Montana Department of Transportation

Bridge Load Rating Summary

Insert Consultant Logo Here

Rating prepared by:

General Bridge Information

MDT Bridge ID	**02965**	MDT District	BUTTE	Year Built	1983
NBI Bridge ID	L16009000+02001	County	GALLATIN	Design Load	Unknown
Feature Intersected	BRIDGER CREEK 047	Location	6M NE BOZEMAN	Deck Type	Corrugated Steel
Facility Carried	KELLY CANYON RD	Inspection Date	8/14/2017	Wearing Surface	Bituminous...
Route Number	16009	Accumulated Miles	0.182	Depth of Cover (inches)	6
Structure Length (feet)	32	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	Wood or Timber	Material Type	Not Applicable
Superstructure Type	Stringer|Multi-beam or Girder	Superstructure Type	Not Applicable

EXAMPLE
Timber Girder/Corrugated Steel Deck - Girders (ASR) control 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‡	Limit State	Safe Load Capacity *(Tons)*	Calculated Safe Posting Load* *(Tons)*
HS 20-44 Inventory	36	0.430	Interior Girder (G2)	1 - (60.0)	Flexure - Maximum	15	
HS 20-44 Operating	36	0.703	Interior Girder (G2)	1 - (60.0)	Flexure - Maximum	25	
Type 3 Inventory	25	0.526	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	13	**13**
Type 3 Operating		0.873	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	22	
Type 3S2 Inventory	36	0.529	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	19	**19**
Type 3S2 Operating		0.879	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	32	
Type 3-3 Inventory	40	0.649	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	26	**NA**
Type 3-3 Operating		1.078	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	43	
SU4 Inventory	27	0.431	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	12	**12**
SU4 Operating		0.716	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	19	
SU5 Inventory	31	0.402	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	12	**12**
SU5 Operating		0.667	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	21	
SU6 Inventory	34.75	0.366	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	13	**13**
SU6 Operating		0.607	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	21	
SU7 Inventory	38.75	0.351	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	14	**14**
SU7 Operating		0.583	Interior Girder (G2)	1 - (50.0)	Flexure - Maximum	23	
EV2 Inventory	28.75	0.450	Interior Girder (G2)	1 - (60.0)	Flexure - Maximum	13	**REFER TO LOAD**
EV2 Operating		0.735	Interior Girder (G2)	1 - (60.0)	Flexure - Maximum	21	**POSTING FORM**
EV3 Inventory	43				Flexure - Maximum	12	**REFER TO LOAD**
EV3 Operating					Flexure - Maximum	21	**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, note if controlling corrugated steel deck results are overridden (see example wording)

Don't need to include overall bridge rating results from Explorer. Instead, please include rating result printouts for each member alternative. See deck for further example

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 AASHT

Posting Required for Emergency Vehicles?	**No**

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

Load Rating by:

Comments and Assumptions *Atta*

Include:
Basis for Load Rating (i.e. measurements from xxxx year, as-built plans/shop drawings/construction plans)
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, EV live load factor (if different than de 1.3), removal of optional limit state checks)

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 timber girders and LRFR analysis was used for the corrugated steel deck. Controlling values (based on ASR Operating and LRFR rating factors) are reported. Per MDT guidance, the least conservative deck results were used to determine controlling rating factors.

OR

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

Steel deck analysis was performed using LRFR methodology and references the provisions of the AASHTO MBE (3rd ed.) and AASHTO LRFD Bridge Design Specifications (8th ed.) Per MDT guidance, the least conservative deck results were used in determination of controlling rating factors. The results of deck analysis do not control the rating.

Rating Results Summary Report

Name:
Struct-Def: 31' Timber Span

Bridge ID: 02965
Member: Deck

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

NBI: L16009000+02001

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating	Rating Factor	Location	Limit State	Impact	Lane
HL-93 (US)	Axle Load	LRFR	Inventory	30.93	0.859	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
HL-93 (US)	Axle Load	LRFR	Operating	40.09	1.114	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
HL-93 (US)	Tandem	LRFR	Inventory	39.59	1.100	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
HL-93 (US)	Tandem	LRFR	Operating	51.32	1.425	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
Lane-Type Legal Load	Axle Load	LRFR	Legal	123.36	3.084	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
Type 3	Axle Load	LRFR	Legal	54.42	2.177	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
Type 3-3	Axle Load	LRFR	Legal	92.52	2.313	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
Type 3S2	Axle Load	LRFR	Legal	85.95	2.388	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
SU4	Axle Load	LRFR	Legal	58.78	2.177	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
SU5	Axle Load	LRFR	Legal	67.49	2.177	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
SU6	Axle Load	LRFR	Legal	75.65	2.177	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
SU7	Axle Load	LRFR	Legal	84.36	2.177	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
EV2m (Single Lane)	Axle Load	LRFR	Legal	31.76	1.105	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
EV3m (Single Lane)	Axle Load	LRFR	Legal	51.33	1.194	17.836	STRENGTH-I Cont Steel Flexu	As Requested	As Requested
EV2m (Multi-Lane	Axle Load	LRFR	Permit	31.76	1.105	17.836	STRENGTH-II Cont Steel Flexu	As Requested	As Requested
EV3m (Multi-Lane	Axle Load	LRFR	Permit	51.33	1.194	17.836	STRENGTH-II Cont Steel Flexu	As Requested	As Requested
HL-93 (US)	Axle Load	LRFR	Inventory	44.62	1.240	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
HL-93 (US)	Axle Load	LRFR	Operating	57.85	1.607	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
HL-93 (US)	Tandem	LRFR	Inventory	28.10	0.781	1.617	STRENGTH-I Simple Steel Fle	As Requested	As Requested
HL-93 (US)	Tandem	LRFR	Operating	36.43	1.012	1.617	STRENGTH-I Simple Steel Fle	As Requested	As Requested
Lane-Type Legal Load	Axle Load	LRFR	Legal	133.49	4.450	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
Type 3	Axle Load	LRFR	Legal	78.52	3.141	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
Type 3-3	Axle Load	LRFR	Legal	133.49	3.337	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
Type 3S2	Axle Load	LRFR	Legal	124.02	3.445	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
SU4	Axle Load	LRFR	Legal	84.81	3.141	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
SU5	Axle Load	LRFR	Legal	97.37	3.141	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
SU6	Axle Load	LRFR	Legal	109.15	3.141	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
SU7	Axle Load	LRFR	Legal	121.71	3.141	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
EV2m (Single Lane)	Axle Load	LRFR	Legal	45.83	1.594	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
EV3m (Single Lane)	Axle Load	LRFR	Legal	74.07	1.722	3.934	STRENGTH-I Simple Steel Fle	As Requested	As Requested
EV2m (Multi-Lane	Axle Load	LRFR	Permit	45.83	1.594	3.934	STRENGTH-II Simple Steel Fle	As Requested	As Requested
EV3m (Multi-Lane	Axle Load	LRFR	Permit	74.07	1.722	3.934	STRENGTH-II Simple Steel Fle	As Requested	As Requested

BrR reports these lower/controlling values

MDT guidance is to use the least conservative deck results

Please cross out lower rating values and include a note - example wording:
BrR analyzes the deck as both a simple and continuous span. MDT considers both methods to be conservative, so lower ratings are ignored.

Legacy AASHTO Deck LRFR Engine Version 6.8.3.3001
Analysis Preference Setting: None
Analysis Time: 10/17/2019 16:18:02
Print Time: 10/17/2019 16:18:38

Analyzed By: ops$u5801

Rating Results Summary Report

Name:
Struct-Def: 31' Timber Span

Bridge ID: 02965
Member: G1

NBI: L16009000+02001
Member Alt: Typ Ext

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
EV2	Axle Load	ASD	Inventory	27.76	0.966	18.60	1 - (60.0)	Flexure - Maximum	As R	As
EV2	Axle Load	ASD	Operatin	43.26	1.505	18.60	1 - (60.0)	Flexure - Maximum	As R	As
EV3	Axle Load	ASD	Inventory	26.96	0.627	15.50	1 - (50.0)	Flexure - Maximum	As R	As
EV3	Axle Load	ASD	Operatin	42.46	0.987	15.50	1 - (50.0)	Flexure - Maximum	As R	As
HS 20-44	Axle Load	ASD	Inventory	33.22	0.923	18.60	1 - (60.0)	Flexure - Maximum	As R	As
HS 20-44	Axle Load	ASD	Operatin	51.77	1.438	18.60	1 - (60.0)	Flexure - Maximum	As R	As
HS 20-44	Lane	ASD	Inventory	44.28	1.230	15.50	1 - (50.0)	Flexure - Maximum	As R	As
HS 20-44	Lane	ASD	Operatin	69.74	1.937	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU4	Axle Load	ASD	Inventory	25.26	0.936	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU4	Axle Load	ASD	Operatin	39.78	1.473	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU5	Axle Load	ASD	Inventory	27.01	0.871	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU5	Axle Load	ASD	Operatin	42.53	1.372	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU6	Axle Load	ASD	Inventory	27.57	0.793	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU6	Axle Load	ASD	Operatin	43.42	1.249	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU7	Axle Load	ASD	Inventory	29.51	0.761	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU7	Axle Load	ASD	Operatin	46.47	1.199	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3	Axle Load	ASD	Inventory	28.50	1.140	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3	Axle Load	ASD	Operatin	44.88	1.795	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3-3	Axle Load	ASD	Inventory	56.33	1.408	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3-3	Axle Load	ASD	Operatin	88.71	2.218	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3S2	Axle Load	ASD	Inventory	41.34	1.148	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3S2	Axle Load	ASD	Operatin	65.11	1.809	15.50	1 - (50.0)	Flexure - Maximum	As R	As

Rating Results Summary Report

Name:
Struct-Def: 31' Timber Span

Bridge ID: 02965
Member: G2

NBI: L16009000+02001
Member Alt: Typ Int

Live Load	Live Load Type	Rating Method	Rating Level	Load Rating (Ton)	Rating Factor	Location (ft)	Location Span-(%)	Limit State	Impact	Lane
EV2	Axle Load	ASD	Inventory	12.93	0.450	18.60	1 - (60.0)	Flexure - Maximum	As R	As
EV2	Axle Load	ASD	Operatin	21.15	0.735	18.60	1 - (60.0)	Flexure - Maximum	As R	As
EV3	Axle Load	ASD	Inventory	12.43	0.289	15.50	1 - (50.0)	Flexure - Maximum	As R	As
EV3	Axle Load	ASD	Operatin	20.65	0.480	15.50	1 - (50.0)	Flexure - Maximum	As R	As
HS 20-44	Axle Load	ASD	Inventory	15.47	0.430	18.60	1 - (60.0)	Flexure - Maximum	As R	As
HS 20-44	Axle Load	ASD	Operatin	25.30	0.703	18.60	1 - (60.0)	Flexure - Maximum	As R	As
HS 20-44	Lane	ASD	Inventory	20.41	0.567	15.50	1 - (50.0)	Flexure - Maximum	As R	As
HS 20-44	Lane	ASD	Operatin	33.91	0.942	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU4	Axle Load	ASD	Inventory	11.65	0.431	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU4	Axle Load	ASD	Operatin	19.34	0.716	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU5	Axle Load	ASD	Inventory	12.45	0.402	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU5	Axle Load	ASD	Operatin	20.68	0.667	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU6	Axle Load	ASD	Inventory	12.71	0.366	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU6	Axle Load	ASD	Operatin	21.11	0.607	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU7	Axle Load	ASD	Inventory	13.60	0.351	15.50	1 - (50.0)	Flexure - Maximum	As R	As
SU7	Axle Load	ASD	Operatin	22.60	0.583	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3	Axle Load	ASD	Inventory	13.14	0.526	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3	Axle Load	ASD	Operatin	21.82	0.873	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3-3	Axle Load	ASD	Inventory	25.97	0.649	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3-3	Axle Load	ASD	Operatin	43.13	1.078	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3S2	Axle Load	ASD	Inventory	19.06	0.529	15.50	1 - (50.0)	Flexure - Maximum	As R	As
Type 3S2	Axle Load	ASD	Operatin	31.66	0.879	15.50	1 - (50.0)	Flexure - Maximum	As R	As

Include additional sheets (as needed) for:

- Comments/Assumptions
- Calculations

See *Load Rating Report Requirements* and *Additional Report Guidance* on MDT's Load Rating Website for additional details

MDT Vehicle Template for LFR/ASR Analysis

Analysis Settings:

Used for analysis of timber girders

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

MDT 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

Used for analysis of corrugated steel deck

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

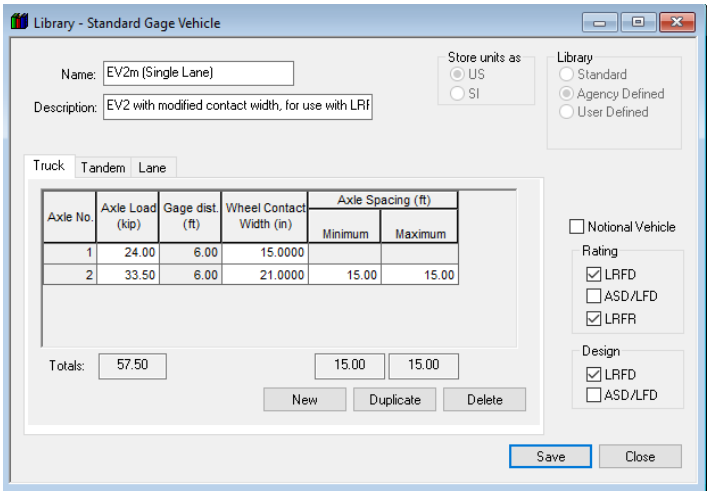
Adjacent vehicle live load factor: 1.300

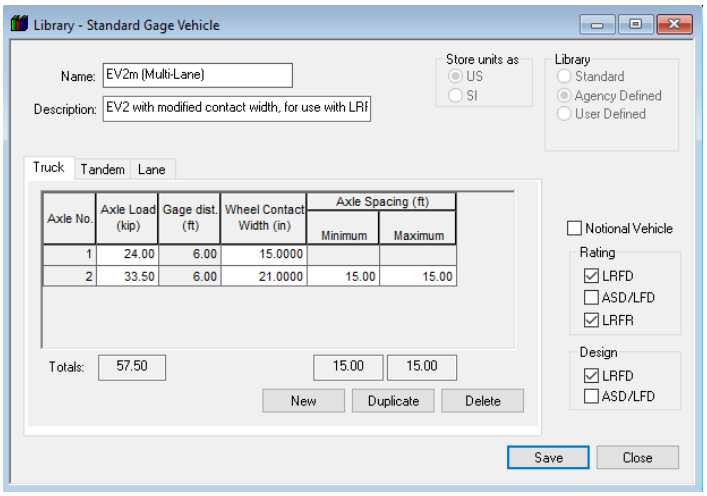
☐ Exclude permit lane load from permit vehicle location

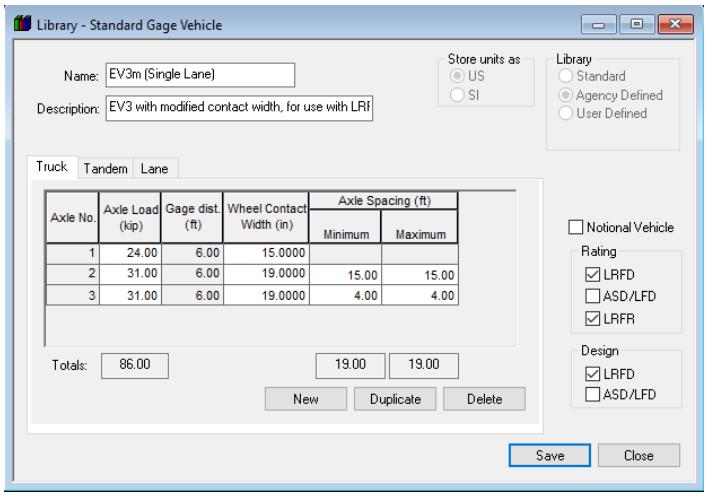
EVs and Adjacent Type 3-3 are Agency Defined vehicles – see next page

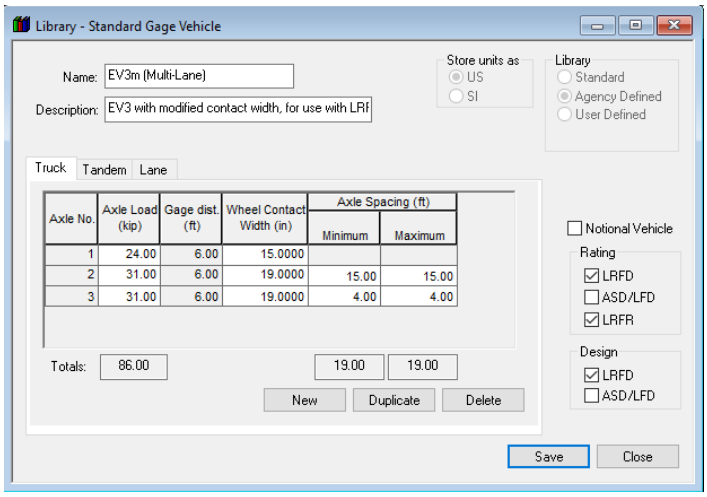
Standard library definitions used for all other vehicles

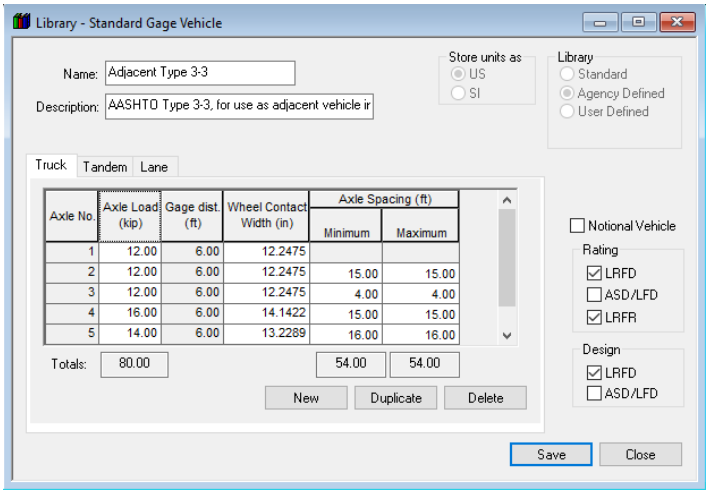
MDT Vehicle Template for LRFR Analysis – Agency Defined Vehicles











Include additional sheets (as needed) for:

- PDF copy of measurements or plan sheet used in analysis

See *Load Rating Report Requirements* on MDT's Load Rating Website for additional details