Montana Department of Transportation

Bridge Load Rating Summary

Insert Consultant Logo Here

Rating prepared by:

General Bridge Information

MDT Bridge ID	**02734**	MDT District	BILLINGS	Year Built	1980
NBI Bridge ID	L14008003+03001	County	FERGUS	Design Load	Unknown
Feature Intersected	WARM SPRINGS CREEK 078	Location	5M N DANVERS	Deck Type	Wood or Timber
Facility Carried	72 BENCH RD	Inspection Date	2/22/2018	Wearing Surface	Wood or Timber...
Route Number	14008	Accumulated Miles	3.364	Depth of Cover (inches)	0
Structure Length (feet)	50	Bridge Owner	County Hwy Agency	Maintenance Responsibility	County Hwy Agency

Span Data

Main Span(s)		Approach Span(s)	
Number of Spans	1	Number of Spans	0
Material Type	Steel	Material Type	Not Applicable
Superstructure Type	Stringer|Multi-beam or Girder	Superstructure Type	Not Applicable

EXAMPLE
Steel Girder/Timber Deck - Deck (ASR) controls rating

Load Rating Information

Load Rating Method Used	ASR	Load Rating Program Used	BrR
Load Rating Status	Final	Version	6.8.3.3001

Truck / Load Type	Vehicle Weight *(Tons)*	Rating Factor	Controlling Member	Controlling Location *Span - (%)*	Limit State	Safe Load Capacity *(Tons)*	Calculated Safe Posting Load* *(Tons)*
HS 20-44 Inventory	36	0.314	Deck	n/a	Flexure - One-lane	11	
HS 20-44 Operating	36	0.418	Deck	n/a	Flexure - One-lane	15	
Type 3 Inventory	25	0.535	Deck	n/a	Flexure - One-lane	13	**13**
Type 3 Operating		0.713	Deck	n/a	Flexure - One-lane	18	
Type 3S2 Inventory	36	0.580	Deck	n/a	Flexure - One-lane	21	**21**
Type 3S2 Operating		0.773	Deck	n/a	Flexure - One-lane	28	
Type 3-3 Inventory	40	0.564	Deck	n/a	Flexure - One-lane	23	**23**
Type 3-3 Operating		0.752	Deck	n/a	Flexure - One-lane	30	
SU4 Inventory	27	0.500	Deck	n/a	Flexure - One-lane	14	**14**
SU4 Operating		0.667	Deck	n/a	Flexure - One-lane	18	
SU5 Inventory	31	0.500	Deck	n/a	Flexure - One-lane	16	**16**
SU5 Operating		0.667	Deck	n/a	Flexure - One-lane	21	
SU6 Inventory	34.75	0.500	Deck	n/a	Flexure - One-lane	17	**17**
SU6 Operating		0.667	Deck	n/a	Flexure - One-lane	23	
SU7 Inventory	38.75	0.500	Deck	n/a	Flexure - One-lane	19	**19**
SU7 Operating		0.667	Deck	n/a	Flexure - One-lane	26	
EV2 Inventory	28.75	0.300	Deck	n/a	Flexure - One-lane	9	**REFER TO LOAD**
EV2 Operating		0.400	Deck	n/a	Flexure - One-lane	12	**POSTING FORM**
EV3 Inventory	43	0.324	Deck	n/a	Flexure - One-lane	14	**REFER TO LOAD**
EV3 Operating		0.432	Deck	n/a	Flexure - One-lane	19	**POSTING FORM**

** Recommended values based on MBE Equation 6A.8.3-1. If posting is required, refer to supplemental Load Posting Form for final determination on load posting values.*

***Minimum permissible posting load is 3 tons. Refer to Load Posting Form for documentation of engineering judgement if posted at alternate level*

Use summary sheet for controlling methodology, note mixed methodology (see example wording)

Don't need to include overall bridge rating results from Explorer. Instead, please include rating result printouts for each member alternative.
Preference - highlight member at top of each sheet, highlight controlling rating factors

Include Calculations/Additional Assumptions/ Measurements sheets like normal

Include vehicle templates for both rating methods

Posting Required for Legal Vehicles?	**Yes**

Posting is required if Rating Factor is < 1 for any of the AASI

Posting Required for Emergency Vehicles?	**No**

*Posting is required if Rating Factor is < 1 for either EV **and** an interstate or within 1 mile from any interstate interchan*

Load Rating by:	
Date:	
QC by:	

Comments and Assumptions

Include:
Basis for Load Rating
References (i.e. MBE edition, AASHTO LRFD edition)
Anything unique about rating (i.e. alternate superstructure was created in BrR for xxx reason, mixed materials)
Anything that needs to be flagged for attention (i.e. reduced capacity for timber members)

The intent of this section is to provide a brief overview/summary; it's encouraged to attach more detailed documentation of engineering judgement and calculations as additional pages. Please include a note referencing any additional comments/assumptions/calculations (i.e. "Additional assumptions and calculations are detailed within the attached load rating report)

Example wording:

References:
AASHTO MBE (3rd Ed.)
AASHTO LRFD Bridge Design Specifications (8th Ed.) - steel girders
AASHTO Standard Specifications (17th Ed.) - timber decking

Due to BrR limitations, ASR analysis was used for the timber deck and LRFR analysis was used for steel girders. Controlling values (based on ASR Operating and LRFR rating factors) are reported.

OR

Timber deck analysis was performed using ASR methodology and references the provisions of the AASHTO MBE (3rd ed.) and AASHTO Standard Specifications (17th ed.)

Steel Girder analysis was performed using LRFR methodology and references the provisions of the AASHTO MBE (3rd ed.) and AASHTO LRFD Bridge Design Specifications (8th ed.) The Legacy AASHTO LRFR analysis module was selected to account for timber deck loads (BrR bug workaround). The results of girder analysis do not control the rating.

Rating Results Summary Report

Name:
Struct-Def: 48' Steel Girder Span

Bridge ID: 02734
Member: Deck

Deck results don't include indication of member - please add

NBI: L14008003+03001

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating	Rating Factor	Location	Limit State	Impact	Lane
EV2	Axle Load	ASD	Inventory	8.62	0.300		Flexure - One-lane	As Requested	As Requested
EV2	Axle Load	ASD	Operating	11.49	0.400		Flexure - One-lane	As Requested	As Requested
EV3	Axle Load	ASD	Inventory	13.94	0.324		Flexure - One-lane	As Requested	As Requested
EV3	Axle Load	ASD	Operating	18.57	0.432		Flexure - One-lane	As Requested	As Requested
HS 20-44	Axle Load	ASD	Inventory	11.30	0.314		Flexure - One-lane	As Requested	As Requested
HS 20-44	Axle Load	ASD	Operating	15.06	0.418		Flexure - One-lane	As Requested	As Requested
SU4	Axle Load	ASD	Inventory	13.51	0.500		Flexure - One-lane	As Requested	As Requested
SU4	Axle Load	ASD	Operating	18.00	0.667		Flexure - One-lane	As Requested	As Requested
SU5	Axle Load	ASD	Inventory	15.51	0.500		Flexure - One-lane	As Requested	As Requested
SU5	Axle Load	ASD	Operating	20.67	0.667		Flexure - One-lane	As Requested	As Requested
SU6	Axle Load	ASD	Inventory	17.39	0.500		Flexure - One-lane	As Requested	As Requested
SU6	Axle Load	ASD	Operating	23.17	0.667		Flexure - One-lane	As Requested	As Requested
SU7	Axle Load	ASD	Inventory	19.39	0.500		Flexure - One-lane	As Requested	As Requested
SU7	Axle Load	ASD	Operating	25.84	0.667		Flexure - One-lane	As Requested	As Requested
Type 3	Axle Load	ASD	Inventory	13.38	0.535		Flexure - One-lane	As Requested	As Requested
Type 3	Axle Load	ASD	Operating	17.82	0.713		Flexure - One-lane	As Requested	As Requested
Type 3-3	Axle Load	ASD	Inventory	22.57	0.564		Flexure - One-lane	As Requested	As Requested
Type 3-3	Axle Load	ASD	Operating	30.06	0.752		Flexure - One-lane	As Requested	As Requested
Type 3S2	Axle Load	ASD	Inventory	20.88	0.580		Flexure - One-lane	As Requested	As Requested
Type 3S2	Axle Load	ASD	Operating	27.82	0.773		Flexure - One-lane	As Requested	As Requested

Rating Results Summary Report

Name:
Struct-Def: 48' Steel Girder Span

Bridge ID: 02734
Member: G1

NBI: L14008003+03001
Member Alt: Exterior

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	Inventory	24.88	0.691	28.80	1 - (60.0)	STRENGTH-I Steel Flexure Stress	As R	As
HL-93 (US)	Truck + Lane	LRFR	Operatin	32.31	0.897	28.80	1 - (60.0)	STRENGTH-I Steel Flexure Stress	As R	As
HL-93 (US)	Tandem + Lan	LRFR	Inventory	27.90	0.775	28.80	1 - (60.0)	STRENGTH-I Steel Flexure Stress	As R	As
HL-93 (US)	Tandem + Lan	LRFR	Operatin	36.20	1.005	28.80	1 - (60.0)	STRENGTH-I Steel Flexure Stress	As R	As
Type 3	Axle Load	LRFR	Legal	35.26	1.410	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
Type 3-3	Axle Load	LRFR	Legal	67.63	1.691	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
Type 3S2	Axle Load	LRFR	Legal	55.77	1.549	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
Lane-Type Legal Load	Truck + Lane	LRFR	Legal	3960.00	99.000	0.00	1 - (0.0)	STRENGTH-I Steel Shear	As R	As
SU4	Axle Load	LRFR	Legal	33.04	1.224	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
SU5	Axle Load	LRFR	Legal	35.20	1.135	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
SU6	Axle Load	LRFR	Legal	35.45	1.020	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
SU7	Axle Load	LRFR	Legal	36.68	0.947	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
EV2 (Single Lane)	Axle Load	LRFR	Legal	35.05	1.219	28.80	1 - (60.0)	SERVICE-II Steel Flexure Stress	As R	As
EV3 (Single Lane)	Axle Load	LRFR	Legal	34.24	0.796	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
EV2 Multi-Lane	Axle Load	LRFR	Permit	43.27	1.505	28.80	1 - (60.0)	STRENGTH-II Steel Flexure Stress	As R	As
EV3 Multi-Lane	Axle Load	LRFR	Permit	45.23	1.052	28.80	1 - (60.0)	STRENGTH-II Steel Flexure Stress	As R	As

Legacy AASHTO LRFR Engine Version 6.8.3.3001
Analysis Preference Setting: None
Analysis Time: 10/16/2019 10:34:23
Print Time: 10/16/2019 10:35:42

Analyzed By: ops$u5801

Rating Results Summary Report

Name:
Struct-Def: 48' Steel Girder Span

Bridge ID: 02734
Member: G2

NBI: L14008003+03001
Member Alt: Interior

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	Inventory	22.73	0.631	28.80	1 - (60.0)	STRENGTH-I Steel Flexure Stress	As R	As
HL-93 (US)	Truck + Lane	LRFR	Operatin	29.51	0.820	28.80	1 - (60.0)	STRENGTH-I Steel Flexure Stress	As R	As
HL-93 (US)	Tandem + Lan	LRFR	Inventory	25.50	0.708	28.80	1 - (60.0)	STRENGTH-I Steel Flexure Stress	As R	As
HL-93 (US)	Tandem + Lan	LRFR	Operatin	33.07	0.919	28.80	1 - (60.0)	STRENGTH-I Steel Flexure Stress	As R	As
Type 3	Axle Load	LRFR	Legal	32.18	1.287	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
Type 3-3	Axle Load	LRFR	Legal	61.73	1.543	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
Type 3S2	Axle Load	LRFR	Legal	50.91	1.414	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
Lane-Type Legal Load	Truck + Lane	LRFR	Legal	3960.00	99.000	0.00	1 - (0.0)	STRENGTH-I Steel Shear	As R	As
SU4	Axle Load	LRFR	Legal	30.16	1.117	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
SU5	Axle Load	LRFR	Legal	32.12	1.036	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
SU6	Axle Load	LRFR	Legal	32.36	0.931	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
SU7	Axle Load	LRFR	Legal	33.48	0.864	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
EV2 (Single Lane)	Axle Load	LRFR	Legal	32.00	1.113	28.80	1 - (60.0)	SERVICE-II Steel Flexure Stress	As R	As
EV3 (Single Lane)	Axle Load	LRFR	Legal	31.25	0.727	24.00	1 - (50.0)	SERVICE-II Steel Flexure Stress	As R	As
EV2 Multi-Lane	Axle Load	LRFR	Permit	39.49	1.374	28.80	1 - (60.0)	STRENGTH-II Steel Flexure Stress	As R	As
EV3 Multi-Lane	Axle Load	LRFR	Permit	41.32	0.961	28.80	1 - (60.0)	STRENGTH-II Steel Flexure Stress	As R	As

Legacy AASHTO LRFR Engine Version 6.8.3.3001
Analysis Preference Setting: None
Analysis Time: 10/16/2019 10:34:23
Print Time: 10/16/2019 10:36:06

Analyzed By: ops$u5801

Include additional sheets (as needed) for:

- Calculations
    - *Include any calculations not included in the rating program's analysis (i.e. LLDFs, dead loads, section loss, etc.). Include appropriate references to equations and relevant code articles, and format with a level of detail that's easy to follow for checking purposes.*

- Additional Assumptions/Comments
    - Details about unique rating processes/checks
        - *i.e. additional superstructure definition used for alternate rating, check for failed girder condition, etc.*
    - BrR issues that affect model
        - *Include JIRA ticket (if applicable), brief statement of issue and how model/rating is affected, workaround procedure performed*
    - Document all rationale and justification
        - *i.e. reduction of timber member capacity, removal of optional limit state checks, EV live load factor override, etc.*

Vehicle Templates – please include following:

***Only the analysis template that's applicable to rating methodology used needs to be attached. For mixed material/mixed code bridges, please include both.*

- Vehicle Summary (Analysis Template)
- Vehicle Properties (Advanced Settings)
    - *Hint – cannot adjust size of this window; may have to adjust column widths to fit in one screenshot*
    - *Note – this will need to be updated for LRFR if EV live load factor is changed*
- Any non-standard library vehicle definitions
    - For ASR/LFR
        - Use standard definitions for all vehicles
        - No additional screenshots necessary, please note that standard vehicle definitions were used for all vehicles
    - For LRFR
        - Use modified contact area for EVs
        - Include screenshots of agency defined vehicles (i.e. EVs, Adjacent Type 3-3)

Note – please ensure that the attached template is the actual template used in the rating

Example Vehicle Template for LFR/ASR Analysis

Analysis Settings:

Vehicle Summary:

- Rating Vehicles
  - LRFR
  - LFD/ASD
    - Inventory
      - EV2
      - EV3
      - HS 20-44
      - SU4
      - SU5
      - SU6
      - SU7
      - Type 3
      - Type 3-3
      - Type 3S2
    - Operating
      - EV2
      - EV3
      - HS 20-44
      - SU4
      - SU5
      - SU6
      - SU7
      - Type 3
      - Type 3-3
      - Type 3S2
    - Legal Operating
    - Permit Inventory
    - Permit Operating

Advanced Settings:

Vehicle Properties

Vehicle	Tandem Train	Scale Factor	Impact	Single Lane Loade	Lega Pair	Override	Legal Live Load	Frequency	Loading Condition	Override	Permit Live Load
EV2	☐	1		☐	☐	☐		Single Trip	Mixed with traffic	☐	
EV3	☐	1		☐	☐	☐		Single Trip	Mixed with traffic	☐	
HS 20-44	☐	1		☐	☐	☐		Single Trip	Mixed with traffic	☐	
SU4	☐	1		☐	☐	☐		Single Trip	Mixed with traffic	☐	
SU5	☐	1		☐	☐	☐		Single Trip	Mixed with traffic	☐	
SU6	☐	1		☐	☐	☐		Single Trip	Mixed with traffic	☐	
SU7	☐	1		☐	☐	☐		Single Trip	Mixed with traffic	☐	
Type 3	☐	1		☐	☐	☐		Single Trip	Mixed with traffic	☐	
Type 3-3	☐	1		☐	☐	☐		Single Trip	Mixed with traffic	☐	
Type 3S2	☐	1		☐	☐	☐		Single Trip	Mixed with traffic	☐	

Permit lane load: kip/ft

Adjacent vehicle live load factor:

☐ Exclude permit lane load from permit vehicle location

Standard library definitions used for all vehicles

Example Vehicle Template for LRFR Analysis

Analysis Settings:

Vehicle Summary:

- Rating Vehicles
  - LRFR
    - Design Load Rating
      - Inventory
        - HL-93 (US)
      - Operating
        - HL-93 (US)
      - Fatigue
        - LRFD Fatigue Truck (US)
    - Legal Load Rating
      - Routine
        - Lane-Type Legal Load
        - Type 3
        - Type 3-3
        - Type 3S2
      - Specialized Hauling
        - SU4
        - SU5
        - SU6
        - SU7
        - EV2m (Single Lane)
        - EV3m (Single Lane)
    - Permit Load Rating
      - EV2m (Multi-Lane)
        - Adjacent Vehicle
          - Adjacent Type 3-3
      - EV3m (Multi-Lane)
        - Adjacent Vehicle
          - Adjacent Type 3-3

Advanced Settings:

Vehicle Properties

Vehicle	Tandem Train	Scale Factor	Impact	Single Lane Loade	Lega Pair	Override	Legal Live Load	Frequency	Loading Condition	Override	Permit Live Load
HL-93 (US)	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☐	
Lane-Type Legal Load	☐	1		☐	☑	☐		Single Trip	Mixed with traffi	☐	
LRFD Fatigue Truck (US)	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☐	
SU4	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☐	
SU5	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☐	
SU6	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☐	
SU7	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☐	
Type 3	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☐	
Type 3-3	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☐	
Type 3S2	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☐	
EV2m (Multi-Lane)	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☑	1.3
EV2m (Single Lane)	☐	1		☑	☐	☑	1.3	Single Trip	Mixed with traffi	☐	
EV3m (Multi-Lane)	☐	1		☐	☐	☐		Single Trip	Mixed with traffi	☑	1.3
EV3m (Single Lane)	☐	1		☑	☐	☑	1.3	Single Trip	Mixed with traffi	☐	

Permit lane load: kip/ft

Adjacent vehicle live load factor: 1.300

☐ Exclude permit lane load from permit vehicle location

EVs and Adjacent Type 3-3 are Agency Defined vehicles – see next page

Standard library definitions used for all other vehicles

Example Vehicle Template for LRFR Analysis – Agency Defined Vehicles









