CHAPTER ELEVEN
LOAD RATING

11.1 GENERAL INFORMATION

The New Mexico Department of Transportation (NMDOT) uses the current edition of *The Manual for Bridge Evaluation* (Washington DC: American Association of State Highway and Transportation Officials, AASHTO) as the engineering standards for bridge load rating. Until *The Manual for Bridge Evaluation* becomes widely available, use the *Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges* (AASHTO, 2003 with 2005 interim revisions). Exercise appropriate engineering judgments to convert this manual's LRFR bias for use with LFR. Virtis (available through AASHTOWare) is NMDOT's chosen tool for permanently recording bridge structural parameters in electronic form.

All new bridges and all major bridge rehabilitation projects require a complete bridge load rating—including, when possible, a Virtis model. Additionally, when any bridge becomes "Structurally Deficient," a qualified bridge engineer must re-evaluate the bridge capacity. This re-evaluation requires a special-emphasis site inspection to support the updated bridge load rating. Typically, a bridge becomes "Structurally Deficient" when the deck, superstructure, or substructure (Items 58, 59, or 60 in the National Bridge Inventory Condition Rating) drop to Condition Rating 4 (Poor Condition) or less.

Formal bridge load ratings and rating documentation are relatively new developments in New Mexico and several other states. Engineers and technicians involved in NMDOT bridge load rating should expect a high potential for policy or procedure changes. Consider the information in this chapter subject to change.

11.1.1 Purpose

Bridge load-ratings provide several useful results:

- Confirm a bridge has adequate design for normal operations capacity
- Identify those bridges that do not have adequate capacity for normal operations and consider such bridges for posting
- Provide bridge capacity information and models for routing overload permit vehicles
- Identify unused capacity in existing bridges
- Support examination of Structurally Deficient bridges
- Provide a review on new bridge design

11.1.2 Records Required for Rating

The engineer in charge of a specific bridge load rating is responsible for insuring that available documents are adequate to rate the bridge in the current condition and design. The minimum records required are:

- Bridge drawings of superstructure elements
    - Original and significant rehabilitations
- Bridge Inspection Reports

Some circumstances require a special-emphasis site inspection to complete the load rating. The most notable circumstances are bridges classified by routine bridge inspections to be "Structurally Deficient."

11.1.3 Deliverables

A typical bridge load rating provides two deliverables: 1) A Virtis bridge model for NMDOT's bridge model database and 2) a completed "NMDOT Bridge Load Rating Form." Load ratings for a "Structurally Deficient" bridge also require explanation of how the structural deficiency affects the bridge load capacity.

11.3 RATING METHODS

The Manual for Bridge Evaluation includes three rating methods: Load and Resistance Factored Rating (LRFR, based on Load and Resistance Factored Design, LRFD), Load Factored Rating (LFR, based on Load Factored Design), and Allowable Stress Rating (ASR, based on Allowable Stress Design). NMDOT uses BRASS as the primary underlying engine for Virtis bridge model analysis.

Use ASR for timber bridges and decks. Use LFR for all prestress concrete, reinforced concrete (including slab bridges), and steel bridges.

NMDOT plans to move to LRFR ratings. However, NMDOT has found problems with Virtis, BRASS, or with LRFR itself. Therefore, NMDOT is not yet routinely using LRFR ratings.

While NMDOT is not yet rating LRFR, the Virtis models created today for LFR load ratings will later be the same models used for LRFR. Therefore, data needed by LRFR but not by LFR must be included in all Virtis bridge models.

11.4 RATING NOTES AND VALUES

Virtis inputs require some values that are not readily apparent from drawings. Instead, these values typically rely on "policy values" established through standard assumptions in the absence of actual data. NMDOT also notes some issues that may be misleading, or otherwise unclear, during drawing interpretation for Virtis model. This section covers policies and notes applicable to completing New Mexico bridge models.

In bridges that consist of beams supporting a deck, the concrete deck slabs and metal decks that satisfactorily carry normal traffic need not be routinely evaluated for load capacity. Routine inspections will identify those metal and concrete bridge decks with unsatisfactory performance—which will likely result in a "Structurally Deficient" bridge classification and require a special-emphasis inspection. In contrast, timber decks should be routinely evaluated for load capacity.

Members of substructures need not be routinely checked for load capacity. Substructure elements such as pier caps and columns should be checked in situations where the engineer has reason to believe that their capacity may govern the load capacity of the entire bridge. Examples of distress that could trigger a substructure load-rating include: a high degree of corrosion and section loss, caps cracked and distorted under torsion with inadequate sheer stirrups, changes in column end conditions due to deterioration, changes in column unbraced length due to scour, or columns with impact damage. Such cases will generally render a bridge "Structurally Deficient" and require a special-emphasis inspection.

When a bridge exhibits load capacity rating less than LFR HS20/HS33 Inventory/Operating (see Section 11.5 for HS20 definition) or LRFR $R_f < 1.0$, the bridge should be re-examined for rating improvement opportunities. These opportunities routinely include:

- Review the assumptions and model simplifications that affect bridge rating.
- Bridge drawings may include allowance for future wearing surface, but the bridge might have no wearing surface. If the bridge has no wearing surface or a lighter wearing surface, a rater may reflect this in the bridge model. In no case should the bridge

model contain a wearing surface that is less than the actual existing wearing surface.

- Prestress concrete bridge designs before or shortly after 1979 used a different shear code standard. Virtis currently has no way to alter its shear analysis to recognize the pre-1979 code. If the controlling failure mode in a prestress concrete girder is shear, use the shear policy outlined under Section 11.4.5 “Prestress Concrete” to modify the rating.

Non-routine methods to improve load-rating results include:

- Virtis has deck finite element modeling capability. In a few rare cases, it is possible that using a finite element determined distribution factor will be more accurate and allow rating improvements.
- Use refined Methods of Analysis described in *AASHTO LRFD Bridge Design Specifications* Article 4.4.
- In extraordinary cases, consider “Nondestructive Load Testing” as described in Section 8 of *The Manual for Bridge Evaluation* or of the *Manual for Condition Evaluation*

Insure that deviations used to achieve sufficient load capacity are documented in “Notes, additional loads, comments or deviation from general rating practice” in the Bridge Load Rating Form. See Section 11.6.

11.4.1 Materials\Concrete

This section covers specific entries in the Virtis file tree, Materials\Concrete. The reader can launch Virtis and open the specific file folders “Material” and “Concrete.” Many other sections that follow also cover specific entries as identified in **bold**.

Density. Typically, use 0.150 kcf density for dead loads and 0.145 kcf for modulus of elasticity.

Copy from Library. Many older NM bridge drawings will call for “Class A Concrete.” This is not the same concrete as found in the Virtis Standard Library called “Class A” or “Class A (US).” NMDOT Class A Concrete is 3,000 psi while that listed in the Virtis Standard library is 4,000 psi concrete. The Virtis Standard library has no concrete matching NMDOT Class A. Virtis Standard Library Class A matches NMDOT Class AA. NMDOT Agency library files are available from the Bridge Bureau, and they include all NMDOT concrete classes.

11.4.2 Impact/Dynamic Load Allowance and Factors.

For general ratings without deviations from standard practice, make no changes to “Impact/Dynamic Load Allowance” or “Factors” in Virtis.

11.4.3 Superstructure Definitions

New Superstructure Definition. Generally, when selecting “New Superstructure Definition” in Virtis, select “Girder System Superstructure.” However, circumstances may prevent using a “Girder System.” For example, the most common circumstance requiring selecting a “Girder Line Superstructure” over a “Girder System” is modeling a slab bridge. Virtis has no method to model a complete slab bridge. Instead, it is modeled as a 12-inch strip analysis in a Girder Line. See Section 11.4.6.

Structure Typical Section\Parapet or Railing. Notice that typical bridge barrier rails in New Mexico are placed 18-inches from the bridge edge, but are not a full 18-inches wide. Therefore, modeling a bridge barrier rail as 0 from the bridge edge to the back of the rail is technically not accurate. A better approach is to model the barrier rail (parapet) as: “Measure To” *Front*; “Distance” *1.50 feet*.

Structure Typical Section\Wearing Surface. NMDOT current policy is to design for a 30 psf future wearing surface. Previous design policy included a 15 psf wearing surface. If a bridge does not currently have a wearing surface, *The Manual for Bridge Evaluation* and the *Manual for Condition Evaluation* allow rating without the design future wearing surface included. One should always rate the bridge with the actual wearing surface if it is equal to, or greater than, the designed wearing surface. However, if a bridge has a wearing surface less than design wearing surface, first rate the bridge with the assumed design surface (typically 30 psf or 15 psf). If the bridge rates at least an HS20 Inventory and HS33 Operating, retain the model with the future wearing surface included. If the bridge rates less than HS20/33, then remove or reduce the wearing surface in the model to match actual bridge condition. Model and rate the bridge with this reduced wearing surface.

11.4.4 Member Alternatives

New Member Alternative Description\Girder property input method. When provided a choice between "Schedule based" and "Cross-section based" in "Member Alternative Description," always select "Schedule based." "Cross-section based" does not provide the same valuable schematics.

New Member Alternative Description\Crack Control Parameter (Z) and Exposure factor. Use Z = 170 kip/in for the concrete crack control parameter. Use Exposure factor = 1.0.

New Member Alternative Description\Default rating method. Each "Member Alternative" in Virtis has an input for "Default rating method." Timber can only be rated using ASD. Virtis defaults to ASD on timber girders and decks. For all other "Member Alternatives" set the "Default rating method" to LRFR so that each model is set to rating bridges with LRFR when "Rating Method" selected is "Member Alternative." This sets the Virtis bridge database for compliance with future LRFR ratings.

Deck Profile\Structural Thickness. Past NMDOT policy provided a ¼" sacrificial thickness in concrete decks. This is no longer NMDOT policy. A rating for older bridges with drawings that specify this sacrificial surface may, instead, include the full deck thickness without section reduction for sacrificial surface. Typically enter the full deck thickness for "Structural Thickness."

11.4.5 Prestress Concrete

Note that prestress concrete bridges that are simple spans for both dead and live load but have *jointless decks* are not uncommon—both in bridge conversions to jointless decks and in new bridges. (See Section 5.6.2 "Eliminating Deck Joints" in this NMDOT *Bridge Procedures and Design Guide*). Caution: it is easy to misinterpret such bridges as being continuous for live loads. If it is possible that a continuous deck bridge is *not* continuous for live load, check details for breaks in continuity over the piers. One should model such jointless-deck simple-span bridge girders as simple span, not continuous.

Many prestress concrete bridges designed before or shortly after 1979 have served normal operations and overload permit loads well. These same bridges may theoretically fail in shear when analyzed with current shear design models. Virtis does not have an option to use the pre-1979 code, therefore use the procedure shown in Figure 11.4A.

Beam Shapes\Prestress Beam Shapes\I Beams. Prestress I-beam strand patterns in Virtis default to vertical distances from bottom on 2-inch spacing. NMDOT typically

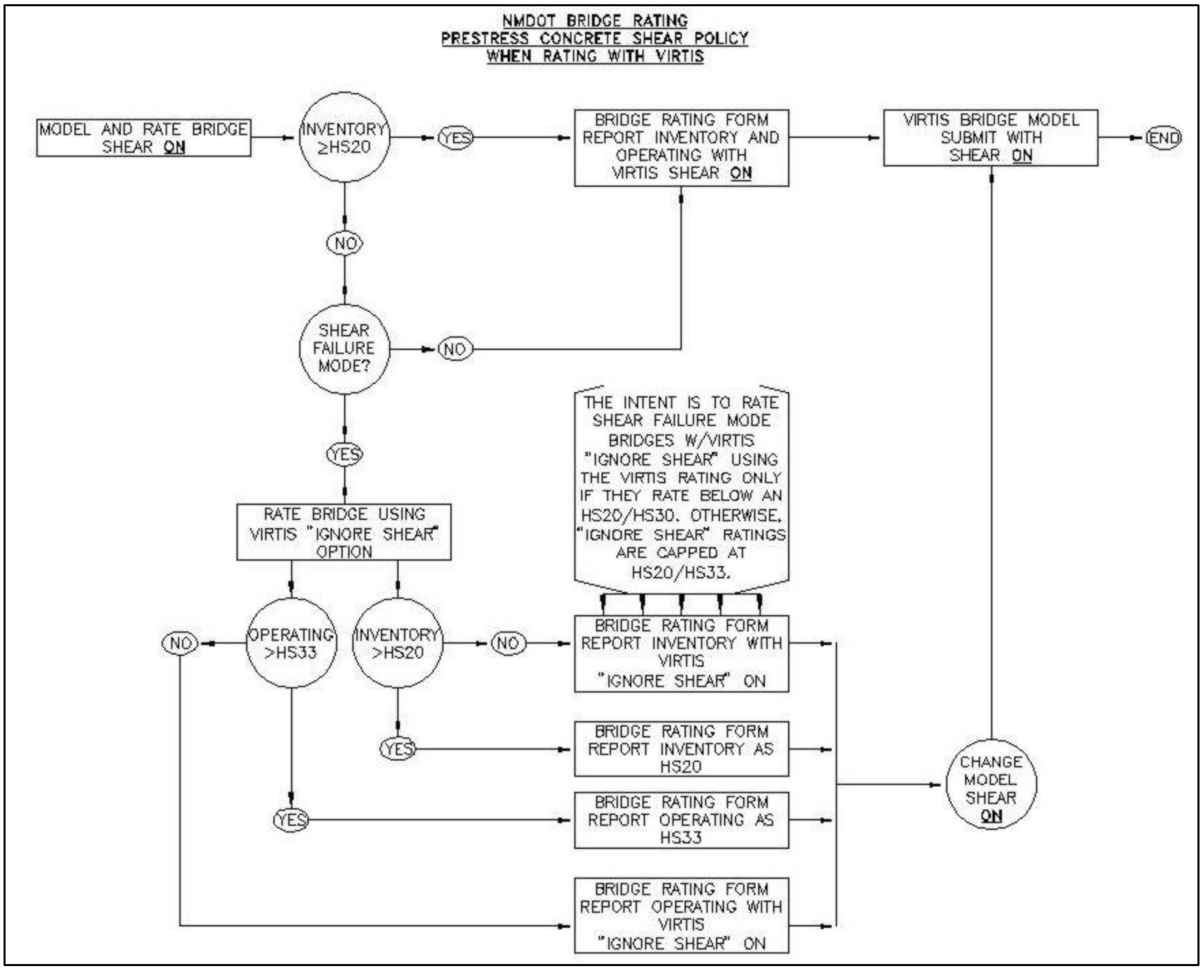


Figure 11.4A
NMDOT Bridge Load Rating Shear Policy for Prestress Concrete

specifies strand patterns placed as 2-inch spacing from the bottom, but also as 2-inch spacing from the top for draped stands. The result is that strand patterns in New Mexico may not match the Virtis defaults for AASHTO beams with an odd number of inches for overall height. These are the Type 45 (AASHTO III), Type 63 (AASHTO V), and Type BT-63. Modify strand patterns as needed in these beams to match NMDOT prestress beam strand patterns accurately.

Prestress Properties. LRFR ratings require inputs that are not required by LFR. Since NMDOT will convert to LRFR rating, these inputs must be included in all Virtis models. Under "Superstructure Definitions" and "Prestress Properties," they are:

- Transfer time, use 15.0 hours
- Age at deck placement, use 270 days
- Final age, use 3650 days

Deck Profile\Reinforcement. Prestress concrete bridge superstructures have steel reinforcing bars in the deck. However, the composite decks in ***simple spans*** are always modeled in compression for longitudinal capacity. Therefore, the deck rebar for simple spans (simple for dead *and* for live loads) is immaterial for load rating capacity and can be ignored. In contrast, the deck rebar is critical in prestress continuous bridges (simple for dead but continuous for live load).

11.4.6 Concrete Slab

Superstructure Definitions. Unlike most bridges, a concrete slab bridge cannot be Virtis-modeled as a "Girder System." Instead, one must rate a concrete slab bridge using a "Girder Line." Virtis "Girder Line" modeling does not allow Virtis to calculate several bridge aspects. Instead, the user must calculate these by hand. Calculated values available in a "Girder System" but not available for a "Girder Line" include:

- Live load distribution factors
- Dead load distribution
  - Wearing surface
  - Bridge barrier rail (parapet, railing)
  - Medians and curbs
  - Utilities

Member\Member Location. Users may rate concrete slab bridges using only "Interior" for "Member Location." This assumes that the original designer correctly designed the exterior (or edge) of the slab bridge. Alternatively, it recognizes that, although not modeled in design, a bridge barrier rail provides edge stiffness. Modeling only an interior equivalent slab assumes that the interior controls the slab bridge rating.

Live Load Distribution. The Live Load Distribution Factors for LFR using a 1-ft equivalent interior strip are:

Moment—

$$DF = \frac{1 \cdot ft}{4 \cdot ft + 0.06 \cdot S} \geq \frac{1}{7}$$

Deflection—

$$DF = \frac{1}{6}$$

For LRFR ratings, use the following distribution factors for moment, shear, and deflection:

One-lane loaded—

$$DF = \frac{12 \cdot in}{10 \cdot in + 5 \cdot \frac{in}{ft} \cdot \sqrt{L \cdot W_1}}$$

Two or more lanes loaded—

$$DF = \frac{12 \cdot in}{84 \cdot in + 1.44 \cdot \frac{in}{ft} \cdot \sqrt{L \cdot W_2}} \geq \frac{1 \cdot ft \cdot N_L}{W}$$

DF	=	Live Load Distribution Factor
N_L	=	Number of design lanes Not applicable if w < 20 ft (only one lane loaded) 2 if 20 ft ≤ w < 24 ft Integer part of (w/12ft) otherwise
L	=	Modified span length; the lesser of S or 60 ft
S	=	Longitudinal Span length
W	=	Edge-to-edge bridge width
W_1	=	Modified edge-to-edge width, one-lane loaded; lesser of W or 30 ft.
W_2	=	Modified edge-to-edge width, two or more lanes loaded; lesser of W or 60 ft.
w	=	Clear roadway width between curbs or barriers

Girder Profile\Section. Use a 12-inch Girder Line Equivalent Slab strip to model slab bridges. This is the selected NMDOT policy width calculation for equivalent slab width. Using a different width complicates model comparisons for quality control.

11.4.7 Steel

Deck Profile\Reinforcement. BRASS LFR load rating does not consider minimum negative flexure concrete deck reinforcement. However, BRASS *LRFR* rating does. LRFD 6.10.1.7 covers "Minimum Negative Flexure Concrete Deck Reinforcement." If the deck reinforcing steel is not included in a continuous steel bridge model, Virtis/BRASS LRFR will fail the bridge under Service II over the piers. Therefore, all Virtis continuous steel bridges must include the deck reinforcement in the model for future use in LRFR rating.

Lateral Support. A steel girder with a concrete deck poured in direct contact develops an affinity for concrete. Therefore, a continuous hardened concrete deck provides continuous lateral support to the top flange of a girder. Note that the lateral support applied in the "Lateral Support" window applies only to the top flange. Virtis picks up the discrete locations of lateral support on the bottom flange from the "Framing Plan Detail, Diaphragms."

11.4.8 Timber

Use Allowable Stress Rating (ASR) for timber girders and timber decks. Timber decks often control the rating in more primitively designed bridges found in New Mexico's inventory. Timber decks must be routinely evaluated for a bridge load rating.

Materials\Timber. *Girder unknown species and grade.* In selecting timber materials, Virtis has a "Copy from Library" option. For completely unknown species and grade, but reasonably typical New Mexico timber bridge, choose Douglas Fir-Larch, No. 1 for Beams and Stringers or for Posts and Timbers. If the rater knows that the girders in a particular bridge are free of notable weathering and without checks or splits, the rater may choose Douglas Fir-Larch, Dense No.1.

"Beams and Stringers" are rectangular timber members whose nominal dimensions are greater than 5" in both directions, but one dimension is more than 2" greater than the other is. E.g., 9"x14", 8"x12".

"Posts and Timbers" are rectangular timber members whose nominal dimensions are greater than 5" in both directions and the dimensions are the same or no more than 2" difference. E.g., 12"x12", 8"x10".

Southern Yellow Pine Dense. In some old timber bridge drawings, the species and grade specified for the bridge is Southern Yellow Pine Dense Longleaf and Shortleaf. This is a dated specification. If a timber bridge uses this specification for girders, select "Southern Pine (Dry or Wet), Dense Select Structural, 5"x5" & larger." For the deck, the drawings will call for Southern Yellow Pine Dense. However, unless otherwise known, assume the deck has been replaced. Since the replacement deck species is probably unknown, see below.

Deck unknown species and grade. Decks will typically be lumber. Lumber reads as "2"– 4" thick 2" and wider," or similar description in the Virtis/Opis library. Choose Hem-Fir No.2 unless more is known from records or reports.

Timber Beam Shapes\Rectangular\ Properties. The "Compute" button will fill in all areas except "Nominal load," "Nominal width," and "Nominal depth." Use 50 lb/cf and actual dimensions to calculate "Nominal load." "Nominal width" or "Nominal depth" is the next highest whole number for the actual dimension. 9.25" → 10"

Superstructure Definitions. A rater should be sure to select "Deck type" as "timber" the first time "Girder System Superstructure Definitions" comes up in the bridge model inputs. Failure to note the correct "Deck type" will require restarting the "Superstructure Definition." Virtis does not allow returning and correcting the "Deck type" after initial entry.

Deck. The "Deck LL distribution width" is 15-inches plus the "Total deck thickness."

Deck\Factors. Always exercise the Deck\Factors input page. For all three moisture conditions, leave the default, "Wet," selected. Use the "Compute" button to supply the various modification factors for the deck timber. Unless one is familiar with judging "Shear factor" by visual inspection or if the rater has not had an opportunity to inspect the deck lumber, enter 1.0 for the "Shear factor."

Structure Typical Section\Wearing Surface. Many timber bridges have excessive asphalt wearing surfaces. A timber bridge's load rating is sensitive to this dead load. The rater must examine the bridge documents, or examine the bridge itself, to ascertain an estimate of the existing overlay thickness.

Beam Details\Adjustment Factors. As with the Deck Factors, always exercise the Beam Details\Adjustment Factors input page. Moisture conditions should all remain "Wet." The "Compute" button will supply all factors except the "Shear factor." Enter 1.0 for "Shear factor" unless otherwise familiar with a girder visual inspection and what to look for to allow an improved "Shear factor."

11.4.9 Library Explorer

NMDOT Bridge Bureau maintains an "Agency File" for addition to the Virtis Library. This Agency File contains materials, vehicles, and appurtenances encountered repeatedly in New Mexico. Consultants should insure they have the latest NMDOT Agency Files when appropriate.

11.5 RATING VEHICLES

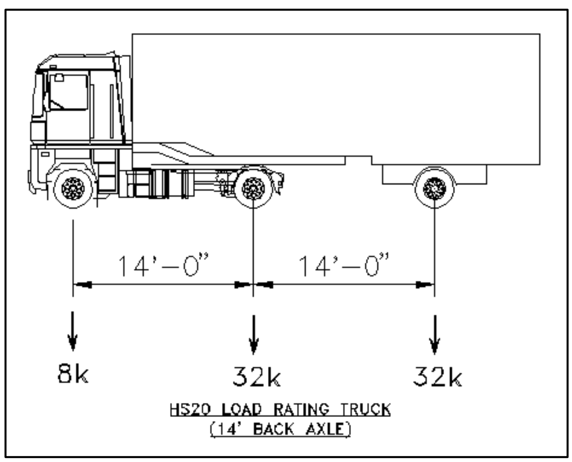
Figure 11.5A through 11.5F illustrate rating vehicles used in New Mexico.

11.5.1 NMDOT Rating Truck

Figure 11.5A shows a modified HS20 Truck. The modification from the standard AASHTO HS20 is that the rear axle is fixed at 14-feet rather than varying from 14 to 30-feet. This modified HS20 Truck is the basis for NMDOT's Permit Load bridge evaluation software, OVLOAD, and its "Method of Equivalent Loading." NMDOT requires this fixed-rear-axle truck be the basis for Inventory and Operationing rating. One should note that the fixed axle yields slightly better ratings in some bridge geometries than would the unmodified HS20. Use this modified HS20 Truck. This truck is available in NMDOT's Virtis Agency File, titled "HS20 Rating Truck." A R_f = 1 using this NMDOT Rating Truck results in a bridge capacity rating of HS20.

NMDOT is aware that the HS20 Rating Truck without the variable axle from 14-ft to 30 ft does not conform to national standards. The use of this HS20 Rating (Fixed 14-ft axles) in New Mexico dates back to 1982 when New Mexico State University first authored OVLOAD. Subsequently this became NMDOT's standard practice. New Mexico does report load ratings to the Federal National Bridge Inventory (NBI) using this fixed-axle truck. However, NMDOT will ignore this minor non-conformity and, instead, concentrate load-rating policy changes on bringing future NMDOT Bridge rating into conformance with LRFR rating approach—both for NBI reporting and for OVLOAD input.

Figure 11.5A
NMDOT HS20 Modified Truck for Rating



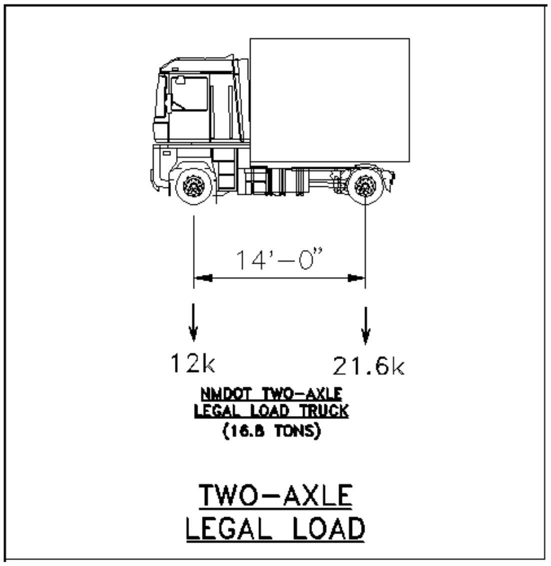


Figure 11.5B
NM Legal 2-Axle

11.5.2 HL-93

AASHTO LRFD Bridge Design Specifications defines the "Design Vehicular Live Load" known as HL-93 in Article 3.6.1.2. HL-93 will become integral to NMDOT's bridge load rating when NMDOT transitions to LRFR.

11.5.3 Legal Loads

New Mexico uses a family of nine trucks as legal load model trucks. Three of these trucks are AASHTO Legal Loads. Six are trucks derived from New Mexico Law to capture a range of likely load-effects from trucks meeting the legislative definition for legal trucks in New Mexico. Figure 11.5B illustrates the two-axle legal load truck. Figure 11.5C illustrates the three trucks with different axle spacing and weights intended to capture three-axle truck effects. Likewise, 11.5D shows a four-axle, and 11.5E shows three five-axle trucks. Figure 11.5F illustrates the AASHTO six-axle vehicle.

11.5.4 Bridge Posting Analysis

NMDOT uses legal load trucks from Section 11.5.3 to establish bridge load posting. Bridges with an Operating Rating less than

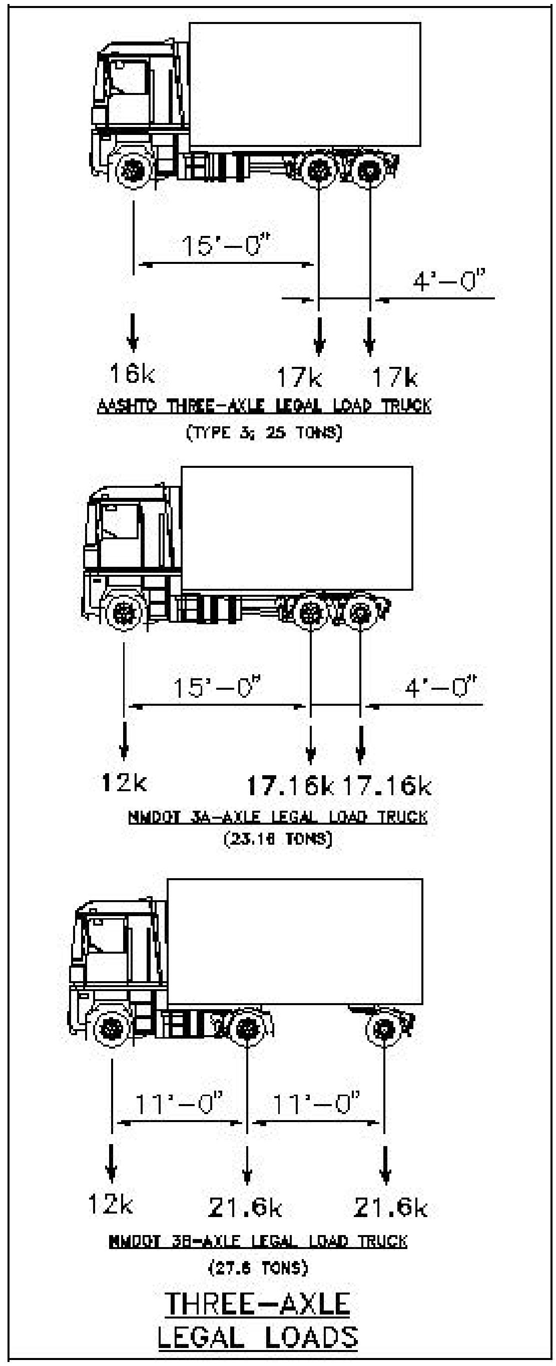


Figure 11.5C
NM Legal 3-Axle

HS17 (Rating Factor < 0.85 for HS 20 Rating Truck) require rating the bridge with this family of nine trucks.

Engineering load rating is only one factor of many in the basis for decisions related to

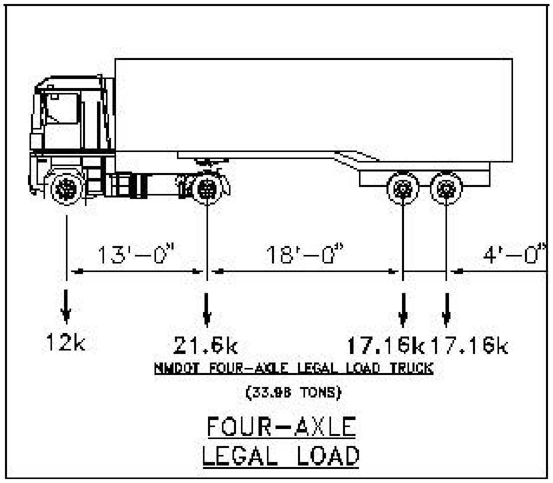


Figure 11.5D
NM Legal 4-Axle

bridge posting. Posting is a policy decision made by the bridge owner. In New Mexico, the bridge owner is one of the NMDOT Districts. Posting is not a purely engineering activity. Other issues involved in a District's decision regarding bridge posting are:

- Bridge structure redundancy
- Bridge condition or visible distress
- Character of traffic
- Likelihood of overweight vehicles
- History of abuse
- Posting enforceability

For the engineering side of posting, as a bridge's capacity becomes further below standard design standards, there is increased uncertainty in the specific effects and in public compliance with load postings.

This increased uncertainty calls for an increased safety factor. Use the following equation from *The Manual for Bridge Evaluation* to produce such increased safety factor:

$$\text{Safe\_Posting\_Load} = \frac{W}{0.7} \cdot (RF - 0.3)$$

RF = Legal load rating factor
W = Weight of rating vehicle

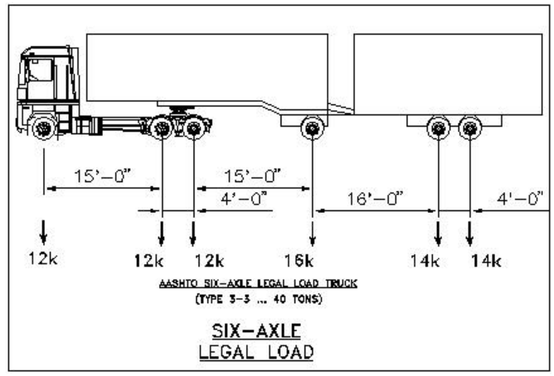
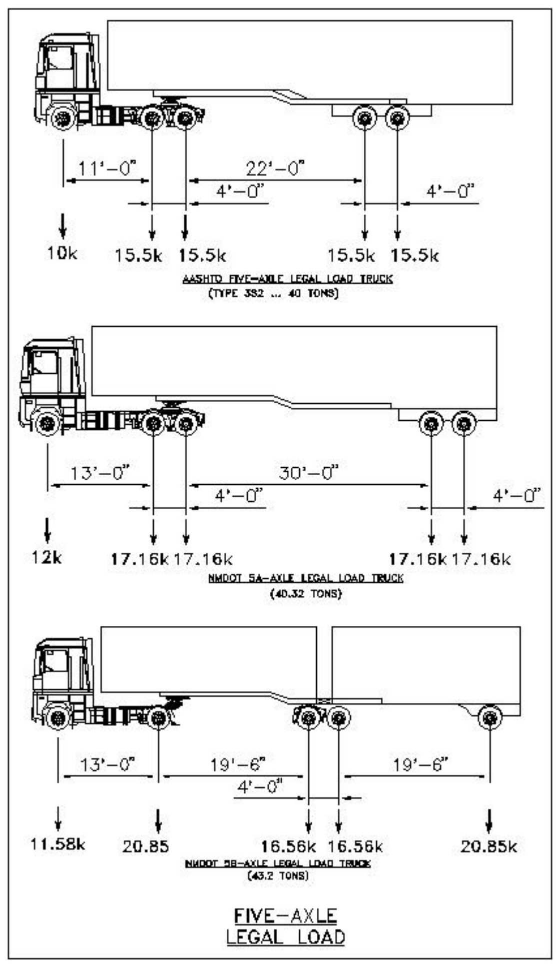


Figure 11.5E
NM Legal 5-Axle

For each axle class, two-axle through five-axle, the resulting lowest "Safe Posting Load" becomes the engineering posting load analysis for that bridge and axle number—with the exception that in no case will fewer axle

Figure 11.5F
NM Legal 6-Axle



posted load be greater. For example, a three-axle posting cannot be greater than a four-axle posting.

11.6 BRIDGE LOAD RATING FORM

A current version of the bridge load rating form is available from the State Bridge Rating Engineer. Figure 11.6 shows an example NMDOT Bridge Rating Form. This is the version current at time of this writing; however, form details may be subject to change. Bridge Inspection Reports contain the information needed for the "Bridge Information" section. These Bridge Inspection Reports also provide the information for "Structure Conditions" under the "Rating Approach Summary."

Notes, additional loads, comments or deviation from general rating practice: This section under "Rating Approach Summary" should never be ignored. Many bridges require some commentary not covered in other "Rating Approach Summary" items. The standard items and this "Notes …" section should provide enough detail so that another engineer, using the same drawings and same tools, would be readily able to replicate the rating.

11.7 QUALITY ASSURANCE

Virtis software demands are high. It always requires accuracy and detail. Sometimes it requires elevated engineering judgment. To improve the assurance NMDOT receives a quality product, NMDOT requires a Quality Control process.

NMDOT's Quality Control process has two engineers create independent Virtis Models. The senior of the two engineers, or a third engineer, uses both models to rate the bridge girders and compares the outcome. Significant differences require reviewing the two models, identifying where they differ, and making changes to models to correct the mismatch. The process continues until both bridges rate within 2% for each girder in both bridge girder systems.

Consultants may adopt NMDOT's Quality Control process or they may propose one of their own. NMDOT's State Bridge Engineer or State Bridge Load Rating Engineer must approve a proposed consultant Quality Control process that differs from the NMDOT Quality Control approach.

NMDOT will also sample consultant's ratings to check results quality. NMDOT will report any errors, even minor ones, back to the consultant. A pattern of errors will lead to a request for discussion regarding rating procedures that might address and correct inaccurate modeling.

NMDOT's quality review will not be comprehensive and will not reliably catch all errors. NMDOT reviews are samplings and spot checks only. Consultant Quality Assurance remains primarily the consultant's responsibility.

Figure 11.6
NMDOT Bridge Rating Form

New Mexico Department of Transportation

BRIDGE RATING FORM

Today's date: *October 8, 2008*	Name of Person Completing Form: *Frank Form*

BRIDGE INFORMATION

Structure Number:	Facility/Route Carried:	Feature Intersected:	Location MP/miles from intersection:	District:	Location Latitude/Longitude:
07734	*NM-88*	*Grabbit Gulch*	*MP 5.1/4 mi W of Jct NM-2*	Four	*36.133d N – 108.34d W*

RATING APPROACH SUMMARY

Rating Method: ☒ LFR ☐ ASR ☐ LRFR
LFR rating using HS-20 req'd on all bridges. LRFR (HL-93) req'd for all *new* bridges.

Live Loads Checked: ☒ HS20 ☐ HL-93 ☐ Legal Loads ☐ Other—Identify:

☐ Original Rating ☒ Re-Rating ... Reason: *Document load rating and generate Virtis model*

Criteria Used in Rating-------------

Current Wear Surface	☒ No	☐ Yes	Magnitude (lb/ft²):
Future Wear Surface	☒ No	☐ Yes	Magnitude (lb/ft²):
SIP Forms	☒ No	☐ Yes	Magnitude (lb/ft²):
Concr Sacrificial Wear	☒ No	☐ Yes	Thk(in):
Utilities	☒ No	☐ Yes	Magnitude/Description:

Structure Conditions	Deck (58)= 5	Super (59) = 6	Sub (60) = 6

Notes, additional loads, comments or deviation from general rating practice: *Original design allowed for 15 psf future wearing surface. However, bridge rates low and has no current wearing surface; therefore, allowance for future wearing surface was ignored in rating.*

CALCULATION TOOLS OR METHODS USED: *Virtis/BRASS*

Quality Control Method, if any—Describe: *Two engineers, (Ed Lead and J Ingles) modeled the bridge independently. Then the senior engineer (Lead) compared and converted the bridge models to rate within 2% of each other.*

RATING

LFR or ASR Rating	Inventory Rating Factor (HS20)		R_f = *0.295*	**LFR INVENTORY RATING**		HS *5.9*	Required
	Operating Rating Factor (HS20)		R_f = *1.576*	**LFR OPERATING RATING**		HS *11.5*	Required
	LEGAL LOADS (OP RATINGS)	Type 3 Type 3-3 Type 3S2	R_f = 0.645 R_f = 0.784 R_f = *0.677*	NM 2-Axle NM 3A-Axle NM 3B-Axle	R_f = 0.853 R_f = 0.667 R_f = *0.701*	NM 4-Axle R_f = 0.875 NM 5A-Axle R_f = 0.639 NM 5B-Axle R_f = *0.668*	Required when LFR Operating Rating < HS17
			LRFR HL-93	Inventory R_f =		Operating R_f =	Optional

	Print Name		Date
Rated By (P.E. in substantial charge)	*Edward Lead*	P.E.	*11/15/08*
Signature	*Edward Lead*		Engineering Seal:
Rating Organization	*NMDOT Bridge Load Rating Unit*		
NMDOT Accepted	*LaVerne Andrews*	P.E.	*11/22/08*
Signature	*LaVerne Andrews*		
	NMDOT Bridge Management Unit		

PLANS AND FILES

Electronic Files Used to Model and Rate Bridge Available at, or delivered to: *Saved to BRIDGEWARE PRODUCTION*
OR Paper Documentation for Bridge Rating Available at, or delivered to:

Plans Available at, or delivered to:

Structure Number: 07734