

2012 MICHIGAN BRIDGE CONFERENCE

LOAD RATING UPDATE

Presentation Outline

- FHWA Audit & Action Plan
- Prioritization list
- Announcements and updates
- Bridge load rating assistance program
- Virtis – load rating software

MDOT Load Rating Program

- 2009 FHWA Audit, Final Report March 2010
 - US DOT OIG audit 2006
 - FHWA division Offices directed to perform in-depth reviews of state load rating and posting practices
- Findings – Conditional Compliance
 - Current practices “are generally in compliance with NBIS and AASHTO requirements”.
 - Many MDOT bridges in the database “may not be load rated in compliance with NBIS” and “as many as 2,900 bridge load ratings must be revised”.
 - Many local agency bridges in the database may not be in compliance with NBIS “as many as 4,100 or more”.
 - “MDOT’s oversight of local agency load rating practices is not sufficient...”

MDOT Load Rating Program

- MDOT & FHWA Action Plan highlights:
 - Prioritize load rating needs
 - Clarify policies for rating substructures, controlling vehicles and load posting
 - Establish a quality assurance program for local agency load ratings.
 - Issue Bridge Advisories for policies and guidelines

MDOT Load Rating Program

- MDOT Response
 - Prioritization List
 - Bridge Advisories
 - MBIS Updates
 - Virtis Super Site License
 - MTU Center for Technology & Training Contract

Prioritization List - Local

* NBI Item 63- Operating Rating Method	6 LF Rating Factor
* NBI Item 64F- Federal Operating Rating	1.87
* MDOT Item 64MA- Michigan Operating Method	6 LF Rating Factor
* MDOT Item 64MB- Michigan Operating Rating	1.22
* MDOT Item 64MC - Michigan Operating Truck	18
* NBI Item 65- Inventory Rating Method	6 LF Rating Factor
* NBI Item 66- Federal Inventory Rating	1.122
* NBI Item 41- Open Posted Closed	A Open, no restriction
* NBI Item 70- Bridge Posting	5 - 100% or more
NBI Item 141- Posted Loading	
MDOT Item 193A- Michigan Overload Class	A
MDOT Item 193C- Overload Status	N - No Restriction

Prioritization List - Local

Item 63 - Method Used to Determine Operating Rating

(X) Method

Use the codes below to indicate which load rating method was used to determine the Operating Rating coded in Item 64 for this structure.

<u>Code</u>	<u>Description</u>
0**	Field Evaluation and documented engineering judgment reported by rating factor (RF) method using equivalent MS loading.
1	Load factor (LF) reported in metric tons using MS loading.
2	Allowable stress (AS) reported in metric tons using MS loading.
3*	Load and Resistant Factor Rating (LRFR) reported in metric tons using equivalent MS loading.
4	Load testing reported in metric tons using equivalent MS loading.
5**	No rating analysis or evaluation performed.
6	Load Factor (LF) rating reported by rating factor (RF) method using MS18 loading.
7	Allowable Stress (AS) rating reported by rating factor (RF) method using MS18 loading.
8	Load and Resistance Factor Rating (LRFR) rating reported by rating factor (RF) method using HL-93 loadings

Prioritization List – Local (Cont'd)

- Tier 1 – No Rating – Due 12/31/2012
 - Nulls in load rating values
 - Item 63 or 65 = 5 (no rating)
 - Item 64f = 66
- Tier 2 – Poor Condition – Due 12/31/2014
 - Deck, superstructure, substructure OR culvert ratings equal to 4 or less AND
 - Deterioration indicator in MBIS equals “No”.

Prioritization List – Local (Cont'd)

- Tier 3 – Other Irregularities – Due 12/31/2016
 - Built after 1993 AND ASR
(Item 63 or 65 equal 2 or 7)
 - Built after 2010 AND not LRFR
(Item 63 or 65 not equal to 3 or 8)
 - NHS bridge AND ASR
(Item 63 or 65 equal 2 or 7)
 - Fed Operating is greater than 3X Fed Inventory
(Item 64F > 3*Item 66)

Prioritization List – Local (Cont'd)

- Bridge list, Bridge Advisory (BA 2011-02)
 - Explains Tiers
 - Sent March 2011
 - Agency specific list of structures in Tiers 1-3
- Current Status – Tier 1 (Local)
 - Original (January 1, 2011) = 1666 bridges
 - Current (March 6, 2012)= 1451 bridges
 - 13% complete

Bridge Advisories

- BA-2010-03 August 2010
 - Load Rating Compliance with NBIS
- BA-2010-06 October 2010
 - Licensing and Use of AASHTOWARE Virtis Software
- BA-2011-02 March 2011
 - Local Agency Load Rating Prioritization and Coding
- BA-2012-XX April 2012??
 - MBIS Update & Coding Revisions

MBIS Updates

- Spring of 2011 – Summary & Assumption
 - Per AASHTO MBE 2.5.1.2:

“A general statement of the results of the analysis with note of which members were found to be weak, and any other modifying factors that were assumed in the analysis, should be given.”
 - MBIS Assumption provides uniform format
- Spring of 2012 - Updates
 - Forms are now printable
 - Data fields enlarged
 - Data validation checks

MBIS Updates – Assumption Sheet

Rating Considers Field Condition of Members:

Yes

Inspection Date:

03/12/2012

Additional Loads:

Utility conduits in fascia bays - wt = 35 plf

Unique Factors That Affect Capacity:

Plastic moment capacity used.

Analyzed By:

Bradley Wagner

Date:

03/12/2012

MBIS Updates – Summary Sheet

NEW INVENTORY CODING

The	NBI Item 63- Operating Rating Method	6 LF Rating Factor	
Ver	NBI Item 64F- Federal Operating Rating	1.05	
Rat	MDOT Item 64MA- Michigan Operating Method	6 LF RATING FACTOR	
Col	MDOT Item 64MB- Michigan Operating Rating	0.98	
Inte	MDOT Item 64MC- Michigan Operating Truck	18	
NE	NBI Item 65- Inventory Rating Method	6 LF Rating Factor	
	NBI Item 66- Federal Inventory Rating	1.33	
	NBI Item 41- Structure Open Posted Closed	P Posted for load	
	NBI Item 70- Bridge Posting	0 59% or less	
	NBI Item 141- Posted Loading	20NNNN	
	MDOT Item 193A- Michigan Overload Class	D	
	MDOT Item 193C- Overload Status	R-Gage Restricted to 8-ft	

Analyzed By: Bradley Wagner

Date: 03/12/2012

Checked By: Creightyn McMunn

Date: 03/12/2012

Virtis Super Site License

- Virtis is:
 - Comprehensive bridge analysis software
 - Owned by AASHTO, managed by a national user group
 - Designed specifically for load rating of bridges
 - Used Nationwide

MDOT has purchased an unlimited license for Michigan local agencies and their consultants

MTU-CTT Contract

- Administered in conjunction with LTAP
- Initiated in October 2011
- Virtis and load rating training and technical support for local agencies and consultants

For MDOT policy issues or prioritization list correspondence, contact

mdot-load-rating@michigan.gov

Future

- Bridge Load Rating Quality Assurance Program
 - Similar to Bridge Inspection QA
 - Review load rating records
 - Methods/Qualifications
 - Ratings represent current condition
 - Proper posting implementation (if applicable)
- Bridge Analysis Guide/SI&A updates
 - Modification to coding procedures for load rating items
 - New reporting procedure for Item 64M

Frequently Given Answers

- When is a load rating required?
 - New or reconstructed bridge
 - Damage, deterioration or rehabilitation that affects the structural capacity
 - Loading conditions have changed
 - Permit request

Frequently Given Answers (Cont'd)

- Load Rating Methodology
 - 3 Options
 - Load and Resistance Factor Rating (LRFR)
 - Load Factor Rating (LFR)
 - Allowable Stress Rating (ASR)
 - Built after 2010 and LRFD Design – LRFR Required
 - Built or reconstruct after 1993 – LFR or LRFR
 - NHS bridge (regardless of age) – LFR or LRFR
 - Exception – ASR may be used for timber structures

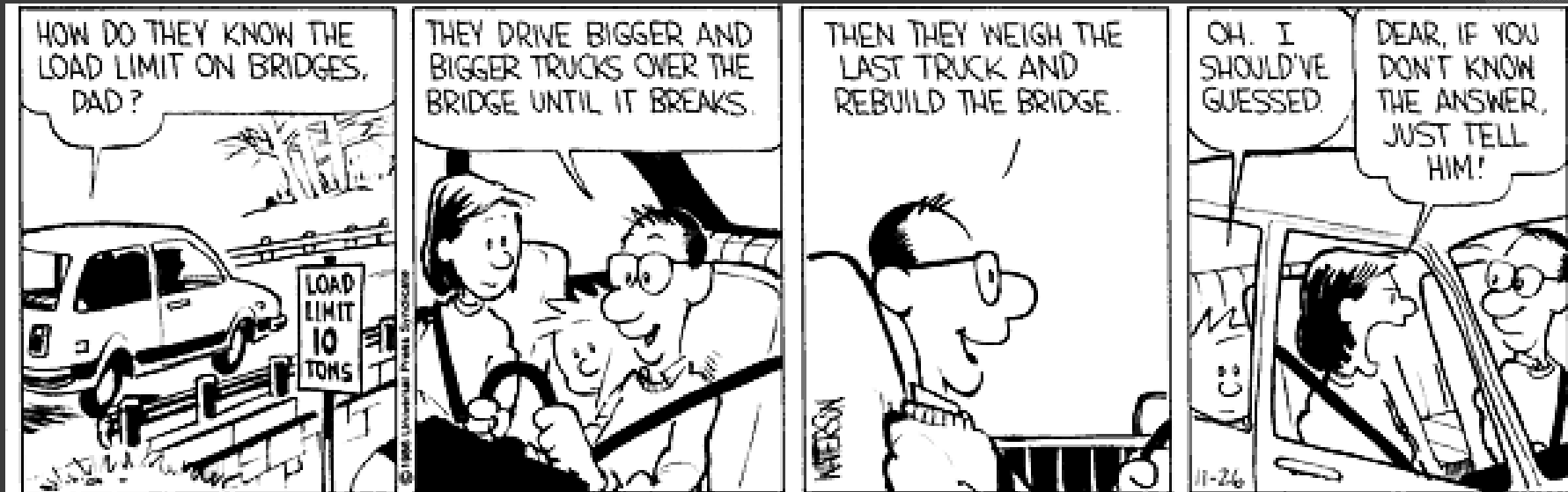
Frequently Given Answers (Cont'd)

- Culvert Load Rating
 - Next version of MBE to include culverts
 - Existing Culverts
 - Box - Virtis, Summer 2012
 - 3-sided or arch or pipe – finite element analysis
 - Analysis typically requires shop drawings
 - Proposed Culverts
 - 2012 MDOT specs require load rating by fabricator for all culverts

Frequently Given Answers (Cont'd)

- Documentation
 - Calculations must include:
 - Analysis methodology
 - Assumptions
 - Factors that affect the rating (condition, unique loads)
 - Results – to include controlling members
 - Fully completed MBIS Assumption and Summary Sheets meet most of these criteria!
 - Must be rated by licensed P.E.

How are bridges load rated?




Something Under the Bed is Drooling:
a Calvin and Hobbes Collection, Bill Watterson, 1988

CTT – Bridge Load Rating Program

- Sponsored by MDOT
- Provides training, technical support for Virtis, and engineering technical assistance
- Serves local Michigan agencies and their consultants

MDOT Virtis Support Website



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Virtis Support

What is Virtis?

Virtis is a comprehensive bridge rating tool developed by AASHTO. For an agency's bridge inventory it stores detailed bridge descriptions sufficient for structural analysis and performs this analysis.

Why use Virtis?

In an effort to standardize load ratings and improve quality control and oversight, MDOT has purchased a super-site license of AASHTOWare Virtis. This license will allow local agencies and/or their consultants to obtain a license of the software at **no cost**.

I represent a local agency bridge owner in Michigan or am a consultant working directly for a local agency in Michigan. How do I obtain a license for Virtis?

As of January 3, 2012, Michigan Technological University's Center for Technology & Training (CTT-MTU) handles all Virtis licensing requests. For more information, please visit <http://loadrating.michiganitap.org/BLR-Software>

How do I get help using Virtis?

As of January 3, 2012, Michigan Technological University's Center for Technology & Training (CTT-MTU) provides limited load rating and Virtis support. For questions specific to Virtis, please visit <http://loadrating.michiganitap.org/> For non-Virtis related load rating support, please contact Brad Wagner (517)322-1186 or wagnerb@michigan.gov

Virtis Tutorials

Tutorials are available from AASHTO on the Virtis/Opis Technical Support Site. After receiving a license, you will be given the user name and password.

Download Instructions

The Michigan Legal and Overload configurations are available as a Virtis library. Click on the zip file link below and choose "Save". After extracting the XML files from the download you will be able to import the library files into your Virtis library. Please refer to the tutorials for help with importing a library file.

- Library of Michigan - Legal Vehicles and Overload Vehicles XML files [ZIP](#)

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Related Content

- Bridge Analysis Spreadsheets
- Bridge Analysis Guide 2005 Edition with 2009 Interim Updates

MDOT Virtis Support Website

MDOT
Department of Transportation

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Michigan's Official Web Site

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Virtis Support

What is Virtis?
Virtis is a comprehensive b... stores detailed bridge desc...

Why use Virtis?
In an effort to standardize l... super-site, license of AASH... obtain a license of the soft...

I represent a local agency or agency in Michigan
As of January 3, 2012, Mich... handles all Virtis licensing... <http://loadrating.michiganitap.org/>

How do I get help using Virtis?
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Bridge Load Rating Program Website

The screenshot shows a website with a dark grey background. At the top left, the title "Bridge Load Rating Program" is displayed in orange. To the right is a search bar with a magnifying glass icon and the text "search this site". Below the title is a horizontal navigation menu with links for "Home", "Publications", "Workshops", "Software", "Staff", and "Contact". On the left side, there is a "Main menu" section with a list of links: "Home", "Publications", "Workshops", "Software", "Staff", and "Contact". Below this is a section for the "Bridge Load Rating Program" with contact information: "Center For Technology & Training", "309 Dillman Hall", "1400 Townsend Dr.", "Houghton, MI 49931", "Phone: (906) 487-2102", "Fax: (906) 487-3409", and "Email: loadrating@mtu.edu". A "Sponsored by:" section features the MDOT logo. Below that is a "Follow us on:" section with an RSS icon and the text "This site (RSS)". The main content area on the right features a large photograph of a multi-lane highway bridge with several vehicles. Below the photo is a section titled "About the Bridge Load Rating Program" with two paragraphs of text. The first paragraph states that approximately 4,000 local agency bridges in Michigan require load rating or review, and that the Michigan Department of Transportation (MDOT) has created a prioritization schedule with three tiers to be completed by the end of 2012, 2014, and 2016. The second paragraph explains that MDOT contracted with the Center for Technology & Training (CTT) at Michigan Technological University (MTU) to develop a Bridge Load Rating Assistance Program to provide training and support for local road agencies. The third paragraph describes the program's support and training for local Michigan agencies, including technical support for Virtis software and engineering assistance.

Technical Assistance

- Center for Technology and Training:
 - 906-487-2102
 - loadrating@mtu.edu
 - <http://loadrating.michiganltap.org>

Classroom Sessions

- Guided tutorials
- Hands-on activities
- Seating limited to 20 participants
- Bring a laptop with Virtis installed
- IT assistance will be available
- **12 hours of bridge inspector recurrent training**



Training Session Locations and Schedule

- **Schedule:**
 - Day 1: 8:00 AM – 5:00 PM
 - Day 2: 8:00 AM – 12:00 PM
- **Locations:**
 - Escanaba (April 10 & 11)
 - Saginaw (April 30 & May 1)
 - Howell (May 2 & 3)
 - Grayling (June 4 & 5)
 - Grand Rapids (June 6 & 7)
 - Big Rapids (September 11 & 12)

2012 Bridge Load Rating Training



Introductory Webinars:

Webinars serve as an introduction to bridge load rating and the bridge load rating software Virtis™. These sessions are recommended as preparation for the classroom sessions for those who have little bridge rating experience or have never used Virtis™.

Two repeat sessions:

March 13, 2012, 1:00 PM - 2:00 PM

March 15, 2012, 10:00 AM - 11:00 AM

Classroom Sessions (Two Days):

Classroom sessions teach participants how to perform bridge load ratings using Virtis™. At the end of the training, participants will perform load ratings using as-builts as their guide (instructors will provide individual assistance). Class sizes are limited to 20 participants, so please register early.

Day 1 – 8:00 AM - 5:00 PM

Day 2 – 8:00 AM - 12:00 PM

April 10 & 11, 2012

Bay College - Joseph Heirman Center
(Access from Danroth Rd.)
2000 North 30th St.
Escanaba, MI 49829

April 30 & May 1, 2012

Horizon's Conference Center
6200 State St.
Saginaw, MI 48603

May 2 & 3, 2012

Cleary University-Livingston Campus,
Chrysler Building
3750 Cleary Dr.
Howell, MI 48843

June 4 & 5, 2012

Ramada Inn & Conference Center
2650 I-75 Business Loop
Grayling, MI 49738

June 6 & 7, 2012

Crowne Plaza
5700 28th St. S. E.
Grand Rapids, MI 49546

September 11 & 12, 2012

Holiday Inn & Conference Center
1005 Perry Ave.
Big Rapids, MI 49307



Virtis – Organization of Bridge Inventory

Virtis - [Bridge Explorer (33 Virtis bridges retrieved for the current folder, all rows retrieved)]

File Edit View Bridge Tools Window Help

US Customary

	BID	Bridge Id	Bridge Name	District	County	Facility	Location	Route	Feat. Intersected	Mi. Post (mi)	Owner	Maintainer	Area	Length (ft)	Built
1		TrainingB	Training Brid	11	01	SR 005	Pittsburg	0051	SR 6060	17.00	1	1	-2	161.00	999
2		TrainingB	Training Brid	-1	-1	N/A	N/A	-1	N/A	0.00	-1		-1	0.00	996
3		TrainingB	Training Brid	11	01	I-79	Pittsburg	0079	Ohio River	125.00	1	1	-1	455.00	999
4		PCITraini	PCI TrainingB					-1		0.00			-1	0.00	0
5		PCITraini	PCITrainingBr					-1		0.00			-1	0.00	0
6		PCITraini	PCI TrainingB					-1		0.00			-1	0.00	0
7		PCITraini	PCITrainingBr					-1		0.00			-1	0.00	0
8		PCITraini	PCI TrainingB					-1		0.00			-1	0.00	0
9		PCITraini	PCITrainingBr					-1		0.00			-1	0.00	0
10		Example7	Example 7 PS					-1		0.00			-1	0.00	0
11		RCTrainin	RC Training B					-1		0.00			-1	0.00	0
12		TimberTr	Timber Tr. Bri					-1		0.00			-1	0.00	0
13		FSys GF	FloorSystem	06	15	NJ-Tur	NJCity	-1		0.00			-1	0.00	002
14		FSys FS	FloorSystem	11	333	I-95	NYC	-1		0.00	1	2	-1	0.00	998
15		FSys GF	FloorSystem	07	06	I-95	ATL	-1		0.00	2		-1	0.00	998
16		FLine GF	FloorLine GF	01	01	I-75	JAX	-1		0.00	1	1	-1	0.00	001
17		FLine FS	FloorLine FS	02	02	I-75	GNV	-1		0.00	1	1	-1	0.00	000
18		FLine GF	FloorLine GF	01	01	I-95	NY	15		2200.00	2	-1	-1	0.00	999
19		TrussTrai	Truss Trainin					5		0.00				0.00	930
20		LRFD Su	LRFD Substr							0.00				0.00	0
21		LRFD Su	LRFD Substr			SR 403	ERIE CO	4034	FOUR MILE	8.12				095.80	002
22		LRFD Su	LRFD Substr							0.00				0.00	0
23		LRFD Su	LRFD Substr					-1		0.00				240.00	004
24		Visual Re	Visual Refer	01	12	I-76	WAITSFI	I-76	MAD RIVER	1199.25	1	1	-1	168.00	938
25		RCTeeBe	R C Tee Bea					-1		0.00				0.00	0
26		RollBeam	Rolled Beam					-1		0.00				0.00	0
27		A1 test	AASHTO ste				book	41		0.00				65.00	964
28		Example	Example 4a	-2	-2	Sample	Sample	76	Samle	2.00	-2	-2	-2	161.00	999
29		PS1 Train	PS1 1-span I							0.00				0.00	0
30		RC Tee B	RC Tee Beam							0.00				0.00	0
31		0310311		05	005	106 TH	1.0 MI N	00312	US-131	4.46	1	1	5B	187.01	960
32		2512503				WILSO	1.0 MI S	00000	I-75	4.82	1	1		218.80	958
34		4714706				I-96 EB	2.4 MI N	00098	GRAND RIV	20.55	1	1		173.88	962

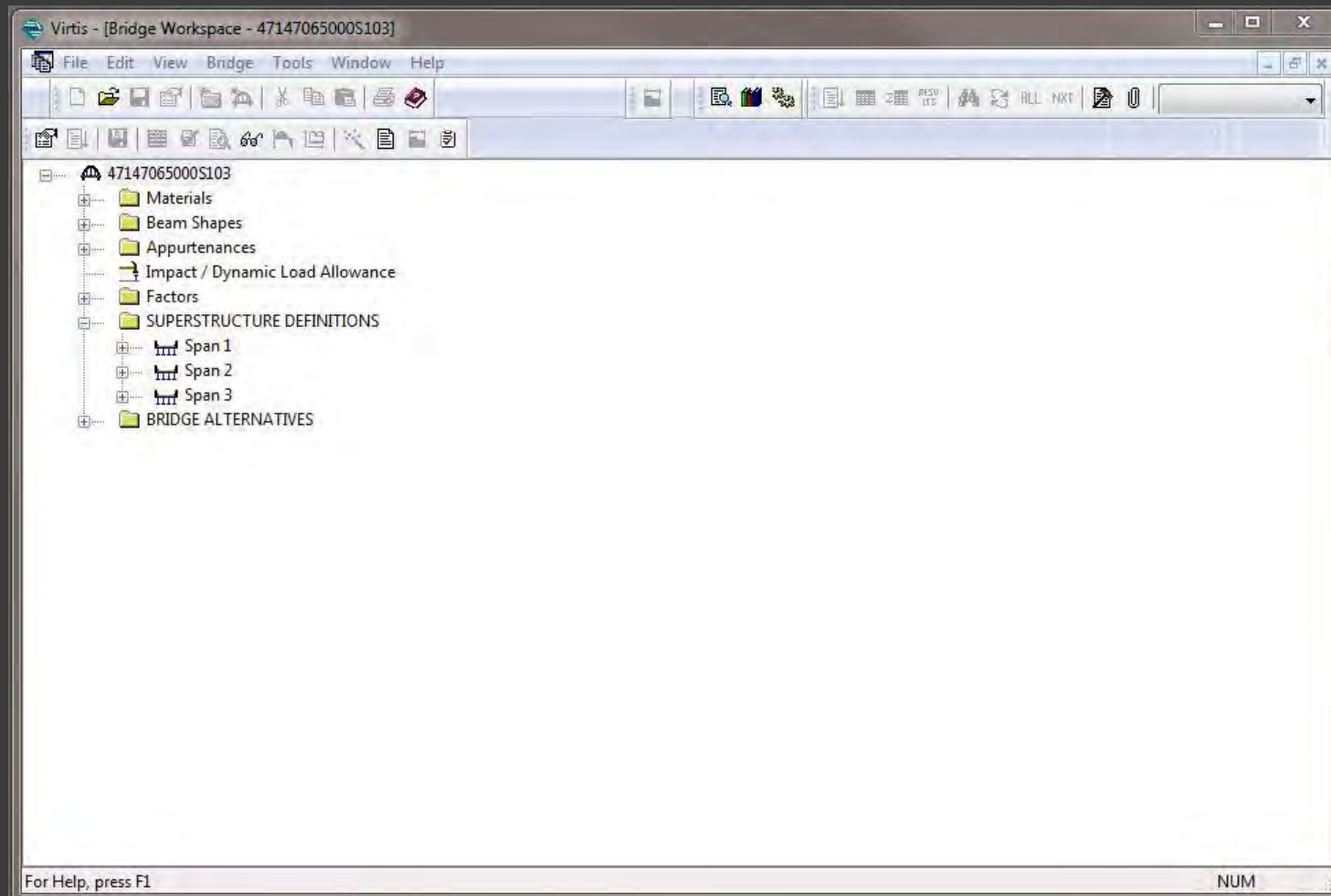
For Help, press F1

NUM

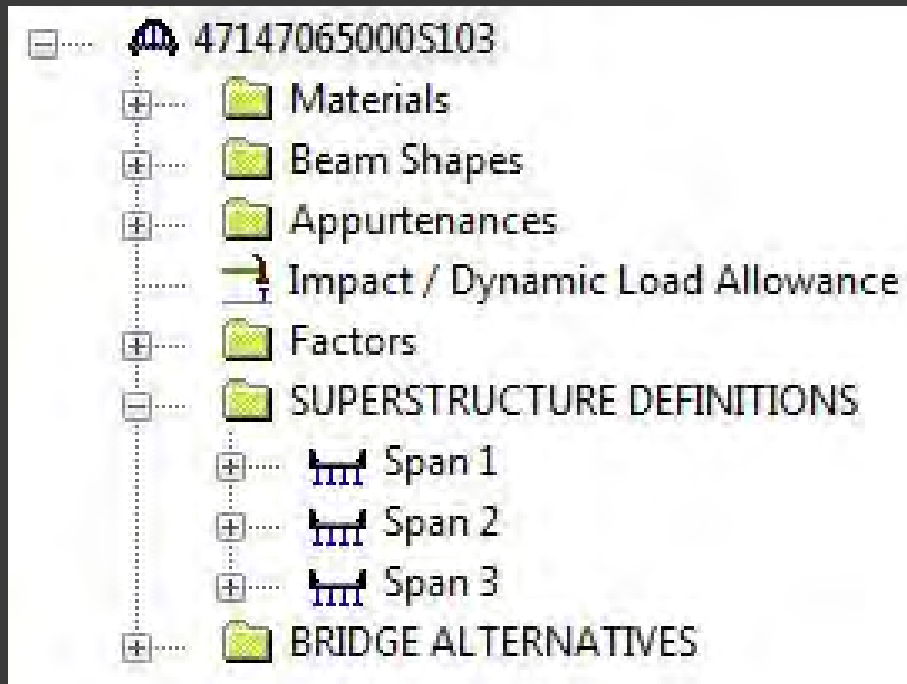
Virtis - Capabilities

- Simple or continuous spans, hinges
- Steel, reinforced & prestressed concrete
- Steel rolled beams, plate girders, hybrid systems
- Harped and/or debonded strands
- Parallel, tapered, and parabolic webs
- Transverse and longitudinal stiffened
- Load rate individual members, whole bridge, or multiple bridges

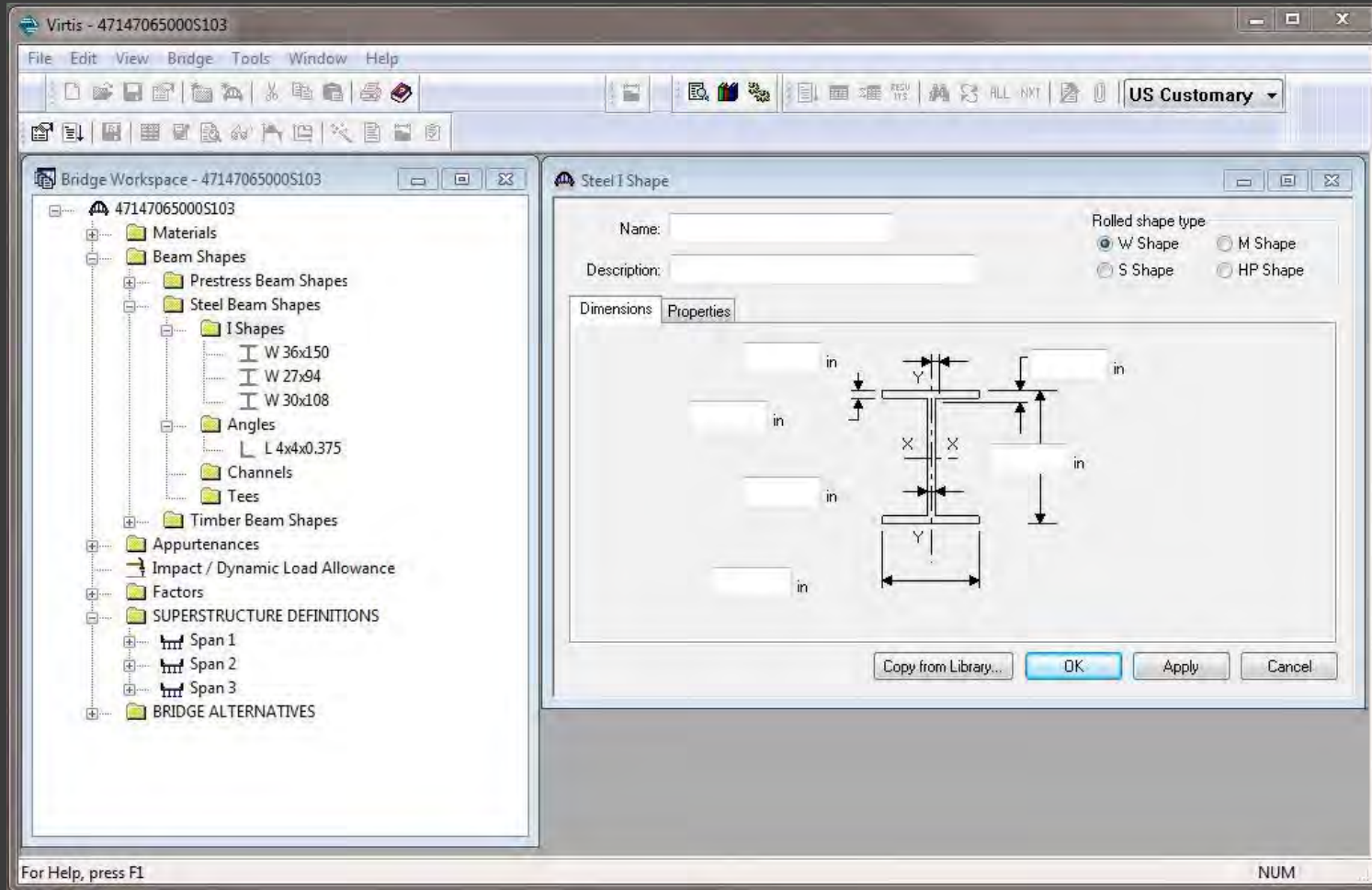
Virtis – Bridge Description



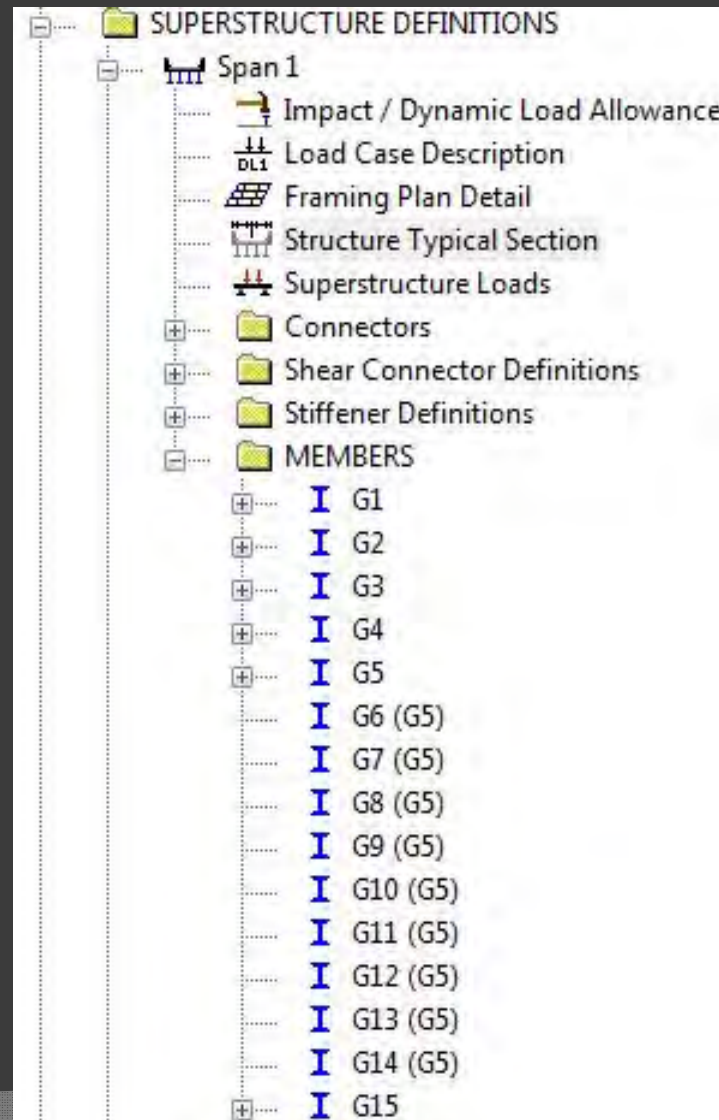
Virtis – Bridge Description



Virtis – Beam Shapes



Virtis – Superstructure Definition



Virtis – Superstructure Definition

Structure Typical Section

Distance from left edge of deck to superstructure definition ref. line

Distance from right edge of deck to superstructure definition ref. line

Deck thickness

Superstructure Definition Reference Line

Left overhang

Right overhang

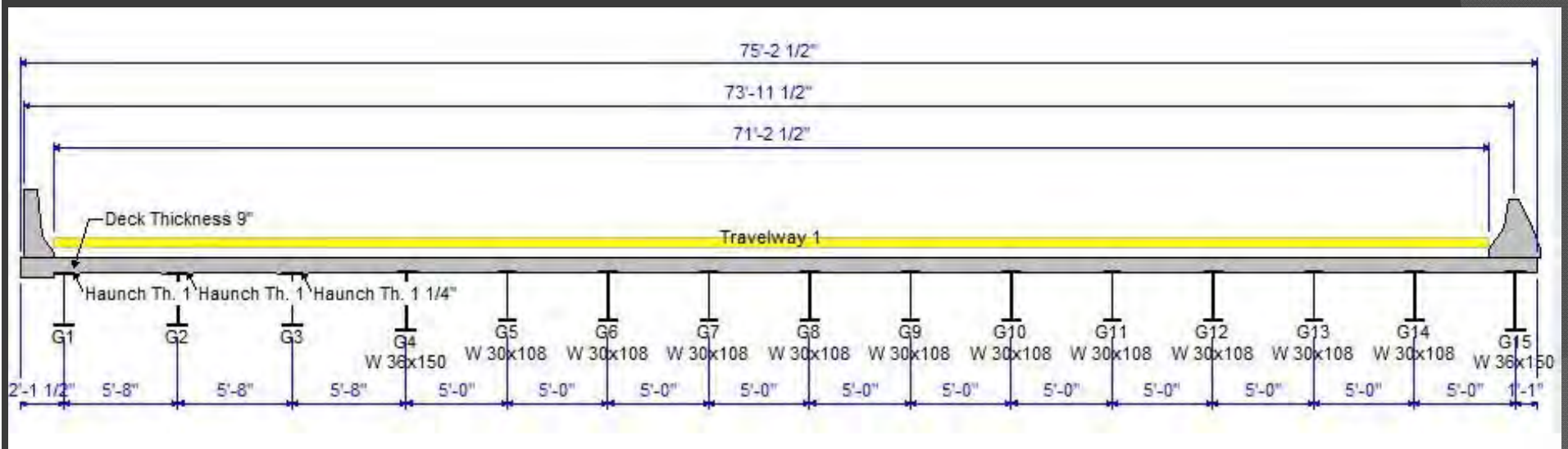
Deck: Deck (Cont'd) Parapet Median Railing Generic Sidewalk Lane Position Wearing Surface

Superstructure definition reference line is the bridge deck.

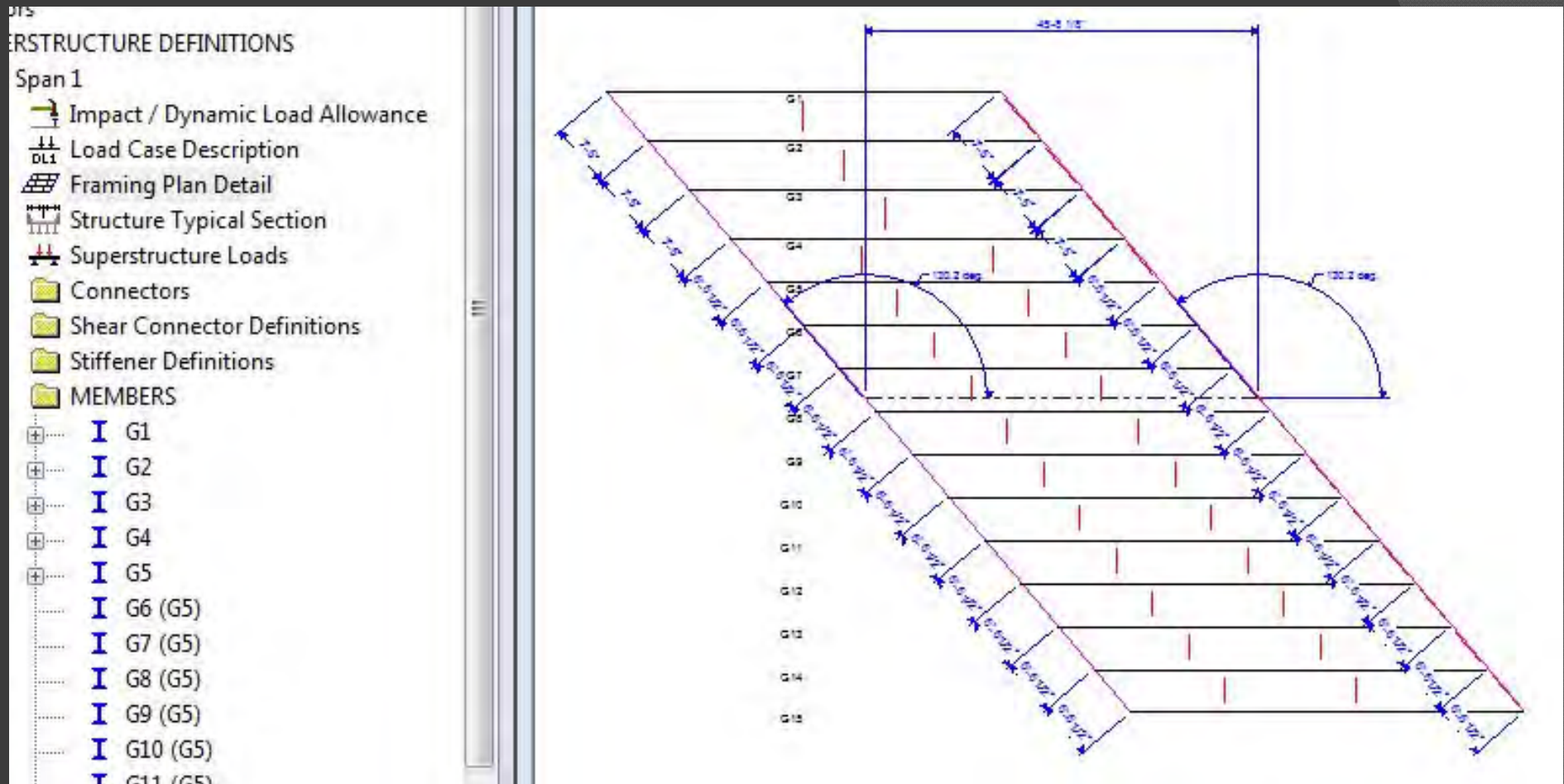
	Start	End
Distance from left edge of deck to superstructure definition reference line =	37.63 ft	37.63 ft
Distance from right edge of deck to superstructure definition reference line =	37.58 ft	37.58 ft
Left overhang =	2.13 ft	2.13 ft
Computed right overhang =	<input type="text" value="1.08"/> ft	<input type="text" value="1.08"/> ft

OK Apply Cancel

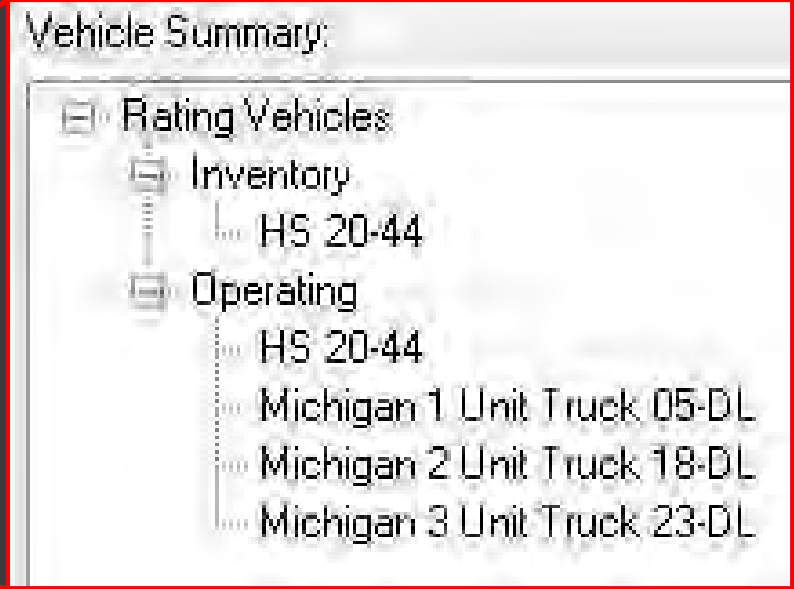
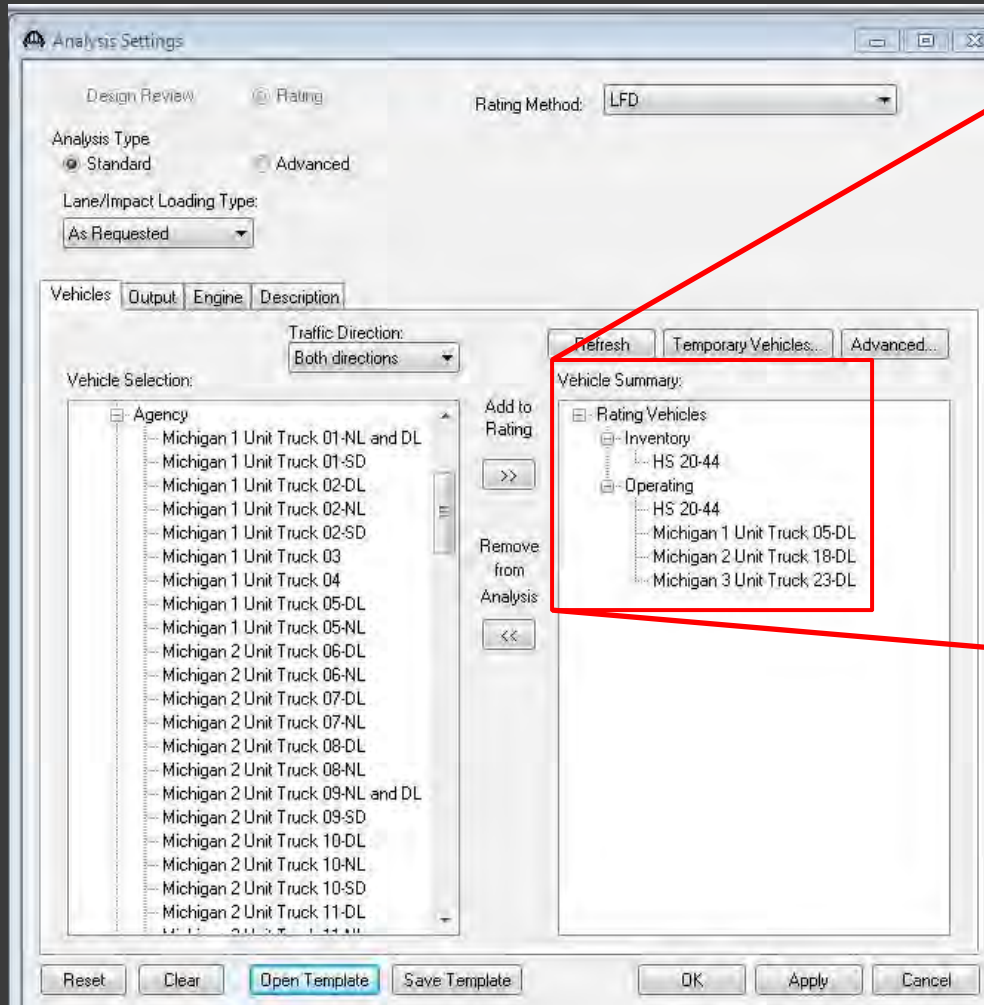
Virtis - Typical Section Overview



Virtis – Framing Plan Details



Virtis – Analysis Settings



Virtis – Analysis Reports

		Rating	Load Factor Ratio
Live Load		Factor	Controls
HS 20-44	Inventory	2.182	Design Flexure - Steel
	Operating	3.644	Design Flexure - Steel
Michigan 1 Unit Truck 05-DL	Inventory	**	**
	Operating	3.393	Design Flexure - Steel
Michigan 2 Unit Truck 18-DL	Inventory	**	**
	Operating	2.345	Design Flexure - Steel
Michigan 3 Unit Truck 23-DL	Inventory	**	**
	Operating	2.626	Design Flexure - Steel

Why Virtis?



- Easy to keep calculations up to date
- Can be adapted quickly to reflect most current bridge condition
- Store all load rating files in one location
- Reduce costs when updating ratings
- Files are portable – can be supplied to new consultant when updated rating is required

How to get Virtis

- Submit AASHTO software request form to CTT
- CTT will verify Michigan agencies (consultants must submit letter stating their use of software only for MI bridges)
- AASHTO will send a supplemental license agreement to requestor
- Software will be issued direct from the software vendor
- **For more information:**
<http://loadrating.michiganltap.org>

Bridge Load Rating Program Website

Bridge Load Rating Program

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Bridge Load Rating Program

Center For Technology & Training
309 Dillman Hall
1400 Townsend Dr.
Houghton, MI 49931
Phone: (906) 487-2102
Fax: (906) 487-3409
Email: loadrating@mtu.edu

Sponsored by:



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Software

Virtis load rating software is available to local agencies and their consultants free of charge (courtesy of MDOT) for use on Michigan bridges.

If you would like to obtain Virtis software, please use the following steps:

Bridge owners may proceed directly to step 2.

1. Consultants must submit a letter or email stating their understanding and agreement that the license may only be used on bridges within the State of Michigan. This must be received before AASHTO will license the software. Submit this letter to the Bridge Load Rating Program; contact information is presented in the left panel.
2. Fill out and submit the AASHTOware Products and Services Request Form.

Note that these steps take you through filling out the parts of the form for getting AASHTOware's Virtis software. The extra fields in the software request form are for ordering other software packages.

To begin, [click here](#) to directly open the software request form for non-members
(You can also find the AASHTOware software request form on [their website](#).)

On page 1, enter the name of your organization, and type "Michigan DOT Agency Sponsored License" for the Purchase Order Number

On page 2, select the "Virtis Special Consultant Option". Later, when you print off this form, write in "\$0" for the total cost

American Association of State Highway and Transportation Officials
444 North Capitol Street, N.W. Suite 240
Washington, DC 20001

AASHTOware Products and Services Request Form

Organization: _____

This organization wishes to license AASHTOware products for the period of July 1, 2011 through June 30, 2012, and to participate in the AASHTOware software development program on the following terms. It is understood that the entry of a signed form will be regarded by AASHTO as an obligation on the part of the licensee.

Purchase Order (optional): _____

Purchase Order Number: Michigan DOT Agency Sponsored License

Please indicate the purchase order number that you're applying directly on the national software request form if you have orders registered in each instance of the AASHTOware service and include a purchase order with your return of the national form. This will permit us to reference the appropriate member directly on the invoice that will be mailed along with the Supplemental License Agreement documents, which should help you and AASHTO make payment and be more efficient. AASHTO requests full payment before distributing the software, or in installments as indicated on your purchase order.

AASHTOware Products and Services	
<input type="checkbox"/> Open Single Workstation Option - \$K,500	Quantity: _____
<input type="checkbox"/> Open Educational Option - \$17,500	Quantity: _____
<input checked="" type="checkbox"/> Virtis Special Consultant Option - \$0	Quantity: _____
<input type="checkbox"/> Open Special Consultant Option - \$2,750	Quantity: _____
<input type="checkbox"/> Virtis Educational Option - 300 Lic	Quantity: _____
<input type="checkbox"/> Open Educational Option - 300 Lic	Quantity: _____
<input type="checkbox"/> Director Training Course - \$11,000 (2008)	Quantity: _____
SafetyAnalyst	
<input type="checkbox"/> Single Workstation License - \$13,000	Quantity: _____

Thank you for your attention

