

Revisions to Design Policy and Practices

John M. Holt, P.E.



BRG Webinar
February 2013

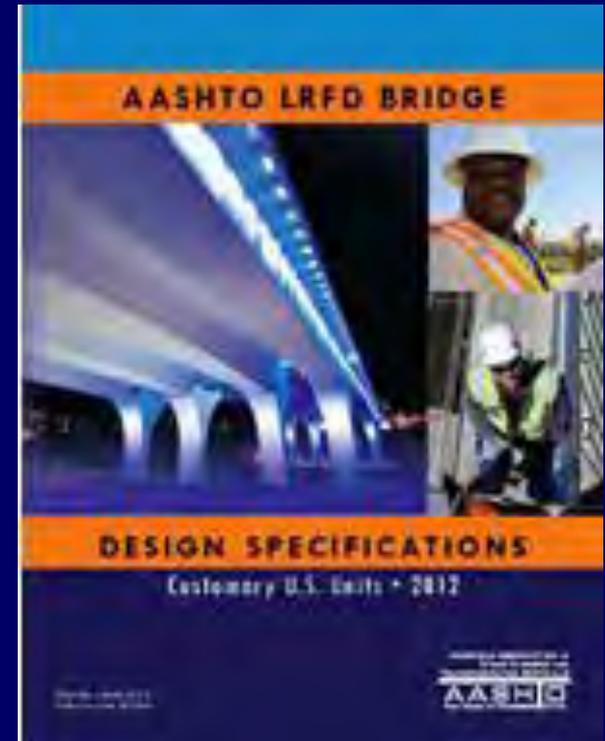


Outline

- New Design Policy
- New Design Practices
- New Detailing Practices
- Summary

Design Policy - New

- Revised TxDOT Bridge Design Manual (expected online March 2013)
- This revision reflects TxDOT adoption of 6th Edition, AASHTO LRFD Bridge Design Specifications



Design Policy - New

- Major changes:
 - Vehicular Collision Force, LRFD Art 3.6.5
 - Consideration of this article if pier is within 30' of roadway
 - Calculate Annual Frequency for a bridge pier to be hit by a heavy vehicle—address collision if over 0.001
 - Re-direct or absorb load with TL-5 barriers OR
 - Provide resistance by design for 600 kip impact load
 - Based on pooled fund research at TTI; Texas was lead state.

Design Policy - New

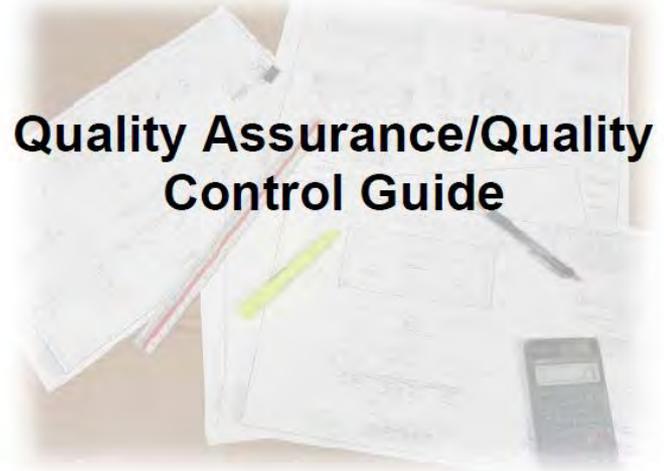
- Major changes, cont'd:
 - Pretensioned Concrete Design
 - Upper limit on $f'_{ci} = 6 \text{ ksi}$ and $f'_c = 8.5 \text{ ksi}$
 - New Sections on Segmental Spans and Post-Tensioned Caps
 - Too early for a new section on Spliced Precast Girders, but expect this soon
 - STRAIGHT Steel Plate Girders
 - Lean-on bracing design allowed for STRAIGHT steel plate girders
 - Flange width limit liberalized for STRAIGHT steel girders, to $0.20D$, down from $0.25D$

Design Policy - New

- Major changes, cont'd:
 - Punching shear for inverted-T ledges
 - Resistance at fascia girder to match/exceed the factored loading at adjacent interior girders
 - Not doing so limits our ability to widen bridges
 - No proven way to add punching shear strength to existing ledges

Design Policy - New

- New QA/QC Guide for bridge design
- Can be found on TxDOT Home Page
- This guide sets minimums
- In the future—
design notes to be stored in Pontex



Quality Assurance/Quality Control Guide

Texas Department of Transportation
Bridge Division, Design Section
August 2012

Design Practices - New

- New Phasing Recommendations for both Superstructure and Substructure
- Information can be found on TxDOT Home Page

Superstructure Design

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

> General Recommendations

▼ Superstructure Phasing Guidance

Phased Construction Recommendations

Do not use span standard detail sheets for phased structures.

Geometric Constraints

When selecting a location for the phase line, consider the following items:

1. Traffic needs and the placement of any temporary barriers. If the clear distance between the back of the barrier and the edge of the slab is less than 2 feet, anchor the barrier to the deck.
2. When building next to an existing structure (such as for phased replacements), provide enough space between the existing structure and the new construction to accommodate splicing of the deck reinforcement, the portion of the beam that extends beyond the edge of slab, the portion of bent or abutment that extends past the beam edge, and form work.
3. Do not place a phase line in the middle or at the edge of a precast panel.
4. For adjacent slab or box beam superstructures, place the phase line at the edge of

Design Practices - New

- No longer recommending bridges be designed for a possible future 2" thick overlay
 - A study of numerous spans indicated adequate bridge rating factor if bridge is not specifically designed for 2" overlay
 - Adding overlay to a bridge is discouraged and not designing for a future overlay provides a more consistent message
 - BRG engineers instructed to not include a future overlay in their designs

Design Practices - New

- No longer applying **Concrete Surface Treatment (Item 428)** to new bridge decks
 - Memo from Gregg Freeby, dated Feb 11, 2013, to Districts communicated this change to our practice
 - Numerous studies indicate many products do not penetrate new concrete as hoped and require frequent applications
 - Other strategies—increased cover, HPC, epoxy coated reinforcement—are considered a better solution
 - Item 428 is being left in for older bridge decks, with a focus on maintenance

Design Practices - New

- **Strand transfer length** considered in girder design
- PGSuper v 2.7.2 has TxDOT library settings with transfer length considered
- Beneficial effects:
 - Reduction in f'_{ci} for heavily prestressed girders
 - Significant reduction in debonding requirements seen

Design Practices - New

- Debonding:
 - Policy on limits in Bridge Design Manual unchanged
 - PGSuper settings have debonding limits decreased, for example, U-beams are limited to 50 percent
 - Recommend using the lower limits and using the higher allowed debonding limits only if necessary
 - What is considered “necessary”?

Design Practices - New

- Deck reinforcing:
 - Implementation of Research Project 6348 recommendations for common 8" & 8.5" decks
 - Switch A-bars from #5 to #4, same 6" spacing
 - Overhangs require supplemental short bars
 - Welded Wire Reinforcement, WWR, could provide better crack control with same or better strength, using D19.6 wire
 - BRG is preparing plans for initial construction evaluation

Design Practices – Cost Savings

- If saving costs is a good idea...
 - No overlay, estimate \$450,000 per year
 - No concrete surface treatment, estimate \$1.5 million per year
 - New deck reinforcement, estimate \$1.5 million per year
 - None of these changes were targeted to save money, but the change led to this beneficial outcome

Detailing Practices - New

- *New Title Block*
- *Uses an approved Flying T logo and one line signature*
- *More space in Job, Hwy, and County fields*

 Texas Department of Transportation				Bridge Division	
FILE#	DR#	EX#	DB#	CR#	
 TxDOT	CONT	SECT	JOB		HIGHWAY
REVISIONS					
DCST	COUNTY			SHEET NO.	

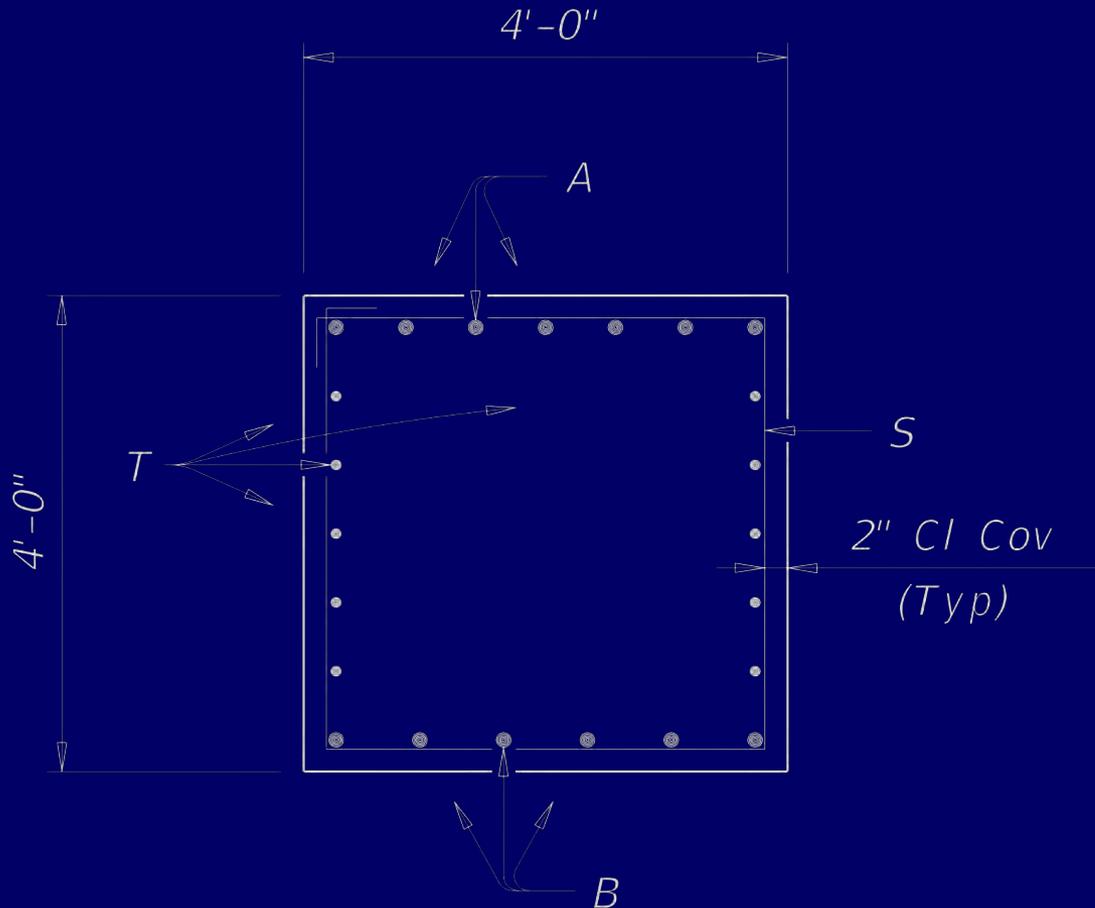
Detailing Practices - New

- *BRG began trial implementation of REBAR, an application that works within Microstation that assists in detailing reinforcing steel*
- *To ensure our reinforcing steel details are meeting our customer's needs, BRG met with industry for their input...*

Detailing Practices - New

- *Outcome—dimension bars to their outside limits, and use clear cover, not bar ϕ cover*
- *This is common practice elsewhere*
- *Industry has to re-dimension our shape bars to accomplish their purposes*

Detailing Practices - New

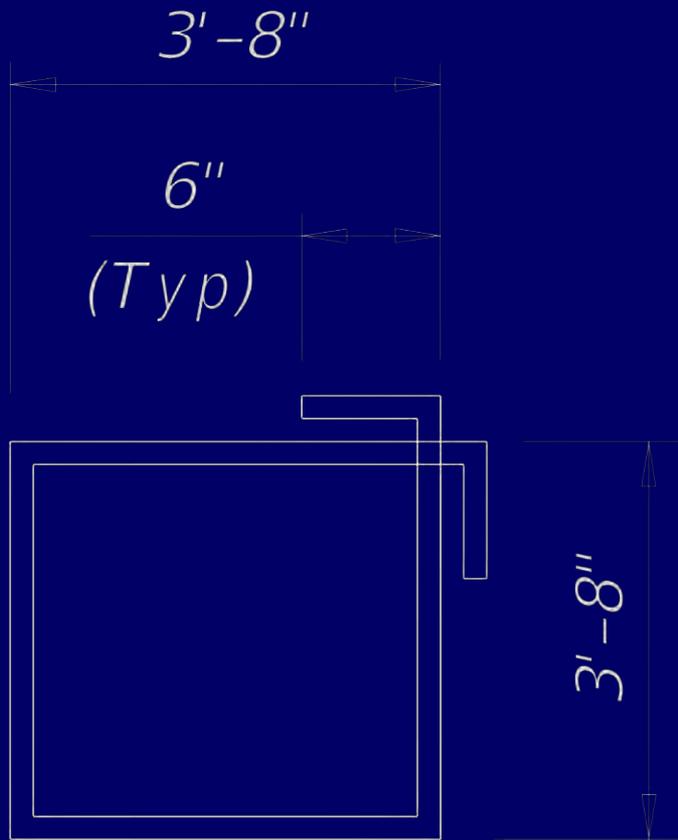


*Example,
showing 2"
clear cover*

*Old way
would be
2¼" to the
"Q" of the S-
bar*

SECTION A-A

Detailing Practices - New



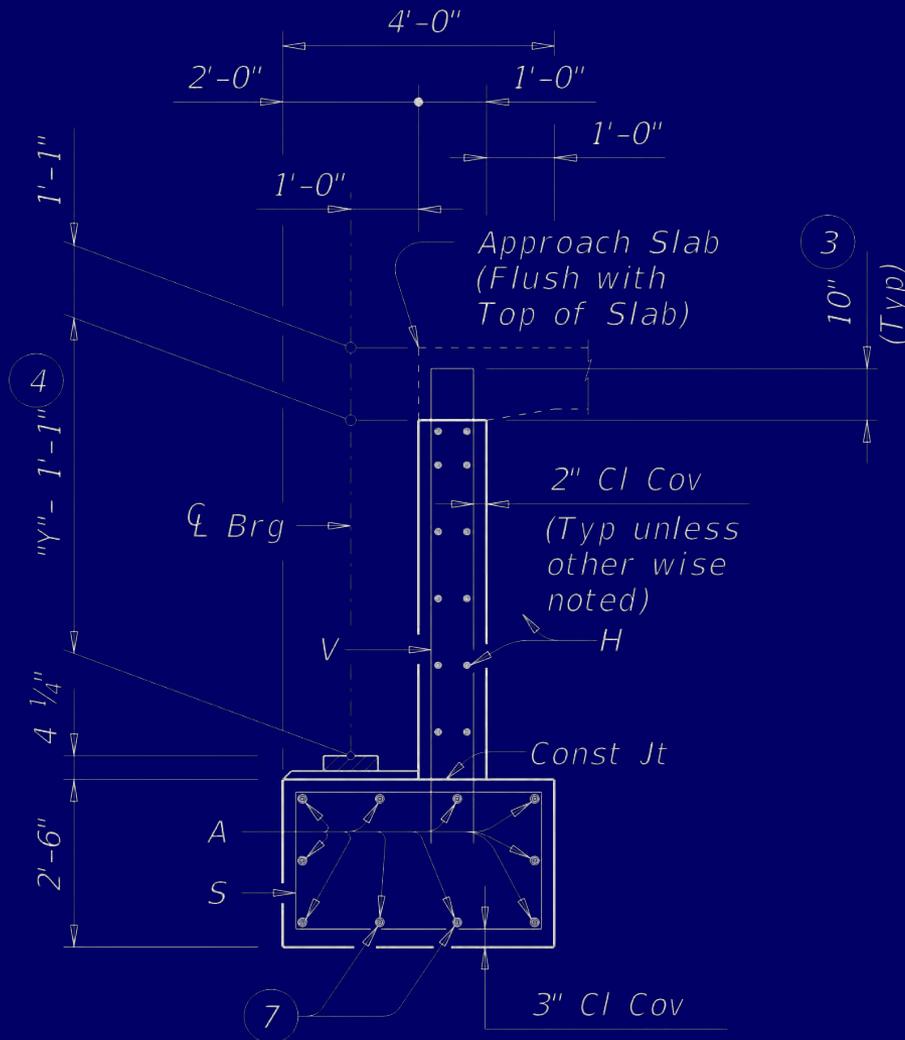
BARS S

*Example of S-bar for a
4' x 4' cap*

*Bar length = (4 * 3.67')
+ 1'*

*Not an "exact" length,
but fine for our
purposes, which is to
provide an accurate
estimate of reinforcing
steel weight*

Detailing Practices – New



Example of an Abutment Section, detailed with clear cover

SECTION A-A

(With Approach Slab)

Detailing Practices – New

- *Since we're embarking on this change in reinforcing steel detailing, checked with technicians for any other beneficial changes we could adopt*
- *True type font*

Detailing Practices – New Font

- *True Type fonts—no change in appearance across several applications: Microstation, AutoCAD, Word, Excel, etc.*
- *Allows .dgn files to be dynamically updated easily with changes to source Excel file, for example*

Detailing Practices – New Font

- *Search for a true type font favorable to engineering drawings led to font from Florida DOT*
- *$\frac{55}{64}$ (stacked fractions have good appearance)*
 - *Non-vulgar fractions may need to be input as symbols*
- *ℚ, ℞, ℔, ℥ (one-stroke symbols)*
- *FDOT and FDOT Bold*

Detailing Practices – New Font

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.
Concrete strength $f'c = 3,600$ psi.
All cap and wall reinforcing must be Grade 60.
See Bridge Layout for header slope and foundation type, size and length.
See Foundation Detail Standard Sheet, FD, for all foundation details and notes.
See Concrete Riprap Standard Sheet, CRR, for riprap attachment details, if applicable.
See applicable rail details for rail anchorage in wingwalls.
Details are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These abutment details may be used with Standard SIG-62-40-45 only.

Old font

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New font,
uses less
space

Summary

- 6th Edition of AASHTO LRFD Specifications will be officially adopted by TxDOT with next revision to the Bridge Design Manual
- Many changes in design policy lead to cost savings
- Using technology to improve detailing practices

Send Questions to:

- John.Holt@txdot.gov
- 512-416-2212