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 AND
  - Deterioration indicator in MBRS equals "No" or is blank.
  - Also includes new Tier 1 bridges after 1/1/2011

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Program Update (Cont'd)

2012 Guidance

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

Bridge Load Rating Program Support

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

Center for Technology & Training

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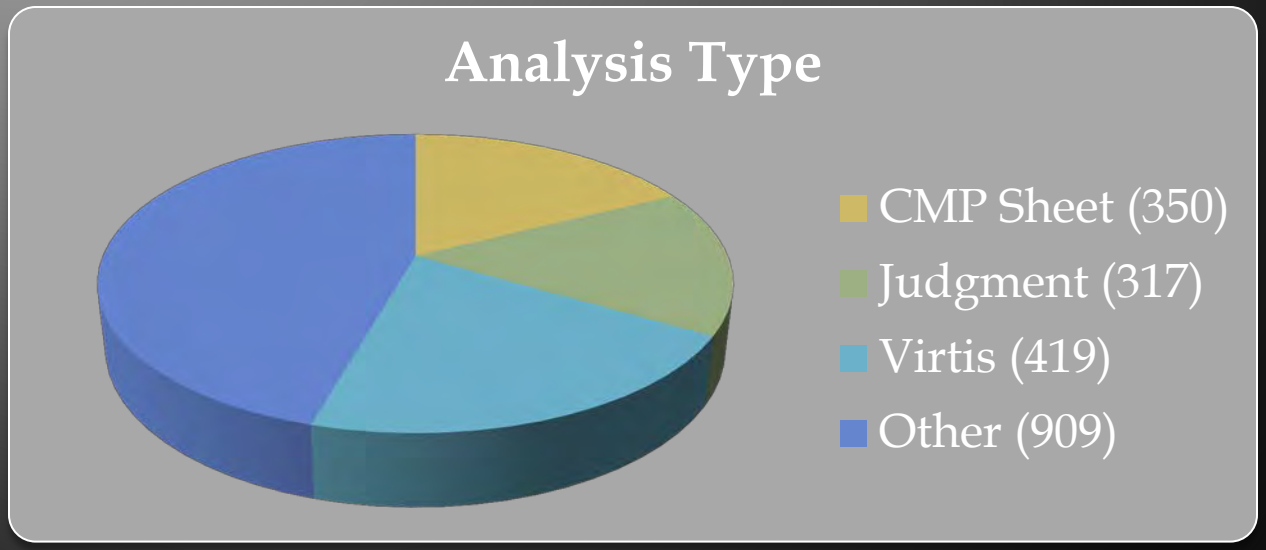
Program Update (Cont'd)

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 and unknown analysis type

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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
    - 1 or 2 centralized Virtis training sessions
    - Advanced topic webinars
  - Other miscellaneous assistance
    - Spreadsheets?
    - SHV guidance
    - Camelback bridge guidance
    - Other items as necessary

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Load Rating Basics

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

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Load Rating Basics

- 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 every inspection.

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Load Rating Basics

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?

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Load Rating Basics

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.

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Load Rating Basics

Design or Reconstruction Method	Existing and Valid Rating Method	Allowable Analysis Methods*
Load and Resistance Factor Design (LRFD)	None or Invalid	8 – LRFR by Rating Factor
	Load and Resistance Factor Rating (LRFR)	8 – LRFR by Rating Factor
	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 Factor Design (LFD) or Allowable Stress Design (ASD)	None or Invalid	8 – LRFR by Rating Factor or 6 – LFR by Rating Factor or 1 – LFR in Metric Tons
	Load and Resistance Factor Rating (LRFR)	8 – LRFR by Rating Factor
	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
Combination of Specifications (LRFD, LFD, ASD or unknown)	None or Invalid	8 – LRFR by Rating Factor or 6 – LFR by Rating Factor or 1 – LFR in Metric Tons
	Load and Resistance Factor Rating (LRFR)	8 – LRFR by Rating Factor
	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)	8 – LRFR by Rating Factor or 7 – ASR by Rating Factor or 2 – ASR in Metric Tons

* 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.

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Load Rating Basics

Other rating methods

- Field Evaluation and Documented Engineering Judgment (MDOT BA-2012-2)
  - Use only 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 metric Tons,
  - Michigan Operating rating (64M) is in Rating Factor

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Load Rating Basics

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)

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Load Rating Basics

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
    - Proof load is desired load multiplied by a safety factor (X_p)
    - (X_p) is dependent on redundancy, condition, traffic

AASHTO MBE Appendix A8 gives general procedures.

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Load Rating Basics

Load rating data entry

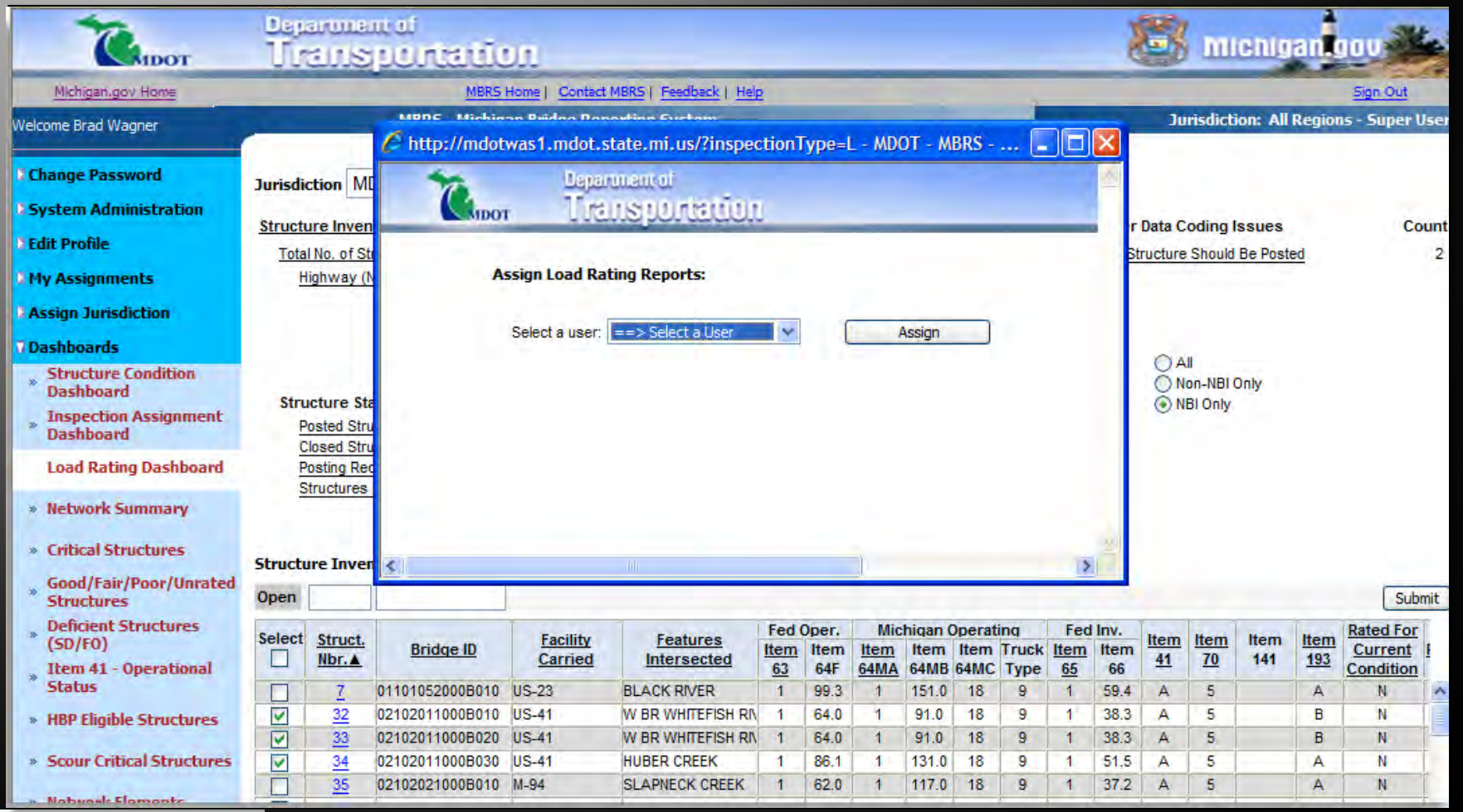
- Cannot edit load rating in SI&A
- May be entered in MBIS or MBRS
- Bridge must be assigned by owner
- Assigned directly from Dashboard
- Summary and Assumption sheets for entry

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



Select	Struct. Nbr.	Bridge ID	Facility Carried	Features Intersected	Fed Oper. Item 63	Fed Oper. Item 64F	Michigan Operating Item 64MA	Michigan Operating Item 64MB	Michigan Operating Item 64MC	Michigan Operating Truck Type	Fed Inv. Item 65	Fed Inv. Item 66	Item 41	Item 70	Item 141	Item 193	Rated For Current Condition
☐	7	01101052000B010	US-23	BLACK RIVER	1	99.3	1	151.0	18	9	1	59.4	A	5		A	N
☑	32	02102011000B010	US-41	W BR WHITEFISH RI	1	64.0	1	91.0	18	9	1	38.3	A	5		B	N
☑	33	02102011000B020	US-41	W BR WHITEFISH RI	1	64.0	1	91.0	18	9	1	38.3	A	5		B	N
☑	34	02102011000B030	US-41	HUBER CREEK	1	86.1	1	131.0	18	9	1	51.5	A	5		A	N
☐	35	02102021000B010	M-94	SLAPNECK CREEK	1	62.0	1	117.0	18	9	1	37.2	A	5		A	N

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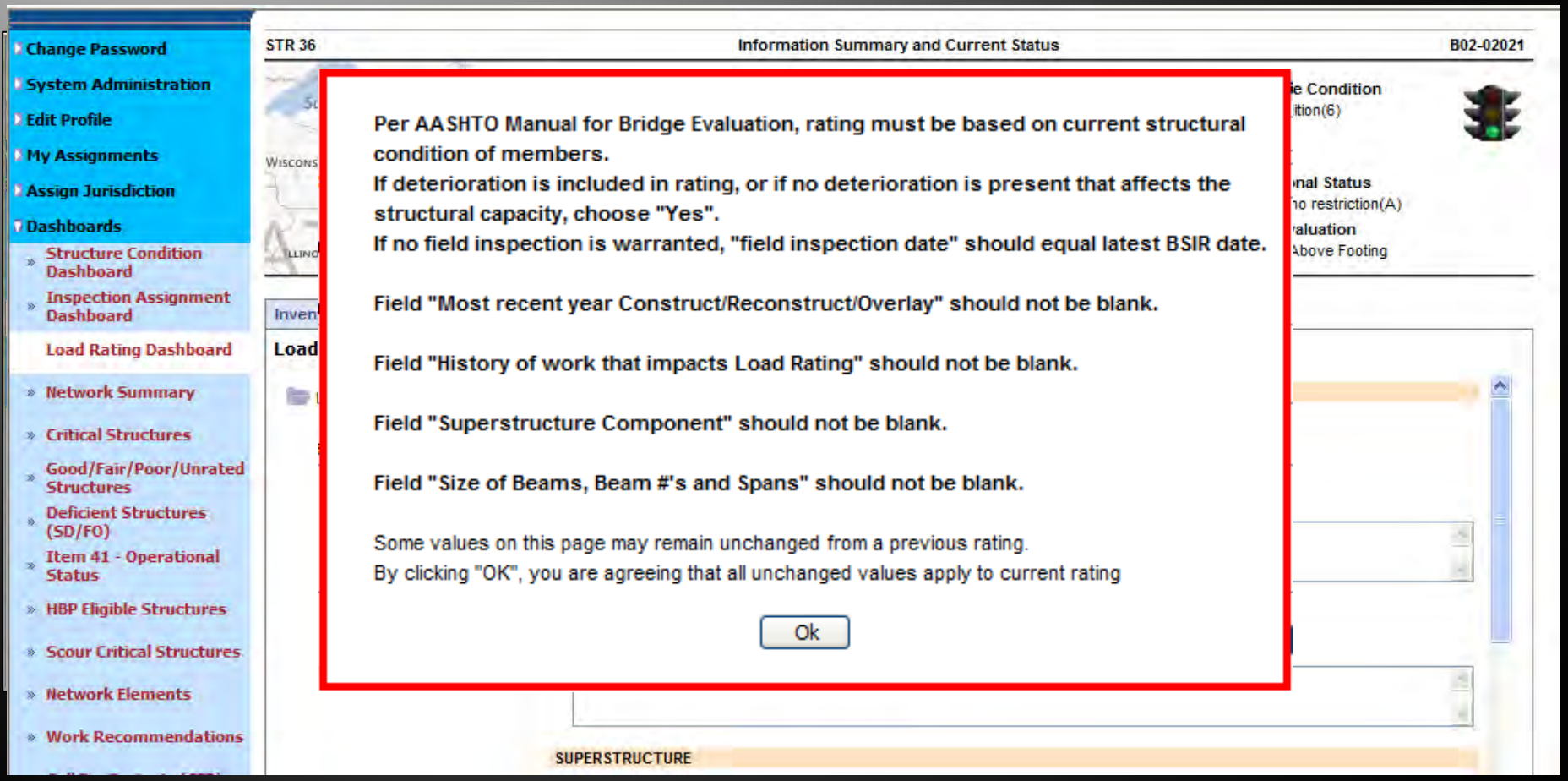
MBRS – Load Rating

Entering Load Rating Information



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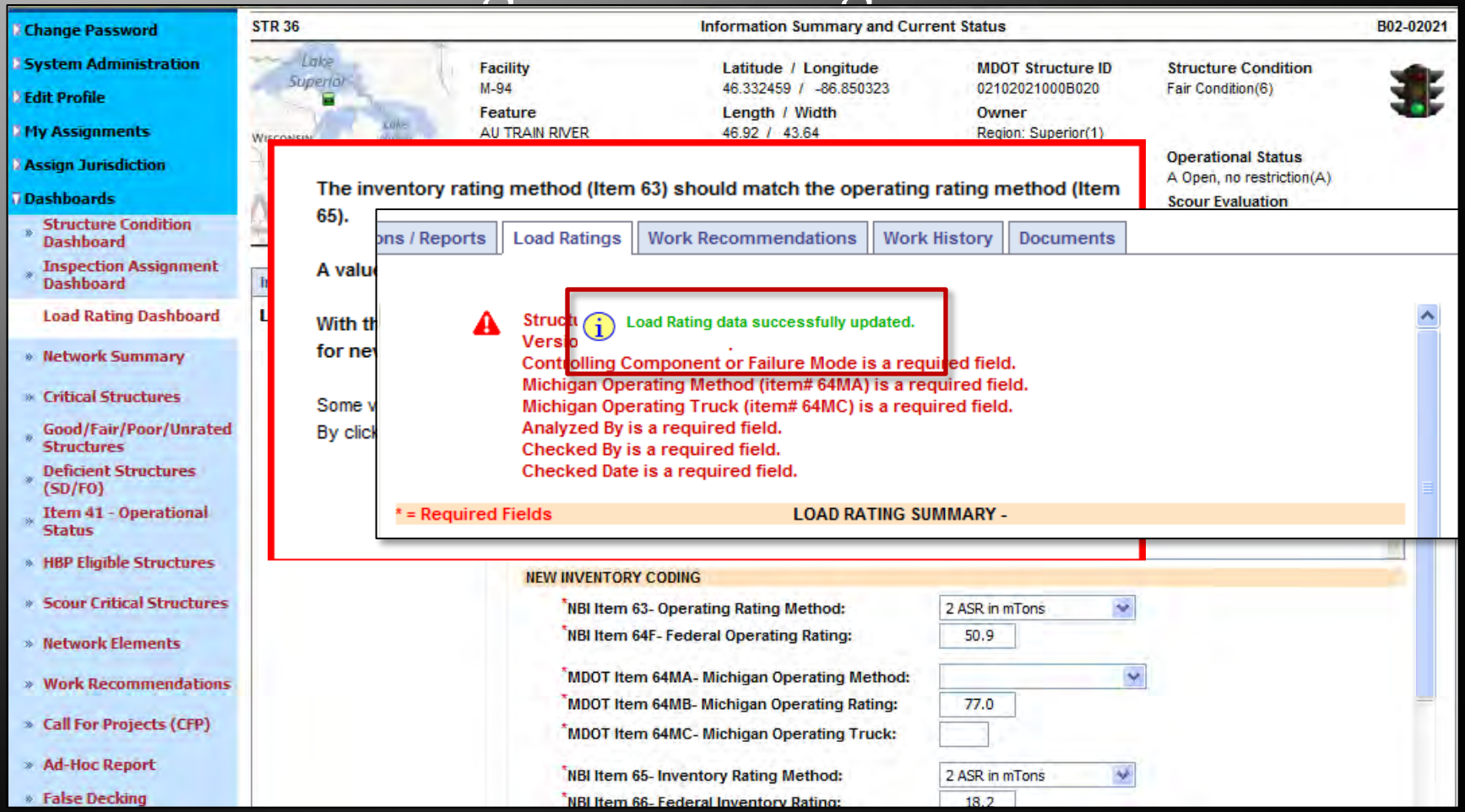
MBRS – Load Rating

Entering Load Rating Information



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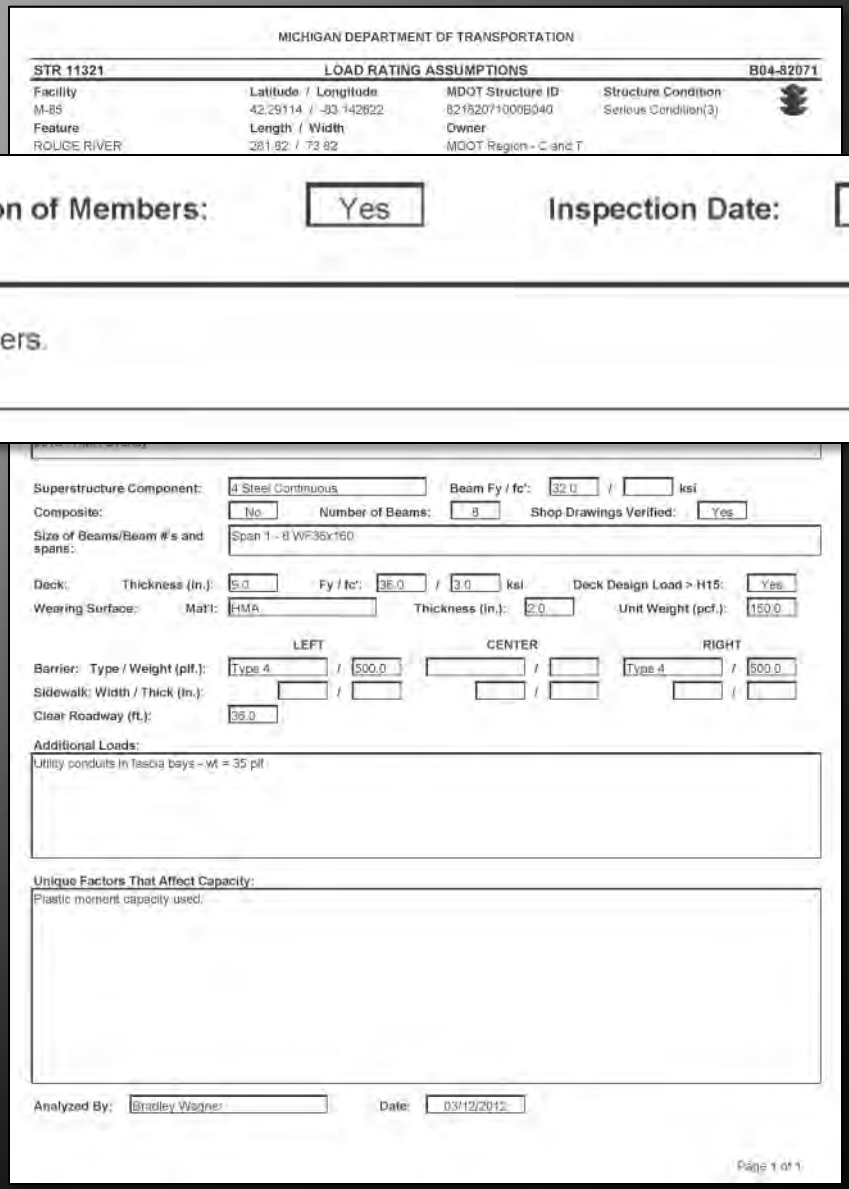
MBRS Assumption Sheet



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STR 11321 — LOAD RATING ASSUMPTIONS — B04-82071

Facility	Latitude / Longitude	MDOT Structure ID	Structure Condition
M-85	42.29114 / -83.142822	82182071000B040	Serious Condition(3)
Feature	**Length / Width**	**Owner**	
ROUGE RIVER	281.82 / 73.82	MDOT Region - C and T	

Rating Considers Field Condition of Members: Yes **Inspection Date:** 03/12/2012

Deterioration:

Stringers are rated 4.
Holes in the ends of several stringers.

Superstructure Component: 4 Steel Continuous **Beam Fy / fc':** 32.0 / ksi

Composite: No **Number of Beams:** 8 **Shop Drawings Verified:** Yes

Size of Beams/Beam #'s and spans: Span 1 - 8 WF36x160

Deck: Thickness (in.): 8.0 Fy / fc': 36.0 / 3.0 ksi Deck Design Load > H15: Yes

Wearing Surface: Mat'l: HMA Thickness (in.): 2.0 Unit Weight (pcf.): 150.0

	LEFT	CENTER	RIGHT
Barrier: Type / Weight (plf.):	Type 4 / 500.0	/	Type 4 / 500.0
Sidewalk: Width / Thick (In.):	/	/	/

Clear Roadway (ft.): 36.0

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

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MBRS Summary Sheet

NEW INVENTORY CODING	
NBI Item 63- Operating Rating Method	6 LF Rating Factor
NBI Item 64F- Federal Operating Rating	1.05
MDOT Item 64MA- Michigan Operating Method	6 LF RATING FACTOR
MDOT Item 64MB- Michigan Operating Rating	0.98
MDOT Item 64MC- Michigan Operating Truck	18
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

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