Continuous Span Reinforced Concrete Slab Bridge

As-Built Model Only

November, 2011
# Virtis V6.2

## DETAILED EXAMPLE

### CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT

**AS-BUILT MODEL ONLY**

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CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

CREATING A NEW BRIDGE

To create a new bridge right click on the folder where you want to save the bridge and choose New → New Bridge.

A new window will appear. Fill in the fields as appropriate under the Description tab:

**Note:** The description box is a good place to show the plan number used to analyze the structure.

**Template:** Template bridges serve as templates to help develop other bridges.

**Bridge Completely Defined:** Check the box if the specified bridge is completely defined within the Virtis/Opis database. Do not check this box if some of the structures making up the bridge are not in the database.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

**BridgeWare Association Button:** Opens the BridgeWare Association window allowing you to specify this current bridge as a Virtis, Opis or Virtis/Opis bridge and also to link this current bridge to a bridge in the Pontis database if Pontis is installed.

**Description (cont’d) tab:** Fill in fields as appropriate.

No input required for the **Alternatives** and **Global Reference Point** tabs.

**Traffic tab:**

To find the traffic data follow the link below:


Left click the most current year.
Left click Jurisdiction Publications.

Right click the excel icon for the appropriate jurisdiction.

Left click Save Target As... and save the file to a desired location on the user’s computer.

Open the excel file and the user can locate the proper traffic data for the structure.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Truck PCT: The percentage of trucks in the average daily traffic.

ADT: Average Daily Traffic

Directional PCT: Percentage used to compute traffic in one direction

Recent ADTT: Virtis computes this value based on above inputs

For all Windows:

OK button: Saves the bridge description in this window and its tabs to memory and closes the window.

Apply button: Saves the bridge description in this window and its tabs to memory and keeps the window open.

Cancel button: Closes the window without saving the bridge description in this window and its tabs to memory.

Left click OK to accept and close.

NOTE: It is strongly recommended that the user save the bridge data at this time. In addition, the user should routinely save the bridge data during the input process.

Left click the Save icon and the Bridge Validation window will appear. Left click Continue Saving to finish the save process.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

SELECTING MATERIAL PROPERTIES

Expand the Materials folder.

Double click Concrete to open the Bridge Materials – Concrete Window.

Copy from Library Button:
Opens the Library - Materials – Concrete window, allowing you to copy a set of concrete material properties from the library to this window.

Left click the appropriate concrete properties and left click the OK Button to accept.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Left click **OK** to accept and close.

Repeat the process for **Reinforcing Steel**.

Double click **Reinforcing Steel** to open the **Bridge Materials – Reinforcing Steel** Window.

**Copy from Library Button:** Opens the Library - Materials – Reinforcing Steel window, allowing you to copy a set of steel reinforcing steel material properties from the library to this window.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Left click the appropriate reinforcing steel properties and left click the OK Button to accept.

Type: User can select whether the reinforcing steel is Plain, Epoxy, Galvanized, or Other. For this example select Epoxy.

Left click OK to accept and close.
SELECTING IMPACT/DYNAMIC LOAD ALLOWANCES

Double click Impact / Dynamic Load Allowance to open.

15.0% and 33.0% are AASHTO LRFD defaults.

Left click the OK button to accept and close.
SELECTING FACTORS

Expand the Factors folder.

Double click LRFR to open.

Left click the Copy from Library... button to open the library data for LRFR factors.

Select the appropriate factors and left click the OK button to accept.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Left click the OK button to accept and close.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

CREATING SUPERSTRUCTURE DEFINITIONS: AS-BUILT

Double click **SUPERSTRUCTURE DEFINITIONS** to open.

Select **Girder Line Superstructure** and left click the **OK** button to accept and close.

The Girder Line definition will be used since a 12" wide portion of the slab will be rated.

Fill out the following fields:

**Name:** AS-BUILT.

**Description:** No information required, but user can input additional information or assumptions if desired.

**Live Load Lanes:** In most cases, **Multi-Lane** should be selected.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

**Member Alt. Types:** Select R/C since a reinforced concrete slab is rated.

Consider **structural slab thickness for rating:** Check this box if the structural slab thickness should be used to compute section properties for rating. If this box is not checked, the rating will use section properties computed from the total deck thickness.

Consider **structural slab thickness for design:** Check this box if the structural slab thickness should be used to compute section properties for design. If this box is not checked, the design will use section properties computed from the total deck thickness.

**Factor Override:** None selected.

No input required for the **Engine** tab.

Left click **OK** to accept and close.
DEFINING LOAD CASES

Double click **Load Case Description** to open the Load Case Description window.

Left click **Add Default Load Case Descriptions** to apply default load cases. The default load cases include dead load (DC1) acting on non-composite section, dead load (DC2) acting on long term composite section, dead load (DW) acting on long term composite section and stay-in-place forms acting on non-composite section. These default load cases can be edited and modified as desired.
LEFT CLICK THE OK BUTTON TO ACCEPT AND CLOSE.
DEFINE STEEL REINFORCEMENT

Double click **Bar Mark Definitions**.

![Diagram of Bridge Workspace - 12415](image)

Fill out the fields as appropriate based on the information in the plans (See Appendix A for the design plans).

**Bar Type**: Select the **Straight** bar type even if the bar has hooks at the end. The user will be able to define the bar as fully developed later to model hooks at the start and end of the bar.

**A Dimension**: This is the length of the reinforcement definition of interest.

Left click **OK** to accept and close.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Since the bridge has continuous spans, longitudinal reinforcement is required in the bottom and top of the slab which results in several unique bar mark definitions. Therefore, a screen shot is provided for only one of the bar mark definitions. See the summary table below for a complete list of bar mark definitions and their input.

### Bar Mark Definition Summary

<table>
<thead>
<tr>
<th>Name</th>
<th>Bar Size</th>
<th>A Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC1002</td>
<td>10</td>
<td>45.6270</td>
</tr>
<tr>
<td>SB1001</td>
<td>10</td>
<td>27.7187</td>
</tr>
<tr>
<td>SB1002</td>
<td>10</td>
<td>26.4688</td>
</tr>
<tr>
<td>SC1003</td>
<td>10</td>
<td>58.1667</td>
</tr>
<tr>
<td>SC1001</td>
<td>10</td>
<td>52.8333</td>
</tr>
<tr>
<td>SB1003</td>
<td>10</td>
<td>26.7500</td>
</tr>
<tr>
<td>SC0404</td>
<td>4</td>
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<tr>
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<td>25.9583</td>
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<tr>
<td>SB0507</td>
<td>5</td>
<td>12.1667</td>
</tr>
<tr>
<td>SB1005</td>
<td>10</td>
<td>27.2500</td>
</tr>
<tr>
<td>SB1006</td>
<td>10</td>
<td>29.9583</td>
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<tr>
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<td>10</td>
<td>26.9583</td>
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<tr>
<td>SC1008</td>
<td>10</td>
<td>60.0000</td>
</tr>
<tr>
<td>SC1010</td>
<td>10</td>
<td>37.5000</td>
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<tr>
<td>SC1115</td>
<td>11</td>
<td>25.0000</td>
</tr>
</tbody>
</table>
CREATING A MEMBER: EXTERIOR SLAB

Double click MEMBERS to open the Member window.
Fill out the fields as appropriate based on the information in the plans.

**Member Name:** Since this is the input for the exterior portion of the slab use “Exterior Slab” for the name.

**Description:** No information required, but user can input additional information or assumptions if desired.

**Number of Spans:** There are 4 spans.

**Span Length (ft):** Enter the appropriate span length for each span. The span length is measured as the CL bearing to CL bearing distance for each span. Use as many decimal places as desired. For this example, 43.982361 ft., 55.00 ft., 55.00 ft., and 43.982361 ft. were used for the span lengths.

**Deck Concrete Crack Control Parameter (Z):** Enter 130.00 kip/in since the top of the slab is directly exposed to environmental elements.

**Member Location:** Select Exterior

**Deck Exposure Factor:** Use 1.000 for a Class 1 exposure condition.

Left click **OK** to accept and close.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

APPLYING DEAD LOADS

Double click **Member Loads** to apply loads to the members.

Typically the two uniform loads applied to a slab are a DC2 load for the barrier and DW load for the wearing surface. However, since the example bridge does not have a wearing surface, only a DC2 load is required.

Left click the dropdown menu and left click **DC2**.
Left click the **New** button and enter the appropriate uniform load of the barrier that is distributed to a 12” portion of the slab. See Appendix B for a sample calculation.

Left click **OK** to accept and close.
DEFINING SUPPORTS

Double click Supports to define the support conditions at each bearing location.

**Support Type**: Select from the drop down menu the appropriate bearing condition for each support. Use engineering judgment for the support type based on Translation and Rotation Constraints.

For expansion bearings, use “Roller” type supports.

For fixed bearings, use “Pinned” type supports.

Left click OK to accept and close.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

CREATING A MEMBER ALTERNATIVE: EXTERIOR SLAB

Double click **MEMBER ALTERNATIVES** to further define the member.

Select **Reinforced Concrete** from the left drop down menu.

Select **Reinforced Concrete Slab** from the right drop down menu.

Left Click **OK** to accept.
Description tab:

Member Alternative: Exterior Slab

Girder property input method: The Schedule Based method views the beam as an elevation with Bar Mark Definitions.

The cross section based method views the beam as a series of cross sections with particular dimensions and rebar counts. For this example, select Schedule Based.

Sustained Modular Ratio Factor: 2.00 for concrete members.

Crack control parameter (Z): 170.00 kip/in since the bottom of the slab is not directly exposed to the environment.

Exposure Factor: 1.000 for a Class 1 exposure condition.

Additional Self Load: User can apply an additional load to the specific beam as a defined distributed load or as a distributed load calculated based on a percentage of the self-load of the beam. These fields are often used for items such as bolts and splice plates. For this example, leave these fields blank.

End Bearing Locations: This input is not used for a reinforced concrete slab and should be left blank.

Default Rating Method: LRFR

Analysis Module:

LFD: Virtis LFD

LRFR: Virtis LRFR

Leave the ASD and LRFD modules as the default values.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

No changes to the following tabs:

Factors
Engine
Import

Control Options tab:

Select the options shown in the screen shot below.

Left click **OK** to accept and close.
DEFINING LIVE LOAD DISTRIBUTION FACTORS

Expand Exterior Slab (E) (C).

Double click Live Load Distribution.

Standard tab:


Input the LFD live load distribution factor for moment.

See Appendix C for a sample calculation.
LRFD tab:

Virtis does not compute the LRFD live load distribution factors correctly.

Therefore, under the LRFD tab left click the **New** button.

Input the LRFD live load distribution for **Deflection**.

See Appendix C for a sample calculation.

Enter length of **197.964722** ft.

Left click **Apply**.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Select Moment from the Action drop down menu.

Enter the span lengths and the LRFD live load distribution for Moment for each span.

Enter length of 43.982361 ft. for Spans 1 and 4.

Left click Apply.

Select Shear from the Action drop down menu and repeat the process to input the LRFD live load distribution factors for shear.

Input the LRFD live load distribution for Shear.

Left click Apply.

Left click OK to accept and close.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

DEFINING THE GIRDER PROFILE

Double click Girder Profile.

Under the Section tab input the appropriate information:

**Beam Dimension:** 12.00 in since a 12 inch wide portion of the slab is analyzed.

**Concrete Material:** Select A4 Concrete (US) from the drop down menu.

**Modular Ratio:** 8.0 (See calculation below)

**Sacrificial Wearing Surface:** 0.50 in.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Modular Ratio Calculation

Unit Weight of Concrete, \( w_c = 0.145 \text{ kip/ft}^3 \)
Compressive Strength of Concrete, \( f'_c = 4.00 \text{ ksi} \)
Modulus of Elasticity of Reinf. Steel, \( E_s = 29000 \text{ ksi} \)
Modulus of Elasticity of Concrete, \( E_c = 33,000 \times w_c^{0.15} \times f'_c^{0.65} \text{ Eq. 5.4.2.4-1} \)
\( E_c = 33,000 \times 0.145^{0.15} \times 4.00^{0.65} \)
\( E_c = 3644.15 \text{ ksi} \)

Modular Ratio, \( n = \frac{E_s}{E_c} = 5.71 \)
\( n = \frac{29,000}{3,644.15} = 8.0 \)

Web tab:

**Begin Depth:** Top of slab to bottom of slab.

**Depth Vary:** Varies, See plans

**Support Number:** 1

**Start Distance:** 0.00 ft

**Length:** Varies, See plans

Left click **New** to create a new Web definition.

Note: See the following sheet for the detailed girder web profile definition table which includes exact lengths for input. For each new line of data, the start distance is automatically computed based on the previous length entered. The profile definition table shows start distances for the overall bridge length. The start distances automatically calculated by Virtis show values from each support.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Detailed Girder Web Profile Definition

<table>
<thead>
<tr>
<th>Begin Depth (in)</th>
<th>Depth Vary</th>
<th>End Depth (in)</th>
<th>Support Number</th>
<th>Start Distance (ft)</th>
<th>Length (ft)</th>
<th>End Distance (ft)</th>
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<td>37.464723</td>
<td>197.447084</td>
</tr>
</tbody>
</table>

Under the Reinforcement tab: Left click the New button.
**Reinforcement** tab:

- **Input the fields based on the information in the plans.**
- **Bar Mark:** SB1006
- **Invert:** Unchecked since the bar mark is defined as straight
- **Measured From:** Top of Slab
- **Distance:** 14.75 inches (from top of the slab to the CL of reinforcement)
- **Number:** 2.00 bars (4.5” cover plus 5.0” spacing provides only 2 bars)
- **Bar Spacing:** 5.00 inches
- **Side Cover:** 4.25 inches
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Support Number: 1

Direction: Right (defines if the start distance for the rebar is to the right or left of the support number.

Start Distance: 0.00

Full Developed: Checked since there are hooks at the end of the bar

Left click **New** to create additional reinforcement definitions.

At least one set of reinforcement must be extended to the exact end of Span 4 (43.982361 ft) or rating results will show values of 0.0 for any vehicle rated on the Exterior Slab.

For Set 4, enter a Start Distance of 14.024061 ft for the SB1006 bar measured from the right of Support Number 4.

Span Length – Bar Length = Start Distance

\[ 43.982361 \text{ ft} - 29.9583 \text{ ft} = 14.024061 \text{ ft} \]

Note that later, for the Interior Slab, this problem is avoided by defining the Start Distance from the left of Support Number 5 for Set 14 as the exact length of the SC0404 bar.

Left click **OK** to accept and close.

***THE INPUT FOR THE EXTERIOR SLAB IS COMPLETE. USER CAN ADVANCE TO THE INTERIOR SLAB.***
CREATING A MEMBER: INTERIOR SLAB

Right click **Exterior Slab** directly underneath the **MEMBERS** folder and select **Copy**.
Right click **MEMBERS** and select **Paste**.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Double click Copy of Exterior Slab.

Change the Member name to Interior Slab.

Change the Member Location to Interior.

Left click OK to accept and close.
APPLYING DEAD LOADS

Since the dead loads applied to the exterior slab are equal to the loads applied to the interior slab, the user is not required to open the Member Loads window.
CREATING A MEMBER ALTERNATIVE: INTERIOR SLAB

Expand the MEMBER ALTERNATIVES folder.

Double click Exterior Slab (E) (C) to open the Member Alternative Description window.

Description Tab:

Change the Member Alternative name to Interior Slab.

The user is not required to update any other fields.

Left click OK to accept and close.
DEFINING LIVE LOAD DISTRIBUTION FACTORS

Expand Interior Slab (E) (C).

Double click Live Load Distribution.

Standard tab:

This input is the same for the exterior and interior slabs. Therefore, updates by the user are not required for this tab.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

LRFD tab:

Update the 1 lane and Multi-Lane values for the interior slab for Deflection (See Appendix C).

No change required.

Left click Apply to accept values.

Update the 1 Lane and Multi-Lane values for the interior slab for Moment (See Appendix C).

Left click Apply to accept values.

Update the 1 Lane and Multi-Lane values for the interior slab for Shear (See Appendix C).

Left Click OK to accept and close.
DEFINING THE GIRDER PROFILE

Double click Girder Profile.

The information for the Section and Web tabs do not have to be revised.

Proceed to the Reinforcement tab.
Under the Reinforcement tab, revise the input as required:

Select a previously entered line and click **Delete** to remove definitions entered for the Exterior Slab.

Left click **New** to create additional reinforcement definitions.

Left click **OK** to accept and close.

***THE INPUT FOR THE INTERIOR SLAB IS COMPLETE. THE USER CAN ADVANCE TO CREATING BRIDGE ALTERNATIVES.***
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

CREATING A BRIDGE ALTERNATIVE

A bridge can have several unique bridge alternatives. Each bridge alternative must include the entire bridge but can consist of a different layout of superstructures. The number of spans, the span lengths, and the pier locations are defined within the bridge alternative (and its accompanying windows). Entering different bridge alternatives can be useful when comparing various alternatives for a preliminary study.

BRIDGE ALTERNATIVES permit the user to determine which spans to include in an analysis. For example, if a structure had two unique spans, the user can decide to include only one of the spans in the analysis and exclude the other. The rating summary will then only have results from the span that was analyzed rather than comparing the two spans. Typically however, every span entered will be included in a BRIDGE ALTERNATIVE.

Double click BRIDGE ALTERNATIVES.
Alternative Name: AS-BUILT

Left click OK to accept and close.

Double click SUPERSTRUCTURES.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Superstructure Name: AS-BUILT

No other action is required for any of the tabs.

Left click OK to accept and close.

Expand AS-BUILT.

Double click SUPERSTRUCTURE ALTERNATIVES.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Alternative Name: AS-BUILT

Superstructure Definition: Select AS-BUILT from the drop down menu.

Note that once AS-BUILT is selected for the Superstructure Definition, the Superstructure type and number of main members is displayed.

Left click OK to accept and close.

***THE INPUT FOR THE BRIDGE ALTERNATIVE IS COMPLETE. MAKE SURE THE FILE IS SAVED PRIOR TO ANALYSIS.
The file is now ready to be analyzed. The user can either analyze individual beams with the file open or analyze the entire bridge with the file closed.

To analyze an individual member, highlight the MEMBER ALTERNATIVE of interest and left click the View Analysis Settings Icon.
The Analysis Settings window will appear. On theRating Method dropdown menu, change the method to LRFR.
Add the vehicles shown in the screen shot to the **Vehicle Summary** list.

This is done by first left clicking the destination such as Design Load Rating, Legal Load Rating, and Permit Load Rating in the right column. Then, left click the desired vehicle from the left column and left click the **Add to Rating** button.

Once all vehicles for the LRFR Continuous Span (Run 1 of 2) template have been entered, this can be saved as a Template for future ratings.
Left click the Save Template button.

**Template Name**: Continuous Span (Run 1 of 2)

Left Click the **Save** button.

Left click **OK** on the **Analysis Settings** window to accept and close.

---

**NOTE**: TO REDUCE THE ANALYSIS TIME AND TO PREVENT ERROR GENERATION DURING THE ANALYSIS, THE LIVE LOAD ANALYSIS FOR CONTINUOUS SPANS IS DIVIDED INTO TWO SEPARATE RUNS.

**FOLLOW THE DIRECTIONS BELOW TO CREATE THE SECOND RUN.**
Add the vehicles shown in the screenshot to the Vehicle Summary list.

This is done by first left clicking the destination such as Design Load Rating, Legal Load Rating, and Permit Load Rating in the right column. Then, left click the desired vehicle from the left column and left click the Add to Rating >> Button.

Once all vehicles for the LRFR Continuous Span (Run 2 of 2) template have been entered, left click the Advanced button above the right column.

For the Lane-Type Legal Load, left click the Legal Pair box.

For the two Blanket Permit vehicles, change the Frequency to Unlimited Crossings.

Left click OK to accept and close.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Once complete, this can be saved as a Template for future

**Template Name:** Continuous Span (Run 2 of 2)

Left Click the **Save** button.

Left click **OK** on the **Analysis Settings** window to accept and close.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

ANALYZE MEMBER

To analyze a specific member, right click the desired MEMBER ALTERNATIVE and select Analyze.

Allow the program to analyze the member alternative. After the analysis is completed, the user can read any warnings or errors by scrolling up the Analysis Progress window.

Click OK to proceed to view results.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

To view the results keep the analyzed MEMBER ALTERNATIVE selected.

Left click the View Analysis Report icon.

The Analysis Results window will appear. To view a more compact version of the results, select Single rating level per row under the Display Format Window.

Exterior Slab Rating Results:

<table>
<thead>
<tr>
<th>Rating Type</th>
<th>Rating Results Summary</th>
<th>Lane/Impact Loading Type</th>
<th>Display Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>As Requested</td>
<td>Detailed</td>
<td>Multiple rating levels per row</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single rating level per row</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LVC Load</th>
<th>Live Load Type</th>
<th>Rating Method</th>
<th>Inventory Rating (Ton)</th>
<th>Operating Load Rating (Ton)</th>
<th>Local Rating (Ton)</th>
<th>Perpetual Rating Factor</th>
<th>Local Rating Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML 93 (US)</td>
<td>Truck</td>
<td>LPRF</td>
<td>85.53</td>
<td>125.08</td>
<td>2.650</td>
<td>3.174</td>
<td></td>
</tr>
<tr>
<td>ML 93 (US)</td>
<td>Tractor</td>
<td>LPRF</td>
<td>72.25</td>
<td>101.98</td>
<td>3.130</td>
<td>4.075</td>
<td></td>
</tr>
<tr>
<td>ML 93 (US)</td>
<td>Tractor + Truck</td>
<td>LPRF</td>
<td>385.73</td>
<td>438.10</td>
<td>1.706</td>
<td>5.096</td>
<td></td>
</tr>
<tr>
<td>National Rating Load</td>
<td>Acre Load</td>
<td>LPRF</td>
<td>166.67</td>
<td>4.167</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QEH</td>
<td>Acre Load</td>
<td>LPRF</td>
<td>135.54</td>
<td>6.057</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QEU</td>
<td>Acre Load</td>
<td>LPRF</td>
<td>141.81</td>
<td>4.261</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QEF</td>
<td>Acre Load</td>
<td>LPRF</td>
<td>161.11</td>
<td>4.249</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUI</td>
<td>Acre Load</td>
<td>LPRF</td>
<td>163.22</td>
<td>4.188</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUB</td>
<td>Acre Load</td>
<td>LPRF</td>
<td>120.09</td>
<td>5.700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUB</td>
<td>Acre Load</td>
<td>LPRF</td>
<td>200.19</td>
<td>5.700</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VDOT Virginia Department of Transportation

VERSION 6.2
Note: If rating results show 0.0 for all vehicles, see note in section on Reinforcement tab of Girder Profile for the Exterior Girder.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

ANALYZE FILE FROM BRIDGE EXPLORER

To analyze the entire file at once, first **Save** and then **Close** the bridge.

In the **Bridge Explorer** window, select the bridge, right click, and select **Rate**.
The Analysis Settings window will appear.

If a template has already been created, left click the Open Template button.

Left click Continuous Span (Run 1 of 2) and left click the Open button.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Left click **OK** to accept the template and rate.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Allow the bridge to run. Once the analysis is completed, the user can read any warnings or errors by scrolling up on the Analysis Progress window.

Left click OK to view results.

The Bridge Rating Results window will appear. To view a more compact set of results, select Single rating level per row.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

FINAL STRUCTURE RATINGS

Continuous Span (Run 1 of 2)

Note: The rating of the structure is now complete. Continue to the next sheet to fill out the rating form.
REVIEWING SPECIFICATION CHECKS AND RATING FACTORS

To review the specification checks and to find the rating factors follow the steps below. Note that most output review options are only available when the analysis is performed from the Bridge Workspace. Only the Analysis Report is available when a structure is analyzed from the Bridge Explorer.

Once the member of interest has been analyzed, highlight the Member Alternative. Left click the View Spec Check icon.

Expand the Superstructure Component folder. Expand the Stage 3 folder. Expand the Interior Slab folder to display the points of analysis for each span.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

For this example, the controlling member is the interior slab. One of the controlling locations is in Span 4 at distance 19.57 ft. Scroll down to this location and left click on the associated folder.

Double click 6.4.2.1 Concrete Flexure General Rating Equation – Concrete Flexure from the “Specification Reference” column. A new window will appear for this specification check.

The information provided for this specification check looks to the adjacent section to the left and right at this specific location. The ratings for each load and vehicle combination are displayed.

The controlling rating for the section at this specific location is summarized at the bottom for each type of load (Design Inventory, Design Operating, Legal Load, Permit Load).

The rating factor and capacity is displayed in the right columns.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

A screenshot of this window can be seen below:
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

COMPLETING VDOT LRFR RATING FORM

Complete the information fields at the top portion of rating form. Structure identification information can be obtained from the current inspection report for the bridge.

The VDOT Reviewer line should be left blank.

The box in the upper right hand corner of the rating form is for the seal and signature of a professional engineer licensed in the state of Virginia.
Analyze the file from the Bridge Explorer.

**DESIGN LOAD: HL-93**

<table>
<thead>
<tr>
<th>DESIGN LOAD</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL-93 (INV)</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL-93 (OPR)</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To fill out the rating information for the HL-93 vehicle, first highlight the HL-93 (US) Inventory and Operating Rating Level rows in the Bridge Rating Results window.

Then, left click the View Structure Rating Results window.

The Structure Rating Results window will appear. Highlight both the Inventory and Operating Rating Level rows.

Left click the View Member Rating Results button.

The Member Rating Results window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The HL-93 vehicle is the only vehicle without a tonnage since it is a truck load combined with a lane load. The **CONTROLLING FORCE** column will be filled in later.

<table>
<thead>
<tr>
<th>DESIGN LOAD</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL-93 (INV)</td>
<td>N/A</td>
<td>1.17</td>
<td>Interior Slab</td>
<td>Span 4 – 19.57'</td>
</tr>
<tr>
<td>HL-93 (OPR)</td>
<td>N/A</td>
<td>1.52</td>
<td>Interior Slab</td>
<td>Span 4 – 19.57'</td>
</tr>
</tbody>
</table>

Note: For all results do not round up. Only record 2 significant digits for the rating factor.
To fill out the rating information for the HS-20 vehicle, first highlight the HS-20 Truck Only Inventory and Operating Rating Level rows in the Bridge Rating Results window. The HS-20 Lane Load Only and HS-20 Tandem ratings are for informational purposes only and are not included on the rating form.

Then, left click the View Structure Rating Results window.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

The Structure Rating Results window will appear. Highlight both the Inventory and Operating Rating Level rows for AS-BUILT.

![Structure Rating Results](image)

Left click the View Member Rating Results button.

The Member Rating Results window will appear.

![Member Rating Results](image)

Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The CONTROLLING FORCE column will be filled in later.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Structure</th>
<th>Member</th>
<th>Vehicle</th>
<th>Rating Level</th>
<th>Rating Factor</th>
<th>Capacity (Tons)</th>
<th>Time Stamp</th>
<th>Rated By</th>
<th>Impact</th>
<th>Lane</th>
<th>Up To Date</th>
<th>EC</th>
<th>Vehicle Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>12415</td>
<td>AS-BUILT</td>
<td>Interior Slab</td>
<td>HS-20 Truck Only</td>
<td>Inventory</td>
<td>1.505</td>
<td>50.18</td>
<td>THURSDAY, SEPTEMBER 14, 2023</td>
<td>As Requested</td>
<td>As Requested</td>
<td></td>
<td>175.65 LFRN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12412</td>
<td>AS-BUILD</td>
<td>Interior Slab</td>
<td>HS-20 Truck Only</td>
<td>Operating</td>
<td>0.951</td>
<td>70.09</td>
<td>THURSDAY, SEPTEMBER 14, 2023</td>
<td>As Requested</td>
<td>As Requested</td>
<td></td>
<td>170.00 LHRN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12412</td>
<td>AS-BUILD</td>
<td>Interior Slab</td>
<td>HS-20 Truck Only</td>
<td>Operating</td>
<td>0.951</td>
<td>70.09</td>
<td>THURSDAY, SEPTEMBER 14, 2023</td>
<td>As Requested</td>
<td>As Requested</td>
<td></td>
<td>170.00 LHRN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS-20 (INV)</td>
<td>36</td>
<td>54</td>
<td>Interior Slab</td>
<td>Span 4 – 19.57</td>
</tr>
<tr>
<td>HS-20 (OPR)</td>
<td>36</td>
<td>70</td>
<td>Interior Slab</td>
<td>Span 4 – 19.57</td>
</tr>
</tbody>
</table>

Note: For all tonnages do not round up. Instead, round down to the nearest ton.
LEGAL LOAD: VA TYPE 3

<table>
<thead>
<tr>
<th>LEGAL LOADS</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (L)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA Type 3</td>
<td>21</td>
<td>TONS</td>
<td>**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VA Type 3S2</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LANE</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To fill out the rating information for the VA-Type 3 vehicle, first highlight the VA Type 3 row in the Bridge Rating Results window.

Then, left click the View Structure Rating Results window.

The Structure Rating Results window will appear. Highlight the row for AS-BUILT.

Left click the View Member Rating Results button.

The Member Rating Results window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

<table>
<thead>
<tr>
<th>LEGAL LOADS</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA Type 3</td>
<td>27</td>
<td>70</td>
<td>Interior Slab</td>
<td>Span 4 – 13.98'</td>
<td></td>
</tr>
<tr>
<td>VA Type 3S2</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>x</strong> LANE</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LEGAL LOAD: VA TYPE 3S2

To fill out the rating information for the VA-Type 3S2 vehicle, first highlight the **VA Type 3S2** row in the **Bridge Rating Results** window.

Then, left click the **View Structure Rating Results** window.

The **Structure Rating Results** window will appear. Highlight the row for **AS-BUILT**.

Left click the **View Member Rating Results** button.

The **Member Rating Results** window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

<table>
<thead>
<tr>
<th>LEGAL LOADS</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA Type 3</td>
<td>27</td>
<td>70</td>
<td>Interior Slab</td>
<td>Span 4 – 13.98'</td>
<td></td>
</tr>
<tr>
<td>VA Type 3S2</td>
<td>40</td>
<td>100</td>
<td>Interior Slab</td>
<td>Span 4 – 26.38'</td>
<td></td>
</tr>
<tr>
<td>* <strong>LANE</strong></td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LEGAL LOAD: LANE

<table>
<thead>
<tr>
<th>LEGAL LOADS</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (LI)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA Type 3</td>
<td>27</td>
<td>70</td>
<td>Interior Slab</td>
<td>Span 4 – 13.98'</td>
<td></td>
</tr>
<tr>
<td>VA Type 3S2</td>
<td>40</td>
<td>100</td>
<td>Interior Slab</td>
<td>Span 4 – 26.3'</td>
<td></td>
</tr>
</tbody>
</table>

To fill out the rating information for the LANE vehicle, first highlight the Lane-Type Legal Load row in the Bridge Rating Results window.

Then, left click the View Structure Rating Results window.

The Structure Rating Results window will appear. Highlight the row for AS-BUILT.

Left click the View Member Rating Results button.

The Member Rating Results window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

<table>
<thead>
<tr>
<th>LEGAL LOADS</th>
<th>Gvw (Tons)</th>
<th>Rating</th>
<th>Controlling Members</th>
<th>Controlling Location (ft)</th>
<th>Controlling Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA type 3</td>
<td>27</td>
<td>70</td>
<td>Interior Slab</td>
<td>Span 4 – 13.98'</td>
<td></td>
</tr>
<tr>
<td>VA type 3S2</td>
<td>40</td>
<td>100</td>
<td>Interior Slab</td>
<td>Span 4 – 26.38'</td>
<td></td>
</tr>
<tr>
<td>LANE</td>
<td>40</td>
<td>163</td>
<td>Interior Slab</td>
<td>Span 4 – 5.90'</td>
<td></td>
</tr>
</tbody>
</table>
To fill out the rating information for the BP-90 vehicle, first highlight the Blanket Permit 90 (BP-90) row in the Bridge Rating Results window.

Then, left click the View Structure Rating Results window.

The Structure Rating Results window will appear. Highlight the row for AS-BUILT.

Left click the View Member Rating Results button.

The Member Rating Results window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.
To fill out the rating information for the BP-90 vehicle, first highlight the Blanket Permit 115 (BP-115) row in the Bridge Rating Results window.

Then, left click the View Structure Rating Results window.

The Structure Rating Results window will appear. Highlight the row for AS-BUILT.

Left click the View Member Rating Results button.

The Member Rating Results window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

<table>
<thead>
<tr>
<th>PERMIT LOAD</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP-90</td>
<td>45</td>
<td>86</td>
<td>Interior Slab</td>
<td>Span 4 – 13.98’</td>
<td></td>
</tr>
<tr>
<td>BP-115</td>
<td>57.5</td>
<td>109</td>
<td>Interior Slab</td>
<td>Span 4 – 26.01’</td>
<td></td>
</tr>
</tbody>
</table>
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

SH VEHICLE: NRL

<table>
<thead>
<tr>
<th>SH VEHICLES</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRL</td>
<td>40</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU4</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU5</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU6</td>
<td>34.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU7</td>
<td>38.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To fill out the rating information for the NRL vehicle, first highlight the Notional Rating Load-NRL row in the Bridge Rating Results window.

Then, left click the View Structure Rating Results window.

The Structure Rating Results window will appear. Highlight the row for AS-BUILT.

Left click the View Member Rating Results button.

The Member Rating Results window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

<table>
<thead>
<tr>
<th>SH VEHICLES</th>
<th>GVV (TONS)</th>
<th>RATING TONS</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NKI</td>
<td>40</td>
<td>65</td>
<td>Interior Slab</td>
<td>Span 4 – 19.56'</td>
<td></td>
</tr>
<tr>
<td>SU4</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>SU5</td>
<td>31</td>
<td></td>
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<tr>
<td>SU6</td>
<td>34.75</td>
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</tr>
<tr>
<td>SU7</td>
<td>38.75</td>
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</tbody>
</table>
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

SH VEHICLE: SU4

<table>
<thead>
<tr>
<th>SH VEHICLES</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
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</thead>
<tbody>
<tr>
<td>NRL</td>
<td>40</td>
<td>65</td>
<td>Interior Slab</td>
<td>Span 4 – 19.56'</td>
<td></td>
</tr>
<tr>
<td>SU4</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SU5</td>
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<td>SU6</td>
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</tr>
</tbody>
</table>

To fill out the rating information for the SU4 vehicle, first highlight the SU4 row in the Bridge Rating Results window.

Then, left click the View Structure Rating Results window.

The Structure Rating Results window will appear. Highlight the row for AS-BUILT.

Left click the View Member Rating Results button.

The Member Rating Results window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

<table>
<thead>
<tr>
<th>SH VEHICLES</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
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</thead>
<tbody>
<tr>
<td>NKL</td>
<td>40</td>
<td>65</td>
<td>Interior Slab</td>
<td>Span 4 – 19.56’</td>
<td></td>
</tr>
<tr>
<td>SU4</td>
<td>27</td>
<td>58</td>
<td>Interior Load</td>
<td>Span 4 – 13.98’</td>
<td></td>
</tr>
<tr>
<td>SU5</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SU6</td>
<td>34.75</td>
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<tr>
<td>SU7</td>
<td>38.75</td>
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</tbody>
</table>
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

SH VEHICLE: SU5

<table>
<thead>
<tr>
<th>SH VEHICLES</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRL</td>
<td>40</td>
<td>65</td>
<td>Interior Slab</td>
<td>Span 4 - 19.56 ft</td>
<td></td>
</tr>
<tr>
<td>SU4</td>
<td>27</td>
<td>58</td>
<td>Interior Load</td>
<td>Span 4 - 13.98 ft</td>
<td></td>
</tr>
<tr>
<td>SU5</td>
<td>31</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>SU6</td>
<td>34.75</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SU7</td>
<td>38.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To fill out the rating information for the SU5 vehicle, first highlight the **SU5** row in the **Bridge Rating Results** window.

Then, left click the **View Structure Rating Results** window.

The **Structure Rating Results** window will appear. Highlight the row for **AS-BUILT**.

Left click the **View Member Rating Results** button.

The **Member Rating Results** window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

SH VEHICLE: SU6

<table>
<thead>
<tr>
<th>SH VEHICLES</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>NRL</td>
<td>40</td>
<td>65</td>
<td>Interior Slab</td>
<td>Span 4 - 19.56'</td>
<td></td>
</tr>
<tr>
<td>SU4</td>
<td>27</td>
<td>58</td>
<td>Interior Load</td>
<td>Span 4 - 13.98'</td>
<td></td>
</tr>
<tr>
<td>SU5</td>
<td>31</td>
<td>62</td>
<td>Interior Slab</td>
<td>Span 4 - 13.98'</td>
<td></td>
</tr>
<tr>
<td>SU6</td>
<td>34.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU7</td>
<td>38.75</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

To fill out the rating information for the SU6 vehicle, first highlight the SU6 row in the Bridge Rating Results window.

Then, left click the View Structure Rating Results window.

The Structure Rating Results window will appear. Highlight the row for AS-BUILT.

Left click the View Member Rating Results button.

The Member Rating Results window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

SH VEHICLE: SU7

<table>
<thead>
<tr>
<th>SH VEHICLES</th>
<th>GVW (TONS)</th>
<th>RATING</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRL</td>
<td>40</td>
<td>65</td>
<td>Interior Slab</td>
<td>Span 4 - 19.56'</td>
<td></td>
</tr>
<tr>
<td>SU4</td>
<td>27</td>
<td>58</td>
<td>Interior Load</td>
<td>Span 4 - 13.98'</td>
<td></td>
</tr>
<tr>
<td>SU5</td>
<td>31</td>
<td>62</td>
<td>Interior Slab</td>
<td>Span 4 - 13.98'</td>
<td></td>
</tr>
<tr>
<td>SU6</td>
<td>31.75</td>
<td>64</td>
<td>Interior Slab</td>
<td>Span 4 - 13.98'</td>
<td></td>
</tr>
<tr>
<td>SU7</td>
<td>31.75</td>
<td>64</td>
<td>Interior Slab</td>
<td>Span 4 - 13.98'</td>
<td></td>
</tr>
</tbody>
</table>

To fill out the rating information for the SU7 vehicle, first highlight the SU7 row in the Bridge Rating Results window.

Then, left click the View Structure Rating Results window.

The Structure Rating Results window will appear. Highlight the row for AS-BUILT.

Left click the View Member Rating Results button.

The Member Rating Results window will appear.
Since the interior slab has lower ratings than the exterior slab, the rating information for the interior slab will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.
COMPLETING THE VDOT RATING FORM: CONTROLLING FORCE

Once the controlling member(s) is known, the user can obtain the controlling force for each vehicle by double clicking the bridge in the Bridge Explorer window to open the file.

Expand the folders to get to the controlling MEMBER ALTERNATIVE. For the example, the controlling member is the Interior Slab.

Select the appropriate rating template by clicking on the View analysis settings button. Then right click the Interior Slab (E) (C) and select Analyze.
CONTINUOUS SPAN REINFORCED CONCRETE SLAB BRIDGE INPUT: VERSION 6.2

Left click OK on the Analysis Progress window when the analysis is complete.

Highlight Interior Slab (E) (C) and left click the View Analysis Report icon.
The Analysis Results – Interior Slab window will appear.

Select **Single rating level per row** from the **Display Format** drop down menu.

The controlling force can be obtained from the Limit State column. Fill in the rating form as appropriate. See Appendix D for the completed rating form.
The second page of the rating form provides space for assumption and comments. Some common assumptions and comments are for material strengths, which plan was used, wearing surface thicknesses, and any deterioration or other changes applied to the structure.

If the current inspection report indicates that there is deterioration, the user will have to create an IR (inspection report) structure in addition to the AS-BUILT within Virtis. For continuous span reinforced concrete slabs, the typical deterioration that warrants an IR structure is section loss to the longitudinal reinforcement.

***THE BRIDGE RATING IS NOW COMPLETE.***
APPENDIX A: DESIGN PLANS
PLAN

ELEVATION
(This and Flanking Reinforcement cut shown)

SECTION A-B

PILE PLAN
(Showing Reinforcing Steel)

Scale: 1/8" = 1'-0" unless otherwise noted
NOTES:

- Each terminal wall shall be cast as one piece.
- Terminal walls are detalled to take guard rail attachment GR-105.
- All beams for concrete on this sheet shall be 2" x 4".
- Wood edging with 1" radius may be used in lieu of beams along top of terminal wall.
- The Contractor at his option may substitute Concrete Class A2 for Concrete Class A3 at no additional cost to the Department in accordance with Section 229 of VDHBT Specifications.
- For Reinforcing Steel Schedule, Section E-1 and Section G-5 see sheet B.
- Quantities include all concrete and reinforcement in four (4) terminal walls and wood rails. These quantities are included with omission quantities.
- Holes, where shown, shall be formed with sleeves of ⅛" dia. nominal pipe.

ESTIMATED QUANTITIES**

Concrete Class A3 104 CS
Reinforcing Steel 1200 Lbs.
*All bars shall be epoxy coated.*

**REINFORCING STEEL SCHEDULE**

<table>
<thead>
<tr>
<th>Bar</th>
<th>No.</th>
<th>Dia.</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>RVO40</td>
<td>106</td>
<td>3/8</td>
<td>RVO40</td>
</tr>
<tr>
<td>RVO40</td>
<td>106</td>
<td>3/8</td>
<td>RVO40</td>
</tr>
<tr>
<td>RVO40</td>
<td>106</td>
<td>3/8</td>
<td>RVO40</td>
</tr>
<tr>
<td>RVO40</td>
<td>106</td>
<td>3/8</td>
<td>RVO40</td>
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<tr>
<td>RVO40</td>
<td>106</td>
<td>3/8</td>
<td>RVO40</td>
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<tr>
<td>RVO40</td>
<td>106</td>
<td>3/8</td>
<td>RVO40</td>
</tr>
</tbody>
</table>

**SECTION A-A**

Alternate Reinforcing Steel

Scale 1"=1'-0"

Gross Concrete Quantities (CY)=3,000

(All concrete above roadway slabs)

**SECTION B-B**

Gusset detail for both sides of parapet.

**SECTION C-C**

Deflection Joint detail for both sides of parapet.

**SECTION D-D**

End of Parapet for Flared Terminal Wall

For Flared Terminal Wall, see sheet 7.

**ABUTMENTS A**

**ABUTMENT B**

ELEVATION

Scale 1"=1'-0"

NOTES:

- Flush edges with 1" radius may be used in lieu of bevels along top of parapet.
- For details of Flared Terminal Wall, see sheet 7.
- The parapets, RVO40, RVO40, RVO40, RVO40, and RVO40, shall be spaced and detailed in accordance with the requirements of this sheet and the requirements of the Flared Terminal Wall.
- The parapets shall be spaced at 1'-0" on center.
- The parapets shall be spaced at 1'-0" on center.

When the bridge roadway is sloped, the cross slope is 1% per ft. The parapet section dimensions are horizontal and parallel to the bridge roadway, and the parapet section dimensions are parallel to and perpendicular to the roadway surface.

**SECTION A-A**

Alternate Reinforcing Steel

Scale 1"=1'-0"

Gross Concrete Quantities (CY)=3,000

(All concrete above roadway slabs)

**COMPREHENSIVE LIST OF VEHICLES**

**DEPARTMENT OF HIGHWAYS AND TRANSPORTATION**

**CAST-IN-PLACE CONCRETE PARAPET**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Date</th>
<th>Sheet No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>262-37</td>
</tr>
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</table>

Rev: 3

May 1667

B6-33
### Reinforcing Steel Schedule

<table>
<thead>
<tr>
<th></th>
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### Dimension Table

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### Dimension Variation Table

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</tr>
</tbody>
</table>

### Bending Diagrams

![Bending Diagrams](image)

### Notes:
- All dimensions in bending schedules are in feet and inches.
- The bending schedules and the reinforcing steel are to be used as a guide. Final steel quantities are to be determined by the contractor and are subject to change. Any discrepancies in the bending schedules, industry standards, or construction practices may require adjustments in the bending schedules. The bending schedules are intended as a guide for construction purposes and may not be used as a substitute for the contractor's technical requirements. The bending schedules are subject to change without notice and may be modified to meet the needs of the project.
APPENDIX B: DEAD LOAD CALCULATIONS
Uniform DC2 Load for Parapet

\[ g_{\text{conc}} = 150 \text{ pcf} \]

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>3.00 in</td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td>10.00 in</td>
<td></td>
</tr>
<tr>
<td>H3</td>
<td>19.00 in</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>32.00 in</td>
<td></td>
</tr>
<tr>
<td>W1</td>
<td>7.00 in</td>
<td></td>
</tr>
<tr>
<td>W2</td>
<td>2.00 in</td>
<td></td>
</tr>
<tr>
<td>W3</td>
<td>6.00 in</td>
<td></td>
</tr>
<tr>
<td>W4</td>
<td>5.00 in</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>20.00 in</td>
<td></td>
</tr>
</tbody>
</table>

Weights

\[
\begin{align*}
1 &= (7 \text{ in} + 2 \text{ in} + 6 \text{ in}) \times 3 \text{ in} / 144 \times 150 \text{ pcf} = 46.9 \text{ lb/ft} \\
2 &= 0.5 \times 7 \text{ in} \times 10 \text{ in} / 144 \times 150 \text{ pcf} = 36.5 \text{ lb/ft} \\
3 &= 2 \text{ in} \times 10 \text{ in} / 144 \times 150 \text{ pcf} = 20.8 \text{ lb/ft} \\
4 &= 0.5 \times 2 \text{ in} \times 19 \text{ in} / 144 \times 150 \text{ pcf} = 19.8 \text{ lb/ft} \\
5 &= 6 \text{ in} \times (10 \text{ in} + 19 \text{ in}) / 144 \times 150 \text{ pcf} = 181.3 \text{ lb/ft} \\
6 &= 0.5 \times 5 \text{ in} \times 32 \text{ in} / 144 \times 150 \text{ pcf} = 83.3 \text{ lb/ft} \\
\text{Total} &= 388.5 \text{ lb/ft} \\
\end{align*}
\]

Railing Weight = 0.0 lb/ft

Total Wt. with Railing = 0.389 kip/ft

1/2 Bridge Width = 16.67 ft

Width of slab analyzed, W = 1.00 ft

Parapet Load for a 1.00 ft strip = 0.389 / 16.6667 = 0.023 kip/ft
APPENDIX C: LFD & LRFD LIVE LOAD DISTRIBUTION FACTOR CALCULATIONS
LFD Live Load Distribution Factor Calculation

- AASHTO Standard Specifications for Highway Bridges, 16th Ed, 3.24.3.2 states:

"For wheel loads, the distribution width, E, shall be (4 +0.06S) but shall not exceed 7.0 feet."

Distribution Width  
(Use shortest span, conservative assumption)

Span Length, S = 43.98 feet
Distribution Width, E = 4 + 0.06*S = 6.64 feet

Is E < 7 feet? YES therefore Span length OK

Width of slab analyzed, W = 1.00 feet

Distribution Factor for Moment

Distribution Factor, DF_M = W / E = 0.151

Distribution Factor for Shear

- AASHTO Standard Specifications for Highway Bridges, 16th Ed, 3.24.4 states:

"Slabs designed for bending moment in accordance with Article 3.24.3 shall be considered satisfactory in bond and shear."

Therefore, distribution factors for shear will be ignored.
LRFD Live Load Distribution Factor Calculation

NOTES

1. All References taken from AASHTO LRFD Bridge Design Specifications, 4th ed.
2. Assumes all spans are greater than 15 feet and therefore Table 4.6.2.1.3-1 does not apply.

INPUT

<table>
<thead>
<tr>
<th>Total Number of Spans =</th>
<th>4.00</th>
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</thead>
<tbody>
<tr>
<td>Physical Span 1 Length, $L_1 =$</td>
<td>43.98 ft</td>
</tr>
<tr>
<td>Physical Span 2 Length, $L_2 =$</td>
<td>55.00 ft</td>
</tr>
<tr>
<td>Physical Span 3 Length, $L_3 =$</td>
<td>55.00 ft</td>
</tr>
<tr>
<td>Physical Span 4 Length, $L_4 =$</td>
<td>43.98 ft</td>
</tr>
<tr>
<td>Width of Slab Analyzed, $W_s =$</td>
<td>12.00 in</td>
</tr>
<tr>
<td>Physical Edge-to-Edge Width, $W =$</td>
<td>33.33 ft</td>
</tr>
<tr>
<td>Curb-to-Curb Width, $w =$</td>
<td>30.00 ft</td>
</tr>
<tr>
<td>Barrier Width, $B_b =$</td>
<td>20.00 in</td>
</tr>
<tr>
<td>Skew Angle, $\theta =$</td>
<td>15.00</td>
</tr>
</tbody>
</table>

EQUIVALENT WIDTH BASED ON 4.6.2.3

Skew Reduction Factor

\[ r = 1.05 - 0.25 \cdot \tan(\theta) \leq 1.00 = 1.05 - 0.25 \cdot \tan(15.00^\circ) \leq 1.00 = 0.983 \]  

4.6.2.3

<table>
<thead>
<tr>
<th>Interior Strip: Single Lane Distribution Factor for Moment and Shear (4.6.2.3)</th>
<th>Span 1</th>
<th>Span 2</th>
<th>Span 3</th>
<th>Span 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Span Length, $L_1 \leq 60 =$</td>
<td>43.98</td>
<td>55.00</td>
<td>55.00</td>
<td>43.98 ft</td>
</tr>
<tr>
<td>Physical Edge-to-Edge Width, $W =$</td>
<td>33.33</td>
<td>33.33</td>
<td>33.33</td>
<td>33.33 ft</td>
</tr>
<tr>
<td>Modified Edge-to-Edge Width, $W_1 \leq 30 =$</td>
<td>30.00</td>
<td>30.00</td>
<td>30.00</td>
<td>30.00 ft</td>
</tr>
<tr>
<td>Equivalent Width, $E_{11} =$</td>
<td>10.0 + 5.0 \cdot (L_1 \cdot W) \cdot 0.5</td>
<td>10.0 + 5.0 \cdot (43.98 \cdot 30.00) \cdot 0.5 = 191.62 in</td>
<td>213.10 in</td>
<td>213.10 in</td>
</tr>
</tbody>
</table>

4.6.2.3-1

| Distribution Factor, $DF_1 = r \cdot (W_s / E_{11}) =$ | 0.98 \cdot (12.00 in / 191.62 in) = | 0.062 | 0.055 | 0.055 | 0.062 |

<table>
<thead>
<tr>
<th>Interior Strip: Multi-Lane Distribution Factor for Moment and Shear (4.6.2.3)</th>
<th>Span 1</th>
<th>Span 2</th>
<th>Span 3</th>
<th>Span 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Span Length, $L_1 \leq 60 =$</td>
<td>43.98</td>
<td>55.00</td>
<td>55.00</td>
<td>43.98 ft</td>
</tr>
<tr>
<td>Physical Edge-to-Edge Width, $W =$</td>
<td>33.33</td>
<td>33.33</td>
<td>33.33</td>
<td>33.33 ft</td>
</tr>
<tr>
<td>Modified Edge-to-Edge Width, $W_1 \leq 60 =$</td>
<td>33.33</td>
<td>33.33</td>
<td>33.33</td>
<td>33.33 ft</td>
</tr>
<tr>
<td>Curb-to-Curb Width, $w =$</td>
<td>30.00</td>
<td>30.00</td>
<td>30.00</td>
<td>30.00 ft</td>
</tr>
<tr>
<td>No. of Design Lanes, $N_1 =$</td>
<td>$w / 12 =$</td>
<td>$3.611.1$</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Use the Lesser of the two values for $E$:

- Equivalent Width, $E_{IM1} =$ \[ 84.0 + 1.44 \cdot (L_1 \cdot W) \cdot 0.5 \] \[ 4.6.2.3-2 \]
- Equivalent Width, $E_{IM1} =$ \[ 84.0 + 1.44 \cdot (43.98 \cdot 33.33) \cdot 0.5 = 139.14 \text{ in} \]  

OR

- Equivalent Width, $E_{IM2} =$ \[ 12.0 \cdot W / N_1 \] \[ 4.6.2.3-2 \]
- Equivalent Width, $E_{IM2} =$ \[ 12.0 \cdot (33.33 / 2) = 200.00 \text{ in} \]

Equivalent Width, $E_{IM} = \text{MIN}(E_{IM1}, E_{IM2}) = \text{MIN}(139.14 \text{ in}, 200.00 \text{ in}) = 139.14 \text{ in}  

| Distribution Factor, $DF_2 = r \cdot (WA / E_{IM}) =$ | 0.98 \cdot (12.00 in / 139.14 in) = | 0.085 | 0.081 | 0.081 | 0.085 |
Exterior Strip: Single/Multi Lane Distribution Factor for Moment and Shear (4.6.2.1.4b)

Use the minimum strip width, \( w_{MIN} \), from 4.6.2.3:

\[
w_{MIN} = \text{MIN}(E1, EIM) = \text{MIN}(191.62 \text{ in}, 139.14 \text{ in}) = 139.14 \text{ in}
\]

Use the Minimum of the three values for \( E \):

Effective Width, \( E_{E1} = Bw + 12 + 0.25 * w_{MIN} = 20.00 + 12 + 0.25 * (139.14 \text{ in}) = 66.78 \text{ in} \)

OR

Effective Width, \( E_{E2} = 0.5 * w_{MIN} = 0.5 * (139.14 \text{ in}) = 69.57 \text{ in} \)

OR

Effective Width, \( E_{E3} = 72 \text{ in} \)

Effective Width, \( EE = \text{MIN}(E_{E1}, E_{E2}, E_{E3}) = 66.78 \text{ in} \)

Distribution Factor, \( DF_1 = r * (W_A / E_{E}) * 0.5 \)

**Distribution factor has been multiplied by 0.5 due to the fact that an exterior strip is assumed to support one line of wheels and a portion of the lane where appropriate per 4.6.2.1.4b.**

**DISTRIBUTION FACTOR SUMMARY FOR MOMENT AND SHEAR**

<table>
<thead>
<tr>
<th>Span</th>
<th>(Interior) 4.6.2.3</th>
<th>(Exterior) 4.6.2.1.4b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Lane</td>
<td>Multi Lane</td>
</tr>
<tr>
<td>1</td>
<td>0.062</td>
<td>0.085</td>
</tr>
<tr>
<td>2</td>
<td>0.055</td>
<td>0.081</td>
</tr>
<tr>
<td>3</td>
<td>0.055</td>
<td>0.081</td>
</tr>
<tr>
<td>4</td>
<td>0.062</td>
<td>0.085</td>
</tr>
</tbody>
</table>

**Single-Lane Distribution Factor for Deflection**

No. of Design Lanes, \( N_L \) = 1 Lane

Lane width, \( W_L = 12.00 \text{ ft} \) 3.6.1.1.1

Width of Slab Analyzed, \( W_A = 1.00 \text{ ft} \)

Multiple Presence Factor, \( m_1 = 1.2 \) Table 3.6.1.1.2-1

Single Lane, Deflection Distribution Factor, \( DF_{D1} = m_1 * N_L / (N_L * W_L / W_A) \)

\[
DF_{D1} = 1.2 * (1 \text{ lanes}) / (1 \text{ lanes} * 12.00 \text{ ft} / 1.00 \text{ ft}) = 0.100
\]

**Multi-Lane Distribution Factor for Deflection**

No. of Design Lanes, \( N_{LM} \) = 2 Lane(s)**

Lane width, \( W_L = 12.00 \text{ feet} \) 3.6.1.1.1

Width of Slab Analyzed, \( W_A = 1.00 \text{ feet} \)

Multiple Presence Factor, \( m_M = 1.0 \) Table 3.6.1.1.2-1

Multi-Lane, Deflection Distribution Factor, \( DF_{DM} = m_1 * N_{LM} / (N_{LM} * W_L / W_A) \)

\[
DF_{DM} = 1.0 * (2 \text{ lanes}) / (2 \text{ lanes} * 12.00 \text{ ft} / 1.00 \text{ ft}) = 0.083
\]

**For multi-lane, 2 Lanes will always control since value is in the denominator. Therefore, use 2 lanes.**
APPENDIX D: VDOT LRFR RATING FORM
LOAD RATING SUMMARY FORM FOR STRUCTURES

Rte.: 00056, Tye Brook Road  
Over: Tye River  

Va. Str. No.: 1017  
Fed. ID: 12415  

County: Nelson  
District: Lynchburg  

Rated By: ABC Date: 09/14/11  
Checked By: DEF Date: 10/12/11  

Calculation Tools/Method Used: Virtis 6.2 – Virtis LRFR Engine  
Basis for Rating: Conversion to LRFR  

<table>
<thead>
<tr>
<th>DESIGN LOAD</th>
<th>GFW (TONS)</th>
<th>RATING FACTOR</th>
<th>CONTROLLING MEMBERS</th>
<th>CONTROLLING LOCATION (FT)</th>
<th>CONTROLLING FORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>***HL-93 (INV)</td>
<td>N/A</td>
<td>1.17</td>
<td>Interior Slab</td>
<td>Span 4 – 19.56'</td>
<td>STR I – Conc. Flexure</td>
</tr>
<tr>
<td>***HL-93 (OPR)</td>
<td>N/A</td>
<td>1.52</td>
<td>Interior Slab</td>
<td>Span 4 – 19.56'</td>
<td>STR I – Conc. Flexure</td>
</tr>
</tbody>
</table>

| HS-20 (INV)  | 36         | 54            | Interior Slab       | Span 4 – 19.56'           | STR I – Conc. Flexure |
| HS-20 (OPR)  | 36         | 70            | Interior Slab       | Span 4 – 19.56'           | STR I – Conc. Flexure |

<table>
<thead>
<tr>
<th>LEGAL LOADS</th>
<th>TONS</th>
<th>**</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VA Type 3</td>
<td>27</td>
<td>70</td>
<td>Interior Slab</td>
<td>Span 4 – 13.98'</td>
</tr>
<tr>
<td>VA Type 3S2</td>
<td>40</td>
<td>100</td>
<td>Interior Slab</td>
<td>Span 4 – 26.38'</td>
</tr>
<tr>
<td><em>.</em> LANE</td>
<td>40</td>
<td>163</td>
<td>Interior Slab</td>
<td>Span 4 – 5.99'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PERMIT LOAD</th>
<th>TONS</th>
<th>**</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BP-90</td>
<td>45</td>
<td>86</td>
<td>Interior Slab</td>
<td>Span 4 – 13.98'</td>
</tr>
<tr>
<td>BP-115</td>
<td>57.5</td>
<td>109</td>
<td>Interior Slab</td>
<td>Span 4 – 26.01'</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SH VEHICLES</th>
<th>TONS</th>
<th>**</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NRL</td>
<td>40</td>
<td>65</td>
<td>Interior Slab</td>
<td>Span 4 – 19.56'</td>
</tr>
<tr>
<td>SU4</td>
<td>27</td>
<td>58</td>
<td>Interior Load</td>
<td>Span 4 – 13.98'</td>
</tr>
<tr>
<td>SU5</td>
<td>31</td>
<td>62</td>
<td>Interior Slab</td>
<td>Span 4 – 13.98'</td>
</tr>
<tr>
<td>SU6</td>
<td>34.75</td>
<td>64</td>
<td>Interior Slab</td>
<td>Span 4 – 13.98'</td>
</tr>
<tr>
<td>SU7</td>
<td>38.75</td>
<td>66</td>
<td>Interior Slab</td>
<td>Span 4 – 19.56'</td>
</tr>
</tbody>
</table>

* Not applicable for single spans less than and equal to 200 feet.  
** FOR LFR or ASD: Denote if it is a mid range or operating level for posting and provide the safe posting load.  
*** Not applicable for LF/AS rating methods.  
**** Denotes does not meet the rating requirements.
LOAD RATING SUMMARY FORM FOR STRUCTURES

INSPECTION REPORT USED FOR THIS RATING:  0621017-000000000012415  07/23/2009

ASSUMPTIONS/COMMENTS BY LOAD RATING ENGINEER:

Bridge No. 12415 – Four Span Continuous Reinforced Concrete Slab Bridge

1. 1.0’ wide section of slab analyzed.

2. Sacrificial wearing thickness = 0.5”.

3. Based on year built 1987 and the design plans 262-37:
   a. Reinforcing steel yield point = 60.0 ksi
   b. Concrete compressive strength of 4.0 ksi.

4. Based on the July 2009 inspection report there is no deterioration or other changes to warrant an IR structure.