FLORIDA DEPARTMENT OF TRANSPORTATION

BRIDGE LOAD RATING MANUAL

OFFICE OF MAINTENANCE

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1 Introduction

1.1 Load Rating and Inspection

Load rating analysis is a component of the inspection process and consists of determining the safe load carrying capacity of bridges, determining if Florida legal loads or the FL120 permit load can safely cross the bridge and determining if a bridge needs to be restricted and the level of posting required. During and as a result of each inspection, the Districts will determine if the load rating on file reflects the current capacity of the bridge and will update the rating in Bridge Management (BrM, formerly Pontis) if necessary. Components of the bridge management system are defined in Section 3.3 of the Manual of Bridge Evaluation (MBE) by the American Association of State Highway and Transportation Officials (AASHTO).

1.2 Purpose

This Manual serves as a standard and provides uniformity in the procedures and policies for determining the load capacity of the State`s highway bridges.

1.3 Quality Assurance Review of Load Ratings and Decision to Update Load Ratings

1.3.1 General Requirements

The mission of the Department is to provide a safe transportation system that ensures the mobility of people and goods. The load rating process recognizes a need to provide safety, preserve the State`s bridges and provide mobility to promote economic prosperity. The load rating results shall be checked for accuracy as part of the quality control process. Specifically when the load rating for a new bridge is marginal, the load rating shall be reviewed to determine the reason(s). If the consultant performs the load rating, the consultant shall provide in writing the reason(s) why the rating is marginal.

1.3.2 Specific Check and Review Requirements

1.3.2.1 Computer Programs

The load rater shall perform independent checks on the computer analysis to verify that the computer program is accurate. It is of utmost importance that the load rater understands whether the computer results are reasonable. The checker shall perform quality control on the load rater`s calculations and verify that the summary of load capacity information accurately reflects the analysis.

1.3.2.2 Review

The analysis must be performed under the supervision of a professional engineer. If the load rater is not a professional engineer, then the professional engineer in charge must review the work for accuracy and completeness. The load rating shall be signed and sealed by a professional engineer registered in the State of Florida.

1.3.2.3 Quality Assurance Review

Each year, the Office of Maintenance will perform a quality assurance review of the load rating performance for each District. The current schedule, monitoring plan, critical requirements and compliance indicators are included in the Quality Assurance Plan available at the Office of Maintenance SharePoint site.

1.3.2.4 Re-load Rating

When the condition of a bridge changes, a re-load rating of the bridge may be required. Conditions that may require re-load rating are structural deterioration, damage due to vessel and/or vehicular hits, modifications to the structure. Every bridge inspection report and accident report should be reviewed by the District load rating staff to determine if re-load rating is required. The District Quality Control Plan shall document that this review is performed for every routine bridge inspection.

1.3.2.5 Load Rating File

Computer input and output files, hand calculations, field measurements, catalog cuts, signed and sealed Load Rating Summary Form and other pertinent information, used in performing the load rating, shall be stored in the load rating file. This will provide easy access for reviewing or revising the load rating.

1.3.2.6 Bridge Management System Data

The accuracy of this data is vital to the operations of the Overweight/Over-Dimensional Permit Office (Permit Office), which uses load rating and bridge dimensional data in the BrM to determine if it is safe for an overweight load to cross a bridge. Therefore, the District load rating staff will obtain an output of the Comprehensive Inventory Data Report (CIDR) after the inspection report has been reviewed. The District load rating staff shall verify that the load rating data is accurate and updated properly in the BrM.

1.3.2.7 Quality Control Plan

The District shall have a quality control plan in place which includes quality assurance review of consultants performing the quality control of load ratings. The plan shall also include clear recommendations for determining if a bridge load rating needs to be updated during any inspection cycle. The Department shall notify the agencies within one week after a need for posting is identified. Timetable for load rating related actions are given in FDOT Table 3.1.

2 Load Rating Process

2.1 General

Florida Administrative Code 14-15.002, Manual of Uniform Minimum Standards for Design, Construction, and Maintenance for Streets and Highways (commonly known as the "Florida Greenbook") requires load rating for all bridges in Florida. For the purpose of this Manual, the term “bridge” applies to bridges that are 20 ft or longer. However, this Manual can be used to load rate shorter structures.

The specifications governing this work is the current version of the MBE as modified by this Manual. The District Structures Maintenance Engineer and appropriate staff are responsible for ensuring that every bridge within their jurisdiction is properly load rated.

2.2 Concepts

The following concepts are to be applied to the load rating process:

a) Substructures generally do not control the load rating. However, after the superstructure has been load rated, the load rater shall determine if the substructure can carry an equivalent or greater load than the superstructure. If not, the substructure will be load rated and the load rating will be adjusted.

b) Reinforced concrete bridge decks on redundant, multi-girder bridges will not normally be rated unless damage, deterioration, or other reasons merit this analysis. All other bridge deck systems shall be load rated.

c) Utilizing engineering judgment, all superstructure spans and components of the span shall be load rated for flexure, shear and service until the governing component is established. For example, a two girder superstructure system with floor beams and stringers would require the rating of stringers, floor beams and girders to establish the governing component. Refined analysis of non-controlling components is not required if the engineer, using engineering judgment, determines that these components will not control the rating.

d) For most bridges, the governing rating shall be the lesser of the shear, flexural, or service capacity of the critical component. For more complex bridges, other stresses such as principal web tension in concrete post-tensioned segmental bridges may govern the load rating.

e) Some composite pre-stressed concrete girder bridges are designed with the deck continuous over the supports in order to eliminate transverse deck joints. The girders of these bridges are not continuous over the support. Bridges meeting this description shall be load rated as simple spans.

f) When consultants perform load ratings, they will follow the requirements of this Manual and the current version of the MBE. The District load rating staff will review the consultant’s load ratings and perform spot checks to confirm accuracy of the consultant’s work. The consultant`s load ratings shall be signed and sealed by a professional engineer registered in the State of Florida. The consultant shall have quality control procedures in place to assure the accuracy and completeness of the load ratings. The District shall have a quality assurance program to approve the consultant`s quality control plan and to ensure the consultants follow their quality control procedures.

2.3 Requirements

The load rating process shall follow the flowchart shown in FDOT Figure 2-1.

2.3.1 New Bridges and Culverts

a) When load rating new bridges, perform a load rating analysis using LRFR as defined in the MBE, Section 6, Part A and as modified by this Manual.

b) For new bridges, the Engineer of Record (EOR) shall submit the load rating calculations with the 90% design submittals for the project and attach the completed Load Rating Summary Form, as given in Appendix C of this Manual.

c) The as-built load rating shall be submitted, if applicable, prior to putting the bridge into service. Notification and monitoring of load rating information in conjunction with construction project activity shall be provided in accordance

with the Construction Project Administration Manual (CPAM) Section 10.11.4. Schedule of load rating related actions shall be in accordance with FDOT Table 3.1.

d) Bridge-size culverts, as defined in the FDOT Plans Preparation Manual (PPM), Volume 1, Chapter 33, shall be load rated in accordance with the MBE, Section 6, Part A, and the Structures Design Guidelines (SDG), Section 3.15. The calculations must be signed and sealed by a professional engineer, registered in the State of Florida, currently approved to perform bridge load rating under Rule 14-75 of the Florida Administrative Code. The engineer must provide the Department with the Load Rating Summary Form.

2.3.2 Existing Bridges and Culverts

Load ratings for existing bridges shall be performed using the load resistance factor rating (LRFR), load factor rating (LFR), or allowable stress rating (ASR) methods, as shown in the FDOT Figure 2-1. Load testing, as described in Section 8 of the MBE and Section 8 of this Manual, may be utilized to determine the load ratings. Unless there is a change in the condition of the bridge, existing load ratings performed with the ASR method or LFR method do not have to be recalculated with the LRFR method. For the acceptable load rating methods, see FDOT Table 6.0-1.

Existing culverts not designed using LRFD method shall be load rated using LFR method as defined in the MBE, Section 6, Part B and as modified by this Manual.

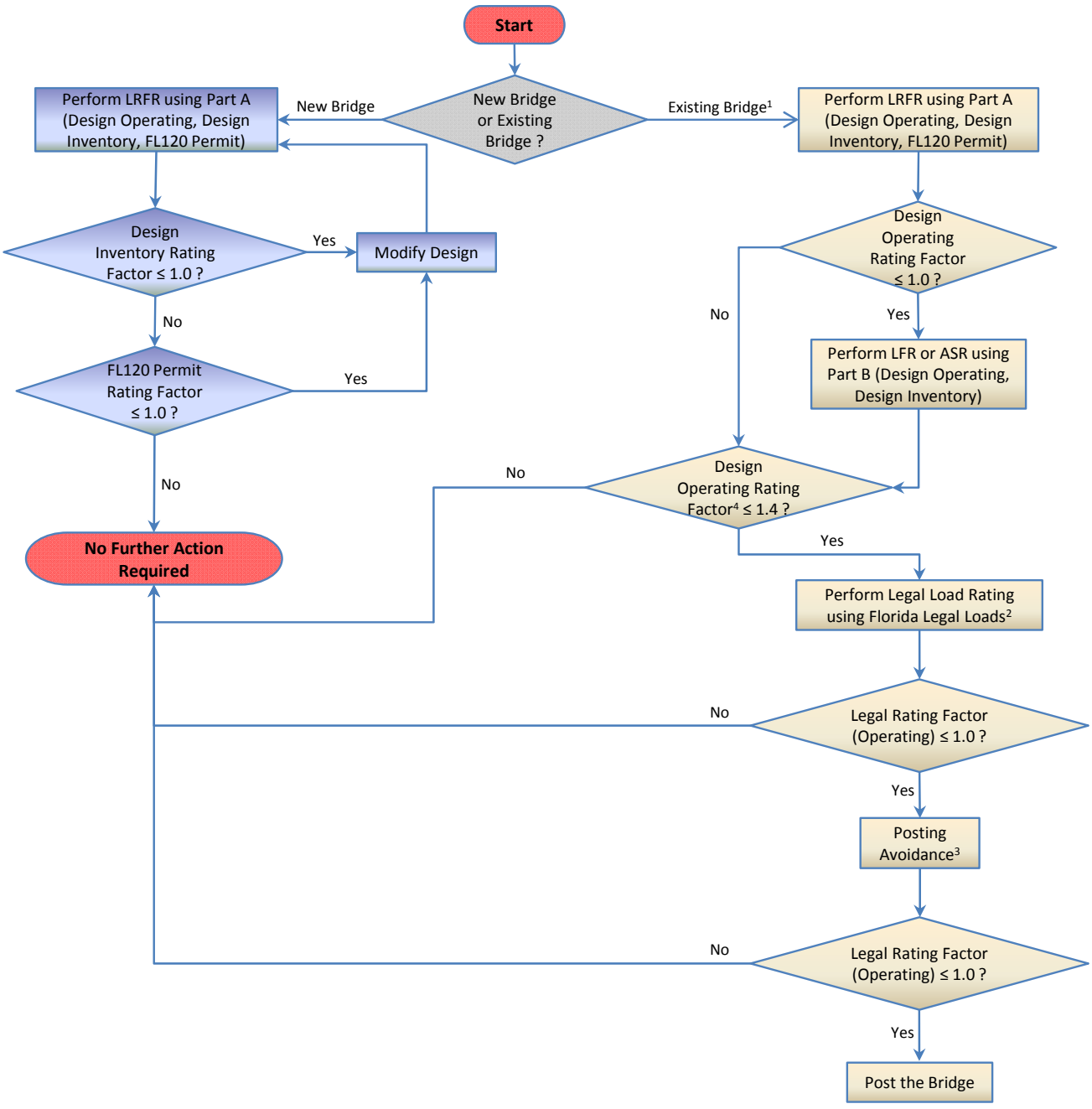
When the required information such as bridge plans are not available to perform the load rating, assigned load ratings may be used for the bridge provided that the bridge shows no major sign of distress. Otherwise, the load rating shall be determined by field measurements. The maximum ratings that should be assigned shall be in accordance with the FDOT Bridge Management System Coding Guide (Items 63 and 65). The ratings can be lowered at the discretion of the Districts. Average daily traffic (ADT) and average daily truck traffic (ADTT) should be considered when assigning the ratings.

Deck panel systems which are in poor condition (exhibiting either transverse or longitudinal spalling or significant cracking), shall have the live load distribution factors established as if the deck slabs act as simple spans between girders.

2.3.3 Widening and Rehabilitation

Load rating of bridges to be widened or rehabilitated shall be performed in accordance with the Structures Design Guidelines, Section 7.1.1. When the load rating is performed using a refined method of analysis, as described in Section 6 of this Manual, the State Load Rating Engineer shall be contacted with the bridge number and a signed and sealed copy of the Load Rating Summary Form shall be provided.

FDOT Figure 2-1 Flowchart for Load Rating



[1]See Structures Design Guidelines Section 7.1.1 for bridges to be widened
[2]See Section 6B.6.2
[3]See Section 7
[4]Districts may request load ratings for all Florida legal loads regardless of the design operating rating.

3 Department and Consultants Working Responsibilities

3.1 District Structures Maintenance Office

The responsibilities of the District Structures Maintenance Office are as follows:

a) Perform load ratings.
b) Administer consultant contracts performing load ratings.
c) Review load ratings prepared by consultants for new and existing bridges.
d) The maximum time in days allowed for load rating related actions will follow the table below:

FDOT Table 3.1 Timetable for Load Rating Related Actions

	Action	Effective Starting Date	Maximum Number of Days Allowed	
			State Bridges	Local Bridges
New Bridges	Enter as-bid load rating into BrM[1]	Immediately	3	14
	Enter as-built load rating into BrM[2]	Final bridge configuration open to traffic	14	90
Existing Bridges	Re-load rate a Category 1 bridge[3]	Signed and sealed inspection report	60	60
	Re-load rate a Category 2 bridge[3]	Signed and sealed inspection report	90	90
	Update BrM based on re-load rating	Acceptance of the re-load rating	14	14

[1]Load rating performed at 90% of design.

[2]Exception to this requirement shall be made in writing to the State Load Rating Engineer within 14 days after the bridge is opened to traffic. See CPAM Section 10.11.4 for other requirements.

[3]Exception to this requirement shall be made in writing to the State Load Rating Engineer no later than 30 days after the inspection report is signed and sealed. Definitions of Category 1 and Category 2 bridges are given in Section 26.3, Volume 1, of the Plans Preparation Manual (PPM).

e) Recommend bridges to be load tested to the Office of Maintenance for coordination and prioritization.
f) For State bridges, immediately inform the Office of Maintenance and the State Load Rating Engineer in writing of any decrease in load rating capacity (LFR & ASR: HS20-44 at Operating Level, LRFR: FL120) and update the BrM accordingly.
g) Initiate requests for load postings and removal of load postings. This includes verification that the maintaining agency has properly posted the structure, or removed all signage.
h) Maintain bridge design plans, as-built plans, shop drawings, and other bridge related documents.
i) Collect relevant existing data and documents required to perform the load rating. The following hierarchy of data will be used for load rating:
    - As-built plans to be supplemented with field measurements and bridge inspection reports;
    - In the absence of as-built plans, design plans supplemented with field measurements and bridge inspection reports;
    - In the absence of plans, field measurements and bridge inspection reports.
j) Review bridge inspection reports to determine when a re-load rating is required.
k) Provide information to the Overweight/Over-Dimensional Permit Office to determine potential conflicts due to temporary changes in clearances and recommend time of movement for oversized/overweight vehicles.
l) Verify that the consultant, if utilized, meets the FDOT pre-qualification requirements, as stated in FAC 14-75, Group 5.

3.2 Office of Maintenance

The responsibilities of the Office of Maintenance are:

a) Perform quality assurance reviews.
b) Maintain the FDOT Load Rating Manual.
c) Provide training.
d) Assist Districts and Overweight/Over-Dimensional Permit Office when requested.
e) Participate in testing groups to review and test the load rating software used nationwide.
f) Inform Districts of new procedures and concerns.
g) Review load posting and load posting removal requests for State owned bridges and provide courtesy review for locally owned bridges.
h) Perform evaluations and load ratings for State owned bridges to improve commercial truck mobility.

3.3 Overweight/Over-Dimensional Permit Office

The responsibilities of the Overweight and Over-Dimensional Permit Office are to request from the District Maintenance Engineer or from his or her designee:

a) Temporary clearance restriction(s) due to widening.
b) Time of movement occurring during higher levels of daily traffic.
c) Local event generating an unusual level of traffic. The District Maintenance Engineers have designated a single contact person (and a back-up person) to coordinate comments provided on specific moves.

3.4 State Structures Design Office

The responsibilities of the State Structures Design Office are:

a) Assist the Office of Maintenance in resolving inconsistencies between the Structures Manual and this Manual.
b) Propose analysis programs.
c) Address malfunctions in software approved by the State Structures Design Office.
d) Quality assurance review based on new proposed software or methods.

3.5 Consultants

Consultant shall load rate bridges in accordance with this Manual, the current version of the MBE, and other documents included and referred to in the contract.

6 Load Rating Analysis

This section of the Manual is consistent with the current AASHTO Manual of Bridge Evaluation (MBE). Where this section of the Manual is silent, the current MBE shall govern. The chapter numbers in this section are organized using the same chapter numbers of the MBE to quickly coordinate and associate this Manual's criteria with that of the MBE.

6.0 Overview of Load Rating Methods and Procedures

The load rating of all bridges shall be in accordance with Section 2 of this Manual. The order of preference in rating methodologies is:

- *Load and Resistance Factor Rating (LRFR)*
- *Load Factor Rating (LFR)*
- *Allowable Stress Rating (ASR)*

C6.0

In 1993, FHWA requested that all bridges on the National Highway System (NHS) that were load rated with allowable stress be reload rated with load factor, and FDOT and FHWA agreed that only NHS bridges that were structurally deficient or functionally obsolete required reload rating, and that whenever an NHS bridge that had an allowable stress load rating required reload rating it would be done with load factor or load resistance factor rating.

FDOT Table 6.0-1 Acceptable Load Rating Methodologies

DESIGN METHODOLOGY	LOAD-RATING METHODOLOGY[1]		
	Allowable Stress Rating ASR (Part B)	Load Factor Rating LFR (Part B)	Load & Resistance Factor Rating - LRFR (Part A)
Allowable Stress Design (ASD)	✓[2]	✓	✓
Load Factor Design (LFD)		✓	✓
Load & Resistance Factor Design (LRFD)			✓

[1]The analysis shall specify the version of the code or manual used.

[2]Allowable stress rating is not permitted for bridges on the National Highway System if the bridge is either structurally deficient or functionally obsolete.

6.1 Scope

6.1.5 Component-Specific Evaluation

Add the following:

Bridges may contain local details that must be appropriately designed to carry local loads or distribute forces to the main bridge components. Although forces in these details can vary as a function of the applied live loads (with the exception of in-span beam splices), it is recommended that they not be included in the load rating. Rather, the capacities of such details should be checked only for critical loads or ratings and when there is evidence of distress (e.g. cracks).

C6.1.5

Add the following:

Important local details in concrete or steel bridges include diaphragms, corbels, support for expansion joint devices, and anchorages for post-tensioning tendons, stiffeners, and bracing. The behavior of these details and the forces to which they are subjected may be determined by appropriate models or hand calculations. Analysis methods and design procedures are available in AASHTO LRFD Bridge Design Specifications (e.g. strut and tie method).

6.1.5.3 Diaphragms

Transverse diaphragms need not be analyzed as part of a routine load rating. At the discretion of the engineer, a structural analysis may be necessary if there is evidence of distress such as major cracks, efflorescence, rust stains, buckling or local failures. Diaphragms and cross-frame members in horizontally curved bridges shall be considered to be primary members and shall be load rated accordingly at the discretion of the Districts.

6.1.5.4 Support for Expansion Joint Devices

Expansion joint devices are usually contained in a recess formed in the top of the end of the slab and transverse diaphragm. Occasionally, depending upon the need to accommodate other details, such as drainage systems, this may involve a corbel - usually as a contiguous part of the expansion joint diaphragm. It is not required to analyze such a detail for routine load rating. At the discretion of the engineer, a structural analysis may be necessary if there is evidence of distress such as major cracks, efflorescence, and rust stains.

6.1.5.5 Anchorages for Post-Tensioning Tendons

Anchorages are normally contained in a widened portion of the web at the ends of a beam. It is not required to analyze anchorage details for routine load rating. At the discretion of the engineer, a structural analysis may be necessary if there is evidence of distress such as major cracks, efflorescence, and rust stains.

6.1.5.6 Post-Tensioned Concrete Beam Splices

Beam splices within a span are frequently used to connect portions of continuous girders. Such splices usually require reinforcing bars projecting from the ends of the precast beams into a reinforced, cast-in-place transverse diaphragm. Longitudinal post-tensioning ducts are connected and tendons pass through the splice.

Beam splices are typically near inflection points; consequently, live load effects may induce longitudinal tensile stress at the top or bottom. Therefore, the longitudinal tendons are approximately concentric, i.e. at mid-depth of the composite section. It is required to check longitudinal flexure and shear effects at in-span beam splices.

6.1.5.7 Post-Tensioned Concrete Beam Dapped Hinges within a Span

Dapped hinges are rarely used in beam bridges in Florida. Forces acting through dapped hinges within a span should be calculated for statically determinate structures or be determined as a part of the time-dependent construction

analysis for indeterminate structures. Maximum live load reactions should also be calculated. Once all reaction forces are known, local analyses should be performed to develop the hinge forces into the main beam components using suitable strut-and-tie techniques. An alternate approach would be to develop three-dimensional finite element models to analyze the flow of forces.

6.1.5.8 Bascule Bridges

Use the appropriate system factors and condition factors given in this Manual and in the MBE. Load rate the bridge for design inventory, design operating, FL120 permit load (LRFR only) and legal loads, assuming the span locks are engaged (driven) to transmit live load to the opposite leaf. In addition, for the Strength II limit state using the FL120 permit load, load rate the bridge assuming the span locks are not engaged to transmit live load to the opposite leaf. For both cases, assume the live load to be on the tip side (in front) of the trunnion.

Report the load ratings along with the span lock assumptions. Contact the District Structures Maintenance Engineer for directions on reporting the controlling load case and assumptions. Span locks shall be load rated for shear and flexure based upon their condition and the engineer`s evaluation. Use the dynamic allowance provided in the SDG 8.6.6 when load rating the span locks.

6.1.5.9 Gusset Plates on Truss Bridges

When evaluating new and existing truss bridges with gusset plates, follow FHWA Technical Advisory T 5140.29 "Load-carrying Capacity Considerations of Gusset Plates in Non-load-path-redundant Steel Truss Bridges."

Part A – Load and Resistance Factor Rating

6A.1 Introduction

6A.1.5 Load and Resistance Factor Rating

Replace Appendix A6A, Load and Resistance Factor Rating Flow Chart, with FDOT Figure 2-1. Delete the last sentence of the second paragraph and add the following:

The routine FDOT rating process is described in Section 2 of this Manual. Since LFR (Part B) does not specifically address segmental concrete bridges, this type of bridge shall be load rated using LRFR (Part A) procedures. For this bridge type, a minimum acceptable rating factor of 1.0 is required for design loads, legal loads and the FL120 permit load (Strength and Service when applicable).

C6A.1.5

Add the following:

The rating process of AASHTO LRFR suggests that each permit vehicle be evaluated individually. Such is not the case with FDOT. Traditionally, annual blanket permits were issued based upon a comparison of force effects of the permit vehicle in question to that of the HS20 operating rating. To continue the practice of having information available to easily judge permit applications, FDOT's standard rating process includes an FL120 permit load rating. Single-trip permit vehicles will be evaluated outside of the standard FDOT rating process.

6A.1.5.2 Legal Load Rating

Replace with the following:

This second level rating provides a single safe load capacity (for a given truck configuration) applicable to legal loads. Using this check, bridges are screened for both the strength and service limit states as noted in FDOT Table 6A.4.2.2-1.

6A.1.5.3 Permit Load Rating

Replace with the following:

Consultants performing special permit load ratings shall follow the MBE requirements, unless otherwise specified in writing by the Office of Maintenance.

C6A.1.5.3

Add the following:

The FL120 permit load is calibrated to be used for in-house permit reviews as a screening vehicle. It is not suitable to be used by Consultants when performing special permit analysis.

6A.2 Loads for Evaluation

Tables showing the maximum live load moments and shears are given in Appendix A of this Manual.

C6A.2

The tabulated values are those produced by the vehicular live loads as described in this Manual. These tables have been primarily developed to provide guidance and ballpark figures to the engineer. However, the engineer should do the necessary verifications when using the tables.

6A.2.3.1 Vehicular Live Loads (Gravity Loads): LL

Replace the live load models with the following models:

Design Load: HL-93 Design Load per the AASHTO LRFD Design Specifications

Legal Loads: Florida Legal Loads (SU4, C5, and ST5, see 6A.4.4.2.1 for vehicle configurations).

Additional Florida Legal Loads: (SU2, SU3, C3, and C4, see 6A.4.4.2.1 for vehicle configurations).

Permit Load: Florida Permit Load (FL120, see 6A.4.5.4.1 for vehicle configurations).

6A.3 Structural Analysis

Transverse ratings shall be reported for concrete segmental bridges. All bridge decks designed with transverse prestressing require transverse ratings. For all other bridges, only longitudinal ratings are required.

6A.3.1 General

C6A.3.1

Replace with the following:

Evaluation seeks to verify adequate performance of existing bridges with an appropriate level of effort. Within a given evaluation procedure, the evaluator has the option of using simplified methods that tend to be somewhat conservative or pursue a more refined approach for improved accuracy. When simplified methods yield satisfactory results, there is no need to perform a more refined analysis. It is recommended that wherever feasible, simplified evaluation procedures should be first applied before resorting to higher level evaluation methods. Satisfactory results would be the establishment of a safe load carrying capacity that does not require posting the bridge and does not unduly restrict the flow of permitted overweight trucks. Refined approaches to capacity evaluation of existing bridges can be economically justified where increased capacity is required to achieve a desired safe load capacity or permit load capability.

6A.3.2 Approximate Methods of Structural Analysis

Add the following:

Approximate methods include one-dimensional line-girder analysis using distribution factors as described in LRFD 4.6.2 and SDG 2.9.

For bridges constructed with composite pre-stressed deck panels, the live load distribution factors will be increased by a factor of 1.1.

6A.3.3 Refined Methods of Analysis

C6A.3.3

Add the following:

Refined methods of analysis include two or three dimensional models using grid or finite-element analysis.

All analyses will be performed assuming no benefit from the stiffening effects of any traffic railing barrier or other appurtenances.

Refined methods of analysis may utilize actual material properties as determined from field sampling and tests of the materials.

Actual material properties may be significantly better due to suppliers exceeding minimum standards, concrete increasing in strength with age, or structures material properties being higher grade than assumed. Therefore, testing material may result in higher material property values thus increasing the rating of the structure. Conversely, the opposite of the above statement is true for deteriorated conditions.

When a refined method of analysis is used, it shall be indicated in the Load Rating Summary Form why it is used and where it applies. The name and version of the software used shall also be indicated in the Load Rating Summary Form.

Refined methods may be performed before attempting load tests (for load testing, see Section 8 of this Manual).

If a refined analysis is used, it should be applied to the entire bridge rather than partial areas on the bridge. This is especially important for widening analyses where partial use of refined methods can lead to non-uniform live load distribution factors that can be significantly different from the ones calculated based on approximate methods.

6A.4 Load Rating Procedures

6A.4.1 Introduction

C6A.4.1

Replace the first paragraph with the following:

The load rating procedures are structured to be performed in a sequential manner, as needed, starting with the design load rating (see FDOT Figure 2-1, Flowchart for Load Rating).

6A.4.2 General Load Rating Equation

Add the following:

When calculating the Service Limit State capacity for pre-tensioned concrete flat slabs and girders, use the transformed section properties as follows: at strand transfer; for calculation of prestress losses; for live load application. For precast, pretensioned, normal weight concrete members designed as simply supported beams, use LRFD 5.9.5.3, approximate estimate of time-dependent losses.

C6A.4.2

Add the following:

For a detailed explanation of stress calculations in pre-tensioned concrete girders, see NCHRP Report 496. The correct use of transformed section properties for calculation of pre-stress losses is essential for the precise calculation of stresses at Service Limit State.

6A.4.2.2 Limit States

Replace Table 6A.4.2.2-1 with the following:

FDOT Table 6A.4.2.2-1 Limit States and Load Factors for Load Rating

Bridge Type	Direction	Limit State	Load Factors									
			Permanent Load			Transient Load			Design Load		Legal Load	FL120 Permit Load
			DC	DW	EL	FR	TU[1] CR SH	TG[1]	Inventory	Operating		
Steel	Longitudinal	Strength I	1.25	1.50	n/a	n/a	n/a	n/a	1.75	1.35	1.35	n/a
		Strength II	1.25	1.50	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.35
		Fatigue	0.00	1.50	n/a	n/a	n/a	n/a	0.75[5]	n/a	n/a	n/a
		Service II[2]	1.00	1.00	n/a	n/a	n/a	n/a	1.30	1.00	1.30	0.90
Reinforced Concrete	Longitudinal	Strength I	1.25	1.50	n/a	n/a	n/a	n/a	1.75	1.35	1.35	n/a
		Strength II	1.25	1.50	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.35
Pre-stressed Concrete	Longitudinal	Strength I	1.25	1.50	n/a	n/a	n/a	n/a	1.75	1.35	1.35	n/a
		Strength II	1.25	1.50	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.35
		Service I	1.00	1.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.00
		Service III[3]	1.00	1.00	n/a	n/a	n/a	n/a	0.80	0.80	0.80	n/a
Wood	Longitudinal	Strength I	1.25	1.50	n/a	n/a	n/a	n/a	1.75	1.35	1.35	n/a
		Strength II	1.25	1.50	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.35
Post Tensioned Concrete	Longitudinal	Strength I	1.25	1.50	1.00	1.00	0.50	n/a	1.75	1.35	1.35	n/a
		Strength II	1.25	1.50	1.00	1.00	0.50	n/a	n/a	n/a	n/a	1.35
		Service III[3]	1.00	1.00	1.00	1.00	1.00	0.50	0.80	0.80 or 1.0 SL[4]	0.80 or 1.0 SL[4]	0.70 or 0.90 SL[4]
	Transverse	Strength I	1.25	1.50	1.00	n/a	n/a	n/a	1.75	1.35	n/a	n/a
		Service I	1.00	1.00	1.00	n/a	n/a	n/a	1.00	1.00	n/a	n/a

Notes:

1. TU and TG are considered for Service I and Service III Design Inventory rating only.
2. The Service II limit state need only be checked for compact steel girders. For all other steel girders, the Strength limit states will govern.
3. For Service III tensile stress limits, see FDOT Table 6A.5.4.1-1.
4. For I-girders use a load factor of 0.8 (inventory, operating, legal) or 0.7 (permit); for segmental box girders use 0.8 (inventory) or 1.0 and striped lanes (SL) (operating and legal) or 0.9 and striped lanes (SL) (permit).
5. Optional. Fatigue limit state is checked using the LRFD fatigue truck.

6A.4.2.3 Condition Factor, φ_c

Add the following after Table 6A.4.2.3-1:

The Department prefers load ratings be performed taking into account field measured deterioration. However, in the absence of measurements, condition factors shown in the table above shall be used.

6A.4.2.4 System Factor, φ_s

Replace Table 6A.4.2.4-1 with FDOT Tables 6A.4.2.4-1, 2 and 3 and add the following:

The system factors of FDOT Tables 6A.4.2.4-1, 2 and 3 shall apply for flexural and axial effects at the Strength Limit States. Higher values than those tabulated may be considered on a case-by-case basis with the approval of the Department. System factors shall not be less than 0.85. In no case shall the system factor exceed 1.3.

FDOT Table 6A.4.2.4-1 General System Factors (φ_s)

Superstructure Type	System Factor (φ_s)
Rolled/Welded Members in Two-Girder/Truss/Arch Bridges[1]	0.85
Riveted Members in Two-Girder/Truss/Arch Bridges[1]	0.90
Multiple Eyebar Members in Truss Bridges	0.90
Floor beams with Spacing > 12 feet and Non-Continuous Stringers and Deck	0.85
Floor beams with Spacing >12 feet and Non-Continuous Stringers but with continuous Decks	0.90
Redundant Stringer subsystems between Floor beams	1.00
All beams in non-spliced concrete girder bridges	1.00
Steel Straddle Bents	0.85

[1]Pertains to type of build-up or rolled members not to the type of connection between members

FDOT Table 6A.4.2.4-2 System Factors (φ_s) for Post-Tensioned Concrete Girder Bridges

Number of Girders in Cross Section	Span Type	Number of Hinges Required for Mechanism	System Factors (φ_s)			
			Number of Tendons per Web			
			1	2	3	4
2	Interior	3	0.85	0.90	0.95	1.00
	End	2	0.85	0.85	0.90	0.95
	Simple	1	0.85	0.85	0.85	0.90
3 or 4	Interior	3	1.00	1.05	1.10	1.15
	End	2	0.95	1.00	1.05	1.10
	Simple	1	0.90	0.95	1.00	1.05
5 or more	Interior	3	1.05	1.10	1.15	1.20
	End	2	1.00	1.05	1.10	1.15
	Simple	1	0.95	1.00	1.05	1.10

Note: The tabulated values above may be increased by 0.05 for spans containing more than three intermediate, evenly spaced, diaphragms in addition to the diaphragms at the end of each span.

FDOT Table 6A.4.2.4-3 System Factors (φ_s) for Steel Girder Bridges

Number of Girders in Cross Section	Span Type	Number of Hinges Required for Mechanism	With Diaphragms[1]	Without Diaphragms
2	Interior	3	1.00	0.85
	End	2	1.00	0.85
	Simple	1	1.00	0.85
3 or 4	Interior	3	1.00	1.00
	End	2	1.00	0.95
	Simple	1	1.00	0.90
5 or more	Interior	3	1.00	1.00
	End	2	1.00	1.00
	Simple	1	1.00	0.95

[1]With at least three evenly spaced intermediate diaphragms (excluding end diaphragms) in each span. The above tabulated values may be increased by 0.05 for riveted members.

6A.4.4 Legal Load Rating

6A.4.4.1 Purpose

Replace with the following:

If the SU4 or C5 or ST5 legal load rating factors are less than 1.0, ratings shall be required for SU2, SU3, C3 and C4.

At the discretion of the districts, any or all of the Florida legal loads may be required for load rating.

Load rating for legal loads determines the safe load capacity of a bridge for the AASHTO family of legal loads and State legal loads, using safety and serviceability criteria considered appropriate for evaluation. A single safe load capacity is obtained for a given legal load configuration.

6A.4.4.2 Live Loads and Load Factors

6A.4.4.2.1 Live Loads

Replace with the following:

For all span lengths, the critical load effects shall be taken as the larger of the following:

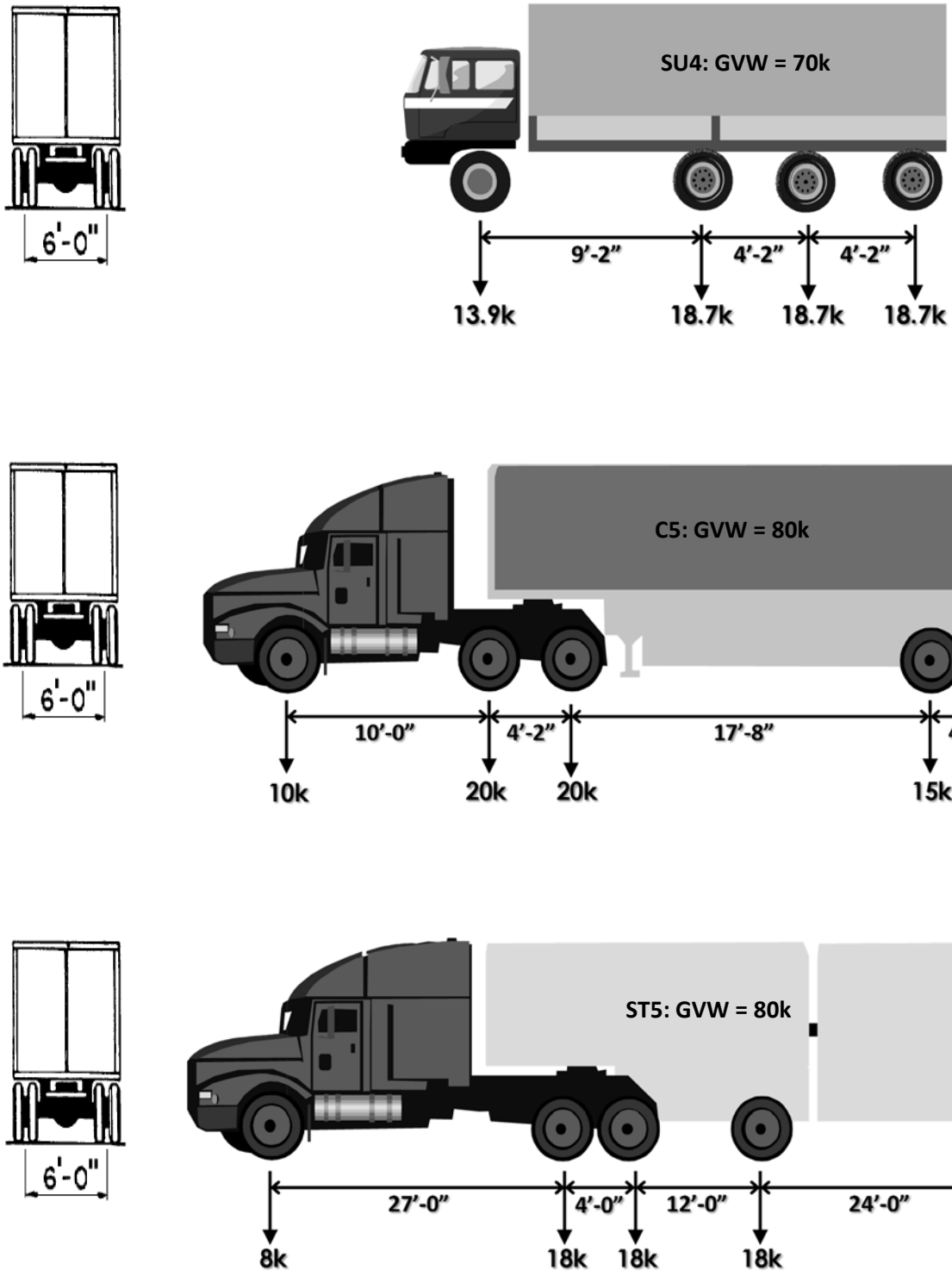
- For all load effects, Florida legal loads defined in FDOT Figures 6A.4.4.2.1-1 and 6A.4.4.2.1-2. Assume the same legal loads are in each loaded lane; do not mix trucks.
- For negative moments and reactions at interior supports, a lane load of 0.2 klf combined with two of the same legal trucks, multiplied by 0.75 heading in the same direction separated by 30 ft clear space.

In addition, for span lengths greater than 200 ft, critical load effects shall be created by:

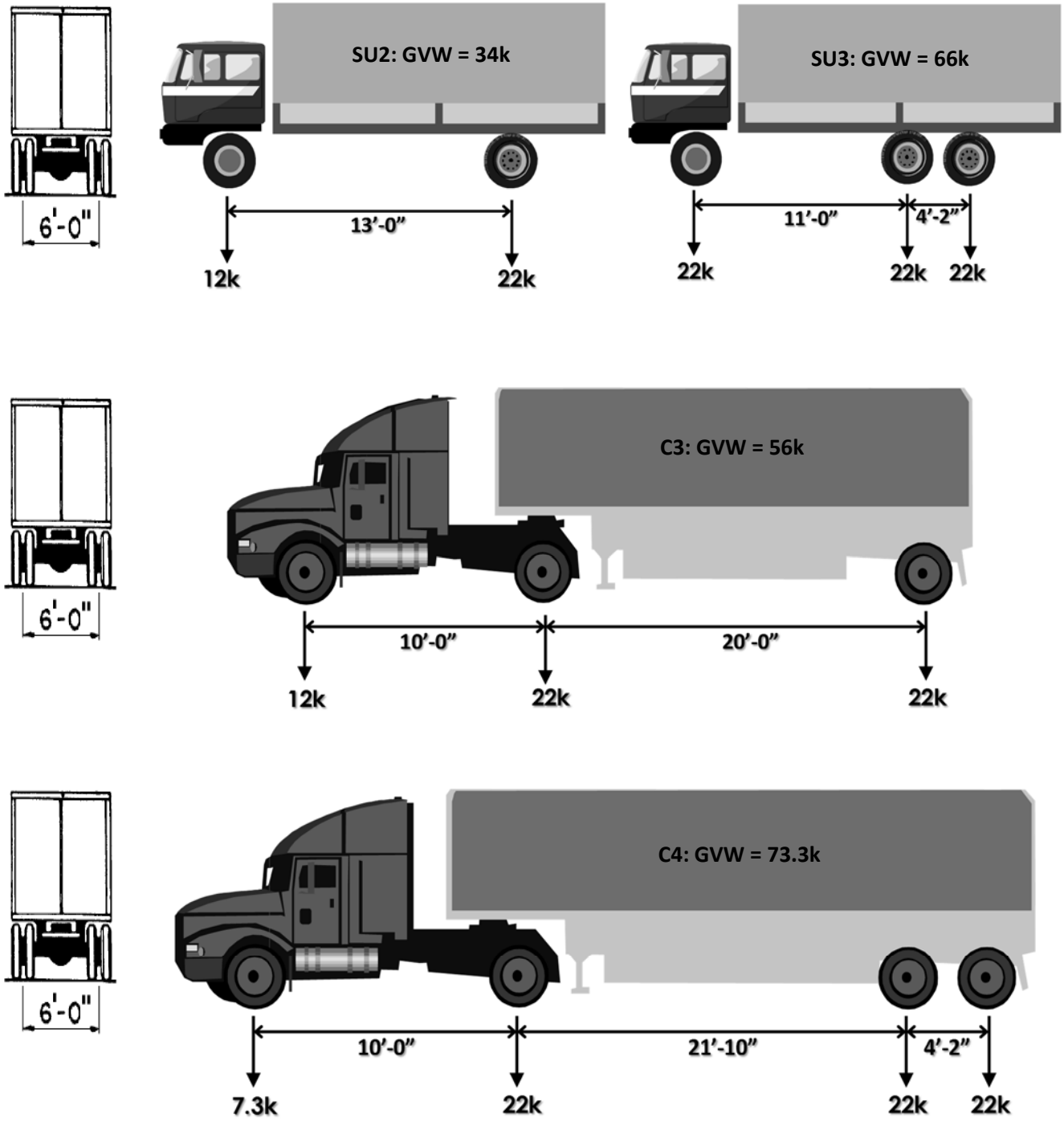
- The Florida legal loads, multiplied by 0.75 and combined with a lane load of 0.2 klf; do not mix trucks.

Dynamic load allowance shall be applied to the axle loads but not the lane loads.

FDOT Figure 6A.4.4.2.1-1 Florida Legal Trucks



FDOT Figure 6A.4.4.2.1-2 Additional Florida Legal Trucks



6A.4.4.2.3 Generalized Live Load Factors: γ_L

6A.4.4.2.3a Generalized Live Load Factors for Routine Commercial Traffic

Delete the paragraph and revise Table 6A.4.4.2.3a-1 as follows:

For all traffic volumes, revise all load factors to 1.35.

C6A.4.4.2.3a

Replace with the following:

The LRFR live load factor of 1.35 for the design operating rating yields a reliability index consistent with traditional operating ratings. Since the LRFD HL-93 live-load model envelopes FDOT legal loads, a live load factor of 1.35 can be used for legal load rating. Live load factor for FDOT legal loads are not specified as a function of ADTT.

6A.4.4.4 Rating in Tons

Replace the last paragraph with the following:

When the lane-type load model governs the load rating, the rating in tons is calculated by multiplying the rating factor by 36.

6A.4.5 Permit Load Rating

6A.4.5.1 Background

Add the following:

The two or more lanes distribution factor assumes the FL120 permit load is present in all loaded lanes. LRFD live load distribution equations shall be used and multiple presence factor shall be applied to the FL120 permit load as specified in LRFD 3.6.1.1.2.

C6A.4.5.1

Add the following:

FDOT has chosen to apply Service I limit state for the FL120 permit load on prestressed concrete (flat slab and deck/girder). It is understood that prestressed concrete may crack under Service I loading conditions. The Service I check limits the stress in the prestressing tendons to 90% of yield to ensure that once the load has been removed, these cracks will close. Using the Service I limit state will increase the mobility of overweight permitted loads throughout the State without compromising the safety or serviceability of Florida`s bridges.

6A.4.5.2 Purpose

Replace with the following:

All bridges that are load rated with the LRFR method shall have a FL120 permit load rating.

C6A.4.5.2

Delete the commentary.

6A.4.5.4 Live Load and Load Factors

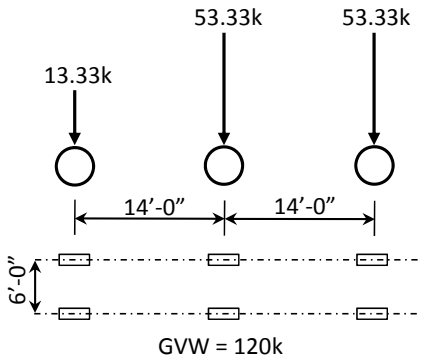
6A.4.5.4.1 Live Load

The FL120 permit load shall be used to verify overload capacity of Florida bridges. The FL120 shall be checked at both Strength and Service limit states as noted in FDOT Table 6A.4.2.2-1. The minimum rating factor for new bridges is 1.0.

C6A.4.5.4.1

The FL120 permit load is conceived to be a benchmark to past load factor design (LFD) practice in which the HS20 loading (truck, tandem or lane) was used at the operating level with a load factor of 1.3. A LRFR permit load rating factor of 1.0 for the FL120 permit load is equivalent to an LFD operating rating factor of 1.67 for the HS20 loading. Accordingly, the truck axle loads shown are 1.67 times of the HS20 truck.

The FL120 permit load configuration is shown below:



For span lengths greater than 200 ft, apply an additional lane load of 0.2 klf. Assume the FL120 permit loads are in each lane; do not use mixed traffic.

6A.4.5.4.2 Load Factors

Replace with the following:

Use FDOT Table 6A.4.2.2-1 for live load factors.

C6A.4.5.4.2

Replace with the following:

Since permits are evaluated using the FL120 permit load and values of average daily truck traffic (ADTT) are not well known, a single load factor is specified for the FL120 permit load rating at both Strength and Service limit states, when applicable.

6A.4.5.4.2a Routine (Annual) Permits

Delete the entire section.

C6A.4.5.4.2a

Delete the commentary.

6A.4.5.4.2b Special (Limited-Crossing) Permits

Add the following:

Consultant performing special permit load rating shall follow the MBE requirements, unless otherwise specified in writing by the Office of Maintenance.

6A.4.5.4.2c Permit Checks Using Refined Analysis

Add the following:

Special permit load ratings using refined analysis shall be performed in accordance with the MBE requirements and with the written approval of the Office of Maintenance.

6A.5 Concrete Structures

6A.5.2 Materials

6A.5.2.1 Concrete

Add the following:

Concrete modulus of elasticity shall be calculated as described in SDG 1.4.1.

Replace Table 6A.5.2.1-1 with the following:

FDOT Table 6A.5.2.2-1 Minimum Compressive Strength of Concrete by Year of Specification

Year of Specification	Compressive Strength, f_c', (ksi)
Prior to 1959	2.5
Between 1959 and 1973	3.0 (RC Deck)
	5.0 (Prestressed Beam)
1974 and Later	3.4 (RC Deck)
	5.0 (Prestressed Beam)

6A.5.2.2 Reinforcing Steel

Replace Table 6A.5.2.2-1 with the following:

FDOT Table 6A.5.2.2-1 Yield Strength of Reinforcing Steel

Type of Reinforcing Steel	Yield Strength, f_y, ksi
Unknown steel constructed prior to 1954	33.0
Billet or intermediate grade, Grade 40 and unknown steel constructed between 1954 and 1972	40.0
Unknown steel constructed after 1972	60.0
Structural grade	36.0
Rail or hard grade, Grade 50	50.0
Grade 60	60.0

6A.5.4 Limit States

6A.5.4.1 Design Load Rating

Add the following:

The stress limits given in FDOT Table 6A.5.4.1-1 shall be satisfied by all prestressed/post-tensioned concrete bridges.

FDOT Table 6A.5.4.1-1 Stress Limits for Prestressed/Post-Tensioned Concrete Bridges		
Condition	**Design Inventory**	**Design Operating, Legal and FL120 Permit**
Compressive Stress – All Bridges (Longitudinal or Transverse) Compressive stress under effective prestress, permanent loads, and transient loads (Allowable compressive stress shall be reduced according to AASHTO LRFD 5.9.4.2.1 when slenderness of flange or web is greater than 15)	$0.60f'_c$	$0.60f'_c$
Longitudinal Tensile Stress in Precompressed Tensile Zone – All bridge types excluding segmental bridges For components, with bonded prestressing tendons or reinforcement that are subject to not worse than:		
(a) extremely aggressive corrosion environment	$3\sqrt{f'_c}$ psi	$7.5\sqrt{f'_c}$ psi
(b) slightly or moderately aggressive corrosion environments	$6\sqrt{f'_c}$ psi	$7.5\sqrt{f'_c}$ psi
For components with unbonded prestressing tendons	No Tension	No Tension
Longitudinal Tensile Stress in Precompressed Tensile Zone - Segmental Box Girder Bridges For components, with bonded prestressing tendons or reinforcement that are subject to not worse than:		
(a) extremely aggressive corrosion environment	$3\sqrt{f'_c}$ psi	$3\sqrt{f'_c}$ psi
(b) slightly or moderately aggressive corrosion environments	$6\sqrt{f'_c}$ psi	$6\sqrt{f'_c}$ psi
For components with unbonded prestressing tendons (Type A joints)	No Tension	No Tension
For components with Type B joints (dry joints, no epoxy)	100 psi min. compression	No Tension
Tensile Stress in Other Areas - Segmental Box Girder Bridges		
Areas without bonded reinforcement	No tension	No tension
Areas with bonded reinforcement sufficient to carry the tensile force in the concrete calculated on the assumption of an uncracked section is provided at a stress of $0.5f_y$ (< 30 ksi)	$6\sqrt{f'_c}$ psi	$6\sqrt{f'_c}$ psi
Transverse Tension, Bonded Post-Tensioned Deck Slabs Tension in the transverse direction in the precompressed tensile zone calculated on the basis of an uncracked section (i.e. top prestressed slab) for:		
(a) extremely aggressive corrosion environment	$3\sqrt{f'_c}$ psi	$6\sqrt{f'_c}$ psi
(b) slightly or moderately aggressive corrosion environments	$6\sqrt{f'_c}$ psi	$6\sqrt{f'_c}$ psi
Principal Tensile Stress at Neutral Axis in Webs (Service III) – Segmental Box Girder Bridges All types of segmental construction with internal and/or external tendons:	$3.5\sqrt{f'_c}$ psi tension	$3.5\sqrt{f'_c}$ psi tension

6A.5.4.2 Legal Load Rating and Permit Load Rating

6A.5.4.2.2a Legal Load Rating

Replace with the following:

Legal load rating of bridges is based on satisfying Strength and Service limit states as shown in FDOT Table 6A.4.2.2-1.

6A.5.4.2.2b Permit Load Rating

Add the following:

FL120 permit load rating of bridges is based on satisfying Strength and Service limit states as shown in FDOT Table 6A.4.2.2-1.

6A.5.6 Minimum Reinforcement

Add the following:

See SDG 4.1.5 for additional requirements on minimum reinforcement.

6A.5.8 Evaluation for Shear

Replace with the following:

The shear capacity shall be calculated using the area of stirrup intersected by the distance of $0.5d_v\cot\Theta$ on each side of the section under consideration, as described in LRFD Figure C5.8.3.2-2.

C6A.5.8

Add the following:

LRFD Section C5.8.3.2 proposes various approaches on determining shear capacity of the concrete sections. The traditional approach typically determines the uniform required stirrup spacing at discrete locations along the member. The stirrups are then detailed such that this spacing is not exceeded over a length of the beam extending from the design section to the next design section out into the span. Another approach is to determine a simplified section by extending the required stirrup spacing for a distance of $0.5d_v\cot\Theta$ toward each side, for the applied load acting at or above the mid-depth of the member. In line with these approaches, some commercially available load rating analysis software allows calculating the shear capacity based on the number of stirrups crossing the potential shear failure plane.

LRFD Section 5.8.3.4 gives two methods on evaluating shear resistance. The “general procedure” given in LRFD 5.8.3.4.2 either directly calculates the shear parameters or uses the tabularized values. The “simplified procedure”, as described in LRFD Section 5.8.3.4.3, is applicable when there is no net axial tensile load and at least the minimum shear reinforcement is provided. Use of the latter method in conjunction with considering the stirrups crossing the shear failure plane may dramatically affect the shear ratings. In the case of heavily debonded strands for significant distances, the shear ratings may even be more unconservative. Therefore, the simplified procedure should be used with caution and the results be

verified with hand calculations. FDOT prefers the general procedure.

Overall, the engineer should have a good understanding of each approach and be able to determine the level of conservatism of each approach depending on specific project needs. However, more conservative methods should be used first to see if favorable results are attainable. If not, the engineer may utilize the less conservative methods for the items not meeting the first attempt, provided that the results/outputs are supported with independent calculations.

6A.5.10 Temperature, Creep, and Shrinkage Effects

Add the following:

The load factors given in FDOT Table 6A.4.2.2-1 for uniform temperature (TU), creep (CR), shrinkage (SH), and temperature gradient (TG) effects shall apply, where specified.

6A.5.11 Rating of Segmental Concrete Bridges

6A.5.11.2 General Rating Requirements

Add the following:

Six features of concrete segmental bridges are to be load rated at both inventory and operating levels. Three of these criteria are at the Service limit state and three at the Strength limit state, as follows:

At the Service limit state:

- Longitudinal Box Girder Flexure
- Transverse Top Slab Flexure
- Principle Web Tension

At the Strength limit state:

- Longitudinal Box Girder Flexure
- Transverse Top Slab Flexure
- Web Shear

In accordance with MBE Equation 6A.4.2.1-1, the general load rating factor, RF, shall be determined according to the formula given below:

$$\mathrm{RF} = [\mathrm{C} - \gamma_{\mathrm{DC}}\mathrm{DC} - \gamma_{\mathrm{DW}}\mathrm{DW} \pm \gamma_{\mathrm{EL}}(\mathrm{P} + \mathrm{EL}) - \gamma_{\mathrm{FR}}\mathrm{FR} - \gamma_{\mathrm{CR}}(\mathrm{TU} + \mathrm{CR} + \mathrm{SH}) - \gamma_{\mathrm{TG}}\mathrm{TG}] \div \gamma_{\mathrm{L}}(\mathrm{LL} + \mathrm{IM})$$

where:

for Strength limit states:

C = Capacity = $(\varphi_c * \varphi_s * \varphi) * R_n$

φ_c : Condition Factor per Article 6A.4.2.3

φ_s : System Factor per MBE 6A.5.11.6

φ : Strength Reduction Factor per LRFD

R_n : Nominal member resistance as inspected, measured and calculated according to LRFD

for Service limit states:

C = f_R = Allowable stress at the Service limit state (FDOT Table 6A.5.4.1-1).

6A.6 Steel Structures

6A.6.4 Limit States

6A.6.4.1 Design Load Rating

Replace the second paragraph with the following:

Bridges shall not be rated for fatigue. If the fatigue crack growth is anticipated, Section 7 of the MBE can be used to estimate the remaining fatigue life.

C6A.6.4.1

Add the following:

The estimate of the remaining fatigue life of Section 7 of the MBE requires a historical record of past truck traffic in terms of ADTT and projected future traffic. Many times, conservative recreation and projection of traffic volumes produces a worst case scenario which results in low remaining fatigue lives or totally exhausted fatigue lives. As fatigue life estimates are based upon statistical evaluation of laboratory tests, different levels of confidence are presented in Section 7 of the MBE. The minimum expected fatigue life, the evaluation fatigue life and the mean fatigue life are based upon approximately 98%, 85% and 50% probabilities of cracking, respectively. Judgment must be used in evaluating the results of the fatigue-life estimates.

6A.6.13 Fracture-Critical Members (FCMs)

As with all other steel members, the appropriate system factors of FDOT Tables 6A.4.2.4-1 or 6A.4.2.4-3 shall be applied in the ratings of FCMs.

Steel members which are traditionally classified as FCMs may be declassified through analysis if the material satisfies the LRFD Table 6.6.2-2, Charpy V-notch impact energy requirements.

After the approval of an exception based upon an approved refined analysis demonstrating that the bridge with the fractured member can continue to carry a significant portion of the design load, the member may be declassified and treated as a redundant member (see MBE Section C6A.4.2.4). After declassification, the member may be rated using a system factor of 1.0.

C6A.6.13

Only FCMs which are fabricated from material meeting the FCM fracture-toughness requirements are candidates for declassification. Newer bridges designed, fabricated and constructed since the concept of FCMs was introduced should meet this material requirement.

The demonstration of non-fracture criticality must include an analysis of the damaged bridge with the member in question fractured and a corresponding dynamic load representing the energy release of the fracture. Acceptable remaining load carrying capacity may be considered equal to the full factored load of the Strength I load combination associated with the number of striped lanes.

6A.8 Posting of Bridges

Posting of weight restrictions on bridges shall follow the procedures given in Section 7 of this Manual.

6A.8.2 Posting Loads

Replace the AASHTO legal loads with the Florida legal loads as defined in Section 6A.4.4.2 and in accordance with Section 6A.4.4.1.

6A.8.3 Posting Analysis

Replace with the following:

The safe posting load shall be taken as the weight in tons for each Florida legal load multiplied by the corresponding rating factor. A Bridge Owner may close a structure at any posting threshold, but bridges with an operating rating less than 3 tons for any Florida legal load must be closed.

Appendix A6A – Load and Resistance Factor Rating Flow Chart

Replace the flowchart with FDOT Figure 2-1.

Appendix B6A – Limit States and Load Factors for Load Rating

Delete all three tables and use FDOT Table 6A.4.2.2-1.

Appendix D6A – AASHTO Legal Loads

Delete Section (a) and use the Florida legal loads defined in Article 6A.4.4.2.1.

Appendix J6A – Step-by-Step Supplement for Rating of Segmental Concrete Box Girder Bridges

J6A.1 - Load Factors and Load Combinations

Load factors and load combinations for the Strength and Service limit states shall be made in accordance with FDOT Table 6A.4.2.2-1. Load factors for permanent (e.g. dead) loads and transient (e.g. temperature) loads are provided. Note: One-half thermal gradient (0.5TG) is used only for longitudinal Service III Inventory conditions.

Strength I & II and Service I & III limit states are used in the context of their definitions as given in FDOT Table 6A.4.2.2 summarizing:

Strength I - applies to design load rating (inventory and operating) and legal load rating.

Strength II - applies only to permit loads.

Service I - applies primarily for concrete in compression but is also to prevent yield of tension face reinforcement or prestress under overloads (permits). This limit state is extended to concrete tension in transversely prestressed deck slabs, typical of most segmental bridges.

Service III - applies to concrete in longitudinal tension and principal tension. Load factors for Service III for design operating, legal, and permit load ratings have been selected in conjunction with either higher allowable tensile stress or use of the number of striped lanes.

The following is a detailed checklist of the load applications, combinations and circumstances necessary to satisfy FDOT and AASHTO LRFR ratings.

J6A.2 – Design Load Rating - Inventory

Transverse:

- Apply HL93 Truck or Tandem (FDOT Table 6A.4.2.2-1).
- Do not apply uniform lane load.
- Apply same axle loads in each lane if multiple lane loading applies.
- Apply Dynamic Load Allowance, IM = 1.33 on Truck or Tandem.
- For both Strength and Service limit states, use number of load lanes per LRFD.
- Apply multi-presence factor: one lane, m = 1.20; two lanes, m = 1.00; three, m = 0.85; four or more, m = 0.65.
- Place loads in full available width as necessary to create maximum effects.
- Apply pedestrian live load as necessary (counts as one lane for “m”).
- Apply no Thermal Gradient transversely.
- Use Service I limit state with live load factor, γ_L = 1.00 and limit concrete transverse flexural stresses to values in FDOT Table 6A.5.4.1-1. (Note: γ_L = 1.00 as AASHTO LRFR).
- For Strength I limit state, use live load factor, γ_L = 1.75.

Longitudinal:

- Apply HL93 Truck or Tandem, including 0.64 kip/ft uniform lane load (FDOT Table 6A.4.2.2-1).
- Apply same load in each lane.
- Apply Dynamic Load Allowance, IM = 1.33 on Truck or Tandem only.
- For both Strength and Service limit states, use number of load lanes per LRFD.
- Apply multi-presence factor: one lane, m =1.2; two lanes, m = 1.00; three, m = 0.85; four or more, m = 0.65.
- For negative moment regions: apply 90% of the effect of two design trucks of 72 kip GVW placed in adjacent spans and spaced a minimum of 50 feet apart between the leading axle of one and the trailing axle of the other, plus 90% of uniform lane load.
- Place loads in full available width as necessary to create maximum effects.
- Apply pedestrian live load as necessary (counts as one lane for "m").
- For thermal gradient, apply 0.5 TG with live load for Service but zero TG for Strength.
- Use Service III limit state with live load factor, γ_L = 0.80 and limit longitudinal tensile stress to values in FDOT Table 6A.5.4.1-1.
- For Strength I limit state, use live load factor, γ_L = 1.75

J6A.3 – Design Load Rating - Operating

Transverse:

- Apply one HL93 Truck or Tandem per lane (FDOT Table 6A.4.2.2-1).
- Do not apply uniform lane load.
- Apply same axle loads in each lane if multiple lane loading applies.
- Apply Dynamic Load Allowance, IM = 1.33 on Truck or Tandem.
- For both Strength and Service limit states, use number of load lanes per LRFD.
- Apply multi-presence factor: one and two lanes, m = 1.0; three, m = 0.85; four or more, m = 0.65. (Maximum limit of 1.0 applies because this is a rating for specific (defined) axle loads, not notional loads or rogue vehicles).
- Place loads in full available width as necessary to create maximum effects.
- Apply pedestrian live load as necessary (counts as one lane for "m").
- Apply no thermal gradient transversely.
- Use Service I limit state with live load factor, γ_L = 1.00 and limit concrete transverse flexural stresses to values in FDOT Table 6A.5.4.1-1.
- For Strength I limit state, use live load factor, γ_L = 1.35.

Longitudinal:

- Apply HL93 Truck or Tandem, including 0.64 kip/ft uniform lane load (FDOT Table 6A.4.2.2-1).
- Apply same load in each lane.
- Apply Dynamic Load Allowance, IM = 1.33 on Truck or Tandem only.
- For the Strength limit state, use number of load lanes per LRFD.
- For the Service limit state, use the number of striped lanes.
- Place loads in full available width as necessary to create maximum effects (for example, in shoulders).
- Multi-presence factor: HL93 design load (including uniform lane load) one lane, m = 1.20; two lanes, m = 1.00; three, m = 0.85; four or more, m = 0.65. (The maximum value of 1.20 for one lane is necessary because the load is a notional load with a uniform lane load component).
- For negative moment regions, apply 90% of the effect of two design trucks of 72 kip GVW placed in adjacent spans and each spaced a minimum of 50 feet apart between the leading axle of one and the trailing axle of the other, plus 90% of 0.64 kip/ft uniform lane load.
- Apply pedestrian live load as necessary (counts as one lane for "m").
- Apply no thermal gradient.
- Use Service III limit state, use live load factor γ_L = 1.0, striped lanes, and limit concrete longitudinal flexural tensile and principal tensile stresses to values in FDOT Table 6A.5.4.1-1.
- For Strength I limit state use live load factor, γ_L = 1.35.

J6A.4 – Legal Load Rating

Longitudinal:

- Apply FDOT legal load trucks SU4, C5, and ST5 (FDOT Table 6A.4.2.2-1).
- Apply same truck load in each lane using only one truck per lane (i.e. do not mix trucks).
- Apply no uniform lane load.
- Apply Dynamic Load Allowance, IM = 1.33 on legal trucks.
- For the Strength limit state, use number of load lanes per LRFD.
- For Service limit states, use number of striped lanes.
- Place loads in full available width as necessary to create maximum effects (i.e., in shoulders).
- Use multi-presence factor: one and two lanes, m = 1.00; three, m = 0.85; four or more, m = 0.65.
- Apply no pedestrian live load (unless very specifically necessary for the site - in which case it counts as one lane for establishing “m”).
- Apply no thermal gradient.
- Use Service III limit state, use live load factor, γ_L = 1.0, striped lanes, and limit concrete longitudinal flexural tensile and principal tensile stresses to values in FDOT Table 6A.5.4.1-1.
- For Strength I limit state, use live load factor, γ_L = 1.35.

J6A.5 – FL120 Permit Load Rating

Longitudinal, annual “blanket” permits:

- Apply FL120 permit load, as described Section 6A.4.5.4, in all lanes (FDOT Table 6A.4.2.2-1).
- For the Strength limit state, use number of load lanes per LRFD.
- Place loads in full available width as necessary to create maximum effects (for example, in shoulders).
- Use multi-presence factor: one and two lanes, m = 1.00; three, m = 0.85; four or more, m = 0.65.
- Dynamic Load Allowance, IM = 1.33 on axle loads.
- Apply no pedestrian live load (unless very specifically necessary for the site - in which case it counts as one lane for establishing “m”).
- Apply no thermal gradient.
- Use Service III limit state, use live load factor γ_L = 0.9, striped lanes, and limit concrete longitudinal flexural tensile and principal tensile stresses to values in FDOT Table 6A.5.4.1-1 as appropriate.
- For Strength II limit state, use live load factor, γ_L = 1.35.
- Reduced Dynamic Load Allowance (IM) may be considered only to avoid restrictions.

J6A.6 – Capacity – Strength Limit State

The capacity of a section in transverse and longitudinal flexure may be determined by using any of the relevant formulae or methods in the LRFD Specifications, or AASHTO Guide Specification for Segmental Bridges dated 1999, including more rigorous analysis techniques involving strain compatibility. The latter should be used in particular where the capacity depends upon a combination of both internal (bonded) and external (unbonded) tendons.

For load rating, the capacity should be determined based upon actual rather than specified or assumed material strengths and characteristics. Concrete strength should be found from records or verified by suitable tests. If no data is available, the specified design strength may be assumed and appropriately increased for maturity. All new designs will assume the plan specified concrete properties. Post construction will include updated concrete properties.

In particular, for shear or combined shear with torsion, the capacity at the Strength limit state for segmental bridges should be calculated according to the AASHTO Guide Specification for Segmental Bridges. The “Modified Compression Field Theory” of LRFD may be used as an alternative, but only for structures with continuously bonded reinforcement (e.g. large boxes cast-in-place in cantilever or on false-work).

J6A.7 – Allowable Stress Limits – Service Limit State

Allowable stresses for the Service limit state are given in FDOT Table 6A.5.4.1-1. The intent is to ensure a minimum level of durability for FDOT bridges that avoids the development or propagation of cracks or the potential breach of corrosion protection afforded to post-tensioning tendons. Also, these are recommended for the purpose of designing new bridges.

J6A.7.1 – Longitudinal Tension in Joints

Type "A" Joints with Minimum Bonded Reinforcement

The Service level tensile stress is limited to $3\sqrt{f'_c}$ or $6\sqrt{f'_c}$ (psi) for cast-in-place joints with continuous longitudinal mild steel reinforcing for design inventory rating. (Reference: AASHTO Guide Specification for Segmental Bridges and LRFD Table 5.9.4.2.2-1). Reduced reliability at design operating, legal and permit conditions is attained by using the number of striped lanes and by allowing an increase in tensile stress to $7.5\sqrt{f'_c}$ (psi) (FDOT Table 6A.5.4.1-1).

Type "A" Epoxy Joints with Discontinuous Reinforcement

The Service level tensile stress is limited to zero tension for epoxy joints for design inventory, design operating, Legal, and Permit ratings. (Reference: AASHTO Guide Specification for Segmental Bridges and LRFD Table 5.9.4.2.2-1). Reduced reliability is attained by using the number of striped lanes.

Type "B" Dry Joints

Early precast segmental bridges with external tendons and non-epoxy filled, Type-B (dry) joints were designed to zero longitudinal tensile stress. In 1989, a requirement for 200 psi residual compression was introduced with the first edition of the AASHTO Guide Specification for Segmental Bridges. This was subsequently revised in 1998 to 100 psi compression. Service level design inventory ratings shall be based on a residual compression of 100 psi for dry joints. For design operating, legal, and permit ratings, the limit is zero tension. (Reference: AASHTO Guide Specification for Segmental Bridges and LRFD Table 5.9.4.2.2-1). Reduced reliability is attained by using the number of striped lanes.

J6A.7.2 – Transverse Tensile Stress

For a transversely prestressed deck slab, the allowable flexural stresses for concrete tension are provided in FDOT Table 6A.5.4.1-1; namely, for inventory $3\sqrt{f'_c}$ or $6\sqrt{f'_c}$ (psi) and for operating $3\sqrt{f'_c}$ (psi).

J6A.7.3 – Principal Tensile Stress – Service Limit State

A check of the principal tensile stress has been introduced to verify the adequacy of webs for longitudinal shear at service. This is to be applied to both for the design of new bridges and load rating. The verification, made at the neutral axis, is the recommended minimum prescribed procedure, as follows:

Sections should be considered only at locations greater than "H/2" from the edge of the bearing surface or face of diaphragm, where classical beam theory applies: i.e. away from discontinuity regions. In general, verification at the elevation of the neutral axis may be made without regard to any local transverse flexural stress in the web itself given that in most large, well-proportioned boxes the maximum web shear force and local web flexure are mutually exclusive load cases. This is a convenient simplification. However, should the neutral axis lie in a part of the web locally thickened by fillets, then the check should be made at the most critical elevation, taking into account any coexistent longitudinal flexural stress. Also, if the neutral axis (or critical elevation) lies within 1 duct diameter of the top or bottom of an internal, grouted duct, the web width for calculating stresses should be reduced by half the duct diameter.

Calculate principle tension without the effect of thermal gradient.

Classical beam theory and Mohr's circle for stress should be used to determine shear and principal tensile stresses. At the Service limit state, the shear stress and principal tensile stress should be determined at the neutral axis (or critical elevation) under the long-term residual axial force, maximum shear and/or maximum shear force combined with shear from torsion in the highest loaded web, using the live load factor shown in FDOT Table 6A.4.2.2-1. The live load should then be increased in magnitude so the shear stress in the highest loaded web increases until the principal tensile stress reaches its allowable maximum value (FDOT Table 6A.5.4.1-1).

The Service limit state rating factor is the ratio between the live load shear stress required to induce the maximum principal tensile stress to that induced by the live load factor shown in FDOT Table 6A.4.2.2-1.

J6A.8 - Local Details

Local details (i.e. diaphragms, anchorage zones, blisters, deviation saddles, etc.) in concrete segmental bridges are discussed in Chapter 4 of Volume 10A Load Rating Post-tensioned Concrete Segmental Bridges. If a detail shows signs of distress (cracks), a structural evaluation should be performed for the Strength limit state. The influence of anchorage zones shall be checked for principal tension in accordance with Structure Design Guidelines Section 4.5.11.

Part B – Allowable Stress Rating and Load Factor Rating

6B.1 General

Add the following:

Use the most current edition of the AASHTO Standard Specifications for Highway Bridges with the allowable stresses shown in FDOT Table 6A.5.4.1-1.

6B.1.1 Application of Standard Design Specifications

Add the following:

When using the AASHTO Standard Specifications for Highway Bridges, follow explicitly the guidance in the Specifications. All deviations from the Specifications require approval by the Department.

6B.2 Rating Levels

6B.2.2 Operating Rating Level

Add the following:

Bridges that do not have a minimum rating factor of 1.4 at the operating level shall be load rated for the SU4, C5, and ST5 legal loads to establish the potential need for load posting or strengthening. The results are also suitable for NBI and BMS reporting.

If the SU4 or C5 or ST5 legal load rating factors are less than 1.0, ratings shall be required for SU2, SU3, C3 and C4.

At the discretion of the districts, any or all of the Florida legal loads may be required for load rating.

C6B.2.2

In determining when a structure should have Florida legal loads evaluated, FDOT has determined that a structure with an inventory rating of 1.0 would perform satisfactorily for all Florida legal loads. This rating factor in some bridge types was overly conservative, while for others it was critical. It was decided instead to look at the operating rating. Due to differences in the limit states and the corresponding load factors, the approximate level that needs to be achieved to safely pass all Florida legal loads was determined to be 1.4. This rating factor accounts for those differences and for the possibility that some shorter wheel based vehicles could exceed the effects of the design loads.

6B.5 Nominal Capacity: C

6B.5.3.2 Reinforced Concrete

Replace the table with the FDOT Table 6A.5.2.2-1

6B.6 Loadings

Add the following:

Tables showing the maximum live load moments and shears are given in Appendix B of this Manual.

C6B.6

The tabulated values are those produced by the vehicular live loads as described in this Manual. These tables have been primarily developed to provide guidance and ballpark figures to the engineer. However, the engineer should do the necessary verifications when using the tables.

6B.6.2 Rating Live Load

Add the following:

Design Load: HS20-44 loading as defined in the AASHTO Standard Specifications.

Bridges on Interstate highways shall be load rated for HS20-44 loading or an Alternate Military Loading of two axles 4 feet apart with each axle weighing 24 kips, whichever produces the greatest stress.

Legal Loads: Florida Legal Loads (SU4, C5, and ST5, see 6A.4.4.2.1 for vehicle configurations).

Additional Florida Legal Loads: SU2, SU3, C3, and C4, see 6A.4.4.2.1 for vehicle configurations.

For spans, over 200 feet in length, the selected legal load shall be spaced with 30 feet clear distance between vehicles heading in the same direction to simulate a train of vehicles in one lane. If the SU4 or C5 or ST5 legal load rating factors are less than 1.0, ratings shall be required for SU2, SU3, C3 and C4.

At the discretion of the districts, any or all of the Florida legal loads may be required for load rating. For all span lengths, assume the same legal loads are in each loaded lane; do not mix trucks.

6B.7 Posting of Bridges

6B.7.2 Posting Loads

Replace the AASHTO legal loads with the Florida legal loads as defined in Section 6A.4.4.2 and in accordance with Section 6A.4.4.1.

6B.8 Permits

Replace with the following:

Consultants performing special permit load ratings shall follow the MBE requirements, unless otherwise specified in writing by the Office of Maintenance.

7 Posting of Bridges and Posting Avoidance

7.1 General

All bridges shall be posted, if required, within 30 days after receipt of official posting notification from the Department. Before weight limit posting is recommended, posting avoidance strategies shall be discussed and approved by the Department and may require additional analysis.

When temporary bridging such as Acrow is opened to traffic at a site, the District Structures Maintenance Engineer or his/her designee shall ensure that signs are installed to restrict permitted overweight vehicles unless the bridge has been specifically designed to allow higher loads than legal. The signs should state “Legal Weight Only”.

7.2 Procedures for Posting of Weight Restrictions on Department Maintained Bridges

If load rating calculations indicate that any of the Florida legal loads, as defined in Section 6A.4.4 of this Manual, have an operating rating factor less than 1.0, then the bridge must be posted for weight. A load test may be performed to determine if the actual stress levels induced by the Florida legal loads exceed the stress limits at the operating level.

When weight restrictions on the Department maintained bridges are required, the following procedure shall be followed:

a) To initiate weight limit restrictions, the recommendations shall be developed by the District Structures Maintenance Engineer and endorsed by the District Maintenance Engineer.

b) The request for weight limit restrictions, load rating calculations, the Load Rating Summary Form, computer program output or load test results and sign configuration are to be submitted to the State Structures Maintenance Engineer for processing through the Director of the Office of Maintenance to the Secretary of the Department of Transportation for approval. The recommendations should be accompanied by the following:

    1. Explanation of the cause of the low rating.
    2. Proposed repair procedure and duration of the repair, if applicable.
    3. Possibility of performing the repairs or strengthening by state resources instead of contract.
    4. Cost of the repair, if applicable.
    5. If the bridge is scheduled for rehabilitation or replacement. If so, when.
    6. Anticipated effects of posting the bridge on local

traffic and emergency vehicles, including detour routes for affected vehicles.

c) Upon approval of the weight limit restrictions, the District Traffic Operations Engineer and the State Load Rating Engineer shall be sent a copy of these restrictions. The District Traffic Operations Office shall notify the appropriate local governments that a weight limit regulation has been approved.

d) The request for removal of weight limit restrictions shall be initiated by the District Structures Maintenance Engineer with the District Maintenance Engineer's approval. This request shall indicate that the bridge has adequate legal load capacity. This request shall be sent to the State Structures Maintenance Engineer for review. Before processing the request, the Office of Maintenance may perform a review of the load rating. Lifting of the weight limit restrictions must have the approval of the Secretary of the Department of Transportation, prior to removal of the posting signs.

e) If the bridge is permanently taken out of service, then the District Structures Maintenance Engineer must notify the State Structures Maintenance Engineer in writing of this occurrence so that the Office of Maintenance removes the bridge from the list of posted bridges.

f) Weight limits to be shown on the posting signs at a bridge site shall represent the gross vehicle weight limit (GVW) in tons for a maximum of three truck types. The three truck types are as follows:

1. Single unit trucks: SU2, SU3 or SU4
2. Combination trucks with a single trailer: C3, C4 or C5
3. Combination trucks with two trailers or a single unit truck with one trailer: ST5

g) The following are the requirements for weight limit signs:

1. The location and construction of the weight limit signs shall be in accordance with the FDOT Design Standards, Index No. 17357.

2. After approval of the weight limit restrictions by the Secretary of the Department of Transportation, the District Maintenance Engineer shall solicit the recommendations of the District Traffic Operations Engineer for sign location and design.

3. After receiving the District Traffic Operations Engineer's recommendations, the District Maintenance Engineer shall order the signs from the Lake City Sign Shop and request immediate installation of the signs upon delivery.

h) In case of bona fide emergencies, the District Maintenance Engineer shall take the necessary steps to protect public safety. Corrective action may be initiated while seeking approval for the weight limit posting. Such action may consist of restricting the traffic to certain lanes or posting the bridge for no trucks or only trucks below a specified gross weight, while analysis and/or repairs are performed and the official request is prepared and sent to the State Structures Maintenance Engineer.

The bridge file shall contain all pertinent information regarding posting and removal of posting actions.

7.3 Procedures for Posting of Weight Restrictions on Local Government Bridges

Local government agencies are responsible for load posting of their bridges. The Department, or its consultant, may load rate local government bridges. When local government bridges require weight restrictions, the following procedure shall be followed:

a) The Department, or its consultant, will develop recommendations for weight restrictions and notify the Department's local government bridge inspection project manager.

b) The project manager will send the recommendations for weight restrictions to the local government agency. The agency will be required to perform the necessary actions to post the bridge. The agency shall notify the Department that the bridge has been posted accordingly.

c) If the required postings are not acted upon by the local agency within 30 days after the notification, the Department shall post the bridge immediately in accordance with the recommended weight restrictions. All costs incurred by the Department shall be assessed to the agency.

d) The agency may elect to use their own resources or hire a consultant engineer to perform additional testing and/or analysis as described in Section 6 of this Manual. However, any additional analysis or testing shall not exempt the agency from taking the necessary steps to post the bridge within 30 days.

e) The Department shall be kept informed of all posting actions accomplished by the local government agencies. This should include copies of all calculations and testing results.

Weight limit signs shall be in accordance with the FDOT Design Standards, Index No. 17357. Exceptions to these requirements may be approved by the project manager on a

case by case basis.

7.4 Posting Avoidance

Posting avoidance is the application of engineering judgment to a load rating by modifying the specification defined procedures described herein.

The following methods of posting avoidance are presented in an approximate hierarchy judged to return the greatest benefit for the least cost or effort for Florida bridges. This hierarchy is not absolute and may change depending on the particular bridge being load rated. Posting avoidance techniques are to be used to avoid weight limit posting, when appropriate, to extend the useful life of a bridge until strengthening or replacement of the bridge is planned and executed.

Posting avoidance techniques shall not be used when load rating a new bridge or when making widening or rehabilitation decisions. Posting avoidance techniques require approval from the State Structures Maintenance Engineer. For bridges where the owner is a local government, concurrence from the bridge owner is required.

7.4.1 Dynamic Load Allowance for Improved Surface Conditions

Using field observations and engineering judgment for spans greater than 40 feet, the dynamic load allowance may be reduced if the following conditions exist:

Where the transitions from the bridge approaches to the bridge deck across the expansion joints are smooth and where there are minor surface imperfections or depressions on the bridge deck, the dynamic load allowance may be reduced to 20%.

Where there is a smooth riding surface on the bridge and where the transitions from the bridge approaches to the bridge deck across the expansion joints are smooth, the dynamic load allowance may be reduced to 10%. (An example of this would be a deck slab finished by grinding and grooving to remove irregularities and with no bumps or steps at expansion joints).

7.4.2 Approximate and Refined Methods of Analysis

When using an approximate method of structural analysis and the code defined live load distribution factors, a rating factor of 0.95 can be rounded up to 1.0.

Refined methods of structural analyses, as discussed in Section 6A.3.3, may be performed in order to establish an enhanced live load distribution and improved load rating.

7.4.3 Existing Bridges Designed before January 2005

If a bridge is required to be posted for Service III limit state and the current bridge inspection is showing no signs of either shear or flexural cracking, the safe load capacity for design load and legal loads can be established using Strength limit states.

7.4.4 Stiffness of Traffic Barrier

Barrier stiffness should be considered and appropriately included if necessary. Inclusion of the barriers acting compositely with the deck slab and beams should improve longitudinal load ratings. When barriers are considered in this manner, the difference in the modulus of elasticity of the lower strength barrier concrete relative to that of the deck slab and to that of the beams should be taken into account. The presence of joints in a barrier reduces the overall effective section at the joint to that of the deck slab plus beam. This may result in a local concentration of longitudinal stress that should be appropriately considered. Nevertheless, load ratings should benefit from reasonable consideration of barrier stiffness.

7.4.5 Reduced Structural (DC) Dead Load

A lower dead load factor may be considered in accordance with the following criteria. Under no circumstance should this load factor be less than 1.10. For the self-weight determined by:

a) Design plan or shop drawing dimensions and assumed average density for concrete, reinforcement and embedded items: $\gamma_{DC} = 1.25$.

b) As-built dimensions, deck slab thickness, build-up thickness, and concrete density determined from construction records, adjusted for weight of embedded reinforcing: $\gamma_{DC} = 1.15$.

c) Actual beam weights measured during construction: $\gamma_{DC} = 1.10$.

Cases (b) and (c) may only be used provided that neither additional structural component (DC) nor superimposed dead loads (DW) have been added whose weight cannot be accurately ascertained.

In using either (a) or (b) above, and when it is known that the original design was based on an assumed density for normal concrete and that a check or investigation can verify that a bridge has been constructed with Florida Limerock, then the unit weight may be reduced to 138 lbs per cubic foot for the concrete plus an allowance for the weight of steel.

7.4.6 Segmental Concrete Box Girder Bridges - Shear Capacity

When calculated in accordance with the AASHTO LRFD 5.8.6, the shear capacity at the Strength limit state, is based upon an assumed crack angle of 45 degrees, and may lead to an unsatisfactory load rating. The assumed angle of crack may be reconsidered using variable crack angle and the capacity may be recalculated.

7.4.7 Segmental Concrete Box Girder Bridges – Longitudinal Tension in Epoxy Joints

The AASHTO Guide Specification for Segmental Bridges and LRFD limit longitudinal tensile stresses to zero at epoxy match-cast joints under Service level conditions. The ability of the epoxy joint to accept tension is not considered. However, in properly prepared epoxy joints the bond usually exceeds the tensile strength of the concrete. Consequently, for posting avoidance, tensile stresses may be accepted as a function of the location and quality of the epoxy joint:

- For top fiber stresses on the roadway surface: no tension is permitted for all load rating calculations.
- For bottom fiber stresses:
  a) Allow 200 psi tension at good quality epoxy joints (i.e. no leaks and fully sealed).
  b) No tension allowed for poor quality epoxy joints (i.e. leaky or not filled, gaps).

7.4.8 Segmental Concrete Box Girder Bridges – Principal Tensile Stress

If the load rating based upon the limiting principal tensile stress at the neutral axis of the critical web is not satisfactory, the rating factor for legal load with regard to principal tension may be taken as 1.0 providing that:

a) There is no visible evidence of any representative cracking in the webs.
b) The capacity is satisfactory under the required Strength limit state.

However, if during field inspection, cracks are discovered at or near a critical section where, by calculation, the principal tensile stress is found to be less than the allowable, then further study is recommended to determine the origin of the cracks and their significance to normal use of the structure. A check should be made for any significant out of plane flexural web stress that might lead to a high local tension when combined with other effects. A check should be made for local stress distribution from applied concentrated forces, such as at certain types or

C7.4.6

Use of variable crack angle for shear capacity calculations is described in Appendix B of “New Directions for Florida Post-Tensioning Bridges, Volume 10A – Load Rating Post-Tensioned Concrete Segmental Bridges”.

arrangements of anchorage blisters, or eccentric forces. If possible, a check should be made of construction records to determine if there was any change of construction, temporary loads or support reactions that may have induced a significant but temporary local affect.

8 Load Rating of Bridges Through Load Testing

8.1 General

The Department uses both diagnostic and proof testing as described in Section 8 of the MBE. When a load test has been performed on a structure, the load ratings determined by the load test should be entered in the database.

Analysis methods by their very nature represent engineering approximations of the stresses in a structure. Assumptions are made at every step of the analysis process. For example, a steel girder without shear connectors is assumed to act non-composite with the concrete deck. Experiments have shown that a girder without shear connectors will have a portion of the composite action of a girder with shear connectors. Stiffness provided to the deck by concrete barriers aids in distributing live load. The cumulative effects of these assumptions may result in actual safe load carrying capacity being significantly larger than that calculated by analysis. These conservative assumptions are generally good in that they provide a safe conservative approach and simplify the analysis. For some critical structures, it may be desirable to establish a higher safe load carrying capacity. The following types of structures are candidates for load testing:

a) Bridges that restrict the flow of overweight vehicles.
b) Bridges that are posted for weight restrictions.
c) Bridges that are difficult to analyze.
d) Bridges for which plans are not available.

8.2 Load Test Candidate

Periodically, the State Load Rating Engineer in coordination with the District Structures Maintenance Engineers will develop a list of candidate bridges for load testing. The following is the process for the development of the load test candidate list.

1. The District Structures Maintenance Engineer will develop a list of bridges for possible load testing.
2. The District Structures Maintenance Engineer should assign a priority order to this list and submit the list to the State Load Rating Engineer who will compile a statewide list of bridges to be load tested, possibly adding bridges to the list considering routing and permitting requirements.
3. The State Load Rating Engineer will send the statewide list to the Structures Research Center.
4. The Structures Research Center will schedule the load tests with the Districts using the established priority ranking modified to reduce travel time from site-to-site.

It is anticipated that the Structures Research Center will perform a minimum of three (3) load tests each fiscal year. The Structures Research Center will send the load test report within 60 days of completion of the field load test to the District Structures Maintenance Engineer with copies to the State Load Rating Engineer. If it is anticipated that the evaluation requires more time due to the complexity of the analyses performed, the Structures Research Center will provide a written notification to the Office of Maintenance including the anticipated date of completion. The District Structures Maintenance Engineer will update the database based on the load test report within 14 days of receiving it.

8.3 Load Test Reports

Load tests shall be performed in conformance with the directions provided in the MBE. The Structures Research Center will verify that the load tested span(s) governs the load rating for the bridge. Results shall be obtained for both one lane loaded and two lanes loaded cases. If a load test is performed on a bridge having a twin structure, the Structures Research Center will state if the results apply to both structures. The load test report shall at a minimum contain the following information, determined from the load test or collected during the analysis phase of the load test:

a) Date of the load test performed.
b) Brief description of bridge and condition.
c) Controlling span and length.
d) Rating controlled by shear, positive moment, or negative moment or other.
e) Controlling element.
f) Impact factor or Dynamic Load Allowance.
g) Live load distribution factor.

h) Truck(s) used for the load test.
i) Number of trucks and their lateral and longitudinal locations.
j) General assumptions made.
k) Load test static or dynamic.
l) Available live load moment and shear.
m) Applied moment and shear.
n) Ratings for HS20 vehicle(s) as well as HL-93 loading, all Florida legal loads, and FL120 permit load.
o) Longitudinal location of controlling axle. For GFS (Girder – Floor Beam - Stringer) systems as well as for transversely post-tensioned bridge decks, transverse location of controlling axles.
p) Signature and seal of the professional engineer registered in the State of Florida responsible the load test.

Appendix A – Maximum Longitudinal Live Load Moments and Shears (LRFR)

Application of Live Load:

- Design Loads: HL-93 loading as defined in the AASHTO LRFD 2012.

- Florida Legal Loads: Assume the same legal load in each loaded lane. Do not mix trucks.

  - Positive moment:
    - Span length ≥ 200 ft, larger of the following:
      - the effect of one legal truck
      - the effect of one legal truck multiplied by 0.75, combined with the effect of the 200 plf lane load

    - Span length < 200 ft
      - the effect of one legal truck

  - Negative moment and reactions at interior supports:
    - For all span lengths, larger of the following:
      - the effect of one legal truck
      - the effect of two legal trucks multiplied by 0.75 heading in the same direction separated by 30 ft clear space, combined with the effect of the 200 plf lane load

- FL120 Permit Load: Assume the FL120 permit load in each loaded lane. Do not use mixed traffic.

  - Span length ≥ 200 ft,
    - the effect of one FL120 permit load combined with the effect of the 200 plf lane load

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LRFR)

Bridge			Positive Moment (kip-ft)									Negative Moment (kip-ft)									Shear (kip)								
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design
			SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93
1	10	10	83	83	77	73	92	73	92	177	114	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	43.5	42.1	38.3	29.3	46.3	29.3	46.3	70.9	56.4
1	15	15	176	148	135	110	163	110	163	266	205	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	53.9	46.6	41.5	31.4	50.4	34.6	50.4	75.7	62.4
1	20	20	269	213	194	146	235	153	235	355	301	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	61.4	51.5	47.9	34.8	59.5	37.2	52.4	92.2	66.3
1	30	30	477	377	351	243	440	264	380	625	506	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	72.0	57.6	55.9	38.3	68.9	39.9	58.4	109.9	75.6
1	40	40	708	543	530	354	659	388	526	997	728	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	77.2	66.5	59.9	40.0	73.6	47.9	66.7	122.4	86.2
1	50	50	940	798	709	466	878	571	732	1392	1033	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	80.4	71.8	67.0	41.1	76.5	53.2	72.8	129.8	93.9
1	60	60	1172	1062	888	579	1097	755	956	1788	1359	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	82.5	75.8	71.8	41.8	78.4	56.7	77.0	134.8	100.1
1	70	70	1404	1326	1095	691	1316	940	1196	2185	1701	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	84.0	80.2	75.2	42.3	79.7	59.3	79.9	138.3	105.4
1	80	80	1637	1591	1356	804	1535	1125	1437	2582	2060	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	85.2	83.5	77.8	42.6	80.7	61.2	82.1	141.0	110.2
1	90	90	1870	1857	1620	916	1754	1310	1678	2980	2434	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	86.1	86.0	79.8	42.9	81.5	62.7	83.8	143.0	114.6
1	100	100	2102	2122	1885	1029	1974	1496	1920	3378	2825	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	86.8	88.1	81.4	43.1	82.1	63.8	85.2	144.7	118.8
1	110	110	2335	2387	2149	1142	2193	1681	2162	3776	3232	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	87.3	89.7	82.7	43.3	82.6	64.8	86.3	146.1	122.8
1	120	120	2567	2653	2415	1255	2412	1867	2404	4174	3655	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	87.8	91.1	83.8	43.5	83.1	65.6	87.2	147.2	126.7
1	130	130	2800	2918	2680	1368	2632	2053	2647	4572	4095	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	88.2	92.3	84.7	43.6	83.4	66.3	88.0	148.1	130.5
1	140	140	3033	3184	2945	1481	2851	2239	2889	4971	4550	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	88.6	93.3	85.5	43.7	83.7	66.9	88.7	149.0	134.2
1	150	150	3265	3450	3211	1594	3070	2424	3132	5370	5021	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	88.9	94.2	86.2	43.8	84.0	67.4	89.3	149.7	137.8
1	160	160	3498	3716	3476	1707	3290	2610	3376	5769	5508	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	89.1	94.9	87.0	43.9	84.2	67.8	89.8	150.3	141.4
1	170	170	3730	3982	3741	1820	3509	2796	3619	6167	6011	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	89.4	95.6	88.1	44.0	84.5	68.2	90.2	150.8	144.9
1	180	180	3963	4247	4007	1932	3728	2982	3862	6566	6530	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	89.6	96.2	89.1	44.1	84.6	68.6	90.6	151.3	148.4
1	190	190	4196	4513	4273	2045	3948	3169	4105	6965	7065	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	89.8	96.7	90.0	44.1	84.8	68.9	91.0	151.8	151.9
1	200	200	4428	4779	4538	2158	4167	3355	4348	7364	7616	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	89.9	97.2	90.9	44.2	85.0	69.2	91.3	152.2	155.3
1	210	210	4661	5045	4804	2805	4392	3757	4591	8864	8183	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	90.1	97.7	91.6	54.2	85.1	73.1	91.6	173.5	158.7
1	220	220	4894	5311	5070	2998	4665	4004	4835	9370	8766	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	90.2	98.1	92.3	55.2	85.9	74.2	91.9	174.8	162.1
1	250	250	5756	6143	5962	3604	5511	4775	5735	10919	10613	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	92.9	99.3	95.5	58.3	89.1	77.7	94.4	178.6	172.2
1	300	300	7317	7827	7646	4716	7021	6160	7335	13600	14010	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	98.2	105.2	102.0	63.4	94.4	83.2	100.0	184.6	188.8
1	400	400	10812	11572	11389	7314	10417	9307	10911	19339	22004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	108.6	116.4	114.0	73.5	104.8	93.9	110.8	195.9	221.5
1	500	500	14808	15817	15634	10412	14313	12953	14988	25579	31598	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	118.9	127.0	125.1	83.6	115.0	104.3	121.3	206.6	254.0

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LRFR)

Bridge			Positive Moment (kip-ft)									Negative Moment (kip-ft)									Shear (kip)								
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design
			SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93
2	10	10	64	68	62	61	75	61	75	147	94	-58	-50	-46	-36	-61	-42	-46	-97	-66	47.3	44.7	40.6	29.3	49.1	29.3	49.1	70.9	60.4
2	15	15	137	119	109	91	131	91	131	221	165	-110	-89	-98	-65	-119	-65	-77	-203	-140	59.8	49.1	44.7	31.9	54.7	35.8	52.9	77.1	66.4
2	20	20	212	173	157	121	190	128	190	294	242	-155	-161	-131	-83	-156	-113	-146	-266	-195	66.2	55.0	50.8	36.1	63.3	38.7	54.6	98.3	70.2
2	30	30	383	302	282	201	352	216	310	513	409	-224	-281	-217	-141	-234	-200	-268	-373	-329	77.1	62.2	59.6	39.8	73.3	43.5	60.9	117.2	82.3
2	40	40	569	440	425	290	528	316	431	794	588	-474	-360	-331	-264	-461	-268	-349	-503	-480	81.9	72.1	63.9	41.5	77.7	51.6	70.5	130.2	94.1
2	50	50	758	635	570	381	706	457	597	1110	818	-685	-541	-415	-366	-649	-434	-492	-657	-626	84.6	77.5	72.2	42.4	80.2	57.3	77.2	137.5	102.5
2	60	60	949	844	717	473	886	603	778	1431	1077	-854	-809	-507	-453	-800	-616	-731	-827	-987	86.3	82.6	77.4	43.0	81.7	61.0	81.5	142.1	109.2
2	70	70	1140	1056	895	565	1066	751	968	1754	1351	-995	-1045	-769	-531	-928	-775	-950	-993	-1355	87.5	86.9	80.8	43.3	82.7	63.4	84.4	145.1	115.1
2	80	80	1332	1271	1087	658	1247	901	1161	2079	1639	-1118	-1251	-1013	-603	-1040	-915	-1142	-1156	-1691	88.3	89.9	83.3	43.6	83.4	65.1	86.4	147.3	120.4
2	90	90	1524	1487	1296	750	1428	1052	1356	2406	1939	-1229	-1432	-1274	-674	-1143	-1043	-1313	-1317	-2004	88.9	92.2	85.1	43.8	84.0	66.4	87.9	148.9	125.4
2	100	100	1717	1704	1508	844	1610	1204	1552	2734	2252	-1334	-1597	-1527	-761	-1239	-1161	-1469	-1477	-2313	89.4	93.9	86.5	44.0	84.4	67.4	89.1	150.2	130.1
2	110	110	1909	1922	1722	937	1791	1356	1750	3062	2578	-1463	-1749	-1759	-891	-1421	-1274	-1614	-1636	-2636	89.7	95.3	87.6	44.1	84.8	68.2	90.0	151.2	134.7
2	120	120	2102	2141	1937	1030	1973	1509	1948	3392	2916	-1679	-1893	-1975	-1024	-1626	-1383	-1750	-1794	-2973	90.1	96.4	88.5	44.2	85.1	68.8	90.8	152.0	139.2
2	130	130	2294	2359	2153	1124	2154	1662	2147	3721	3267	-1897	-2030	-2178	-1161	-1834	-1490	-1882	-1950	-3322	90.3	97.4	89.3	44.3	85.3	69.3	91.4	152.7	143.6
2	140	140	2487	2578	2369	1217	2336	1815	2346	4050	3629	-2117	-2163	-2370	-1301	-2044	-1648	-2010	-2107	-3686	90.5	98.1	90.9	44.4	85.5	69.7	91.9	153.3	148.0
2	150	150	2680	2797	2586	1311	2518	1969	2545	4380	4005	-2340	-2317	-2553	-1445	-2258	-1850	-2163	-2263	-4064	90.7	98.8	92.1	44.4	85.7	70.1	92.4	153.7	152.2
2	160	160	2872	3017	2804	1405	2700	2122	2745	4710	4393	-2567	-2579	-2731	-1594	-2473	-2053	-2410	-2419	-4456	90.9	99.3	93.2	44.5	85.8	70.4	92.7	154.2	156.5
2	170	170	3065	3236	3022	1498	2881	2276	2945	5040	4793	-2795	-2843	-2903	-1746	-2694	-2260	-2660	-2575	-4861	91.0	99.8	94.2	44.5	85.9	70.7	93.1	154.5	160.7
2	180	180	3258	3456	3240	1592	3063	2430	3146	5370	5205	-3029	-3110	-3072	-1904	-2918	-2471	-2911	-2731	-5281	91.2	100.2	95.0	44.6	86.0	70.9	93.3	154.8	164.9
2	190	190	3451	3676	3459	1686	3245	2584	3347	5700	5629	-3266	-3379	-3239	-2066	-3146	-2684	-3166	-2887	-5715	91.3	100.6	95.7	44.6	86.1	71.2	93.6	155.1	169.1
2	200	200	3644	3896	3678	1779	3427	2737	3549	6031	6066	-3507	-3651	-3404	-2232	-3378	-2902	-3424	-3041	-6163	91.4	100.9	96.4	44.7	86.2	71.4	93.8	155.4	173.2
2	210	210	3837	4116	3897	2248	3609	3012	3750	7205	6515	-3752	-3926	-3568	-2403	-3614	-3123	-3684	-4298	-6626	94.8	102.2	99.0	59.8	91.0	79.9	96.8	181.8	177.4
2	220	220	4030	4336	4116	2401	3791	3210	3951	7617	6977	-4002	-4205	-3768	-2579	-3856	-3348	-3948	-4560	-7103	96.2	103.6	100.6	61.0	92.3	81.3	98.1	183.3	181.5
2	250	250	4652	4996	4776	2881	4448	3826	4612	8878	8435	-4777	-5062	-4672	-3136	-4604	-4050	-4764	-5377	-8619	100.1	107.9	105.3	64.8	96.2	85.3	102.2	187.5	193.8
2	300	300	5902	6294	6126	3758	5656	4930	5894	11057	11109	-6160	-6572	-6242	-4159	-5946	-5307	-6206	-6836	-11433	106.5	114.7	112.6	71.1	102.6	91.9	108.9	194.4	214.1
2	400	400	8688	9286	9115	5800	8360	7426	8747	15704	17378	-9283	-9928	-9676	-6574	-8989	-8174	-9428	-10127	-18138	119.2	127.9	126.4	83.7	115.3	104.8	121.8	207.6	254.6
2	500	500	11857	12661	12489	8224	11446	10305	11983	20733	24870	-12895	-13756	-13554	-9485	-12521	-11524	-13125	-13917	-26281	131.8	140.8	139.7	96.3	127.9	117.5	134.6	220.5	294.8

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LRFR)

Bridge			Positive Moment (kip-ft)									Negative Moment (kip-ft)									Shear (kip)								
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design
			SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93
2	10	12.5	97	91	83	74	100	74	100	180	125	-80	-72	-68	-48	-87	-53	-69	-131	-89	54.6	47.1	42.6	29.3	51.8	33.3	51.8	70.9	64.1
2	15	18.75	188	156	141	112	171	116	171	270	217	-151	-123	-122	-79	-147	-85	-113	-233	-163	64.4	53.7	49.2	35.4	61.6	38.3	54.5	93.8	69.4
2	20	25	285	229	208	155	260	168	244	379	316	-203	-206	-156	-98	-186	-149	-194	-309	-232	73.4	58.1	56.4	38.6	69.9	40.5	55.7	110.0	75.7
2	30	37.5	509	394	379	261	471	278	391	697	530	-334	-338	-302	-192	-331	-236	-321	-510	-401	81.5	70.4	63.0	41.3	77.3	49.9	68.5	128.5	91.6
2	40	50	740	618	556	372	689	445	583	1081	796	-595	-460	-427	-323	-570	-367	-420	-730	-606	85.1	77.8	72.2	42.6	80.6	57.8	77.7	138.4	102.4
2	50	62.5	973	873	744	485	908	624	804	1474	1115	-807	-726	-542	-429	-759	-562	-664	-966	-877	87.0	84.6	78.5	43.2	82.3	62.1	82.8	143.7	110.4
2	60	75	1207	1133	964	598	1129	806	1037	1871	1454	-977	-1007	-735	-521	-912	-751	-915	-1194	-1294	88.3	89.3	82.4	43.6	83.4	64.7	86.0	147.0	117.3
2	70	87.5	1442	1397	1211	712	1351	990	1275	2270	1814	-1122	-1247	-1013	-618	-1045	-915	-1139	-1419	-1684	89.1	92.4	85.0	43.9	84.2	66.5	88.1	149.2	123.4
2	80	100	1678	1662	1469	825	1573	1175	1515	2670	2193	-1318	-1457	-1306	-778	-1284	-1062	-1337	-1641	-2044	89.7	94.6	86.8	44.1	84.7	67.8	89.5	150.8	129.2
2	90	112.5	1913	1928	1730	940	1795	1361	1757	3072	2592	-1599	-1645	-1586	-941	-1549	-1198	-1515	-1862	-2401	90.1	96.2	88.1	44.2	85.1	68.7	90.6	152.0	134.8
2	100	125	2149	2195	1993	1054	2018	1548	2000	3474	3010	-1880	-1819	-1848	-1107	-1816	-1395	-1680	-2080	-2776	90.4	97.5	89.2	44.3	85.4	69.4	91.5	152.9	140.1
2	110	137.5	2385	2463	2257	1168	2240	1735	2244	3876	3447	-2163	-2083	-2090	-1278	-2084	-1648	-1934	-2298	-3169	90.7	98.5	91.2	44.4	85.6	70.0	92.2	153.6	145.4
2	120	150	2621	2731	2522	1282	2463	1923	2488	4280	3902	-2448	-2422	-2317	-1453	-2356	-1903	-2251	-2515	-3579	90.9	99.3	92.8	44.5	85.8	70.4	92.7	154.2	150.6
2	130	162.5	2858	3000	2788	1397	2686	2110	2733	4684	4376	-2736	-2760	-2533	-1634	-2630	-2160	-2568	-2731	-4008	91.1	99.9	94.2	44.6	86.0	70.8	93.1	154.7	155.7
2	140	175	3094	3269	3055	1512	2909	2298	2978	5088	4869	-3028	-3100	-2740	-1820	-2909	-2420	-2888	-2948	-4455	91.3	100.5	95.3	44.6	86.1	71.1	93.5	155.1	160.8
2	150	187.5	3330	3538	3322	1626	3131	2487	3224	5492	5380	-3325	-3441	-2945	-2012	-3193	-2684	-3208	-3164	-4921	91.4	101.0	96.2	44.7	86.3	71.4	93.8	155.4	165.9
2	160	200	3567	3807	3590	1741	3354	2675	3470	5897	5910	-3625	-3785	-3260	-2209	-3482	-2954	-3533	-3379	-5404	91.5	101.4	97.0	44.7	86.4	71.6	94.1	155.7	170.9
2	170	212.5	3803	4077	3858	2229	3577	2985	3715	7139	6459	-3932	-4133	-3633	-2413	-3776	-3226	-3860	-4542	-5907	94.4	102.0	99.0	59.3	90.6	79.6	96.5	181.7	175.9
2	180	225	4039	4346	4126	2416	3800	3228	3961	7645	7026	-4244	-4485	-4009	-2622	-4076	-3504	-4192	-4872	-6428	96.0	103.7	100.9	60.8	92.1	81.2	98.1	183.4	180.8
2	190	237.5	4276	4616	4395	2609	4062	3476	4208	8157	7612	-4561	-4840	-4386	-2839	-4381	-3788	-4529	-5208	-6969	97.6	105.4	102.8	62.3	93.7	82.8	99.8	185.1	185.8
2	200	250	4542	4886	4664	2808	4343	3731	4498	8675	8216	-4884	-5201	-4767	-3061	-4692	-4076	-4870	-5550	-7528	99.1	107.1	104.7	63.9	95.3	84.4	101.4	186.8	190.8
2	210	262.5	4838	5155	4977	3013	4629	3991	4802	9198	8839	-5212	-5566	-5151	-3289	-5009	-4370	-5215	-5900	-8106	100.7	108.8	106.5	65.4	96.8	86.0	103.0	188.5	195.7
2	220	275	5140	5470	5303	3224	4920	4257	5111	9728	9481	-5547	-5936	-5538	-3523	-5332	-4670	-5567	-6255	-8703	102.3	110.5	108.3	66.9	98.4	87.6	104.6	190.2	200.6
2	250	312.5	6081	6486	6317	3891	5830	5091	6076	11352	11517	-6587	-7079	-6726	-4265	-6338	-5604	-6653	-7360	-10605	106.9	115.4	113.5	71.5	103.0	92.4	109.4	195.1	215.4
2	300	375	7764	8295	8124	5118	7463	6596	7799	14174	15281	-8443	-9097	-8799	-5629	-8138	-7282	-8579	-9333	-14152	114.6	123.3	121.9	79.1	110.7	100.2	117.3	203.0	239.8
2	400	500	11565	12348	12175	8006	11162	10041	11682	20254	24199	-12633	-13590	-13365	-8844	-12218	-11109	-12888	-13768	-22663	129.9	139.0	137.9	94.3	125.9	115.6	132.7	218.7	288.5
2	500	625	15945	16981	16807	11474	15441	14066	16145	26915	34971	-17469	-18713	-18532	-12711	-16946	-15579	-17831	-18857	-33061	145.1	154.4	153.6	109.4	141.1	130.9	148.0	234.1	337.1

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LRFR)

Bridge			Positive Moment (kip-ft)									Negative Moment (kip-ft)									Shear (kip)								
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design
			SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93
2	10	15	130	114	104	88	126	88	126	213	157	-113	-94	-90	-61	-112	-63	-93	-164	-120	59.3	49.5	43.9	32.0	53.4	36.0	53.4	77.1	66.7
2	15	22.5	238	193	174	133	215	144	211	319	270	-192	-161	-146	-92	-176	-114	-157	-265	-198	70.9	56.7	54.4	37.7	67.6	40.0	55.5	104.8	71.8
2	20	30	366	289	270	193	336	207	297	491	392	-268	-260	-199	-130	-248	-184	-241	-402	-297	78.1	62.3	60.0	40.1	74.2	42.4	61.5	118.4	82.5
2	30	45	635	508	476	321	590	368	492	906	660	-447	-396	-389	-250	-431	-275	-374	-683	-536	84.4	75.7	68.6	42.3	79.9	55.6	75.1	135.9	98.8
2	40	60	909	804	689	454	848	575	744	1366	1027	-720	-625	-538	-387	-682	-479	-571	-992	-820	87.1	84.0	77.7	43.2	82.3	61.8	82.4	143.5	109.0
2	50	75	1186	1110	946	587	1109	789	1017	1834	1424	-937	-924	-714	-501	-878	-698	-843	-1290	-1170	88.5	89.9	82.6	43.7	83.7	65.1	86.3	147.6	117.2
2	60	90	1463	1421	1237	722	1370	1007	1296	2306	1850	-1152	-1214	-978	-676	-1129	-896	-1110	-1581	-1626	89.5	93.4	85.6	44.0	84.5	67.1	88.8	150.1	124.5
2	70	105	1741	1735	1542	856	1632	1226	1580	2779	2303	-1509	-1465	-1306	-874	-1465	-1072	-1345	-1868	-2052	90.1	95.8	87.6	44.2	85.1	68.5	90.4	151.8	131.2
2	80	120	2019	2049	1851	991	1894	1446	1867	3254	2782	-1863	-1690	-1621	-1077	-1799	-1351	-1574	-2152	-2466	90.5	97.5	89.0	44.4	85.5	69.4	91.5	153.0	137.7
2	90	135	2297	2365	2162	1126	2157	1667	2154	3729	3287	-2216	-2118	-1934	-1284	-2134	-1666	-1962	-2435	-2903	90.8	98.7	91.5	44.5	85.8	70.1	92.3	153.9	143.9
2	100	150	2575	2681	2475	1261	2419	1889	2443	4205	3820	-2571	-2543	-2223	-1496	-2472	-1982	-2358	-2716	-3364	91.1	99.7	93.4	44.6	86.0	70.7	93.0	154.6	150.1
2	110	165	2854	2998	2789	1396	2682	2110	2732	4682	4379	-2929	-2966	-2494	-1716	-2812	-2300	-2754	-2996	-3849	91.3	100.4	94.9	44.6	86.2	71.1	93.5	155.1	156.1
2	120	180	3132	3315	3103	1532	2945	2332	3022	5158	4964	-3292	-3390	-2779	-1942	-3160	-2623	-3152	-3277	-4358	91.5	101.0	96.2	44.7	86.3	71.4	93.9	155.5	162.1
2	130	195	3411	3633	3419	1667	3208	2554	3312	5635	5576	-3662	-3816	-3236	-2177	-3512	-2949	-3551	-3557	-4892	91.6	101.5	97.2	44.7	86.4	71.7	94.2	155.9	168.1
2	140	210	3691	3950	3735	2147	3471	2877	3603	6906	6214	-4037	-4246	-3700	-2419	-3871	-3282	-3955	-4692	-5450	93.9	102.0	98.6	58.7	90.0	79.0	96.0	181.3	174.0
2	150	225	3970	4268	4051	2367	3734	3162	3893	7501	6878	-4419	-4680	-4165	-2668	-4239	-3620	-4364	-5097	-6033	95.7	103.6	100.9	60.5	91.9	81.0	97.9	183.3	179.9
2	160	240	4249	4586	4368	2594	4038	3455	4184	8104	7567	-4809	-5119	-4633	-2927	-4612	-3966	-4778	-5511	-6642	97.6	105.6	103.1	62.3	93.7	82.9	99.9	185.4	185.7
2	170	255	4570	4904	4685	2830	4370	3756	4527	8716	8283	-5205	-5563	-5103	-3193	-4993	-4318	-5198	-5934	-7275	99.5	107.6	105.3	64.1	95.6	84.8	101.8	187.3	191.6
2	180	270	4922	5233	5066	3074	4709	4065	4887	9337	9025	-5609	-6014	-5577	-3467	-5382	-4678	-5624	-6365	-7934	101.3	109.6	107.5	65.9	97.4	86.7	103.7	189.3	197.4
2	190	285	5282	5622	5454	3326	5057	4383	5255	9965	9793	-6021	-6472	-6056	-3750	-5780	-5044	-6057	-6805	-8618	103.1	111.5	109.5	67.7	99.2	88.6	105.6	191.3	203.3
2	200	300	5649	6020	5851	3586	5413	4709	5632	10602	10587	-6441	-6936	-6540	-4041	-6185	-5419	-6497	-7253	-9326	105.0	113.4	111.6	69.5	101.0	90.4	107.5	193.2	209.1
2	210	315	6025	6425	6256	3854	5777	5042	6017	11247	11408	-6870	-7408	-7029	-4340	-6598	-5800	-6945	-7710	-10059	106.8	115.4	113.6	71.3	102.9	92.3	109.3	195.1	214.9
2	220	330	6410	6839	6669	4131	6149	5384	6411	11900	12254	-7306	-7887	-7524	-4649	-7020	-6191	-7400	-8175	-10818	108.6	117.3	115.6	73.1	104.7	94.1	111.2	197.0	220.7
2	250	375	7611	8129	7958	5009	7315	6459	7641	13909	14948	-8664	-9369	-9048	-5624	-8334	-7410	-8810	-9625	-13244	114.1	122.9	121.5	78.5	110.1	99.7	116.8	202.6	238.0
2	300	450	9775	10442	10270	6635	9419	8414	9853	17418	19960	-11095	-12000	-11730	-7422	-10694	-9608	-11322	-12213	-17792	123.1	132.2	131.1	87.5	119.2	108.8	125.9	211.9	266.9
2	400	600	14714	15680	15505	10496	14238	12933	14890	25048	31934	-16601	-17883	-17680	-11671	-16060	-14639	-16969	-18045	-29033	141.2	150.5	149.7	105.5	137.2	126.9	144.1	230.2	324.5
2	500	750	20466	21730	21554	15171	19870	18266	20739	33493	46509	-22971	-24619	-24457	-16789	-22288	-20532	-23471	-24748	-43295	159.1	168.6	168.0	123.4	155.2	145.0	162.2	248.3	381.9

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LRFR)

Bridge			Positive Moment (kip-ft)									Negative Moment (kip-ft)									Shear (kip)								
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design
			SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93
3	10	10	63	69	61	60	73	63	74	145	98	-57	-50	-45	-34	-58	-41	-49	-87	-64	47.4	44.8	40.8	29.3	49.3	29.3	49.3	71.2	60.6
3	15	15	135	119	109	90	129	92	132	220	163	-111	-91	-95	-64	-117	-63	-82	-191	-131	59.7	49.2	44.4	31.9	54.3	35.8	53.1	77.1	66.5
3	20	20	208	170	160	120	187	126	189	290	241	-159	-152	-130	-83	-156	-106	-141	-255	-185	66.5	54.9	50.9	36.2	63.6	38.8	54.7	98.2	70.3
3	30	30	377	297	278	198	346	213	305	506	407	-238	-273	-213	-131	-220	-194	-260	-371	-312	77.4	62.2	59.7	39.9	73.6	43.2	61.1	117.5	82.3
3	40	40	561	434	418	286	519	312	426	781	587	-436	-358	-332	-245	-426	-250	-344	-530	-457	82.3	72.2	64.0	41.6	78.0	51.8	70.7	130.8	94.2
3	50	50	747	625	562	376	695	450	589	1093	816	-641	-505	-422	-345	-610	-403	-457	-700	-607	84.9	77.7	72.2	42.5	80.4	57.6	77.5	138.0	102.5
3	60	60	935	830	706	466	872	594	767	1409	1076	-809	-751	-509	-431	-761	-575	-680	-881	-907	86.5	83.1	77.5	43.0	81.9	61.2	81.8	142.5	109.2
3	70	70	1123	1040	882	558	1050	740	953	1728	1351	-950	-978	-709	-507	-888	-729	-890	-1060	-1256	87.7	87.3	81.0	43.4	82.9	63.6	84.6	145.6	115.0
3	80	80	1312	1251	1069	649	1228	888	1144	2050	1640	-1075	-1179	-940	-579	-1000	-867	-1077	-1231	-1581	88.5	90.4	83.5	43.7	83.6	65.4	86.7	147.7	120.2
3	90	90	1501	1464	1275	741	1406	1037	1336	2372	1941	-1185	-1360	-1184	-649	-1103	-993	-1246	-1403	-1886	89.1	92.6	85.3	43.9	84.2	66.6	88.2	149.3	125.1
3	100	100	1691	1678	1484	833	1585	1186	1530	2695	2257	-1295	-1524	-1426	-778	-1262	-1111	-1400	-1573	-2180	89.5	94.3	86.7	44.0	84.6	67.6	89.4	150.6	129.8
3	110	110	1881	1892	1695	925	1764	1337	1725	3019	2586	-1518	-1676	-1652	-909	-1474	-1221	-1545	-1743	-2484	89.9	95.7	87.8	44.2	84.9	68.4	90.3	151.5	134.3
3	120	120	2070	2108	1906	1017	1943	1488	1921	3343	2927	-1741	-1817	-1864	-1044	-1685	-1329	-1680	-1911	-2801	90.2	96.8	88.6	44.3	85.2	69.0	91.0	152.3	138.8
3	130	130	2260	2323	2119	1109	2122	1638	2118	3667	3283	-1965	-1952	-2062	-1181	-1898	-1489	-1807	-2079	-3131	90.4	97.7	89.8	44.4	85.4	69.5	91.6	153.0	143.1
3	140	140	2450	2539	2333	1201	2301	1789	2315	3991	3652	-2191	-2124	-2251	-1322	-2113	-1691	-1978	-2248	-3476	90.7	98.4	91.3	44.4	85.6	69.9	92.1	153.6	147.4
3	150	150	2640	2755	2547	1293	2480	1940	2512	4316	4035	-2419	-2393	-2433	-1466	-2332	-1897	-2231	-2413	-3830	90.8	99.1	92.5	44.5	85.8	70.3	92.5	154.0	151.6
3	160	160	2830	2971	2761	1385	2659	2092	2709	4641	4431	-2651	-2663	-2609	-1614	-2551	-2103	-2483	-2578	-4198	91.0	99.6	93.6	44.5	85.9	70.6	92.9	154.4	155.8
3	170	170	3020	3187	2976	1477	2838	2243	2907	4967	4840	-2883	-2934	-2776	-1766	-2774	-2313	-2739	-2744	-4579	91.1	100.1	94.6	44.6	86.0	70.9	93.2	154.7	160.0
3	180	180	3210	3403	3191	1570	3017	2394	3105	5292	5262	-3121	-3206	-2942	-1922	-3002	-2526	-2995	-2909	-4973	91.3	100.5	95.4	44.6	86.1	71.1	93.5	155.0	164.1
3	190	190	3399	3620	3406	1662	3196	2546	3303	5617	5697	-3362	-3481	-3105	-2083	-3233	-2741	-3254	-3074	-5381	91.4	100.8	96.1	44.6	86.2	71.3	93.7	155.3	168.2
3	200	200	3589	3837	3622	1754	3375	2697	3501	5942	6145	-3605	-3757	-3266	-2248	-3467	-2961	-3516	-3240	-5803	91.4	101.2	96.7	44.7	86.3	71.5	94.0	155.6	172.3
3	210	210	3779	4053	3837	2273	3556	3021	3699	7149	6606	-3852	-4037	-3552	-2417	-3706	-3182	-3781	-4435	-6238	94.5	102.0	98.9	59.4	90.7	79.6	96.5	181.7	176.4
3	220	220	3969	4270	4053	2430	3778	3222	3897	7561	7080	-4104	-4321	-3853	-2590	-3949	-3407	-4049	-4701	-6687	95.8	103.4	100.5	60.7	92.0	81.0	97.9	183.1	180.4
3	250	250	4667	4948	4779	2923	4467	3849	4619	8818	8579	-4883	-5187	-4773	-3135	-4701	-4109	-4869	-5526	-8113	99.7	107.6	105.1	64.4	95.8	85.0	101.9	187.3	192.6
3	300	300	5938	6319	6148	3826	5696	4976	5919	11002	11338	-6267	-6705	-6354	-4136	-6039	-5359	-6316	-6993	-10756	106.0	114.3	112.3	70.7	102.1	91.4	108.5	194.0	212.6
3	400	400	8782	9365	9192	5936	8459	7533	8828	15682	17831	-9364	-10051	-9785	-6479	-9052	-8185	-9517	-10266	-17039	118.6	127.3	125.9	83.1	114.6	104.2	121.2	207.0	252.5
3	500	500	12032	12818	12643	8452	11627	10497	12143	20767	25619	-12915	-13834	-13618	-9284	-12518	-11457	-13161	-14007	-24671	131.0	140.1	139.0	95.4	127.1	116.7	133.8	219.8	292.2

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LRFR)

Bridge			Positive Moment (kip-ft)									Negative Moment (kip-ft)									Shear (kip)								
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design
			SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93
3	10	12.5	76	71	64	62	77	64	77	149	100	-66	-60	-56	-41	-73	-46	-55	-114	-77	50.1	45.1	40.9	29.3	49.7	31.9	49.6	71.4	61.2
3	15	18.75	147	122	111	92	134	94	134	224	169	-127	-102	-107	-70	-130	-74	-90	-215	-150	60.7	51.0	46.4	33.7	57.6	36.6	53.1	86.7	67.2
3	20	25	222	182	161	124	201	133	192	299	249	-173	-181	-140	-88	-167	-131	-166	-286	-212	68.7	56.1	52.9	36.9	65.6	39.9	55.2	102.5	71.1
3	30	37.5	398	314	296	207	368	220	313	545	422	-283	-303	-255	-167	-283	-214	-288	-420	-360	77.9	65.7	60.3	40.1	74.1	45.3	64.4	120.8	85.7
3	40	50	585	476	439	295	545	343	455	840	616	-530	-397	-369	-291	-511	-319	-366	-586	-523	82.4	73.7	68.2	41.6	78.1	53.4	73.1	132.0	96.8
3	50	62.5	776	676	586	387	724	482	624	1152	867	-736	-638	-468	-393	-695	-499	-582	-780	-751	84.9	78.4	74.5	42.5	80.4	58.4	78.7	138.5	105.1
3	60	75	968	884	754	480	905	627	807	1473	1138	-904	-902	-631	-482	-846	-678	-819	-968	-1140	86.5	83.9	78.8	43.0	81.8	61.6	82.4	142.7	112.0
3	70	87.5	1161	1096	950	573	1088	776	995	1798	1425	-1045	-1134	-889	-563	-974	-836	-1035	-1154	-1509	87.6	87.8	81.8	43.4	82.8	63.8	85.0	145.6	118.1
3	80	100	1356	1312	1153	667	1271	926	1188	2126	1727	-1170	-1338	-1159	-640	-1089	-977	-1224	-1337	-1851	88.4	90.6	84.0	43.7	83.5	65.4	86.8	147.6	123.7
3	90	112.5	1551	1529	1361	761	1454	1079	1384	2457	2046	-1290	-1521	-1422	-772	-1253	-1108	-1397	-1517	-2179	88.9	92.7	85.6	43.9	84.1	66.6	88.2	149.2	129.1
3	100	125	1746	1748	1572	856	1639	1232	1583	2787	2378	-1525	-1687	-1672	-913	-1476	-1231	-1555	-1697	-2519	89.4	94.3	86.9	44.0	84.5	67.6	89.4	150.4	134.2
3	110	137.5	1941	1968	1786	950	1823	1385	1783	3118	2725	-1763	-1844	-1905	-1058	-1702	-1349	-1705	-1876	-2875	89.8	95.6	87.9	44.1	84.8	68.3	90.2	151.4	139.2
3	120	150	2137	2188	2002	1045	2007	1540	1983	3452	3087	-2002	-1993	-2122	-1208	-1932	-1551	-1848	-2054	-3246	90.1	96.7	88.7	44.2	85.1	68.9	90.9	152.2	144.0
3	130	162.5	2333	2409	2219	1140	2191	1695	2185	3786	3464	-2246	-2235	-2330	-1362	-2163	-1767	-2083	-2231	-3633	90.4	97.6	90.0	44.3	85.3	69.4	91.5	152.8	148.8
3	140	175	2528	2631	2436	1235	2376	1849	2387	4120	3856	-2492	-2521	-2526	-1521	-2398	-1987	-2351	-2408	-4036	90.6	98.3	91.4	44.4	85.5	69.8	92.0	153.4	153.5
3	150	187.5	2724	2853	2655	1330	2560	2004	2589	4455	4261	-2742	-2808	-2716	-1685	-2638	-2211	-2622	-2585	-4455	90.7	98.9	92.6	44.4	85.7	70.2	92.4	153.8	158.2
3	160	200	2920	3075	2874	1425	2744	2159	2792	4789	4680	-2997	-3098	-2903	-1854	-2884	-2441	-2895	-2762	-4891	90.9	99.5	93.6	44.5	85.8	70.5	92.8	154.2	162.8
3	170	212.5	3115	3297	3094	1777	2928	2374	2994	5761	5114	-3257	-3392	-3084	-2029	-3134	-2672	-3173	-3779	-5343	91.6	99.9	94.5	56.8	87.8	76.4	93.2	177.9	167.4
3	180	225	3311	3520	3314	1926	3113	2568	3198	6172	5561	-3521	-3689	-3264	-2209	-3389	-2909	-3454	-4058	-5813	93.1	100.3	96.2	58.2	89.2	78.0	94.8	179.6	172.0
3	190	237.5	3507	3743	3534	2079	3298	2767	3402	6588	6023	-3790	-3991	-3579	-2393	-3647	-3150	-3738	-4343	-6299	94.5	101.6	98.1	59.6	90.7	79.5	96.3	181.3	176.6
3	200	250	3702	3966	3755	2236	3494	2970	3606	7008	6499	-4064	-4297	-3901	-2584	-3910	-3395	-4028	-4633	-6801	96.0	103.2	99.9	61.0	92.1	81.0	97.9	182.9	181.1
3	210	262.5	3898	4189	3977	2397	3723	3178	3830	7433	6989	-4342	-4607	-4225	-2781	-4180	-3646	-4323	-4930	-7321	97.4	104.8	101.7	62.4	93.6	82.5	99.4	184.5	185.7
3	220	275	4138	4412	4217	2564	3957	3390	4078	7862	7493	-4627	-4921	-4554	-2984	-4456	-3902	-4621	-5232	-7857	98.9	106.4	103.4	63.7	95.0	84.0	100.9	186.1	190.2
3	250	312.5	4890	5190	5027	3089	4684	4053	4848	9181	9093	-5513	-5892	-5562	-3622	-5312	-4702	-5546	-6167	-9563	103.1	111.0	108.5	67.9	99.3	88.4	105.3	190.7	203.7
3	300	375	6232	6634	6469	4053	5984	5245	6222	11468	12042	-7096	-7610	-7332	-4801	-6848	-6141	-7187	-7839	-12737	110.2	118.4	116.4	74.8	106.3	95.6	112.6	198.1	226.0
3	400	500	9247	9857	9688	6311	8914	7965	9302	16373	19000	-10683	-11451	-11235	-7587	-10344	-9431	-10880	-11623	-20340	124.1	132.9	131.4	88.6	120.2	109.7	126.8	212.5	270.3
3	500	625	12702	13523	13349	9010	12286	11126	12826	21720	27369	-14841	-15851	-15679	-10951	-14415	-13292	-15133	-15987	-29615	138.0	147.0	145.9	102.4	134.0	123.7	140.8	226.7	314.5

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LRFR)

Bridge			Positive Moment (kip-ft)									Negative Moment (kip-ft)									Shear (kip)								
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design	Florida Legal Loads							Florida Permit Load	Design
			SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93	SU4	C5	ST5	SU2	SU3	C3	C4	FL120	HL93
3	10	15	99	87	79	72	95	72	95	174	120	-91	-77	-74	-51	-93	-54	-74	-140	-96	54.8	47.3	42.4	30.8	51.5	34.1	51.5	74.1	64.0
3	15	22.5	184	150	134	108	163	112	162	261	208	-160	-133	-126	-81	-153	-95	-125	-240	-171	65.8	53.9	50.6	35.7	62.9	38.3	54.3	96.2	69.6
3	20	30	278	225	205	151	256	161	232	370	305	-213	-223	-161	-103	-196	-159	-204	-322	-248	73.5	58.0	56.5	38.5	70.0	41.2	58.4	110.2	76.3
3	30	45	490	385	367	250	455	279	377	691	514	-371	-349	-323	-211	-361	-244	-330	-544	-433	81.1	70.9	64.6	41.2	77.0	50.7	70.1	128.5	92.4
3	40	60	711	610	535	356	663	435	566	1046	782	-629	-520	-455	-340	-599	-404	-476	-791	-664	84.7	77.6	73.1	42.4	80.2	57.7	77.8	137.8	103.1
3	50	75	934	849	726	463	873	603	776	1417	1092	-838	-789	-580	-448	-787	-603	-721	-1033	-976	86.7	84.2	78.6	43.1	82.0	61.8	82.5	143.0	111.4
3	60	90	1159	1095	952	572	1086	775	994	1795	1425	-1008	-1064	-817	-543	-942	-790	-970	-1270	-1397	87.9	88.7	82.2	43.5	83.1	64.4	85.6	146.4	118.5
3	70	105	1386	1346	1189	682	1299	950	1219	2178	1781	-1186	-1302	-1111	-696	-1155	-955	-1191	-1504	-1792	88.8	91.8	84.7	43.8	83.9	66.1	87.6	148.6	124.9
3	80	120	1613	1599	1430	791	1513	1128	1449	2562	2157	-1474	-1513	-1400	-864	-1427	-1106	-1391	-1735	-2165	89.4	94.0	86.4	44.0	84.5	67.4	89.1	150.3	131.0
3	90	135	1840	1855	1678	901	1727	1306	1680	2947	2552	-1764	-1706	-1681	-1034	-1703	-1316	-1573	-1966	-2547	89.9	95.7	87.8	44.2	84.9	68.4	90.3	151.5	136.9
3	100	150	2067	2111	1928	1012	1942	1486	1913	3334	2969	-2057	-2002	-1943	-1211	-1982	-1574	-1859	-2194	-2949	90.2	97.0	88.8	44.3	85.2	69.1	91.1	152.5	142.5
3	110	165	2295	2368	2180	1122	2156	1666	2148	3723	3405	-2354	-2346	-2189	-1393	-2264	-1836	-2181	-2421	-3372	90.5	98.0	90.6	44.4	85.5	69.7	91.8	153.2	148.1
3	120	180	2523	2626	2432	1233	2371	1846	2383	4112	3861	-2654	-2696	-2423	-1582	-2550	-2101	-2508	-2648	-3813	90.8	98.8	92.2	44.4	85.7	70.1	92.4	153.8	153.5
3	130	195	2751	2884	2687	1343	2585	2026	2618	4501	4337	-2958	-3047	-2650	-1776	-2842	-2373	-2838	-2875	-4277	91.0	99.5	93.6	44.5	85.8	70.6	92.8	154.3	159.0
3	140	210	2979	3143	2942	1683	2800	2248	2853	5483	4832	-3269	-3401	-2920	-1977	-3139	-2648	-3171	-3827	-4763	91.1	100.1	94.7	55.8	86.8	75.5	93.2	177.1	164.3
3	150	225	3206	3402	3198	1854	3014	2472	3090	5960	5346	-3584	-3760	-3300	-2185	-3444	-2929	-3510	-4161	-5268	92.4	100.6	95.6	57.4	88.5	77.3	94.1	179.0	169.6
3	160	240	3434	3661	3453	2030	3229	2702	3327	6443	5879	-3906	-4124	-3683	-2398	-3752	-3216	-3851	-4503	-5795	94.1	101.3	97.9	59.0	90.2	79.1	95.9	181.0	174.9
3	170	255	3662	3921	3712	2213	3458	2939	3565	6932	6432	-4234	-4493	-4070	-2620	-4066	-3507	-4198	-4852	-6342	95.7	103.1	100.0	60.6	91.9	80.8	97.7	182.8	180.2
3	180	270	3898	4180	3970	2402	3725	3181	3832	7427	7005	-4568	-4865	-4462	-2849	-4388	-3805	-4552	-5208	-6912	97.4	105.0	102.0	62.3	93.5	82.5	99.5	184.7	185.5
3	190	285	4181	4440	4263	2597	3999	3429	4122	7928	7597	-4909	-5244	-4857	-3085	-4718	-4109	-4911	-5571	-7501	99.1	106.8	104.0	63.9	95.2	84.3	101.2	186.5	190.7
3	200	300	4470	4735	4575	2798	4278	3684	4418	8438	8209	-5257	-5628	-5256	-3327	-5053	-4421	-5276	-5939	-8111	100.7	108.6	106.0	65.5	96.8	86.0	102.9	188.3	195.9
3	210	315	4765	5054	4893	3005	4564	3944	4721	8953	8841	-5612	-6019	-5662	-3576	-5395	-4739	-5647	-6315	-8742	102.4	110.3	107.9	67.1	98.5	87.7	104.6	190.0	201.1
3	220	330	5067	5379	5217	3219	4855	4211	5029	9474	9492	-5972	-6417	-6073	-3832	-5744	-5061	-6025	-6698	-9395	104.0	112.1	109.8	68.7	100.1	89.3	106.3	191.8	206.3
3	250	375	6007	6391	6227	3895	5766	5046	5991	11075	11562	-7096	-7642	-7340	-4646	-6832	-6075	-7191	-7893	-11481	108.9	117.2	115.3	73.5	105.0	94.3	111.4	196.9	221.8
3	300	450	7695	8199	8034	5143	7405	6562	7716	13864	15398	-9110	-9826	-9565	-6146	-8788	-7900	-9277	-10031	-15384	117.0	125.7	124.1	81.6	113.1	102.6	119.6	205.3	247.6
3	400	600	11525	12274	12101	8092	11137	10050	11625	19895	24523	-13682	-14708	-14511	-9697	-13246	-12093	-13972	-14861	-24781	133.1	142.2	141.0	97.6	129.2	118.8	135.9	221.8	299.0
3	500	750	15960	16954	16777	11647	15474	14143	16141	26531	35585	-18988	-20308	-20150	-13985	-18436	-17005	-19382	-20426	-36307	149.2	158.4	157.6	113.6	145.2	135.0	152.1	238.1	350.3

Appendix B – Maximum Longitudinal Live Load Moments and Shears (LFR)

Application of Live Load:

- Design Loads: HS20-44 loading as defined in the Section 3.7, 3.8 and 3.11 of the AASHTO Standard, 17th edition.

- Florida Legal Loads: Assume the same legal load in each loaded lane. Do not mix trucks.

  - Positive moment, negative moment, and reactions at interior supports:
    - Span length ≥ 200 ft
      - the effect of selected legal truck spaced with 30 ft clear distance heading in the same direction (as many as possible for the worst effect).

    - Span length < 200 ft
      - the effect of one legal truck

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LFR)

Bridge			Positive Moment (kip-ft)								Negative Moment (kip-ft)								Shear (kip)							
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Design	Florida Legal Loads							Design	Florida Legal Loads							Design
			SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44
1	10	10	81	81	75	72	90	72	90	104	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	42.5	41.2	37.4	28.6	45.3	28.6	45.3	41.6
1	15	15	172	145	132	107	159	107	159	156	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	52.7	45.5	40.6	30.7	49.3	33.8	49.3	44.4
1	20	20	263	209	190	143	230	150	230	208	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	60.0	50.4	46.8	34.1	58.2	36.4	51.2	54.1
1	30	30	466	368	343	238	430	258	371	367	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	70.3	56.3	54.6	37.4	67.4	39.0	57.0	64.5
1	40	40	692	531	518	346	644	379	514	585	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	75.5	65.0	58.5	39.1	72.0	46.8	65.2	71.8
1	50	50	909	771	685	451	848	552	707	807	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	77.7	69.4	64.8	39.7	73.9	51.4	70.4	75.3
1	60	60	1120	1013	848	552	1047	721	914	1025	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	78.8	72.4	68.6	39.9	74.8	54.2	73.5	77.2
1	70	70	1327	1253	1034	653	1243	887	1129	1238	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	79.4	75.8	71.1	39.9	75.3	56.0	75.5	78.4
1	80	80	1531	1488	1268	752	1435	1051	1344	1449	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	79.7	78.1	72.8	39.9	75.5	57.2	76.8	79.1
1	90	90	1732	1721	1500	849	1625	1214	1555	1657	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	79.7	79.7	74.0	39.8	75.5	58.1	77.7	79.5
1	100	100	1931	1950	1731	946	1813	1374	1764	1863	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	79.7	80.9	74.8	39.6	75.5	58.7	78.3	79.8
1	110	110	2128	2177	1960	1041	1999	1533	1970	2066	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	79.6	81.8	75.4	39.5	75.4	59.1	78.7	79.9
1	120	120	2323	2401	2186	1136	2183	1690	2176	2267	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	79.5	82.5	75.9	39.4	75.2	59.4	79.0	80.0
1	130	130	2517	2624	2410	1230	2366	1846	2380	2467	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	79.3	83.0	76.2	39.2	75.0	59.6	79.1	80.9
1	140	140	2709	2845	2632	1323	2548	2001	2582	2666	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	79.2	83.4	76.4	39.1	74.8	59.8	79.3	84.2
1	150	150	2901	3064	2853	1415	2728	2154	2783	2925	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	79.0	83.7	76.6	39.0	74.6	59.9	79.3	87.5
1	160	160	3091	3282	3072	1508	2907	2307	2983	3254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	78.8	83.9	76.9	38.8	74.5	59.9	79.4	90.7
1	170	170	3280	3499	3290	1599	3085	2458	3182	3599	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	78.6	84.1	77.5	38.7	74.3	60.0	79.4	94.0
1	180	180	3468	3715	3506	1690	3263	2609	3380	3960	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	78.4	84.2	78.0	38.6	74.1	60.0	79.3	97.3
1	190	190	3655	3930	3722	1781	3439	2759	3576	4337	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	78.2	84.3	78.5	38.4	73.9	60.0	79.3	100.6
1	200	200	3842	4144	3936	1872	3615	2909	3772	4731	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	78.0	84.4	78.8	38.3	73.7	60.0	79.2	103.8
1	210	210	9484	7943	5364	5127	9441	6023	7266	5141	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	207.2	169.0	126.2	111.1	204.5	129.6	160.5	107.1
1	220	220	10424	8600	5878	5594	10350	6543	7889	5567	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	215.3	175.3	131.2	115.1	211.6	134.9	166.3	110.4
1	250	250	13293	10821	7630	7055	13057	8313	9933	6942	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	237.2	194.6	144.7	127.5	234.5	149.0	183.9	120.1
1	300	300	18631	15422	10783	10059	18550	11892	14155	9556	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	275.2	225.7	164.1	147.6	272.0	172.9	212.1	136.4
1	400	400	32422	26638	18207	17416	32225	20547	24450	15990	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	350.5	286.7	206.0	188.0	346.2	220.8	268.0	168.7
1	500	500	49907	41060	28218	26754	49538	31568	37649	24030	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	425.3	348.7	247.7	228.2	420.0	267.8	324.7	200.9

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LFR)

Bridge			Positive Moment (kip-ft)								Negative Moment (kip-ft)								Shear (kip)							
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Design	Florida Legal Loads							Design	Florida Legal Loads							Design
			SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44
2	10	10	63	66	61	59	73	59	73	86	-56	-49	-45	-35	-60	-41	-45	-57	46.2	43.7	39.7	28.6	48.0	28.6	48.0	41.6
2	15	15	134	112	106	89	128	89	128	129	-108	-87	-95	-64	-117	-63	-75	-119	58.4	48.0	43.7	31.2	53.5	35.0	51.7	45.2
2	20	20	207	167	152	118	186	125	186	173	-151	-157	-127	-82	-153	-111	-143	-160	64.7	53.7	49.6	35.3	61.9	37.9	53.3	57.6
2	30	30	374	295	252	196	344	211	303	301	-218	-274	-212	-106	-202	-195	-262	-251	75.3	60.8	58.2	38.9	71.6	42.6	59.6	68.7
2	40	40	556	427	390	283	515	309	420	466	-315	-351	-324	-153	-294	-246	-341	-346	80.1	70.4	62.5	40.6	76.0	50.4	68.9	76.4
2	50	50	732	613	535	368	682	442	574	644	-405	-399	-401	-196	-379	-278	-388	-480	81.8	74.9	69.8	41.0	77.5	55.4	74.7	79.8
2	60	60	905	805	684	451	844	576	743	820	-490	-478	-474	-238	-459	-339	-430	-630	82.4	78.9	73.9	41.0	78.0	58.2	77.8	81.4
2	70	70	1075	997	846	534	1005	710	914	994	-572	-583	-540	-277	-538	-412	-527	-797	82.6	82.1	76.4	40.9	78.1	59.9	79.7	82.3
2	80	80	1243	1188	1015	615	1163	843	1086	1167	-653	-683	-614	-316	-614	-482	-620	-982	82.5	84.1	77.9	40.8	78.0	60.9	80.8	82.7
2	90	90	1409	1376	1200	695	1320	975	1257	1338	-732	-781	-691	-354	-688	-549	-709	-1183	82.4	85.4	78.9	40.6	77.8	61.5	81.5	82.8
2	100	100	1574	1564	1384	775	1475	1106	1427	1507	-809	-875	-785	-392	-761	-615	-796	-1401	82.1	86.3	79.5	40.4	77.6	61.9	81.9	82.8
2	110	110	1736	1750	1568	854	1628	1236	1596	1675	-885	-967	-885	-430	-834	-679	-881	-1636	81.8	86.9	79.9	40.2	77.3	62.1	82.1	84.9
2	120	120	1897	1934	1751	932	1781	1365	1764	1842	-960	-1057	-983	-467	-905	-743	-963	-1888	81.5	87.3	80.1	40.0	77.0	62.3	82.2	89.1
2	130	130	2057	2117	1933	1009	1932	1493	1931	2008	-1035	-1146	-1077	-503	-975	-805	-1045	-2156	81.2	87.5	80.3	39.8	76.7	62.3	82.2	93.3
2	140	140	2216	2299	2114	1086	2083	1620	2097	2172	-1110	-1234	-1169	-539	-1045	-866	-1125	-2441	80.9	87.7	81.2	39.7	76.4	62.3	82.1	97.5
2	150	150	2375	2480	2294	1163	2232	1747	2262	2335	-1183	-1321	-1261	-575	-1114	-926	-1205	-2742	80.6	87.8	81.9	39.5	76.1	62.3	82.0	101.6
2	160	160	2532	2660	2474	1239	2380	1873	2426	2543	-1256	-1406	-1352	-611	-1183	-986	-1284	-3059	80.3	87.8	82.4	39.3	75.8	62.2	81.9	105.8
2	170	170	2689	2839	2652	1315	2528	1998	2590	2810	-1329	-1491	-1439	-646	-1252	-1046	-1363	-3393	80.0	87.8	82.8	39.2	75.5	62.2	81.8	109.9
2	180	180	2845	3017	2830	1390	2675	2122	2753	3090	-1401	-1576	-1526	-681	-1320	-1105	-1440	-3743	79.8	87.7	83.1	39.0	75.3	62.1	81.7	114.1
2	190	190	3000	3194	3007	1465	2821	2246	2915	3382	-1473	-1659	-1613	-716	-1388	-1164	-1517	-4110	79.5	87.6	83.4	38.9	75.0	62.0	81.5	118.2
2	200	200	3154	3370	3184	1540	2967	2369	3076	3686	-1545	-1742	-1699	-751	-1456	-1223	-1593	-4492	79.2	87.6	83.6	38.7	74.8	61.9	81.4	122.3
2	210	210	7292	6115	4250	3932	7212	4606	5614	4002	-9380	-7825	-5454	-5069	-9311	-5965	-7156	-4891	251.2	205.2	149.8	134.5	248.0	157.4	193.2	126.4
2	220	220	7956	6630	4598	4293	7911	5036	6082	4331	-10264	-8488	-5897	-5535	-10244	-6514	-7749	-5307	261.2	213.8	156.1	139.5	256.9	164.0	200.7	130.5
2	250	250	10178	8397	5869	5462	10041	6428	7715	5392	-13139	-10852	-7386	-7047	-12970	-8339	-9932	-6649	289.0	239.1	173.1	155.2	285.9	181.8	222.6	142.8
2	300	300	14357	11804	8304	7688	14160	9101	10817	7407	-18587	-15302	-10606	-9994	-18415	-11840	-14025	-9211	337.8	279.8	197.6	180.3	332.9	211.7	258.1	163.2
2	400	400	24889	20549	14103	13320	24566	15711	18838	12359	-32266	-26686	-18271	-17319	-32068	-20463	-24432	-15540	433.5	357.9	250.4	231.0	427.2	274.0	328.4	203.7
2	500	500	38232	31481	21594	20519	37819	24224	28856	18538	-49674	-40898	-27997	-26652	-49344	-31486	-37477	-23476	528.1	436.7	303.3	282.3	521.4	334.1	400.4	244.1

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LFR)

Bridge			Positive Moment (kip-ft)								Negative Moment (kip-ft)								Shear (kip)							
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Design	Florida Legal Loads							Design	Florida Legal Loads							Design
			SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44
2	10	12.5	95	89	81	72	98	72	98	106	-78	-70	-66	-47	-85	-51	-67	-77	53.4	46.0	41.7	28.6	50.6	32.6	50.6	41.6
2	15	18.75	183	148	138	109	167	113	167	159	-147	-120	-119	-77	-144	-83	-111	-136	62.9	52.4	48.1	34.6	60.2	37.5	53.3	55.0
2	20	25	279	224	203	151	254	164	238	223	-198	-202	-153	-95	-182	-145	-189	-186	71.8	56.8	55.1	37.7	68.3	39.6	54.4	64.5
2	30	37.5	498	384	348	255	460	271	382	409	-324	-329	-295	-157	-302	-231	-313	-299	79.7	68.8	61.6	40.4	75.6	48.8	67.0	75.4
2	40	50	724	604	528	364	673	435	567	634	-455	-411	-417	-221	-426	-293	-392	-427	83.2	76.1	70.6	41.6	78.7	56.5	76.0	81.2
2	50	62.5	941	844	718	468	878	603	778	855	-576	-569	-523	-279	-540	-403	-512	-591	84.1	81.8	75.9	41.8	79.6	60.0	80.0	83.4
2	60	75	1153	1083	920	571	1078	770	991	1072	-691	-715	-637	-335	-651	-505	-648	-781	84.3	85.3	78.7	41.6	79.7	61.8	82.1	84.3
2	70	87.5	1362	1319	1144	672	1275	935	1204	1287	-805	-856	-753	-390	-757	-602	-777	-993	84.1	87.3	80.3	41.5	79.5	62.8	83.2	84.6
2	80	100	1568	1555	1374	772	1470	1099	1417	1498	-914	-990	-887	-443	-861	-696	-900	-1229	83.8	88.5	81.2	41.2	79.2	63.4	83.7	84.6
2	90	112.5	1772	1787	1604	871	1662	1262	1629	1708	-1023	-1120	-1029	-496	-963	-786	-1020	-1486	83.5	89.2	81.7	41.0	78.8	63.6	84.0	85.7
2	100	125	1973	2017	1832	968	1852	1423	1839	1915	-1129	-1247	-1166	-549	-1064	-876	-1136	-1766	83.1	89.6	82.0	40.7	78.5	63.8	84.1	90.9
2	110	137.5	2173	2246	2059	1065	2040	1583	2047	2121	-1235	-1372	-1298	-600	-1163	-963	-1251	-2068	82.7	89.8	83.2	40.5	78.1	63.8	84.0	96.1
2	120	150	2371	2472	2284	1161	2227	1741	2253	2325	-1339	-1495	-1428	-651	-1261	-1048	-1364	-2392	82.3	89.9	84.0	40.3	77.7	63.7	83.9	101.2
2	130	162.5	2567	2697	2508	1256	2412	1898	2459	2584	-1443	-1616	-1555	-701	-1359	-1133	-1476	-2737	81.9	89.9	84.7	40.1	77.3	63.6	83.7	106.4
2	140	175	2762	2920	2731	1351	2595	2054	2663	2920	-1546	-1736	-1679	-751	-1456	-1217	-1587	-3104	81.6	89.8	85.1	39.9	77.0	63.5	83.6	111.5
2	150	187.5	2955	3142	2952	1445	2778	2209	2866	3275	-1647	-1855	-1801	-801	-1552	-1301	-1696	-3493	81.2	89.7	85.5	39.7	76.6	63.4	83.4	116.5
2	160	200	3147	3362	3172	1538	2959	2363	3067	3649	-1749	-1972	-1923	-850	-1648	-1385	-1803	-3904	80.9	89.6	85.7	39.5	76.3	63.3	83.1	121.6
2	170	212.5	7363	6158	4293	3965	7281	4643	5653	4041	-8235	-6849	-4804	-4453	-8186	-5246	-6270	-4336	251.1	204.5	150.0	134.2	247.7	157.5	193.2	126.6
2	180	225	8202	6796	4722	4412	8140	5210	6236	4453	-9234	-7605	-5311	-4941	-9184	-5860	-6972	-4789	263.0	214.4	157.3	140.7	258.3	165.3	202.0	131.7
2	190	237.5	9115	7501	5202	4868	9001	5780	6878	4883	-10282	-8453	-5841	-5451	-10121	-6508	-7738	-5264	273.4	224.9	164.2	147.4	270.3	172.3	211.5	136.7
2	200	250	10032	8303	5787	5382	9897	6356	7607	5332	-11268	-9344	-6433	-6030	-11112	-7139	-8544	-5761	285.6	234.2	171.4	153.4	282.7	179.7	220.2	141.7
2	210	262.5	10977	9111	6374	5900	10887	6934	8354	5800	-12306	-10255	-7067	-6634	-12235	-7811	-9372	-6278	298.1	243.2	177.8	159.4	293.9	186.8	228.2	146.7
2	220	275	12022	9925	6964	6420	11884	7566	9103	6287	-13490	-11147	-7720	-7226	-13408	-8530	-10199	-6817	309.6	252.8	183.9	165.9	304.5	194.6	237.2	151.7
2	250	312.5	15217	12592	8797	8180	15095	9677	11555	7860	-17204	-14186	-9740	-9230	-17054	-10910	-12985	-8562	344.5	282.0	202.4	184.4	339.7	216.5	263.9	166.6
2	300	375	21672	17827	12332	11570	21428	13686	16348	10854	-24411	-20062	-13843	-13078	-24159	-15460	-18379	-11895	401.5	329.4	234.9	215.5	396.6	252.8	307.2	191.3
2	400	500	37515	30891	21194	20133	37118	23769	28315	18242	-42337	-34919	-23902	-22720	-42059	-26832	-31984	-20147	515.7	422.9	297.9	276.6	509.4	324.9	392.7	240.5
2	500	625	57675	47480	32444	30959	57228	36540	43532	27489	-65240	-53666	-36620	-34972	-64712	-41312	-49172	-30511	628.2	515.8	361.7	337.3	622.0	396.8	477.8	289.5

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LFR)

Bridge			Positive Moment (kip-ft)								Negative Moment (kip-ft)								Shear (kip)							
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Design	Florida Legal Loads							Design	Florida Legal Loads							Design
			SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44
2	10	15	127	111	102	86	123	86	123	125	-110	-92	-88	-59	-109	-61	-90	-96	58.0	48.4	42.9	31.3	52.2	35.2	52.2	45.2
2	15	22.5	232	189	170	130	210	140	206	187	-188	-157	-143	-90	-172	-111	-153	-156	69.3	55.4	53.1	36.8	66.1	39.1	54.2	61.4
2	20	30	358	281	260	188	328	202	290	288	-262	-254	-195	-127	-242	-180	-236	-236	76.3	60.9	58.7	39.2	72.5	41.5	60.1	69.4
2	30	45	621	496	447	314	576	360	476	531	-435	-387	-380	-211	-407	-268	-365	-401	82.4	74.0	67.0	41.3	78.1	54.4	73.4	79.7
2	40	60	889	786	671	443	829	562	727	801	-601	-586	-526	-292	-564	-416	-528	-582	85.1	82.1	75.9	42.2	80.5	60.4	80.5	84.2
2	50	75	1146	1074	912	568	1072	763	982	1064	-756	-782	-689	-366	-711	-552	-708	-748	85.6	86.9	79.8	42.2	80.9	62.9	83.5	85.6
2	60	90	1397	1358	1181	689	1309	962	1238	1321	-905	-966	-845	-438	-851	-679	-877	-984	85.4	89.2	81.7	42.0	80.7	64.1	84.8	86.0
2	70	105	1645	1639	1457	809	1542	1158	1493	1575	-1049	-1142	-1034	-509	-988	-801	-1038	-1258	85.1	90.5	82.7	41.8	80.3	64.7	85.3	86.0
2	80	120	1888	1917	1731	927	1772	1353	1746	1826	-1191	-1311	-1219	-578	-1122	-921	-1194	-1563	84.6	91.2	83.2	41.5	79.9	64.9	85.5	89.4
2	90	135	2129	2192	2004	1044	1999	1545	1997	2074	-1331	-1476	-1393	-647	-1253	-1036	-1346	-1898	84.2	91.5	84.8	41.2	79.5	65.0	85.5	95.6
2	100	150	2367	2465	2275	1159	2224	1736	2245	2319	-1468	-1639	-1565	-714	-1383	-1149	-1496	-2262	83.7	91.6	85.8	40.9	79.0	64.9	85.4	101.9
2	110	165	2603	2735	2544	1274	2446	1925	2492	2628	-1605	-1798	-1732	-780	-1511	-1261	-1643	-2656	83.2	91.6	86.6	40.7	78.6	64.8	85.2	108.0
2	120	180	2837	3002	2810	1387	2666	2112	2737	3035	-1740	-1956	-1895	-846	-1639	-1372	-1788	-3079	82.8	91.5	87.1	40.4	78.1	64.6	85.0	114.2
2	130	195	3068	3268	3076	1499	2884	2297	2980	3468	-1873	-2111	-2055	-911	-1765	-1482	-1930	-3531	82.4	91.3	87.4	40.2	77.7	64.5	84.7	120.3
2	140	210	7154	5963	4173	3832	7025	4494	5475	3928	-7625	-6348	-4386	-4092	-7548	-4814	-5800	-4012	249.3	203.3	149.3	133.7	246.5	156.4	192.1	126.3
2	150	225	8106	6721	4682	4362	8044	5165	6167	4415	-8713	-7156	-4944	-4640	-8622	-5493	-6543	-4522	264.1	215.4	158.3	141.2	259.4	166.0	203.0	132.4
2	160	240	9190	7595	5259	4915	9069	5842	6960	4928	-9832	-8081	-5551	-5234	-9686	-6236	-7403	-5061	276.9	227.8	166.7	149.2	273.6	174.1	214.3	138.4
2	170	255	10280	8550	5954	5528	10176	6529	7836	5468	-10971	-9104	-6262	-5913	-10873	-6977	-8326	-5628	291.5	238.6	174.8	156.2	288.2	183.1	224.3	144.4
2	180	270	11473	9512	6649	6148	11370	7233	8724	6035	-12253	-10157	-7023	-6563	-12189	-7771	-9289	-6224	306.0	249.3	182.0	163.8	301.1	192.0	234.1	150.4
2	190	285	12734	10485	7354	6787	12572	8013	9620	6628	-13643	-11218	-7816	-7266	-13444	-8613	-10265	-6849	318.8	261.1	188.8	171.7	315.2	201.4	245.0	156.4
2	200	300	14006	11490	8084	7488	13804	8849	10556	7248	-14970	-12363	-8583	-8027	-14811	-9508	-11321	-7502	333.2	273.3	196.1	178.6	329.8	209.7	255.8	162.3
2	210	315	15303	12629	8816	8200	15164	9701	11593	7894	-16404	-13577	-9340	-8804	-16290	-10400	-12420	-8184	347.8	284.6	204.5	186.2	342.6	218.4	266.5	168.3
2	220	330	16721	13827	9550	8977	16540	10578	12685	8566	-17967	-14833	-10127	-9619	-17797	-11354	-13572	-8894	360.8	295.2	212.6	193.8	356.3	227.1	275.9	174.2
2	250	375	21387	17601	12210	11452	21145	13531	16143	10741	-22943	-18870	-12948	-12276	-22679	-14507	-17277	-11195	402.3	329.9	235.6	215.9	397.3	253.3	307.8	191.9
2	300	450	30213	24897	17055	16202	29977	19105	22835	14890	-32429	-26758	-18309	-17411	-32201	-20579	-24505	-15596	470.6	385.8	274.0	252.4	464.9	296.5	359.0	221.3
2	400	600	52477	43280	29644	28187	52033	33273	39662	25153	-56442	-46554	-31774	-30297	-56007	-35775	-42634	-26513	605.8	496.5	348.5	324.7	599.0	382.2	460.2	279.7
2	500	750	80853	66518	45453	43347	80124	51150	60950	38025	-86932	-71530	-48808	-46621	-86196	-55050	-65541	-40243	739.7	607.0	424.0	396.8	732.2	467.1	561.4	337.7

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LFR)

Bridge			Positive Moment (kip-ft)								Negative Moment (kip-ft)								Shear (kip)							
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Design	Florida Legal Loads							Design	Florida Legal Loads							Design
			SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44
3	10	10	62	66	59	58	71	61	71	90	-56	-49	-43	-34	-57	-40	-47	-52	46.3	43.8	39.8	28.6	48.2	28.6	48.2	42.7
3	15	15	129	114	106	88	126	88	129	135	-108	-88	-93	-62	-114	-61	-80	-112	58.3	47.8	43.4	31.2	53.1	34.3	51.9	45.2
3	20	20	202	162	151	117	183	124	183	170	-155	-148	-116	-81	-152	-103	-134	-152	65.0	53.5	49.5	35.3	62.1	38.0	53.5	57.6
3	30	30	370	289	254	194	339	208	299	297	-232	-266	-208	-112	-214	-189	-253	-239	75.6	60.8	58.3	39.0	71.9	42.2	59.7	68.9
3	40	40	548	419	381	280	508	305	415	458	-336	-347	-324	-162	-313	-241	-335	-330	80.4	70.5	62.5	40.6	76.2	50.6	69.1	76.7
3	50	50	723	605	523	363	673	435	567	634	-430	-400	-406	-208	-404	-278	-383	-451	82.0	75.1	69.8	41.1	77.7	55.7	74.9	80.1
3	60	60	894	794	675	446	834	568	733	808	-519	-506	-485	-252	-488	-360	-455	-592	82.6	79.3	73.9	41.1	78.1	58.5	78.1	81.7
3	70	70	1062	983	835	527	993	700	902	980	-607	-619	-555	-295	-570	-436	-557	-749	82.7	82.4	76.4	41.0	78.2	60.1	79.9	82.5
3	80	80	1229	1172	1002	607	1150	832	1071	1150	-692	-725	-645	-336	-651	-510	-657	-922	82.7	84.4	78.0	40.8	78.1	61.1	81.0	82.9
3	90	90	1393	1358	1183	687	1305	962	1240	1319	-777	-828	-727	-377	-730	-583	-753	-1111	82.5	85.8	79.0	40.7	77.9	61.7	81.7	83.0
3	100	100	1556	1544	1366	766	1457	1090	1408	1486	-858	-928	-831	-417	-809	-656	-843	-1315	82.2	86.6	79.6	40.5	77.6	62.1	82.0	83.0
3	110	110	1716	1727	1547	843	1609	1220	1574	1652	-939	-1026	-940	-458	-887	-722	-932	-1535	81.9	87.2	79.9	40.3	77.3	62.3	82.2	84.2
3	120	120	1876	1910	1726	920	1759	1348	1741	1816	-1020	-1122	-1047	-497	-962	-788	-1020	-1771	81.6	87.6	80.2	40.1	77.0	62.4	82.3	88.3
3	130	130	2034	2091	1907	997	1909	1475	1907	1979	-1100	-1217	-1145	-537	-1037	-854	-1106	-2022	81.3	87.8	80.7	39.9	76.7	62.4	82.3	92.5
3	140	140	2191	2271	2087	1073	2057	1601	2071	2140	-1179	-1310	-1243	-575	-1112	-919	-1192	-2288	80.9	87.9	81.5	39.7	76.5	62.4	82.3	96.6
3	150	150	2347	2450	2265	1149	2205	1726	2234	2375	-1257	-1403	-1339	-613	-1186	-983	-1276	-2570	80.6	87.9	82.2	39.5	76.2	62.4	82.2	100.7
3	160	160	2502	2627	2442	1225	2351	1850	2396	2641	-1334	-1494	-1434	-650	-1259	-1048	-1361	-2867	80.4	87.9	82.7	39.3	75.9	62.4	82.0	104.8
3	170	170	2657	2804	2619	1299	2497	1973	2558	2921	-1412	-1585	-1528	-688	-1332	-1111	-1444	-3180	80.1	87.9	83.1	39.2	75.6	62.3	81.9	108.9
3	180	180	2810	2980	2794	1374	2642	2096	2719	3214	-1488	-1676	-1622	-725	-1404	-1175	-1528	-3507	79.8	87.9	83.4	39.0	75.3	62.2	81.8	113.0
3	190	190	2964	3155	2970	1448	2786	2219	2879	3520	-1565	-1764	-1714	-762	-1476	-1238	-1611	-3850	79.5	87.8	83.7	38.9	75.1	62.1	81.6	117.0
3	200	200	3116	3330	3145	1522	2930	2340	3039	3839	-1641	-1853	-1806	-799	-1548	-1301	-1693	-4208	79.3	87.7	83.9	38.7	74.8	62.0	81.5	121.1
3	210	210	7182	5942	4187	3789	7034	4509	5471	4171	-8698	-7273	-5067	-4701	-8638	-5508	-6653	-4581	251.0	208.1	148.1	132.7	246.7	158.6	191.2	125.2
3	220	220	7766	6447	4530	4139	7636	4962	5932	4517	-9528	-7877	-5459	-5133	-9497	-6036	-7222	-4970	260.8	216.3	154.3	138.0	255.3	164.8	198.6	129.2
3	250	250	9859	8273	5654	5350	9830	6328	7579	5631	-12189	-10062	-6819	-6532	-12012	-7732	-9210	-6226	289.5	240.3	171.5	154.1	285.6	182.9	220.4	141.3
3	300	300	14088	11554	8042	7535	13890	8792	10616	7750	-17229	-14152	-9829	-9260	-17072	-10953	-12961	-8621	338.2	280.9	196.1	180.1	333.4	213.1	256.7	161.4
3	400	400	24328	20124	13887	13060	24165	15390	18441	12964	-29885	-24725	-16933	-16030	-29711	-18962	-22632	-14539	434.0	360.0	250.6	231.7	428.5	276.1	329.8	201.4
3	500	500	37384	30747	20932	20061	37125	23662	28171	19478	-46001	-37883	-25963	-24688	-45713	-29166	-34700	-21958	531.2	440.3	304.7	285.9	526.9	337.7	403.9	241.3

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LFR)

Bridge			Positive Moment (kip-ft)								Negative Moment (kip-ft)								Shear (kip)							
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Design	Florida Legal Loads							Design	Florida Legal Loads							Design
			SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44
3	10	12.5	71	69	61	59	73	62	75	92	-64	-58	-55	-40	-71	-45	-53	-67	49.0	44.1	40.0	28.6	48.6	31.1	48.5	42.6
3	15	18.75	136	113	109	89	129	89	130	136	-124	-98	-104	-68	-127	-73	-88	-126	59.3	49.9	45.3	32.9	56.3	35.8	51.9	50.8
3	20	25	216	166	157	119	197	126	187	174	-168	-176	-131	-86	-162	-127	-162	-171	67.1	54.8	50.4	36.0	64.1	39.0	53.8	60.1
3	30	37.5	390	295	258	201	360	213	305	320	-260	-294	-240	-127	-240	-207	-280	-270	76.1	64.2	58.5	39.2	72.4	44.3	63.0	70.9
3	40	50	573	467	394	289	533	334	436	493	-366	-371	-355	-179	-343	-258	-354	-382	80.4	72.0	66.6	40.7	76.3	52.2	71.4	77.4
3	50	62.5	752	656	551	374	702	467	601	668	-466	-451	-448	-227	-437	-319	-409	-532	82.0	75.7	71.9	41.1	77.6	56.4	76.0	80.4
3	60	75	928	846	723	459	868	601	769	844	-562	-572	-527	-272	-528	-405	-519	-702	82.5	80.1	75.1	41.1	78.1	58.8	78.6	81.8
3	70	87.5	1101	1039	901	542	1031	734	942	1019	-655	-687	-619	-316	-614	-483	-622	-892	82.7	82.8	77.2	41.0	78.1	60.3	80.2	82.5
3	80	100	1272	1231	1083	625	1191	866	1114	1193	-744	-798	-705	-361	-700	-560	-724	-1102	82.5	84.6	78.4	40.8	78.0	61.2	81.1	82.9
3	90	112.5	1441	1421	1265	706	1350	1001	1285	1366	-832	-904	-819	-405	-785	-634	-824	-1331	82.3	85.8	79.2	40.6	77.8	61.7	81.7	83.0
3	100	125	1608	1611	1448	787	1508	1135	1459	1537	-919	-1007	-933	-448	-867	-707	-921	-1581	82.1	86.6	79.8	40.4	77.6	62.0	82.1	85.5
3	110	137.5	1773	1799	1633	867	1665	1267	1630	1706	-1007	-1109	-1043	-491	-948	-780	-1015	-1849	81.8	87.1	80.1	40.2	77.3	62.2	82.2	90.2
3	120	150	1938	1985	1817	947	1821	1398	1800	1875	-1091	-1211	-1147	-532	-1028	-853	-1107	-2137	81.5	87.4	80.3	40.0	77.0	62.4	82.2	94.8
3	130	162.5	2101	2171	2000	1026	1975	1527	1969	2043	-1176	-1312	-1250	-573	-1108	-922	-1198	-2445	81.2	87.6	80.9	39.8	76.7	62.4	82.2	99.4
3	140	175	2264	2355	2182	1105	2128	1656	2138	2275	-1260	-1411	-1351	-613	-1187	-992	-1288	-2771	80.9	87.8	81.6	39.6	76.4	62.4	82.2	104.0
3	150	187.5	2425	2539	2364	1183	2280	1783	2305	2549	-1343	-1509	-1452	-654	-1265	-1060	-1376	-3117	80.6	87.8	82.2	39.5	76.1	62.3	82.1	108.6
3	160	200	2585	2722	2547	1261	2431	1910	2471	2837	-1425	-1606	-1553	-694	-1343	-1129	-1464	-3482	80.3	87.8	82.7	39.3	75.8	62.3	82.0	113.2
3	170	212.5	4992	4066	2930	2685	4946	3136	3748	3139	-7235	-6032	-4238	-3913	-7209	-4596	-5524	-3865	230.4	187.1	137.8	123.3	227.1	144.5	176.7	117.8
3	180	225	5583	4564	3262	2979	5507	3490	4191	3456	-8131	-6695	-4683	-4352	-8072	-5163	-6122	-4268	241.0	196.6	144.6	129.1	237.0	151.3	185.6	122.3
3	190	237.5	6177	5066	3600	3274	6071	3852	4666	3787	-9042	-7429	-5119	-4783	-8909	-5725	-6786	-4690	251.0	205.8	151.1	135.1	247.8	158.0	194.2	126.9
3	200	250	6774	5578	3947	3574	6639	4217	5141	4133	-9921	-8227	-5649	-5302	-9753	-6272	-7516	-5130	261.9	214.3	157.6	140.6	258.9	164.1	202.0	131.4
3	210	262.5	7374	6098	4298	3915	7224	4628	5615	4492	-10804	-9024	-6212	-5831	-10752	-6860	-8247	-5590	273.1	222.9	163.5	145.9	269.1	171.0	209.8	135.9
3	220	275	7973	6616	4651	4271	7900	5095	6088	4866	-11861	-9796	-6784	-6348	-11781	-7472	-8974	-6068	283.4	230.9	169.1	152.0	278.8	178.1	216.8	140.5
3	250	312.5	10150	8495	5844	5494	10095	6499	7783	6074	-15123	-12476	-8580	-8111	-14974	-9590	-11413	-7616	315.0	257.8	185.7	168.7	310.7	197.4	241.8	154.0
3	300	375	14469	11868	8257	7739	14265	9066	10904	8371	-21433	-17639	-12183	-11494	-21217	-13582	-16158	-10572	366.9	300.7	215.4	196.8	362.3	230.6	280.9	176.4
3	400	500	24986	20672	14262	13416	24823	15806	18943	14030	-37217	-30647	-21017	-19967	-36930	-23573	-28059	-17887	470.6	385.6	272.4	252.4	464.7	296.3	358.6	221.0
3	500	625	38406	31586	21526	20607	38137	24304	28939	21105	-57275	-47081	-32125	-30703	-56816	-36251	-43155	-27070	572.5	470.1	330.6	307.4	566.7	361.5	435.9	265.4

Maximum Longitudinal Live Load Moments and Shears per Lane with Impact (LFR)

Bridge			Positive Moment (kip-ft)								Negative Moment (kip-ft)								Shear (kip)							
No. Spans	Short Span (ft)	Long Span (ft)	Florida Legal Loads							Design	Florida Legal Loads							Design	Florida Legal Loads							Design
			SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44	SU4	C5	ST5	SU2	SU3	C3	C4	HS20-44
3	10	15	93	81	74	66	88	70	92	102	-89	-75	-72	-50	-91	-53	-71	-82	53.6	46.2	41.4	30.1	50.3	33.3	50.3	43.4
3	15	22.5	176	141	129	102	160	98	158	153	-156	-129	-123	-78	-148	-93	-121	-141	64.3	52.7	49.5	34.9	61.4	37.4	53.0	56.4
3	20	30	273	199	198	146	251	143	212	216	-207	-216	-151	-100	-190	-154	-198	-196	71.8	56.7	53.6	37.7	68.3	40.3	56.4	64.6
3	30	45	479	377	330	244	446	273	361	405	-346	-338	-308	-169	-322	-236	-322	-319	79.3	69.3	63.1	40.3	75.2	49.5	68.5	75.4
3	40	60	697	598	506	348	650	427	552	613	-480	-458	-444	-234	-450	-324	-415	-464	82.7	75.8	71.4	41.4	78.3	56.3	76.0	80.8
3	50	75	906	823	705	448	848	585	750	822	-607	-617	-557	-295	-571	-437	-560	-640	83.7	81.3	75.9	41.6	79.2	59.7	79.7	83.0
3	60	90	1112	1050	913	547	1040	742	953	1029	-728	-766	-682	-352	-682	-539	-695	-849	83.9	84.6	78.4	41.5	79.3	61.4	81.6	83.9
3	70	105	1313	1276	1127	645	1229	898	1154	1234	-843	-910	-808	-410	-795	-639	-827	-1084	83.8	86.6	79.9	41.4	79.2	62.5	82.7	84.2
3	80	120	1512	1501	1340	740	1417	1057	1359	1438	-957	-1046	-959	-467	-904	-734	-955	-1345	83.5	87.8	80.8	41.1	78.9	63.0	83.3	84.3
3	90	135	1708	1724	1560	835	1604	1214	1562	1638	-1072	-1179	-1105	-523	-1011	-828	-1080	-1630	83.2	88.6	81.3	40.9	78.6	63.3	83.6	88.7
3	100	150	1904	1944	1777	930	1788	1369	1763	1838	-1183	-1312	-1242	-577	-1116	-924	-1199	-1941	82.8	89.0	81.5	40.7	78.3	63.5	83.7	94.2
3	110	165	2097	2164	1992	1024	1971	1522	1963	2037	-1293	-1444	-1377	-630	-1219	-1015	-1318	-2276	82.4	89.2	82.5	40.4	77.9	63.5	83.6	99.6
3	120	180	2289	2381	2206	1117	2151	1674	2162	2316	-1402	-1573	-1509	-683	-1322	-1105	-1435	-2637	82.1	89.4	83.4	40.2	77.5	63.5	83.6	105.1
3	130	195	2479	2598	2423	1209	2331	1824	2359	2643	-1510	-1700	-1640	-735	-1424	-1195	-1550	-3021	81.7	89.4	84.1	40.0	77.1	63.4	83.4	110.5
3	140	210	4768	3958	2770	2542	4694	3010	3636	2990	-6419	-5360	-3684	-3434	-6359	-4021	-4889	-3431	225.0	182.7	135.5	120.9	222.2	141.3	172.9	115.9
3	150	225	5405	4488	3169	2894	5343	3400	4128	3357	-7333	-5991	-4160	-3900	-7228	-4618	-5487	-3864	238.2	194.3	143.5	127.5	234.3	149.4	183.5	121.2
3	160	240	6112	5030	3592	3261	6023	3814	4626	3743	-8250	-6785	-4643	-4396	-8142	-5233	-6205	-4322	249.9	205.1	151.0	134.3	246.7	156.9	193.6	126.6
3	170	255	6826	5601	4030	3646	6728	4310	5156	4150	-9225	-7632	-5244	-4967	-9138	-5869	-6988	-4805	262.8	214.8	158.1	140.8	259.3	164.3	202.6	131.9
3	180	270	7583	6229	4456	4067	7474	4811	5729	4576	-10302	-8533	-5910	-5514	-10231	-6503	-7798	-5311	275.3	224.1	164.6	147.6	271.2	172.9	211.1	137.2
3	190	285	8380	6947	4903	4499	8298	5320	6386	5022	-11452	-9440	-6578	-6097	-11296	-7229	-8634	-5842	287.2	234.8	170.6	154.4	283.7	181.1	220.5	142.5
3	200	300	9247	7656	5375	4965	9161	5859	7031	5487	-12574	-10368	-7225	-6734	-12430	-7955	-9480	-6396	299.8	245.6	176.7	160.7	296.3	188.6	230.5	147.8
3	210	315	10158	8380	5869	5437	10055	6430	7678	5972	-13762	-11399	-7857	-7393	-13663	-8724	-10424	-6975	312.5	255.7	184.7	167.5	308.0	195.9	240.1	153.1
3	220	330	11106	9156	6393	5938	10956	7009	8375	6477	-15078	-12423	-8474	-8075	-14939	-9511	-11372	-7578	324.4	265.3	192.1	174.2	320.2	204.0	248.8	158.4
3	250	375	14081	11634	7994	7579	13968	8929	10680	8109	-19241	-15840	-10847	-10303	-19020	-12183	-14505	-9531	361.1	295.9	212.4	193.8	356.7	227.0	276.6	174.1
3	300	450	19944	16483	11357	10695	19672	12646	15116	11219	-27172	-22437	-15390	-14587	-26928	-17231	-20565	-13263	422.1	345.7	246.5	226.4	416.9	265.9	322.2	200.2
3	400	600	34676	28561	19538	18590	34375	21875	26184	18900	-47341	-39033	-26669	-25404	-46963	-29949	-35756	-22516	542.2	443.9	312.8	290.8	536.0	342.0	412.2	252.1
3	500	750	53309	43935	29992	28611	52889	33773	40265	28524	-72873	-59943	-40947	-39091	-72279	-46134	-54912	-34147	661.4	542.7	380.0	354.8	654.5	417.6	502.4	303.8

Appendix C – Load Rating Summary Form

After the structure has been load rated, the "Load Rating Summary Form" shall be completed, placed in Section D of the Bridge Record File and included in the contract plans (if applicable). The Load Rating Summary Form is provided in Excel format at: http://www.dot.state.fl.us/statemaintenanceoffice/Divisions.shtm

Bridge # N/A	FDOT Bridge Load Rating Summary Form	Form Date 1/1/2014

LRFR using Part A

Rating Level	Vehicle	Weight (tons)	LLDF per Lane (M)	LLDF per Lane (V)	Rating Factor	Tons	Controlling Span and Member	Controlling Location		Controlling Force		Bridge Management Value (Tons)	
								Distance (ft)	Percent (%)	Limit State	Type		
Design Operating	HL-93	36.0				--						Operating Rating (64)	**0.0**
Design Inventory						--						Inventory Rating (66)	**0.0**
Legal	SU2	17.0				--						Single Unit Truck 2 Axles	**-1.0**
	SU3	33.0				--						Single Unit Truck 3 Axles	**-1.0**
	SU4	35.0				--						Single Unit Truck 4 Axles	**-1.0**
	C3	28.0				--						Comb. Unit Truck 3 Axles	**-1.0**
	C4	36.7				--						Comb. Unit Truck 4 Axles	**-1.0**
	C5	40.0				--						Comb. Unit Truck 5 Axles	**-1.0**
	ST5	40.0				--						Truck Trailer 5 Axles	**-1.0**
Permit	FL120	60.0				--						FL120	**0.0**

Notes:

1. This table is based on the requirements established in the 2014 FDOT Bridge Load Rating Manual.
2. Controlling location is given both by the distance from the left support on that span and the fraction of that span. Ex: 28.5' - 50%
3. Controlling force is provided as flexure, shear, or stress together wih the corresponding limit state. Ex: Strength I - Flexure
4. If a legal vehicle is not required for load rating, enter "N/A" as the rating factor. Bridge management value will automatically be "-1.0"
5. Values in the the shaded cells will automatically be calculated.
6. LLDF: Live load distribution factor (per lane) is entered for the controlling span and the controlling case.
7. If posting is not required, enter "99" tons.

Bridge Load Rating Manual & Bridge Management System (BMS) Coding Guide are available at:
http://www.dot.state.fl.us/statemaintenanceoffice/divisions.shtm

Bridge Management Information			
Load Rating Date			
Reason for L.R.			
Program Used & Version No.			
Load Rating Origination			
Design Method			
Method of Calculation for LLDF			
LLDF (per lane)			
Impact Factor			
Design Load (31)			
Operating Type (63)			
Inventory Type (65)			
Main Type Material (43A)			
Main Type Design (43B)			
Approach Type Material (44A)			
Approach Type Design (44B)			
Open/Posted/Closed (41)			
Posting (70)			
Spans in Main Unit (45)			
Approach Spans (46)			
Length of Max Span (ft) (48)			
Structure Length (ft) (49)			
Recommended Posting	SU		tons
	C		tons
	ST		tons

Comments/Assumptions

P.E. Information

Performed by:	Date:
Checked by:	Date:
Reviewed by:	Date:
Responsible Engineer:	P.E. License #:
Telephone:	e-mail:

P.E. Seal

Bridge # N/A	FDOT Bridge Load Rating Summary Detail (Span-by-Span)	Form Date 1/1/2014

			LRFR using Part A											
	Span No.		1			2			3			4		
	Span Length (ft)													
			Controlling Rating Factor			Controlling Rating Factor			Controlling Rating Factor			Controlling Rating Factor		
Rating Level	Vehicle	Weight (Tons)	Flexure (Strength)	Shear (Strength)	Stress (Service)	Flexure (Strength)	Shear (Strength)	Stress (Service)	Flexure (Strength)	Shear (Strength)	Stress (Service)	Flexure (Strength)	Shear (Strength)	Stress (Service)
Design Operating	HL-93	36.0												
Design Inventory														
Legal	SU2	17.0												
	SU3	33.0												
	SU4	35.0												
	C3	28.0												
	C4	36.7												
	C5	40.0												
	ST5	40.0												
Permit	FL120	60.0												

Notes:

1. Fill this table for each span and attach it to the main summary form.
2. Change the span numbers as needed. Assign N/A if not applicable.
3. Span length is from CL bearing to CL bearing.

Bridge # N/A	**FDOT Bridge Load Rating Summary Form**	Form Date 1/1/2014

LFR using Part B

Rating Level	Vehicle	Weight (tons)	LLDF per Wheel Line (M)	LLDF per Wheel Line (V)	Rating Factor	Tons	Controlling Span and Member	Controlling Location		Controlling Force		Bridge Management Value (Tons)	
								Distance (ft)	Percent (%)	Limit State	Type		
Design Operating	HS20-44	36.0				--						Operating Rating (64)	**0.0**
Design Inventory						--						Inventory Rating (66)	**0.0**
Legal	SU2	17.0				--						Single Unit Truck 2 Axles	**-1.0**
	SU3	33.0				--						Single Unit Truck 3 Axles	**-1.0**
	SU4	35.0				--						Single Unit Truck 4 Axles	**-1.0**
	C3	28.0				--						Comb. Unit Truck 3 Axles	**-1.0**
	C4	36.7				--						Comb. Unit Truck 4 Axles	**-1.0**
	C5	40.0				--						Comb. Unit Truck 5 Axles	**-1.0**
	ST5	40.0				--						Truck Trailer 5 Axles	**-1.0**

Notes:

1. This table is based on the requirements established in the 2014 FDOT Bridge Load Rating Manual.
2. Controlling location is given both by the distance from the left support on that span and the fraction of that span. Ex: 28.5' - 50%
3. Controlling force is provided as flexure, shear, or stress together wih the corresponding limit state. Ex: Strength I - Flexure
4. If a legal vehicle is not required for load rating, enter "N/A" as the rating factor. Bridge management value will automatically be "-1.0"
5. Values in the the shaded cells will automatically be calculated.
6. LLDF: Live load distribution factor (per wheel line) is entered for the controlling span and the controlling case.
7. If posting is not required, enter "99" tons.

Bridge Load Rating Manual & Bridge Management System (BMS) Coding Guide are available at:
http://www.dot.state.fl.us/statemaintenanceoffice/divisions.shtm

Bridge Management Information			
Load Rating Date			
Reason for L.R.			
Program Used & Version No.			
Load Rating Origination			
Design Method			
Method of Calculation for LLDF			
LLDF (per wheel line)			
Impact Factor			
Design Load (31)			
Operating Type (63)			
Inventory Type (65)			
Main Type Material (43A)			
Main Type Design (43B)			
Approach Type Material (44A)			
Approach Type Design (44B)			
Open/Posted/Closed (41)			
Posting (70)			
Spans in Main Unit (45)			
Approach Spans (46)			
Length of Max Span (ft) (48)			
Structure Length (ft) (49)			
Recommended Posting	SU		tons
	C		tons
	ST		tons

Comments/Assumptions

P.E. Information

Performed by:	Date:
Checked by:	Date:
Reviewed by:	Date:
Responsible Engineer:	P.E. License #:
Telephone:	e-mail:

P.E. Seal

Bridge # N/A	FDOT Bridge Load Rating Summary Detail (Span-by-Span)	Form Date 1/1/2014

			LFR using Part B											
		Span No.	1			2			3			4		
		Span Length (ft)												
			Controlling Rating Factor			Controlling Rating Factor			Controlling Rating Factor			Controlling Rating Factor		
Rating Level	Vehicle	Weight (Tons)	Flexure (Strength)	Shear (Strength)	Stress (Service)	Flexure (Strength)	Shear (Strength)	Stress (Service)	Flexure (Strength)	Shear (Strength)	Stress (Service)	Flexure (Strength)	Shear (Strength)	Stress (Service)
Design Operating	HS20-44	36.0												
Design Inventory														
Legal	SU2	17.0												
	SU3	33.0												
	SU4	35.0												
	C3	28.0												
	C4	36.7												
	C5	40.0												
	ST5	40.0												

Notes:

1. Fill this table for each span and attach it to the main summary form.
2. Change the span numbers as needed. Assign N/A if not applicable.
3. Span length is from CL bearing to CL bearing.