Continuous Span Reinforced Concrete Tee Beam Bridge

As-Built Model Only

December, 2011

Virtis V6.2

DETAILED EXAMPLE

CONTINUOUS SPAN REINFORCED CONCRETE TEE BEAM BRIDGE INPUT

AS-BUILT MODEL ONLY

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AASHTOWare® Transportation Software Solutions	American Association of State Highway and Transportation Officials A Proprietary Computer Software Product
Connect	Virtis® Bridge Load Rating Version 6.2.0 Build date Sep 22 2010
Username:	virtis
Password:	
Data Source:	Virtis62s_SQLServer
[OK Cancel Help
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CREATE A NEW BRIDGE

Bridge Explo	orer (68 Virtis bridg	es retrieved for	the curre	ent fo	lder, all rows retrieved)				
🚖 All Bridges	1			BID	Bridge Id	Bridge Name	District	County	Facility
LOA	New 🕨	New Folder		1	TrainingBridge1	Training Brid	11	01	SR 0051
🗀 LOA	Import	New Bridge		2	TrainingBridge2	Training Brid	-1	-1	N/A
LOA -	Folder Dreparties			3	TrainingBridge3	Training Brid	11	01	I-79
🗄 💼 Sam	Folder Properties			4	PCITrainingBridge1	PCI TrainingB			
💼 Deleted	Rate			5	PCITrainingBridge2	PCITrainingBr			
	Report Tool			6	PCITrainingBridge3	PCI TrainingB			
	Bridge Exchange			7	PCITrainingBridge4	PCITrainingBr			
	2	1		8	PCITrainingBridge5	PCI TrainingB			
				9	PCITrainingBridge6	PCITrainingBr			
				10	Example7	Example 7 P			
				11	RCTrainingBridge1	RC Training			
				12	TimberTrainingBridge1	Timber Tr. Bri			
				13	FSys GFS TrainingBridge1	FloorSystem	06	15	NJ-Turnpike
				14	FSys FS TrainingBridge2	FloorSystem	11	333	1-95
				15	FSys GF TrainingBridge3	FloorSystem	07	06	1-95
				16	FLine GFS TrainingBridge1	FloorLine GF	01	01	I-75
				17	FLine FS TrainingBridge2	FloorLine FS	02	02	1-75
				18	FLine GF TrainingBridge3	FloorLine GF	01	01	1-95
				19	TrussTrainingExample	Truss Trainin			
				20	LRFD Substructure Example 1	LRFD Substr			
				21	LRFD Substructure Example 2	LRFD Substr			SR 4034
				22	LRFD Substructure Example 3	LRFD Substr			
				23	LRFD Substructure Example 4	LRFD Substr			
				24	Visual Reference 1	Visual Refer	01	12	I-76
				25	06070	06070	04	053	Wheeler's Po
				26	06035	06035	04	053	Halligan Park
				28	05234	05234	04	041	Route 604 WI
				30	02967	02967	01	021	South Scenic

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

A 08108					A
Bridge ID: 08108	NBI Structure ID	, (8): 08108 □ T ♥ B	emplate ridge Complete	ely Defined	a fi
	on (cont'd) Alternatives Gl	obal Reference Point Traffic			u
Name:	08108		Year Built:	1942	C
Description:	Three Span Continuous Cor E valuated by XXX	ncrete Tee-Beam Bridge			Ν
	Plan 079-18 was used for th	e analysis.			b
Location:	0.0 Shen Co.; 0.0 Fred Co	Length:	170.00	ft	S
Facility Carried (7):	John Marshall Hwy	Route Number:	00055		s
Feat. Intersected (6):	Cedar Creek	Mi. Post:			
Default Units:	US Customary				Т
					b
					te
					d
BridgeWare Association	on) 🗸 Virtis 🔽 Opis 🗌	Pontis OK	Apply	Cancel	

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.

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
Bridge ID: 08108 NBI Structure ID (8): 08108 Template Description Description (cont'd) Alternatives Global Reference Point Traffic	Fill in fields as appropriate.
District (2): Staunton	
County: Frederick	
Owner (22): State Highway Agency	
Maintainer:	
Admin. Area:	
NHS Indicator:	
Functional Class:	
BridgeWare Association Virtis V Opis Pontis OK Apply Cancel	

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

Virginia.gov onlines	Services Commonwealth Sites Help Governor Search Virgini	a.gov GO Traffic tab:
Virginia Department of Transportation	Info Center	To find the traffic data follow the link below:
Home > Info > Traffic Data Travel Center Newsroom	Contact Us Search Virgini	aDOT.org CO http://www.virginiadot. org/info/ct- TrafficCounts.asp
Info Center Business Center Programs Projects and Studies About VDOT Jobs Site Map	All of the traffic data publications that The Virginia Department of Transpor are available to the public on this web site. The most recent editions are f 2010. 2010 Traffic Data Publications 2009 Traffic Data Publications 2008 Traffic Data Publications 2006 Traffic Data Publications 2005 Traffic Data Publications 2004 Traffic Data Publications 2004 Traffic Data Publications 2003 Traffic Data Publications 2003 Traffic Data Publications 2003 Traffic Data Publications 2003 Traffic Data Publications 2002 Traffic Data Publications 2002 Traffic Data Publications 2002 Traffic Data Publications	Left click the most current year.
Report Road Problems	Historical Traffic Data Publications	





City of Franklin		×		
Frederick County	R	×	Open Link	
City of Fredericksburg	R	3	Open Link i Open Link i Save Targe Print Targe	n New Tab n New Window et As
Town of Fries	Þ	3	Show Pictu Save Pictur	re e As
Town of Front Royal	R	2	Print Pictur Go to My Pi Set as Bad	e ictures kground
City of Galax		2	Out Copy Copy Short	lcut
Town of Gate City		2	Paste Add to Fav	orites
Giles County	R	2	Append Lin Append to Convert Lin	k Target to Existing PDF Existing PDF ik Target to Adobe PDF Adobe PDE
Town of Glade Spring	R	3	Google Side Properties	ewiki

Right click the excel icon for the appropriate jurisdiction.

Left click **Save Target As...** and save the file to a desired folder on user's computer.

Open the excel file and the user can locate the proper traffic data for the structure.



	 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
BridgeWare Association Virtis Opis Pontis O Apply Cancel	Virtis computes this value based on above inputs

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

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.



NOTE:

1. 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.

2. The user can view the **Virtis/Opis - Help** window for any of the input windows shown in the example by pressing **F1** on the keyboard when a window is open.

Virtis	Bookma	Help	ns Heln					
ontents	Index	Eind	Back	Print	>2	2>		
Brid	ge D	escri	ption					
This w referen	indow al ice point	lows you . Enter	u to ente the requ	er admin iired info	nistrative prmation	informatio and click	, at the bridge. You can provide a general description, bridge alternatives, and a global ${\bf K}$ button.	Ĺ
A bridg entire rather	ge is sho bridge to than wit	own in th the enc nin the b	e schen l of the e ridge.	natic in entire br	<u>Figure 1</u> . idge. Ho	As sho wever, th	his schematic, a bridge represents a series of spans, extending from the beginning of ber of spans, the span lengths, and the pier locations are defined within the bridge altr	the ernative
Also s one an	hown in other, re	Figure 1 efer to th	are vari e <u>Gener</u>	ous oth al Bridg	er terms le Descri	used with ption. Fo	is/Opis. For additional information about these various terms, including how they rela nation about the applicable system of units, refer to <u>Units</u> .	ite to
If the c read-or linked. Bridge	urrent V nly. Dat These Ware /	irtis/Opi a fields data fiel Associat	s bridge such as ds canno tion br	is linke Bridge ot be ch utton or	ed to a co ID, NBI S nanged in n this win	rrespond Structure Virtis/Op dow.	Ige in the Pontis database, some of the input data fields on this window and its tabs v will be read-only since they must match the fields in the Pontis database if the bridg ess the link is broken by the user. The link can be made or broken by selecting the	will be je is
Engine	Related	<u>Help</u>						
Bridge	e ID							
Enter t	he bridg	e identif	ication n	umber	assigned	to the br	This must be unique within the system.	
NBI St	ructure	ID (8)						
Enter t the Fe Decem	he Natio deral Hig ber 199	onal Brid ghway A 5 Edition	ge Inven dministr ns). This	tory (Ni ation's s must	BI) struct <i>Recordin</i> be unique	ure identi g and Co e within tl	I number assigned to the bridge. This value corresponds with Item 8 – Structure Num uide for the Structure Inventory and Appraisal of the Nation 's Bridges (December 19) tem.	iber in 88 and
Temp	late							
Check part of this bo	the box the bato	if the sp h <u>Ratin</u>	pecified I g From t	oridge is he Brid	s a templ ge Exploi	ate bridge rer. If you	nplate bridges serve as templates to help develop other bridges. Template bridges are the specified bridge to be part of the batch <u>Rating From the Bridge Explorer</u> , do not c	e not heck



SELECT MATERIAL PROPERTIES

🖥 Bridge Workspace - 08108 🛛 🗖 🔀								
= 🕰 08108								
🚊 ···· 🧰 Materials								
🔤 Structural Steel								
····· 🚞 Concrete								
🔤 Reinforcing Steel								
🦳 Prestress Strand								
🗄 ····· 🧰 Timber								
🗄 🚥 💼 Beam Shapes								
🗄 … 🚞 Appurtenances								
📑 Impact / Dynamic Load Allowance								
🗄 🚥 Factors								
SUPERSTRUCTURE DEFINITIONS								
BRIDGE ALTERNATIVES								

Expand the Materials folder.

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

🕰 Bridge Materials - Concrete										
Name: Des	scription:									
Compressive strength at 28 days (f'c) =	ksi									
Initial compressive strength ("ci) =	ksi									
Coefficient of thermal expansion =	0.0000060000 1/F									
Density (for dead loads) =	kcf									
Density (for modulus of elasticity) =	kcf									
Modulus of elasticity (Ec) =	ksi									
Initial modulus of elasticity =	ksi									
Poisson's ratio =	0.200									
Composition of concrete =	Normal									
Modulus of rupture –	ksi									
Shear factor =	1.000									
Copy from Library OK Apply Cancel										

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.

Library Data: Materials - Concrete											
Name	Description	Library	Units	fc	fci	alpha	DL Density	Modulus Density	Modulus of Elasticity	Poisson's Ratio	Modulus of Rupture
1900 to 1989	Built 1900 to 1989 - Concret	Agenc	US Cu	3.000		0.000	0.150	0.145	3155.92	0.200	0.416
1990 to 2000	Built 1990 to 2000 - Concret	Agenc	US Cu	4.000		0.000	0.150	0.145	3644.15	0.200	0.480
A3 Concrete	Class A3 Concrete	Agenc	US Cu	3.000		0.000	0.150	0.145	3155.92	0.200	0.416
A3 Tremie	Class A3 Tremie Concrete	Agenc	US Cu	3.000	0.180	0.000	0.150	0.150	3320.56	0.200	0.416
A4 Concrete	Class A4 Concrete	Agenc	US Cu	4.000		0.000	0.150	0.145	3644.15	0.200	0.480
A5 Concrete	Class A5 Concrete	Agenc	US Cu	5.000	4.000	0.000	0.150	0.145	4074.28	0.200	0.537
Class A	Class A cement concrete	Standa	SI/Me	28.00		0.000	2400.0	2320.00	25426.08	0.200	3.33
Class A (US)	Class A cement concrete	Standa	US Cu	4.000		0.000	0.150	0.145	3644.15	0.200	0.480
Class B	Class B cement concrete	Standa	SI/Me	17.00		0.000	2400.0	2320.00	19811.84	0.200	2.60
Class B (US)	Class B cement concrete	Standa	US Cu	2.400		0.000	0.150	0.145	2822.75	0.200	0.372
Class C	Class C cement concrete	Standa	SI/Me	28.00		0.000	2400.0	2320.00	25426.08	0.200	3.33
Class C (US)	Class C cement concrete	Standa	US Cu	4.000		0.000	0.150	0.145	3644.15	0.200	0.480
								OK	Appl	y [Cancel

Left click the appropriate concrete properties and left click the **OK** to accept.



A Bridge Materials - Concrete			(_ 🗆 🖂	Left click OK to accept
					and close.
Name: 1900 to 1989	Descrip	otion: Built 19	900 to 1989 - Concrete Unknow	'n	
Compressive strength at 28	days (f'c) = 3	000	ksi		
Initial compressive stra	ength (f'ci) =		ksi		
Coefficient of the mal	expansion = 0	0000060000	1/F		
Density (for d	ead loads) = 0	150	kcf		
Density (for moduus of	elasticity) = 0	145	kcf		
Modulus of ela	sticity (Eic) = 3	155.92	ksi		
Initial modulus o	f elasticity = 0	.00	ksi		
Pois	son's ratio = 0	.200			
Composition of	concrete =	lormal			
Modulus	of rupture – 0	.416	ksi		
SF SF	ear factor = 1	.000			
	Copy from Libra	ry) C	DK Apply (Cancel	



Repeat the process for Reinforcing Steel.

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

A Bridge Materials - Reinforcing Steel	_ 🗆 🔀
Name: Description:	
Material Properties	
Specified yield strength (Fy) = ksi	
Modulus of elasticity (Es) = ksi	
Ultimate strength (Fu) = ksi	
Type ③ Plain ○ Epoxy ○ Galvanized ○ Other	
Copy from Library	Apply Cancel

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.



Name	Description	Library	Units	Fy	Fu	Es	
1955 to 1989	Built 1955 -	Agenc	US Cu	40.00	70.00	29000	
1990 to 2000	Built 1990 t	Agenc	US Cu	60.00	90.00	29000	
Grade 300	300 MPa rei	Standa	SI/Me	300.0	500.0	19994	
Grade 350	350 MPa rei	Standa	SI/Me	35 <mark>0.</mark> 0	550.0	19994	
Grade 40	40 ksi reinf	Standa	US Cu	40.00	70.00	29000	
Grade 400	400 MPa rei	Standa	SI/Me	400.0	600.0	19994	
Grade 50	50 ksi reinf	Standa	US Cu	50. <mark>0</mark> 0	80.00	29000	
Grade 500	500 MPa rei	Standa	SI/Me	500.0	700.0	19994	
Grade 60	60 ksi reinf	Standa	US Cu	60. <mark>0</mark> 0	90.00	29000	
Grade 75	75 ksi reinf	Standa	US Cu	75.00	100.0	29000	
Prior to 1954	Built prior to	Agenc	US Cu	33.00	60.00	29000	
Structural or unknown grade prior 1954	Structural o	Standa	US Cu	33. <mark>0</mark> 0	60.00	29000	

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

A Bridge Materials - Reinforcing Steel	Type: User can
Name: Prior to 1954 Description: Built prior to 1954 - Steel Unknown	the reinforcing steel is Plain , Epoxy ,
Material Properties	Galvanized or
Specified yield strength (Fy) = 33.000 ksi	Other. For this
Modulus of elasticity (Es) = 29000.00 ksi	example, select
Liltimate strength (Fu) = 60.000 ksi	Fidili.
Type O Plain Epoxy G alvanized O Other	Left click OK to accept and close.
Copy from Library OK Apply Cancel	



DEFINE APPURTENANCES

The user can define parapets, medians, railing, and generic appurtenances. For parapets and medians, the user enters dimensions and a unit weight and Virtis computes the distributed load in kip/ft.

For the railing and generic definitions, the user must manually calculate a distributed load.



Width: Enter the overall width of the barrier from the edge of deck to the inside face of the barrier (4 ft + 8 ft + 0.6667 ft + 1.125 ft - 13 ft = 0.7917 ft = 9.50 in).

Barrier Load: User must calculate the barrier load. See Appendix B for the calculation.

Click **OK** to accept and close.



SELECT IMPACT / DYNAMIC LOAD ALLOWANCES



Double click Impact / Dynamic Load Allowance to open.

🚇 Bridge Impact / Dynamic Load Allowance 💶 🗖 🔀
Standard Impact Factor For structural components where impact is to be included per AASHTO 3.8.1, choose the impact factor to be used:
Standard AASHTO impact = L + 125
O Modified impact = times AASHTO impact
◯ Constant impact override = 📃 🌫
LRFD Dynamic Load Allowance
Fatigue and fracture limit states: 15.0 $_{st}$
All other limit states: 33.0 \gtrsim
OK Apply Cancel

15.0% and 33.0% are AASHTO LRFD defaults.

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



SELECT FACTORS



actors - L	RFR													
Name:	1													
Description:									~					
oad Factors	Legal	l Loads	Perm	it Loads	Con	prete	Steel	Wood						
Bridge Type:	Stee	:				~								
	Dead	Load	Desig	n Load				Ve	hicle			 		-
Limit State	Deau	Invent Operation				Permit	Consider							
	DC	DW	LL	LL	LL	LL	Inv	Ор	Legal	Permit	ļ			
STRENGT					Table									
STRENGT						Table								
SERVICE II														
-														
FATIQUE														

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

a	Libra	ary Data: Factors - LRFR		
	Name 2003	Description 2003 AASHTO LRFR Specifications, including 2005 Interims	Library Standard	
	1		OK	Apply Cancel

Select the appropriate factors and left click the **OK** button to accept.



	Factors - L	RFR												.)[0	X	Left click the OK
	Name:	2000 4	AGHT	ο ιηγγ) Speci	fication	s									button to accept and
	Description:	2003 / Interim	∖ASHT ™	O LRFF	} Speci	fication	s, inclue	ding 200)5							0036.
٩	load Factors	Legal	Loads	Perm	it Load:	: Con	crete	Steel	Wood	ł					_	
	Bridge Type	Stee	I				~					 				
	Limit State	Dead	Load	Design Invent	n Load Opera	Legal	Permit		Ve Con	hicle sider						
		DC	DW	LL	LL	LL	LL	Inv	Ор	Legal	Permit					
	STRENGT	1.250	1.500	1.750	1.350	Table		V	 Image: A set of the set of the	V						
	STRENGT	1.250	1.500				Table				V					
	SERVICE II	1.000	1.000	1.300	1.000	1.300	1.000	V	 Image: A set of the set of the	4	V					
	FATIGUE	0.000	0.000	0.750				V								
							Сору	from Li	brary		OK	Apply	С	ancel		

VDDT Virginia Department of Transportation

CREATE SUPERSTRUCTURE DEFINITIONS





Name:	AS-BUILT		Frame Struct	ture efinition
Description:			Deck type: Concrete	•
Default Units: Number of spans: Number of girders:	US Customary 3 * 4 *	Enter Span Lengths Along the Reference Line: Span Length (ft) 1 50.00 2 69.00 3 50.00	For PS only Average humi	dity: ypes
			P/S ■ R/C	

Fill out the following fields:

Name: AS-BUILT

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

Deck Type: Concrete

Number of Spans: 3

Number of Girders: Enter the number of beams in the bridge cross section. For this example, enter 4 beams.

Span Length (ft): Enter the CL BRG to CL pier length for exterior spans and CL pier to CL pier lengths for interior spans. For this example, enter **50.00** ft for spans 1 and 3 and **69.00** for span 2.

Member Alt. Types: Select R/C since a reinforced concrete tee beam is rated.



🕰 Girder System Superstructure Definition	Eeft cli	ick the
Definition Analysis Engine Factor Override LRFD	Analy	sis tab:
LRFD factors:		
LRFR factors:		
 Structural Slab Thickness Consider structural slab thickness for rating Consider structural slab thickness for design 		
Wearing Surface Consider wearing surface for rating Consider wearing surface for design		
OK Apply Cane	e	

Factor Override: None selected. Factor Override allows you to override the System Defaults library factors with a set of factors that have been entered for this bridge only. Factor overrides will remain when files are imported into future versions of Virtis. Unless factors specific to the bridge are required, overrides are not recommended as they can prevent updates to System Defaults in future versions (e.g., legal load SHV factors in the MBE).

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.

Consider wearing surface for rating: Check this box if the wearing surface should be included in the dead load for rating. If this box is not checked, the rating will ignore any wearing surface input.

Consider wearing surface for design: Check this box if the wearing surface should be included in the dead load for design. If this box is not checked, the design will ignore any wearing surface input.

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



SELECT IMPACT / DYNAMIC LOAD ALLOWANCES



Double click **Impact / Dynamic Load Allowance** to open.

🙈 Structure Definition Impact / Dynamic 🖃 🗖 🔀
Standard Impact Factor For structural components where impact is to be included per AASHTO 3.8.1, choose the impact factor to be used:
Standard AASHTO impact = L + 125
O Modified impact =timesAASHTO mpact
◯ Constant impact override = 📃 👷
LHFD Dynamic Load Allowance
Fatigue and fracture limit states 15.0 $_{\%}$
All other limit states 33.0 $\%$
OK Apply Cancel

15.0% and 33.0% are AASHTO LRFD defaults.

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



DEFINE LOAD CASES



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

🕰 Load Case Description			
Load Case Name Description	Stage Type Time* (Days)		
*Prestressed members only	Add Default Load Case Descriptions	New Duplicate	Delete
		ОК Арріу (Cancel

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 stayin-place forms acting on non-composite section. These default load cases can be edited and modified as desired.



<u>a</u>	A Load Case Description									Left click the OK
]	button to accept and
	Load Case Name	Description	Stage	Туре	Time* (Days)					close.
	DC1	DC acting o	No 🗡	D,D <u>~</u>						
	DC2	DC acting o	Co 🚩	D,D <u>~</u>						
	DW	DW acting	Co 🚩	D,D <u>~</u>						
	SIP Forms	Weight due	No 🗡	D,D <u>~</u>						
	 *Prostronged memb	oro oplu								
	Freshessed memo	iers only	Add D Case [efault L Descript	oad ions		New	Duplicate	Delete	
							OK	Apply	Cancel	



DEFINE FRAMING PLAN DETAIL



Double click **Framing Plan Detail** to open the framing plan detail window.

•	Structure Framing Plan	Details				_ 🗆 🔀	L
			Nu	imber of spa	ns = 3	Number of girders = 4	F
	Support Skew (Degrees) 1 0.0000 2 0.0000 3 0.0000 4 0.0000	Girder Pe Alc Girder Ray 1 2 3	Spacing Crient rpendicula: to <u>o</u> ong suppor: Girder Sp (ft) Stort of Girder 8.00 8.00 8.00 8.00	acing Erd of Grder 8.00 8.00 8.00			\$
					СК	Apply Cancel	

_ayout Tab:

Fill out the following fields:

Skew (Degrees): Enter the AASHTO skew angle for the bridge per the design plans (See Appendix A). For this example, enter **0.000°** at all supports.

Note: Enter clockwise rotation as a positive value.

Girder Spacing Orientation: If the girder spacings are constant along the length of the bridge, the user should select **Perpendicular to Girder** (as done in this example). If the girder spacings vary, **Along Support** may be selected.

Girder Spacing (ft), Start of Girder: Enter the girder spacing from CL of beam to CL of beam. Enter **8.00 ft** for all bays for this example.



Structure Fram <mark>ing</mark> Plan Details				
avout Diaphragms)	Number of spans	= 3	Number of girders = 4	
Girder Bay: 1	Сору Вау То	Diaphragm Wizard		
Support Start Distance (ft) Left Girder Right Girder	Diaphragm Spacing (ft) of Space	r Length ss (ft)	End Distance (ft) Left Girder Right Girder	Load (kip)
			New Dupica	te Delete
				ply Cancel

Left click the **Diaphragms** tab and left click the **New** button.

ructure	e Framing Pla	an Details								
Number of spans = 3 Number of girders = 4										
iout (Di	aphragms									
irder Bay	t 1	•	Сору Вау То		Diaphragm Wizard					
Support	Start Di	istance t)	Diaphragm Spacing	Number	Length	End Dis (f	stance t)	Load		
umber	Left Girder	Right Girder	(ft)	of Spaces	(π)	Left Girder	Right Girder	(KIP)		
1 🗠	0.00	0.00	0.00	1	0.00	0.00	0.00	5.8750		
2 🛩	0.00	0.00	0.00	1	0.00	0.00	0.00	3.8750		
3 🚩	0.00	0.00	0.00	1	0.00	0.00	0.00	3.8750		
3 🚩	50.00	50.00	0.00	1	0.00	50.00	50.00	5.8750		
						New	Duplicate	e Delete		
						Π	K An			

Girder Bay: Select Bay 1

Support Number: For the selected girder bay, select the number of the support from which the range will be dimensioned.

Start Distance (ft): For the selected girder bay, enter the distance along the centerline of girder from the selected support to the left end of the range. For each row, a diaphragm is not placed at the start distance. A diaphragm is placed at each space within the range, including the end distance.

Left Girder: Enter the start distance for the left girder in the selected girder bay (looking ahead station) for the diaphragm definition.

Right Girder: Enter the start distance for the right girder in the selected girder bay (looking ahead station) for the diaphragm definition.

Diaphragm Spacing (ft): For the selected girder bay, enter the spacing between adjacent diaphragms within the given diaphragm group. Diaphragm spacings must be equal within a given group.



For skewed structures, the location along the left girder will not be the same as the right girder unless the diaphragms are laid out parallel to the skew.

Number of Spaces: For the selected girder bay and diaphragm group, enter the number of spaces, beginning at the left diaphragm of the group, that are of equal spacing and that define a diaphragm location.

If the diaphragm spacing for the left girder is different than the diaphragm spacing for the right girder, enter 1 for the number of spaces and enter each diaphragm location individually in separate rows.

Load (kip): Enter the load of an individual diaphragm, which will be distributed to each beam equally by the program. See calculation below.

Concrete Diaphragm Weight Calculation

Weight/diaph	5.875	k	Weight/diaph	3.875	k
vvt/cr	0.150	кст	wt/cf	0.150	кст
14/4/25	0.150	l. of	1A/# / = f	0.150	l. of
Cubic Feet	39.167		Cubic Feet	25.833	
Depth	70.500	in	Depth	46.500	in
Width	12.000	in	Width	12.000	in
Length	80.000	in	Length	80.000	in
Diaphragms at Abutr	<u>ments</u>		<u>Diaphragms at Piers</u>		

For this example, enter the four lines of ranges shown on the previous sheet that define the diaphragm locations at all supports.

Left click **Apply** on the **Structure Framing Plan Details** window.

If the diaphragm locations and loads are identical for other bays, the user can use the **Copy Bay to...** function.

Copy Diaphragm Bay						
Select the new bay:	2 🗸					
C	Apply Cancel					

For this example, left click the **Copy Bay to...** button and the **Copy Diaphragm Bay** window will open. Select bay **2** and left click **Apply**. Then, left click **Apply** on the **Structure Framing Plan Details** window.

Repeat this process for bay 3.

Left click OK on the Structure Framing Plan Details window to accept and close.





The user can compare the entered data to the design plans by right clicking **Framing Plan Detail** and selecting **Schematic**.

A schematic of the framing plan will appear that can be compared to the framing plan in the design plans.

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DEFINE STRUCTURE TYPICAL SECTION

Double click **Structure Typical Section** to open the Structure Typical Section window.

Structure Typical Section				
Distance from left edge superstructure definitio	e of deck to † Dist- n ref. linesupe	ance from right edge of dec erstructure definition ref. line	sk to e	
De De	eck 🖕 S ckness F	Superstructure Definition Reference Line	Δ	
Left overhang k	Railing Generic	Sidewalk Lane Position	, Right overhang I Wearing Surface	
Superstructure definition reference line is	within	👽 the bridge deck.		
Distance from left edge of deck to superstructure definition reference line =	Start 13.79 ft	End 13.79 (t		
Distance from right edge of deck to superstructure definition reference line =	1 3.79 ft	13.79 _{(t}		
Left overhang =	1.79 ft	1.79 ít		
Computed right overhang =	1.79 ft	1.79 ft		

Deck Tab:

Superstructure definition reference line is: User can select either within, to the left of, or to the right of the bridge deck. For this example, select within since the reference line will be placed at the CL of the deck.

Distance from left edge of deck to superstructure definition reference line: To define the reference line at the bridge CL divide the deck out-to-out width by two. For this example, enter **13.7917 ft** (27.5833 ft / 2).

Distance from left edge of deck to superstructure definition reference line: 13.7917 ft.

Note: Since the bridge deck width does not vary along the length of the bridge, the distance at the start and end will be equal.



Left Overhang: Distance from the CL of exterior beam to the edge of deck. For this example, enter **1.7917** ft.

Computed Right Overhang: This value is computed by Virtis and can be used to verify the input above.

Distance fir superstruct H	nm eft edge o ure defnition i Deck ↓ thick †	If deck to Dis:ance from right edge of dack to ef. line superstructure definition ref. line Superstructure Delinition Reference Line	
eck Deck [Cont'd] Farapet	Median R	allinc Generic Sidewalk Lane Position Wearing Surface	
Deek concrete:	1900 to 198	9	
Total deck thickness:	7.5000	in	
Deck crack control parameter:	130.000	kip/in	
Sustained modular latio factor	2.300		
Deck exposure factor	1.300		
		ИК Дррју) [Lancel

Deck (Cont'd) Tab:

Deck Concrete: Select the appropriate concrete definition.

Total Deck Thickness: 7.5 in.

Deck Crack Control Parameter: Enter 130.00 kip/in since the top of the deck slab is directly exposed to environmental elements. For surfaces not directly exposed to the environment, such as the bottom of the deck, 170.00 kip/in is to be used.

Sustained Modular Ratio Factor: 2.00 for concrete members.

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



tructure Typical Section		- Generic Shape		
	Bask	Front		
eck. Deck (Cont'd) Parape:	Mediar Railing Gene	ic Sidewalk Lane Position V	Wearing Surface	
Name	Load Case Measure To	Edge of Deck Distance At Dist. Measured Starl From (ft)	Eistance At Erd (ft)	ace tion
Concrete Railing and Posts	DC2 M Back M	Left Edge 20.00	0.00 Right	<u>×</u>
Concrete Railing and Posts		Right Luge 1 0.00	0.00 [LBIT	-
			New Duplicate	Delete
		ſ		

Generic Tab:

Since there is a barrier on both sides of the bridge, 2 barriers need to be entered.

Select **New** to enter a line. Duplicate to copy a line down.

Name: Select Concrete Railing and Posts from the drop down menu.

Load Case: DC2

Measure To: Back

Edge of Deck Dist. Measured from: Select the edge of the deck from which the distance is measured as either left or right, as shown in the sketch for the Deck tab. For this example, select **Left Edge** for the 1st input line and **Right Edge** for the 2nd input line.

Distance at Start: Since the back of the parapet is flush with the edge of deck, enter **0.00 ft**. for both parapets.

Distance at End: Since the back of the parapet is flush with the edge of deck, enter **0.00 ft**. for both parapets.

Front Face Orientation: Select the front face orientation as either left or right, as shown in the sketch. For this example, select **Right** for the 1st input line and **Left** for the 2nd input line.



Parapet, Median, Railing, Sidewalk, and Wearing Surface Tabs: No input for this example.



A Structure Typical Section	Lane Position Tab:
IA) IA) IA) I A) I A)	Left click the Compute button.
Deck Deck (Cont'd) Parapet Median Railing Generic Sidewak Care Position Wearing Surface Distance From Left Edge of Travelway to Superstructure Perintion Reference Line At Start (A) (ft) Distance From Left Edge of Travelway to Superstructure Definition Reference Line At Start (B) (ft) Distance From Left Edge of Travelway to Superstructure Definition Reference Line At Start (B) (ft) Distance From Left Edge of Travelway to Superstructure Definition Reference Line At Start (B) (ft) Distance From Left Edge of Travelway to Superstructure Definition Reference Line At End (A) (ft) Distance From Left Edge of Travelway to Superstructure Definition Reference Line At End (ft) Distance From Left Edge of Travelway to Superstructure Definition Reference Line At End (ft) Distance From Left Edge of Travelway to Superstructure Definition Reference Line At End (ft) Distance From Left Edge of Travelway to Superstructure Definition Reference Line At End (ft) Distance From Left Edge of At End (ft) Distance From Left Edge of Travelway to Superstructure Travelway to Superstructure At End (ft) Travelway to Superstructure At End (ft) Distance From At End (ft) Definition Reference At End	Right Edge of uperstructure sense Line d (8) Delete
Compute Lane Positions Image: Construction of the state of the sta	he Compute Lane Positions vindow will appear displaying the alues computed by Virtis. eft click Apply to accept.
A Structure Typical Section	Left click OK to accept

A Structure Typical Section				
 − −− <u></u> <u>ℓ</u>	and close.			
		welway 2		
Deck Deck (Cont'd) Parapet Medi	n Railing Generic Sidewalk	Lane Position Wearing Surf	ace	
Travelway Number	of Distance From Right Edge of ure Travelway to Superstructure e Definition Reference Line At Start (B) (ft)	Distance From Left Edge of Travelway to Superstructure Definition Reference Line At End (A) (ft)	Distance From Right Edge of Travelway to Superstructure Definition Reference Line At End (B) (ft)	
1 -13	.00 13.00	-13.00	13.00	
LRFD Fatigue Lanes available to trucks:	Compute	New	Dupicate Delete Apply Cancel	



Note: A schematic of the typical section can be viewed similar to the framing plan by right clicking the **Structure Typical Section** and selecting **Schematic**.

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DEFINE SUPERSTRUCTURE LOADS



Double click **Superstructure Loads** to open the **Superstructure Loads** window.

Uniform Temperature, Gradient Temperature, and Wind Tabs: No input required.

Superstructure Loads		DL Distribution Tab
Unitom Temperature Gradient Temperature Wind OL Distribution		
Stage 1 Dead Load Distribution ③ By tributary area		
O By transverse simple-beam analysis		
O By transverse continuous-beam analysis		
O User-defined dead load		
Stage 2 Dead Load Distribution		
Uniformly to all girders		
O By tributary area		
O By transverse simple-beam analysis		
O By transverse continuous-beam analysis		
O User-defined dead load		
	OK Apply Cancel	

Stage 1 Dead Load Distribution: Select **By tributary areas** to distribute DC1 loads based on girder spacing.

Stage 2 Dead Load Distribution: Select **Uniformly to all girders** to distribute the DC2 loads evenly to all girders. With 4 girders lines in this example, each girder will carry one-fourth of each barrier and is consistent with VDOT practice.



SPECIFY VERTICAL SHEAR REINFORCEMENT DEFINITIONS



Left click **Shear Reinforcement Definitions** to expand the folder and double click **Vertical**.

A Shear Reinforcement Definition - Vertical	Fill out the fields as appropriate based on the information in the plans (See Appendix A for the design plans).
Material: Prior to 1954 V Bar size: 9 V Number of legs: 0.50 Inclination (alpha): 90.0 Degrees	Name: S Material: Select the appropriate material from the drop down
Vertical Shear Reinforcement OK Apply Cancel	menu. Bar Size: 9

Number of Legs: 0.50, since 0.5" square bar was used. ($2 \text{ legs} * 0.25 \text{ in}^2 = 0.50 \text{ in}^2$. Compare with using No. 9 bar. 0.50 legs * 1.00 in² = 0.50 in²).

Inclination (alpha): 90.0°



SPECIFY BAR MARK DEFINITIONS



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

Name: B

Material: Select the appropriate material from the drop down menu.

Bar Size: 9

Bar Type: Select the Straight bar type even if the bar has hooks at the end or is a bent bar. 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: Use the CL-to-CL of bearing dimension for the bridge if the bar is effective for the full span length. For a bent bar, enter the middle straight length. Enter 19.00 ft.



Since the bridge has continuous spans, longitudinal reinforcement is required in the bottom and top of the beam which results in a number of unique bar mark definitions. See the summary table for a complete list of bar mark definitions and their input.

Bar Mark Definition Summary

Name	Bar Size	A Dimension
В	9	19.0000
B1	9	25.0000
B2	9	31.0000
B3	9	37.0000
B4	9	40.0000
B5	9	21.0000
B6	9	29.0000
B7	9	35.0000
B8	9	39.0000
B9	9	49.0000
B10	9	48.0000
B11	9	46.0000
B12	9	42.0000
B13	9	38.0000
B14	9	31.0000
B15	9	22.0000
B16	9	20.0000
B17	9	24.0000
B18	9	16.0000
B19	10	24.0000
B20	9	27.0000
B21	10	40.0000
B22	9	24.0000
B23	9	32.0000
B24	10	49.0000
B25	9	40.0000
L	4	169.0000
L1	4	27.8333
L2	4	12.0000
L3	4	43.6667
L4	4	29.5000
L5	4	25.0000

Note: For 1" square bars, No. 9 bars were used. Likewise, No. 10 bars were used for 1 $\frac{1}{8}$ " square bars.

Enter each definition found in the **Bar Mark Definition Summary** above. Double click on the **Bar Mark Definitions** folder each time a new definition is started and click **OK** to accept and close once the input is complete for each.



When all the bar mark definitions have been entered, the file should have the following bars defined.





CREATING A MEMBER: G1



Virtis will automatically generate the appropriate members based on the number of girders entered in the **Superstructure Definition** window.


APPLYING MEMBER LOADS



User defined dead loads can be applied to each member.

Expand member **G1** and Double click **Member Loads**.

🕰 Girder Member Loads	
Uniform Distributed Concentrated Settlement	
Load Case Name: DC1	
Span U DC1 DC2 DW SIP Forms	
	New Duplicate Delete
	OK Apply Cancel
VDDT Virginia Department of Transportation	VERSION 6.2

Uniform Tab:

Left click the dropdown menu and left click the desired dead load case. For this example, select **DC1**.

🕰 Girder Member Loads	
Uniform Distributed Concentrated Settlement	
Load Case Name: DC1	
Span Uniform Load (kip/ft) All Spans 💌 0.019	
New Duplicate	Delete
ОК Арріу	Cancel

Left click the **New** button and enter the appropriate uniform load. For this example, enter 0.019 kip/ft to account for the architectural blister on the exterior beams. See the hand calculation below.

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

DC1 LOAD FOR G1

To Account for Extra Concrete on Tee-Beam

Height =	9.000	in
Width =	2.000	in
Area = 9.00 in * 2.00 in / 12 ² =	0.125	ft²



Dist. DC1 Load = 0.125 ft² * 0.150 lb/ft³ = 0.019 kip/ft

The uniform load for the architectural blister is not entered for G4 at this time because G4 will be linked to G1 later in this example.



DEFINING SUPPORTS

🐻 Bridge Workspace - 08108 📃 🗆 🔀	Double click Supports.
Bridge Workspace - 08108 Concrete Con	Double click Supports .
BRIDGE ALTERNATIVES	



General Tab:

Select a **Roller** support type for supports 1, 2, and 4 since they are expansion supports.

Select a Pinned

support type for support 3 since it is a fixed support.

No input is required for the Elastic tab.

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

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CREATING A MEMBER ALTERNATIVE: G1



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

New Member Alternative	, 🔀
Material Type:	Girder Type:
Prestressed (Pretension 🔽	PS Precast Box 🛛 🖌
Prestressed (Pretensioned) Co Reinforced Concrete Steel Timber	procee
	OK Cancel

 New Member Alternative
 Image: Constant of the second constant of the

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

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

Left Click **OK** to accept.



scription) Factors Engine In	noort Control Oc	otions				
Description:	<u> </u>		Material	Type: Rein	forced Concret	e
			Girder	Type: Rein	forced Concret	e Tee
			Default	Units: US (Customary 🔽	
Girder property input method	End bearing	locations	r	Analysis Mo	dule	
 Schedule based Cross-section based 	Left:	in		ASD:	BRASS ASD	Y
<u> </u>	Right:	in		LFD:	Virtis LFD	~
		Default rating me	ethod:	LRFD:	Opis LRFD	~
Additional Self Load		LRFR	~	LRFR:	Virtis LRFR	~
Additional self load =	kip/ft		L			
Additional self load =	2					
Crack control parameter (Z)						
	kip/in					
Bottom of beam: 170.000						
Bottom of beam: 170.000						
Bottom of beam: 170.000 Exposure factor						
Bottom of beam: 170.000 Exposure factor Bottom of beam: 1.000						
Bottom of beam: 170.000 Exposure factor Bottom of beam: 1.000						

Member Alternative: G1

Description Tab:

Girder Property Input Method: User can select either Schedule Based or Crosssection Based.

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**.

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. Leave these fields blank for this example.

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

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

Exposure Factor: 1.000 for a Class 1 exposure condition.

Default Rating Method: LRFR

Analysis Module:

ASD: Not used for rating. Use default.

LFD: Virtis LFD

LRFD: Not used for rating. Use default.

LRFR: Virtis LRFR



No changes to the following tabs:

Factors

Engine

Import

Control Options Tab:

Select the options shown in the screen shot below.

Member Alternative: Gil		
Description Factors Engine Import Control Opt	ions	
LRFD	LRFR	
 Points of Interest Generate at tenth points Generate at section change points Generate at user-defined points Shear Computation Method Ignore General Procedure General Procedure - Appendix B5 Simplified Procedure - Vci, Vcw Distribution Factor Application Method By axle By PD1 	 Points of Interest Generate at tenth points Generate at section change points Generate at user-defined points Shear Computation Method Ignore General Procedure General Procedure - Appendix B5 Simplified Procedure - Vci, Vcw Ignore design & legal load shear Ignore permit load shear Consider permit load shear Ignore long, reinf, in rating Distribution Factor Application Method By axle By POI 	
LFD	ASD	
 Points of Interest Generate at tenth points Generate at section change points Generate at user-defined points Ignore shear Distribution Factor Application Method By axle By PD1 	 Points of Interest Generate at tenth points Generate at section change points Generate at user-defined points Shear Computation Method Ignore Use AASHTO 1973 or earlier code Use AASHTO 1974 interim Use current AASHTO 	

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



DEFINE LIVE LOAD DISTRIBUTION FACTORS



Expand the **MEMBER ALTERNATIVE** for **G1**.

G1 LRFR live load distribution factors cannot be computed from the typical section until the entire cross-section is defined. Continue with the other input for G1.



DEFINE THE GIRDER PROFILE



Double click Girder Profile.



Section Tab:

Tributary Width:

The physical width of the deck between the girders which is the Overhang + 0.5 * Girder Spacing. For G1, 21.5 in + 96 in / 2 = 69.5 in.

Total Deck Thickness: 7.50

Web Thickness at Top Flange: 16.00 in.

Web Thickness at Bottom of Beam: 16.00 in.

Chamfer Dimension, A: 7.5 in. (Average of vertical and horizontal chamfer dimensions).



Top Flange:

Material: Select the appropriate material from the drop down menu.

Modular Ratio: 9.2 (See calculation below)

Eff. Width (Std): The effective flange width for LFD. For this example, enter 69.50 in. See Appendix C for sample calculation.

Eff. Width (LRFD): The effective flange width for LRFR. For this example, enter 69.50 in. This value will equal the tributary width per AASHTO 2007 with 2008 Interims, *LRFD Bridge Design Specifications*, 4th Edition, section 4.6.2.6.

Struct. Thick.: Typically, 0.50 in. is removed from the actual thickness of the top flange. Therefore, enter 7.00 in. for this example.

Other Parts: (Other than the top flange)

Material: Select the appropriate material from the drop down menu.

Modular Ratio: 9.2 (See calculation below)

Modular Ratio Calculation

Note: References from AASHTO LRFD Bridge Design Spefications, 2007 with 2008 int.

Unit Weight of Concrete, w_c =	0.145	kip/ft ³	
Compressive Strength of Concrete, f $'_{c}$ =	3.00	ksi	
Modulus of Elasticity of Reinf. Steel, E_s =	29000	ksi	
Modulus of Elasticity of Concrete, E_c =	33,000 *	W _c ^{1.5} * f ' _c ^{0.5}	Eq. 5.4.2.4-1
E _c =	33,000 *	0.145 ^{1.5} * 3.00 ^{0.5}	
E _c =	3155.92	ksi	

Modular Ratio, n = Es / Ec	5.7.1
n = 29,000 / 3,155.92	
n = 9.2	



Web Tab:

Left click **New** to add rows. Enter rows as shown below.

A Girder Profi	ile								
Type: Reinforce	ed Concrete Tee								
Scotion	Reinforcement								
Begin Depth (in)	Depth Vary		End Depth (in)	Supp Num	oort ber	Start Distance (ft)	Length (ft)	End Distance (ft)	
75.7500	None	¥	75.75	1	Y	0.000	0.500	0.500	
75.7500	Parabolic Concave	~	36.50	1	¥	0.500	24.375	24.875	
36.5000	Parabolic Concave	Y	75.75	1	Y	24.875	24.375	49.250	
75.7500	None	Y	75.75	1	Y	49.250	1.500	50.750	
75.7500	Parabolic Concave	×	36.50	2	Y	0.750	33.750	34.500	
36.5000	Parabolic Concave	¥	75.75	2	Y	34.500	33.750	68.250	
75.7500	None	¥	75.75	2	Y	68.250	1.500	69.750	
75.7500	Parabolic Concave	Y	36.50	3	¥	0.750	24.375	25.125	
36.5000	Parabolic Concave	~	75.75	3	¥	25.125	24.375	49.500	
75.7500	None	~	75.75	3	¥	49.500	0.500	50.000	
							New Duplic	cate	Delete
								pply (Cancel

Begin Depth: The distance from the top of the deck slab to the bottom of the beam at the start of the range.

Depth Vary: User can select the Girder web depth to be constant, have a linear variation or a parabolic concave variation.

End Depth: Only available if **Linear** or **Parabolic Concave** is selected for **Depth Vary**. Otherwise, this value will equal the **Begin Depth**.

Support Number: Select the number of the support from which the range will be dimensioned.

Start Distance: The start distance for the web range.

Length: The length of the web range.

End Distance: The end distance for the web range. This value is calculated by Virtis.



Reinforcement Tab:

Left click **New** to define a reinforcement set.

Bar Mark: Select the appropriate bar mark from the drop down menu.

Invert: This option is used to change the orientation of a bent bar. However, since only straight bars are used, this box can be left unchecked.

Measured from: The user can select to measure either from the bottom or top of the girder to the reinforcement set CL.

Distance (in): Distance from either the top or bottom of the girder to the reinforcement set CL.

Std Number: The number of rebar used for LFD calculations. This input should match the number of bars shown on the design plan for the given cross-section or effective slab width.

LRFD Number: The number of rebar used for LRFR calculations. This input should match the number of bars shown on the design plan for the given cross-section or effective slab width.

Bar Spacing (in): Distance from CL of rebar to CL of rebar in the reinforcement set.

Side Cover (in): Distance from the CL of rebar to the side edge of the girder.

Support Number: Select the number of the support from which the range will be dimensioned.

Direction: Select whether the start distance is located to the left or right of the selected support number.

Start Distance (ft): Enter the distance from the left end of the range to the selected support.

Straight Length (ft): The value is entered by Virtis based on the bar mark definitions previously defined.

End Distance (ft): The value is calculated by Virtis.

Fully Developed: This field should be checked if the bar mark used has hooks or is a bent bar, and has been modeled as straight. Otherwise, it should be left unchecked.

Enter the fields as shown on the next page and left click **OK**.



🐣 Girder Profile

Type: Reinforced Concrete Tee

			-
Section	Web	Heinford	ement

1 B21 · Botom of Girder M <thm< th=""> M M <</thm<>	Set	Bar Mark	Invert	Measured From	Distance (in)	Std Number	LRFD Number	Bar Spacing (in)	Side Cover (in)	Suppor Number	t Direction	Start Distance (ft)	Straight Length (tt)	End Distance (ft)	Fully Devel oped
2 20 x Bottom of Girder 6 5000 2.00 2.00 1.000 2.00 1.000 2.00 1.000 2.00 1.000 2.00 1.000 2.00 1.000 2.00 2.00 1.000 2.	1	B21 🚩		Bottom of Girder 👱	3.0000	4.00	4.00	3.5000	2.750	1 🗡	Right 🗡	0.000	40.000	40.000	
3 819 · Bottom of Girder 6 5000 2.00 2.00 0.5000 2.75 3 Right Y 0.000 6.000 V 5 220 · Bottom of Girder 3.0000 4.00 3.000 2.20 3.800 2.75 3 Right Y 1.000 4.000 5.000 V 6 B19 · Bottom of Girder 3.0000 4.00 3.000 2.750 3 Right Y 1.000 4.000 4.000 V 7 B16 · Bottom of Girder 3.0000 4.00 4.00 3.500 2.750 2 Right Y 0.000 7.000 V 8 Bottom of Girder M 3.0000 4.00 3.500 2.750 2 Right Y 1.600 3.000 4.00 3.000 2.00 3.500 2.250 2.000 7.000 7.000 7.00 7.00 7.000 7.000 7.000 7.000 7.00 7.000 7.000 7.000 7.000 7.000 7.000 7.	2	B20 💌		Bottom of Girder 💌	6.5000	2.00	2.00	3.5000	6.250	1 🕑	Right 💌	6.000	27.000	33.000	 Image: A set of the set of the
4 Bottom of Girder N 3,0000 4,00 3,5000 2,750 3 M Right 1,0000 4,000 5,0000 7 5 Bottom of Girder M 6,5000 2,00 2,000 1,5000 2,750 1 M Right 1,7000 2,000 4,000 7 7 Bife I Bottom of Girder M 3,0000 4,00 4,000 3,5000 2,750 1 M Right 1,7000 2,0000 4,000 7 8 Bife I Bottom of Girder M 3,0000 4,00 4,00 3,5000 2,750 1 M Right 1,000 4,000	3	B19 🚩		Bottom of Girder 🕑	6.5000	2.00	2.00	10.5000	2.750	1 🗹	Right 💌	9.000	24.000	33.000	 Image: A set of the set of the
5 B20 M Detem of Girder M 6.500 2.00 3.500 6.250 3 M Right M 7000 2.000 4.000 V 7 B16 M Detom of Girder M 6.5000 2.00 1.5000 2.750 1 M Right M 0.000 4.00 4.00 8 B16 M Detom of Girder M 3.000 4.00 4.00 3.500 2.750 2 M Right M 0.000 4.00 7.00 </td <td>4</td> <td>B21 🚩</td> <td></td> <td>Bottom of Girder 💌</td> <td>3.0000</td> <td>4.00</td> <td>4.00</td> <td>3.5000</td> <td>2.750</td> <td>3 🗹</td> <td>Right 💌</td> <td>10.000</td> <td>40.000</td> <td>50.000</td> <td></td>	4	B21 🚩		Bottom of Girder 💌	3.0000	4.00	4.00	3.5000	2.750	3 🗹	Right 💌	10.000	40.000	50.000	
6 B19 M Bottom of Girder 6.5000 2.00 10.5000 2.75 3 M Right 17.000 24.000 41.000 V 7 B16 M Bottom of Girder 3.0000 4.00 3.5000 2.75 1 M Right 40.000 20.000 60.000 V 8 B16 M Bottom of Girder 3.0000 4.00 4.00 3.5000 2.75 2 M Right 59.000 40.00 45.000 10 12 10 M Top of Girder 4.23750 2.00 10.000 10.001 10.000 2.000 2.000 1 M Right 42.000 46.000 24.000 10.000 10.000 10.000 10.000 10.000 10.000 10.000 10.000 10.000 10.000 10.000 10.000 10.000 10.000 10.000	5	B20 🚩		Bottom of Girder 👱	6.5000	2.00	2.00	3.5000	6.250	3 🖌	Right 🚩	17.000	27.000	44.000	
7 B16 M Dettom of Girder M 3.0000 4.00 3.000 2.750 I M Right M 4.00 2.000 7.000 V 8 B16 Image: State St	6	B19 🚩		Bottom of Girder 🕑	6.5000	2.00	2.00	10.5000	2.750	3 🚩	Right 🚩	17.000	24.000	41.000	 Image: A set of the set of the
8 B16 M Bottom of Girder 3.000 4.00 3.500 2.750 2 Nght 59.00 20.00 79.00 V 9 B24 M Bottom of Girder 3.000 4.00 3.500 2.750 2 Night 10.001 49.00 59.000 V 10 B23 M Bottom of Girder 6.5000 2.00 2.00 3.500 6250 2 Night 12.500 24.00 4.000 4.000 50.00 V 11 B22 M Bottom of Girder 2.3750 2.00 2.00 15.000 3.000 2 Left 2.4000 4.000 2.000 V 13 B11 M Top of Girder 2.3750 2.00 2.00 3.000 1 Night 38.000 24.000 48.00 24.000 40.00 24.000 40.00 24.000 40.00 24.000 40.00 24.000 40.00 24.000 40.00 24.000 40.00 24.000 40.00 24.000 40.00 24.000 40.00 20.00 <td>7</td> <td>B16 🚩</td> <td></td> <td>Bottom of Girder 👱</td> <td>3.0000</td> <td>4.00</td> <td>4.00</td> <td>3.5000</td> <td>2.750</td> <td>1 🗡</td> <td>Right 🗡</td> <td>40.000</td> <td>20.000</td> <td>60.000</td> <td> Image: A start of the start of</td>	7	B16 🚩		Bottom of Girder 👱	3.0000	4.00	4.00	3.5000	2.750	1 🗡	Right 🗡	40.000	20.000	60.000	 Image: A start of the start of
9 B24 M Bottom of Girder X S000 4.00 3.500 2.750 2 N Noith 10.000 49.000 59.000 V 10 B23 M Bottom of Girder 6.5000 2.00 3.5000 6250 2 N Right 11.850 32.000 64.500 V V N N 11.850 32.000 64.500 V N N N 11.850 32.000 64.500 V N N N 11.80 22.500 44.000 45.000 V V N N 11.80 1.50 of Girder V 2.3750 2.00 2.00 3.000 1 W N 10.00 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.000 46.00 24.	8	B16 🚩		Bottom of Girder 👱	3.0000	4.00	4.00	3.5000	2.750	2 🗡	Right 🔛	59.000	20.000	79.000	
10 B23 M Bottom of Girder M 6.5000 2.00 3.5000 2.575 2 M Right M 18.500 32.000 46.500 V 11 B22 M Bottom of Girder M 6.5000 2.00 10.5000 2.757 2 M Right M 22.500 24.000 46.500 V 12 B10 M Top of Girder M 2.3750 2.00 2.00 15.500 3.00 2 Left W 24.000 46.000 23.000 V V 13 B11 M Top of Girder M 2.3750 2.00 2.00 3.000 1 M Right 42.000 46.000 23.000 V <	9	B24 💌		Bottom of Girder 👱	3.0000	4.00	4.00	3.5000	2.750	2 🖌	Right 💌	10.000	49.000	59.000	v
11 B22 M Bottom of Girder M 6.500 2.00 12.00 12.00 2.500 2 M Right M 22.500 24.000 46.500 V 12 B10 M Top of Girder M 2.3750 2.00 15.500 3.000 2 M Left M 24.000 46.000 24.000 14 13 B11 M Top of Girder M 2.3750 2.00 2.000 3.000 1 M Right M 2.000 62.000 V 14 B11 M Top of Girder M 2.3750 2.00 2.000 3.000 1 M Right M 2.000 63.000 3.000 1 M Right M 2.000 63.000 3.000 1 M Right M 2.000 63.000 3.000 1 M Right M 2.000 8.000 3.000 1 M Right M 2.000 8.000 3.000 1 M 1.000 1.000 1.000	10	B23 🚩		Bottom of Girder 👱	6.5000	2.00	2.00	3.5000	6.250	2 🖌	Right 🚩	18.500	32.000	50.500	 Image: A start of the start of
12 B10 Image Top of Girder Image 2.3750 2.00 2.00 15.000 3.000 2 Image Image 24.000 48.000 24.000 700 13 B11 Image Top of Girder Image 2.3750 2.00 2.00 6.000 3.000 2 Image Image 23.000 45.000 700 7 Image 7 7 10p of Girder Image 2.3750 2.00 2.00 3.000 1 Wight 38.000 24.000 48.000 24.000 7 18 B10 Image Top of Girder 2.3750 2.00 2.00 15.000 3.000 3 Image 1 7 70p of Girder 2.3750 2.00 2.00 3.000 3 Image 1 2.000 48.000 48.000 2.000 7 18 B17 Image Top of Girder 2.3750 2.00 2.00 3.000 3 Image Image 12.000 40.000 2.000 7 19 B18 Image <	11	B22 💌		Bottom of Girder 🕑	6.5000	2.00	2.00	10.5000	2.750	2 🚩	Right 🚩	22.500	24.000	46.500	
13 B11 M Top of Girder W 2.3750 2.00 2.00 6.0000 3.000 2 W Left M 2.3.000 46.000 23.000 V 14 B17 M 10p of Girder M 2.3750 2.00 2.00 34.5000 3.000 1 M Night M 23.000 46.000 23.000 V 16 B10 Top of Girder M 2.3750 2.00 2.00 15.500 3.000 3 W Left W 24.000 48.000 24.000 V 17 B11 Top of Girder W 2.3750 2.00 2.00 10.003 3 W Left W 24.000 48.000 24.000 V 18 B17 Top of Girder W 2.3750 2.00 2.000 3.000 3 W Left W 20.000 40.00 20.000 V V 22.000 40.00 20.000 V V Left W 20.000 40.00 20.000 V	12	B10 🚩		Top of Girder 🛛 💆	2.3750	2.00	2.00	15.5000	3.000	2 🎽	Left 🗡	24.000	48.000	24.000	
14 B17 Ipp of Girder 2.3750 2.00 2.00 2.000 3.000 1 W Right 38.000 24.000 62.000 7 15 B18 Ipp of Girder 2.3750 2.00 2.00 34.5000 3.000 1 W Right 4.2.000 68.000 7 16 B10 Ipp of Girder 2.3750 2.00 2.00 15.5000 3.000 3 Left 24.000 48.000 2.000 7 17 B11 Ipp of Girder 2.3750 2.00 2.00 3.000 3 Left 2.3000 46.000 2.000 7 18 B17 Ipp of Girder 2.3750 2.00 2.00 3.000 3 Left 2.3000 46.000 7 <td>13</td> <td>B11 🚩</td> <td></td> <td>Top of Girder 🛛 ⊻</td> <td>2.3750</td> <td>2.00</td> <td>2.00</td> <td>6.0000</td> <td>3.000</td> <td>2 🔽</td> <td>Left 🗡</td> <td>23.000</td> <td>46.000</td> <td>23.000</td> <td></td>	13	B11 🚩		Top of Girder 🛛 ⊻	2.3750	2.00	2.00	6.0000	3.000	2 🔽	Left 🗡	23.000	46.000	23.000	
15 B18 Image: Correct or Co	14	617 💌		Top of Girder 🛛 💌	2.3750	2.00	2.00	25.0000	3.000	1 🖉	Right 💌	38.000	24.000	62.000	
16 B10 Image: Top of Girder 2.3750 2.00 2.00 15.500 3.000 3 Image: Left Y 24.000 48.000 24.000 Y 17 B11 Image: Top of Girder Y 2.3750 2.00 2.00 6.0000 3.000 3 Image: Left Y 23.000 46.000 23.000 Y 18 B17 Image: Top of Girder Y 2.3750 2.00 2.00 3.000 3 Image: Left Y 12.000 46.000 24.000 Y 19 B18 Image: Top of Girder Y 2.3750 2.00 2.00 3.000 3 Image: Left Y 8.000 6.000 3.000 3 Image: Left Y 8.000 40.000 2.000 Y 21 B25 Image: Top of Girder Y 7.5000 2.00 2.00 15.500 3.000 3 Image: Left Y 15.500 3.000 1mage: Left Y 15.500 3.000 1 Right Y 15.500 3.000 1 Right	15	B18 👱		Top of Girder 🛛 💆	2.3750	2.00	2.00	34.5000	3.000	1 🗡	Right 👱	42.000	16.000	58.000	
17 B11 M Top of Girder M 2.3750 2.00 2.00 6.0000 3.000 3 W Left M 23.000 46.000 23.000 V 18 B17 M Top of Girder M 2.3750 2.00 2.00 2.000 3.000 3 W Left M 12.000 24.000 12.000 V 19 B18 M Top of Girder M 2.3750 2.00 2.00 3.000 3 W Left M 3.000 4.000 4.000 2.000 V 20 B25 M Top of Girder M 7.5000 2.00 2.00 6.0000 3.000 3 W Left M 2.0000 40.000 2.0000 V 21 B25 M Top of Girder M 7.5000 2.00 2.00 15.500 3.000 3 W Left M 15.500 31.000 15.500 31.000 15.500 31.000 15.500 31.000 15.500 31.000 15.500	16	B10 🚩		Top of Girder 🛛 💆	2.3750	2.00	2.00	15.5000	3.000	3 🖌	Left 🗡	24.000	48.000	24.000	V
18 B17 Top of Girder 2.3750 2.00 2.00 25.000 3.00 3 M Left M 12.000 24.00 12.000 7 19 B18 Top of Girder M 2.3750 2.00 2.00 34.500 3.000 3 M Left M 8.000 16.000 8.000 7 20 B25 Top of Girder M 7.5000 2.00 2.00 6.000 3.000 2 M Left M 20.000 40.000 20.00 7 21 B25 Top of Girder M 7.5000 2.00 2.00 6.000 3.000 3 M Left M 20.000 40.000 20.00 7 22 B14 Top of Girder M 7.5000 2.00 2.00 15.500 3.000 3 M Left M 15.500 31.00 15.500 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	17	B11 🚩		Top of Girder 🛛 💆	2.3750	2.00	2.00	6.0000	3.000	3 🚩	Left 🚩	23.000	46.000	23.000	 Image: A set of the set of the
19 B18 Top of Girder V 2.3750 2.00 2.00 34.500 3.000 3 Left N 8.000 16.000 8.000 V 20 B25 Image: Top of Girder V 7.5000 2.00 6.0000 3.000 2 Left V 20.00 40.000 20.00 V 21 B25 Image: Top of Girder V 7.5000 2.00 2.00 6.0000 3.000 3 Left V 20.00 40.000 20.00 V 22 B14 Image: Top of Girder V 7.5000 2.00 2.00 15.500 3.000 3 Left V 15.500 31.000 15.500 V V 2.000 2.000 15.500 V V 15.500 31.000 15.500 31.000 15.500 31.000 15.500 31.000 15.500 31.000 15.500 31.000 15.500 31.000 15.500 31.000 1 N Right 0.000 27.833 27.833 27.833 27.833 27.833 50.000 <td>18</td> <td>B17 🚩</td> <td></td> <td>Top of Girder 🛛 💆</td> <td>2.3750</td> <td>2.00</td> <td>2.00</td> <td>25.0000</td> <td>3.000</td> <td>3 🚩</td> <td>Left 🚩</td> <td>12.000</td> <td>24.000</td> <td>12.000</td> <td> Image: A set of the set of the</td>	18	B17 🚩		Top of Girder 🛛 💆	2.3750	2.00	2.00	25.0000	3.000	3 🚩	Left 🚩	12.000	24.000	12.000	 Image: A set of the set of the
20 B25 Imp of Girder V 7.500 2.00 6.000 3.000 2 Left V 20.00 40.000 20.00 V 21 B25 Imp of Girder V 7.500 2.00 6.000 3.000 3 Left V 20.00 40.000 20.00 V 22 B14 Imp of Girder V 7.500 2.00 15.500 3.000 3 Left V 15.500 31.00 15.500 V 23 B14 Imp of Girder V 7.500 2.00 2.00 15.500 3.000 3 Left V 15.500 31.00 15.500 V 24 L1 Imp of Girder V 2.3750 2.00 2.00 16.500 3.000 3 V Right 0.000 27.833 50.000 1 V Right 22.000 2.00 16.500 3.000 1 V Right 22.000 2.000 16.500 3.000 1 V Right 0.000 169.00 16.000 10.	19	B18 🚩		Top of Girder 🛛 💆	2.3750	2.00	2.00	34.5000	3.000	3 🗡	Left 🗡	8.000	16.000	8.000	
21 B25 Image: Specific structure Top of Girder V 7.500 2.00 6.000 3.00 3 V Left V 20.00 40.000 20.00 V 22 B14 Image: Specific structure Top of Girder V 7.500 2.00 15.500 3.000 2 V Left V 15.500 31.00 15.500 V 23 B14 Image: Specific structure Top of Girder V 7.500 2.00 15.500 3.000 3 V Left V 15.500 31.00 15.500 V 24 L1 Image: Specific structure V 2.3750 2.00 2.00 16.500 3.000 3 V Right 0.000 27.833 27.833 0.000 1 V Right 0.000 27.833 50.000 0.000 1 V Right 0.000 16.900 10.00 1 V Right 0.000 16.900 10.00 1 V Right 0.000 16.900 16.900 1 V 10.90	20	B25 💌		Top of Girder 🛛 👱	7.5000	2.00	2.00	6.0000	3.000	2 🗡	Left 🚩	20.000	40.000	20.000	
22 B14 Image: Top of Girder V 7.500 2.00 15.500 3.000 2 V Left V 15.500 31.00 15.500 V 23 B14 Image: Top of Girder V 7.500 2.00 15.500 3.000 3 V Left V 15.500 31.00 15.500 V 24 L1 Image: Top of Girder V 2.3750 2.00 2.00 16.500 3.000 1 V Right 0.000 27.833 27.833 0.00 1 V Right 0.000 27.833 50.000 0 0 0.000 27.833 50.000 0 0 0.000 2.00 16.500 3.000 1 W 0.000 26.00 47.000 10.00 10.00 2.000 10.00 10.00 2.000 10.00 1.000 1.00 1.00 1.000 1.000 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00	21	B25 💌		Top of Girder 🛛 💆	7.5000	2.00	2.00	6.0000	3.000	3 🖌	Left 💌	20.000	40.000	20.000	 Image: A set of the set of the
23 B14 Image: Top of Girder V 7.500 2.00 15.500 3.00 3 V Left V 15.500 31.00 15.500 V 24 L1 Image: Top of Girder V 2.3750 2.00 2.00 16.500 3.000 1 V Right 0.000 27.833 27.833 Image: Top of Girder V 2.3750 2.00 16.500 3.000 3 V Right 0.000 27.833 50.000 Image: Top of Girder V 2.3750 2.00 16.500 3.000 3 V Right V 22.000 26.00 47.000 Image: Top of Girder V 2.3750 2.00 2.00 16.500 3.000 1 V Right 0.000 169.00 169.00 169.00 169.00 100 16.500 3.000 1 V Right 0.000 169.00 169.00 169.00 169.00 100 16.500 3.000 1 V Right 0.000 169.00 169.00 100 16.00 100 1 V	22	B14 🚩		Top of Girder 🛛 💆	7.5000	2.00	2.00	15.5000	3.000	2 🖌	Left 🕑	15.500	31.000	15.500	 Image: A set of the set of the
24 L1 M Top of Girder M 2.3750 2.00 2.00 16.5000 3.000 I M Right 0.000 27.833 27.833	23	B14 🚩		Top of Girder 🛛 💆	7.5000	2.00	2.00	15.5000	3.000	3 🗡	Left 🗡	15.500	31.000	15.500	
25 L1 M Top of Girder W 2.3750 2.00 2.00 16.5000 3.000 3 W Right W 22.167 27.833 50.000 1 26 L5 M Top of Girder W 2.3750 2.00 2.00 16.5000 3.000 2 W Right W 22.000 25.000 47.000 1 27 L M Top of Girder M 2.3750 2.00 2.00 16.5000 3.000 1 W Right M 0.000 169.00 169.000 1 28 L2 M Top of Girder M 2.3750 1.00 1.00 24.7500 3.000 1 W Right 44.000 12.000 75.000 1 29 L2 M Top of Girder M 2.3750 1.00 1.00 16.5000 3.000 1 W Right 43.000 12.000 75.000 1 1 1 4 M Top of Girder 2.3750 1.00 1.00 16.5000	24	L1 🚩		Top of Girder 🛛 💆	2.3750	2.00	2.00	16.5000	3.000	1 👱	Right 🚩	0.000	27.833	27.833	
26 L5 M Top of Girder M 2.3750 2.00 2.00 16.5000 3.000 2 M Right 22.000 26.000 47.000 1 27 L M Top of Girder M 2.3750 2.00 2.00 16.5000 3.000 1 M Right 0.000 169.00 169.00 1 </td <td>25</td> <td>L1 🚩</td> <td></td> <td>Top of Girder 🛛 🚩</td> <td>2.3750</td> <td>2.00</td> <td>2.00</td> <td>16.5000</td> <td>3.000</td> <td>3 🖌</td> <td>Right 💌</td> <td>22.167</td> <td>27.833</td> <td>50.000</td> <td></td>	25	L1 🚩		Top of Girder 🛛 🚩	2.3750	2.00	2.00	16.5000	3.000	3 🖌	Right 💌	22.167	27.833	50.000	
27 L M Top of Girder M 2.3750 2.00 2.00 16.5000 3.000 I M Right M 0.000 169.00 169.000 1 28 L2 M Top of Girder M 2.3750 1.00 1.00 24.7500 3.000 I M Right M 0.000 169.00 56.000 29 L2 M Top of Girder M 2.3750 1.00 1.00 24.7500 3.000 I M Right M 63.000 12.000 75.000 30 L4 M Top of Girder M 2.3750 1.00 1.00 16.5000 3.000 I M Right 35.250 29.500 64.750 31 L4 M Top of Girder M 2.3750 1.00 1.00 16.5000 3.000 I M Right 54.250 29.500 63.750 32 L3 M Top of Girder 2.3750 1.00 1.00 16.5	26	L5 🚩		Top of Girder 🛛 🚩	2.3750	2.00	2.00	16.5000	3.000	2 🖌	Right 💌	22.000	25.000	47.000	
28 L2 Image: Top of Girder Image: Zar50 1.00 1.00 24.750 3.00 Image: Weight Image: Carbon and Carbon a	27	L 🚩		Top of Girder 🛛 🚩	2.3750	2.00	2.00	16.5000	3.000	1 🗠	Right 🚩	0.000	169.00	169.000	
29 L2 Image: Top of Girder Image: Za750 1.00 1.00 24.750 3.000 2 Image: Right Image: R	28	L2 🚩		Top of Girder 🛛 🚩	2.3750	1.00	1.00	24.7500	3.000	1 🖌	Right 💌	44.000	12.000	56.000	
30 L4 M Top of Girder M 2.3750 1.00 1.00 16.5000 3.000 I M Right 35.250 29.500 64.750 [] 31 L4 M Top of Girder M 2.3750 1.00 1.00 16.5000 3.000 2 M Right 54.250 29.500 63.750 [] 32 L3 M Top of Girder M 2.3750 1.00 1.00 16.5000 3.000 1 M Right 0.000 43.667 43.667 [] 33 L3 M Top of Girder M 2.3750 1.00 1.00 16.5000 3.000 3 M Right 6.333 43.667 50.000 [] 34 L M Top of Girder M 2.3750 3.00 3.00 1 M Right 0.000 169.00 169.00 [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] <	29	L2 🗡		Top of Girder 🛛 🚩	2.3750	1.00	1.00	24.7500	3.000	2 🖌	Right 🗡	63.000	12.000	75.000	
31 L4 Image: Constraint of Girder I	30	L4 🚩		Top of Girder 🛛 🚩	2.3750	1.00	1.00	16.5000	3.000	1 🗹	Right 💌	35.250	29.500	64.750	
32 L3 Image: Top of Girder Image: 2,3750 1.00 1.00 16,5000 3.000 Image: 2,3750 1.00 1.00 16,5000 3.000 Image: 2,3750 1.00 1.00 16,5000 3.000 3 Image: 2,3750 1.00 1.00 16,5000 3.000 1 Image: 2,3750 1.00 1.00 16,5000 3.000 1 Image: 2,3750 1.00 1.00 16,5000 3.000 1 Image: 2,3750 1.00 1.00 1.00 16,5000 3.000 1 Image: 2,3750 1.00 1.00 16,5000 3.000 1 Image: 2,3750 1.00 1.00 16,5000 3.000 1 Image: 2,3750 16,9000 16,9000 169,000 169,000 169,000 169,000 100 100 100 100 100 100 </td <td>31</td> <td>L4 🛩</td> <td></td> <td>Top of Girder 🛛 💆</td> <td>2.3750</td> <td>1.00</td> <td>1.00</td> <td>16.5000</td> <td>3.000</td> <td>2 🖌</td> <td>Right 🚩</td> <td>54.250</td> <td>29.500</td> <td>83.750</td> <td></td>	31	L4 🛩		Top of Girder 🛛 💆	2.3750	1.00	1.00	16.5000	3.000	2 🖌	Right 🚩	54.250	29.500	83.750	
33 L3 Image: Top of Girder Image: Z23750 1.00 1.00 16.5000 3.000 3 Image: Right Image:	32	L3 🚩		Top of Girder 🛛 🚩	2.3750	1.00	1.00	16.5000	3.000	1 🗹	Right 💌	0.000	43.667	43.667	
34 L Image: Top of Girder 4.8750 3.00 3.00 16.5000 3.000 Image: Weight image: Wei	33	L3 🚩		Top of Girder 🛛 🚩	2.3750	1.00	1.00	16.5000	3.000	3 🖌	Right 🚩	6.333	43.667	50.000	
New Duplicate Delete	34	L 🚩		Top of Girder 🛛 🚩	4.8750	3.00	3.00	16.5000	3.000	1 🗠	Right 🚩	0.000	169.00	169.000	
											Ne	w C	Duplica	te 🗌	Delete





The user can compare the entered data to the design plans by right clicking **Girder Profile** and selecting **Schematic**.



VDDT Virginia Department of Transportation

DEFINE SHEAR REINFORCEMENT RANGES



Double click Shear Reinforcement Ranges.

Left click **New** to define a shear reinforcement set.

Name: Select the appropriate shear reinforcement definition from the drop down menu.

Support Number: Select the number of the support from which the range will be dimensioned.

Start Distance (ft): Enter the distance from the selected support to the left end of the range. The selected shear reinforcement for this range is not located at the start distance. However, it is located at all other locations within the range, including the end distance.

For example, if the user defines a reinforcement range starting at 0.00 ft from support 1 with 3 spaces at 4 inches. The first vertical shear bar will be located at 0.33 ft from support 1, not at 0.00 ft.

Number of Spaces: Enter the number of spaces, beginning at the start distance, that are of equal spacing and that define the location of the selected shear reinforcement.

Spacing (in): Enter the spacing between adjacent shear reinforcement within the given range. Spacings must be equal within a given range.

Length (ft): This value is calculated by Virtis. It is the total length of the shear reinforcement range.

End Distance (ft): This value is calculated by Virtis. It is the end distance of the shear reinforcement range.



		4	Start	Distance	▶ <mark> </mark>		2	Z.
Na	ime	Supp Numb	ort xer	Start Distance (ft)	Number of Spaces	Spacing (in)	Length (ft)	End Distance (ft)
S	<u>×</u>	1	~	0.00	1	0.0000	0.00	0.00
S	~	1	~	0.00	12	15.0000	15.00	15.00
5	~	1	~	15.00	6	12.0000	6.00	21.00
5	<u> </u>	1	×	21.00	6	10.0000	5.00	26.00
5 -	<u> </u>	1	<u>×</u>	26.00	6	8.0000	4.00	30.00
5		1	<u> </u>	30.00	18	7.0000	10.50	40.50
> 2	<u>×</u>	<u>।</u> ज	<u>×</u>	40.50		8.0000	2.00	42.50
, ;		1		42.00	<u>۲</u>	10,0000	1.00	44.00
, ,	v v	1	v	49.00	1	12,0000	1.00	49.00
- 5	~	2	~	0.00	1	12.0000	1.00	1 00
5	~	2	~	1.00	16	10.0000	13.33	14.33
5	~	2	~	14.33	4	11.0000	3.67	18.00
5	~	2	~	18.00	5	12.0000	5.00	23.00
5	~	2	~	23.00	5	15.0000	6.25	29.25
5	~	2	~	29.25	7	18.0000	10.50	39.75
3	~	2	~	39.75	5	15.0000	6.25	46.00
3	<u> </u>	2	~	46.00	5	12.0000	5.00	51.00
5	<u>~</u>	2	~	51.00	4	11.0000	3.67	54.67
5	<u>×</u>	2	~	54.67	16	10.0000	13.33	68.00
5	<u> </u>	2	~	68.00	1	12.0000	1.00	69.00
5	<u>×</u>	3	×	0.00	1	12.0000	1.00	1.00
5 -	<u> </u>	3	<u>×</u>	1.00	6	10.0000	5.00	6.00
5 •	<u> </u>	3	<u> </u>	6.00	2	9.0000	1.50	/.50
>		ა ი		1.50	40	8.0000 7.0000	2.00	9.50
- -		<u>২</u>		9.00 20.00	01	8 0000	4.00	20.00
- 		3	V	20.00	<u>ہ</u>	10 0000	5.00	29.00
- 3		3	~	29.00	6	12 0000	6.00	35.00
3	~	3	~	35.00	12	15.0000	15.00	50.00
Stirn	up Wizard	±				New	Duplicate	Delete

Enter the fields as shown and left click **OK** to accept and close.

***INPUT FOR MEMBER G1 IS COMPLETE. PROCEED TO G2



MEMBER G2

Member loads are not required for G2.

DEFINING SUPPORTS



Double click **Supports**.

A 5	Support	5					_ 🗆 🛛
	ieneral [<u></u>			2	
	Support	Support		Translation Cor	straints	Rotation Constraints	
	Number	Туре		х	Y	z	
	1	Roller	~		v		
	2	Roller	<u>×</u>		V		
	3	Pinned	$\mathbf{\mathbf{x}}$	V	V		
	4	Roller	<u>×</u>		v		
						OK Apply	Cancel

General Tab:

Select a **Roller** support type for supports 1, 2, and 4 since they are expansion supports.

Select a **Pinned** support type for support 3 since it is a fixed support.

No input is required for the Elastic tab.

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



CREATING A MEMBER ALTERNATIVE: G2



Right click **MEMBER ALTERNATIVE G1** and select **Copy**.

Right click the **MEMBER ALTERNATIVE** folder for **G2** and select **Paste**.



VDDT Virginia Department of Transportation



Change the Member Alterative name to G2.

No other changes are required.

Left click OK to accept and



DEFINE LIVE LOAD DISTRIBUTION FACTORS



Expand the **MEMBER ALTERNATIVE** for **G2**.

G2 LRFR live load distribution factors cannot be computed from the typical section until the entire cross-section is defined. Continue with the other input for G2.



DEFINE THE GIRDER PROFILE



Tributary Width: The physical width of the deck between the girders. For this example, use the beam spacing of

Total Deck Thickness: 7.50 in.

Web Thickness at Top Flange: 16.00 in.

Web Thickness at Bottom of Beam: 16.00 in.

Chamfer Dimension, A: 7.5 in. (Average of vertical and horizontal chamfer dimensions).



Top Flange:

Material: Select the appropriate material from the drop down menu.

Modular Ratio: 9.2 (See calculation below)

Eff. Width (Std): The effective flange width for LFD. For this example, enter 96.00 in. See Appendix C for sample calculation.

Eff. Width (LRFD): The effective flange width for LRFR. For this example, enter 96.00 in. This value will equal the tributary width per AASHTO 2007 with 2008 Interims, *LRFD Bridge Design Specifications*, 4th Edition, section 4.6.2.6.

Struct. Thick.: Typically, 0.50 in. is removed from the actual thickness of the top flange. Therefore, enter 7.00 in. for this example.

Other Parts: (Other than the top flange)

Material: Select the appropriate material from the drop down menu.

Modular Ratio: 9.2 (See calculation below)

Modular Ratio Calculation

Note: References from AASHTO LRFD Bridge Design Spefications, 2007 with 2008 int.

Unit Weight of Concrete, w _c =	0.145	kip/ft ³	
Compressive Strength of Concrete, f $'_{c}$ =	3.00	ksi	
Modulus of Elasticity of Reinf. Steel, E_s =	29000	ksi	
Modulus of Elasticity of Concrete, E_c =	33,000 *	Wc ^{1.5} * f'c ^{0.5}	Eq. 5.4.2.4-1
E _c =	33,000 *	0.145 ^{1.5} * 3.00 ^{0.5}	
E _c =	3155.92	ksi	
Modular Ratio, n = n =	3,155.92	5.7.1	
n =	9.2		



Web Tab:

Update the Begin and End Depths as shown.

<mark>ጫ</mark> G	🗳 Girder Profile 📃 🗖 🔀									
Typ Se	e: Reinforce	d Concrete Tee								
	Begin Depth (in)	Depth Vary		End Depth (in)	Sup; Num	bort ber	Start Distance (ft)	Length (ft)	End Distance (ft)	
	76.7500	None	>	76.75	1	¥	0.000	0.500	0.500	
	76.7500	Parabolic Concave	4	37.50	1	Y	0.500	24.375	24.875	
	37.5000	Parabolic Concave	¥	76.75	1	Y	24.875	24.375	49.250	
	76.7500	None	Y	76.75	1	Y	49.250	1.500	50.750	
	76.7500	Parabolic Concave	¥	37.50	2	Y	0.750	33.750	34.500	
	37.5000	Parabolic Concave	~	76.75	2	¥	34.500	33.750	68.250	
	76.7500	None	¥	76.75	2	Y	68.250	1.500	69.750	
	76.7500	Parabolic Concave	~	37.50	3	~	0.750	24.375	25.125	
	37.5000	Parabolic Concave	Y	76.75	3	Y	25.125	24.375	49.500	
	76.7500	None	~	76.75	3	~	49.500	0.500	50.000	
	New Duplicate Delete									
	OK Apply Cancel									



Reinforcement Tab:

Update the reinforcement sets as shown below.

tion	Web	K	Reinfo	cement											
	Ba	r		Measured	Distance	Std	LRFD	Bar	Side	Support		Start	Straight	End	Fully
Set	Ма	k	Invert	From	(in)	Number	Number	Spacing (in)	Cover (in)	Number	Direction	Distance (ft)	Length (ff)	Distance (ff)	Devel
1	B4	\mathbf{v}		Bottom 💙	3.0000	4.00	4.00	3,5000	2.750	1 🗸	Right 💌	0.000	40,000	40,000	
2	B4	~		Bottom 🖌	3.0000	4.00	4.00	3.5000	2.750	3 🗸	Right 💌	10.000	40.000	50.000	
3	B16	×		Bottom 🚩	3.0000	4.00	4.00	3.5000	2.750	2 💙	Left ⊻	10.000	20.000	10.000	
4	B16	Y		Bottom ⊻	3.0000	4.00	4.00	3.5000	2.750	3 🚩	Left 🚩	10.000	20.000	10.000	V
5	B 3	~		Bottom 🚩	6.5000	2.00	2.00	10.5000	2.750	1 🚩	Right 🚩	2.000	37.000	39.000	V
6	B 3	×		Bottom 🚩	6.5000	2.00	2.00	10.5000	2.750	3 🗡	Right 👱	11.000	37.000	48.000	 Image: A set of the set of the
7	B2	~		Bottom 🚩	6.5000	2.00	2.00	3.5000	6.250	1 🗡	Right 🗡	5.000	31.000	36.000	Image: A start of the start
8	B2	¥		Bottom 🚩	6.5000	2.00	2.00	3.5000	6.250	3 🗡	Right 🚩	14.000	31.000	45.000	
9	B1	×		Bottom 🗡	10.0000	2.00	2.00	3.5000	6.250	1 🗡	Right 🗡	8.000	25.000	33.000	Image: A state of the state
10	B1	4		Bottom 🚩	10.0000	2.00	2.00	3.5000	6.250	3 🚩	Right 🗡	17.000	25.000	42.000	
11	B			Bottom M	10.0000	2.00	2.00	10.5000	2.750	1 🚩	Right 🗡	11.000	19.000	30.000	
12	В			Bottom Y	10.0000	2.00	2.00	10.5000	2.750	3 🚩	Right 🗡	20.000	19.000	39.000	
13	89			Bottom Y	3.0000	4.00	4.00	3.5000	2.750	2 🗡	Right 🗡	10.000	49.000	59.000	
14	88			Bottom Y	6.5000	2.00	2.00	10.5000	2.750	2 ¥	Right 💌	15.000	39.000	54.000	
10	D/ DC			Bottom M	0.0000	2.00	2.00	3.5000	6.200 e 260	2 💌	Right M	20,000	20,000	40.000	
10	BS			Bottom V	10.0000	2.00	2.00	10 5000	2 750	2 1	Dight 💉	24.000	24.000	45.000	
18	B11			Top of Y	2 3750	2.00	2.00	6.0000	3,000	2 .	Left V	24.000	46.000	23.000	
19	B11	<u> </u>		Top of Y	2 3750	2.00	2.00	6.0000	3,000	2 <u>v</u>	Left ¥	23,000	46.000	23,000	
20	B10	~		Top of Y	2 3750	2.00	2.00	15 5000	3 000	2 🗸	Left Y	24 000	48 000	24 000	
21	B10	V		Top of Y	2.3750	2.00	2.00	15.5000	3.000	3 🗸	Left Y	24.000	48.000	24.000	
22	B14	V		Top of 💙	2.3750	2.00	2.00	27.5000	3.000	2 🗸	Left 💙	15.500	31.000	15.500	
23	B14	\mathbf{v}		Top of 💌	2.3750	2.00	2.00	27.5000	3.000	3 🔽	Left 💌	15.500	31.000	15.500	
24	B15	Y		Top of ⊻	2.3750	2.00	2.00	39.5000	3.000	2 💙	Left 💌	11.000	22.000	11.000	
25	B15	Y		Top of 🚩	2.3750	2.00	2.00	39.5000	3.000	3 💙	Left 🗹	11.000	22.000	11.000	
26	B12	~		Top of 🚩	7.5000	2.00	2.00	6.0000	3.000	1 🚩	Right 💌	29.000	42.000	71.000	
27	B12	~		Top of 🗡	7.5000	2.00	2.00	6.0000	3.000	2 🎽	Right 🗡	48.000	42.000	90.000	V
28	B13	~		Top of 🗡	7.5000	2.00	2.00	15.5000	3.000	1 🗡	Right 🗡	31.000	38.000	69.000	
29	B13	2		Top of 🗡	7.5000	2.00	2.00	15.5000	3.000	2 🚩	Right 🗡	50.000	38.000	88.000	V
30	L1	×		Top of 🗡	2.3750	2.00	2.00	8.2500	3.000	1 🗡	Right 🗡	0.000	27.833	27.833	
31	L1	4		Top of 🚩	2.3750	2.00	2.00	8.2500	3.000	3 🗡	Right 🗡	22.167	27.833	50.000	
32	L5	×		Top of 🚩	2.3750	2.00	2.00	8.2500	3.000	2 🚩	Right 🗡	22.000	25.000	47.000	
33	L			Tee of 💌	2.3750	4.00	4.00	5.2500	3.000	1 📉	Right 🚩	0.000	169.00	169.000	
34 96	12				2.3750	2.00	2.00	24.7500	3.000	1 <u>×</u>	Right 💌	44.000	12.000	75.000	
00 36	1			Top of 💌	2.3750	2.00	2.00	24.7500	3,000	2 🗡 1 😼	Right 💌	0.000	12.000	169,000	
-00	L				2.3750	6.00	6.00	5.2500	5.000	1 💌	Right 💌	0.000	169.00	169.000	
											N	ew C	Duclica	ate	Delete

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



DEFINE SHEAR REINFORCEMENT RANGES





		4	<u>Start</u>	Distance	▶ Spacing		2	7	
Na	ime	Support Number		Start Distance (ft)	Number of Spaces	Spacing (in)	Length (ft)	End Distance (ft)	
S	~	1	~	0.00	1	0.0000	0.00	0.00	
s	~	1	¥	0.00	12	15.0000	15.00	15.00	
s	~	1	×	15.00	6	12.0000	6.00	21.00	
S	Y	1	~	21.00	6	10.0000	5.00	26.00	
S	~	1	V	26.00	6	8.0000	4.00	30.00	
S	¥	1	Y	30.00	18	7.0000	10.50	40.50	
S	*	1	~	40.50	3	8.0000	2.00	42.50	
s	~	1	~	42.50	2	9.0000	1.50	44.00	
S	~	1	~	44.00	6	10.0000	5.00	49.00	
S	Y	1	~	49.00	1	12.0000	1.00	50.00	
S	v	2	×	0.00	1	12.0000	1.00	1.00	
S	<u>×</u>	2	~	1.00	16	10.0000	13.33	14.33	
S	~	2	~	14.33	4	11.0000	3.67	18.00	
S	~	2	~	18.00	5	12.0000	5.00	23.00	
S	<u>×</u>	2	~	23.00	5	15.0000	6.25	29.25	
S	<u>×</u>	2	~	29.25	7	18.0000	10.50	39.75	
S	~	2	~	39.75	5	15.0000	6.25	46.00	
S	<u>×</u>	2	~	46.00	5	12.0000	5.00	51.00	
S	<u>×</u>	2	~	51.00	4	11.0000	3.67	54.67	
s	<u>×</u>	2	~	54.67	16	10.0000	13.33	68.00	
S	<u> </u>	2	~	68.00	1	12.0000	1.00	69.00	
s -	<u>×</u>	3	~	0.00	1	12.0000	1.00	1.00	
5 -	<u>×</u>	3	~	1.00	6	10.0000	5.00	6.00	
5	<u>×</u>	3	×	6.00	2	9.0000	1.50	7.50	
ទ ក	<u>×</u>	3	<u>×</u>	7.50	3	8.0000	2.00	9.50	
ა ი	<u>×</u>	3	×	9.50	18	7.0000	10.50	20.00	
a e	×	<u>ن</u>	*	20.00	6	8.0000	4.00	24.00	
5 0	<u>×</u>	3	<u>×</u>	24.00	6	10.0000	5.00	29.00	
১ ০	<u>×</u>	3	×	29.00	6	12.0000	6.00	35.00	
3	_	3		35.00	12	15.0000	15.00	50.00	
Stim	up Wizar	d				New	Duplicate	Delete	

The shear reinforcement ranges for G2 are identical to G1. Therefore, left click **OK** to accept and close.



Once MEMBER G2 is complete, other MEMBERS can be linked with G1 and G2 since the beams are identical and the girder spacing and overhangs are equal.

LINK MEMBERS

When a bridge has members that are identical, the user can specify a link to members that have already been entered to save both input and analysis time. Once a member is linked to a previously defined member, no other input is required.



For the example, the interior beams are identical to each other and both exterior beams are identical to each other.

Double click member G3.

▲ Member ■ ■ ▼ Member name: 63 Link with: 62 ▼ Description: 61 62 ■	Select G2 from the Link with: drop down menu.
G4 None Existing Current Member Alternative Name Description V G2	Left click OK to accept and close.
Number of spans: 3 Span Span Length (ft) 1 50.00	Use this process for member G4 . Link G4 with G1 .
2 69.00 3 50.00 OK Apply Cancel	Click Continue each time the warning message appears.

<u>Note</u>: Engineering judgment should always be used to determine if linking girders is appropriate for a particular bridge.



🚯 Bridge	Workspace - 08108 📃 🗖 🔀
····	08108 Materials Beam Shapes Appurtenances
	Impact / Dynamic Load Allowance Factors SUPERSTRUCTURE DEFINITIONS Impact / Dynamic Load Allowance Impac

The screen shot to the left demonstrates how Virtis displays linked members.



DEFINE LIVE LOAD DISTRIBUTION FACTORS



Expand the **MEMBER ALTERNATIVE** for **G1**.

Double click Live Load Distribution.

•	Live Load I	Distribution					-	. 🗆 🗙	Standard Tab:
	Distribution	RFD h Factor Input Metho e Simplified Method	d O Use Adva	anced Method					Distribution Factor Input Method: Use Simplified
	Lanes	Distribution Factor							Method.
	Loaded	Shear	Shear at Supports	Moment	Deflection				Left click
	1 Lane	1.000000	1.000000	1.000000	0.500000				Compute from
	Multi-Lane	1.000000	1.000000	1.000000	1.000000				Typical Section.
	Compute fr Typical Sec	rom stion				οκ ΓΑ		ancel	



A Live Load Distribution											X	LRFD Tab:
	Standard 🤇	LRFD										Left click
	Action:	Deflection	~									Compute from
	Support	Start Distance	Length	End Distance	Distributi (La	ion Factor nes)						Typical Section.
	Number	(ft)	(ft)	(ft)	1 Lane	Multi-Lane						
	Comp Typical	ute from Section	View (Cales			New	Duplic	ate	Delete		
							OK) [vpply	Cancel]	

Lrfd Distribution Factor Progress
Generating Stage 3 Model Span superstructure finite element model Finished generating Stage 3 Vodel Span superstructure finite element model Computing contraflexure ranges Initiating finite element analysis FEA - Building model FEA - Creating rodes FEA - Creating elements FEA - Creating constraints FEA - Creating load cases Verifying finite element model Performing linear solution Successful finite element analysis. Computing LRFD live load distribution factors Finished computing LRFD live load distribution factors Analysis completed!
Print OK

The LRFD Distribution Factor **Progress** window will appear.

Left click **OK** to close the **LRFD Distribution Factor Progress** window once the analysis is complete.



🕰 Live Load Distribution	This will compute
Live Load Distribution	This will compute live load distribution factors for deflection, moment, and shear.
Compute from Typical Section View Dates Delete	
OK Apply Cancel	

The screen shots for moment and shear are as follows:

Action: Moment						
Sup	port	Start Distance	Length	End	Distribution Factor (Lanes)	
Num	iber	(ft)	(ft)	(ft) 1 Lane		Multi-Lane
1	~	0.00	30.90	30.90	0.660	0.660
1	~	30.90	38.32	69.22	0.660	0.723
2	~	19.22	30.55	49.78	0.660	0.660
2	~	49.78	38.32	88.10	0.660	0.723
3	¥	19.10	30.90	50.00	0.660	0.660

4	Actio	n:	Shear	✓			
	Support Number		Start Distance (ft)	Length (ft)	End Distance (ft)	Distribution Factor (Lanes)	
						1 Lane	Multi-Lane
ľ	1	Y	0.00	50.00	50.00	0.660	0.660
I	2	¥	0.00	69.00	69.00	0.660	0.660
I	3	Y	0.00	50.00	50.00	0.660	0.660

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





Expand the **MEMBER ALTERNATIVE** for **G2**.

Double click Live Load Distribution.

andard I RF - Distribution F O Use S	n actor Input Metho implified Method	d O Use Adva	inced Method		Distribution Factor Input Method: Use Simplified Method.
Lanes	Distribution Factor (Wheels)				
Loaded	Shear	Shear at Supports	Moment	Deflection	Left click
1 Lane	1.250000	1.250000	1.250000	0.500000	Compute from
Multi-Lane	1.333333	1.625000	1.333333	1.000000	Typical Section
Compute from	n pr				



A Live Load Distribution	LRFD Tab:
Standard LRFD	Left click
Action: Deflection	Compute from
Support Start Distance Length End (Lanes)	Section.
Number (ft) (ft) (ft) 1 Lane Multi-Lane	
Compute from Typical Section View Calcs New Duplicate Delete	
OK Apply Cancel	

Lrfd Distribution Factor Progress
Generating Stage 3 Model Span superstructure finite element model Finished generating Stage 3 Vodel Span superstructure finite element model Computing contraflexure ranges Initiating finite element analysis FEA - Building model FEA - Creating rodes FEA - Creating constraints FEA - Creating constraints FEA - Creating constraints FEA - Adding load cases Verifying finite element model Performing linear solution Successful finite element analysis. Computing LRFD live load distribution factors Finished computing LRFD live load distribution factors Analysis completed!
Print OK

The LRFD Distribution Factor **Progress** window will appear.

Left click **OK** to close the **LRFD Distribution Factor Progress** window once the analysis is complete.



🕰 Live Load Distribution	This will compute
Live Load Distribution	This will compute live load distribution factors for deflection, moment, and shear.
Compute from Typical Section View Dates Delete	
OK Apply Cancel	

The screen shots for moment and shear are as follows:

Action	n:	Moment	~			
Support Number		Start Distance	Length (ft)	End Distance (ft)	Distribution Factor (Lanes)	
		(ft)			1 Lane	Multi-Lane
1	Y	0.00	30.96	30.96	0.543	0.730
1	Y	30.96	38.18	69.14	0.602	0.822
2	Y	19.14	30.72	49.86	0.465	0.642
2	Y	49.86	38.18	88.04	0.602	0.822
3	Y	19.04	30.96	50.00	0.543	0.730

Action: Shear

Support		port	Start Distance	Length	End Distance	Distribution Factor (Lanes)		
Nu	Im	ber	(ft)	(ft)	(ft)	1 Lane	Multi-Lane	
1	1	~	0.00	50.00	50.00	0.680	0.814	
2	2	~	0.00	69.00	69.00	0.680	0.814	
3	3	~	0.00	50.00	50.00	0.680	0.814	

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

~



CREATE 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 a three span structure with identical exterior spans, the user can decide to only include AS-BUILT Spans 1 and 3 in the analysis and exclude AS-BUILT Span 2. The rating summary will then only have results from Spans 1 and 3 rather than comparing Spans 1 and 3 to Span 2. Typically however, every span entered will be included in a **BRIDGE ALTERNATIVE**.



Double click **BRIDGE ALTERNATIVES.**



🕮 Bridge Alternative		Alternative Name:
Alternative Narre: AS-BUILT		AS-BUILT
Description		Left click OK to accept and close.
Description		
	← Global Positioning	
Reference Line Length =ft	Distance =ft	
Stating Station =ft	Offset =ft	
Bearing = N 90^ 0' 0.00'' E	Elevation =ft	
Superstructure Wizard		
	OK Apply Cancel	



Expand **BRIDGE ALTERNATIVES** and **AS-BUILT** folders.

Double click **SUPERSTRUCTURES.**



A Superstructure	Superstructure
Superstructure Name: AS-BUILT	Name: AS-BUILT
Description Alternatives Vehicle Path Engine	Left click OK to accept and close.
Description:	
Distance = ft	
Offset = ft	
Angle = 0.00 Degrees	
Starting Station = ft	
OK Apply Cancel	

Expand **SUPERSTRUCTURES** and **AS-BUILT** folders.

Double click SUPERSTRUCTURE ALTERNATIVES.


A Superstructure Alternative	Alternative
Alternative Name: 65-BLIII T	Name: AS-BUILT
Description:	Superstructure Definition: Select AS-BUILT
Superstructure Definition: None	from the drop down menu.
	Left click OK to accept and close.
OK Apply Cancel	

🚯 Bridge Workspace - 08108 📃 🗖 🔀
··· 🗛 08108
🕀 🚥 Materials
🕀 🚾 🛅 Beam Shapes
🕀 🚾 Appurtenances
🕀 🚾 Factors
📮 ····· 🧰 SUPERSTRUCTURE DEFINITIONS
😑 🚥 📊 AS-BUILT
Impact / Dynamic Load Allowance
+++ Load Case Description
🛲 Framing Plan Detail
Structure Typical Section
👫 Superstructure Loads
🕀 👘 🦲 Shear Reinforcement Definitions
😟 🚥 🧰 Bar Mark Definitions
🖻 ····· 🗛 AS-BUILT
😑 🚥 🧰 superstructures
i⊟····· ∓≭ AS-BUILT
AS-BUILT (E) (C) (AS-BUILT)

***THE INPUT FOR THE BRIDGE IS NOW COMPLETE. MAKE SURE THE FILE IS SAVED PRIOR TO ANALYSIS.



ANALYSIS



The file is now ready to be analyzed. The user can either analyze individual members with the file open or analyze the entire bridge with the file closed.

To analyze a single member, highlight an individual member and left click the **View Analysis Settings** icon.



Either select **Open Template** from the database OR create a new template by following these instructions:

The **Analysis Settings** window will appear. On the **Rating 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.





Save Template			×
Templates Continuous Span (Run 1 of 2) Continuous Span (Run 2 of 2) HL 93 Design Review HS 20 Rating LFD LRFR Design Load Rating LRFR Legal Load Rating LRFR Virtis Engine SS < 200 ft.	Description Virtis' new analysis event Virtis' new analysis event HL 93 Design Review HS 20 Rating Virtis' new analysis event LRFR Design Load Rating LRFR Legal Load Rating Virtis' new analysis event	Analysis Rating Rating Rating Rating Rating Rating Rating Rating	0wner Public/Private Public Public Public Public Public Public Public Public Public
Public/Private Public Private Delete		Template name	e: Continuous Span (Run 1 of 2)

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 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.

🗅 Analysis Settings	
O Design Review Rating Rating	Method: LRFR
Analysis Type Standard Advanced	
Vehicles Output Engine Description	
Traffic Direction: He Both directions Ye	Iresh Temporary Vehicles Advanced
Add to Rating HL93 (SI) HL93 (US) HS 15-44 HS 20 (SI) HS 20-44 Cane-Type Legal Load LRFD Fatigue Truck (SI) LRFD Fatigue Truck (US) Type 3 Type 3.3 Type 3.3 Type 3.3 Type 3.3 Type 3.3 Type 3.3 Type 3.3 Type 3.3 Type 3.2 Blanket Permit 115 (BP-115) Blanket Permit 90 (BP-90) HL-33 · Negative Mometries (UK HS-20-Truck Only HS-20-Truck Only Lane Legal Load-Negative Mome LRFD Fatigue Truck for Rating Notional Rating Load-NRL SU4 SU5 SU6 SU7 VA Type 3 VA Type 3 VA Type 3S2	 Rating Vehicles LRFR Design Load Rating Inventory HS-20-Lane Load Only HS-20-Truck Only Operating HS-20-Truck Only Operating HS-20-Truck Only S-20-Truck Only HS-20-Truck Only HS
Reset Clear Open Template Save Template	OK Apply Cancel

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.



VERSION 6.2

ehicle Properties												
Vehicle	Tandem Train	Scale Factor	Impact	Single Lane Loaded	Legal Pair	Frequency		Loading Condition		Override Live Los Factor		OK Cancel
Lane-Type Legal Load		1			V	Single Trip 📃	Y	Mixed with traffic	Y		_	
Blanket Permit 115 (BP-115)		1				Unlimited Crossing 👌	Y	Mixed with traffic	Y			
Blanket Permit 90 (BP-90)		1				Unlimited Crossing	Ý	Mixed with traffic	۷		_	
HS-20-Lane Load Only		1				Multiple: Trips (<100 c	DI.	Mixed with traffic	٧			
HS-20-Tandem		1				Single Trip Unlimited Crossing		Mixed with traffic	٧			
HS-2D-Truck Only		1				Single Trip	Y	Mixed with traffic	v			
HS-20-Truck Only		1				isingle trip <u>n</u>	*	Mitxed with traffic	<u>×</u>		-	
1.41											-	
<u>× </u>					IIII				_			

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.

Once complete, this can be saved as a Template for future ratings. Left click the **Save Template** button.

Save Template			×
Templates	Description	Analysis C)wner Public/Private
Continuous Span (Run 1 of 2) Continuous Span (Run 2 of 2) HL 93 Design Review HS 20 Rating LFD LRFR Design Load Rating LRFR Legal Load Rating LRFR Virtis Engine SS < 200 fl.	Virtis' new analysis event Virtis' new analysis event HL 93 Design Review HS 20 Rating Virtis' new analysis event LRFR Design Load Rating LRFR Legal Load Rating Virtis' new analysis event	Rating Rating Design-Review Rating Rating Rating Rating Rating	Public Public Public Public Public Public Public Public
Public/Private Public Public Private Delete		Template name: Cor	ntinuous Span (Run 2 of 2)

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.



ANALYZE MEMBER



Once the Analysis Settings have been set, to analyze a specific member, right click the desired **MEMBER ALTERNATIVE** and select **Analyze**.

Note: Left click the **View Analysis Settings** icon and open the "Continuous Span (Run 1 of 2)" template prior to running the analysis.

Analysis Progress	- Location - 164.0000 (ft) - Location - 167.9997 (ft) - Location - 168.0000 (ft) - Location - 168.0003 (ft) - Location - 168.5000 (ft) - Location - 5.9810 (ft) - Location - 44.5813 (ft) - Location - 113.5813 (ft) - Location - 124.4188 (ft) - Location - 163.0192 (ft) Completed Specification Check. Info - Finished LRFR specification checking	
View Rating Log	Info - Finished populating specification checking results Info - Analysis completed! Print	OK

Allow the program to analyze the beam.

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.



w He	lp
8 4	5 🤣 🖪 🛍 🗞 🖆 🗉 🛯 🗑 🗑 🖬 🐟 🐂 🕮 📉 🖻
В	ridge Workspace - 08108
-8	•••••••••••••••••••••••••••••

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 drop down menu.

Hepoti Type Lane/Inpact Loading Type Display Format									
	1	Sing	le rating leve	per row			1		
Live Load	Live Load Type	Rating Method	Load Rating (Ton)	Operating Load Rating (Ton)	Legal Load Rating (Ton)	Permit Load Rating (Ton)	hventory Rating Factor	Operating Rating Factor	Legal Rating Fac
HL-93 (US)	Truck + Lane	LRFR	17.94	23.26			0.498	0.646	
HL-93 (US)	Tandem + Lane	LRFR	14.63	18. 97			0.585	0.759	
HL-93 (US)	90%(Truck Pair + Lane)	LRFR	57.74	74.85			0.802	1.040	
Notional Rating Load-NRL	Axe Load	LRFR			28.50				0.7
SU4	Axe Load	LRFR			26.91				0.9
SU5	Axe Load	LRFR			28.20				0.9
SU6	Axe Load	LRFR			28.39				0.0
SU7	Axe Load	LRFR			28.89				0.3
VA Type 3S2	Axe Load	LRFR			43.77				1.0
VA Type 3	Axe Load	LRFR			30.37				1.1
<)									>
/irts LRFR Engine Version 6.2.0.	300-								



🕰 Analysis Results - G1										
Report Type Rating Result: Summary		:/Inpact l s Feques	.oading ted	Type O Detaied	Displ. Sing	ay Format le rating le	vel per row	v		
Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
HL-93 (US)	Truck + Lane	LRFR	Invent	17.94	0.498	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	Truck + Lane	LRFR	Opera	23.26	0.646	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	Tandem + Lane	LRFR	Invent	14.63	0.585	84.50	2 - (50.0)	STRENGTH-I Concrete Flexure	As Requested	As Recuested
HL-93 (US)	Tandem + Lane	LRFR	Opera	18.97	0.759	84.50	2 - (50.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	90%(Truck Pair	LRFR	Invent	57.74	0.802	134.50	3 - (31.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	90%(Truck Pair	LRFR	Opera	74.85	1.040	134.50	3 - (31.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
Notional Rating Load-NRL	Axle Load	LRFR	Legal	28.50	0.713	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
SU4	Axle Load	LRFR	Legal	26.91	0.997	84.50	2 - (50.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
SU5	Axle Load	LRFR	Legal	28.20	0.910	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
SU6	Axle Load	LRFR	Legal	28.39	0.817	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Recuested
SU7	Axle Load	LRFR	Legal	28.89	0.745	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
VA Type 3S2	Axle Load	LRFR	Legal	43.77	1.094	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
VA Type 3	Axle Load	LRFR	Legal	30.37	1.125	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
Virts LRFR Engine Version 6	2.0.300								Δ	Close



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.

Bridge Explorer (11 Virtis bridges retrieved for the c	urrent fo	lder, al	ll rows retrieved)			
All Bridges	BID		Bridge Id	Bridge Name	District	County
	123	02975		02975	01	021
	124	22360		22360	01	197
LOA 14 Slabs	170	24167		24167	01	191
LOA15	198	07323		07323	07	061
📄 LOA15 - ALA	199	08704		08704	01	077
	209	15793		15793	08	165
🗄 💼 Sample Bridges	210	12076		12076	04	117
🔤 Deleted Bridges	236	06165		06165	06	057
	265	12415		12415	03	125
	270	11968		11968	04	117
	276	08108	Open	Ctrl+O		069
					-11	
			Сору	Ctri+C		
			Delete			
			Remove From Folde	er	- 11	
			Rate			
			Rating Results			
			Manage Analysis Ev	vents		
			Report Tool			
			Attachments			
		L				
	<	1111				
	,,,	_				



Design Review ● Rating Analysis Type ③ Standad Vehicles Output Ingine Description Vehicles Output Ingine Description Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Pation: Perior: Pation:	Analysis Settings	
Vehicles Dutput Engine Description Traffic Direction: Both directions Vehicle Selection: H 15-44 H 2-44 H 5-44 H 5-44 H 5-44 H 5-44 H 5-20 (SI) H 5-44 H 5-20 (SI) H 5-20 (S	Design Review Standard Advanced	Rating Method: LFD v Save Analysis Results
Vehicles Taffic Direction: Both directions Both directions Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Selection: Vehicle Summay: Add to Rating H15:44 H5:244 H5:20:10) H5:20:10) H5:20:44 Type 33 Type 33: Type 33: Type 33: Type 33: Blancet Permit 115 (BP 115) Blancet Permit 90 (BP-90) BP-115 (Cont. Spans or > 200 ft) BS:20:Tanden H5:20:Tanden H5:20:Tanden H5:20:Tanden H5:20:Tanden H5:20:Tandek Only SU6 SU7 VA Type 33: Va Type 33: User Defined PickUp Truck	Vehicles Duant Tanin Description	
	Vehicle Selection: Traffic Direction: Both directions Vehicle Selection: Vehicle Select	Refresh Temporary Vehicles Vehicle Summary: Add to Rating Pating Vehicles Inventory Operating Remove from Analysis <

The **Analysis Settings** window will appear.

Left click the **Open Template** button or create the vehicle summary by following the steps previously explained.



Left click Continuous Span (Run 1 of 2) and left click the Open button.

0	pen Template				×
	Templates	Description	Analysis	Owner	Public/Priv
	Continuous Span (Run 1 of 2) Continuous Span (Run 2 of 2)	Virtis' new analysis event Virtis' new analysis event Virtis' new analysis event	nating Rating Rating		Public Public Public
	HL 93 Design Review HS 20 Rating	HL 93 Design Řeview HS 20 Rating	Design-Review Rating		Public Public
	LRFR Design Load Rating LRFR Legal Load Rating	LRFR Design Load Rating	naung Rating Rating		Public Public
	LRFR Virtis Engine SS < 20 LRFR Virtis Engine SS > 20	Virtis' new analysis event Virtis' new analysis event	Rating Rating		Public Public
	Delete			Open	Cancel

Left click **OK** to accept the template and rate.

Analysis Progress	
Analysis Event Analysis Event Graden STRUCTURES Graden AS-BUILT [A Graden	 Location - 164.0000 (ft) Location - 167.0000 (ft) Location - 168.0000 (ft) Location - 168.0003 (ft) Location - 168.5000 (ft) Location - 6.0807 (ft) Location - 44.5063 (ft) Location - 55.4938 (ft) Location - 113.5063 (ft) Location - 124.4938 (ft) Location - 162.9195 (ft) Completed Specification Check. Info - Finished LRFR specification checking Info - Finished populating specification checking results
View Rating Log	Info - Analysis completed!

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**.

US Custo	many OSI/Metric		quested) Detailed	Display Forma Mutiple ratin	at g levels per row	~				
Bridge Id	Vehicle	Inventory Rating Factor	Operating Rating Factor	Legal Rating Factor	Single rating Rating Factor	g levels per row level per row Rating Method	g Rating Method	Legal Rating Method	Permit Rating Method	Inventory Capacity (Ton)	Operatin Capacity (Ton)
08108	HL-93 (US)	0.498	0.646			LRFR	LRFR			17.94	23.2
08108	Notional Rating Load-NRL			0.713				LRFR			
08108	SU4			0.997			[]	LRFR			
08108	SU5			0.910				LRFR			
08108	SU6			0.817		1		LRFR			
08108	SU7			0.745				LRFR			
08108	VA Type 3S2			1.094				LRFR			
08108	VA Type 3			1.125		2		LRFR			
		<i></i>	100						49		



FINAL STRUCTURE RATINGS

Continuous Span (Run 1 of 2)

Bridge Id	Vehicle	Rating	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicl Path
08108	HL-93 (US)	Inventory	0.498	LRFR	17.94	Tuesday, November 15, 2011 14:00:	virtis	As Requested	As Requested			
08108	HL-93 (US)	Operating	0.646	LRFR	23.26	Tuesday, November 15, 2011 14:00:	virtis	As Requested	As Requested	~		
08108	Notional Rating Load-NRL	Legal	0.713	LRFR	28.50	Tuesday, November 15, 2011 14:00:	virtis	As Requested	As Requested	 Image: A start of the start of		
08108	SU4	Legal	0.997	LRFR	26.91	Tuesday, November 15, 2011 14:00:	virtis	As Requested	As Requested	~		
08108	SU5	Legal	0.910	LRFR	28.20	Tuesday, November 15, 2011 14:00:	virtis	As Requested	As Requested	~		
08108	SU6	Legal	0.817	LRFR	28.39	Tuesday, November 15, 2011 14:00:	virtis	As Requested	As Requested	V		
08108	SU7	Legal	0.745	LRFR	28.89	Tuesday, November 15, 2011 14:00:	virtis	As Requested	As Requested	~		
08108	VA Type 3S2	Legal	1.094	LRFR	43.77	Tuesday, November 15, 2011 14:00:	virtis	As Requested	As Requested	~		
08108	VA Type 3	Legal	1.125	LRFR	30.37	Tuesday, November 15, 2011 14:00:	virtis	As Requested	As Requested	~		

Continuous Span (Run 2 of 2)

US Custo	omary 🔘 SI / Metric	⊙ As	Reques	ted	🔿 Detaile	d Single rating level per row	~					
Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehic Path
08108	HS-20-Lane Load Only	Inventory	1.260	LRFR	0.00	Tuesday, November 15, 2011 14:05:	virtis	As Requested	As Requested			
08108	HS-20-Lane Load Only	Operating	1.633	LRFR	0.00	Tuesday, November 15, 2011 14:05:	virtis	As Requested	As Requested	~		
08108	HS-20-Truck Only	Inventory	0.650	LRFR	23.41	Tuesday, November 15, 2011 14:05:	virtis	As Requested	As Requested	~		
08108	HS-20-Truck Only	Operating	0.843	LRFR	30.34	Tuesday, November 15, 2011 14:05:	virtis	As Requested	As Requested	~		
08108	HS-20-Tandem	Inventory	0.787	LRFR	18.89	Tuesday, November 15, 2011 14:05:	virtis	As Requested	As Requested	~		
08108	HS-20-Tandem	Operating	1.021	LRFR	24.49	Tuesday, November 15, 2011 14:05:	virtis	As Requested	As Requested	~		
08108	Lane-Type Legal Load	Legal	1.679	LRFR	67.16	Tuesday, November 15, 2011 14:05:	virtis	As Requested	As Requested	~		
08108	Blanket Permit 115 (BP-115)	Permit	1.002	LRFR	57.64	Tuesday, November 15, 2011 14:05:	virtis	As Requested	As Requested	~		
08108	Blanket Permit 90 (BP-90)	Permit	0.824	LRFR	37.08	Tuesday, November 15, 2011 14:05:	virtis	As Requested	As Requested	~		



REVIEWING SPECIFICATION CHECKS AND RATING FACTORS

To review the specification checks and to find the rating factors follow these steps:



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 **G1** folder to display the points of analysis for each span.

Specification Checks for G1		
🖃 🧰 Superstructure Component 🛛 🖌	Specification Reference	Flex. Sense Pass/Fail
📄 💼 Stage 3		
📄 🚖 G1		
🦳 🧰 Span 1 - 0.00 ft.		
💼 Span 1 - 1.00 ft.		
🛄 Span 1 - 5.00 ft.		
📄 Span 1 - 5.98 ft.		
🔚 🛄 Span 1 - 6.00 ft.		
🛁 Span 1 - 9.00 ft.		
🛄 Span 1 - 10.00 ft.		
📄 Span 1 - 20.00 ft. 🛽		



For this example, the controlling member is G1. One of the controlling locations is in Span 3 at distance 24.00 ft. Scroll down to this location and left click on the associated folder.

Specification Checks for G1 - 18 of the second s	f 1734		_ 🗆 🔀
Span 3 - 14.75 ft. 🔺	Specification Reference	Flex. Sense	Pass/Fail
Span 3 - 15.00 ft.	2.5.2.6.2 Criteria for Deflection	N/A	Passed
	🖹 5.4.2.5 Poisson's Ratio	N/A	General Comp.
	5.4.2.6 Modulus of Rupture	N/A	General Comp.
Span 3 - 20.00 ft.	NA 5.5.3.2 Reinforcing Bars	N/A	Not Required
	5.7.2.2 Rectangular Stress Distribution	N/A	General Comp.
🦳 Span 3 - 23.00 ft.	X 5.7.3.2 Flexural Resistance (Reinforced Concrete)	N/A	Failed
🦳 🔚 Span 3 - 23.17 ft.	× 5.7.3.3.2 Minimum Reinforcement	N/A	Failed
	NA 5.7.3.4 Control of Cracking by Distribution of Reinforcement	N/A	Not Required
Span 3 - 25.00 ft.	5.8.2.5 Minimum Transverse Reinforcement	N/A	Passed
	5.8.2.7 Maximum Spacing of Transverse Reinforcement	N/A	Passed
	✓ 5.8.3.3 Nominal Shear Resistance	N/A	Passed
🔚 Span 3 - 35.00 ft.	5.8.3.4 Procedures for Determining Shear Resistance	N/A	General Comp.
	× 5.8.3.5 Longitudinal Reinforcement	N/A	Failed
	X 6.4.2.1.Concrete Flexure General Load Rating Equation - Concrete Flexure	N/A	Failed
📄 Span 3 - 44.00 ft.	6.4.2.1.Concrete Shear General Load Rating Equation - Concrete Shear	N/A	Passed
📄 Span 3 - 44.02 ft. 📄	NA 6.5.4.2.2.2 Permit Load Rating	N/A	Not Required
Span 3 - 45.00 ft.	Cracked_Moment_of_Inertia Section Property Calculations	Positive Fl	General Comp.
	Cracked_Moment_of_Inertia Section Property Calculations	Negative	General Comp.

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.



Screenshots of this window can be seen below:

Spec Check D	etail for 6.4.2.1.Concrete Flexure	General Lo	ad Rating Equation	n - Concre	te Flexure						
6 Load and 6.4 Load Ra 6.4.2 Gene: 6.4.2.1 Con (AASHTO Mar Rating (IJ RC T-Beam - Input: Condition H System Fact Dystem Fact DW Moment	Load and Resignation Structure A: denotesting Spreadness A: denotesting Spreadness 4.2 Sectoral Load-Rating Equation A: 1: Concrete Flexure General SHIO Monuel for Condition Fullation and Load and Resignance Factor string (LRR) of Highway Bridges, First Faller A: denotesting - 2003, 3005 Interims) T-Beam - At Location = 143.0000 (ft) - Left put: addition Factor = 1.0000 stem Factor = 0.0000 (kip-ft) meant = 0.1000 stem Factor = 0.0000 (kip-ft) add Vehicle State LL (kip-ft) signifue Hi-93 (05) - Truck + Lane STR-1 (47.22 1.25 1.50 1.75 0.90 E13.09 1.00 0.76 27.42 signifue Hi-93 (05) - Truck + Lane STR-1 (47.22 1.25 1.50 1.35 0.90 E13.09 1.00 0.97 Sister signifue Hi-93 (05) - Truck + Lane STR-1 (47.22 1.25 1.50 1.35 0.90 E13.09 1.00 0.97 Sister signifue Hi-93 (05) - Truck + Lane STR-1 (42.21 1.25 1.50 1.35 0.90 E13.09 1.00 0.97 Sister signifue Hi-93 (05) - Truck + Lane STR-1 (42.21 1.25 1.50 1.35 0.90 E13.09 1.00 0.97 Sister signifue Hi-93 (05) - Truck + Lane STR-1 (42.21 1.25 1.50 1.35 0.90 E13.09 1.00 0.97 Sister signifue Hi-93 (05) - Truck + Lane STR-1 (24.21 1.25 1.50 1.35 0.90 E13.09 1.00 0.98 Sister signifue Hi-93 (05) - Truck + Lan										
		Limit			Load Fac	tors					
Load	Vehicle	State	LL (kip-ft)	DC	DW	LL	Phi	Mn (kip-ft)	K	RF	Capacity (Ton)
DesignInv	HL-93 (US) - Truck + Lane	STR-I	467.29	1.25	1.50	1.75	0.90	813.09	1.00	0.76	27.42
Designinv	HL-93 (US) - Truck + Lane	STR-1	-321.12	1.25	1.50	1.75	0.90	-358.19	0.54	0.77	27.63
DesignOp	HL-93 (US) - Truck + Lane	STR-I	467.29	1.25	1.50	1.35	0.90	813.09	1.00	0.99	35.54
DesignOp	HL-93 (US) - Truck + Lane	STR-I	-321.12	1.25	1.50	1.35	0.90	-358.19	0.75	0.99	35.82
DesignInv	HL 93 (US) Tandem Lane	STR I	448.96	1.25	1.50	1.75	0.90	813.09	1.00	0.79	19.82
DesignInv	HL-93 (US) - Tandem + Lane	STR-I	-264.37	1.25	1.50	1.75	0.90	-358.19	0.69	0.93	23.31
DesignOp	HL-93 (US) - Tandem + Lane	STR-I	448.96	1.25	1.50	1.35	0.90	813.09	1.00	1.03	25.69
DesignOp	HL-93 (US) - Tandem + Lane	STR-I	-264.37	1.25	1.50	1.35	0.90	-358.19	0.98	1.21	30.21
Designinv	HL-93 (US) - 90%(Truck Pair +	~ STR-1	0.00	1.25	1.50	1.75	0.90	813.09	1.00	99.00	7128.00
Designinv	HL 93 (US) 90% (Truck Pair)	- STR I	0.00	1.25	1.50	1.75	0.90	813.09	1.00	99.00	7128.00
Designop	HL-93 (US) - 90-8 (IFUCk Pair +	CTD T	0.00	1.25	1.50	1.35	0.90	013.09	1.00	99.00	7120.00
Leggl	IL-93 (05) - 90% (Iruck Pair +	SIR-1	0.00	1.25	1.50	1.35	0.90	912 00	1.00	99.00	2050.00
Legal	Isne-Type Legal Load - Legal	~ STR-I	0.00	1 25	1.50	1 42	0.50	813.09	1.00	99.00	3960.00
Legal	Notional Bating Load-NBL - Tr	~ STR-T	423.02	1.25	1.50	1.42	0.90	013.09	1.00	1.04	41.53
Legal	Notional Rating Load-NRL - Tr	~ STR-T	-277.70	1.25	1.50	1.42	0.90	-358.19	0.85	1.10	43.90
Legal	SU4 - Truck	STR-I	318.17	1.25	1.50	1.42	0.90	813.09	1.00	1.38	37.34
Legal	SU4 - Truck	STR-I	-193.60	1.25	1.50	1.42	0.90	-358.19	1.00	1.57	42.50
Legal	SU5 - Truck	STR-I	344.02	1.25	1.50	1.42	0.90	813.09	1.00	1.28	39.66
Legal	SU5 - Truck	STR-I	-217.54	1.25	1.50	1.42	0.90	-358.19	1.00	1.40	43.43
Legal	SU6 - Truck	STR-I	378.53	1.25	1.50	1.42	0.90	813.09	1.00	1.16	40.40
Legal	SU6 - Truck	STR-I	-242.24	1.25	1.50	1.42	0.90	-358.19	1.00	1.26	43.72
Legal	SU7 - Truck	STR-T	405.15	1.25	1.50	1.42	0.90	813.09	1.00	1.09	42.09
Legal	SU7 - Truck	STR-I	-265.45	1.25	1.50	1.42	0.90	-358.19	0.91	1.15	44.49
Legal	VA Type 352 - Truck	STR-I	280.22	1.25	1.50	1.42	0.90	813.09	1.00	1.57	62.82
Legal	VA Type 352 - Truck	SIR-I	-180.84	1.25	1.50	1.42	0.90	-358.19	1.00	1.69	67.41
Legal	VA Type 3 - Truck	SIR-I	261.09	1.25	1.50	1.42	0.90	813.09	1.00	1.69	45.51
Legend: NA - Resist	tance and live load are of oppo	site sign	so rating facto:	r is not	applicabl	e.	0.50	-336.13	1.00	1.75	
											×
<u> </u>			ш							_	>
											UK

Spec Check Detail for 6.4.2.1.Concrete Flexure Gen	eral Load Kating Equatio	n - Concre	ete Flexure						
6 Load and Resistance Factor Rating 6.4 Load Rating Procedures 6.4.2 General Load-Rating Equation 6.4.2.1 Concrete Flexure General (AAOHTO Manual For Condition Evaluation and Rating (LRER) of Highway Bridges, First Edi RC T-Ream - At Location = 143.0000 (ft) - Le	Load and Resistance Fe tion - 2003, 2005 Inte fr.	ctor rims)							
Input:									=
Condition Factor = 1.0000 System Factor = 1.0000 DC Moment = 07.1645 (klp-ft) DW Moment = 0.0000 (klp-ft)			T						
Load Vehicle S	imit tate LL (kip-it)	DC	DW DW	LL	Phi	Mn (kip-it)	ĸ	RF	Capacity (Ion)
Legal Lane-Type Legal Load - Legal - S Legal Lane-Type Legal Load - (Legal - S Legal Lane-Type Legal Load - (Legal - S Legal Lane-Type Legal Load - (Legal - S Designiny HS-20-Lane Load Only - Lane S DesignOp HS-20-Landem - Tandem S DesignIny HS-20-Tandem - Tandem S DesignOp HS-20-Tandem - Tandem S DesignOp HS-20-Tandem - Tandem S DesignOp HS-20-Tandem - Tandem S DesignOp HS-20-Tande Only - Truck S Permit Blanket Permit 15 (BP-115) S Permit Blanket Permit 190 (BP-90) - T - S Permit Blanket Permit 90 (BP-90) - T - S DesignOp (BS-20-Tandem 1) - S DesignOp (BS-20) - T - S DesignOp (BS-20) - Tandem S DesignOp (BS-20) - Tande	IR-I 0.00 IR I 0.00 IR-I 0.00 IR-I 0.00 IR-I 0.00 IR-I 0.00 IR-I 206.42 IR-I -267.00 IR-I -267.00 IR-I -267.00 IR-I -261.81 IR-I -81.61 IR-I -81.61 IR-I -246.13 IR-I -246.13 IR-II 390.62 IR-II 390.62 IR-II -360.34 IR-II -360.34 IR-II -246.65	1.25 1.25 1.25 1.25 1.25 1.25 1.25 1.25	1.50 1.50 1.50 1.50 1.50 1.50 1.50 1.50	1.42 1.42 1.42 1.75 1.75 1.75 1.75 1.35 1.75 1.35 1.35 1.35 1.35 1.35 1.35 1.32 1.32	0.90 0.90 0.90 0.90 0.90 0.90 0.90 0.90	E13.09 613.09 E13.09 E13.09 E13.09 -356.19 013.09 -356.19 013.09 -356.19 E13.09 -356.19 E13.09 -356.19 E13.09 -356.19 E13.09 -356.19 E13.09 -356.19 E13.09 -356.19 E13.09 -356.19 E13.09 -356.19 E13.09 -356.19 E13.09 -356.19 E13.09 -356.19 E13.09	1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00	99.00 99.00 99.00 1.72 1.72 1.36 1.39 1.76 0.98 1.07 1.26 1.39 1.76 0.98 1.00 1.26 1.35 1.21 1.55 1.22	3960.00 3960.00 3960.00 0.00 0.00 0.00 0.00 0.00 25.68 32.54 33.29 42.18 35.13 36.05 45.13 36.45 45.45 45.45 45.45 45.50 57.11
<									
									ОК

Continuous Span (Run 2 of 2)

Continuous Span (Run 1 of 2)

COMPLETING VDOT LRFR RATING FORM

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

	nd Bridge
Rte.: 00055, John Marshall Highway	
Over: Cedar Creek Va. Str. No.: 1996 Fed. ID: 08108	
County: Frederick District: Staunton	
Rated By: ABC Date: 10/15/11 Checked By: DEF Date: 10/19/11 VDOT Reviewer:	Signature: Date:

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.



DESIGN LOAD: HL-93

Gross Vehicle Weight

	\sim				
	(GVW)	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
DESIGN LOAD		FACTOR			
***HL-93 (INV)	N/A				
***HL-93 (OPR)	N/A				

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.

System of Ur US Custo	nits mary OSI / Metric	⊂Lane/Ir ⊙As	mpact Lo Reques	bading Ty ted	ype O Dietaile	d Display Format Single rating level per row	*					
Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impa ct	Lane	Up To Date	DB	Vehic Pat
08108	HL-93 (US)	Inventory	0.498	LIRFR	17.94	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	HL-93 (US)	Operating	0.646	LIRFR	23.26	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	Notional Rating Load-NRL	Legal	0.713	LIRFR	28.50	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	SU4	Legal	0.997	LIRFR	26.91	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		
08108	SU5	Legal	0.910	LRFR	28.20	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	v		
08108	SU6	Legal	0.817	LIRFR	28.39	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	SU7	Legal	0.745	LIRFR	28.89	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		
08108	VA Type 3S2	Legal	1.094	LIRFR	43.77	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	v		
08108	VA Type 3	Legal	1.125	LIRFR	30.37	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
Show up-to Tew Structur	-date results only e Rating Results Save	All										Diose

Then, left click the View Structure Rating Results button.

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

Structure Ra	tructure Rating Results														
System of Ur	nits omary 🚫 SI / Metri	c L	ane/Impact) As Requ	Loading iested	і Туре О De	etailed	Display Format Single rating level per row	¥							
Bridge Id	Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path		
08108	AS-BUILT	HL-93 (US)	Inventory	0.498	LRFR	17.94	Tuesday, November 15, 2011 14	: virtis	As Requested	As Requested	V				
08108	AS-BUILT	HL-93 (US)	Operating	0.646	LRFR	23.26	Tuesday, November 15, 2011 14	: virtis	As Requested	As Requested	V				
View Membe	View Member Rating Results View up-to-date results only														

Left click the View Member Rating Results button.



The Member Rating Results window will appear.

ember Rating Results System of Units Lane/Impact Loading Type Display Format It is US Customary SI / Metric It is a constrained of the constrained of th																	
	Bridge Id	Structure	Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
	68108	AS-BUILT	G1	HL-93 (US)	Inventory	0.498	17.94	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	68108	AS-BUILT	G1	HL-93 (US)	Operating	0.646	23.26	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	(8108	AS-BUILT	G2	HL-93 (US)	Inventory	0.676	24.35	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	(8108	AS-BUILT	G2	HL-93 (US)	Operating	0.877	31.56	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
Ub105 AS-BULT G2 HL-93 (US) Inventory U.br/c 24.3b 143.00 LH*H Image: Comparison of the second																	
<mark>⊘</mark> SI	now up I	to-date resi	ults only														Close

Since **G1** has lower ratings than **G2**, the rating information for **G1** 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.

	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING LOCATION (FT)	CONTROLLING FORCE
DESIGN LOAD		FACTOR			
***HL-93 (INV)	N/A	0.49	G1	143.00	
***HL-93 (OPR)	N/A	0.64	G1	143.00	

Note: For all results, do not round up. Only record 2 significant digits for the rating factor.



DESIGN LOAD: HS-20

	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING	CONTROLLING FORCE
	(10110)	TONS	MEMBERRO	200/11011	TONOL
HS-20 (INV)	36				
HS-20 (OPR)	36				

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.

Br	idge Ratin	g Results											
	System of U US Custo	nits omary OSI / Metric	Lane/Ir As	mpact Lo Reques	bading Ty ≋ted	/pe O Detaile	d Display Format Single rating level per row	¥					
	Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
	08108	HS-20-Lane Load Only	Inventory	1.260	LIRFR	0.00	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	-		
	08108	HS-20-Lane Load Only	Operating	1.633	L <mark>IRFR</mark>	0.00	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	HS-20-Truck Only	Inventory	0.650	LIRFR	23.41	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	V		
	08108	HS-20-Truck Only	Operating	0.843	LIRFR	30.34	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	HS-20-Tandem	Inventory	0.787	LIRFR	18.89	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	-		
	08108	HS-20-Tandem	Operating	1.021	LIRFR	24.49	Tuesday, November 15, 2011 14:59:	virtis	A.s Requested	As Requested	>		
	08108	Lane-Type Legal Load	Legal	1.679	LIRFR	67.16	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	V		
	08108	Blanket Permit 115 (BP-115)	Permit	1.002	LIRFR	57.64	Tuesday, November 15, 2011 14:59:	virtis	A.s Requested	As Requested	~		
	08108	Blanket Permit 90 (BP-90)	Permit	0.824	LIRFR	37.08	Tuesday, November 15, 2011 14:59:	virtis	A.s Requested	As Requested	V		
	☑ Show up-to View Structu	o-date results only re Rating Results Save	All										Close

Then, left click the View Structure Rating Results button.

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

Structure Ra	structure Rating Results														
System of Un	nits omary 🔿 SI / Metric	• [L	ane/Impact • As Requ	: Loading Jested	Туре О De	atailed	Display Format Single rating level per row	v							
Bridge Id	Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path		
08108	AS-BUILT	HS-20-Truc	Inventory	0.650	LRFR	23.41	Tuesday, November 15, 2011 14	: virtis	As Requested	As Requested	V				
08108	AS-BUILT	HS-20-Truc	Operating	0.843	LRFR	30.34	Tuesday, November 15, 2011 14	: virtis	As Requested	As Requested	V				
View Memb	er Rating Results 🛛 🔽	Show up to	-date result:	s only								(Close		

Left click the View Member Rating Results button.

The Member Rating Results window will appear.



M	embe	er Rat	ting Resu	ılts														
	Syste	em of L IS Cus	Jnits tomary (🔾 SI 7 M	etric	Lane/Impa	ot Loadir quested	ng Type O De	ailed	Display Single	v Format e rating ev	/el pe	r 10W					
	B	ridge Id	Structure	Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
	6	8108	AS-BUILT	G1	HS-20-Truck	Inventory	0.650	23.41	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	Q	8108	AS-BUILT	G1	HS-20-Truck	Operating	0.843	30.34	143.00	LRFR	~		Tuesday, November 15 2011 14:	virtis	As Requested	As Requested		
	0	8108	AS-BUILT	G 2	HS-20-Truck	Inventory	0.882	31.77	143.00	LRFR	~		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	6	8108	AS-BUILT	G2	HS-20-Truck	Operating	1.144	41.18	143.00	LRFR	~		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
E	🖌 Sho	ow up I	to-date resi	ults only														Close

Since **G1** has lower ratings than **G2**, the rating information for **G1** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
		TONS			
HS-20 (INV)	36	23	G1	143.00	
HS-20 (OPR)	36	30	G1	143.00	

Note: For all tonnages, do not round up. Instead, round down to the nearest ton.



LEGAL LOAD: VA TYPE 3

	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING LOCATION (FT)	CONTROLLING FORCE
LEGAL LOADS		TONS	**		
VA Type 3	27				
VA Type 3S2	40				
* [,] ***LANE	40				

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.

າມລາວແຜ່ນເປ	mary 🔘 SI / Metric	• As	Reques	ted (🔵 Detaile	d Single rating level per row	¥					
Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehi Pat
08108	HL-93 (US)	Inventory	0.498	LIRF R	17.94	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	>		
08108	HL-93 (US)	Operating	0.646	LIRFR	23.26	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		
08108	Notional Rating Load-NRL	Legal	0.713	LIRFR	28.50	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	SU4	Legal	0.997	LIRFR	26.91	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		
08108	SU5	Legal	0.910	LIRFR	28.20	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		
08108	SU6	Legal	0.817	LIRFR	28.39	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	SU7	Legal	0.745	LIRF R	28.89	Tuesday, November 15, 2011 14:19:	virtis	A.s Requested	As Requested	V		
08108	VA Type 3S2	Legal	1.094	LIRFR	43.77	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		
08108	VA Type 3	Legal	1.125	LIRFR	30.37	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		

Then, left click the View Structure Rating Results button.

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

Structure Ra	Structure Rating Results														
System of Units US Customary SI / Metric As Requested Detailed Display Format As Requested Detailed Single rating level per row															
Bridge Id	Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path		
08108	AS-BUILT	VA Type 3	Legal	1.125	LRFR	30.37	Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested	 Image: A start of the start of				
View Membe	er Rating Results	Show up-to	date result:	s only								(Close		

Left click the View Member Rating Results button.

The Member Rating Results window will appear.



M	ember	Rating Res	ults														
	System	of Units Customary	🔿 SI 7 M	letric	Lane/Impa ④ As Re	ct Loadii quested	ng Type O De	aled	Displa Single	y Format e rating ev	vel pe	r 10W					
	Brid Id	e Structur	Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
	(810	8 AS-BUIL	F G1	VA Type 3	Legal	1.125	30.37	143.00	LRFR	V		Tuesday, November 15 2011 14:	virtis	As Requested	As Requested		
	<mark>(81</mark> 0	8 AS-BUIL	r G2	VA Type 3	Legal	1.526	41.21	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
C8108 AS-BULT G2 VA Type 3 Legal 1.526 41.21 143.00 LRFR V Tuesday, November 15 2011 14: virtis As Requested As Requested																	
E	Z Show	up•to•date re	sults only														Close

Since **G1** has lower ratings than **G2**, the rating information for **G1** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
LEGAL LOADS		IONS	XX		
VA Type 3	27	30	G1	143.00	
VA Type 3S2	40				
*, ***LANE	40				



LEGAL	LOAD:	VA T	YPE 3S2

	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING LOCATION (FT)	CONTROLLING FORCE
LEGAL LOADS		TONS	**		
VA Type 3	27	30	G1	143.00	
VA Type 3S2	40				
*, ***LANE	40				

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.

			Tieques	ted (🔿 Detaile	d Single rating level per row	*					
Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehi Pat
08108	HL-93 (US)	Inventory	0.498	LIRFR	17.94	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	HL-93 (US)	Operating	0.646	LIRFR	23.26	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	Notional Rating Load-NRL	Legal	0.713	LIRFIR	28.50	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	SU4	Legal	0.997	LIRFR	26.91	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	SU5	Legal	0.910	LIRFR	28.20	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	v		
08108	SU6	Legal	0.817	LIRFR	28.39	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	Image: A start of the start		
08108	SU7	Legal	0.745	LIRFR	28.89	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
08108	VA Type 3S2	Legal	1.094	LIRFR	43.77	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	 Image: A set of the set of the		
08108	VA Type 3	Legal	1.125	LIRFR	30.37	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		
08108 08108 08108 08108	SU7 VA Type 3S2 VA Type 3 r-date results only	Legal Legal Legal most recen	0.745 1.094 1.125 t results	LRFR LRFR LRFR only	28.89 43.77 30.37	Tuesday, November 15, 2011 14:19: Tuesday, November 15, 2011 14:19: Tuesday, November 15, 2011 14:19:	virtis virtis virtis	As Requested As Requested As Requested	As Requested As Requested As Requested			

Then, left click the View Structure Rating Results button.

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

Structure R	tructure Rating Results													
System of L O US Cust	System of Units Lane/Impact Loading Type Display Formet US Customary SI / Metric As Requested Detailed Single rating level per row Image: Compared level per row Image: Compared level per row													
Bridge k	d Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path	
08108	AS-BUILT	VA Type 3S	Legal	1.094	LRFR	43.77	Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested	v			
View Memb	er Rating Results	Show up to-	date result:	s only								(Close	

Left click the View Member Rating Results button.

The Member Rating Results window will appear.



M	ember Rating Results																
	- System of Units US Dustomary OSI / Metric																
	Bride	e Structure	e Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
	0810	8 AS-BUILT	G1	VA Type 3S2	Legal	1.094	43.77	143.00	LRFR	~		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	(810	8 AS-BUILT	G2	VA Type 3S2	Legal	1.464	58.54	20.00	LRFR	~		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	C8108 AS-BUILT G2 VA Type 3S2 Legal 1.464 58.54 20.00 LRFR 🖓 🔲 Tuesday, November 15 2011 14: virtis As Requested As Requested																
E	Show up-to-date results only																

Since **G1** has lower ratings than **G2**, the rating information for **G1** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
LEGAL LOADS		IONS	XX		
VA Type 3	27	30	G1	143.00	
VA Type 3S2	40	43	G1	143.00	
*, ***LANE	40				



LEGAL LOAD: LANE

	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING LOCATION (FT)	CONTROLLING FORCE
LEGAL LOADS		TONS	**		
VA Type 3	27	30	G1	143.00	
VA Type 3S2	40	43	C1	1 4 3.00	
*, ***LANE	40				

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

stem of Ur US Custo	nits omary 🚫 SI / Metric	CLane/Ir As	Reques	ted ted	ype O Detaile	d Display Format Single rating level per row	¥					
Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehi Pat
08108	HS-20-Lane Load Only	Inventory	1.260	LIRFR	0.00	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	V		
08108	HS-20-Lane Load Only	Operating	1.633	LIRFR	0.00	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	V		
08108	HS-20-Truck Only	Inventory	0.650	LIRFR:	23.41	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	V		
08108	HS-20-Truck Only	Operating	0.843	LIRFR	30.34	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
08108	HS-20-Tandem	Inventory	0.787	LIRFR	18.89	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
08108	HS-20-Tandem	Operating	1.021	LIRFR:	24.49	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	V		
08108	Lane-Type Legal Load	Legal	1.679	LIRFR	67.16	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested			
08108	Blanket Permit 115 (BP-115)	Permit	1.002	LIRFR	57.64	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
08108	Blanket Permit 90 (BP-90)	Permit	0.824	LIRFR	37.08	Tuesday, November 15, 2011 14:59:	virtis	A.s Requested	As Requested	v		
08108	Blanket Permit 90 (BP-90)	Permit	0.824	LRFR	37.08	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested			

Then, left click the View Structure Rating Results button.

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

5	itructure Rating Results													
	System of Units Lane/Impact Loading Type Display Format Structure As Requested Detailed Single rating level per row Image: Single rating level per row													
	Bridge k	I Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
	08108	AS-BUILT	Lane-Type	Legal	1.679	LRFR	67.16	Tuesday, November 15, 2011 14	virtis	As Requested	As Requested	v		
	View Memb	er Rating Results	Show up to	-date result	s only								(Close

Left click the View Member Rating Results button.



The Member Rating Results window will appear.

M	ember Rating Results																	
	Sys ()	tem of US Cu-	Units stomary	🔿 SI / M	etric	Lane/Impa	ot Loadin quested	g Type O De	tailed	Display Single	Format rating ev	vel pe	r 10/4					
	1	Bridge Id	Structure	Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
	((8108	AS-BUILT	G1	Lane-Type Le	Legal	1.804	72.15	50.00	LRFR	V		Tuesday, November 15 2011 14:	virtis	As Requested	As Requested		
	(08108	AS-BUILT	G2	Lane-Type Le	Legal	1.679	67.16	119.00	LRFR	~		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	Corros AS-BULT G2 Lane-Type Le Legal 1.679 67.16 119.00 LRFR V Tuesday, November 15 2011 14: virtis As Requested As Requested																	
[Z Sł	now up	-to-date res	ults only														Close

Since **G2** has lower ratings than **G1**, the rating information for **G2** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
LEGAL LOADS		TONS	**		
VA Type 3	27	30	G1	143.00	
VA Type 3S2	40	43	G1	143.00	
* [,] ***LANE	40	67	G2	119.00	



PERMIT LOAD: BP-90

	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING LOCATION (FT)	CONTROLLING FORCE
PERMITLOAD		TONS			
BP-90	45			143.00	
BP-115	57.5			04.50	

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.

Bri	lge Ratin	g Results											
	stem of Ur US Custo	nits mary OSI / Metric	Lane/II	npact Lo Reques	bading Ty ted	pe O Dietaile	d Display Format Single rating level per row	v					
	Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
	08108	HS-20-Lane Load Only	Inventory	1.260	LRFR	0.00	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	V		
	08108	HS-20-Lane Load Only	Operating	1.633	LIRFR	0.00	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	v		
	08108	HS-20-Truck Only	Inventory	0.650	LIRFR	23.41	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	HS-20-Truck Only	Operating	0.843	LIRFR	30.34	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	HS-20-Tandem	Inventory	0.787	LIRFR	18.89	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	HS-20-Tandem	Operating	1.021	LIRFR	24.49	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	4		
	08108	Lane-Type Legal Load	Legal	1.679	LIRFR	67.16	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	Blanket Permit 115 (BP-115)	Permit	1.002	LIRFR	57.64	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	Blanket Permit 90 (BP-90)	Permit	0.824	LIRFR	37.08	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	V		
	Show up to ïew Structur	-date results only re Rating Results Save	All										Close

Then, left click the View Structure Rating Results button.

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

Structure R	ating Results												
System of U O US Cust	inits comary OSI/Metric	• [Li	ene/Impact () As Requ	Loading iested	De	stailed	Display Format Single rating level per row	v					
Bridge k	d Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
08108	AS-BUILT	Blanket Per	Permit	0.824	LRFR	37.08	Tuesday, November 15, 2011 14	virtis	As Requested	As Requested	V		
View Memb	er Rating Results]Show up to	date result:	s only								(Close

Left click the View Member Rating Results button.



The Member Rating Results window will appear.

Men	nber Ra	ting Res	ults														
	ystem of I US Cus	Units rtomary	🔿 SI / M	etric	Lane/Impa	<mark>ct Loadin</mark> quested	g Type O De	tailed	Display Single	Format rating ev	/el pe	10W					
	Bridge Id	Structure	Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
	(8108	AS-BUILT	G1	Blanket Permit	t Permit	0.824	37.08	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	(8108	AS-BUILT	G2	Blanket Permi	t Permit	1.118	50.31	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	Show up	to-date resi	ults only														Close

Since **G1** has lower ratings than **G2**, the rating information for **G1** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
PERMITLOAD		TONS			
BP-90	45	37	G1	143.00	
BP-115	57.5		G1	04.50	



PERMIT LOAD: BP-115

	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING LOCATION (FT)	CONTROLLING FORCE
PERMITLOAD		TONS			
BP-90	45	37	G1	143.00	
BP-115	57.5	220	- 01	04.50	

To fill out the rating information for the BP-115 vehicle, first highlight the **Blanket Permit 115** (BP-115) row in the **Bridge Rating Results** window.

Bridg	e Ratin	g Results											
Sys	tem of Ur US Custo	iits mary OSI / Metric	⊂Lane/Ir ⊙As	npact Lo Reques	ading Ty ted	∩pe ◯ Detaile	d Display Format Single rating level per row	v					
	Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
	08108	HS-20-Lane Load Only	Inventory	1.260	LIRFR	0.00	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	HS-20-Lane Load Only	Operating	1.633	LIRFR	0.00	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	v		
	08108	HS-20-Truck Only	Inventory	0.650	LIRFR	23.41	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	4		
	08108	HS-20-Truck Only	Operating	0.843	LIRFR	30.34	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	HS-20-Tandem	Inventory	0.787	LIRFR	18.89	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	HS-20-Tandem	Operating	1.021	LIRFR	24.49	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	4		
	08108	Lane-Type Legal Load	Legal	1.679	LIRFR	67.16	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	~		
	08108	Blanket Permit 115 (BP-115)	Permit	1.002	LIRFR	57.64	Tuesday, November 15, 2011 14:59:	virtis	A.s Requested	As Requested	~		
	08108	Blanket Permit 90 (BP-90)	Permit	0.824	LIRFR	37.08	Tuesday, November 15, 2011 14:59:	virtis	As Requested	As Requested	v		
☑ SH Viet	✓ Show up-to-date results only View Structure Rating Results Save All												

Then, left click the View Structure Rating Results button.

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

Structure R	ating Results												
System of U	nits omary OSI/Metri	• [Li	ene/Impact () As Requ	: Loading uested	De O De	tailed	Display Format Single rating level per row	v					
Bridge k	I Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
08108	AS-BUILT	Blanket Per	Permit	1.002	LRFR	57.64	Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested	V		
View Memb	er Rating Results]Show up to	date result:	s only								(Close

Left click the View Member Rating Results button.



The Member Rating Results window will appear.

Mei	mber Ra	iting Resi	ults														
	iystem of OUS Cu-	Units stomary	🔿 SI / M	etric	Lane/Impa	ot Loadin quested	g Type O De	tailed	Display Single	Format rating ev	/el pe	10W					
	Bridge Id	Structure	Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
	08108	AS-BUILT	G1	Blanket Permit	t Permit	1.002	57.64	20.00	LRFR	V		Tuesday, November 15 2011 14:	virtis	As Requested	As Requested		
	68108	AS-BUILT	G2	Blanket Permi	Permit	1.115	64.14	20.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	Show up	•to•date resi	ults only														Close

Since **G1** has lower ratings than **G2**, the rating information for **G1** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
PERMITLOAD		TONS			
BP-90	45	37	G1	143.00	
BP-115	57.5	57	G1	20.00	



	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
SH VEHICLES		TONS	**		
NRL	40				
SU4	27				
SU5	31				
SU6	34.75				
SU7	38.75				

SH VEHICLE: NRL

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

Brid	lge Ratin	g Results											
6	ystem of Ur) US Custo	nits mary OSI / Metric	⊂Lane/Ir ⊙As	npact Lo Reques	bading Ty sted	ype O Dietaile	d Display Format Single rating level per row	¥					
	Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
	08108	HL-93 (US)	Inventory	0.498	LIRFR	17.94	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested			
	08108	HL-93 (US)	Operating	0.646	LIRFR	23.26	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
	08108	Notional Rating Load-NRL	Legal	0.713	LIRFR	28.50	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		
	08108	SU4	Legal	0.997	LIRFR	26.91	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
	08108	SU5	Legal	0.910	LIRFR	28.20	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		
	08108	SU6	Legal	0.817	LIRFR	28.39	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
	08108	SU7	Legal	0.745	LIRFR	28.89	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V		
	08108	VA Type 3S2	Legal	1.094	LIRFR	43.77	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	v		
	08108	VA Type 3	Legal	1.125	LIRFR	30.37	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~		
	Show up-to-date results only Show most recent results only Close Close												

Then, left click the View Structure Rating Results button.

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

S	tructure R	ating Results												
	System of Units Lane/Impact Loading Type Display Format Image: System of Units Image: System of Units Single rating level per row Image: System of Units Image: System of Units Single rating level per row													
	Bridge k	I Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
	08108	AS-BUILT	Notional Rati	Legal	0.713	LRFR	28.50	Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested	V		
	View Memb	er Rating Results	Show up-to-	date result:	s only								(Close

Left click the View Member Rating Results button.



The Member Rating Results window will appear.

Member Rating Resu	Member Rating Results														
System of Units Lane/Impact Loading Type Display Format O US Cuvtomary O SI / Metric O Detailed Single rating evel per row															
Bridge Id Structure	Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
08108 AS-BUILT	G1 I	Notional Ratin	Legal	0.713	28.50	143.00	LRFR	V		Tuesday, November 15 2011 14:	virtis	As Requested	As Requested		
C8108 AS-BUILT	G2	Notional Ratin	Legal	0.967	38.69	143.00	LRFR	~		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
Show up to-date resu	ilts only														Close

Since **G1** has lower ratings than **G2**, the rating information for **G1** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
SH VEHICLES		TONS	**		
NRL	40	28	G1	143.00	
SU4	27				
SU5	31				
SU6	34.75				
SU/	38.75				



	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING LOCATION (FT)	CONTROLLING FORCE
SH VEHICLES		TONS	**		
NRL	40	28	G1	143.00	
SU4	27				
SU5	31				
SU6	34.75				
SU7	38.75				

SH VEHICLE: SU4

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

Br	idge Ratin	g Results												
System of Units Lane/Impact Loading Type Display Format O US Customary O SI / Metric O Detailed Single rating level per row														
	Bridge Id Vehicle Rating Level Rating Factor Rating (Ton) Capacity Time Stamp Rated By Impact Lane											DB	Vehicle Path	
	08108	HL-93 (US)	Inventory	0.498	LIRFR	17.94	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested				
	08108	HL-93 (US)	Operating	0.646	LIRFR	23.26	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	Notional Rating Load-NRL	Legal	0.713	LIRFR	28.50	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	SU4	Legal	0.997	LIRFR	26.91	Tuesday, November 15, 2011 14:19:	virtis	A.s Requested	As Requested	V			
	08108	SU5	Legal	0.910	LIRFR	28.20	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	v			
	08108	SU6	Legal	0.817	LIRFR	28.39	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	SU7	Legal	0.745	LIRFR	28.89	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	VA Type 3S2	Legal	1.094	LIRFR	43.77	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	v			
	08108	VA Type 3	Legal	1.125	LIRFR	30.37	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	 Image: A set of the set of the			
	Show up-to View Structu	o-date results only 📃 Show re Rating Results	most recer	it results	only							[[Close	

Then, left click the View Structure Rating Results button.

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

Stru	icture Ra	ting Results												
S	ystem of Ur US Custo	nits omary 🔿 SI/Metr	c L	ane/Impac • As Requ	t Loading uested	∣Type O De	tailed	Display Format Single rating level per row	v					
	Bridge Id	Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
	08108	AS-BUILT	SU4	Legal	0.997	LRFR	26.91	Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested	V		
	fiew Membe	er Rating Results	Show up to	-date result	s only								(Close

Left click the View Member Rating Results button.



The Member Rating Results window will appear.

N	Member Rating Results																
	System of Units Current Loading Type Display Format Its Current Water A & Requested Detailed Single rating evel per row																
	Brid k	ge Structur	e Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
	681	08 AS-BUIL	T G1	SU4	Legal	0.997	26.91	84.50	LRFR	V		Tuesday, November 15 2011 14:	virtis	As Requested	As Requested		
	681	08 AS-BUIL	T G2	SU4	Legal	1.296	34.99	20.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	C8108 AS-BULT G2 SU4 Legal 1.296 34.99 20.00 LRFR 🔽 Tuesday, November 15 2011 14: virtis As Requested As Requested																
	🗹 Show	up•to•date re	sults only														Close

Since **G1** has lower ratings than **G2**, the rating information for **G1** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
SH VEHICLES		TONS	**		
NRL	40	28	G1	143.00	
SU4	27	26	G1	84.50	
SU5	31				
SU6	34.75				
SU/	38.75				


	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING LOCATION (FT)	CONTROLLING FORCE
SH VEHICLES		TONS	**		
NRL	40	28	G1	143.00	
SU4	27	26	C1	84.50	
SU5	31				
SU6	34.75				
SU7	38.75				

SH VEHICLE: SU5

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

Bri	ridge Rating Results													
	ystem of Ur	nits omary OSI / Metric	⊂Lane/Ir ⊙As	npact Lo Reques	bading Ty ted	ype O Dietaile	Display Format Single rating level per row	¥						
	Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path	
	08108	HL-93 (US)	Inventory	0.498	LIRFR	17.94	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested				
08108 HL-93 (US) Operating 0.646 LRFR 23.26 Tuesday, November 15, 2011 14:19: virtis As Requested As Requested 🔽 🔲														
	08108	Notional Rating Load-NRL	Legal	0.713	LIRFR	28.50	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	SU4	Legal	0.997	LIRFR	26.91	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	SU5	Legal	0.910	LIRFR	28.20	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~			
	08108	SU6	Legal	0.817	LIRFR	28.39	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	SU7	Legal	0.745	LIRFR	28.89	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	VA Type 3S2	Legal	1.094	LIRFR	43.77	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	v			
	08108	VA Type 3	Legal	1.125	LIRFR	30.37	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	Image: A start of the start			
	Show up-to-date results only Show most recent results only Close Close													

Then, left click the View Structure Rating Results button.

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

Str	Structure Rating Results													
	System of Units Lane/Impact Loading Type Display Format O US Customary SI / Metric As Requested Detailed Single rating level per row Image: Single rating level per row Image: Single rating level per row													
	Bridge Id	Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
	08108	AS-BUILT	SU5	Legal	0.910	LRFR	28.20	Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested	V		
	View Member Rating Results Show up-to-date results only													

Left click the View Member Rating Results button.



The Member Rating Results window will appear.

N	Nember Rating Results																	
	System of Units Lane/Impact Loading Type Display Format Image: Strain Strai																	
	Bric	ge Stru	cture	Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
	(81	08 AS-B	ULT	G1	SU5	Legal	0.910	28.20	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	(81	08 AS-E	ULT	G2	SU5	Legal	1.192	36.97	20.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	(8108 AS-BULT G1 SU5 Legal 0.910 28.20 143.00 LRFR Image: Truesday, November 15 2011 14: virtis As Requested As Requested (8108 AS-BULT G2 SU5 Legal 1.192 36.97 20.00 LRFR Image: Truesday, November 15 2011 14: virtis As Requested As Requested (8108 AS-BULT G2 SU5 Legal 1.192 36.97 20.00 LRFR Image: Truesday, November 15 2011 14: virtis As Requested As Requested																	
	🖌 Show	up•to-dat	e resu	ults only														Close

Since **G1** has lower ratings than **G2**, the rating information for **G1** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
SH VEHICLES		TONS	**		
NRL	40	28	G1	143.00	
SU4	27	26	G1	84.50	
SU5	31	28	G1	143.00	
SU6	34.75				
SU/	38.75				



	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING LOCATION (FT)	CONTROLLING FORCE
SH VEHICLES		TONS	**		
NRL	40	28	G1	143.00	
SU4	27	26	C1	84.50	
SU5	31	28	G1	143.00	
SU6	34.75				
SU7	38.75				

SH VEHICLE: SU6

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

Bric	Bridge Rating Results													
(S	ystem of Ur US Custo	nits omary OSI / Metric	⊂Lane/Ir ⊙As	npact Lo Reques	bading Ty sted	ype O Dietaile	d Display Format Single rating level per row	*						
	Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impaict	Lane	Up To Date	DB	Vehicle Path	
	08108	HL-93 (US)	Inventory	0.498	LIRFR	17.94	Tuesday, November 15, 2011 14:19:	virtis	A.s Requested	As Requested				
	08108	HL-93 (US)	Operating	0.646	LIRFR	23.26	Tuesday, November 15, 2011 14:19:	virtis	A.s Requested	As Requested	V			
	08108	Notional Rating Load-NRL	Legal	0.713	LIRFR	28.50	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	SU4	Legal	0.997	LIRFR	26.91	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	SU5	Legal	0.910	LIRFR	28.20	Tuesday, November 15, 2011 14:19:	virtis	A.s Requested	As Requested	v			
	08108	SU6	Legal	0.817	LIRFR	28.39	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	SU7	Legal	0.745	LIRFR	28.89	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	VA Type 3S2	Legal	1.094	LIRFR	43.77	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	v			
	08108	VA Type 3	Legal	1.125	LIRFR	30.37	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	 Image: A set of the set of the			
	Image: Show up-to-date results only Image: Show most recent results only View Structure Rating Results Close													

Then, left click the View Structure Rating Results button.

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

St	itructure Rating Results														
System of Units Lane/Impact Loading Type Image: US Customary SI / Metric As Requested Detailed															
	Bridge	Id	Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
	08108	A	S-BUILT	SU6	Legal	0.817	LRFR	28.39	Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested	V		
	View Member Rating Results View up to-date results only													Close	

Left click the View Member Rating Results button.



The Member Rating Results window will appear.

N	ember R	lating Res	ults															
	System of Units Image: System of Units Image: Lane/Image: La																	
Bridge Id Structure Member Vehicle Rating Level Factor (Ton) (ft) Method Date DB Time Stamp Rated By Impact Lane Vehicle Distribut Path Factor (Ton) (ft) Method Date DB Time Stamp Rated By Impact Lane Vehicle Distribut Path Factor												Distribution Factor						
	(8108	AS-BUILT	G1	SU6	Legal	0.817	28.39	143.00	LRFR	V		Tuesday, November	15, 2011 14:	virtis	As Requested	As Requested		
	<mark>(81</mark> 08	3 AS-BUILT	G2	SU6	Legal	1.084	37.67	20.00	LRFR	~		Tuesday, November	15, 2011 14:	virtis	As Requested	As Requested		
	(\$108 AS-BULT G1 SU6 Legal 0.817 28.39 143.00 LRFR Image: Control of the second s																	
	🛃 Show u	p•to-date res	ults only															Close

Since **G1** has lower ratings than **G2**, the rating information for **G1** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
SH VEHICLES		TONS	**		
NRL	40	28	G1	143.00	
SU4	27	26	G1	84.50	
SU5	31	28	G1	143.00	
SU6	34.75	28	G1	143.00	
SU7	38.75				



	GVW (TONS)	RATING	CONTROLLING MEMBERS	CONTROLLING LOCATION (FT)	CONTROLLING FORCE
SH VEHICLES		TONS	**		
NRL	40	28	G1	143.00	
SU4	27	26	G1	84.50	
SU5	31	28	G1	143.00	
SU6	34.75	28	G1	143.00	
SU7	38.75				

SH VEHICLE: SU7

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

Br	Bridge Rating Results													
	System of Ur US Custo	nits omary OSI / Metric	⊂Lane/I ⊙As	mpact Lo Reques	pading Ty sted	ype O Dietaile	d Display Format Single rating level per row	*						
	Bridge Id	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impaict	Lane	Up To Date	DB	Vehicle Path	
	08108	HL-93 (US)	Inventory	0.498	LIRFR	17.94	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
08108 HL-93 (US) Operating 0.646 LRFR 23.26 Tuesday, November 15, 2011 14:19: virtis As Requested As Requested V														
08108 Notional Rating Load-NRL Legal 0.713 LRFR 28.50 Tuesday, November 15, 2011 14:19: virtis As Requested As Requested V														
	08108	SU4	Legal	0.997	LIRFR	26.91	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	-			
	08108	SU5	Legal	0.910	LIRFR	28.20	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~			
	08108	SU6	Legal	0.817	LIRFR	28.39	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	SU7	Legal	0.745	LIRFR	28.89	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	V			
	08108	VA Type 3S2	Legal	1.094	LIRFR	43.77	Tuesday, November 15, 2011 14:19:	virtis	As Requested	As Requested	~			
	08108	VA Type 3	Legal	1.125	LIRFR	30.37	Tuesday, November 15, 2011 14:19:	virtis	A.s Requested	As Requested	~			
	Show up-to-date results only View Structure Rating Results Close													

Then, left click the View Structure Rating Results button.

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

St	tructure Rating Results													
	System of Units Lane/Impact Loading Type Display Format Image: Structure of Units As Requested Detailed Single rating level per row Image: Structure of Units													
	Bridge Id	Structure	Vehicle	Rating Level	Rating Factor	Rating Method	Capacity (Ton)	Time Stamp	Rated By	Impact	Lane	Up To Date	DB	Vehicle Path
	08108	AS-BUILT	SU7	Legal	0.745	LRFR	28.89	Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested	V		
	View Memb	er Rating Results	Show up to	-date results	s only								(Close

Left click the View Member Rating Results button.



The Member Rating Results window will appear.

N	lember Rating Results																
	System of Units Lane/Impact Loading Type Display Format Image: Straight of Units Image: Straight of Comparison of Co																
	Brid k	ge Structu	e Member	Vehicle	Rating Level	Rating Factor	Capacity (Ton)	Location (ft)	Rating Method	Up To Date	DB	Time Stamp	Rated By	Impact	Lane	Vehicle Path	Distribution Factor
	(81	08 AS-BUI	.T G1	SU7	Legal	0.745	28.89	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	(81	08 AS-BUIL	.T G2	SU7	Legal	1.012	39.21	143.00	LRFR	V		Tuesday, November 15, 2011 14:	virtis	As Requested	As Requested		
	🗹 Show	up•to-date re	esults only														Close

Since **G1** has lower ratings than **G2**, the rating information for **G1** will be recorded on the rating form. The **CONTROLLING FORCE** column will be filled in later.

	GVW	RATING	CONTROLLING	CONTROLLING	CONTROLLING
	(TONS)		MEMBERS	LOCATION (FT)	FORCE
SH VEHICLES		TONS	**		
NRL	40	28	G1	143.00	
SU4	27	26	G1	84.50	
SU5	31	28	G1	143.00	
SU6	34.75	28	G1	143.00	
SU/	38.75	28	G1	143.00	



COMPLETING THE VDOT RATING FORM: CONTROLLING FORCE

Virtis -				
Edit View Bridge Tools Window Help				
📽 🖬 🖆 🖄 👗 🖻 🖻 🎒 🤣 🖪	📶 🎭 🔛 📄 🖬 🖬 🖬 🖓 😚	ALL NXT 🛛 🛃 🕕	US C	Custon
Bridge Explorer (11 Virtis bridges retrieved	for the current folder, all rows retriev	ved)		
🖃 💼 All Bridges	BID Bridge Id	Bridge Name	District	Count
LOA13	123 02975	02975	01	021
- 🛅 LOA14	124 22360	22360	01	197
LOA14 ALA	170 24167	24167	01	191
LOA14 Slabs	198 07323	07323	07	061
- DA15	199 08704	08704	01	077
LOA15 - ALA	209 15793	15793	08	165
	210 12076	12076	04	117
😟 💼 Sample Bridges	236 06165	06165	06	057
Deleted Bridges	265 12415	12415	03	125
	270 11968	11968	04	117

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.



For this example, **G1** is the controlling member for the majority of the vehicles. Expand the folders to get to the controlling **MEMBER ALTERNATIVE**.

Select the **Continuous Span (Run 1 of 2)** template and right click **G1 (E) (C)** and select **Analyze**.



Analysis Progress		
⊡ 🗹 Analysis Event	- Location - 164.0000 (ft) - Location - 167.9997 (ft) - Location - 168.0000 (ft) - Location - 168.0003 (ft) - Location - 168.5000 (ft) - Location - 168.5000 (ft) - Location - 5.9810 (ft) - Location - 44.5813 (ft) - Location - 113.5813 (ft) - Location - 113.5813 (ft) - Location - 163.0192 (ft) Completed Specification Check. Info - Finished LRFR specification checking Info - Populating specification checking results Info - Finished populating specification checking results	
	Info - Analysis completed!	Ì
View Rating Log	Print OK	ונ

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



Highlight G1 (E) (C) and left click the View analysis report icon.



The Analysis Results – G1 window will appear. Select Single rating level per row from the **Display Format** drop down menu.

A /	nalysis Results - G1									_ 🗆 🔀
Re	port Type sting Results Summary 🛛 👻	Lane/Inpact Loading Type As Fequested	etaied Displ Muti Muti Sina	ay Format ple rating leve ple rating leve le rating level	els per row els per row ner row		v			
	Live Load	Live Load Type	Rating Method	Inventory Load Rating (Ton)	Operating Load Rating (Ton)	Legal Load Rating (Ton)	Permit Load Rating (Ton)	hventory Rating Factor	Operating Rating Factor	Legal Rating Fact
HI	-93 (US)	Truck + Lane	LRFR	17.94	23.26			0.498	0.646	
H	-93 (US)	Tandem + Lane	LRFR	14.63	18.97			0.585	0.759	
HI	-93 (US)	90%(Truck Pair + Lane)	LRFR	57.74	74.85			0.802	1.040	
N	tional Rating Load-NRL	Axe Load	LRFR			28.50				0.71
SI	4	Axe Load	LRFR			26.91				0.99
SI	5	Axe Load	LRFR			28.20				0.91
SI	6	Axe Load	LRFR			28.39				0.81
SI	7	Axie Load	LRFR			28.89				0.74
V.	A Type 3S2	Axe Load	LRFR			43.77				1.05
<u>v</u> .	A Type 3	Axe Load	LRFR			30.37				1.12
		-								>
	s En in Engine YBISION 6.2.0.300									Close

Rating Results Summary	Lane	rinpact s Feques	Loading sted	O Detaied	Sing	ay Format le rating le	vel per row	~		
								·		
Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
HL-93 (US)	Truck + Lane	LRFR	Invent	17.94	0.498	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	Truck + Lane	LRFR	Opera	23.26	0.646	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	Tandem + Lane	LRFR	Invent	14.63	0.585	84.50	2 - (50.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	Tandem + Lane	LRFR	Opera	18.97	0.759	84.50	2 - (50.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	90%(Truck Pair	LRFR	Invent	57.74	0.802	134.50	3 - (31.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
HL-93 (US)	90%(Truck Pair	LRFR	Opera	74.85	1.040	134.50	3 - (31.0)	STRENGTH-I Concrete Flexure	As Requested	As Recuested
Notional Rating Load-NRL	Axle Load	LRFR	Legal	28.50	0.713	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
SU4	Axle Load	LRFR	Legal	26.91	0.997	84.50	2 - (50.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
SU5	Axle Load	LRFR	Legal	28.20	0.910	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
SU6	Axle Load	LRFR	Legal	28.39	0.817	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
SU7	Axle Load	LRFR	Legal	28.89	0.745	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
VA Type 3S2	Axle Load	LRFR	Legal	43.77	1.094	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Requested
. .	Avle Load	I RFR	Leoal	30,37	1.125	143.00	3 - (48.0)	STRENGTH-I Concrete Flexure	As Requested	As Recuested

The controlling force can be obtained from the Limit State column. Fill in the rating form as appropriate for each vehicle.

Follow the same process with the Continuous Span (Run 2 of 2) vehicle template.

See Appendix D for the completed rating form.



COMPLETING THE RATING FORM: ASSUMPTIONS/COMMENTS



Structure and Bridge

LOAD RATING SUMMARY FORM FOR STRUCTURES

INSPECTION REPORT USED FOR THIS RATING: 0341996-0000000008108 06/01/2010

ASSUMPTIONS/COMMENTS BY LOAD RATING ENGINEER:

Bridge No. 08108 – Three Span Continuous Reinforced Concrete Tee-Beam Bridge

- 1. Plan 079-18 was used for the rating.
- 2. Sacrificial wearing surface = 0.50 in.

The bridge identification data and latest inspection date can be found at the top of the most recent inspection report.

- Based on year built 1942 and using the information contained in the VDOT BARS Custom Data:
 - a. Reinforcing steel yield point = 33 ksi.
 - b. Concrete compressive strength of 3.0 ksi.

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 and assumptions 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. For continuous span reinforced concrete tee beam bridges, the typical deterioration that warrants an IR structure is section loss to the longitudinal or vertical reinforcement.

***RATING FOR THE BRIDGE IS NOW COMPLETE.



APPENDIX A: DESIGN PLANS







			en norman a	onymeta (na kontrasti
				20
FED. ROAD STATE PR	A STATE SHEE	TOTAL		
14 VA	55 121981 191	3 16		
HEDULE OF 2" STIR	RUPS Exterior BEAMS			c
Length Bending Diagram	Mark No. 8 Leng SE 20 5-75 13-3	<i>th</i>		
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			
10-82 10-82 10-3	S4 E 4 A - 64 11 - 0 S5 E 4 A - 54 10 - 6 S6 E 4 4 - 02 10 - 1			
19'-10' 19'-5' 19'-1'	S7 E 4 3'- 10" 9'- 8 S8 E 4 3'- 72" 9'- 3 S9 E 4 3'- 52" 8'- 1		\mathcal{M}	*(•
8-9* [1013]	SIOE 4 3'-3'' 8'-1 SIIE 4 3'-1'' 8'-3 SI2E 4 3'-0'' 8'-3	·		
* 8-1* 5* 7'-11 #1 7'-95	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		to restanting (proto	
- 7-6- - 7-7- 7-6-	SIGE 4 2'-9" 7-6 SITE 4 2'-8" 7-5 SI8E 4 2'-8" 7-4			(3)
· 7-52·	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		O	
7'-6' 7-6'	522 E 4 2'-8' 7'-4 \$23 E 4 2'-84'' 7'-4 \$24 E 4 2'-84'' 7'-4			
· 7-7: · 7-8: · 7-8:	S25 E 4 2'-84 7'-2 S26 E 4 2'-94" 7'-0 S27 E 4 2'-94" 7'-0	24 14 12 12		
1 7-102* 1 7-102* 1 7-112*	$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
8'-2" 8'-3 <u>'</u>	$\begin{array}{cccccccccccccccccccccccccccccccccccc$			C.
8-42 8-6 8-6	S33 E 4 3'-14' 8-2 S34 E 4 3'-2" 8'-4 S35 E 4 3'-2" 8'-5	<u>.</u> <u>.</u>		
8' 8'-9'- 5' 8'-11'' 5' 9'-1''	S36 E 4 5'-33" 8'-7 S37 E 4 5'-42" 8'-9 S38 E 4 3'-52" 8'-1			
* 9-3* * 9-5* * 9-7*	S39 E 4 3'-62" 9'-1 S40 E 4 3'-72" 9'-3 S41 E 4 3'-85" 9'-4	* * * * * * * * * * * * * * * * * * *		
1 9-9- 1 9-112 1 9-112	S42 E 4 3'-95' 9'-7 S43 E 4 3'-103 9-9 S44 F 4 4'-0" 10-0			¢
10-45" 10-45"	$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
11-12 11-12 11-52	$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
12'-2" 12'-2" 12'-6"	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			
12'11' 13'42' 13'42'	S53 E 4 5'-4 [*] / ₂ " 12'-9 S54 E 4 5'-74" 13'-2 S55 E 4 5'-84" 13'-4			¢
13-25- 12-11- 12-11-	S56 E 4 5 - 64 13 - 0 S57 E 4 5 - 42 12 - 9 S58 E 4 5 - 42 12 - 9			
12'-4' 12'-4'	S59 E 4 5'-1' 12'-2 S60 E 4 4'-112'' 11'-1			85
11-48 11-65 11-35	SG2E 4 4'- 64' 11'- 4 SG3E 4 4'- 64' 11'- 4			
11-02 10-92 10-77	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		4	<u>,</u> C +
10'-4 <u>2'</u> 	SG7E 4 4'-14" 10'-2 SG8E 4 3'-114" 9'-1 SG9E 4 3'-105 9'-9			
2 9 - 9 - 9	STOE 4 3'-9'" 9'-1 STIE 4 3'-84' 9'-4 ST2E 4 3'-7" 9'-2			80
2 9-12 2 8-112 3 8-112	ST3E 4 3'-54 8'-1 ST4E 4 3'-44' 8'-0 ST5E 4 3'-44' 8'-0			
2 - 72+ 2 - 72+ 2 - 8 - 52+	S76E 4 3'-24" 8-3 S77E 4 3'-13" 8-3		O	C.
8-2' 8-2' 8-0'	S79 E 4 3'-0 8'-0 S79 E 4 2'-11" 7'-1 S80 E 4 2'-11" 7'-1			S
<u>1-102</u> <u>1-102</u> <u>1-102</u> <u>1-102</u>	$\begin{array}{cccccccccccccccccccccccccccccccccccc$		- -	
7-7-	584 E 4 2'-8" 7-3 585 E 4 2'-8" 7-4		· · ·	~
CEDAR CREE	K BRIDGE			• (
DETAILS OF SUF	ERSTRUCTUR	E		
VIRGINIA DEPARTMEN OFFICE OF THE BR RICHMOND VIRGINIA	DGE ENGINEER NOV. 1941		even and the	
			k – k	•d ²¹
v. 24, 1941	LXX	X-18	2. I	<u>e</u>
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	FED. ROAD DIST. NO 14	STATE VA	P.R.A ST OUTE NO PROJ. NO RT NO 55	TATE SHEET TOTAL PROJ NO NO SHETS 1219B-1 14C 16		.]	¢ .
	S				~	t	
No.	Length 21'-0"	Shape Bent	Location Int. Beam Span A&C		م ويصدينيا ول		
8 8 16 :4 4	33'-0" 39'-0" 45'-5" 23'-0" 31'-0"	•	Int. Beam Spon*8"		C		
4 18 16 13	41:-0 51'-2 50'-0 48'-0 44'-0		All. Beam over support				
8 16 8 32 8 8 8 8 8 8 8 8	40-0 35-0 24'-3 20-3 26-0 18-0 23'-3 29'-0	*	All Int All Ext. Ext. Ext. Beam Spons A'GC Ext. Beam SpontA'GC			ļ	¢.
16 4 4 8 8	45'-6" 26'-3" 34'-0' 57'-2" 42'-0"		ext. Beam over support	3			
112	6'-2" 5'-7"	Bent	All beam span. "B" "X&C"		A.C.		¢
42 20 42	4-0" 24'-0" 7'-8"	Bent	Strut over pier Strut ond endwalls End walls	2			
110 48 24	28'-9 " 26'-5" 35'-5"	str.	Rail spons A"&c " span "B"				c
462 598 80	2'-9" 2'-5" 35'-11"	Bent Bent Str.	" Curb		V	U	
12 28 8 8	5'-0" 10'-10" 9'-5' 8'-0"	Bent -	Curb blocks Interm. brack. Brack. over Piers " " Abut.				
56 68 16 8 4	11'-3" 3'-7" 12'-3" 15'-7 13'-0"	Bent	Inter Post. Brackets Posts@ Piers " * Abut. " * *	alı -	C-		<u>.</u> 0
150 16 12 4 4	35' 6' 28'-4' 12'-0" 44'-2' 29'-6'	- str. - -	Slab				*
o heet	No.3 for sci	hedule	of stirrups.		C		(·
	CEDA	R	CREEK B	RIDGE	die sta	•	
	DETAILS	S OF	REINFORCING	STEEL			¢
	VIRGINIA OFFICE RICHMON	DEP. OF T	ARTMENT OF HIG THE BRIDGE ENGINE	GHWAYS INEER IOV. 1941		an "	
		1	i. See See	LXXIX-18			<u>c</u> i
S	cale 4" 1'-0"			SHEET 4 of 5	1	23	
				an a	ſ	8	14
	1.000					81	Sec. Sec. Sec.



APPENDIX B: BARRIER WEIGHT CALCULATION

Concrete Rail and Post Load

Note: Shaded areas denote railing. Non-shaded areas denote post.

$\gamma_{conc} =$	150	pcf
Length of Bridge =	169.00	ft
No.of Posts at Pier =	2	posts
No.of Int. Posts =	14	posts



	Post at Pier									
Shape	Base	Height	Width	Weight	Weight					
	in	in	in	lb/ft	lb					
5	9.00	2.00	18	18.75	28.13					
6	3.00	10.00	18	31.25	46.88					
7	12.00	14.00	18	175.00	262.50					
8	8.00	10.25	18	85.42	128.13					
9	23.00	5.13	26	122.79	266.04					
10	8.75	3.13	26	28.48	61.71					
11	23.00	15.88	26	380.34	824.07					
12	13.50	8.50	26	119.53	258.98					
13	23.00	14.88	15	356.38	445.48					
14	13.50	14.88	15	209.18	261.47					
15	4.38	45.50	24	207.36	414.71					



	Intermediate Post										
Shape	Base	Height	Width	Weight	Weight						
	in	in	in	lb/ft	lb						
5	9.00	2.00	12	18.75	18.75						
6	3.00	10.00	12	31.25	31.25						
7	12.00	14.00	12	175.00	175.00						
8	8.00	10.25	12	85.42	85.42						
9	23.00	5.13	15	122.79	153.48						
10	8.75	3.13	15	28.48	35.60						
11	24.50	11.38	15	290.30	362.87						
12	0.00	0.00	0	0.00	0.00						
13	27.50	14.88	10	426.11	355.09						
14	10.00	14.88	10	154.95	129.12						
15	0.00	0.00	0	0.00	0.00						

Summary

Weight of Rail as Distributed Load =		253.13 lb/ft	
Weight of Posts at Pier as Distributed Load =		35.48 lb/ft	
Weight of Intermediate Posts as Distributed Load =	+	111.55 lb/ft	

Weight of Rail and Post as Distributed Load =	0.400 kip/ft



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APPENDIX C: LFD EFFECTIVE FLANGE WIDTH

LFD Effective Flange Width (AASHTO 8.10)

					-
	Span 1 & 3		Spa	an 2	
GIRDERS	G1	G2	G1	G2	
EFFECTIVE SPAN LENGTH, S _{EFF}	50.00	50.00	69.00	69.00	FΤ
EFFECTIVE SLAB THICKNESS, T _{EFF}	7.00	7.00	7.00	7.00	IN
WEB THICKNESS, T _{WEB}	16.00	16.00	16.00	16.00	IN
AVG BEAM SPACING	8.00	8.00	8.00	8.00	FΤ
W _{OVERHANG}	1.79		1.79		FΤ

INTERIOR BEAM EFFECTIVE FLANGE WIDTH; THE LEAST OF:

B _{INTEFF} =	96.00	96.00	IN
			•
AVG BEAM SPACING =	96.00	96.00	IN
12 (T_{EFF}) + MAX T_{WEB} =	100.00	100.00	IN
1/4 (S _{EFF}) =	150.00	207.00	IN

EXTERIOR BEAM EFFECTIVE FLANGE WIDTH; THE LEAST OF:

B _{exteff} =	69.50	69.50	IN
W _{OVERHANG} + AVG BM SPACING/2 =	69.50	69.50	IN
12 (T_{EFF}) + MAX T_{WEB} =	100.00	100.00	IN
1/4 (S _{EFF}) =	150.00	207.00	IN

VD	Virginia Department of Transportation
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APPENDIX D: LRFR RATING FORM



Structure and Bridge

LOAD RATING SUMMARY FORM FOR STRUCTURES

Rte.: 00055, John Marshall Highway

Over: Cedar Creek

Va. Str. No.: 1996 Fed. ID: 08108

County: Frederick District: Staunton

Signature: _ Name:	 Date:

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

	GVW (TONS)	RATING	CONTROLLING		CONTROLLING
	(10NS)		IVIEIVIBERS	LOCATION (FT)	FURCE
DESIGN LOAD		FACTOR			
HL-93 (INV)	N/A	0.49*	G1	143.00	STR-I Concrete Flexure
HL-93 (OPR)	N/A	0.64*	G1	143.00	STR-I Concrete Flexure
		TONS			
HS-20 (INV)	36	23****	G1	143.00	STR-I Concrete Flexure
HS-20 (OPR)	36	30****	G1	143.00	STR-I Concrete Flexure
LEGAL LOADS		TONS	**		
VA Type 3	27	30	G1	143.00	STR-I Concrete Flexure
VA Type 3S2	40	43	G1	143.00	STR-I Concrete Flexure
* [,] ***LANE	40	67	G2	119.00	STR-I Concrete Flexure
PERMIT LOAD		TONS			
BP-90	45	37****	G1	143.00	STR-II Concrete Flexure
BP-115	57.5	57****	G1	20.00	STR-II Concrete Flexure
SH VEHICLES		TONS	**		
NRL	40	28****	G1	143.00	STR-I Concrete Flexure
SU4	27	26****	G1	84.50	STR-I Concrete Flexure
SU5	31	28****	G1	143.00	STR-I Concrete Flexure
SU6	34.75	28****	G1	143.00	STR-I Concrete Flexure
SU7	38.75	28****	G1	143.00	STR-I Concrete Flexure

* 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.



Structure and Bridge

LOAD RATING SUMMARY FORM FOR STRUCTURES

INSPECTION REPORT USED FOR THIS RATING: 0341996-0000000008108 06/01/2010

ASSUMPTIONS/COMMENTS BY LOAD RATING ENGINEER:

Bridge No. 08108 – Three Span Continuous Reinforced Concrete Tee-Beam Bridge

- 1. Plan 079-18 was used for the rating.
- 2. Sacrificial wearing surface = 0.50 in.
- 3. Based on year built 1942 and using the information contained in the VDOT BARS Custom Data:
 - a. Reinforcing steel yield point = 33 ksi.
 - b. Concrete compressive strength of 3.0 ksi.