



**BRIDGE ADVISORY**  
**Design Division**  
**Bridge Management Section**

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BRIDGE ADVISORY NUMBER: BA-2012-01

DATE: July 24, 2012

SUBJECT: Modifications and Improvements to Load Rating Data and MBIS/MBRS

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## **PURPOSE**

In an effort to standardize load ratings and improve quality control, Michigan Department of Transportation (MDOT) has developed modifications and improvements to the load rating data collected in the Michigan Bridge Inspection System (MBIS) and reported from the Michigan Bridge Reporting System (MBRS). Changes to data collection have been made to comply with newly mandated federal requirements.

## **CHANGES TO DATA COLLECTION**

The National Bridge Inspection Standard (NBIS) requires that all bridges be load rated for capacity in accordance with the AASHTO Manual for Bridge Evaluation (MBE). The Federal Highway Administration (FHWA) requires the method used to calculate the load rating be based upon the specification of design and the specification of the existing and valid load rating. The required load ratings include rating the structure for design loads and state legal loads. Unique circumstances may also lead to field evaluations, load testing, and assigned or judgment ratings. To provide data that supports NBIS and FHWA requirements, the Structure Inventory and Appraisal (SI&A) Items 31, 63, 64F, 64M, 65, and 66 have been modified. Additionally, MBIS has been updated to collect Assumption and Summary information.

All changes that impact SI&A coding can be found in the MDOT Structure Inventory and Appraisal Coding Guide (to be updated in 2012). Draft revised portions of the guide have been included in Appendix A.

## **DESIGN LOAD**

Item 31 contains a single digit to identify the load used to design the bridge. This item has been updated to account for Load and Resistance Factor Design (LRFD) design loading.

## **METHOD USED TO DETERMINE FEDERAL (DESIGN) RATING**

Items 63 and 65 contain a single digit to identify the method used to determine the rating. Previously, this field was reported in metric tons. The field has been expanded to allow reporting by rating factor, field evaluation, load test and assigned rating.

HL-93, the current standard bridge design load, is based on a notional load scenario rather than a specific truck configuration. Due to the notional load status, FHWA now requires the Load and Resistance Factor Ratings (LRFR's) to be reported by the rating factor instead of converting to Metric Tons. In order to standardize ratings, MDOT also recommends reporting Load Factor Ratings (LFR) by rating factor.

Table 1 details the allowable rating methods for load ratings performed after October 1, 2010. This table reflects current requirements, and does not necessarily apply to existing and valid ratings. Further information can be found in FHWA memo dated October 30, 2006 (<http://www.fhwa.dot.gov/bridge/nbis/103006.cfm>).

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.

Table 1: Allowable Load Rating Analysis Methods

In lieu of performing load rating calculations, in some cases, assigned ratings (codes A-F) may be used to report the Federal (Design) Ratings for a structure. See FHWA memo dated September 29, 2011 (<http://www.fhwa.dot.gov/bridge/110929.cfm>) and Appendix A for additional information.

#### **METHOD USED TO DETERMINE MICHIGAN OPERATING (LEGAL) RATING**

Item 64MA contains a single digit to identify the method used to determine the Michigan Operating (legal) rating. The NBIS allows LRFR, LFR or ASR to be used to calculate the rating for legal load posting. Due to the fact that there are multiple configurations of Michigan Legal Loads that may control the rating, it is recommended to use the rating factor method when reporting the Michigan Operating (Legal) Rating. Reporting in U.S. tons does not give a clear picture of the posting status of a bridge without investigating which truck is controlling.

In lieu of performing load rating calculations, in limited cases, assigned ratings (codes A-F) may be used to report the Michigan Operating (Legal) Rating for a structure. See FHWA memo dated September 29, 2011 (<http://www.fhwa.dot.gov/bridge/110929.cfm>) and Appendix A for additional information. Please note that the engineer performing the assigned rating is responsible for performing a verification confirming that the design loading exceeds load effects of all legal and/or permit configurations for the structure.

#### **MICHIGAN OPERATING (LEGAL) RATING**

Item 64MB is the value of the load rating (in U.S. Tons or rating factor) corresponding to the method chosen in 64MA. Structure files with coding of Field Evaluation (0), Load Testing (4) or Assigned Rating (A-F) may or may not contain calculations; however documentation of how the rating was developed must still be included in the bridge file. The values should be based upon the controlling legal loading.

#### **MICHIGAN OPERATING (LEGAL) RATING CONTROLLING VEHICLE**

Item 64MC is a new field intended to capture the controlling vehicle configuration. 28 Standard Michigan Legal Loads are identified in Chapter 2 of the Michigan Bridge Analysis Guide. The controlling vehicle depends upon the span length, the controlling limit state and the type of structure. Chapter 2 of the Michigan Bridge Analysis Guide also provides recommendations for which vehicles to include in the analysis. The vehicle that produces the lowest **rating factor**, **NOT** the lowest rating in U.S. tons, should be used to calculate and record Items 64MB and 64MC. This may require checking multiple vehicle configurations to determine the controlling vehicle.

**PLEASE NOTE:** Selection of the vehicle that produces the lowest rating factor represents a change in the way Item 64M is reported. The changes detailed in this Bridge Advisory supersede the flow chart that is located on page 5-2 of the 2009 Michigan Bridge Analysis Guide. This flow chart shall no longer be used. A new version of the Guide will be released to reflect these changes.

#### **LOAD RATING ASSUMPTION AND SUMMARY FORMS**

In addition to enhancing current SI&A items, Assumption and Summary Forms (similar to the .pdf forms available on MDOT's website ([http://www.michigan.gov/mdot/0,4616,7-151-962524768\\_59520---,00.html](http://www.michigan.gov/mdot/0,4616,7-151-962524768_59520---,00.html))) have been added MBIS/MBRS to aid in the collection of load rating data. For help with access to MBIS/MBRS please contact Rich Kathrens at [kathrens@michigan.gov](mailto:kathrens@michigan.gov) or 517-322-5715.

The Assumption Form offers a uniform format to assure that load ratings are being performed and documented consistently. Currently, use of the Assumption Form is optional, but strongly recommended. However, for bridges that are in poor condition (Tier 2), the Assumption Form field “Rating Condition Considers Field Condition of Members” must be entered as “Yes”, and an inspection date must be included to remove the bridge from Tier 2.

The Summary Form is now the only available method for revising SI&A load rating data in MBIS. The load rating values are now “Read Only” on the SI&A form in MBIS.

**Load Rating and Posting**

31- Design of Load: H 20 (M 18)

41- Open, Posted, Closed: A Open, no restriction

63- Oper Rtg Method: 2-AS in Metric Tons

64F- Fed Oper Rtg (met Ton): 0

64M- Mich Oper Rtg (US Ton): 37

65- Inv Rtg Method: 2-AS in Metric Tons

66- Inventory Load (met Ton): 37.3

70- Posting: 5 Above Legal Loads

141- Posted Loading:

195- Analysis ID: 4050

193- Overload Class: Class B

204

R-Axis Loads Restricted

Shaded values are read-only

Michigan.gov Home | MBIS Home | Feedback | Help | State Web Sites  
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In order to access the Assumption and Summary Forms, log into MBIS and select a bridge. Link to MBIS: <https://mdotwas1.mdot.state.mi.us/login/userLogin.do>. Select “Rating Assumption” or “Rating Summary”.

BSIR New

Department of Transportation

Michigan.gov

Home Sign Out

User: Brad Wagner

Save Print Previous Inspection SIA Rating Assumption Rating Summary Back to Bridge List

\* = Required Fields

**Bridge Safety Inspection Report for Structure 13652 (New)**

Facility	Federal Struc ID	Inspector Name	Agency/Consultant	Inspection Date
I-96 EB(SCHEDULED)	47147064000S093	Brad Wagner	MDOT SUPERUSER	MM/DD/YYYY
Feature	Latitude	Longitude	Struc Num	Insp. Freq
US-23 SB			13652	24
Location	Length	Width	Year Built	Year Recon
@ US-23 INTERCHANGE				
Material	Design	Scour Eval	No. P	
		N		

NBI INSPECTION

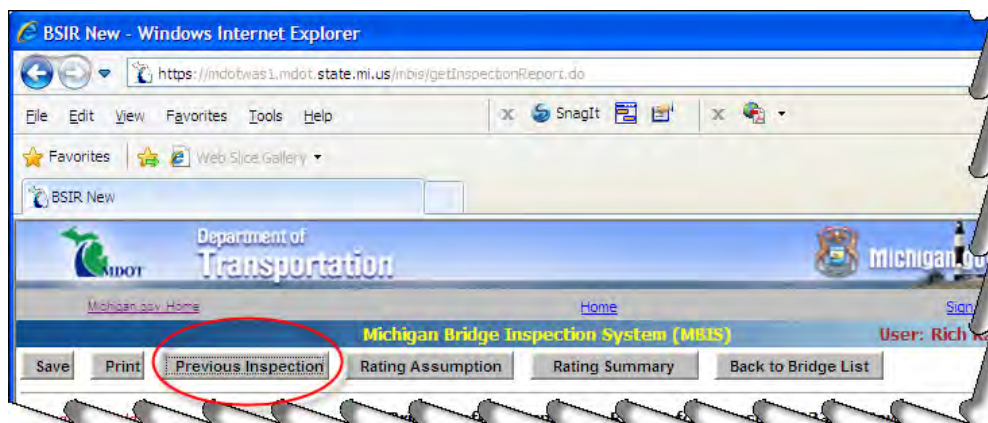
DECK

01 12

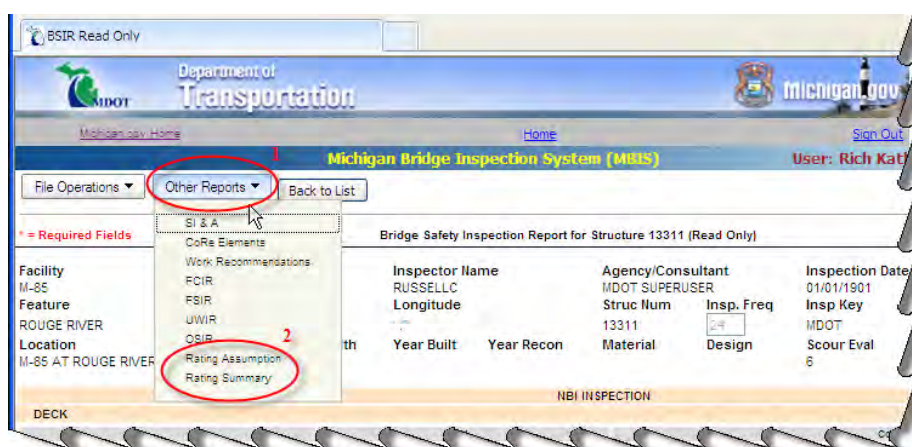
Comments



Alternately, select the “Previous Inspection” button and then choose “ok” to continue.



At the “Other Reports” drop down, select Rating Assumption or Rating Summary to access the pages with the forms.



The Rating Assumption screen records information that describes the cross-section, main superstructure component and strength and allows for free form entry to describe unique characteristics or deterioration of the structure. The Rating Summary screen collects the load rating SI&A items. The data collected in the Rating Assumption and Rating Summary screens is further described in Appendix B.

Please note: Once sheets have been completed, they can be viewed and printed by logging into MBRS and selecting the bridge ID from the list. Link to MBRS: <http://mdotwas1.mdot.state.mi.us/mbrs/mbrslogin.jsp>. An upcoming release of MBRS will include the ability to assign bridges to consultants for load ratings and inspections as well as enter load rating information through MBRS instead of MBIS.

## LOAD RATING DASHBOARD

A Load Rating Dashboard has been added to MBRS to provide bridge owners an effective and simple means to monitor the load rating needs for their jurisdiction. The dashboard is interactive and shows real time information about the bridges in the NBI Database.

To access the Load Rating Dashboard, log into MBRS and choose Load Rating Dashboard as shown below:

The screenshot shows the MDOT - MBRS - Load Rating Dashboard. The left sidebar contains navigation links such as 'Change Password', 'System Administration', 'Edit Profile', 'Assign Jurisdiction', 'Dashboards', 'Structure Condition Dashboard', 'Inspection Assignment Dashboard', 'Load Rating Dashboard', 'Network Summary', 'Critical Structures', 'Good/Fair/Poor/Unrated Structures', 'Deficient Structures (SD/FO)', 'Item 41 - Operational Status', 'HBP Eligible Structures', and 'Inspection Schedule'. The main content area is titled 'MBRS - Michigan Bridge Reporting System' and 'Jurisdiction: All Regions'. It features three main summary sections: 'Structure Inventory Summary', 'Local Agency Load Rating Needs Summary', and 'Other Data Coding Issues'. The 'Structure Inventory Summary' table shows counts for 'Total No. of Structures' (6,503), 'Highway (NBI) Structures greater than 20'' (6,503), 'Posted Structures' (907), 'Closed Structures' (50), 'Posting Recommended Structures' (55), and 'Structures in Poor Condition' (1,025). The 'Local Agency Load Rating Needs Summary' table shows counts for 'Tier 1' (1,391), 'Tier 2' (907), and 'Tier 3' (672). The 'Other Data Coding Issues' table shows counts for 'Fed Oper (64F) < Fed Inv (66)' (43), 'No Rating Performed' (854), 'Fed Oper(64F) = Fed Inv(66)' (811), 'Poor Condition AND Rating Does NOT Represent Current Condition' (907), 'Fed Oper(64F) < 2.7 mTons' (6), 'Structure Should Be Posted' (21), 'Built/Rebuilt > 2010 AND NOT LRFR' (53), 'Built/Rebuilt/Overlay > 1993 AND ASR' (466), 'NHS and ASR' (44), and 'Fed Oper(64F) > 3 x Fed Inv(66)' (144). The 'Other Data Coding Issues' section also includes radio buttons for 'All', 'Non-NBI Only', and 'NBI Only'. The 'NBI Radio Button' is highlighted with a red arrow. The 'Structure Inventory Summary' section includes a table with columns for 'Select', 'Struct. Nbr.', 'Bridge ID', 'Facility Carried', 'Features Intersected', 'Fed Oper.', 'Michigan Operating', 'Fed Inv.', and 'Item'. The table lists several bridges, including 'BAMFIELD ROAD AU SABLE RIVER' and 'MIKADO GLENNIPINE RIVER'. Red arrows point to underlined text in the 'Structure Inventory Summary' and 'Local Agency Load Rating Needs Summary' sections, with a note: 'Clicking underlined text filters bridge list below'. Another red arrow points to the 'NBI Radio Button' in the 'Other Data Coding Issues' section.

At the top of the page are three columns of information. The left column is the Structure Inventory Summary. It contains counts of all of the bridges in the selected jurisdiction. The middle column is the Load Rating Needs Summary. It show counts for bridges in the selected jurisdiction that currently fall into each of the three load rating prioritization tiers as agreed upon with FHWA. The right column includes other coding issues that are not part of the prioritization tiers but may still represent errors in the database.

A few general notes about the Load Rating Dashboard are as follows:

All underlined text are links. Clicking on any of the links above the bridge list will filter the bridge list accordingly. Clicking on any of the underlined column headings on the bridge list will sort all bridges by the selected column.

The radio buttons at the right filter the bridge list and modify the summaries to include All, NBI or Non-NBI bridges. Note that even though Non-NBI bridges are not part of the tier list agreed upon with FHWA, they are included in the Load Rating Needs Summary. To filter them from this list, choose “NBI Only” radio button.

A guidance document that details the Load Rating Dashboard as well as several other MBRS enhancements will soon be made available, and will include additional information regarding the use of the dashboard.

## APPENDIX A

### SI&A CODING GUIDE DRAFT CHANGES

#### Item 31 - Design Load

(X)

Use the codes below to indicate the live load for which the structure was designed. The numerical value of the railroad loading should be recorded on the form. Classify any other loading, when feasible, using the nearest equivalent of the loadings given below.

<u>Code</u>	<u>English Description</u>		<u>Metric Description</u>
1	H 10	or	M 9
2	H 15		M 13.5
3	HS 13.5		MS 13.5
4	H 20		M 18
5	HS 20		MS18
6	HS 20+Mod		MS18+Mod
7	Pedestrian		Pedestrian
8	Railroad		Railroad
9	HS 25 or greater		MS 22.5 or greater
0	Unknown		
A	HL93		HL93
B	Greater than HL-93		Greater than HL93
C	Other		Other

Per FHWA Memo Dated February 2, 2011 (<http://www.fhwa.dot.gov/bridge/110202.cfm>): There are two distinct codes for "Unknown" and "Other". Code 0 has only describes "Unknown" situations. This code is to be used where the design live load is unknown due to the absence of plans, design calculations, or other information. Code C is for situations which increase the design load but are not based upon AASHTO design trucks. Code B is to be used only for increased design loads which are based on the HL93 AASHTO design load configuration.

#### Item 32 - Approach Roadway Width

(XXX.X)

Using up to 4 digits, record the normal width of usable roadway approaching the structure measured to the nearest tenth of a foot. Usable roadway width will include the width of traffic lanes and the widths of shoulders, where shoulders are defined as follows:

Shoulders must be constructed and normally maintained flush with the adjacent traffic lane, and must be structurally adequate for all weather and traffic conditions consistent with the facility carried.

Unstabilized grass or dirt, with no base course, flush with and beside the traffic lane is not to be considered a shoulder for this item.



**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 64F for this structure.

<u>Code</u>	<u>Description</u>
0**	Field Evaluation and documented engineering judgment reported in metric tons using MS18 loading.
1	Load Factor Rating (LFR) reported in metric tons using MS18 loading.
2	Allowable Stress Rating (ASR) reported in metric tons using MS loading.
3*	Load and Resistance Factor Rating (LRFR) reported in metric tons using equivalent MS loading.
4	Load testing reported in metric tons using equivalent MS18 loading.
5**	No rating analysis or evaluation performed.
6	Load Factor Rating (LFR) reported by rating factor method using MS18 loading.
7	Allowable Stress Rating (ASR) reported by rating factor method using MS18 loading.
8	Load and Resistance Factor Rating (LRFR) rating reported by rating factor method using HL-93 loadings
A	Assigned rating based on Load Factor Design (LFD) reported in metric tons
B	Assigned rating based on Allowable Stress Design (ASD) reported in metric tons
C	Assigned rating based on Load and Resistance Factor Design (LRFD) reported in metric tons
D	Assigned rating based on Load Factor Design (LFD) reported by rating factor using MS18 loading
E	Assigned rating based on Allowable Stress Design (ASD) reported by rating factor using MS18 loading
F	Assigned rating based on Load and Resistance Factor Design (LRFD) reported by rating factor using HL93 loading

\* per the FHWA Memo Dated October 30, 2006 "The NBI Code of 3 for Items 63 and 65 will no longer be valid for new load ratings of new or existing bridges after October 1, 2010."

\*\* per the FHWA Memo Dated February 2, 2011 "Existing code 5 is clarified to only be used for bridges that have not been load rated or load rating documentation does not exist. Code 0 has been added for use when the load rating is determined by field evaluation and documented engineering judgment, typically done when plans are not available or severe deterioration exists. Field evaluation and engineering judgment ratings must be documented.

See FHWA memo dated September 29, 2011 (<http://www.fhwa.dot.gov/bridge/110929.cfm>) and for additional information regarding the use of Assigned Ratings.



**Item 64F - Federal Operating Rating****(XX.XX) metric tons or rating factor**

This capacity rating, referred to as the operating rating, will result in the maximum permissible load level to which the structure may be subjected for the vehicle type used in the rating.

The data entry is dependent upon the method used to determine the operating rating, Item 63. When Item 63 is entered as 0, 1, 2, 3, or 4, A, B, or C, record the operating rating as a 4-digit number to represent the total mass in metric tons of the entire vehicle measured to the nearest hundredth of a metric ton. It should be emphasized that, when recording with metric tons, MS18 loading shall be used to determine the operating rating. This is the metric equivalent of an HS20 loading. The total mass in tons of the entire vehicle should be recorded; that is, MS18 which has a mass of 32.40 metric tons shall be recorded '32.40', and likewise, a MS13.5 shall be recorded '24.30'.

When Item 63 is entered as 6, 7, or 8, D, E, or F record the operating rating as a 4-digit number to the nearest hundredth to represent the rating factor for the appropriate loading (MS18 or HL-93).

The AASHTO Manual for Bridge Evaluation provides a choice of load rating methods, such as the Load and Resistance Factor Rating (LRFR) method, in addition to the traditional Allowable Stress Rating (ASR) and Load Factor Rating (LFR) methods. Of the three rating methods, the LRFR method is the now the national standard chosen by FHWA. However, the methods allowed for use varies depending upon the method of design, the date of design and the NHS status of the structure. Please refer to the FHWA memo dated October 30, 2006 (<http://www.fhwa.dot.gov/bridge/nbis/103006.cfm>) for allowable methods. The highway agencies may elect to use LFR, ASR or LRFR to establish load limits for purposes of load posting.

If the bridge will not carry a minimum of 2.70 metric tons of live load, the operating rating shall be recorded 00.00; and consistent with the direction of the AASHTO Manual, it shall be closed.

The use or presence of a temporary bridge requires special consideration in recording. In such cases, since there is no permanent bridge, Items 64 and 66 should be recorded as 00.00, though the temporary structure is rated for as much as full legal load.

A bridge shored up or repaired on a temporary basis is considered a temporary bridge and the inventory and operating rating shall be recorded as if the temporary shoring were not in place. See Item 103 - Temporary Structure Designation for definition of a temporary bridge.

Record 99.99 for a structure under sufficient fill such that, according to AASHTO design, the live load is insignificant in the structure load capacity.

**EXAMPLES:**

	<u>Record</u>
MS27	48.60
Temporary bridge	00.00
Shored-up bridge	03.00 *
Structure under fill (not affected by live load)	99.99

\* load capacity without shoring.

**Item 64MA - Michigan Operating Rating Method****(X) Method**

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

<u>Code</u>	<u>Description</u>
0	Field Evaluation and documented engineering judgment reported by rating factor method using equivalent legal loading.
1*	Load Factor Rating (LFR) reported in U.S. tons.
2*	Allowable Stress Rating (ASR) reported in U.S. tons.
3*	Load and Resistant Factor Rating (LRFR) reported in U.S. tons.
4	Load testing reported in U.S. tons using equivalent legal loading.
5	No rating analysis or evaluation performed.
6	Load Factor Rating (LFR) reported by rating factor method.
7	Allowable Stress Rating (ASR) reported by rating factor method.
8	Load and Resistance Factor Rating (LRFR) rating reported by rating factor method
A*	Assigned rating based on Load Factor Design (LFD) reported in U.S. tons
B*	Assigned rating based on Allowable Stress Design (ASD) reported in U.S. tons
C*	Assigned rating based on Load and Resistance Factor Design (LRFD) reported in U.S. tons
D	Assigned rating based on Load Factor Design (LFD) reported by rating factor using equivalent legal loading
E	Assigned rating based on Allowable Stress Design (ASD) reported by rating factor using equivalent legal loading
F	Assigned rating based on Load and Resistance Factor Design (LRFD) reported by rating factor using equivalent legal loading

\* Not the preferred methods.

There are multiple configurations of Michigan Legal Loads, as given in the Michigan Bridge Analysis Guide. Due to this, reporting in U.S. tons does not give a clear picture of the posting status of a bridge without investigating which truck is controlling. The vehicle that produces the lowest rating factor is the correct vehicle to use for reporting the Michigan Operating Rating.



**Item 65 - Method Used to Determine Inventory Rating****(X) Method**

Use the codes below to indicate which load rating method was used to determine the Inventory Rating coded in Item 66 for this structure.

<u>Code</u>	<u>Description</u>
0**	Field Evaluation and documented engineering judgment reported in metric tons using MS18 loading.
1	Load Factor Rating (LFR) reported in metric tons using MS18 loading.
2	Allowable Stress Rating (ASR) reported in metric tons using MS18 loading.
3*	Load and Resistant Factor Rating (LRFR) reported in metric tons using equivalent MS18 loading.
4	Load testing reported in metric tons using equivalent MS18 loading.
5**	No rating analysis or evaluation performed.
6	Load Factor Rating (LFR) reported by rating factor method using MS18 loading.
7	Allowable Stress Rating (ASR) reported by rating factor method using MS18 loading.
8	Load and Resistance Factor Rating (LRFR) rating reported by rating factor method using HL-93 loadings
A	Assigned rating based on Load Factor Design (LFD) reported in metric tons
B	Assigned rating based on Allowable Stress Design (ASD) reported in metric tons
C	Assigned rating based on Load and Resistance Factor Design (LRFD) reported in metric tons
D	Assigned rating based on Load Factor Design (LFD) reported by rating factor using MS18 loading
E	Assigned rating based on Allowable Stress Design (ASD) reported by rating factor using MS18 loading
F	Assigned rating based on Load and Resistance Factor Design (LRFD) reported by rating factor using HL93 loading

\* per the FHWA Memo Dated October 30, 2006 "The NBI Code of 3 for Items 63 and 65 will no longer be valid for new load ratings of new or existing bridges after October 1, 2010."

\*\* per the FHWA Memo Dated February 2, 2011 "Existing code 5 is clarified to only be used for bridges that have not been load rated or load rating documentation does not exist. Code 0 has been added for use when the load rating is determined by field evaluation and documented engineering judgment, typically done when plans are not available or severe deterioration exists. Field evaluation and engineering judgment ratings must be documented.

See FHWA memo dated September 29, 2011 (<http://www.fhwa.dot.gov/bridge/110929.cfm>) and for additional information regarding the use of Assigned Ratings.



**EXAMPLES:**Record

When Item 64MA is entered as 1, 2, 3, 4, A, B or C

Temporary bridge	00.00
Shored-up bridge	03.00 *
Structure under fill (not affected by live load)	99.99

When Item 64MA is entered as 0, 6, 7 8, D, E, or F

Temporary bridge	1.00
Shored-up bridge	0.75 *
Structure under fill (not affected by live load)	99.99

\* load capacity without shoring.

**Item 64MC - Michigan Operating Vehicle****(XX) Legal Vehicle**

28 Standard Michigan Legal Loads are identified in Chapter 2 of the Michigan Bridge Analysis Guide. The vehicle that controls may depend upon the span length, the controlling limit state and the type of structure. Chapter 2 of the Michigan Bridge Analysis Guide also provides recommendations for which vehicles are recommended for analysis. The vehicle that produces the lowest rating factor, **NOT** the lowest rating in U.S. tons, should be used to calculate and record Items 64MB and 64MC.

**Item 65 - Method Used to Determine Inventory Rating****(X) Method**

Use the codes below to indicate which load rating method was used to determine the Inventory Rating coded in Item 66 for this structure.

<u>Code</u>	<u>Description</u>
0**	Field Evaluation and documented engineering judgment reported in metric tons using MS18 loading.
1	Load Factor Rating (LFR) reported in metric tons using MS18 loading.
2	Allowable Stress Rating (ASR) reported in metric tons using MS18 loading.
3*	Load and Resistant Factor Rating (LRFR) reported in metric tons using equivalent MS18 loading.
4	Load testing reported in metric tons using equivalent MS18 loading.
5**	No rating analysis or evaluation performed.
6	Load Factor Rating (LFR) reported by rating factor method using MS18 loading.
7	Allowable Stress Rating (ASR) reported by rating factor method using MS18 loading.
8	Load and Resistance Factor Rating (LRFR) rating reported by rating factor method using HL-93 loadings
A	Assigned rating based on Load Factor Design (LFD) reported in metric tons
B	Assigned rating based on Allowable Stress Design (ASD) reported in metric tons
C	Assigned rating based on Load and Resistance Factor Design (LRFD) reported in metric tons
D	Assigned rating based on Load Factor Design (LFD) reported by rating factor using MS18 loading
E	Assigned rating based on Allowable Stress Design (ASD) reported by rating factor using MS18 loading
F	Assigned rating based on Load and Resistance Factor Design (LRFD) reported by rating factor using HL93 loading

\* per the FHWA Memo Dated October 30, 2006 "The NBI Code of 3 for Items 63 and 65 will no longer be valid for new load ratings of new or existing bridges after October 1, 2010."

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See FHWA memo dated September 29, 2011 (<http://www.fhwa.dot.gov/bridge/110929.cfm>) and for additional information regarding the use of Assigned Ratings.

**Item 66 - Inventory Rating****(XX.XX) metric tons or rating factor**

This capacity rating, referred to as the inventory rating, will result in a load level which can safely utilize an existing structure for an indefinite period of time. Only the MS18 or HL-93 loadings shall be used to determine the inventory rating.

The data entry is dependent upon the method used to determine the operating rating, Item 63. When Item 63 is entered as 0, 1, 2, 3, 4, A, B, or C, record the operating rating as a 4-digit number to represent the total weight in metric tons of the entire vehicle measured to the nearest hundredth of a metric ton. It should be emphasized that, when recording with metric tons, MS18 loading shall be used to determine the operating rating. This is the metric equivalent of an HS20 loading. The total mass in tons of the entire vehicle should be recorded; that is, MS18 which has a mass of 32.40 metric tons shall be recorded '32.4', and likewise, a MS13.5 shall be recorded '24.30'.

When Item 63 is entered as 6, 7, 8, D, E, or F, record the operating rating as a 4-digit number to the nearest hundredth to represent the rating factor for the appropriate loading (MS18 or HL-93).

The statements in Item 64 - Operating Rating, apply to this item also.

**Items 67, 68, 69, 71, and 72 - Appraisal Ratings**

The items in the Appraisal Section are used to evaluate a bridge in relation to the level of service which it provides on the highway system of which it is a part. The structure will be compared with a new one which is built to current standards for that particular type of road as further defined in this section, except Item 72 - Approach Roadway Alignment. See Item 72 for special criteria for rating that item.

Items 67, 68, 69, 71, and 72 will be coded with a 1 digit code that indicates the appraisal rating for the item. The ratings and codes are as follows:

<u>Code</u>	<u>Description</u>
N	Not applicable
9	Superior to present desirable criteria
8	Equal to present desirable criteria
7	Better than present minimum criteria
6	Equal to present minimum criteria
5	Somewhat better than minimum adequacy to tolerate being left in place as is
4	Meets minimum tolerable limits to be left in place as is
3	Basically intolerable requiring high priority of corrective action
2	Basically intolerable requiring high priority of replacement
1	This value of rating code not used
0	Bridge closed



## APPENDIX B

### RATING ASSUMPTION AND SUMMARY SHEET FIELD DESCRIPTIONS

#### Rating Assumption Fields

Data Name	Format	Description of Data
Does rating consider field condition of members?	Y or N	Y/N flag that indicates whether the current condition of structural members is considered in the rating. Note that this field should be “Y” even if it is determined that deterioration does not exist, or does not affect the rating results. This field MUST be “Y” for poor condition structures.
If Yes, enter field inspection date.	MM/DD/YYYY	All ratings should reference a field inspection. If a special inspection is not warranted, most recent BSIR date can be used.
Describe any deterioration	500 characters	A description of the bridge deterioration that was considered in the load rating calculations
Most Recent Year Constructed/ Reconstructed	XXXX	The year of the latest construction or reconstruction that was considered in the load rating.
Describe history of work that impacts load rating	500 characters	Description of any construction work performed on the bridge that was considered in the load rating
Superstructure Component	Drop Down List	Describes the material used in the superstructure members. This code corresponds to the National Bridge Inventory Item 43A- Material Type
Beam fy	XXX.X	Yield stress of the structural steel (or ultimate strength of prestressing strands) in the superstructure, kips per square inch
Beam f'c or Beam fb	XXX.X	Compressive strength of the concrete or bending strength of timber superstructure members, kips per square inch
Size of Beams, Beam #'s and Spans	200 characters	Depth of the beams, inches or standard AISC designation of rolled steel members
Composite?	Y or N	Y/N flag that indicates whether the main structural members are composite with the bridge deck
# of Beams	XX	Number of longitudinal members in the superstructure
Shop Drawings Verified?	Y or N	Y/N flag that indicates whether the structural dimensions used in the load rating calculations have been verified against shop drawings
Deck thickness	XXXXXX	Thickness of the bridge deck, inches
Deck Reinf. Fy	XX.X	Yield strength of the reinforcing steel bars, kips per square inch
Deck Conc. f'c	XX.X	Compressive strength of the concrete bridge deck, kips per square inch
Deck Design > H15?	Y or N	Y/N flag that indicates whether the bridge deck was designed for greater than H15 loading. If “N”, the deck should be load rated.
Wearing Surface Type	20 characters	Description of the deck wearing surface material (if any) (concrete, bituminous, brick, etc.)
Wearing Surface Weight	XXXXXXXX.XX	Density of the deck wearing surface (if any), pounds per cubic foot
Wearing Surface Thickness	XXXXXXXX.XX	Thickness of the deck wearing surface (if any), inches
Barrier Left Type	20 characters	Description of the type of bridge barrier or railing on the left side of the bridge (looking N or E)
Barrier Left Weight	XXXXXXXX.XX	Weight of the bridge barrier or railing on the left side of the bridge, lbs per foot (looking N or E)
Barrier Center Type	20 characters	Description of the type of bridge barrier or railing (if any) in the center of the bridge (looking N or E)
Barrier Center Weight	XXXXXXXX.XX	Weight of the bridge barrier or railing in the center of the bridge, lbs per foot (looking N or E)

Rating Assumption Fields (Continued)

Date Name	Format	Description of Data
Barrier Right Type	20 characters	Description of the type of bridge barrier or railing on the right side of the bridge (looking N or E)
Barrier Right Weight	XXXXXXXX.XX	Weight of the bridge barrier or railing on the right side of the bridge, lbs per foot (looking N or E)
Sidewalks Left Width	XXXXXXXX.XX	Width of the curb or sidewalk on the left side of the bridge, feet (looking N or E)
Sidewalks Left Thick	XXXXXXXX.XX	Thickness of the curb or sidewalk on the left side of the bridge, inches (looking N or E)
Sidewalks Center	XXXXXXXX.XX	Width of the curb, sidewalk, or island in the center of the bridge, feet (looking N or E)
Sidewalks Center Thick	XXXXXXXX.XX	Thickness of the curb, sidewalk, or island in the center of the bridge, inches (looking N or E)
Sidewalks Right Width	XXXXXXXX.XX	Width of the curb or sidewalk on the right side of the bridge, feet (looking N or E)
Sidewalks Right Thick	XXXXXXXX.XX	Thickness of the curb or sidewalk on the right side of the bridge, inches (looking N or E)
Clear Roadway	XXX.XX	Width of the clear roadway, feet
Additional Loads	1000 characters	Description of any additional loads that were considered in the load rating calculations
Unique Factors That Affect Capacity	2000 characters	Description of any unique factors or circumstances that were considered in the load rating calculations

Rating Summary Fields

Data Name	Format	Description of Data
The above structure was analyzed using	Drop Down List	Name of the software or other method used in the load rating calculations
Version or Other	100 characters	Version of the software or description of the other method used in load rating calculations
The controlling component and failure mode are	500 characters	Description of the mode of failure (e.g. bending moment at mid-span) that controls the load rating calculations
NBI Item 63- Operating Rating Method	Drop Down List	Refer to Michigan SI&A
NBI Item 64F- Federal Operating Rating	XX.XX	Refer to Michigan SI&A
MDOT Item 64MA- Michigan Operating Method	Drop Down List	Refer to Michigan SI&A
MDOT Item 64MB- Michigan Operating Rating	XXX.XX	Refer to Michigan SI&A
MDOT Item 64MC - Michigan Operating Truck	XX	Refer to Michigan SI&A
NBI Item 65- Inventory Rating Method	Drop Down List	Refer to Michigan SI&A
NBI Item 66- Federal Inventory Rating	XX.XX	Refer to Michigan SI&A
NBI Item 41- Open Posted Closed	Drop Down List	Refer to Michigan SI&A
NBI Item 70- Bridge Posting	Drop Down List	Refer to Michigan SI&A
NBI Item 141- Posted Loading	XXXXXX	Refer to Michigan SI&A
MDOT Item 193A- Michigan Overload Class	Drop Down List	Refer to Michigan SI&A (Optional for Local Agencies)
MDOT Item 193C- Overload Status	Drop Down List	Refer to Michigan SI&A (Optional for Local Agencies)
Analyzed By - Name	20 characters	Name of the person that performed the load rating calculations
Analyzed By - Date	MM/DD/YYYY	Date that the load rating calculations were performed
Checked By - Name	20 characters	Name of the person that checked the load rating calculations
Checked By - Date	MM/DD/YYYY	Date that the load rating calculations were checked