

AASHTOWare BrDR 7.6.1

Library Tutorial

LIB1 - Libraries

LIB1 – Libraries

Library Concepts

The libraries of BrDR allow for the description of items that are standardized or used frequently in the description of a bridge or by analysis events. The libraries of BrDR currently define the following items:

- Appurtenances (parapets, medians, railings, etc.)
- Connectors (bolts, nails)
- Corrugated Metal Panel
- Factors
- LRFD DF Applicability Ranges
- LRFD Substructure Design Settings
- Materials (steel, concrete, etc.)
- Metal Box Culvert
- Metal Pipe Culvert (corrugated, spiral rib, structural plate)
- Prestress Shapes
- Steel Shapes
- Timber Shapes
- Vehicles

BrDR is pre-loaded with library items selected by AASHTO. These items were taken from various sources including the following:

- *AASHTO LRFD Bridge Design Specifications*
- *AASHTO Manual for Bridge Evaluation*
- *AASHTO Standard Specifications for Highway Bridges*
- *AASHTO Standard Specifications for Transportation Materials*
- *AISC Manual of Steel Construction*
- *PCI Precast Prestressed Concrete Bridge Design Manual*

LIB1 – Libraries

Library Types

Three types of library items:

Standard Items added to database by AASHTO. Standard library items are not editable.

Agency All items added to the library by a user.

User Defined Only available for vehicles.

Using Library Data

Two methods to use library items:

Linking Library item associated with a bridge component or analysis event. If the library item is modified, then the updated data is used by the bridge component or analysis event. (Factors, Vehicles, LRFD DF Applicability Ranges)

Copying Data from library item copied from a library item to a bridge item. A change in the library item has no effect on bridge items that use data previously copied from library item. (Steel Shapes, PS Shapes, Timber Shapes, Factors, LRFD Substructure Design Settings, Materials, Appurtenances, Connections, Corrugated Metal Panel)

Linking is used to reduce amount of data stored in database for items that are unlikely to be modified.

Library Security

- Library access can be restricted for read, write, create, and delete access.
- Access restrictions apply to all libraries for a given user or group of users.
- Limit number of users with write, create, and delete access.
 - Reduce possibility of incorrect data.
 - Reduce duplicate items and inappropriate items.

LIB1 – Libraries

Library Explorer

The Library Explorer is used to navigate the various libraries. The tree control in the left pane organizes the libraries. The item selected in the tree control determines the library items to be listed in the right pane of the window.

The screenshot shows the AASHTOWare Bridge Design and Rating Library Explorer window. The left pane contains a tree view of library categories. The right pane displays a table of library items.

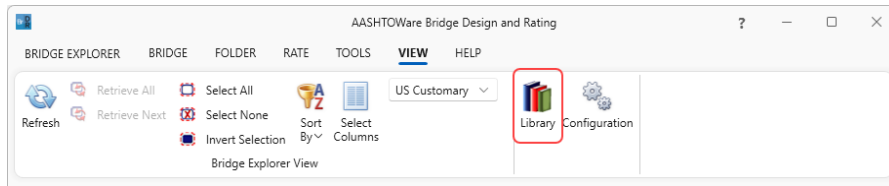
Library	Units	Name	Description
Standard	SI / Metric	Grade 250	AASHTO M270M Grade 250
Standard	SI / Metric	Grade 345	AASHTO M270M Grade 345
Standard	SI / Metric	Grade 345W	AASHTO M270M Grade 345W
Standard	SI / Metric	Grade 485W	AASHTO M270M Grade 485W
Standard	SI / Metric	Grade 690 <= 65 mm	AASHTO M270M Grade 690 up to 65 mm thick, inclusive
Standard	SI / Metric	Grade 690W <= 65 mm	AASHTO M270M Grade 690W up to 65 mm thick, inclusive
Standard	SI / Metric	Grade 690 - > 65 to 100 incl.	AASHTO M270M - over 65 to 100 mm thick, inclusive
Standard	SI / Metric	Grade 690W - > 65 to 100 incl.	AASHTO M270M - over 65 to 100 mm thick, inclusive
Standard	US Customary	Grade 36	AASHTO M270 Grade 36
Standard	US Customary	Grade 50	AASHTO M270 Grade 50
Standard	US Customary	Grade 50W	AASHTO M270 Grade 50W
Standard	US Customary	Grade 70W - Fu = 90 ksi	AASHTO M270 Grade 70W - Fu = 90 ksi
Standard	US Customary	Grade 70W - Fu = 85 ksi	AASHTO M270 Grade 70W - Fu = 85 ksi
Standard	US Customary	Grade 100 <= 2.5"	AASHTO M270 Grade 100 up to 2.5" thick, inclusive
Standard	US Customary	Grade 100W <= 2.5"	AASHTO M270 Grade 100W up to 2.5" thick, inclusive
Standard	US Customary	Grade 100 - > 2.5" to 4" incl.	AASHTO M270 Grade 100 - over 2.5" to 4" thick, inclusive
Standard	US Customary	Grade 100W - > 2.5" to 4" incl.	AASHTO M270 Grade 100W - over 2.5" to 4" thick, inclusive
Standard	US Customary	Prior to 1905	Built prior to 1905 - steel unknown
Standard	US Customary	1905 to 1936	Built 1905 to 1936 - steel unknown
Standard	US Customary	1936 to 1963	Built 1936 to 1963 - steel unknown
Standard	US Customary	After 1963	Built after 1963 - steel unknown
Standard	US Customary	AASHTO M 94(1961)	AASHTO M 94(1961) or ASTM A 7(1967)
Standard	US Customary	AASHTO M 95(1961)	AASHTO M 95(1961) or ASTM A 94(1966)
Standard	US Customary	AASHTO M 96(1961)	AASHTO M 96(1961) or ASTM A 8(1961)
Standard	US Customary	ASTM A94 - <= 1 1/8"	ASTM A 94 - 1 1/8" thick and under
Standard	US Customary	ASTM A94 - over 1 1/8" to 2" incl.	ASTM A 94 - over 1 1/8" to 2" thick, inclusive
Standard	US Customary	ASTM A572 - 1 1/2" max, Fy = 45 ksi	ASTM A 572 - 1 1/2" thick max, Fy=45 ksi
Standard	US Customary	ASTM A572 - 1/2" max, Fy = 65 ksi	ASTM A 572 - 1/2" thick max, Fy=65 ksi
Standard	US Customary	ASTM A514 - over 2 1/2" to 4" incl.	ASTM A 514 - over 2 1/2" to 4" thick, inclusive
Standard	US Customary	ASTM A242 - <= 3/4"	ASTM A 242 - 3/4" thick and under
Standard	US Customary	ASTM A440 - <= 3/4"	ASTM A 440 - 3/4" thick and under

LIB1 – Libraries

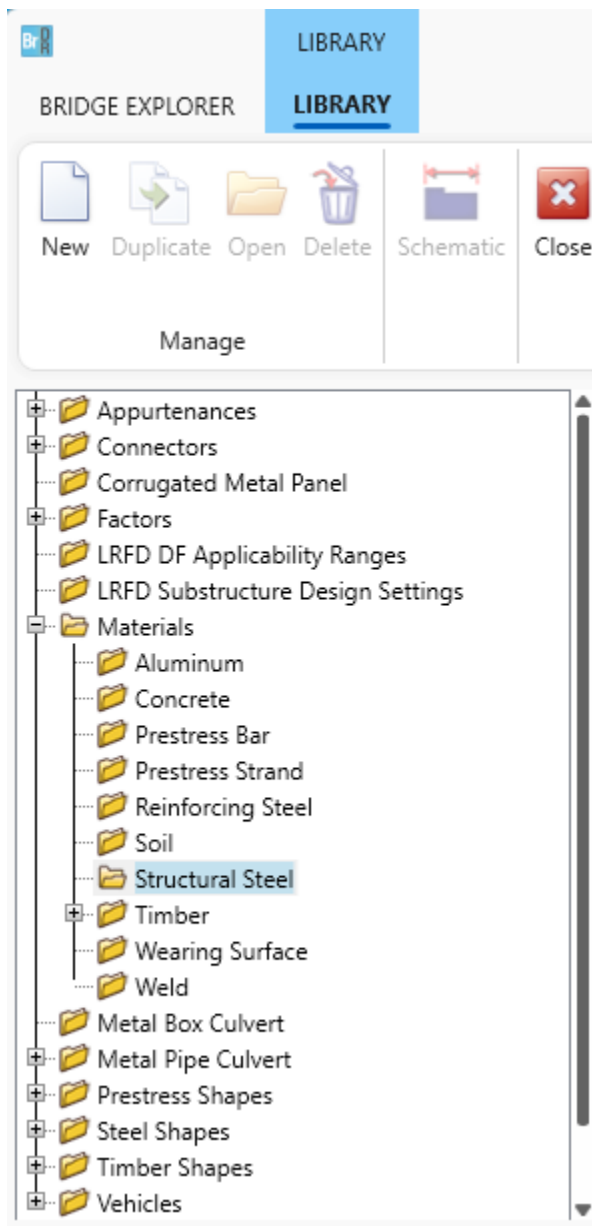
Exercise

Add Steel Material Library Item

1. Click the **Library** button under the **VIEW** tab in the ribbon.

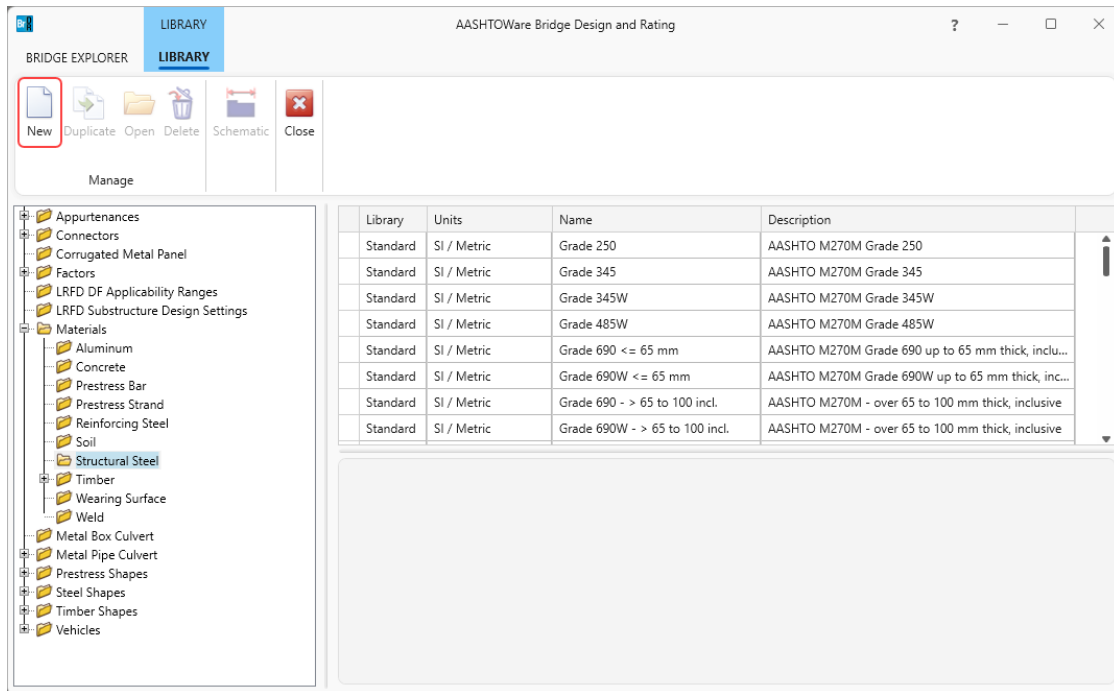


Select the tree item **Materials/Structural Steel** as shown below.



LIB1 – Libraries

- Click the **New** button in the ribbon. A **Materials: Structural Steel: New Item** window will appear in the panel below the list of Standard library items.



- Select the system of units using the radio buttons and then fill in the structural steel information as shown below. Note that the name must be unique among all structural steel library items.

The 'Materials: Structural Steel: New Item' dialog box is shown. It contains fields for Name, Description, and Material properties. The 'Store units as' section has radio buttons for US and SI, with US selected. The 'Library' section has radio buttons for Standard and Agency defined, with Agency defined selected.

Name: Steel 1
Description: AASHTO M270 50W

Store units as: ☒ US ☐ SI
Library: ☐ Standard ☒ Agency defined

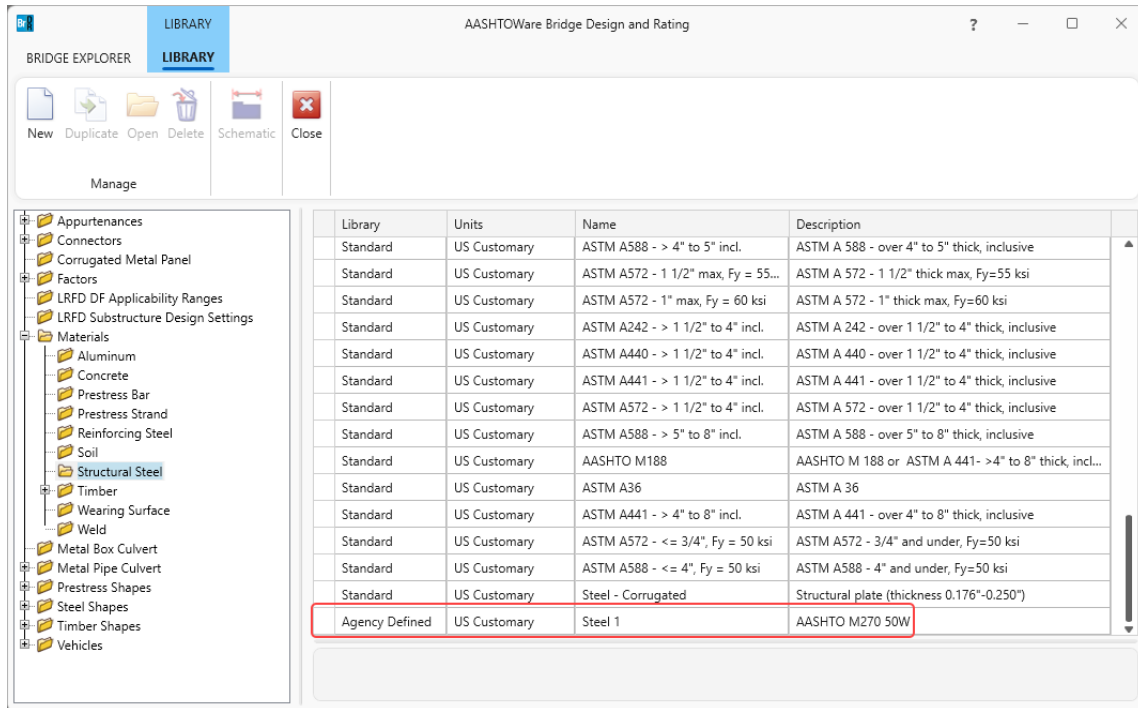
Material properties

Specified minimum yield strength (Fy):	50.000	ksi
Specified minimum tensile strength (Fu):	70.000	ksi
Coefficient of thermal expansion:	0.0000065000	1/F
Density:	0.4900	kcf
Modulus of elasticity (E):	29000.00	ksi

Save Close

LIB1 – Libraries

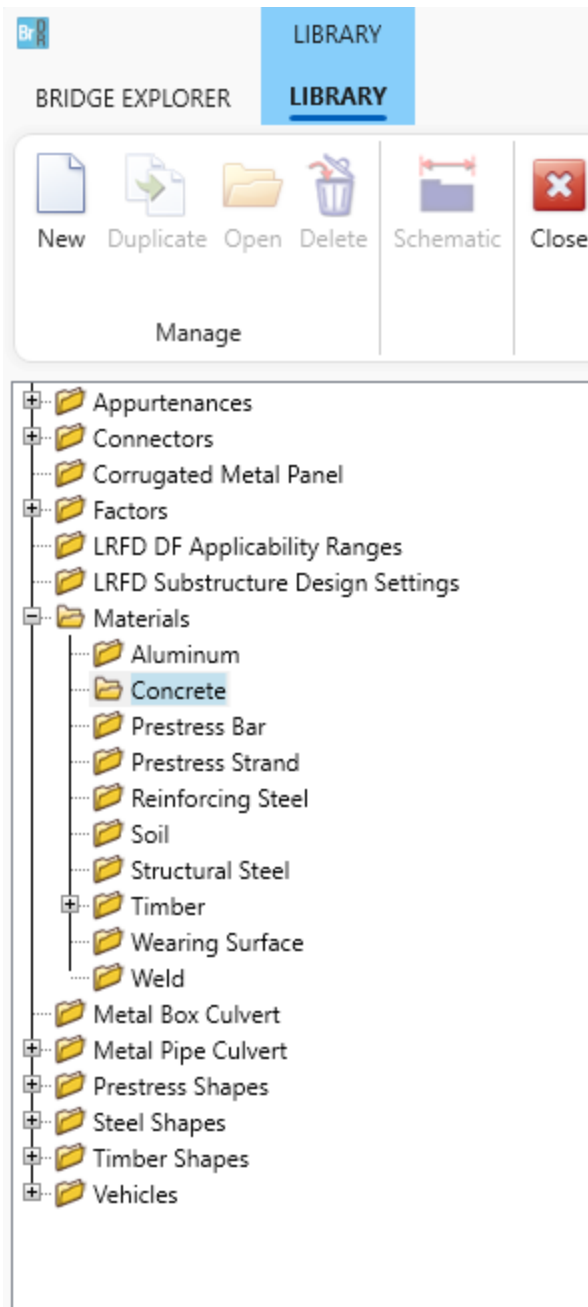
- Click **Save**. The new structural steel material will now be listed in the right pane of the Library Explorer for the tree items **Materials/Structural Steel** as an Agency Defined item.



LIB1 – Libraries

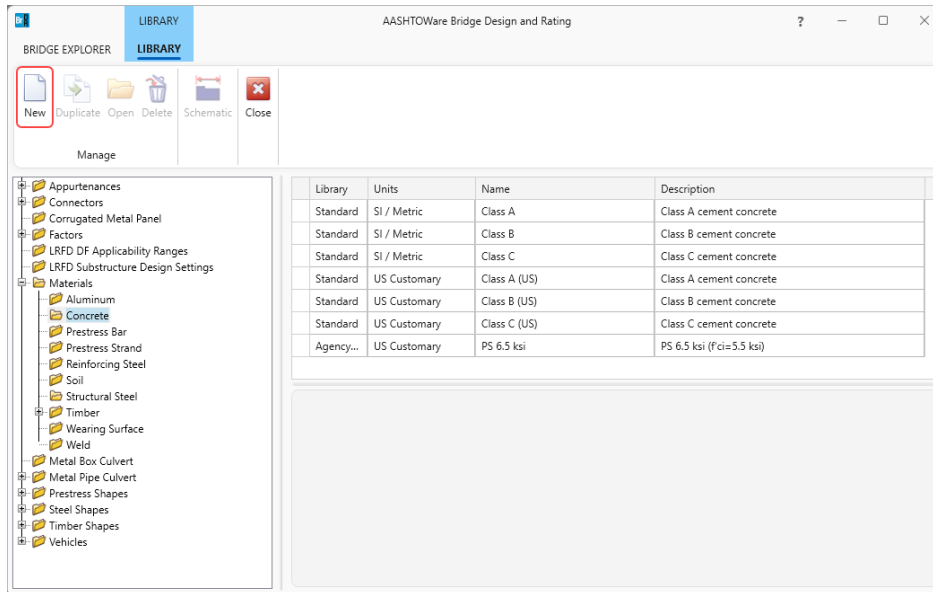
Add Concrete Material Library Item

1. Select the tree item **Materials/Concrete** as shown below.



LIB1 – Libraries

- Click the **New** button in the ribbon. A **Materials: Concrete: New Item** window will appear in the panel below the list of Standard library items.



- Select the system of units using the radio buttons and then fill in the concrete information as shown below. Note that the name must be unique among all concrete library items.

Materials: Concrete: New Item

Name: PS 6.5 ksi

Description: PS 6.5 ksi (f'ci=5.5 ksi)

Store units as: ☒ US ☐ SI

Library: ☐ Standard ☒ Agency defined

Specified compressive strength at 28 days (f'c): 6.500 ksi

Initial compressive strength (f'ci): 5.500 ksi

Composition of concrete: Normal

Density (for dead loads): 0.150 kcf

Density (for modulus of elasticity): 0.150 kcf

Poisson's ratio: 0.200

Coefficient of thermal expansion: 0.0000060000 1/F

Splitting tensile strength (fct):

LRFD maximum aggregate size:

Compute

Std modulus of elasticity (Ec):

LRFD modulus of elasticity (Ec):

Std initial modulus of elasticity:

LRFD initial modulus of elasticity:

Std modulus of rupture:

LRFD modulus of rupture:

Shear factor: 1.000

Save Close

LIB1 – Libraries

- Click the **Compute** button to calculate the remaining properties or manually enter the values.

Materials: Concrete: New Item — □ ×

Name:

Description:

Store units as: ☒ US ☐ SI

Library: ☐ Standard ☒ Agency defined

Specified compressive strength at 28 days (f'c): ksi

Initial compressive strength (f'ci): ksi

Composition of concrete: ▼

Density (for dead loads): kcf

Density (for modulus of elasticity): kcf

Poisson's ratio:

Coefficient of thermal expansion: 1/F

Splitting tensile strength (fct): ksi

LRFD maximum aggregate size: in

Compute

Std modulus of elasticity (Ec): ksi

LRFD modulus of elasticity (Ec): ksi

Std initial modulus of elasticity: ksi

LRFD initial modulus of elasticity: ksi

Std modulus of rupture: ksi

LRFD modulus of rupture: ksi

Shear factor:

- Click **Save**. The new concrete material will now be listed in the right pane of the Library Explorer for the tree items **Materials/Concrete** as an Agency Defined item.

AASHTOWare Bridge Design and Rating

BRIDGE EXPLORER **LIBRARY**

New Duplicate Open Delete Schematic Close

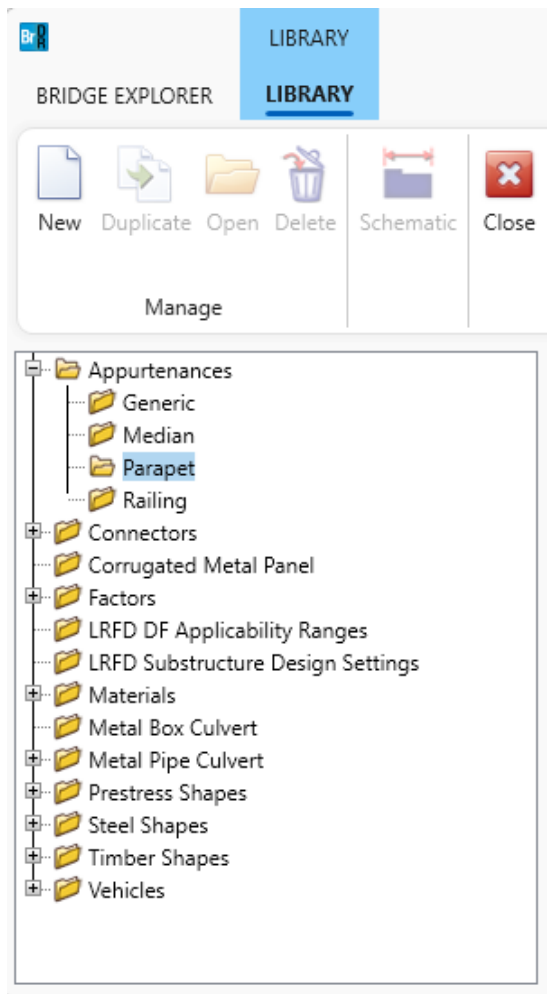
Manage

Library	Units	Name	Description
Standard	SI / Metric	Class A	Class A cement concrete
Standard	SI / Metric	Class B	Class B cement concrete
Standard	SI / Metric	Class C	Class C cement concrete
Standard	US Customary	Class A (US)	Class A cement concrete
Standard	US Customary	Class B (US)	Class B cement concrete
Standard	US Customary	Class C (US)	Class C cement concrete
> Agency Defined	US Customary	PS 6.5 ksi	PS 6.5 ksi (f'ci = 5.5 ksi)

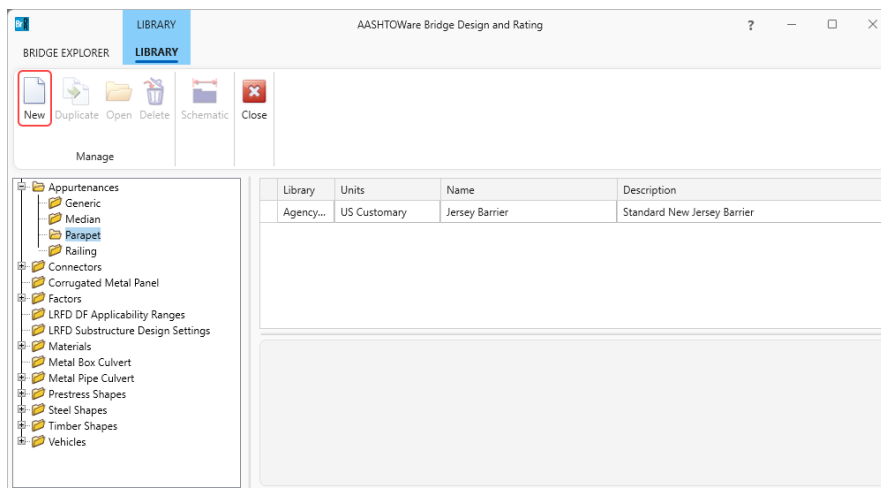
LIB1 – Libraries

Add Parapet Library Item

1. Select the tree item **Appurtenances/Parapet** as shown below.



2. Click the **New** button in the ribbon. An **Appurtenances: Parapet: New Item** window will appear in the panel below the list of Standard library items.



LIB1 – Libraries

- Select the system of units using the radio buttons and then fill in the parapet information as shown below.
Note that the name must be unique among all parapet library items.

Appurtenances: Parapet: New Item

Name:

Description:

All dimensions are in inches

Additional load: kip/ft

Parapet unit load: kcf

Store units as: ☒ US ☐ SI

Library: ☐ Standard ☒ Agency defined

Calculated properties

Net centroid (from reference line): 7.880 in

Total load: 0.505 kip/ft

Diagram labels: Reference Line, Back, Front, Roadway Surface

Diagram dimensions: 12.0000, 2.0000, 7.0000, 19.0000, 10.0000, 3.0000

Buttons: Save, Close

- Click **Save**. The new parapet will now be listed in the right pane of the Library Explorer for the tree items **Appurtenances/Parapet** as an Agency Defined item.

AASHTOWare Bridge Design and Rating

BRIDGE EXPLORER

LIBRARY

Manage

New Duplicate Open Delete Schematic Close

Tree View:

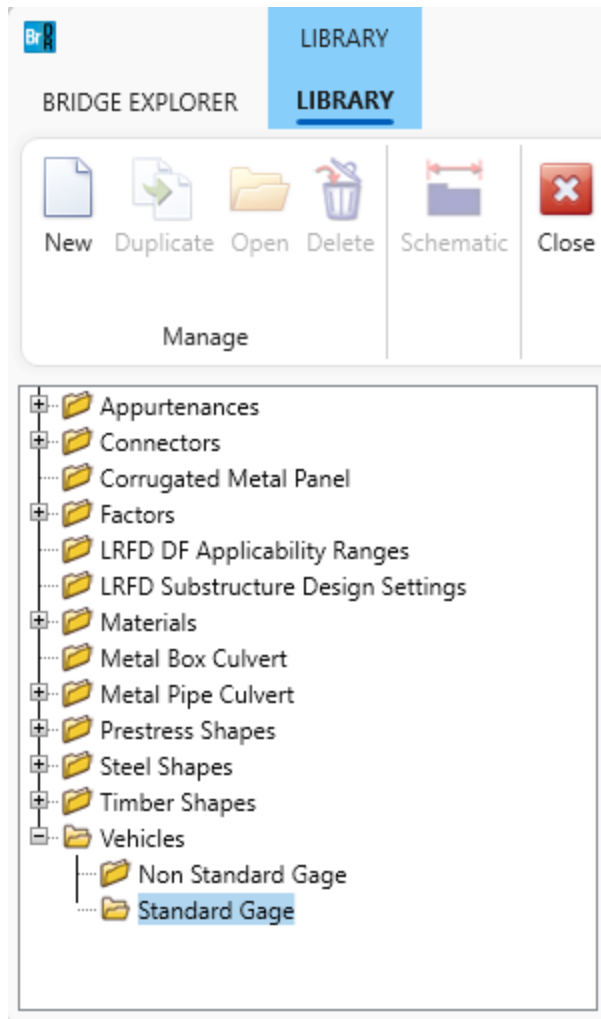
- Appurtenances
 - Generic
 - Median
 - Parapet
 - Railing
- Connectors
- Corrugated Metal Panel
- Factors
- LRFD DF Applicability Ranges
- LRFD Substructure Design Settings
- Materials
- Metal Box Culvert
- Metal Pipe Culvert
- Prestress Shapes
- Steel Shapes
- Timber Shapes
- Vehicles

Library	Units	Name	Description
Agency Defined	US Customary	Jersey Barrier	Standard New Jersey Barrier
> Agency Defined	US Customary	Parapet 1	Standard Jersey Barrier

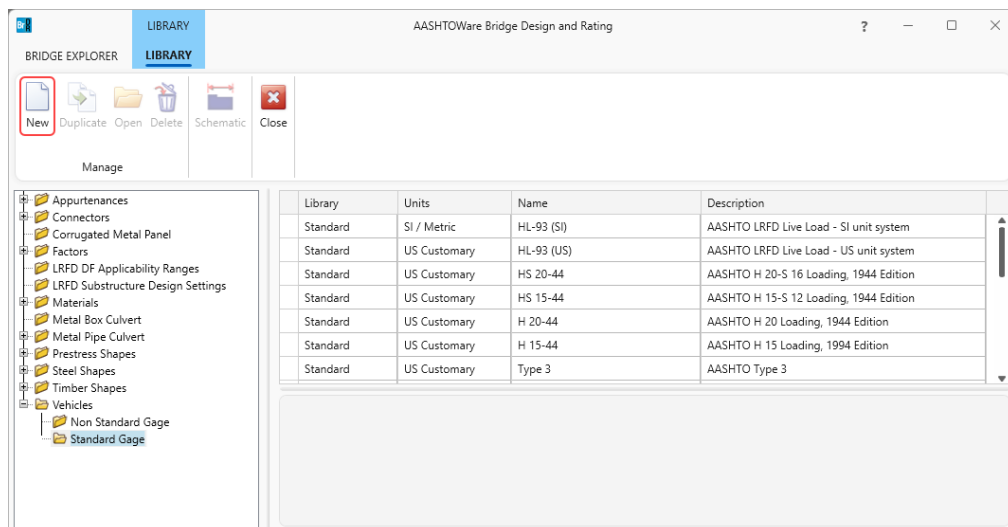
LIB1 – Libraries

Add Vehicle Library Item

1. Select the tree item **Vehicles/Standard Gage** as shown below.



2. Click the **New** button in the ribbon. A **Vehicle: Standard Gage: New Item** window will appear.



LIB1 – Libraries

- Select the system of units using the radio buttons and then fill in the vehicle information as shown below for all items not on the tab control. Note that the name must be unique among all vehicle library items. The checkboxes inside the **Design** and **Rating** groups are used to filter the vehicle during an analysis event based on the type of event and the type of analysis engine selected. The **Vehicle Library** has a library type called **User Defined**. This library allows users to add their own vehicles.

Vehicle: Standard Gage: New Item

Name:

Description:

Store units as: ☒ US ☐ SI

Library: ☐ Standard ☒ Agency defined ☐ User defined

☐ Notional vehicle

Rating: ☒ LRFD ☒ ASR/LFR ☐ LRFR

Design: ☒ LRFD ☐ ASD/LFD

Truck Tandem Lane

	Axle no.	Axle load (kip)	Gage dist. (ft)	Wheel contact width (in)	Axle spacing (ft)	
					Minimum	Maximum
>	1	8.00	6.00	10.0000		
	2	32.00	6.00	20.0000	14.00	14.00
	3	32.00	6.00	20.0000	14.00	30.00

Totals: 72.0 kip 28.00 44.00

New Duplicate Delete

Save Close

- Click the **New** button to add an axle to the vehicle.
- Enter the first axle's dimensions. (Axle spacing is not applicable for the first axle.)
- Repeat steps 4 and 5 for each additional axle.
- Select the **Lane Tab**. Enter data on the **Lane** tab as shown below.

LIB1 – Libraries

Vehicle: Standard Gage: New Item

Name:

Description:

Store units as: ☒ US ☐ SI

Library: ☐ Standard ☒ Agency defined ☐ User defined

Truck Tandem **Lane**

Load per axle line

Uniform lane load: kip/ft

Concentrated load for moment: kip

Concentrated load for shear: kip

☐ Add a second, equal magnitude concentrated load in one other span to determine maximum negative moment for continuous spans

☐ Notional vehicle

Rating

☒ LRFD ☒ ASR/LFR ☐ LRFR

Design

☒ LRFD ☐ ASD/LFD

Save Close

8. Click **Save**. The new vehicle will now be listed in the right pane of the Library Explorer for the tree items **Vehicles/Standard Gage**.

AASHTOWare Bridge Design and Rating

BRIDGE EXPLORER LIBRARY

New Duplicate Open Delete Schematic Close

Manage

Appurtenances
Connectors
Corrugated Metal Panel
Factors
LRFD DF Applicability Ranges
LRFD Substructure Design Settings
Materials
Metal Box Culvert
Metal Pipe Culvert
Prestress Shapes
Steel Shapes
Timber Shapes
Vehicles
Non Standard Gage
Standard Gage

Library	Units	Name	Description
Standard	US Customary	SU4	SU4 - Single-Unit Bridge Posting Loads
Standard	US Customary	SU5	SU5 - Single-Unit Bridge Posting Loads
Standard	US Customary	SU6	SU6 - Single-Unit Bridge Posting Loads
Standard	US Customary	SU7	SU7 - Single-Unit Bridge Posting Loads
Standard	US Customary	EV2	2 Axle FAST Act Emergency Vehicle 2016
Standard	US Customary	EV3	3 Axle FAST Act Emergency Vehicle 2016
> Agency Defined	US Customary	Vehicle 1	AASHTO H20-16 Loading, 1944 Edition