AASHTOWare BrDR 7.5.0

Prestressed Concrete Design Tool

Three Span Wide Flange PS I Beam Example

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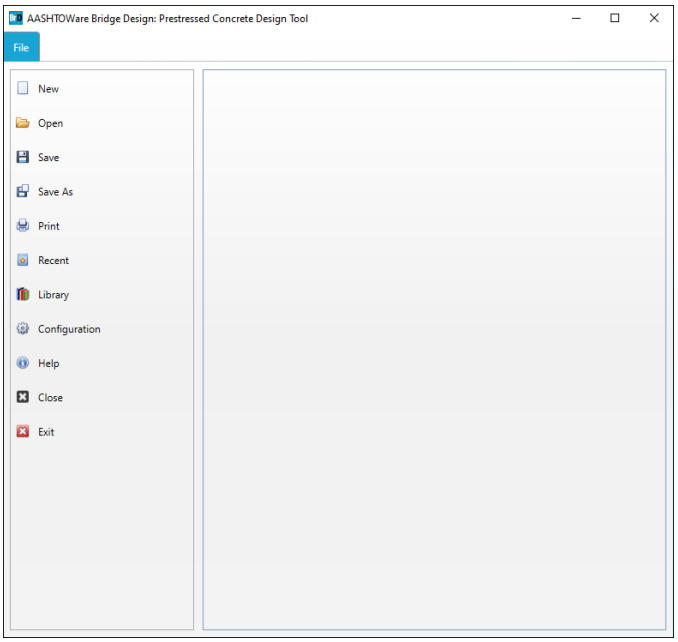
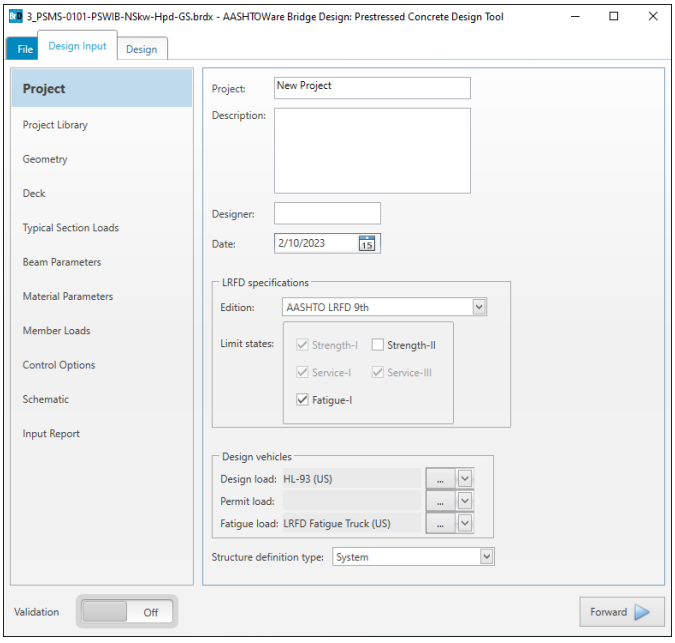
Start the **Prestressed Design Tool** program, create a new input file using the **File | New** command. The program will switch from the **File** tab to the **Design Input** tab.

File | New and File | Save As



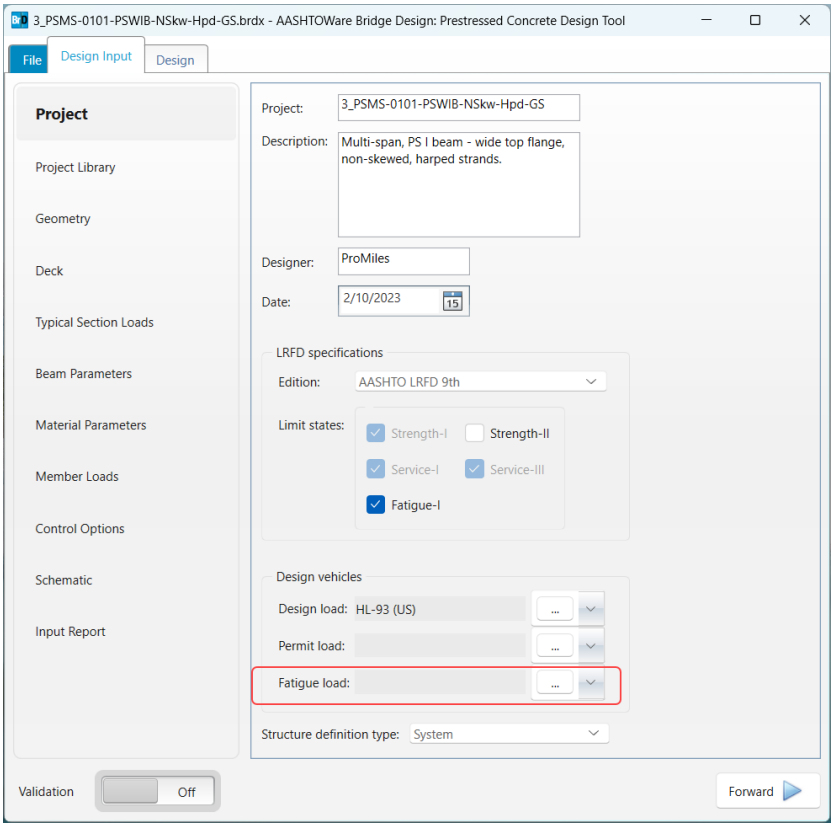
Before proceeding with **Design Input** return to the **File** tab and click **Save As** to rename the file from **New Project** to **3_PSMS-0101-PSWIB-NSkw-Hpd-GS** and remove the **LRFD Fatigue Truck (US)** from the **Design vehicles** list.



The new file name will appear in the program title bar and the program will again bring up the the **Design Input** with the **Project** input screen. The **Project** property will still display **New Project** which will be changed in the next step. The **Project** property determines the name of the subfolder in the Documents\AASHTOWare\PSDesign75\ folder where design run output files will be stored. In the bottom left corner of the program window, there is a **Validation** button that enables input validation. When validation is enabled, the program will mark sections and input boxes with missing or incorrect information. In this example, the **Validation** will be disabled during input and will be enabled after all input is entered to verify that there are no validation errors.

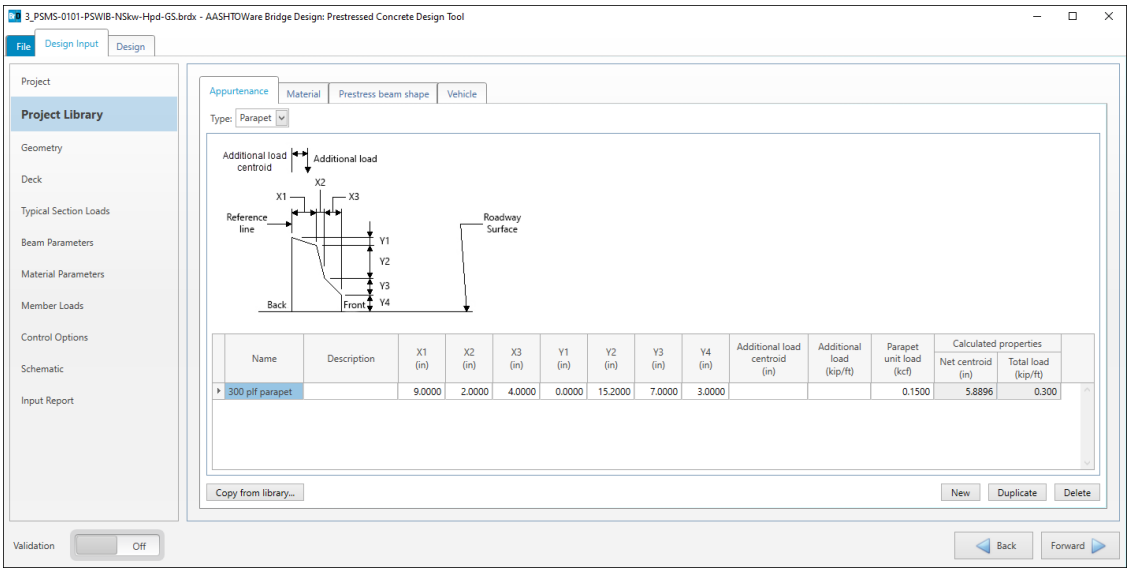
Design Input | Project

On the Design Input | **Project** input screen, enter the data as shown below.



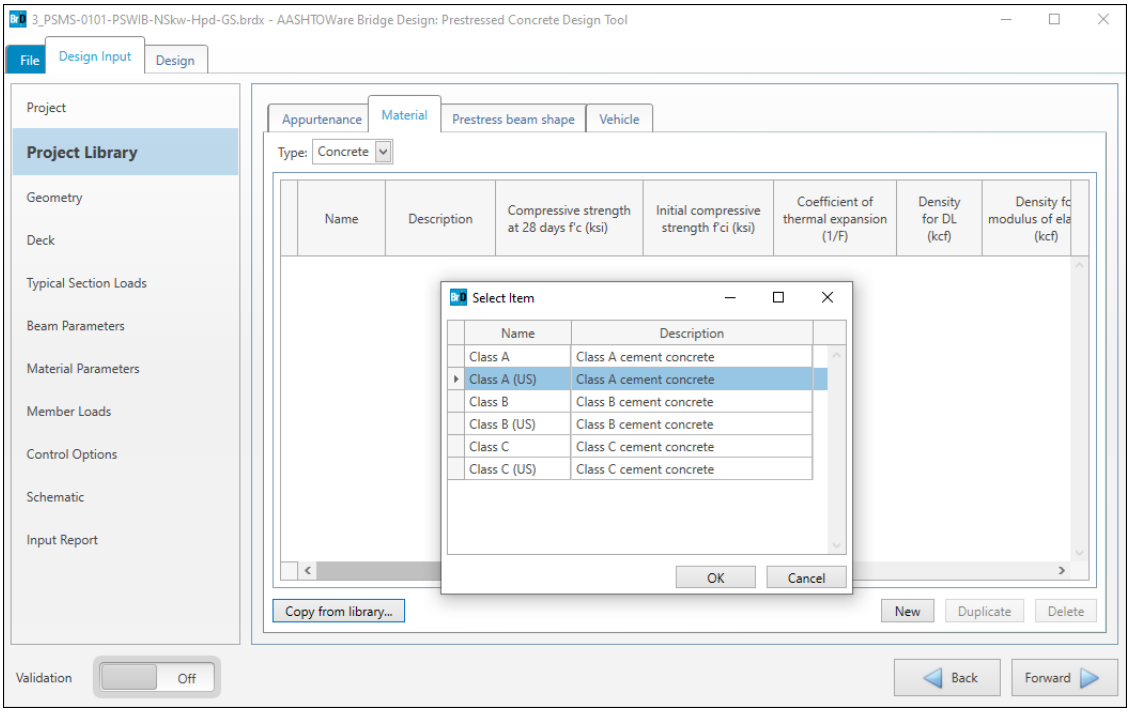
Design Input | Project Library | Appurtenance

On the **Apputenance** tab, select **Parapet** for **Type** from the drop down menu and click the **New** button to add a new parapet. Enter the data as shown below.

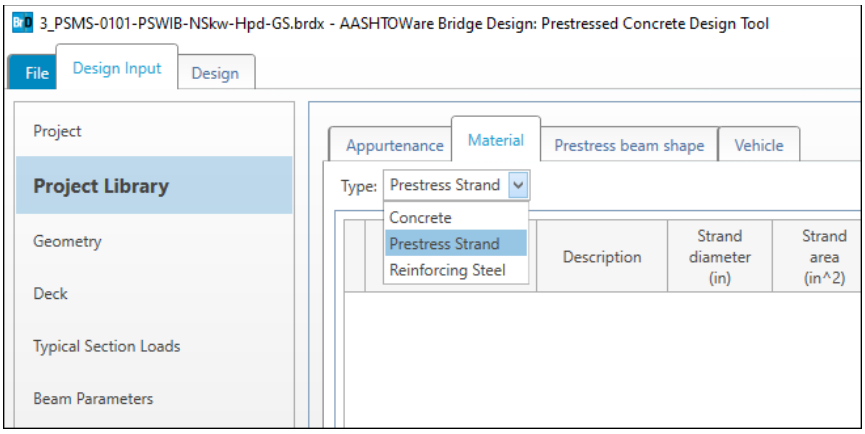


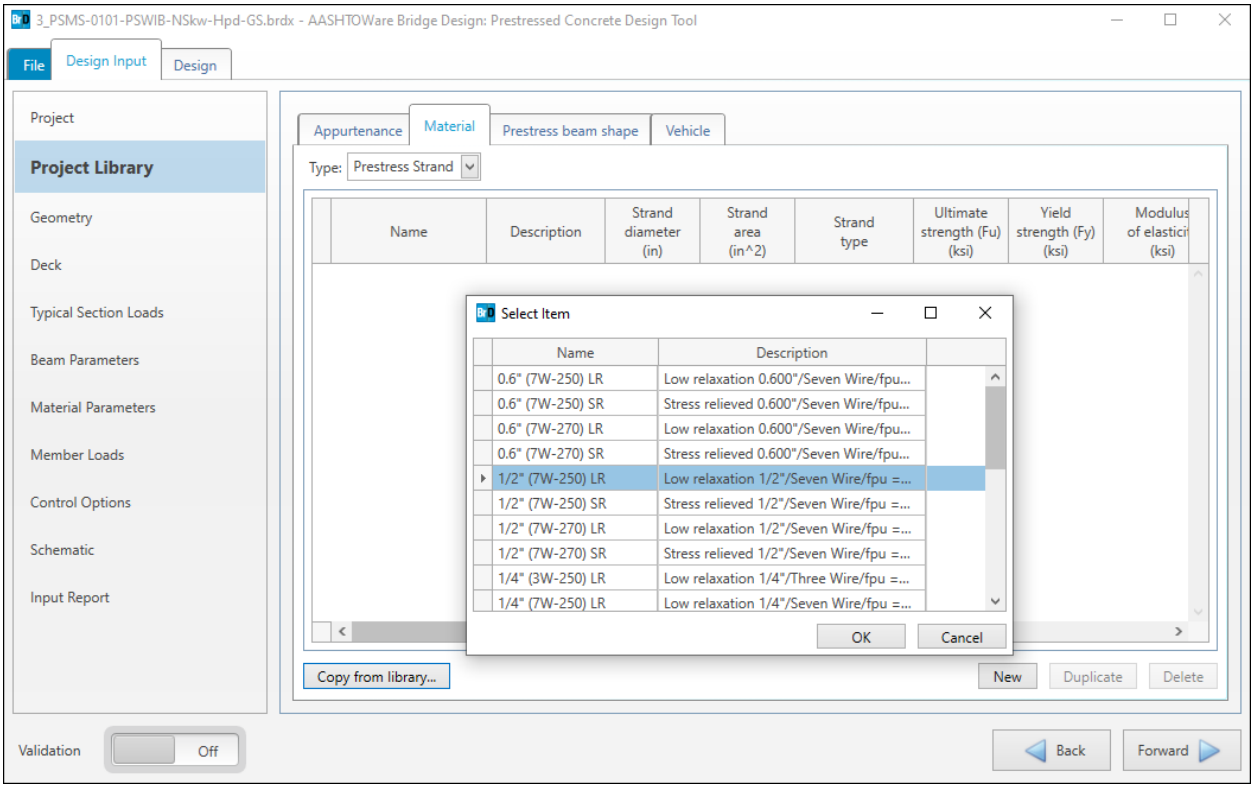
Design Input | Project Library | Material

On the **Material** tab, select **Concrete** for **Type** from the drop down menu and click the **Copy from library** button to copy the **Class A (US)** concrete material definition from **File | Library** to the **Project Library**.

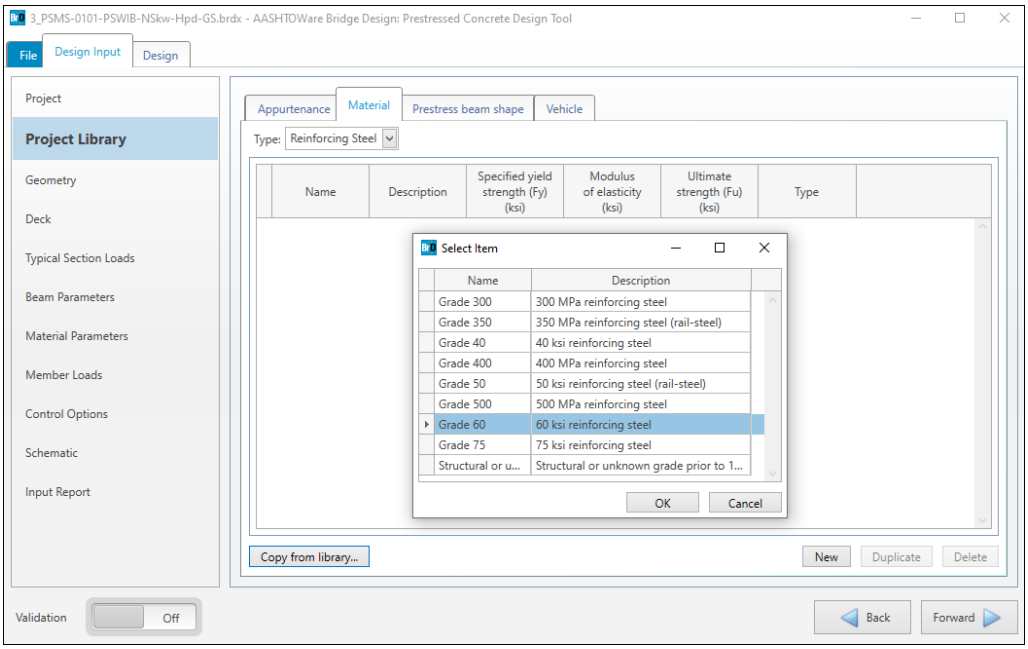


On the **Material** tab, select **Prestress Strand** for **Type** from the drop down menu and click the **Copy from library** button to copy the **½" (7W-250) LR** prestressing strand material definition from **File | Library** to the **Project Library**.



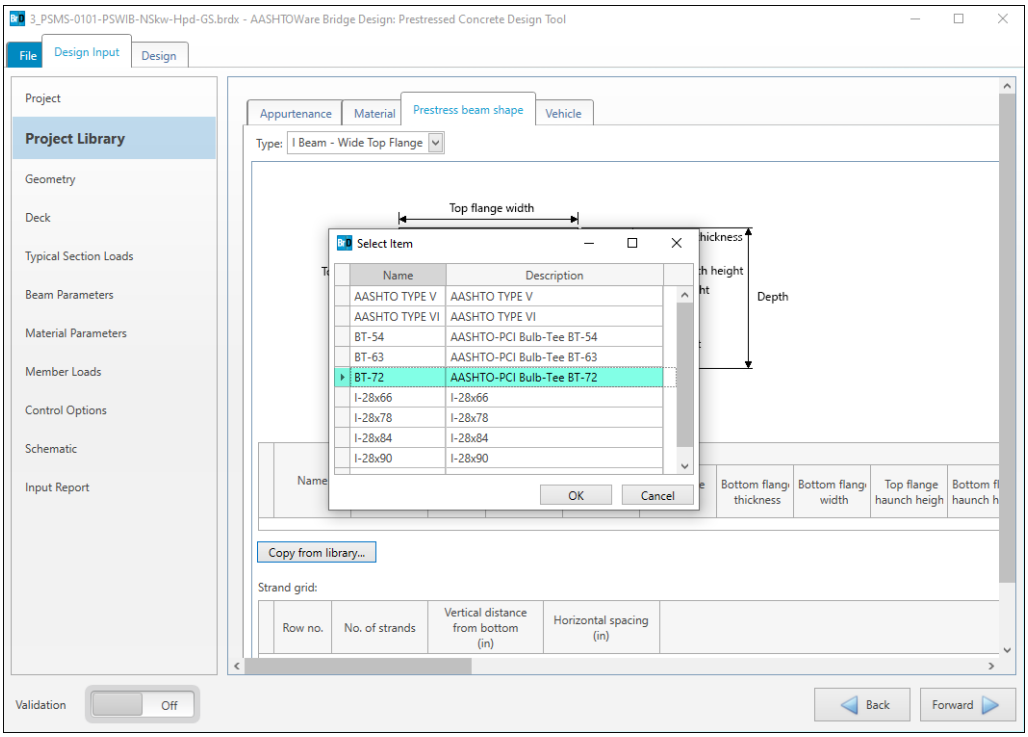


On the **Material** tab, select **Reinforcing Steel** for **Type** from the drop down menu and click the **Copy from library** button to copy the **Grade 60** reinforcing steel material definition from **File | Library** to the **Project Library**.



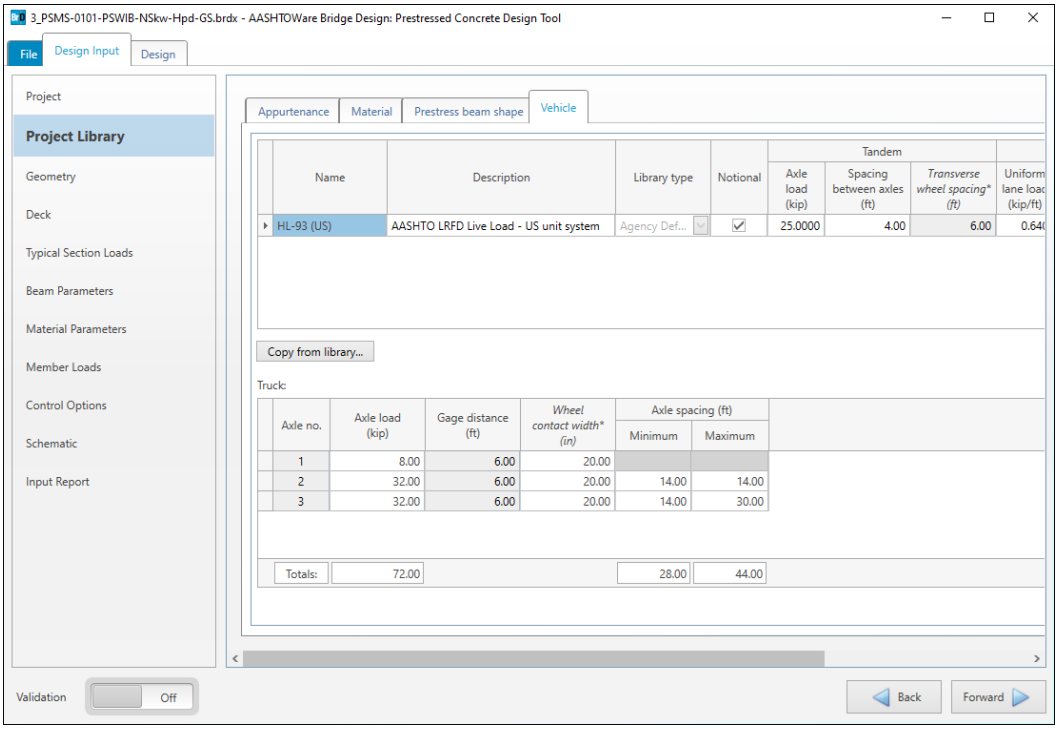
Design Input | Project Library | Prestress Beam Shape

On the **Prestressed beam shape** tab, select **I Beam – Wide Top Flange** for **Type** from the drop down menu and click the **Copy from library** button to copy the BT-72 shape definition from **File | Library** to the **Project Library**.



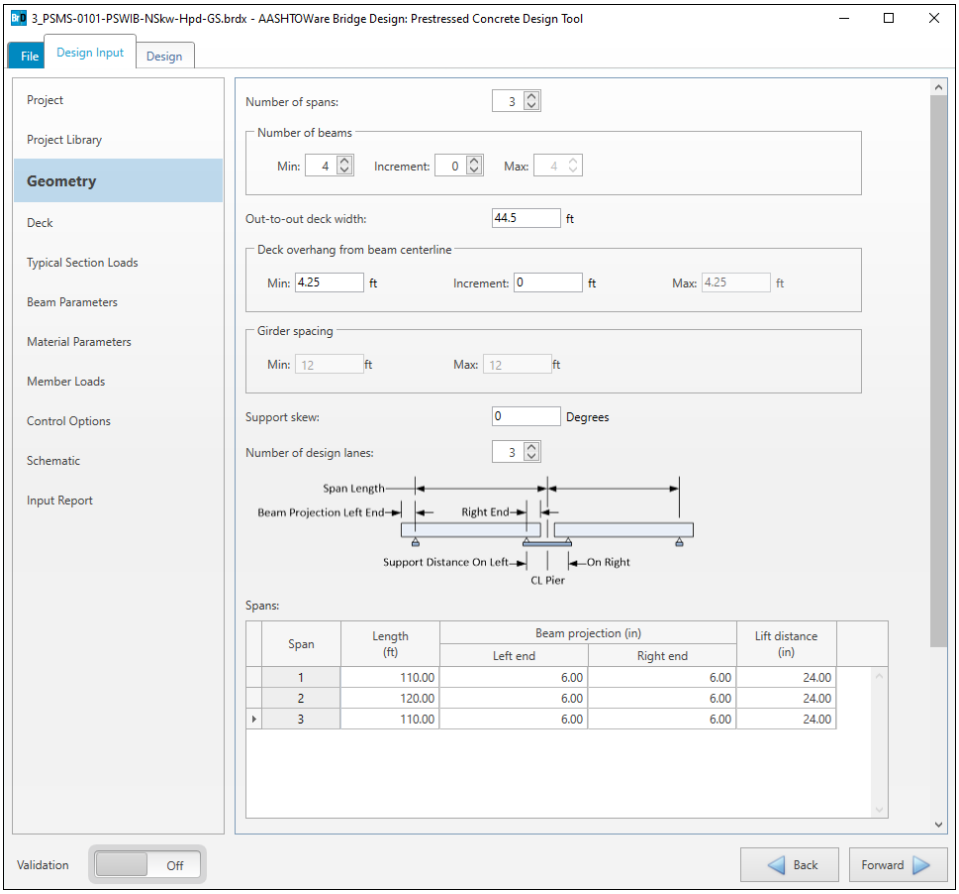
Design Input | Project Library | Vehicle

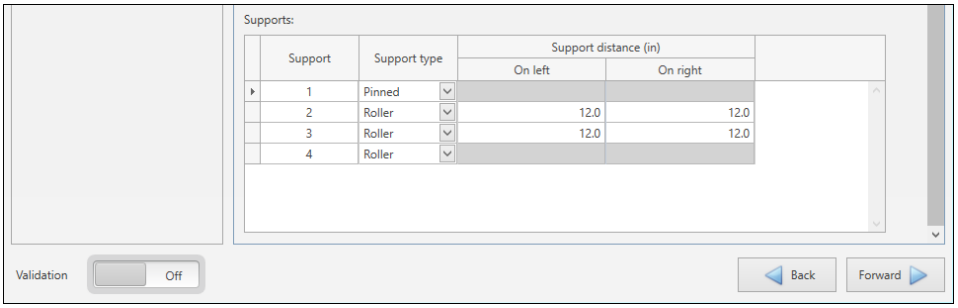
On the **Vehicle** tab, make sure that only the HL-93 (US) vehicle is present in the table. If not, copy it from the library. If there are any vehicles other than HL-93 (US) in the **Project Library**, remove them using the **Delete** button.



Design Input | Geometry

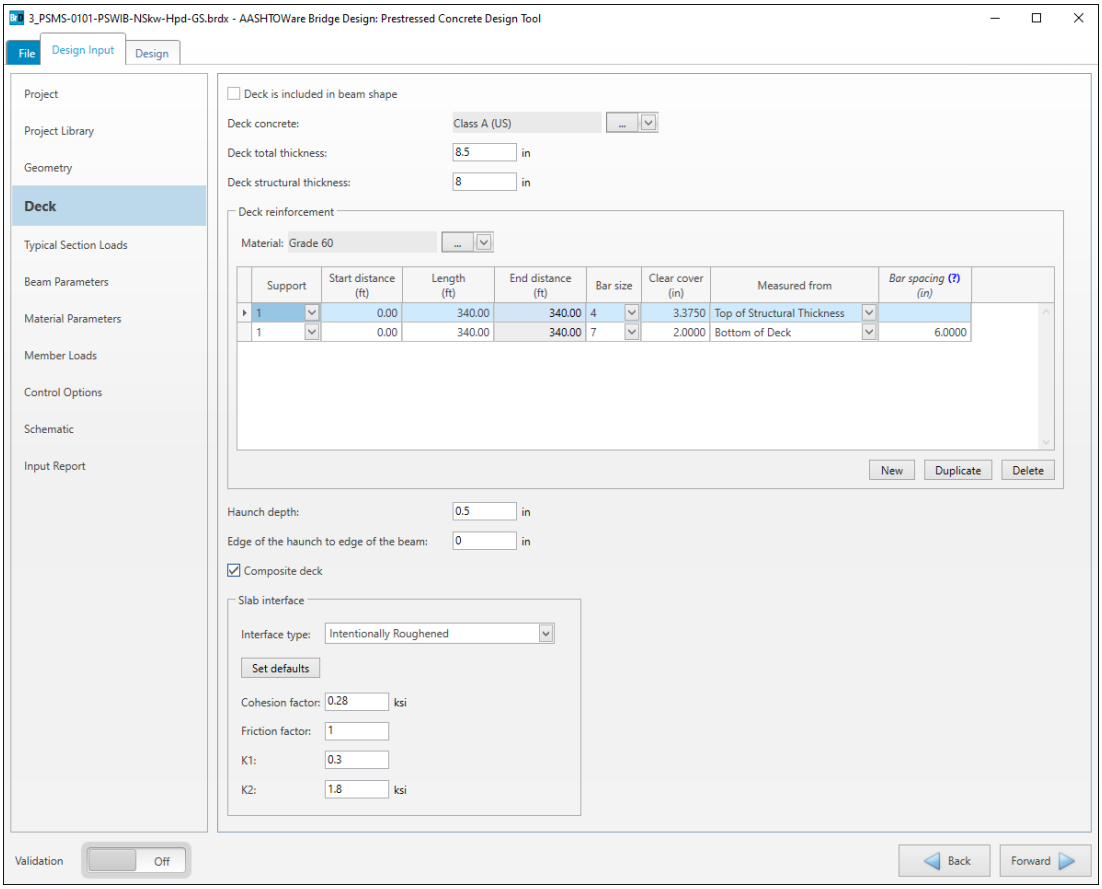
On the **Geometry** tab, enter the data as shown below. Depending on the screen resolution, scroll down to enter the **Support** information.





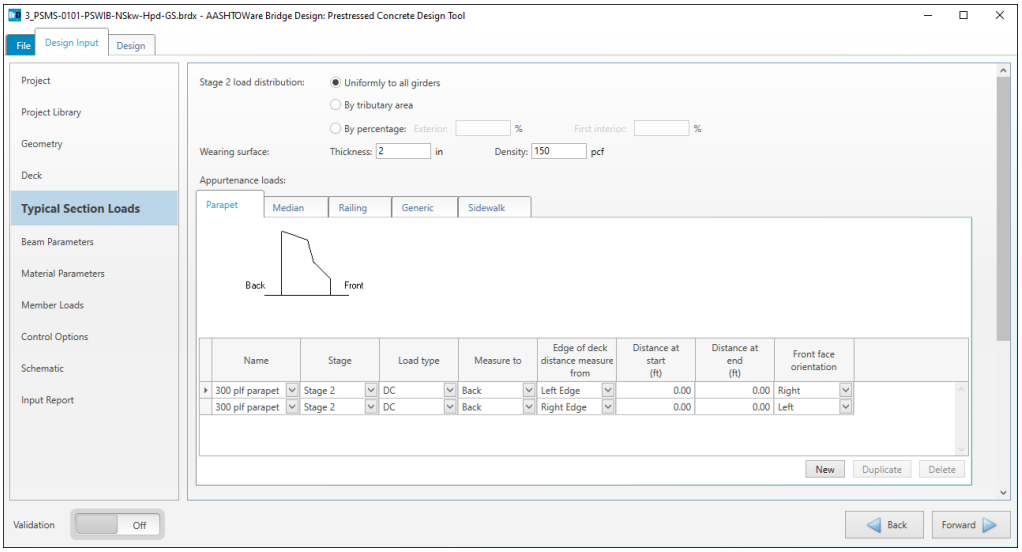
Design Input | Deck

On the **Deck** tab, enter the data as shown below. Leaving the **Bar Spacing** input empty in the first row instructs the program to look during the **Design Input** run for the bar spacing that will satisfy the flexural reinforcement requirement. The bar spacing can be adjusted in **Design Review** runs after the Design Input is performed.



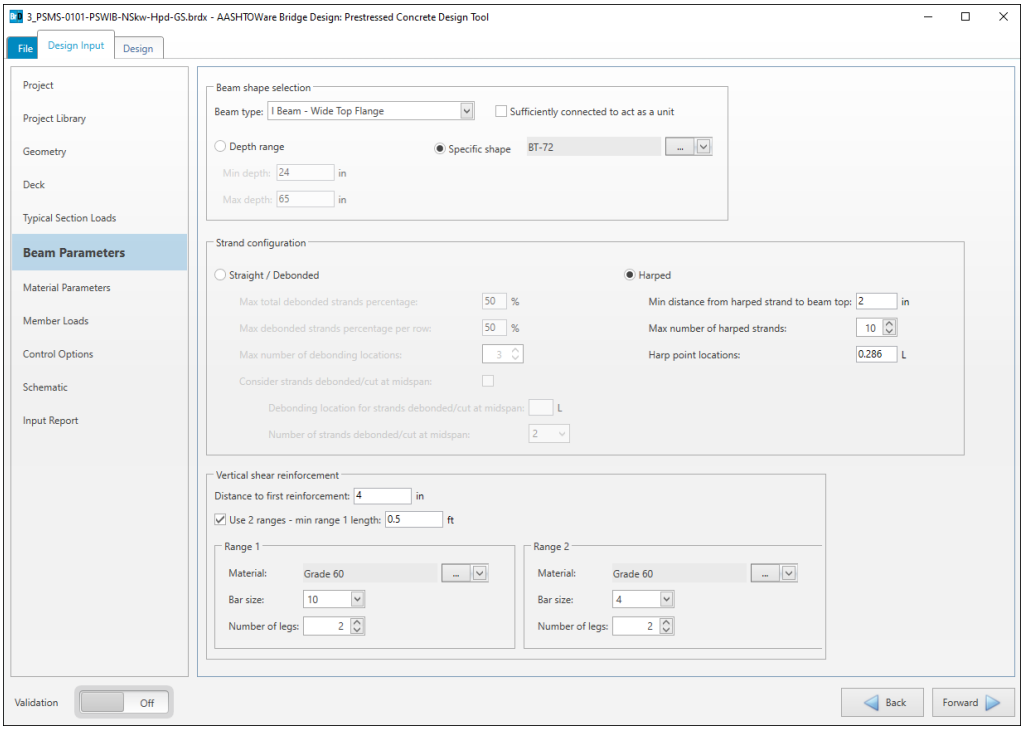
Design Input | Typical Section Load | Parapet

On the **Parapet** tab in **Typical Section Loads**, enter the data as shown below. In this example, the generic parapet is the only typical section load.



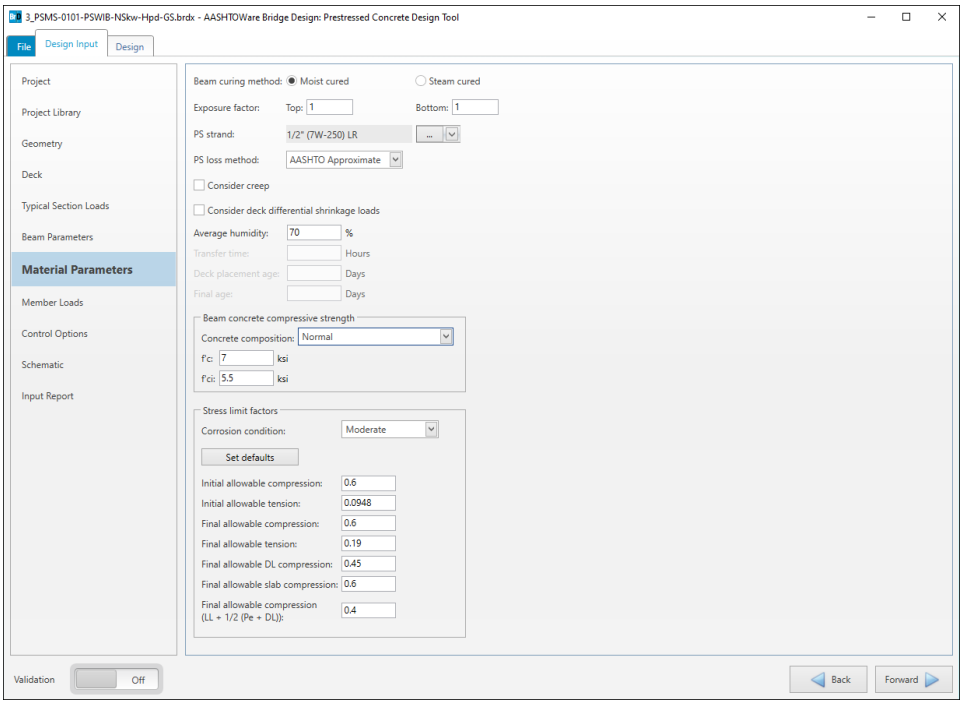
Design Input | Beam Parameters

In the **Beam Parameters** input section, enter the data as shown below. Harp point location is equal to 0.286 L. In this example, Range 1 of the vertical shear reinforcement is used to satisfy the splitting resistance requirement which is the reason why a large (#10) bar size and the short 0.5 ft Range 1 length are used.



Design Input | Material Properties

In the **Material Parameters** input section, enter the data as shown below.



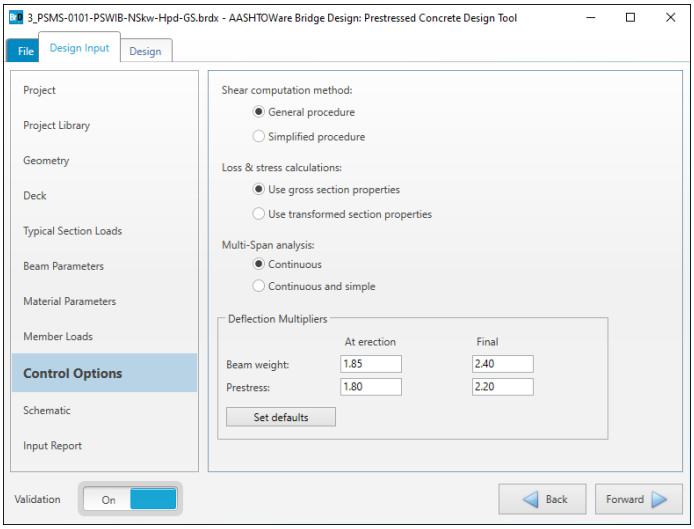
Design Input | Member Loads

There are no member loads assigned in this example.

Design Input | Control Options

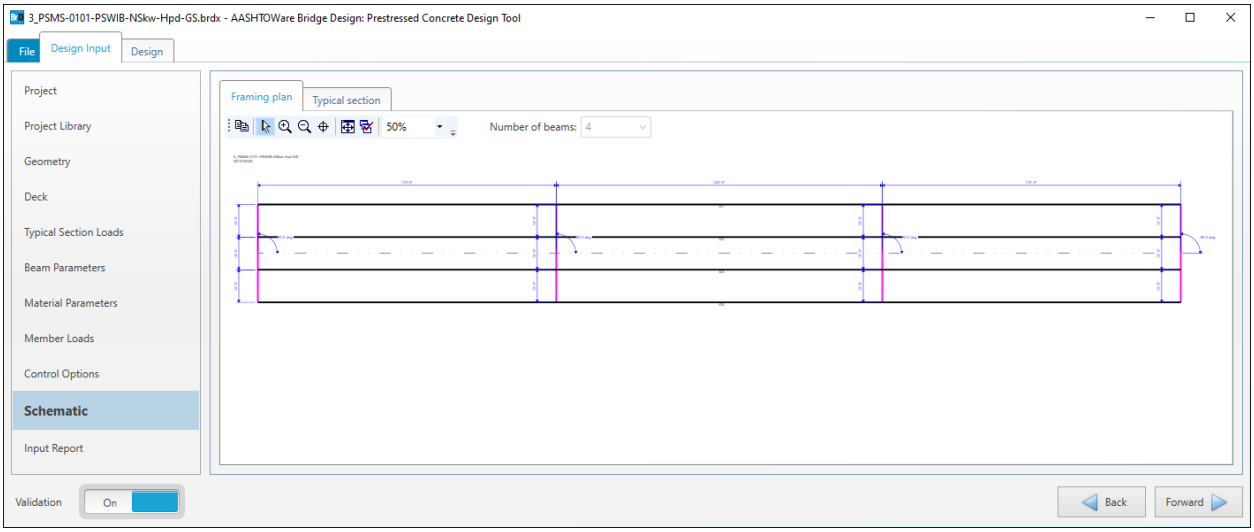
In the **Control Options** input section, enter the data as shown in the screenshot below.

Once the data is entered, turn **Validation** back on and ensure that there are no validation error marks displayed next to the input section. Otherwise, go back to these sections and resolve the errors.



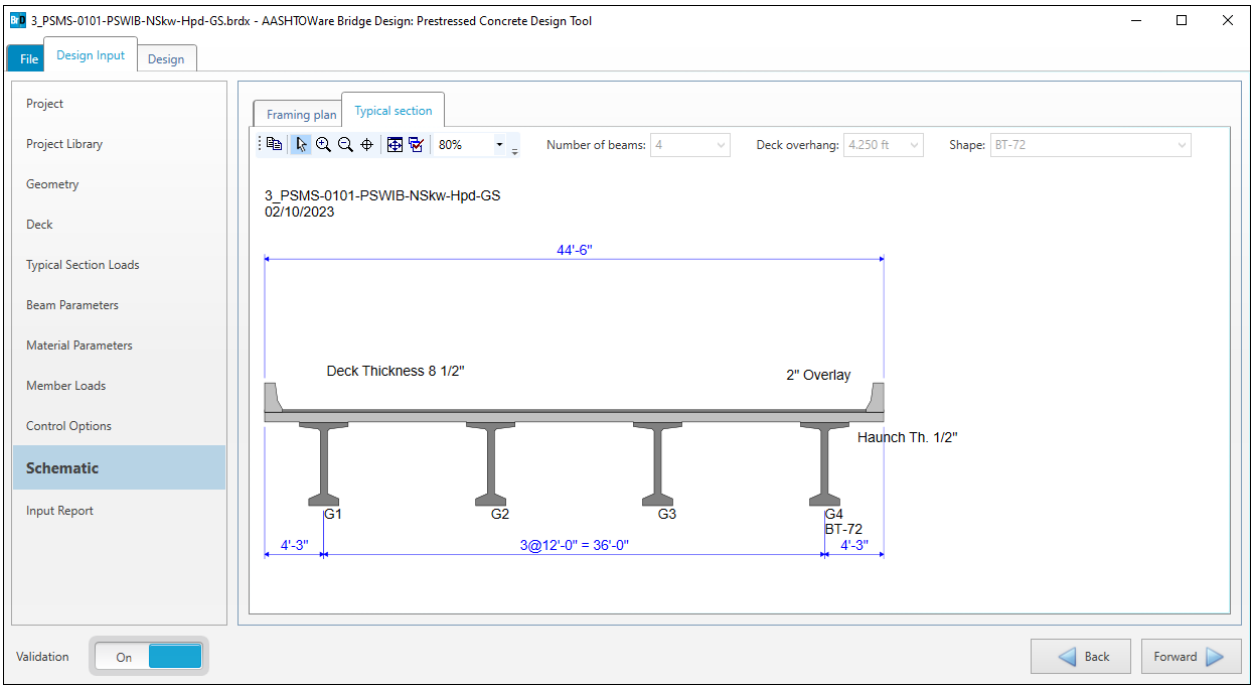
Design Input | Schematic | Framing Plan

To verify the input data, review the **Framing Plan** view in the **Schematic** section.



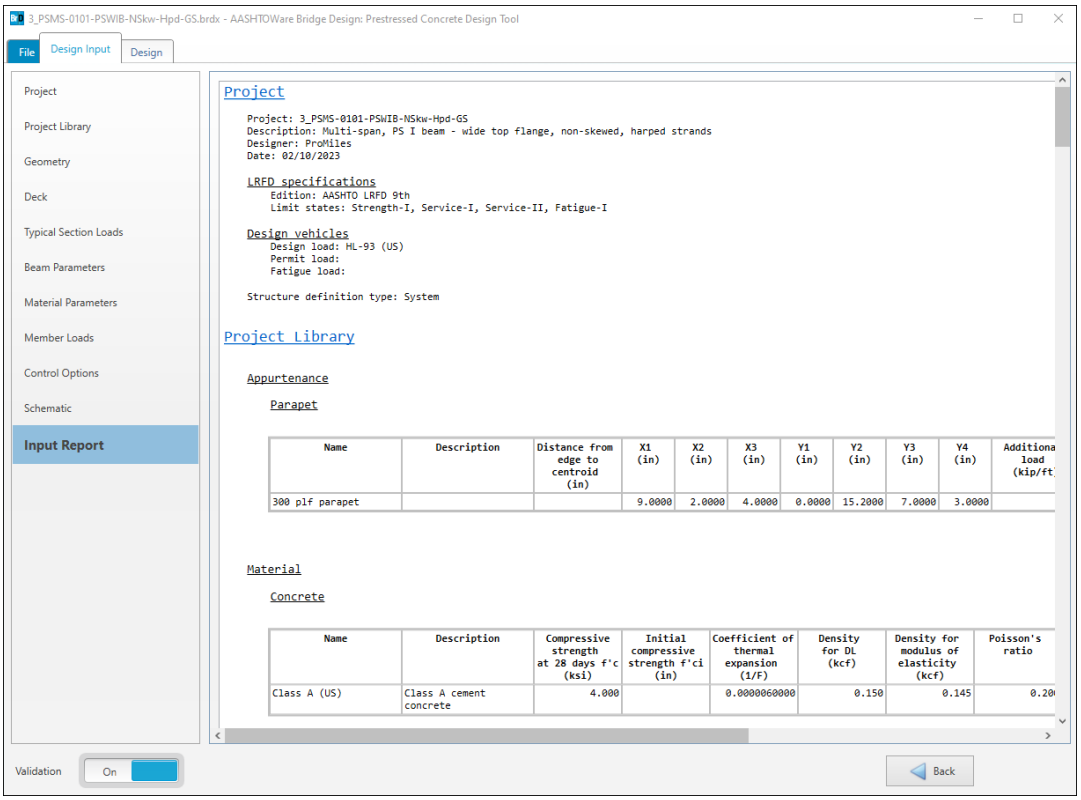
Design Input | Schematic | Typical Section

To verify the input data, review the **Typical Section** view in the **Schematic** section.



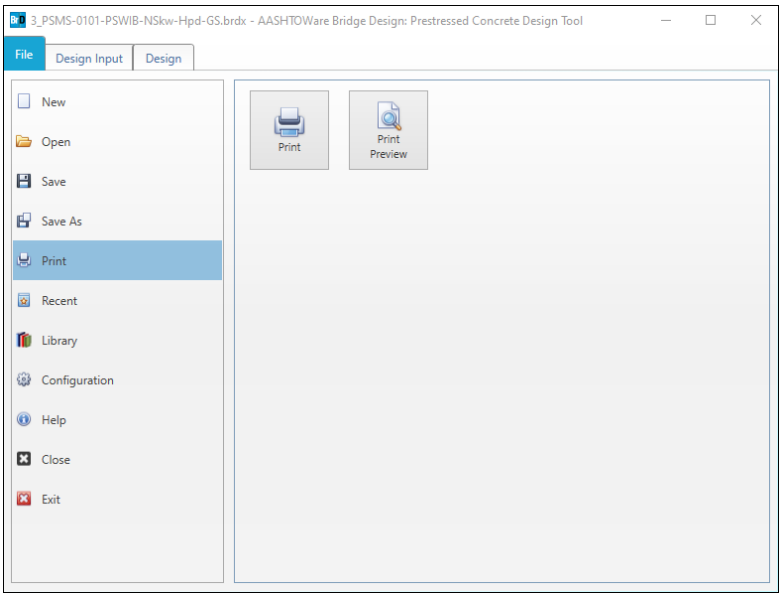
Design Input | Input Report

The **Input Report** section provides a complete echo of the input data in tabular and graphical format.



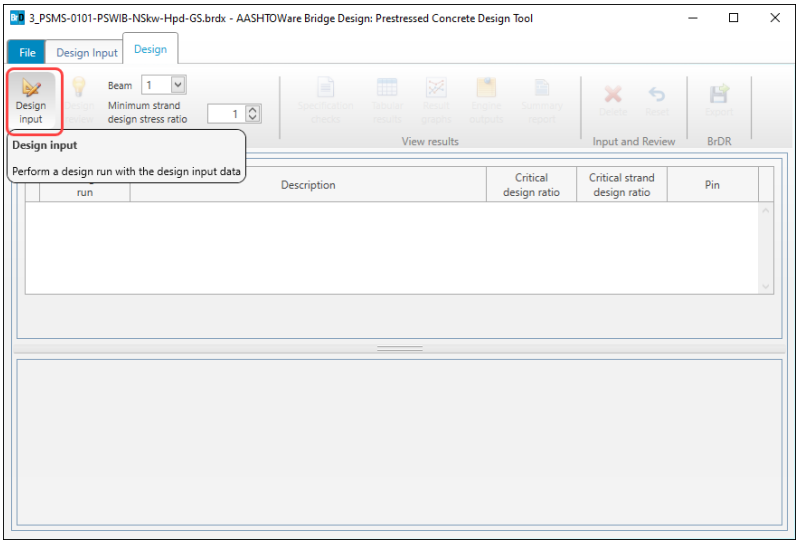
File | Print

The **Print** and **Print Preview** buttons in the **File | Print** section apply to the **Input Report**.



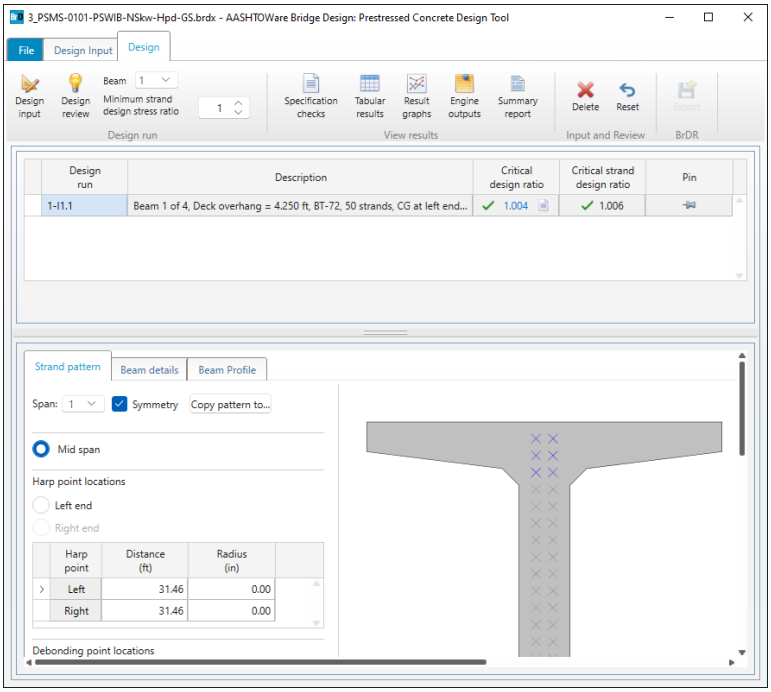
Design | Design Input

After the input data is entered and reviewed, a **Design Input** can be performed by clicking on the **Design Input** button located on the **Design ribbon**. The **Design Input** option is based on the input data and produces a design that is displayed in the **Design Run** grid with a brief description and values of the critical design ratios. The **Design Input** option can be further adjusted by modifying the data displayed on the **Strand Pattern** and **Beam Details** tabs.



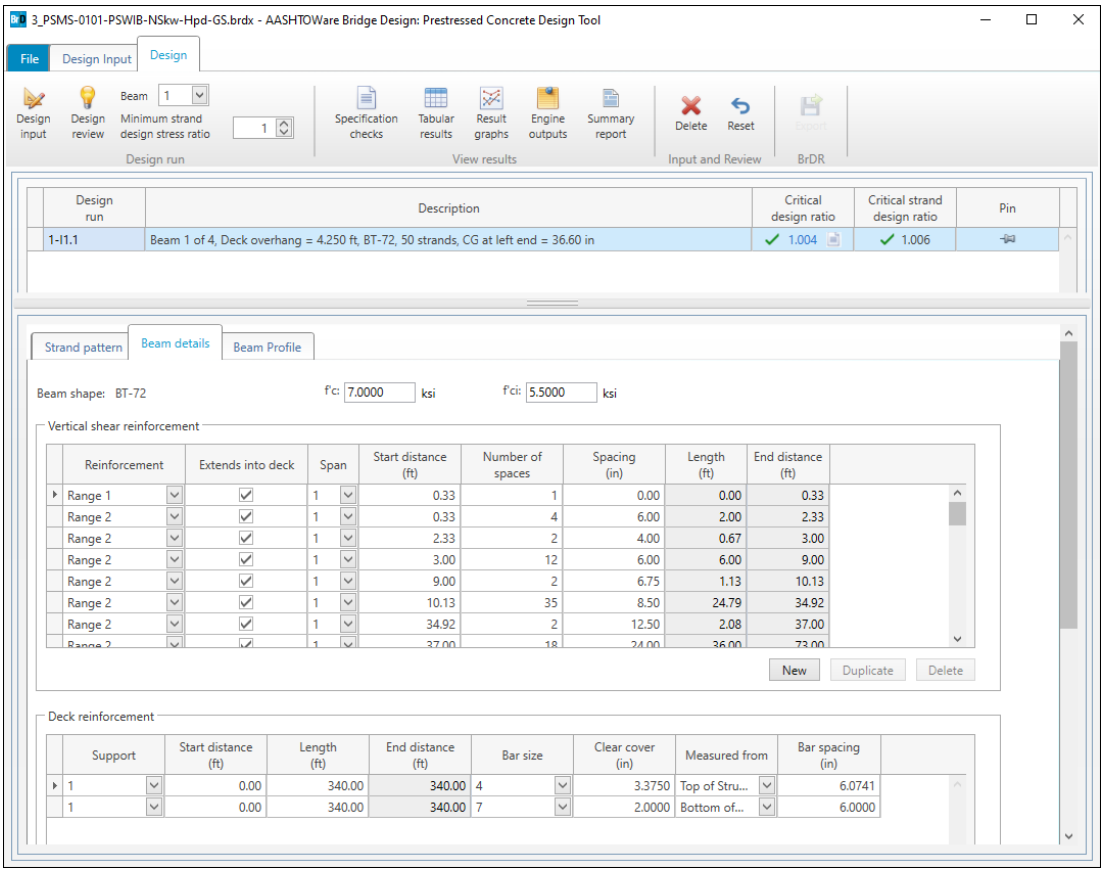
Design | Strand Pattern

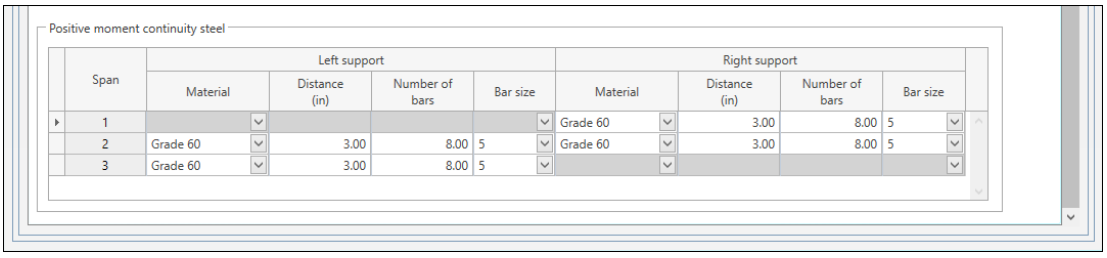
The **Strand Pattern** tab displays the strand pattern calculated by the program together with the corresponding initial and final concrete stresses. The strand pattern can also be modified by the user. Harping and debonding configurations can be applied simultaneously (to different strands.)



Design | Beam Details

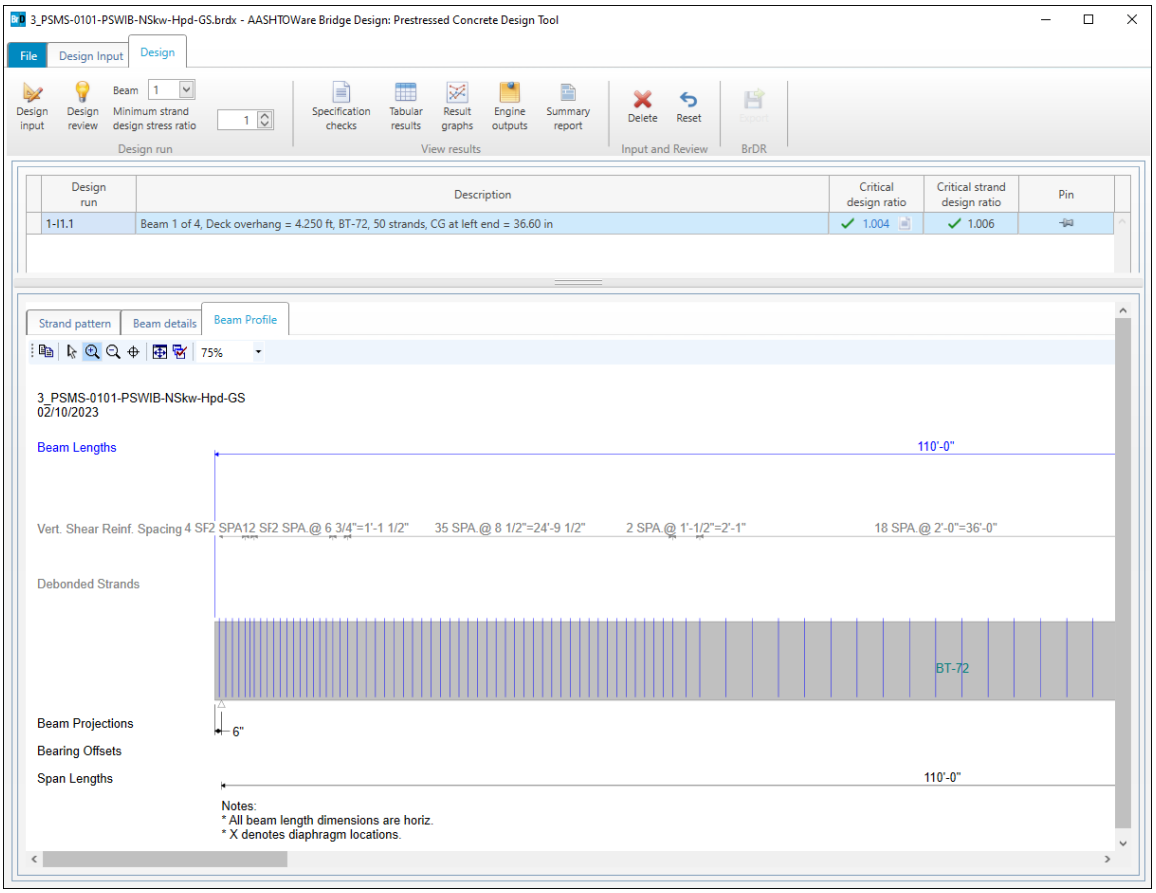
The **Beam Details** tab displays concrete strength and reinforcement data. Depending on the screen resolution, scrolling down to view the **Positive moment continuity steel** table may be necessary. Note that the bar spacing in the first row of the deck reinforcement table that was blank in the **Design Input | Deck** has been calculated by the program and is now displayed. It came close to the 6 in. spacing provided in the input in the second row. The calculated value will later be adjusted to be exactly 6 in. and a design review will be run to check if it is sufficient.





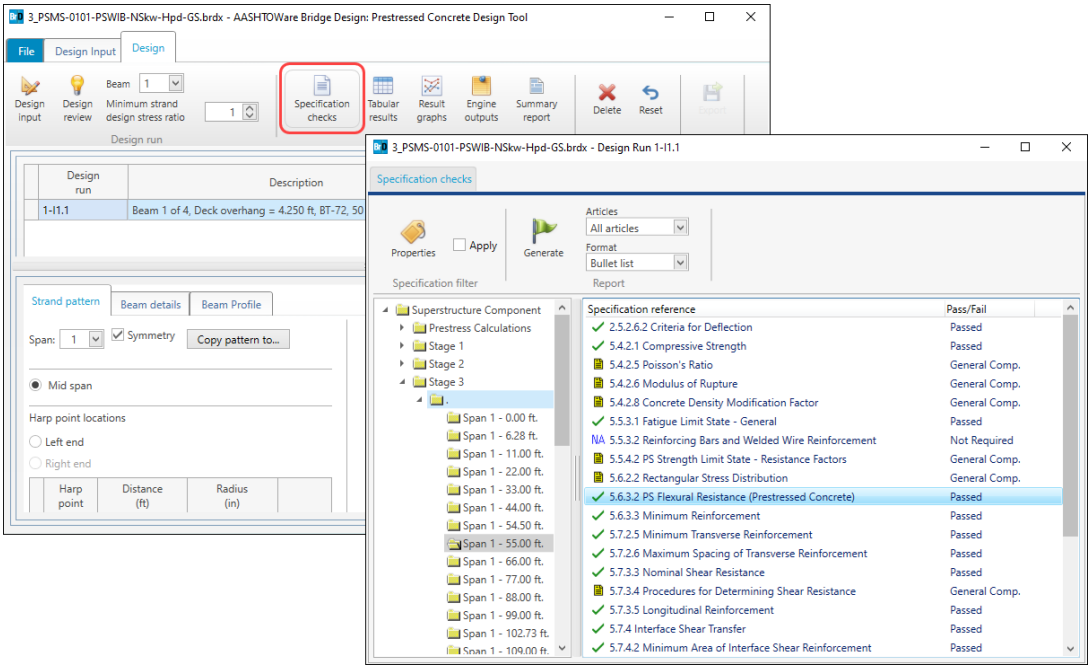
Design | Beam Profile

The **Beam Profile** tab shows an elevation view of the beam together with dimension and reinforcement information.



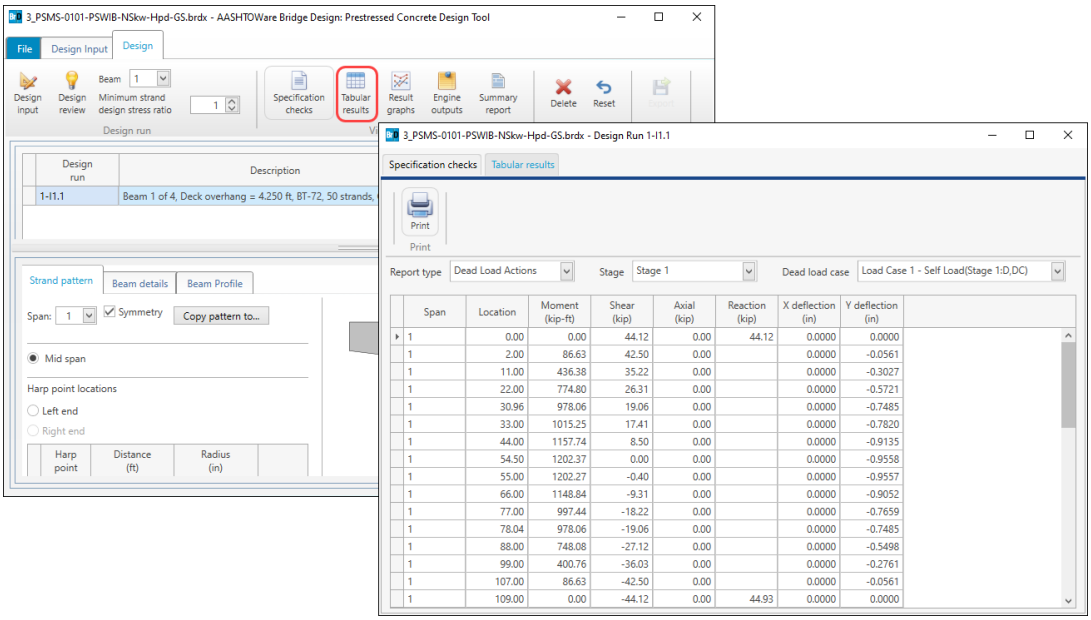
Design | Specification Check

To view the specification check results, click on the **Specification checks** button from the **View results** group of the **Design** ribbon.



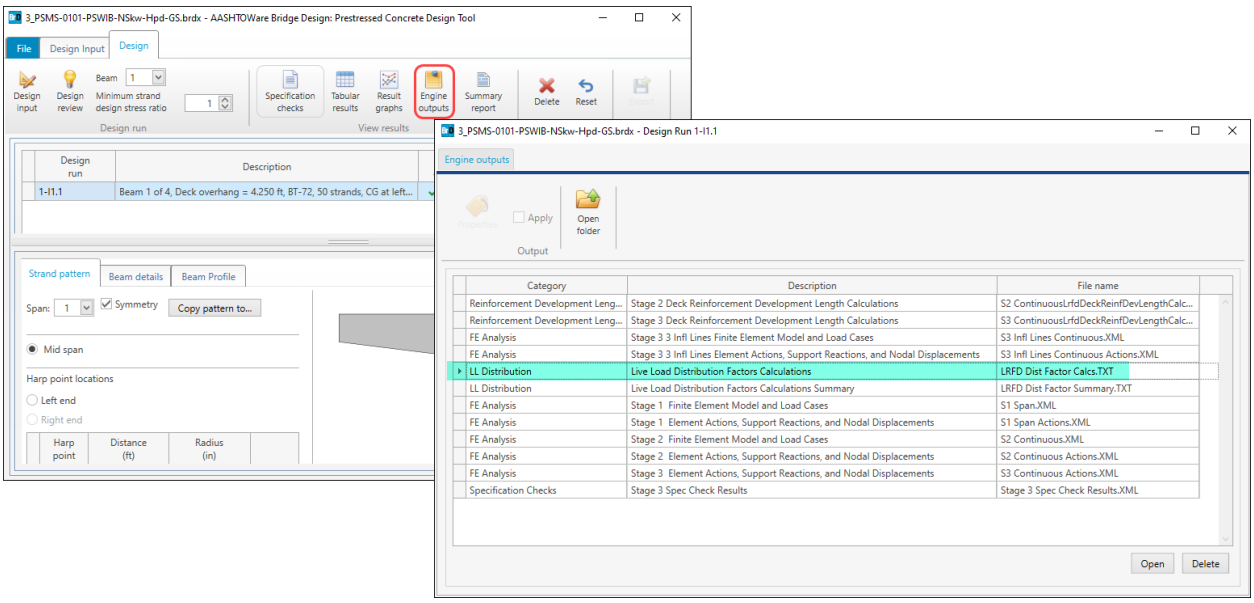
Design | Tabular Results

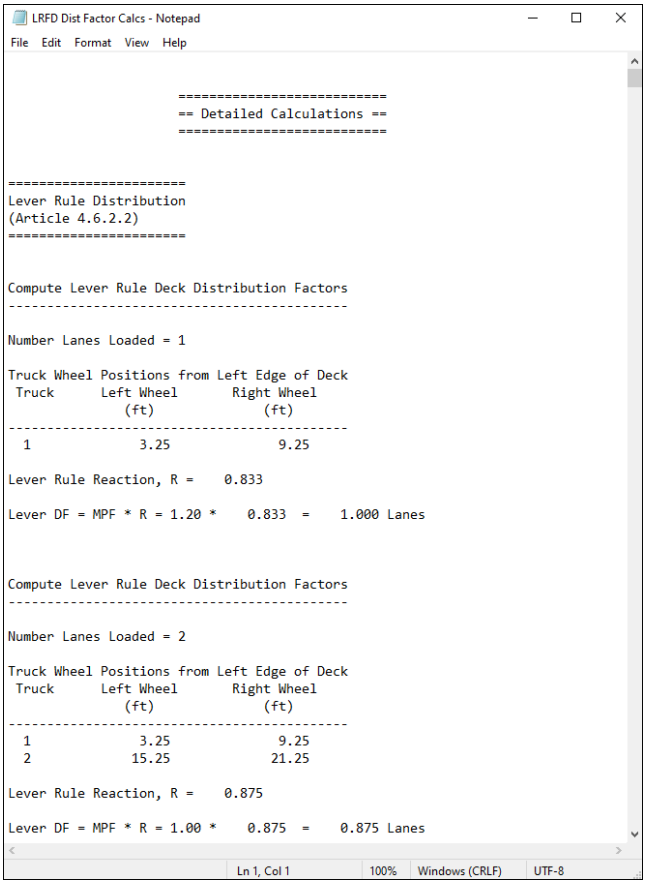
To view the tabular results, click on the **Tabular results** button from the **View results** group of the **Design** ribbon.



Design | Engine Outputs

To view the contents of the engine output files, click on the **Engine outputs** button from the **View results** group of the **Design** ribbon, and then double-click on the row corresponding to the required file.





LRFD Dist Factor Calcs - Notepad

File Edit Format View Help

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                    ============================
                    == Detailed Calculations ==
                    ============================


======================
Lever Rule Distribution
(Article 4.6.2.2)
======================


Compute Lever Rule Deck Distribution Factors
--------------------------------------------

Number Lanes Loaded = 1

Truck Wheel Positions from Left Edge of Deck
 Truck      Left Wheel       Right Wheel
              (ft)              (ft)
--------------------------------------------
  1             3.25              9.25

Lever Rule Reaction, R =    0.833

Lever DF = MPF * R = 1.20 *    0.833  =    1.000 Lanes



Compute Lever Rule Deck Distribution Factors
--------------------------------------------

Number Lanes Loaded = 2

Truck Wheel Positions from Left Edge of Deck
 Truck      Left Wheel       Right Wheel
              (ft)              (ft)
--------------------------------------------
  1             3.25              9.25
  2            15.25             21.25

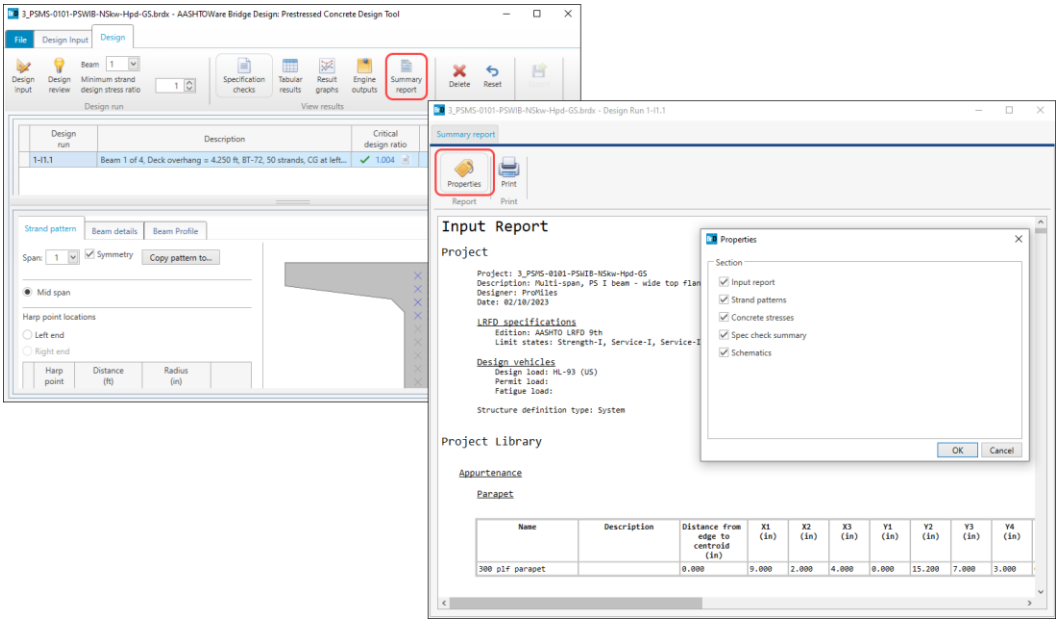
Lever Rule Reaction, R =    0.875

Lever DF = MPF * R = 1.00 *    0.875  =    0.875 Lanes
```

Ln 1, Col 1 | 100% | Windows (CRLF) | UTF-8

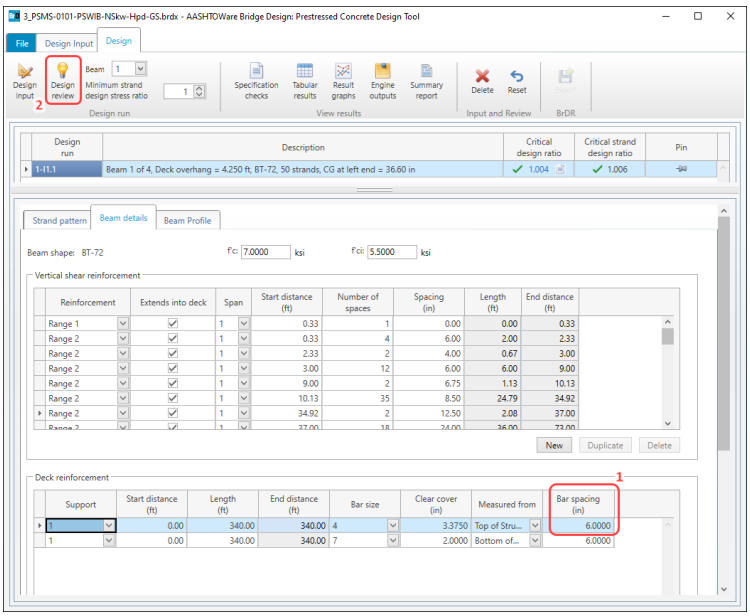
Design | Summary Report

To view the summary report, click on the **Summary Report** button from the **View results** group of the **Design** ribbon. The summary report is composed of several sections. The sections included in the report can be selected by clicking on the **Properties** button in the **Summary Report** window and checking or unchecking the corresponding sections.



Design | Design Review

To illustrate the ability of the program to adjust results of the **Design Input** run, modify the **Bar spacing** in the first row of the **Deck reinforcement** table to be exactly 6.0 in. Then, click the **Design Review** run button on the **Design** ribbon.



After the program finishes performing the design review, it will add another row to the design run grid. The design review runs are indicated with an **R** displayed in the **Design run** column in contrast to an **I** shown in that column for design input runs. The results for the **Design review** runs are displayed and can be reviewed or further modified the same way as design input runs. Additional design input runs can be performed by modifying the input on the **Design Input** tab. Each of the design runs, either input or review, stores a copy of its design input data that is reloaded every time the design input run is selected in the design run grid.