



Design Directive Updates

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August 21, 2024



Bridge Design Manual Updates



August 21, 2024

Bridge Design Manual *Upcoming* Updates

TxDOT Bridge Design Manual LRFD

<http://onlinemanuals.txdot.gov/txdotmanuals/lrf/lrf.pdf>

- Updates coming for end **Aug 2024**
 - Empirical Deck Design
 - Prefabricated Alternatives
 - Steel Straddle Caps



Bridge Design Manual - LRFD

Bridge Division

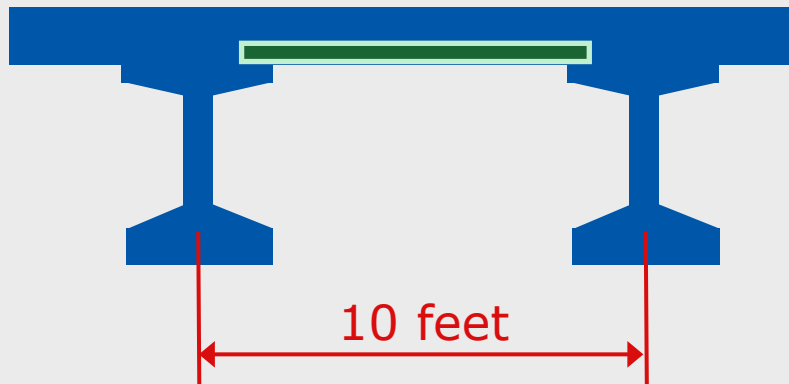
August 2024

Empirical Deck Design

- Chapter 3 — Superstructure Design
 - Section 2
 - **Concrete Deck Slabs** on I-Girders, U-Beams, Spread Box Beams, Spread Slab Beams, Steel Plate Girders, and Steel Tub Girders

Empirical Deck Design

- For I girders and steel I beam/girders maximum beam spacing is **10 feet**.
- For spread box beams, U beams, and steel tub girders maximum of **10 feet** spacing from exterior web.



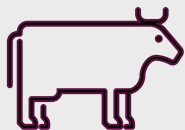
Empirical Deck Design

Remember your 10-foot beam spacing limit

- Alligators are dangerous



6 ft



8 ft



10 ft



10+ ft

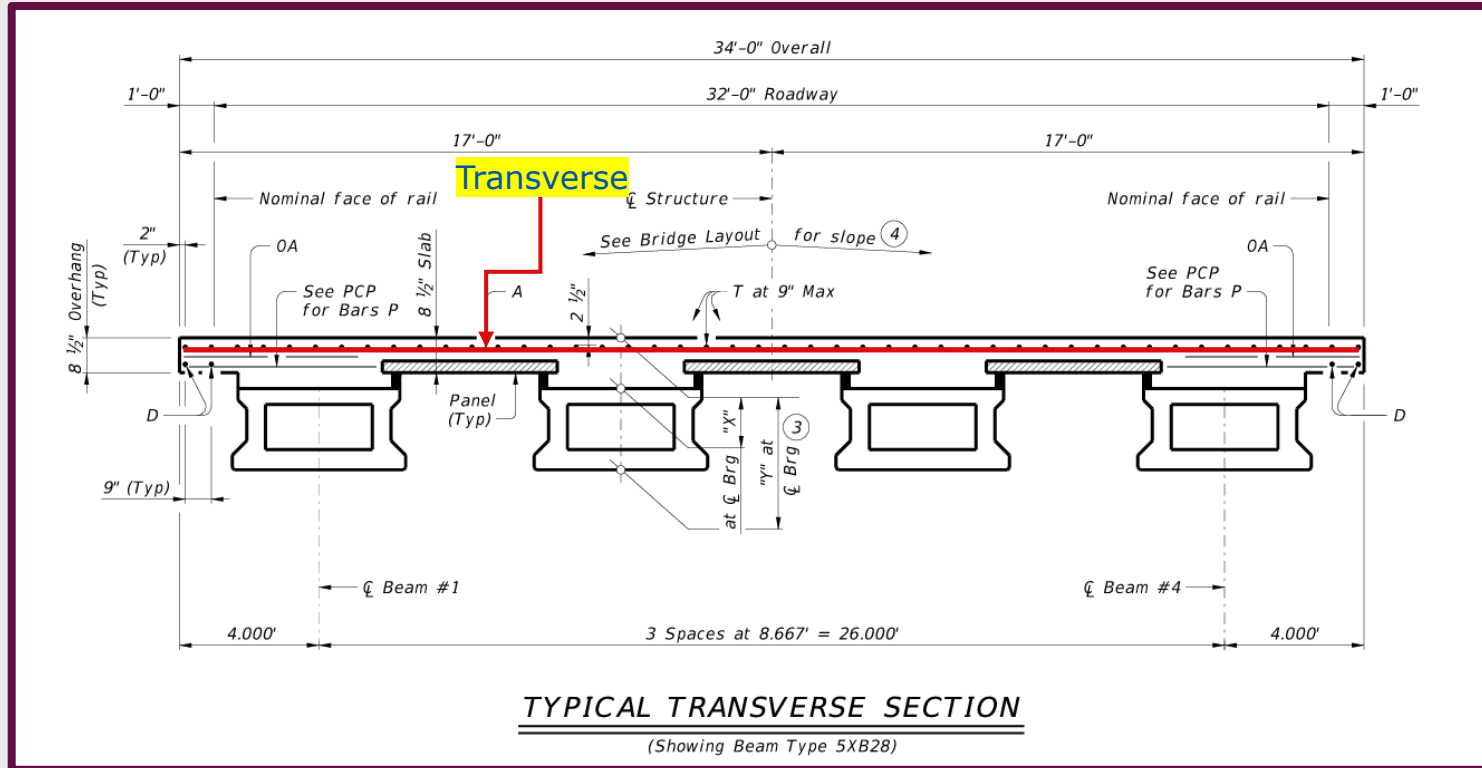


Empirical Deck Design

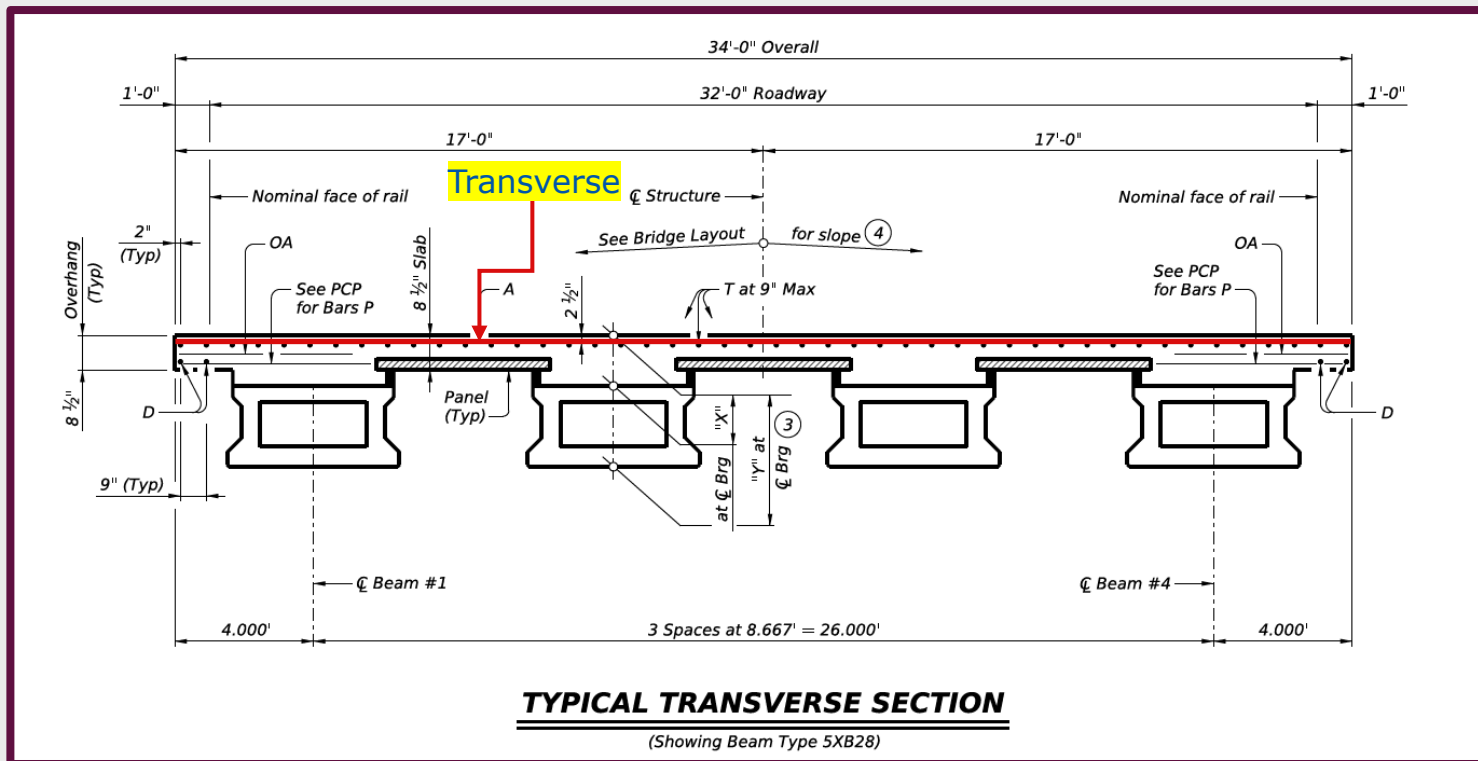
Top mat reinforcement in No. 4 bars at 9 in maximum spacing (0.27 sq in./ft.) in both transverse and longitudinal direction. Place **transverse** bars closest to the top slab surface. In the overhangs, place No. 5 bars extending 2 ft. minimum past fascia girder web centerline between each transverse No. 4 bar.

- “Flipping the mat”
- Changes the direction of the crack

Empirical Deck Design



Empirical Deck Design



Empirical Deck Design

- Updates to standards coming
 - TxGirder standards (~November)
 - X Beam standards (~November)
 - The Misc standards {PCP, SGMD, SGTS, etc} (~September)

Precast Alternates

- Chapter 3 — Superstructure Design
 - Section 18
 - Prefabricated Superstructure Alternatives
- Chapter 4 — Substructure Design
 - Section 11
 - Precast and Prefabricated Substructure Alternatives

Precast Alternates

Removing current SOP and replacing with a working drawing

- This working drawing must be modified on project-by-project basis, then signed and seal
- Do not develop complex precast alternatives



Precast Alternates

- Will be posted under the Misc standards
- PCA-SUP
- PCA-SUB

GENERAL NOTES:

Precast concrete alternate may be submitted in accordance with the TxDOT Bridge Design Manual - LRFD. Acceptance or denial of an alternate is at the sole discretion of the TxDOT impacts to the project schedule and any additional costs resulting from the use of an alternate are the responsibility of the Contractor.

Develop alternate using the TxDOT Bridge Standards and working drawings for precast alternates. An alternate not covered by the standards or design shall be developed based on the relevant concrete construction with the standards and working drawings. Do not include precast alternatives that will require additional studies or investigation without prior approval from Bridge Division.

Do not develop entire bridge redesigns. Precast Alternates must adhere to the design requirements of the original plans and as amended by the requirements provided in these sheets. Notes included on this sheet shall be reproduced on the Precast Alternate Plans, and followed for design and construction purposes.

The proposer of Precast Alternates shall be the new Engineer of Record for each portion of the bridge. The new Engineer of Record must be licensed by TxDOT and provide signed and sealed plans and calculations.

Design in accordance to ASDOT LRFD Bridge Design Specifications, the Edition 02/03 and TxDOT bridge Design Manual - LRFD (Aug 2024).

Provide alternate sheets that are detailed in accordance with the TxDOT Bridge Detailing Guide.

ALTERNATE SUBMISSION REQUIREMENTS:

Submit design concepts beyond the scope of TxDOT Bridge Standards and here within, in accordance with the procedure outlined below:

1. Contractor is solely responsible for impacts to schedule and cost due to alternate proposals.
2. Contractor meets with the TxDOT District PM to discuss impacted elements and qualifications.
3. The TxDOT District PM meets with the Bridge Division for approval of the concepts.
4. If approved, contractor creates alternate design packages with signed plans and calculations signed and sealed by an Engineer licensed by TxDOT. Shop drawings are not acceptable as Alternate Plans.
5. The TxDOT District PM sends the alternate design to TxDOT Bridge Division for a 21 calendar day review period, including public review. If comments are generated, the Contractor must address those comments and resubmit the alternate. The review time restarts with each submission.
6. The TxDOT District PM returns the contractor to whom and where to send the shop drawing submittals for review.
7. The TxDOT District PM ensures that approved alternate Plans are filed with certified plans to ensure the as-built plans are accurate and notifies the district bridge inspection coordinator of the change.

SUPERSTRUCTURE - WIDE FLANGE TX GIRDERS

For the exterior girders, the Contractor has the option of furnishing either the as designed T-girder or an approved alternate design for a Wide Flange T-girder. All alternate design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

Submit a revised plan set including the Bridge Layout, Bearing Seat Elevations, Span Sheets, Framing Plan, Beams/Chord details, Beams/Chord Stair Details, and Bearing Seat Details. Verify the substructure as shown in the plans is still applicable for alternate beam/girder load. Submit redesigned substructure sheets if a redesign is needed.

SUPERSTRUCTURE - ALTERNATE TYPE OF PRESTRESSED BEAMS

The Contractor has the option of furnishing either the as designed prestressed beam/girder or an approved alternate type of prestressed beam/girder design. All alternate design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

Submit a revised plan set including the Bridge Layout, Bearing Seat Elevations, Span Sheets, Framing Plan, Beams/Chord details, Beams/Chord Stair Details, and Bearing Seat Details. Verify the substructure as shown in the plans is still applicable for alternate beam/girder load. Submit redesigned substructure sheets if a redesign is needed.

SUPERSTRUCTURE - CONTINUOUS PRESTRESSED CONCRETE SPLICED GIRDERS

Contractor has the option of furnishing either the designed girder or an approved alternate girder. As an approved design, Contractor must meet the following design criteria and be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

LOADING:

Dead Loads: total weight of girder reinforced concrete: ____ ksf
 Live Loads: HS 20-IP Impact
 Design Temperature: Range of ____°F to ____°F with installation of ____°F
 Concrete Thermal Coefficient: 0.00006 per degree F
 Wind and Temperature Category: ____ with wind speed of ____ mph per hour
 Allowable Lateral force for substructure to substructure connection: 0.15 times the sum of the tributary dead loads and half the tributary live load.

PRE-TENSIONING PARAMETERS:

Modulus of elasticity = 29,000 ksi
 Optimal design for girders must have a calculated residual camber equal to or greater than that of the designed girder. Residual camber for the designed girder have been calculated for a relative humidity of ____ percent. Optional design must include camber.

POST-TENSIONING PARAMETERS:

Modulus of elasticity = 29,000 ksi
 ductility ratio = 1.25
 Friction coefficient, μ = 0.28
 Wobble coefficient, k = 0.00025
 Coefficiency between μ and k : Duct and CG Tension = 1°

LIMITS:


Temporary Stresses
 At time of transfer
 Compression: 0.85 F_c
 Tension: 0.24 (self weight)
 During transportation due to prestress plus 1.33 times self-weight
 Compression: 0.65 F_c
 Tension: 0.24 (self weight)
 During construction
 Compression: 0.65 F_c
 Tension: 0.24 (self weight)

Stresses at service levels after all losses have occurred
 Due to permanent losses including post tensioning the live load
 Compression: 0.65 F_c
 Tension: no tension allowed
 Due to service load combination (includes live load)
 Compression: 0.75 F_c
 Tension: 0.09 (self weight) + 0.33 (Service II)
 Minimum Tension: 0.11 (self weight)
 Due to fatigue load (Fatigue II) live load plus one-half of the sum of prestress and permanent design loads
 Compression: 0.60 F_c
 Tension: no tension allowed

Stresses in post-tensioning strand
 Prior to splicing the chucks
 0.90 F_y
 At the time of transfer (after casting of the chucks)
 At anchorages: 0.70 F_y
 Elsewhere: 0.74 F_y
 Due to service load combinations after all losses have occurred (with and without live load)
 0.80 F_y

NOTE TO DESIGNER:

These sheets are to be used as a guide for preparing plans for precast superstructure alternatives. Included on these sheets are design and construction requirements for various superstructure precast options. Include appropriate notes from this guide for the specific application. These sheets cannot be used without modification in all cases (note not required) must be reviewed. This note and the phrase "Not to be used as a standard" must be removed and the sheet must be signed and sealed by a Professional Engineer.

 <p>Texas Department of Transportation</p>	<p>Bridge Division</p>
<p>PRECAST SUPERSTRUCTURE ALTERNATES</p>	
<p>(Not to be used as a standard)</p>	
<p>NO. _____</p>	<p>DATE _____</p>

Precast Alternates

NOTE TO DESIGNER:

These sheets are to be used as a guide for preparing plans for precast superstructure alternates. Included on these sheets are design and construction requirements for various superstructure precast options. Include appropriate notes from this guide for the specific application. These sheets cannot be used without modification and in all cases notes not required must be removed. This note and the phrase "Not to be used as a standard" must be removed and the sheet must be signed and sealed by a Professional Engineer.



Texas Department of Transportation

Bridge
Division

PRECAST SUPERSTRUCTURE ALTERNATES

(Not to be used as a standard)

NOTE TO DESIGNER:

These sheets are to be used as a guide for preparing plans for precast substructure alternates. Included on these sheets are design and construction requirements for various substructure precast options. Include appropriate notes from this guide for the specific application. These sheets cannot be used without modification and in all cases notes not required must be removed. This note and the phrase "Not to be used as a standard" must be removed and the sheet must be signed and sealed by a Professional Engineer.



Texas Department of Transportation

Bridge
Division

PRECAST SUBSTRUCTURE ALTERNATES

(Not to be used as a standard)

Steel Straddle Bent Caps

- Chapter 4 — Substructure Design
 - Section 6
 - Steel Straddle Bent Caps



Steel Straddle Bent Caps

Updating some of the wording in manual, basic process is still the same

- Redundancy -> Internal Redundancy
- FHWA approval



Elastomeric Bearings

- Chapter 5 — Other Designs
 - Section 2
 - Steel-Reinforced Elastomeric Bearings for Pretensioned Concrete Beams
 - Use load factor for uniform temperature (TU) of 1.0






Standards Updates



August 21, 2024

Want to know what changed?

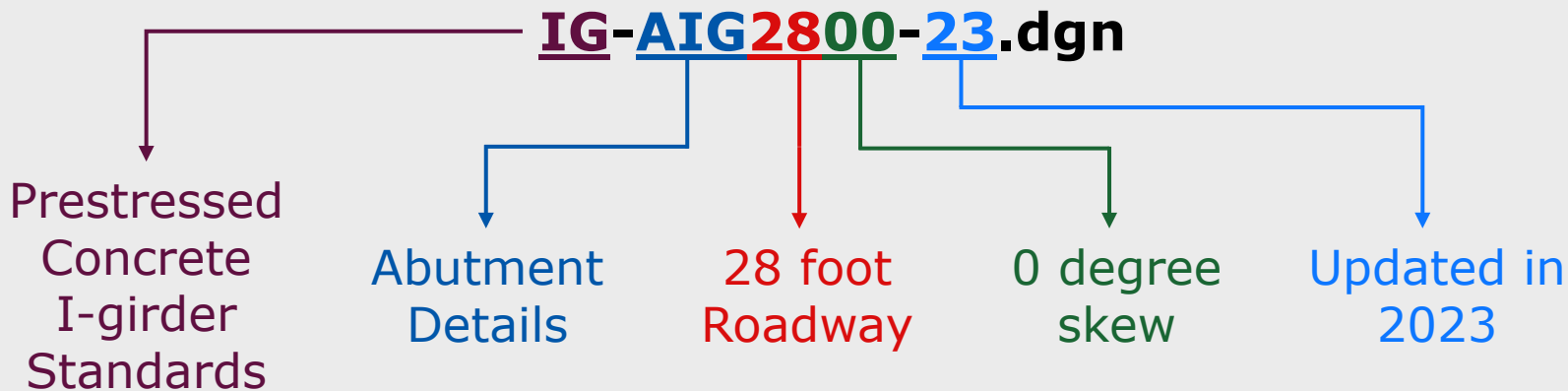
- <https://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/bridge-e.htm>

<i>Memorandums of Issued/Revised Standards From September 2000 to Present</i>		
Rev Date	Subject	File Name
08/06/2024	New Wide Flange I-Girder Standards	 memo83.pdf
06/18/2024	New and Revised Culvert and Drainage Standards	 memo82.pdf
06/18/2024	New and Revised Bridge Railing Standards	 memo81.pdf
06/18/2024	New Wildlife Accommodation Standards and Working Drawings	 memo80.pdf
05/29/2024	New Foundation Note sheet and Foundation Load Sheets for Designers Information	 memo79.pdf
02/23/2024	New and Revised Working Drawings	 memo78.pdf
10/23/2023	Revised Prestressed Concrete I-Girder Standard Drawings	 memor77.pdf
07/31/2023	All Standard Drawings Update for Sheet Models and File Names	 memoi76.pdf
06/26/2023	Revised Culvert Standard Drawings	 memoi75.pdf
04/17/2023	New OBM Templates	 memoi74.pdf
03/09/2023	New and Revised Miscellaneous, Bridge Railing, Culvert, I-Girder and U-beam Standard Drawings	 memoi73.pdf
01/18/2023	New and Revised Concrete I-Girder Standard Drawings	 memoi72.pdf
08/23/2022	Revised Prestressed Concrete X Beam Standard Drawings	 memor71.pdf
08/23/2022	Revised Retaining Wall Standard Drawings	 memor70.pdf
08/08/2022	New Working Drawings	 memoi69.pdf

Standard Drawing File Names

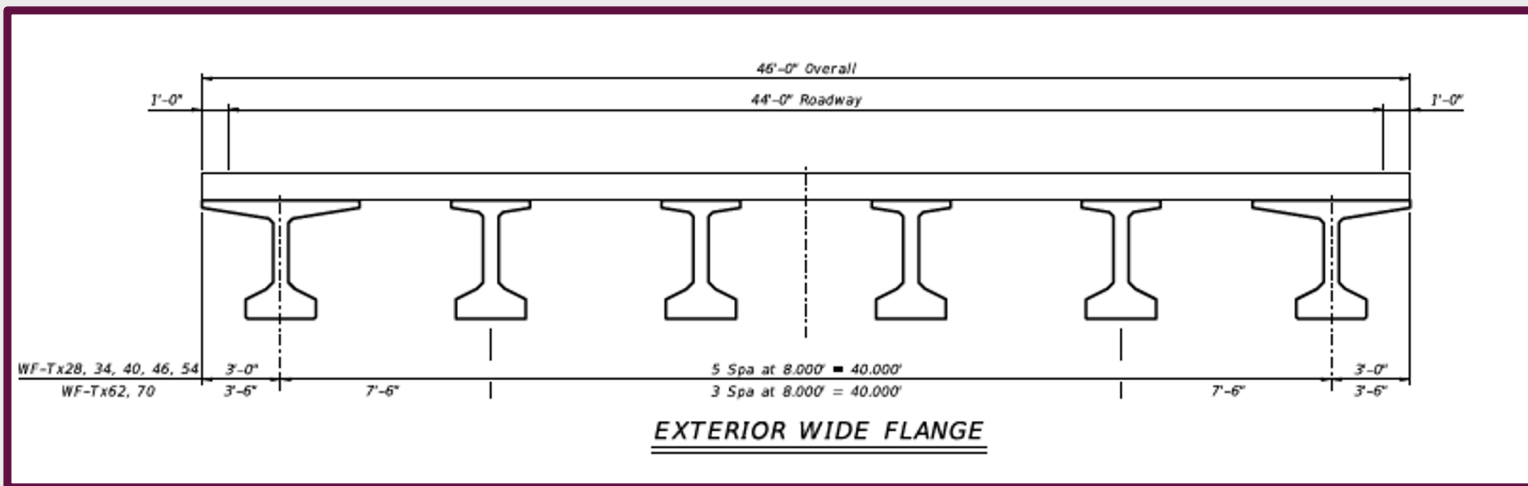
File names now represent standard type, standard name, and year of posting or most recent revision. Some names contain more information than others.

- For example, SSTR has a file name of RL-SSTR-19



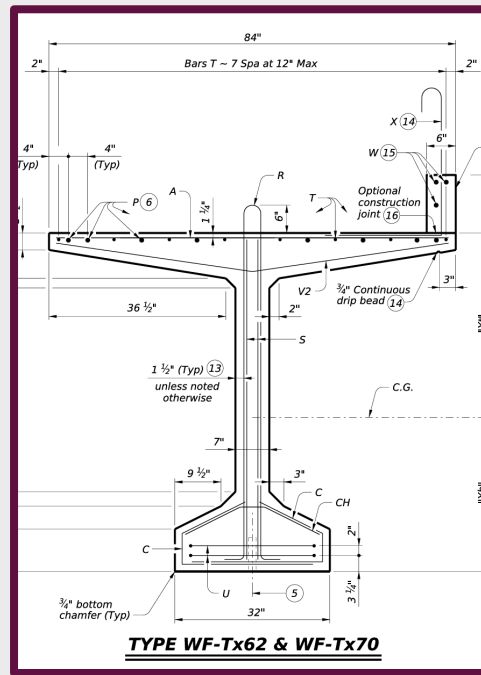
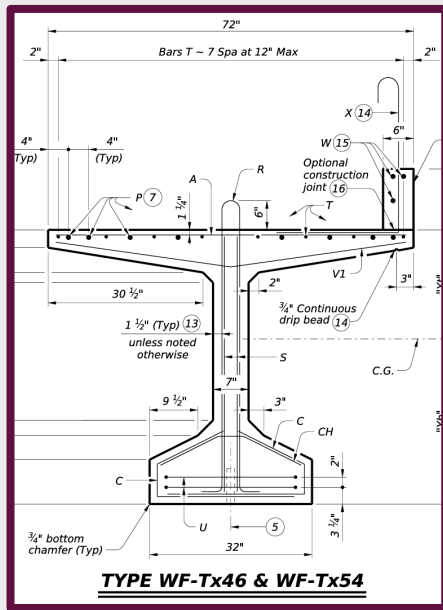
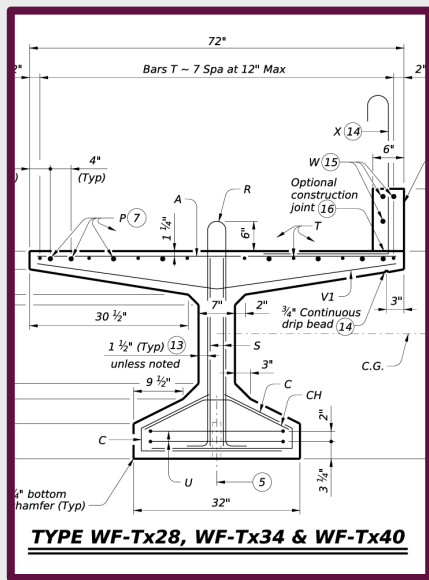
Wide Flanges

- The wide flange girder may be used as exterior girders (Exterior Wide Flange) or as all the girders (All Wide Flange). When used as exterior girder, the wide flange is placed along the deck edge and replaces the traditional 3-foot overhang.



Wide Flanges

- Prestressed Concrete Wide Flange I-Girder Details (WF-IGD) standard provides the girder shapes and reinforcement details



Wide Flanges

- Prestressed Concrete Wide Flange I-Girder Designs (WF-IGND) standard is to provide the strand pattern and optional design information. This sheet must be filled out, the block removed, and the sheet signed and sealed.

STRUCTURE	DESIGNED GIRDERS										DEPRESSED STRAND PATTERN	CONCRETE			OPTIONAL DESIGN				LOAD RATING FACTORS				NON-STANDARD STRAND PATTERNS	
	SPIN NO.	SPIN NO.	ORDER TYPE	NO. OF STRANDS	TOTAL NO.	SIZE	STITCH	"x"	"x"	"x"		NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	PATTERN	STRAND ARRANGEMENT AT 'E' OF GIRDER	

TYPE WF-Tx28, WF-Tx34 & WF-Tx40

TYPE WF-Tx46 & WF-Tx54

TYPE WF-Tx62 & WF-Tx70

① Based on the following allowable stresses (ksi):
 Compression = 0.65 f_c'
 Tension = $0.24 \sqrt{f_c'}$
 Optional designs must likewise conform.

② Portion of full HL93.

DESIGN NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications. Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.
 Optional designs for girders 22.5 feet or longer must have a calculated section modulus ratio to be greater than that of the designed girder.
 Prestress losses for the designed girders have been calculated for a relative humidity of ___ percent. Optional designs must likewise conform.

FABRICATION NOTES:
 Provide Class B rebar.
 Provide Grade 60 reinforcing steel bars.
 Use four reinforcement strands, each prestressed to 75 percent of f_p .
 Full-length debonded strands are only permitted in optional designs marked "D". Double wrap full-length debonded strands in outer most position of each.
 When shown on this sheet, the Fabricator has the option of furnishing other the designed girder or an approved optional design. All optional design submissions must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.
 Side cracks in girder ends according to 6.10.11.1 in width as directed by the Engineer. The Fabricator is permitted to decrease this spacing of rebar as long as it provides additional steel to help limit crack width provided the decreased spacing results in no less than 2" clear between bars. The Fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

DEPRESSED STRAND DESIGNS:
 Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Full 2" x 2" grid spacing is required. If the 2" x 2" grid spacing is not possible, the spacing shall be no less than 2" in any direction and the spacing shall be no less than 2" in any direction. All strands in the "A" position must have a minimum of 2" spacing to the top of the girder. At the girder ends, the upper two strands are in the position shown in the table.

To complete this sheet input the girder designs in the table and the responsible vendor design files. In all cases, remove this block. This sheet must be signed, sealed, and dated by a registered Professional Engineer.

HL93 LOADING

PRESTR CONC WIDE FLANGE I-GIRDER DESIGNS (NON-STANDARD SPANS)

WF-IGND

Rev. 04/01 (02/24) | Rev. 10/07 | Rev. 10/07 | Rev. 07/11 | Rev. 10/11

DATE: _____

DESIGNER: _____

CHECKER: _____

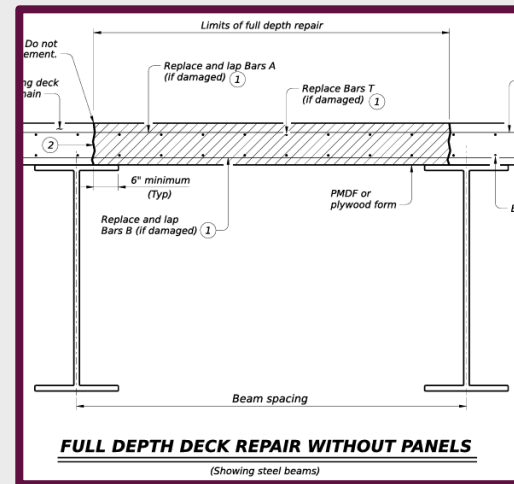
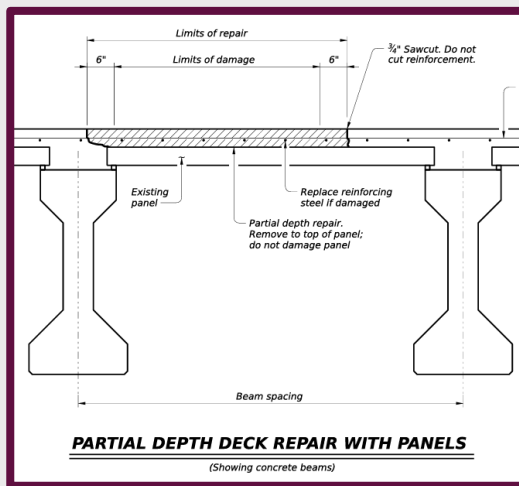
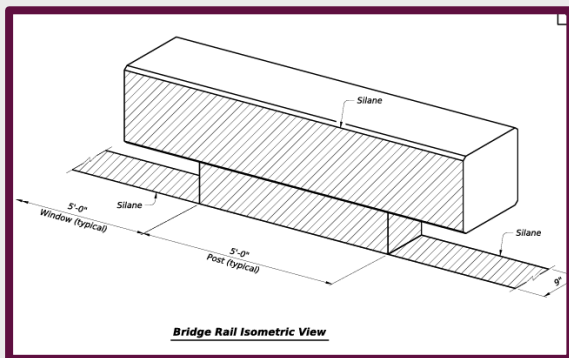
BridgeLink v8.0.6 (PGSUPER)

- New wide flange TxGirder shapes and templates are available in latest BridgeLink version
- <https://www.txdot.gov/business/resources/design-tools-training/txdot-fhwa-engineering-software.html>
- Bearing Seat Elevations are not part of Geometry Report in this version. Please go to the Details Report for this output.

Working Drawings

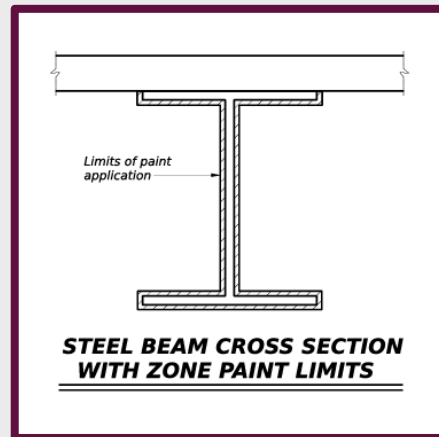
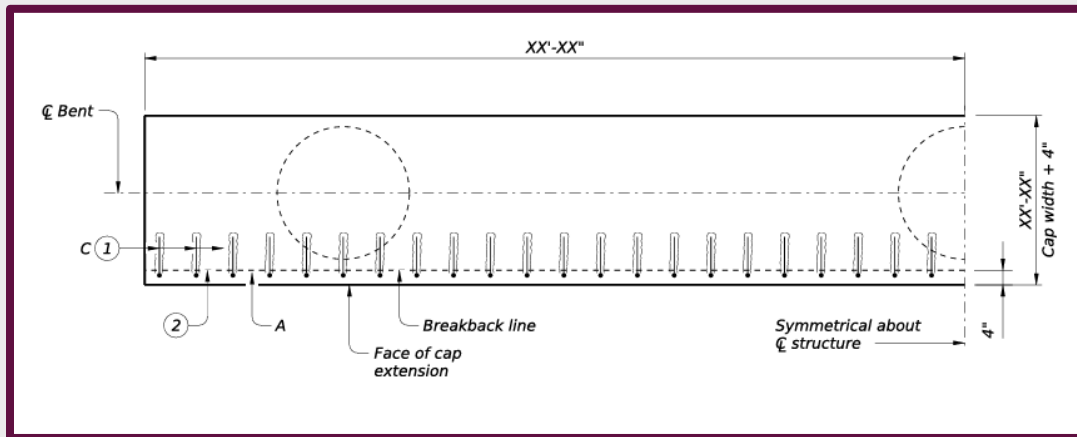
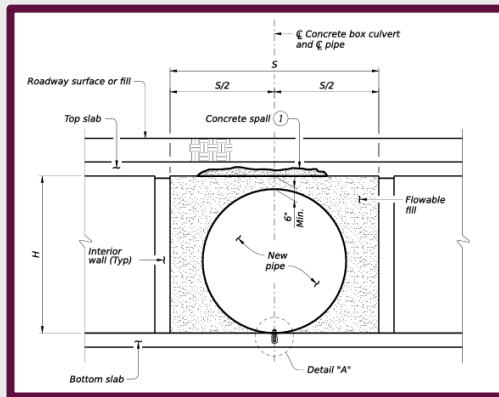
New Working Drawings posted on Feb 2024

- Full Depth Deck Repair
- Partial Depth Deck Repair
- Waterproofing Details



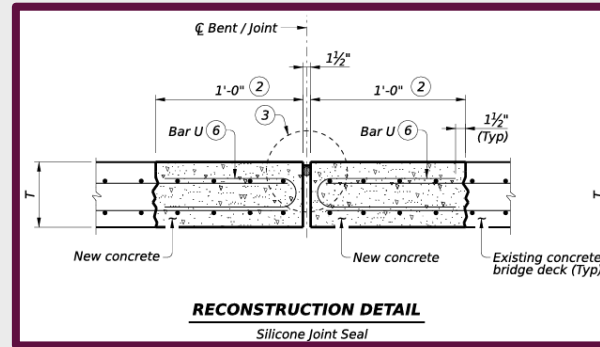
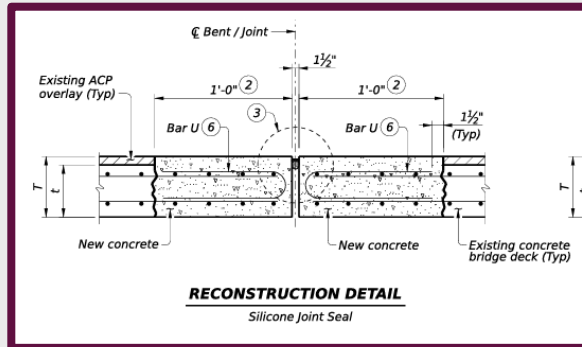
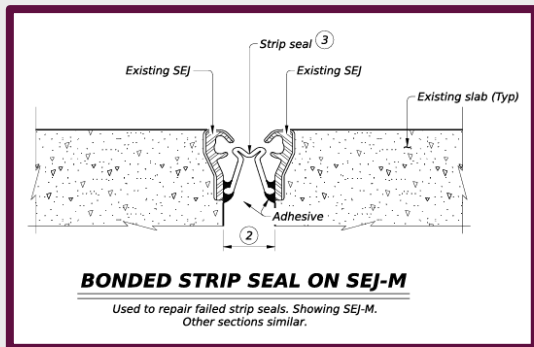
Working Drawings

- Zone Painting Details
- Bent Cap Repair Details
- Box Culvert Slip Lining Details



Working Drawings

- Cleaning and Sealing Existing Bridge Joints (Strip Seal)
- Joint Repair and Replacement Details (Bridges with Asphalt Overlay)
- Joint Repair and Replacement Details (Bridges without Asphalt Overlay)



Thermoplastic Pipes, Joints, and Fittings

TRENCH AND BEDDING DIAGRAM

NOTE TO DESIGNER:
This sheet is to be used as a guide for installing thermoplastic pipe backfill as well as any limitations (including maximum fill depth) on use of aggregate backfills. Include trench excavation protection as required and confirm whether filter fabric, shown in "Trench and Bedding Diagram" is required or not necessary.
Pipe installation is accordance with the following:
(1) Refer to the manufacturer's installation instructions.
(2) This sheet cannot be used without modification and in all cases, details and details not required to be removed. This note and the phrase "Not to be used as a standard" must be removed and the sheets must be signed and sealed by a Professional Engineer.

EXPOSED END OF PIPE PROTECTION

Provide concrete headwall, wingwalls, and apron at each exposed end of pipe

MAXIMUM FILL DEPTH		PIPE DEDUCT FROM FILL	
Pipe Diameter (Inches)	Depth (Feet)	Pipe Diameter (Inches)	Minimum (Feet)
12	12	12	0.95
18	18	18	2.09
24	24	24	3.65
30	30	30	5.76
36	36	36	8.22
42	42	42	11.80
48	48	48	15.90

Note: Maximum fill depth measured from top of pipe to top of finished grade or pavement.

- Excavate to create vertical trench with a minimum height of 2" above pipe to ensure uniformity in compaction above pipe. Use firm, stable material. If the trench walls rough or are unstable, widen or restore trench as directed.
- When placing pipe in an embankment, limit trench depth to 2" above pipe to ensure uniformity in compaction above pipe, unless otherwise allowed. See Item 402, "Trench Excavation Protection."
- Minimum bedding thickness is 4" on a stable foundation. If foundation consists of large rocks, increase minimum bedding thickness to 8". Do not compact the bedding directly under the pipe as shown.
- Ensure backfill completely fills the void between the bedding and the pipe in the excavation. Compact backfills in 6" lifts and shovel compaction.
- Backfill above structural backfill may be other embankment as shown on the plans.
- See specifications for minimum cover required when subject to heavy earth moving equipment.
- Provide a minimum total cover depth to accommodate pavement structure depth and 4" of minimum pipe structural depth for pipe diameters up to 36". Provide a minimum total depth of fill not less than 48" for pipe diameters over 36".
- See specifications for minimum trench width.
- Perform manhole testing in the presence of the Engineer prior to placing roadway surface.
- Quantity to deduct for structural backfill measurement.

GENERAL NOTES:
Since this sheet is to be used for pipe structural backfill, submit a plan to install pipe or a plan to install fill to the owner.
Trench and final thermoplastic pipe accordance with Item 402, "Thermoplastic Pipe Culverts and Drains."
Agree that the Engineer is required when performing manhole testing under Item 41, "Manhole Testing."
Payment for excavation, shaping, bedding, structural backfill, final backfill, and concrete end treatments will be in accordance with applicable bid items.

THERMOPLASTIC PIPE INSTALLATION
(Not to be used as a standard)

P.E. SEAL REQUIRED
PRELIMINARY
SUBJECT TO REVISION

To Owner: 2 sheets
To Engineer: 1 sheet
To Bidder: 1 sheet
To Inspector: 1 sheet
To Surveyor: 1 sheet
To Utility: 1 sheet
To Water: 1 sheet

DATE: June 2024
BY: [Signature]

MAXIMUM FILL DEPTH

Pipe Diameter (Inches)	Depth (Feet)
12	
18	
24	
30	
36	
42	
48	

Note: Maximum fill depth measured from top of pipe to top of finished grade or pavement.

Thermoplastic Pipes, Joints, and Fittings

<https://www.txdot.gov/business/resources/highway/bridge/pipe-design-durability.html>

Structural Design Considerations for Specifying Thermoplastic Pipe

- Materials
- Site Condition
- Excavation
- Design Loading

Working Drawings

Revised working drawings include the following:

- Bridge Deck Overlay Notes
- Cleaning and Sealing Existing Bridge Joints (Pan Girders)
- Cleaning and Sealing Existing Bridge Joints
- Precompressed Foam Expansion Joint Seal
- Elastomeric Bearing Replacement Details for Concrete Beams
- Elastomeric Bearing Replacement Details for Steel Beams
- Prestressed Concrete Beam Repair Details
- Bridge Protective Beam Wrap
- Steel Beam Repair
- Pile Encasement Details

LRFD Foundations

- The FDN is a working drawing that must be filled out, modified, sign, sealed, and dated by a Professional Engineer for all bridge foundations designed using LRFD in accordance with the TxDOT Geotechnical Manual – LRFD



LRFD Foundations

- Provide foundation design data in plan sheets

FOUNDATION DESIGN DATA					
<i>Abutments</i>			<i>Bents</i>		
<i>Load Case</i>	<i>Strength I</i>		<i>Load Case</i>	<i>Strength I</i>	
<i>Axial Foundation Loads (tons)</i>	81	<i>Abut No. 1</i>	<i>Axial Foundation Loads (tons)</i>	134	<i>Bent No. 2</i>
	87	<i>Abut No. 4</i>		146	<i>Bent No. 3</i>
<i>Nominal Friction Resistance (tons/square foot)</i>	1.2	<i>(clay)</i>	<i>Nominal Friction Resistance (tons/square foot)</i>	1.2	<i>(clay)</i>
	3.8	<i>(shale, IGM)</i>		3.8	<i>(shale, IGM)</i>
				11.6	<i>(limestone, intact)</i>
<i>Friction Resistance Factor(s)</i>	0.45	<i>(clay)</i>	<i>Friction Resistance Factor(s)</i>	0.45	<i>(clay)</i>
	0.7	<i>(shale, IGM)</i>		0.7	<i>(shale, IGM)</i>
				0.55	<i>(limestone, intact)</i>
<i>Cumulative Factored Friction Resistance (tons/shaft)</i>	99		<i>Cumulative Factored Friction Resistance (tons/shaft)</i>	299	
<i>Nominal Bearing Resistance (tons/square foot)</i>	46		<i>Nominal Bearing Resistance (tons/square foot)</i>	315	
<i>Bearing Resistance Factor</i>	0.7		<i>Bearing Resistance Factor</i>	0.5	
<i>Factored Bearing Resistance (tons/shaft)</i>	101		<i>Factored Bearing Resistance (tons/shaft)</i>	495	
<i>Additional Notes:</i> <i>Design lengths based on side resistance (skin friction) alone, and disregarding to an elevation of 383 feet.</i>			<i>Additional Notes:</i> <i>Design lengths based on side resistance (skin friction) alone, and disregarding to an elevation of 372 feet.</i>		

LRFD Foundations

- For standard bridge designs, use the Foundation Loads for Designer's Information sheets to fill out the tables on the FDN. The Foundation Loads for Designer's Information sheets provide foundation loads for a given beam type, roadway width, and span length as covered by the standard bridge types.
- **The Foundation Load for Designer's Information sheets must not be included in the plan set.** These sheets are for reference and are to be used by the designer only.

LRFD Foundations

TABLE OF FOUNDATION LOADS - 0° SKEW

Span Average	Drilled Shaft Loads				Pile Load											
	DC	LL	Service / Strength		3 Pile				4 Pile							
			(1)	(2)	DC	LL	Service / Strength	DC	LL	Service / Strength	DC	LL	Service / Strength			
Ft	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Pile
40	76	28	104	144	29	10	39	54	23	7	30	41				
45	83	30	113	156	31	10	41	56	24	8	32	44				
50	89	31	120	166	33	11	44	61	26	8	34	47				
55	95	33	128	177	35	11	46	63	27	9	36	50				
60	102	34	135	186	37	12	49	67	29	9	38	52				
65	107	35	142	195	39	12	51	70	30	9	39	53				
70	114	37	151	207	41	13	54	74	32	10	42	58				
75	120	38	158	217	44	13	57	78	34	10	44	60				
80	126	39	165	226	46	13	59	80	35	10	45	61				
85	132	40	172	235	48	14	62	85	37	10	47	64				
90	139	42	181	247	50	14	64	87	38	11	49	67				
95	145	43	188	257	52	15	67	91	40	11	51	69				
100	151	44	195	266	54	15	69	94	41	11	52	71				
105	157	45	202	275	56	15	71	96	43	12	55	75				
110	163	46	209	284	58	16	74	101	44	12	56	76				
115	170	47	217	295	60	16	76	103	46	12	58	79				
120	178	49	225	306	62	17	79	107	48	13	61	83				
125	182	50	232	315	64	17	81	110	49	13	62	84				

TABLE OF FOUNDATION LOADS - 15° SKEW

Span Average	Drilled Shaft Loads				Pile Load											
	DC	LL	Service / Strength		3 Pile				4 Pile							
			(1)	(2)	DC	LL	Service / Strength	DC	LL	Service / Strength	DC	LL	Service / Strength			
Ft	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Pile
40	77	28	105	145	29	10	39	54	23	7	30	41				
45	83	30	113	156	31	10	41	56	24	8	32	44				
50	89	31	120	166	33	11	44	61	26	8	34	47				
55	95	33	128	177	35	11	46	63	27	9	36	50				
60	102	34	136	187	37	12	49	67	29	9	38	52				
65	108	35	143	196	39	12	51	70	30	9	39	53				
70	114	37	151	207	42	13	55	75	32	10	42	58				
75	120	38	158	217	44	13	57	78	34	10	44	60				
80	126	39	165	226	46	13	59	80	35	10	45	61				
85	133	40	173	236	48	14	62	85	37	10	47	64				
90	139	42	181	247	50	14	64	87	38	11	49	67				
95	145	43	188	257	52	15	67	91	40	11	51	69				
100	151	44	195	266	54	15	69	94	41	11	52	71				
105	158	45	203	276	56	15	71	96	43	12	55	75				
110	164	46	210	286	58	16	74	101	44	12	56	76				
115	170	47	217	295	60	16	76	103	46	12	58	79				
120	176	49	225	306	62	17	79	107	48	13	61	83				
125	182	50	232	315	64	17	81	110	49	13	62	84				

TABLE OF FOUNDATION LOADS - 30° SKEW

Span Average	Drilled Shaft Loads				Pile Load											
	DC	LL	Service / Strength		3 Pile				4 Pile							
			(1)	(2)	DC	LL	Service / Strength	DC	LL	Service / Strength	DC	LL	Service / Strength			
Ft	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Pile
40	78	28	106	147	30	10	40	55	23	7	30	41				
45	84	30	114	158	32	10	42	58	25	8	33	45				
50	90	31	121	167	34	11	45	62	26	8	34	47				
55	97	33	130	179	36	11	47	64	28	9	37	51				
60	103	34	137	188	38	12	50	69	29	9	38	52				
65	109	35	144	198	40	12	52	71	31	9	40	55				
70	115	37	152	209	42	13	55	75	32	10	42	58				
75	121	38	159	218	44	13	57	78	34	10	44	60				
80	128	39	167	228	46	13	59	80	35	10	45	61				
85	134	40	174	238	48	14	62	85	37	10	47	64				
90	140	42	182	249	50	14	64	87	39	11	50	68				
95	146	43	189	258	52	15	67	91	40	11	51	69				
100	153	44	197	268	54	15	69	94	42	11	53	72				
105	159	45	204	278	56	15	71	96	43	12	55	75				
110	165	46	211	287	59	16	75	102	45	12	57	77				
115	172	47	218	296	61	16	77	104	46	12	58	79				
120	177	49	226	307	63	17	80	109	48	13	61	83				
125	184	50	234	318	65	17	82	111	49	13	62	84				

TABLE OF FOUNDATION LOADS - 45° SKEW

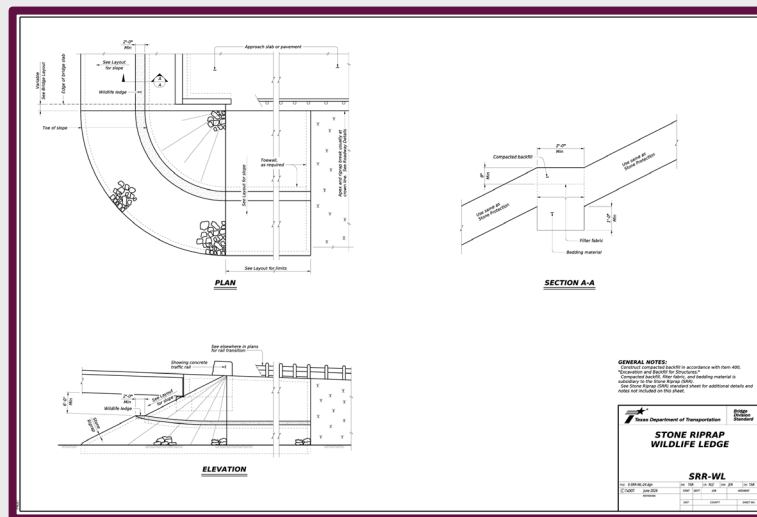
Span Average	Drilled Shaft Loads				Pile Load											
	DC	LL	Service / Strength		3 Pile				4 Pile							
			(1)	(2)	DC	LL	Service / Strength	DC	LL	Service / Strength	DC	LL	Service / Strength			
Ft	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Pile
40	80	28	108	149	30	10	40	55	24	7	31	42				
45	86	30	116	160	32	10	42	58	25	8	33	45				
50	92	31	123	169	34	11	45	62	27	8	35	48				
55	99	33	132	182	36	11	47	64	28	9	37	51				
60	105	34	139	191	39	12	51	70	30	9	39	53				
65	111	35	146	200	41	12	53	72	31	9	40	55				
70	117	37	154	211	43	13	56	77	33	10	43	59				
75	124	38	162	222	45	13	58	79	34	10	44	60				
80	130	39	169	231	47	13	60	82	36	10	46	63				
85	136	40	176	240	49	14	63	86	38	10	48	65				
90	142	42	184	251	51	14	65	88	39	11	50	68				
95	148	43	191	260	53	15	68	93	42	11	52	71				
100	155	44	199	271	55	15	70	95	42	11	53	72				
105	161	45	206	280	57	15	72	98	44	12	56	76				
110	167	46	213	289	59	16	75	102	45	12	57	77				
115	173	47	220	299	61	16	77	104	47	12	59	80				
120	180	49	229	311	63	17	80	109	48	13	61	83				
125	186	50	236	320	65	17	82	111	50	13	63	85				

LRFD Foundations

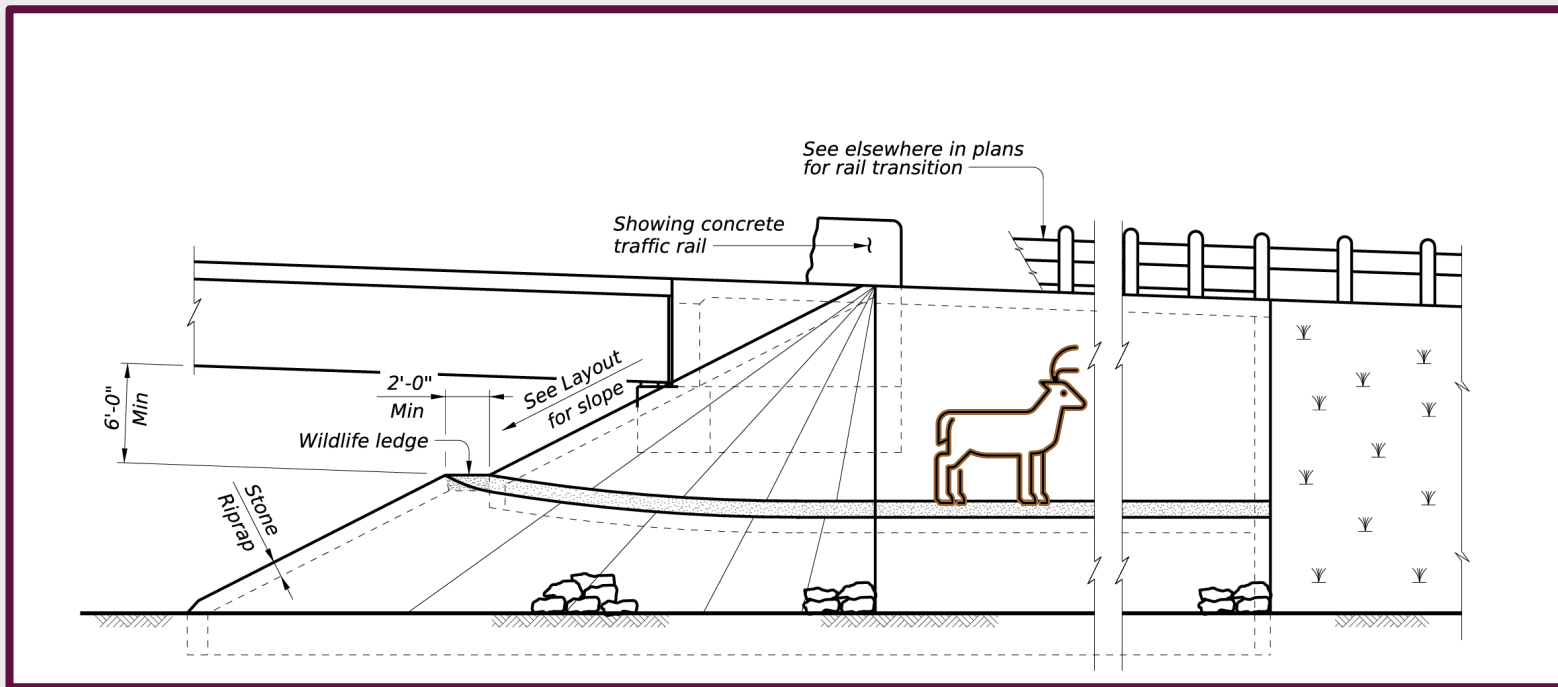
TABLE OF FOUNDATION LOADS - 0° SKEW									
Span Average	Beam Type	Drilled Shaft Loads				Pile Loads			
		DC	LL	Service I (1)	Strength I (2)	DC	LL	Service I (1)	Strength I (2)
Ft		Tons/Shaft	Tons/Shaft	Tons/Shaft	Tons/Shaft	Tons/Pile	Tons/Pile	Tons/Pile	Tons/Pile
25	5SB12	41	22	63	90	25	14	39	56
30	5SB12	48	25	73	104	29	15	44	63
35	5SB12	54	27	81	115	33	16	49	69
40	5SB12	61	28	89	125	37	17	54	76
25	5SB15	46	22	68	96	28	14	42	60
30	5SB15	54	25	79	111	33	15	48	68
35	5SB15	61	27	88	124	37	16	53	74
40	5SB15	68	28	96	134	41	17	58	81
45	5SB15	75	30	105	146	45	18	63	88
50	5SB15	82	31	113	157	50	19	69	96

Wildlife Accommodations

- Stone Riprap Wildlife Ledge (SRR-WL) standard that works in conjunction with the Stone Riprap standard to provide a wildlife path
- Still need to include the SRR in plan set when using SRR-WL



Wildlife Accommodations



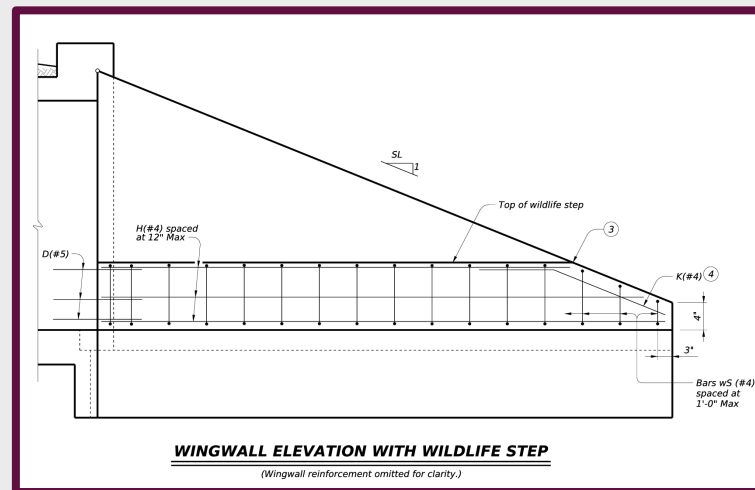
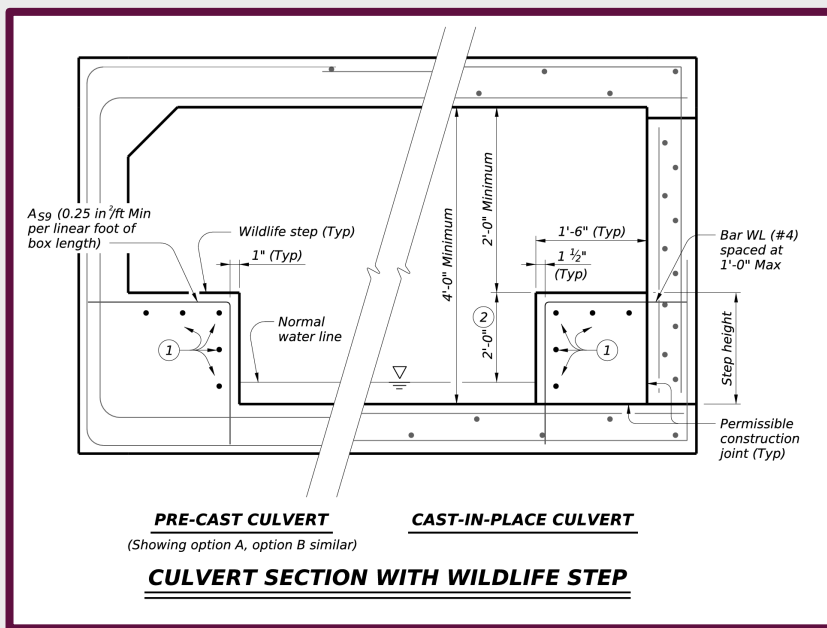
Wildlife Accommodations

- Wildlife Step for Box Culverts (WSBC) standard that works with the concrete box culvert standard to provide a wildlife step above the water line

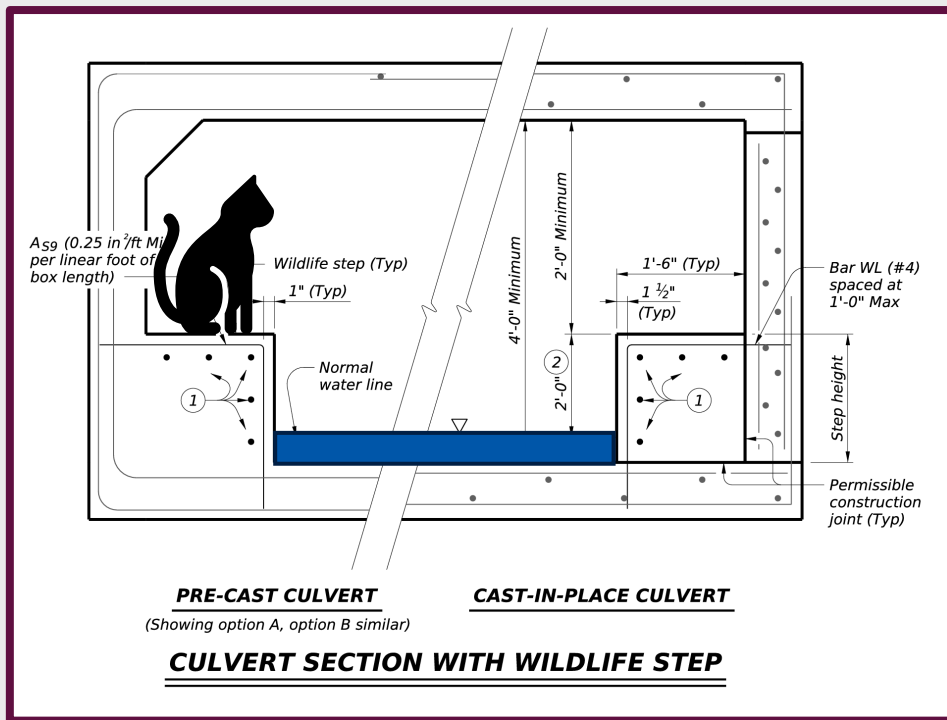


Wildlife Accommodations

- To be used with Pre-Cast Single Box Culverts, Cast-in-Place Single Box or Multiple Box Culverts, along with wingwall and end treatment standards

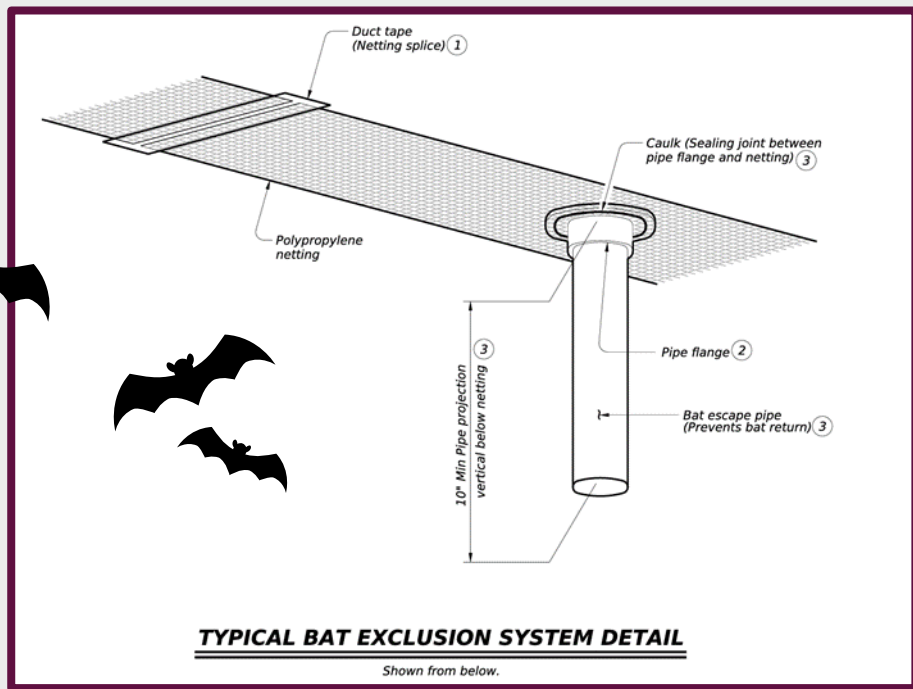


Wildlife Accommodations



Wildlife Accommodations

- Bat Exclusion System (BES) working drawing that provides guidance for construction projects



3D Models

- Required for 30% PBLR and 100% submittal
- TxDOT districts have the discretion to request the model at additional milestones
- Consists of 3D elements for slab, beams, abutments, wingwalls, caps, columns, and foundations
- <https://www.txdot.gov/business/resources/highway/bridge/3d-bridge-modeling.html>
- More Questions on 3D Models? Ask Bridge3DDesign@txdot.gov

3D Models

- Are you looking to prepare a letter report which includes the findings of the comparison of OBM 3D bridge model geometry and quantities verified by traditional design methods?
 - Templates are available [here](#)

3D bridge modeling

Bridge design, construction, maintenance, inspection, and management

Pipe design and durability

Shop drawing submittal cycle

Approved systems ▼

Geotechnical ▼

Construction ▼

Webinar presentations ▼

Extended span precast girders

Texas Steel Quality Council

Resources

- [Expectation of Use of OpenBridge Designer](#)
- [OpenBridge Designer Workspace Files](#)
- [OpenBridge Designer Workspace Readme](#)
- [OpenBridge Designer FAQs](#)
- [Bridge Standards - OBM Templates](#) [↗](#)
- [3D Model Completion Checklist](#)
- [OBM Comparison Report Template](#)
- [OBM Comparison Bearing Seat Elevations](#)
- [OBM Comparison Quantities](#)
- [OBM Drafting Workflow](#)

OpenBridge Modeler Training 2024

- [TxDOT OBM Training Manual](#)
- [TxDOT OBM Training Videos](#)
- [BRG300-OBM.zip](#)

Questions

- Under what scenarios would engineers be encouraged to use the new WF TxGirders?
 - Wide Flange girders enable faster and safer construction by eliminating the need for overhang brackets
- If we have submitted 60% plans and are in process of working towards 90%, do we still need to incorporate the new WF for exterior? What is the cutoff time for incorporation of these new standards?
 - Currently, consideration for providing these optional exterior wide flange girder designs should be given to project that are at 30% design or less

Questions

- With the new FDN sheet, will we still have to show foundation loads on the abutment and bent detail sheets?
 - Foundations loads will no longer be required on the abutment and bent details and will be shown on the FDN sheet
- Will the foundation sheets require dual signatures by the structural and geotechnical engineers?
 - The FDN sheet will be signed by the engineer responsible for the geotechnical design

Questions


- What version of PGSuper do you recommend we use at this point?
 - BridgeLink v8.0.6 (PGSUPER) now available [here](#)
- Will the OBM comparison report be required for PBLR Submittal?
 - The OBM comparison reports are required at the 100% submittal with the 100% 3D model

Reminders

- Chat is turned off, please use the Q&A box
- Slides will be posted on the Bridge Website:
<https://www.txdot.gov/business/resources/highway/bridge/webinar-presentations/bridge-briefings.html>
- Please submit additional Bridge Design related questions brg-design@txdot.gov

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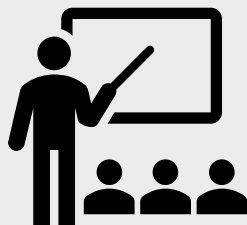
Steel Quality Council

Superheavy Review

Texas Ancillary Structures Interest Group

PDH

- Please remember Bridge Division does not provide documentation for TX Board PDH approval. Each engineer should exercise personal judgement when counting webinar topics for their professional development hours. For more info on what qualifies for Continuing Education, please visit <https://pels.texas.gov/CEPInfo.htm>





Next Bridge Briefing: Sept 19th TIP Testing and Load Testing Drilled Shaft Guidance



August 21, 2024