WSDOT/TxDOT
Bridge Practices and Innovations

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Texas Department of Transportation

Washington State Department of Transportation

BridgeSight Software™

WSDOT

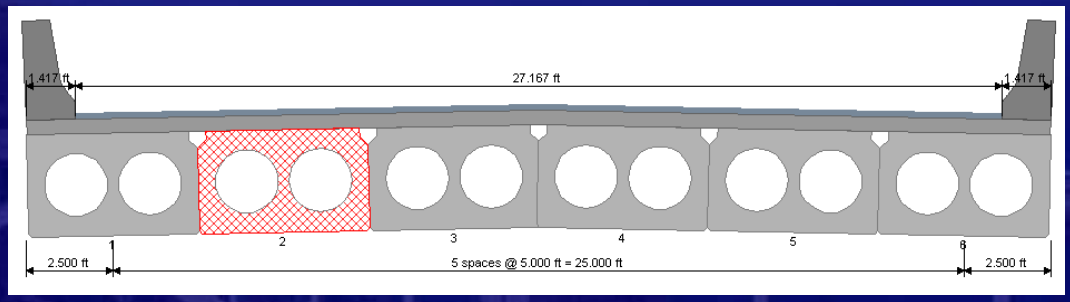
Washington State Department of Transportation

- Precast/Pretensioned I-Girder
- Design Practices
  - Envelope of Simple and Continuous Behavior
  - Moderately High Seismic Zones
  - Standard Intermediate Diaphragm Layout Rules
  - Design for Shipping and Handling
  - Compute LRFR Rating Factors for All LRFD Designs

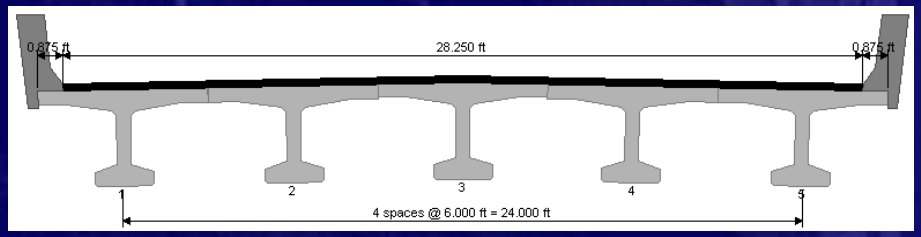
Span Capabilities

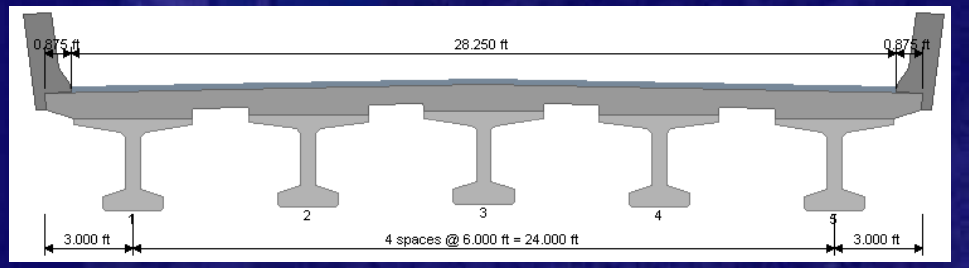
Short/Medium Spans

- Solid or Voided Slab
  - To ~98 ft



- Decked Bulb Tee and Bulb Tee
  - To ~145 ft





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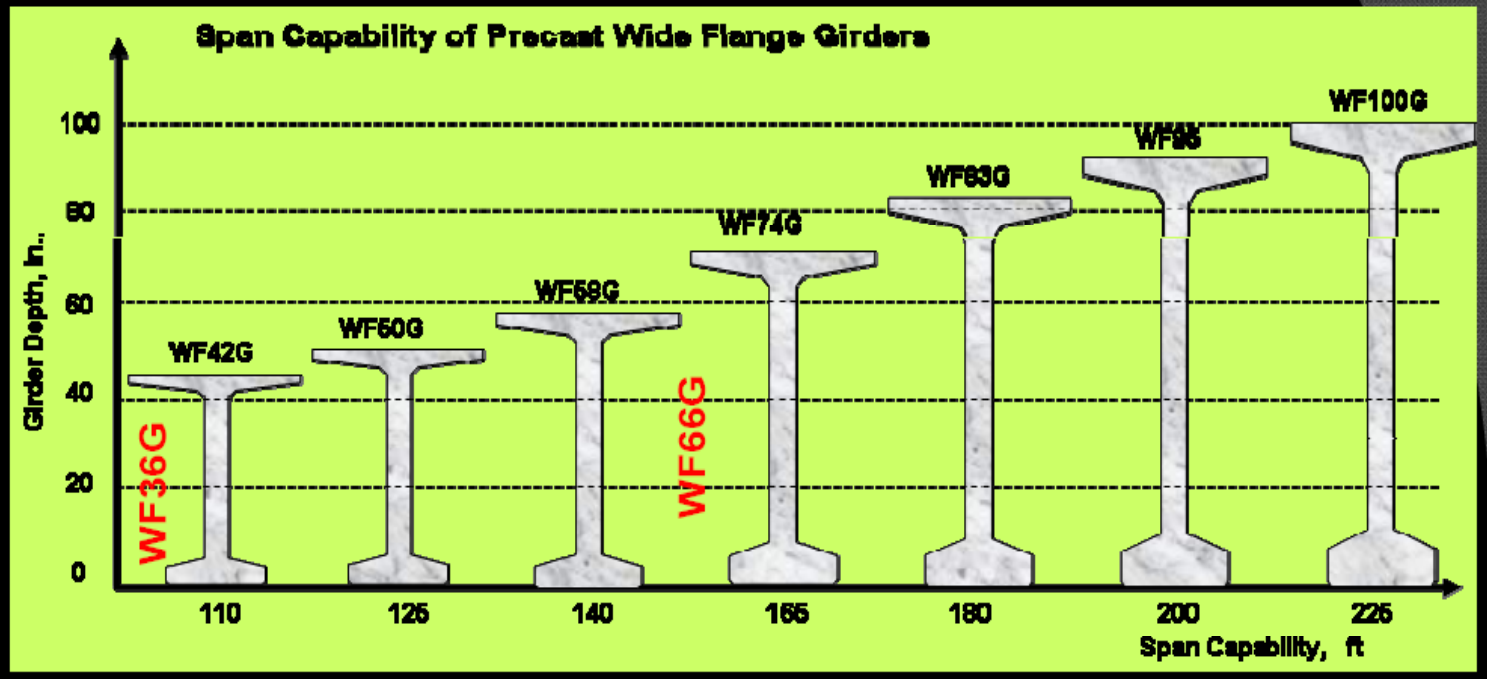
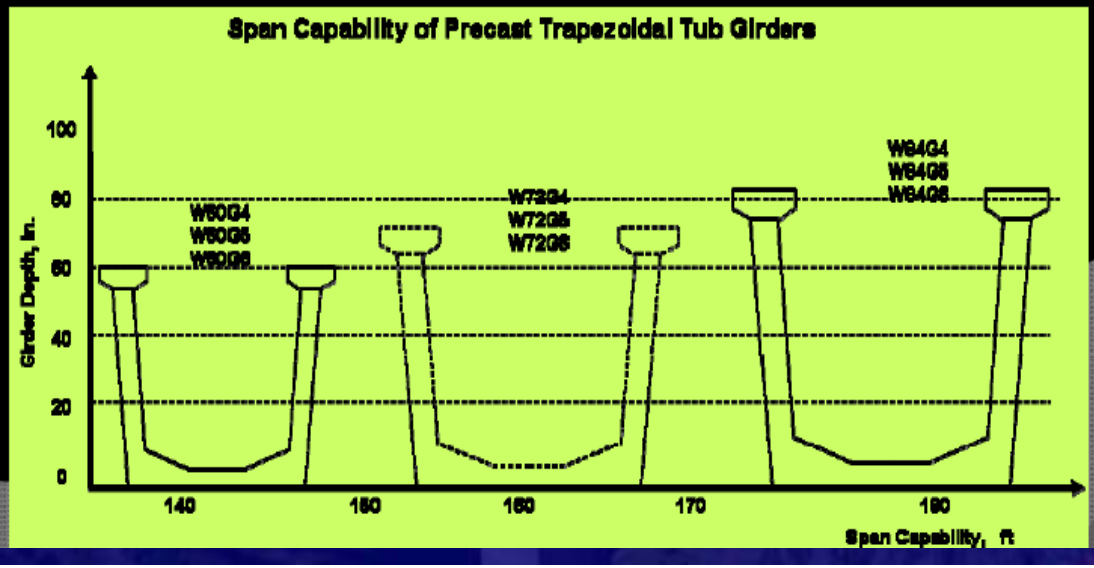
Standard Precast Pretensioned Girders

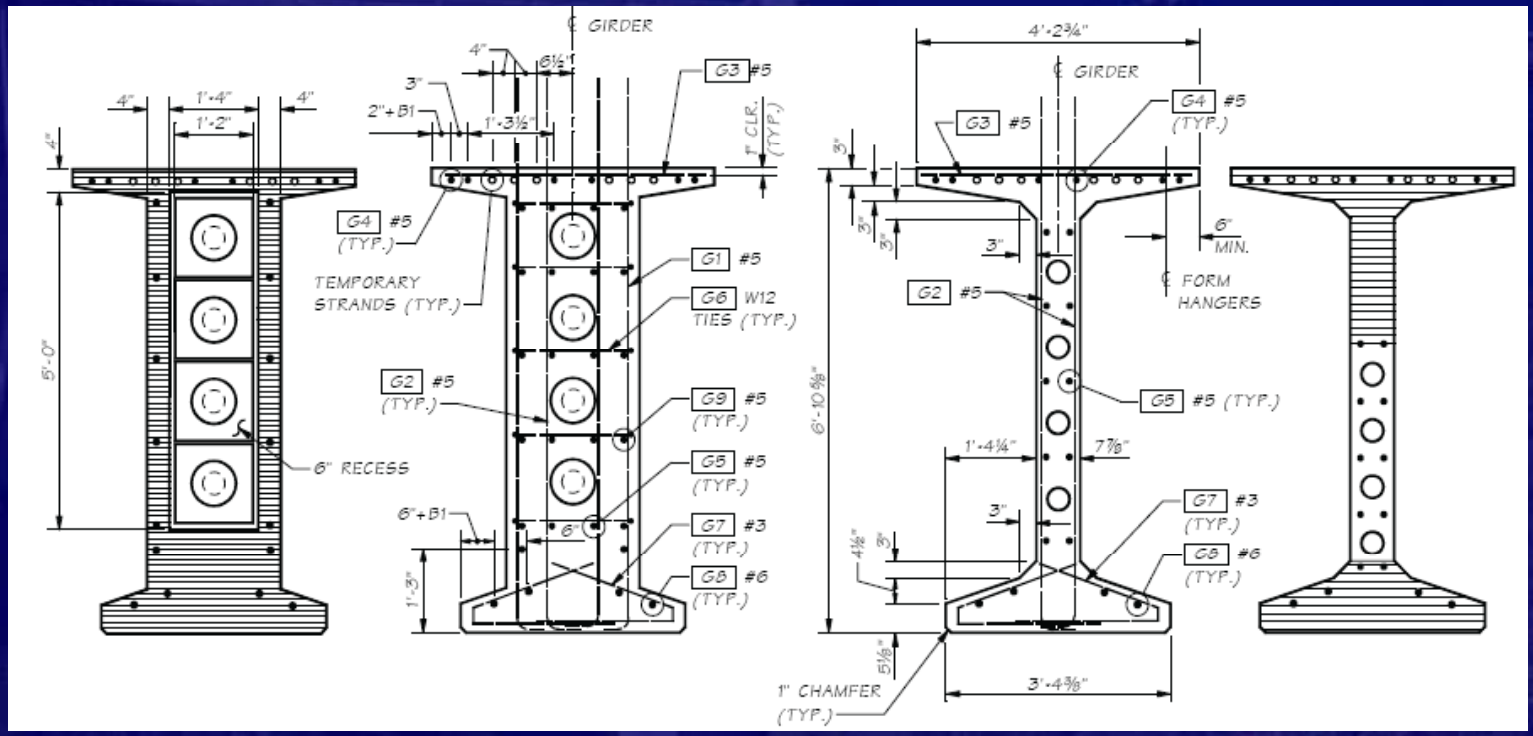




Spliced/Post-Tensioned I-Girders

- WF##PTG Series
  - Splice for Handling/Hauling
  - Simple/Cont Span Design
  - PT Before/After Slab Casting

- 7-7/8” Web Thickness
- 24” Tapered End Block



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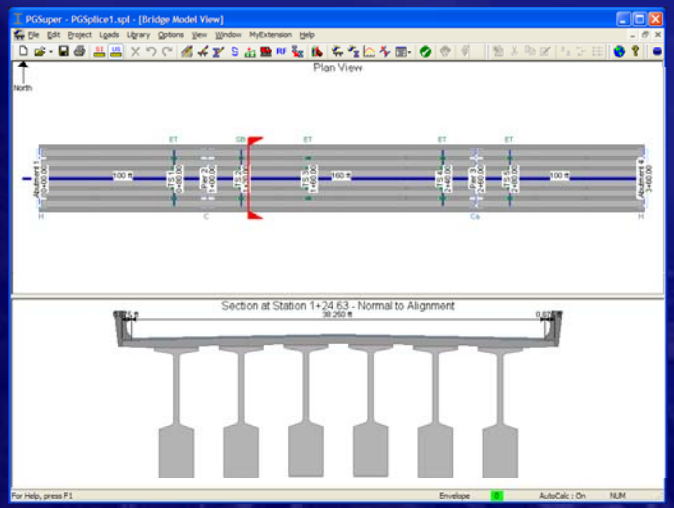
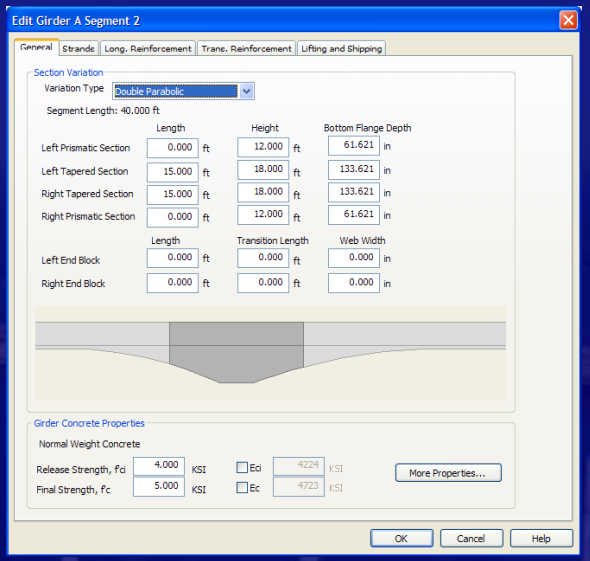
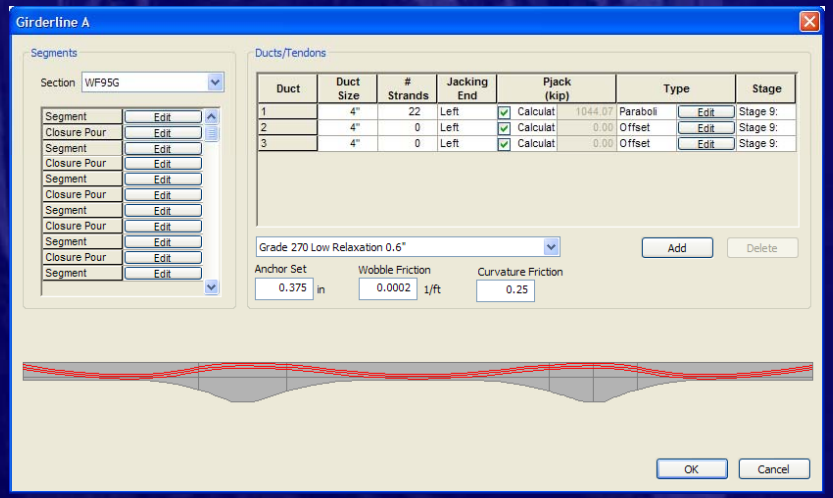
Post-Tensioning For Continuity







- 250 ft Main Span

Washington State Department of Transportation

LRFR Load Rating

- Section 6, Part A of the AASHTO Manual for Bridge Evaluation, First Edition.

Load Rating

Design Load Rating

Limit State	Type	Inventory			Operating		
		RF	γ_{LL}	Location from Left Support	RF	γ_{LL}	Loca Left Support
Strength I	Flexure	1.49	1.750	Span 1 Girder B, ($0.5L_s$) 60.000 ft	1.93	1.350	Span 1 Girder B, ($0.5L_s$) 60.000 ft
	Shear	1.58	1.750	Span 1 Girder B, 23.700 ft	2.46	1.350	Span 1 Girder B, (FoS, $0.0L_s$) 0.000 ft
Service III	Stress	0.97	0.800	Span 1 Girder B, ($0.5L_s$) 60.000 ft			

MEMORANDUM

U.S. Department of Transportation
Federal Highway Administration

Subject: **INFORMATION**: Bridge Load Ratings for the National Bridge Inventory

Date: October 30, 2006

From: */s/ Original Signed by*
M. Myint Lwin, P.E., S.E.
Director, Office of Bridge Technology

Reply to Attn of: HIBT-30

To: Directors of Field Services
Division Administrators
Federal Lands Highway Division Engineers

Several State and FHWA Bridge Engineers have suggested that we clarify our policy regarding the appropriate methodology and loads to be used in reporting operating and inventory rating data (Items 63, 64, 65 and 66 of the 1995 Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (Coding Guide), Report No. FHWA-PD-96-001) to the National Bridge Inventory (NBI). An overview of our past bridge load rating policies are provided in the attached appendix and our current policy and future direction is provided herein.

With the adoption of the AASHTO Load and Resistance Factor Design (LRFD) Specifications, our June 28, 2000, policy memorandum requiring all new bridges to be designed by the LRFD Specifications after October 1, 2007, and the ongoing effort to merge the Manual for Condition Evaluation of Bridges and the Guide Manual for Condition Evaluation and Load and Resistance Factor Rating of Highway Bridges (LRFR Manual), we believe that it is necessary to accommodate and support Load and Resistance Factor Rating (LRFR), while continuing to accept Load Factor Rating (LFR) for the large inventory of in-service bridges that have been designed by another method other than LRFD. The FHWA does not intend to mandate re-rating existing and valid bridge load ratings by LRFR.

Therefore, FHWA's policy for Items 63, 64, 65, and 66 of the Coding Guide is as follows (see Table 1 for more information):

1. For bridges and total replacement bridges designed by LRFD Specifications using HL-93 loading, prior to October 1, 2010, Items 63, 64, 65 and 66 are to be computed and reported to the NBI as either a Rating Factor (RF) or in metric tons. Rating factors shall be based on LRFR methods using HL-93 loading (see Appendix A - Example 1) or LFR methods using MS18 loading (see Appendix A - Example 2). Metric ton rating values shall be reported in terms of MS18 (32.4 metric tons) loading derived from a RF calculated using LRFR methods and HL-93 loading, or LFR methods using MS18 loading (see Appendix A - Example 3).
2. For bridges and total replacement bridges designed by LRFD Specifications using HL-93, after October 1, 2010 Items 63, 64, 65 and 66 are to be computed and reported to the NBI as a RF based on LRFR methods using HL-93 loading (see Appendix A - Example 1).

TxDOT

- ~ $50/sq ft. Avg. Unit Cost For I-Girder Bridge
- 2004 – Over 1,000,000 lin. ft of I-Girders
- Design Practices
  - Simple Span Design
  - Low Seismic Zone
  - No Intermediate Diaphragms
  - “Standard” Designs Via Parametric Plan Sheets

FY 2009 Average % Breakdown of Overall Project Costs for Bridges

System	Structure %	Mobilization %	Removal %	Approach, etc. %
Off-System Bridges	59.5%	7.4%	2.3%	30.7%
Off-System Culverts	49.0%	7.6%	3.4%	40.0%
On-System Bridges	47.6%	10.6%	3.0%	38.3%
On-System Culverts	49.9%	9.2%	3.9%	37.1%

FY 2009 Average Unit Cost*

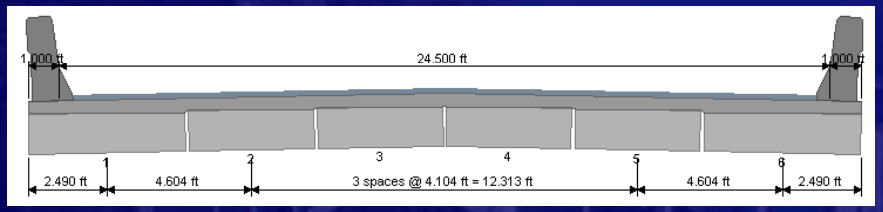
System	Structure Type	Number Bridges	Deck Area (sq.ft.)	Adjusted Structure Cost**	Average Unit Cost ($/sq.ft.)
Off Culvert					
	Culverts	32	36,570	$ 3,574,054	$ 97.73
Off Span					
	Concrete Girder "Pan" (CG-PN)	2	5,304	$ 260,638	$ 49.14
	Girder Prestressed "Box" Beam (GP-BX)	11	29,078	$ 3,681,523	$ 126.61
	Girder Prestressed Decked Slab Beam (GPDSB)	1	1,961	$ 174,576	$ 89.02
	Girder Prestressed "I" Beam	26	183,079	$ 9,964,855	$ 54.43
	Girder Prestressed "I" Beam "Texas Shape" (GPITX)	1	1,820	$ 112,436	$ 61.78
	Prestressed Concrete Slab Beam (PCSB)	68	186,130	$ 14,322,225	$ 76.95
	Concrete Slab (SLAB)	8	50,088	$ 2,931,359	$ 58.52
	Structural Steel Truss (STRTR)	1	2,028	$ 256,693	$ 126.57
	Girder Steel "I" Beam (GS-I)	2	2,753	$ 427,740	$ 155.37
Off Span Totals					
	Off Totals	120	462,241	$ 32,132,045	$ 69.51
On Culvert					
	Culverts	42	259,815	$ 17,173,705	$ 66.10
On Span					
	Girder Prestressed "Box" Beam (GP-BX)	15	92,831	$ 7,768,311	$ 83.68
	Girder Prestressed "I" Beam (GP-I)	138	3,203,136	$ 156,434,885	$ 48.84
	Girder Prestressed "I" Beam "Texas Shape" (GPITX)	18	522,839	$ 25,172,736	$ 48.15
	Girder Prestressed "U" Beam (GP-U)	6	229,100	$ 15,995,769	$ 69.82
	Prestressed Concrete Slab Beam (PCSB)	32	260,921	$ 16,501,775	$ 63.24
	Concrete Slab (SLAB)	4	39,122	$ 2,212,262	$ 56.55
	Girder Steel "I" Beam (GS-I)	5	79,740	$ 8,502,834	$ 106.63
	Girder Steel Trapezoidal (GS-TR)	3	93,795	$ 13,388,855	$ 142.75
On Span Totals					
	On Totals	221	4,521,484	$ 245,977,427	$ 54.40

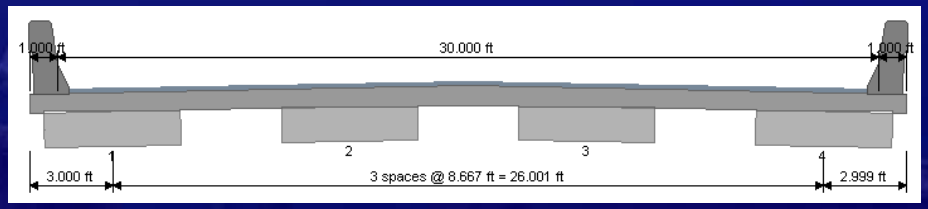
Span Capabilities

Short/Medium Spans

Solid Slab

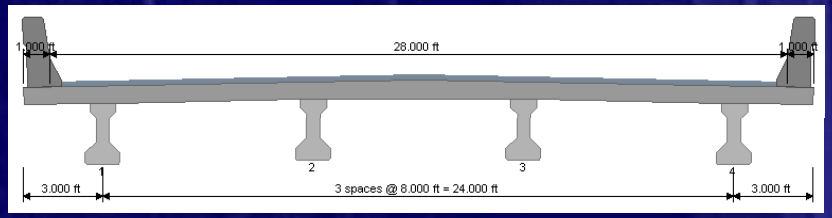
- To ~50 ft



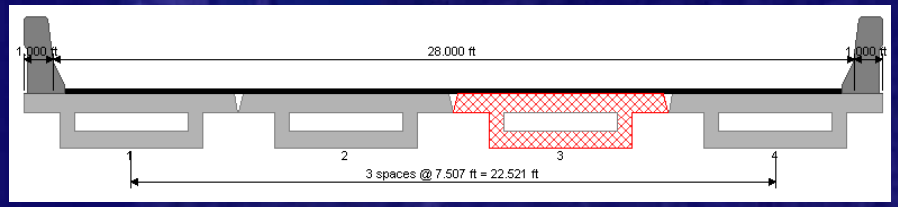


AASHTO I-Girder or Decked Slab Beam

- 50-70 ft



- 40-60 ft

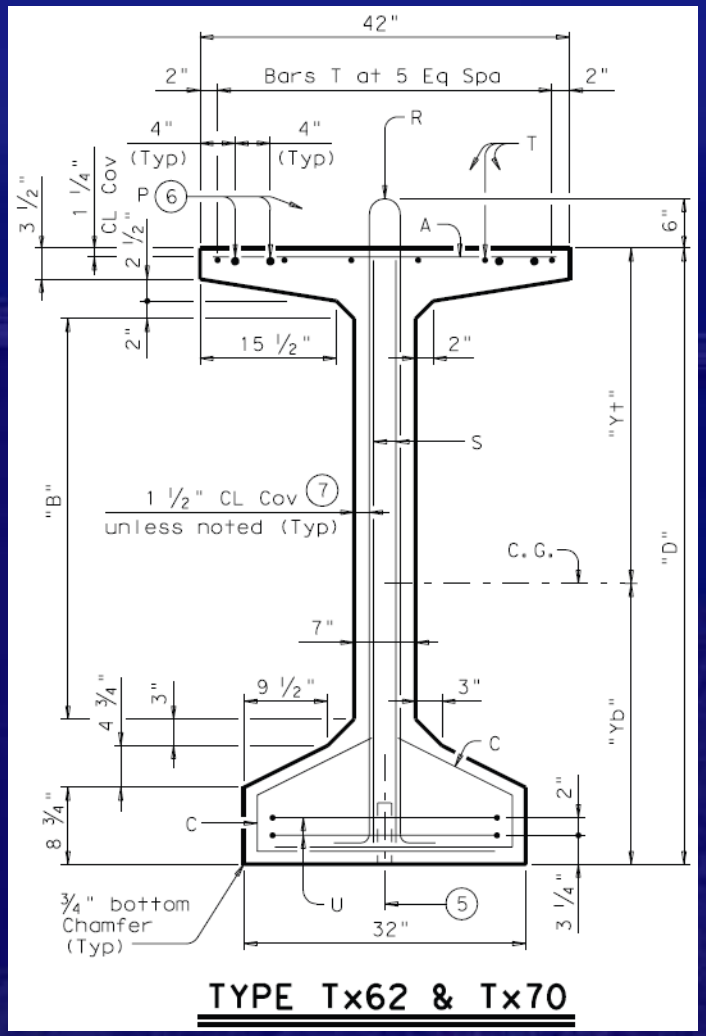


Span Capabilities

Longer Spans

TxDOT I Girder (Tx##)

- Tx28 to ~70 ft
- Tx85 to ~165 ft



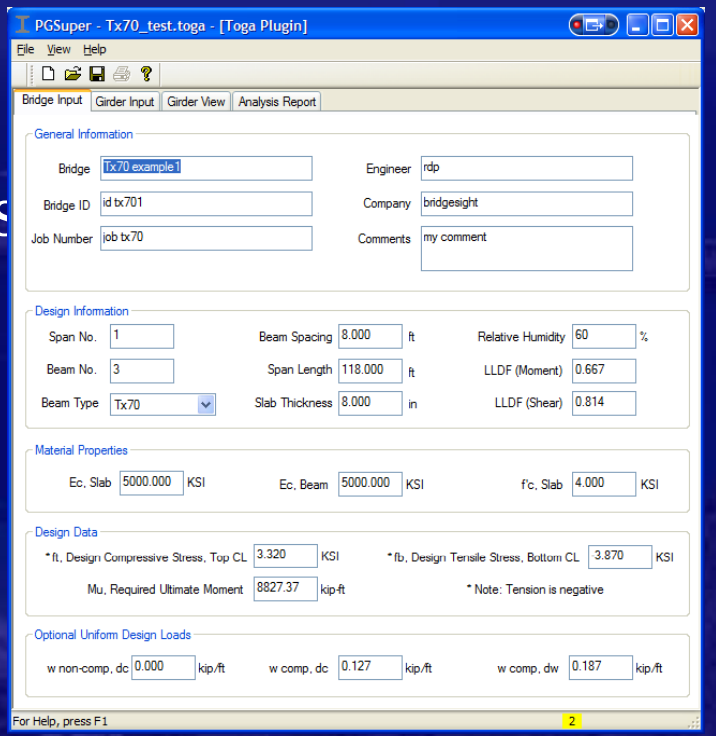
I Girders, Recommended Span Lengths for LRFD

Beam Type	Beam Depth	[1]Approx Structure Depth	Use
TX28	28 in.	38 in.	Economical span limit is 70 ft. Spans should not exceed 80 ft.
TX34	34 in.	44 in.	Economical span limit is 80 ft. Spans should not exceed 95 ft.
TX40	40 in.	50 in.	Economical span limit is 95 ft. Spans should not exceed 105 ft.
TX46	46 in.	56 in.	Economical span limit is 105 ft. Spans should not exceed 120 ft.
TX54	54 in.	64 in.	Economical span limit is 125 ft. Spans should not exceed 140 ft.
TX62	62 in.	72 in.	Economical limt is 135ft. Spans should not exceed 150 ft.
TX70	70 in.	80 in.	Economical limt is 145 ft. Spans should not exceed 150 ft due to handling constraints.

[1]Approx Structure depth is Beam Depth plus 8" minimum slab plus 2" estimated haunch.

TxDOT Optional Girder Analysis (TOGA)

- Value Engineering
  - Streamlined Evaluation of Fabricator Optional Designs
- Simplified UI can be Used by Technicians
- Utilizes PGSuper as Underlying "Engine"




Thank You!!
Questions?
• Special Thanks:
– Doug Mooradian, PCMAC
– Jim Ma, CalTrans
– Rick Brice, WSDOT
– Gregg Freeby, TxDOT
BridgeSight
Software™