CONSULTING ENGINEERS
GENERAL MEMORANDUM 12-01

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING AND
CONSTRUCTION
OFFICE OF ENGINEERING

New Bridge Design Standard Practice

March 16, 2012

To: CONSULTING ENGINEERS

The following Bridge Standard Practice regarding the Load Resistance Factor Rating (LRFR) shall supersede the Bridge Standard Practice issued via Consultant Engineers Memorandum 11-03 dated February 10, 2011. While the requirements of Section 3.1.3 remain unchanged from the Consultant Engineers Memorandum11-03, Section 1.4.4 (enclosed) is revised in regard to determination of load factor values and selection of rating equation capacity factors. The revisions will provide bridge designers added clarity on the selection of capacity factors to be used in the LRFR load rating analysis and improve reliability of the results. Load ratings for both new and existing bridges shall be performed in accordance with these requirements.

The latest available version of AASHTOWare Virtis shall be the software of choice for bridge load ratings. MathCad and/or Microsoft spread sheets may be used to create Virtis input data. The use of other live-load rating software for curved girder structures and other structure types not presently supported by Virtis must be approved on a case-by-case basis by the Department. These requirements shall supersede the bridge load rating analysis software requirements outlined in Chapter 7 of the Bridge Inspection Manual,

Very truly yours,

Timothy M Wilson, P.E.
Manager of Highway Design
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Enclosure

1.4.4 Design, Legal and Permit Live Load Ratings

Design, legal and permit vehicle live load ratings shall be prepared for all new structures and existing structures where rehabilitation/repair of the structure will affect the live load rating.

The live load ratings shall be prepared and submitted in accordance with the Chapter 7 of the Department's Bridge Inspection Manual amended as follows:

- Live load ratings shall be computed in accordance with the load and resistance factor rating (LRFR) method described in the AASHTO Manual for Bridge Evaluation (AASHTO MBE).

- Live load ratings shall be computed using the latest version of AASHTOWARE's Virtis software. For structure types not addressed by Virtis, the rating software must be pre-approved by the Department.

- In the event of conflict between live load rating requirements and procedures outlined in the Bridge Inspection Manual with those of the AASHTO MBE, the AASHTO MBE shall govern.

Live load ratings shall be prepared in accordance with the criteria and parameters for the following three general scope of work categories:

- New Structure and Superstructure Replacement

  Live load ratings for new structures and new elements, components and members of existing structures that undergo rehabilitation, such as superstructure replacement, shall be prepared in accordance with the requirements of AASHTO MBE Table 6A.4.2.2-1 for all limit states, including all optional checks.

  For strength I and II limit states, the live load ratings shall be prepared for the live loads, the load factor criteria and analysis parameters shown in Table 1.4.4-1. The average daily truck traffic (ADTT), in one direction, used to determine load factors shall be greater than 5000, unless noted otherwise. The value of the condition factor used in the rating analysis shall be 1.00 due to all new components and members. The value of the system factor used in flexural and axial rating analysis shall be obtained from Table 6A.4.2.4-1 of the AASHTO MBE, unless otherwise directed by the Department. The value of the system factor used in shear rating analysis shall be 1.00. The dynamic load allowance shall conform to the AASHTO MBE, unless noted otherwise. The minimum acceptable rating factors shall be no less than the values shown in Table 1.4.4-1, Column A.

For service limit states, the live load ratings shall be prepared for the live loads, the load factor criteria and analysis parameters shown in Table 1.4.4-2. The live load distribution and dynamic load allowance shall conform to the AASHTO MBE, unless noted otherwise. The minimum acceptable rating factors shall be no less than the values shown in Table 1.4.4-2, Column A.

For the fatigue limit state, the minimum acceptable live load rating factor shall be no less than 1.00.

- Major Structure Rehabilitation

Live load ratings for elements, components, and members of existing structures that undergo major rehabilitation, such as deck replacement, structural steel repair or structure widening, shall be prepared in accordance with the requirements of AASHTO MBE Table 6A.4.2.2-1 for all limit states, including all optional checks.

For strength I and II limit states, the live load ratings shall be prepared for the live loads, the load factor criteria and analysis parameters shown in Table 1.4.4-1. The average daily truck traffic (ADTT), in one direction, used to determine load factors shall be based on the Department's ADTT data, unless noted otherwise. The value of the condition factor used in the rating analysis shall be 1.00 for all elements, unless otherwise directed by the Department. The value of the system factor used in flexural and axial rating analysis shall be obtained from Table 6A.4.2.4-1 of the AASHTO MBE unless otherwise directed by the Department. The value of the system factor used in shear rating analysis shall be 1.00. The dynamic load allowance shall conform to the AASHTO MBE unless noted otherwise. The minimum acceptable rating factors shall be no less than the values shown in Table 1.4.4-1, Column B.

For service limit states, the live load ratings shall be prepared for the live loads, the load factor criteria and analysis parameters shown in Table 1.4.4-2. The live load distribution and dynamic load allowance shall conform to the AASHTO MBE, unless noted otherwise. The minimum acceptable rating factors shall be no less than the values shown in Table 1.4.4-2, Column B.

For the fatigue limit state, the minimum acceptable live load rating factor shall be no less than 1.00, unless permitted in writing by the Department.

- Minor Structure Rehabilitation

Live load ratings for existing structures that undergo minor rehabilitation, such as increased overlay thickness and expansion joint replacement, shall be prepared in accordance with the requirements of AASHTO MBE Table 6A.4.2.2-1 for all limit states, including all optional checks except for the fatigue limit state.

For strength I and II limit states, the live load ratings shall be prepared for the live loads, the load factor criteria and analysis parameters shown in Table 1.4.4-1. The average daily truck traffic (ADTT), in one direction, used to determine load factors shall be based on the Department's ADTT data, unless noted otherwise. The value of the condition factor used in the rating analysis shall be 1.00 for all elements, unless otherwise directed by the Department. The value of the system factor used in flexural and axial rating analysis shall be obtained from Table 6A.4.2.4-1 of the AASHTO MBE, unless otherwise directed by the Department. The value of the system factor used in shear rating analysis shall be 1.00. The dynamic load allowance shall conform to the AASHTO MBE, unless noted otherwise. The minimum acceptable rating factors shall be no less than the values shown in Table 1.4.4-1, Column C.

For service limit states, the live load ratings shall be prepared for the live loads, the load factor criteria and analysis parameters shown in Table 1.4.4-2. The live load distribution and dynamic load allowance shall conform to the AASHTO MBE, unless noted otherwise. The minimum acceptable rating factors shall be no less than the values shown in Table 1.4.4-2, Column C.

Table 1.4.4-1
Strength Limit States

Rating Procedure	Live Load Vehicle	Load factor criteria and analysis parameters	Minimum Acceptable Rating Factor (RF)		
			Column A	Column B	Column C
Design Load Rating	HL-93	Evaluation Level – inventory	1.00	1.00, unless permitted in writing by the Department.	Report value
Design Load Rating	HL-93	Evaluation Level – operating	Report value	1.00	1.00, unless permitted in writing by the Department.
Legal Load Rating	CT-L73.0	Load Factor: use AASHTO MBE Table 6A.4.5.4.2a-1 Permit Type: Routine or Annual Frequency: Unlimited Crossings Loading Condition: Mix with traffic Distribution Factor: Two or more lanes	1.00	1.00	1.00, unless permitted in writing by the Department.
Legal Load Rating	CT-L3S2	Load Factor: use AASHTO MBE Table 6A.4.5.4.2a-1 Permit Type: Routine or Annual Frequency: Unlimited Crossings Loading Condition: Mix with traffic Distribution Factor: Two or more lanes	1.00	1.00	1.00, unless permitted in writing by the Department.
Permit Load Rating	CT-P76.5	Load Factor: use AASHTO MBE Table 6A.4.5.4.2a-1 Permit Type: Routine or Annual Frequency: Unlimited Crossings Loading Condition: Mix with traffic Distribution Factor: Two or more lanes	1.00	1.00, unless permitted in writing by the Department.	Report value, may be less than 1.00
Permit Load Rating	CT-P204	Load Factor: use AASHTO MBE Table 6A.4.5.4.2a-1 Permit Type: Routine or Annual Frequency: Unlimited Crossings Loading Condition: Mix with traffic Distribution Factor: Two or more lanes	1.00	1.00, unless permitted in writing by the Department.	Report value, may be less than 1.00
Permit Load Rating	CT-P380	Load Factor: use AASHTO MBE Table 6A.4.5.4.2a-1 Permit Type: Special or Limited Crossing Frequency: Single Trip Loading Condition: Escorted with no other vehicles on the bridge Distribution Factor: One lane ADTT: N/A	1.00	1.00, unless permitted in writing by the Department.	Report value, may be less than 1.00
Permit Load Rating	CT-TLC	Load Factor: use AASHTO MBE Table 6A.4.5.4.2a-1 Permit Type: Special or Limited Crossing Frequency: Single trip Loading Condition: Mix with traffic Distribution Factor: One lane Dynamic Load Allowance: 0.00	1.00	1.00, unless permitted in writing by the Department.	Report value, may be less than 1.00

Table 1.4.4-2
Service Limit States

Rating Procedure	Live Load Vehicle	Load factor criteria and analysis parameters	Minimum Acceptable Rating Factor (RF)		
			Column A	Column B	Column C
Design Load Rating	HL-93	Evaluation Level – inventory Load Factor: use AASHTO MBE Table 6A.4.2.2.1	1.00	1.00, unless permitted in writing by the Department.	Report value
Design Load Rating	HL-93	Evaluation Level – operating Load Factor: use AASHTO MBE Table 6A.4.2.2.1	Report value	1.00	1.00, unless permitted in writing by the Department.
Legal Load Rating	CT-L73.0	Load Factor: use AASHTO MBE Table 6A.4.2.2.1	1.00	1.00	1.00, unless permitted in writing by the Department.
Legal Load Rating	CT-L3S2	Load Factor: use AASHTO MBE Table 6A.4.2.2.1	1.00	1.00	1.00, unless permitted in writing by the Department.
Permit Load Rating	CT-P76.5	Load Factor: use AASHTO MBE Table 6A.4.2.2.1	1.00	1.00, unless permitted in writing by the Department.	Report value, may be less than 1.00
Permit Load Rating	CT-P204	Load Factor: use AASHTO MBE Table 6A.4.2.2.1	1.00	1.00, unless permitted in writing by the Department.	Report value, may be less than 1.00
Permit Load Rating	CT-P380	Load Factor: use AASHTO MBE Table 6A.4.2.2.1 Distribution Factor: One lane	1.00	1.00, unless permitted in writing by the Department.	Report value, may be less than 1.00
Permit Load Rating	CT-TLC	Load Factor: use AASHTO MBE Table 6A.4.2.2.1 Distribution Factor: One lane Dynamic Load Allowance: 0.00	1.00	1.00, unless permitted in writing by the Department.	Report value, may be less than 1.00