



UPDATES

Project Management, Field Operations,
Bridge Design and Standards





PROJECT MANAGEMENT

Vertical Clearance on Freight Corridors
& Emergency Response for Damaged Bridges





VERTICAL CLEARANCE ON FREIGHT CORRIDORS



Purpose and Goals

- The Texas Freight Mobility Plan was accepted by the Texas Transportation Commission at the January 2016 Commission Meeting.
- Section 11.6.5 states, “TxDOT should develop a Bridge Reconstruction and Replacement Program to address deficient bridges, increase vertical clearance to 18 feet 6 inches to accommodate oversize/overweight vehicles and military transportation needs and facilitate efficient movement of people and goods”.
- *PLAN* but no *POLICY*. Policy requires:
 - Detailed information
 - Implementation Date
- Freight Corridor Vertical Clearance Workgroup formed to assist in formulating a policy for increased vertical clearance on freight corridors.

Draft Memo Providing Policy Direction

- For projects letting **09/2019** and later, 18.5-ft bridge underpass vertical clearance is required for all Primary and Secondary TxDOT Freight Corridors for all new construction and reconstruction projects. Prior to this implementation date, current guidelines for underpass vertical clearance may be used at the direction of the District Engineer. **The 18.5-ft vertical clearance shall not apply to Freight Corridor overpasses, frontage roads, direct connectors off the Freight Corridor, and entrance and exit ramps that include bridge underpasses.** All incidental vertical obstructions inclusive to Freight Corridors, such as overhead sign bridges, must exceed 18.5-ft vertical clearance.
- It is recognized that many of the metropolitan areas will not be able to meet the 18.5-ft underpass vertical clearance in the downtown areas. District Engineers are to determine major city bypass routes in conjunction with their MPO's and Local Governments by **March 1, 2018.**

Draft Memo Providing Policy Direction

- Primary and Secondary TxDOT Freight Corridors are defined on the Statewide Planning Map on Crossroads at the TPP Division webpage (<http://crossroads.org/tpp/StatewideMapping>). The Statewide Planning Map can be used to locate underpasses and information about existing vertical clearances.
- Exceptions approval authority for 18.5-ft vertical clearances on Freight Corridors and Freight Bypass Routes will reside with the Design Division in consultation with the Bridge Division.
- Divisions shall revise the appropriate manuals, standards, and guidance documents by **March 1, 2018**. Notable examples include the Roadway Design Manual, Bridge Project Development Manual, and the Texas MUTCD. All Division Directors shall ensure that any documents they are responsible for are in compliance with this memo.
- If you have any questions, please contact the Design Division for assistance.



EMERGENCY RESPONSE FOR DAMAGED BRIDGES

2017 BRIDGE WEBINAR



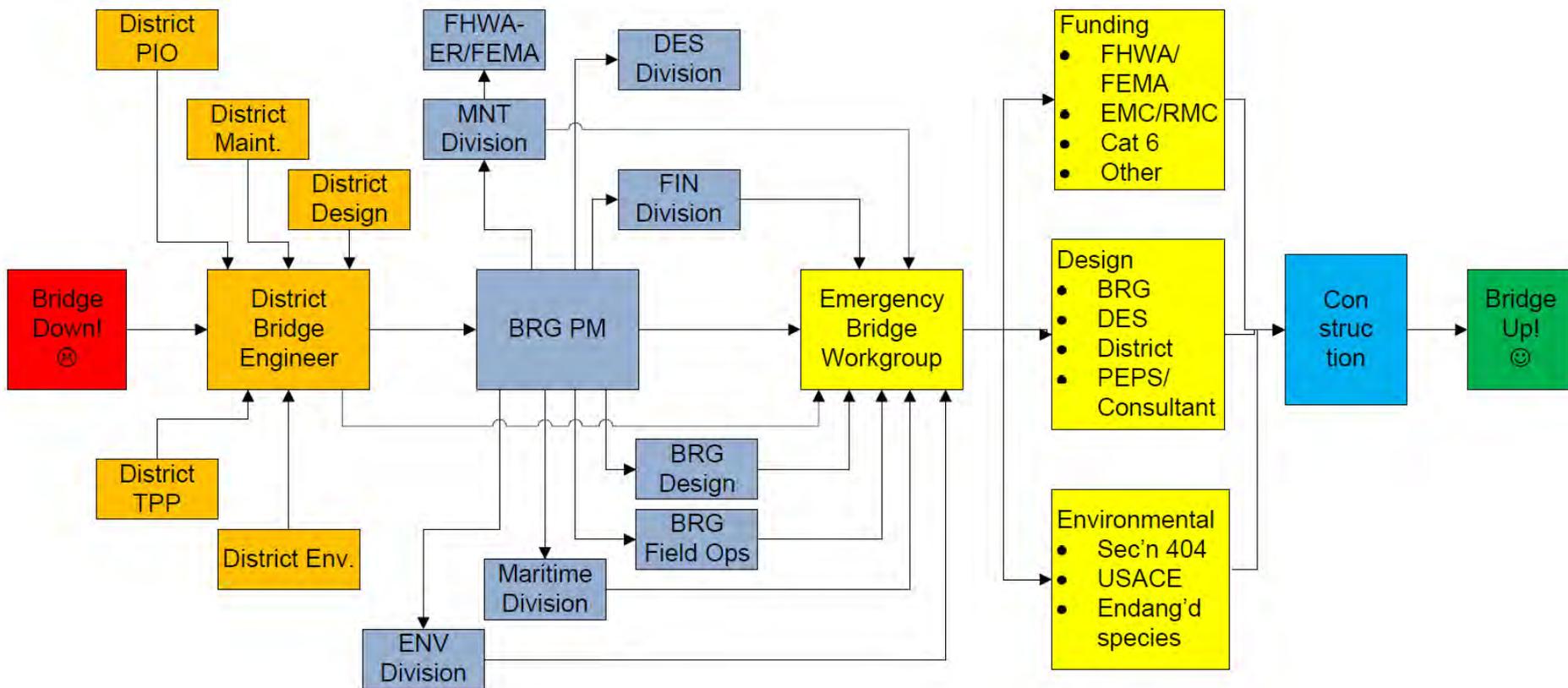
Emergency Bridge Workgroup

Meet as an Emergency Bridge Workgroup

- Team should have an identified leader and should be able to convene quickly
- Need to have notification procedure that clearly states which parties need to be involved.
- Experts from district and divisions to guide emergency projects through TxDOT processes
- Identify:
 - Funding
 - Design
 - Environmental
 - Other hurdles

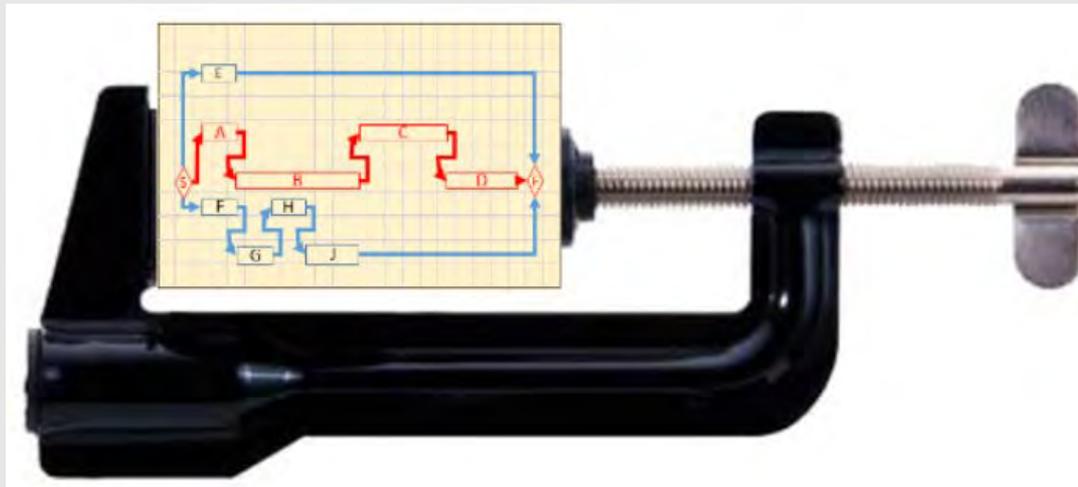


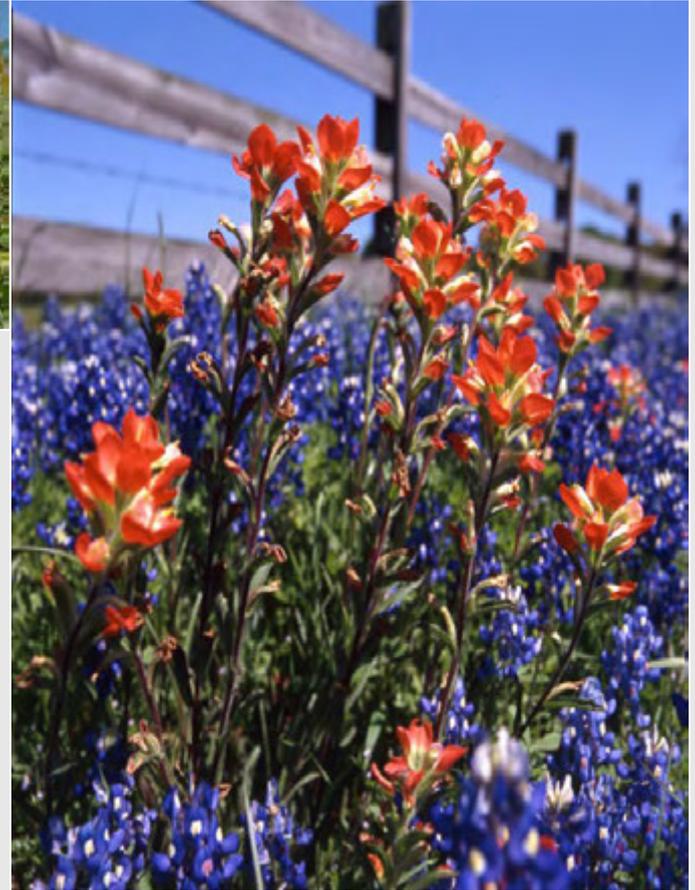
Emergency Bridge Workgroup



Recent Development

- **Conventional Letting/Compressed Schedule**
- Coordinate with CST so that the job is top priority for processing after commission award.
- Advise hand carrying through the final signature process with the contractor.
- Shouldn't take much longer than letting as an emergency and we would be more confident with cost





BRIDGE FIELD OPS MANUAL UPDATES

Graham Bettis, P.E.

Bridge Field Operations Section

- Concrete Repair Manual
- Bridge Inspection Manual
- Geotechnical Manual



- Updated January 2017 (2nd Edition)
- Added section, “Rail Damage Due to Vehicular Impact”
- Made consistent with revisions to DMS 4655, “Concrete Repair Materials”
- Bridge Deck Repair (Chapter 3, Section 4):
 - Expanded classifications of repair types based on depth
 - Direction on evaluating precast concrete panels
 - Sets default to 3,600 psi for reopening to traffic (plans may state otherwise)
 - How to address existing epoxy coated reinforcement
- Gravity-Fed Epoxy (Chapter 3, Section 6):
 - Added requirements for sand spreading/broadcasting in flood applications
 - Clarified need for temporary dams in discrete applications

Rail Damage Due to Vehicular Impact

- Assessment
 - Minor: no loss in structural capacity
 - Intermediate: damage extends beyond rebar cage but insignificant loss in capacity
 - Major: necessitates restoration of structural capacity
- Repair Procedures
- For major damage, err on the side of full-depth repairs
- Do not reuse damaged components (especially galvanized)



DMS 4655 – Concrete Repair Materials

- Type A – Rapid Repair Materials
 - Type B – Ultra-Rapid Repair Materials
 - Type C – Vertical or Overhead Repair Materials
 - Type D – Standard (Non-Rapid) Repair Materials
-
- Coefficient of Thermal Expansion (COTE) and Modulus of Elasticity (MOE) made informational.
 - Remember, slower is usually better.
 - High strength and MOE usually not what you want for repairs.

Departmental Materials Specification		DMS-4655
DMS-4655		
Concrete Repair Materials		
<i>Effective Date: April 2017</i>		
1.	DESCRIPTION	
		This Specification governs the pre-qualification procedure, material properties, and packaging of inorganic cementing material for concrete repair. DMS-6170 covers polymeric materials, and Item 431 covers pneumatically placed materials.
2.	UNITS OF MEASUREMENTS	
		The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.
3.	MATERIAL PRODUCER LIST	
		The Materials and Pavements Section of the Construction Division (CST/M&P) maintains the Material Producer List (MPL) of all materials conforming to the requirements of this Specification. Materials appearing on the MPL, entitled "Concrete Repair Materials," require no further sampling and testing before use, unless deemed necessary by the Project Engineer or CST/M&P. Materials listed on the MPL have been tested as received and do not include optional additives.
4.	BIDDERS' AND SUPPLIERS' REQUIREMENTS	
		The Department will only purchase or allow on projects those products listed by producer and product code or designation shown on the MPL.
		Use of pre-qualified product does not relieve the Contractor of the responsibility to provide product that meets this Specification. The Department may inspect or test material at any time and reject any material that does not meet the specifications.
5.	PRE-QUALIFICATION PROCEDURE	
5.1.	Pre-Qualification Request.	Submit a request for evaluation under DMS-4655 to DMS_Preqqual@txdot.gov .
		Include the following information in the request:
		<ul style="list-style-type: none">■ company name;■ physical and mailing addresses;■ contact person, phone number(s), and email address; and■ repair material classification listed under Article 6 of this Specification;■ independent laboratory test report from a laboratory audited and inspected by the Cement and Concrete Reference Laboratory containing test results and certifying compliance of the repair material with this Specification;■ technical data sheets typically accompanying product with printed instructions for mixing and application and shelf life; and

- Chapter 9, QC/QA:
 - Rewriting entire chapter based on findings from FHWA audit and TxDOT's approved Plan of Corrective Action
 - Clarifies and elaborates on QC procedures
- Other Revisions:
 - Chapter 3 – Qualifications
 - Chapter 4 – Field Inspection Requirements
 - Chapter 5 – Ratings and Load Postings
 - Chapter 6 – Routing and Permits
 - Chapter 8 – Bridge Records

- Field Testing updated to reference AASHTO Standard Penetration Test design methodology
- Interpreting soil data
- Drilled shafts: reinforcement cage length, design considerations for various conditions, Thermal Integrity Profile Testing, larger diameter drilled shafts



- Piling: Pile Driving Analyzer testing (PDA), Wave Equation of Analysis of Pile Driving (WEAP), and design considerations for various conditions
- Scour:
 - Completely rewriting this section
 - Plans of Action for existing bridges
 - Analysis for bridges with unknown foundations



- New section on foundation testing
- Updated design considerations for MSE walls, concrete block walls, soil nail walls, rock nail walls, and temporary earth walls
- Factor of Safety for critical facilities
- New section on slope failures and slope repair





BRIDGE DESIGN MANUAL UPDATE

Bridge Division

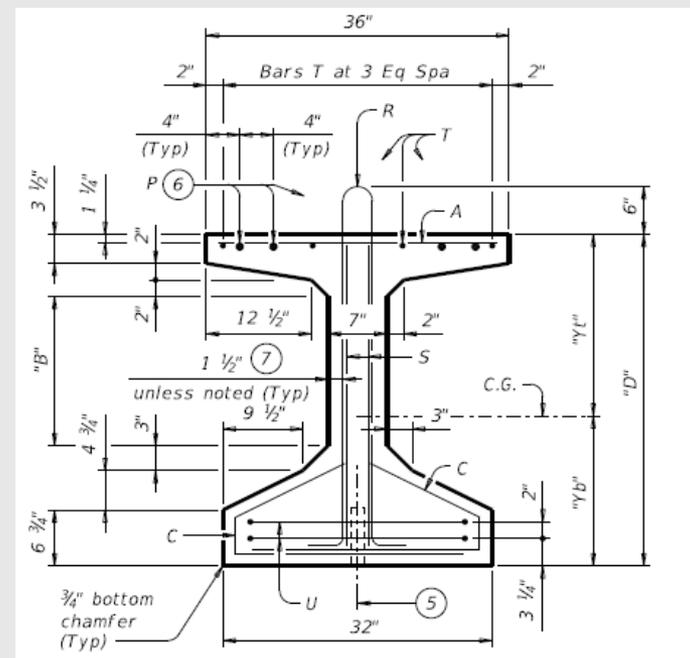


Table of contents

- 1 Recent Design Directive Memos
- 2 Future AASHTO Updates
- 3 Future Bridge Design Manual Updates
- 4 QA/QC Manual Updates
- 5 Pipe Design Website
- 6 Culvert Layout Checklist
- 6 Questions

Recent Design Directive Memos

- New Design Procedures for Prestressed Concrete Beams and Girders– 12/15/2015
 - Use of 0.6 in diameter strand for all prestressed beams and girders
 - Updated design procedure for prestressed concrete I-girders – uses a 3 tier approach. When stress and concrete stresses and strength limits are exceeded, proceed to the next approach.
 - Straight strands, non-debonded
 - Straight strands, with debonding
 - Harped strands



Recent Design Directive Memos

- **Lateral Restraint of Bridge Superstructures – 8/18/2016**
 - Bridges Crossing Water Features
 - I-Girder Bridges
 - U-Beam Bridges
 - Spread Slab Beam and Spread Box Beam (X-beam) Bridges
 - Slab Beam, Box Beam, Decked Slab Beam and Double-Tee Beam Bridges
 - Steel Beam or Girder Bridges



Recent Design Directive Memos

- **Lateral Restraint of Bridge Superstructures – 8/18/2016**
 - Provide details for shear keys on abutments and bent caps of I-girder, U-beam, and spread box beam bridges that meet the following:
 - River and stream crossings: freeboard less than 4 ft.
 - Tidally influenced bridges: A revised TxDOT Hydraulics Manual is scheduled to release later this year. In the interim, use AASHTO Guide Spec. for Bridges Vulnerable to Coastal Storms



Recent Design Directive Memos

- **Steel Beam or Plate Girder Field Splice – 12/12/2016**
 - Before the Memo, the primary field splice option required to be shown on the plans was a full penetration groove weld.
 - Bolted field splices were always designed and shown in the plans, but labeled as optional



Recent Design Directive Memos

- **Steel Beam or Plate Girder Field Splice – 12/12/2016**
 - Bolting has become the primary way that contractors connect steel superstructures and welding is uncommon.
 - **Moving forward – bolted field splices should be identified as the primary connection option on the plans**
 - Base the structural steel pay weight on the bolted field splice regardless of field splice chosen



Recent Design Directive Memos

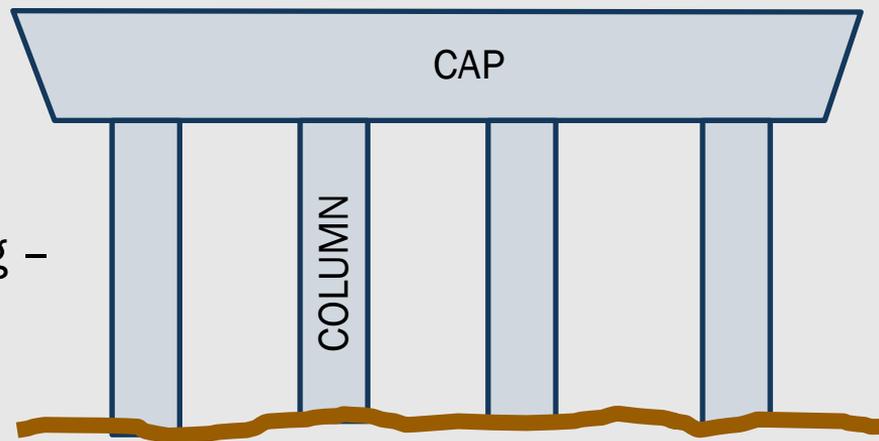
■ Concrete Bent Quantity– 04/06/2017

- Guidance on bid item selection for concrete bents
- Separate the bent quantity into two bid items: Cap and Column

– Example:

- 0420 6029 CL C CONC (CAP)
- 0420 6037 CL C CONC (COLUMN)

– For substructures that have a footing – use footing bid item as well



Future AASHTO Updates

- Release of next LRFD AASHTO Bridge Design Specifications - **COMING SOON**
 - Chapter 5 (Concrete)–complete reorganization
 - Chapter 6 (Steel) – Bolted Field Splice Design - revised
 - Chapter 6 (Steel) – ASTM F3125 is a new standard for high-strength bolts combining A325 and A490 and all others. Chapter 6 is changed to be consistent with the new ASTM standard
- Many of the balloted AASHTO updates to review



Future Bridge Design Manual Update

- Process:
 - Review all AASHTO revisions
 - Accept or reject AASHTO revisions
 - Clarify any sections that have received numerous questions over the past 2 years

Bridge Design Manual - LRFD



**UPDATE COMING SOON
WINTER 2017**

(512) 463-8630 all rights reserved

The screenshot displays the Texas Department of Transportation website. At the top, the logo and name 'TEXAS DEPARTMENT OF TRANSPORTATION' are visible, along with navigation links for 'A - Z Site Index', 'Contact Us', and 'Español'. A search bar labeled 'Search TxDOT' is present. Below the header, a secondary navigation bar includes 'Inside TxDOT', 'Get Involved', 'Media Center', 'Projects', 'Forms & Publications', 'Administration', 'Districts', and 'Divisions'. The main content area features a left-hand navigation menu with 'Divisions' listed, where 'Bridge' is highlighted with an orange box and a large arrow. The 'Bridge' page content includes a breadcrumb trail 'Home > Inside TxDOT > Divisions', a 'Director' section with a description of the division's role in structural planning and inspection, and several categorized lists: 'Approved Systems' (Concrete Block Retaining Walls, Mechanically Stabilized Earth, Expansion Joints), 'Programs' (Highway Bridge Program Brochure, Highway Bridge Program Video, Participation Waived/Equivalent Match Project Program), 'Resources' (Bridge Unit Costs, UT Bridge & UT Lift Software FAQ, Webinars, Texas Steel Quality Council, Extended Span Precast Girders), 'Geotechnical' (Field Testing, Retaining Walls, Soil and Bedrock), and 'Construction' (Curing Mats for Concrete Structures, Deck Texture Requirements).

- ### Divisions
- Aviation >
 - Bridge >
 - Civil Rights >
 - Communications >
 - Compliance >
 - Construction >
 - Contract Services >
 - Design >
 - Environmental Affairs >
 - Financial Management >
 - Fleet Operations >
 - General Counsel >
 - Government Affairs >
 - Human Resources >
 - Information Management >
 - Internal Audit >
 - Maintenance >
 - Maritime >
 - Occupational Safety >
 - Procurement >

Bridge Forms & Publications

[Home](#) > [Inside TxDOT](#) > [Divisions](#) > [Bridge](#)

Forms

- [Bridge Forms](#)

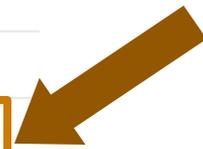
Publications

- [Bridge Facts](#)
- [Bridge Unit Costs](#)
- [Construction and Maintenance](#)
- [Design](#)
- [Geotechnical Resources](#)
- [Inspection](#)
- [Report on Texas Bridges](#)
- [Substructure/Superstructure Design Examples and Spreadsheets](#)
- [Miscellaneous](#)



QA/QC Guide Update

Design	Format
Bridge Detailing Guide (view online)	
Bridge Detailing Guide (download)	
Design Example for Two Drilled Shaft Footing Using Strut-and-Tie Method	
Design Example for Elastomeric Bearings for Prestressed Concrete Beams	
Design Software Programs	
Pile Type Selection - Geotech	
Prestressed Concrete I-Beams Distribution Factor Spreadsheet	
Prestressed Concrete U-Beams Distribution Factor Spreadsheet	
Quality Assurance/Quality Control Guide	
Recommended Beam Spacings	
Recommended Span Lengths for Double-T Beams	
Recommended Span Lengths for I-Girders	
Recommended Span Lengths for Slab Beams	
Recommended Span Lengths for LRFD, Box Beams	
Rectangular Reinforced Concrete Caps, Shear Design	
Shear Design Spreadsheets	
Steel Bridge Design Preferred Practices	



- **Purpose:** provide highest quality products to TxDOT Divisions and Districts
- Applies to all types of BRG – Design Section projects
- Objectives
 - Products are designed free of errors
 - Complete and thorough design elements
 - Conform to policies and procedures
 - Clearly define the source of information
 - Result in constructible plans
- Updates include updating figures, added procedure for Archiving Bridge Design Notes



Quality Control and Quality Assurance Guide

Bridge Division, Design Section
April 2017

Pipe Design Website

TxDOT turns 100 – Connecting Texans To What Matters Most

[Read More >](#)



Driver

Learn more about Texas travel, driving laws and highway safety.



Government

Find studies, policies and legislation, and explore ways TxDOT can work with your community.



Business

Find information on partnering with TxDOT, including opportunities, resources and the bidding process.

My TxDOT



DriveTexas™

Get highway road conditions information.



Traffic Cameras

Get live traffic camera information.

Looking for These?



Browse and apply for jobs at TxDOT.

[News](#)

[How Do I](#)



Find up-to-date news and media resources.

A - Z Site Index | Contact Us | Español

Search TxDOT

Driver | Government | Business | **Inside TxDOT** | Jobs

Inside TxDOT

Get Involved | Media Center | Projects | Forms & Publications | Administration | Districts | Divisions

Page Options

Inside TxDOT

[Home](#)

This page provides a snapshot of the organization. To explore our website more thoroughly, navigate using the tabs on the blue ribbon above, to the right of the gold arrow that says "Inside TxDOT."

Headquartered in Austin, the Texas Department of Transportation (TxDOT) is organized by administration, districts and divisions.

TxDOT's workforce is made up of engineers, administrators, financial experts, designers, architects, sign makers, accountants, purchasers, maintenance workers, travel counselors and many other professions. All of our employees work together to realize the TxDOT mission: Through collaboration and leadership, we deliver a safe, reliable, and integrated transportation system that enables the movement of people and goods.

Inside TxDOT

- [About This Site](#)
- [Values, Vision, Mission and Goals](#)
- [Strategic Plan](#)
- [Administrative Rules](#)
- [OneDOT Data Shop](#)
- [Pocket Facts](#)

TxDOT Structure

- [Texas Transportation Commission](#)
- [Administration](#)
- [Districts](#)
- [Divisions](#)

Government Affairs

- [Federal Affairs](#)
- [State Legislative Affairs](#)

Get Involved

- [Texas Transportation Commission Meetings](#)
- [Public Hearings and Meetings Schedule](#)
- [Volunteer](#)

Media

- [News](#)
- [Public Service Announcements](#)

Initiatives

- [Project Tracker](#)
- [Proposition 12 \(General Obligation Bond Projects\)](#)
- [Cost-Efficiency Suggestions Program](#)
- [Performance Results Summary](#)

Fraud Hotline



Divisions

- Aviation >
- Bridge >
- Civil Rights >
- Communications >
- Compliance >
- Construction >
- Contract Services >
- Design >
- Environmental Affairs >
- Financial Management >
- Fleet Operations >
- General Counsel >
- Government Affairs >
- Human Resources >
- Information Management >

Divisions

Home > Inside TxDOT

From rail crossings to right of way, traffic cameras to travel maps, and bridge inspections to bid opportunities, TxDOT's divisions handle a diverse range of services for the agency.

- [Aviation](#)
- [Bridge](#)
- [Civil Rights](#)
- [Communications](#)
- [Compliance](#)
- [Construction](#)
- [Contract Services](#)
- [Design](#)
- [Environmental Affairs](#)
- [Financial Management](#)
- [Fleet Operations](#)
- [General Counsel](#)
- [Government Affairs](#)
- [Human Resources](#)
- [Information Management](#)
- [Internal Audit](#)





Divisions

- Aviation
- Bridge
- Civil Rights
- Communications
- Compliance
- Construction
- Contract Services
- Design
- Environmental Affairs
- Financial Management
- Fleet Operations
- General Counsel
- Government Affairs
- Human Resources
- Information Management
- Internal Audit

Bridge

[Home](#) > [Inside TxDOT](#) > [Divisions](#)

The Bridge Division supports the structural planning, design, review, construction and inspection of the state's 50,000 bridges. The division also develops policies, design standards, manuals and guidelines for the design, maintenance and construction of a safe and comprehensive state bridge system.

[Gregg Freeby, P.E.](#), serves as director. [Contact us](#) with questions or comments.

General

- [Specifications](#)
- [Standards](#)
- [Pipe Design and Durability](#)
- [Shop Drawings](#)
- [Load and Resistance Factor Design](#)
- [Corrosion Protection Measures](#)
- [Publications](#)

Geotechnical

- [Field Testing](#)

Approved Systems

- [Concrete Block Retaining Walls](#)
- [Mechanically Stabilized Earth](#)
- [Expansion Joints](#)

Programs

- [Highway Bridge Program Brochure](#)
- [Highway Bridge Program Video](#)
- [Participation Waived/Equivalent Match Project Program](#)



Divisions

- [Aviation](#)
- [Bridge](#)
- [Civil Rights](#)
- [Communications](#)
- [Compliance](#)
- [Construction](#)
- [Contract Services](#)
- [Design](#)
- [Environmental Affairs](#)
- [Financial Management](#)
- [Fleet Operations](#)
- [General Counsel](#)
- [Government Affairs](#)
- [Human Resources](#)
- [Information Management](#)
- [Internal Audit](#)
- [Maintenance](#)
- [Maritime](#)

Pipe Design and Durability

[Home](#) > [Inside TxDOT](#) > [Divisions](#) > [Bridge](#)

TxDOT Information

Format

[Corrosion Protection Measures](#)

[HTML](#)

[Bridge Standards](#)

[HTML](#)

[Material Requirements](#)

[HTML](#)

[Hydraulic Design Manual](#)

[HTML](#)

Additional Design Information

- **Bridge vs. culvert**
Choose structure type based on: construction/maintenance cost, risk of failure, risk of property damage, traffic safety, environmental and aesthetics, and construction expedience
- **Selection of culvert**
Choose type of culvert based on roadway profile, channel characteristics, flood damage evaluation, construction/maintenance cost, and service life estimates
- **Commonly used culvert shapes**
Circular, pipe-arch, elliptical, box, modified box, arch
- **Selection of material**
Choose type of material based on required structure strength, required

- Links
 - Corrosion Protection Measures
 - Bridge Standards
 - Material Requirements
 - Hydraulic Design Manual
- Design Information
 - Bridge vs. culvert
 - Selection of culvert
 - Commonly used culvert shapes
 - Selection of material
 - Inlets and end treatments



- Standard Specification list
- Material producer list
- Service life of culverts
- Design information and manuals:
 - Reinforced Concrete Pipes
 - Corrugated Metal Pipes (Steel)
 - Thermoplastic (HDPE and PVC) Pipe



Culvert Layout Checklist

- Simple checklist is provided in the PS&E Preparation Manual
- Culvert Layout Checklist will be added to the Bridge Detailing Guide in the future.
- Want a copy sooner... contact Taya.Retterer@txdot.gov



CULVERT LAYOUT CHECKLIST

Plan View

1. N/A OK Locate reference line, centerline, or profile grade line (bearing, location, and station).
2. N/A OK Begin and end bridge class culvert stations and elevations.
3. N/A OK Show widths (overall, roadway, shoulders, etc.).
4. N/A OK Show traffic direction and stream flow.
5. N/A OK Include North arrow.
6. N/A OK Show skew angle.
7. N/A OK Description of existing structure.
8. N/A OK Show wingwall type or end treatment with relevant dimensions.
9. N/A OK Show right-of-way or easements.
10. N/A OK Show type and limits of riprap.
11. N/A OK Show existing structure (dashed) with existing National Bridge Inventory (NBI) number shown for culvert replacements.

Profile View

1. N/A OK Show roadway cross section
2. N/A OK Show earthwork slopes and extents.
3. N/A OK Show flowline elevations.
4. N/A OK Show direction of flow.
5. N/A OK Show slope of culvert.
6. N/A OK Show wingwall type or end treatment with relevant dimensions.
7. N/A OK Show rail or metal beam guard fence (MBGF).
8. N/A OK Show overall length of culvert.
9. N/A OK Description for proposed culvert with appropriate standards.
10. N/A OK Hydraulic data (headwater and tailwater elevations).
11. N/A OK Existing and proposed ground lines.
12. N/A OK Show grid elevations.
13. N/A OK Show existing structure (dashed) with existing National Bridge Inventory (NBI) number shown for culvert replacements.

Additional Information

1. N/A OK Show estimated quantities in tabulated form.
2. N/A OK Scale (vertical and horizontal are relative to sheet size). Ensure dimensions and scales conform to grid (and elevations).
3. N/A OK Special details. (Include details such as bill of reinforcing if the proposed work is not included on the standards or provide location of such details elsewhere in the plans.)
4. N/A OK For staged (or phased) construction information, show dimension to stage construction joints.
5. N/A OK For lengthenings and widenings, show existing structure, existing NBI number, and overall roadway widths of existing and new structures.
6. N/A OK Include standards layout title with National Bridge Inventory (NBI) number.
7. N/A OK Include Engineer's seal.



BRIDGE STANDARDS UPDATE

Taya Retterer



Plan Set – Ordering of Bridge Standards

- Preferred Order of Standards (per the Bridge Detailing Guide)
 - When assembling a plan set for PS&E submission, place the bridge standards in alphabetical order. Alphabetize standards by their standard names, not by descriptions. Place modified standards at the beginning of the standard sheets.

Preferred Order of Standards: Example 1

Place No.	Std Name	Description
1	SBB-BS-B20-24 (MOD)	Span, Ty B20, 24' Rdwy, w/Slab, 0 Skew
2	ABB-24	Abut, 30' thru 95' Spans, 24' Rdwy, 0 Skew
3	BB-B20	Prestr Conc Box Beam Details, Type B20
4	BBB-24	Bent, 30' thru 95' Spans, 24' Rdwy, 0 Skew
5	BBEB	Box Beam Elastomeric Bearing Details
6	BBRAS	Box Beam Rail Anchorage Details w/Slab
7	BBSDS-B20-24	Std Design, Ty B20, 24' Rdwy w/Slab, 0 Skew
8	FD	Common Foundation Details
9	SRR	Stone Riprap Details
10	T223	Conc Bm & Post w/6' Openings (32' tall)

Preferred Order of Standards: Example 2

Place No.	Std Name	Description
1	AIG-40 (MOD)	Abut, Ty Tx28 Thru Tx54 Girders, 40' Rdwy
2	BTIG-40 (MOD)	Trestle Bent, Ty Tx28 Thru Tx54, 40' Rdwy
3	FD (MOD)	Common Foundation Details
4	IGCS (MOD)	Continuous Slab Details
5	PCP (MOD)	Prestressed Concrete Panels
6	SIG-40 (MOD)	Span, Ty Tx28 Thru Tx54 Girders, 40' Rdwy
7	AJ	Armor Joint with/without Seal
8	BAS-A	Bridge Approach Slab, (ACP)
9	C223	T223 w/Steel Pipe Rail (42" tall)
10	CP	Prestressed Concrete Piling
11	CRR	Concrete Riprap (Type
12	CSAB	Cement Stabilized Abutment Backfill
13	IGD	Prestressed Concrete I-Girder Details
14	IGEB	Elastomeric Bearing & Girder End Details
15	IGMS	Miscellaneous Slab Details
16	IGSD-40	Std Designs, Ty Tx28 Thru Tx62 Girders, 40' Rdwy
17	IGSK	Shear Key Details for I-Girders
18	IGTS	Thickened Slab End Details
19	MEBR(C)	Minimum Erection & Bracing Requirements
20	PBC-RC	Precast Conc Bent Cap Opt for Round Columns
21	PCP-FAB	Prestressed Concrete Panel Fabrication Details
22	PMDF	Permanent Metal Deck Forms

- Updated July 2016
- Added MASH Implementation
 - Chapter 2 and 4
 - From Chapter 2,
“MASH Implementation. Per FHWA memo, all new installations of bridge railing, with contract letting date after December 31, 2019, must be evaluated and approved with MASH crash-test criteria.”



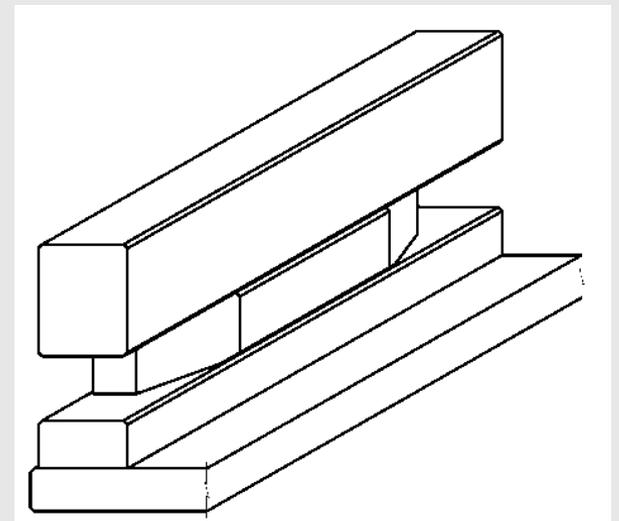
- Chapter 3
 - Updated combination railings acceptable for high-speed use.
 - Added C221 and C223
- Chapter 5
 - Added steel barriers for temporary use
- Appendix A
 - Added T224 and T221P Rails
 - Added guidance on pay quantities for T631 and T631LS
 - Update the test level (TL) for select railings

Rail Types	Prev. TL	New TL	Reason
C221 & C223	TL-2	TL-3	No pedestrian rail snag effect
T221 & T223	TL-4	TL-3	Height below MASH limit for TL-4

Bridge Railing Standards – T224

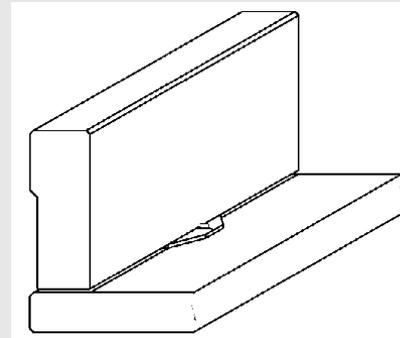
▪ *New Traffic Rail Type T224*

- Released March 2016
- 42” Tall Continuous Concrete Beam on Posts w/ Open Windows
- Tested and Evaluated for Approved Use in MASH TL-5 Applications
- Use With Heavy Truck Traffic Applications
- Restricted Use With Bridge Standards
 - Bulky – 1’-6” Nominal Face of Rail
 - Heavy – 577 lbs./ft.



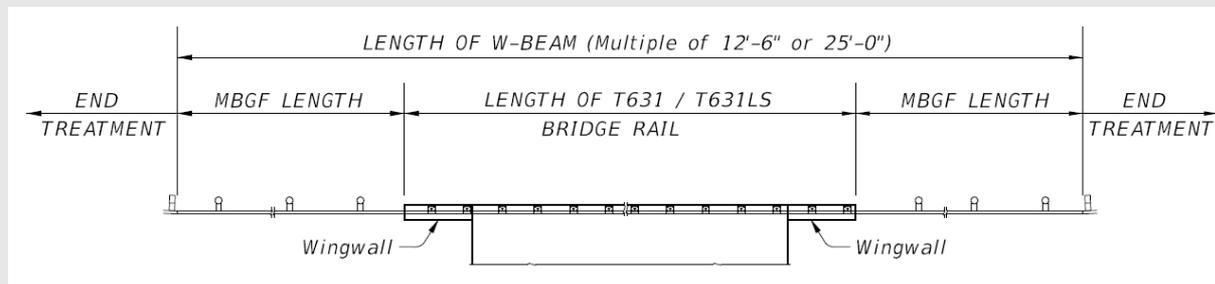
Bridge Railing Standards – T221P

- ***New Guide for Precast Traffic Rail Type T221P***
 - Released March 2016
 - Guide for designing job-specific precast rail
 - Tested and Evaluated for Approved Use in MASH TL-3 Applications
 - Why Not a Standard?
 - Consider details at wingwalls and expansion joints
 - Allows for broad use with applications in phased construction
 - Narrower than CSB's & SSCB's (1'-0" vs. 2'-0" toe-to-toe)



Bridge Railing Manual

- T631 and T631LS
 - Design Directive Memo issued August 1, 2016
 - Clarification of Length of Metal Beam Guard Fence (MBGF) with T631/T631LS Bridge Rail



- The length of W-beam is the MBGF length of need plus the length of T631/T631LS bridge rail. Therefore, it is continuous across the MBGF and Type T631/T631LS bridge rail and is fabricated in 12'-6" or 25'-0" sections. Note that the fabrication lengths should be taken into consideration when calculating the MBGF length, since the required quantity of MBGF may need to be adjusted until the length of W-beam (MBGF + T631/T631LS) is a multiple of 12'-6" or 25'-0". The length of the T631/T631LS is based on the nominal end of bridge rail as shown on the standard and should not be adjusted.

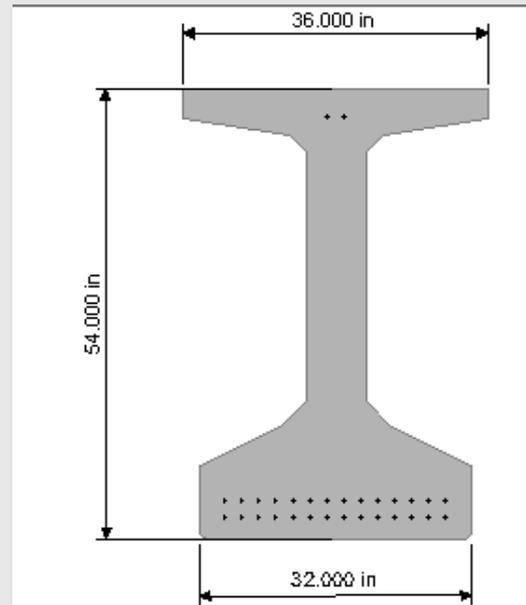
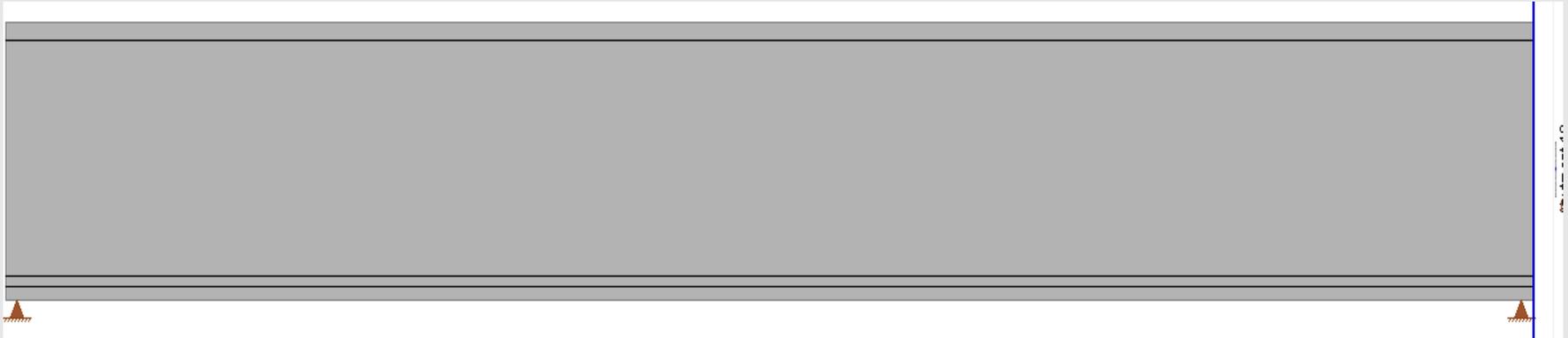
- Revised Prestressed Concrete Beam Designs Standard Drawings issued May 9, 2016
- IGND, IGSD-24, IGSD-28, IGSD-30, IGSD-32, IGSD-38, IGSD-40, IGSD-44
- These standard drawings are revised as such:
 - Standard designs of prestressed beams using a three-tiered approach, executed in these steps:
 - Straight strands, non-debonded – when stress and concrete strength limits are exceeded, proceed to,
 - Straight strands, with debonding – when stress and concrete strength limits are exceeded, proceed to,
 - Harped strands,

in accordance with new design procedures described in the December 15, 2015 memo from Gregg A. Freeby. For the straight strand scenarios, the designs also reduced web stresses by raising straight web strands.

IGND and IGSDs

STRUCTURE	DESIGNED GIRDERS									STRAIGHT STRAND PATTERN						DEPRESSED STRAND PATTERN ①			CONCRETE		OPTIONAL DESIGN						
	SPAN LENGTH	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					TOT NO. DEB	DEBONDED STRANDS PER ROW						NO.	TD (in)	TO (in)	RELEASE STRGTH ② (ksi)	MINIMUM 28 DAY COMP STRGTH (ksi)	DESIGN LOAD COMP STRESS (TOP EJ) (SERVICE I) (ksi)	DESIGN LOAD TENSILE STRESS (BOT EJ) (SERVICE III) (ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (ft-kips)	LIVE LOAD DISTRIBUTION FACTOR ③			
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" (in)		"e" END (in)	DIST FROM BOTTOM (in)	NO. OF STRANDS	NUMBER OF STRANDS DEBONDED TO (FT. FROM ROW)														
													TOTAL	DE-BONDED	3									6	9	12	15
Type Tx54 Girders 38' Roadway 8.5" Slab	40	ALL	Tx54		8	0.6	270	21.01	21.01									4.000	5.000	0.521	-0.531	2048	0.920	0.940			
	45	ALL	Tx54		10	0.6	270	21.01	21.01									4.000	5.000	0.651	-0.766	2423	0.890	0.950			
	50	ALL	Tx54		10	0.6	270	21.01	21.01									4.000	5.000	0.799	-0.922	2865	0.860	0.950			
	55	ALL	Tx54		12	0.6	270	21.01	21.01									4.000	5.000	0.962	-1.092	3339	0.840	0.950			
	60	ALL	Tx54		12	0.6	270	21.01	21.01									4.000	5.000	1.139	-1.272	3317	0.820	0.960			
	65	ALL	Tx54		12	0.6	270	21.01	21.01									4.000	5.000	1.329	-1.461	3263	0.800	0.960			
	70	ALL	Tx54		14	0.6	270	21.01	21.01									4.000	5.000	1.532	-1.660	3639	0.780	0.960			
	75	ALL	Tx54		16	0.6	270	20.76	20.76									4.100	5.000	1.751	-1.877	4064	0.770	0.970			
	80	ALL	Tx54		16	0.6	270	20.76	20.76									4.000	5.000	1.981	-2.095	4470	0.750	0.970			
	85	ALL	Tx54		18	0.6	270	20.56	20.56									4.900	5.900	2.229	-2.333	4920	0.740	0.970			
	90	ALL	Tx54		20	0.6	270	20.41	20.41									5.800	5.800	2.490	-2.582	5385	0.730	0.970			
	95	ALL	Tx54		28	0.6	270	16.72	16.72						2	50.5	50.5	4.400	5.200	2.765	-2.842	5864	0.720	0.970			
	100	ALL	Tx54		30	0.6	270	16.87	16.87						2	50.5	50.5	4.700	5.600	3.053	-3.112	6357	0.710	0.980			
	105	ALL	Tx54		34	0.6	270	16.89	16.89						2	50.5	50.5	5.300	6.300	3.356	-3.393	6863	0.700	0.980			
	110	ALL	Tx54		36	0.6	270	16.90	16.90						2	50.5	50.5	6.000	6.800	3.672	-3.685	7382	0.690	0.980			
115	ALL	Tx54		42	0.6	270	16.91	16.34						2	50.5	50.5	5.500	6.400	4.002	-3.987	7913	0.680	0.980				
120	ALL	Tx54		44	0.6	270	16.92	16.38	6	2.5	14	4	0	0	2	0	2	2	50.5	50.5	5.700	7.100	4.346	-4.300	8458	0.670	0.980
125	ALL	Tx54	*	48	0.6	270	18.42	11.34	6	4.5	14	2	2	0	0	0	0	2	50.5	50.5	6.000	7.300	4.711	-4.642	9082	0.670	0.980

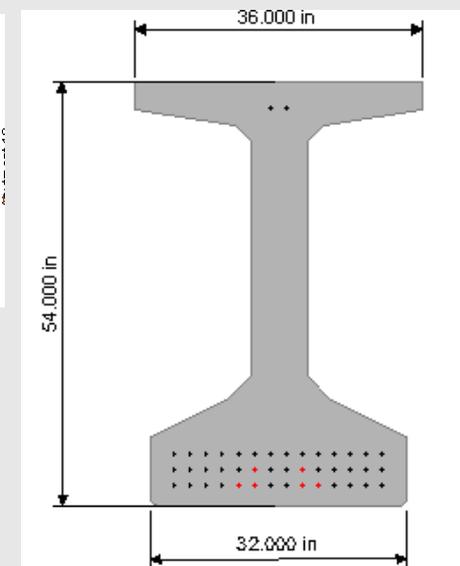
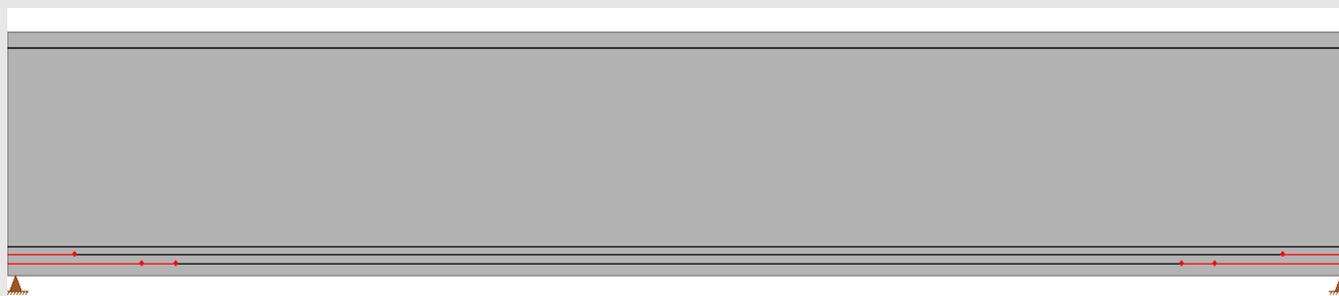
- Straight strands, with raised strands



IGND and IGSDs

- Straight Strands, with debonding, and raised strands

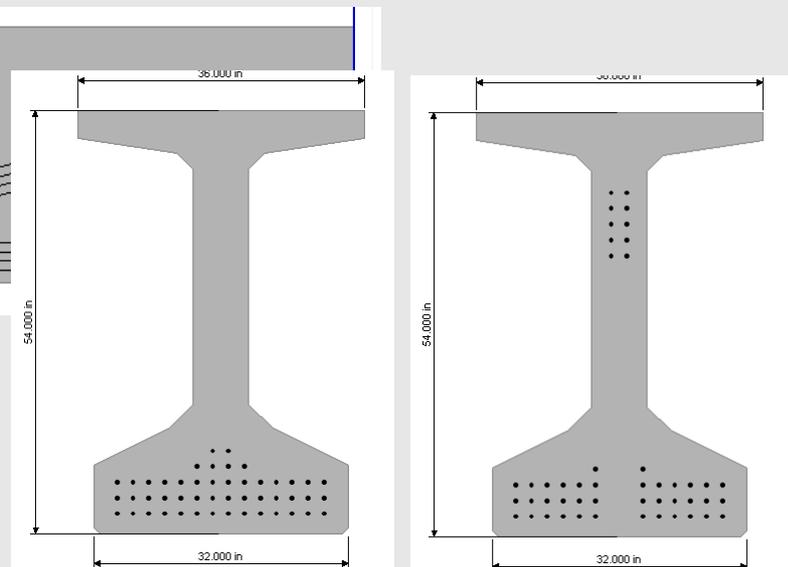
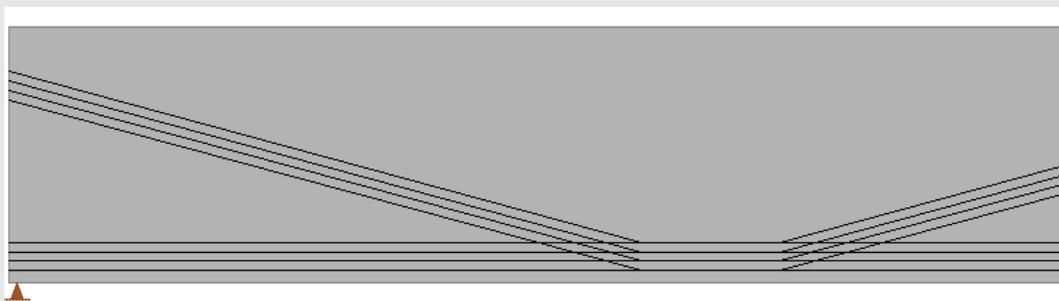
STRUCTURE	DESIGNED GIRDERS									STRAIGHT STRAND PATTERN						DEPRESSED STRAND PATTERN ①			CONCRETE		OPTIONAL DESIGN						
	SPAN LENGTH	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					TOT NO. DEB	DEBONDED STRANDS PER ROW					NO.	TO END (in)	TO ϵ (in)	RELEASE STRGTH ② (ksi)	MINIMUM 28 DAY COMP STRGTH (ksi)	DESIGN LOAD COMP STRESS (TOP ϵ) (SERVICE I) (ksi)	DESIGN TENSILE STRESS (BOT ϵ) (SERVICE III) (ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (ft-kips)	LIVE LOAD DISTRIBUTION FACTOR ③				
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH (ksi)	e (in)		e END (in)	DIST FROM BOTTOM (in)	NO. OF STRANDS	NUMBER OF STRANDS DEBONDED TO (ft. From end)										Moment	Shear			
													TOTAL	DE-BONDED											3	6	9
Type Tx54 Girders 38' Roadway 8.5" Slab	40	ALL	Tx54	8	0.6	270	21.01	21.01									4.000	5.000	0.521	-0.631	2048	0.920	0.940				
	45	ALL	Tx54	10	0.6	270	21.01	21.01									4.000	5.000	0.651	-0.766	2423	0.890	0.950				
	50	ALL	Tx54	10	0.6	270	21.01	21.01									4.000	5.000	0.799	-0.922	2865	0.860	0.950				
	55	ALL	Tx54	12	0.6	270	21.01	21.01									4.000	5.000	0.962	-1.092	3339	0.840	0.950				
	60	ALL	Tx54	12	0.6	270	21.01	21.01									4.000	5.000	1.139	-1.272	3317	0.820	0.960				
	65	ALL	Tx54	12	0.6	270	21.01	21.01									4.000	5.000	1.329	-1.461	3263	0.800	0.960				
	70	ALL	Tx54	14	0.6	270	21.01	21.01									4.000	5.000	1.532	-1.660	3639	0.780	0.960				
	75	ALL	Tx54	16	0.6	270	20.76	20.76									4.100	5.000	1.751	-1.877	4064	0.770	0.970				
	80	ALL	Tx54	16	0.6	270	20.76	20.76									4.000	5.000	1.981	-2.095	4470	0.750	0.970				
	85	ALL	Tx54	18	0.6	270	20.56	20.56									4.900	5.900	2.229	-2.333	4920	0.740	0.970				
	90	ALL	Tx54	20	0.6	270	20.41	20.41									5.800	5.800	2.490	-2.582	5385	0.730	0.970				
	95	ALL	Tx54	28	0.6	270	16.72	16.72							2	50.5	50.5	4.400	5.200	2.765	-2.842	5864	0.720	0.970			
	100	ALL	Tx54	30	0.6	270	16.87	16.87							2	50.5	50.5	4.700	5.600	3.053	-3.112	6357	0.710	0.980			
	105	ALL	Tx54	34	0.6	270	16.89	16.89							2	50.5	50.5	5.300	6.300	3.356	-3.393	6863	0.700	0.980			
	110	ALL	Tx54	36	0.6	270	16.90	16.90							2	50.5	50.5	6.000	6.800	3.672	-3.685	7382	0.690	0.980			
	115	ALL	Tx54	42	0.6	270	16.91	16.34	6	2.5	14	4	0	0	2	2	50.5	50.5	5.500	6.400	4.002	-3.987	7913	0.680	0.980		
120	ALL	Tx54	44	0.6	270	16.92	16.38	6	2.5	14	4	0	0	2	2	50.5	50.5	5.700	7.100	4.346	-4.300	8458	0.670	0.980			



IGND and IGSDs

Harped

STRUCTURE	DESIGNED GIRDERS									STRAIGHT STRAND PATTERN						DEPRESSED STRAND PATTERN ①		CONCRETE		OPTIONAL DESIGN							
	SPAN LENGTH	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS					TOT NO. DEB	DEBONDED STRANDS PER ROW						NO.	TO END (in)	TO € (in)	RELEASE STRGTH ② f _c (ksi)	MINIMUM 28 DAY COMP STRGTH f _c (ksi)	DESIGN LOAD COMP STRESS (TOP €) (SERVICE I) f _c (ksi)	DESIGN LOAD TENSILE STRESS (BOT €) (SERVICE III) f _c (ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (ft-kips)	LIVE LOAD DISTRIBUTION FACTOR ③			
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH f _{pu} (ksi)	e" € (in)		e" END (in)	TOTAL	DF-BONDED	NUMBER OF STRANDS DEBONDED TO (ft from end)											Moment	Shear		
													3	6	9											12	15
Type Tx54 Girders 38" Roadway 8.5" Slab	40	ALL	Tx54		8	0.6	270	21.01	21.01									4,000	5,000	0.521	-0.631	2048	0.920	0.940			
	45	ALL	Tx54		10	0.6	270	21.01	21.01									4,000	5,000	0.651	-0.766	2423	0.890	0.950			
	50	ALL	Tx54		10	0.6	270	21.01	21.01									4,000	5,000	0.799	-0.922	2865	0.860	0.950			
	55	ALL	Tx54		12	0.6	270	21.01	21.01									4,000	5,000	0.962	-1.092	3339	0.840	0.950			
	60	ALL	Tx54		12	0.6	270	21.01	21.01									4,000	5,000	1.139	-1.272	3317	0.820	0.960			
	65	ALL	Tx54		12	0.6	270	21.01	21.01									4,000	5,000	1.329	-1.461	3263	0.800	0.960			
	70	ALL	Tx54		14	0.6	270	21.01	21.01									4,000	5,000	1.532	-1.660	3639	0.780	0.960			
	75	ALL	Tx54		16	0.6	270	20.76	20.76									4,100	5,000	1.751	-1.877	4064	0.770	0.970			
	80	ALL	Tx54		16	0.6	270	20.76	20.76									4,000	5,000	1.981	-2.095	4470	0.750	0.970			
	85	ALL	Tx54		18	0.6	270	20.56	20.56									4,900	5,900	2.229	-2.333	4920	0.740	0.970			
	90	ALL	Tx54		20	0.6	270	20.41	20.41									5,800	5,800	2.490	-2.582	5385	0.730	0.970			
	95	ALL	Tx54		28	0.6	270	16.72	16.72							2	50.5	50.5	4,400	5,200	2.765	-2.842	5864	0.720	0.970		
	100	ALL	Tx54		30	0.6	270	16.87	16.87							2	50.5	50.5	4,700	5,600	3.053	-3.112	6357	0.710	0.980		
	105	ALL	Tx54		34	0.6	270	16.89	16.89							2	50.5	50.5	5,300	6,300	3.356	-3.393	6863	0.700	0.980		
	110	ALL	Tx54		36	0.6	270	16.90	16.90							2	50.5	50.5	6,000	6,800	3.672	-3.685	7382	0.690	0.980		
115	ALL	Tx54		42	0.6	270	16.91	16.34	6	2.5	14	4	0	0	2	0	2	5,500	6,400	4.002	-3.987	7913	0.680	0.980			
120	ALL	Tx54		44	0.6	270	16.92	16.38	6	4.5	14	2	2	0	0	0	0	5,700	7,100	4.346	-4.300	8458	0.670	0.980			
125	ALL	Tx54	*	48	0.6	270	18.42	11.34	6	4.5	14	2	0	2	0	0	0	6,000	7,300	4.711	-4.642	9082	0.670	0.980			



Bridge Drains

- Issued October 7, 2016
- Bridge Deck Drain Details (BD-1 and BD-2)
 - Editorial changes
- Bridge Deck Drain Details (BD-3)
 - Editorial changes
 - Added 2 approved iron cast drain options
- Sloping Inlet Type S w/Grate (IL-S)
 - Editorial changes
 - Reinforcing steel changes
 - Detailed with clear cover dimensions and out-to-out bar dimensions

Slab Beams

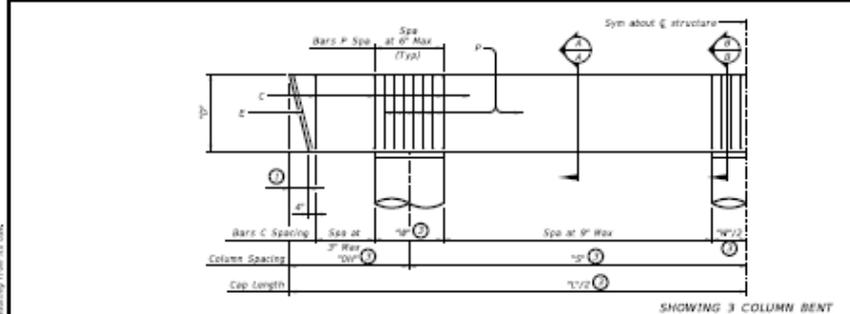
- Issued January 5, 2017
- Notable revisions to the standard drawings include the following:
 - All drawings comply with *2014 Standard Specifications for Construction*.
 - All drawings reflect current design practices prescribed in the *Bridge Design Manual – LRFD*.
 - Updated bar lap lengths
 - Increased embedment depth of Bars V into abutment cap
 - All drawings reflect current detailing practices shown in the *Bridge Detailing Guide*.
 - Clear cover and out-to-out bar detailing
 - Notes grouped
 - Bar spacing at MAX
 - 1 ½ turns top and bottom of column and DS spirals

Prestressed, Precast Bent Caps

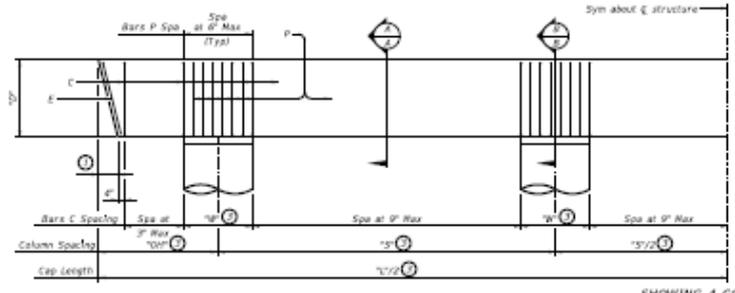
- Prestressed, Precast Bent Cap Option for Round Column (PPBC-RC)
- Issued April 20, 2017
- Insert these sheets in addition to the standard bent details.
- Provides prestressed, precast bent designs and details, as an alternate to conventionally reinforced standard interior bents for round columns on TxGirders (BIG standards), X-Beams (BXB standards), Box Beams (BBB standards), Decked Slab Beams (BDSB standards), and Slab Beams (PBSB standards)
- Do not use this standard with non-standard interior bent designs.
- No adjustments to quantities are necessary nor are any Special Specifications required.

Prestressed, Precast Bent Caps

DISCLAIMER: The information is provided for general information only. It is not intended to be used as a substitute for professional engineering or architectural services. The user of this information assumes all liability for any use of any information provided in this manual or for the accuracy of any information provided in this manual.



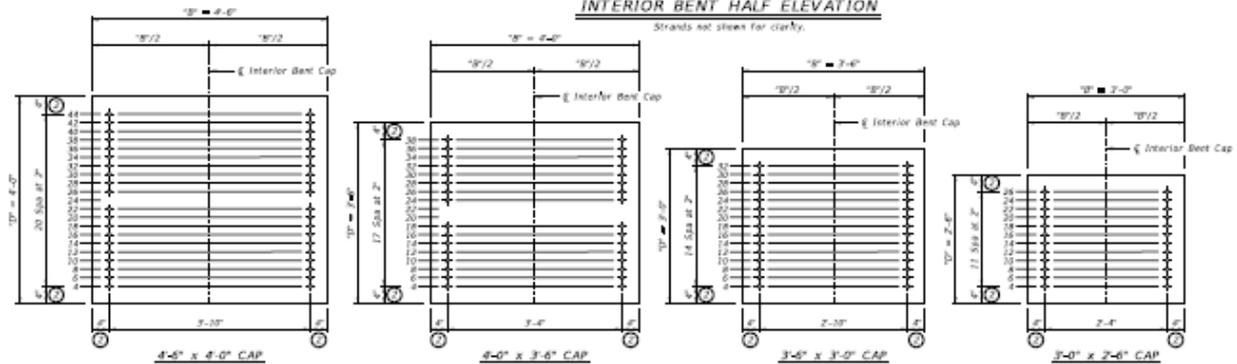
SHOWING 3 COLUMN BENT



SHOWING 4 COLUMN BENT

INTERIOR BENT HALF ELEVATION

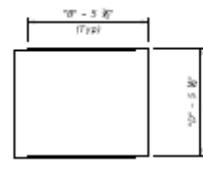
Strands not shown for clarity.



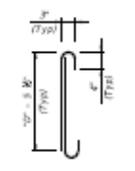
INTERIOR BENT SECTIONS

(Showing strands only)

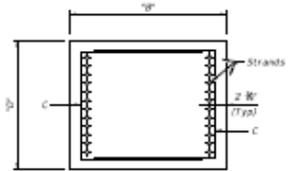
SUPERSTRUCTURE TYPE	DESIGNED CAPS				OPTIONAL DESIGN					
	CAP DIMENSIONS		CONCRETE		PRESTRESSING STRANDS					
	CAP WIDTH 10' (11-in)	CAP DEPTH 2'-0" (16-in)	CORRUGATED PIPE INSIDE DIAMETER 7'-6" (71-in)	RELEASE STRENGTH F _r (ksi)	MINIMUM 28 DAY COMP STRENGTH F _c (ksi)	LAYERS OF PS STRANDS	TOTAL NO. PS STRANDS	SIZE	STRENGTH	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I)
Slab Beams	3'-0"	2'-0"	7'-6"	4.0	5.0	32	24	0.6	270	1,201
Decked Sub Beams	3'-0"	2'-0"	7'-6"	4.0	5.0	35	30	0.6	270	1,886
Box Beams	3'-0"	2'-0"	7'-6"	4.0	5.0	35	30	0.6	270	1,886
T-Beams	4'-0"	2'-0"	7'-6"	5.2	6.5	36	32	0.6	270	2,671
T-Girders (T&B-T&E)	4'-0"	2'-0"	7'-6"	6.0	5.0	36	32	0.6	270	2,484
T-Girders (T&B)	4'-0"	2'-0"	7'-6"	4.0	5.0	20	40	0.6	270	2,614



BARS C (#5)
Showing one complete bar.

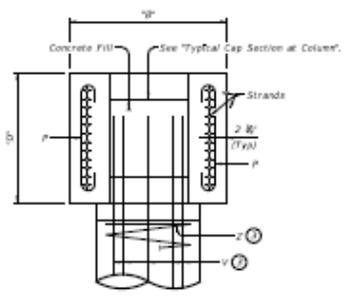


BARS P (#3)
Showing one complete bar.



SECTION A-A

- ① Variable. See Interior Bents sheet for dimension. When dimension is 0', omit bars C and reduce end cover to bars C to 3". Measured parallel to top of cap cross-slope.
- ② Dimensioned to center of strand.
- ③ See Interior Bents sheet.



SECTION B-B

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation
PRESTRESSED, PRECAST BENT CAP OPTION FOR ROUND COLUMNS

PPBC-RC

DATE	APPROVED BY	DATE	DATE	DATE	DATE
05/05/2011	APR 2011				

Questions?

Michael O'Toole, PE

Michael.OToole@txdot.gov

512-416-2240

Jamie F. Farris, PE

Jamie.Farris@txdot.gov

512-416-2433

Graham Bettis, PE

Graham.Bettis@txdot.gov

512-416-2526

Taya Retterer, PE

Taya.Retterer@txdot.gov

512-416-2719



Copyright 2017 • Texas Department of Transportation • All Rights Reserved

Entities or individuals that copy and present state agency information must identify the source of the content, including the date the content was copied. Entities or individuals that copy and present state agency information on their websites must accompany that information with a statement that neither the entity or individual nor the information, as it is presented on its website, is endorsed by the State of Texas or any state agency. To protect the intellectual property of state agencies, copied information must reflect the copyright, trademark, service mark, or other intellectual property rights of the state agency whose protected information is being used by the entity or individual. Entities or individuals may not copy, reproduce, distribute, publish, or transmit, in any way this content for commercial purposes. This presentation is distributed without profit and is being made available solely for educational purposes. The use of any copyrighted material included in this presentation is intended to be a “fair use” of such material as provided for in Title 17 U.S.C. Section 107 of the US Copyright Law.