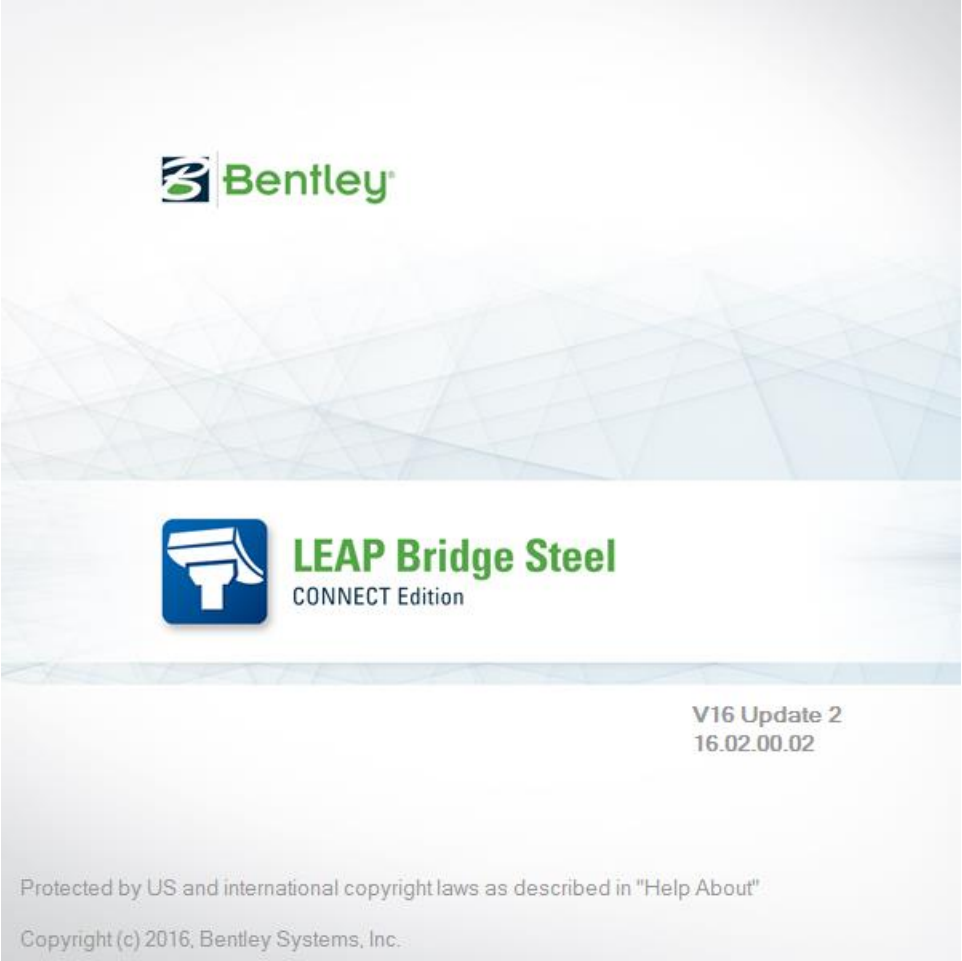
LEAP Bridge Steel CONNECT Edition V16 Update 2
January 2017 Release Notes



LEAP Bridge Steel CONNECT Edition V16 Update 2 contains enhancements, improvements, and several bug fixes. Major enhancements include the addition of: design optimization for the web plates, the ability to design code check multiple years (AASHTO LRFD 2015 and 2016), use of wheel loading for live load analysis, design check summary reports, and improved display of analysis results.

Critical Bug fix

A critical bug has been identified and fixed concerning live loads not properly being carried into the field splice design. All designs made with previous version LEAP Bridge Steel CONNECT Edition V16 Update 1 should be reviewed for this.

Enhancements in LEAP Bridge Steel V16 Update 2:

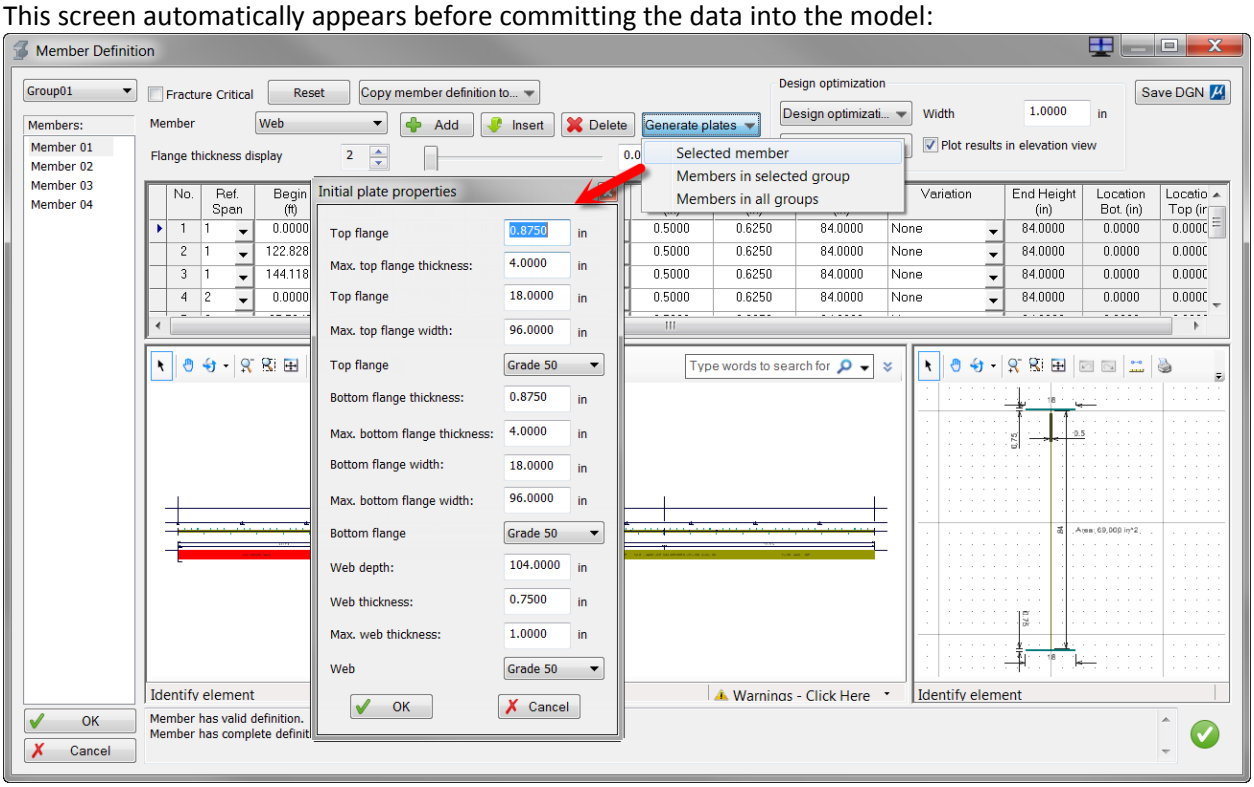
The following enhancements and maintenance items are included in this release:

- Added **Initial Plate Properties** screen to **Generate Plates** feature
- Improved plate input – multiple cells may be changed simultaneously

- Design optimization for girder web plates
- Flange plate **Auto Design**
- AASHTO LRFD 2016 Interims
    - Wind pressure revisions. Wind pressure P_z may be computed by LBS or directly specified by user.
    - Added concrete density modification factor λ. Concrete materials may now be stored as either user-specified material properties or LBS-computed properties
    - Load combination factor change for WS. Factors may now be declared as "User Specified" which are not dependent on code year, or set as per AASHTO code year
- Multiple AASHTO code year capability
- **State Specification** capability (Pennsylvania)
- Added **NCHRP Report 725** usage switch for lateral flange bending
- Improved color-mapped graphical display of analysis results
- Added wheel load or axle load option for live load analysis
- Design summary reports
- Several bug fixes

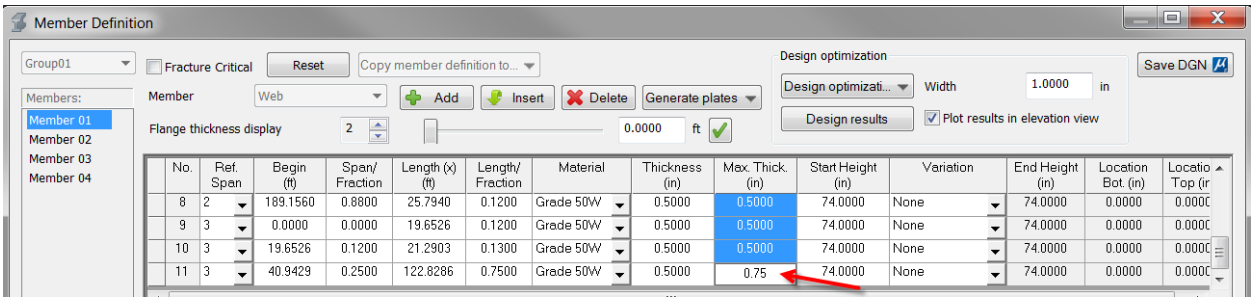
Initial Plate Properties

This screen provides ability for previewing and modifying plate data generated using Generate Plates. This screen automatically appears before committing the data into the model:



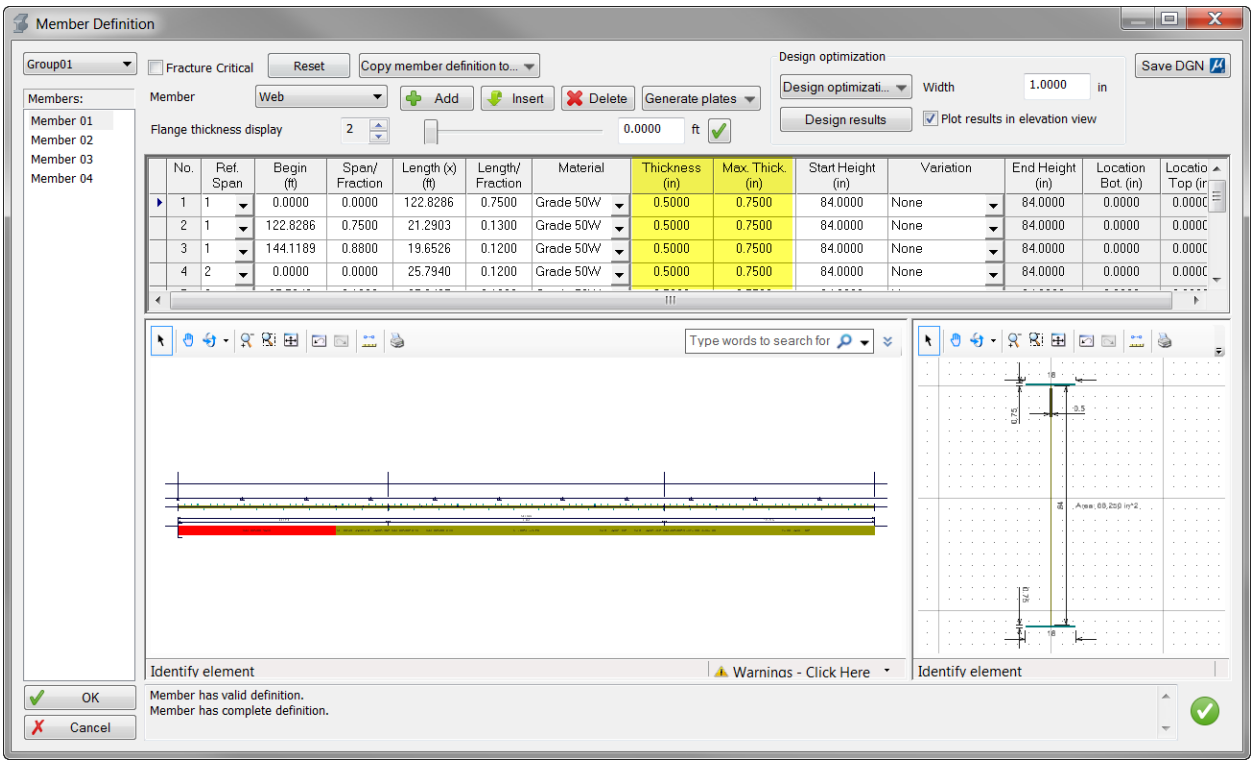
Improved Plate Input Functionality

Girder plate data may now be edited over multiple cells by dragging the selection over the cells to be changed and entering the desired value in the last cell:



Design Optimization for girder web plates

This enhancement performs design optimization of the web plates, with consideration of possible web designs as unstiffened, transversely stiffened, or longitudinally stiffened. The user specifies a starting web thickness as well as a maximum web thickness on the member definition screen:



When design optimization is selected, LBS will proceed to compute the web capacity using input web thickness in conjunction with any stiffeners input on the model (LBS considers cross-frame locations to also be stiffener locations, if not so defined). The web optimization proceeds according to the following order of precedence until a workable design is achieved:

1) Unstiffened web
2) Transversely stiffened web
3) Longitudinally (and transversely) stiffened web

In addition to the shear demand, LBS will report the following web design information:

- Web capacity using input thickness and stiffening

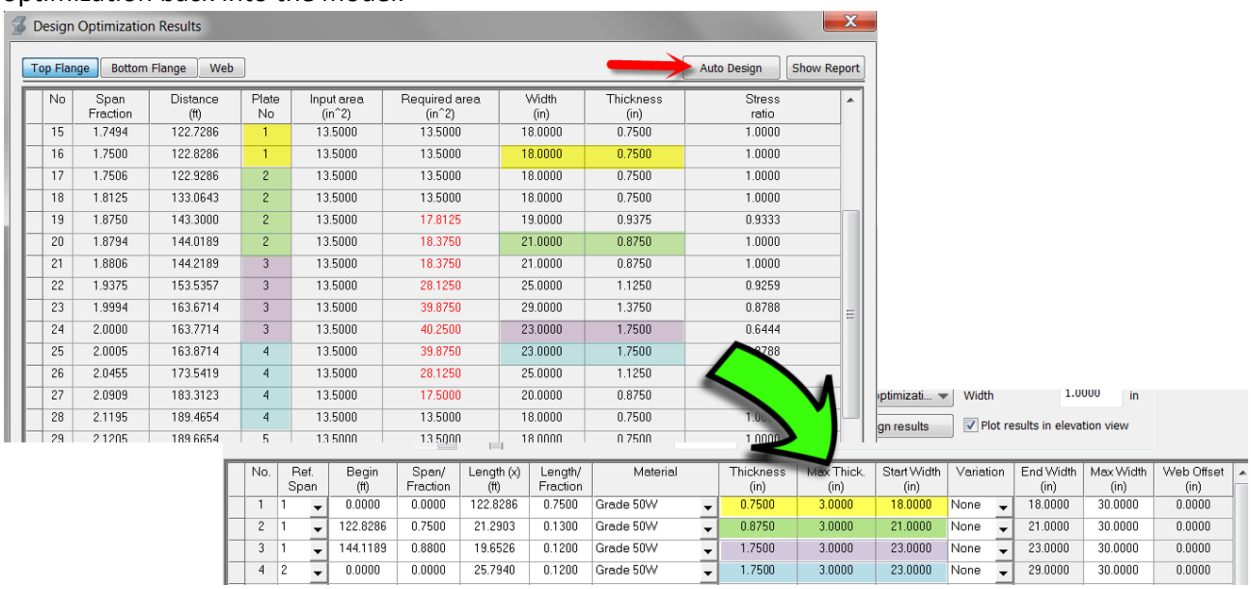
- Required web thickness, transverse stiffener spacing (if needed), longitudinal stiffener (if needed)
- Alternate web thickness that works as unstiffened

If the web requires stiffeners, the following additional data is provided:

- Alternate web thickness that works as transversely stiffened, using maximum transverse stiffener spacing
- If $D/t_w > 150$, an alternate web thickness that works as longitudinally stiffened, using maximum transverse stiffener spacing

Flange Plate Auto Design

This enhancement allows user to transfer largest required flange plates computed from design optimization back into the model.



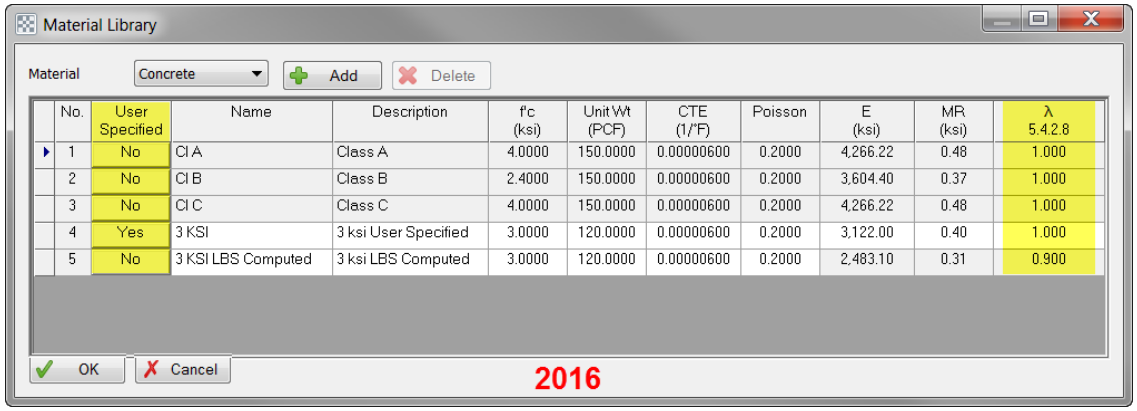
No	Span Fraction	Distance (ft)	Plate No	Input area (in^2)	Required area (in^2)	Width (in)	Thickness (in)	Stress ratio
15	1.7494	122.7286	1	13.5000	13.5000	18.0000	0.7500	1.0000
16	1.7500	122.8286	1	13.5000	13.5000	18.0000	0.7500	1.0000
17	1.7506	122.9286	2	13.5000	13.5000	18.0000	0.7500	1.0000
18	1.8125	133.0643	2	13.5000	13.5000	18.0000	0.7500	1.0000
19	1.8750	143.3000	2	13.5000	17.8125	19.0000	0.9375	0.9333
20	1.8794	144.0189	2	13.5000	18.3750	21.0000	0.8750	1.0000
21	1.8806	144.2189	3	13.5000	18.3750	21.0000	0.8750	1.0000
22	1.9375	153.5357	3	13.5000	28.1250	25.0000	1.1250	0.9259
23	1.9994	163.6714	3	13.5000	39.8750	29.0000	1.3750	0.8788
24	2.0000	163.7714	3	13.5000	40.2500	23.0000	1.7500	0.6444
25	2.0005	163.8714	4	13.5000	39.8750	23.0000	1.7500	[illegible]
26	2.0455	173.5419	4	13.5000	28.1250	25.0000	1.1250	[illegible]
27	2.0909	183.3123	4	13.5000	17.5000	20.0000	0.8750	[illegible]
28	2.1195	189.4654	4	13.5000	13.5000	18.0000	0.7500	[illegible]
29	2.1205	189.6654	5	13.5000	13.5000	18.0000	0.7500	[illegible]

No.	Ref. Span	Begin (ft)	Span/ Fraction	Length (x) (ft)	Length/ Fraction	Material	Thickness (in)	Max Thick. (in)	Start Width (in)	Variation	End Width (in)	Max Width (in)	Web Offset (in)
1	1	0.0000	0.0000	122.8286	0.7500	Grade 50W	0.7500	3.0000	18.0000	None	18.0000	30.0000	0.0000
2	1	122.8286	0.7500	21.2903	0.1300	Grade 50W	0.8750	3.0000	21.0000	None	21.0000	30.0000	0.0000
3	1	144.1189	0.8800	19.6526	0.1200	Grade 50W	1.7500	3.0000	23.0000	None	23.0000	30.0000	0.0000
4	2	0.0000	0.0000	25.7940	0.1200	Grade 50W	1.7500	3.0000	23.0000	None	29.0000	30.0000	0.0000

AASHTO LRFD 2016 Interims

Several program modifications have been made for incorporation of the 2016 AASHTO Interims as follows:

- Concrete density modification factor λ. This factor has been incorporated as a material property into the materials library along with Modulus of elasticity E and Modulus of Rupture MR:



Material Library

Material: Concrete | Add | Delete

No.	User Specified	Name	Description	f'c (ksi)	Unit Wt (PCF)	CTE (1/°F)	Poisson	E (ksi)	MR (ksi)	λ 5.4.2.8
1	No	Cl A	Class A	4.0000	150.0000	0.00000600	0.2000	4,266.22	0.48	1.000
2	No	Cl B	Class B	2.4000	150.0000	0.00000600	0.2000	3,604.40	0.37	1.000
3	No	Cl C	Class C	4.0000	150.0000	0.00000600	0.2000	4,266.22	0.48	1.000
4	Yes	3 KSI	3 ksi User Specified	3.0000	120.0000	0.00000600	0.2000	3,122.00	0.40	1.000
5	No	3 KSI LBS Computed	3 ksi LBS Computed	3.0000	120.0000	0.00000600	0.2000	2,483.10	0.31	0.900

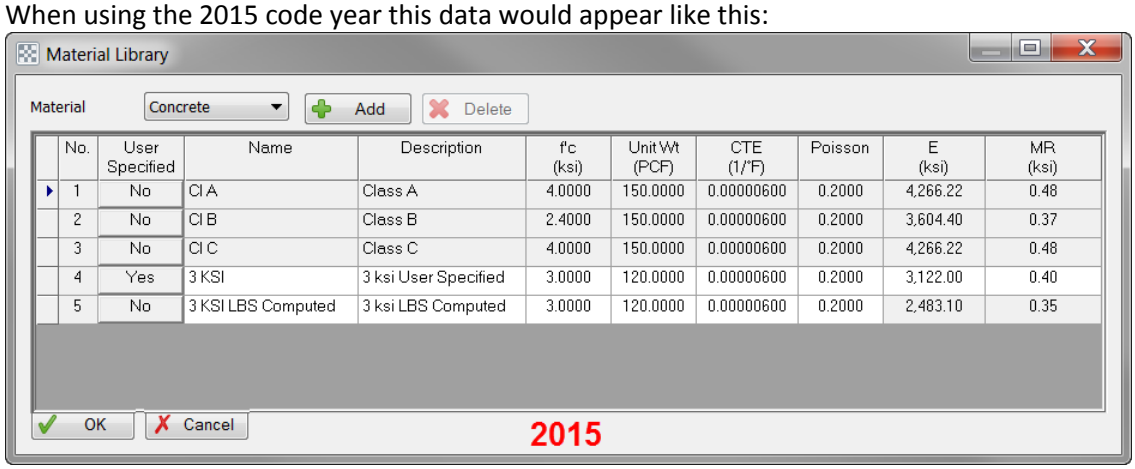
OK | Cancel

2016

The user-entered concrete materials are now classified as either:

1) User Specified-YES: User enters all material properties: f'_c, Unit Wt, CTE, Poisson's ratio, E, MR, and λ; or,
2) User Specified-NO: User enters material properties: f'_c, Unit Wt, CTE, Poisson's ratio; LBS computes E, MR, and λ depending on code year.

When using the 2015 code year this data would appear like this:



Material Library

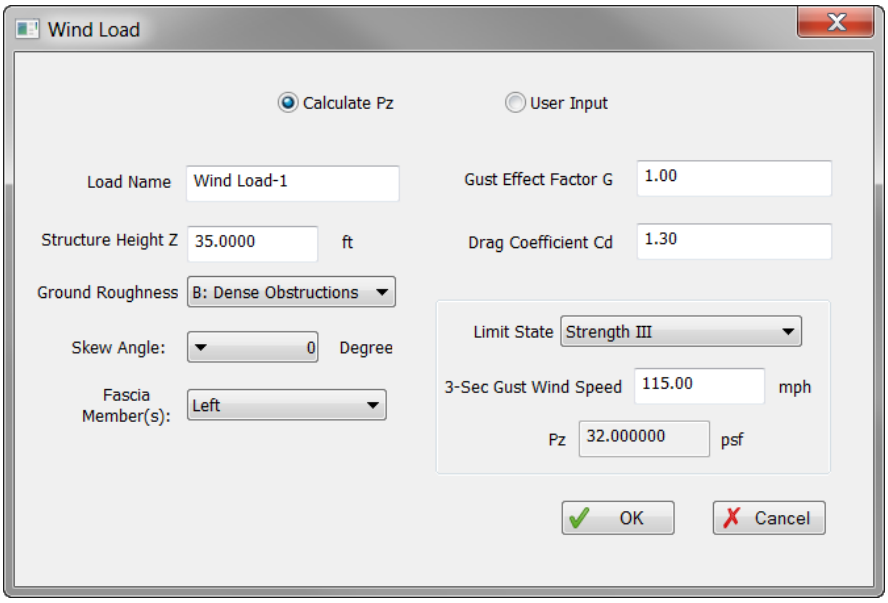
Material: Concrete | Add | Delete

No.	User Specified	Name	Description	f'c (ksi)	Unit Wt (PCF)	CTE (1/°F)	Poisson	E (ksi)	MR (ksi)
1	No	Cl A	Class A	4.0000	150.0000	0.00000600	0.2000	4,266.22	0.48
2	No	Cl B	Class B	2.4000	150.0000	0.00000600	0.2000	3,604.40	0.37
3	No	Cl C	Class C	4.0000	150.0000	0.00000600	0.2000	4,266.22	0.48
4	Yes	3 KSI	3 ksi User Specified	3.0000	120.0000	0.00000600	0.2000	3,122.00	0.40
5	No	3 KSI LBS Computed	3 ksi LBS Computed	3.0000	120.0000	0.00000600	0.2000	2,483.10	0.35

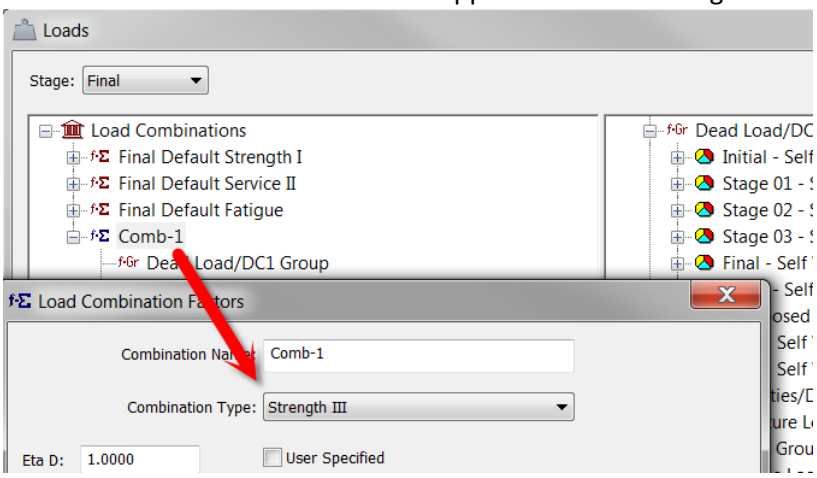
OK | Cancel

2015

- Wind pressure P_z. The wind pressure calculation was substantially revised in the 2016 interims. LBS has been revised to allow either user input of the required parameters for LBS calculation of P_z, or the user may specify P_z directly.

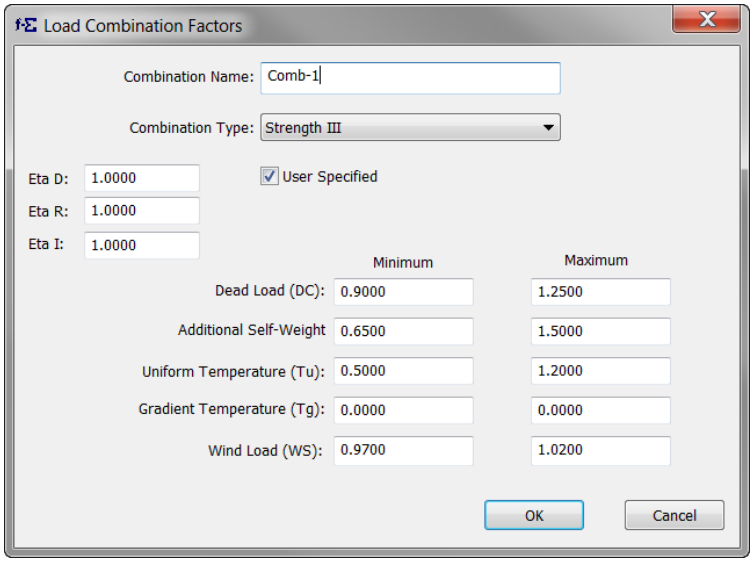


Note that different pressures may be required for limit states Strength III, Strength V, and Service I, so multiple wind loads may be required. The Limit State specified on the Wind Load can only be applied to load combinations using the same limit state. For example, the Strength III Wind Load shown above could be applied to the following load combination Comb-1:



- Load Combination Factors. The load combination factors for Wind on Structure (WS) changed in the 2016 interims for limit states: Strength III, Strength V, Service I, and Service IV. The load combination factor screens have been revised for all load factors to be specified as either:

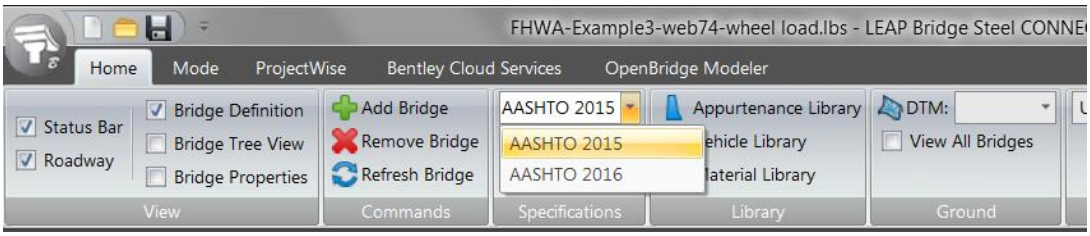
1) User Specified. The factors will retain original user specified value regardless of code year:



2) Non-User Specified. The factors are set per the AASHTO code and are code-year dependent.

Multiple AASHTO Code Year Capability

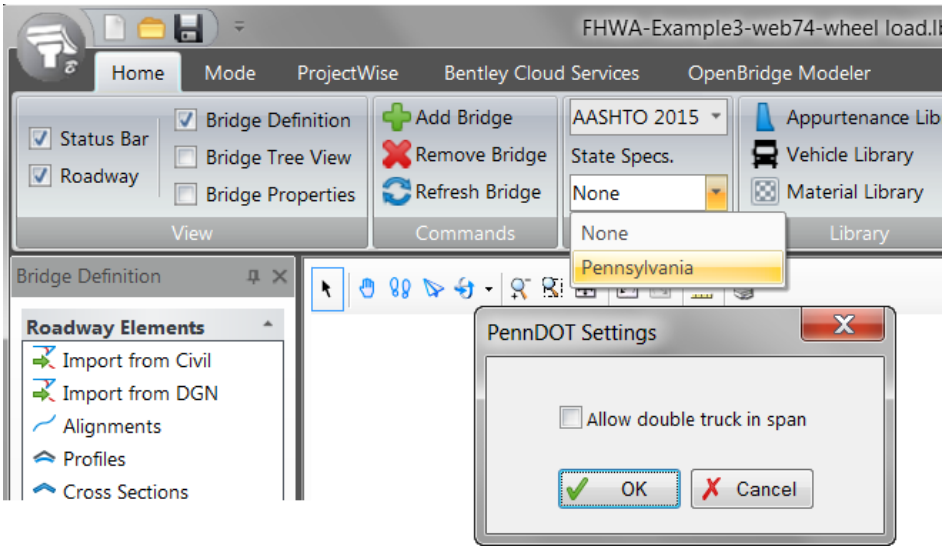
Select the desired AASHTO LRFD Design Specification code year from the drop-list located on the Home tab:



State Specification Capability

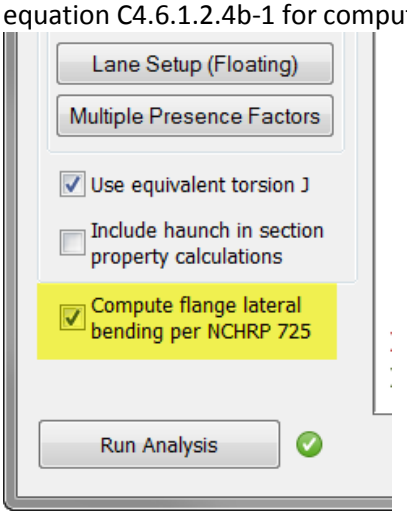
Select the state from the dropdown list. The current selection option is Pennsylvania.

For Pennsylvania, options are:
Allow double truck in span - if this option is checked LEAP Bridge Steel will allow (if possible) both trucks of a PHL-93 double truck to be in the same span when generating maximum load effect at an interior support (as opposed to both trucks being placed in adjacent spans per AASHTO).



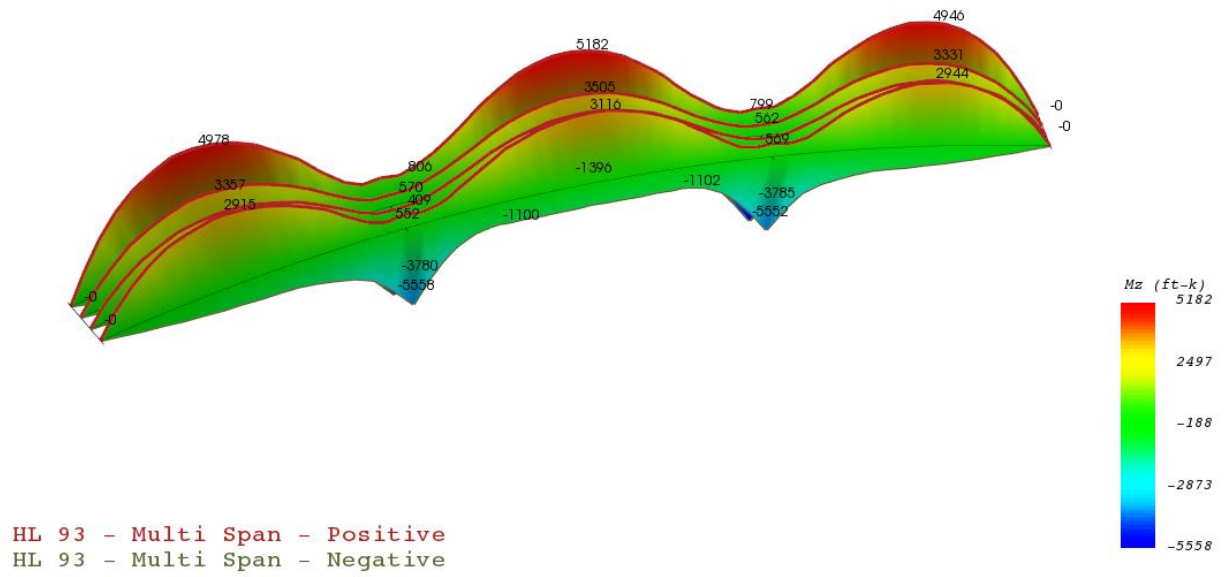
NCHRP Report 725 Usage Switch

LBS by default uses NCHRP Report 725 methodology for calculation of girder lateral flange bending moments (M_{lat}) in the grillage analysis. In some instances, this method produces very large M_{lat} that are overly conservative. A switch has been added to the Analysis screen allowing the choice for usage of NCHRP Report 725 or not for calculation of M_{lat}. If the switch is unchecked, LBS will use AASHTO equation C4.6.1.2.4b-1 for computing M_{lat} of curved girders, and M_{lat} will be 0.0 for straight girders.



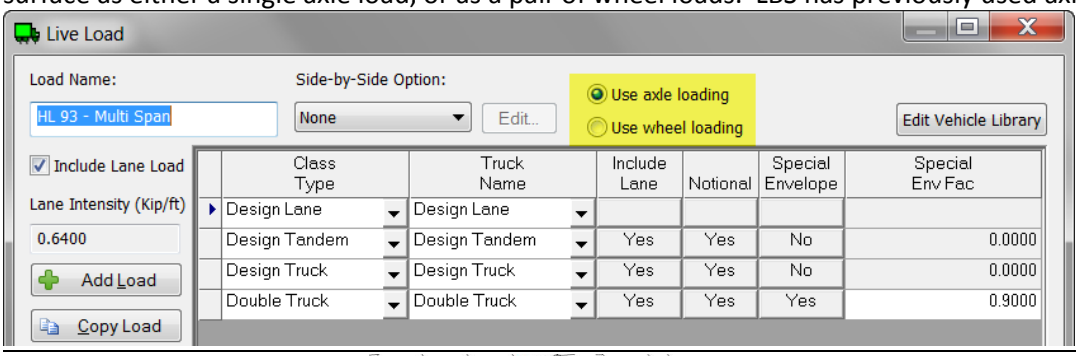
Color-Mapped Graphical Display of Analysis Results

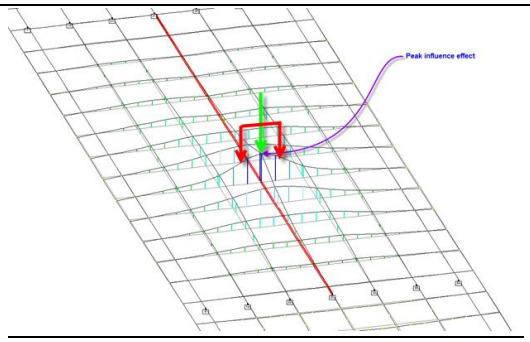
A robust 3D viewer of analysis results is now available that shows moment and shear analysis results in color-mapped contours. This provides quick visualization of high stress regions.



Wheel Load or Axle Load Option for Live Load Analysis

A switch has been added to the live load screens allowing choice for applying live load to the influence surface as either a single axle load, or as a pair of wheel loads. LBS has previously used axle loading.





Design Summary Reports

Design check summary reports have been added as an option, including for all members:

- Overall design summary report
- Summary Flexure Report by load combination
- Summary Shear Report by load combination

The reports list the plate dimensions, performance ratio, and controlling equation for each POI along the member.

Fixes in this release

- Live loads missing from field splice
- Intelligent element data restored to DGN file.
- Corrected NCHRP Report 725 error in lateral flange bending equation.
- Splice design considers the hole size factor.
- Multiple presence factor applied to pedestrian load has been removed.
- Shear capacity now set to 0.0 when $D/t_w > 300$.
- Deck self-weight incorrect when using individual pier offsets.
- Shear stud spacing incorrectly reported.
- Longitudinal stiffeners are not considered effective unless transverse stiffeners are present with maximum spacing of 1.5D.
- Left and right designation of V-frame diagonal members switched.
- Added cross-frame member identification diagrams to reports.

Product Interoperability:

- MicroStation, GEOPAK, InRoads, MXROAD
- ProjectWise
- InspectTech
- Bentley LEAP Concrete Substructure
- OpenBridge Modeler

System Requirements

Supported Operating Systems:

- Windows 7 (32 and 64-bit), Windows 8 (32 and 64-bit), Windows 10 (32 and 64-bit)

Communications Protocols:

- Internet Protocol version 4 (IPv4)
- Internet Protocol version 6 (IPv6)

Prerequisites:

- Windows Installer Version 3.1v2
- Microsoft .NET Framework 3.5 SP1
- Microsoft Access Runtime 2007

Processor:

- Intel or AMD processor 2.0 GHz or greater

Memory:

- 8 GB minimum, 32GB or higher recommended

Hard Disk:

- 700 MB free disk space (includes 300 MB install footprint for a complete installation)

Video:

- 250 MB of video RAM or higher recommended

Quick Install Guide

To install, run the installation .exe file and follow the prompts. All prerequisites will be installed as required. LEAP Bridge Steel will install under "Program Files (x86)\Bentley\LEAP Bridge Steel" by default.