCEMENT DETAILS - WWR
	LG-63	BD.2.2.4.6.01	1 OF 2	LG-63 REINFORCEMENT DETAILS - CONVENTIONAL
		BD.2.2.4.6.02	2 OF 2	LG-63 REINFORCEMENT DETAILS - WWR
	LG-72	BD.2.2.4.7.01	1 OF 2	LG-72 REINFORCEMENT DETAILS - CONVENTIONAL
		BD.2.2.4.7.02	2 OF 2	LG-72 REINFORCEMENT DETAILS - WWR
	LG-78	BD.2.2.4.8.01	1 OF 2	LG-78 REINFORCEMENT DETAILS - CONVENTIONAL
		BD.2.2.4.8.02	2 OF 2	LG-78 REINFORCEMENT DETAILS - WWR

3. MISC. SPAN SPECIAL DETAILS

The following Miscellaneous Span Special Details (including expansion joint details) have been developed. Common Details (2 sheets) shall be included in all bridge projects. The EOR shall select applicable expansion joint details per project requirements. These details, dated 7/19/2018, have been published in ProjectWise for implementation.

	BRIDGE STANDARD INDEX NO.	SERIES	DESCRIPTION
COMMON DETAILS	BD.2.4.1.0.01	1 OF 2	INDEX, CROWN, DECK PLACEMENT, FORMWORK @ LINK SLAB
	BD.2.4.1.0.02	2 OF 2	DECK DRAINAGE
EXPANSION JOINTS	BD.2.4.5.1.01	1 OF 2	SEALED EXPANSION JOINT (PREFORMED NEOPRENE SEAL)
	BD.2.4.5.1.02	2 OF 2	SEALED EXPANSION JOINT (PREFORMED NEOPRENE SEAL)
	BD.2.4.5.2.01	1 OF 2	SEALED EXPANSION JOINT (PREFORMED SILICONE SEAL)
	BD.2.4.5.2.02	2 OF 2	SEALED EXPANSION JOINT (PREFORMED SILICONE SEAL)
	BD.2.4.5.3.01	1 OF 1	POURED SILICONE JOINT

4. AASHTO GIRDER SPECIAL DETAILS

The following AASHTO Girder Special Details have been separated from the existing Misc. Span and Girder Details. These details, dated 7/19/2018, have been published in ProjectWise for implementation.

The use of AASHTO girders will require approval from the Bridge Design Engineer Administrator. In the near future, a revised version of these special details will be published to eliminate the use of girder end clip angle and anchor bolts and replace them with concrete seismic shear keys. Refer to BDEM Part II Chapter 5 Section 5.14.1.2 for policy on the use of AASHTO girders.

BRIDGE STANDARD INDEX NO.	SERIES	DESCRIPTION
BD.2.2.2.0.01	1 OF 3	GIRDER HARDWARE AND BEARING PADS
BD.2.2.2.0.02	2 OF 3	MILD STEEL REINFORCEMENT
BD.2.2.2.0.03	3 OF 3	WELDED WIRE FABRIC REINFORCEMENT

EXISTING MISCELLANOUS SPAN AND GIRDER DETAILS

The existing Miscellaneous Span and Girder Details will be archived. All relevant details from the existing Misc. Span and Girder Details have been incorporated into the new Misc. Span Special Details and the AASHTO Girder Special Details.

This technical memorandum is posted on the LA DOTD Website under *Inside La DOTD* > *Divisions - Engineering* > *Bridge Design* > *Technical Memoranda – BDTMs.*

Please contact Ms. Zhengzheng "Jenny" Fu (225-379-1321, zhengzheng.fu@la.gov) if you have questions or comments.

PF/zzf

Attachments

Cc: Chris Knotts (Chief Engineer)
Chad Winchester (Chief, Project Development Division)
Edward Wedge (Deputy Engineer Administrator)
Vince Latino (Assistant Secretary of Operations)
David Miller (Chief Maintenance Administrator)
Nick Fagerburg (Bridge Maintenance Administrator)
Michael Vosburg (Chief Construction Division Engineer)
Brian Kendrick (Project Management Director)
Chris Nickel (Pavement and Geotechnical Engineer Administrator)
David Smith (Road Design Engineer Administrator)
Art Aguirre (FHWA)
District Administrators, ADA Engineering, ADA Operations, and District Bridge Engineers and Area Engineers

Attachment 1 – Revisions in BDEM Part II Chapter 5-Concerte Structures

The following sections have been revised:

Section	Major Revisions
5.4.1	Added a "Structural Concrete Classes Summary Table" per 2016 Louisiana Standard Specifications for Road and Bridges that provides design strength and application guidance for each structural concrete class. Added requirements for MASS concrete elements.
5.4.2.1	Added reference to D5.4.1.
5.7.3.6.2	Revised and added camber and deflection terminologies. Added camber related filed measurement requirements and the Camber Data Table.
5.8.2.7	Clarified the 3 inch dimension in the first bullet of second paragraph to be 3 inch clear from the face of a pile, etc.
5.10.10.1	Added new provisions to address the placement of required splitting resistance reinforcement in girders with depth < 4 feet.
5.10.11.1	Added new policy of using concrete seismic shear key to resist seismic forces, which replaces current practice of using clip angles and anchor bolts at the end of girders.
5.11.4.3	Revised to emphasize that straight strand patterns shall be used whenever possible. Draped/harped strands may be used to satisfy the allowable stresses at release when required. Debonding is not allowed without prior approval. When draped/harped strands are used, the tie down points shall be consistent within a project whenever possible. The maximum uplift at each strand hold down device is limited to 40 kips.
5.12.3	Updated Concrete Cover Table.
5.13.2.2	Added reference to diaphragm design aids in Part III Chapter 1.
5.14.1.2	Added policy of using LG girders for all new construction, bridge widening and bridge rehabilitation projects. Quad Beam and AASHTO girders may be used for bridge rehabilitation projects with approval of the Bridge Design Engineer Administrator. Results of efficiency study for LG girders, AASHTO girders and Quad beam are included in the commentary. Added requirement of the Girder Data Table. Clarified haunch thickness determination. Added reference to PCI report NO. CB-02-16 "Recommended Practice for Lateral Stability of Precast, Prestressed Concrete Bridge Girders." Revised the maximum No. of strands for AASHTO Type II in the Girder Maximum Span Length Table.
5.14.1.4	Introduced new method of "link slab" as the standard practice of making simple spans to a multi-span continuous deck unit, which replaces past practice of continuity diaphragms. Introduced a new concept of "floating span", which requires no fixed bearing, for simple spans and multi-span continuous units that are subject to no extreme lateral and uplifting forces, such as wave action.

No changes are made to all other sections in Chapter 5 except page numbers.

Attachment 2 – New provisions in BDEM Part II Chapter 14 – Joints and Bearings

New provisions have been added in this chapter to supplement Section 14 of the AASHTO LRFD Bridge Design Specifications. The table below lists major provisions.

Section	Major Provisions
14.4.2	Referenced thermal movement and movement due to concrete creep and shrinkage in BDEM Part II Vol. 1 Chapter 3.
14.5	Provided definitions for joint movement and joint opening, Joint Selection Table, Joint Data Table, and two design aids in Appendix A and B for expansion length and joint data table examples.
14.6	Provided a "Bearing Selection Table", riser policy, sloped girder requirements table, and additional design and detail requirements for steel-reinforced bearing pad.
14.7.5.2	Specified elastomer shear modulus for design.
14.7.5.3.2	Specified shear deformation check caused by braking force.
14.8.3.1	Specified slippage check requirements for elastomeric bearings without anchorage. Specified min. compressive stress due to dead load to prevent elastomeric bearing walking.
Appendix A	Provided expansion length examples
Appendix B	Provided joint data table examples

Attachment 3 – Revisions and Additions in BDEM Part III Chapter 1 – LG Girder

Revisions

The title of Part III Chapter 1 has been changed from "LG Girder Preliminary Design Charts" to "LG Girders". Existing Sections 1.1 to 1.4 are combined under a new Section 1.1 – LG girder Preliminary Design Charts, where existing Sections 1.1 to 1.4 are renumbered as Section 1.1.1 to 1.1.4. Few modifications have been made in these sections as listed in the Table below.

Section	Major Revisions
1.1	Added an introduction to the LG girder preliminary design charts.
1.1.1	Specified no harping for LG-25; clarified intermediate diaphragm dead load, tensile stress limit at transfer, bridge skew, and reinforcement in girder end zone.
1.1.3	Updated maximum span length for LG-25.
1.1.4	Referenced LG girder special details for end zone dimension and reinforcement.

Additions

Two new sections (1.2 and 1.3) and two new Appendices are added. The table below lists major provisions in these two sections.

Section	Major Provisions
1.2	Added new section – LG Girder Bearing Design Chart
1.2.1	Introduced nine standard bearing pads (types B1-B9); discussed bearing design assumptions and requirements for the development of standard bearing pads and design chart.
1.2.2	Discussed the process of developing the Bearing Design Chart.
1.2.3	Provided a flowchart for application of the Bearing Design Chart.
1.2.4	Provided two examples to demonstrate the use of the Bearing Design Chart.
1.3	Added new Section – LG Girder Special Details and Design Aids
1.3.1	Introduced the LG Girder Special Details including common details and specific details.
1.3.1.1	Discussed application of common details.
1.3.1.2	Discussed application of specific details.
1.3.2	Introduced design aids and discussed application of all design aids.
1.3.3	Demonstrated typical organization of a LG girder project plan set utilizing special details and design aids.
Appendix A	Documented the summary of reactions and end rotations that were used to develop standard bearing pads.
Appendix B	Demonstrated an example of bearing design chart development for standard pad type B-1.