The PGSuper Professional Complement to BrDR

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Kansas DOT

BridgeSight Software™

Kansas Department of Transportation

Solutions for the Bridge Engineer's Desktop for:

$\sqrt{400}$

1997 - 2017

Years of Excellence

BridgeSight Software™

History

- BridgeSight Inc. – Founded in 1997
  - Bridge Engineering and Software Development
- Notable Customers
  - TxDOT, WSDOT, Kansas DOT, Idaho DOT, MassDOT
  - Over 20 Consulting Firms

AASHTOWare 3rd Party Developer

- PGSuper Professional
  - 3rd Party Engine
  - Data Integration
  - Secondary Computational Verification

July, 2017
Added to AASHTOWare Catalog

- BridgeLink Professional
- PGSuper Professional

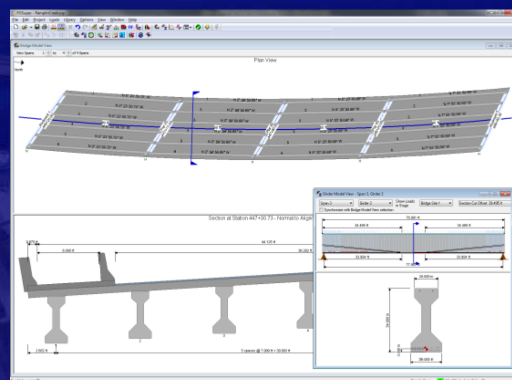
Precast Pretensioned Prestressed Bridge Design
-New post-tensioned spliced girder analysis
-We are not standing still – constant innovation
Value Engineering

PGSuper Overview

- LRFD Precast/PT-PS Girder Bridge Design, Analysis & LRFR Rating
  - Multi-Span Simple or Continuous
  - Harped, Straight, Debonded Strands
  - Automated/Manual Prestressed Design
  - Comprehensive Stirrup Design
  - Constructability and Handling
- Bridge-Centric User Interface
  - Made to Work Like a Bridge Engineer Works
  - Bridge and Roadway Geometry
  - Automatic Load Generation
  - Automatic Spec Checking
- User-Defined
  - Live Loads
  - Dead Loads
  - Load Factors
  - L.L. Distribution

Washington State Department of Transportation

TEXAS DEPARTMENT OF TRANSPORTATION

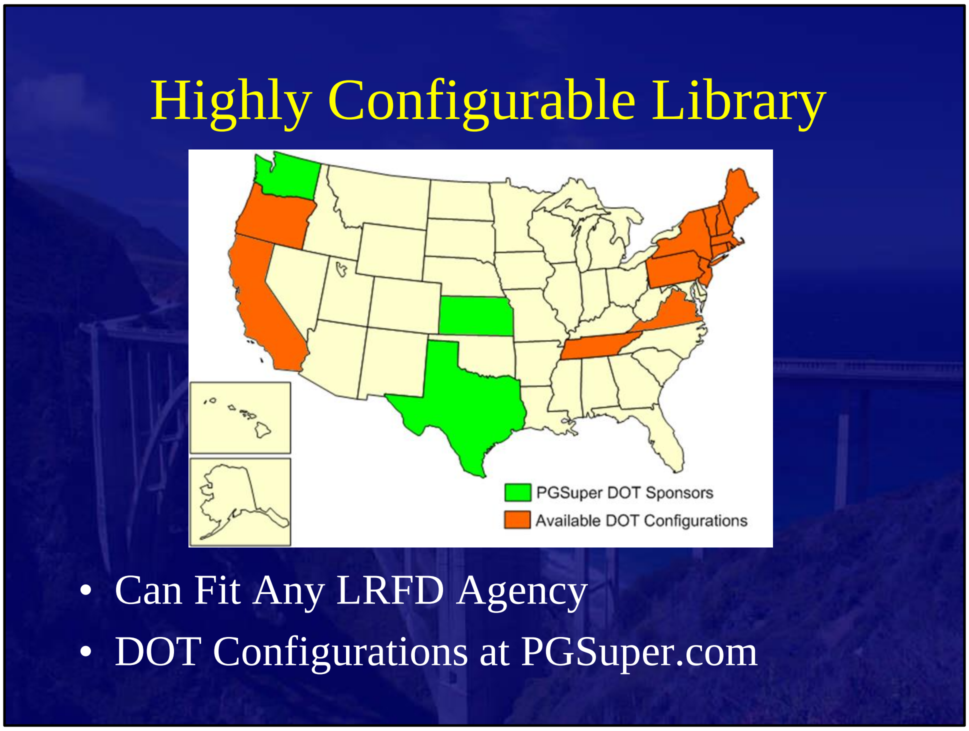


Hold force limits, strand slope, haunch buildup, many more

PGSuper Productivity

- Dedicated Pretensioned-Prestressed Bridge Design Tool
- Comprehensive Spec Checking, Geometry, and Design
- Optimal With Customized Libraries Configurations
  - Automatic Updates Via Internet

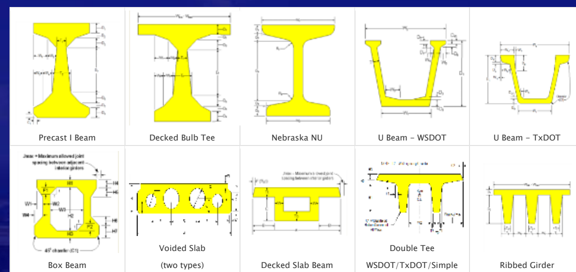
"Most TxDOT Superstructure Designs Take Less Than Half a Day Using PGSuper"



-Over 20,000 downloads from around the world

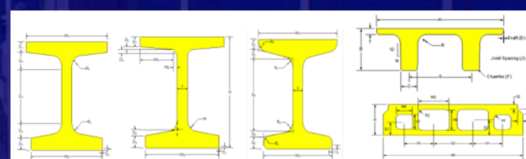
Parametric Sections

Open Source Version

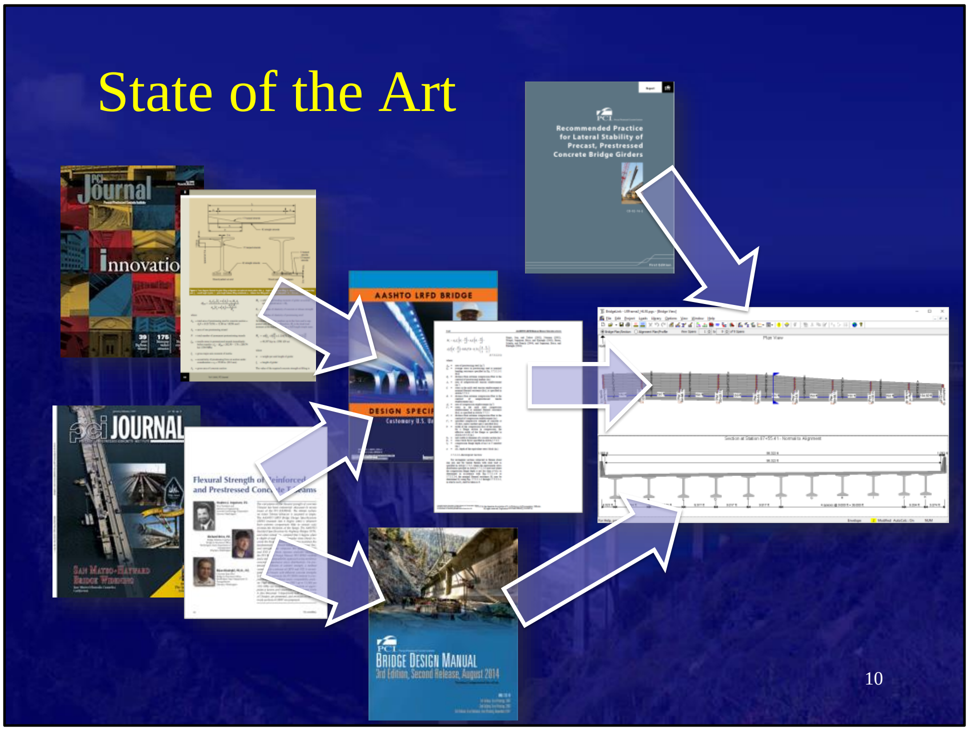


PGSuper Professional

- Florida I-Beam Shape
- Illinois I-Beam Shape
- PCINE NEXT D & F Beam
- Rectangular-Voided Slab



- Adjacent and Spread Spacing



FAST Act Emergency Vehicles
2017 LRFD Already Coded.

Differences With BrDR

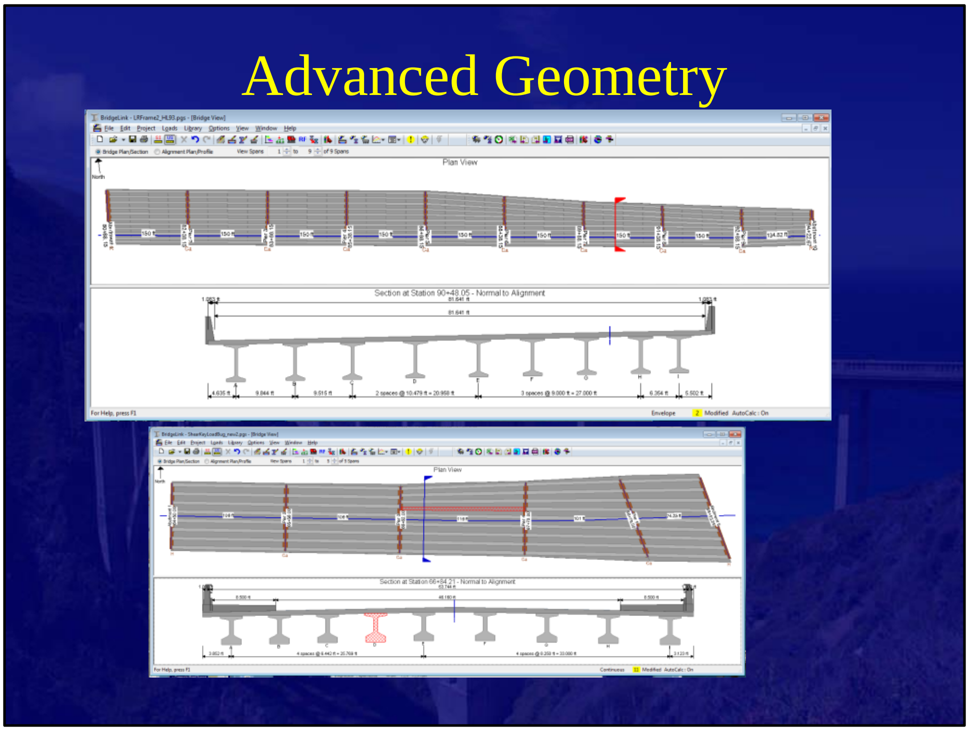
- Not Database Based

- Comprehensive Roadway and Bridge Geometry
  - More Precise Load Generation
  - Exact Girder Lengths
  - Haunch Build up
  - Bearing Seat Elevations
  - Configurable Camber Computations
  - Export to CAD and Graphics Software

Differences With BrDR

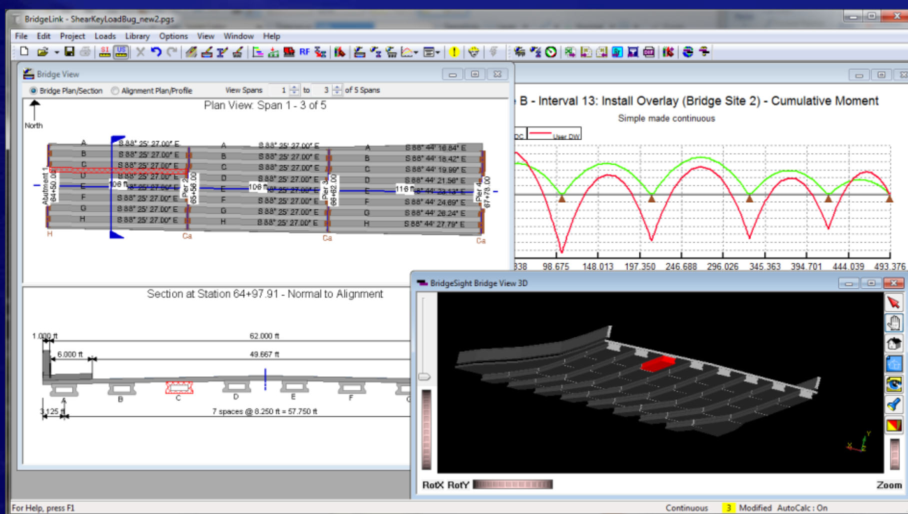
- Constructability Checks and Optimization
  - Casting Yard Checks
  - Lifting
  - Hauling - Based on Fleet of Hauling Equipment
- Cascading Prestress Design Algorithm
  - Straight -> Raised-> Debonded -> Harped
- Comprehensive Stirrup Design
  - Vertical Shear, Horizontal Interface Shear, Longitudinal Reinforcement for Shear, Bursting & Confinement

Lifting and Hauling currently in PCI document – Will be added to AASHTO LRFD Soon



Haunch geometry
Bearing Seat elevations

Highly-Graphical User Interface



LRFR Load Rating

- Section 6, Part A of the AASHTO Manual for Bridge Evaluation, First Edition, 2008 – Second Edition 2011 – 2016 Interims
  - Positive/Negative Moment, Shear, and Flexural Stress
  - Standard or Custom Vehicles
- For:
  - Inventory
  - Operating
  - Legal Loads with Routine Commercial Traffic or Specialized Hauling Vehicles
  - Permit Loads for Routine or Annual Permits
  - Permit Loads for Special or Limited Crossing Permits

Load Rating

Design Load Rating

Limit State	Type	Inventory			Operating		
		RF	γ_{LL}	Location from Left Support	RF	γ_{LL}	Location from 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			

PGSuper Professional™

BridgeSight Software™

- Enhancements
  - Girder Design Dashboard
  - Pgsuper2AASHTOWare Data Translation
  - Exports
    - LandXML | DXF | ViaThor VBent
    - Analysis Results to Excel
  - Enhanced Reporting
  - 3D Visualization and Editing
  - Library Utilities
  - Exclusive DOT Libraries and Configurations
- Toll-Free Technical Support

4.4—ACCEPTABLE METHODS OF STRUCTURAL ANALYSIS

A computer program is only a tool, and the user is responsible for the generated results. Accordingly, all output should be verified to the extent possible.

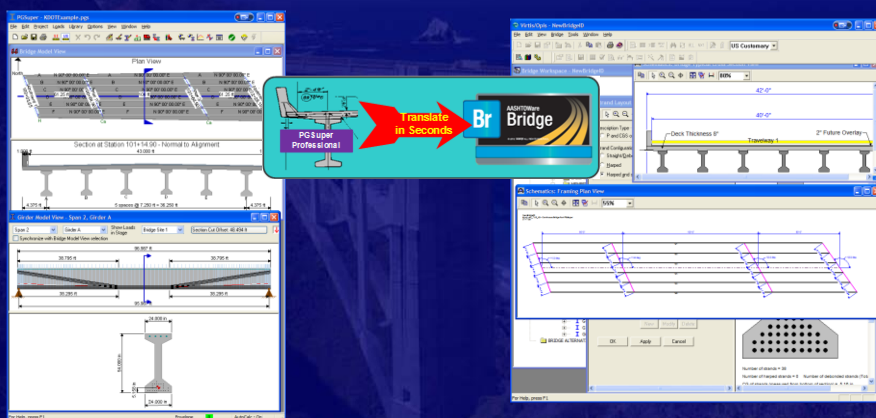
Computer programs should be verified against the results of:

- Universally accepted closed-form solutions,
- Other previously verified computer programs, or
- Physical testing.

PGSuper2AASHTOWare

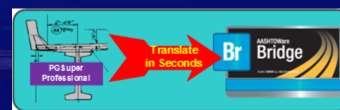
Export PGSuper Bridge Data to BrDR

- PGSuper Data Exporter Plug-in



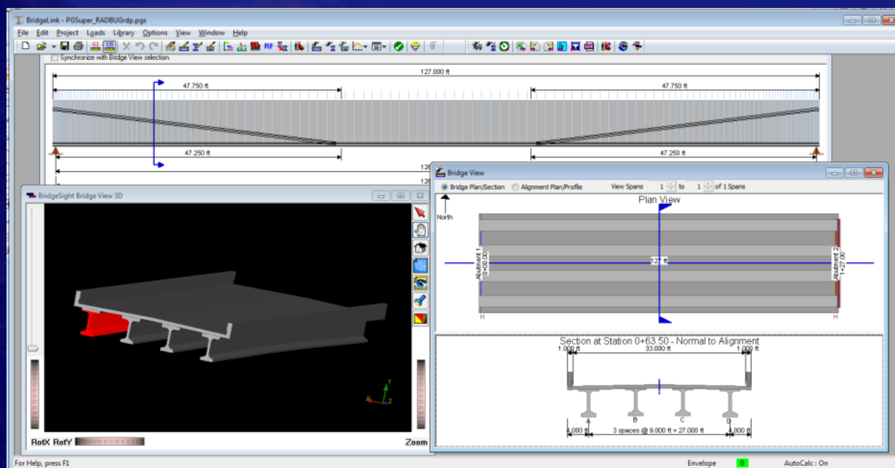
Benefits of Using PGSuper Professional

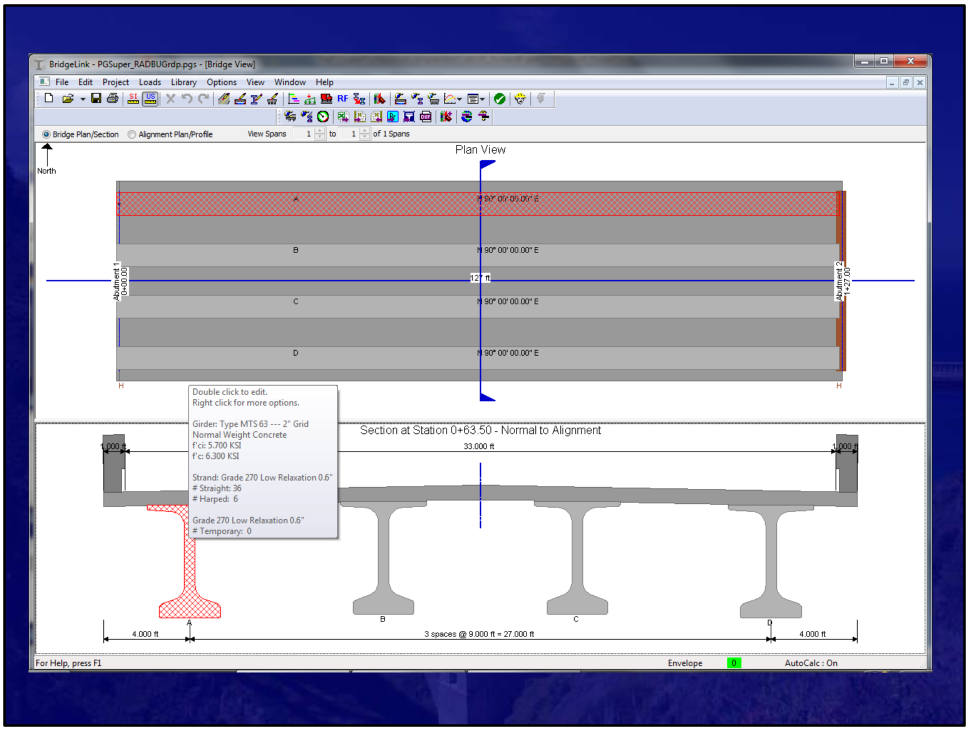
- Use PGSuper Professional for Design
  - The Most Robust And Full-Featured PT/PC Girder Software Available
  - Very Efficient Input UI
  - Optimized Design Algorithm

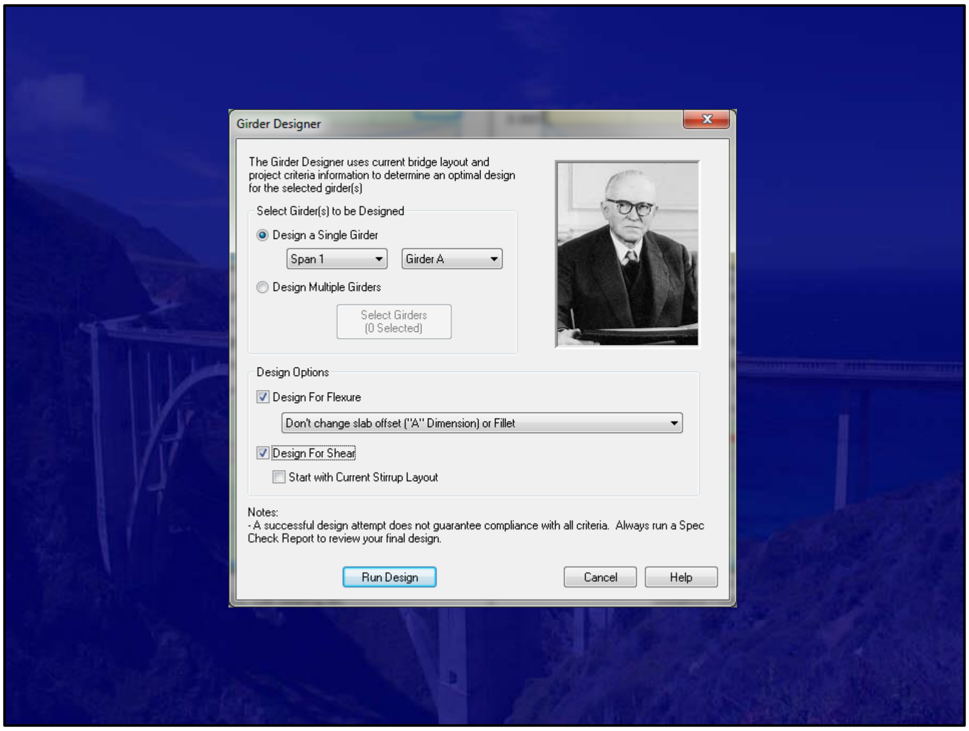


- Export Data to BrDR in Seconds!
  - Nearly Complete Translation
  - Independent LRFD and LRFR Verification
  - On To BrR & BrM for Rating and Bridge Management

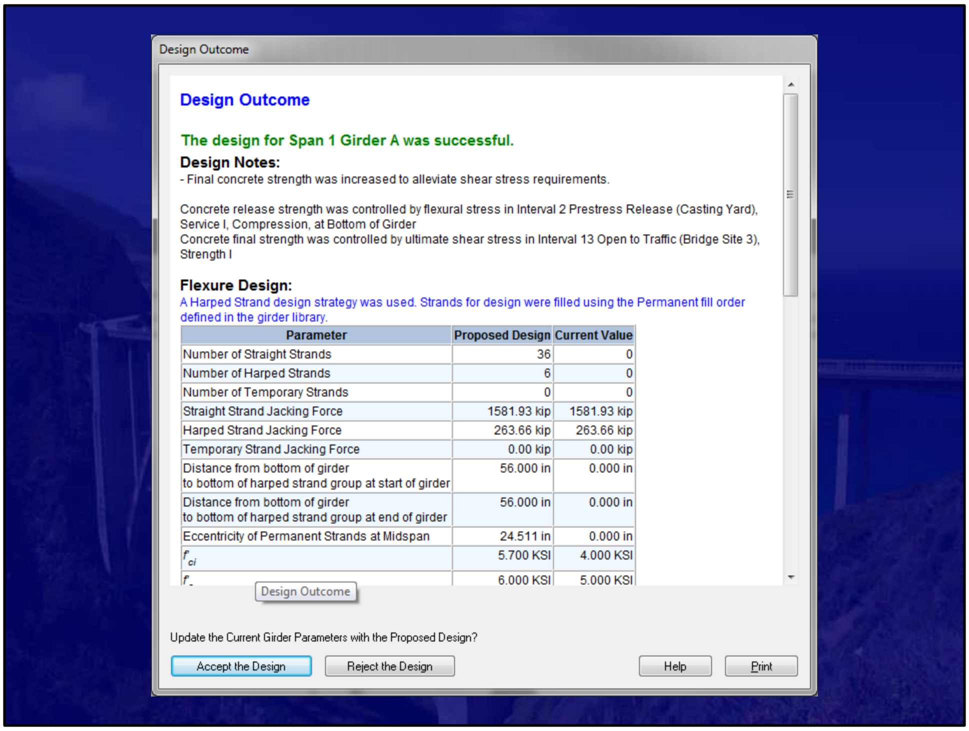
Demo "Bridge"

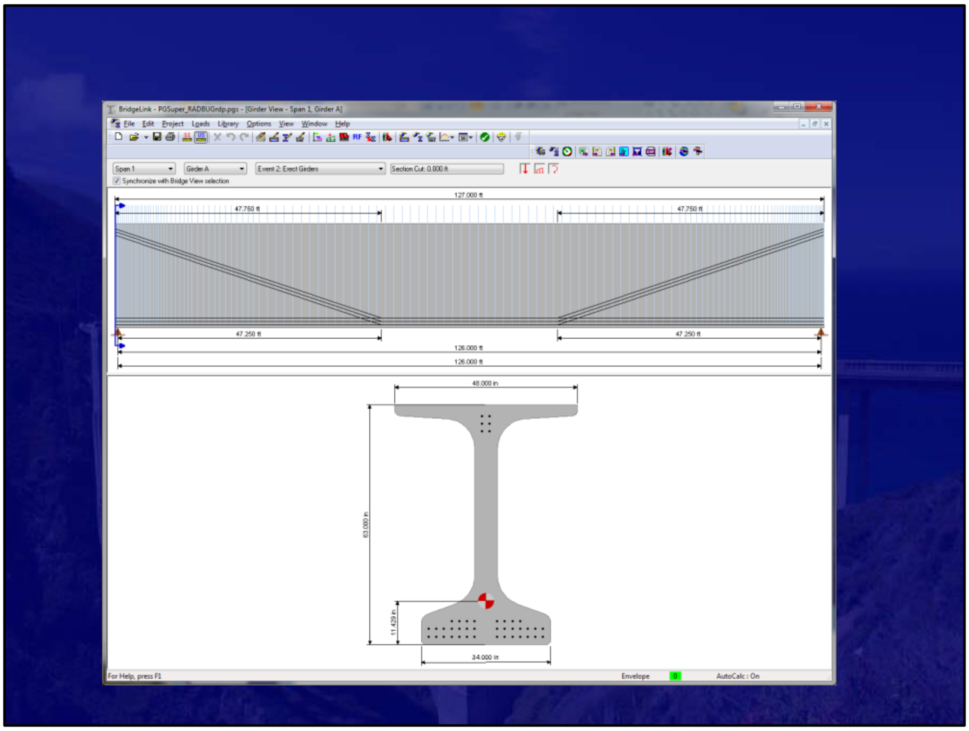


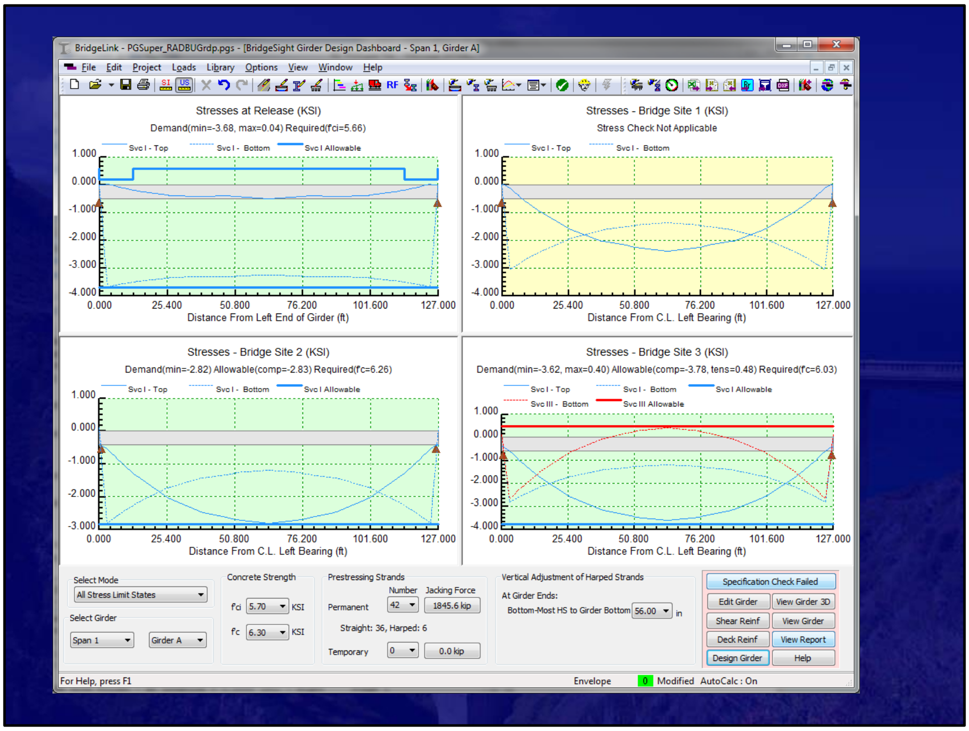

BridgeLink - PGSuper_RADBUGrdp.pgs - [Bridge View]
File Edit Project Loads Library Options View Window Help
Bridge Plan/Section
Alignment Plan/Profile
View Spans 1 to 1 of 1 Spans
Plan View
North
A
B
C
D
N 90° 00' 00.00" E
Abutment 1 0+00.00
Abutment 2 1+27.00
127 ft
Double click to edit.
Right click for more options.
Girder: Type MTS 63 --- 2" Grid
Normal Weight Concrete
f'ci: 5.700 KSI
f'c: 6.300 KSI
Strand: Grade 270 Low Relaxation 0.6"
Straight: 36
Harped: 6
Grade 270 Low Relaxation 0.6"
Temporary: 0
Section at Station 0+63.50 - Normal to Alignment
1.000 ft
33.000 ft
4.000 ft
3 spaces @ 9.000 ft = 27.000 ft
For Help, press F1
Envelope
AutoCalc : On

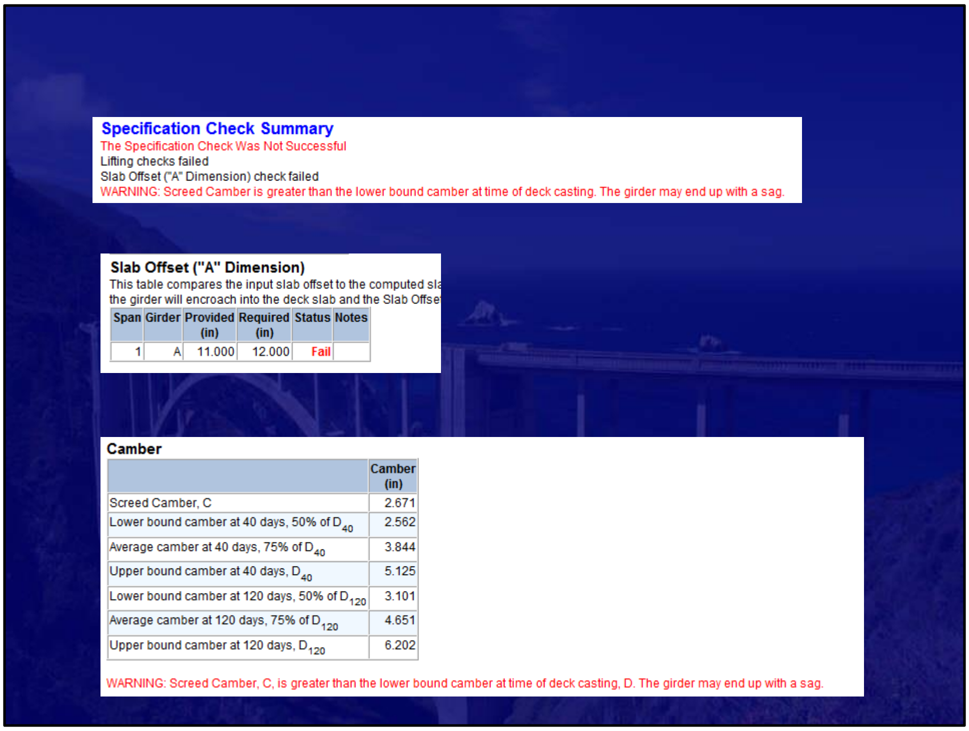


Girder Designer
The Girder Designer uses current bridge layout and project criteria information to determine an optimal design for the selected girder(s)
Select Girder(s) to be Designed
Design a Single Girder
Span 1
Girder A
Design Multiple Girders
Select Girders (0 Selected)
Design Options
Design For Flexure
Don't change slab offset ("A" Dimension) or Fillet
Design For Shear
Start with Current Stirrup Layout
Notes:
- A successful design attempt does not guarantee compliance with all criteria. Always run a Spec Check Report to review your final design.
Run Design
Cancel
Help


Design Outcome
Design Outcome
The design for Span 1 Girder A was successful.
Design Notes:
- Final concrete strength was increased to alleviate shear stress requirements.
Concrete release strength was controlled by flexural stress in Interval 2 Prestress Release (Casting Yard), Service I, Compression, at Bottom of Girder
Concrete final strength was controlled by ultimate shear stress in Interval 13 Open to Traffic (Bridge Site 3), Strength I
Flexure Design:
A Harped Strand design strategy was used. Strands for design were filled using the Permanent fill order defined in the girder library.
Parameter | Proposed Design | Current Value
Number of Straight Strands | 36 | 0
Number of Harped Strands | 6 | 0
Number of Temporary Strands | 0 | 0
Straight Strand Jacking Force | 1581.93 kip | 1581.93 kip
Harped Strand Jacking Force | 263.66 kip | 263.66 kip
Temporary Strand Jacking Force | 0.00 kip | 0.00 kip
Distance from bottom of girder to bottom of harped strand group at start of girder | 56.000 in | 0.000 in
Distance from bottom of girder to bottom of harped strand group at end of girder | 56.000 in | 0.000 in
Eccentricity of Permanent Strands at Midspan | 24.511 in | 0.000 in
f'ci | 5.700 KSI | 4.000 KSI
f'c | 6.000 KSI | 5.000 KSI
Design Outcome
Update the Current Girder Parameters with the Proposed Design?
Accept the Design
Reject the Design
Help
Print


BridgeLink - PGSuper_RADBUGrdp.pgs - [Girder View - Span 1, Girder A]
File Edit Project Loads Library Options View Window Help
Span 1
Girder A
Event 2: Erect Girders
Section Cut: 0.000 ft
Synchronize with Bridge View selection
127.000 ft
47.750 ft
47.750 ft
47.250 ft
47.250 ft
126.000 ft
126.000 ft
48.000 in
63.000 in
11.429 in
34.000 in
For Help, press F1
Envelope
AutoCalc : On


BridgeLink - PGSuper_RADBUGrdp.pgs - [BridgeSight Girder Design Dashboard - Span 1, Girder A]
Stresses at Release (KSI)
Demand(min=-3.68, max=0.04) Required(f'ci=5.66)
Distance From Left End of Girder (ft)
Stresses - Bridge Site 1 (KSI)
Stress Check Not Applicable
Distance From C.L. Left Bearing (ft)
Stresses - Bridge Site 2 (KSI)
Demand(min=-2.82) Allowable(comp=-2.83) Required(f'c=6.26)
Distance From C.L. Left Bearing (ft)
Stresses - Bridge Site 3 (KSI)
Demand(min=-3.62, max=0.40) Allowable(comp=-3.78, tens=0.48) Required(f'c=6.03)
Distance From C.L. Left Bearing (ft)
Select Mode
All Stress Limit States
Select Girder
Span 1
Girder A
Concrete Strength
f'ci 5.70 KSI
f'c 6.30 KSI
Prestressing Strands
Number
Jacking Force
Permanent 42 1845.6 kip
Straight: 36, Harped: 6
Temporary 0 0.0 kip
Vertical Adjustment of Harped Strands
At Girder Ends:
Bottom-Most HS to Girder Bottom 56.00 in
Specification Check Failed
Edit Girder
View Girder 3D
Shear Reinf
View Girder
Deck Reinf
View Report
Design Girder
Help
For Help, press F1
Envelope
Modified AutoCalc : On



Specification Check Summary

The Specification Check Was Not Successful

Lifting checks failed

Slab Offset ("A" Dimension) check failed

WARNING: Screed Camber is greater than the lower bound camber at time of deck casting. The girder may end up with a sag.

Slab Offset ("A" Dimension)

This table compares the input slab offset to the computed sla
the girder will encroach into the deck slab and the Slab Offse

Span	Girder	Provided (in)	Required (in)	Status	Notes
1	A	11.000	12.000	Fail	

Camber

	Camber (in)
Screed Camber, C	2.671
Lower bound camber at 40 days, 50% of D_{40}	2.562
Average camber at 40 days, 75% of D_{40}	3.844
Upper bound camber at 40 days, D_{40}	5.125
Lower bound camber at 120 days, 50% of D_{120}	3.101
Average camber at 120 days, 75% of D_{120}	4.651
Upper bound camber at 120 days, D_{120}	6.202

WARNING: Screed Camber, C, is greater than the lower bound camber at time of deck casting, D. The girder may end up with a sag.

Camber variability is a custom setting.

Intermission…

- **Q&A?**