February 16, 2017

BrR Load Rating Tools and Tips

UNITED Consulting

BrR Load Rating Tools and Tips

Overview

Per INDOT Bridge Inspection Memorandum No. 16-06

DATE: May 26, 2016
SUBJECT: Load Rating Requirement for New County Bridges
EFFECTIVE: Immediately

"…load ratings are to be performed using AASHTOWare BrR…"

BrR Load Rating Tools and Tips

AASHTOWare Bridge Design and Rating Software

- **BrR = Bridge Rating** *(Formally known as Virtis)*
- **BrD = Bridge Design** *(Formally Opis)*
- **BrDR = Bridge Design and Rating**

The Workspace "Tree" is Similar for All

The input fields in BrR and BrD are similar by design. For this reason, there may be input fields in BrR that don't get used at all.

Tip: Use the help command to determine whether or not a feature is used by BrR.

BrR Load Rating Tools and Tips

AASHTOWare BrR Annual License Fees

- **Agency Unlimited Users**
  - **$37,500**
  - ***Technical Support***
- **Special Consultant Option – Requires Agency Approval**
  - **$4,100 per License**
  - **$30,000 (10 Licenses)**
  - ***Installation Support only***

Licenses expire and require renewal annually.

BrR Load Rating Tools and Tips

Creating the Model

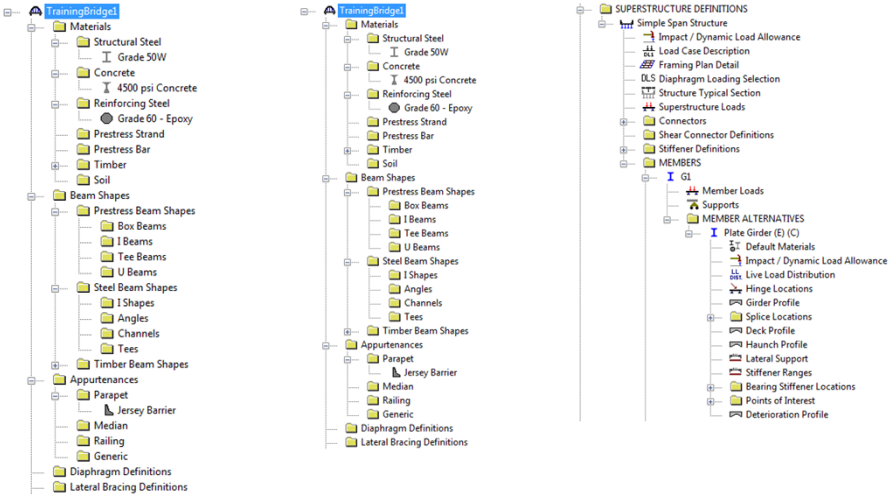
BrR Load Rating Tools and Tips

BrR Limitations

- Timber – ASD only
- Floor Systems – Does not support hinges/pins within main girder
- Post Tensioned – Multi-Cell Box only
- Underfill Structures – Flat Top only – NOT Arched
- Curved Steel Structures
  - Requires added computer capacity
  - May take 20+ hours to evaluate
- Built-Up Sections – Cross-Section Based Input Only
- Solid Box Beams – Treat as having a circular void with 0” diameter

BrR Load Rating Tools and Tips

BrR Bridge Workspace "Tree"



BrR Load Rating Tools and Tips

Bridge Description

The BrR model should best represent the available plans and BIAS data.

- **Bridge ID = BIAS Asset Name**
- **NBI = BIAS Asset Code**
- **Name should include method for analysis (LFR or LRFR)**
- **Description should include:**
  - **Name of individual responsible for the load rating**
  - **Name of individual responsible for review**
  - **Dates for each of the above**

BrR Load Rating Tools and Tips

Materials

The BrR model should best represent the available plans and BIAS data.

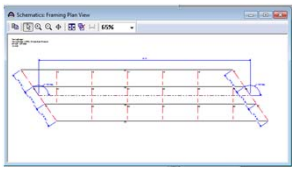
- **BrR Library includes material data for most**
  - **Structural Steel**
  - **Reinforcing Steel**
  - **Prestressing Strands**
  - **Reinforced Concrete**

- **If material data is not available in the plans, use Year Built Date in BIAS along with MBE guidelines**

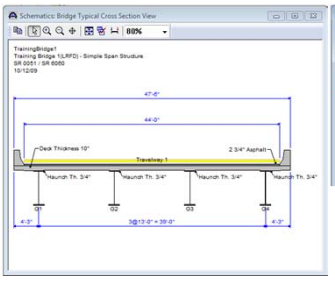
BrR Load Rating Tools and Tips

View Schematic

The BrR model should best represent the available plans and BIAS data. Use the View Schematic Icon as a quick check to confirm the model created matches the plans.



Framing Plan



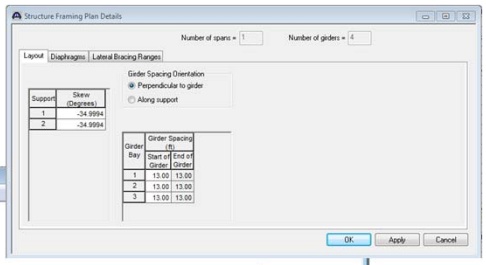
Structure Typical Section

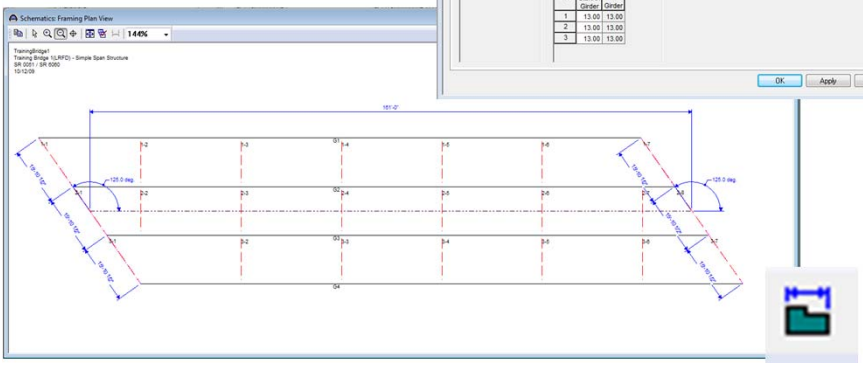
Member Elevation

BrR Load Rating Tools and Tips

Framing Plan Details

Define beam spacing, skew and diaphragm location and loads.





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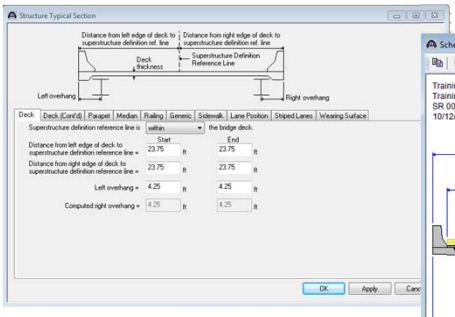
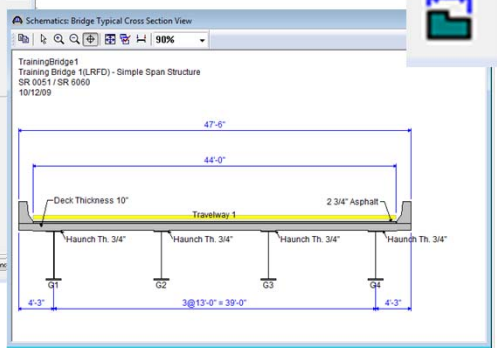
Structure Typical Section

The model should represent all members in the superstructure system. This allows for future modifications to specific members due to deterioration and or collision.





BrR Load Rating Tools and Tips

Structure Typical Section

This section is used to define cross section geometry and assign dead loads.

- **Deck: Geometry and Thickness - DC1**
- **Parapet (etc): Position Rail & Assign Load - DC1 or DC2**
- **Lane Position: Compute Travel Lanes**
- **Wearing Surface: Added concrete for overlay - WS**

Tip: Load rating model should include only what is on the bridge. Add values for wearing surface only if an overlay exists.

BrR Load Rating Tools and Tips

Member Loads

This section is used to apply member loads outside those defined in the typical section and the member self weight.

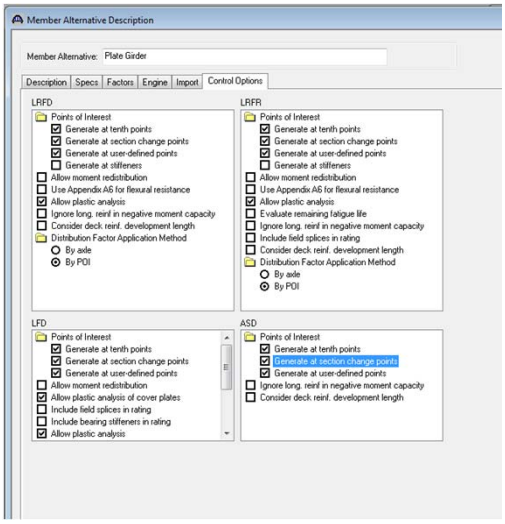
- **SIP Load:**
  Add SIP member load if photos in BIAS show stay in place forms.
- **Parapet:**
  At this time BrR distributes parapet loads evenly to all members. A member load could be used to evaluate 60/40 application.

BrR Load Rating Tools and Tips

Control Options

- **Steel:**

Allow plastic analysis for A36 and Grade 50



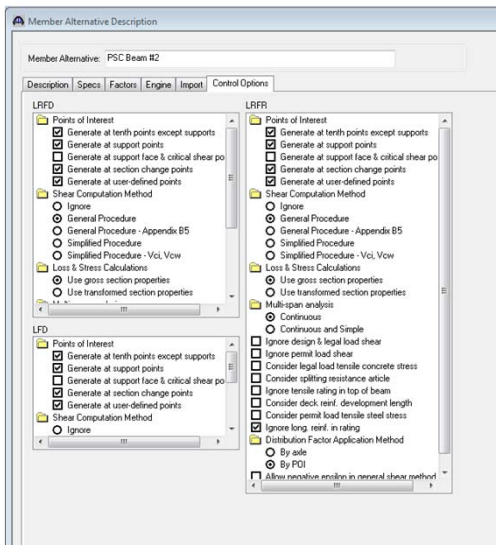
BrR Load Rating Tools and Tips

Control Options

- **Prestress Concrete:**

LRFR use General Procedure

LFR Use current AASHTO for Shear Computation Method.



BrR Load Rating Tools and Tips

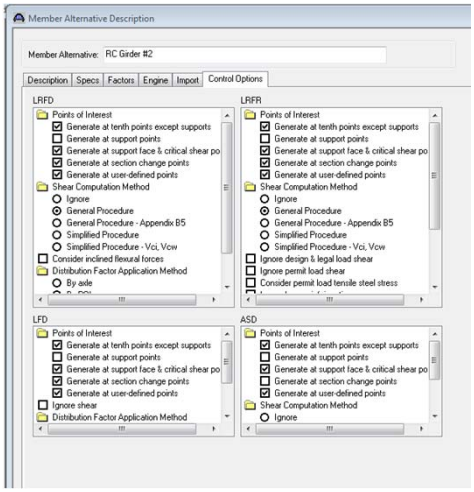
Control Options

- **Single Span Concrete:**

Generate at 10th points except at supports

Generate at support face & critical shear points

Provide information for Effective Supports within model

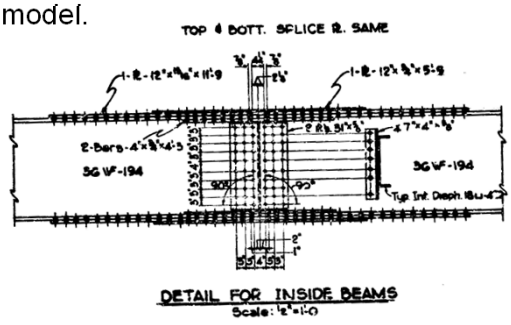


Tip: Using this approach eliminates all checks over the support. This can be used for single span only when model produces low shear values over the supports.

BrR Load Rating Tools and Tips

Steel Tips

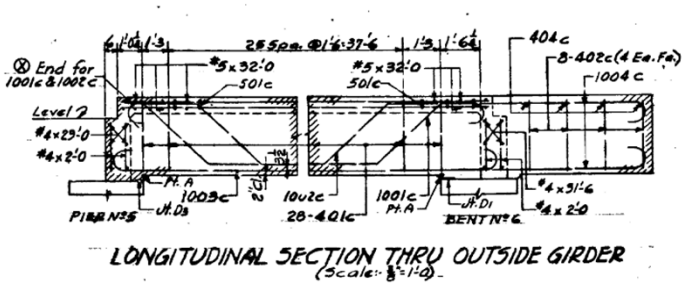
- **Equivalent Cover Plates:** Older structures may splice beams at the piers with cover plates extending beyond the splice limits. An equivalent cover plate, equal to the thickness in excess of the needed splice may be added to the model.



BrR Load Rating Tools and Tips

Concrete Tips

- **Equivalent Stirrup Spacing:** Bent bars in reinforced concrete girders provide additional shear capacity as defined by AASHTO. BrR produces errors when modeling bent bars. An equivalent bar spacing can be computed for the typical shear reinforcement to provide added benefit of the bent bars.



BrR Load Rating Tools and Tips

Concrete Tips

- **Effective Supports: Utilize effective supports when possible for single span analysis.**

- **Shear Stirrup Ranges: When defining stirrups, BrR does not place a stirrup at the start of a range.**

The first line above locates the first stirrup, the second line places the rest of the stirrups in the series

BrR Load Rating Tools and Tips

Generating Output

BrR Load Rating Tools and Tips

Generating Output

BrR has several options to generate output that can be used for comparison with other software and AASHTO

- **Review Input File**
- **View Analysis Results**
- **Report Tool**
- **Spec Check**
- **Analysis Charts**
- **Analysis Output**

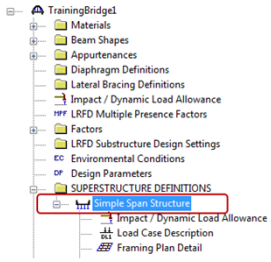
Tip: The model used to produce the HL-93 results in the following example is "TrainingBridge1", which is included in the BrR installation.

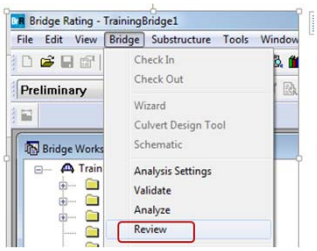
BrR Load Rating Tools and Tips

BrR Review Input File

To create a report of all input for review:

- **Select the Superstructure Definition to be reviewed**





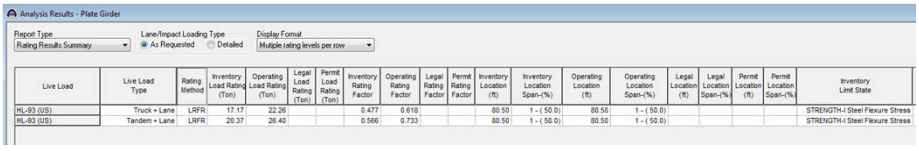
- **Go to Bridge > Review**
- **Go to File > Print for pdf or hard copy of report**

BrR Load Rating Tools and Tips

BrR View Analysis Results

After performing a load rating analysis the View Analysis Results Icon produces an overview of the rating

- **Controlling Rating** *(HL-93 Inv = 0.477)*
- **Limiting Condition** *(Strength-I Steel Flexure Stress)*
- **Location** *(80.50 ft, or 50% of Span 1)*



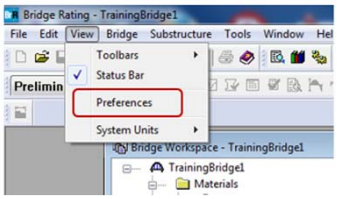
BrR Load Rating Tools and Tips

BrR Report Tool

BrR Report Tools creates several reports as xmls

Set up is required to use BrR's Report Tool icon.

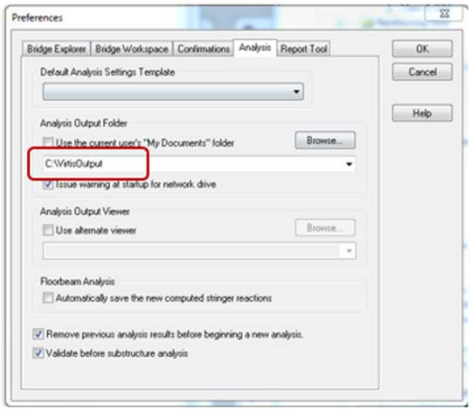
- **Go to VIEW > PREFERENCES**



BrR Load Rating Tools and Tips

BrR Report Tool

- **Go to ANALYSIS TAB**
- **Select BROWSE to identify the folder where output files are being stored .**

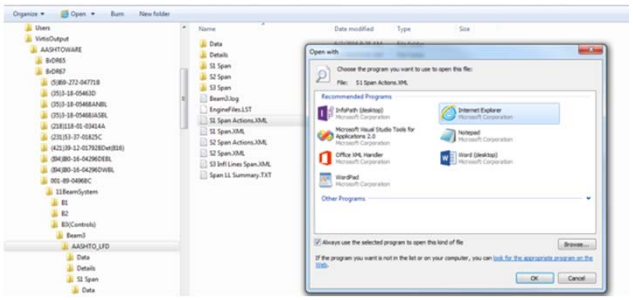


Tip: Analysis is quicker if this folder resides on the local drive

BrR Load Rating Tools and Tips

BrR Report Tool

- **Go to Location of the Analysis Output Folder as defined**
- **Choose an xml viewer as the "Default Program to Open With"**



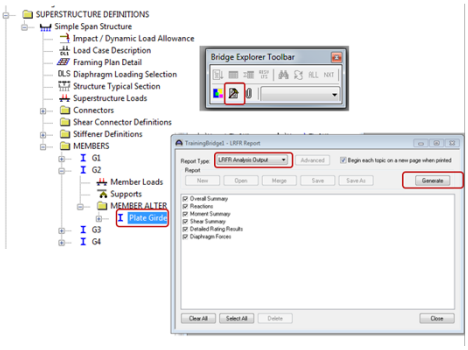
Tip: Every time a bridge is analyzed several reports are created. This folder can get to be quite large and take up a lot of space. Periodic file removal is recommended.

BrR Load Rating Tools and Tips

BrR Report Tool

After setup is complete, perform HL-93 LRFR analysis and use Report Tool Icon to generate report.

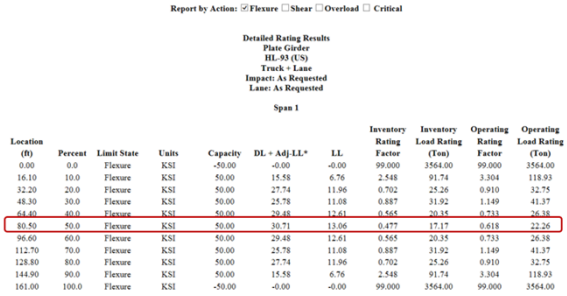
- **Select Member in BrR Tree**
- **Select BrR Report Tool Icon**
- **Select Report Type**
- **Click "Generate" Button**



BrR Load Rating Tools and Tips

BrR Report Tool

BrR will launch the xml viewer selected and create a report displaying load rating summary, reactions, moments, shears and detailed rating results at requested locations.



Report by Action: ☑Flexure ☐Shear ☐Overload ☐ Critical

Detailed Rating Results
Plate Girder
HL-93 (US)
Truck + Lane
Impact: As Requested
Lane: As Requested

Span 1

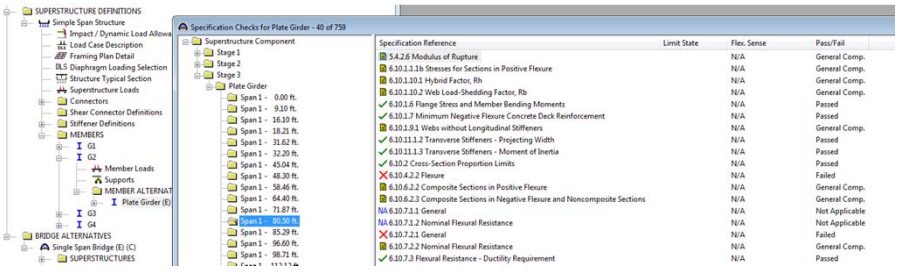
Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
16.10	10.0	Flexure	KSI	50.00	15.58	6.76	2.548	91.74	3.304	118.93
32.20	20.0	Flexure	KSI	50.00	27.74	11.96	0.702	25.26	0.910	32.75
48.30	30.0	Flexure	KSI	50.00	25.78	11.08	0.887	31.92	1.149	41.37
64.40	40.0	Flexure	KSI	50.00	29.48	12.61	0.565	20.35	0.733	26.38
80.50	50.0	Flexure	KSI	50.00	30.71	13.06	0.477	17.17	0.618	22.26
96.60	60.0	Flexure	KSI	50.00	29.48	12.61	0.565	20.35	0.733	26.38
112.70	70.0	Flexure	KSI	50.00	25.78	11.08	0.887	31.92	1.149	41.37
128.80	80.0	Flexure	KSI	50.00	27.74	11.96	0.702	25.26	0.910	32.75
144.90	90.0	Flexure	KSI	50.00	15.58	6.76	2.548	91.74	3.304	118.93
161.00	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Tip: Check boxes in the report are helpful to isolate controlling condition.

BrR Load Rating Tools and Tips

BrR View Spec Check

After the controlling location and condition is identified, use the View Spec Check icon to identify the limiting AASHTO Code reference.



Tip: Select individual Specification References and dial in to additional detailed computations.

BrR Load Rating Tools and Tips

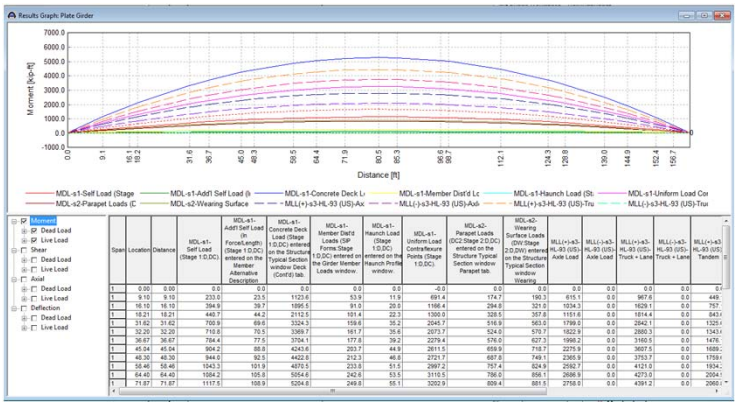
BrR View Spec Check

Spec Check 6A.4.2.1: Steel Flexure Stress General, shows that the HL-93 Inventory rating is controlled by stress in the bottom flange.

BrR Load Rating Tools and Tips

BrR View Analysis Charts

Data from analysis charts can be cut and pasted into MS Excel.

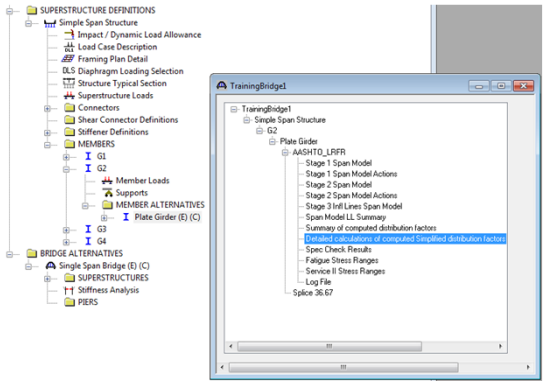


BrR Load Rating Tools and Tips

BrR View Analysis Output

Several of the reports using this icon are generated using Internet Explorer. Options will vary based on structure type.

Tip: The Log File created contains the same information produced during analysis. This can be helpful when trying to identify run-time errors.



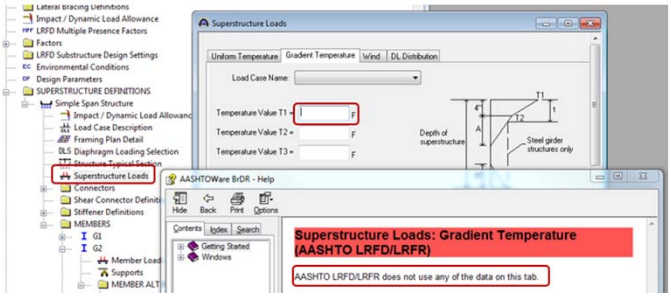
BrR Load Rating Tools and Tips

Help and Technical Support

BrR Load Rating Tools and Tips

BrR Help

Set Engine Help Configuration to the appropriate AASHTO Code. When questions arise, place cursor in the field in question and click the Help Icon. BrR will provide information on the specific field in question. To determine if the field is used in BrR, select "Engine Related Help".



BrR Load Rating Tools and Tips

Help and Technical Support

The website for AASHTOWare Support contains a lot of helpful information

https://aashto.mbakercorp.com/Pages/Support.aspx

- **Technical Notes**
- **Downloads for Service Pack Releases**
- **Tutorials**
- **JIRA Support**
- **email Support**

Tip: Subscribe to the End-user Mailing List-eNotifications to receive Technical Notes and Service Pack Releases.

BrR Load Rating Tools and Tips

Tutorials

Training tutorials on the AASHTOWare Support site include xmls that can be imported into BrR and pdfs for guidance.

BrR Load Rating Tools and Tips

JIRA Support

All licensed users have read only access to open and resolved issues with BrR and BrD.

- **Keyword searchable**
- **Priority for resolution**
- **Potential work around**
- **Issues to be resolved in upcoming releases**

Tip: Select JIRA Support Center link on website to access JIRA Support. Use username: brd and password: brr

BrR Load Rating Tools and Tips

email Support

If the technical notes, tutorials and JIRA Support don't provide a solution, support questions may be emailed to:

BrDR@mbakerintl.com

Special Consultant/Agency License and Agency Sponsored Consultant License includes limited support for installation issues only. Primary technical support must go through the sponsoring agency.

Tip: ***AASHTOWare will only respond to email support requests if INDOT is cc'd.***

BrR Load Rating Tools and Tips

Annual RADBUG Meeting

(Rating And Design Bridge Users Group)

August 15-17, 2017
Kansas City, Kansas

http://aashtobr.org/

A link to all presentations since the 2010 Annual RADBUG meeting can be found on the website. Including Fundamentals Workshop tutorial, Library Training and guidance from other DOTs facing the same Federal mandates.

Thank You!

For additional questions, please contact:

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