LOAD RATING

Andrew DeVault

WHAT?

WHY?

TOPICS

RESOURCES

DESIGN:
IS IT "OK?"

MAINTENANCE:
HOW OK IS IT?

WHAT IS A LOAD RATING?

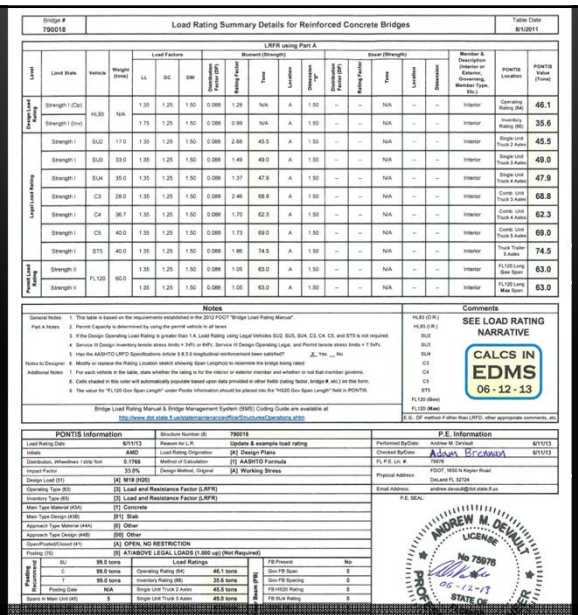
$$RF = \frac{\varphi_c \cdot \varphi_s \cdot \varphi \cdot C - \gamma_{DC} \cdot DC - \gamma_{DW} \cdot DW}{\gamma_{LL} \cdot DF \cdot \left(IM \cdot LL_{axles} - LL_{lane}\right)}$$

$$RF = \frac{\text{"AVAILABLE CAPACITY"}}{\text{"LIVE LOAD"}}$$

RATING FACTOR (RF)

1. 1. SUMMARY
2. 2. NARRATIVE
3. 3. BASIS
4. 4. CALCULATIONS
5. 5. QUICK CHECK

LOAD RATING COMPONENTS



Bridge # 790018

Load Rating Summary Details for Reinforced Concrete Bridges

Table Date 8/1/2011

LRFR using Part A

Level	Limit State	Vehicle	Weight (tons)	Load Factors LL	DC	DW	Moment (Strength) Distribution Factor (DF)	Rating Factor	Tons	Location	Dimension "x"	Shear (Strength) Distribution Factor (DF)	Rating Factor	Tons	Location	Dimension	Member & Description (Interior or Exterior, Governing, Member Type, Etc.)	PONTIS Location	PONTIS Value (Tons)
Design Load Rating	Strength I (Cip)	HL93	N/A	1.35	1.25	1.50	0.088	1.28	N/A	A	1.50	--	--	N/A	--	--	Interior	Operating Rating (R4)	46.1
	Strength I (Inv)			1.75	1.25	1.50	0.088	0.99	N/A	A	1.50	--	--	N/A	--	--	Interior	Inventory Rating (R6)	35.6
Legal Load Rating	Strength I	SU2	17.0	1.35	1.25	1.50	0.088	2.68	45.5	A	1.50	--	--	N/A	--	--	Interior	Single Unit Truck 2 Axles	45.5
	Strength I	SU3	33.0	1.35	1.25	1.50	0.088	1.49	49.0	A	1.50	--	--	N/A	--	--	Interior	Single Unit Truck 3 Axles	49.0
	Strength I	SU4	35.0	1.35	1.25	1.50	0.088	1.37	47.9	A	1.50	--	--	N/A	--	--	Interior	Single Unit Truck 4 Axles	47.9
	Strength I	C3	28.0	1.35	1.25	1.50	0.088	2.46	68.8	A	1.50	--	--	N/A	--	--	Interior	Comb. Unit Truck 3 Axles	68.8
	Strength I	C4	36.7	1.35	1.25	1.50	0.088	1.70	62.3	A	1.50	--	--	N/A	--	--	Interior	Comb. Unit Truck 4 Axles	62.3
	Strength I	C5	40.0	1.35	1.25	1.50	0.088	1.73	69.0	A	1.50	--	--	N/A	--	--	Interior	Comb. Unit Truck 5 Axles	69.0
	Strength I	ST5	40.0	1.35	1.25	1.50	0.088	1.86	74.5	A	1.50	--	--	N/A	--	--	Interior	Truck Trailer 5 Axles	74.5
Permit Load Rating	Strength II	FL120	50.0	1.35	1.25	1.50	0.088	1.05	63.0	A	1.50	--	--	N/A	--	--	Interior	FL120 Long Gov Span	63.0
	Strength II			1.35	1.25	1.50	0.088	1.05	63.0	A	1.50	--	--	N/A	--	--	Interior	FL120 Long Max Span	63.0

Notes

General Notes
1. This table is based on the requirements established in the 2012 FDOT "Bridge Load Rating Manual".

Part A Notes
2. Permit Capacity is determined by using the permit vehicle in all lanes.
3. If the Design Operating Load Rating is greater than 1.4, Load Rating using Legal Vehicles SU2, SU3, SU4, C3, C4, C5, and ST5 is not required.
4. Service III Design Inventory tensile stress limits = 3kFc or 6kFc. Service III Design Operating Legal, and Permit tensile stress limits = 7.5kFc.
5. Has the AASHTO LRFD Specifications Article 5.8.3.5 longitudinal reinforcement been satisfied? X Yes ___ No

Notes to Designer
6. Modify or replace the Rating Location sketch showing Span Length(s) to resemble the bridge being rated.

Additional Notes
7. For each vehicle in the table, state whether the rating is for the interior or exterior member and whether or not that member governs.
8. Cells shaded in this color will automatically populate based upon data provided in other fields (rating factor, bridge #, etc.) on this form.
9. The value for "FL120 Gov Span Length" under Pontis Information should be placed into the "HS20 Gov Span Length" field in PONTIS.

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

Comments

SEE LOAD RATING NARRATIVE

CALCS IN EDMS 06-12-13

HL93 (O.R.)
HL93 (I.R.)
SU2
SU3
SU4
C3
C4
C5
ST5
FL120 (Gov)
FL120 (Max)
(E.G., DF method if other than LRFD, other appropriate comments, etc.)

PONTIS Information

Structure Number (B)	790018		
Load Rating Date	6/11/13	Reason for L, R	Update & example load rating
Initials	AMD	Load Rating Origination	[A] Design Plans
Distribution, Wheelbase / strip first	0.1766	Method of Calculation	[1] AASHTO Formula
Impact Factor	33.0%	Design Method, Original	[A] Working Stress
Design Load (D1)	[4] M18 (H20)		
Operating Type (B3)	[3] Load and Resistance Factor (LRFR)		
Inventory Type (B5)	[3] Load and Resistance Factor (LRFR)		
Main Type Material (K5A)	[1] Concrete		
Main Type Design (K5B)	[01] Slab		
Approach Type Material (K4A)	[0] Other		
Approach Type Design (K4B)	[00] Other		
Open/Posted/Closed (K1)	[A] OPEN, NO RESTRICTION		
Posting (76)	[5] AT/ABOVE LEGAL LOADS (1.000 up) (Not Required)		

Posting (recommended)

SU	99.0 tons		
C	99.0 tons		
T	99.0 tons		
Posting Date	N/A		
Spans in Main Unit (45)	1		

Load Ratings

Operating Rating (R4)	46.1 tons	FB Present	No
Inventory Rating (R6)	35.6 tons	Gov FB Span	0
Single Unit Truck 2 Axles	45.5 tons	Gov FB Spacing	0
Single Unit Truck 3 Axles	49.0 tons	FB HS20 Rating	0
		FB SU4 Rating	0

P.E. Information

Performed By/Date:	Andrew M. Deriault	6/11/13
Checked By/Date:	Adam Brennan	6/11/13
FL P.E. Lic. #	75976	
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P.E. SEAL:

ANDREW M. DERIAULT LICENSE No 75976 STATE OF FLORIDA PROFESSIONAL ENGINEER 06-12-13

(1) SUMMARY

BRIDGE No. 790018, SR40 over HAW CREEK
LOAD RATING NARRATIVE

This load rating is performed as an example, and an update.

HISTORY. In 1965, Project 79100-3503 spanned SR40 over over Haw Creek with five simply-supported 30 foot slab spans. The design loading was H20-S16-44. In 2004, FIN 407096-1-52-01 installed pile jackets among all intermediate piers. In 2006, FIN 417154-1-52-01 removed the concrete barrier posts, and retrofitted the bridge with thrie-beam railing.

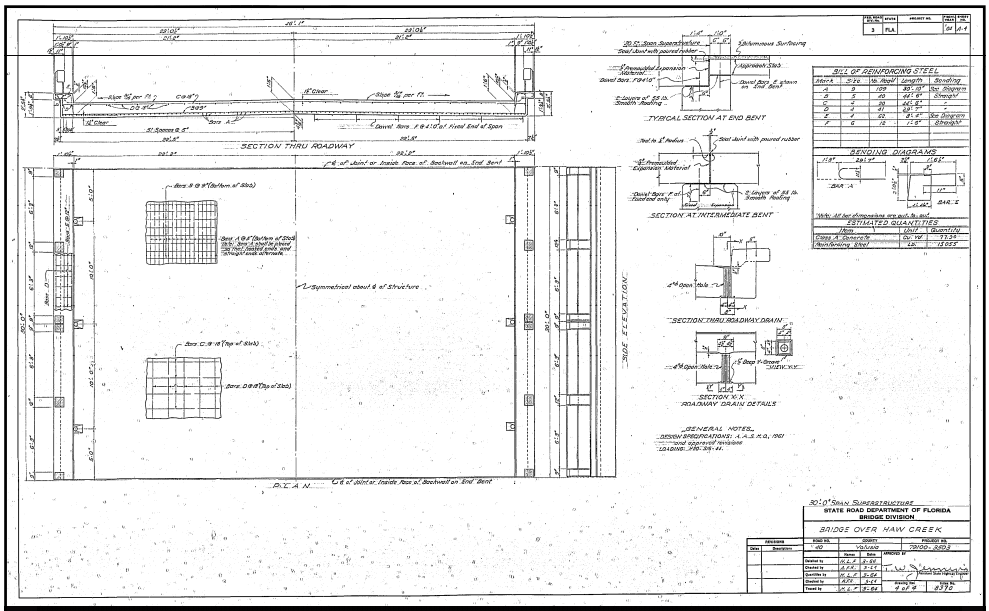
CONDITION. On 03-05-13, Inspector Loveless found the superstructure in good condition (NBI Item No. 59 = 7), and the substructure in satisfactory/fair condition (NBI Item No. 60 = 6). Among the superstructure, Loveless noted slight surface abrasion within each wheel path, randomly-distributed lateral longitudinal and diagonal cracks up to 1/32in. wide within the top and bottom of the slab. Loveless also noted spalls with heavily corroded steel. However these spalls were localized to the deck overhang and curbing. The defects do not appreciably affect the strength of the structure. The substructure is adequate, and the overall condition of the superstructure is good. Full sections are assumed.

ANALYSIS. This rating obtains ample results with a conservative AASHTO distribution. While Load Factor (aliases "LFR," "Std.Spec.," "MBE Part B," and "LRFR Appendix D"), is permitted for existing bridges, LRFD is preferred (FDOT LR MAN at 2.B) and adopted. For simplicity, additional strength from the curb height is neglected, and all railing loads are uniformly distributed across the width of the bridge. Furthermore shear checks, where they occur, are abbreviated.

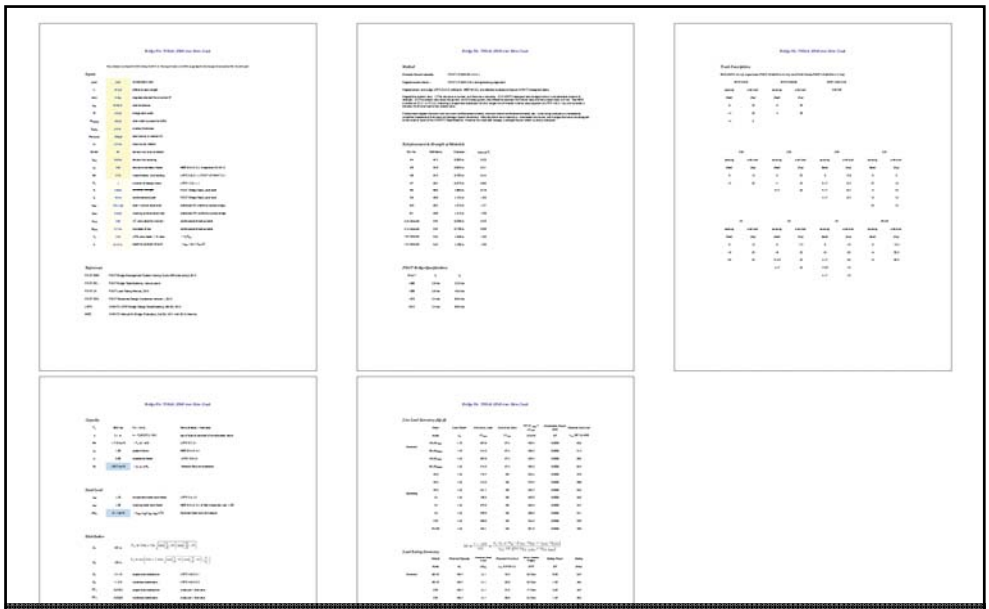
Within this example, consider (1) LRFD simple, (2) Load Factor detailed, and (3) LRFD detailed. For (1) LRFD simple, evaluate a 1 foot equivalent strip for flexure, and neglect extraneous checks. For (2) Load Factor detailed, also analyze an equivalent 1 foot strip width; additionally perform minimum and maximum reinforcement checks, as well as a shear check. For (3) LRFD detailed, use a varying equivalent strip width "E" per lane, to assess three cases: (a) interior multilane, (b) exterior HL93 and legals, and (c) exterior FL120. Also consider reinforcement checks. The detailed checks are intended to support the following statement: *For this structure, and similar slabs, "(1) LRFD simple" is adequate.*

CONCLUSION. Both load factor and LRFD simple are inconsistent or poor, for all legal loads and prudent permit traffic. Adopt "(1) LRFD simple," and its results.

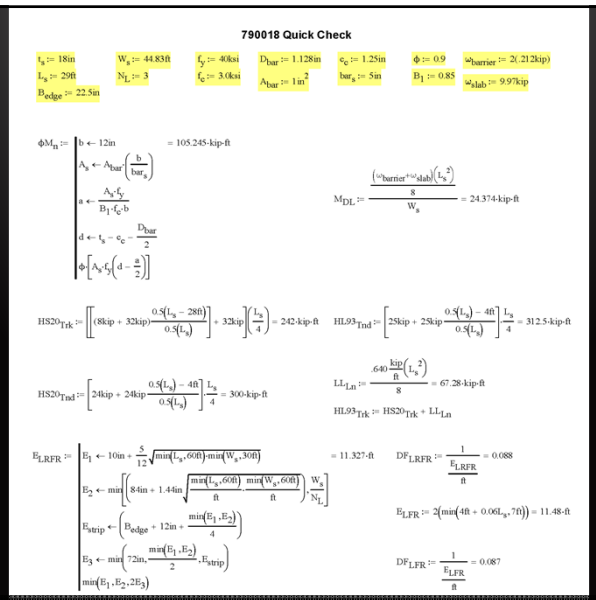
(2) NARRATIVE



(3) BASIS, PLAN HIGHLIGHTS



(4) CALCS



790018 Quick Check

$t_s := 18in$ $W_s := 44.83ft$ $f_y := 40ksi$ $D_{bar} := 1.128in$ $e_c := 1.25in$ $\phi := 0.9$ $\omega_{barrier} := 2(.212kip)$

$L_s := 29ft$ $N_L := 3$ $f'_c := 3.0ksi$ $A_{bar} := 1in^2$ $bar_s := 5in$ $B_1 := 0.85$ $\omega_{slab} := 9.97kip$

$B_{edge} := 22.5in$

$$\phi M_n := \left| \begin{array}{l} b \leftarrow 12in \\ A_s \leftarrow A_{bar}\left(\frac{b}{bar_s}\right) \\ a \leftarrow \frac{A_s \cdot f_y}{B_1 \cdot f'_c \cdot b} \\ d \leftarrow t_s - e_c - \frac{D_{bar}}{2} \\ \phi\left[A_s \cdot f_y\left(d - \frac{a}{2}\right)\right] \end{array} \right. = 105.245 \cdot kip \cdot ft$$

$$M_{DL} := \frac{\left(\omega_{barrier} + \omega_{slab}\right)\left(L_s^2\right)}{8} = 24.374 \cdot kip \cdot ft$$

$$HS20_{Trk} := \left[\left[(8kip + 32kip)\frac{0.5(L_s - 28ft)}{0.5(L_s)}\right] + 32kip\right]\left(\frac{L_s}{4}\right) = 242 \cdot kip \cdot ft$$

$$HL93_{Trd} := \left[25kip + 25kip\frac{0.5(L_s) - 4ft}{0.5(L_s)}\right]\frac{L_s}{4} = 312.5 \cdot kip \cdot ft$$

$$HS20_{Trd} := \left[24kip + 24kip\frac{0.5(L_s) - 4ft}{0.5(L_s)}\right] \cdot \frac{L_s}{4} = 300 \cdot kip \cdot ft$$

$$LL_{Ln} := \frac{.640\frac{kip}{ft}\left(L_s^2\right)}{8} = 67.28 \cdot kip \cdot ft$$

$$HL93_{Trk} := HS20_{Trk} + LL_{Ln}$$

$$E_{LRFR} := \left| \begin{array}{l} E_1 \leftarrow 10in + \frac{5}{12}\sqrt{\min(L_s, 60ft) \cdot \min(W_s, 30ft)} \\ E_2 \leftarrow \min\left[\left(84in + 1.44in\sqrt{\frac{\min(L_s, 60ft)}{ft} \cdot \frac{\min(W_s, 60ft)}{ft}}\right) \cdot \frac{W_s}{N_L}\right] \\ E_{strip} \leftarrow \left(B_{edge} + 12in + \frac{\min(E_1, E_2)}{4}\right) \\ E_3 \leftarrow \min\left(72in, \frac{\min(E_1, E_2)}{2}, E_{strip}\right) \\ \min(E_1, E_2, 2E_3) \end{array} \right. = 11.327 \cdot ft$$

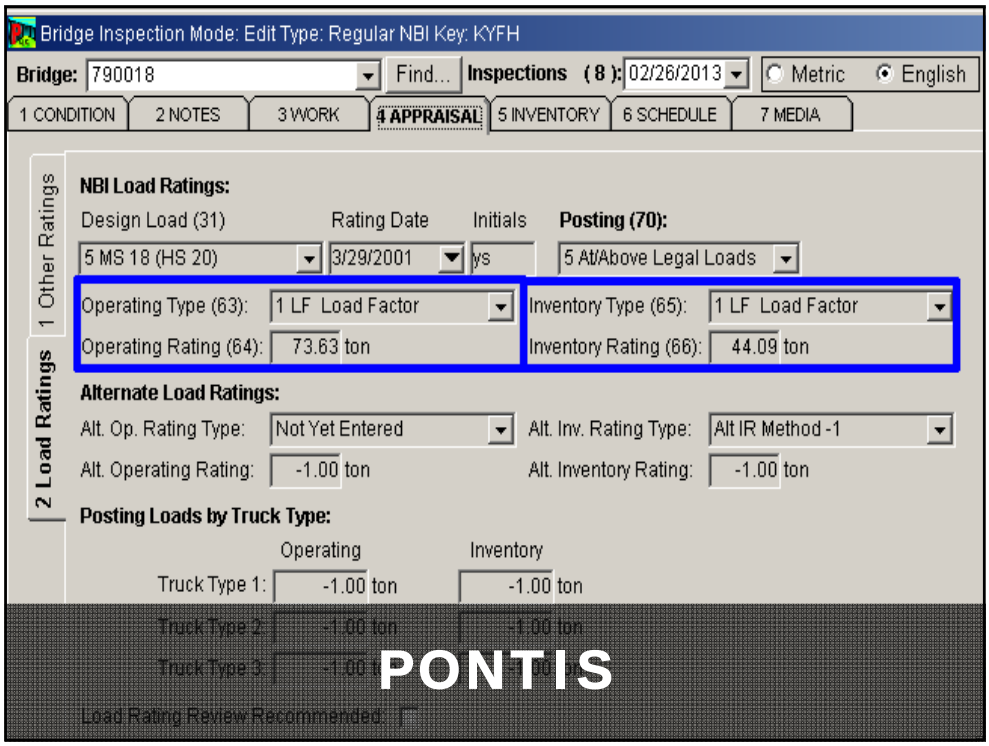
$$DF_{LRFR} := \frac{1}{\frac{E_{LRFR}}{ft}} = 0.088$$

$$E_{LFR} := 2\left(\min\left(4ft + 0.06L_s, 7ft\right)\right) = 11.48 \cdot ft$$

$$DF_{LFR} := \frac{1}{\frac{E_{LFR}}{ft}} = 0.087$$

(5) QUICK CHECK

WHERE DOES A LOAD RATING GO?



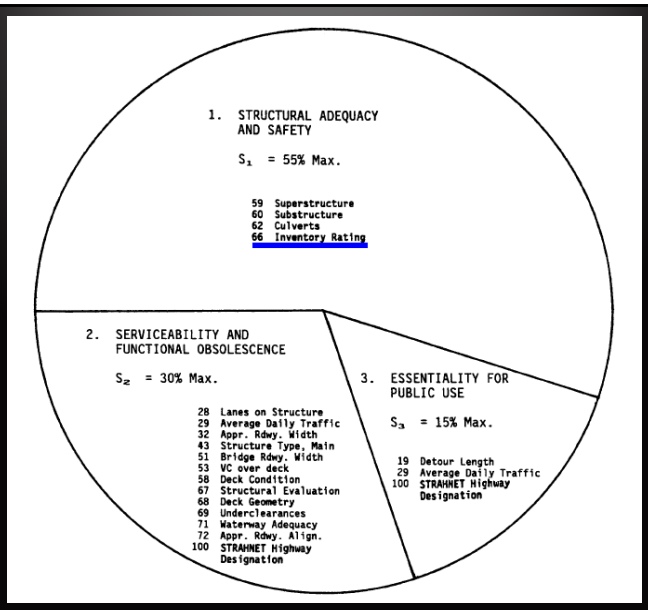
PONTIS

1. SUFFICIENCY
2. POSTING
3. PERMIT ROUTING

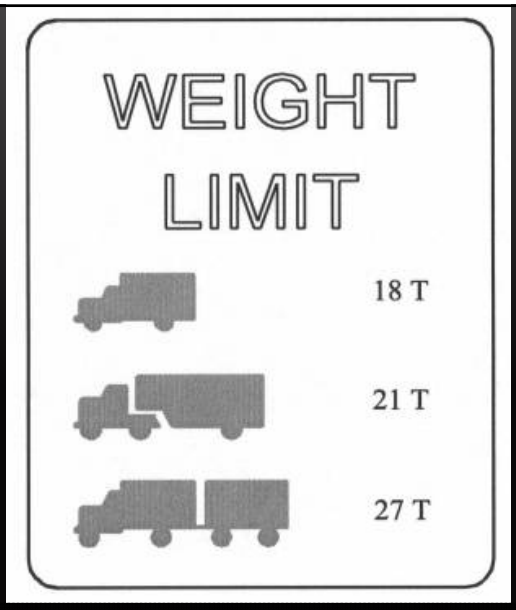
WHY?

BrNo.	Road	Intersect	HS20/FL120
750142	I-4 WB	Central Fl Pkwy	**55.8**
750200	I-4 EB	Central Fl Parkway	**55.8**
796518	Saul Street	Reed Canal	**37.5**
184000	CR-558	Big Prairie Canal	**50.7**
184078	CR-311	Jumper Creek	**76.9**
730023	US-1	Favorita Canal	**70.0**
730064	US-1	Outfall Ditch	**70.8**
730065	US-1	Outfall Ditch	**69.0**
730940	US-1	Korona Canal	**68.1**
730941	US-1 NB	Dupont Canal	**59.2**
750825	Ramp D	SR-408 and SR-417	**91.1**

STRUCTURAL HEALTH



NBI SUFFICIENCY

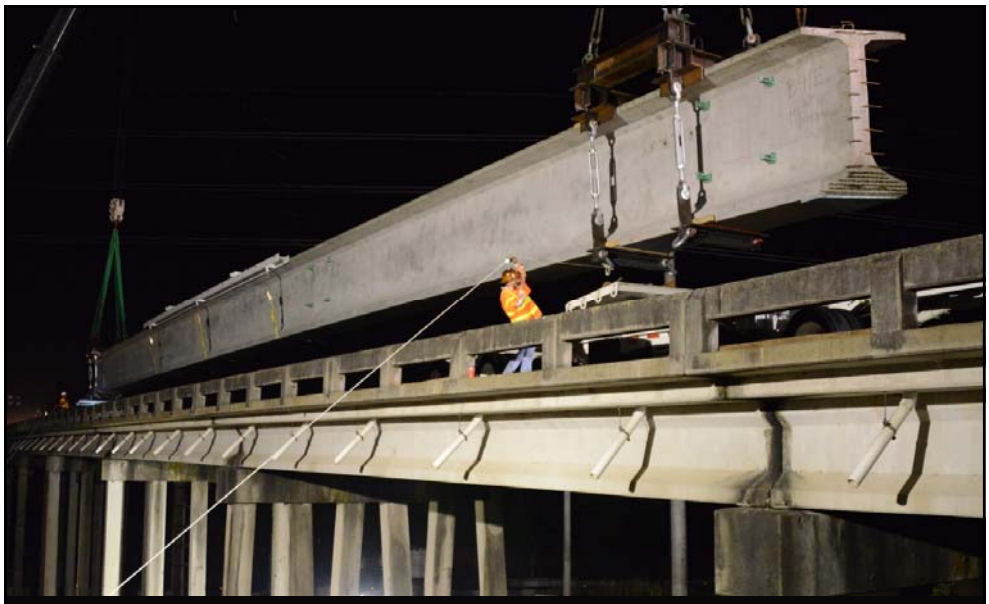


POSTING

POSTING, 1950s

POSTING, 1950s

POSTING, 2011



PERMITTING

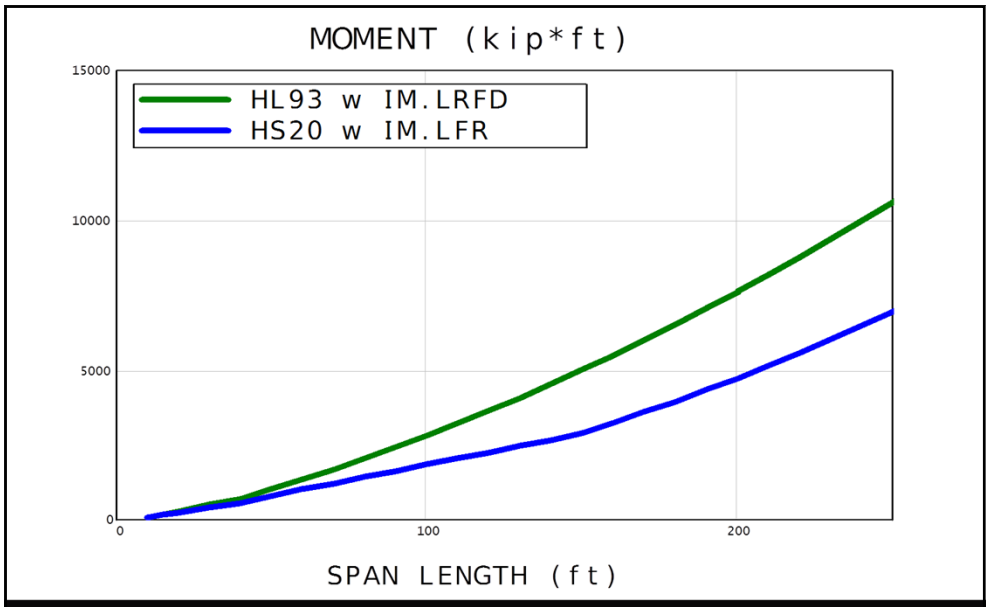
DESIGN

LEGAL

PERMIT

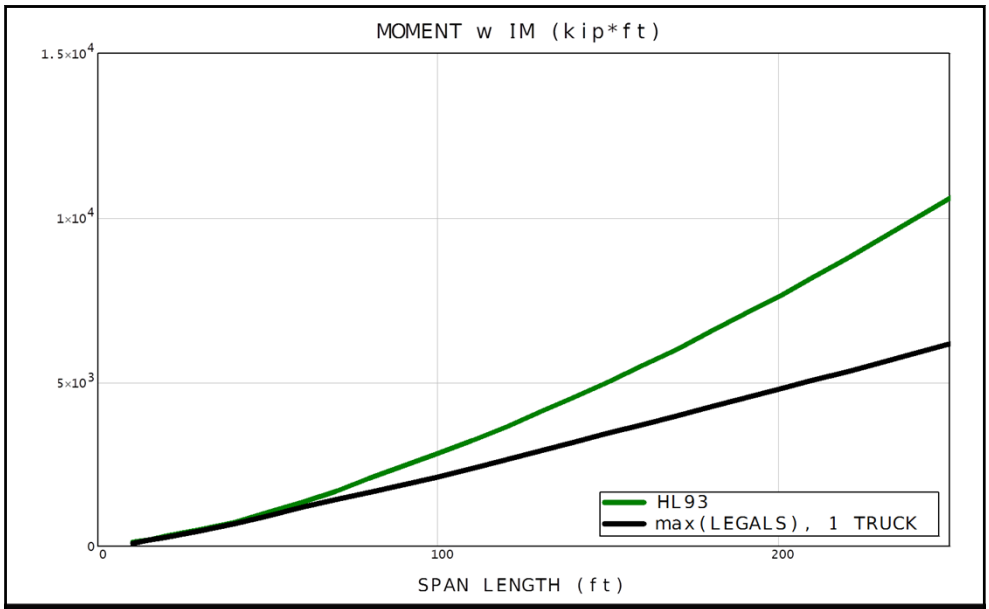
LIVE LOAD

DESIGN
LIVE LOAD

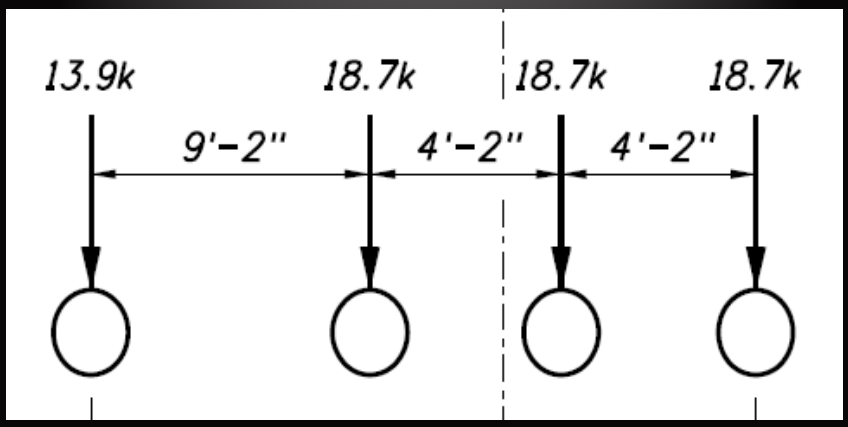


DESIGN

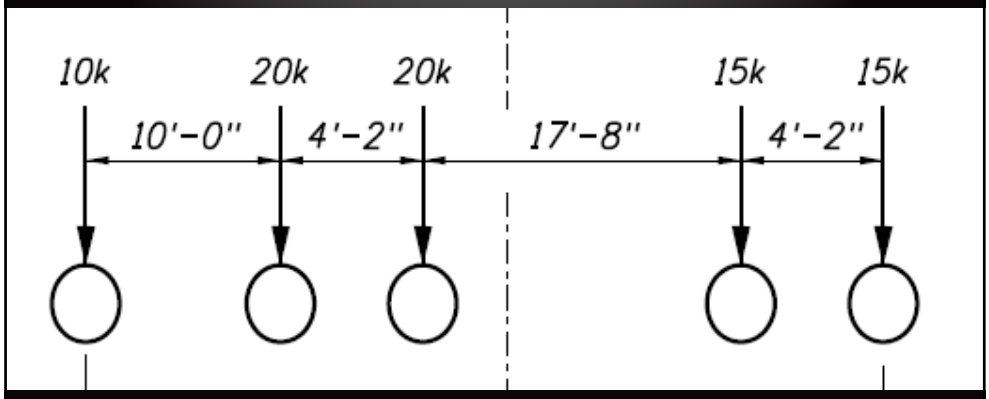
LEGAL LIVE LOAD



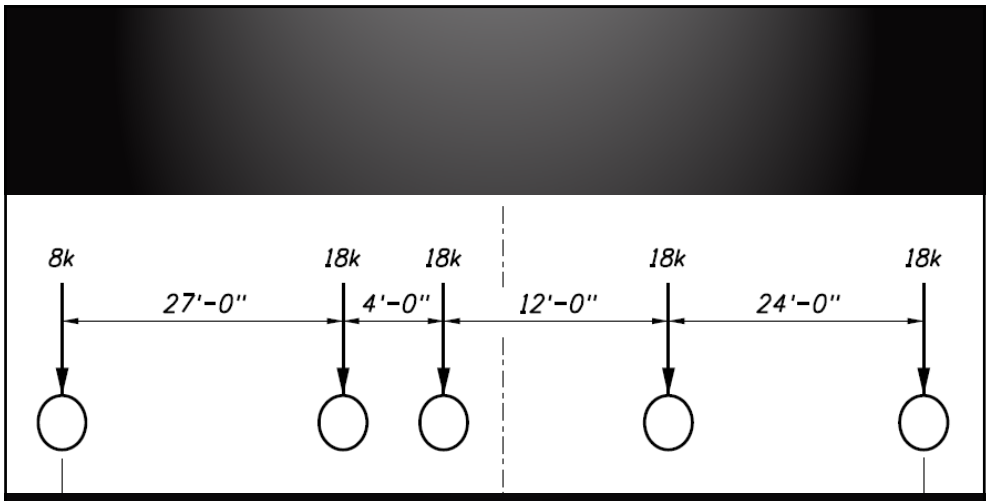
HL93 & LEGALS (1 TRUCK)



SU4 DUMP TRUCK



C5 ~ "18 WHEELER"



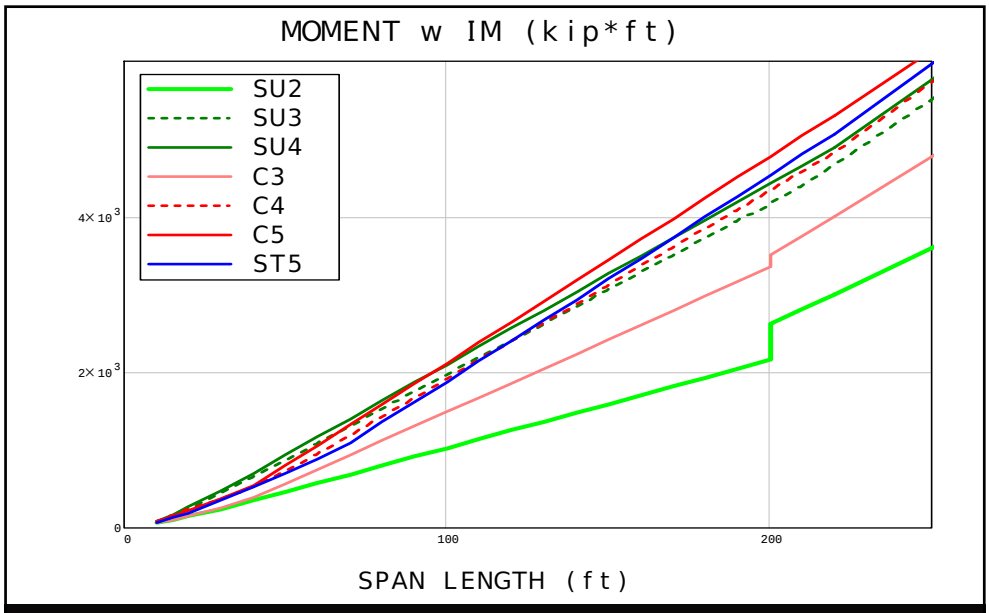
ST5 TANDEM TRAILER

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

- AASHTO Type 3-3 or state legal load multiplied by 0.75 and combined with a lane load of 0.2 klf.

POSITIVE MOMENT
MBE 6A.4.4.2.1a

LEGALS, LRFD



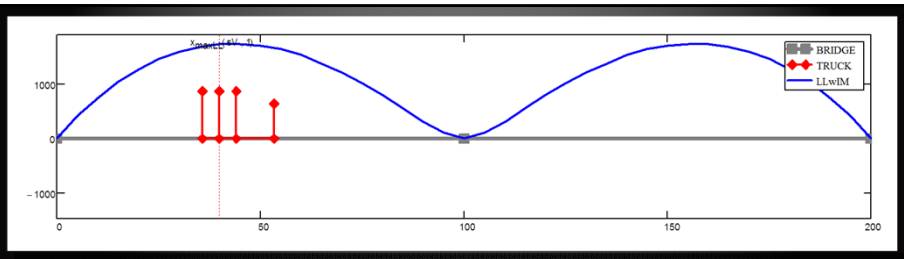
LEGALS, LRFD

- For negative moments and reactions at interior supports, a lane load of 0.2 klf combined with two AASHTO Type 3-3 vehicles or state legal loads multiplied by 0.75 heading in the same direction separated by 30 ft.

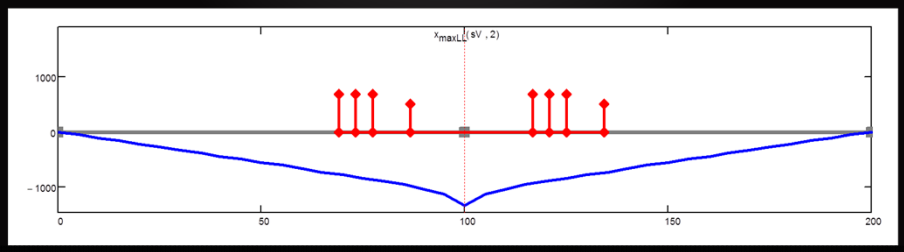
NEGATIVE MOMENT

MBE 6A.4.4.2.1a

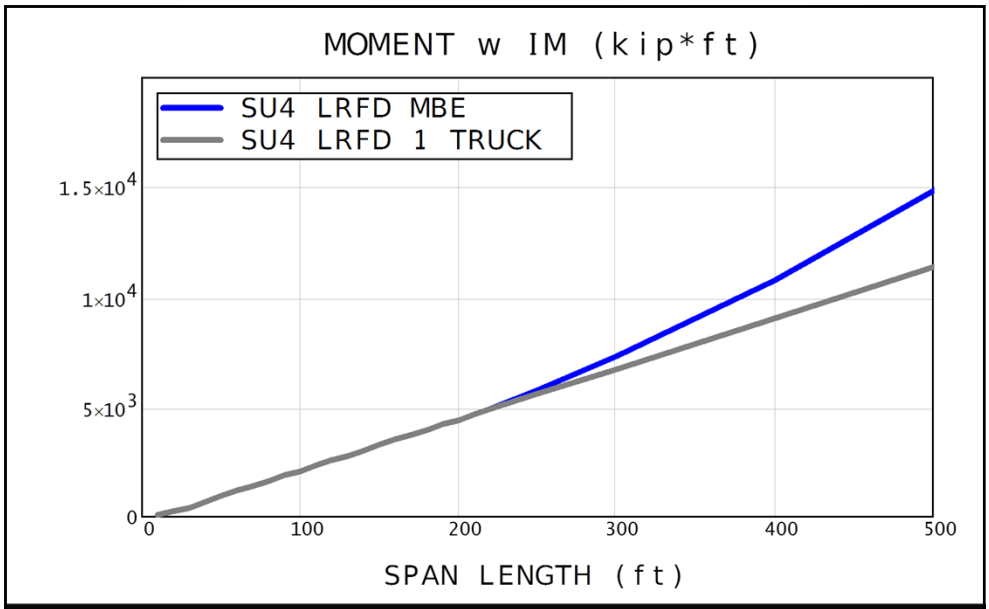
LEGALS, LRFD



+M, 1 EACH 100% + 0plf

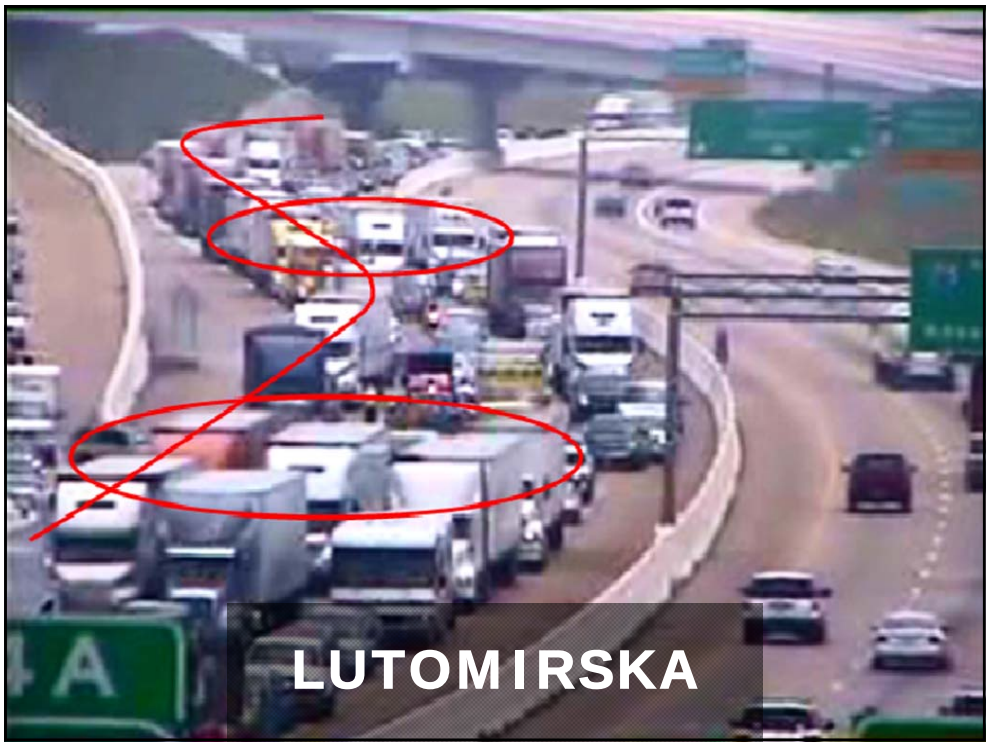


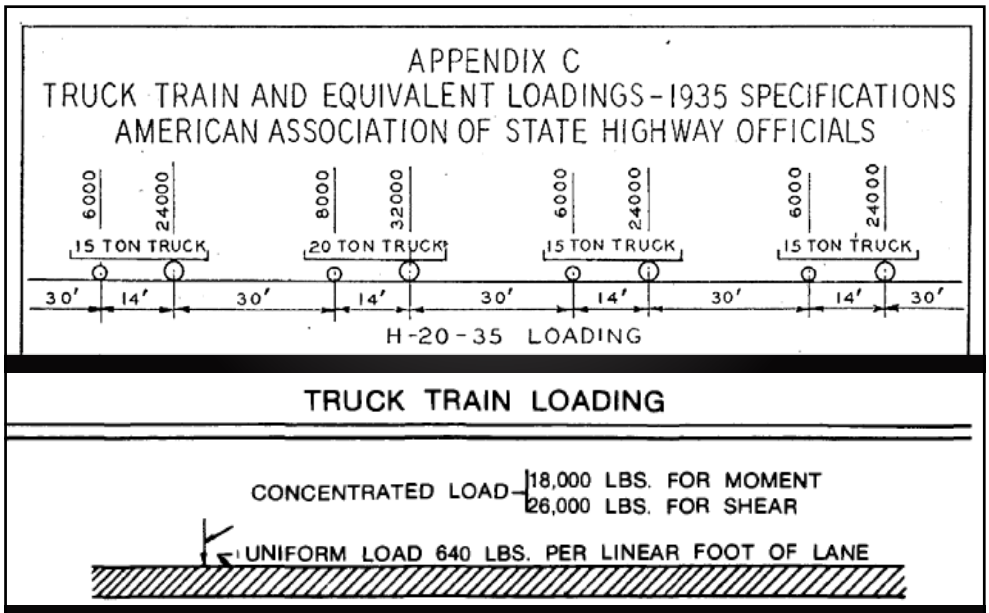
- M, 2 EACH 75% + 200plf


MOMENT w IM (kip*ft)
SU4 LRFD MBE
SU4 LRFD 1 TRUCK
1.5×10^4
1×10^4
5×10^3
0
0
100
200
300
400
500
SPAN LENGTH (ft)

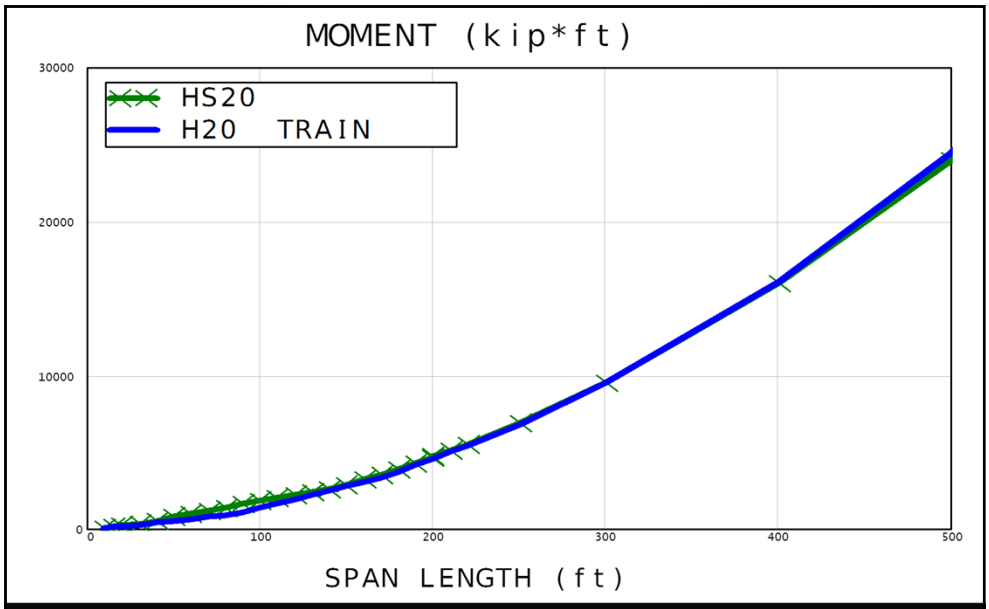
SU4, LRFD

TRAFFIC JAM





HS20 TRAIN, 1935 - 2002

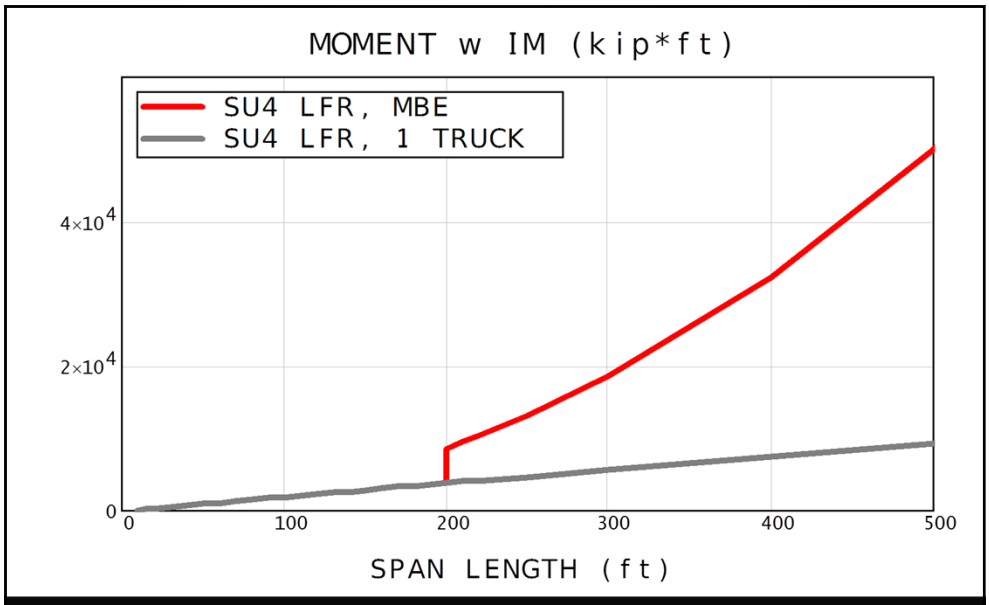


HS20 vs H20 TRAIN
1935 - 2002

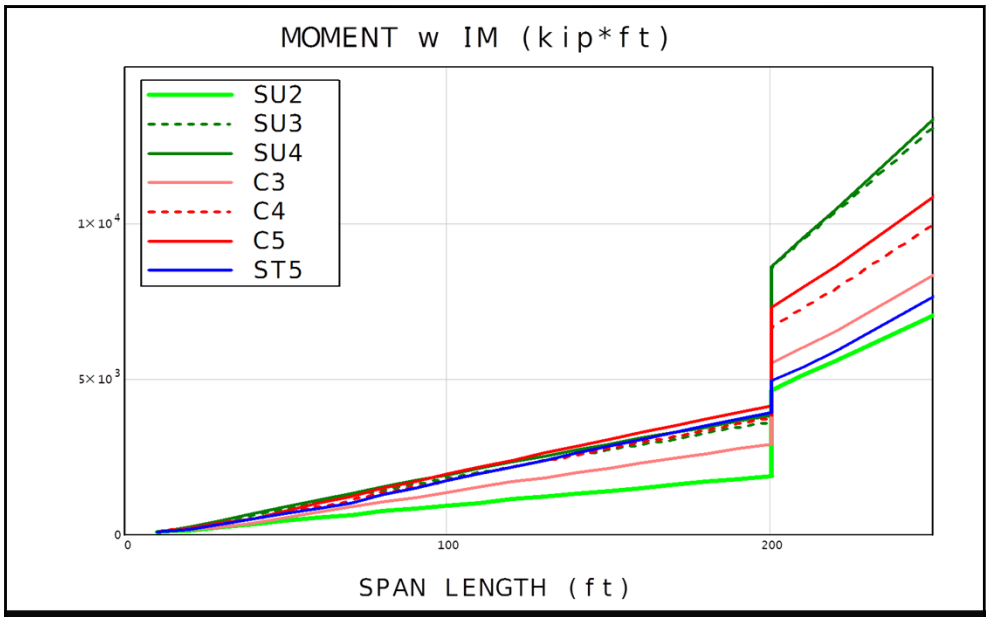
6B.7.2—Posting Loads

The live load to be used in the rating Eq. 6B.4.1-1 for posting considerations should be any of the three typical legal loads shown in Figure 6B7.2-1, any of the four single-unit legal loads shown in Figure 6B7.2-2 or State legal loads. For spans over 200 feet in length, the selected legal load should be spaced with 30 feet clear distance between vehicles to simulate a train of vehicles in one lane and a single vehicle load should be applied in the adjacent lanes(s). When the maximum legal load under state law exceeds the safe load capacity of a bridge, restrictive posting shall be required.

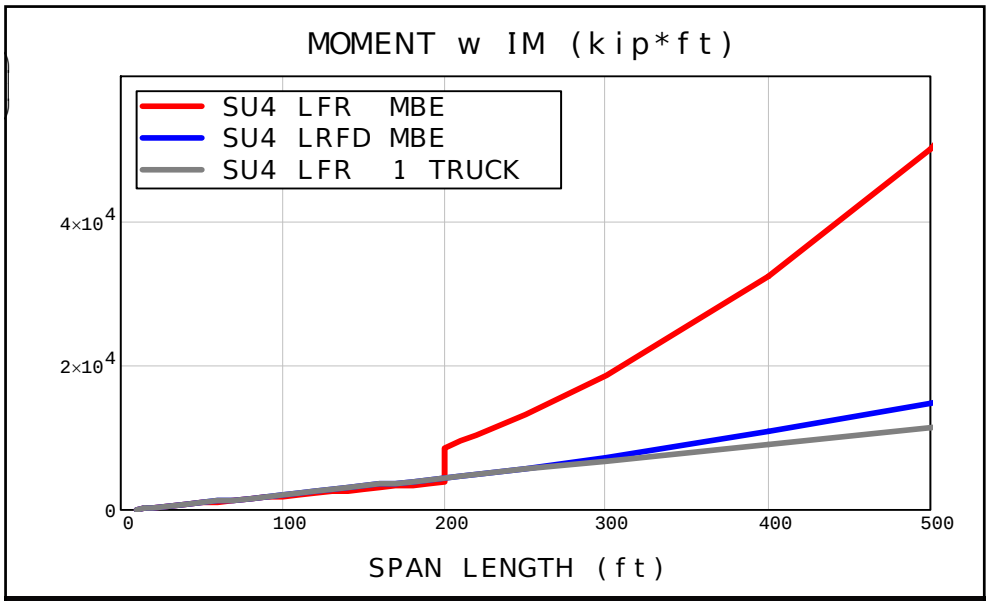
LEGALS, MBE 6B.7.2
LOAD FACTOR



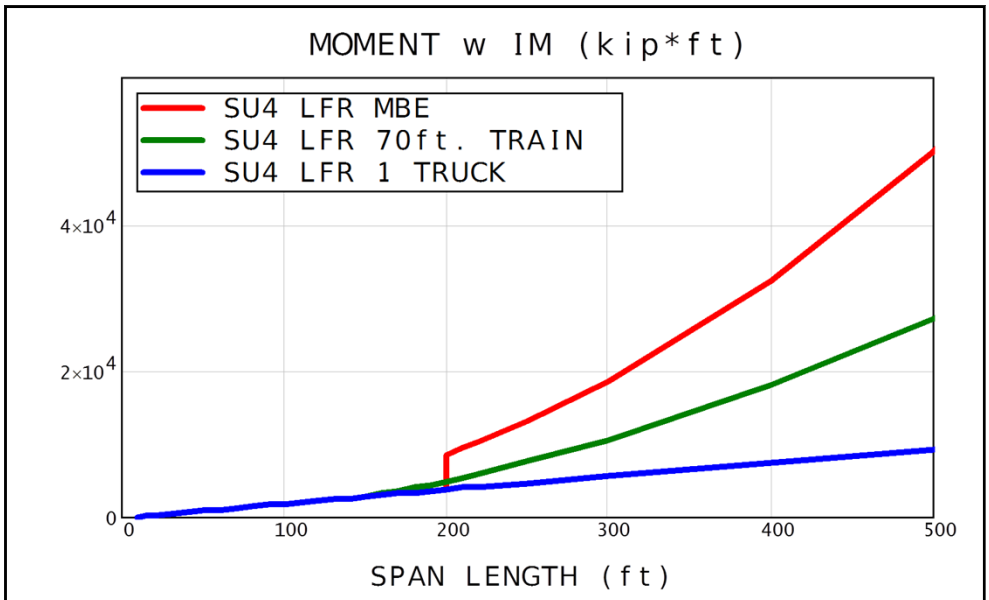
SU4, MBE.B
LOAD FACTOR



LEGALS MBE.B
LOAD FACTOR

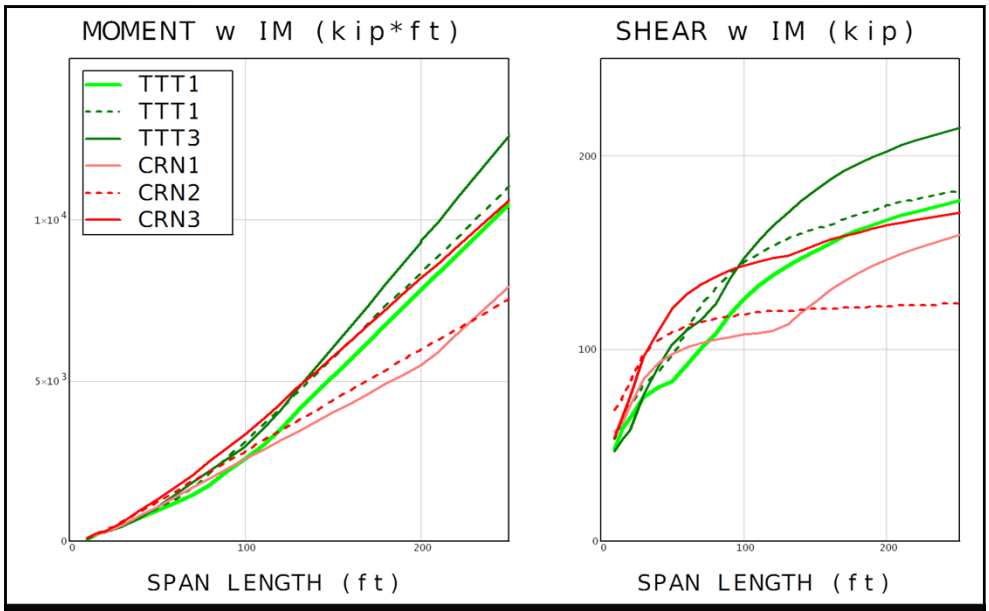


SU4, VARIOUS

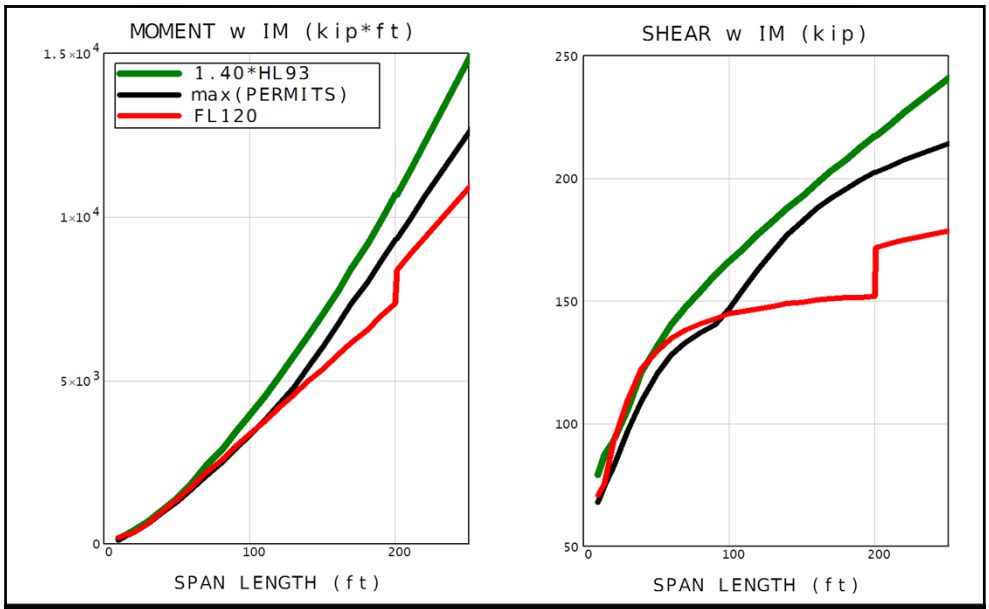


SU4, ANDREW

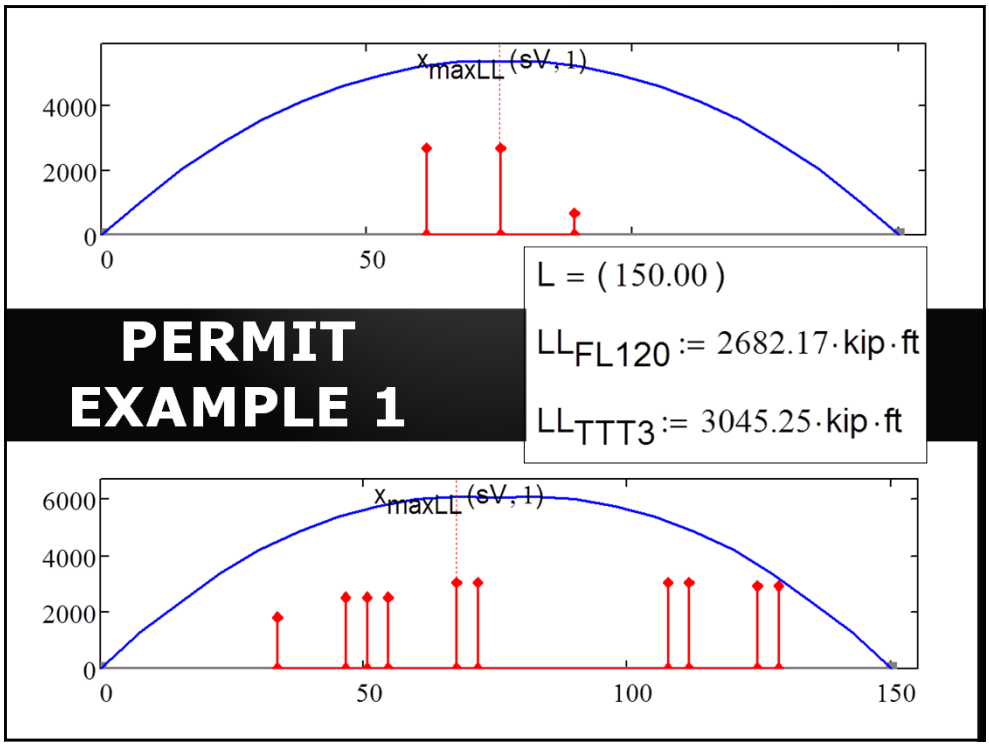
LL PERMITS



PERMIT LL



1.40*HL93, PERMITS, FL120



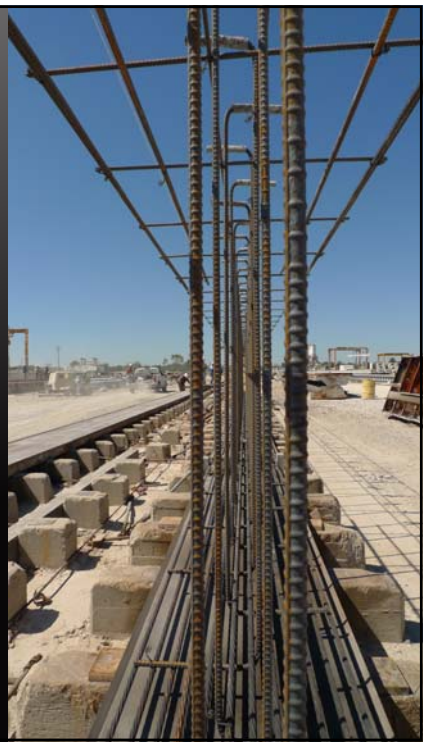
PERMIT EXAMPLE 1

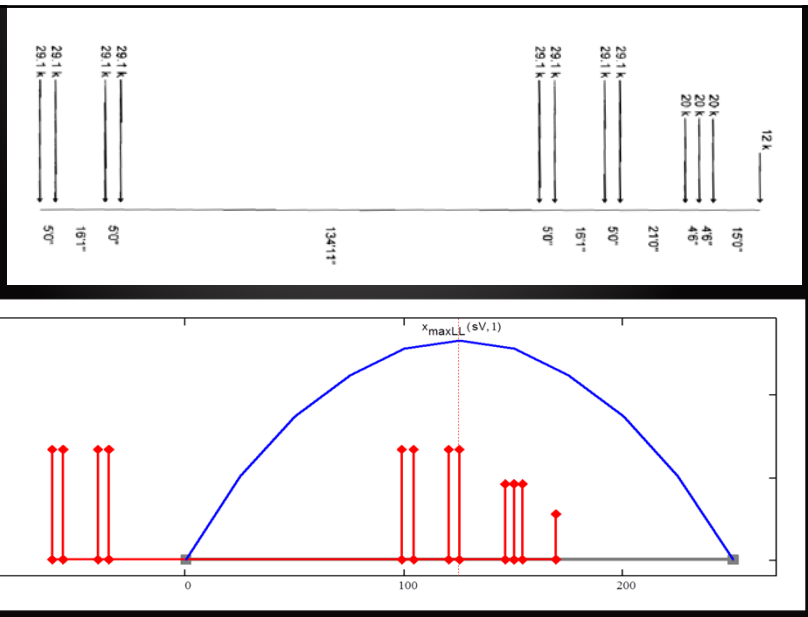
$$RF_{FL120} := 1.15$$

$$LL_{AVAILABLE} := RF_{FL120} \cdot LL_{FL120}$$

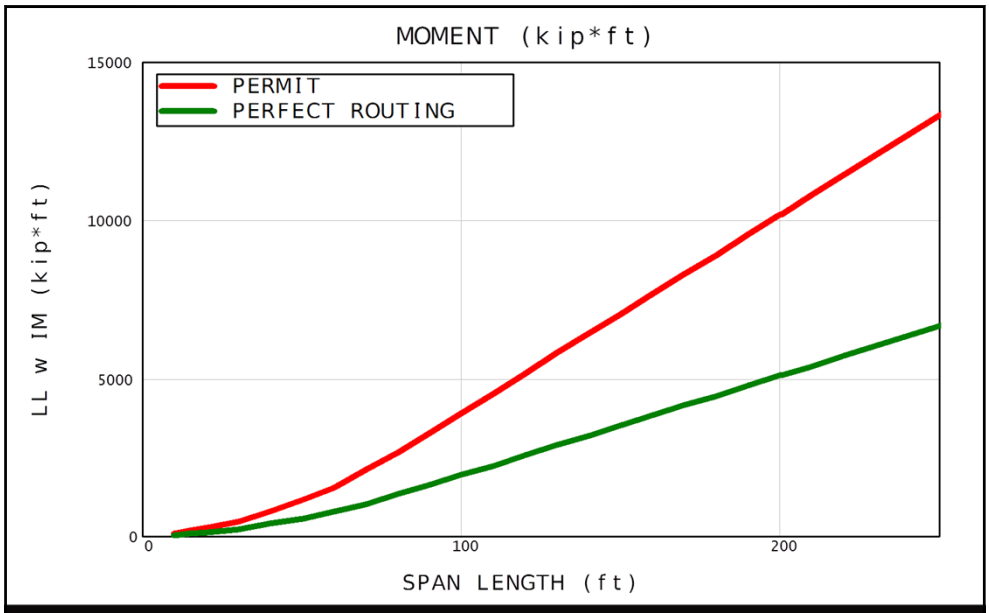
$$RF_{TTT3} := \frac{LL_{AVAILABLE}}{LL_{TTT3}} = 1.01$$

PERMIT EXAMPLE 1

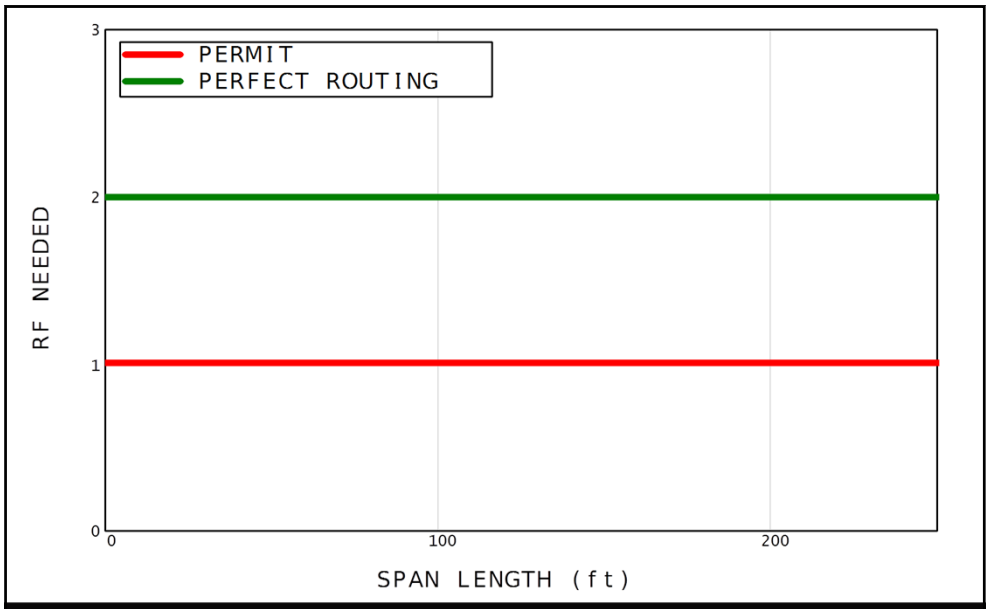




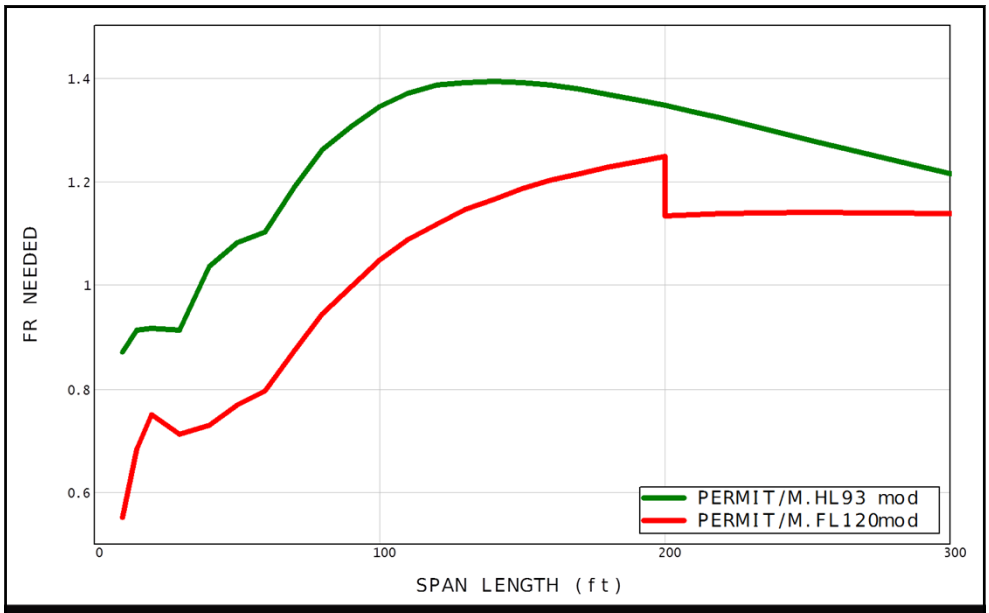
PERMIT EXAMPLE 2



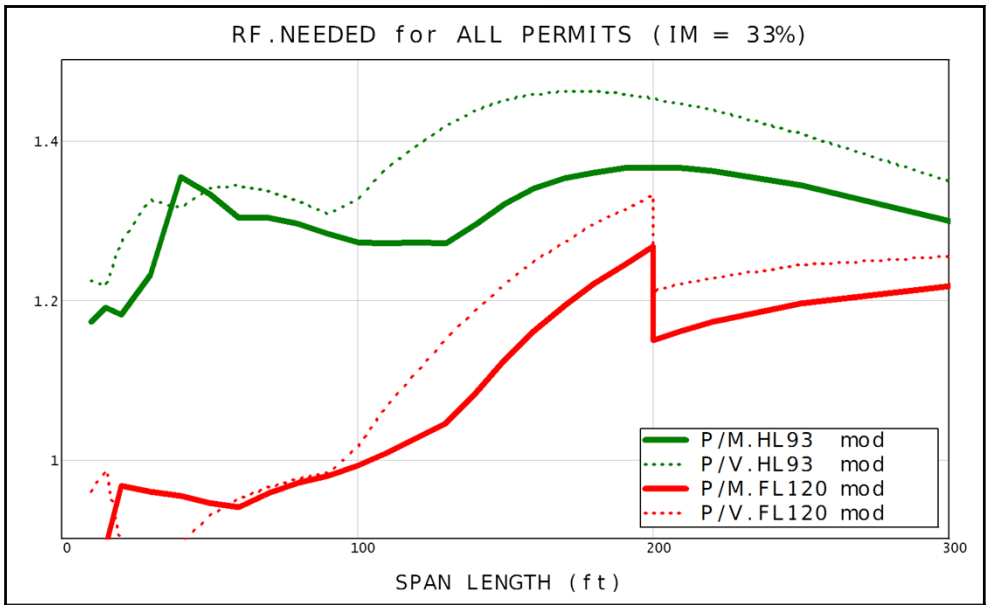
LL w IM, PERFECT ROUTING



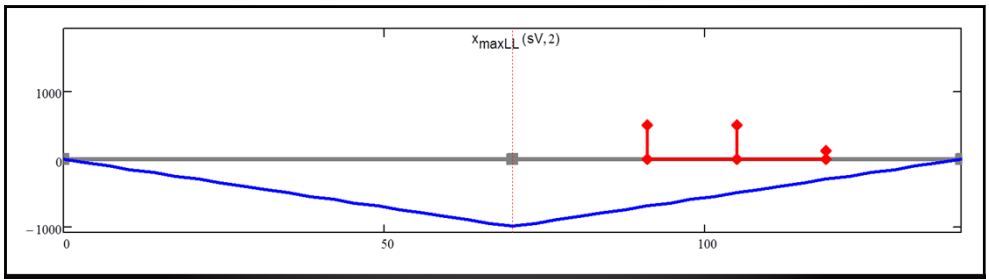
RF NEEDED, PERFECT ROUTING



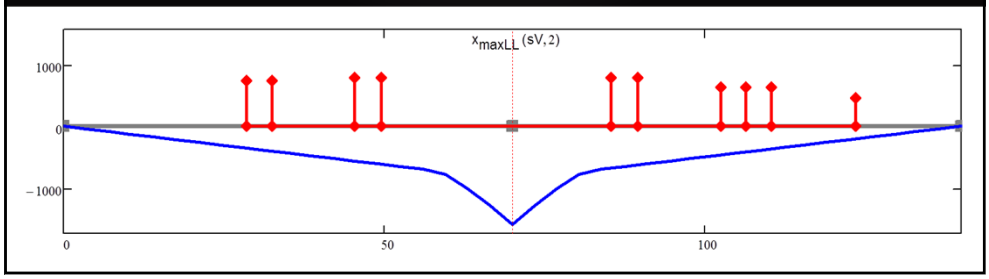
RF NEEDED, REAL-WORLD IM = 20%

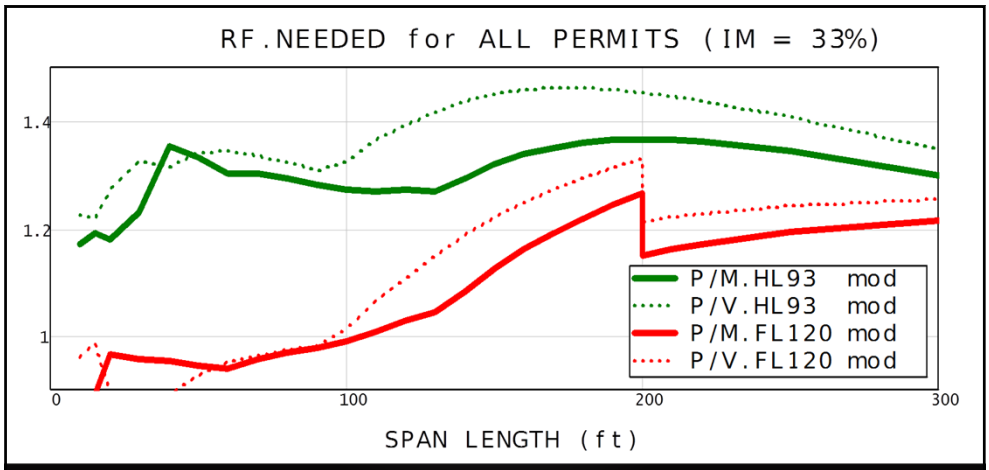


RF NEEDED, ALL PERMITS IM = 33%



ROUTING ACROSS CONTINUOUS SPANS FL120 vs TTT3





FL120 MODIFICATIONS

(1) FL120 - simple
(1) HS20 - historic
(2) HL93 - different

LRFD
PRESTRESS
SHEAR

OPERATING	Method	Level	Vehicle	RATING FACTORS (Operating)			RATING FACTORS (Operating)			RATING FACTORS (Operating)		
				Service I	Service III	Strength	Service I	Service III	Strength	Service I	Service III	Strength
Flexure @ centerline	LFD	Design	HS20 truck	8.06	1.42	2.21	6.34	1.24	2.24	7.41	1.04	2.19
		Permit	T160	5.38	0.95	1.48	4.28	0.83	1.50	4.66	0.65	1.51
	LRFR	Design	HL-93	5.88	1.29	1.59	4.72	1.13	1.57	5.47	0.96	1.59
		Legal	HS-33	4.97	1.11	1.37	4.00	0.96	1.33	4.71	0.82	1.37
		Permit	HS-33	5.39	1.18	1.07	4.27	1.03	1.70	5.01	0.88	1.62
		Permit	T160	5.71	1.25	1.13	4.55	1.10	1.89	5.20	0.91	1.72
Shear @ critical section (h/2)	LFD	Design	HS20 truck			2.92			3.01			4.26
		Permit	T160			1.70			1.81			3.36
	LRFR	Design	HL-93			1.88			2.80			2.83
		Legal	HS-33			1.43			2.31			2.37
		Permit	HS-33			1.96			3.07			3.13
		Permit	T160			2.00			3.16			3.18

HL93 OPERATING

LEAP 1.88

SDR 2.80

CORVEN 2.83

2005

LOAD RATING CONFERENCE

VEH	LOC	CONSPAN, VER12					SMART	DS PS						PG
		BTT 3	GEN 1	GEN 3	ACI 1	ACI 3	BRIDGE	GEN 1	GEN 2	GEN 3	ACI 1	ACI 2	ACI 3	SUPER
HL93 INV	Crit	1.40	0.98	1.33	0.91	1.63	1.12	1.02	1.36	1.71	99.00	99.00	99.00	0.91
	0.1L	1.21	0.99	1.15	1.04	1.65	1.30	0.93	0.90	1.58	0.95	1.24	0.88	0.93
	0.2L	1.06	1.07	1.09	1.31	1.94	0.93	1.00	1.04	0.90	1.32	1.71	1.19	1.19
	0.3L	1.03	1.02	0.90	1.01	2.57	1.23	0.97	0.87	1.04	0.98	1.27	0.90	1.08
	0.4L	1.27	1.13	1.09	1.02	3.52	1.33	1.10	1.10	1.10	1.06	1.36	0.94	1.34
	0.5L	1.54	1.72	1.63	1.12	4.64	1.95	1.74	1.98	1.70	1.23	1.61	1.10	1.64
HL93 OPR	Crit	1.85	1.29	1.75	1.19	2.11	1.46	1.37	1.79	2.25	99.00	99.00	99.00	1.22
	0.1L	1.84	1.31	1.51	1.34	2.14	1.69	1.37	1.54	2.33	1.31	1.69	1.21	1.24
	0.2L	1.45	1.56	1.55	1.70	2.52	1.20	1.58	1.57	1.57	0.97	1.26	0.89	1.61
	0.3L	2.02	1.85	2.01	1.31	3.33	1.60	1.86	2.02	2.02	1.31	1.70	1.19	1.90
	0.4L	2.23	2.16	2.24	1.32	4.56	1.72	2.19	2.27	2.27	1.10	1.42	1.00	2.43
	0.5L	3.04	2.95	2.70	1.45	6.02	2.52	2.98	3.08	3.08	1.05	1.35	0.93	2.99
FL120	Crit	1.21	0.90	1.23	0.83	1.50	1.04	0.79	1.14	1.35	99.00	99.00	99.00	0.83
	0.1L	1.00	0.91	1.05	0.94	1.52	1.19	0.73	0.74	1.36	0.82	1.06	0.75	0.84
	0.2L	0.81	0.81	0.75	1.18	1.76	0.84	0.79	0.86	0.73	0.95	1.24	0.88	0.92
	0.3L	0.74	0.78	0.72	0.91	2.30	1.11	0.77	0.71	0.86	1.32	1.71	1.19	0.87
	0.4L	0.88	0.83	0.85	0.93	3.12	1.18	0.84	0.67	0.87	0.98	1.27	0.90	1.08
	0.5L	1.29	1.30	1.04	1.05	4.14	1.75	1.32	1.06	1.30	1.06	1.36	0.94	1.36

HL93 OPERATING

MIN 0.97, MAX 2.11

2013

PRESTRESS SHEAR

1. 1. BETA-THETA TABLES
2. 2. GENERAL METHOD
3. 3. SIMPLIFIED (ACI)

LRFD PS SHEAR METHODS

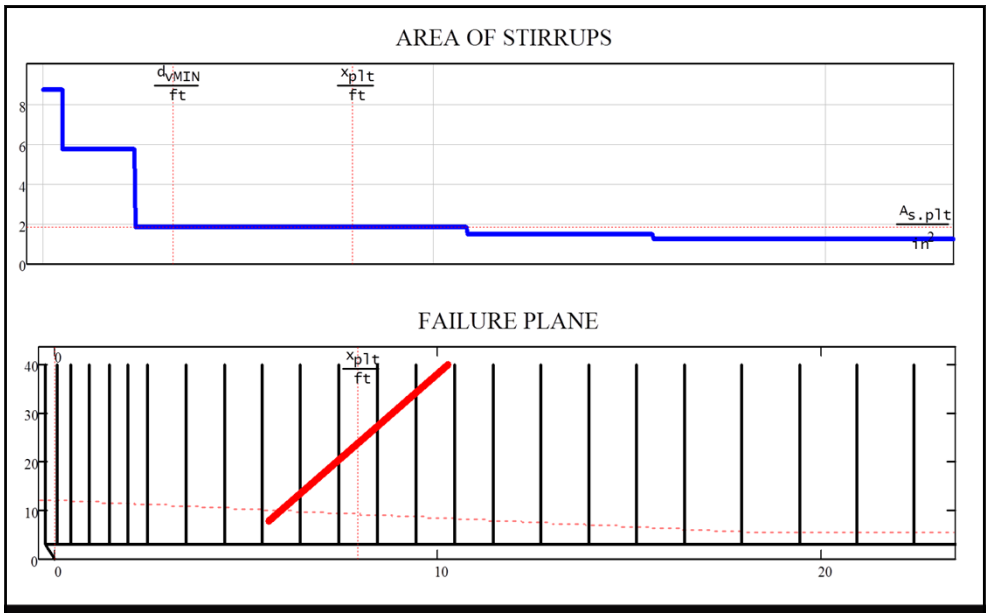
RF HL93 OPERATING AT 30% SPAN IS 1.60 or 2.01?

$$\frac{\frac{|M_u|}{d_v(x)} + (|V_u - V_p|) - A_{ps}(x) \cdot f_{po}}{28500\text{ksi} \cdot A_{ps}(x)}$$

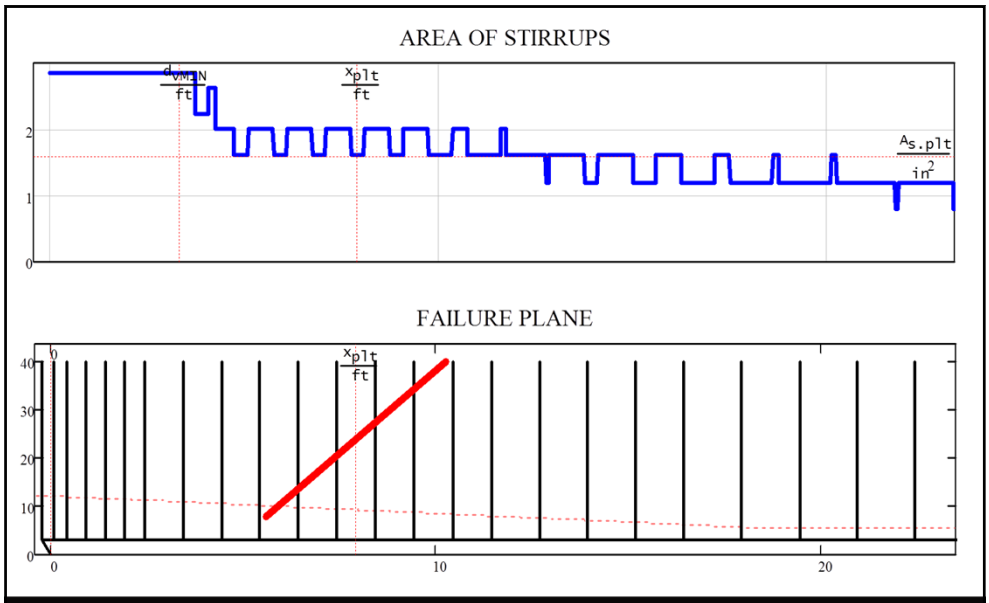
WHETHER CAPACITY PENDS UPON FACTORED LIVE LOAD?

1. 1. TRADITIONAL
2. 2. FAILURE PLANE, 2012
3. 3. FAILURE PLANE, 2007

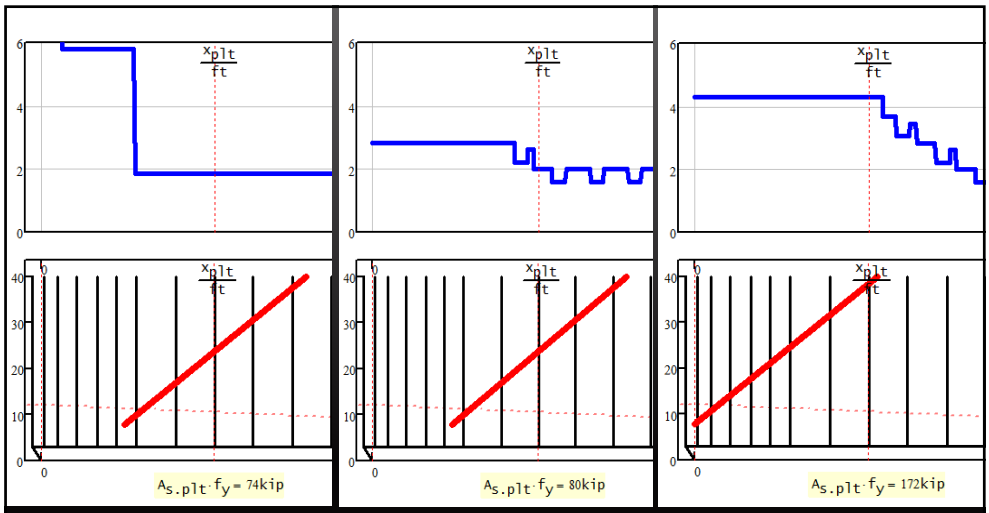
LRFD PS STIRRUP METHODS



(1) TRADITIONAL

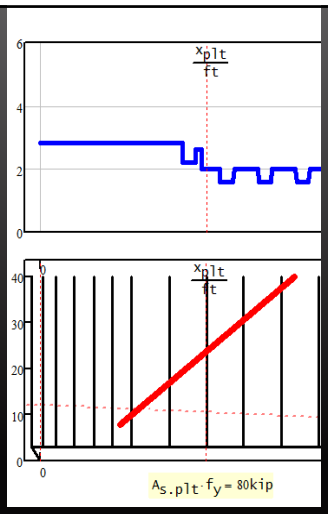


(2) ACROSS FAILURE PLANE



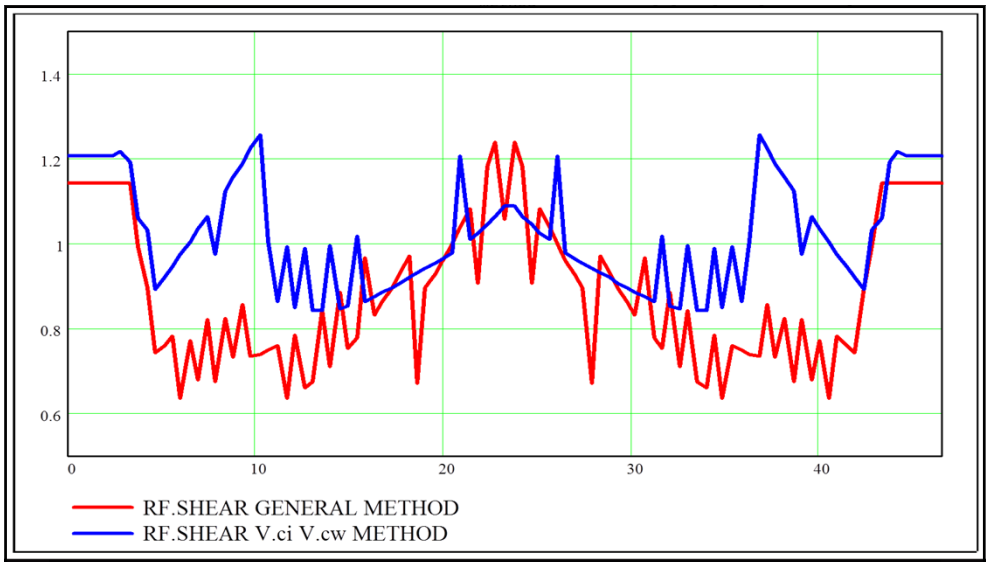
74 KIP	80 KIP	172 KIP
2012 LRFD C5.8.3.2-1	2012 LRFD C5.8.3.2-2	2007 LRFD C5.8.3.2-3

STIRRUP COUNTING METHODS



80 KIP
2012 LRFD C5.8.3.2-2

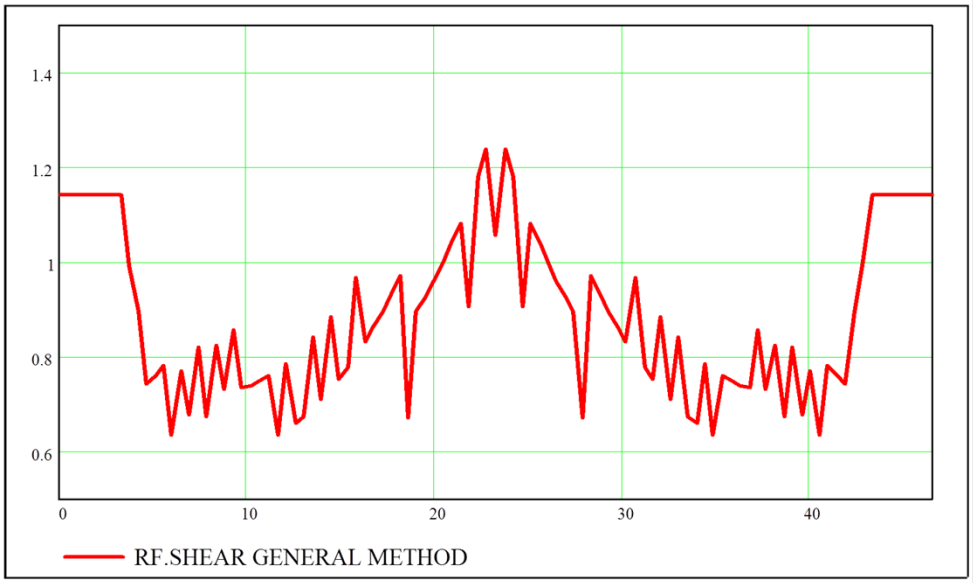
2013



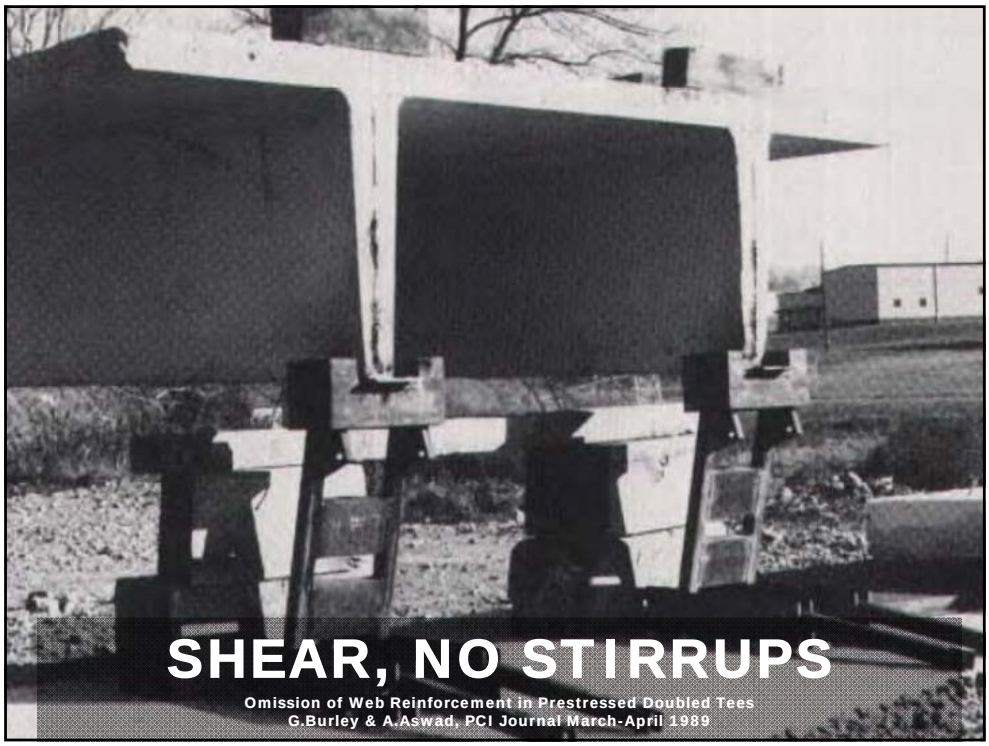
FL120 SHEAR RF

(STIRRUPS ACROSS FAILURE PLANE)

ACI & GENERAL METHOD



SHEAR GOVERNS NEAR MIDSPAN?



SHEAR, NO STIRRUPS

Omission of Web Reinforcement in Prestressed Doubled Tees
G.Burley & A.Aswad, PCI Journal March-April 1989

SHEAR, NO STIRRUPS

SHEAR
UNCONFINED DEBONDING

PRESTRESS FL120 SERVICE I

Limiting steel stress to $0.9F_y$ is intended to ensure that cracks that develop during the passage of overweight vehicles will close once the vehicle is removed. It also ensures that there is reserve ductility in the member.

FL120 SERVICE I RATIONALE MBE C6A.5.4.2.2b

the stress in the tendons is limited to 90% of yield

BULLETIN, 09-01-2011

6A.4.2.2 Limit States

Replace Table 6A.4.2.2-1 with FDOT Table 6A.4.2.2-1.

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

Bridge Type	Direction	Limit State	Load Factors									
			Permanent Load			Transient Load			Design Load		Legal Load	FL120 Permit
			DC	DW	EL	FR	TU CR SH	TG	Inventory	Operating		
Pre-stressed Concrete (Flat Slab and Deck / Girder)	Longitudinal	Strength I	1.25	1.50	n/a	n/a	n/a	n/a	1.75	1.35	1.35	n/a
		Strength II	1.25	1.50	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.35
		Service I	1.00	1.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.00
		Service III[3]	1.00	1.00	n/a	n/a	n/a	n/a	0.80	0.80	0.80	n/a
Wood	Longitudinal	Strength I	1.25	1.50	n/a	n/a	n/a	n/a	1.75	1.35	1.35	n/a

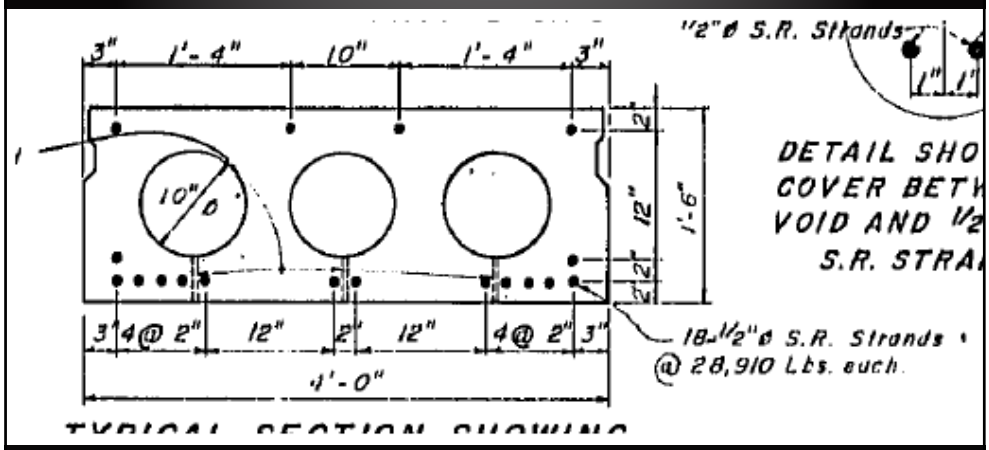
FDOT LOAD RATING MANUAL

$$RF = \frac{0.9 f_y^* - (F_d + F_p + F_s)}{F_1}$$ Prestressing Steel Tension

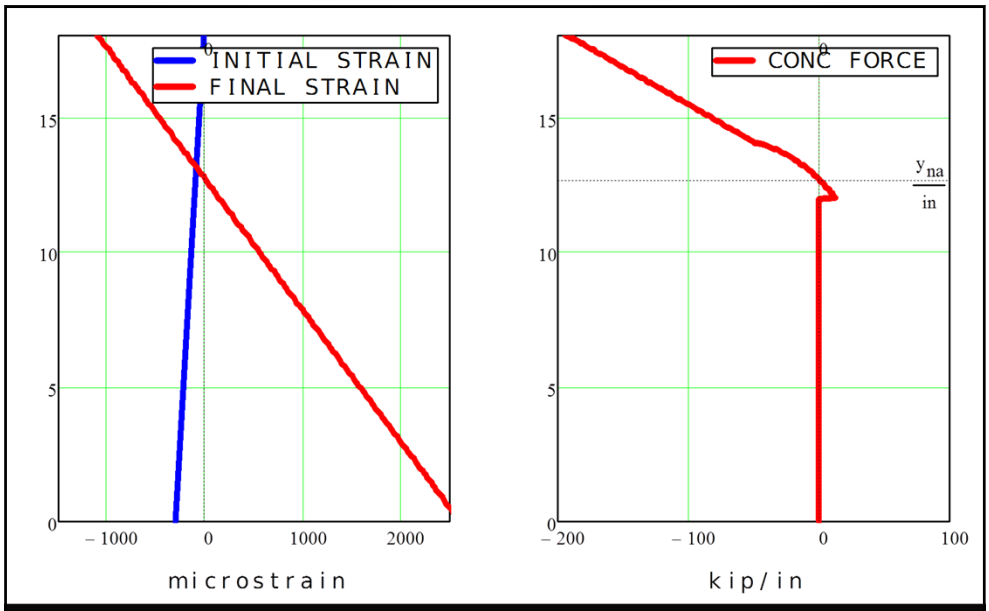
"FL120 SERVICE I"
=
"LOWER TENDON LIMIT, 90% YIELD"

1. MBE RATIO CHECK
   not a true rating factor
2. CRACKED, SIMPLE
   understates capacity
3. UNCRACKED
   overstates capacity
4. STRAIN COMPATABILITY
   difficult

TENDON LIMIT, METHODS

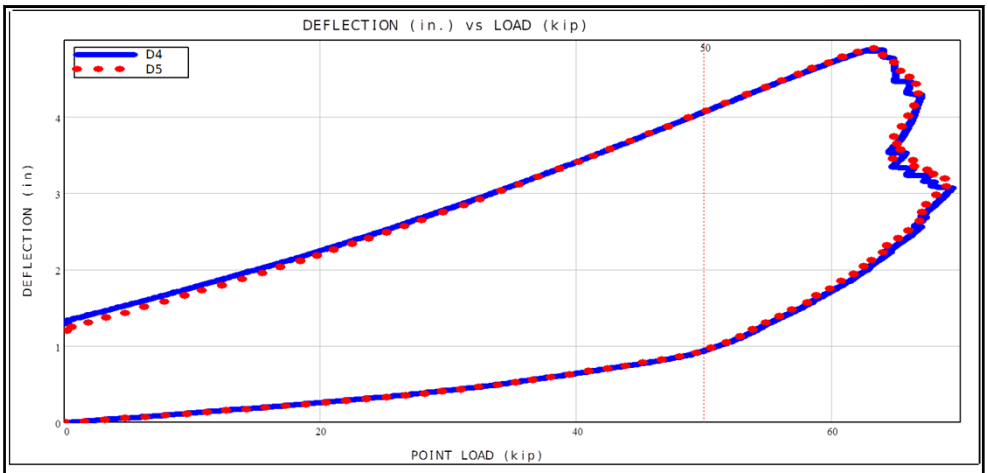


TENDON LIMIT, GOVERNS?



TENDON LIMIT, GOVERNS?

CHECK PROGRAM WITH STRUCTURES LAB DATA



INPUT, STRAND STRESS $f_{psINPUT} \equiv 212.5\ ksi$ $f_{py} = 212.5\ ksi$

Mr AT YIELD, WORKSHEET $M_{Serv} = 498 \cdot kip \cdot ft$

Mr AT YIELD, LOAD TEST $50\ kip \cdot \frac{L}{4} + M_{DL} = 499 \cdot kip \cdot ft$

CHECK PROGRAM

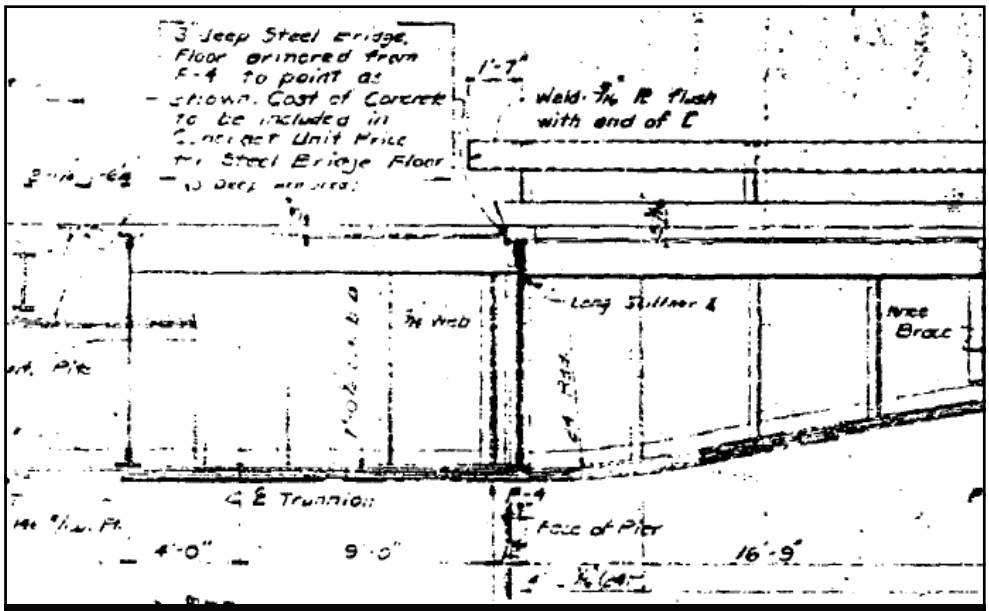
$$\frac{\dfrac{\phi Mn_{LRFD} - 1.25 \cdot M_{DL}}{1.35}}{\dfrac{M_{Serv} - 1.00 \cdot M_{DL}}{1.00}} = 0.90$$

HERE GIVEN $\gamma_{LL} = 1.35$,

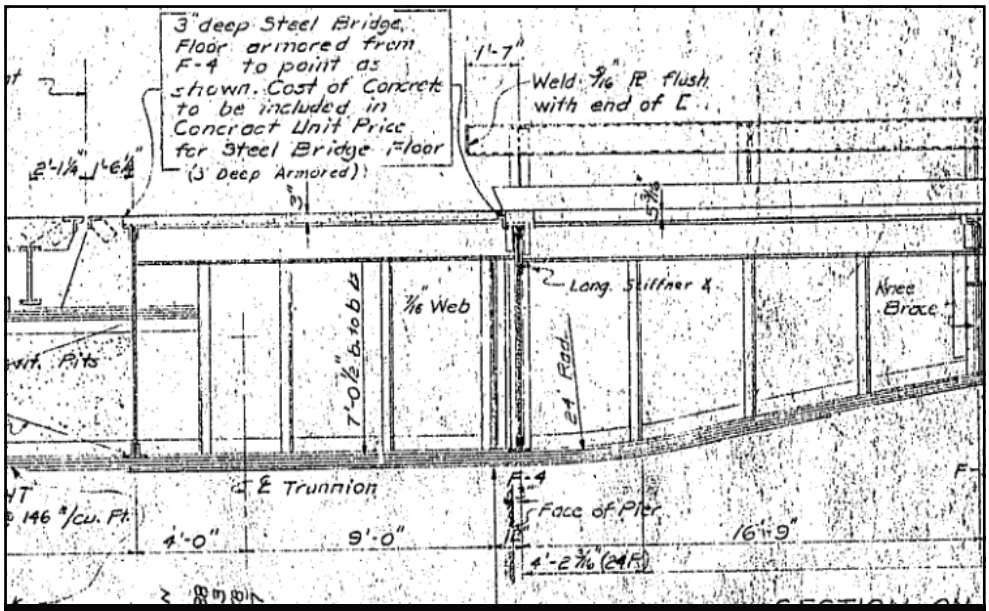
$RF_{STRENGTH\ II} < RF_{TENDON\ LIMIT}$

GOVERNING FL120 SERVICE I TENDON LIMIT, ANYONE? (WITH CALCS)

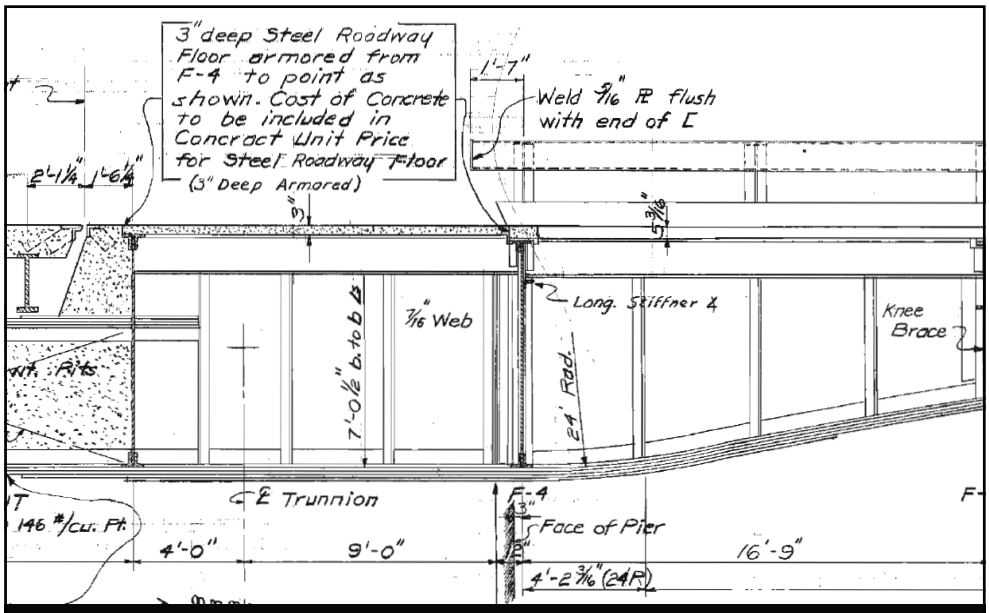
RESOURCES, PLANS



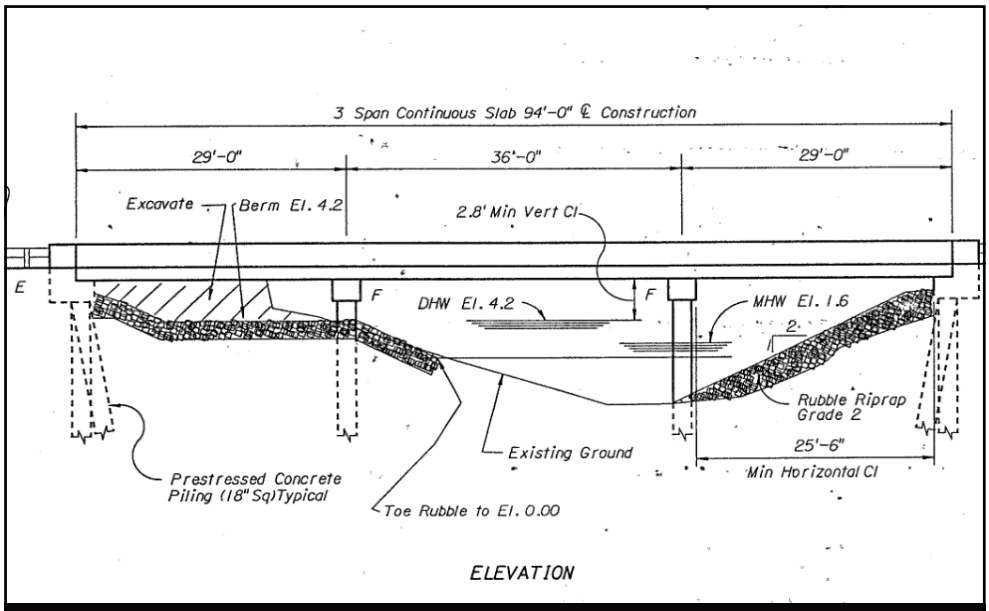
PLANS - ON FILE



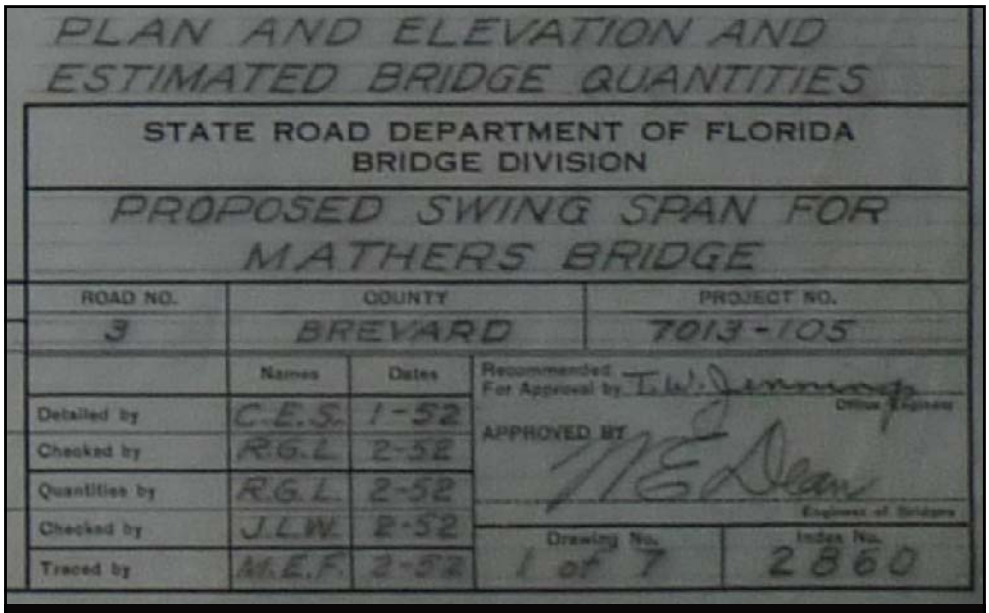
PLANS - MICROFILM



PLANS - STANDARD INDEX



AS-BUILT PLANS
CO's HUEY WHITEHEAD



PLAN AND ELEVATION AND
ESTIMATED BRIDGE QUANTITIES

STATE ROAD DEPARTMENT OF FLORIDA
BRIDGE DIVISION

PROPOSED SWING SPAN FOR
MATHERS BRIDGE

ROAD NO.	COUNTY	PROJECT NO.
3	BREVARD	7013-105

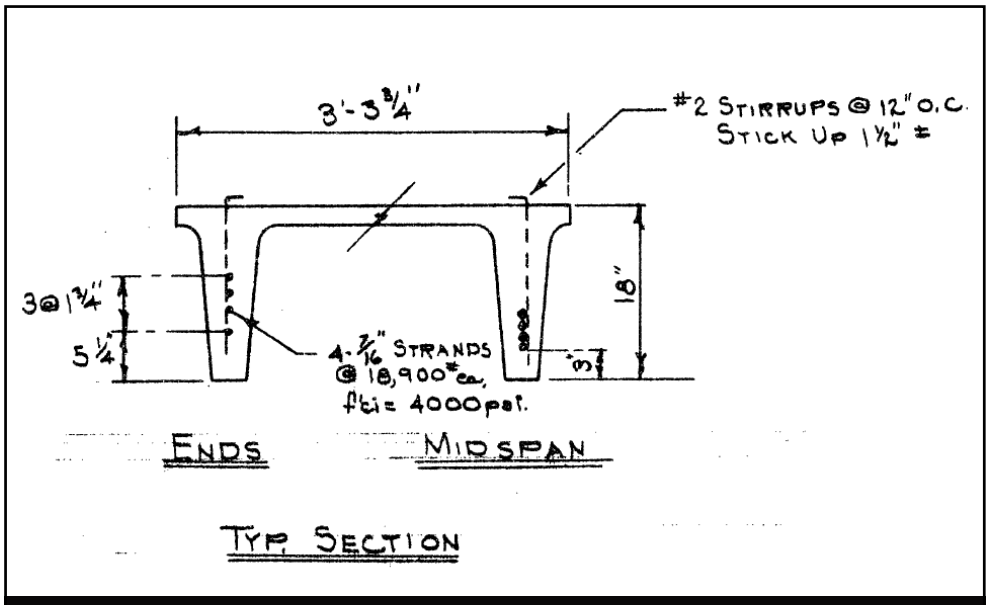
	Names	Dates
Detailed by	C.E.S.	1-52
Checked by	R.G.L.	2-52
Quantities by	R.G.L.	2-52
Checked by	J.L.W.	2-52
Traced by	M.E.F.	2-52

Recommended For Approval by T.W. Jennings
Office Engineer

APPROVED BY M E Dean
Engineer of Bridges

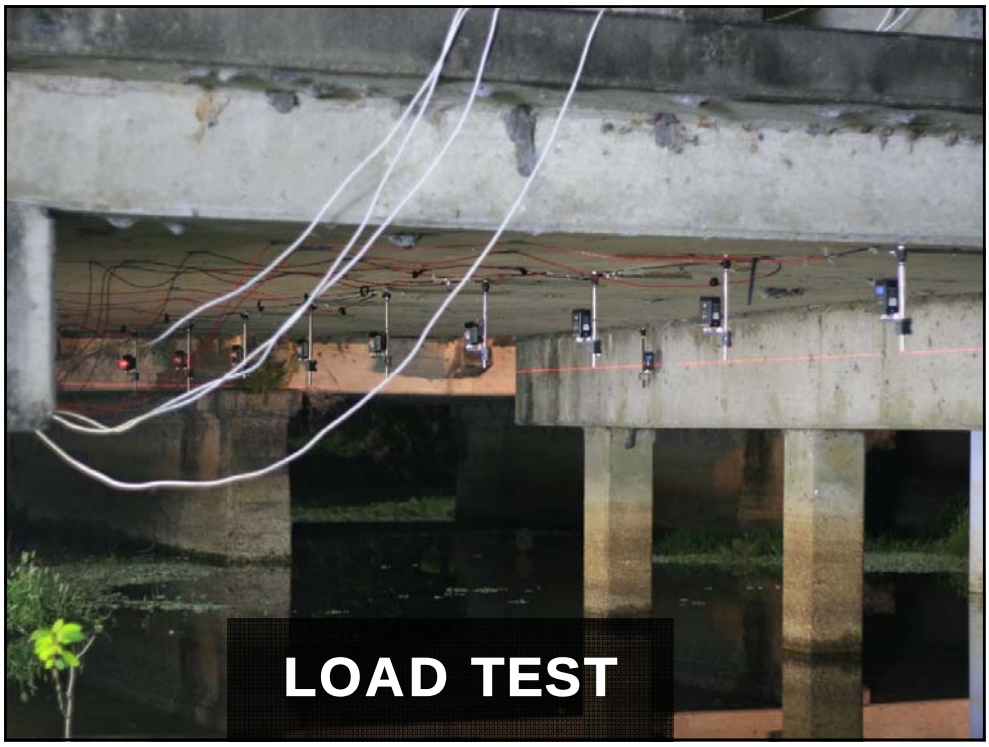
Drawing No.	Index No.
1 of 7	2860

PLANS, STATE ARCHIVES

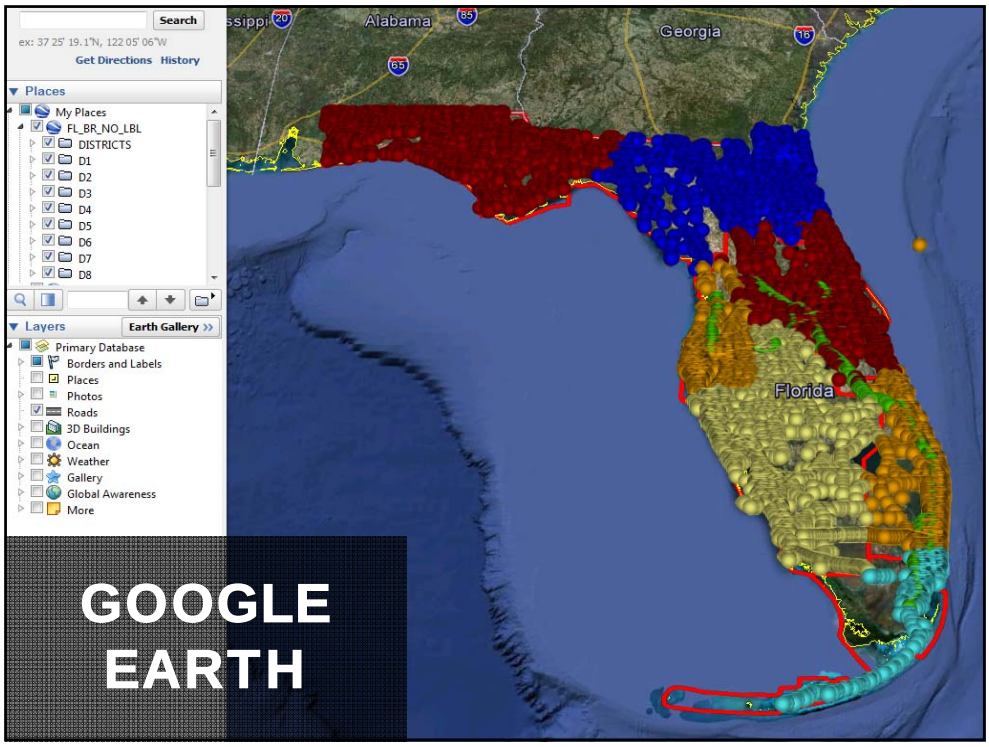


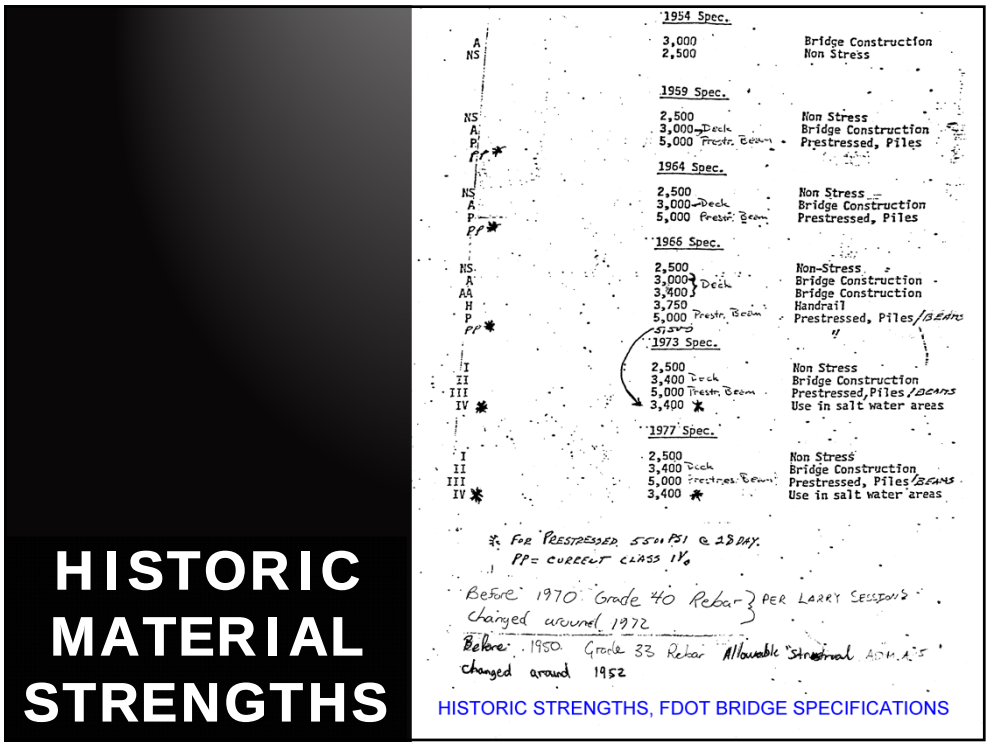
UNKNOWN PLANS, COMPARABLE SHOP DRAWING

RESOURCES, MISCELLANEOUS


LOAD TEST

LOAD TEST





1954 Spec.

A	3,000	Bridge Construction
NS	2,500	Non Stress

1959 Spec.

NS	2,500	Non Stress
A	3,000 Deck	Bridge Construction
P	5,000 Prestr. Beam	Prestressed, Piles
PP *		

1964 Spec.

NS	2,500	Non Stress
A	3,000 Deck	Bridge Construction
P	5,000 Prestr. Beam	Prestressed, Piles
PP *		

1966 Spec.

NS	2,500	Non-Stress
A	3,000 } Deck	Bridge Construction
AA	3,400 }	Bridge Construction
H	3,750	Handrail
P	5,000 Prestr. Beam	Prestressed, Piles/BEAMS
PP *	5,500	"

1973 Spec.

I	2,500	Non Stress
II	3,400 Deck	Bridge Construction
III	5,000 Prestr. Beam	Prestressed, Piles/BEAMS
IV *	3,400 *	Use in salt water areas

1977 Spec.

I	2,500	Non Stress
II	3,400 Deck	Bridge Construction
III	5,000 Prestr. Beam	Prestressed, Piles/BEAMS
IV *	3,400 *	Use in salt water areas

* FOR PRESTRESSED 5500 PSI @ 28 DAY.
PP = CURRENT CLASS IV

Before 1970 Grade 40 Rebar } PER LARRY SESSIONS
Changed around 1972

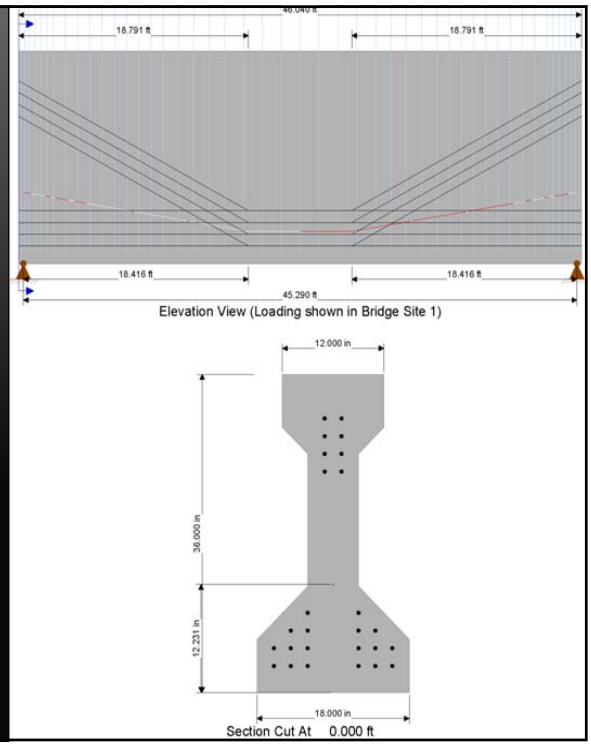
Before 1950 Grade 33 Rebar Allowable Structural ASTM A 15
changed around 1952

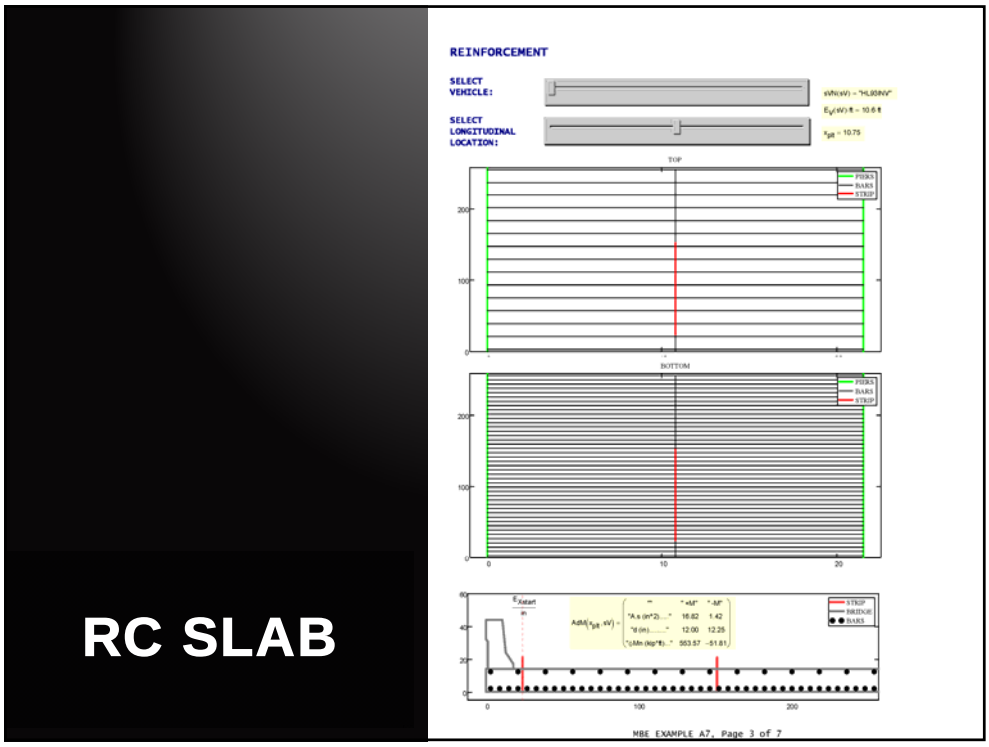
HISTORIC STRENGTHS, FDOT BRIDGE SPECIFICATIONS

HISTORIC MATERIAL STRENGTHS

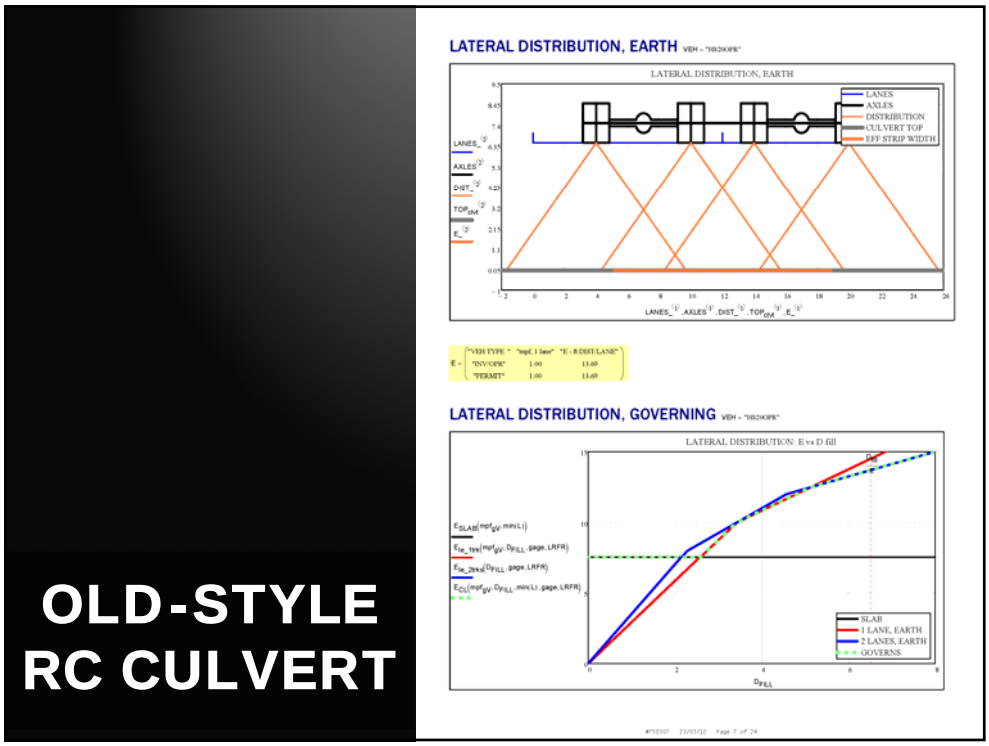
RESOURCES, PROGRAMS

PRESTRESS
PG SUPER





RC SLAB



OLD-STYLE RC CULVERT

RESOURCES, TIPS

DISTRIBUTION
WHEEL LINES PER GIRDER
WHEEL LINES PER STRIP FOOT SLAB

DESIGN LOADING
ORIGINAL DESIGN LOAD
ORIGINAL DESIGN METHOD

IMPACT (IM)
IM = 33% *PERCENT*

LOAD RATINGS SUMMARY
(SEE EXAMPLE)

CONSPAN
CHECK STIRRUP STRENGTH
CHECK ACI SMIPLIFIED SHEAR

SMART BRIDGE, SLABS
CHECK ORIGINAL SECTION BY HAND

MDX
USE “LRFR RATINGS,” FOR LRFD
USE BATCH FILES, FOR LEGAL LOADS

SOFTWARE

PRESTRESS
SHEAR, UNCONFINED & DEBONDED

DISCONTINUOUS BARRIERS
USE RIGID SECTION ASSUMPTION

MAKE A QUICK CHECK
USE HAND CALCS
BE APPROXIMATE, BUT ACCURATE

CAUTIONS

SUBMIT BUSINESS CARD FOR FTP GRAB-BAG ZIP:

EXAMPLE SUMMARY
EXAMPLE LOAD RATING
LIVE LOAD PROGRAMS
RC PROGRAMS
REFERENCE MATERIAL

END