

# AASHTOWare Prestress Design Tool



AASHTOWare Design and Rating Bridge  
User Group Meeting  
Kansas City, KS – August 2017

# Prestress Design Tool



- Capabilities
- Features
- Creating Templates
- Live Demo
- Future Enhancements
- Questions

# Capabilities

- I Beams
- Box Beams
- Double Stem T Beams
- Simple Span or Continuous for Live
- Harped or Straight/Debonded Strands

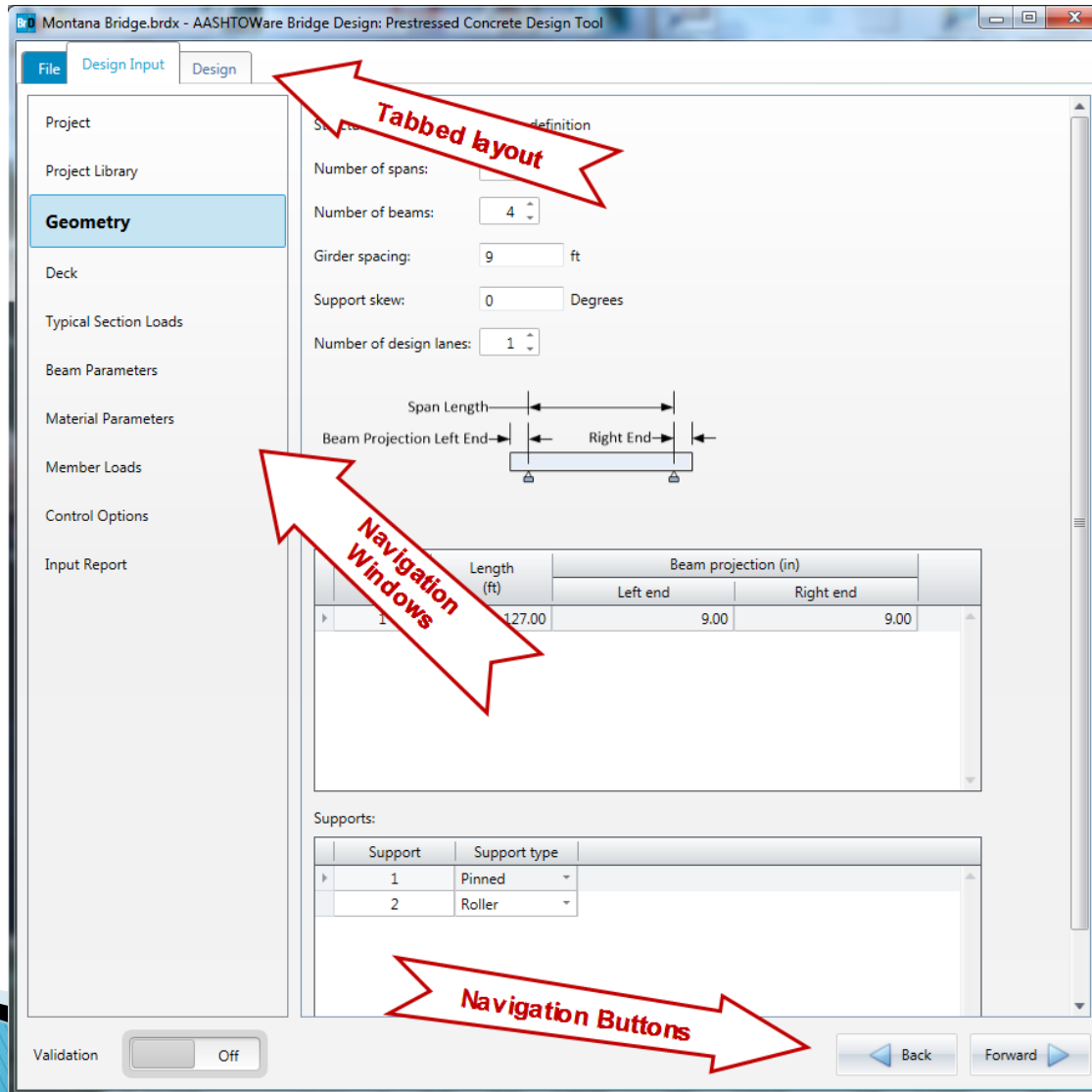
# Capabilities



- Uses Modernized Finite Element Engine
- Stand Alone (no database required)
- Can Import Models into BrDR database

# Features

- User friendly input



Montana Bridge.brdx - AASHTOWare Bridge Design: Prestressed Concrete Design Tool

File Design Input Design

Project  
Project Library  
**Geometry**  
Deck  
Typical Section Loads  
Beam Parameters  
Material Parameters  
Member Loads  
Control Options  
Input Report

Span Length definition  
Number of spans:   
Number of beams:   
Girder spacing:  ft  
Support skew:  Degrees  
Number of design lanes:

Span Length  
Beam Projection Left End → Right End

	Length (ft)	Beam projection (in)	
		Left end	Right end
1	127.00	9.00	9.00

Supports:

Support	Support type
1	Pinned
2	Roller

Validation  Off

Back Forward

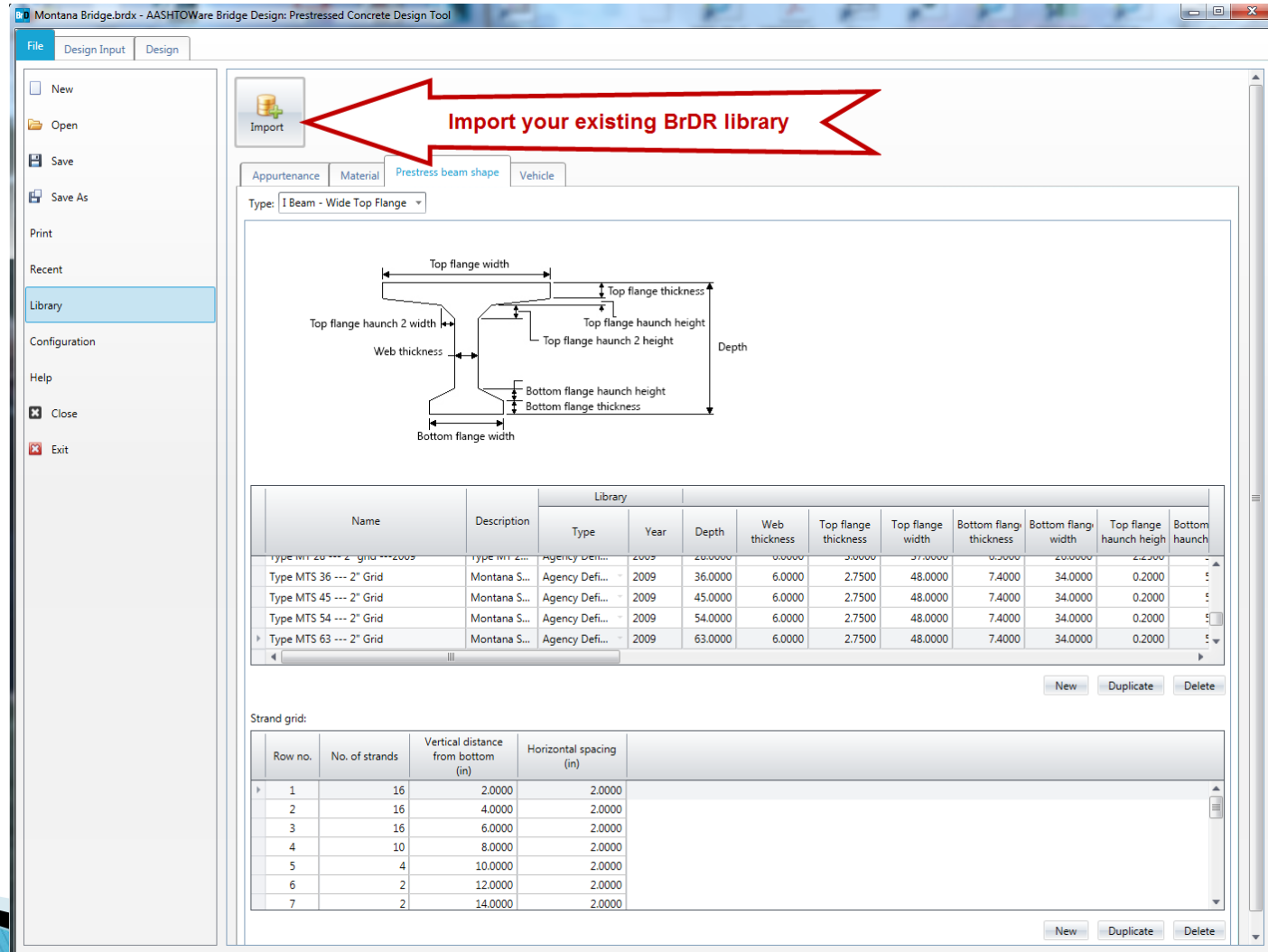
**Tabbed layout**

**Navigation Windows**

**Navigation Buttons**

# Features

- Import existing BrDR libraries



The screenshot displays the AASHTOware Bridge Design software interface. The 'Import' button is highlighted with a red arrow and the text 'Import your existing BrDR library'. The main window shows a cross-section diagram of a beam with various dimensions labeled: Top flange width, Top flange thickness, Top flange haunch 2 width, Top flange haunch height, Web thickness, Top flange haunch 2 height, Depth, Bottom flange haunch height, Bottom flange thickness, and Bottom flange width.

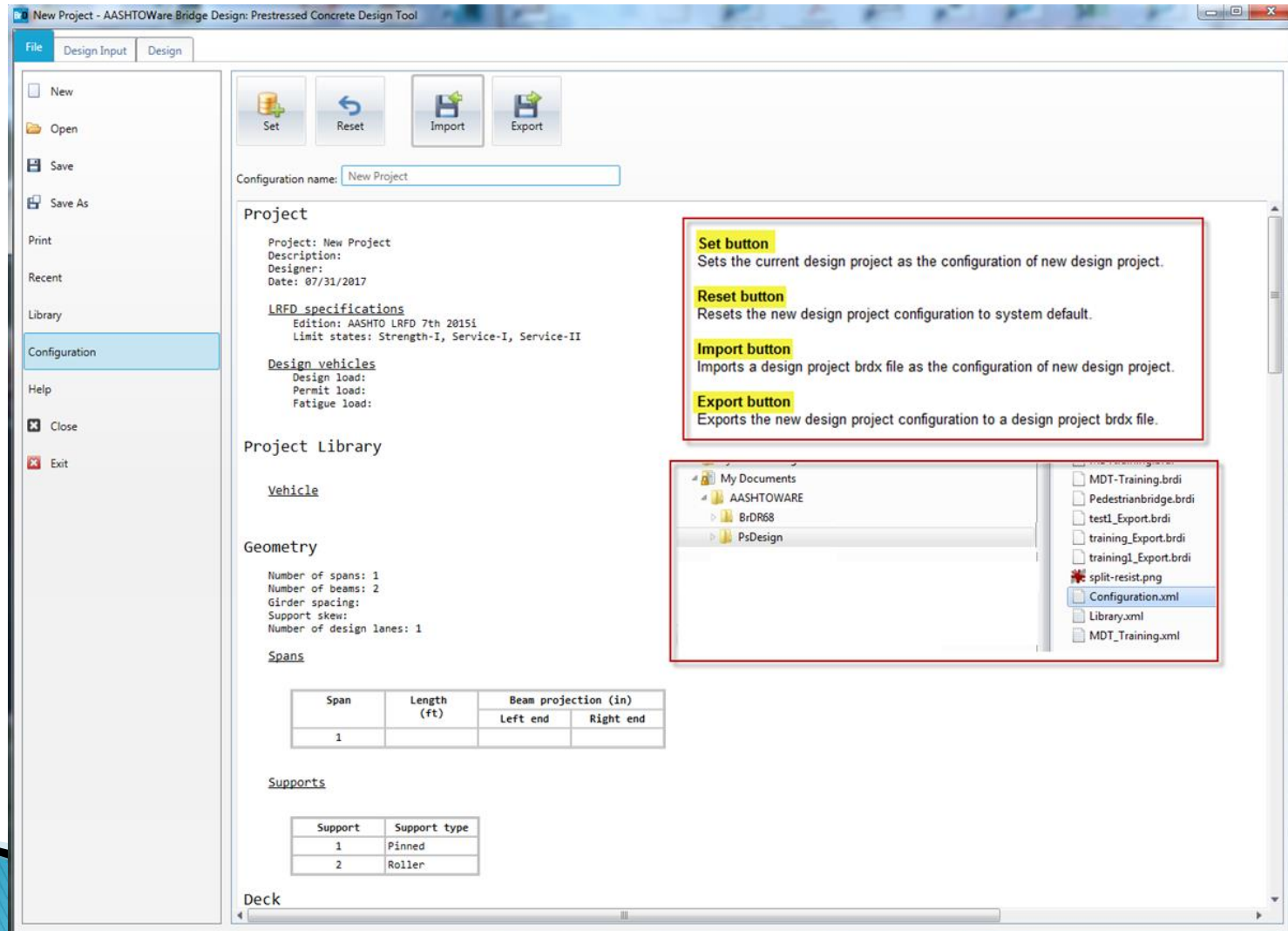
Name	Description	Library									
		Type	Year	Depth	Web thickness	Top flange thickness	Top flange width	Bottom flange thickness	Bottom flange width	Top flange haunch height	Bottom haunch
Type MTS 20 --- 2" Grid --- 2009	Type MTS 20 --- 2" Grid --- 2009	Agency Defi...	2009	20.0000	6.0000	3.0000	37.0000	0.5000	20.0000	2.2000	-
Type MTS 36 --- 2" Grid	Montana S...	Agency Defi...	2009	36.0000	6.0000	2.7500	48.0000	7.4000	34.0000	0.2000	!
Type MTS 45 --- 2" Grid	Montana S...	Agency Defi...	2009	45.0000	6.0000	2.7500	48.0000	7.4000	34.0000	0.2000	!
Type MTS 54 --- 2" Grid	Montana S...	Agency Defi...	2009	54.0000	6.0000	2.7500	48.0000	7.4000	34.0000	0.2000	!
Type MTS 63 --- 2" Grid	Montana S...	Agency Defi...	2009	63.0000	6.0000	2.7500	48.0000	7.4000	34.0000	0.2000	!

Strand grid:

Row no.	No. of strands	Vertical distance from bottom (in)	Horizontal spacing (in)
1	16	2.0000	2.0000
2	16	4.0000	2.0000
3	16	6.0000	2.0000
4	10	8.0000	2.0000
5	4	10.0000	2.0000
6	2	12.0000	2.0000
7	2	14.0000	2.0000

# Features

- Create your own templates



The screenshot shows the 'New Project' dialog box in the AASHTOware Bridge Design software. The interface includes a menu bar (File, Design Input, Design), a toolbar with Set, Reset, Import, and Export buttons, and a configuration name field set to 'New Project'. The main area is divided into sections: Project, Project Library, Geometry, Spans, Supports, and Deck. The Project section contains fields for Project name, Description, Designer, Date, LRFD specifications, and Design vehicles. The Project Library section shows a tree view of the project structure. The Geometry section includes fields for Number of spans, Number of beams, Girder spacing, Support skew, and Number of design lanes. The Spans section contains a table with columns for Span, Length (ft), and Beam projection (in) (Left end, Right end). The Supports section contains a table with columns for Support and Support type. The Deck section is currently empty.

**Set button**  
Sets the current design project as the configuration of new design project.

**Reset button**  
Resets the new design project configuration to system default.

**Import button**  
Imports a design project brdx file as the configuration of new design project.

**Export button**  
Exports the new design project configuration to a design project brdx file.

Span	Length (ft)	Beam projection (in)	
		Left end	Right end
1			

Support	Support type
1	Pinned
2	Roller

# Features

- Input validation

Montana Bridge.brdx - AASHTOware Bridge Design: Prestressed Concrete Design Tool

File Design Input Design

Project

Project Library

Geometry

**Deck** ❌

Typical Section Loads

Beam Parameters ❌

Material Parameters ⚠️

Member Loads

Control Options

Input Report

Deck is included in beam shape

Deck concrete: Class A (US) ...

Deck total thickness: 8 in

Deck structural thickness: 7.5 in

Deck reinforcement

Material: ... ❌

Support	Start distance (ft)	Length (ft)	End distance (ft)	Bar size	Clear cover (in)	Measured from	Bar spacing (in)
---------	---------------------	-------------	-------------------	----------	------------------	---------------	------------------

New Duplicate

Deck overhang from beam centerline: 4.167 ft

Haunch depth: 3 in

Edge of the haunch to edge of the beam: 0 in

Composite deck

Slab interface

Interface type: Intentionally Roughened

Compute

Cohesion factor: ksi ⚠️

Friction factor: ⚠️

K1: ⚠️

K2: ksi ⚠️

Validation  On

Back Forward



# Features

- Design flexibility

The screenshot displays the AASHTOware Bridge Design software interface. The main window shows a design run table, a central beam cross-section diagram, and two stress check graphs. Three red callout boxes highlight key features:

- Multiple Iterations:** A red arrow points to the design run table, which lists three iterations (1-11.1, 1-11.2, 1-11.3) with their respective descriptions and critical design ratios (1.04, 0.53, 1).
- Instant Design Feedback:** A red arrow points to the central beam cross-section diagram, which shows the current design configuration.
- Modify Strand Pattern:** A red arrow points to the strand configuration options on the left, including "Straight/Debonded" and "Harped" settings.

The design run table is as follows:

Design run	Description	Critical design ratio	Pin
1-11.1	Type MTS 72 --- 2" Grid, 38 strands, CG at left end = 32.40 in	✓ 1.04	•
1-11.2	Type MTS 54 --- 2" Grid, 102 strands, CG at left end = 24.27 in	✗ 0.53	•
1-11.3	Type MTS 63 --- 2" Grid, 44 strands, CG at left end = 28.31 in	✓ 1	•

The stress check graphs show Stress [ksi] vs Location [ft]. The "Initial stress check" graph shows stress values for f(t)-allow, f(c)-allow, f(top), and f(bottom). The "Final stress check" graph shows stress values for f(t)-allow, f(c)-allow, f(top-t), f(bottom-t), f(top-c), and f(bottom-c).

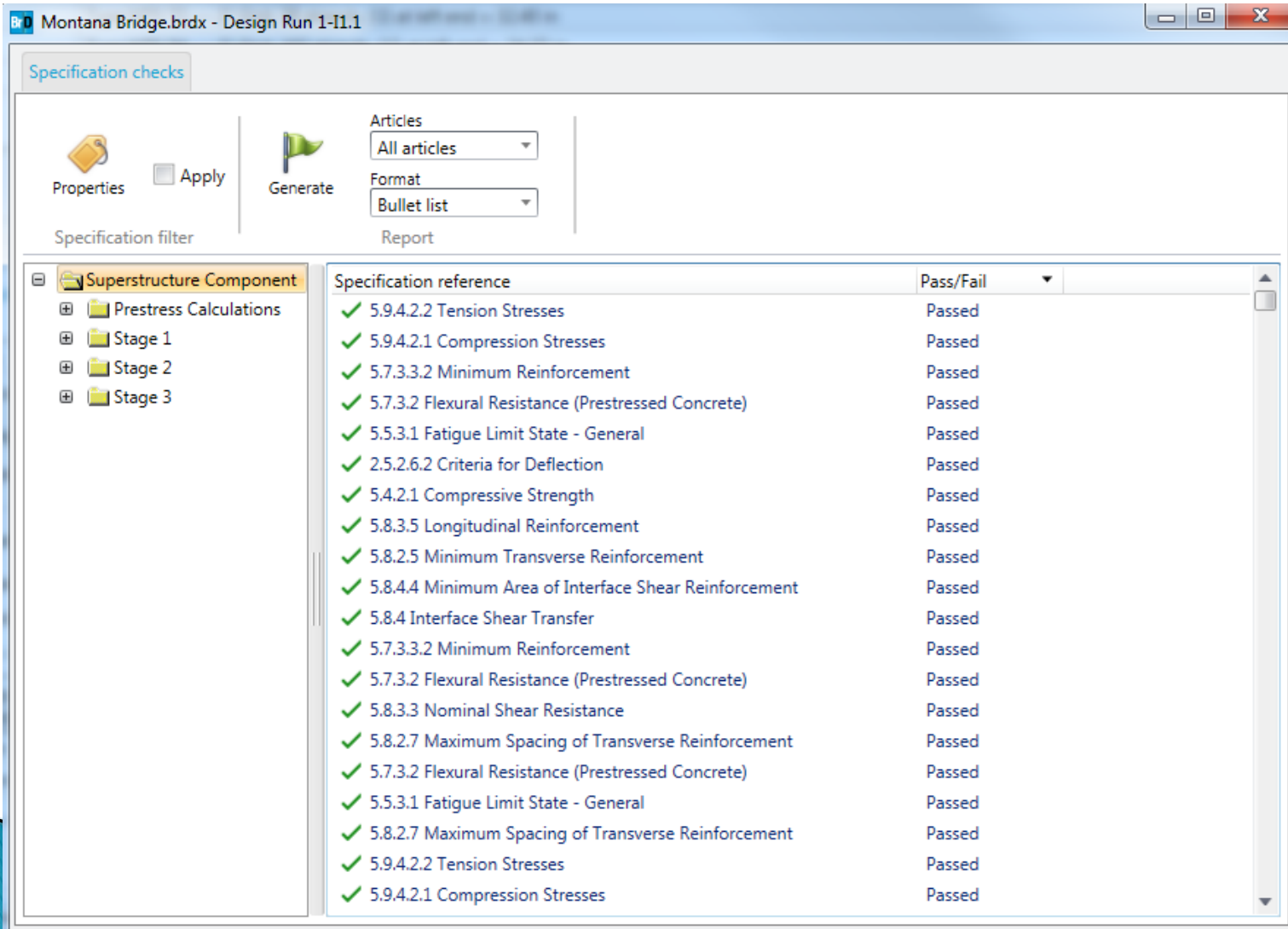
Beam shape: Type MTS 72 --- 2" Grid  
Location = 63.500

Non-composite Section Properties:  
Number of Strands = 38  
Area (Ag) = 884.900  
N.A. to bottom of beam = 32.400  
N.A. to top of beam = 39.000  
S(top) = 19659.620  
S(bot) = 19659.620  
I(x) = 637065.361 (in<sup>4</sup>)

Composite Section Properties:  
N.A. to bottom of beam = 52.610 (in)  
N.A. to top of beam = 19.390 (in)  
N.A. to top of slab = 29.890 (in)  
S(top-slab) = 63769.334 (in<sup>3</sup>)  
S(top) = 75115.802 (in<sup>3</sup>)  
S(bot) = 27685.001 (in<sup>3</sup>)  
I(x) = 1456504.554 (in<sup>4</sup>)

# Features

- Same LRFD Spec Checker as BrDR



Montana Bridge.brdr - Design Run 1-11.1

Specification checks

Properties  Apply  Generate

Articles: All articles

Format: Bullet list

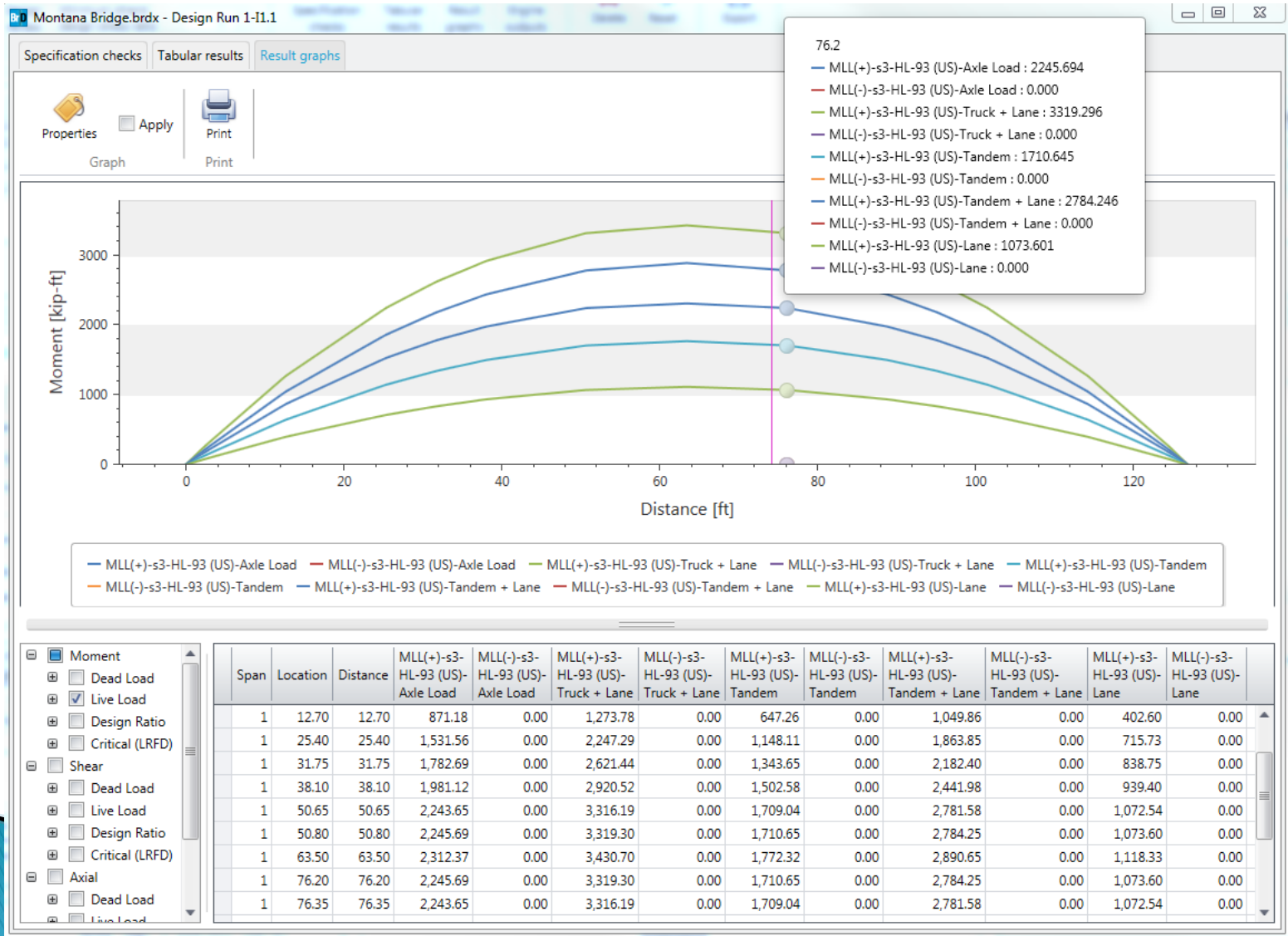
Specification filter

Report

Specification reference	Pass/Fail
✓ 5.9.4.2.2 Tension Stresses	Passed
✓ 5.9.4.2.1 Compression Stresses	Passed
✓ 5.7.3.3.2 Minimum Reinforcement	Passed
✓ 5.7.3.2 Flexural Resistance (Prestressed Concrete)	Passed
✓ 5.5.3.1 Fatigue Limit State - General	Passed
✓ 2.5.2.6.2 Criteria for Deflection	Passed
✓ 5.4.2.1 Compressive Strength	Passed
✓ 5.8.3.5 Longitudinal Reinforcement	Passed
✓ 5.8.2.5 Minimum Transverse Reinforcement	Passed
✓ 5.8.4.4 Minimum Area of Interface Shear Reinforcement	Passed
✓ 5.8.4 Interface Shear Transfer	Passed
✓ 5.7.3.3.2 Minimum Reinforcement	Passed
✓ 5.7.3.2 Flexural Resistance (Prestressed Concrete)	Passed
✓ 5.8.3.3 Nominal Shear Resistance	Passed
✓ 5.8.2.7 Maximum Spacing of Transverse Reinforcement	Passed
✓ 5.7.3.2 Flexural Resistance (Prestressed Concrete)	Passed
✓ 5.5.3.1 Fatigue Limit State - General	Passed
✓ 5.8.2.7 Maximum Spacing of Transverse Reinforcement	Passed
✓ 5.9.4.2.2 Tension Stresses	Passed
✓ 5.9.4.2.1 Compression Stresses	Passed

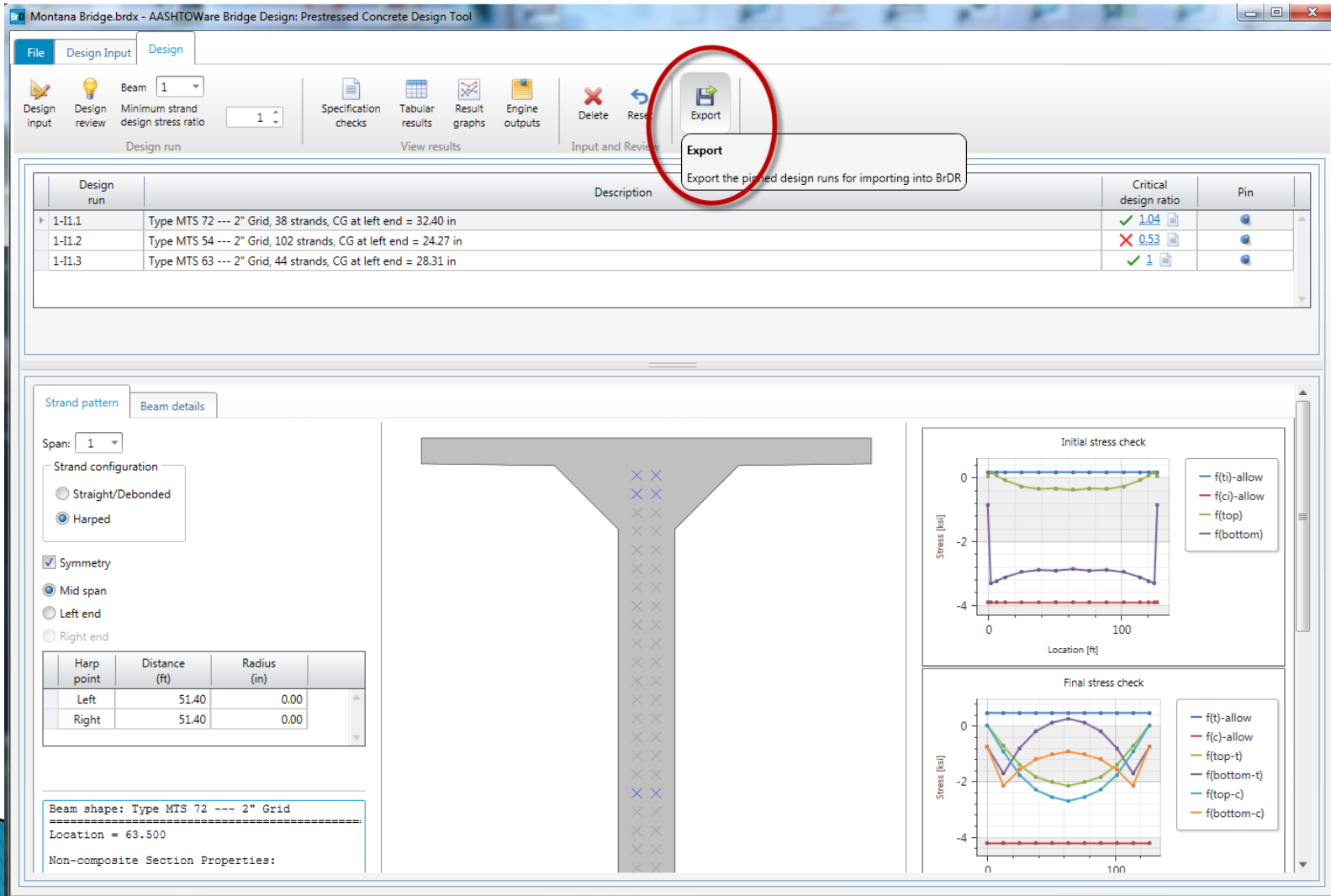
# Features

- Tabular and Graphical Reports



# Features

- Export model and Import into BrDR



Montana Bridge.brdx - AASHTOWare Bridge Design: Prestressed Concrete Design Tool

File Design Input Design

Design input Design review Minimum strand design stress ratio 1

Specification checks Tabular results Result graphs Engine outputs Delete Reset Export

Design run View results Input and Review

Design run	Description	Critical design ratio	Pin
1-11.1	Type MTS 72 --- 2" Grid, 38 strands, CG at left end = 32.40 in	1.04	
1-11.2	Type MTS 54 --- 2" Grid, 102 strands, CG at left end = 24.27 in	0.53	
1-11.3	Type MTS 63 --- 2" Grid, 44 strands, CG at left end = 28.31 in	1	

Strand pattern Beam details

Span: 1

Strand configuration

Straight/Debonded

Harped

Symmetry

Mid span

Left end

Right end

Harp point	Distance (ft)	Radius (in)
Left	51.40	0.00
Right	51.40	0.00

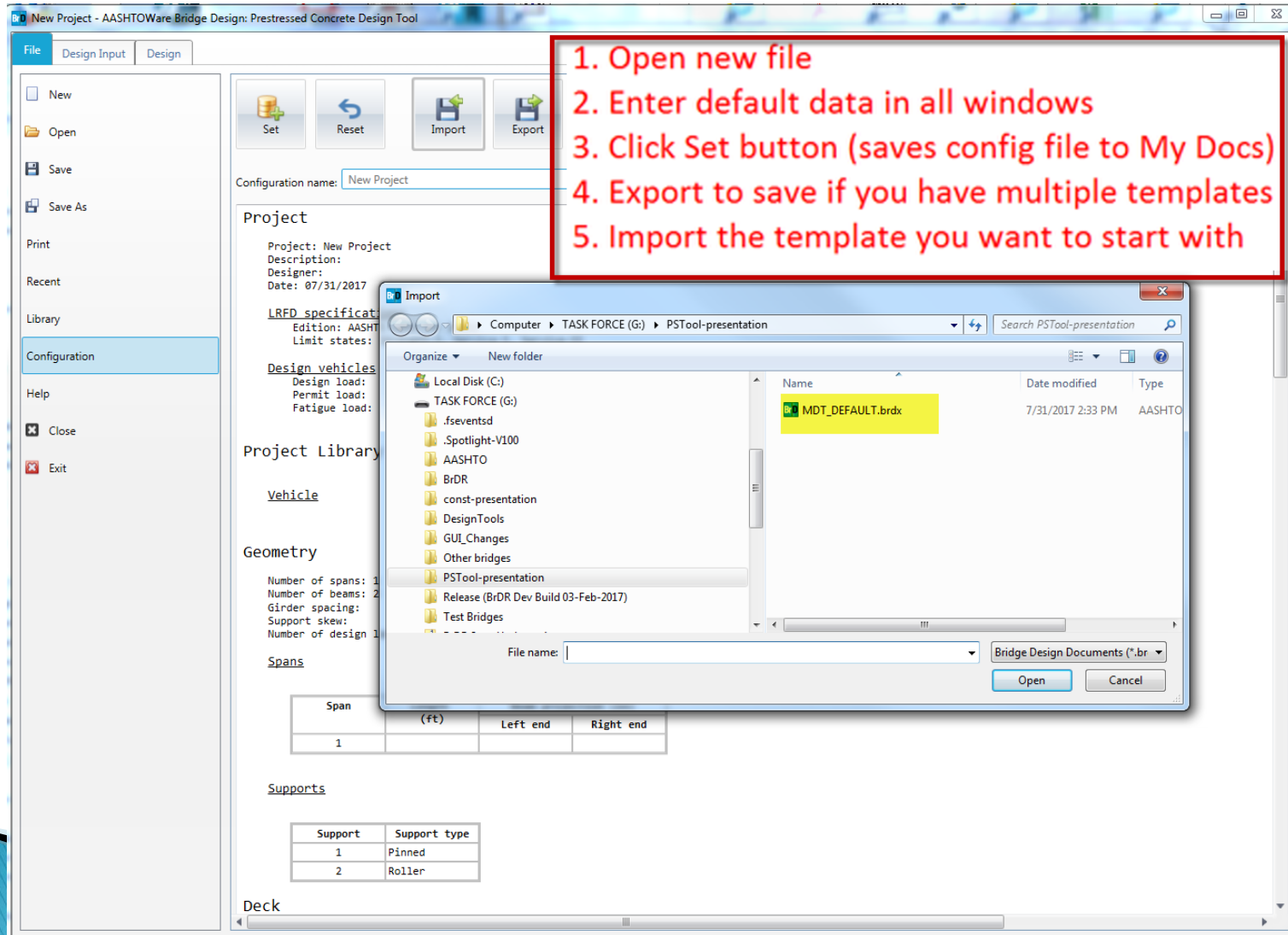
Beam shape: Type MTS 72 --- 2" Grid  
Location = 63.500  
Non-composite Section Properties:

Initial stress check

Final stress check

# Customizing

- Templates minimize input



**1. Open new file**  
**2. Enter default data in all windows**  
**3. Click Set button (saves config file to My Docs)**  
**4. Export to save if you have multiple templates**  
**5. Import the template you want to start with**

The screenshot shows the AASHTOware Bridge software interface. The main window is titled "New Project - AASHTOware Bridge Design: Prestressed Concrete Design Tool". The "File" menu is open, showing options like "New", "Open", "Save", "Save As", "Print", "Recent", "Library", "Configuration", "Help", "Close", and "Exit". The "Configuration" section is active, showing fields for "Configuration name: New Project", "Project: New Project", "Description:", "Designer:", "Date: 07/31/2017", "LRFD specifications", "Design vehicles", "Project Library", "Vehicle", "Geometry", "Spans", and "Supports".

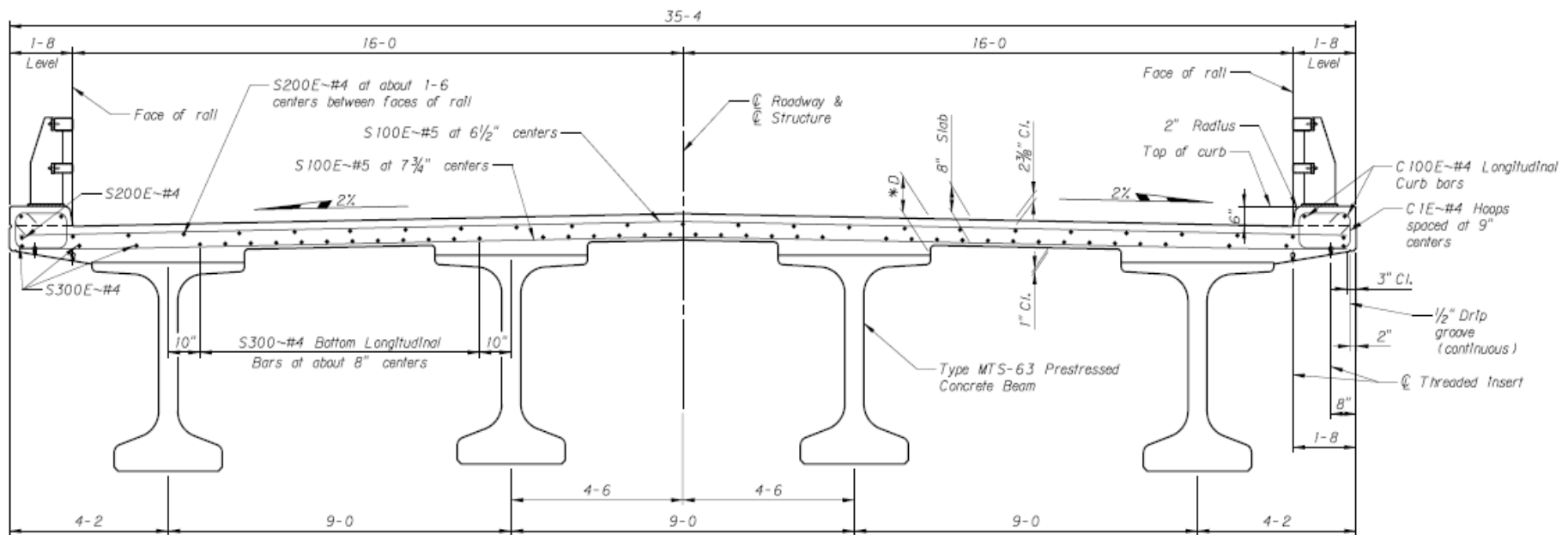
The "Import" dialog box is open, showing a file explorer view of the "TASK FORCE (G:) > PSTool-presentation" folder. The file "MDT\_DEFAULT.brdx" is selected. The "File name" field is empty, and the "File type" is set to "Bridge Design Documents (\*.br\*)".

Span	(ft)	Left end	Right end
1			

Support	Support type
1	Pinned
2	Roller

# Live Demo

- Span length = 130 ft
- Bridge Width = 32 ft
- Deck Thickness = 8 in
- Rail Type = W830



\*NOTE: Dimension D = 11" at  $\text{\O}$  Brg.  
(Varies at tenth points) See  
Dead Load Deflection Table 11's steel and  
Camber Diagram Dwg. No. 21326).

## TRANSVERSE SECTION

Scale =  $\frac{1}{2}'' = 1'-0''$

# Future Enhancements (Phase 2)



- Line Girder Entry
- Design Entire Cross Section
- Add Schematics
- Save Individual Iterations
- User Control for Simple vs Continuous for Live
- Stability and Transport Checks
- Camber Table

# Questions?