## 2013 Michigan Bridge Conference Workshop

## Load Rating Update

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### Program Update

Plan of Corrective Action (PCA) Update

- Tier 1 No Rating Due 12/31/12
  - Tier 1 bridges complete as of 2/28/2013
  - Excludes bridges that became Tier 1 after 1/1/2011
- Tier 2 Poor Condition Due 12/31/14
  - 653 bridges as of 3/12/13
  - Deck, superstructure, substructure OR culvert inspection ratings equal to 4 or less <u>AND</u>
  - Deterioration indicator in MBRS equals "No" or is blank.
  - Also includes new Tier 1 bridges after 1/1/2011



# Program Update (Cont'd)

2012 Guidance

- Bridge Advisory 2012-01 July 2012
   MBIS/MBRS Update and Coding Revisions
- Bridge Advisory 2012-02
  - Guidance for "Judgment" ratings
- Bridge Advisory 2012-03
  - Corrugated Metal Pipe spreadsheet

Bridge Load Rating Program Support

- 6 Virtis Training Workshops
- B 3 Webinars
- Over 240 tech assistance cases



Center for Technology & Training

- October 2012
  - October 2012

# Program Update (Cont'd)

### Load Rating Statistics

- Local Agencies rated 1,429 Tier 1's in 2012
- Per sample of 1995 bridges updated since early 2011:



\* "Other" includes hand calc's, other software, and spreadsheets <u>and</u> unknown analysis type



# Program Update (Cont'd)

- Bridge Load Rating Program Plans for 2013
  - User needs survey has been circulated
  - Continued technical support
  - Continued Virtis licensing support
  - Mix of basic & advanced Virtis/Load Rating training
    - I or 2 centralized Virtis training sessions
    - Advanced topic webinars
  - Other miscellaneous assistance
    - Spreadsheets?
    - SHV guidance
    - Camelback bridge guidance
    - Other items as necessary



- Why do we load rate bridges?
  - NBIS Requirement
  - Unknown design
  - Bridges deteriorate
  - Permit requests
  - Assist with decisions about bridge





- When is a new/updated analysis required?
  - New bridge
  - Existing bridge, no load rating performed
  - Deterioration/Damage
  - Rehabilitation/change to loading condition
  - Permit requests
  - \*\*Code change (LFR, LRFR)

Note: Load rating analysis should be evaluated as part of <u>every</u> inspection.



Evaluating an existing load rating during inspection

- Are there calculations in the file?
- New or more excessive deterioration?
- New overlay or rehabilitation?
- Damage to structural members?
- Super., subs., culv. or Deck rating decreased to 4 or less?
  - Note: Load rating typically assumes deck and substructure do not control rating deterioration may warrant an analysis.
- Lateral support of beams changed? (i.e. diaphragms detached?)
- Significant scour observed?





What methods are acceptable for new ratings?

- Allowable Stress (ASR)
  - Timber or masonry structures ONLY
- Load Factor (LFR)
  - All structures built/reconstructed prior to 2010 (except Timber/Masonry)
- Load & Resistance Factor (LRFR)
  - Built or Reconstructed after 2010

See MDOT Bridge Advisory 2012-01 for more details.



Design or Reconstruction Method	Existing and Valid Rating Method	Allowable Analysis Methods*
	None or Invalid	8 - LRFR by Rating Factor
Load and Resistance Factor	Load and Resistance Factor Rating (LRFR)	8 – LRFR by Rating Factor
Design (LRFD)	Load Factor Rating (LFR) or Allowable Stress Rating (ASR)	8 – LRFR by Rating Factor or 6 – LFR by Rating Factor or 1 – LFR in Metric Tons
Load Faster Design (LED) or	None or Invalid	8 – LRFR by Rating Factor or 6 – LFR by Rating Factor or 1 – LFR in Metric Tons
Allowable Stress Design	Load and Resistance Factor Rating (LRFR)	8 - LRFR by Rating Factor
(ASD)	Load Factor Rating (LFR) or Allowable Stress Rating (ASR)	8 – LRFR by Rating Factor or 6 – LFR by Rating Factor or 1 – LFR in Metric Tons
	None or Invalid	8 – LRFR by Rating Factor or 6 – LFR by Rating Factor or 1 – LFR in Metric Tons
(LRFD, LFD, ASD or	Load and Resistance Factor Rating (LRFR)	8 - LRFR by Rating Factor
unknown)	Load Factor Rating (LFR) or Allowable Stress Rating (ASR)	8 – LRFR by Rating Factor or 6 – LFR by Rating Factor or 1 – LFR in Metric Tons
Timber or Masonry Bridges	None or Invalid	8 – LRFR by Rating Factor or 7 – ASR by Rating Factor or 2 – ASR in Metric Tons
	Load and Resistance Factor Rating (LRFR)	8 - LRFR by Rating Factor
	Allowable Stress Rating (ASR)	<ul> <li>8 – LRFR by Rating Factor or</li> <li>7 – ASR by Rating Factor or</li> <li>2 – ASR in Metric Tons</li> </ul>



\* Field Evaluation (0), Load Testing (4) or Assigned Ratings (A-F) may also be appropriate and should be determined by the engineer on a structure specific basis.

### Other rating methods

- Field Evaluation and Documented Engineering Judgment (MDOT BA-2012-2)
  - Use <u>only</u> if necessary details for traditional analysis are not measurable or available on plans (typically concrete structures with no plans or shop drawings)
  - Include thorough documentation to include known history of structure, condition, measurable dimensions, and comparable structures of known design
    - Include sufficient information in the file such that another engineer can easily understand the assumptions that resulted in the ratings.
  - Calculate ratings based on an assumption, not simply set to defaults
    - If you assume the design load assume fed inventory and calculate fed operating and Michigan operating by comparing load effects.
  - Federal ratings (64f & 66) are in <u>metric Tons</u>,
  - Michigan Operating rating (64M) is in <u>Rating Factor</u>



### Other rating methods (Cont'd)

- Assigned Rating (FHWA Memo 9/29/2011)
  - Original design per LRFD (HL-93) or LFD (HS-20)
  - Built per original design
  - No changes to loading conditions have occurred
  - Perform evaluation to confirm that design loading exceeds legal requirements
  - Original calculations on file (or sealed plans)



#### Other rating methods (Cont'd)

- Load Testing (AASHTO MBE Section 8)
  - Diagnostic Test validate or modify analytical results
    - Composite behavior
    - Load Distribution
    - Continuity
  - Proof Test used in lieu of analytical
    - Establish lower bound of strength
    - <sup>**D**</sup> Proof load is desired load multiplied by a safety factor  $(X_p)$
    - (X<sub>p</sub>) is dependent on redundancy, condition, traffic

#### AASHTO MBE Appendix A8 gives general procedures.



#### Load rating data entry

- Cannot edit load rating in SI&A
- May be entered in MBIS or MBRS
- Bridge must be assigned by owner
- Assigned directly from Dashboard
- Summary and Assumption sheets for entry



### Summary and Assumption sheets

- Includes fields for common assumptions and controlling members
- Error checks assure rating is entered completely
- Warnings highlight common coding errors
- Names of analyst and reviewer are stored in DB
- Sheets are printable



### **MBRS** – Load Rating

### Assigning Bridges

Сирот	Dep Un	aruus EUIS	na portatio	uni.									2	•	m	chig	ant	100	-
Michigan.gov Home			MBRS	Home   Contact	MBRS   Feedback   Help													Sign Out	~
Welcome Brad Wagner	_	-	http://mdot	was1.mdot.s	state.mi.us/?inspec	tion	Type=l	L - MDO	DT - M	BRS -			×	Ju	risdicti	ion: All	Region	ıs - Super	User
Change Password System Administration	Jurisdie <u>Struct</u>	ction M ure Inver	C.mo	Dapa 1 173	mental INSportation	1							× r	Data C	oding l	ssues		c	ount
2 Edit Profile 2 My Assignments	<u>Tota</u>	l No. of St lighway (l	A	ssign Load Ra	ting Reports:								St	ructure	Should	Be Post	ed		2
Assign Jurisdiction				Select a user:	==> Select a User	¥	(	ł	Assign					~					
<ul> <li>Structure Condition</li> <li>Dashboard</li> </ul>	Stra	uctura St												ON	II on-NBI ( BLOcks	Only			
» Inspection Assignment Dashboard	P	losted Stri	c 1											() IN	DI Uniy				
Load Rating Dashboard	PIS	Posting Re Structures	g																
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» Critical Structures	Structu	ure Inve	r <									>	2						
» Good/Fair/Poor/Unrated Structures	Open	1																Sut	omit
» Deficient Structures (SD/F0)	Select	Struct.	Bridge ID	Facility Carried	Features Intersected	Fed	Oper. Item	Mic Item	higan ( Item	Item	ing Truck	Fed Item	Inv. Item	<u>Item</u> 41	<u>Item</u> 70	Item 141	Item 193	Rated For	E
* Status		7	01101052000B010	US-23	BLACK RIVER	1	99.3	1	151.0	18	9	1	59.4	A	5		A	N	
» HBP Eligible Structures	~	32	02102011000B010	US-41	W BR WHITEFISH RIV	1	64.0	1	91.0	18	9	1	38.3	A	5	-	В	N	T
		33	02102011000B020	US-41	W BR WHITEFISH RN	1	64.0	1	91.0	18	9	1	38.3	A	5		В	N	7-
Scour Critical Structures		34	02102011000B030	US-41	HUBER CREEK	1	86.1	1	131.0	18	9	1	51,5	A	5	-	A	N	
· Notwork Flomonte		35	02102021000B010	M-94	SLAPNECK CREEK	1	62.0	1	117.0	18	9	1	37.2	A	5		A	N	4



## MBRS – Load Rating Entering Load Rating Information

Change Password	STR 36	Information Summary and Current Status		B02-02021
System Administration	50		e Condition	-
2 Edit Profile		Per AASHTO Manual for Bridge Evaluation, rating must be based on current structural	inon(o)	
0 My Assignments	WISCONS	condition of members. If deterioration is included in rating, or if no deterioration is present that affects the	nal Status	
Assign Jurisdiction	-	structural capacity, choose "Yes".	ho restriction(A)	
* Structure Condition Dashboard	LLING	If no field inspection is warranted, "field inspection date" should equal latest BSIR date.	Above Footing	_
» Inspection Assignment » Dashboard	Inven	Field "Most recent year Construct/Reconstruct/Overlay" should not be blank.		
Load Rating Dashboard	Load	Field "History of work that impacts Load Rating" should not be blank.		
» Network Summary	i i i i i i i i i i i i i i i i i i i			
» Critical Structures		Field "Superstructure Component" should not be blank.		
<ul> <li>Good/Fair/Poor/Unrated</li> <li>Structures</li> </ul>		Field "Size of Beams, Beam #'s and Spans" should not be blank.		
<ul> <li>Deficient Structures</li> <li>(SD/FO)</li> </ul>		Some values on this page may remain unchanged from a previous rating		
* Item 41 - Operational Status		By clicking "OK", you are agreeing that all unchanged values apply to current rating		-
» HBP Eligible Structures		Ok		
Scour Critical Structures				
» Network Elements				-
Work Recommendations		SUPERSTRUCTURE		



## MBRS - Load Rating

#### **Entering Load Rating Information**

Change Password	STR 36		Information Summary and Cur	rent Status		B02-02021
System Administration	Lake	Facility	Latitude / Longitude	MDOT Structure ID	Structure Condition	
2 Edit Profile	Superior	M-94	46.332459 / -86.850323	02102021000B020	Fair Condition(6)	3.
My Assignments	WISCONSIN	AU TRAIN RIVER	46.92 / 43.64	Region: Superior(1)	California a	
Assign Jurisdiction	7				Operational Status	
🛙 Dashboards	The inventory	rating method (Item 63	3) should match the operating	g rating method (Item	Scour Evaluation	
<ul> <li>Structure Condition</li> <li>Dashboard</li> </ul>	65). Dns / Re	ports Load Ratings V	Vork Recommendations Work	History Documents		
<ul> <li>Inspection Assignment</li> <li>Dashboard</li> </ul>	h A value			_		
Load Rating Dashboard	L With th		d Rating data successfully updated.			^
» Network Summary	for net	Controlling Com	ponent or Failure Mode is a req	uired field.		
» Critical Structures	Some v	Michigan Operat Michigan Operat	ting Method (item# 64MA) is a re ing Truck (item# 64MC) is a reg	equired field. uired field.		
Good/Fair/Poor/Unrated Structures	By click	Analyzed By is a Checked By is a	required field. required field.			
<ul> <li>Deficient Structures</li> <li>(SD/FO)</li> </ul>		Checked Date is	a required field.			
* Item 41 - Operational Status	* = Re	quired Fields	LOAD RATING S	UMMARY -		
» HBP Eligible Structures		NEW INVENTORY C	ODING			
* Scour Critical Structures		NBI Item 63-	Operating Rating Method:	2 ASR in mTons		
» Network Elements		*NBI Item 64F	- Federal Operating Rating:	50.9		
» Work Recommendations		*MDOT Item 6	64MA- Michigan Operating Method:			
Call For Projects (CED)		*MDOT Item 6	64MB- Michigan Operating Rating:	77.0		-
· can for Projects (CPP)		*MDOT Item 6	64MC- Michigan Operating Truck:			
» Ad-Hoc Report		NBI Item 65-	Inventory Rating Method:	2 ASR in mTons		
False Decking		*NBI Item 66-	Federal Inventory Ratino:	18.2		



### **MBRS** Assumption Sheet

	MICHIGAN DEPARTMENT OF TRANSPORTATION				
	STR 11321         LOAD RATING ASSUMPTIONS         B04-82071           Facility         Latitude / Longituda         MDOT Structure ID         Structura Condition           M-85         42-29114 / -93-142822         821630710008040         Serieus Condition(3)           Feature         Length / Width         Owner           ROUGE RIVER         2918 / 73 82         MIDOT Region - Cland T				
Rating Considers Field Cond	tion of Members: Yes Inspection Date: 03/12/2012	-			
Deterioration:					
Stringers are rated 4. Holes in the ends of several str	ngers.				
	Superstructure Component: 4 Steel Continuous Beam Fy / fc': 32 U / ksi				
	Composite: No Number of Beams: B Shop Drawings Verified: Yes Size of Beams/Beam #'s and Span 1 ~ 8 WF36x160 spans:				
	Deck: Thickness (in.): 50 Fy / tc'; 360 / 30 ksl. Deck Design Load > H15: Yes Wearing Surface: Matt: HMA Thickness (in.): 20 Unit Weight (pcf.): 1500				
	LEFT         CENTER         RIGHT           Barrier:         Type / Weight (plf.):         Type 4         /         500.0           Skidewalk:         Width / Thick (m.):         /         /         Type 4         /         500.0           Clear Roadway (ft.):         35.0         /         /         /         (				
	Additional Loads: Utility conduits in Tascia beys – vit = 35 pit				
	Unique Factors That Affect Capacity: Plastic moment capacity used:				
<b>ÈMDOT</b>	Analyzed By: Bradley Wegne: Date: D3/12/2012				
Michigan Department of Transportation	Page 1 of 1				

### **MBRS Summary Sheet**

NEW INVENTORY CODING

NBI Item 63- Operating Rating Method

NBI Item 64F- Federal Operating Rating

MDOT Item 64MA- Michigan Operating Method MDOT Item 64MB- Michigan Operating Rating MDOT Item 64MC- Michigan Operating Truck

NBI Item 65- Inventory Rating Method NBI Item 66- Federal Inventory Rating

NBI Item 41- Structure Open Posted Closed NBI Item 70- Bridge Posting NBI Item 141- Posted Loading MDOT Item 193A- Michigan Overload Class MDOT Item 193C- Overload Status

C.I.F. Dating Factor	-
1.05	-
6 LF RATING FACTOR	Ξ
18	
6 LF Rating Factor	Ľ,
P Posted for load	
20NNNN	
R-Gage Restricted to 8-ft	]

Analyzed By: Checked By:

Bradley W	lagner	
Creightyn	McMunn	

Date:	03/12/2012
Date:	03/12/2012



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Rating Co

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