BridgeLink
WSDOT’s open source bridge engineering application framework

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Washington State Department of Transportation

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Spokane, WA
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Biography

- Richard (Rick) Brice, PE
- BSCE – Saint Martin’s University, Lacey, WA
- MSCE – Texas A&M University, College Station, TX
- 26+ years @ WSDOT
- 22 years as Software Applications Engineer
Presentation outline

- BridgeLink™ application framework
- BridgeLink™ applications
- Flagship applications - PGSuper™ and PGSplice™
- Washington Bridge Foundation Libraries (WBFL)™
- Collaborative software development
- 3rd party development activities
BridgeLink™
BridgeLink™ application framework

BridgeLink™

- PGSuper™
- PGSplice™
- BEToolbox™
- Others...

WSDOT Extensions

- TxDOT Extensions
- 3rd Party Extensions

WSDOT Extensions

- 3rd Party Extensions
Open source software

- **BridgeLink™ is open source software**
  - Licensed with the Alternate Route Open Source License (ARSOL)

- You can
  - use the software for any purpose
  - distribute the software to anyone, gratis or for a fee
  - get a copy of the source code
  - modify the software and distribute modified versions
  - create new software based on this software

- What’s the catch?
  - All distributions of the software, including derivative works, must be under the terms and conditions of the original license
Why open source?

• Creates benefits that exceeds those from a more restrictive model

• Our software has value as a tool, not as a saleable commodity
  – We can do things more efficiently with the tool
  – Does not lose value as a tool if you use it

• Benefits realized from open source
  – Minimize defects from broad and diverse usage of the tools
  – Increased robustness as a result of external inputs
  – Reduced development costs through collaborative development efforts

End user benefits

• License management
  – You can’t violate the license agreement by simply possessing the software.

• Distribution
  – You can give a copy to anyone, at anytime, for gratis or for a fee.

• Validation
  – You get the source code.
  – You can see exactly how every engineering calculation is performed.

• Choice
  – You are not locked in to a single source for support, service, or enhancements.
Who uses BridgeLink?

- State DOTs
  - Washington, Texas, Kansas, Idaho, Oregon, Massachusetts, Tennessee, Virginia, Missouri, Illinois, Kentucky, Georgia, …
- Other Government
  - Army Corps of Engineers, US Forest Service, Many local agencies, …
- Consultants
  - AECOM, COWI, CH2M-Hill, Jacobs, Parsons, WSP, KPFF, Moffatt & Nichol, …
- Universities
  - Washington, Rutgers, Buffalo, Illinois, Iowa, New Mexico, Texas, …
- International
  - Mexico, Canada, India, Pakistan, Netherlands, England, France, Italy, Brazil, Croatia, Dominican Republic, Rwanda, Nigeria, Turkey, Japan, Qatar, Saudi Arabia, Guatemala, Yemen, Albania, China, Romania, Ethiopia, Venezuela,…

Source: WSDOT download records
BridgeLink™ applications
BEToolbox™

- Bridge Engineer’s Toolbox - Collection of utility programs
- BoxGdr - Geometric properties of box girders
- Curvel - Roadway elevations, grades, and crown slope
- GenComp - Geometric properties of a generalized composite section
- GirComp - Geometric properties of composite steel sections
- UltCol - Axial/bending interaction of circular reinforced concrete column
- PGStable - Prestressed girder stability analysis
- Spectra - Design response spectrum generator
PGSuper™

- Design, analysis, and load rating of precast-prestressed girder bridges
• Design, analysis, and load rating of spliced precast-prestressed girder bridges
**PGSLibrary™**

- Utility application for creating and managing libraries for PGSuper™ and PGSplice™
- Typically used by administrators to create shared libraries and custom configurations
TOGA™

- Texas Optional Girder Analysis (TOGA)
- Utility program used by TxDOT technicians and engineers to evaluate contractor submitted optional girder designs
- TOGA is generally not used outside of TxDOT
XBRate™

- Reinforced concrete cross beam load rating application
- Performs load rating analysis for Design, Legal, Emergency, and Permit cases
- Supports AASHTO LRFD and AASHTO MBE LRFR

- Stand-alone application and extension to PGSuper™ and PGSplice™
PGSuper™
What is PGSuper™?

• PGSuper™ (Prestressed Girder SUPERstructures) is precast-prestressed girder bridge design, analysis, and load rating software

• Development began in 1995 for VAX/VMS systems
  – Needed LRFD design tools for our most common bridge type

• Released for Microsoft Windows in January 2000

• Texas Department of Transportation joined as development partner in 2007
Design and specification checking

- **Flexural Design**
  - computes prestressing requirements
  - computes concrete strength requirements
  - computes slab haunch build-up requirements

- **Shear Design**
  - determines reinforcement requirements for:
    - vertical shear,
    - interface shear,
    - web splitting and strand confinement

- **Specification Checking**
  - evaluates strength, service, fatigue, and detailing criteria
  - evaluates stresses and stability during handling and transportation
  - supports LRFD 1st Edition, 1994 through current
Load rating

- AASHTO Manual for Bridge Evaluation, Section 6, Part A (LRFR)

- Load rating analysis can be performed for
  - Design (Inventory and Operating)
  - Legal Loads with Routine Commercial Traffic
  - Legal Loads with Specialized Hauling Vehicles
  - Legal Loads with Emergency Vehicles (EV2/EV3)
  - Permit Loads for routine or annual permits
  - Permit Loads for special or limited crossing permits

- Rating factors are computed for moment, shear, flexural stresses

- Automatically performs load posting analysis as needed
State of the art
Girder sections

- PGSuper™ supports many general families of girder sections:
  - I-Beams
  - U-Beams
  - Deck Bulb Tees
  - Box Beams
  - Slabs (voided and solid)
  - Multi-stem Beams (ribbed girders)

- Girder sections are parametric so virtually any girder can be defined

- 3rd parties can extend the software with new girder families and sections
Bridge-centric user interface
3rd party customization

3rd party configuration server

Custom girders (NEXT)

Extension toolbars and menus

Custom configurations

Extension views, tools, graphs, and reports

Screen images courtesy of BridgeSight, Inc.
Complex geometry
Detailed girder modeling
Automated 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 B
- Design Multiple Girders
  - Select Girders
    - (0 Selected)

Design Options:
- [ ] Design For Flexure
  - Design slab offset ("A" Dimension) and Fillet
- [ ] Design For Shear
- [ ] Start with Current Strut 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

Design Outcome:

The design for Span 1 Girder B was successful.

Design Notes:
- Concrete release strength was controlled by flexural stress in interval 3 Lift girders, Service I, Compression, at Bottom of Girder
- Concrete final strength was controlled by flexural stress in Interval 7 Cast Deck (Bridge Site 1), Service I, Compression, at Bottom of Girder

Flexure Design:

A Harped Strand design strategy was used. Strands for design were filled using Number of Straight and Number of Harped strands.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Design</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Straight Strands</td>
<td>32</td>
<td>38</td>
</tr>
<tr>
<td>Number of Harped Strands</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Number of Temporary Strands</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Straight Strand Jacking Force</td>
<td>1406.16 kip</td>
<td>1069.82 kip</td>
</tr>
<tr>
<td>Harped Strand Jacking Force</td>
<td>659.14 kip</td>
<td>709.57 kip</td>
</tr>
<tr>
<td>Distance from top of girder to top of harped strand group at start of girder</td>
<td>4.000 in</td>
<td>4.000 in</td>
</tr>
<tr>
<td>Distance from top of girder to top of harped strand group at end of girder</td>
<td>4.000 in</td>
<td>4.000 in</td>
</tr>
</tbody>
</table>

Apply the Slab Offset ("A" Dimension) design from
- Span 1, Girder B
- To the entire bridge

Update the Current Girder Parameters with the Proposed Design?
- Accept the Design
- Reject the Design

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Lifting and hauling stability

- Integrated stability analysis for initial lifting and hauling
- Based on PCI Publication CB-02-16-E, “Recommended Practice for Lateral Stability of Precast, Prestressed Concrete Bridge Girders”
Specification compliance checking

Interval 2: Prestress Release (Casting Yard) : Service I

For Temporary Stresses before Losses [5.9.4.1]
Compression Stresses [5.9.4.1.1]
Tension Stresses [5.9.4.1.2]

$f_c' = 5.100$ KSI
Allowable compressive stress = $0.85f_c' = 3.696$ KSI

Allowable tensile stress in areas other than the precompressed tensile zone $= 0.948 \times f_y'$ but not more than $0.200$ KSI $= 0.200$ KSI

Allowable tensile stress in areas with sufficient bonded reinforcement in the precompressed tensile zone $= 0.2400 \times f_y'$ $= 0.593$ KSI if bonded reinforcement sufficient to resist the tensile force in the concrete is provided.

Concrete strength required to satisfy this requirement is $5.658$ KSI.

<table>
<thead>
<tr>
<th>Location from Left Support (ft)</th>
<th>Location from End of Girders (ft)</th>
<th>Pre-tension</th>
<th>Service I</th>
<th>Demand</th>
<th>Tensile Capacity Precompressed Tensile Zone (ksi)</th>
<th>Tension Status (CD)</th>
<th>Compression Status (CD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(BT, STRF) - 1.710</td>
<td>(BT, STRF, 0.000)</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>Pass (a)</td>
<td>Pass (a)</td>
</tr>
<tr>
<td>(FS) 0.583</td>
<td>(FS) 2.293</td>
<td>-0.535</td>
<td>-2.877</td>
<td>-1.128</td>
<td>-1.200 - 0.663 - 2.758</td>
<td>Pass (c)</td>
<td>Pass (c)</td>
</tr>
<tr>
<td>(PSXFR) 1.290</td>
<td>(PSXFR) 3.000</td>
<td>-0.674</td>
<td>-3.787</td>
<td>-1.587</td>
<td>-1.156 - 0.841 - 3.832</td>
<td>Pass (c)</td>
<td>Pass (c)</td>
</tr>
<tr>
<td>(H) 5.417</td>
<td>(H) 7.127</td>
<td>-0.525</td>
<td>-3.924</td>
<td>-3.384</td>
<td>-0.908 - 3.566</td>
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<td>Pass (c)</td>
</tr>
<tr>
<td>(SZB) 5.585</td>
<td>(SZB) 7.045</td>
<td>-0.510</td>
<td>-3.920</td>
<td>-3.393</td>
<td>-0.912 - 3.563</td>
<td>Pass (c)</td>
<td>Pass (c)</td>
</tr>
<tr>
<td>(SZB) 6.335</td>
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<td>-4.041</td>
<td>-0.922 - 3.553</td>
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<td>Pass (c)</td>
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<tr>
<td>(1.5H) 7.833</td>
<td>(1.5H) 9.643</td>
<td>-0.437</td>
<td>-4.004</td>
<td>-4.050</td>
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<td>Pass (c)</td>
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<td>-0.977 - 3.488</td>
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<td>Pass (c)</td>
</tr>
<tr>
<td>11.059</td>
<td>(0.1L) 13.568</td>
<td>-0.292</td>
<td>-4.136</td>
<td>-4.695</td>
<td>-0.987 - 3.489</td>
<td>Pass (c)</td>
<td>Pass (c)</td>
</tr>
<tr>
<td>(SZB) 23.335</td>
<td>(SZB) 25.045</td>
<td>0.122</td>
<td>-4.510</td>
<td>-1.163</td>
<td>-1.040 - 3.428</td>
<td>Pass (c)</td>
<td>Pass (c)</td>
</tr>
</tbody>
</table>

For Help, press F1

WSDOT
Calculation details

Time dependent losses between transfer and hauling [5.9.5.4.2]

[5.9.5.4.2a] Shrinkage of Girder Concrete: $A_{PSRH}^f$

$$\varepsilon_{PSRH} = \varepsilon_{PSH} F_p K_{sh}$$

$$\varepsilon_{PSH} = K_1 K_2 k_{sh} k_{k2} k_{k2} 0.48 \times 10^{-3} \text{ where } k_{sd} = k_{sd}(t = t_r)$$

$$K_{th}(\text{Permanent Strands}) = \frac{1}{1 + \frac{E_p A_{psH}}{E_c A_p} \left( 1 + \frac{A_p e_{psH}}{l_g} \right) \left[ 1 + 0.7 \psi_b(t_f, t_r) \right]}$$

$$K_{th}(\text{Temporary Strands}) = \frac{1}{1 + \frac{E_p A_{psH}}{E_c A_p} \left( 1 + \frac{A_p e_{psH}}{l_g} \right) \left[ 1 + 0.7 \psi_b(t_f, t_r) \right]}$$

$$\psi_b(t_f, t_r) = 1.9 K_4 k_{sh} k_{k2} k_{k2} k_{sd}(t = t_f)$$

$$k_1 = 1.45 - 0.13 \left( \frac{V}{S} \right) \geq 1.0$$

$$k_2 = 2 - 0.014 H$$

$$k_3 = 1.56 - 0.008 H$$

$$k_4 = 5$$

$$k_{sd} = \frac{1}{1 + \frac{E_p A_{psH}}{E_c A_p} \left( 1 + \frac{A_p e_{psH}}{l_g} \right) \left[ 1 + 0.7 \psi_b(t_f, t_r) \right]}$$

For Help, press F1

<table>
<thead>
<tr>
<th>H (%)</th>
<th>V/S (in)</th>
<th>$F_{cd}$ (ksi)</th>
<th>$t_1$ (day)</th>
<th>$t_2$ (day)</th>
<th>$t_f$ (day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>3.196</td>
<td>6.100</td>
<td>1</td>
<td>10</td>
<td>2000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$E_p$ (ksi)</th>
<th>$F_{cd}$ (ksi)</th>
<th>Shrinkage</th>
<th>Creep</th>
</tr>
</thead>
<tbody>
<tr>
<td>28500</td>
<td>5236</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

$k_h, k_{th}, k_{ho}, k_f, \text{ Initial to Hauling } t = 9 \text{ day}$

$k_h, k_{th}, k_{ho}, k_f, \text{ Initial to Final } t = 1999 \text{ day}$

WSDOT
Graphical results
... and much, much more

- Curved alignments with spirals, vertical curves, superelevation transitions
- User defined ad-hoc loads
- User defined live load vehicles
- Gross and transformed section analysis
- Three deck options (CIP, PC-SIP Panels, no-deck/overlay)
- Multiple strand definition methods
- Extended, debonded, and temporary strands
- Multiple methods of computing prestress losses
  - AASHTO approximate and refined (with or without elastic gains)
  - TxDOT method
  - Non-linear time-step method
- Moment capacity using strain compatibility
- Bounded camber computed by classical mechanics with or without multipliers
- Analysis modes (Simple Span, Simple made Continuous, Envelope)
- Detailed online documentation (Tutorials, User Guide, Technical Guide)
- .... and there is still more…
PGSplice™
What is PGSplice™?

- PGSplice™ is precast-prestressed spliced girder bridge design, analysis, and load rating software
- PGSplice™ was first released in January 2017
- Has many similarities with PGSuper™
Multi-span spliced girder
Model real structures
Bridge-centric user interface
Customizable and extensible

- PGSplice™ can be customized with Configurations, Plug-ins, and Extensions.
Time-step analysis

- Analysis performed per LRFD 5.9.5.4.1 with a time-step analysis
- Time-dependent material models from AASHTO LRFD, ACI 209-R92 and CEB-FIP
- Time-step analysis method developed by Tadros, et al.

\[ \Delta \varepsilon_c(i_e, i_b) = \frac{\Delta P_c(i_m)}{A_c E_c(i_m)}[1 + \psi(i_e, i_m)] + \left\{ \sum_{j=1}^{i-1} \frac{\Delta P_c(j_m)}{A_c E_c(j_m)} [\psi(i_e, j_m) - \psi(i_b, j_m)] + \Delta \varepsilon_{sh}(i_e, i_b) \right\} \]

\[ \Delta \varphi_c(i_e, i_b) = \frac{\Delta M_c(i_m)}{I_c E_c(i_m)}[1 + \psi(i_e, i_m)] + \left\{ \sum_{j=1}^{i-1} \frac{\Delta M_c(j_m)}{I_c E_c(j_m)} [\psi(i_e, j_m) - \psi(i_b, j_m)] \right\} \]

\[ \Delta \varepsilon_{ps}(i_e, i_b) = \frac{\Delta P_{ps}(i_m)}{A_{ps} E_{ps}} + \left\{ \sum_{j=1}^{i-1} \frac{\Delta P_{ps}(j_m)}{A_{ps} E_{ps}} \right\} \]

\[ \Delta \varepsilon_{ns}(i_e, i_b) = \frac{\Delta P_{ns}(i_m)}{A_{ns} E_{ns}} + \left\{ \sum_{j=1}^{i-1} \frac{\Delta P_{ns}(j_m)}{A_{ns} E_{ns}} \right\} \]

\[ \Delta P_k = \left[ \frac{\Delta P}{A_{tr} E_{tr}} + \Delta M(Y_{tr} - Y_k) \right] A_k E_k, \Delta M_k = \Delta M \frac{I_p E_k}{I_{tr} E_{tr}} \]

\[ \bar{P}_k = -E_k A_k \varepsilon_k, \bar{M}_k = -E_k I_k \varphi_k \]

\[ \bar{P} = \sum_{k=1}^{n} \bar{P}_k, \bar{M} = \sum_{k=1}^{n} (\bar{M}_k + \bar{P}_k (Y_{tr} - Y_k)) \]

\[ \bar{\varepsilon} = \frac{\bar{P}}{E_{tr} A_{tr}}, \bar{\varphi} = \frac{\bar{M}}{E_{tr} I_{tr}} \]

ACI Structural Journal / January-February 1983

RESEARCH SIGNIFICANCE

Successful design of this type of bridge requires careful prediction of the demand and ultimate capacity of the various elements of construction. This is particularly true in light of the continuing need to withstand larger spans and higher concrete strengths. As accurate prediction is critical, this aspect of the study is of great importance in the design and construction of spliced girders. The research results are significant in the design and construction of spliced girders and will be of great interest to professionals in the field.

STATE OF THE ART

Precast concrete bridges of the range of 200 to 300 ft (60 to 90 m) have become common in some areas. The use of these structures is facilitated by lengths that accommodate the span and by relatively shallow piers that accommodate the layout of the approach and approach slabs. This type of construction is very satisfactory since the weight of the structure can be distributed in such a way that the pier approaches are not penetrated by the bridge superstructure. The research results will be of great interest to professionals in the field.
Timeline manager

Smart Events

Construction Activities
Smart event technology

• Construction sequence (timeline) is modeled with “Smart Events”

• Smart events model the logical steps for each construction activity

• Example: Construct segment activity
  – Stress strands
  – Elapsed time before casting concrete
  – Cast concrete
  – Elapsed time during curing
  – Prestress release
  – Lifting
  – Placement into storage
  – Elapsed time during storage

• Smart events significantly simplifies timeline modeling
## Specification compliance checking

### Interval 2: Prestress Release (Casting Yard): Service II

**Service II**

For Temporary Stresses before Losses [5.9.4.1]

Compression Stresses [5.9.4.1.1]

Tension Stresses [5.9.4.1.2]

\( f'_c = 5000 \text{ KSI} \)

**Allowable compressive stress** = \( 0.65 f'_c = 3000 \text{ KSI} \)

**Allowable tensional stress** in areas other than the precompressed tensile zone = \( 0.0948 \times f'_c \) but not more than \( 0.200 \text{ KSI} = 0.200 \text{ KSI} \)

**Allowable tensional stress** in areas with sufficient bonded reinforcement in the precompressed tensile zone = \( 0.2400 \times f'_c = 0.593 \text{ KSI} \) if bonded reinforcement sufficient to resist the tensile force in the concrete is provided.

Concrete strength required to satisfy this requirement = \( 5058 \text{ KSI} \)

### Table: Stress Analysis

<table>
<thead>
<tr>
<th>Location from Left Support (ft)</th>
<th>Location from End of Girder (ft)</th>
<th>Pre-Tension</th>
<th>Service II</th>
<th>Demand</th>
<th>Tensile Capacity</th>
<th>Precompressed Tensile Zone</th>
<th>Tension Status (C/D)</th>
<th>Compression Status (C/D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ST STRF) 1.710</td>
<td>(ST, STRF, 0.0L) 1.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.200</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>(FS) 0.583</td>
<td>(FS) 2.293</td>
<td>-0.535</td>
<td>-2.877</td>
<td>-0.128</td>
<td>-0.120</td>
<td>-0.663</td>
<td>-2.756</td>
<td>Pass (2.14)</td>
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<tr>
<td>(PSKR) 1.230</td>
<td>(PSKR) 3.000</td>
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<td>3.787</td>
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<td>0.158</td>
<td>0.084</td>
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<tr>
<td>(H) 5.417</td>
<td>(H) 7.127</td>
<td>-0.525</td>
<td>3.924</td>
<td>-0.384</td>
<td>0.358</td>
<td>-0.099</td>
<td>-3.566</td>
<td>Pass (1.82)</td>
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<tr>
<td>(SZB) 5.585</td>
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<td>3.392</td>
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<td>0.365</td>
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<td>-3.566</td>
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<tr>
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<td>0.022</td>
<td>3.566</td>
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<tr>
<td>(1.0H) 7.933</td>
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<td>3.130</td>
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<td>0.047</td>
<td>-0.897</td>
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<tr>
<td>(SZB) 23.335</td>
<td>(SZB) 25.045</td>
<td>-0.122</td>
<td>3.410</td>
<td>1.163</td>
<td>1.093</td>
<td>0.040</td>
<td>3.428</td>
<td>Pass (1.16)</td>
</tr>
</tbody>
</table>

For Help, press F1
Calculation details
... and much, much more

- Curved alignments with spirals, vertical curves, superelevation transitions
- Linear and parabolic variations in segment depth
- Cantilever pier segments
- Drop-in field segments
- Erection towers and strong back hangers
- User defined analysis timeline
- Multiple stages of post-tensioning
- User defined ad-hoc loads
- User defined live load vehicles
- Configurable project criteria
- Extended, debonded, and temporary strands
- Moment capacity using strain compatibility
- Detailed online documentation (Tutorials, User Guide, Technical Guide)
- .... and there is still more...
How to get BridgeLink?

- Free download from WSDOT web site
  - [http://www.wsdot.wa.gov](http://www.wsdot.wa.gov)

- Search

About 257,000 results (0.44 seconds)

Bridge Engineering Software - BridgeLink™ Overview - wsdot
www.wsdot.wa.gov/eesc/bridge/software/index.cfm?fuseaction=software_detail...
BridgeLink™ Overview. BridgeLink™ is an integrated suite of bridge engineering software. BridgeLink™ links together several different bridge engineering ...
Washington Bridge Foundation Libraries (WBFL)

- Software building blocks for bridge engineering applications
- Written in C++, supports COM/OLE Automation
- 45 libraries including
  - Mathematics
  - Geometric primitives
  - Shapes and sections
  - Coordinate geometry (COGO)
  - Bridge geometry
  - Generic bridge modeling and analysis tools
  - Plane frame structural analysis
  - Bridge analysis
  - LRFD support and utilities
  - Material modeling
  - Reinforced concrete tools
  - Units management
  - Direct manipulation graphics
  - Graphing and reporting tools
  - Girder stability analysis

- Licensed with the Alternate Route Library Open Source License
- Permits usage of WBFL components in proprietary and open source applications
Collaborative development

- Collaboratively developing with Texas DOT since 2007
- Kansas DOT contributor 2012-2014

- We simply decided to work together
  - No formal agreements or MOU’s required
Working together

• We coordinate development activities to:
  – eliminate duplication of work
  – eliminate incompatible features
  – find mutually beneficial solutions

• We share the workload on items of common interest
  – software validation and maintenance
  – updating for latest AASHTO LRFD and LRFR requirements

• WSDOT provides overall coordination

• New development partners and contributors are always welcome!
Keys to success

• Open source licensing
  – Eliminates risk
  – At any time, either party can walk away with all of the source code and continue on their own
  – The other party has all the source code and can continue as well

• Commitment to arriving at mutually beneficial solutions

• We have vested interests in long term success
• We recognize the benefits of collaboration over duplication of efforts

• Success leads to more success
3rd party development

• BridgeSight Inc. is offering “Professional” versions
  – BridgeLink Professional
  – PGSuper Professional
  – PGSplice Professional

• Value added features and services
  – Configurations, Plug-ins, and Extensions
    • Configurations for other state DOTs
    • Data import/export plug-ins
    • Extended features including “Designer Dashboard”, 3D Viewers, additional engineering analysis
  – Technical support
  – AASHTOWare Integration (listed in FY2018 catalog)