

## CHAPTER 1 – LADV-11 DEVELOPMENT

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## 1.1—OBJECTIVE OF RESEARCH AND ANALYSIS

The LADOTD current design policy is to use HL-93 live load model as the design load. In addition, designers are required to check the eight (8) Louisiana special design vehicles (LASDV) for Strength II with a specific load factor. This complicated process requires larger design efforts and most often results in new bridges not meeting the minimum load rating criteria. A new load model that envelops the LA special design vehicles and meets the minimum load rating criteria is needed. The purpose of this work is to determine Magnification Factors (MF) for the AASHTO design vehicle HL-93, such that the effects of HL-93 multiplied by the magnification factors will encompass the effects of all LASDV load cases.

This report includes the investigation of flexural moment, shear, and support reaction for different span combinations. Simple and continuous spans with span lengths varying from 20 ft. up to 500 ft. were considered. For support reactions, the investigation only considered reactions at the interior support of two-span bridges, which was determined to be the most critical case.

## 1.2—VEHICLES

### 1.2.1—Design Vehicle

According to *AASHTO LRFD A3.6.1.3.1*, the design vehicular live load effect is taken as the larger of the following:

- The effect of the design tandem combined with the effect of the design lane load, or
- The effect of one design truck with the variable axle spacing specified in *A3.6.1.2.2*, combined with the effect of the design lane load, and
- For negative moment between points of contraflexure under a uniform load on all spans, and reactions at interior piers only, 90 percent of the effect of two design trucks spaced a minimum of 50 ft. between the lead axle of one truck and the rear axle of the other truck combined with 90 percent of the effect of the design lane load. The distance between the 32.0-kip axles of each truck is 14 ft. The two design trucks are placed in adjacent spans in order to produce maximum force effects.

### 1.2.2—Louisiana Special Design Vehicles

The Louisiana Special Design Vehicles are shown in Figure 1.2.2-1 (*LADOTD LRFD Bridge Design Manual*, Figure 2.1, 2008).

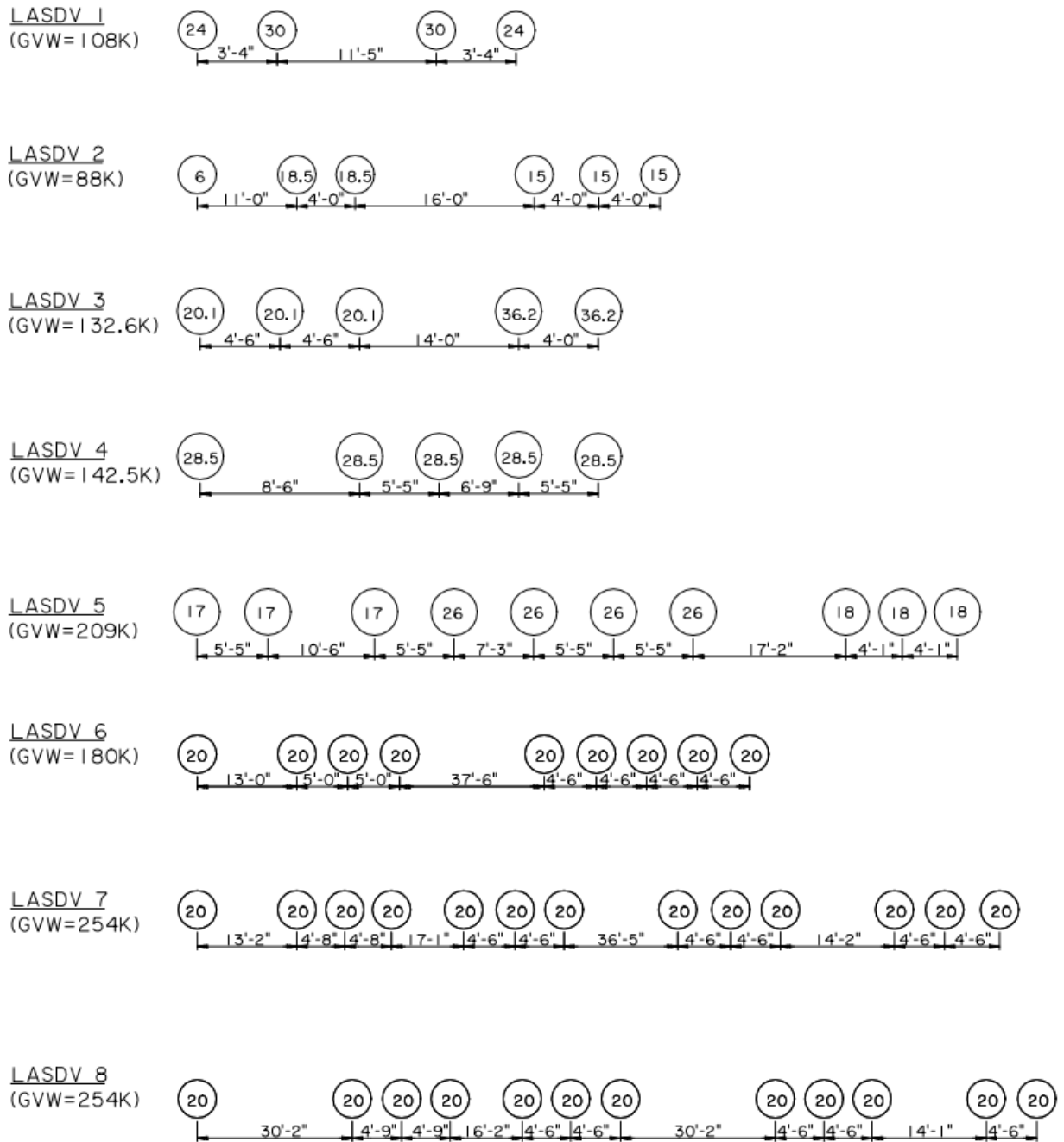


Figure 1.2.2-1: Louisiana Special Design Vehicles

### 1.3—INVESTIGATION OF FLEXURE MOMENT AND SHEAR

This analysis was carried out using the program Smart Bridge Suite 3.0 (Traditional Analysis), which generates flexural moment and shear effects on a superstructure. Bridges with simply supported spans and continuous spans with span lengths varying from 20 ft. up to 500 ft. were investigated. Table 1.3-1 summarizes the bridge types studied.

**Table 1.3-1: Bridge Types Studied For Moment and Shear**

Bridge type		Span length, ft.
Simply supported		20 ~ 240 (every 10'); 260, 300, 350, 400, 450, 500
Two continuous spans	Equal	20 ~ 240 (every 10'); 260, 300, 350, 400, 450, 500 (per each span)
	Unequal	20-30, 30-50, 40-70, 50-70, 60-100, 70-100, 80-100, 90-100, 80-130, 100-160, 110-180, 125-195, 140-210, 155-225, 160-240, 200-300, 260-400, 330-500
Three continuous spans	Equal	20 ~ 240 (every 10'); 260, 300, 350, 400, 450, 500 (per each span)
	Unequal	20-30-20, 30-50-30, 50-80-50, 65-100-65, 80-120-80, 100-150-100, 120-180-120, 135-200-135, 150-225-150, 160-240-160, 200-300-200, 260-400-260, 330-500-330

In traditional bridge design, the live load effects are distributed to a specific girder by a distribution factor, as specified in AASHTO bridge design specifications. Since the objective of this work is to investigate the correlation between the HL-93 design load and the LA special design vehicle loads, the flexure and shear effects under per-lane load, without applying the distribution factor, were used for investigation. Note that the dynamic impact factor is included in the study.

#### 1.3.1—Procedure of the Calculation of $MF_F$ and $MF_V$

The following procedure was used to determine the ratio of the maximum factored LASDV moment/shear to the factored HL-93 moment/shear, which represents the magnification factor of HL-93 loading. For each case, the magnification factors are calculated using the following equations:

$$MF_F = \frac{\text{Max}(M_{LASDV})}{\text{Max}(M_{Design})}$$

where:

- $MF_F$  = Magnification factor for flexure moment
- $\text{Max}(M_{LASDV})$  = Maximum flexure moment caused by factored LASDVs
- $\text{Max}(M_{Design})$  = Maximum flexure moment caused by factored HL-93

$$MF_V = \frac{Max(V_{LASDV})}{Max(V_{Design})}$$

where:

- MF<sub>V</sub> = Magnification factor for shear
- Max(V<sub>LASDV</sub>) = Maximum shear caused by factored LASDV
- Max(V<sub>Design</sub>) = Maximum shear caused by factored HL-93

The detailing procedure is presented as follows:

1) Flexural moment and shear force at bridge sections are exported from Smart Bridge Suite and plotted in Microsoft Excel.

*Note: 0.2 kip/ft. uniform load was applied with the LASDV to determine the positive and negative moments of bridge for any span length exceeding 200 feet.*

2) Appropriate load factors are applied to the lane moment/shear under each loading. For bridge design and load rating at strength limit state, live load factors are applied. The load factors for design loading (Inventory) and LASDV, listed in Table 1.3.1-1, are in accordance with AASHTO specifications and LADOTD policies for bridge rating and evaluation.

**Table 1.3.1-1: Load Factors for Design Loading and LASDV**

Loading Vehicle		Load Factor
Design Loading	HL-93	1.750
LA Special Design Vehicles (LASDV <sub>s</sub> )	LASDV1	1.720
	LASDV2	1.800
	LASDV3	1.474
	LASDV4	1.375
	LASDV5	1.300
	LASDV6	1.300
	LASDV7	1.300
	LASDV8	1.300

3) Calculate the ratio of the 1.75\*HL93 moment/shear to the maximum of factored LASDV<sub>s</sub> moment/shear, respectively. This ratio is determined to justify the percentage difference between the design loading and the control LA special vehicles.

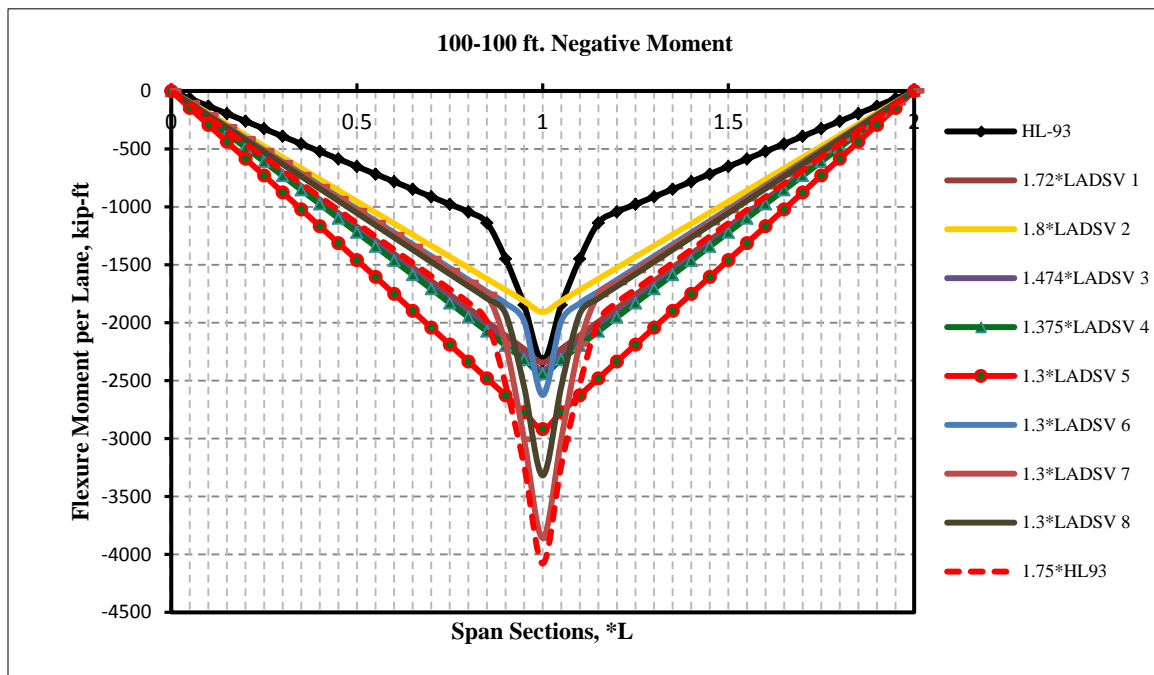
- Flexure Moment Ratio  $\frac{1.75(HL93)}{Max.(Factored\ LASDV\ 1,2,...8)}$  for the maximum moment section (i.e., 0.5L for the simply supported case).
- Shear Ratio  $\frac{1.75(HL93)}{Max.(Factored\ LASDV\ 1,2,...8)}$  for the critical shear section, at approximately 0.05L.

Note that for continuous cases, flexure and shear ratio are calculated for each span of a 2-span continuous unit, and for Span 1 and Span 2 for a 3-span continuous unit (since Span 1 = Span 3 in this study) and the lesser one is taken as the control value for  $\frac{1.75(HL93)}{Max.(Factored\ LASDV\ 1,2,\dots,8)}$ .

Therefore, it results in the larger value of  $\frac{Max.(Factored\ LASDV\ 1,2,\dots,8)}{1.75(HL-93)}$ , which represents the controlling magnification factor of HL-93 for flexure moment ( $MF_F$ ) or shear ( $MF_V$ ).

A special case for the negative flexural moment of certain span lengths, the MF calculated on the basis of the support region differs largely from regions away from the support. For example, for a 100-100 ft. continuous span unit, as shown in Figure 1.3.1-1, 1.75\*HL93 can envelop all factored LASDVs at the support region, but not at the other regions. Hence, a ratio based on the negative moment at 0.85L is considered better for the case of “Within Span Negative Moment.”

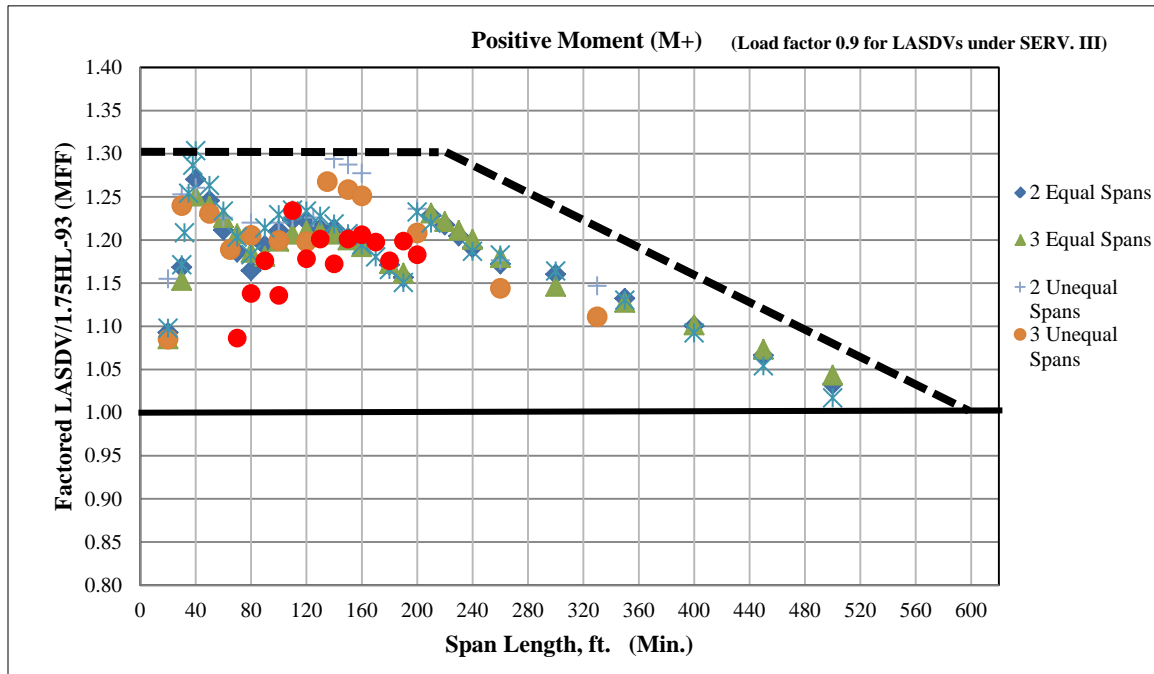
4.) Plotting of the ratio  $\frac{Max.(Factored\ LASDV\ 1,2,\dots,8)}{1.75(HL93)}$  ( $MF_F$  or  $MF_V$ ) against the span length in feet is shown in Figures 1.3.2-1, 1.3.2-2, and 1.3.2-3. (*Note that the span length used for the figures is the single span length for simply-supported and equal continuous span, but the shortest span length for unequal span cases.*)



**Figure 1.3.1-1: Negative Moment for 100-100 ft. Continuous Span Unit**

### 1.3.2—Upper Boundary Line to Cover All Data

The upper boundary line is selected so that it envelops the ratios from all covered cases (i.e. simply supported, 2 equal spans, 3 equal spans, 2 unequal spans, and 3 unequal spans), as shown in Figures 1.3.2-1, 1.3.2-2, and 1.3.2-3, respectively.



**Figure 1.3.2-1: Upper Boundary Lines for Positive Flexure Moment**

Condition	$MF_F$
$S \leq 240$ ft.	1.30
$240$ ft. $< S < 600$ ft.	Interpolation
$S \geq 600$ ft.	1.00

where:

$MF_F$  = Magnification Factor

$S$  = Span length, use shortest span for unequal continuous spans (feet)

Note that the red data points shown in Figure 1.3.2-1 are for checking Service III for prestressed concrete bridges, load factor 0.9 is applied to the LASDVs under Service III limit state, for which the load rating analysis for Service III is addressed in details as follows.

The proposed upper boundary lines in Figure 1.3.2-1 are based on strength limit state, for which the service limit state shall be taken into account as well.

For consistency, design examples hereafter will be performed with the new LG Girders with concrete strengths as specified in the new LADOTD *Bridge Design and Evaluation Manual* (BDEM). Only span lengths from 70 ft. to 200 ft. are to be investigated herein due to following considerations:

- At most cases the maximum span length for prestressed concrete girder bridges would be less than

200 ft.

- From Figure 1.3.2-1 it can be seen that the upper boundary line reserves about 10 percent more than the actual ratio for the 70 ft long spans, which could account for the service limit state at this range. Hence only span length varying from 70-200 ft. is considered.

Assumptions for Service III examples as shown in Figure 1.3.2-1 are given in Table 1.3.2-1. In addition, the load factor for Design loading is 1.0, while 0.9 load factor for LA permit Vehicles (LASDVs).

**Table 1.3.2-1: Design Assumptions for Service III Examples**

Bridge Girder:	New LG Girders
Rating Methodology:	Mixed with traffic
$f_c'$ (girder):	8.5ksi - 10.0 ksi
$f_{ci}'$ (girder):	6.5ksi - 7.5ksi
Allowable tension (Inv.):	$6 \sqrt{f_c'}$ (girder)
Allowable tension (Op.):	$7.5 \sqrt{f_c'}$ (girder)
$f_c'$ (deck):	4.0 ksi
Design load:	1.3 *HL-93

Table 1.3.2-2 summarizes the load rating results for bridges with span length from 70 ft. to 200 ft. Note that the minimum design is performed for the new design loading.

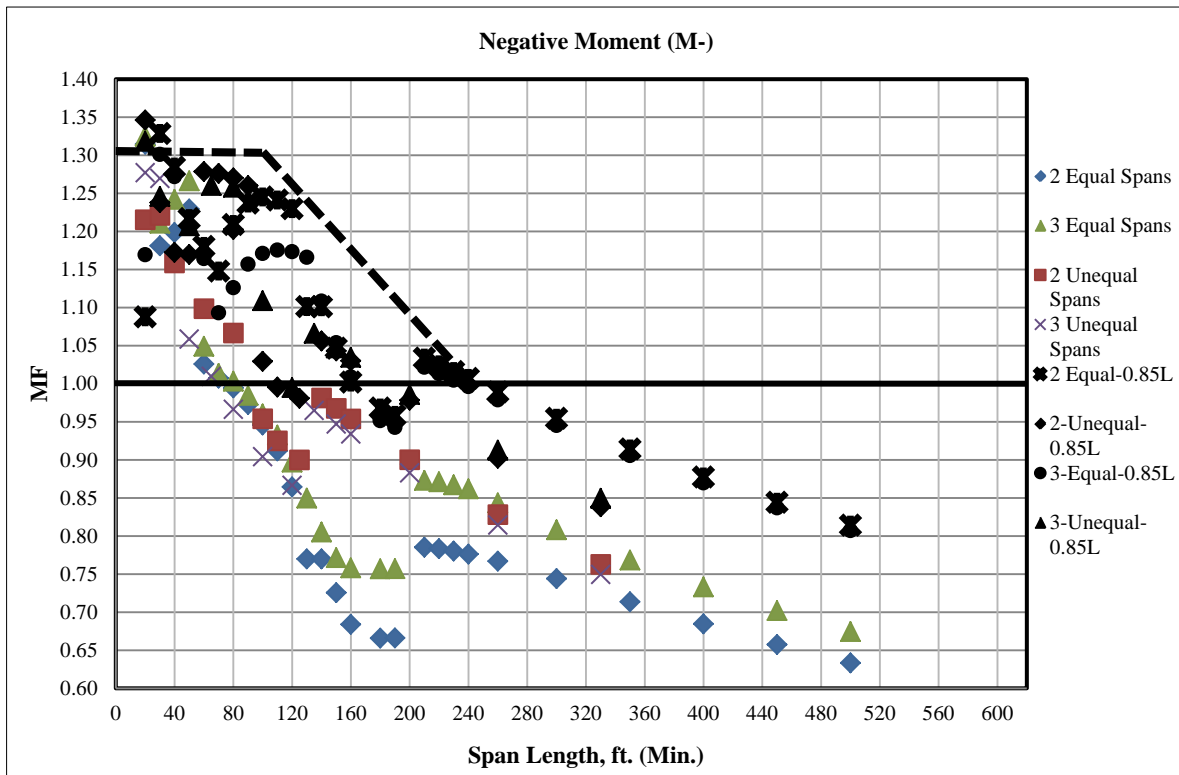
**Table 1.3.2-2: Load Rating Summary Based on Above Assumptions**

Service III				
Span Length, ft.	Design load (*HL93)	Rating Factor (RF)		1.3/ RF <sub>LASDV</sub>
		RF <sub>Design load (Inv.)</sub>	RF <sub>LASDV</sub>	
70	1.30	1.02	1.20	1.09
80	1.30	1.05	1.14	1.14
90	1.30	1.01	1.11	1.18
100	1.30	1.07	1.14	1.14
110	1.30	1.00	1.05	1.23
120	1.30	1.05	1.10	1.18
130	1.30	1.05	1.08	1.20
140	1.30	1.07	1.11	1.17
150	1.30	1.05	1.08	1.20
160	1.30	1.03	1.08	1.21
170	1.30	1.03	1.09	1.20
180	1.30	1.04	1.11	1.18
190	1.30	1.01	1.08	1.20
200	1.30	1.01	1.10	1.18
		Min. Design		



The factor of “ $1.3/R.F._{LASDV}$ ” is the required magnification for HL-93 to account for the service limit state, as plotted in Figure 1.3.2-1.

It can be seen that, for prestressed concrete bridges, using a load factor of 0.9 for LASDVs under Service III limit state, provides higher load rating factor than that from design loading ( $1.3 \cdot HL-93$ ) with 1.0 load factor. Hence, it becomes unnecessary to check for LADOTD permits if the bridges are designed on the basis of  $1.3 \cdot HL-93$  design loading.



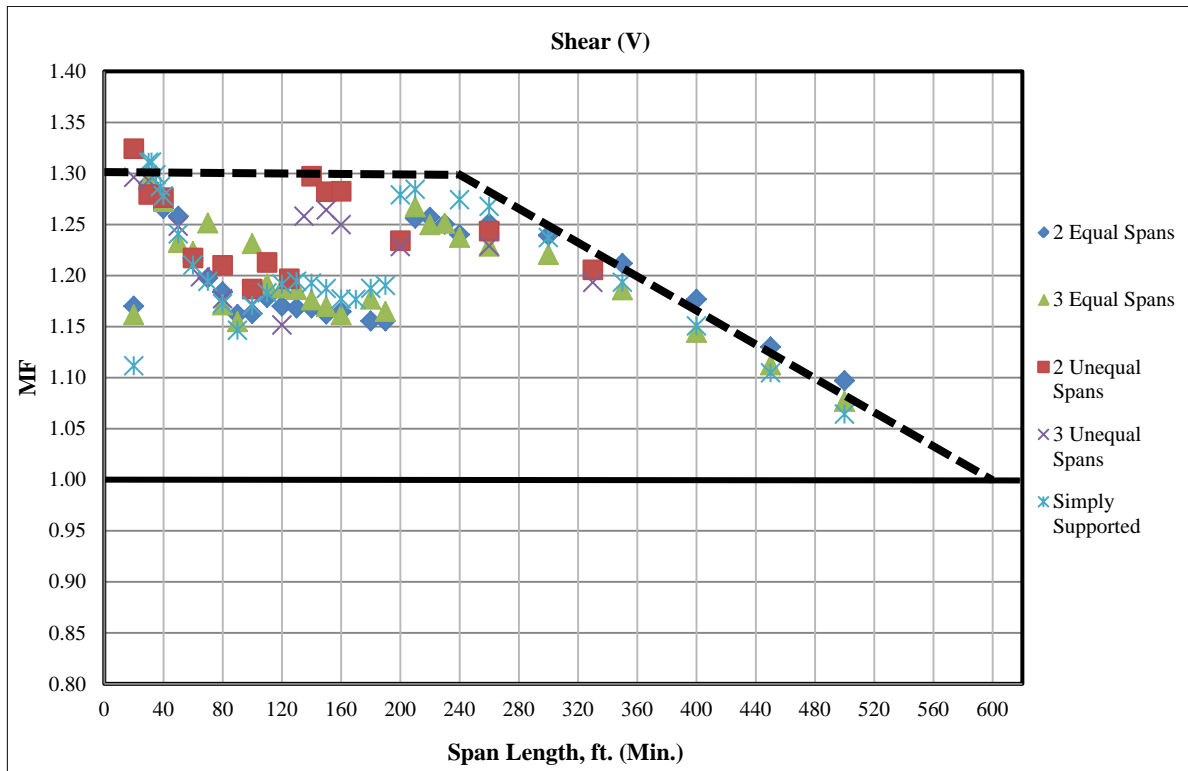
**Figure 1.3.2-2: Upper Boundary Lines for Negative Flexure Moment**

Condition	$MF_F$
$S \leq 100$ ft.	1.30
$100$ ft. $< S < 240$ ft.	Interpolation
$S \geq 240$ ft.	1.00

where:

$MF_F$  = Magnification Factor

S = Span Length, use shortest span for unequal continuous spans (feet)



**Figure 1.3.2-3: Upper Boundary Lines for Shear**

Condition	$MF_v$
$S \leq 240$ ft.	1.30
$240$ ft. $< S < 600$ ft.	Interpolation
$S \geq 600$ ft.	1.00

where:

$MF_v$  = Magnification Factor

S = Span Length, use shortest span for unequal continuous spans (feet)

### 1.3.3—Summary of Magnification Factor for Flexure Moment and Shear

Span Length	Magnification Factor	
	Positive Flexure (MF <sub>F</sub> )	Shear (MF <sub>V</sub> )
$S \leq 240$ ft.	1.30	1.30
$240$ ft. < $S$ < $600$ ft.	Interpolation	Interpolation
$S \geq 600$ ft.	1.00	1.00

Span Length	Magnification Factor	
	Negative Flexure (MF <sub>F</sub> )	
$S \leq 100$ ft.	1.30	
$100$ ft. < $S$ < $240$ ft.	Interpolation	
$S \geq 240$ ft.	1.00	

where:

$S$  = Span Length, use shortest span for unequal continuous spans (feet)

### 1.3.4— Serviceability of Slab Bridges

The serviceability of slab bridges with spans between 20 and 35 ft. was also investigated to determine whether crack control requirements are satisfied. Four examples of slab bridges are presented in Tables 1.3.4-1 through 1.3.4-4. It is concluded from the results presented in these tables that the crack control requirement is based on the steel stress under service, providing that the maximum steel stress is less than  $0.6f_y$ . No serviceability requirements are affected by increasing design live load.

**Table 1.3.4-1: 20 ft. Long Simply Supported Slab Span**

<b>20 FT. SIMPLE SPAN</b>													
<b>Left Edge Beam</b>													
<b>Vehicles</b>	<b>Section, ft.</b>	<b>0</b>	<b>2.00</b>	<b>4.00</b>	<b>6.00</b>	<b>8.00</b>	<b>10.00</b>	<b>12.00</b>	<b>14.00</b>	<b>16.00</b>	<b>18.00</b>	<b>20</b>	<b>Load factor</b>
HL93	Strength I (Inv.) M+	N/A	3.05	1.65	1.20	1.02	1.01	1.02	1.20	1.65	3.05	N/A	1.750
	Strength I (Op.) M+	N/A	3.95	2.13	1.56	1.33	1.31	1.33	1.56	2.13	3.95	N/A	1.350
	Service I (Inv.) M+	N/A	5.22	2.86	2.11	1.82	1.79	1.82	2.11	2.86	5.22	N/A	1.000
LASDV 1	Strength II M+	N/A	2.83	1.57	1.18	1.01	0.97	1.01	1.18	1.57	2.83	N/A	1.720
	Service I M+	N/A	4.76	2.68	2.03	1.75	1.70	1.75	2.03	2.68	4.76	N/A	1.000
LASDV 2	Strength II M+	N/A	4.16	2.22	1.67	1.41	1.34	1.41	1.67	2.22	4.16	N/A	1.800
	Service I M+	N/A	7.31	3.97	3.03	2.57	2.45	2.57	3.03	3.97	7.31	N/A	1.000
LASDV 3	Strength II M+	N/A	2.77	1.45	1.06	0.92	0.90	0.92	1.06	1.45	2.77	N/A	1.474
	Service I M+	N/A	3.98	2.13	1.56	1.37	1.35	1.37	1.56	2.13	3.98	N/A	1.000
LASDV 4	Strength II M+	N/A	3.27	1.83	1.43	1.19	1.12	1.19	1.43	1.83	3.27	N/A	1.375
	Service I M+	N/A	4.40	2.49	1.97	1.65	1.57	1.65	1.97	2.49	4.40	N/A	1.000
LASDV 5	Strength II M+	N/A	3.67	2.02	1.58	1.30	1.22	1.30	1.58	2.02	3.67	N/A	1.300
	Service I M+	N/A	4.66	2.61	2.07	1.71	1.62	1.71	2.07	2.61	4.66	N/A	1.000
LASDV 6	Strength II M+	N/A	4.06	2.24	1.61	1.36	1.32	1.36	1.61	2.24	4.06	N/A	1.300
	Service I M+	N/A	5.16	2.89	2.10	1.80	1.75	1.80	2.10	2.89	5.16	N/A	1.000
LASDV 7	Strength II M+	N/A	4.38	2.54	1.82	1.55	1.41	1.55	1.82	2.54	4.38	N/A	1.300
	Service I M+	N/A	5.57	3.28	2.38	2.04	1.86	2.04	2.38	3.28	5.57	N/A	1.000
LASDV 8	Strength II M+	N/A	4.69	2.46	1.85	1.54	1.47	1.54	1.85	2.46	4.69	N/A	1.300
	Service I M+	N/A	5.96	3.18	2.41	2.03	1.95	2.03	2.41	3.18	5.96	N/A	1.000
<b>Interior Beam</b>													
<b>Vehicles</b>	<b>Section, ft.</b>	<b>0</b>	<b>2.00</b>	<b>4.00</b>	<b>6.00</b>	<b>8.00</b>	<b>10.00</b>	<b>12.00</b>	<b>14.00</b>	<b>16.00</b>	<b>18.00</b>	<b>20</b>	<b>Load factor</b>
HL93	Strength I (Inv.) M+	N/A	3.09	1.66	1.21	1.03	1.02	1.03	1.21	1.66	3.09	N/A	1.750
	Strength I (Op.) M+	N/A	4.00	2.16	1.57	1.34	1.32	1.34	1.57	2.16	4.00	N/A	1.350
	Service I (Inv.) M+	N/A	5.28	2.89	2.13	1.83	1.81	1.83	2.13	2.89	5.28	N/A	1.000
LASDV 1	Strength II M+	N/A	2.94	1.63	1.22	1.04	1.01	1.04	1.22	1.63	2.94	N/A	1.720
	Service I M+	N/A	4.94	2.78	2.11	1.82	1.77	1.82	2.11	2.78	4.94	N/A	1.000
LASDV 2	Strength II M+	N/A	4.31	2.31	1.74	1.46	1.39	1.46	1.74	2.31	4.31	N/A	1.800
	Service I M+	N/A	7.59	4.12	3.14	2.66	2.54	2.66	3.14	4.12	7.59	N/A	1.000
LASDV 3	Strength II M+	N/A	2.87	1.51	1.10	0.95	0.93	0.95	1.10	1.51	2.87	N/A	1.474
	Service I M+	N/A	4.14	2.21	1.62	1.42	1.40	1.42	1.62	2.21	4.14	N/A	1.000
LASDV 4	Strength II M+	N/A	3.40	1.89	1.48	1.23	1.16	1.23	1.48	1.89	3.40	N/A	1.375
	Service I M+	N/A	4.57	2.59	2.05	1.72	1.63	1.72	2.05	2.59	4.57	N/A	1.000
LASDV 5	Strength II M+	N/A	3.81	2.10	1.64	1.35	1.27	1.35	1.64	2.10	3.81	N/A	1.300
	Service I M+	N/A	4.84	2.71	2.15	1.78	1.68	1.78	2.15	2.71	4.84	N/A	1.000
LASDV 6	Strength II M+	N/A	4.22	2.32	1.67	1.42	1.37	1.42	1.67	2.32	4.22	N/A	1.300
	Service I M+	N/A	5.36	3.00	2.18	1.87	1.82	1.87	2.18	3.00	5.36	N/A	1.000
LASDV 7	Strength II M+	N/A	4.55	2.64	1.89	1.61	1.46	1.61	1.89	2.64	4.55	N/A	1.300
	Service I M+	N/A	5.78	3.40	2.47	2.12	1.93	2.12	2.47	3.40	5.78	N/A	1.000
LASDV 8	Strength II M+	N/A	4.87	2.55	1.92	1.60	1.53	1.60	1.92	2.55	4.87	N/A	1.300
	Service I M+	N/A	6.19	3.30	2.50	2.11	2.02	2.11	2.50	3.30	6.19	N/A	1.000

**Table 1.3.4-2: 25 ft. Long Simply Supported Slab Span**

<b>25 FT. SIMPLE SPAN</b>													
<b>Left Edge Beam</b>													
<b>Vehicles</b>	<b>Section, ft.</b>	<b>0</b>	<b>2.50</b>	<b>5.00</b>	<b>7.50</b>	<b>10.00</b>	<b>12.50</b>	<b>15.00</b>	<b>17.50</b>	<b>20.00</b>	<b>22.50</b>	<b>25</b>	<b>Load factor</b>
HL93	Strength I (Inv.) M+	N/A	3.32	1.74	1.23	1.04	1.01	1.04	1.23	1.74	3.32	N/A	1.750
	Strength I (Op.) M+	N/A	4.30	2.26	1.59	1.35	1.30	1.35	1.59	2.26	4.30	N/A	1.350
	Service I (Inv.) M+	N/A	5.72	3.07	2.20	1.89	1.83	1.89	2.20	3.07	5.72	N/A	1.000
LASDV 1	Strength II M+	N/A	2.66	1.47	1.07	0.95	0.97	0.95	1.07	1.47	2.66	N/A	1.720
	Service I M+	N/A	4.51	2.54	1.88	1.69	1.73	1.69	1.88	2.54	4.51	N/A	1.000
LASDV 2	Strength II M+	N/A	4.39	2.30	1.67	1.39	1.31	1.39	1.67	2.30	4.39	N/A	1.800
	Service I M+	N/A	7.78	4.17	3.08	2.59	2.45	2.59	3.08	4.17	7.78	N/A	1.000
LASDV 3	Strength II M+	N/A	2.89	1.55	1.12	0.95	0.91	0.95	1.12	1.55	2.89	N/A	1.474
	Service I M+	N/A	4.19	2.30	1.69	1.45	1.40	1.45	1.69	2.30	4.19	N/A	1.000
LASDV 4	Strength II M+	N/A	3.12	1.72	1.23	1.02	1.03	1.02	1.23	1.72	3.12	N/A	1.375
	Service I M+	N/A	4.23	2.37	1.73	1.45	1.47	1.45	1.73	2.37	4.23	N/A	1.000
LASDV 5	Strength II M+	N/A	3.65	1.99	1.41	1.19	1.15	1.19	1.41	1.99	3.65	N/A	1.300
	Service I M+	N/A	4.67	2.60	1.88	1.61	1.56	1.61	1.88	2.60	4.67	N/A	1.000
LASDV 6	Strength II M+	N/A	3.78	2.07	1.42	1.22	1.14	1.22	1.42	2.07	3.78	N/A	1.300
	Service I M+	N/A	4.84	2.71	1.89	1.64	1.54	1.64	1.89	2.71	4.84	N/A	1.000
LASDV 7	Strength II M+	N/A	4.74	2.48	1.80	1.49	1.40	1.49	1.80	2.48	4.74	N/A	1.300
	Service I M+	N/A	6.06	3.24	2.40	2.00	1.89	2.00	2.40	3.24	6.06	N/A	1.000
LASDV 8	Strength II M+	N/A	4.79	2.49	1.81	1.49	1.43	1.49	1.81	2.49	4.79	N/A	1.300
	Service I M+	N/A	6.14	3.26	2.41	2.00	1.93	2.00	2.41	3.26	6.14	N/A	1.000
<b>Interior strip</b>													
<b>Vehicles</b>	<b>Section, ft.</b>	<b>0</b>	<b>2.50</b>	<b>5.00</b>	<b>7.50</b>	<b>10.00</b>	<b>12.50</b>	<b>15.00</b>	<b>17.50</b>	<b>20.00</b>	<b>22.50</b>	<b>25</b>	<b>Load factor</b>
HL93	Strength I (Inv.) M+	N/A	3.41	1.79	1.26	1.07	1.03	1.07	1.26	1.79	3.41	N/A	1.750
	Strength I (Op.) M+	N/A	4.43	2.32	1.64	1.39	1.34	1.39	1.64	2.32	4.43	N/A	1.350
	Service I (Inv.) M+	N/A	5.88	3.16	2.26	1.94	1.88	1.94	2.26	3.16	5.88	N/A	1.000
LASDV 1	Strength II M+	N/A	2.82	1.55	1.13	1.00	1.02	1.00	1.13	1.55	2.82	N/A	1.720
	Service I M+	N/A	4.78	2.69	1.99	1.79	1.83	1.79	1.99	2.69	4.78	N/A	1.000
LASDV 2	Strength II M+	N/A	4.65	2.44	1.77	1.47	1.39	1.47	1.77	2.44	4.65	N/A	1.800
	Service I M+	N/A	8.24	4.41	3.26	2.74	2.59	2.74	3.26	4.41	8.24	N/A	1.000
LASDV 3	Strength II M+	N/A	3.06	1.64	1.18	1.01	0.97	1.01	1.18	1.64	3.06	N/A	1.474
	Service I M+	N/A	4.44	2.43	1.79	1.54	1.48	1.54	1.79	2.43	4.44	N/A	1.000
LASDV 4	Strength II M+	N/A	3.30	1.82	1.30	1.08	1.09	1.08	1.30	1.82	3.30	N/A	1.375
	Service I M+	N/A	4.47	2.51	1.83	1.53	1.55	1.53	1.83	2.51	4.47	N/A	1.000
LASDV 5	Strength II M+	N/A	3.86	2.10	1.50	1.26	1.22	1.26	1.50	2.10	3.86	N/A	1.300
	Service I M+	N/A	4.94	2.75	1.99	1.70	1.65	1.70	1.99	2.75	4.94	N/A	1.000
LASDV 6	Strength II M+	N/A	4.01	2.19	1.50	1.29	1.20	1.29	1.50	2.19	4.01	N/A	1.300
	Service I M+	N/A	5.13	2.87	2.00	1.73	1.63	1.73	2.00	2.87	5.13	N/A	1.000
LASDV 7	Strength II M+	N/A	5.01	2.62	1.91	1.57	1.48	1.57	1.91	2.62	5.01	N/A	1.300
	Service I M+	N/A	6.42	3.43	2.54	2.12	2.00	2.12	2.54	3.43	6.42	N/A	1.000
LASDV 8	Strength II M+	N/A	5.07	2.64	1.91	1.57	1.52	1.57	1.91	2.64	5.07	N/A	1.300
	Service I M+	N/A	6.49	3.45	2.55	2.12	2.05	2.12	2.55	3.45	6.49	N/A	1.000

**Table 1.3.4-3: 30 ft. Long Simply Supported Slab Span**

<b>30 FT. SIMPLE SPAN</b>													
<b>Left Edge Beam</b>													
<b>Vehicles</b>	<b>Section, ft.</b>	<b>0</b>	<b>3.00</b>	<b>6.00</b>	<b>9.00</b>	<b>12.00</b>	<b>15.00</b>	<b>18.00</b>	<b>21.00</b>	<b>24.00</b>	<b>27.00</b>	<b>30</b>	<b>Load factor</b>
HL93	Strength I (Inv.) M+	N/A	3.59	1.82	1.27	1.06	1.01	1.06	1.27	1.82	3.59	N/A	1.750
	Strength I (Op.) M+	N/A	4.66	2.36	1.65	1.37	1.31	1.37	1.65	2.36	4.66	N/A	1.350
	Service I (Inv.) M+	N/A	6.20	3.23	2.30	1.95	1.87	1.95	2.30	3.23	6.20	N/A	1.000
LASDV 1	Strength II M+	N/A	2.74	1.41	1.00	0.87	0.90	0.87	1.00	1.41	2.74	N/A	1.720
	Service I M+	N/A	4.64	2.46	1.78	1.57	1.64	1.57	1.78	2.46	4.64	N/A	1.000
LASDV 2	Strength II M+	N/A	4.59	2.42	1.73	1.42	1.30	1.42	1.73	2.42	4.59	N/A	1.800
	Service I M+	N/A	8.14	4.40	3.22	2.68	2.48	2.68	3.22	4.40	8.14	N/A	1.000
LASDV 3	Strength II M+	N/A	2.91	1.53	1.12	0.97	0.93	0.97	1.12	1.53	2.91	N/A	1.474
	Service I M+	N/A	4.22	2.29	1.71	1.50	1.44	1.50	1.71	2.29	4.22	N/A	1.000
LASDV 4	Strength II M+	N/A	3.14	1.66	1.16	0.95	0.92	0.95	1.16	1.66	3.14	N/A	1.375
	Service I M+	N/A	4.26	2.31	1.65	1.38	1.34	1.38	1.65	2.31	4.26	N/A	1.000
LASDV 5	Strength II M+	N/A	3.48	1.89	1.30	1.09	1.04	1.09	1.30	1.89	3.48	N/A	1.300
	Service I M+	N/A	4.46	2.48	1.75	1.49	1.44	1.49	1.75	2.48	4.46	N/A	1.000
LASDV 6	Strength II M+	N/A	3.81	2.00	1.37	1.13	1.05	1.13	1.37	2.00	3.81	N/A	1.300
	Service I M+	N/A	4.88	2.64	1.85	1.55	1.44	1.55	1.85	2.64	4.88	N/A	1.000
LASDV 7	Strength II M+	N/A	4.83	2.59	1.81	1.50	1.39	1.50	1.81	2.59	4.83	N/A	1.300
	Service I M+	N/A	6.19	3.41	2.43	2.05	1.92	2.05	2.43	3.41	6.19	N/A	1.000
LASDV 8	Strength II M+	N/A	4.79	2.59	1.85	1.50	1.39	1.50	1.85	2.59	4.79	N/A	1.300
	Service I M+	N/A	6.14	3.41	2.49	2.04	1.91	2.04	2.49	3.41	6.14	N/A	1.000
<b>Interior strip</b>													
<b>Vehicles</b>	<b>Section, ft.</b>	<b>0</b>	<b>3.00</b>	<b>6.00</b>	<b>9.00</b>	<b>12.00</b>	<b>15.00</b>	<b>18.00</b>	<b>21.00</b>	<b>24.00</b>	<b>27.00</b>	<b>30</b>	<b>Load factor</b>
HL93	Strength I (Inv.) M+	N/A	3.75	1.90	1.33	1.11	1.05	1.11	1.33	1.90	3.75	N/A	1.750
	Strength I (Op.) M+	N/A	4.87	2.47	1.72	1.43	1.36	1.43	1.72	2.47	4.87	N/A	1.350
	Service I (Inv.) M+	N/A	6.47	3.37	2.40	2.04	1.95	2.04	2.40	3.37	6.47	N/A	1.000
LASDV 1	Strength II M+	N/A	2.94	1.52	1.07	0.93	0.97	0.93	1.07	1.52	2.94	N/A	1.720
	Service I M+	N/A	4.99	2.64	1.91	1.69	1.76	1.69	1.91	2.64	4.99	N/A	1.000
LASDV 2	Strength II M+	N/A	4.94	2.60	1.86	1.52	1.40	1.52	1.86	2.60	4.94	N/A	1.800
	Service I M+	N/A	8.76	4.74	3.47	2.89	2.66	2.89	3.47	4.74	8.76	N/A	1.000
LASDV 3	Strength II M+	N/A	3.13	1.65	1.21	1.04	1.00	1.04	1.21	1.65	3.13	N/A	1.474
	Service I M+	N/A	4.55	2.46	1.84	1.61	1.55	1.61	1.84	2.46	4.55	N/A	1.000
LASDV 4	Strength II M+	N/A	3.38	1.78	1.24	1.03	0.99	1.03	1.24	1.78	3.38	N/A	1.375
	Service I M+	N/A	4.58	2.48	1.77	1.48	1.44	1.48	1.77	2.48	4.58	N/A	1.000
LASDV 5	Strength II M+	N/A	3.74	2.03	1.40	1.17	1.12	1.17	1.40	2.03	3.74	N/A	1.300
	Service I M+	N/A	4.80	2.67	1.88	1.61	1.54	1.61	1.88	2.67	4.80	N/A	1.000
LASDV 6	Strength II M+	N/A	4.10	2.16	1.48	1.22	1.13	1.22	1.48	2.16	4.10	N/A	1.300
	Service I M+	N/A	5.25	2.84	1.99	1.67	1.55	1.67	1.99	2.84	5.25	N/A	1.000
LASDV 7	Strength II M+	N/A	5.19	2.79	1.94	1.61	1.50	1.61	1.94	2.79	5.19	N/A	1.300
	Service I M+	N/A	6.66	3.67	2.62	2.21	2.06	2.21	2.62	3.67	6.66	N/A	1.000
LASDV 8	Strength II M+	N/A	5.15	2.79	1.99	1.61	1.49	1.61	1.99	2.79	5.15	N/A	1.300
	Service I M+	N/A	6.61	3.67	2.68	2.20	2.06	2.20	2.68	3.67	6.61	N/A	1.000

**Table 1.3.4-4: 35 ft. Long Simply Supported Slab Span**

<b>35 ft SIMPLE SPAN</b>													
<b>Left Edge Beam</b>													
<b>Vehicles</b>	<b>Section, ft</b>	<b>0</b>	<b>3.50</b>	<b>7.00</b>	<b>10.50</b>	<b>14.00</b>	<b>17.50</b>	<b>21.00</b>	<b>24.50</b>	<b>28.00</b>	<b>31.50</b>	<b>35</b>	<b>Load factor</b>
HL93	Strength I (Inv.) M+	N/A	3.52	1.85	1.29	1.06	1.01	1.06	1.29	1.85	3.52	N/A	1.750
	Strength I (Op.) M+	N/A	4.56	2.40	1.67	1.38	1.31	1.38	1.67	2.40	4.56	N/A	1.350
	Service I (Inv.) M+	N/A	6.09	3.29	2.36	1.98	1.89	1.98	2.36	3.29	6.09	N/A	1.000
LASDV 1	Strength II M+	N/A	2.73	1.39	0.96	0.82	0.83	0.82	0.96	1.39	2.73	N/A	1.720
	Service I M+	N/A	4.65	2.43	1.73	1.51	1.52	1.51	1.73	2.43	4.65	N/A	1.000
LASDV 2	Strength II M+	N/A	4.31	2.29	1.65	1.40	1.33	1.40	1.65	2.29	4.31	N/A	1.800
	Service I M+	N/A	7.66	4.20	3.10	2.68	2.57	2.68	3.10	4.20	7.66	N/A	1.000
LASDV 3	Strength II M+	N/A	2.89	1.50	1.09	0.92	0.90	0.92	1.09	1.50	2.89	N/A	1.474
	Service I M+	N/A	4.21	2.25	1.68	1.44	1.43	1.44	1.68	2.25	4.21	N/A	1.000
LASDV 4	Strength II M+	N/A	3.07	1.58	1.07	0.90	0.83	0.90	1.07	1.58	3.07	N/A	1.375
	Service I M+	N/A	4.18	2.22	1.54	1.32	1.23	1.32	1.54	2.22	4.18	N/A	1.000
LASDV 5	Strength II M+	N/A	3.56	1.81	1.21	1.01	0.96	1.01	1.21	1.81	3.56	N/A	1.300
	Service I M+	N/A	4.58	2.39	1.65	1.40	1.34	1.40	1.65	2.39	4.58	N/A	1.000
LASDV 6	Strength II M+	N/A	3.86	1.97	1.33	1.09	1.02	1.09	1.33	1.97	3.86	N/A	1.300
	Service I M+	N/A	4.96	2.60	1.80	1.51	1.42	1.51	1.80	2.60	4.96	N/A	1.000
LASDV 7	Strength II M+	N/A	4.88	2.47	1.70	1.44	1.41	1.44	1.70	2.47	4.88	N/A	1.300
	Service I M+	N/A	6.27	3.27	2.31	2.00	1.96	2.00	2.31	3.27	6.27	N/A	1.000
LASDV 8	Strength II M+	N/A	4.70	2.46	1.76	1.48	1.42	1.48	1.76	2.46	4.70	N/A	1.300
	Service I M+	N/A	6.04	3.26	2.40	2.05	1.98	2.05	2.40	3.26	6.04	N/A	1.000
<b>Interior strip</b>													
<b>Vehicles</b>	<b>Section, ft</b>	<b>0</b>	<b>3.50</b>	<b>7.00</b>	<b>10.50</b>	<b>14.00</b>	<b>17.50</b>	<b>21.00</b>	<b>24.50</b>	<b>28.00</b>	<b>31.50</b>	<b>35</b>	<b>Load factor</b>
HL93	Strength I (Inv.) M+	N/A	3.73	1.96	1.36	1.12	1.07	1.12	1.36	1.96	3.73	N/A	1.750
	Strength I (Op.) M+	N/A	4.84	2.54	1.77	1.46	1.38	1.46	1.77	2.54	4.84	N/A	1.350
	Service I (Inv.) M+	N/A	6.46	3.48	2.49	2.09	2.00	2.09	2.49	3.48	6.46	N/A	1.000
LASDV 1	Strength II M+	N/A	2.99	1.52	1.05	0.90	0.90	0.90	1.05	1.52	2.99	N/A	1.720
	Service I M+	N/A	5.08	2.65	1.89	1.64	1.66	1.64	1.89	2.65	5.08	N/A	1.000
LASDV 2	Strength II M+	N/A	4.70	2.50	1.80	1.53	1.45	1.53	1.80	2.50	4.70	N/A	1.800
	Service I M+	N/A	8.36	4.58	3.39	2.92	2.80	2.92	3.39	4.58	8.36	N/A	1.000
LASDV 3	Strength II M+	N/A	3.16	1.63	1.19	1.00	0.99	1.00	1.19	1.63	3.16	N/A	1.474
	Service I M+	N/A	4.60	2.45	1.84	1.58	1.56	1.58	1.84	2.45	4.60	N/A	1.000
LASDV 4	Strength II M+	N/A	3.36	1.73	1.17	0.99	0.91	0.99	1.17	1.73	3.36	N/A	1.375
	Service I M+	N/A	4.56	2.42	1.68	1.45	1.34	1.45	1.68	2.42	4.56	N/A	1.000
LASDV 5	Strength II M+	N/A	3.89	1.97	1.33	1.11	1.05	1.11	1.33	1.97	3.89	N/A	1.300
	Service I M+	N/A	5.00	2.61	1.80	1.53	1.46	1.53	1.80	2.61	5.00	N/A	1.000
LASDV 6	Strength II M+	N/A	4.21	2.15	1.45	1.19	1.11	1.19	1.45	2.15	4.21	N/A	1.300
	Service I M+	N/A	5.41	2.84	1.97	1.65	1.55	1.65	1.97	2.84	5.41	N/A	1.000
LASDV 7	Strength II M+	N/A	5.33	2.70	1.86	1.58	1.54	1.58	1.86	2.70	5.33	N/A	1.300
	Service I M+	N/A	6.84	3.57	2.52	2.18	2.14	2.18	2.52	3.57	6.84	N/A	1.000
LASDV 8	Strength II M+	N/A	5.13	2.69	1.93	1.61	1.56	1.61	1.93	2.69	5.13	N/A	1.300
	Service I M+	N/A	6.59	3.56	2.62	2.23	2.17	2.23	2.62	3.56	6.59	N/A	1.000

## 1.4—INVESTIGATION OF SUPPORT REACTION

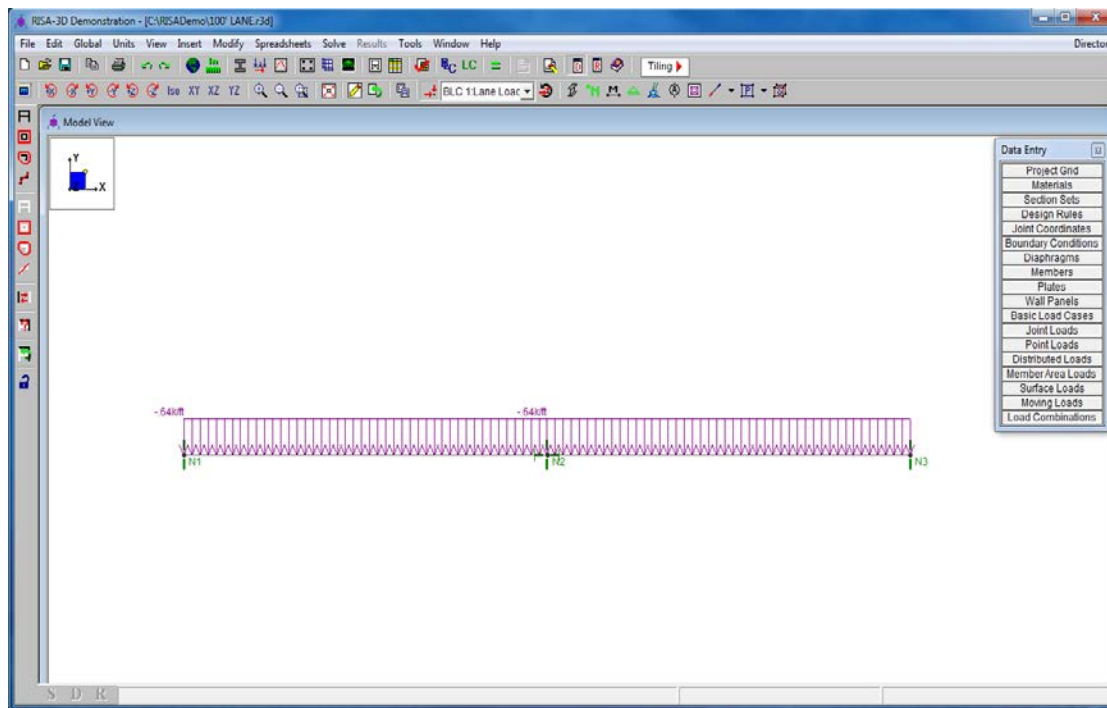
Through the course of this analysis it was immediately apparent that there was no single magnification factor that could be suitably applied to every span length combination. The relationship between the magnification factor and span length was obtained using the following steps:

1. Calculate the reactions for different span length combinations.
2. Summarize the results.
3. Find the best equation to cover all data.

### 1.4.1—Calculate the Reaction for Different Span Length Combinations

The reactions at the interior supports of two-span bridges were calculated using the program RISA 3D V8.1, as shown in Figure 1.4.1-1. The bridge was modeled using frame elements. The lane load was applied as a distributed load. The truck loads were modeled using the moving load function in RISA. In each analysis step, the truck loads were moved through the bridge in both directions. The reactions at the interior support were recorded for further analysis.

The model was analyzed using different span length combinations. The starting length for each span was 20 ft., which is the minimum span length as stated in the definition of bridge in the AASHTO *Manual for Bridge Evaluation* (MBE). First, Span 1 was maintained at 20 ft., while the length of Span 2 was increased by 10 ft. for each analysis step (20 ft., 30 ft., 40 ft. and so on). At each analysis step, the reaction at the interior support was calculated and recorded. The length of Span 2 was increased until the magnification factor was found to be less than 1.00, indicating that the effect of the design vehicle was larger than all the LASDV. Next, Span 1 was maintained at 30 ft., while Span 2 was increased by 10 ft. for each analysis step. This continued until all the span combinations with a magnification factor larger than 1.00 were found.



**Figure 1.4.1-1: RISA Model**



For long spans, only the “2HL93 + lane”, “LASDV 5” and “LASDV 7” are included in the study, since the other vehicles are obviously not controlling, and the span length is increased by 20 ft. in each step. A lane load of 0.2 klf is added to spans equal or greater than 200 ft.

#### 1.4.2—Summarize the Results

Tables 1.4.2-1 through 1.4.2-6 summarize the reactions at the interior support for all span combinations: simple or continuous, with or without the effect of impact, and factored or service load.

For each span length, the magnification factor is calculated using the following equation:

$$MF_{SR} = \frac{Max(R_{LASDV})}{Max(R_{Design})}$$

where:

$MF_{SR}$  = Magnification Factor for support reaction

$Max(R_{LASDV})$  = The maximum reaction caused by the eight LASDVs

$Max(R_{Design})$  = The maximum reaction caused by the three HL93 load combinations

**Table 1.4.2-1: Factored Reactions for Continuous Spans Without Impact (kips)**

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
20-20	121.32	109.19	114.05	152.25	90.81	128.77	146.23	124.93	112.53	88.62	85.31	1.255	LASDV 1
20-30	143.67	129.30	125.13	169.16	114.05	156.89	168.03	144.83	122.23	114.33	106.51	1.177	LASDV 1
20-40	167.26	150.53	140.54	186.52	136.29	180.76	188.80	172.54	133.21	135.78	129.81	1.129	LASDV 4
20-50	191.61	172.45	158.61	203.64	155.81	202.28	208.65	204.78	144.58	156.48	150.02	1.089	LASDV 4
20-60	217.05	195.34	178.76	220.77	173.74	222.60	227.88	244.08	156.19	180.93	168.37	1.125	LASDV 5
20-70	243.77	219.40	200.71	237.98	190.74	242.29	246.83	280.44	184.79	203.33	194.96	1.150	LASDV 5
20-80	271.86	244.68	224.34	255.28	207.19	261.66	265.67	314.62	216.30	224.39	229.58	1.157	LASDV 5
20-90	301.34	272.81	249.54	272.67	223.31	280.84	284.45	347.07	220.40	254.52	270.69	1.152	LASDV 5
20-100	332.21	316.84	276.28	290.12	239.20	299.91	303.21	378.20	281.09	292.87	312.35	1.138	LASDV 5
20-110	364.49	369.06	304.52	307.63	254.95	318.89	321.96	408.34	310.92	340.76	351.70	1.106	LASDV 5
20-120	398.18	422.07	334.22	325.19	270.59	337.83	340.71	437.76	339.55	390.15	389.15	1.037	LASDV 5
20-130	433.27	474.70	365.38	342.78	286.15	356.74	359.45	466.64	367.23	437.39	428.72	0.983	LASDV 5
20-140	469.76	527.24	397.98	360.41	301.66	375.63	378.21	495.09	394.16	482.75	468.86	0.939	LASDV 5
20-150	507.67	579.93	432.02	378.07	317.12	394.50	396.98	523.21	420.51	526.57	507.67	0.908	LASDV 7
20-160	546.99	632.94	467.49	395.75	332.56	413.36	415.75	551.06	446.38	569.00	545.42	0.899	LASDV 7
20-180		740.60						606.15		650.60		0.878	LASDV 7
20-200		851.05						751.45		819.73		0.963	LASDV 7
20-220		964.91						821.73		911.84		0.945	LASDV 7
20-240		1082.60						893.01		1003.42		0.927	LASDV 7
20-260		1204.37						965.34		1094.90		0.909	LASDV 7
20-280		1330.44						1038.79		1186.57		0.892	LASDV 7
20-300		1460.96						1113.40		1278.66		0.875	LASDV 7
20-320		1596.03						1189.18		1371.33		0.859	LASDV 7
30-30	152.13	136.91	128.82	170.25	123.23	163.56	172.13	155.78	121.90	123.20	117.51	1.132	LASDV 4
30-40	165.80	149.22	138.02	177.00	134.24	174.71	180.99	176.73	125.89	134.54	129.17	1.092	LASDV 4
30-50	181.72	163.54	150.10	185.68	145.15	186.47	191.31	203.72	131.48	150.40	140.49	1.121	LASDV 5
30-60	199.05	179.14	164.12	195.17	155.75	198.25	202.19	228.29	147.83	165.29	156.59	1.147	LASDV 5
30-70	217.62	195.86	179.67	205.21	166.09	210.01	213.39	251.19	170.07	179.28	181.57	1.154	LASDV 5
30-80	237.34	214.38	196.56	215.62	176.24	221.84	224.81	272.90	194.49	198.42	210.84	1.150	LASDV 5

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
30-90	258.15	243.00	214.66	226.29	186.33	233.76	236.42	293.72	216.97	224.82	240.66	1.138	LASDV 5
30-100	280.03	280.72	233.88	237.18	196.38	245.73	248.16	313.83	237.94	259.57	268.57	1.118	LASDV 5
30-110	302.93	318.76	254.18	248.22	206.40	257.78	260.02	333.39	257.81	294.95	294.89	1.046	LASDV 5
30-120	326.84	356.23	275.53	259.38	216.43	269.87	271.97	352.51	276.80	328.40	322.15	0.990	LASDV 5
30-130	351.75	393.33	297.89	270.65	226.45	282.02	283.99	371.31	295.12	360.28	350.15	0.944	LASDV 5
30-140	377.65	430.26	321.25	282.01	236.48	294.22	296.09	389.88	312.95	390.79	377.05	0.908	LASDV 7
30-150	404.52	467.21	345.60	293.43	246.52	306.45	308.24	408.26	330.38	420.17	403.06	0.899	LASDV 7
30-170		541.74						444.62		476.25		0.879	LASDV 7
30-190		617.77						480.59		529.54		0.857	LASDV 7
30-210		695.83						591.30		655.84		0.943	LASDV 7
30-230		776.29						638.96		717.84		0.925	LASDV 7
30-250		859.37						687.37		779.60		0.907	LASDV 7
30-270		945.24						736.54		841.39		0.890	LASDV 7
30-290		1034.04						786.50		903.37		0.874	LASDV 7
30-310		1125.83						837.27		965.70		0.858	LASDV 7
40-40	172.70	155.43	143.10	176.86	137.66	176.93	182.08	193.12	125.34	142.71	133.34	1.118	LASDV 5
40-50	183.34	165.01	151.54	180.35	143.24	182.57	186.62	209.83	132.69	151.80	142.31	1.144	LASDV 5
40-60	196.02	176.42	162.07	185.50	149.55	189.41	192.70	225.79	149.94	160.97	161.78	1.152	LASDV 5
40-70	210.11	189.21	174.11	191.59	156.16	196.82	199.61	241.17	169.58	173.39	184.82	1.148	LASDV 5
40-80	225.33	208.92	187.38	198.26	162.94	204.59	207.02	256.07	187.40	194.09	208.31	1.136	LASDV 5
40-90	241.56	239.45	201.73	205.35	169.80	212.61	214.79	270.59	203.84	221.82	230.08	1.120	LASDV 5
40-100	258.73	269.88	217.03	212.76	176.75	220.84	222.81	284.81	219.23	249.98	250.50	1.055	LASDV 5
40-110	276.77	299.58	233.23	220.41	183.77	229.23	231.05	298.77	233.83	276.41	271.52	0.997	LASDV 5
40-120	295.66	328.83	250.28	228.24	190.86	237.76	239.46	312.53	247.79	301.43	293.23	0.950	LASDV 5
40-130	315.35	357.85	268.15	236.23	198.01	246.29	248.00	326.11	261.27	325.21	314.00	0.911	LASDV 5
40-140	335.84	386.75	286.81	244.34	205.21	255.13	256.65	339.57	274.38	347.98	334.02	0.900	LASDV 7
40-160		444.66						366.23		391.14		0.880	LASDV 7
40-180		503.37						392.70		431.85		0.858	LASDV 7
40-200		563.43						477.49		529.24		0.939	LASDV 7
40-220		625.16						513.17		576.33		0.922	LASDV 7
40-240		688.79						549.45		623.13		0.905	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
40-260		754.48						586.35		669.87		0.888	LASDV 7
40-280		822.32						623.88		716.71		0.872	LASDV 7
40-300		892.41						662.04		763.77		0.856	LASDV 7
40-320		964.78						700.85		811.14		0.841	LASDV 7
50-50	189.90	170.91	157.23	179.99	144.76	183.41	186.89	218.41	142.79	155.83	155.28	1.150	LASDV 5
50-60	199.20	179.28	165.27	182.08	148.01	186.69	189.57	228.38	158.50	162.46	173.78	1.146	LASDV 5
50-70	210.21	192.33	174.94	185.49	152.06	191.12	193.56	238.65	172.83	179.32	192.97	1.135	LASDV 5
50-80	222.48	218.20	185.83	189.73	156.58	196.22	198.33	249.04	186.08	202.59	210.61	1.119	LASDV 5
50-90	235.75	243.71	197.75	194.50	161.35	201.73	203.62	259.45	198.49	226.15	227.06	1.065	LASDV 5
50-100	249.92	268.54	210.57	199.68	166.32	207.56	209.27	269.85	210.22	248.05	243.94	1.005	LASDV 5
50-110	264.91	292.89	224.20	205.18	171.44	213.64	215.21	280.23	221.42	268.65	261.66	0.957	LASDV 5
50-120	280.66	316.93	238.57	210.91	176.69	219.92	221.39	290.57	232.20	288.20	278.57	0.917	LASDV 5
50-130	297.12	340.83	253.65	216.85	182.03	226.37	227.74	300.88	242.64	306.86	294.80	0.900	LASDV 7
50-150		388.62						321.42		342.06		0.880	LASDV 7
50-170		436.84						341.91		375.05		0.859	LASDV 7
50-190		485.98						362.41		406.45		0.836	LASDV 7
50-210		536.37						438.87		492.64		0.918	LASDV 7
50-230		588.24						467.73		530.36		0.902	LASDV 7
50-250		641.72						497.15		567.98		0.885	LASDV 7
50-270		696.92						503.72		605.65		0.869	LASDV 7
50-290		753.90						557.63		643.48		0.854	LASDV 7
50-310		812.71						588.68		681.54		0.839	LASDV 7
60-60	205.69	186.77	171.30	181.72	148.76	187.02	189.57	233.31	167.68	174.15	187.93	1.134	LASDV 5
60-70	214.28	208.88	179.11	183.09	150.84	189.13	191.31	239.72	177.82	193.86	201.88	1.119	LASDV 5
60-80	224.32	230.35	188.23	185.52	153.65	192.22	194.12	246.76	187.57	213.88	215.10	1.071	LASDV 5
60-90	235.45	251.33	198.38	188.63	156.90	195.93	197.61	254.18	196.96	232.41	228.96	1.011	LASDV 5
60-100	247.47	272.01	209.41	192.23	160.45	200.05	201.57	261.84	206.01	249.77	243.48	0.963	LASDV 5
60-110	260.30	292.47	221.22	196.20	164.23	204.49	205.89	269.67	214.77	266.18	257.48	0.922	LASDV 5
60-120	273.85	312.81	233.72	200.46	168.18	209.19	210.50	277.60	223.28	281.82	270.95	0.901	LASDV 7
60-140		353.46						293.67		311.31		0.881	LASDV 7
60-160		394.50						309.91		338.94		0.859	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
60-180		436.24						326.29		365.16		0.837	LASDV 7
60-200		478.96						390.46		437.99		0.914	LASDV 7
60-220		522.88						414.25		469.57		0.898	LASDV 7
60-240		568.13						438.56		501.02		0.882	LASDV 7
60-260		614.81						463.39		532.50		0.866	LASDV 7
60-280		662.98						488.71		564.09		0.851	LASDV 7
60-300		712.69						514.53		595.88		0.836	LASDV 7
60-320		763.96						540.82		627.91		0.822	LASDV 7
70-70	220.80	226.20	185.35	182.78	151.23	189.23	191.21	242.78	183.73	209.77	211.13	1.073	LASDV 5
70-80	228.98	243.55	193.00	183.74	152.65	190.68	192.42	247.15	190.63	225.13	222.34	1.015	LASDV 5
70-90	238.38	260.91	201.75	185.55	154.70	192.96	194.51	252.22	197.59	239.64	234.06	0.967	LASDV 5
70-100	248.74	278.29	211.38	187.93	157.15	195.77	197.17	257.76	204.51	253.43	245.38	0.926	LASDV 5
70-110	259.91	295.71	221.79	190.74	159.90	198.96	200.25	263.62	211.36	266.60	256.48	0.902	LASDV 7
70-120	271.79	313.19	232.87	193.89	162.87	202.48	203.67	269.71	218.12	279.26	267.30	0.892	LASDV 7
70-130		330.77						275.97		291.49		0.881	LASDV 7
70-150		366.30						288.85		314.91		0.860	LASDV 7
70-170		402.55						302.08		337.21		0.838	LASDV 7
70-190		439.67						315.57		358.64		0.816	LASDV 7
70-210		477.80						377.02		427.16		0.894	LASDV 7
70-230		517.08						397.56		454.12		0.878	LASDV 7
70-250		557.59						418.61		481.09		0.863	LASDV 7
70-270		599.39						440.15		508.16		0.848	LASDV 7
70-290		642.53						462.15		535.40		0.833	LASDV 7
70-310		687.02						484.60		562.86		0.819	LASDV 7
80-80	235.52	257.41	199.38	183.46	152.86	190.69	192.30	249.15	194.62	236.26	231.07	0.968	LASDV 5
80-90	243.44	271.72	206.93	184.17	153.89	191.74	193.18	252.27	199.55	247.39	239.92	0.928	LASDV 5
80-100	252.42	286.37	215.41	185.58	155.43	193.48	194.78	256.07	204.70	258.22	248.71	0.902	LASDV 7
80-110	262.23	301.29	224.66	187.46	157.35	195.68	196.87	260.34	209.97	268.76	257.42	0.892	LASDV 7
80-120		316.44						264.95		279.02		0.882	LASDV 7
80-140		347.39						274.89		298.83		0.860	LASDV 7
80-160		379.20						285.48		317.86		0.838	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
80-180		411.90						296.49		336.25		0.816	LASDV 7
80-200		445.56						350.06		396.37		0.890	LASDV 7
80-220		480.25						367.65		419.85		0.874	LASDV 7
80-240		516.05						385.77		443.35		0.859	LASDV 7
80-260		552.99						404.38		466.95		0.844	LASDV 7
80-280		591.13						423.45		490.72		0.830	LASDV 7
80-300		630.47						442.95		514.69		0.816	LASDV 7
80-320		671.03						462.88		538.90		0.803	LASDV 7
90-90	250.03	283.39	213.40	183.94	153.99	191.70	193.04	253.63	202.35	255.42	246.24	0.901	LASDV 7
90-100	257.77	295.69	133.26	184.48	154.76	192.49	193.72	255.95	205.98	263.73	252.86	0.892	LASDV 7
90-110		308.47						258.88		272.03		0.882	LASDV 7
90-130		335.17						265.98		288.46		0.861	LASDV 7
90-150		363.10						274.15		304.54		0.839	LASDV 7
90-170		392.07						283.01		320.28		0.817	LASDV 7
90-190		422.07						292.34		335.72		0.795	LASDV 7
90-210		453.06						345.23		394.10		0.870	LASDV 7
90-230		485.08						360.97		414.81		0.855	LASDV 7
90-250		518.16						377.21		435.64		0.841	LASDV 7
90-270		552.33						393.92		456.64		0.827	LASDV 7
90-290		587.60						411.07		477.84		0.813	LASDV 7
90-310		623.99						428.64		499.27		0.800	LASDV 7
100-100	264.39	305.91	227.42	184.28	154.81	192.43	193.58	256.90	208.02	269.70	257.56	0.882	LASDV 7
100-120		328.29						260.99		282.57		0.861	LASDV 7
100-140		352.51						266.79		295.79		0.839	LASDV 7
100-160		378.13						273.63		309.07		0.817	LASDV 7
100-180		404.92						281.15		322.30		0.796	LASDV 7
100-200		432.78						328.16		374.44		0.865	LASDV 7
100-220		461.66						341.87		392.80		0.851	LASDV 7
100-240		491.55						356.13		411.32		0.837	LASDV 7
120-120		344.53						261.25		289.09		0.839	LASDV 7
120-140		363.52						263.91		297.29		0.818	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
120-160		384.44						267.97		306.29		0.797	LASDV 7
120-180		406.85						272.96		315.73		0.776	LASDV 7
120-200		430.50						315.42		362.26		0.841	LASDV 7
140-140		378.13						263.93		301.30		0.797	LASDV 7
140-160		395.20						265.77		306.85		0.776	LASDV 7
140-180		414.09						268.77		313.30		0.757	LASDV 7
160-160		408.93						265.70		309.45		0.757	LASDV 7
160-180		424.82						267.04		313.41		0.738	LASDV 7
170-170		423.65						266.37		312.55		0.738	LASDV 7
200-200		466.09						332.81		384.33		0.825	LASDV 7
200-250		505.06						344.86		400.01		0.792	LASDV 7
200-300		550.85						361.12		419.90		0.762	LASDV 7
250-250		533.54						350.44		407.10		0.763	LASDV 7
250-300		570.11						361.17		419.89		0.737	LASDV 7
250-350		613.87						375.11		436.10		0.710	LASDV 7
300-300		599.00						367.44		426.97		0.713	LASDV 7
300-350		634.26						385.08		445.89		0.703	LASDV 7
500-500		854.67						433.56		497.36		0.582	LASDV 7

**Table 1.4.2-2: Factored Reactions for Continuous Spans With Impact (kips)**

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
20-20	152.17	136.95	142.50	202.50	120.77	171.26	194.48	166.16	149.66	117.87	113.47	1.331	LASDV 1
20-30	179.19	161.27	154.54	224.99	151.68	208.66	223.49	192.62	162.56	152.06	141.66	1.256	LASDV 1
20-40	207.26	186.54	171.73	248.07	181.26	240.41	251.11	229.48	177.17	180.58	172.64	1.212	LASDV 4
20-50	235.83	212.25	191.93	270.85	207.22	269.03	277.50	272.36	192.29	208.11	199.53	1.177	LASDV 4
20-60	265.34	238.81	214.42	293.62	231.07	296.05	303.07	324.63	207.73	240.63	223.93	1.223	LASDV 5
20-70	296.09	266.48	238.82	316.51	253.68	322.25	328.29	372.99	245.77	270.43	259.29	1.260	LASDV 5
20-80	328.18	295.36	264.98	339.52	275.57	348.01	353.34	418.44	287.68	298.44	305.34	1.275	LASDV 5
20-90	361.64	327.62	292.76	362.65	297.00	373.52	378.32	461.60	293.14	338.52	360.01	1.276	LASDV 5
20-100	396.51	380.59	322.12	385.86	318.14	398.87	403.27	503.01	373.85	389.51	415.43	1.269	LASDV 5
20-110	432.77	444.05	353.00	409.15	339.08	424.13	428.21	543.10	413.53	453.21	467.76	1.223	LASDV 5
20-120	470.44	508.12	385.37	432.50	359.88	449.32	453.14	582.23	451.60	518.90	517.57	1.146	LASDV 5
20-130	509.51	571.29	419.22	455.89	380.58	474.46	478.07	620.63	488.41	581.73	570.20	1.086	LASDV 5
20-140	549.98	633.91	454.51	479.34	401.20	499.58	503.02	658.47	524.24	642.06	623.58	1.039	LASDV 5
20-150	591.88	696.31	491.25	502.83	421.78	524.69	527.98	695.87	559.28	700.34	675.20	1.006	LASDV 7
20-160	635.19	758.73	529.45	526.35	442.30	549.77	552.95	732.91	593.69	756.77	725.41	0.997	LASDV 7
20-180		884.48						806.18		865.29		0.978	LASDV 7
20-200		1012.29						969.46		1060.27		1.047	LASDV 7
20-220		1142.97						1057.58		1177.42		1.030	LASDV 7
20-240		1277.06						1146.59		1293.43		1.013	LASDV 7
20-260		1414.93						1236.58		1408.88		0.996	LASDV 7
20-280		1556.85						1327.61		1524.16		0.979	LASDV 7
20-300		1703.02						1419.77		1639.57		0.963	LASDV 7
20-320		1853.59						1513.06		1755.32		0.947	LASDV 7
30-30	188.50	169.65	157.51	226.43	163.90	217.53	228.94	207.18	162.12	163.86	156.28	1.215	LASDV 4
30-40	204.11	183.70	167.16	235.42	178.54	232.37	240.72	235.05	167.44	178.94	171.79	1.179	LASDV 4
30-50	222.25	200.03	180.20	246.95	193.05	248.00	254.44	270.95	174.87	200.03	186.86	1.219	LASDV 5
30-60	241.90	217.71	195.44	259.57	207.15	263.67	268.92	303.62	196.61	219.83	208.27	1.255	LASDV 5
30-70	262.86	236.58	212.39	272.93	220.89	279.31	283.80	334.08	226.20	238.44	241.49	1.271	LASDV 5



	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
30-80	285.01	257.53	230.77	286.77	234.40	295.05	299.00	362.96	258.67	263.89	280.41	1.273	LASDV 5
30-90	308.29	291.64	250.43	300.97	247.82	310.89	314.43	390.65	288.57	299.02	320.08	1.267	LASDV 5
30-100	332.65	337.55	271.28	315.44	261.18	326.83	330.05	417.40	316.46	345.23	357.20	1.237	LASDV 5
30-110	358.07	383.61	293.24	330.13	274.52	342.84	345.82	443.40	342.88	392.28	392.21	1.156	LASDV 5
30-120	384.53	428.63	316.27	344.98	287.85	358.93	361.71	468.83	368.14	436.78	428.47	1.094	LASDV 5
30-130	411.99	472.88	340.35	359.97	301.18	375.09	377.71	493.85	392.51	479.17	465.70	1.044	LASDV 5
30-140	440.45	516.61	365.45	375.07	314.52	391.31	393.80	518.54	416.23	519.75	501.48	1.006	LASDV 7
30-150	469.90	560.10	391.54	390.26	327.87	407.58	409.96	542.99	439.40	558.83	536.07	0.998	LASDV 7
30-170		647.06						591.34		633.41		0.979	LASDV 7
30-190		734.90						639.19		704.29		0.958	LASDV 7
30-210		824.35						761.69		847.52		1.028	LASDV 7
30-230		915.85						821.07		925.97		1.011	LASDV 7
30-250		1009.74						881.16		1003.83		0.994	LASDV 7
30-270		1106.23						941.99		1081.43		0.978	LASDV 7
30-290		1205.50						1003.57		1159.01		0.961	LASDV 7
30-310		1307.65						1065.95		1236.77		0.946	LASDV 7
40-40	211.24	190.11	171.87	235.22	183.09	235.32	242.16	256.84	166.71	189.81	177.34	1.216	LASDV 5
40-50	222.87	200.59	180.57	239.86	190.51	242.82	248.21	279.07	176.48	201.89	189.28	1.252	LASDV 5
40-60	236.86	213.17	191.71	246.72	198.90	251.92	256.28	300.30	199.42	214.09	215.16	1.268	LASDV 5
40-70	252.43	227.34	204.55	254.82	207.69	261.76	265.48	320.75	225.54	230.61	245.80	1.271	LASDV 5
40-80	269.23	250.45	218.76	263.69	216.70	272.10	275.34	340.57	249.24	258.13	277.06	1.265	LASDV 5
40-90	287.11	287.72	234.12	273.12	225.83	282.77	285.66	359.88	271.11	295.03	306.00	1.251	LASDV 5
40-100	305.98	324.62	250.52	282.97	235.07	293.72	296.34	378.80	291.57	332.47	333.16	1.167	LASDV 5
40-110	325.77	360.35	267.87	293.14	244.41	304.88	307.30	397.37	310.99	367.63	361.12	1.103	LASDV 5
40-120	346.44	395.25	286.10	303.56	253.84	316.22	318.48	415.66	329.56	400.91	389.99	1.052	LASDV 5
40-130	367.95	429.63	305.18	314.19	263.35	327.57	329.84	433.72	347.48	432.53	417.63	1.010	LASDV 5
40-140	390.28	463.62	325.07	324.97	272.93	339.33	341.35	451.62	364.92	462.82	444.25	0.998	LASDV 7
40-160		531.16						487.09		520.22		0.979	LASDV 7
40-180		598.90						522.29		574.36		0.959	LASDV 7
40-200		667.59						615.77		684.60		1.025	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
40-220		737.67						660.11		744.12		1.009	LASDV 7
40-240		809.44						705.04		803.04		0.992	LASDV 7
40-260		883.11						750.58		861.66		0.976	LASDV 7
40-280		958.81						796.75		920.21		0.960	LASDV 7
40-300		1036.66						843.54		978.84		0.944	LASDV 7
40-320		1116.72						890.97		1037.65		0.929	LASDV 7
50-50	229.49	206.54	186.04	239.39	192.53	243.93	248.56	290.48	189.91	207.26	206.52	1.266	LASDV 5
50-60	239.37	215.43	194.25	242.16	196.85	248.30	252.13	303.74	210.80	216.07	231.13	1.269	LASDV 5
50-70	251.25	230.29	204.33	246.70	202.24	254.19	257.43	317.40	229.86	238.49	256.65	1.263	LASDV 5
50-80	264.54	261.99	215.79	252.34	208.25	260.97	263.79	331.22	247.48	269.44	280.11	1.252	LASDV 5
50-90	278.93	292.98	228.39	258.69	214.60	268.31	270.81	345.07	263.99	300.78	301.99	1.178	LASDV 5
50-100	294.30	322.87	241.96	265.58	221.20	276.06	278.33	358.90	279.60	329.91	324.45	1.112	LASDV 5
50-110	310.56	351.94	256.41	272.88	228.01	284.14	286.23	372.70	294.49	357.30	348.00	1.059	LASDV 5
50-120	327.62	380.42	271.64	280.52	234.99	292.50	294.44	386.46	308.83	383.30	370.49	1.016	LASDV 5
50-130	345.43	408.54	287.62	288.41	242.11	301.07	302.90	400.17	322.72	408.13	392.08	0.999	LASDV 7
50-150		464.22						427.49		454.94		0.980	LASDV 7
50-170		519.79						454.74		498.81		0.960	LASDV 7
50-190		575.90						482.01		540.58		0.939	LASDV 7
50-210		633.00						565.23		636.75		1.006	LASDV 7
50-230		691.39						600.88		684.18		0.990	LASDV 7
50-250		751.25						637.09		731.30		0.973	LASDV 7
50-270		812.72						642.73		778.31		0.958	LASDV 7
50-290		875.89						711.18		825.36		0.942	LASDV 7
50-310		940.83						749.05		872.55		0.927	LASDV 7
60-60	245.87	223.47	200.13	241.69	197.85	248.73	252.13	310.31	223.01	231.61	249.94	1.262	LASDV 5
60-70	254.84	250.67	208.06	243.51	200.62	251.54	254.45	318.83	236.50	257.84	268.50	1.251	LASDV 5
60-80	265.49	276.78	217.48	246.74	204.35	255.65	258.18	328.19	249.47	284.46	286.08	1.186	LASDV 5
60-90	277.36	302.06	228.06	250.88	208.68	260.58	262.82	338.06	261.95	309.10	304.52	1.119	LASDV 5
60-100	290.22	326.75	239.60	255.66	213.40	266.06	268.09	348.25	273.99	332.19	323.83	1.066	LASDV 5
60-110	303.97	350.98	251.99	260.94	218.42	271.97	273.84	358.66	285.65	354.02	342.45	1.022	LASDV 5

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
60-120	318.50	374.89	265.13	266.61	223.68	278.23	279.97	369.21	296.96	374.82	360.36	1.000	LASDV 7
60-140		422.21						390.58		414.04		0.981	LASDV 7
60-160		469.44						412.18		450.78		0.960	LASDV 7
60-180		517.02						433.97		485.66		0.939	LASDV 7
60-200		565.33						503.59		566.80		1.003	LASDV 7
60-220		614.67						532.87		606.45		0.987	LASDV 7
60-240		665.21						562.70		645.78		0.971	LASDV 7
60-260		717.09						593.07		684.99		0.955	LASDV 7
60-280		770.39						623.97		724.22		0.940	LASDV 7
60-300		825.17						655.37		763.57		0.925	LASDV 7
60-320		881.48						687.27		803.10		0.911	LASDV 7
70-70	261.33	271.75	214.19	243.09	201.14	251.68	254.31	322.90	244.36	278.99	280.81	1.188	LASDV 5
70-80	269.78	292.64	221.93	244.37	203.03	253.61	255.92	328.71	253.54	299.42	295.71	1.123	LASDV 5
70-90	279.63	313.34	230.91	246.78	205.75	256.63	258.69	335.45	262.79	318.72	311.30	1.071	LASDV 5
70-100	290.56	333.88	240.88	249.95	209.01	260.37	262.23	342.82	272.00	337.06	326.35	1.027	LASDV 5
70-110	302.38	354.33	251.69	253.68	212.66	264.62	266.33	350.61	281.11	354.58	341.11	1.001	LASDV 7
70-120	315.00	374.70	263.23	257.88	216.62	269.30	270.88	358.71	290.10	371.42	355.50	0.991	LASDV 7
70-130		395.06						367.04		387.68		0.981	LASDV 7
70-150		435.89						384.17		418.83		0.961	LASDV 7
70-170		477.13						401.77		448.50		0.940	LASDV 7
70-190		519.02						419.71		476.99		0.919	LASDV 7
70-210		561.76						485.67		552.37		0.983	LASDV 7
70-230		605.53						510.79		586.01		0.968	LASDV 7
70-250		650.46						536.46		619.55		0.952	LASDV 7
70-270		696.61						562.65		653.10		0.938	LASDV 7
70-290		744.06						589.34		686.76		0.923	LASDV 7
70-310		792.82						616.50		720.59		0.909	LASDV 7
80-80	276.30	309.11	228.23	244.01	203.31	253.62	255.75	331.37	258.85	314.22	307.33	1.072	LASDV 5
80-90	284.41	325.96	235.84	244.95	204.67	255.01	256.93	335.52	265.40	329.03	319.10	1.029	LASDV 5
80-100	293.73	343.09	244.51	246.81	206.73	257.32	259.06	340.57	272.25	343.44	330.79	1.001	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
80-110	303.99	360.41	254.02	249.32	209.27	260.25	261.84	346.25	279.26	357.45	342.36	0.992	LASDV 7
80-120		377.91						352.39		371.10		0.982	LASDV 7
80-140		413.37						365.60		397.45		0.961	LASDV 7
80-160		449.46						379.69		422.75		0.941	LASDV 7
80-180		486.27						394.33		447.21		0.920	LASDV 7
80-200		523.92						451.64		513.23		0.980	LASDV 7
80-220		562.49						473.05		542.48		0.964	LASDV 7
80-240		602.09						495.06		571.64		0.949	LASDV 7
80-260		642.79						517.61		600.83		0.935	LASDV 7
80-280		684.64						540.67		630.14		0.920	LASDV 7
80-300		727.68						564.20		659.61		0.906	LASDV 7
80-320		771.91						588.18		689.29		0.893	LASDV 7
90-90	290.97	339.50	242.26	244.64	204.81	254.96	256.75	337.33	269.13	339.71	327.50	1.001	LASDV 7
90-100	298.86	353.69	133.26	245.36	205.83	256.01	257.64	340.41	273.95	350.76	336.30	0.992	LASDV 7
90-110		368.37						344.31		361.80		0.982	LASDV 7
90-130		398.80						353.75		383.65		0.962	LASDV 7
90-150		430.37						364.63		405.03		0.941	LASDV 7
90-170		462.89						376.41		425.98		0.920	LASDV 7
90-190		496.34						388.81		446.51		0.900	LASDV 7
90-210		530.71						444.90		509.89		0.961	LASDV 7
90-230		566.05						463.92		535.53		0.946	LASDV 7
90-250		602.40						483.52		561.24		0.932	LASDV 7
90-270		639.81						503.65		587.07		0.918	LASDV 7
90-290		678.31						524.27		613.07		0.904	LASDV 7
90-310		717.91						545.34		639.28		0.890	LASDV 7
100-100	305.45	365.29	256.28	245.09	205.90	255.93	257.47	341.68	276.66	358.70	342.56	0.982	LASDV 7
100-120		390.58						347.12		375.81		0.962	LASDV 7
100-140		417.81						354.83		393.40		0.942	LASDV 7
100-160		446.44						363.93		411.06		0.921	LASDV 7
100-180		476.20						373.94		428.66		0.900	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
100-200		507.00						423.59		485.13		0.957	LASDV 7
100-220		538.78						440.06		507.80		0.942	LASDV 7
100-240		571.55						457.18		530.59		0.928	LASDV 7
120-120		408.33						347.47		384.50		0.942	LASDV 7
120-140		429.18						351.00		395.40		0.921	LASDV 7
120-160		452.13						356.40		407.37		0.901	LASDV 7
120-180		476.67						363.03		419.92		0.881	LASDV 7
120-200		502.50						407.36		469.65		0.935	LASDV 7
140-140		444.71						351.03		400.72		0.901	LASDV 7
140-160		463.03						353.48		408.11		0.881	LASDV 7
140-180		483.37						357.47		416.69		0.862	LASDV 7
160-160		477.35						353.39		411.57		0.862	LASDV 7
160-180		494.13						355.17		416.83		0.844	LASDV 7
170-170		492.78						354.27		415.69		0.844	LASDV 7
200-200		536.74						421.19		489.71		0.912	LASDV 7
200-250		577.25						434.29		507.64		0.879	LASDV 7
250-250		605.66						439.27		514.63		0.850	LASDV 7
500-500		928.81						523.01		607.86		0.654	LASDV 7

**Table 1.4.2-3: Factored Reactions for Simply Supported Spans Without Impact (kips)**

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
20-20	99.40	89.46	101.15	118.98	71.46	107.16	120.83	103.13	94.25	69.76	69.98	1.195	LASDV 4
20-30	118.07	106.26	109.67	138.26	91.44	130.12	133.62	117.96	100.75	89.92	84.14	1.171	LASDV 1
20-40	130.20	117.18	116.73	148.54	104.22	143.82	145.89	132.49	106.60	102.05	97.66	1.141	LASDV 1
20-50	141.68	127.51	123.20	154.71	113.98	152.04	153.91	144.85	110.11	111.41	107.99	1.092	LASDV 1
20-60	151.20	136.08	129.38	158.83	120.48	158.71	159.25	158.19	118.08	120.94	114.87	1.053	LASDV 4
20-70	159.60	143.64	135.40	161.77	125.13	163.98	163.07	168.79	129.72	128.79	125.77	1.058	LASDV 5
20-80	167.30	151.83	141.31	164.77	128.61	167.93	165.93	177.97	140.73	137.01	138.50	1.064	LASDV 5
20-90	174.53	163.80	147.16	167.10	131.32	171.01	169.25	185.11	150.44	147.09	151.10	1.061	LASDV 5
20-100	181.44	178.42	152.95	168.96	133.63	173.47	171.90	190.87	158.21	159.44	163.95	1.052	LASDV 5
20-110	188.11	192.67	158.71	170.49	135.88	175.48	174.07	197.02	164.57	172.62	174.46	1.023	LASDV 5
20-120	194.60	206.01	164.44	171.76	137.76	177.16	175.88	202.64	169.87	185.34	183.23	0.984	LASDV 5
20-140		229.14						211.87		206.13		0.925	LASDV 5
20-160		249.01						218.80		221.93		0.891	LASDV 7
20-180		266.70						224.19		234.23		0.878	LASDV 7
20-200		282.87						254.50		270.06		0.955	LASDV 7
20-220		297.93						260.75		280.71		0.942	LASDV 7
20-240		312.17						266.57		290.02		0.929	LASDV 7
20-260		325.76						271.90		298.69		0.917	LASDV 7
20-280		338.85						276.84		306.50		0.905	LASDV 7
20-300		351.54						281.50		313.61		0.892	LASDV 7
20-320		363.90						285.92		320.16		0.880	LASDV 7
20-340		376.00						290.13		326.24		0.868	LASDV 7
30-30	126.93	114.24	115.27	141.24	96.84	133.67	145.86	128.65	106.17	95.77	89.99	1.149	LASDV 4
30-40	139.07	125.16	122.33	150.71	109.26	147.38	152.26	145.61	109.42	108.28	103.37	1.095	LASDV 4
30-50	148.59	133.73	128.80	156.84	116.93	155.60	157.66	159.99	112.93	119.04	111.61	1.077	LASDV 5
30-60	156.80	141.12	134.98	160.95	122.28	161.08	162.57	172.52	123.28	126.21	118.84	1.100	LASDV 5
30-70	165.20	148.92	141.00	163.89	126.93	164.99	166.39	182.23	133.90	132.44	131.82	1.103	LASDV 5
30-80	172.90	157.92	146.91	166.09	130.41	167.93	169.25	189.58	144.84	143.46	143.57	1.096	LASDV 5
30-90	180.13	170.52	152.76	167.80	133.12	171.01	171.48	195.29	153.54	154.19	157.18	1.084	LASDV 5

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
30-100	187.04	185.64	158.55	169.18	135.29	173.47	173.26	200.64	160.51	166.94	168.74	1.073	LASDV 5
30-110	193.71	199.84	164.31	170.49	137.06	175.48	174.72	205.32	166.52	180.68	178.20	1.027	LASDV 5
30-120	200.20	212.52	170.04	171.76	138.54	177.16	175.93	209.21	171.82	192.13	186.22	0.984	LASDV 5
30-130		224.02						212.51		201.82		0.949	LASDV 5
30-150		244.44						217.81		217.40		0.891	LASDV 5
30-170		263.12						223.24		230.54		0.876	LASDV 7
30-190		279.98						227.92		241.32		0.862	LASDV 7
30-210		295.56						259.11		277.38		0.939	LASDV 7
30-230		310.18						264.93		287.32		0.926	LASDV 7
30-250		324.07						270.22		296.07		0.914	LASDV 7
30-270		337.40						275.13		303.92		0.901	LASDV 7
30-290		350.28						279.71		311.04		0.888	LASDV 7
30-310		362.80						284.03		317.58		0.875	LASDV 7
30-330		375.02						288.23		323.64		0.863	LASDV 7
40-40	146.30	131.67	127.93	152.37	111.96	149.16	158.38	160.47	112.13	115.86	106.87	1.097	LASDV 5
40-50	155.82	140.24	134.40	158.05	119.63	157.38	162.22	173.71	115.83	124.54	118.07	1.115	LASDV 5
40-60	164.03	147.63	140.58	162.01	124.74	162.86	164.78	183.08	127.40	131.19	130.52	1.116	LASDV 5
40-70	171.50	155.43	146.60	164.95	128.39	166.77	168.28	190.30	138.26	137.98	143.63	1.110	LASDV 5
40-80	178.50	165.38	152.51	167.15	131.31	169.71	170.91	197.32	148.04	149.74	156.27	1.105	LASDV 5
40-90	185.73	180.60	158.36	168.87	134.02	171.99	173.14	202.97	156.51	162.43	166.10	1.093	LASDV 5
40-100	192.64	194.80	164.15	170.24	136.19	173.82	174.92	207.54	163.28	175.30	173.99	1.065	LASDV 5
40-110	199.31	207.56	169.91	171.36	137.96	175.48	176.38	211.28	168.91	187.32	183.75	1.018	LASDV 5
40-120	205.80	219.03	175.64	172.29	139.44	177.16	177.60	214.39	173.66	197.98	192.02	0.979	LASDV 5
40-140		241.11						220.24		215.10		0.913	LASDV 5
40-160		260.19						224.83		228.60		0.879	LASDV 7
40-180		277.27						228.40		239.09		0.862	LASDV 7
40-200		292.95						257.28		273.55		0.934	LASDV 7
40-220		308.01						262.96		283.68		0.921	LASDV 7
40-240		322.25						268.37		292.87		0.909	LASDV 7
40-260		335.84						273.45		301.05		0.896	LASDV 7
40-280		348.93						278.18		308.46		0.884	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
40-300		361.62						282.63		315.28		0.872	LASDV 7
40-320		373.98						286.85		321.57		0.860	LASDV 7
50-50	162.40	146.16	140.00	159.05	121.25	158.45	165.89	182.72	119.34	129.09	128.40	1.125	LASDV 5
50-60	170.61	153.55	146.18	162.83	126.36	163.93	168.45	191.47	130.91	134.87	139.94	1.122	LASDV 5
50-70	178.08	161.57	152.20	165.58	130.01	167.84	170.28	198.04	141.77	145.22	153.95	1.112	LASDV 5
50-80	185.08	173.94	158.11	167.79	132.75	170.78	172.24	203.22	151.55	159.17	165.29	1.098	LASDV 5
50-90	191.77	189.67	163.96	169.50	134.88	173.06	174.28	207.83	159.15	172.86	174.35	1.084	LASDV 5
50-100	198.24	203.36	169.75	170.87	136.73	174.89	175.92	212.19	165.23	183.88	182.22	1.043	LASDV 5
50-110	204.91	216.12	175.51	171.99	138.50	176.38	177.38	215.88	170.77	194.25	189.75	0.999	LASDV 5
50-130		238.08						221.64		211.73		0.931	LASDV 5
50-150		256.87						225.86		225.98		0.880	LASDV 7
50-170		274.86						229.67		237.14		0.863	LASDV 7
50-190		291.18						232.85		246.50		0.847	LASDV 7
50-210		306.31						262.73		281.37		0.919	LASDV 7
50-230		320.57						267.46		290.23		0.905	LASDV 7
50-250		334.15						271.87		298.14		0.892	LASDV 7
50-270		347.48						276.43		305.65		0.880	LASDV 7
50-290		360.36						280.92		312.63		0.868	LASDV 7
50-310		372.88						285.20		319.11		0.856	LASDV 7
60-60	176.87	159.18	151.78	163.50	127.44	164.64	170.90	197.55	133.25	143.83	148.02	1.117	LASDV 5
60-70	184.33	169.20	157.80	166.21	131.09	168.55	172.73	203.76	144.61	155.23	161.35	1.105	LASDV 5
60-80	191.33	182.39	163.71	168.23	133.83	171.49	174.10	208.66	153.89	170.17	172.21	1.091	LASDV 5
60-90	198.02	198.24	169.56	169.93	135.96	173.77	175.16	212.62	161.49	182.71	181.58	1.073	LASDV 5
60-100	204.49	211.93	175.35	171.30	137.66	175.60	176.80	215.84	167.57	193.09	189.45	1.018	LASDV 5
60-110	210.81	224.05	181.11	172.42	139.06	177.09	178.14	219.13	172.55	202.05	195.88	0.978	LASDV 5
60-120		234.99						222.11		209.57		0.945	LASDV 5
60-140		255.18						226.97		223.52		0.889	LASDV 5
60-160		272.84						230.64		234.91		0.861	LASDV 7
60-180		288.82						233.50		244.65		0.847	LASDV 7
60-200		304.50						262.17		278.47		0.915	LASDV 7
60-220		319.16						267.11		287.94		0.902	LASDV 7



	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
60-240		333.06						271.66		296.26		0.890	LASDV 7
60-260		346.37						275.90		303.71		0.877	LASDV 7
60-280		359.22						279.92		310.46		0.864	LASDV 7
60-300		371.70						283.75		316.70		0.852	LASDV 7
60-320		384.06						287.71		322.75		0.840	LASDV 7
70-70	190.40	176.76	163.40	166.68	131.86	169.06	174.48	208.14	147.27	163.52	169.71	1.093	LASDV 5
70-80	197.40	189.95	169.31	168.71	134.60	172.00	175.85	212.76	156.12	178.27	180.81	1.078	LASDV 5
70-90	204.09	205.80	175.16	170.29	136.73	174.28	176.91	216.57	163.16	190.57	189.63	1.052	LASDV 5
70-100	210.56	219.49	180.95	171.60	138.43	176.11	177.77	219.68	169.24	200.59	196.84	1.001	LASDV 5
70-110		231.61						222.32		208.80		0.960	LASDV 5
70-130		252.58						227.03		222.45		0.899	LASDV 5
70-150		270.98						231.12		233.30		0.861	LASDV 7
70-170		287.72						234.34		242.91		0.844	LASDV 7
70-190		303.06						236.89		250.93		0.828	LASDV 7
70-210		317.40						266.25		285.29		0.899	LASDV 7
70-230		331.65						270.83		293.71		0.886	LASDV 7
70-250		345.24						275.22		301.51		0.873	LASDV 7
70-270		358.31						279.34		308.58		0.861	LASDV 7
70-290		370.96						283.25		315.04		0.849	LASDV 7
80-80	203.35	196.88	174.91	169.07	135.18	172.38	177.16	216.08	158.11	185.33	187.50	1.063	LASDV 5
80-90	210.04	212.73	180.76	170.64	137.31	174.66	178.23	219.65	164.99	196.80	196.10	1.033	LASDV 5
80-100	216.51	226.42	186.55	171.91	139.01	176.49	179.08	222.70	170.50	206.49	203.16	0.984	LASDV 5
80-120		249.48						227.39		221.53		0.911	LASDV 5
80-140		268.83						231.00		232.84		0.866	LASDV 7
80-160		285.86						234.51		241.68		0.845	LASDV 7
80-180		301.84						237.33		249.64		0.827	LASDV 7
80-200		316.64						265.62		282.65		0.893	LASDV 7
80-220		330.58						270.09		291.26		0.881	LASDV 7
80-240		343.87						274.25		299.19		0.870	LASDV 7
80-260		357.19						278.36		306.30		0.858	LASDV 7
80-280		370.04						282.37		312.95		0.846	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
80-300		382.52						286.20		319.15		0.834	LASDV 7
90-90	215.91	219.24	186.36	170.92	137.76	174.96	179.25	222.26	166.54	202.29	201.33	1.014	LASDV 5
90-100	222.38	232.93	192.15	172.18	139.46	176.78	180.10	225.10	172.05	211.46	208.21	0.966	LASDV 5
90-110		245.05						227.59		219.28		0.929	LASDV 5
90-130		266.02						231.49		231.90		0.872	LASDV 7
90-150		284.09						234.46		241.39		0.850	LASDV 7
90-170		300.28						237.36		249.12		0.830	LASDV 7
90-190		315.38						239.81		255.65		0.811	LASDV 7
90-210		329.72						269.18		288.98		0.876	LASDV 7
90-230		343.32						273.48		296.81		0.865	LASDV 7
90-250		356.35						277.51		304.10		0.853	LASDV 7
90-270		368.95						281.33		310.87		0.843	LASDV 7
100-100	228.20	239.15	197.75	172.40	139.82	177.02	180.91	227.21	173.29	215.86	212.40	0.950	LASDV 5
100-120		262.21						231.59		229.78		0.883	LASDV 5
100-140		281.56						234.87		240.53		0.854	LASDV 7
100-160		298.59						237.46		248.59		0.833	LASDV 7
100-180		314.08						239.76		255.43		0.813	LASDV 7
100-200		328.48						267.95		286.94		0.874	LASDV 7
100-220		342.42						272.39		294.73		0.861	LASDV 7
100-240		355.72						276.55		302.02		0.849	LASDV 7
100-260		368.52						280.47		308.66		0.838	LASDV 7
120-120		274.05						234.62		236.22		0.862	LASDV 7
120-140		293.40						237.73		246.06		0.839	LASDV 7
120-160		310.43						240.18		254.09		0.818	LASDV 7
120-180		325.92						242.16		260.35		0.799	LASDV 7
120-200		340.33						269.77		291.54		0.857	LASDV 7
120-220		353.95						274.02		298.62		0.844	LASDV 7
120-240		366.98						278.11		304.99		0.831	LASDV 7
140-140		304.74						239.92		250.76		0.823	LASDV 7
140-160		321.77						242.23		258.14		0.802	LASDV 7
140-180		337.26						244.14		264.28		0.784	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
140-200		351.67						271.69		295.30		0.840	LASDV 7
140-220		365.29						275.61		302.00		0.827	LASDV 7
160-160		332.80						243.89		261.67		0.786	LASDV 7
160-180		348.28						245.68		267.40		0.768	LASDV 7
160-200		362.69						273.20		298.24		0.822	LASDV 7
170-170		346.13						245.53		266.16		0.769	LASDV 7
170-190		361.03						247.11		271.27		0.751	LASDV 7
180-180		359.10						246.98		270.15		0.752	LASDV 7
180-200		373.51						274.40		300.73		0.805	LASDV 7
190-190		371.77						248.28		273.72		0.736	LASDV 7
200-200		384.17						301.45		328.93		0.856	LASDV 7
200-250		417.16						295.15		343.90		0.824	LASDV 7
200-300		447.55						318.98		356.41		0.796	LASDV 7
250-250		443.42						318.90		354.15		0.799	LASDV 7
250-300		473.81						327.16		366.21		0.773	LASDV 7
250-350		502.72						334.97		377.01		0.750	LASDV 7

**Table 1.4.2-4: Factored Reactions for Simply Supported Spans With Impact (kips)**

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL +1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
20-20	124.81	112.33	127.14	158.25	95.04	142.52	160.70	137.16	125.35	92.79	93.08	1.264	LASDV 4
20-30	147.79	133.01	136.62	183.89	121.62	173.06	177.71	156.89	134.00	119.59	111.91	1.244	LASDV 1
20-40	162.08	145.87	144.16	197.56	138.61	191.28	194.04	176.22	141.78	135.73	129.89	1.219	LASDV 1
20-50	175.50	157.95	150.92	205.77	151.59	202.22	204.70	192.65	146.45	148.18	143.62	1.172	LASDV 1
20-60	186.31	167.68	157.30	211.24	160.24	211.09	211.81	210.40	157.05	160.84	152.77	1.137	LASDV 4
20-70	195.64	176.07	163.45	215.15	166.42	218.10	216.88	224.49	172.53	171.29	167.28	1.147	LASDV 5
20-80	204.03	185.30	169.46	219.14	171.05	223.35	220.69	236.70	187.16	182.23	184.21	1.160	LASDV 5
20-90	211.80	199.56	175.39	222.24	174.66	227.44	225.10	246.19	200.08	195.63	200.96	1.162	LASDV 5
20-100	219.14	217.33	181.25	224.72	177.73	230.71	228.63	253.85	210.42	212.06	218.05	1.158	LASDV 5
20-110	226.16	234.62	187.06	226.75	180.73	233.39	231.52	262.04	218.88	229.59	232.04	1.117	LASDV 5
20-120	232.95	250.71	192.84	228.45	183.22	235.62	233.92	269.51	225.92	246.50	243.69	1.075	LASDV 5
20-130	239.55	265.09	198.58	229.88	185.33	262.92	235.96	276.11	231.88	261.34	253.55	1.042	LASDV 5
20-140	246.01	278.15	204.31	231.10	187.14	268.72	237.70	281.78	237.00	274.15	262.00	1.013	LASDV 5
20-150	252.35	290.13	210.02	232.17	188.71	273.74	239.21	286.70	241.43	285.36	269.55	0.988	LASDV 5
20-160		301.24						291.00		295.17		0.980	LASDV 7
20-180		321.45						298.17		311.52		0.969	LASDV 7
20-200		339.63						329.90		350.60		1.032	LASDV 7
20-220		356.33						337.36		363.91		1.021	LASDV 7
20-240		371.94						344.25		375.43		1.009	LASDV 7
20-260		386.69						350.47		386.10		0.998	LASDV 7
20-280		400.77						356.18		395.63		0.987	LASDV 7
20-300		414.33						361.52		404.23		0.976	LASDV 7
20-320		427.44						366.55		412.08		0.964	LASDV 7
20-340		440.20						371.29		419.32		0.953	LASDV 7
30-40	172.02	154.82	149.76	200.44	145.32	196.01	202.50	193.67	145.52	144.01	137.48	1.177	LASDV 4
30-50	182.84	164.55	156.52	208.59	155.51	206.95	209.69	212.79	150.19	158.32	148.44	1.164	LASDV 5
30-60	191.91	172.72	162.90	214.06	162.63	214.24	216.22	229.46	163.97	167.86	158.06	1.196	LASDV 5

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL +1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
30-70	201.24	181.43	169.05	217.97	168.81	219.44	221.30	242.37	178.09	176.15	175.33	1.204	LASDV 5
30-80	209.63	191.74	175.06	220.90	173.45	223.35	225.11	252.14	192.64	190.80	190.95	1.203	LASDV 5
30-90	217.40	206.83	180.99	223.18	177.05	227.44	228.07	259.74	204.21	205.08	209.05	1.195	LASDV 5
30-100	224.74	225.28	186.85	225.01	179.93	230.71	230.44	266.85	213.47	222.03	224.42	1.185	LASDV 5
30-110	231.76	242.51	192.66	226.75	182.29	233.39	232.38	273.07	221.47	240.30	237.00	1.126	LASDV 5
30-120	238.55	257.70	198.44	228.45	184.26	235.62	233.99	278.25	228.52	255.53	247.68	1.080	LASDV 5
30-130	245.15	271.34	204.18	229.88	185.92	265.86	236.03	282.64	234.48	268.41	256.74	1.042	LASDV 5
30-140	251.61	283.74	209.91	231.10	187.35	271.66	237.77	286.39	239.59	279.46	264.84	1.009	LASDV 5
30-150	257.95	295.17	206.87	232.17	188.71	276.68	239.28	289.69	244.02	289.14	272.24	0.981	LASDV 5
30-170		316.68						296.90		306.61		0.968	LASDV 7
30-190		335.79						303.13		320.95		0.956	LASDV 7
30-210		353.18						335.61		359.91		1.019	LASDV 7
30-230		369.29						342.48		372.26		1.008	LASDV 7
30-250		384.45						348.67		383.05		0.996	LASDV 7
30-270		398.85						354.33		392.63		0.984	LASDV 7
30-290		412.65						359.57		401.24		0.972	LASDV 7
30-310		425.97						364.47		409.08		0.960	LASDV 7
30-330		438.90						369.20		416.28		0.948	LASDV 7
40-40	179.80	161.82	155.36	202.65	148.91	198.38	210.65	213.43	149.13	154.10	142.14	1.187	LASDV 5
40-50	190.61	171.55	162.12	210.21	159.11	209.31	215.75	231.03	154.05	165.64	157.03	1.212	LASDV 5
40-60	199.68	179.72	168.50	215.47	165.90	216.60	219.15	243.50	169.44	174.48	173.60	1.219	LASDV 5
40-70	207.77	188.43	174.65	219.38	170.76	221.81	223.82	253.09	183.89	183.52	191.02	1.218	LASDV 5
40-80	215.23	199.99	180.66	222.31	174.64	225.71	227.32	262.43	196.89	199.16	207.84	1.219	LASDV 5
40-90	223.00	218.58	186.59	224.59	178.25	228.75	230.28	269.94	208.15	216.03	220.92	1.211	LASDV 5
40-100	230.34	235.79	192.45	226.42	181.13	231.18	232.65	276.02	217.16	233.15	231.41	1.171	LASDV 5
40-110	237.36	251.10	198.26	227.91	183.49	233.39	234.59	281.00	224.65	249.13	244.39	1.119	LASDV 5
40-120	244.15	264.70	204.04	229.15	185.46	235.62	236.20	285.14	230.97	263.31	255.39	1.077	LASDV 5
40-130	250.75	278.33	209.78	230.20	187.12	267.94	237.57	289.17	236.31	275.31	265.49	1.039	LASDV 5
40-140	257.21	290.74	215.51	231.10	188.54	273.13	238.74	292.92	240.89	286.09	274.15	1.008	LASDV 5

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL +1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
40-150	263.55	302.16	221.22	232.17	189.78	278.15	239.76	296.18	245.32	295.66	281.65	0.980	LASDV 5
40-160		312.79						299.03		304.03		0.972	LASDV 7
40-180		332.18						303.78		317.99		0.957	LASDV 7
40-200		349.71						333.61		355.24		1.016	LASDV 7
40-220		366.41						340.30		367.85		1.004	LASDV 7
40-240		382.02						346.64		379.22		0.993	LASDV 7
40-260		396.77						352.54		389.24		0.981	LASDV 7
40-280		410.85						357.97		398.25		0.969	LASDV 7
40-300		424.41						363.03		406.45		0.958	LASDV 7
40-320		437.52						367.78		413.96		0.946	LASDV 7
50-50	197.51	177.76	167.72	211.53	161.26	210.73	220.64	243.01	158.72	171.69	170.77	1.230	LASDV 5
50-60	206.59	185.93	174.10	216.57	168.06	218.02	224.04	254.66	174.11	179.38	186.12	1.233	LASDV 5
50-70	214.67	194.93	180.25	220.23	172.92	223.23	226.47	263.39	188.56	193.14	204.75	1.227	LASDV 5
50-80	222.13	209.72	186.26	223.16	176.56	227.13	229.08	270.29	201.56	211.70	219.84	1.217	LASDV 5
50-90	229.18	228.98	192.19	225.44	179.39	230.17	231.79	276.41	211.67	229.91	231.88	1.206	LASDV 5
50-100	235.94	245.53	198.05	227.26	181.85	232.60	233.97	282.22	219.76	244.57	242.35	1.149	LASDV 5
50-110	242.96	260.83	203.86	228.75	184.21	234.59	235.91	287.12	227.13	258.36	252.37	1.101	LASDV 5
50-120	249.75	274.43	209.64	230.00	186.17	264.49	237.53	291.27	233.27	270.83	263.14	1.061	LASDV 5
50-130	256.35	286.71	215.38	231.05	187.84	270.39	238.89	294.78	238.47	281.60	272.42	1.028	LASDV 5
50-140	262.81	297.96	221.11	231.95	189.26	275.58	240.07	297.78	243.05	291.64	280.39	0.999	LASDV 5
50-150	269.15	308.38	226.82	232.73	190.50	280.08	241.08	300.39	247.02	300.56	287.30	0.975	LASDV 7
50-170		328.97						305.46		315.40		0.959	LASDV 7
50-190		347.35						309.70		327.84		0.944	LASDV 7
50-210		364.15						340.42		365.22		1.003	LASDV 7
50-230		379.78						345.86		376.14		0.990	LASDV 7
50-250		394.53						350.86		385.80		0.978	LASDV 7
50-270		408.93						356.07		394.93		0.966	LASDV 7
50-290		422.73						361.19		403.36		0.954	LASDV 7
50-310		436.05						366.02		411.11		0.943	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL +1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
60-60	213.06	191.75	179.70	217.46	169.50	218.97	227.30	262.74	177.22	191.29	196.87	1.233	LASDV 5
60-70	221.14	203.41	185.85	221.05	174.35	224.17	229.73	271.00	192.33	206.46	214.59	1.225	LASDV 5
60-80	228.60	219.29	191.86	223.75	177.99	228.08	231.55	277.51	204.67	226.33	229.04	1.214	LASDV 5
60-90	235.65	238.71	197.79	226.00	180.83	231.12	232.97	282.79	214.78	243.00	241.50	1.185	LASDV 5
60-100	242.41	255.26	203.65	227.83	183.09	233.55	235.14	287.07	222.87	256.80	251.96	1.125	LASDV 5
60-110	248.96	269.71	209.46	229.32	184.95	235.53	236.92	291.45	229.49	268.72	260.52	1.081	LASDV 5
60-120	255.35	282.60	215.24	230.56	186.65	266.45	238.41	295.41	235.00	278.73	268.69	1.045	LASDV 5
60-130	261.95	294.88	220.98	231.61	188.32	272.35	239.78	298.86	240.20	288.41	277.81	1.013	LASDV 5
60-140	268.41	306.12	226.71	232.51	189.74	277.40	240.95	301.86	244.65	297.28	285.62	0.986	LASDV 5
60-160		326.29						306.75		312.43		0.958	LASDV 7
60-180		344.21						310.55		325.39		0.945	LASDV 7
60-200		361.74						340.11		361.79		1.000	LASDV 7
60-220		377.91						345.82		373.52		0.988	LASDV 7
60-240		393.07						351.01		383.73		0.976	LASDV 7
60-260		407.45						355.80		392.78		0.964	LASDV 7
60-280		421.21						360.28		400.90		0.952	LASDV 7
60-300		434.49						364.52		408.34		0.940	LASDV 7
60-320		447.60						368.92		415.53		0.928	LASDV 7
70-70	227.36	211.81	191.45	221.68	175.38	224.85	232.05	276.83	195.87	217.48	225.72	1.218	LASDV 5
70-80	234.82	227.68	197.46	224.38	179.02	228.76	233.88	282.97	207.63	237.10	240.47	1.205	LASDV 5
70-90	241.87	247.10	203.39	226.48	181.85	231.79	235.30	288.04	217.00	253.45	252.21	1.166	LASDV 5
70-100	248.63	263.65	209.25	228.23	184.12	234.22	236.43	292.17	225.09	266.79	261.79	1.108	LASDV 5
70-110	255.18	278.11	215.06	229.72	185.97	262.72	237.76	295.68	231.71	277.70	270.36	1.063	LASDV 5
70-120	261.57	290.99	220.84	230.97	187.52	268.97	239.25	298.60	237.22	287.46	277.49	1.026	LASDV 5
70-130	267.84	302.67	226.58	232.02	188.83	274.26	240.50	301.96	241.89	295.86	283.53	0.998	LASDV 5
70-150		323.82						307.39		310.29		0.958	LASDV 7
70-170		342.76						311.68		323.07		0.943	LASDV 7
70-190		359.83						315.07		333.74		0.927	LASDV 7
70-210		375.57						345.11		370.42		0.986	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL +1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
70-230		391.20						350.33		380.77		0.973	LASDV 7
70-250		405.95						355.31		390.28		0.961	LASDV 7
70-270		420.00						359.94		398.83		0.950	LASDV 7
70-290		433.50						364.29		406.57		0.938	LASDV 7
80-80	240.89	235.23	203.06	224.86	179.79	229.26	235.62	287.39	210.29	246.49	249.37	1.193	LASDV 5
80-90	247.94	254.66	208.99	226.96	182.62	232.30	237.04	292.14	219.44	261.74	260.82	1.147	LASDV 5
80-100	254.70	271.20	214.85	228.63	184.89	234.73	238.17	296.19	226.76	274.63	270.21	1.092	LASDV 5
80-110	261.24	285.66	220.66	230.02	186.74	264.61	239.10	299.51	233.38	285.54	277.89	1.048	LASDV 5
80-120	267.63	298.54	226.44	231.27	188.29	270.87	239.88	302.43	238.89	294.64	284.86	1.013	LASDV 5
80-130	273.90	310.22	232.18	232.32	189.60	239.78	241.13	304.90	243.56	302.47	290.90	0.983	LASDV 5
80-140		320.95						307.23		309.67		0.965	LASDV 7
80-160		340.28						311.90		321.43		0.945	LASDV 7
80-180		358.20						315.65		332.01		0.927	LASDV 7
80-200		374.56						344.69		367.35		0.981	LASDV 7
80-220		389.77						349.78		377.94		0.970	LASDV 7
80-240		404.13						354.45		387.62		0.959	LASDV 7
80-260		418.51						359.06		396.22		0.947	LASDV 7
80-280		432.27						363.54		404.21		0.935	LASDV 7
80-300		445.54						367.77		411.60		0.924	LASDV 7
90-90	253.90	261.65	214.59	227.32	183.22	232.69	238.40	295.61	221.50	269.05	267.77	1.130	LASDV 5
90-100	260.66	278.20	220.45	229.00	185.49	235.12	239.53	299.38	228.82	281.25	276.91	1.076	LASDV 5
90-110	267.20	292.65	226.26	230.38	187.34	266.24	240.46	302.70	234.81	291.64	284.58	1.034	LASDV 5
90-120	273.60	305.54	232.04	231.52	188.89	272.33	241.23	305.46	240.19	300.73	290.98	1.000	LASDV 5
90-130		317.22						307.88		308.43		0.972	LASDV 7
90-150		337.92						311.84		321.05		0.950	LASDV 7
90-170		356.12						315.68		331.33		0.930	LASDV 7
90-190		372.89						318.95		340.02		0.912	LASDV 7
90-210		388.63						349.00		375.34		0.966	LASDV 7
90-230		403.39						353.86		384.89		0.954	LASDV 7



	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL +1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
90-250		417.40						358.36		393.73		0.943	LASDV 7
90-270		430.82						362.59		401.87		0.933	LASDV 7
100-100	266.55	284.80	226.05	229.30	185.97	235.44	240.62	302.19	230.48	287.10	282.49	1.061	LASDV 5
100-110	273.09	299.26	231.86	230.67	187.82	237.43	241.54	305.25	236.46	297.07	289.97	1.020	LASDV 5
100-120	279.48	312.14	237.64	231.82	189.37	239.08	242.32	308.01	241.46	305.61	296.34	0.987	LASDV 5
100-140		334.55						312.38		319.90		0.956	LASDV 7
100-160		353.88						315.82		330.62		0.934	LASDV 7
100-180		371.15						318.88		339.73		0.915	LASDV 7
100-200		386.99						347.79		373.05		0.964	LASDV 7
100-220		402.20						352.84		382.55		0.951	LASDV 7
100-240		416.56						357.51		391.39		0.940	LASDV 7
100-260		430.26						361.87		399.37		0.928	LASDV 7
110-110	278.93	305.58	237.46	230.91	188.21	237.69	242.43	307.57	237.82	301.87	294.53	1.007	LASDV 5
110-120	285.32	318.46	243.24	232.06	189.76	239.34	243.21	310.10	242.81	310.17	300.77	0.974	LASDV 7
110-130	291.59	330.14	248.98	233.03	191.06	240.74	243.86	312.44	247.03	317.32	306.14	0.961	LASDV 7
120-120	291.12	324.57	248.84	232.26	190.08	239.56	243.95	312.05	243.93	314.17	304.57	0.968	LASDV 7
120-140		346.98						316.18		327.26		0.943	LASDV 7
120-160		366.31						319.44		337.93		0.923	LASDV 7
120-180		383.58						322.07		346.27		0.903	LASDV 7
120-200		399.41						350.22		379.17		0.949	LASDV 7
120-220		414.20						355.00		387.73		0.936	LASDV 7
120-240		428.20						359.58		395.33		0.923	LASDV 7
140-140		358.74						319.09		333.51		0.930	LASDV 7
140-160		378.06						322.17		343.32		0.908	LASDV 7
140-180		395.33						324.70		351.50		0.889	LASDV 7
140-200		411.17						352.77		384.17		0.934	LASDV 7
140-220		425.95						357.12		392.22		0.921	LASDV 7
160-160		389.40						324.38		348.01		0.894	LASDV 7
160-180		406.67						326.75		355.64		0.875	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1.75	1.75	1.75	1.72	1.8	1.474	1.375	1.3	1.3	1.3	1.3		
IM	1.33TL +1.0LL	1.33TL+ 1.0LL	1.33TL+ 1.0LL	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33		
<b>Span Length</b>	<b>Design Vehicle Reactions (kips)</b>			<b>LASDV Reactions (kips)</b>									
160-200		422.50						354.78		388.08		0.919	LASDV 7
170-170		403.80						326.55		353.99		0.877	LASDV 7
170-190		420.30						328.66		360.79		0.858	LASDV 7

**Table 1.4.2-5: Service Reactions for Continuous Spans Without Impact (kips)**

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
20-20	69.33	62.40	65.17	88.52	50.45	87.36	106.35	96.10	86.56	68.17	65.62	1.534	LASDV 4
20-30	82.09	73.89	71.51	98.35	63.36	106.44	122.21	111.40	94.02	87.95	81.93	1.489	LASDV 4
20-40	95.58	86.02	80.31	108.44	75.72	122.63	137.31	132.72	102.47	104.44	99.85	1.437	LASDV 4
20-50	109.49	98.54	90.63	118.40	86.56	137.23	151.74	157.52	111.21	120.37	115.40	1.439	LASDV 5
20-60	124.03	111.62	102.15	128.35	96.52	151.02	165.73	187.76	120.15	139.18	129.51	1.514	LASDV 5
20-70	139.30	125.37	114.69	138.36	105.97	164.38	179.51	215.72	142.15	156.41	149.97	1.549	LASDV 5
20-80	155.35	139.81	128.19	148.42	115.11	177.52	193.21	242.01	166.38	172.61	176.60	1.558	LASDV 5
20-90	172.19	155.89	142.59	158.53	124.06	190.53	206.87	266.98	169.54	195.79	208.22	1.550	LASDV 5
20-100	189.84	181.05	157.88	168.68	132.89	203.46	220.52	290.92	216.22	225.28	240.27	1.532	LASDV 5
20-110	208.28	210.89	174.01	178.86	141.64	216.35	234.15	314.11	239.17	262.12	270.54	1.489	LASDV 5
20-120	227.53	241.18	190.98	189.06	150.33	229.20	247.79	336.74	261.19	300.12	299.35	1.396	LASDV 5
20-130	247.58	271.26	208.79	199.29	158.97	242.02	261.42	358.95	282.48	336.45	329.79	1.323	LASDV 5
20-140	268.44	301.28	227.42	209.54	167.59	254.84	275.06	380.84	303.20	371.35	360.66	1.264	LASDV 5
20-150	290.10	331.39	246.87	219.81	176.18	267.64	288.71	402.47	323.47	405.05	390.52	1.222	LASDV 7
20-160	312.57	361.68	267.14	230.09	184.75	280.44	302.37	423.89	343.37	437.69	419.56	1.210	LASDV 7
20-180		423.20						466.27		500.46		1.183	LASDV 7
20-200		486.31						578.04		630.56		1.297	LASDV 7
20-220		551.38						632.10		701.42		1.272	LASDV 7
20-240		618.63						686.93		771.86		1.248	LASDV 7
20-260		688.21						742.57		842.23		1.224	LASDV 7
20-280		760.25						799.07		912.75		1.201	LASDV 7
20-300		834.83						856.46		983.58		1.178	LASDV 7
20-320		912.02						914.75		1054.87		1.157	LASDV 7
30-30	86.93	78.24	73.61	98.98	68.46	110.96	125.19	119.83	93.77	94.77	90.39	1.440	LASDV 4
30-40	94.74	85.27	78.87	102.91	74.58	118.53	131.63	135.94	96.84	103.49	99.36	1.435	LASDV 5
30-50	103.84	93.45	85.77	107.95	80.64	126.51	139.13	156.71	101.14	115.69	108.07	1.509	LASDV 5
30-60	113.74	102.37	93.78	113.47	86.53	134.50	147.05	175.61	113.71	127.14	120.45	1.544	LASDV 5
30-70	124.36	111.92	102.67	119.31	92.27	142.48	155.19	193.22	130.83	137.91	139.67	1.554	LASDV 5
30-80	135.62	122.50	112.32	125.36	97.91	150.50	163.50	209.92	149.60	152.63	162.18	1.548	LASDV 5

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
30-90	147.52	138.86	122.66	131.57	103.52	158.59	171.94	225.94	166.90	172.94	185.12	1.532	LASDV 5
30-100	160.02	160.41	133.65	137.89	109.10	166.71	180.48	241.41	183.03	199.67	206.59	1.505	LASDV 5
30-110	173.10	182.15	145.25	144.31	114.67	174.88	189.10	256.45	198.31	226.88	226.84	1.408	LASDV 5
30-120	186.77	203.56	157.44	150.80	120.24	183.09	197.79	271.16	212.92	252.62	247.81	1.332	LASDV 5
30-130	201.00	224.76	170.22	157.36	125.81	191.33	206.54	285.62	227.02	277.14	269.35	1.271	LASDV 5
30-140	215.80	245.87	183.57	163.96	131.38	199.61	215.34	299.91	240.73	300.61	290.04	1.223	LASDV 7
30-150	231.15	266.98	197.49	170.60	136.95	207.90	224.18	314.05	254.14	323.21	310.05	1.211	LASDV 7
30-170		309.57						342.01		366.34		1.183	LASDV 7
30-190		353.01						369.69		407.34		1.154	LASDV 7
30-210		397.62						454.85		504.49		1.269	LASDV 7
30-230		443.59						491.51		552.18		1.245	LASDV 7
30-250		491.07						528.75		599.69		1.221	LASDV 7
30-270		540.14						566.57		647.22		1.198	LASDV 7
30-290		590.88						605.00		694.90		1.176	LASDV 7
30-310		643.33						644.05		742.85		1.155	LASDV 7
40-40	98.69	88.82	81.77	102.82	76.48	120.04	132.42	148.55	96.42	109.78	102.57	1.505	LASDV 5
40-50	104.77	94.29	86.59	104.85	79.58	123.86	135.72	161.41	102.07	116.77	109.47	1.541	LASDV 5
40-60	112.01	100.81	92.61	107.85	83.08	128.50	140.14	173.68	115.34	123.83	124.44	1.551	LASDV 5
40-70	120.07	108.12	99.49	111.39	86.75	133.52	145.17	185.51	130.45	133.38	142.17	1.545	LASDV 5
40-80	128.76	119.38	107.08	115.27	90.52	138.80	150.56	196.97	144.15	149.30	160.24	1.530	LASDV 5
40-90	138.04	136.83	115.27	119.39	94.33	144.24	156.21	208.14	156.80	170.63	176.98	1.508	LASDV 5
40-100	147.84	154.22	124.02	123.70	98.19	149.82	162.05	219.08	168.64	192.29	192.69	1.421	LASDV 5
40-110	158.15	171.19	133.28	128.14	102.09	155.52	168.04	229.83	179.87	212.62	208.86	1.343	LASDV 5
40-120	168.95	187.91	143.02	132.70	106.03	161.30	174.15	240.40	190.61	231.87	225.56	1.279	LASDV 5
40-130	180.20	204.49	153.23	137.34	110.00	167.09	180.36	250.85	200.97	250.16	241.54	1.227	LASDV 5
40-140	191.91	221.00	163.89	142.06	114.00	173.09	186.65	261.20	211.06	267.68	256.94	1.211	LASDV 7
40-160	115.91	254.09						281.72		300.88		1.184	LASDV 7
40-180	135.81	287.64						302.07		332.19		1.155	LASDV 7
40-200	157.33	321.96						367.30		407.11		1.264	LASDV 7
40-220	180.46	357.23						394.74		443.33		1.241	LASDV 7
40-240	205.20	393.60						422.65		479.33		1.218	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
40-260	231.55	431.13						451.04		515.28		1.195	LASDV 7
40-280	259.51	469.90						479.91		551.32		1.173	LASDV 7
40-300	289.07	509.95						509.26		587.52		1.152	LASDV 7
40-320	320.23	551.30						539.11		623.95		1.132	LASDV 7
50-50	108.51	97.66	89.85	104.65	80.42	124.43	135.92	168.01	109.84	119.87	119.45	1.548	LASDV 5
50-60	113.83	102.44	94.44	105.86	82.23	126.66	137.87	175.67	121.92	124.97	133.68	1.543	LASDV 5
50-70	120.12	109.90	99.96	107.84	84.48	129.66	140.77	183.58	132.94	137.94	148.44	1.528	LASDV 5
50-80	127.13	124.69	106.19	110.31	86.99	133.12	144.24	191.57	143.14	155.84	162.01	1.507	LASDV 5
50-90	134.72	139.26	113.00	113.08	89.64	136.86	148.08	199.58	152.68	173.96	174.66	1.433	LASDV 5
50-100	142.81	153.45	120.32	116.09	92.40	140.82	152.20	207.58	161.71	190.81	187.65	1.353	LASDV 5
50-110	151.38	167.36	128.11	119.29	95.24	144.94	156.52	215.56	170.32	206.65	201.27	1.288	LASDV 5
50-120	160.38	181.10	136.33	122.62	98.16	149.20	161.01	223.52	178.62	221.69	214.28	1.234	LASDV 5
50-130	169.78	194.76	144.95	126.07	101.13	153.57	165.63	231.45	186.65	236.05	226.77	1.212	LASDV 7
50-150	101.28	222.07						247.25		263.12		1.185	LASDV 7
50-170		249.62						263.01		288.50		1.156	LASDV 7
50-190		277.70						278.78		312.65		1.126	LASDV 7
50-210	154.64	306.50						337.59		378.95		1.236	LASDV 7
50-230		336.14						359.79		407.97		1.214	LASDV 7
50-250		366.70						382.42		436.91		1.191	LASDV 7
50-270		398.24						387.47		465.89		1.170	LASDV 7
50-290		430.80						428.95		494.98		1.149	LASDV 7
50-310		464.40						452.83		524.26		1.129	LASDV 7
60-60	117.54	106.72	97.89	105.65	82.65	126.88	137.87	179.47	128.98	133.96	144.56	1.527	LASDV 5
60-70	122.45	119.36	102.35	106.45	83.80	128.31	139.14	184.40	136.78	149.13	155.29	1.506	LASDV 5
60-80	128.18	131.63	107.56	107.86	85.36	130.41	141.18	189.82	144.29	164.52	165.46	1.442	LASDV 5
60-90	134.54	143.62	113.36	109.67	87.17	132.92	143.72	195.52	151.51	178.77	176.12	1.361	LASDV 5
60-100	141.41	155.43	119.66	111.76	89.14	135.72	146.60	201.42	158.47	192.13	187.29	1.296	LASDV 5
60-110	148.74	167.12	126.41	114.07	91.24	138.73	149.74	207.44	165.21	204.75	198.06	1.241	LASDV 5
60-120	156.49	178.75	133.55	116.55	93.43	141.92	153.09	213.54	171.75	216.78	208.42	1.213	LASDV 7
60-140		201.98						225.90		239.47		1.186	LASDV 7
60-160		225.43						238.39		260.72		1.157	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
60-180		249.28						251.00		280.89		1.127	LASDV 7
60-200		273.69						300.36		336.92		1.231	LASDV 7
60-220		298.79						318.65		361.21		1.209	LASDV 7
60-240		324.65						337.35		385.40		1.187	LASDV 7
60-260		351.32						356.45		409.61		1.166	LASDV 7
60-280		378.85						375.93		433.92		1.145	LASDV 7
60-300		407.25						395.79		458.37		1.126	LASDV 7
60-320		436.55						416.02		483.01		1.106	LASDV 7
70-70	126.17	129.26	105.92	106.26	84.02	128.38	139.06	186.76	141.33	161.36	162.41	1.445	LASDV 5
70-80	130.84	139.17	110.29	106.82	84.81	129.36	139.95	190.12	146.64	173.17	171.03	1.366	LASDV 5
70-90	136.22	149.09	115.29	107.88	85.94	130.91	141.46	194.02	151.99	184.34	180.05	1.301	LASDV 5
70-100	142.14	159.02	120.79	109.26	87.31	132.81	143.39	198.28	157.32	194.95	188.75	1.247	LASDV 5
70-110	148.52	168.98	126.74	110.90	88.83	134.98	145.63	202.78	162.58	205.08	197.29	1.214	LASDV 7
70-120	155.31	178.97	133.07	112.73	90.48	137.37	148.12	207.47	167.78	214.82	205.61	1.200	LASDV 7
70-130		189.01						212.28		224.22		1.186	LASDV 7
70-150		209.32						222.19		242.24		1.157	LASDV 7
70-170		230.03						232.37		259.40		1.128	LASDV 7
70-190		251.24						242.75		275.88		1.098	LASDV 7
70-210		273.03						290.02		328.59		1.203	LASDV 7
70-230		295.47						305.82		349.32		1.182	LASDV 7
70-250		318.62						322.01		370.07		1.161	LASDV 7
70-270		342.51						338.58		390.89		1.141	LASDV 7
70-290		367.16						355.50		411.85		1.122	LASDV 7
70-310		392.58						372.77		432.97		1.103	LASDV 7
80-80	134.59	147.09	113.93	106.67	84.92	129.37	139.85	191.65	149.71	181.74	177.75	1.303	LASDV 5
80-90	139.11	155.27	118.24	107.08	85.49	130.08	140.49	194.06	153.50	190.30	184.56	1.250	LASDV 5
80-100	144.24	163.64	123.09	107.89	86.35	131.26	141.66	196.98	157.46	198.63	191.32	1.214	LASDV 7
80-110	149.85	172.16	128.38	108.99	87.42	132.75	143.18	200.26	161.52	206.74	198.01	1.201	LASDV 7
80-120		180.82						203.81		214.63		1.187	LASDV 7
80-140		198.51						211.45		229.87		1.158	LASDV 7
80-160		216.68						219.60		244.51		1.128	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
80-280		337.79						325.73		377.48		1.118	LASDV 7
80-300		360.27						340.73		395.92		1.099	LASDV 7
80-320		383.45						356.06		414.54		1.081	LASDV 7
90-90	142.87	161.94	121.94	106.94	85.55	130.05	140.40	195.10	155.65	196.48	189.42	1.213	LASDV 7
90-100	147.30	168.97	76.15	107.26	85.98	130.59	140.88	196.88	158.44	202.87	194.51	1.201	LASDV 7
90-110		176.27						199.14		209.25		1.187	LASDV 7
90-130		191.53						204.60		221.89		1.159	LASDV 7
90-150		207.49						210.89		234.26		1.129	LASDV 7
90-170		224.04						217.70		246.37		1.100	LASDV 7
90-190		241.18						224.88		258.25		1.071	LASDV 7
90-210		258.89						265.57		303.15		1.171	LASDV 7
90-230		277.19						277.67		319.09		1.151	LASDV 7
90-250		296.09						290.16		335.11		1.132	LASDV 7
90-270		315.62						303.02		351.26		1.113	LASDV 7
90-290		335.77						316.21		367.57		1.095	LASDV 7
90-310		356.57						329.72		384.05		1.077	LASDV 7
100-100	151.08	174.81	129.95	107.14	86.01	130.55	140.79	197.62	160.01	207.46	198.12	1.187	LASDV 7
100-120		187.59						200.76		217.36		1.159	LASDV 7
100-140		201.44						205.22		227.53		1.130	LASDV 7
100-160		216.07						210.49		237.74		1.100	LASDV 7
100-180		231.38						216.27		247.92		1.071	LASDV 7
100-200		247.30						252.43		288.03		1.165	LASDV 7
100-220		263.81						262.98		302.15		1.145	LASDV 7
100-240		280.89						273.94		316.40		1.126	LASDV 7
120-120		196.87						200.96		222.38		1.130	LASDV 7
120-140		207.73						203.01		228.69		1.101	LASDV 7
120-160		219.68						206.13		235.61		1.073	LASDV 7
120-180		232.49						209.97		242.87		1.045	LASDV 7
120-200		246.00						242.63		278.66		1.133	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
140-140		216.07						203.03		231.77		1.073	LASDV 7
140-160		225.83						204.44		236.04		1.045	LASDV 7
140-180		236.62						206.75		241.00		1.019	LASDV 7
160-160		233.67						204.39		238.04		1.019	LASDV 7
160-180		242.75						205.42		241.08		0.993	LASDV 7
170-170		242.09						204.90		240.43		0.993	LASDV 7
200-200		266.34						256.01		295.64		1.110	LASDV 7
200-250		288.61						265.28		307.70		1.066	LASDV 7
200-300		314.77						277.79		323.00		1.026	LASDV 7
250-250		304.88						269.57		313.15		1.027	LASDV 7
250-300		325.78						277.82		322.99		0.991	LASDV 7
250-350		350.78						288.55		335.46		0.956	LASDV 7
300-300		342.29						282.65		328.44		0.960	LASDV 7
300-350		362.44						296.21		342.99		0.946	LASDV 7
500-500		488.38						333.51		382.58		0.783	LASDV 7



**Table 1.4.2-6: Service Reactions for Simply Supported Spans Without Impact (kips)**

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
20-20	56.80	51.12	57.80	69.18	39.70	72.70	87.87	79.33	72.50	53.66	53.83	1.520	LASDV 4
20-30	67.47	60.72	62.67	80.38	50.80	88.28	97.18	90.74	77.50	69.17	64.72	1.440	LASDV 4
20-40	74.40	66.96	66.70	86.36	57.90	97.57	106.10	101.92	82.00	78.50	75.12	1.426	LASDV 4
20-50	80.96	72.86	70.40	89.95	63.32	103.15	111.93	111.42	84.70	85.70	83.07	1.383	LASDV 4
20-60	86.40	77.76	73.93	92.34	66.93	107.67	115.82	121.69	90.83	93.03	88.36	1.408	LASDV 5
20-70	91.20	82.08	77.37	94.05	69.51	111.25	118.60	129.84	99.79	99.07	96.75	1.424	LASDV 5
20-80	95.60	86.76	80.75	95.79	71.45	113.93	120.68	136.90	108.25	105.39	106.54	1.432	LASDV 5
20-90	99.73	93.60	84.09	97.15	72.96	116.02	123.09	142.39	115.72	113.15	116.23	1.428	LASDV 5
20-100	103.68	101.95	87.40	98.24	74.24	117.68	125.02	146.82	121.70	122.65	126.12	1.416	LASDV 5
20-110	107.49	110.09	90.69	99.12	75.49	119.05	126.60	151.55	126.59	132.79	134.20	1.377	LASDV 5
20-120	111.20	117.72	93.97	99.86	76.53	120.19	127.91	155.88	130.67	142.57	140.94	1.324	LASDV 5
20-140		130.94						162.97		158.56		1.245	LASDV 5
20-160		142.29						168.31		170.72		1.200	LASDV 7
20-180		152.40						172.45		180.18		1.182	LASDV 7
20-200		161.64						195.77		207.74		1.285	LASDV 7
20-220		170.25						200.58		215.93		1.268	LASDV 7
20-240		178.38						205.06		223.09		1.251	LASDV 7
20-260		186.15						209.16		229.76		1.234	LASDV 7
20-280		193.63						212.95		235.77		1.218	LASDV 7
20-300		200.88						216.54		241.24		1.201	LASDV 7
20-320		207.95						219.94		246.28		1.184	LASDV 7
20-340		214.86						223.18		250.96		1.168	LASDV 7
30-30	72.53	65.28	65.87	82.12	53.80	90.69	106.08	98.96	81.67	73.67	69.22	1.463	LASDV 4
30-40	79.47	71.52	69.90	87.62	60.70	99.98	110.73	112.01	84.17	83.29	79.51	1.410	LASDV 5
30-50	84.91	76.42	73.60	91.18	64.96	105.56	114.66	123.07	86.87	91.57	85.86	1.449	LASDV 5
30-60	89.60	80.64	77.13	93.58	67.93	109.28	118.24	132.71	94.83	97.08	91.42	1.481	LASDV 5
30-70	94.40	85.10	80.57	95.28	70.51	111.94	121.01	140.18	103.00	101.88	101.40	1.485	LASDV 5
30-80	98.80	90.24	83.95	96.56	72.45	113.93	123.09	145.83	111.42	110.35	110.44	1.476	LASDV 5
30-90	102.93	97.44	87.29	97.56	73.96	116.02	124.71	150.22	118.11	118.61	120.91	1.459	LASDV 5

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
30-100	106.88	106.08	90.60	98.36	75.16	117.68	126.01	154.34	123.47	128.42	129.80	1.444	LASDV 5
30-110	110.69	114.20	93.89	99.12	76.15	119.05	127.07	157.94	128.09	138.98	137.08	1.383	LASDV 5
30-120	114.40	121.44	97.17	99.86	76.97	120.19	127.95	160.93	132.17	147.79	143.25	1.325	LASDV 5
30-130		128.01						163.47		155.24		1.277	LASDV 5
30-150		139.68						167.55		167.23		1.200	LASDV 5
30-170		150.35						171.72		177.34		1.179	LASDV 7
30-190		159.99						175.32		185.63		1.160	LASDV 7
30-210		168.89						199.32		213.37		1.263	LASDV 7
30-230		177.25						203.79		221.01		1.247	LASDV 7
30-250		185.18						207.87		227.75		1.230	LASDV 7
30-270		192.80						211.64		233.78		1.213	LASDV 7
30-290		200.16						215.16		239.26		1.195	LASDV 7
30-310		207.31						218.49		244.29		1.178	LASDV 7
30-330		214.30						221.72		248.95		1.162	LASDV 7
40-40	83.60	75.24	73.10	88.59	62.20	101.19	115.19	123.44	86.25	89.12	82.21	1.477	LASDV 5
40-50	89.04	80.14	76.80	91.89	66.46	106.77	117.98	133.62	89.10	95.80	90.82	1.501	LASDV 5
40-60	93.73	84.36	80.33	94.19	69.30	110.49	119.84	140.83	98.00	100.92	100.40	1.502	LASDV 5
40-70	98.00	88.82	83.77	95.90	71.33	113.14	122.39	146.38	106.36	106.14	110.48	1.494	LASDV 5
40-80	102.00	94.50	87.15	97.18	72.95	115.14	124.30	151.78	113.88	115.19	120.21	1.488	LASDV 5
40-90	106.13	103.20	90.49	98.18	74.46	116.68	125.92	156.13	120.39	124.94	127.77	1.471	LASDV 5
40-100	110.08	111.31	93.80	98.98	75.66	117.92	127.22	159.64	125.60	134.85	133.84	1.434	LASDV 5
40-110	113.89	118.60	97.09	99.63	76.65	119.05	128.28	162.52	129.93	144.09	141.35	1.370	LASDV 5
40-120	117.60	125.16	100.37	100.17	77.47	120.19	129.16	164.92	133.58	152.29	147.71	1.318	LASDV 5
40-140		137.78						169.42		165.46		1.230	LASDV 5
40-160		148.68						172.95		175.84		1.183	LASDV 7
40-180		158.44						175.70		183.92		1.161	LASDV 7
40-200		167.40						197.91		210.42		1.257	LASDV 7
40-220		176.01						202.28		218.21		1.240	LASDV 7
40-240		184.14						206.44		225.28		1.223	LASDV 7
40-260		191.91						210.35		231.58		1.207	LASDV 7
40-280		199.39						213.99		237.28		1.190	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
40-300		206.64						217.41		242.52		1.174	LASDV 7
40-320		213.71						220.65		247.36		1.157	LASDV 7
50-50	92.80	83.52	80.00	92.47	67.36	107.49	120.65	140.55	91.80	99.30	98.77	1.515	LASDV 5
50-60	97.49	87.74	83.53	94.67	70.20	111.21	122.51	147.29	100.70	103.75	107.65	1.511	LASDV 5
50-70	101.76	92.32	86.97	96.27	72.23	113.87	123.84	152.34	109.06	111.71	118.42	1.497	LASDV 5
50-80	105.76	99.40	90.35	97.55	73.75	115.86	125.26	156.33	116.58	122.44	127.15	1.478	LASDV 5
50-90	109.58	108.38	93.69	98.55	74.93	117.41	126.75	159.87	122.42	132.97	134.11	1.459	LASDV 5
50-100	113.28	116.21	97.00	99.35	75.96	118.65	127.94	163.23	127.10	141.45	140.17	1.405	LASDV 5
50-110	117.09	123.50	100.29	100.00	76.95	119.66	129.00	166.06	131.36	149.43	145.96	1.345	LASDV 5
50-130		136.05						170.49		162.87		1.253	LASDV 5
50-150		146.78						173.74		173.83		1.184	LASDV 7
50-170		157.06						176.67		182.42		1.161	LASDV 7
50-190		166.39						179.12		189.62		1.140	LASDV 7
50-210		175.04						202.10		216.44		1.237	LASDV 7
50-230		183.18						205.74		223.26		1.219	LASDV 7
50-250		190.94						209.13		229.34		1.201	LASDV 7
50-270		198.56						212.64		235.11		1.184	LASDV 7
50-290		205.92						216.10		240.49		1.168	LASDV 7
50-310		213.07						219.39		245.47		1.152	LASDV 7
60-60	101.07	90.96	86.73	95.06	70.80	111.69	124.29	151.96	102.50	110.64	113.86	1.504	LASDV 5
60-70	105.33	96.69	90.17	96.63	72.83	114.35	125.62	156.74	111.24	119.41	124.11	1.488	LASDV 5
60-80	109.33	104.22	93.55	97.81	74.35	116.34	126.62	160.51	118.38	130.90	132.47	1.468	LASDV 5
60-90	113.16	113.28	96.89	98.79	75.53	117.89	127.39	163.55	124.22	140.55	139.68	1.444	LASDV 5
60-100	116.85	121.10	100.20	99.59	76.48	119.13	128.58	166.03	128.90	148.53	145.73	1.371	LASDV 5
60-110	120.46	128.03	103.49	100.24	77.25	120.15	129.56	168.56	132.73	155.42	150.68	1.317	LASDV 5
60-120		134.28						170.86		161.21		1.272	LASDV 5
60-140		145.82						174.59		171.94		1.197	LASDV 5
60-160		155.91						177.41		180.70		1.159	LASDV 7
60-180		165.04						179.61		188.19		1.140	LASDV 7
60-200		174.00						201.67		214.21		1.231	LASDV 7
60-220		182.38						205.47		221.49		1.214	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
60-240		190.32						208.97		227.90		1.197	LASDV 7
60-260		197.93						212.23		233.62		1.180	LASDV 7
60-280		205.27						215.32		238.82		1.163	LASDV 7
60-300		212.40						218.27		243.62		1.147	LASDV 7
60-320		219.47						221.31		248.27		1.131	LASDV 7
70-70	108.80	101.01	93.37	96.91	73.26	114.69	126.89	160.11	113.29	125.78	130.55	1.472	LASDV 5
70-80	112.80	108.54	96.75	98.09	74.78	116.69	127.89	163.66	120.09	137.13	139.08	1.451	LASDV 5
70-90	116.62	117.60	100.09	99.00	75.96	118.24	128.66	166.60	125.51	146.59	145.87	1.417	LASDV 5
70-100	120.32	125.42	103.40	99.77	76.91	119.48	129.28	168.98	130.19	154.30	151.41	1.347	LASDV 5
70-110		132.35						171.01		160.62		1.292	LASDV 5
70-130		144.33						174.64		171.12		1.210	LASDV 5
70-150		154.85						177.78		179.46		1.159	LASDV 7
70-170		164.41						180.26		186.85		1.136	LASDV 7
70-190		173.18						182.22		193.03		1.115	LASDV 7
70-210		181.37						204.81		219.45		1.210	LASDV 7
70-230		189.52						208.33		225.93		1.192	LASDV 7
70-250		197.28						211.71		231.93		1.176	LASDV 7
70-270		204.75						214.88		237.37		1.159	LASDV 7
70-290		211.98						217.89		242.34		1.143	LASDV 7
80-80	116.20	112.50	99.95	98.29	75.10	116.95	128.84	166.22	121.62	142.56	144.23	1.430	LASDV 5
80-90	120.02	121.56	103.29	99.21	76.28	118.49	129.62	168.96	126.92	151.38	150.85	1.390	LASDV 5
80-100	123.72	129.38	106.60	99.95	77.23	119.73	130.24	171.31	131.15	158.84	156.28	1.324	LASDV 5
80-120		142.56						174.92		170.41		1.227	LASDV 5
80-140		153.62						177.69		179.10		1.166	LASDV 7
80-160		163.35						180.39		185.91		1.138	LASDV 7
80-180		172.48						182.56		192.03		1.113	LASDV 7
80-200		180.94						204.32		217.42		1.202	LASDV 7
80-220		188.90						207.76		224.05		1.186	LASDV 7
80-240		196.50						210.96		230.15		1.171	LASDV 7
80-260		204.11						214.12		235.62		1.154	LASDV 7
80-280		211.45						217.21		240.73		1.138	LASDV 7

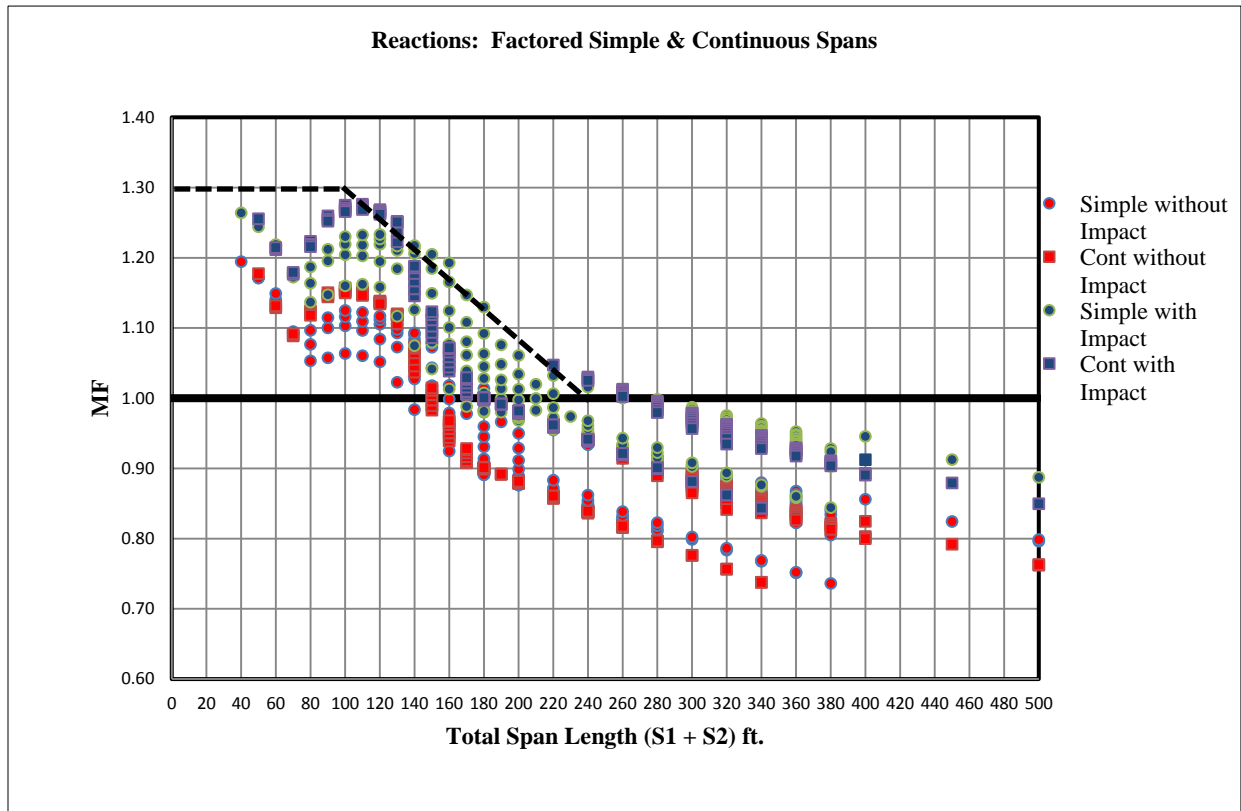
	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
80-300		218.58						220.15		245.50		1.123	LASDV 7
90-90	123.38	125.28	106.49	99.37	76.53	118.70	130.36	170.97	128.11	155.61	154.87	1.365	LASDV 5
90-100	127.08	133.10	109.80	100.11	77.48	119.94	130.98	173.15	132.34	162.66	160.16	1.301	LASDV 5
90-110		140.03						175.07		168.67		1.250	LASDV 5
90-130		152.01						178.07		178.39		1.173	LASDV 7
90-150		162.34						180.36		185.69		1.144	LASDV 7
90-170		171.59						182.58		191.63		1.117	LASDV 7
90-190		180.22						184.47		196.66		1.091	LASDV 7
90-210		188.41						207.06		222.29		1.180	LASDV 7
90-230		196.18						210.37		228.32		1.164	LASDV 7
90-250		203.63						213.47		233.92		1.149	LASDV 7
90-270		210.83						216.41		239.13		1.134	LASDV 7
100-100	130.40	136.66	113.00	100.24	77.68	120.10	131.57	174.78	133.30	166.05	163.38	1.279	LASDV 5
100-120		149.83						178.14		176.76		1.189	LASDV 5
100-140		160.89						180.67		185.02		1.150	LASDV 7
100-160		170.62						182.66		191.22		1.121	LASDV 7
100-180		179.47						184.43		196.49		1.095	LASDV 7
100-200		187.70						206.11		220.73		1.176	LASDV 7
100-220		195.67						209.53		226.71		1.159	LASDV 7
100-240		203.27						212.73		232.32		1.143	LASDV 7
100-260		210.58						215.74		237.43		1.128	LASDV 7
120-120		156.60						180.48		181.71		1.160	LASDV 7
120-140		167.66						182.87		189.28		1.129	LASDV 7
120-160		177.39						184.75		195.45		1.102	LASDV 7
120-180		186.24						186.28		200.27		1.075	LASDV 7
120-200		194.47						207.52		224.26		1.153	LASDV 7
120-220		202.25						210.78		229.71		1.136	LASDV 7
120-240		209.70						213.93		234.60		1.119	LASDV 7
140-140		174.14						184.55		192.89		1.108	LASDV 7
140-160		183.87						186.33		198.57		1.080	LASDV 7
140-180		192.72						187.80		203.29		1.055	LASDV 7

	HS20 +lane	0.9(2*HS20 +lane)	Tandem +lane	LASDV 1	LASDV 2	LASDV 3	LASDV 4	LASDV 5	LASDV 6	LASDV 7	LASDV 8	MF	Controlling Vehicle
Load Factor	1	1	1	1	1	1	1	1	1	1	1		
IM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Span Length	Design Vehicle Reactions (kips)			LASDV Reactions (kips)									
140-200		200.95						208.99		227.15		1.130	LASDV 7
140-220		208.73						212.01		232.31		1.113	LASDV 7
160-160		190.17						187.61		201.28		1.058	LASDV 7
160-180		199.02						188.98		205.69		1.034	LASDV 7
160-200		207.25						210.16		229.42		1.107	LASDV 7
170-170		197.79						188.87		204.74		1.035	LASDV 7
170-190		206.30						190.09		208.67		1.011	LASDV 7
180-180		205.20						189.99		207.81		1.013	LASDV 7
180-200		213.43						211.08		231.33		1.084	LASDV 7
190-190		212.44						190.99		210.55		0.991	LASDV 7
200-200		219.53						231.89		253.03		1.153	LASDV 7
200-250		238.38						227.04		264.54		1.110	LASDV 7
200-300		255.74						245.37		274.16		1.072	LASDV 7
250-250		253.38						245.31		272.42		1.075	LASDV 7
250-300		270.75						251.66		281.70		1.040	LASDV 7
250-350		287.27						257.67		290.01		1.010	LASDV 7

### 1.4.3—Find the Best Function to Cover All Data

Microsoft Excel was used to find the best function to describe and encompass all results in Tables 1.4.2-1 through 1.4.2-6. The data in these tables were plotted into diagrams and the best upper boundary functions were generated using the software. The resulting functions and diagrams are presented below:

#### 1.4.3.1—Factored Support Reaction with or without Dynamic Impact



**Figure 1.4.3.1-1: Upper Boundary Lines for Factored Support Reaction**

Span Length	Magnification Factor ( $MF_{SR}$ )
$S_1+S_2 \leq 100$ ft.	1.30
$100 \text{ ft.} < S_1+S_2 < 240$ ft.	Interpolation
$S_1+S_2 \geq 240$ ft.	1.00

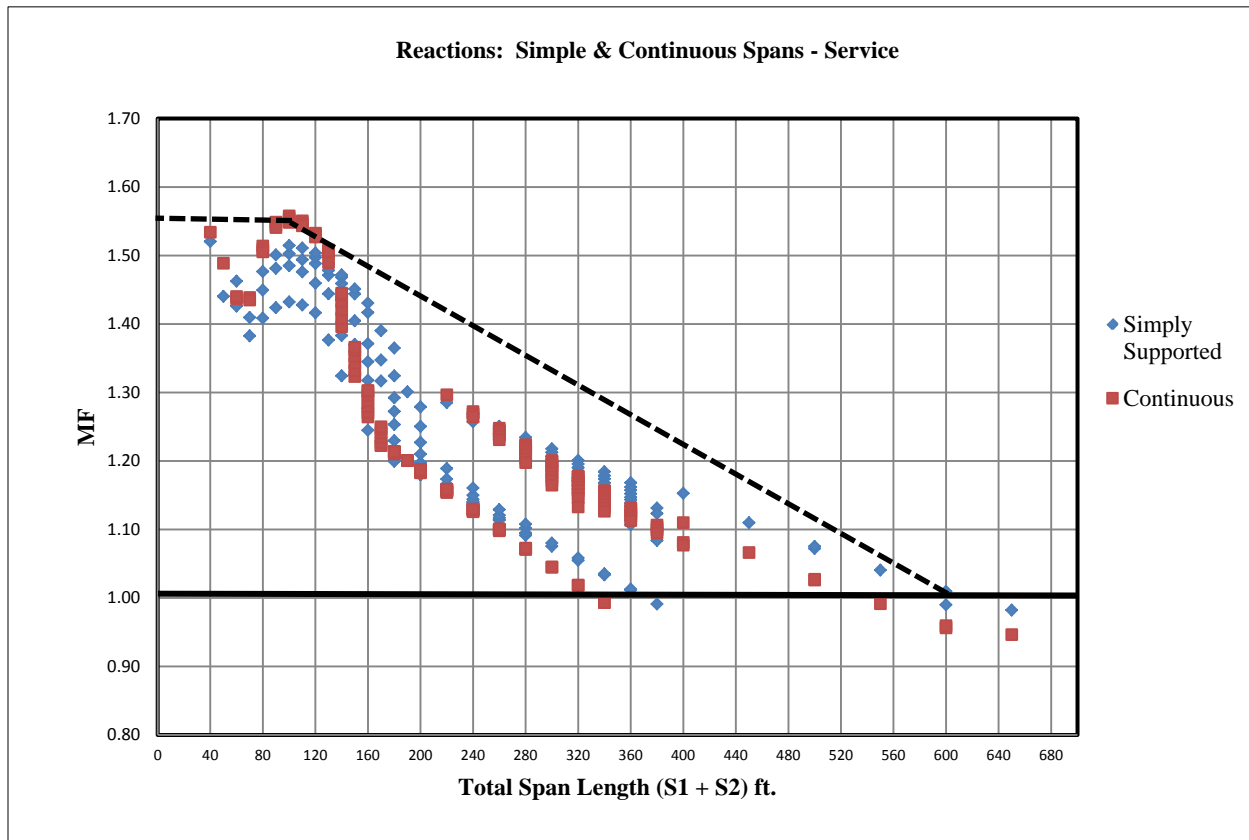
where:

$MF_{SR}$  = Magnification Factor for support reaction

$S_1$  = Length of shorter span, ft.

$S_2$  = Length of longer span, ft.

**1.4.3.2—Support Reaction without Dynamic Impact (Used for Calculating Service Pile Load Only)**



**Figure 1.4.3.2-1: Upper Boundary Lines for Support Reaction (Service)**

Span Length	Magnification Factor ( $MF_{SR}$ )
$S_1+S_2 \leq 100$ ft.	1.55
$100$ ft. $< S_1+S_2 < 600$ ft.	Interpolation
$S_1+S_2 \geq 600$ ft.	1.00

where:

- $MF_{SR}$  = Magnification Factor for support reaction
- $S_1$  = Length of shorter span, ft.
- $S_2$  = Length of longer span, ft.



### 1.4.4–Summary of Equations for Support Reactions

Span Length	Magnification Factor
	Factored Support Reaction
$S_1+S_2 \leq 100$ ft.	1.30
$100$ ft. $< S_1+S_2 < 240$ ft.	Interpolation
$S_1+S_2 \geq 240$ ft.	1.00

Span Length	Magnification Factor
	Support Reaction (Service)
$S_1+S_2 \leq 100$ ft.	1.55
$100$ ft. $< S_1+S_2 < 600$ ft.	Interpolation
$S_1+S_2 \geq 600$ ft.	1.00

## 1.5—SUMMARY AND CONCLUSIONS

Three distinct Magnification Factors (MF) are developed for flexure,  $MF_F$ , shear,  $MF_V$ , and support reactions,  $MF_{SR}$ . The factors are derived based on rigorous analysis of bridges with span lengths varying from 20 ft. to 500 ft. An "Upper Boundary Approach Method" is used in the development of these Magnification Factors. After considerable studies, it was determined that using a single magnification factor will not cover all load effects and will result in significant conservatism in some span ranges; therefore, a variable magnification factor approach is adapted. The value of the MF varies, based on the span length, to accommodate optimum economical solution and yet result in a conservative design.

This study covered both simple and continuous spans and the MF values are applicable to all types of bridges.

The proposed model results in a design load =  $MF \cdot HL-93$ . This approach is selected to provide easy transition to the designer and maintain consistency with *AASHTO LRFD Design Specifications*. The result and benefits are such that engineers need only to design for one vehicle ( $MF \cdot HL-93$ ), which will result in substantial savings to the amount of time and cost of bridge designs and will also ensure meeting the minimum load rating requirements.

This new approach is implemented in the *BDEM*. The new live load model shall be the only design requirement and eliminates the need to check the "Louisiana Special Design Vehicles."

For support reaction, flexure moment and shear force effect, the Upper Boundary Approach can envelop the LASDVs fairly well.

The project results clearly show that the proposed magnification factors  $MF_{SR}$ ,  $MF_F$  and  $MF_V$  as components of a new "Louisiana Design Vehicle Live Load" (LA DVLL) are of significant impact and influence for the design of all bridges in Louisiana.