AASHTOWare™ BRIDGE DESIGN AND RATING

Steel Design Tool

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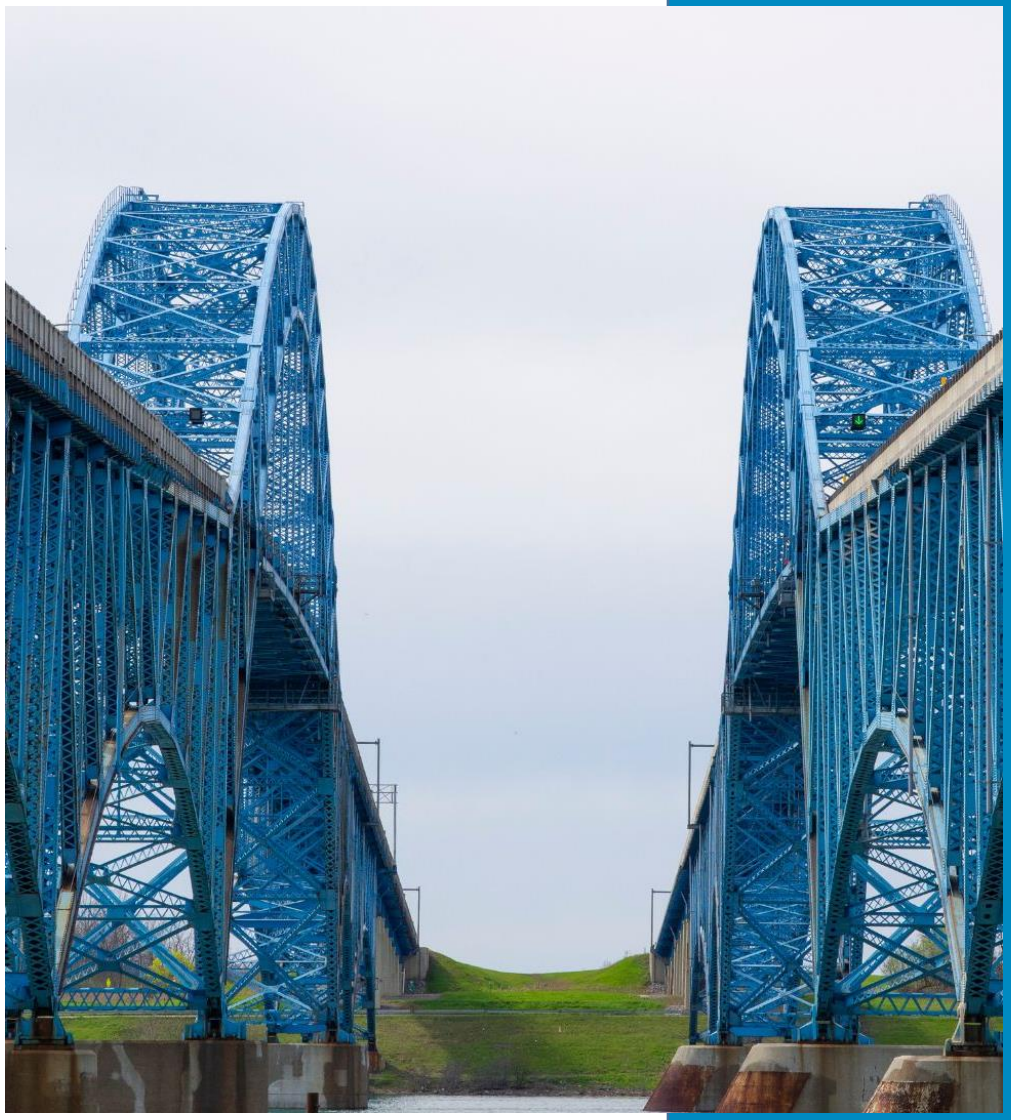

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Outline

- History
- Features
- Design Process and Philosophy
- Design Input
- Design Output
- Future Enhancements and Integration

History

- Introduced with version v7.2
- Standalone tool with data export supported to BrDR
- Design based on AASHTO BDS LRFD 9th edition
- Design TAG Established in 2024 to investigate future enhancements
- Began plans to directly integrate into BrD

Features

- Design for steel plate girders including hybrid girders
- Control options like BrD for advanced analysis
- Shear connector design tool
- Final design specification checking report
- Tabular results for dead and live load
- Beam profile schematic

Design Process and Philosophy

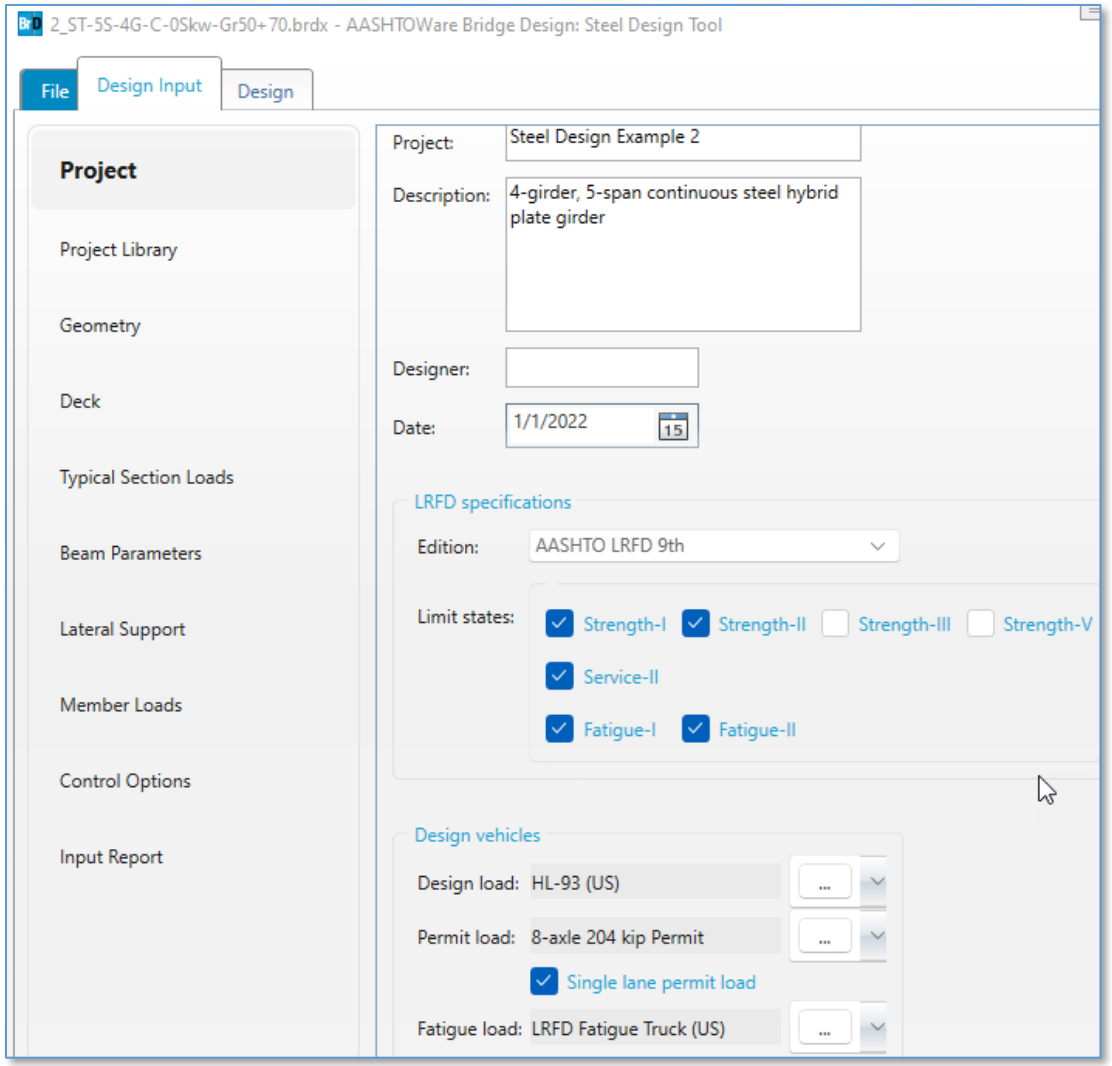
- Input validation checks if a design is possible with the parameters, geometry and maximum plate sizes defined in the input
- Initial design for
  - Proportionality
  - Constructability
  - Permanent Deformation
  - Flexure and Fatigue
- Flange transitions
  - Simple spans at 20% and 80% points
  - Multi-span – based on uniform load contraflexure

Design Process and Philosophy

- Shear design
  - Web thickness
  - Transverse stiffener design
  - Bearing stiffener design
- Optimize design
  - Lowest steel volume within input parameters
  - Design ratio greater than minimum design ratio

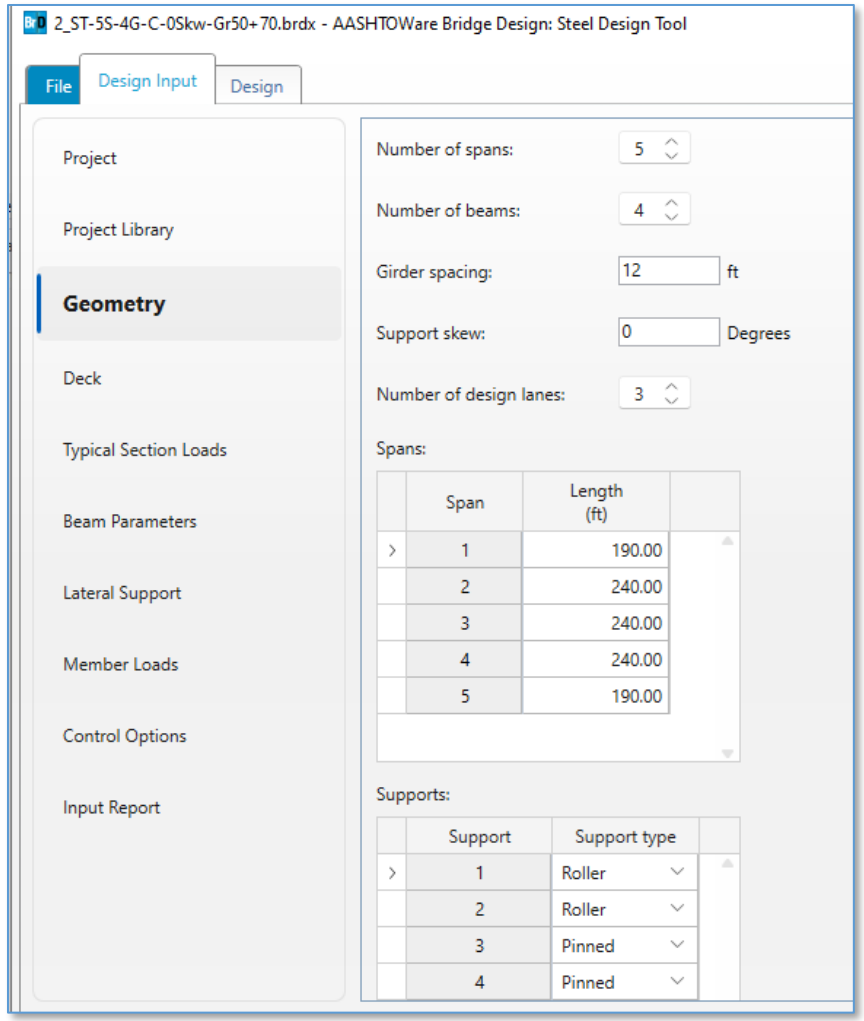
Design Input

- Project
  - AASHTO LRFD Bridge Design Specification Edition
  - Limit states to consider
  - Design vehicles



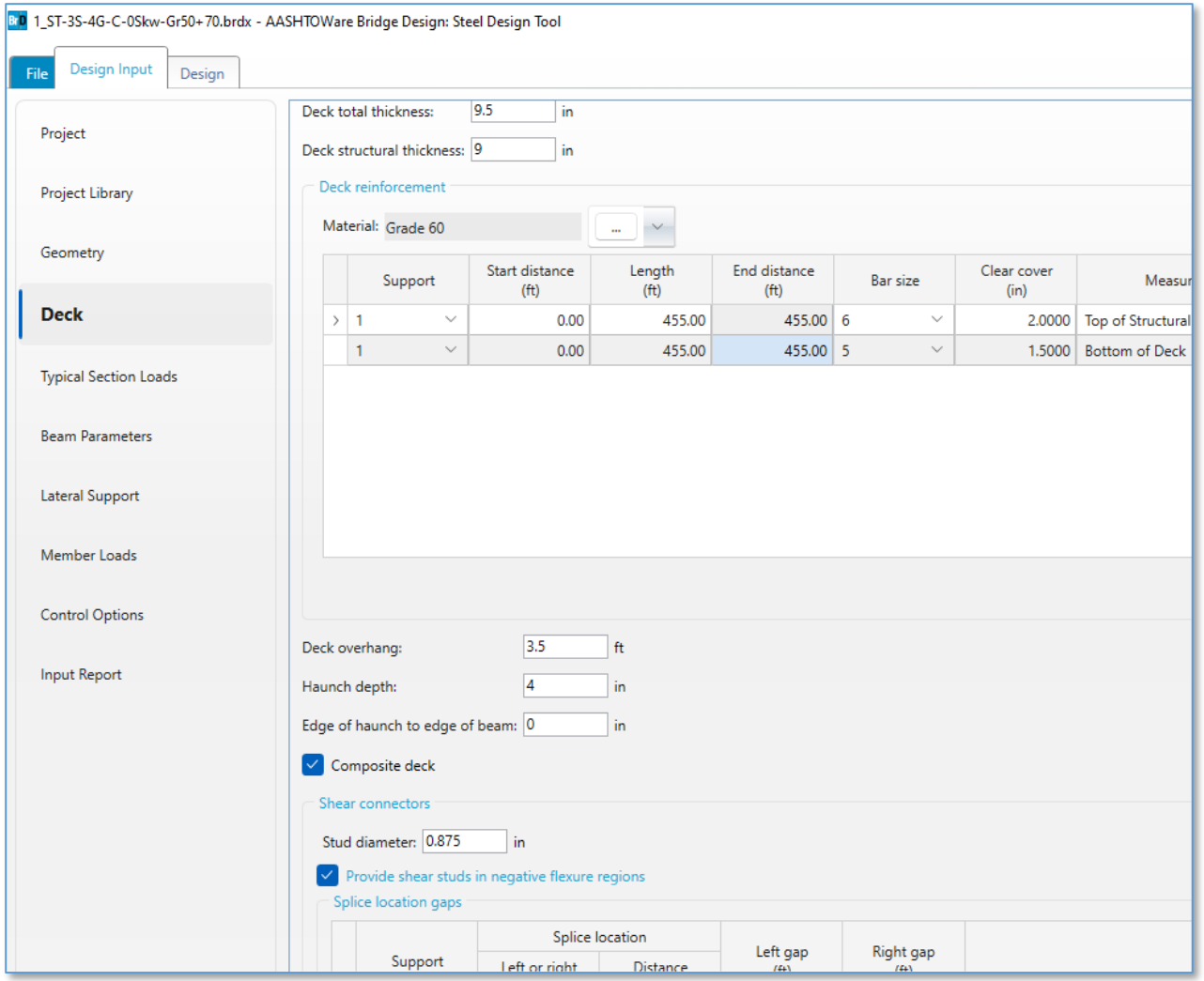
Design Input

- Bridge Geometry
  - Number of spans and span length
  - Number of beams
  - Support skew
  - Number of design lanes
  - Support constraints



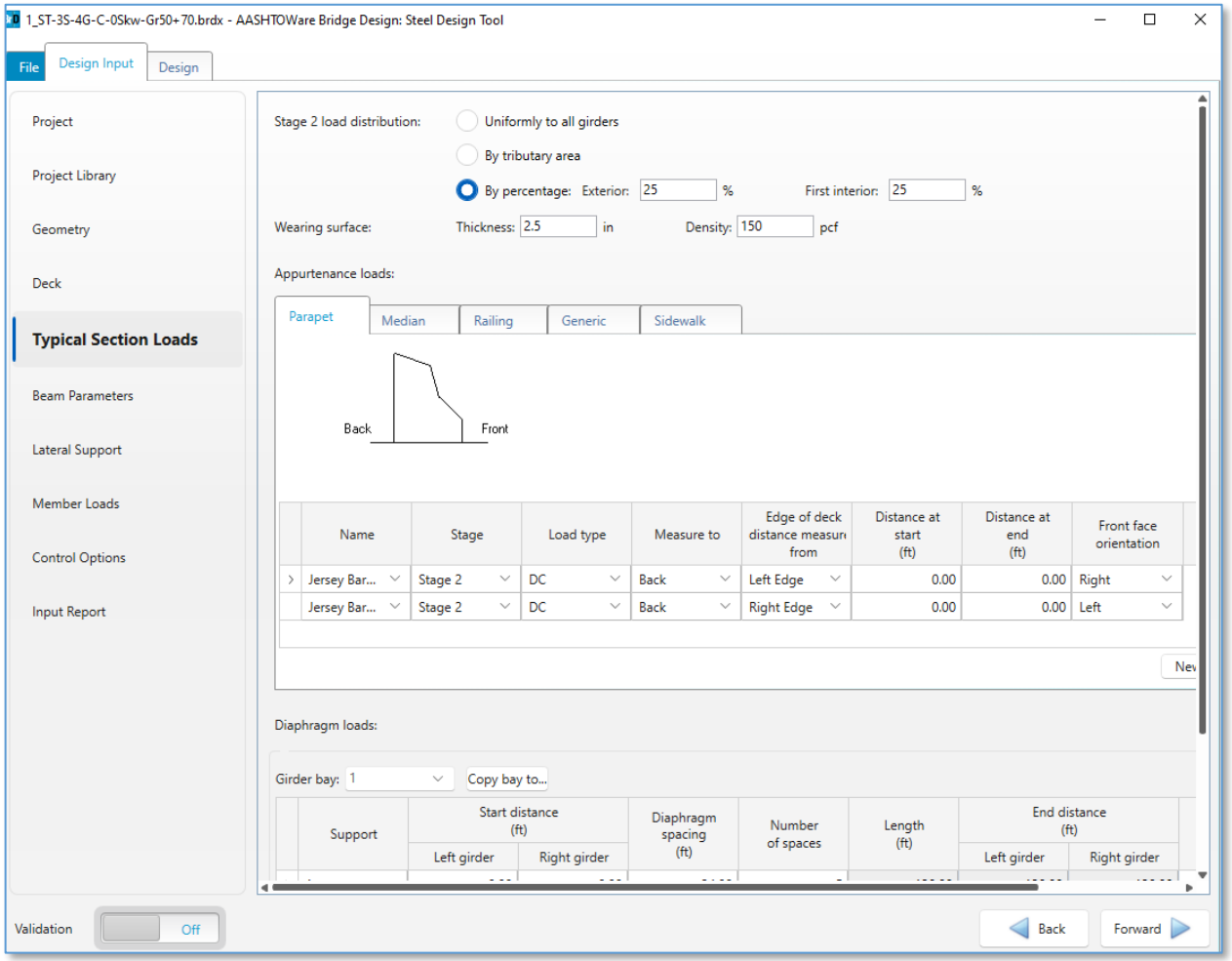
Design Input

- Deck
  - Concrete Material
  - Reinforcement Material
  - Thickness
  - Overhang
- Haunch
- Composite or non-composite
- Shear connector detail



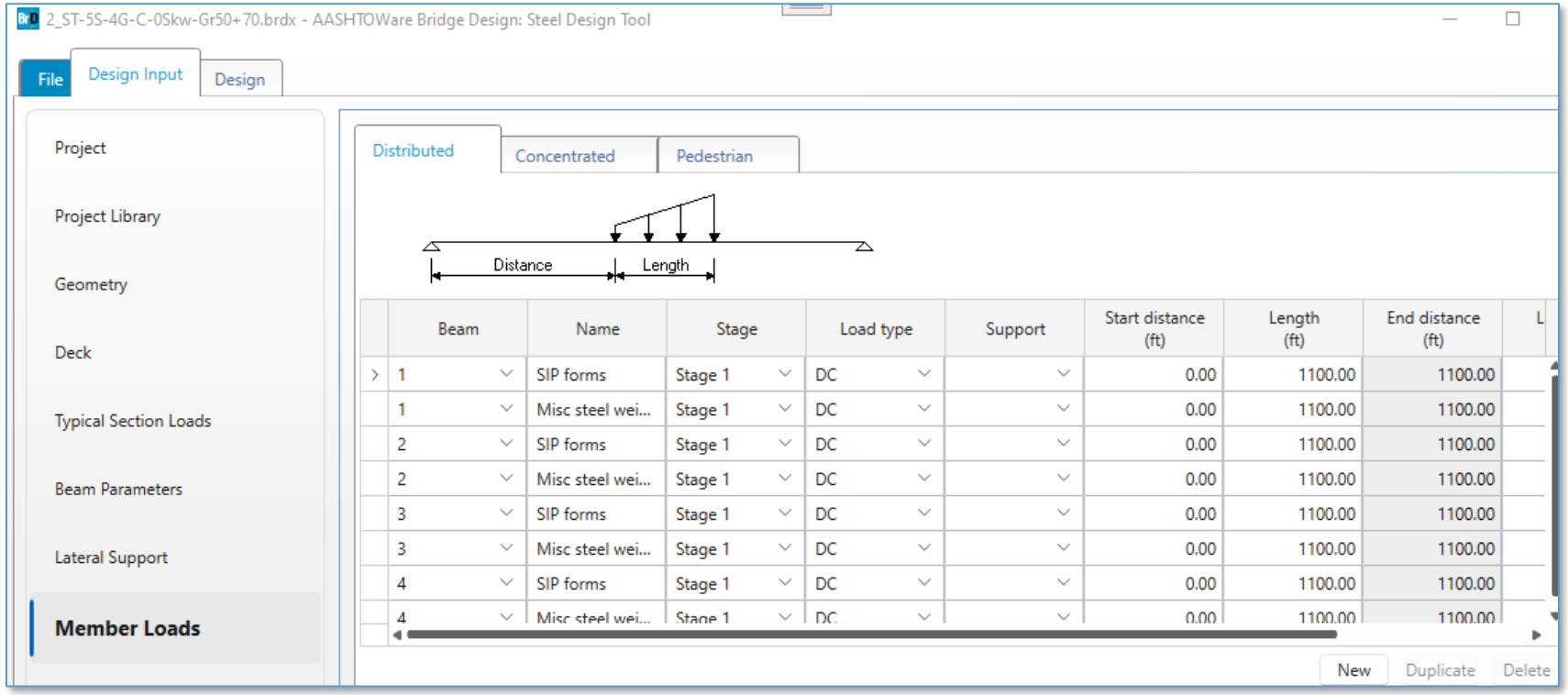
Design Input

- Typical Section Loads
  - Appurtenances
  - Wearing surface
  - Diaphragms
  - Load distribution method



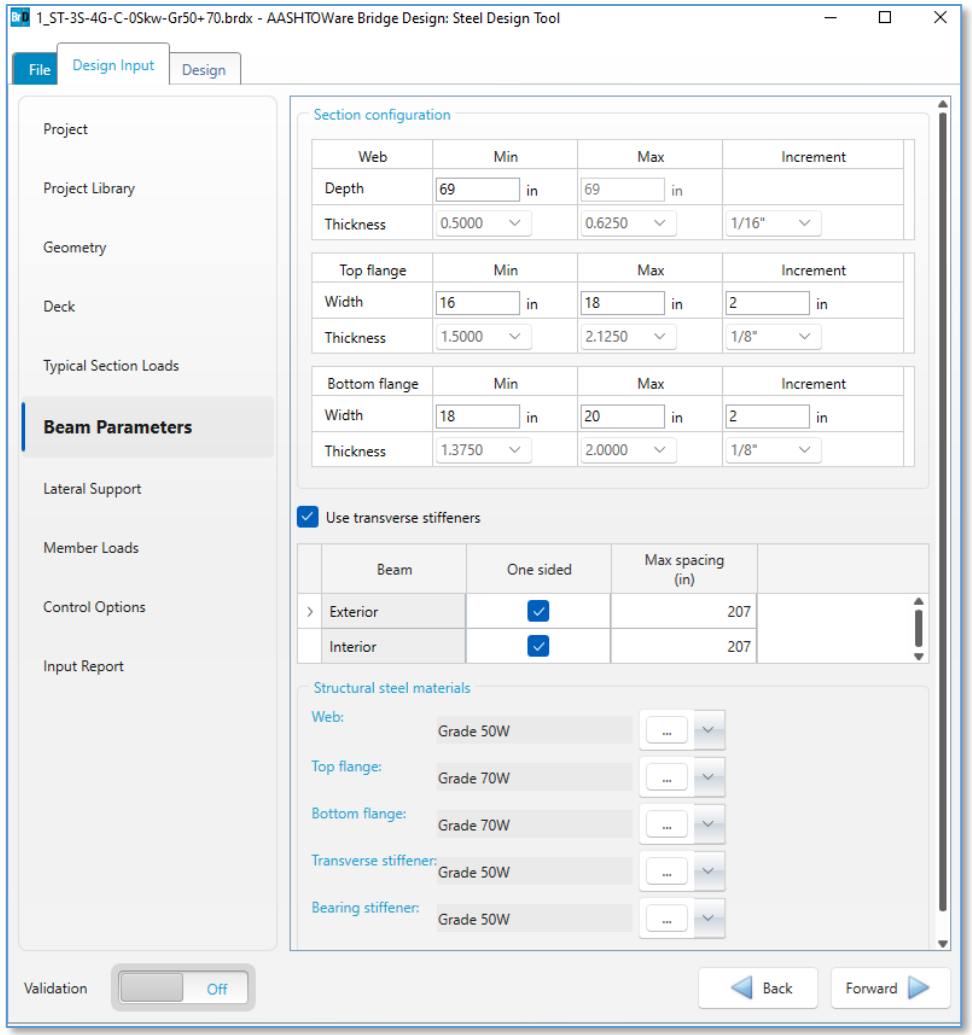
Design Input

- Member Loads
  - Distributed
  - Concentrated
  - Pedestrian



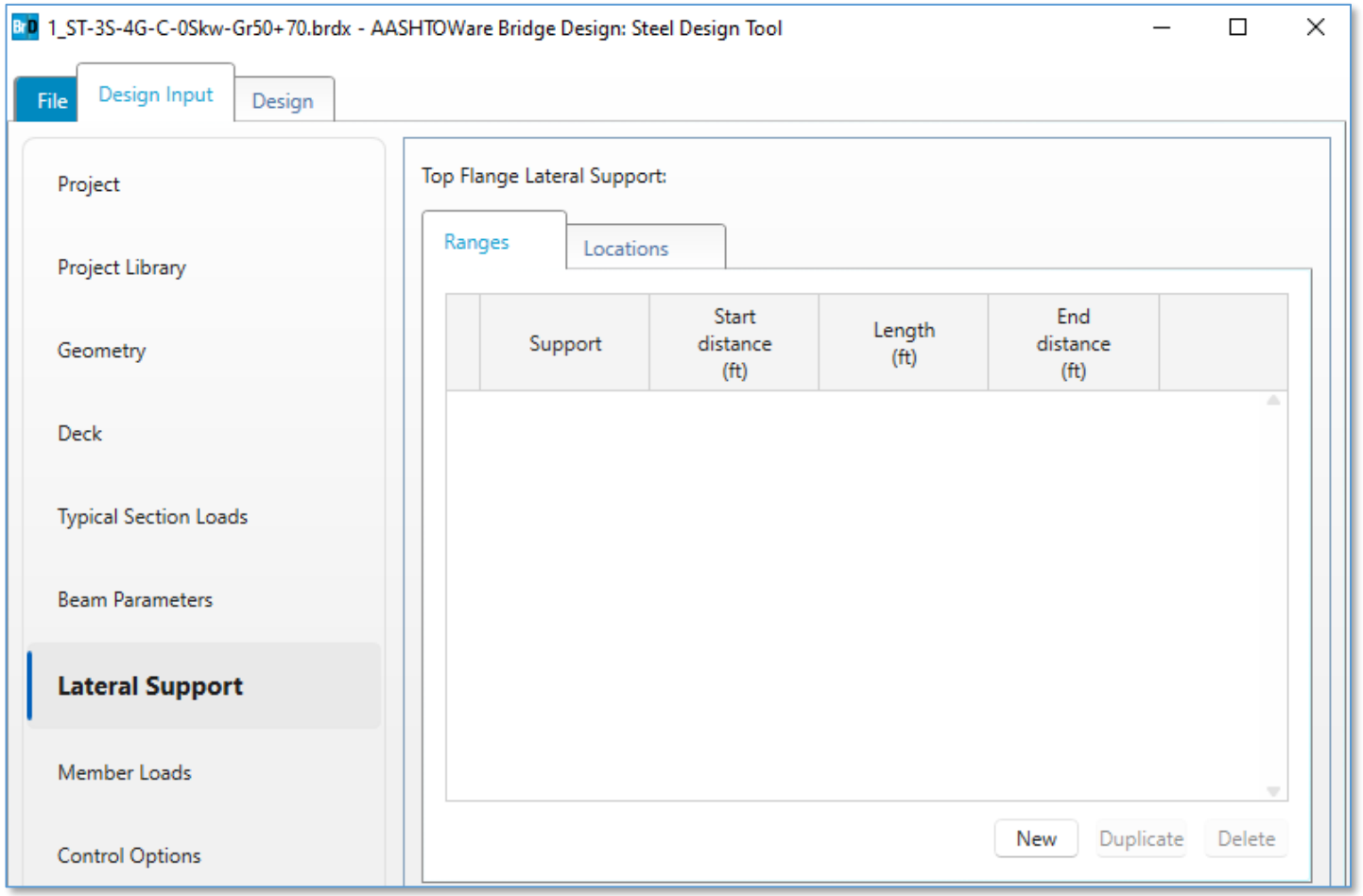
Design Input

- Beam Parameters
  - Web depth
  - Top Flange and Bottom Flange
    - Min./Max. width and increment
  - Web, Top Flange, Bottom Flange
    - Min./Max. thickness and increment
  - Use transverse stiffeners
  - Steel materials
    - Web, top flange, bottom flange, transverse stiffeners, bearing stiffeners



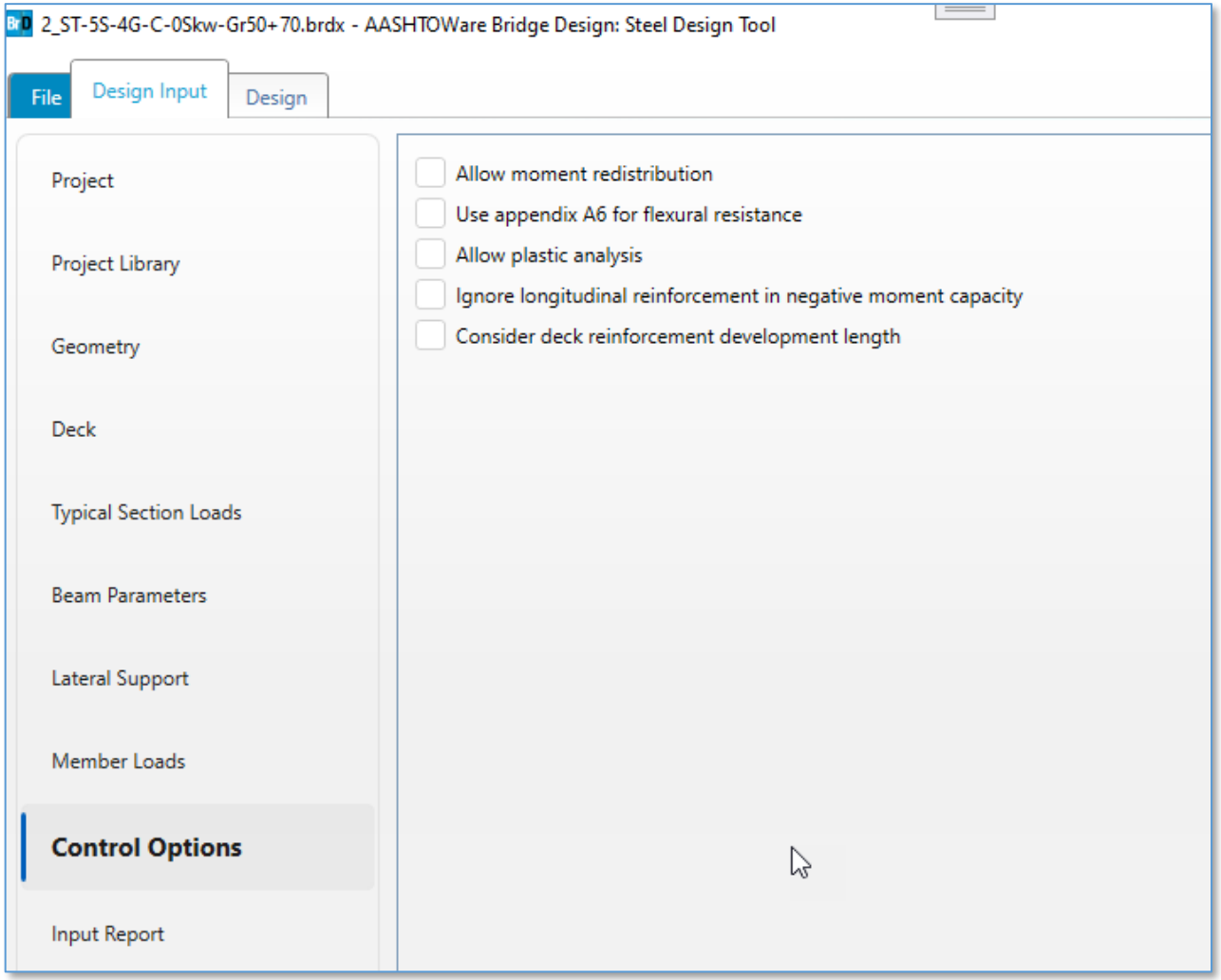
Design Input

- Lateral Support
  - Top Flange Lateral Support
  - As a range
  - At discrete locations

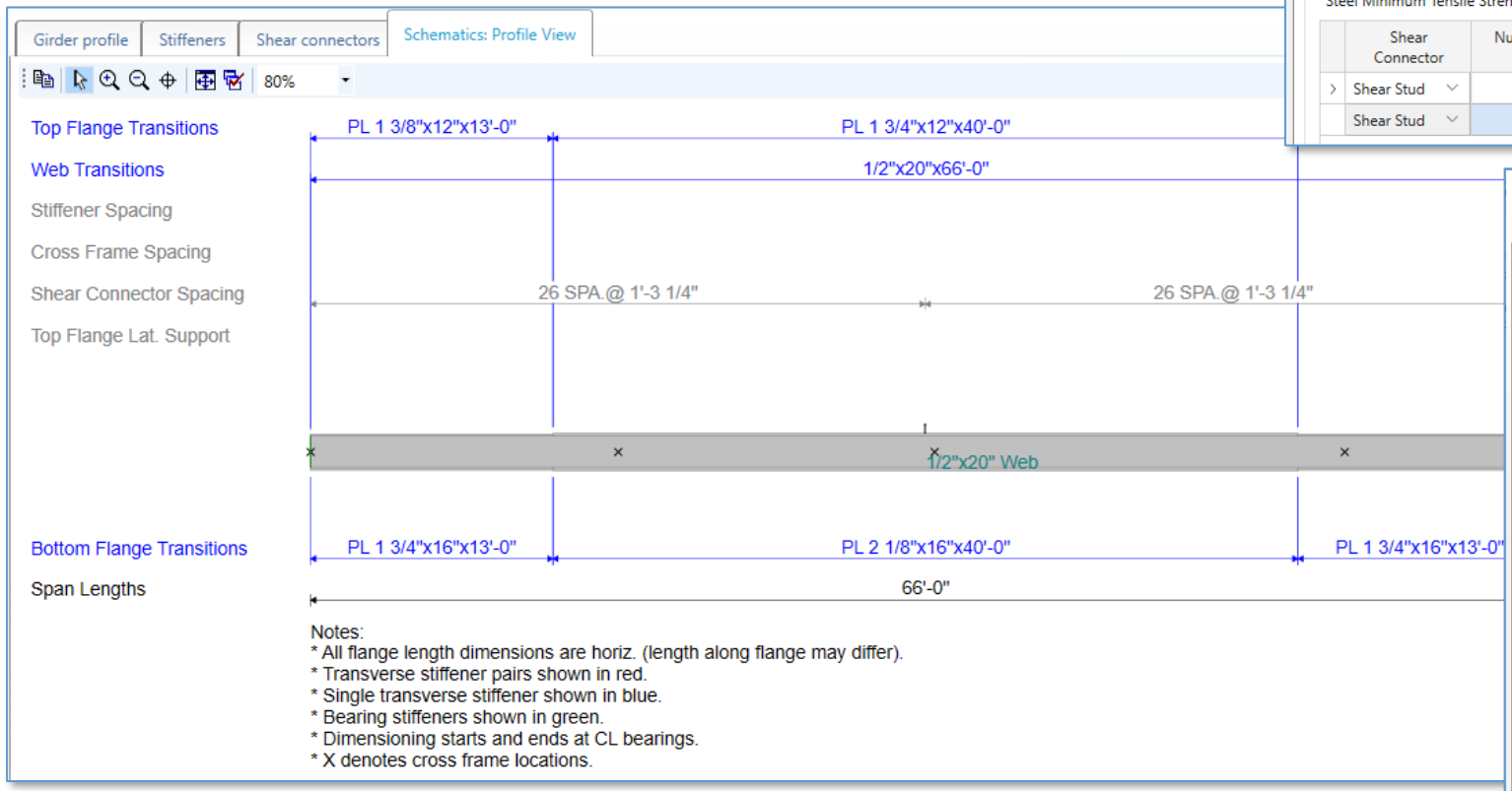


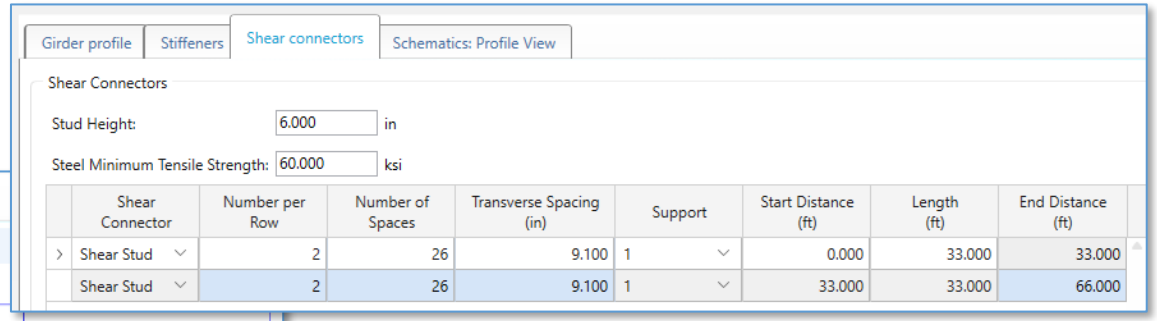
Design Input

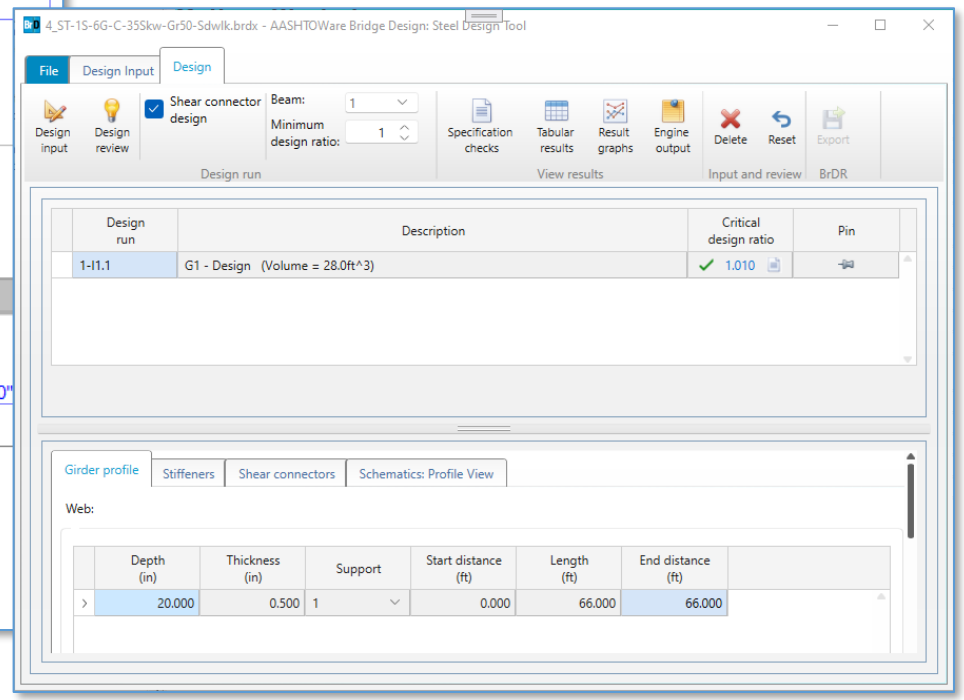
- Control Options
  - Moment redistribution
  - Appendix A6
  - Plastic analysis
  - Longitudinal reinforcement in negative moment capacity
  - Deck reinforcement development length



Design Output

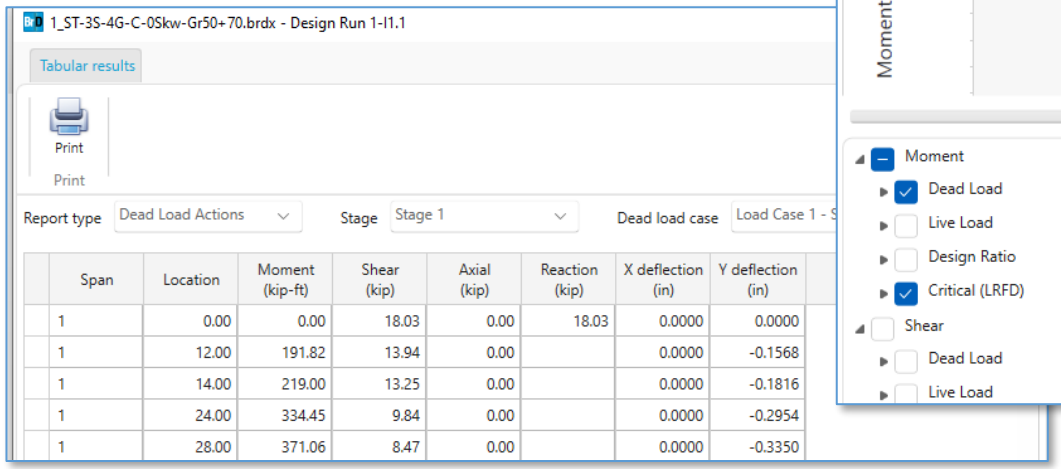


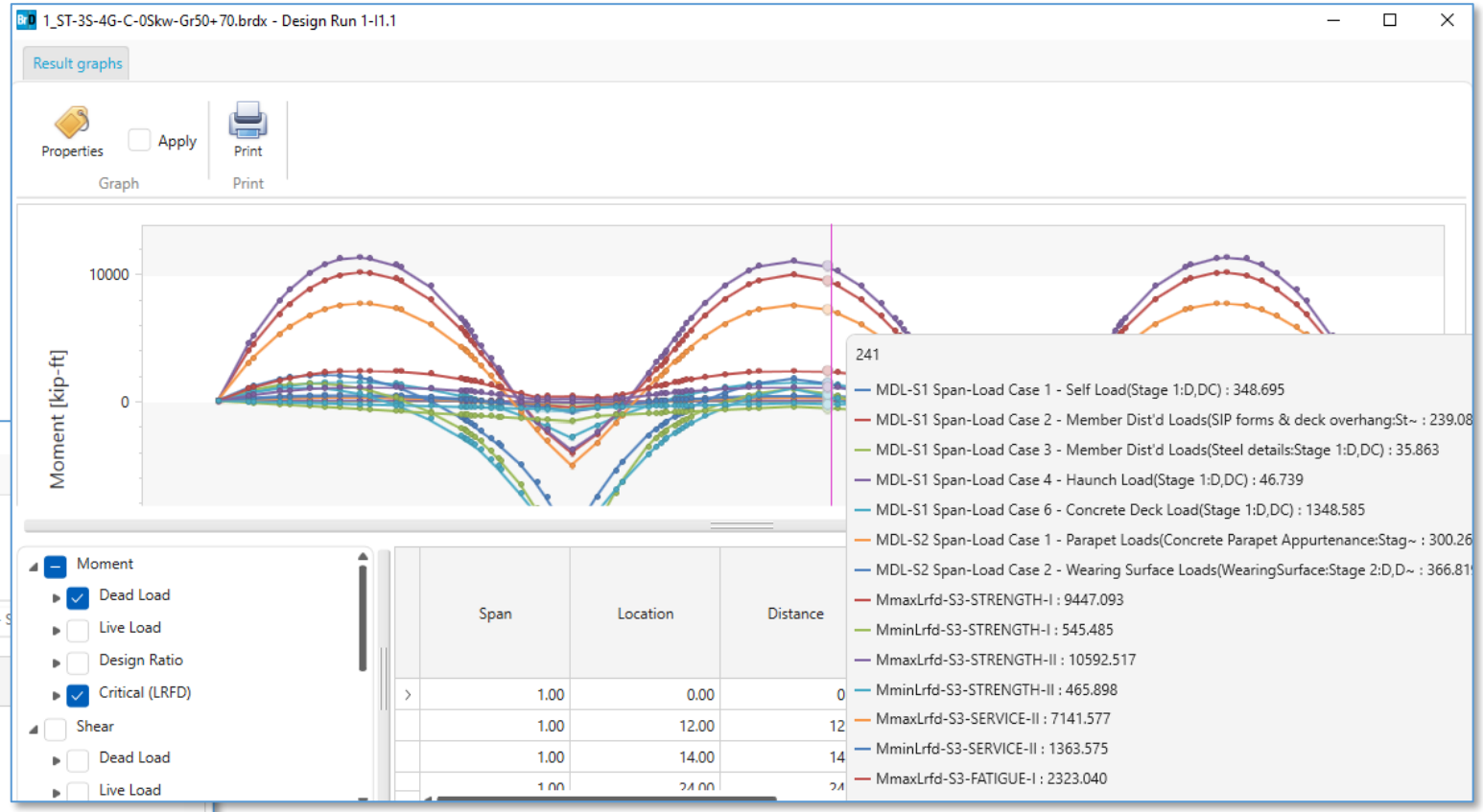




Design Output

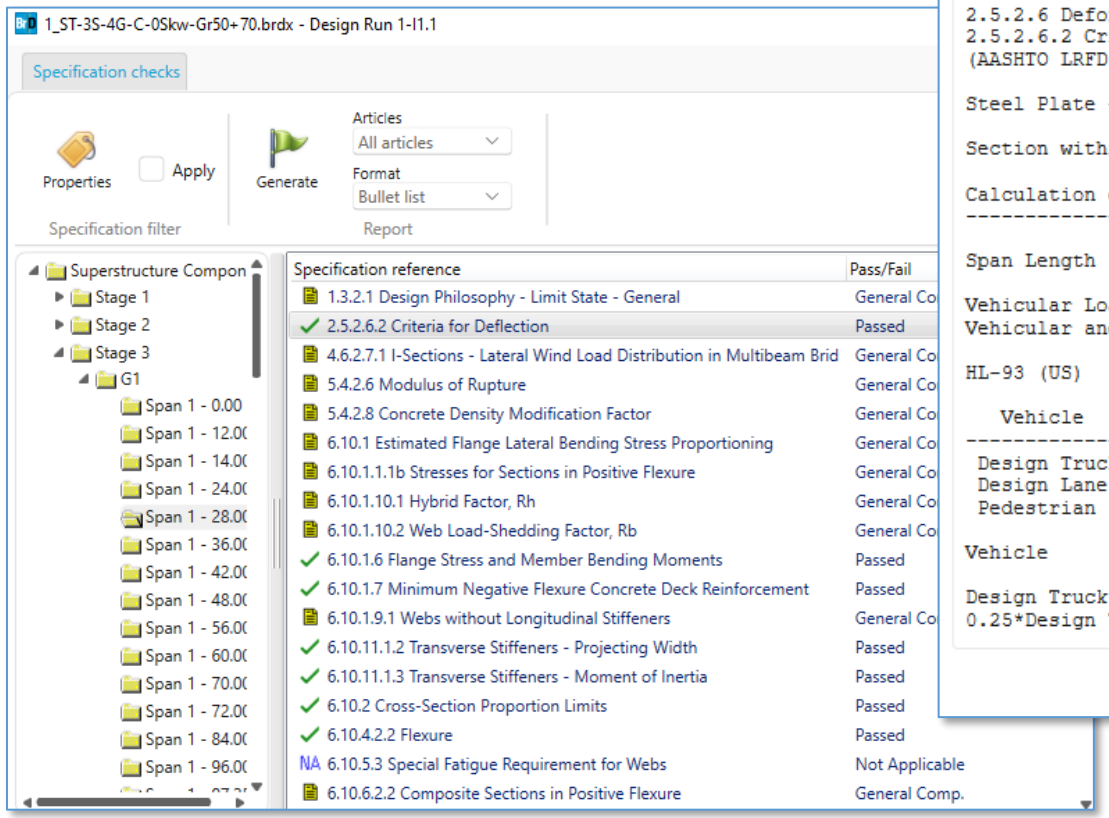
- DL and LL Actions for each load case and load stage

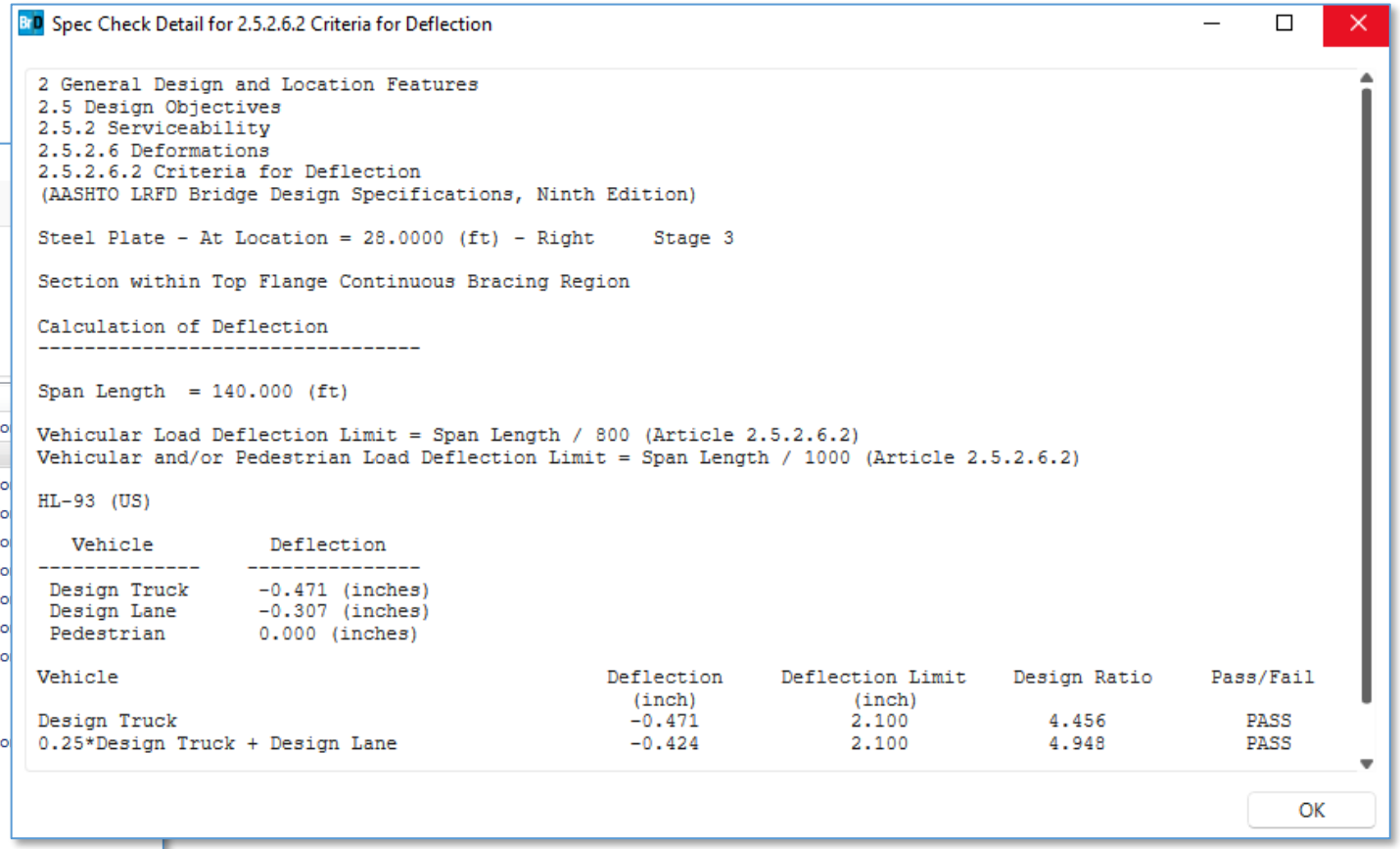




Design Output

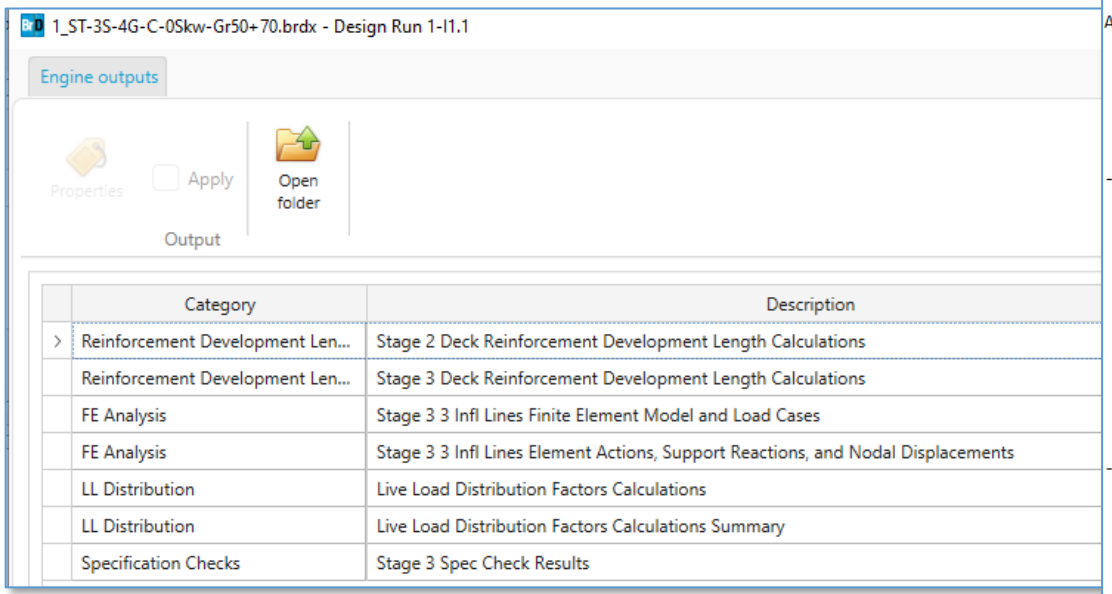
- Detailed Specification Checks

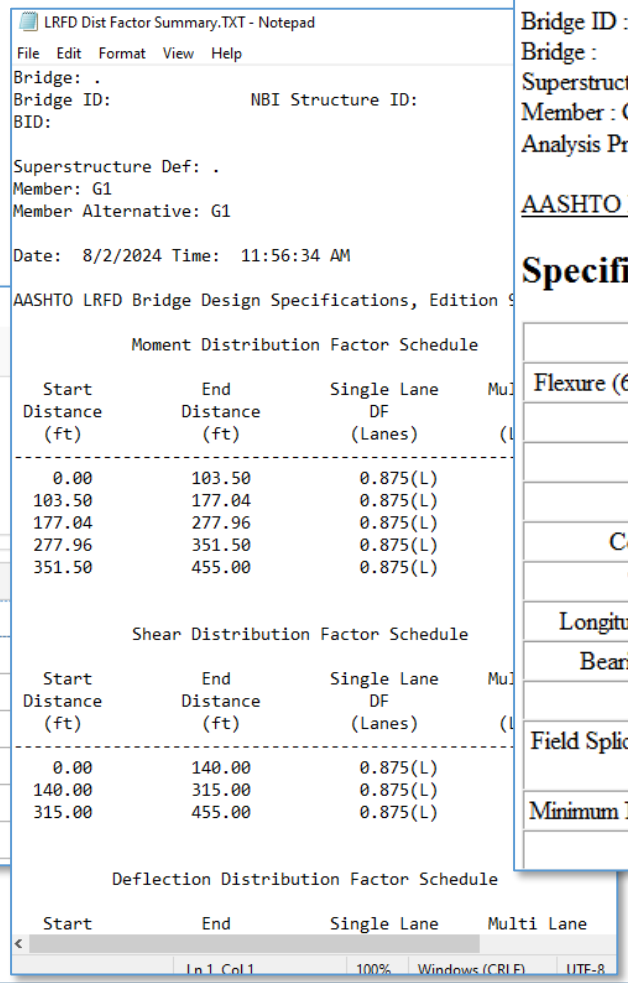


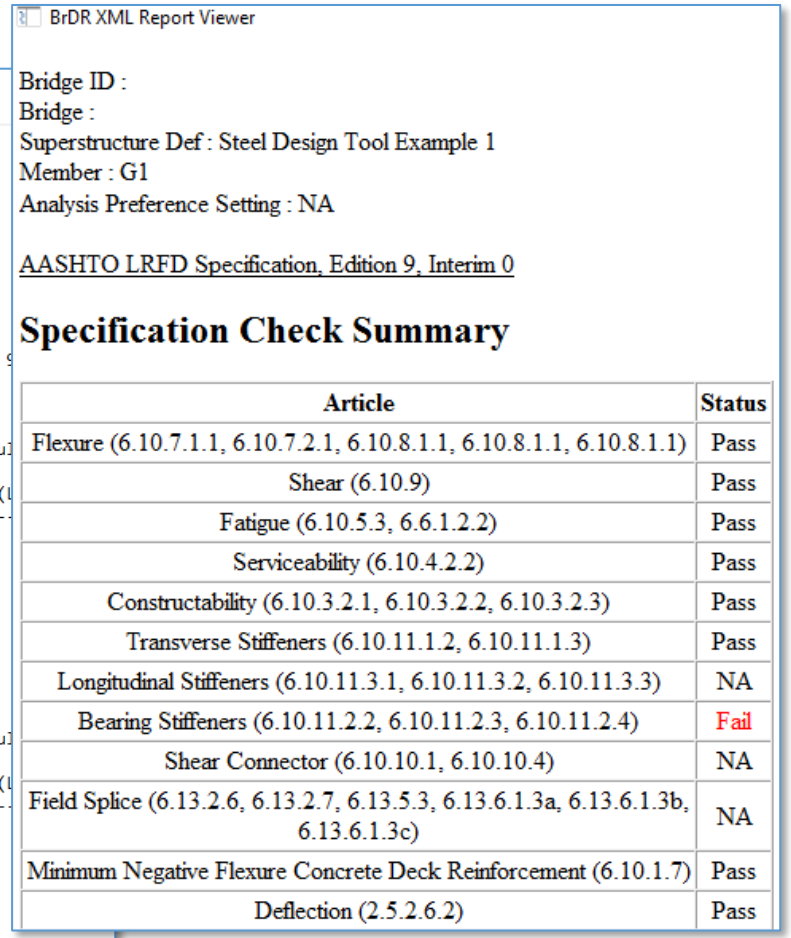


Design Output

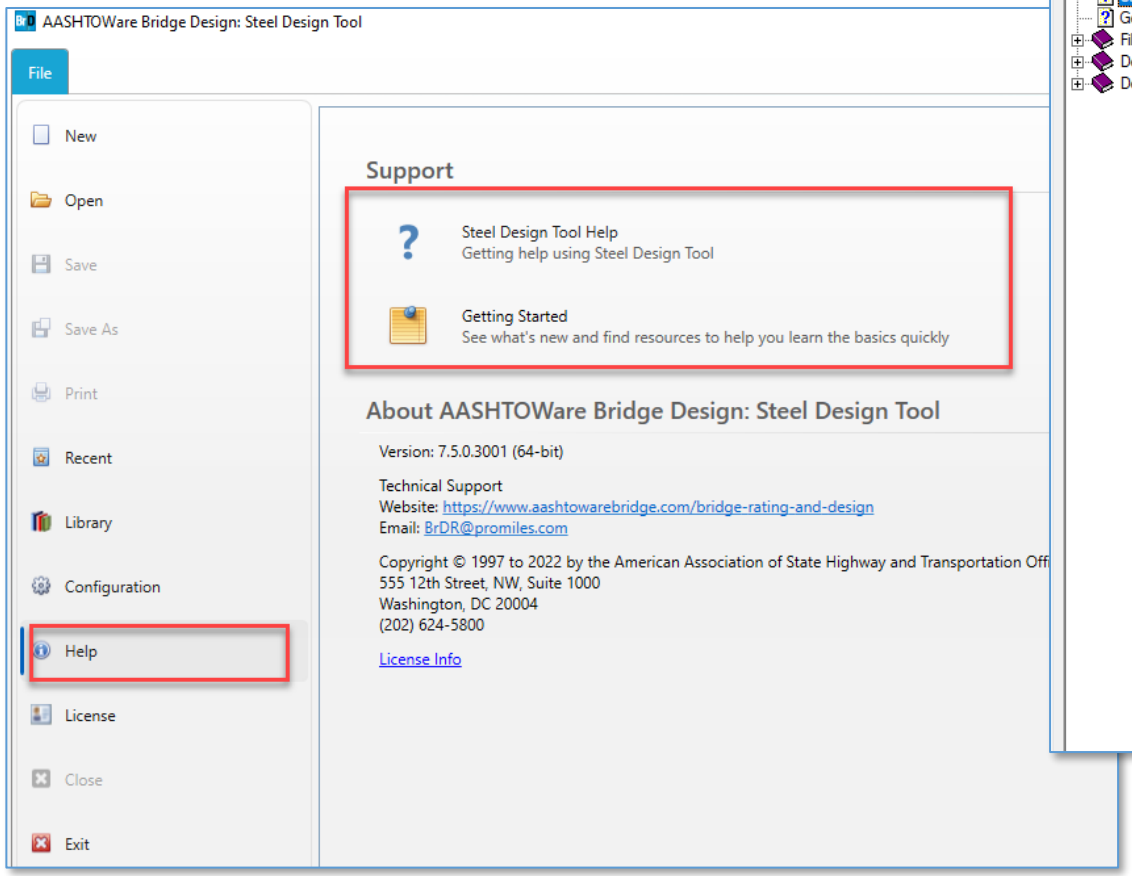
- Reports

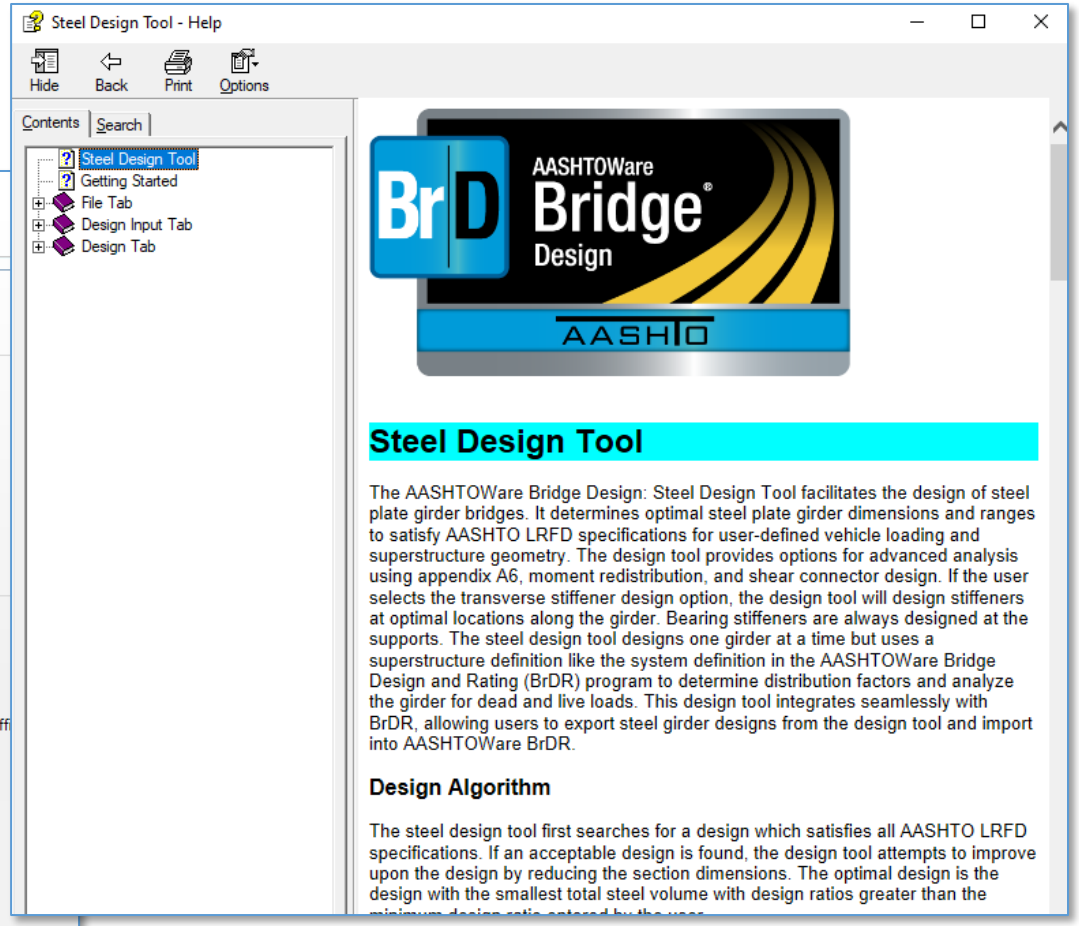






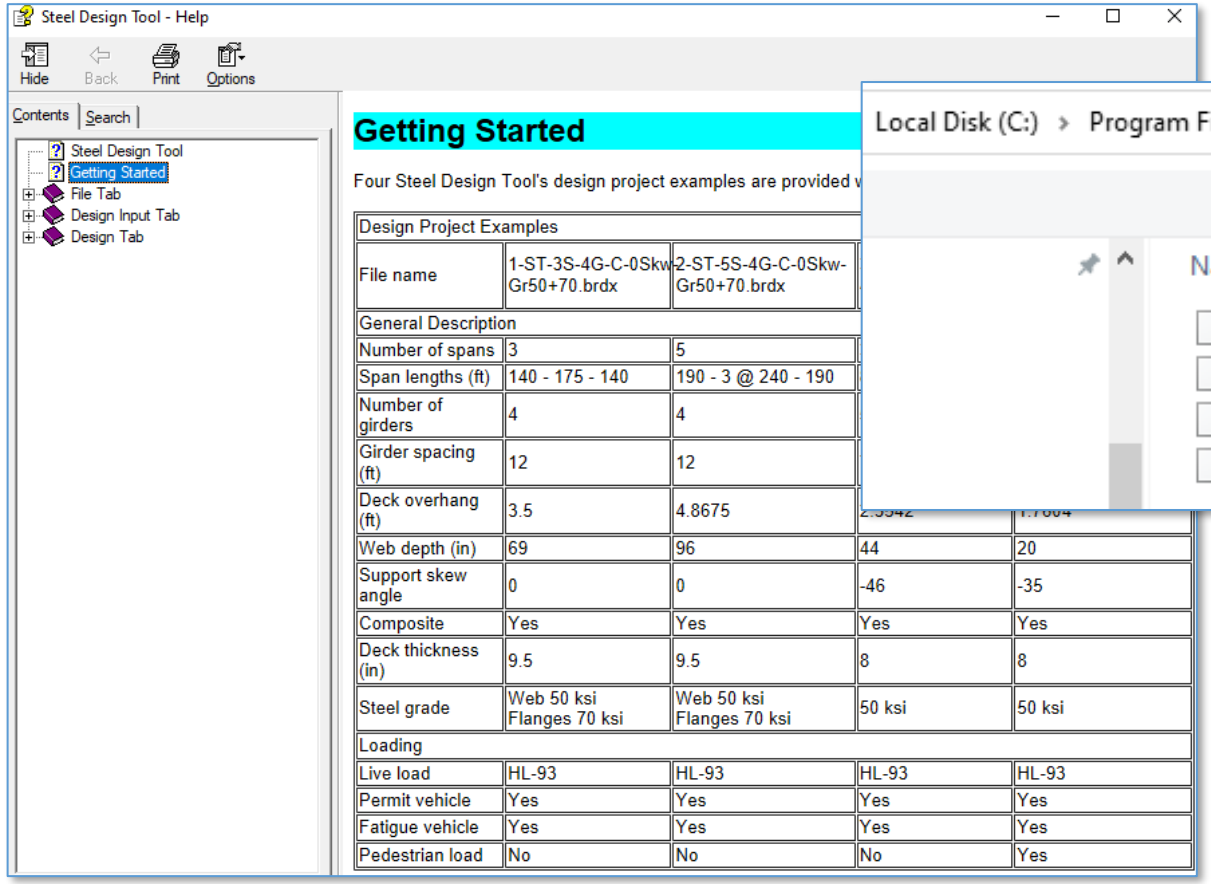
Additional Information



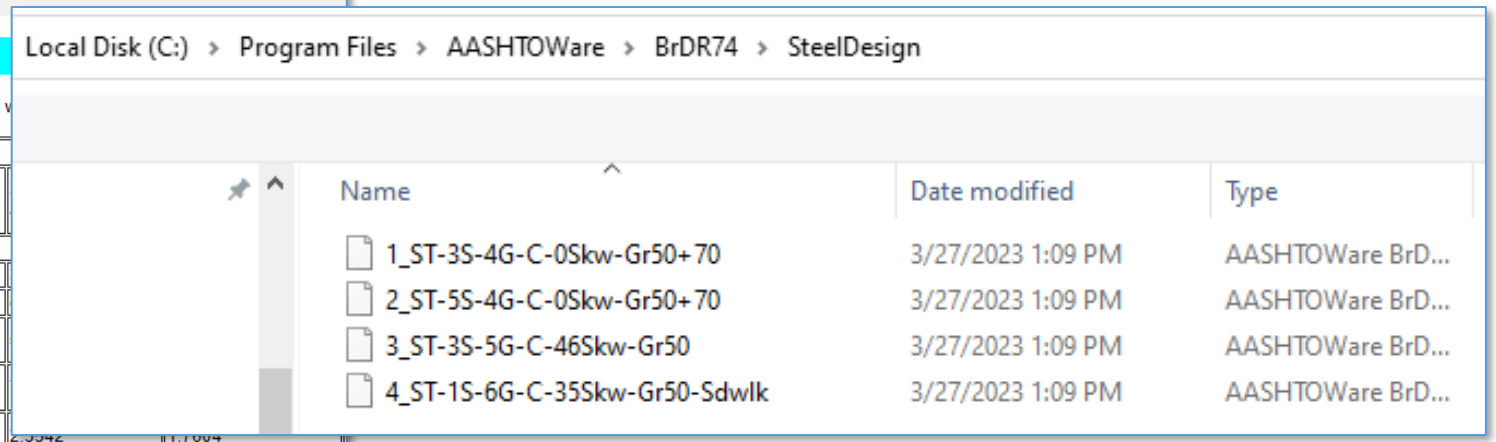


- Help and Methodology

Additional Information



Design Project Examples				
File name	1-ST-3S-4G-C-0Skw-Gr50+70.brdx	2-ST-5S-4G-C-0Skw-Gr50+70.brdx		
General Description				
Number of spans	3	5		
Span lengths (ft)	140 - 175 - 140	190 - 3 @ 240 - 190		
Number of girders	4	4		
Girder spacing (ft)	12	12		
Deck overhang (ft)	3.5	4.8675		
Web depth (in)	69	96	44	20
Support skew angle	0	0	-46	-35
Composite	Yes	Yes	Yes	Yes
Deck thickness (in)	9.5	9.5	8	8
Steel grade	Web 50 ksi Flanges 70 ksi	Web 50 ksi Flanges 70 ksi	50 ksi	50 ksi
Loading				
Live load	HL-93	HL-93	HL-93	HL-93
Permit vehicle	Yes	Yes	Yes	Yes
Fatigue vehicle	Yes	Yes	Yes	Yes
Pedestrian load	No	No	No	Yes



- Design Example Files Provided with Installation

Future Enhancements and Integration

- Performed a gap analysis to identify areas for potential enhancement
- Work with the Design TAG to plan integration into BrD and evaluate and prioritize enhancements

Future Enhancements and Integration

- Anticipated Enhancements in the following areas:
  - Design Algorithm
    - More variability in geometry and design input, and additional options on design optimization
  - Schematics
    - Additional graphics and schematics
  - Design Results
    - Additional design results for splices, diaphragms, bearings
  - Staged Construction and Constructability
    - Advanced evaluation of temporary stresses, staged construction, deck pour sequencing

Questions?

Thank you!