COMMONWEALTH OF MASSACHUSETTS

BRIDGE RATING PROGRAM

ROUTE 6 OVER WEWEANTIC RIVER

Wareham

W - 6 - 16

Maintenance No. 035 - 743 - 072

Dept. Ref. No. 897

Louis Berger & Associates, Inc.
Wellesley, Massachusetts

January , 1980

2/14

Bridge Engineer

Maintenance Engineer February 13, 80

Bridge Rating: Wareham W-6-16
Rte. 6/Weweantic River

We are forwarding a Rating Report for the subject bridge and recommend no posting.

RAV/RVC:cc
cc: P. McHugh

J. J. Aherne, Jr.
Bridge Engineer

COMMONWEALTH OF MASSACHUSETTS

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January , 1980

MASSACHUSETTS BRIDGE RATING

ROUTE 6 OVER WEWEANTIC RIVER

WAREHAM

W-6-16

MAINTENANCE NO. 035-743-072

DEPT. REF. NO. 897

Louis Berger & Associates, Inc.

INDEX

Wareham
W-6-16

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Massachusetts Bridge Rating

SUMMARY SHEET

Town - City	Location	Bridge No.	Maintenance No.
Wareham	Route 6 over Weweantic River	W-6-16	035-743-072

	RATING VEHICLE		
	H - TRUCK	TYPE - 3	TYPE - 3S2
INVENTORY RATING	21.4^{T}	28.7^{T}	37.6^{T}
OPERATING RATING	31.2^{T}	45.1^{T}	67.2^{T}

DATE OF RATING January 1980

COMMONWEALTH OF MASSACHUSETTS
ANDREW FRANK PNIAKOWSKI
No. 21849
REGISTERED PROFESSIONAL ENGINEER

Andrew F. Pniakowski

Wareham
W-6-16

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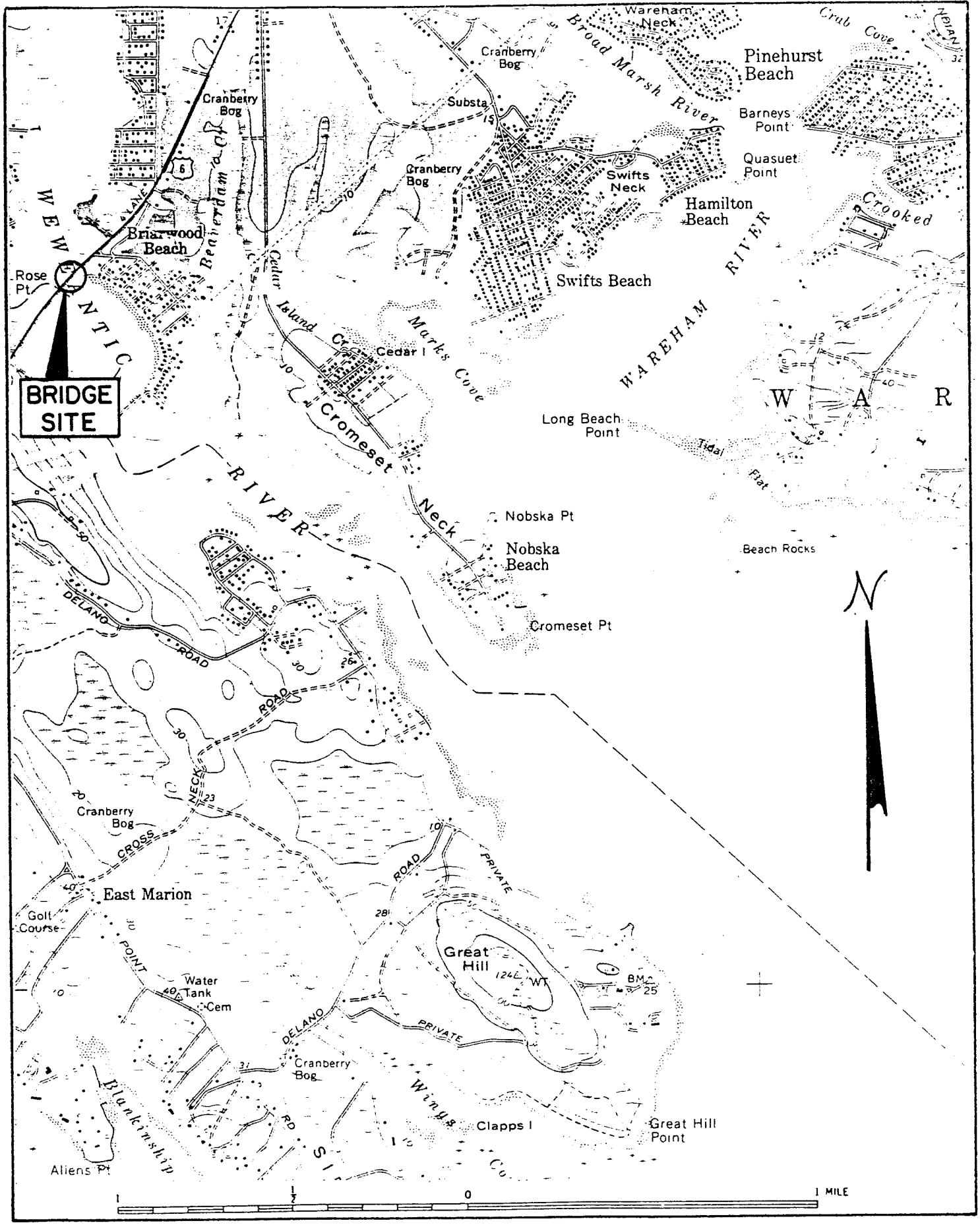
BREAKDOWN OF BRIDGE RATING

Town - City	Location	Bridge No	Maintenance No
Wareham	Route 6 over Weweantic River	W-6-16	035-743-072

BRIDGE COMPONENT	INVENTORY RATING (TONS)			OPERATING RATING (TONS)		
	H-15	TYPE 3	TYPE 3S2	H-15	TYPE 3	TYPE 3S2
		ORIGINAL BRIDGE (1929)				
Concrete Deck	21.4T	39.3T	61.5T	36.9T	67.8T	106.1T
		REINFORCED CONCRETE BEAMS - POSITIVE MOMENT				
At Approach Spans	32.3T	38.7T	63.2T	55.2T	66.2T	108.0T
At Center Span	48.1T	58.2T	92.2T	73.2T	88.5T	140.3T
		REINFORCED CONCRETE BEAMS - NEGATIVE MOMENT				
At Piers	60.0T	63.4T	64.5T	111.3T	117.7T	119.8T
		REINFORCED CONCRETE BEAMS - SHEAR				
At Approach Spans	31.6T	35.4T	53.3T	66.3T	74.3T	112.0T
At Center Span	33.5T	29.1T	41.5T	67.9T	59.0T	84.0T
			BRIDGE WIDENING (1957)			
Concrete Deck	21.8T	39.3T	61.6T	31.2T	56.4T	88.3T
Interior Steel Stringers	23.8T	28.7T	37.6T	37.7T	45.4T	68.0T
Fascia Steel Stringer	33.1T	39.9T	57.7T	37.4T	45.1T	67.2T



Wareham
W-6-16

LOCUS

DESCRIPTION OF BRIDGE

Town	Location	Bridge No.
WAREHAM	ROUTE 6 OVER WEWEANTIC RIVER	W-6-16

DATE OF CONSTRUCTION:	Original bridge: 1929 Bridge widening: 1957
PRESENT POSTED LOADING:	Not posted
SPEED LIMIT ON BRIDGE:	Not posted
BRIDGE TYPE:	Original bridge: 3 spans, continuous reinforced concrete T-beams. Bridge widening: 3 spans, continuous steel stringer with reinforced concrete deck slab, non composite design.
SKEW:	None
SPAN:	3 spans (44'-6", 51'-6", 44'-6") center to center of bearings
WIDTH OF BRIDGE DECK:	58'-6" out to out
ROADWAY SURFACE:	2½" Bituminous Concrete pavement
ROADWAY WIDTH:	44 ft. curb to curb
CURBS:	11" reveal @ north curb 10" reveal @ south curb
SIDEWALK/WALKWAY:	2 sidewalks 5'-7" wide
BRIDGE RAILING:	Steel bridge railing, Type B
APPROACH RAILING:	Concrete posts with two steel cables
SUPERSTRUCTURE:	Original bridge: reinforced concrete slab over 6 reinforced concrete beams. Bridge widening: reinforced concrete slab over 4 steel stringers.
MODIFICATIONS TO SUPERSTRUCTURE:	None

SUBSTRUCTURE:	Concrete Masonry abutments supported on pile foundation. Stone Ashlar Masonry pier, founded on spread footing.
MODIFICATIONS TO SUBSTRUCTURE:	None.
DETERIORATION OF ROADWAY SURFACE:	Transverse contraction cracks and bumps at abutments. No provisions for thermal movement of the superstructure. Many patches on the bituminous concrete pavement at the abutments.
DETERIORATION OF WALKWAYS:	Minor spalling of concrete
DETERIORATION OF BRIDGE RAILINGS:	None
DETERIORATION OF APPROACH RAILING:	None
DETERIORATION OF SUPERSTRUCTURE:	Local heavy spalling of concrete in many places in the North Fascia Beam of the original bridge. Horizontal cracks in the Beam at the level of bottom reinforcing steel. Reinforcing steel exposed in places and corroded. Some repairs have been made to the deteriorated surfaces by patching with concrete. Many cracks exist in the reinforced concrete diaphragms. Most of the deterioration appears to have resulted from insufficient concrete cover of the reinforcing steel. Many concrete cracks and efflorescence appear on the underside of the deck slab. Deposits of roadway chemicals on the surface of the original bridge beams indicate leakage from the deck slab.
DETERIORATION OF SUBSTRUCTURE:	None

RATING ANALYSIS ASSUMPTIONS AND CRITERIA

Based on the review of bridge construction plans, Department inspection reports and site visits by Louis Berger personnel, the following stresses were used for rating purposes:

	INVENTORY	OPERATING
1. Concrete		
Concrete Ultimate Strength		
Ext. 1957	f'c = 3000 psi	f'c = 3000 psi
Orig. 1929 (Mix 1:2:4)	f'c = 2000 psi	f'c = 2000 psi
Allowable Compr. Stress in Concrete		
Ext.	fc = .40 f'c = 1200 psi	fc = .55 f'c = 1650 psi
Orig.	fc = .40 f'c = 800 psi	fc = .55 f'c = 1100 psi
Allowable Shear Stress in Concrete		
Ext.	Vc = .03 f'c = 90 psi	Vc = .05 f'c = 150 psi
Orig.	Vc = .03 f'c = 60 psi	Vc = .05 f'c = 100 psi
2. Reinforcing Steel		
Allowable Tensile Stress in Reinf. Steel		
Ext.) Orig.)	fs = 18,000 psi	fs = 25,000 psi
3. Structural Steel		
Minimum Yield Point	Fy = 33,000 psi	Fy = 33,000 psi
Allowable Tensile Stress	Fb = 18,150 psi	Fb = 24,750 psi
Allowable Compressive Stress	Fb = 18,150 psi	Fb = 24,750 psi
Allowable Shear Stress in Web of Stringer	Fv = 11,000 psi	Fv = 15,000 psi

The bridge substructure was in fair condition and therefore was not considered critical for the rating of this bridge.

The inventory and operating capacities of the bridge were rated in accordance with the provisions of the 1974 edition of the "Manual for Maintenance Inspection of Bridges" by AASHTO and MDPW Rating Guidelines.

The live load used in establishing the ratings was the standard AASHTO H loading and the Type 3 and 3S2 units shown in Plate 15 (page 59) of the above referenced AASHTO manual. As per M.D.P.W. Bridge Rating Guidelines, the Lane Loading effect was not considered in the rating for the standard AASHTO H loading. For both inventory and operating analysis the live load distribution used was according to AASHTO 1977.

RECOMMENDATIONS

In our opinion the bridge will perform well under the rated live load for an indeterminable number of years.

The damaged portions of concrete in original bridge beams should be repaired with epoxy mortar after a thorough cleaning of the exposed reinforcing steel. To alleviate continual deterioration of the bridge deck surface, installation of expansion dams at the abutments should be considered.

The lack of proper corrective repairs could result in a relatively early failure of the original bridge superstructure and ultimate replacement of a major portion of the bridge, which otherwise was found to be in good condition.

AVAILABLE PLANS AND FIELD INSPECTION REPORTS

The following plans and field inspection reports were made available to Louis Berger & Associates, Inc. for use in determining the live load rating of the bridge:

1. The Commonwealth of Massachusetts
   Proposed Bridge Wareham
   Station 5+43.00 over Weweantic River
   Department of Public Works
   State House, Boston, Mass. February 1929

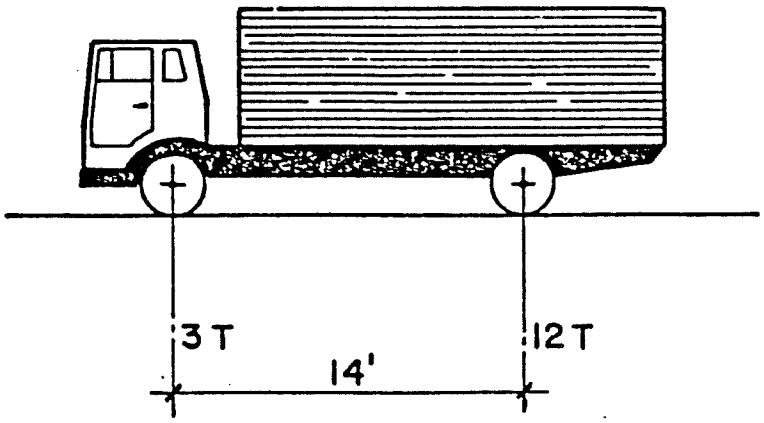
2. The Commonwealth of Massachusetts
   Proposed Bridge Widening
   Wareham
   Route 6 over Weweantic River
   Office of Department of Public Works
   100 Nashua Street Boston, Mass. Nov. 1956

3. Massachusetts Department of Public Works
   Structure Inventory and Appraisal
   Bridge No. W-6-16
   Bridge Mnt. No. 035-743-072
   (see Appendix A)

4. Massachusetts Department of Public Works
   Structures Inspection Field Report
   Plan No. W-6-16
   Structures Maint. No. 035-743-072
   Dated June 15, 1977
   (see Appendix A)

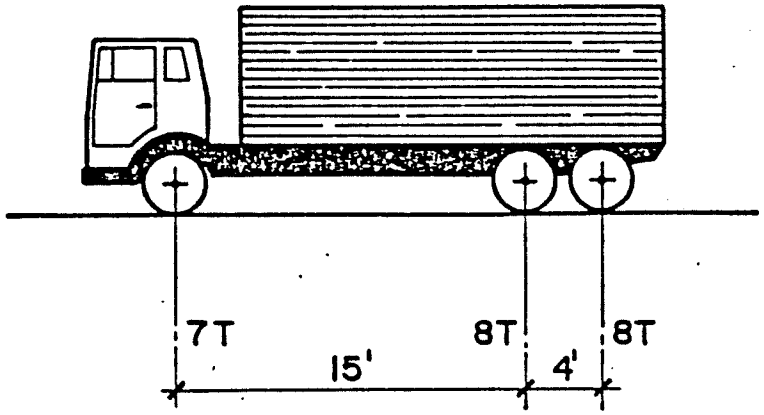
Massachusetts Bridge Rating

TRUCK LOADINGS



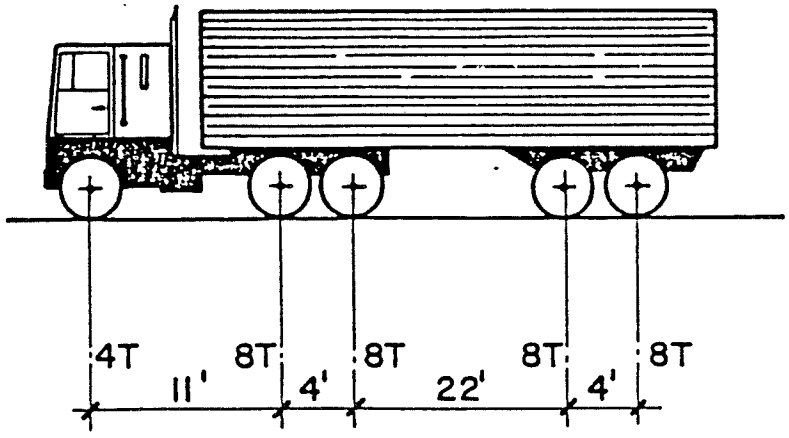
TOTAL WEIGHT
15 TONS

H 15



TOTAL WEIGHT
23 TONS

TYPE 3



TOTAL WEIGHT
36 TONS

TYPE 3-S2

Wareham
W-6-16

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Appendix A

Department Field Inspection Report

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

STRUCTURE INVENTORY AND APPRAISAL

BRIDGE NO. W-6-16 BRIDGE MNT. NO. 035-743-072 PAGE 1

IDENTIFICATION

		CODE	ITEM NO.	CARD CONTROL NUMBER
1	State Mass.			
2	Highway District 7			
3	County Plymouth 4 ~~City~~/Town Wareham			
5	Inventory Route Marion Road Principal ☐ Other ☐			
6	Features Intersected Weweantic River			
7	Facility Carried by Structure Marion Road			
8	Structure No. 035-743-072 1 of			
9	Location NA			
10	Unlimited			
11	Milepoint 41.45			
12	Road Section No. 153			
13	Defense Bridge Letter NA			
14	Defense Milepoint 9.80			
15	Defense Section Length 4.3			
16	Latitude 41° 44.3'			
17	Longitude 70° 44.8'			
18	Physical Vulnerability Concrete Girder			
19	Bypass Detour Length 7 miles			
20	Toll Bridge On Toll Road ☐ On Free Road ☒			
21	Custodian MDPW			
22	Owner MDPW			
23	F.A.P. No.			

CLASSIFICATION

			BY	DATE
24	Fed. Aid System	05	Transfer of Data	
			Maintenance Inspection	
25	Administrative	1	Condition Analysis	
			Appraisal	
26	Functional	04	Cost Estimate	
			General Review	

STRUCTURAL DATA

			CODE				
27	Year Built 1929	Reconst. 1957		43	Structure Type - Main	Conc. T-Beam	
28	Lanes on Str. 4	Under 0		44	Approach	NA	
29	ADT on Str. 8700	30 Year 69		45	No. of Spans - Main	3	
31	Design Load H 20		CODE	46	Approach	NA	
32	Appr. Rdwy Width w/Shld	44'		47		44'	
33	Br. Median ☒ None ☐ Open ☐ Closed			48	Max. Span Length	48	ft.
34	Skew	0 °		49	Structure Length	148	ft.
35	Structure Flared ☐ Yes ☒ No			50	Sidewalk Rt. 5.6 ft.	Lt. 5.6	ft.
36				51	Br. Roadway (curb-curb)	44	ft.
37				52	Deck Width (out-out)	58.8	ft.
38	Navigation Control ☐ Yes ☒ No.			53	Vert. Clearance over Deck	Unlimited	ft.
39	Vertical	NA ft.		54	Under Clearance - Vertical	NA	ft.
40	Horizontal	NA ft.		55	Lateral - Right	NA	ft.
41	No Posting Req'd.			56	Left	NA	ft.
42	Type Service H-P/WW		CODE	57	Wearing Surface	Asphalt w/Membrane	

HMD-738 REV. 6/4/71

CONDITION	MATERIAL	CONDITION ANALYSIS	RATING (9-0)	ITEM NO.	CARD CONTROL NUMBER
58 Deck			7		
59 Superstructure			7		
60 Substructure			7		
61 Channel & Channel Protection			8		
62 Culvert & Retaining Walls			NA		
63 Estimated Remaining Life	15 years	65 Approach Alignment	7		
64 Operating Rating		66 Inventory Rating			

APPRAISAL	DEFICIENCIES	RATING (9-0)
67 Structural Condition		6
68 Deck Geometry		8
69 Underclearances - Vert. & Lateral		NA
70 Safe Load Capacity		
71 Waterway Adequacy		8
72 Approach Roadway Alignment		8

PROPOSED IMPROVEMENTS

73 Year Needed	Completed	Describe (Item 75)	
74 Type of Service			
75 Type of Work			
76 Improvement Length	ft.		
77 Design Loading	[code]		
78 Roadway Width	ft.		
79 Number of Lanes		82 Prop. Rdwy Imprv. – Year	
80 ADT	81 Year	83 – Type	

COST OF IMPROVEMENTS

84 $ ___, ___,000.

REMARKS

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

STRUCTURES INSPECTION FIELD REPORT

CITY — TOWN	DIST.	BRIDGE PLAN NO.	STRUCTURES MAINT. NO.
Wareham	7	W-6-16	035-743-072

COUNTY	STRUCTURE TYPE	INSPECTOR
Plymouth	orig. R.C. Beam + Slab widened- Steel Stringers	Guimares Sandonato

FEDERAL AID SYSTEM	AUTO RTE. NO. — STREET NAME	CROSSING ☒ OVER ☐ UNDER
F.A.P. 035	U.S. 6	Weweantic River

YEAR BUILT	YEAR REBUILT	OWNER	FLD. BOOK NO.	PHOTOS	TOTAL NO. SHEETS	DATE INSP.
1929	1957	State Hwy. Dept.				6/17/77

DECK

	BRIDGE ELEMENT RATING
1. Wearing Surface	7
2. Deck — Structural Condition	6
3. Curbs	7
4. Median	N/A
5. Sidewalks	7
6. Parapet	7
7. Railing	8
8. Drains	7
9. Lighting Standards	N/A
10. Utilities	8
11. Expansion Joints or Devices	8
CONDITION RATING DECK	58 → 7

REMARKS

Note: Same as report of 6/18/76 except as noted.

2.) Several spalls are continuing to deteriorate and enlarge.

7.) Railings have been painted.

SUPERSTRUCTURE

	BRIDGE ELEMENT RATING	
1. Bearing Devices	7	
2. Stringers 2a. Diaphrams	7	7
3. Girder or Beams	6	
4. Floor Beams	N/A	
5. Trusses — General	N/A	
— Portals	N/A	
— Bracing	N/A	
6. Machinery (Movable Spans)	N/A	
7. Rivets or Bolts	7	
8. Welds — Cracks	7	
9. Concrete Cracking	6	
10. Collision Damage	N/A	
11. Deflection Under Load	8	
12. Alignment of Members	8	
13. Vibrations Under Load	8	
CONDITION RATING SUPERSTRUCTURE	59	7

1,2,3-- Light spot rusting.

NOTE: Condition Ratings are to be obtained from page 22 "Recording & Coding Guide for the Structure Inventory and Appraisal of the Nations Bridges - July 1972".

IV-G-16

	BRIDGE ELEMENT RATING	REMARKS

SUBSTRUCTURE

1. Abutments — Wings	7
— Backwall	6
— Breastwall	6
— Footing	X
— Piles	X
— Erosion	8
— Settlement	7
2. Piers or Bents — Caps	7
— Column	7
— Web	N/A
— Footing	X
— Piles	X
— Scour	7
— Settlement	N/A
3. Pile Bents	N/A
4. Concrete Cracking or Spalling	6
5. Debris on Seats	6
6. Collision Damage	N/A
7. Adequacy — Hydraulically	8

Condition Rating SUBSTRUCTURE: 60 | 7

CHANNEL & CHANNEL PROTECTION

1. Channel Scour	8
2. Embankment Erosion	8
3. Drift	8
4. Debris	8
5. Vegetation	8
6. Channel Change	8
7. Fender System	N/A
8. Spur Dikes & Jetties	N/A
9. Rip Rap	8
10. Adequacy	8

Condition Rating CHANNEL & CHANNEL PROTECTION: 61 | 8

CULVERT & RETAINING WALLS

1. Barrel — Floor	N/A
— Walls	
— Roof	
2. Headwall	
3. Cutoff Wall	
4. Adequacy	
5. Debris	
6. Drift	N/A

Condition Rating CULVERT & RETAINING WALL: 62 | N/A

W-6-16 1977

63	ESTIMATED REMAINING LIFE (YRS.)	
	Based on Inspectors Structural Condition of Structure.	15 yrs.

64	OPERATING RATING	
	Record if Available (Tons)	unknown

65	APPROACH ALIGNMENT	
1.	Alignment	8
2.	Approach Slab	X
3.	Relief Joints	N/A
4.	Approach — Guardrail	7
	— Sidewalks	7
	— Pavement	6
	— Curbing	7
	— Embankment	7
	CONDITION RATING APPROACH ALIGNMENT	65 / 7

36	TRAFFIC SAFETY FEATURES	
	BRIDGE RAILING	0
	TRANSITIONS	0
	APPROACH GUARDRAIL	0
	APPROACH GUARDRAIL TERMINAL	0

66	INVENTORY RATING	
	Record if Available (Tons)	unknown

	POSTED LOADING	
1.(A)	Posted Loading (Tons)	NOT POSTED
	(B) Single Loading (Tons)	N/A
2.	Legibility	N/A
3.	Visibility	N/A

CONVERSION METHOD

1. In rating the condition of bridge elements four ratings will be used. These are:
   - o Good — The item is in new or good condition with no repairs necessary.
   - o Fair — The item is still performing the function for which it was intended, but is in need of minor repairs.
   - o Poor — The item is performing the function for which it is intended, at the minimum level. It is in need of major repairs.
   - o Critical — The item is no longer performing the function for which it was intended. Immediate replacement or repair required.

2. Correlation Between Adjectival Condition and Numerical Condition Rating

Adjectival Condition			Numerical Condition Rating
Good	or	None	8 and 9
Fair	or	Slight	6 and 7
Poor	or	Moderate	3, 4 and 5
Critical	or	Heavy	0, 1 and 2

Appendix B

Photos

LIST OF PHOTOGRAPHS

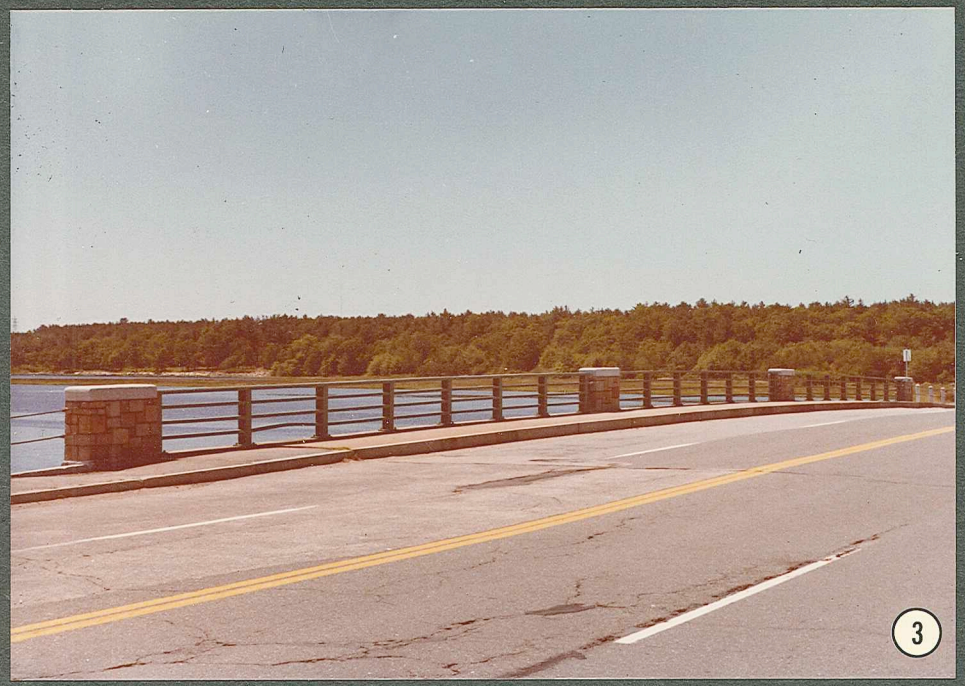
1. Westerly Approach
2. Easterly Approach
3. South Bridge Railing
4. North Bridge Railing
5. North Elevation
6. South Elevation
7. West Abutment from South
8. West Abutment from North
9. West Pier from South
10. West Pier from North
11. East Pier from South
12. East Pier from North
13. East Abutment from North
14. East Abutment from South
15. Detail of South Wingwall at East Abutment
16. Detail of North Fascia at the East Pier. Notice the deposits of roadway chemicals forming the stalactites on the underside of the North Fascia Beam.
17. Detail of bridge thermal contraction crack in pavement at the east abutment.

Wareham
W-6-16

897

1


2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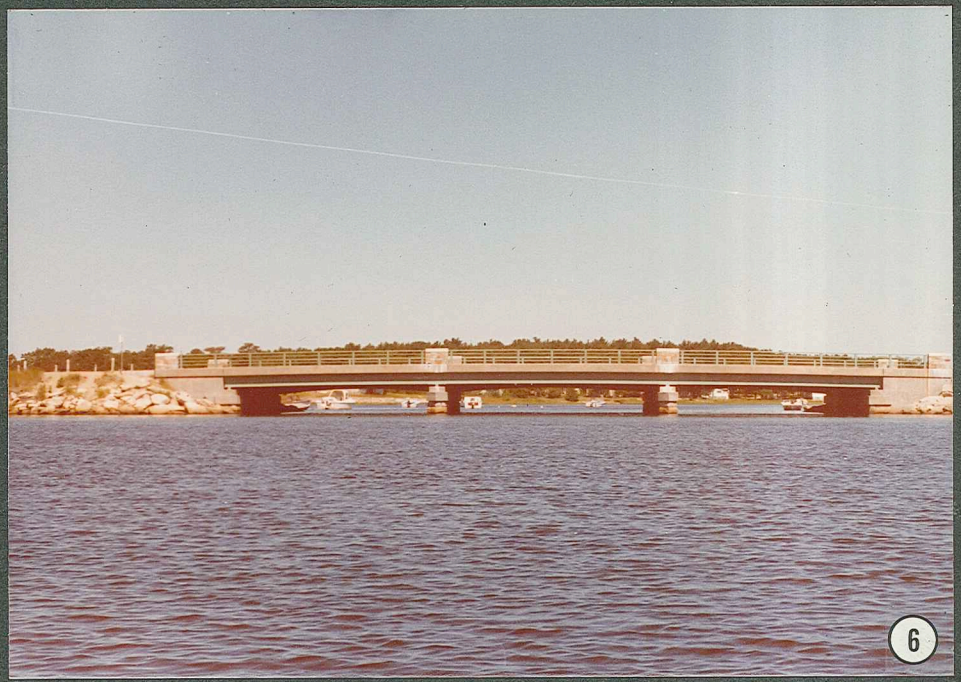
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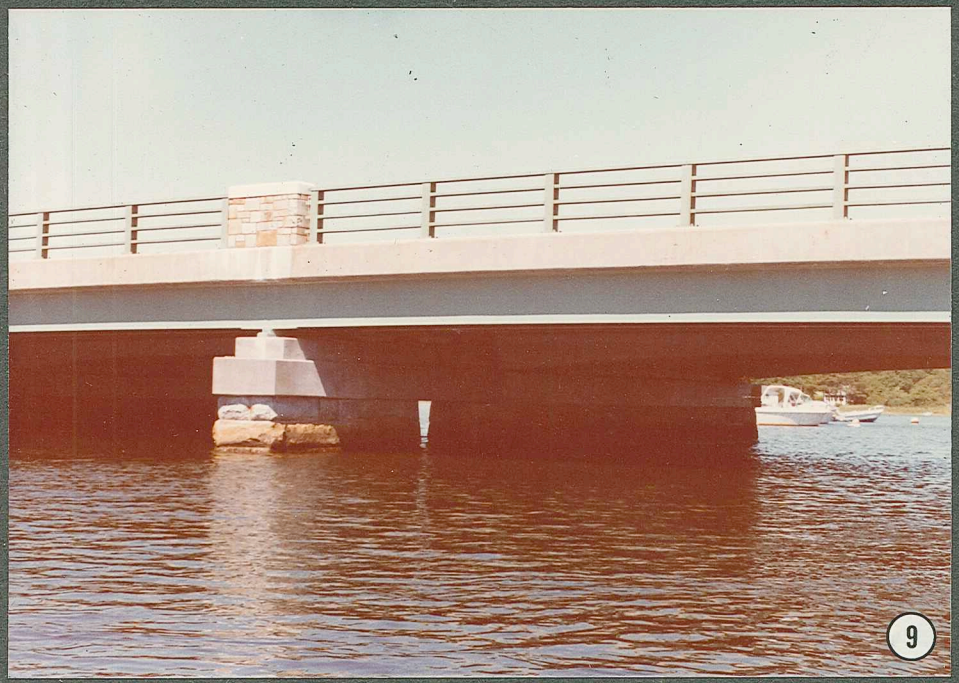
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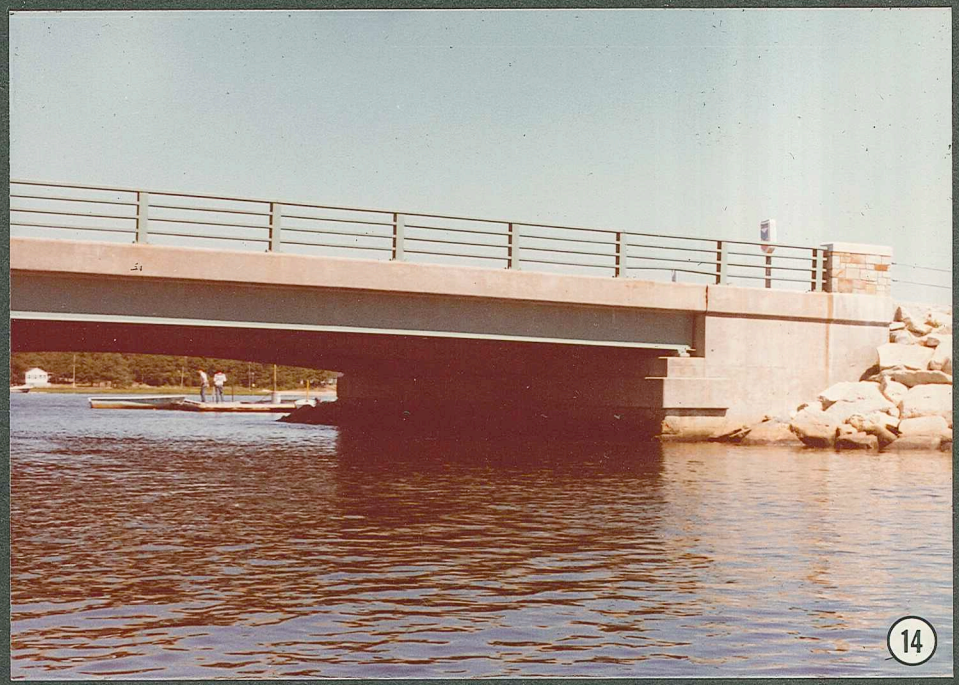
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16


17

Appendix C

Computation Sheets

COMPUTATION SHEETS

Index

Wareham
W-6-16

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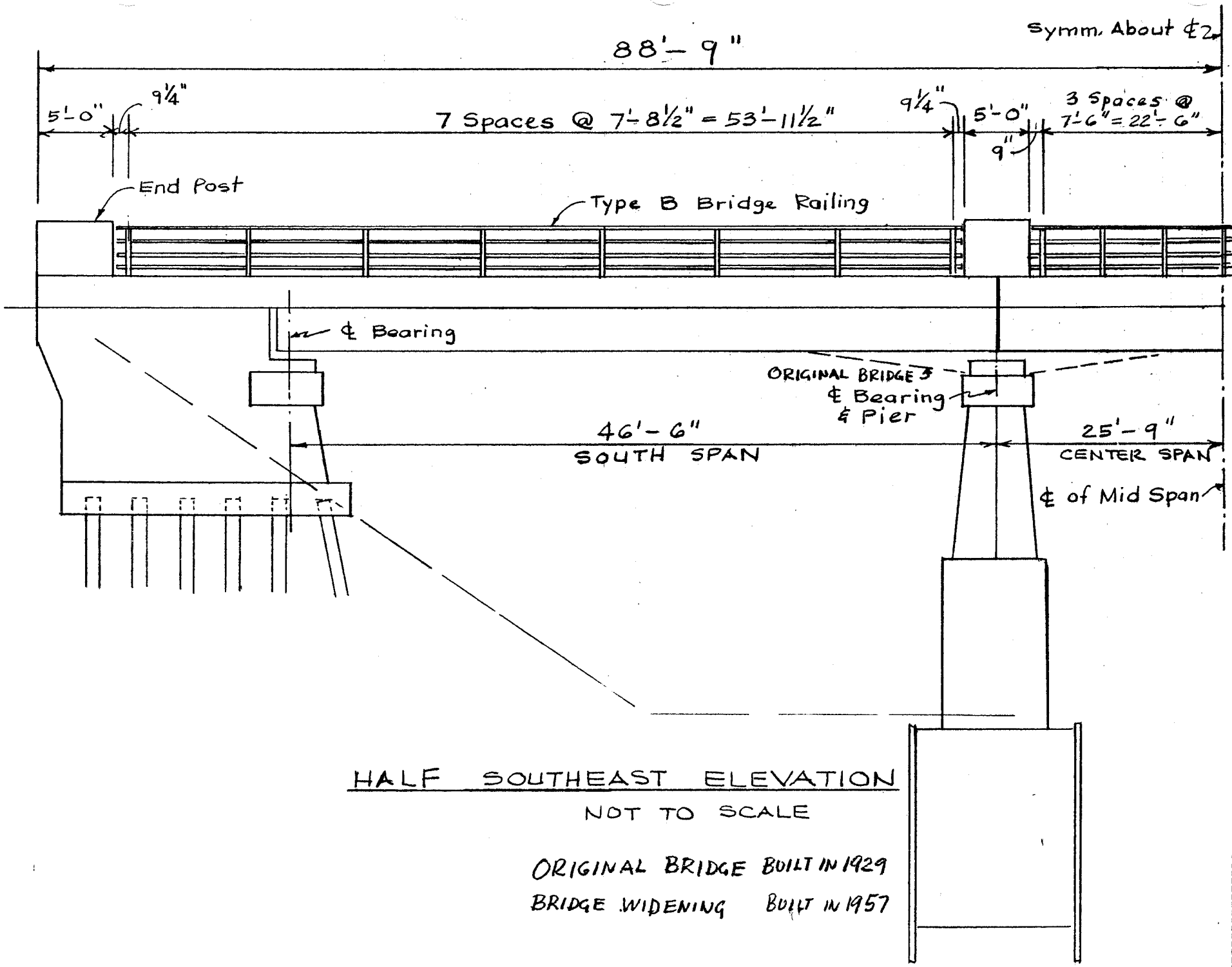


HALF SOUTHEAST ELEVATION

NOT TO SCALE

ORIGINAL BRIDGE BUILT IN 1929

BRIDGE WIDENING BUILT IN 1957

BY ASG DATE 8/14/79

CHKD. BY AEP DATE 8/15/79

SUBJECT BR. No. W-6-16 WAREHAM, MA. BRIDGE RATING RTE 6 OVER WEWEANTIC RIVER

LOUIS BERGER & ASSOCIATES INC.

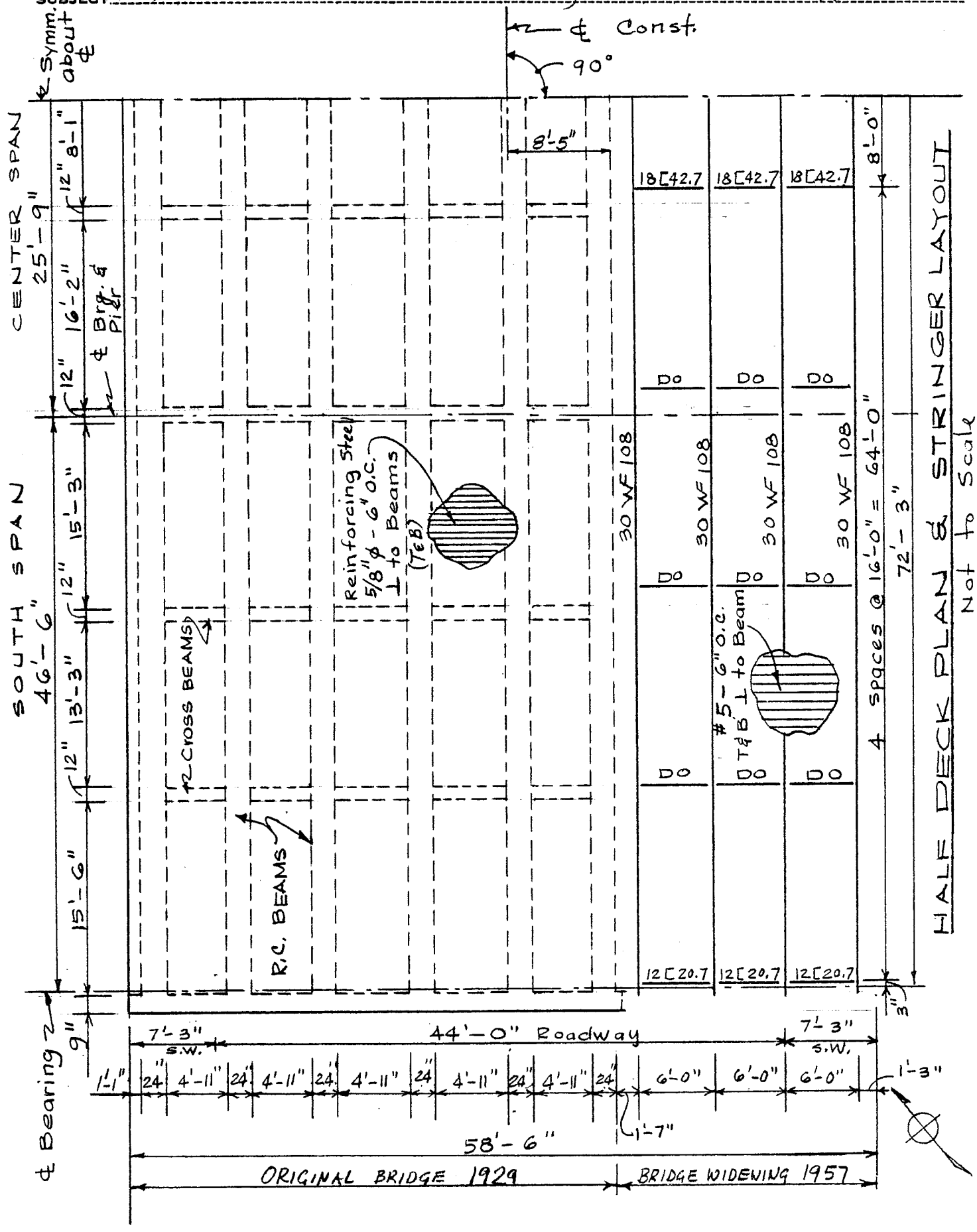
SHEET NO. 1 OF 83

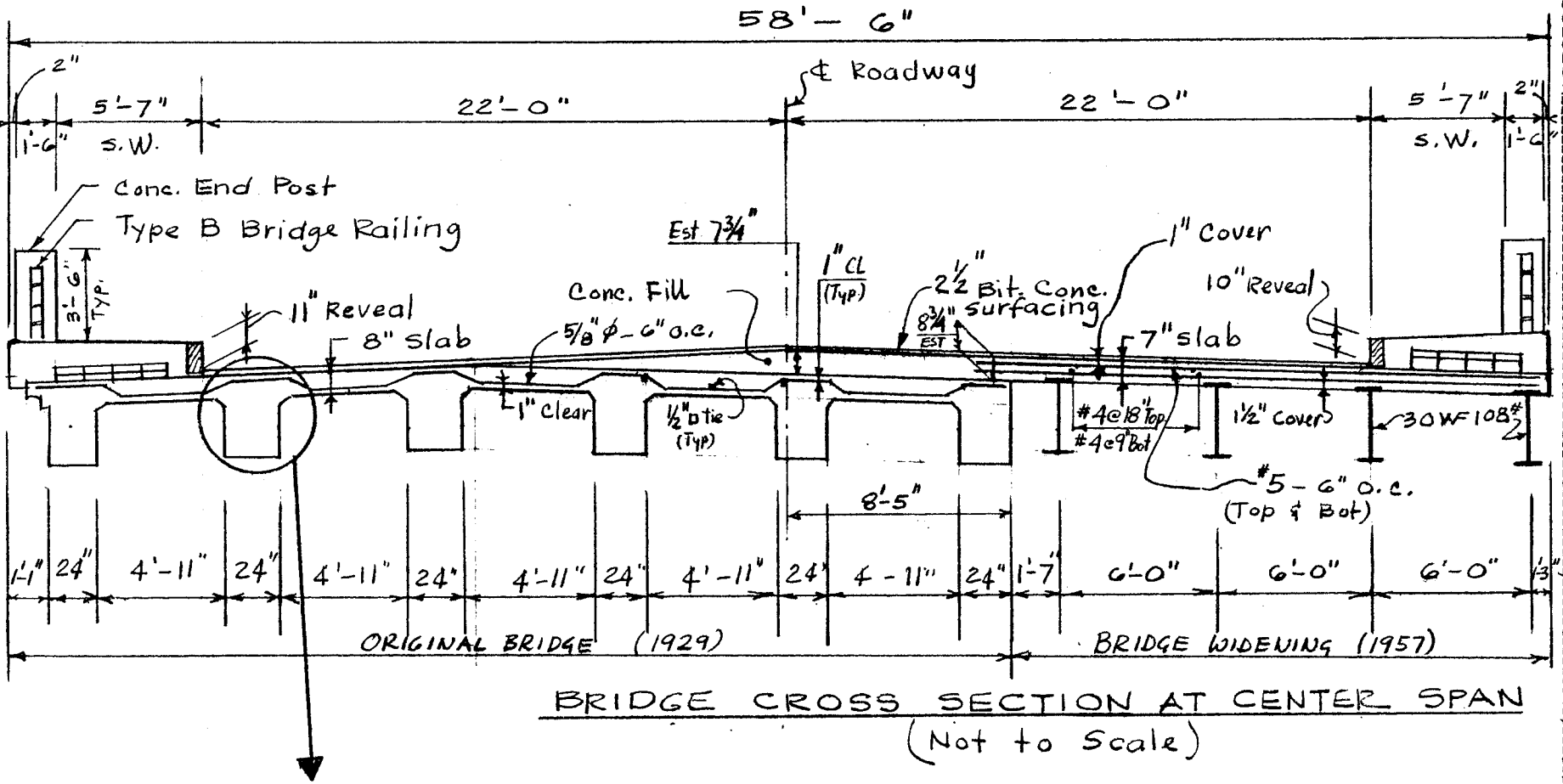
PROJECT W185 B897

BY ASC DATE 8/14/79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 2 OF 83

CHKD. BY AFP DATE 8/15/79 BRIDGE RATING PROJECT W185 B897

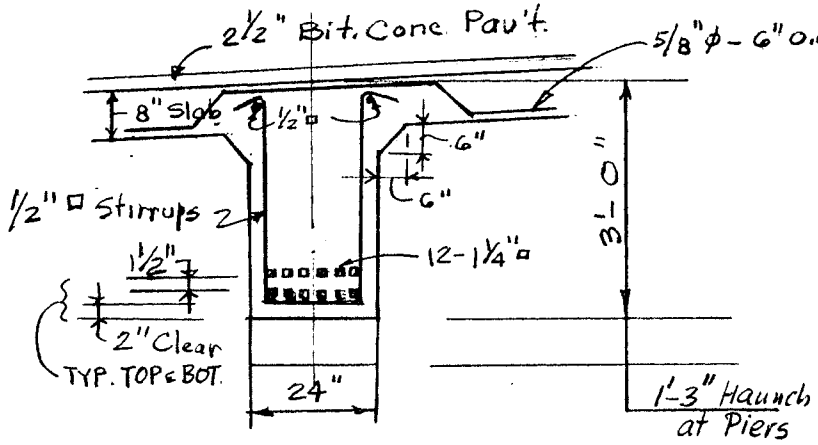
SUBJECT BR. No. W-6-16 WAREHAM MA, RTE 6 OVER WEWEANTIC RIVER





BRIDGE CROSS SECTION AT CENTER SPAN

(Not to Scale)



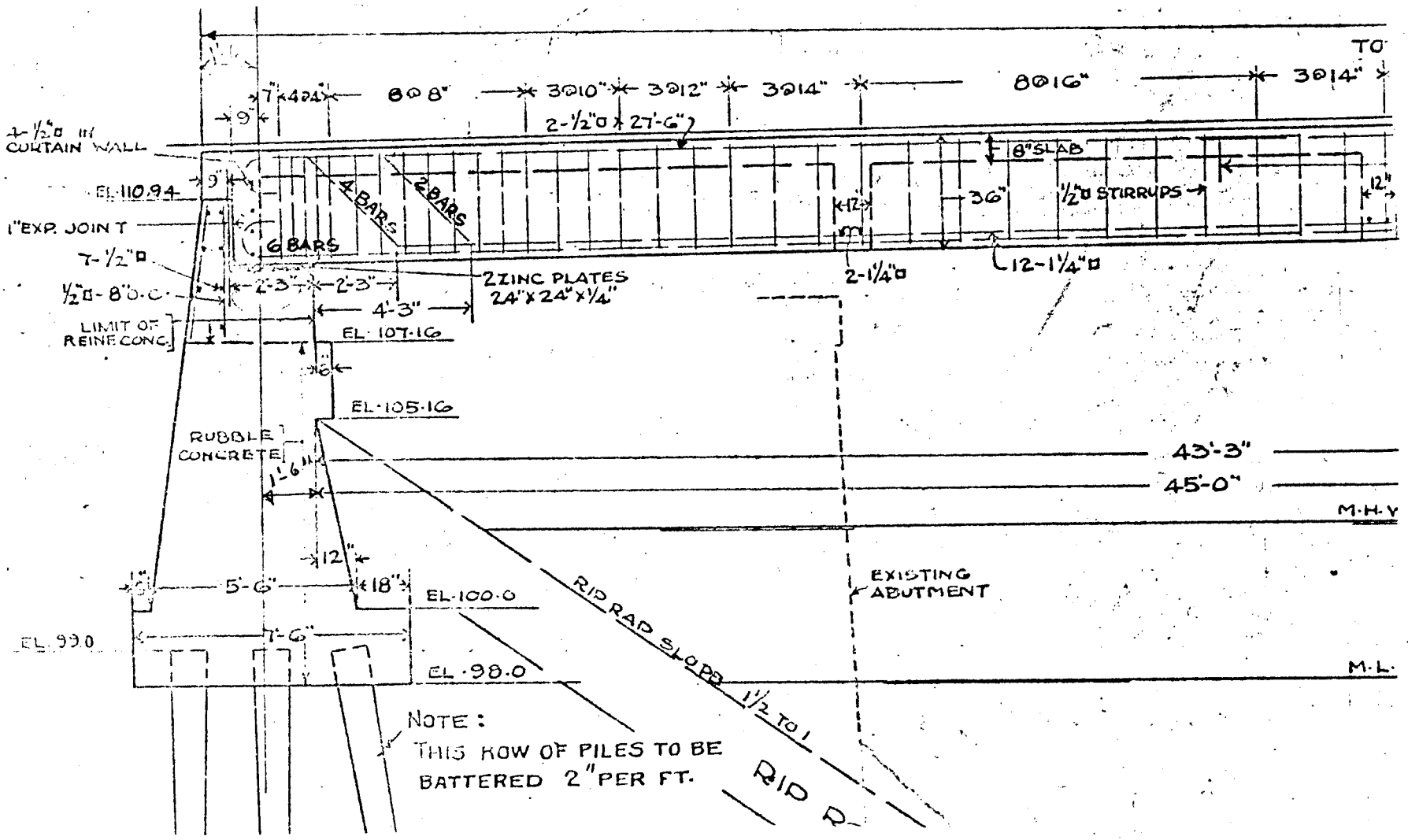
BY ASC DATE 8/15/79
CHKD. BY AFP DATE 8/15/79
SUBJECT BR. No. W-6-16 WAREHAM, MA

LOUIS BERGER & ASSOCIATES INC.

BRIDGE RATING

RTE 6 OVER WEWEANTIC RIVER

SHEET NO. 3 OF 83
PROJECT WIBR 847



APPROACH SPAN

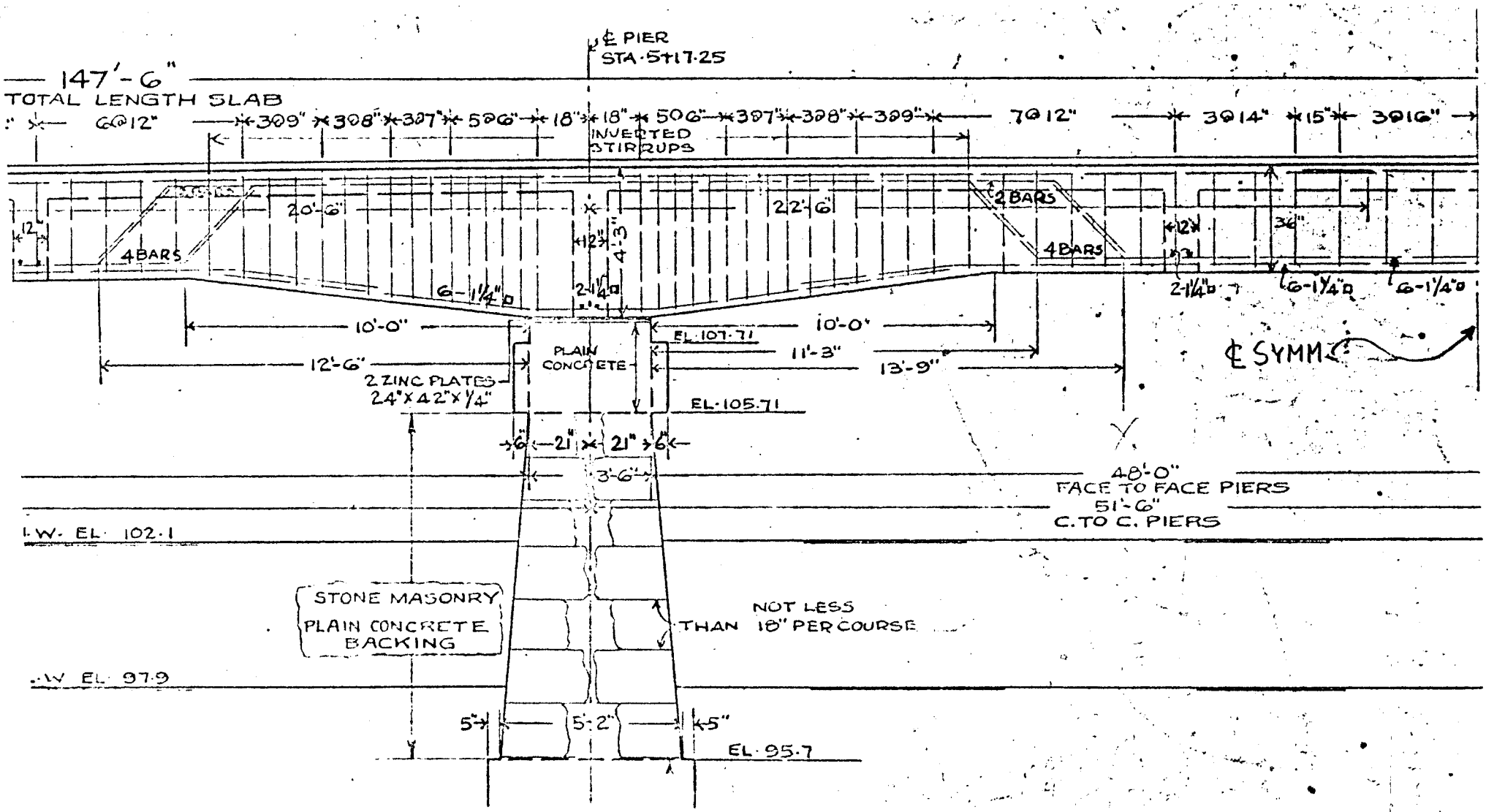
ORIGINAL BRIDGE

INTERIOR BEAM REINFORCING DETAILS 1

BY _____ DATE _____
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. 4 OF 83
PROJECT W185.B.897



APPROACH SPAN

CENTER SPAN

ORIGINAL BRIDGE

INTERIOR BEAM REINFORCING DETAILS 2

SHEET NO. 5 OF 83

PROJECT W185.B.847

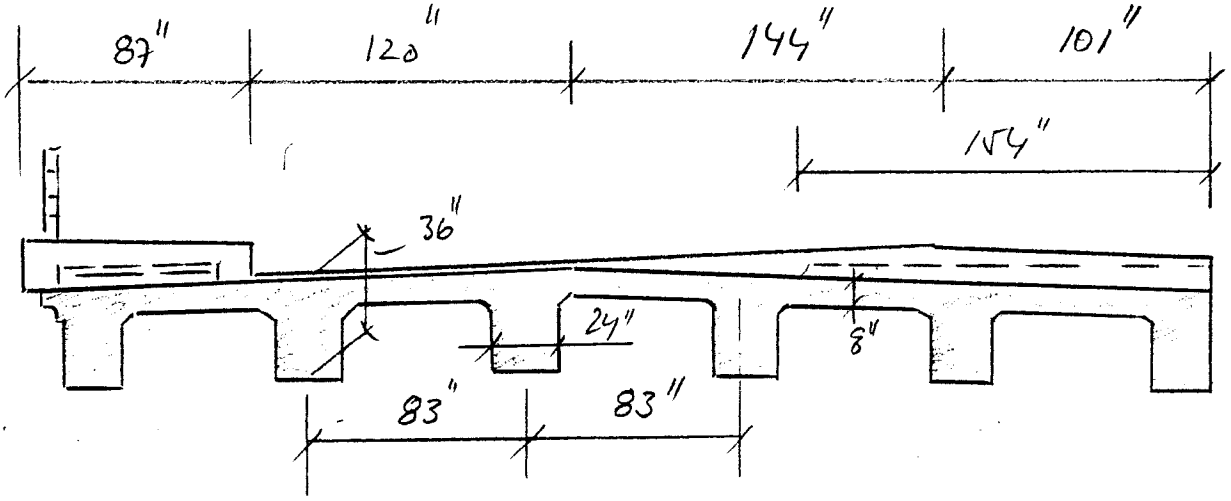
BY CDN DATE 11/08/79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 6 OF 83

CHKD. BY DATE PROJECT W185 B 397

SUBJECT BR NO W-6-16

1ST COMPUTATION

DEAD LOAD



RAILING	=	50	·	10^{-3} · 1/6	= 0.01
SIDEWALK	=	87 · 16.25 · 1.04	·	—"—	= 0.25
		−48 · 8.00 · 0.71	·	—"—	= −0.05
PAVEMENT	=	120 · 3.38 · 1.00	·	—"—	= 0.07
		144 · 6.50 · 1.00	·	—"—	= 0.16
		101 · 10.78 · 1.00	·	—"—	= 0.13
		154 · 7.90 · 0.04	·	—"—	= 0.01
					0.63 k/ft

BEAM	=	83 · 8.00 · 1.04 · 10^{-3}		= 0.69
		6 · 6.00 · 1.04 · 10^{-3}		= 0.04
		24 · 28.00 · 1.04 · 10^{-3}		= 0.70
				2.06 k/ft

DEAD LOAD CNT'D

$M_{0.40} = +206 \cdot 46.5^2 \cdot 0.0756 = +336.7^{1k}$

$M_{1.00} = -206 \cdot 46.5^2 \cdot 0.1109 = -494.0^{1k}$

$M_{1.50} = +206 \cdot 46.5^2 \cdot 0.0427 = +190.2^{1k}$

$V_{0.00} = 206 \cdot 46.5 \cdot 0.5 - \frac{494.0}{46.5} = 37.3^{k}$

$V_{0.20} = 37.3 - 206 \cdot 46.5 \cdot 0.20 = 8.5^{k}$

$V_{0.70} = 28.5 - 206 \cdot 46.5 \cdot 0.20 = 29.8^{k}$

$V_{1.00} = 206 \cdot 46.5 \cdot 0.5 + \frac{494.0}{46.5} = 28.5^{k}$

$V_{1.00} = 206 \cdot 37.5 \cdot 0.5 = 33.1^{k}$

$V_{1.20} = 33.1 - 206 \cdot 15.5 \cdot 0.20 = 21.2^{k}$

LIVE LOAD

THREE TYPES ARE CONSIDERED (AXLE LOADS)

H 15 — 24 K, 14', 6

TYPE 3 — 16, 4', 16, 15', 14

TYPE 3-S2 — 16, 4', 16, 22', 16, 4', 16, 11', 8

} + IMPACT 30%

DISTRIBUTION FACTOR IS (AASHTO)

$$DF = \frac{1}{2} \cdot \frac{6.92}{6} = 0.58$$

MOMENT AND SHEAR FORCES ARE COMPUTED BY MEANS OF INFLUENCE LINES

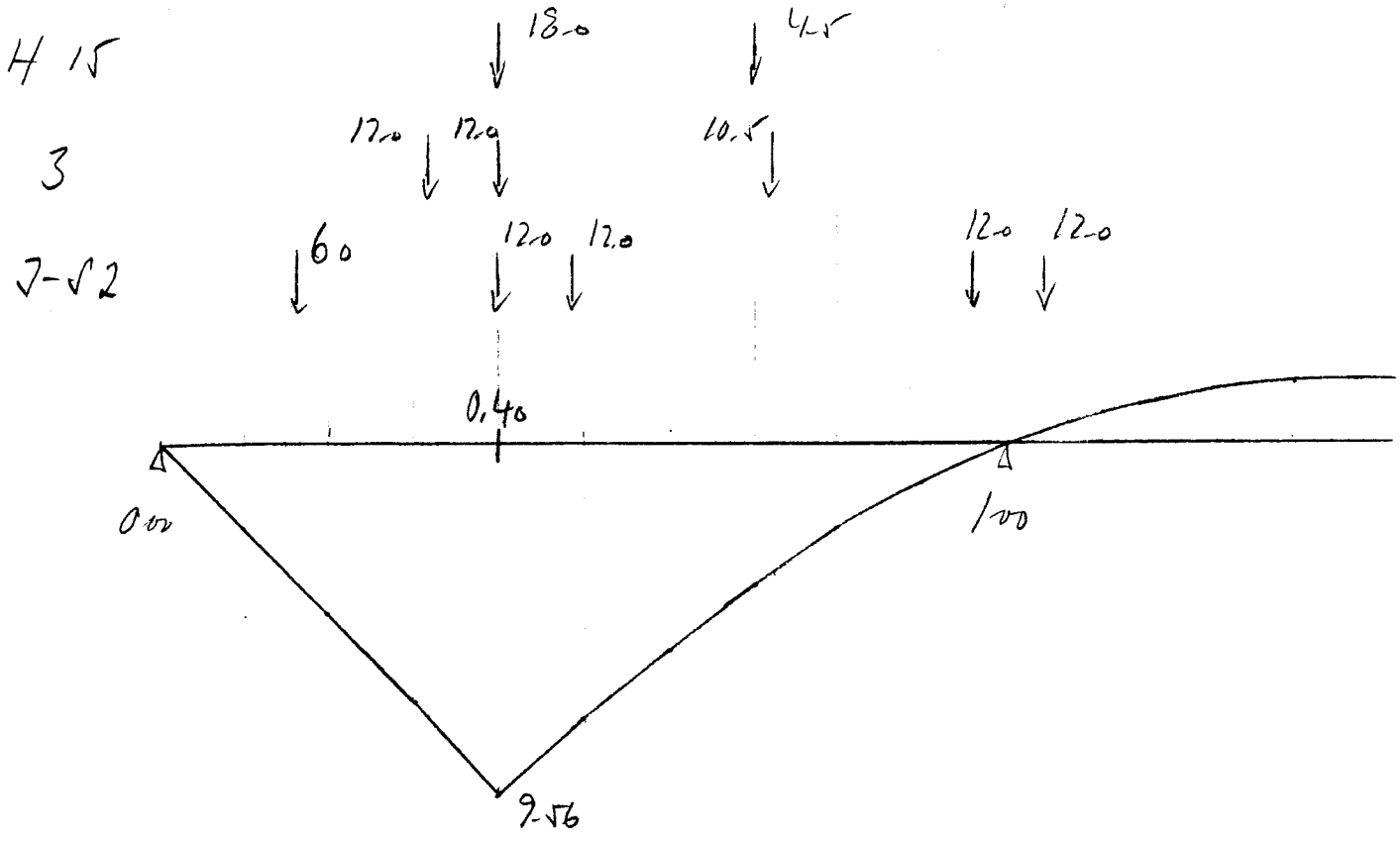
THE AXLE LOADS MULTIPLIED BY THE DISTR. FACTOR 0.58 AND IMPACT 30% ARE AS FOLLOWS

H 15 — 18.0 + 4.5

3 — 12.0 + 12.0 + 10.5

3-S2 — 12.0 + 12.0 + 12.0 + 12.0 + 6.0

SECTION 0.40



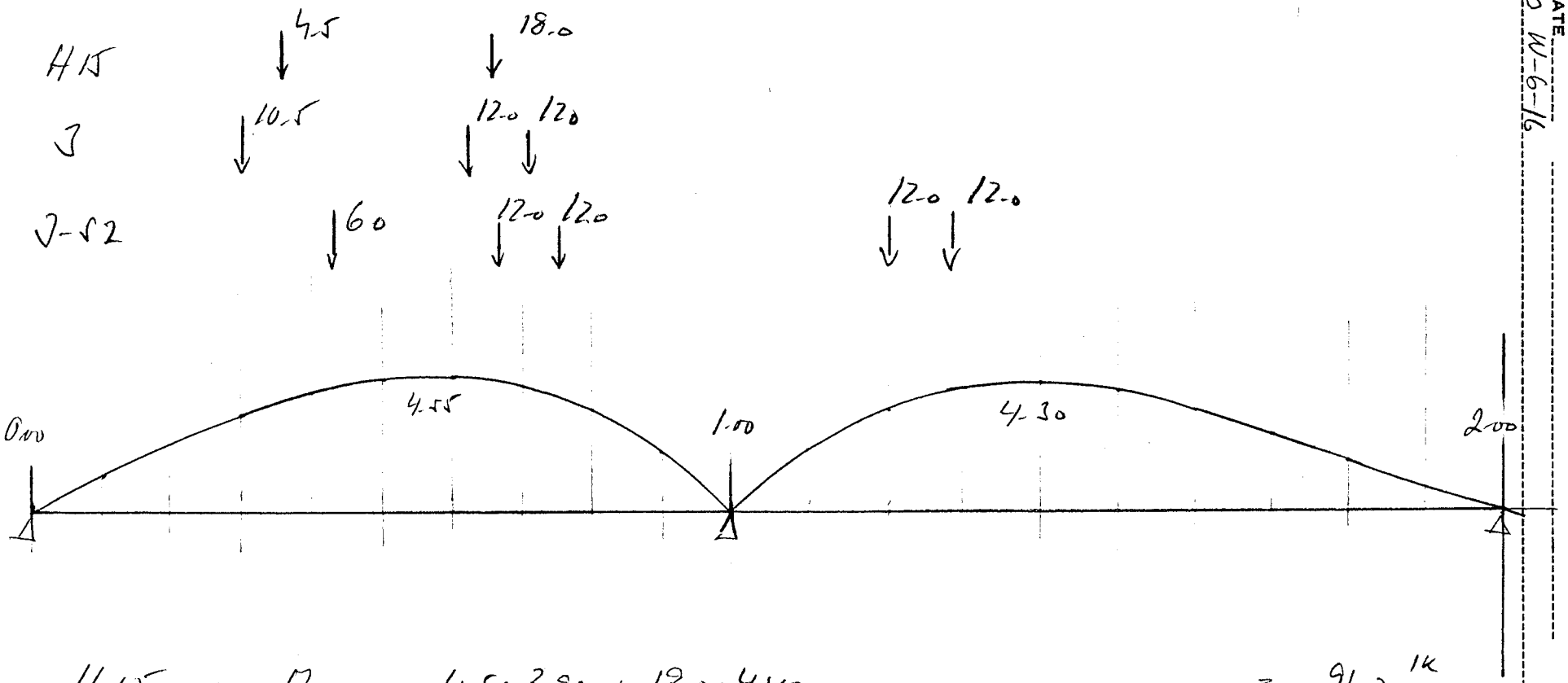
$H\,15 = M_{0.40} = 18.0 \cdot 9.56 + 4.5 \cdot 3.90 = 189.6^{1k}$

$3 = M_{0.40} = 12.0\,(7.55 + 9.56) + 10.5 \cdot 3.50 = 242.1^{1k}$

$3\text{-}S2 = M_{0.40} = 6.0 \cdot 3.90 + 12.0\,(9.56 + 7.80 + 0.40 - 0.35) = 232.4^{1k}$

BY CAN DATE 11/09/29 LOUIS BERGER & ASSOCIATES INC.
CHKD. BY DATE SHEET NO. 10 OF 83
SUBJECT Retro W-6-16 PROJECT W/185B.89

SECTION 1.00

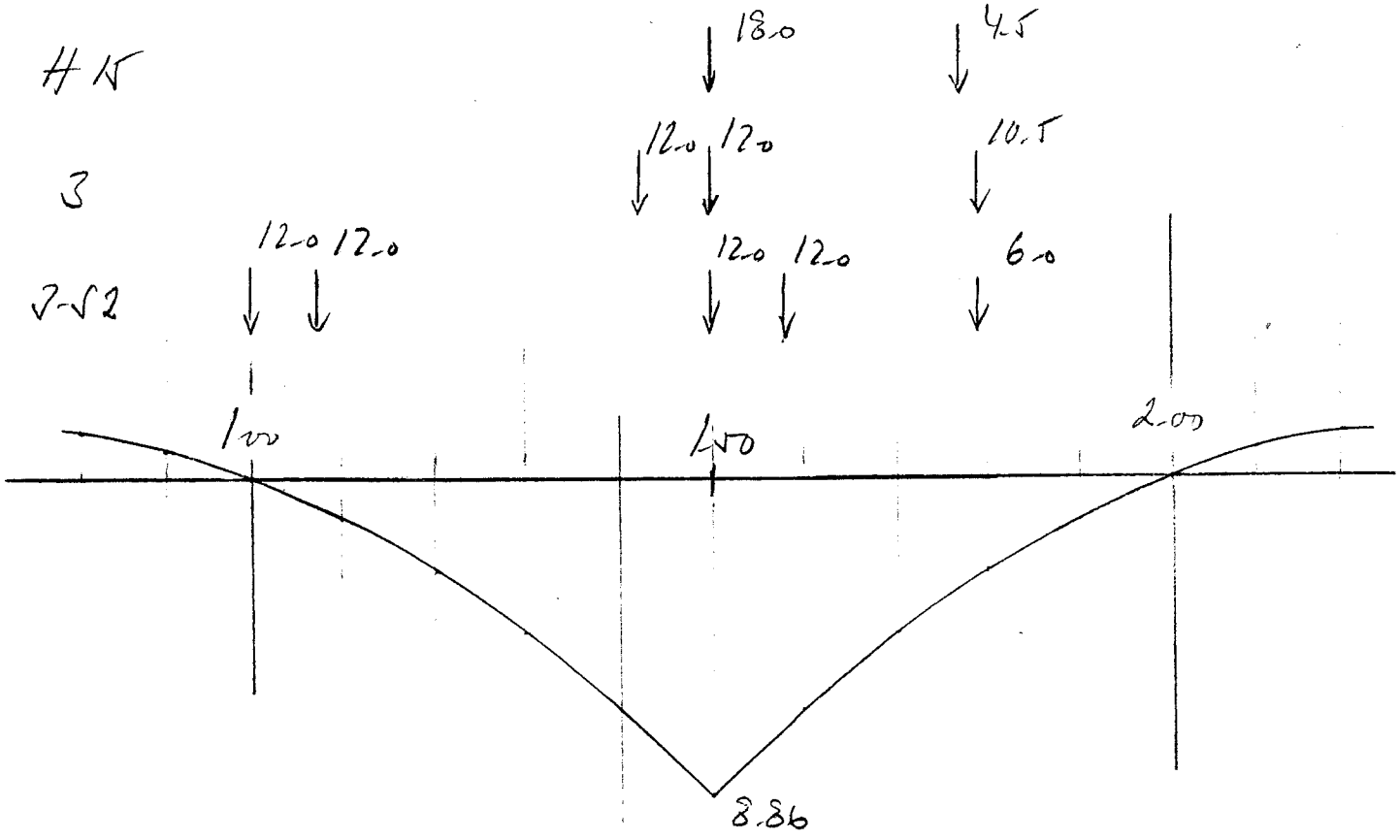


$H15 = M_{1.00} = 4.5 \cdot 3.80 + 18.0 \cdot 4.40 = 96.2^{1k}$

$3 = M_{1.00} = 10.5 \cdot 3.20 + 12.0(4.55 + 4.20) = 139.7$

$3\text{-}S2 = M_{1.00} = 6.0 \cdot 4.20 + 12.0(4.40 + 3.80 + 3.50 + 4.10) = 214.8$

SECTION 1-1

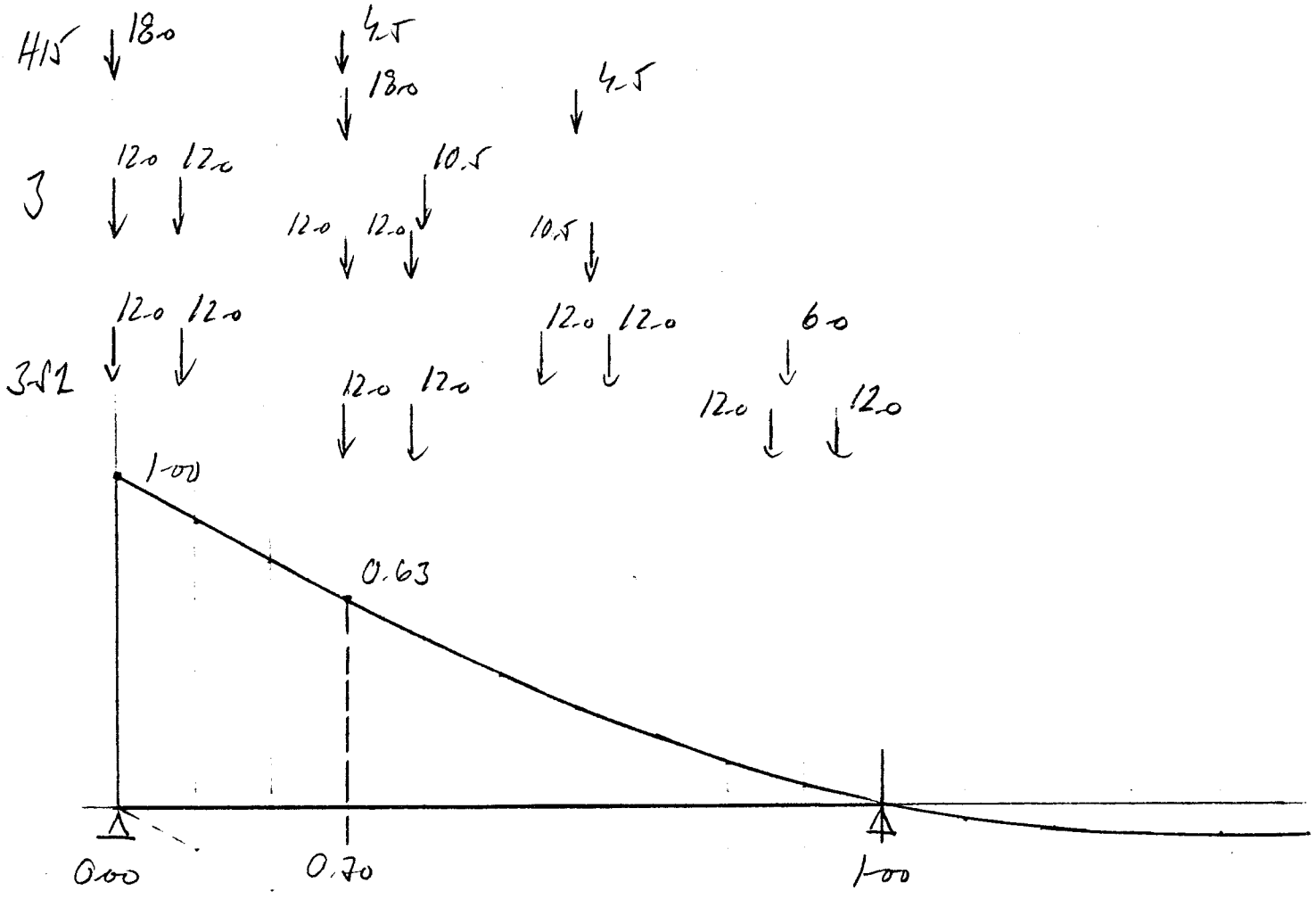


H 15 : $18.0 \cdot 8.86 + 4.5 \cdot 7.00 = 173.0^{1k}$

3 : $12.0\,(7.00 + 8.86) + 10.5 \cdot 2.75 = 219.2^{1k}$

3-12 : $12.0\,(0.00 + 0.80 + 8.86 + 7.00) + 6.0 \cdot 2.75 = 216.5^{1k}$

SECTION 0.00 AND 0.30 SHEAR



H 15

$V_{0.00} = 18.0 \cdot 1.00 + 4.5 \cdot 0.63 = 20.8^{K}$

$V_{0.30} = 18.00 \cdot 0.63 + 4.5 \cdot 0.70 = 12.7$

3

$V_{0.00} = 12.0(1.00 + 0.90) + 10.5 \cdot 0.51 = 28.1$

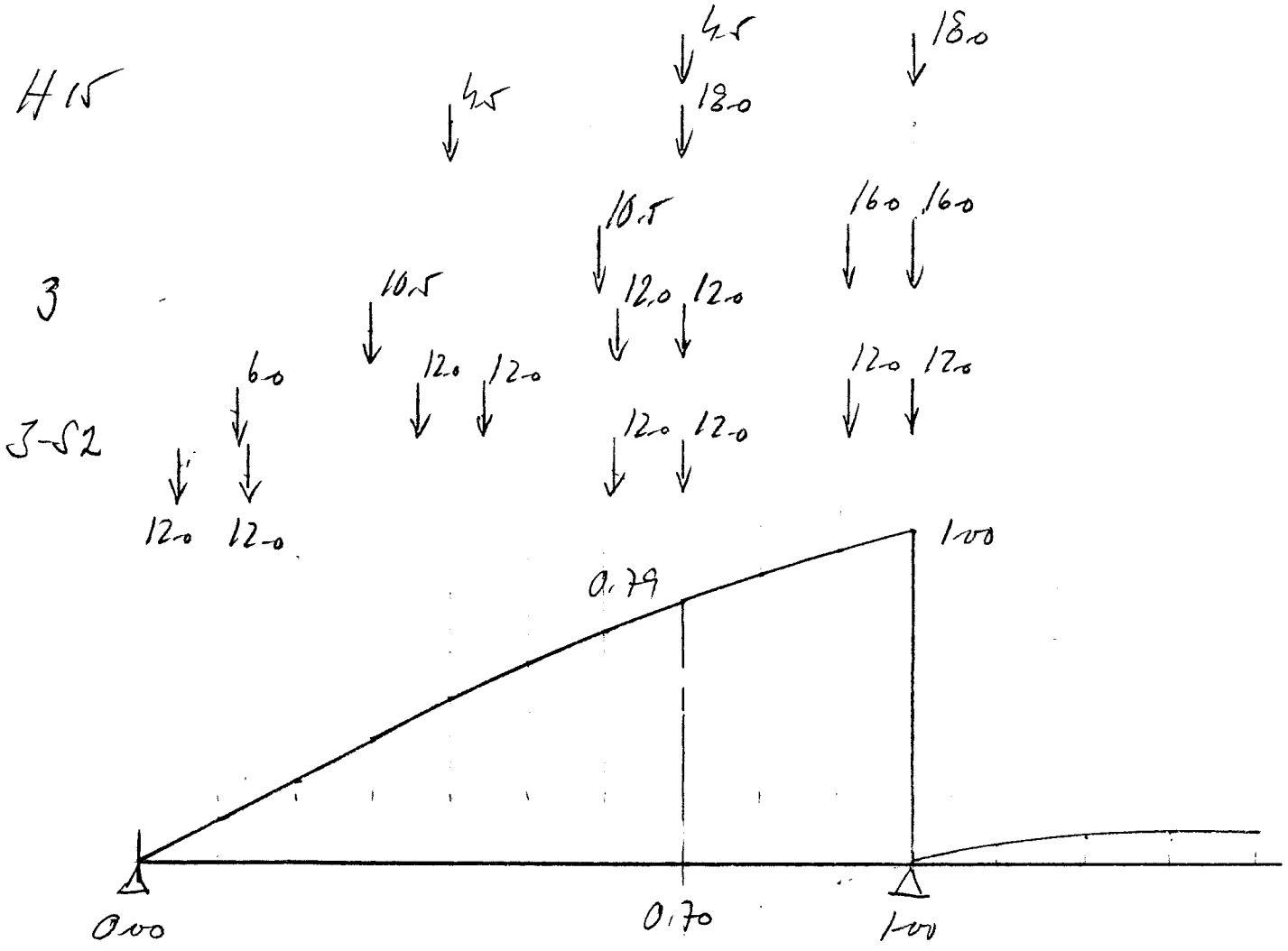
$V_{0.30} = 12.0(0.63 + 0.53) + 10.5 \cdot 0.28 = 16.9$

3-S2

$V_{0.00} = 12.0(1.00 + 0.90 + 0.34 + 0.26) + 6.0 \cdot 0.08 = 30.5$

$V_{0.30} = 12.0(0.63 + 0.53 + 0.09 + 0.04) = 15.5$

SECTION 0.70 AND 1.00 SHEAR

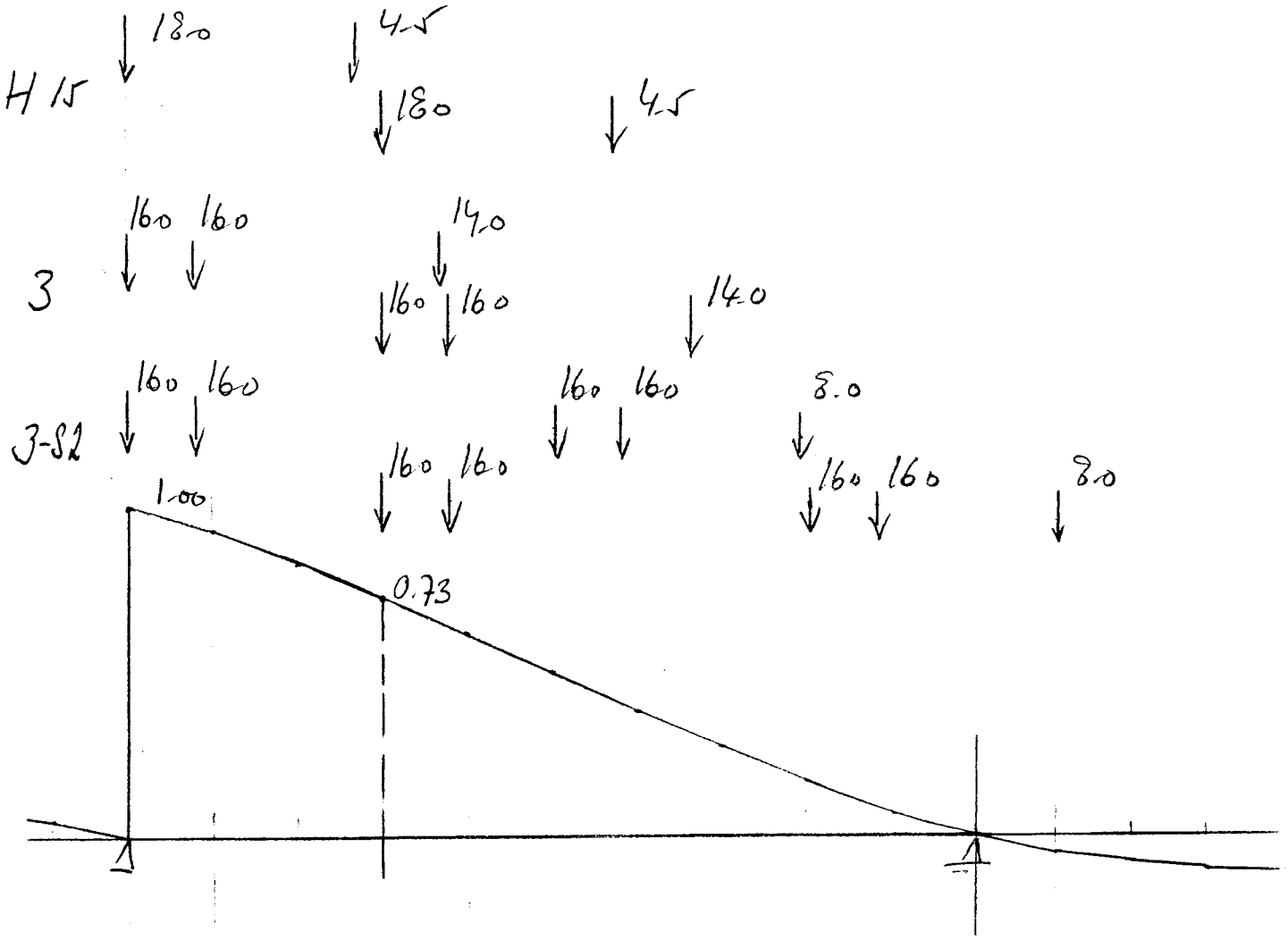


H 15
$V_{0.70} = 4.5 \cdot 0.49 + 18.0 \cdot 0.79 = 16.4$
$V_{1.00} = 4.5 \cdot 0.79 + 18.0 \cdot 1.00 = 21.6$

3
$V_{0.70} = 10.5 \cdot 0.36 + 12.0 (0.72 + 0.79) = 21.9$
$V_{1.00} = 10.5 \cdot 0.69 + 12.0 (0.95 + 1.00) = 30.7$

3-S2
$V_{0.70} = 12.0 (0.06 + 0.17 + 0.72 + 0.79) = 20.9$
$V_{1.00} = 6.0 \cdot 0.15 + 12.0 (0.45 + 0.84 + 0.95 + 1.00) = 36.2$

SECTION 1.00 AND 1.20 SHEAR



H 15

$V_{1.00} = 18.0 \cdot 1.00 + 4.5 \cdot 0.76 = 21.4^{K}$

$V_{1.20} = 18.0 \cdot 0.73 + 4.5 \cdot 0.42 = 15.0$

3

$V_{1.00} = 16.0 (1.00 + 0.95) + 14.0 \cdot 0.65 = 40.2$

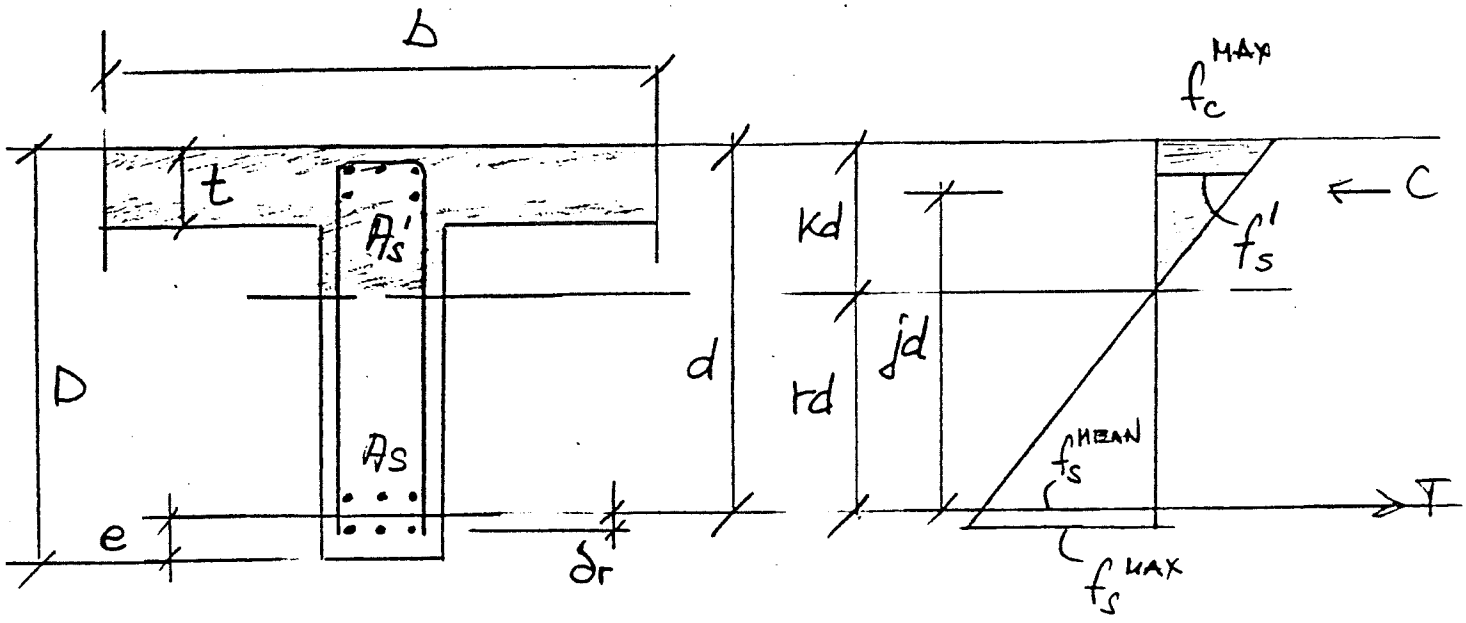
$V_{1.20} = 16.0 (0.73 + 0.60) + 14.0 \cdot 0.30 = 26.0$

3-S2

$V_{1.00} = 16.0 (1.00 + 0.95 + 0.49 + 0.40) + 8.0 \cdot 0.17 = 46.8$

$V_{1.20} = 16.0 (0.73 + 0.60 + 0.16 + 0.08) - 8.0 \cdot 0.05 = 25.2$

INTERIOR BEAM
MOMENT AND SHEAR CAPACITIES



$$f_s^{MAX} = f_s^{MEAN} \times \left(\frac{rd + \delta_r}{rd} \right)$$

$n = 15$

$f_c' = 2000$ psi

f_c^{MAX}	INV	= 800	#
	OPER	= 1100	#
V_c	INV	= 60	#
	OPER	= 100	#
f_s^{MAX}	INV	= 18000	#
	OPER	= 25000	#

USE HP 67 PROGRAM FOR T-SECTION

BY CDW DATE 11/12/98 LOUIS BERGER & ASSOCIATES INC. SHEET NO. 16 OF 83
CHKD. BY ____ DATE ____ PROJECT WIBR 8892
SUBJECT RR NO W-6-16

	1	2	3	4	5	6	4	fa	8												
												INVENTORY					OPERATING				
SECT	b	b'	D	t	e	d'	As	δ_r	As'	rd	jd	f_s^{MAX}	M	f_c^{MAX}	f_s'	Vc	f_s^{MAX}	M	f_c^{MAX}	f_s'	Vc
0.00	83	24	36	8	2.75	0	9.38	0	0	9.10	30.27					43.6					72.6
0.30	83	24	36	8	4.13	0	18.75	1.38	0	12.08	28.31					40.8					67.9
0.40	83	24	36	8	4.13	0	18.75	1.38	0	12.08	28.31	18000	744.4	-684.8			25000	1033.9	-951.2		
0.70	83	24	36	8	2.75	0	9.38	0	0	9.10	30.27					43.6					72.6
0.75	83	24	36	8	2.75	0	9.38	0	0	9.10	30.27					43.6					72.6
1.00	24	24	51	0	4.13	2.75	18.75	1.38	2.70	21.64	40.19	14760	878.9	-800.0	13070	57.8	20300	1208.7	-1100.0	-24860.0	96.4
1.23	83	24	36	8	2.75	0	9.38	0	0	9.10	30.27					43.6					72.6
1.30	24	24	36	8	2.75	0	9.38	0	0	9.10	30.27					43.6					72.6
1.50	24	24	36	8	4.13	0	18.75	1.38	0	12.08	28.31	18000	744.4	-684.8			25000	1033.9	-951.2		

INTERIOR BEAM RATING FOR MOMENT

SECT 0.40 (at Approach Span)
INVENTORY $M = 744.4 - 336.7 = 407.7^{1K}$
OPERATING $M = 1033.9 - 336.7 = 697.2$

LOADING	INVENTORY	OPERATING
H 15	$\frac{407.7}{189.6} \times 15 = 32.3^{T}$	$\frac{697.2}{189.6} \times 15 = 55.2^{T}$
3	$\frac{407.7}{242.1} \times 23 = 38.7^{T}$	$\frac{697.2}{242.1} \times 23 = 66.2^{T}$
3-S2	$\frac{407.7}{232.4} \times 36 = 63.2^{T}$	$\frac{697.2}{232.4} \times 36 = 108.0^{T}$

SECT 1.00 (at Pier)
INVENTORY $M = -878.9 + 494.0 = -384.9$
OPERATING $M = -1208.7 + 494.0 = -714.7$

LOADING	INVENTORY	OPERATING
H 15	$\frac{384.9}{96.3} \times 15 = 60.0^{T}$	$\frac{714.7}{96.3} \times 15 = 111.3^{T}$
3	$\frac{384.9}{139.7} \times 23 = 63.4^{T}$	$\frac{714.7}{139.7} \times 23 = 117.7^{T}$
3-S2	$\frac{384.9}{214.8} \times 36 = 64.5^{T}$	$\frac{714.7}{214.8} \times 36 = 119.8^{T}$

INT. BEAM RATING FOR MOMENT CUT'S

SECT 1-1 (at center span)
INVENTORY $M = 744.4 - 190.2 = 554.2$
OPERATING $M = 1033.9 - 190.2 = 843.7$

LOADING	OPERATING	INVENTORY
H 15	$\frac{554.2}{173.0} \times 15 = 48.1$ T	$\frac{843.7}{173.0} \times 15 = 73.2$ T
3	$\frac{554.2}{219.2} \times 23 = 58.2$ T	$\frac{843.7}{219.2} \times 23 = 88.5$ T
3-S2	$\frac{554.2}{216.5} \times 36 = 92.2$ T	$\frac{843.7}{216.5} \times 36 = 140.3$ T

THE BEAM IS PROVIDED WITH THE FOLLOWING TYPES OF SHEAR REINFORCEMENT

Type

a STIRRUP #½" @ 16" $A_v = 2 \cdot \frac{0.50^2}{16}$ = 0.0313 in²/in

b — 15" A_v = 0.0333

c — 14" A_v = 0.0357

d — 12" A_v = 0.0417

e — 10" A_v = 0.0500

f — 9" A_v = 0.0556

g — 8" A_v = 0.0625

h — 7" A_v = 0.0714

i — 6" A_v = 0.0833

k 2 45° BARS #1¼" $A_v = 2 \cdot \frac{1.25^2 \cdot \sqrt{2}}{32.00}$ = 0.1381

l 4 45° BARS #1¼ A_v = 0.2762

k + d A_v = 0.1381 + 0.0417 = 0.1798

l + d A_v = 0.2762 + 0.0417 = 0.3179

k + g A_v = 0.1381 + 0.0625 = 0.2006

l + g A_v = 0.2762 + 0.0625 = 0.3387

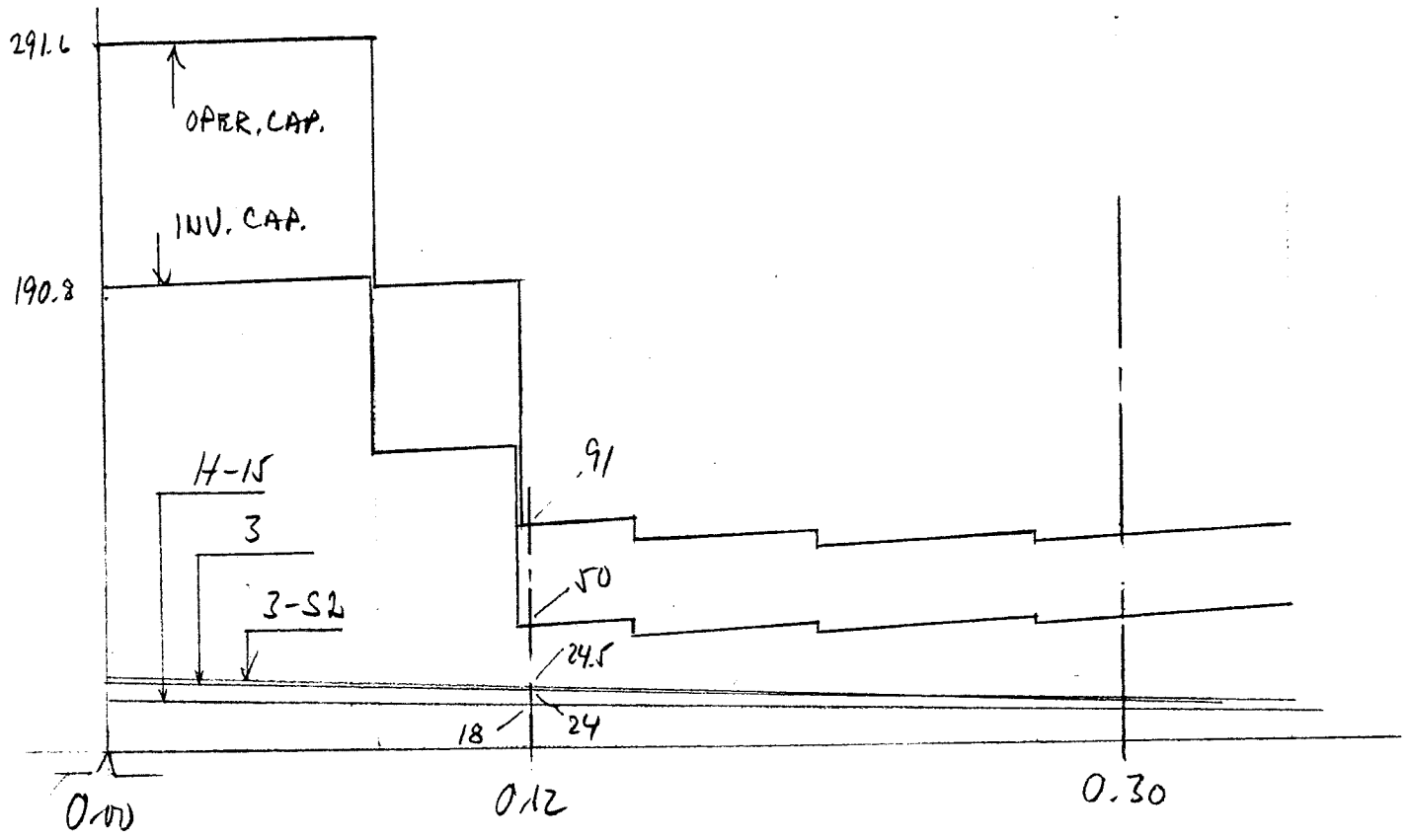
BY CDN DATE 11/15/79 **LOUIS BERGER & ASSOCIATES INC.**
CHKD. BY RE DATE W-6-16 SHEET NO. 20 OF 83
SUBJECT W18V25 897 PROJECT

TOTAL SHEAR CAPACITIES

SECT		V_{DL}	V_c	A_v SHEAR REINFORCEMENT TYPE										
				l+g	k+g	g	e	d	c	k+d	l+d	f	h	i
0.00	INV	-37.0 +	43.6 + 18 · 30.27 · A_v	190.8	115.6	40.4	33.5	29.0	25.8					
	OPER	-37.0 +	72.6 + 25 · 30.27 · A_v	291.6	187.1	82.6	73.1	66.9	62.3					
0.30		- 8.5 +	40.8 + 18 · 28.01 · A_v	204.9	134.5	64.1	57.8	53.5	50.5					
		- 8.5 +	67.9 + 25 · 28.01 · A_v	299.1	201.4	103.6	94.8	88.9	84.7					
0.70		-29.8 +	42.6 + 18 · 30.27 · A_v			47.9		36.5	33.3	111.8	187.0	44.1	52.7	59.2
		-29.8 +	72.6 + 25 · 30.27 · A_v			90.1		74.4	69.8	178.9	283.4	84.9	96.8	105.8
0.75		-34.3 +	42.6 + 18 · 30.27 · A_v			43.4		32.0	28.8	107.3	182.5	39.6	48.2	54.7
		-34.3 +	72.6 + 25 · 30.27 · A_v			85.6		69.9	65.3	174.4	278.9	80.4	92.3	101.3
1.00		-58.5 +	57.8 + 18 · 40.19 · A_v			44.5		29.5	25.1	129.4	229.3	39.5	51.0	59.6
		-58.5 +	96.4 + 25 · 40.19 · A_v			110.7		73.8	73.8	218.6	357.3	93.8	109.6	121.6
1.00		-53.1 +	57.8 + 18 · 40.19 · A_v			49.9		34.9	30.5	134.8	234.7	44.9	56.4	65.0
		-53.1 +	96.4 + 25 · 40.19 · A_v			106.1		85.2	79.2	224.0	362.7	99.2	115.0	127.0
1.23		- 28.8 +	42.6 + 18 · 30.27 · A_v			48.9		37.5	34.3	112.8	188.0	45.1	53.7	60.2
		- 28.8 +	72.6 + 25 · 30.27 · A_v			91.1		75.4	70.8	179.9	284.4	85.9	97.8	106.8
1.30		- 21.2 +	42.6 + 18 · 30.27 · A_v			46.5		45.1	41.9	120.4	195.6	52.7	61.3	67.8
		- 21.2 +	72.6 + 25 · 30.27 · A_v			98.7		83.0	78.4	187.5	292.0	93.5	105.4	114.4

INTERIOR BEAM RATING FOR SHEAR

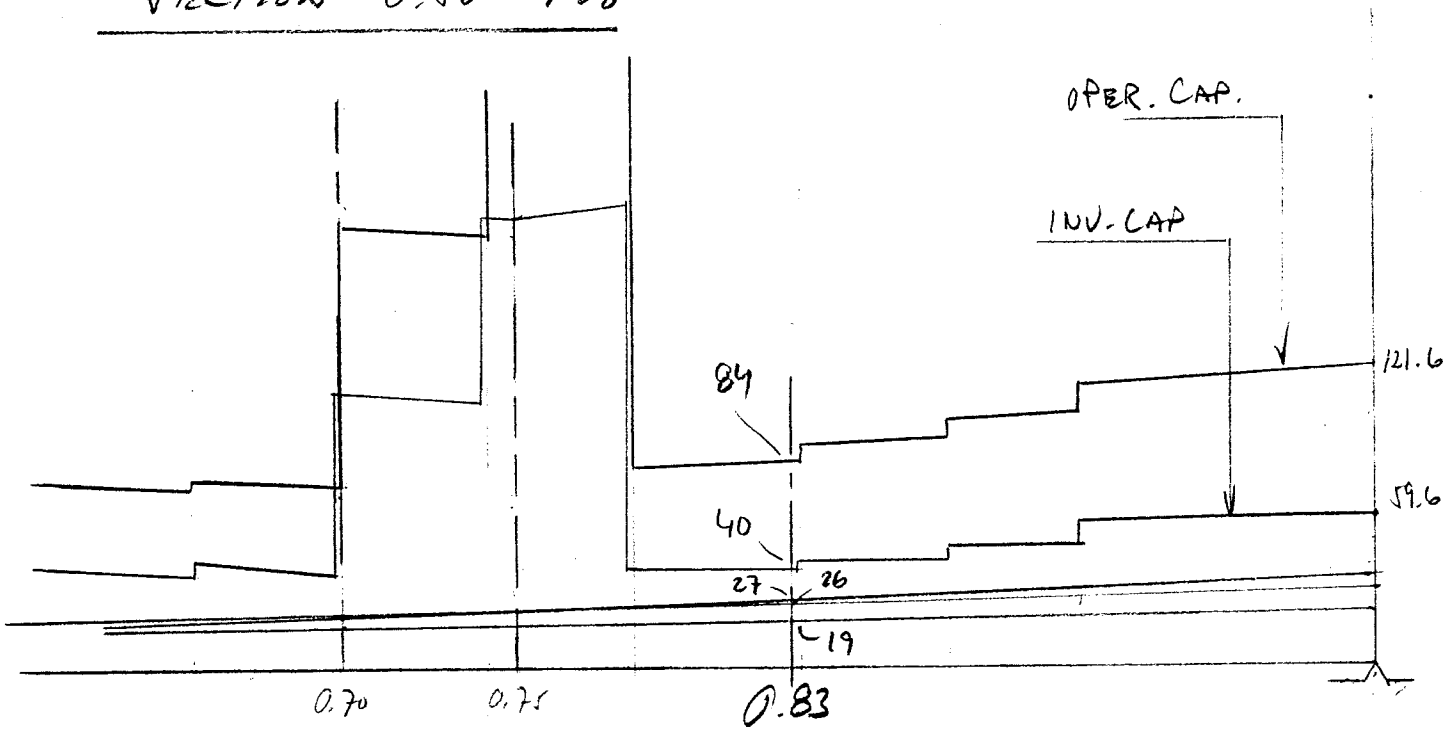
SECTION 0.06 - 0.30



SECT. 0.12 IS GOVERNING

LOADING	INVENTORY	OPERATING
H-15	$\frac{\sqrt{0}}{18} \times 15 = 41.7^T$	$\frac{91}{18} \times 15 = 75.8^T$
3	$\frac{\sqrt{0}}{24} \times 23 = 47.9$	$\frac{91}{24} \times 23 = 87.2$
3-S2	$\frac{\sqrt{0}}{24.5} \times 36 = 73.5$	$\frac{91}{24.5} \times 36 = 133.7$

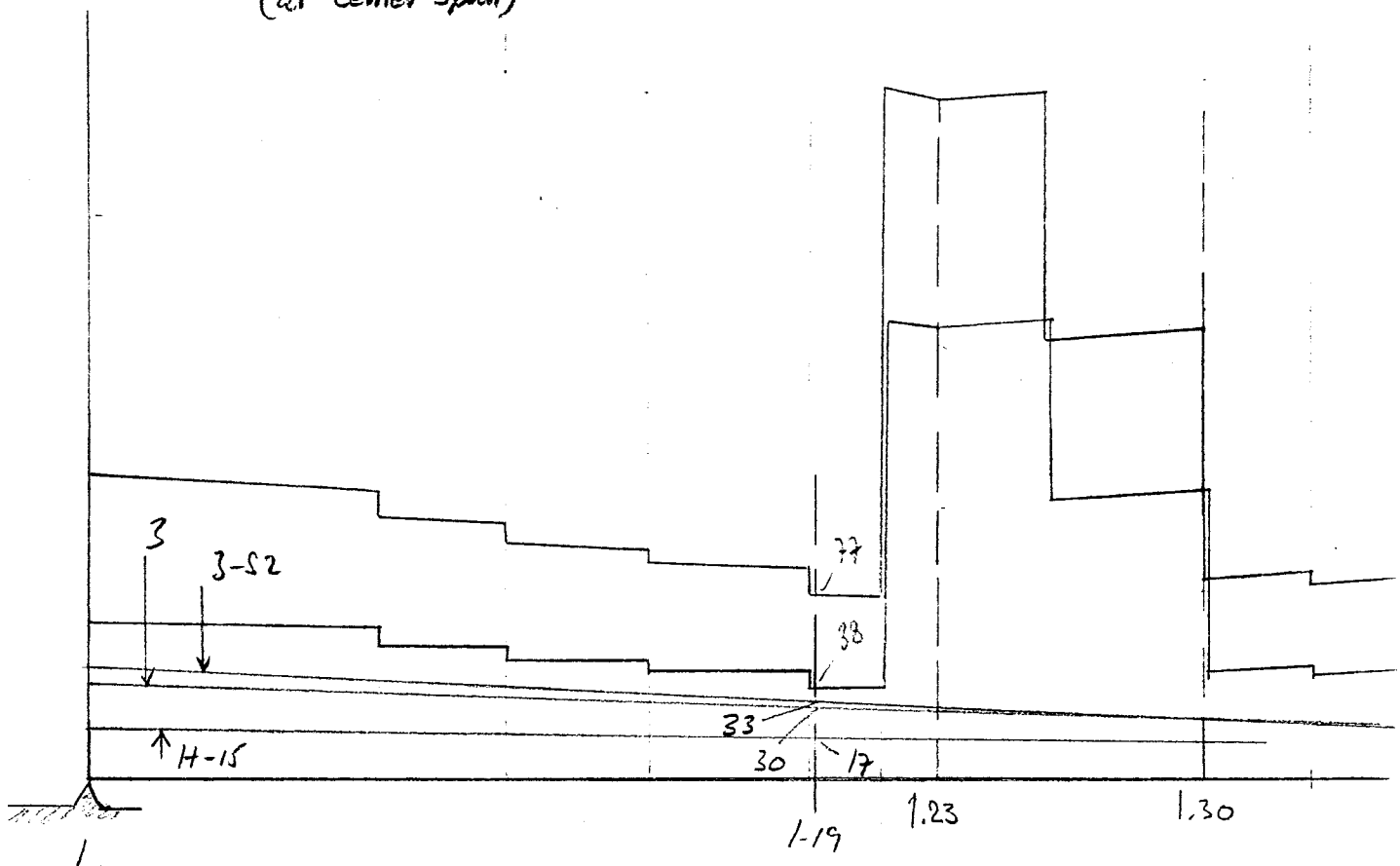
SECTION 0.50 - 1.00



SECT 0.83 IS GOVERNING

LOADING	INVENTORY	OPERATING
H-15	$\frac{40}{19} \times 15 = 31.6^T$	$\frac{84}{19} \times 15 = 66.3^T$
3	$\frac{40}{26} \times 23 = 35.4$	$\frac{84}{26} \times 23 = 74.3$
3-S2	$\frac{40}{27} \times 36 = 53.3$	$\frac{84}{27} \times 36 = 112.0$

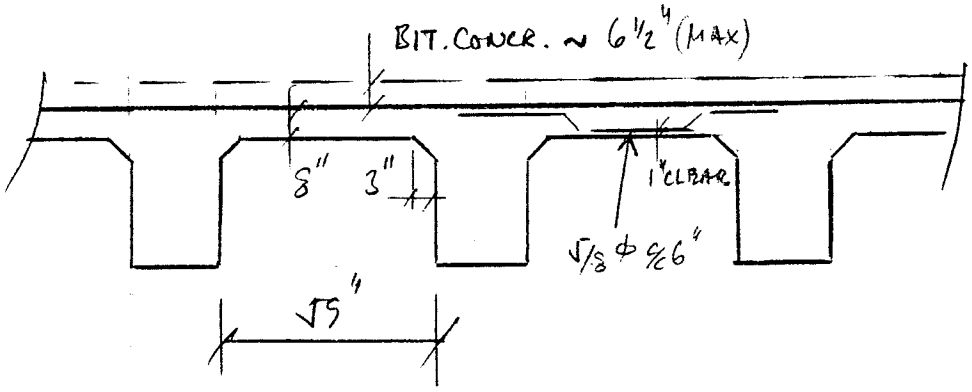
SECTION 1-00 - 1-30
(at Center Span)



SECT 1.19 IS GOVERNING

LOADING	INVENTORY	OPERATING
H-15	$\frac{38}{17} \times 15 = 33.5^T$	$\frac{77}{17} \times 15 = 67.9^T$
3	$\frac{38}{30} \times 23 = 29.1$	$\frac{77}{30} \times 23 = 59.0$
3-S2	$\frac{38}{33} \times 36 = 41.5$	$\frac{77}{33} \times 36 = 84.0$

CALCULATIONS FOR DECK SLAB (Original Bridge)



SLAB	0.67 · 0.150	=	0.102
BIT. COVER	0.54 · 0.144	=	0.078
			0.180 k/ft²

$$M_{DL} = 0.180 \cdot 4.92^2 \cdot 0.125 \cdot 0.80 = 0.44 \text{ k/ft}$$

$$V_{DL} = 0.180 (4.92 \cdot 0.5 - 0.86) \cdot 1.15 = 0.33 \text{ k/ft}$$

H 15 $$M_{LL} = \frac{12}{0.6 \cdot 4.92 + 2.5} \cdot 0.2 \cdot 4.92 \cdot 1.20 = 2.81 \text{ k/ft}$$

3-S2 $$M_{LL} = \frac{8}{0.26 \cdot 4.92 + 2.58} \cdot \text{—} \; \text{v} \; \text{—} = 2.25 \text{ k/ft}$$

H 15 $$V_{LL} = \frac{12}{0.6 \cdot 4.92 + 2.5} \cdot \frac{4.92 - 0.86}{4.92} \cdot 1.15 \cdot 1.20 = 2.72 \text{ k/ft}$$

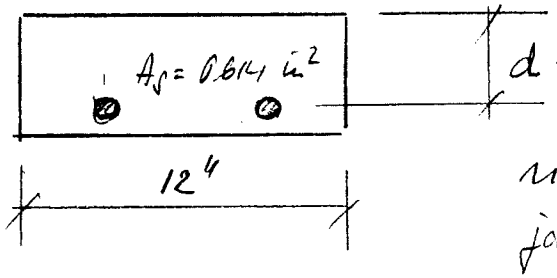
3-S2 $$V_{LL} = \frac{8}{0.26 \cdot 4.92 + 2.58} \cdot \frac{4.92 - 0.86}{4.92} \cdot 1.15 \cdot 1.20 = 2.27 \text{ k/ft}$$

MOMENT AND SHEAR CAPACITY

f'_c = 2000 psi CONCR. ULT STRENGTH

INVENT	f_c =	800 psi		ALLOW. STRESS
OPER		1100 "		
INVENT	V_c =	60 "		ALLOW. SHEAR STRESS
OPER		100 "		
INVENT	f_s =	18000 "		STEEL ALLOW. STRESS
OPER		25000 "		

VIB HP 67 PROGRAM



n = 15
jd = .85

INVENT M_c = .39 k/ft

OPERATING M_c = 7.48 "

INVENT V_c = 0.06 · .85 · 12 = 4.21 k/ft

OPERATING V_c = 0.10 · .85 · 12 = 7.02 "

ARCH SLAB RATING FOR MOMENT (Original Bridge)

INV $M = 5.39 - 0.44 = 4.95$ k/ft
OPER $M = 7.48 - 0.44 = 7.04$ "

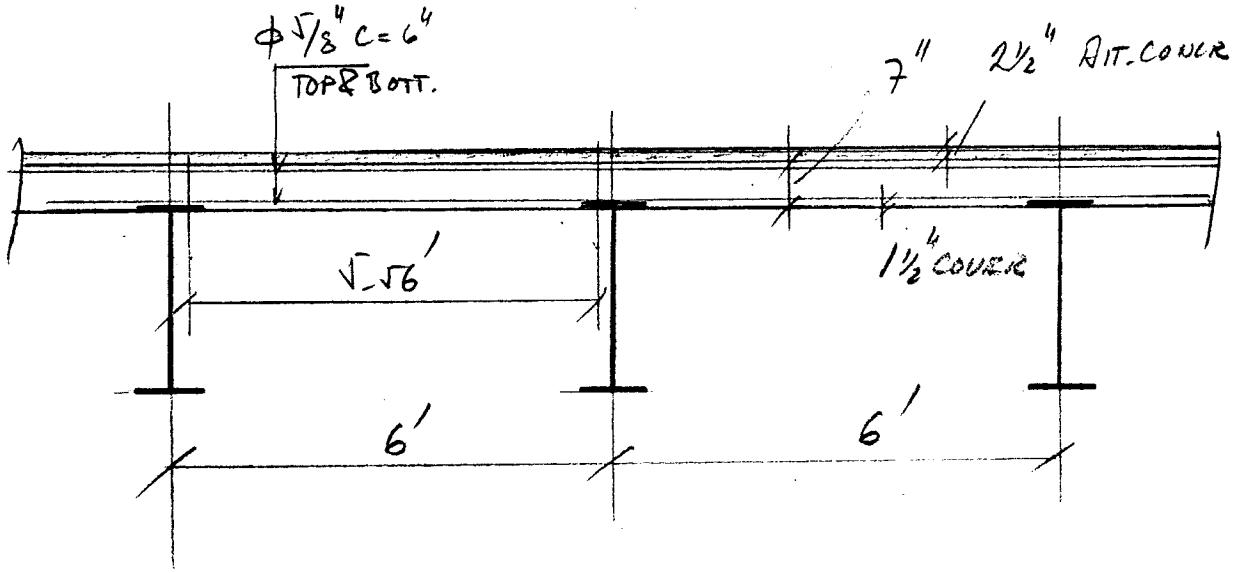
LOADING	INVENTORY	OPERATING
H 15	$\frac{4.95}{2.81} \times 15 = 26.4$ T	$\frac{7.04}{2.81} \times 15 = 37.6$ T
J	$\frac{4.95}{2.25} \times 27 = 48.4$ T	$\frac{7.04}{2.25} \times 23 = 68.9$ T
J-S2	$\frac{4.95}{2.25} \times 36 = 75.8$ T	$\frac{7.04}{2.25} \times 36 = 107.8$ T

DECK SLAB RATING FOR SHEAR (Original Bridge)

INV $M = 4.21 - 0.33 = 3.88$ k/ft
OPER $M = 7.02 - 0.33 = 6.69$ "

LOADING	INVENTORY	OPERATING
H 15	$\frac{3.88}{2.72} \times 15 = 21.4$ T	$\frac{6.69}{2.72} \times 15 = 36.9$ T
J	$\frac{3.88}{2.27} \times 27 = 39.3$ T	$\frac{6.69}{2.27} \times 23 = 67.8$ T
J-S2	$\frac{3.88}{2.27} \times 36 = 61.5$ T	$\frac{6.69}{2.27} \times 36 = 106.1$ T

CALCULATION FOR DECK SLAB II (Bridge Widening)



AIT. COVER : $0.21 \cdot 0.144$ = 0.03
SLAB : $0.58 \cdot 0.150$ = 0.09

0.12 k/ft²

$M_{DL} = 0.12 \cdot 5.56^2 \cdot 0.125 \cdot 0.80$ = 0.37 k/ft
$V_{DL} = 0.12 \cdot (5.56 \cdot 0.5 - 0.47) - 1.15$ = 0.32 k/ft

H15 $M_{LL} = \dfrac{12}{0.6 \cdot 5.56 + 2.5} \cdot 0.2 \cdot 5.56 \cdot 1.20$ = 2.97 k/ft

3-S2 $M_{LL} = \dfrac{8}{0.36 \cdot 5.56 + 2.58}$, —"— = 2.52 —"—

H15 $V_{LL} = \dfrac{12}{0.6 \cdot 5.56 + 2.5} \cdot \dfrac{5.56 - 0.47}{5.56} \cdot 1.15 \cdot 1.20$ = 2.81 k/ft

3-S2 $V_{LL} = \dfrac{8}{0.36 \cdot 5.56 + 2.58}$ · —"— = 2.39 —"—

MOMENT AND SHEAR CAPACITY

f'_c = 3000 psi CONCR. ULT. STRENGTH

INVENT f_c = 1200 — ALLOW. CONCR. STRESS
OPER f_c = 1650

INVENT V_c = 90 — — SHEAR —
OPER V_c = 120

INVENT f_s = 20000 — — STEEL —
OPER f_s = 23000

USE HP67 PROGRAM

$d = 5.19''$

$A_s = 0.614\ in^2$
$(\phi\ 5/8''\ c = 6'')$

$n = 10$

$jd = 4.57''$

INV M_c = 4.68 k/ft ; f_c = 1107 psi
OPER M_c = 6.55 — ; f_c = 1550 —

INV V_c = 0.09 · 4.57 · 12 = 4.94 k/ft
OPER V_c = 0.15 · 4.57 · 12 = 8.23 —

DECK SLAB RATING FOR MOMENT (Bridge Widening)

INV = 4.63 − 0.37 = 4.01 K/ft
OPER = 6.55 − 0.37 = 6.18

LOADING	INVENTORY	OPERATING
H 15	$\frac{4.01}{2.97} \times 15 = 21.8^T$	$\frac{6.18}{2.97} \times 15 = 31.2^T$
3	$\frac{4.01}{2.52} \times 23 = 39.3$	$\frac{6.18}{2.52} \times 23 = 56.4$
3-S2	$\frac{4.01}{2.52} \times 36 = 61.6$	$\frac{6.18}{2.52} \times 36 = 88.3$

DECK SLAB RATING FOR SHEAR (Bridge Widening)

INV = 4.94 − 0.32 = 4.62 K/ft
OPER = 8.23 − 0.32 = 7.91 "

LOADING	INVENTORY	OPERATING
H-15	$\frac{4.62}{2.81} \times 15 = 24.7^T$	$\frac{7.91}{2.81} \times 15 = 42.2^T$
3	$\frac{4.62}{2.39} \times 23 = 44.5$	$\frac{7.91}{2.39} \times 23 = 76.1$
3-S2	$\frac{4.62}{2.39} \times 36 = 69.6$	$\frac{7.91}{2.39} \times 36 = 119.1$

DECK SLAB RATING (ORIGINAL BRIDGE)

SLAB ALONG WITH CONC. BEAMS — 8" THICK, S = 4.92

DL MOMENT 8" SLAB = 0.67 × 0.150 = 0.101
6½" Max BIT CONC = 0.54 × 0.144 = 0.078
0.179 K/LF

$M_{DL} = \frac{1}{8} \times 0.179 \times 4.92^2 = 0.54^{IK}$ cont 0.8 $= 0.43^{IK/LF}$

LL MOMENT E = 0.6S + 2.5 = 0.6 × 4.92 + 2.5 = 5.45 SA
E = 0.36S + 2.58 = 0.36 × 4.92 + 2.58 = 4.35 TA

IMPACT 30%

H-15 $M_{LL} = 1.3 \times 0.2 \times \frac{12}{5.45} \times 4.92 = 2.82^{IK/LF}$

3 $M_{LL} = 1.3 \times 0.2 \times \frac{8}{4.35} \times 4.92 = 2.35^{IK/LF}$

3S2 M_{LL} = " " " = $2.35^{IK/LF}$

SECTION CAPACITY

5/8"ϕ @ 6" = 0.62" d = 8 − 1 − 0.31 = 6.69"
n = 15"

$m = q = \frac{nA_s}{bd} = \frac{15 \times 0.62}{12 \times 6.69} = 0.116$

$K = \sqrt{m^2 + 2q} - m = 0.379$ $j = 1 - zk$ for $z = 0.33$ $j = 1 - 0.33 \times 0.379$
$j = 0.875$

Moment Capacity

Inv $M_c = \frac{18000}{12{,}000} \times 0.875 \times 6.69 \times 0.62 = 5.44^{IK/LF}$

OPER $M_c = \frac{25{,}000}{12{,}000} \times 0.875 \times 6.69 \times 0.62 = 7.56^{IK/LF}$

Concrete Stress.

Inv $f_c = \frac{18{,}000}{15} \times \frac{0.379}{(1-0.379)} = 732$ psi < 800 psi

Oper $f_c = \frac{25{,}000}{15} \times \frac{0.379}{(1-0.379)} = 1017$ psi < 1100 psi

DECK SLAB RATING FOR MOMENT (ORIGINAL BRIDGE)

INV M = 5.44 − 0.43 = 5.01
OPER M = 7.56 − 0.43 = 7.13

	INV		OPERATING	
H-15	(5.01/2.82)15	= 26.6 T	(7.13/2.82)15	= 37.9 T
3	(5.01/2.35)23	= 49.0 T	(7.13/2.35)23	= 69.8 T
3S2	(5.01/2.35)36	= 76.7 T	(7.13/2.35)36	= 109.2 T

DL SHEAR

$V_{DL} = \frac{1}{2} \times 0.179 \times 4.92 - 0.179 \times \frac{6.69}{12} = 0.34^{K/LF}$ Cont 1.15 = $\underline{0.39}^{K/LF}$

$d = 6.69$
$d/12 = 0.56$
Haunch 3" = 0.25
0.81

H-15 $V_{LL} = \frac{1.3 \times 12}{5.45}\left[\frac{4.92 - 0.81}{4.92}\right] = 2.39^{K/LF}$ Cont 1.15 = $\underline{2.75}^{K/LF}$

3 & 3S2 $V_{LL} = \frac{1.3 \times 8}{4.35}\left[\frac{4.92 - 0.81}{4.92}\right] = 2.00^{K/LF}$ Cont 1.15 = $\underline{2.30}^{K/LF}$

SHEAR CAPACITY

INV $V_c = 60 \times 12 \times 6.69 \times 0.875 = \underline{4215}$ LBS
OPER $V_c = 100 \times 12 \times 6.69 \times 0.875 = \underline{7025}$ LBS

DECK SLAB RATING FOR SHEAR (ORIGINAL BRIDGE)

INV $V = 4.22 - 0.39 = \underline{3.83}^{K/LF}$

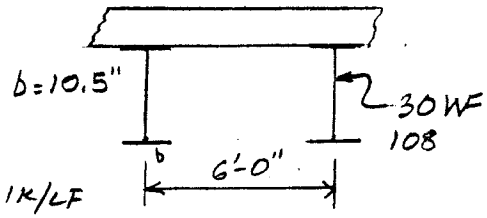
OPER $V = 7.03 - 0.39 = \underline{6.64}^{K/LF}$

	INV		OPER	
H-15	(3.83/2.75)15	= 20.9 T	(6.64/2.75)15	= 36.2 T
3	(3.83/2.30)23	= 38.3 T	(6.64/2.30)23	= 66.4 T
3S2	(3.83/2.30)36	= 59.9 T	(6.64/2.30)36	= 103.9 T

DECK SLAB RATING (BRIDGE WIDENING)

SLAB ALONG WITH STRINGER BEAMS 7" THICK SLAB

DL MOMENT 7" SLAB = 0.58 × 0.150 = 0.087
2½" BIT CONC = 0.21 × 0.144 = 0.030
0.117



$S = 6 - b/2 = 6 - \frac{0.88}{2} = 5.56$

$M_{DL} = \frac{1}{8} \times 0.117 \times 5.56^2 = 0.45^{1K}$ Cont 0.8 $= 0.36^{1K/LF}$

LL MOMENT $E = 0.6S + 2.5 = 0.6 \times 5.56 + 2.5 = 5.84$ SA.
$E = 0.36S + 2.58 = 0.36 \times 5.56 + 2.58 = 4.58$ TA.

IMPACT 30%.

H-15 $M_{LL} = 1.3 \times 0.2 \times \frac{12}{5.84} \times 5.56 = 2.97^{1K/LF}$

3 $M_{LL} = 1.3 \times 0.2 \times \frac{8}{4.58} \times 5.56 = 2.53^{1K/LF}$

3S2 $M_{LL} = 2.53^{1K/LF}$

SECTION CAPACITY 5/8" ϕ @ 6" = 0.62 □" $d = 7 - 1.5 - 0.31 = 5.19"$
$n = 10$

$m = q = \frac{nA_s}{bd} = \frac{10 \times 0.62}{12 \times 5.19} = 0.100$

$k = \sqrt{m^2 + 2q} - m = 0.358$ $j = 1 - zk$ for $z = 0.33$ $j = 1 - 0.33 \times 0.358$
$j = 0.882$

Moment Capacity

INV $M = \frac{20000}{12,000} \times 0.882 \times 5.19 \times 0.62 = 4.73^{1K/LF}$

OPER $M = \frac{28,000}{12,000} \times 0.882 \times 5.19 \times 0.62 = 6.62^{1K/LF}$

Concrete stress

Inv $f_c = \frac{20,000}{10} \times \frac{0.358}{1-0.358} = 1115 < 1200$ psi

OPER $f_c = \frac{28,000}{10} \times \frac{0.358}{1-0.358} = 1561 < 1650$ psi

DECK SLAB RATING FOR MOMENT (BRIDGE WIDENING)

INV M = 4.73 - 0.36 = 4.37
OPER M = 6.62 - 0.36 = 6.26

	INV		OPERATING	
H-15	(4.37/2.97) 15	= 22.1^T	(6.26/2.97) 15	= 31.6^T
3	(4.37/2.53) 23	= 39.7^T	(6.26/2.53) 23	= 56.9^T
3S2	(4.37/2.53) 36	= 62.2^T	(6.26/2.53) 36	= 89.1^T

DL SHEAR

$d = 5.19$
$d/12 = 0.43$

$V_{DL} = \frac{1}{2} \times 0.117 \times 5.56 - 0.117 \times \frac{5.19}{12} = 0.27^{K/LF}$ cont 1.15 = $\underline{0.31}^{K/LF}$

H-15 = $V_{LL} = \frac{1.3 \times 12}{5.84}\left[\frac{5.56 - 0.43}{5.56}\right] = 2.46^{K/LF}$ cont 1.15 = $\underline{2.83}^{K/LF}$

3 & 3S2 $V_{LL} = \frac{1.3 \times 8}{4.58}\left[\frac{5.56 - 0.43}{5.56}\right] = 2.10^{K/LF}$ cont 1.15 = $\underline{2.41}^{K/LF}$

SHEAR CAPACITY

$j = 7/8$ (Assumed)

INV $V_c = 90 \times 12 \times 5.19 \times 0.875 = 4905$ LBS
OPER $V_c = 150 \times 12 \times 5.19 \times 0.875 = 8174$

DECK SLAB RATING FOR SHEAR (BRIDGE WIDENING)

INV V = 4.91 - 0.31 = 4.60
OPER V = 8.17 - 0.31 = 7.86

	INVENTORY		OPERATING	
H-15	(4.60/2.83) 15	= 24.4^T	(7.86/2.83) 15	= 41.7^T
3	(4.60/2.41) 23	= 43.9^T	(7.86/2.41) 23	= 75.0^T
3S2	(4.60/2.41) 36	= 68.7^T	(7.86/2.41) 36	= 117.4^T

MOMENT CAPACITIES FOR SECTIONS

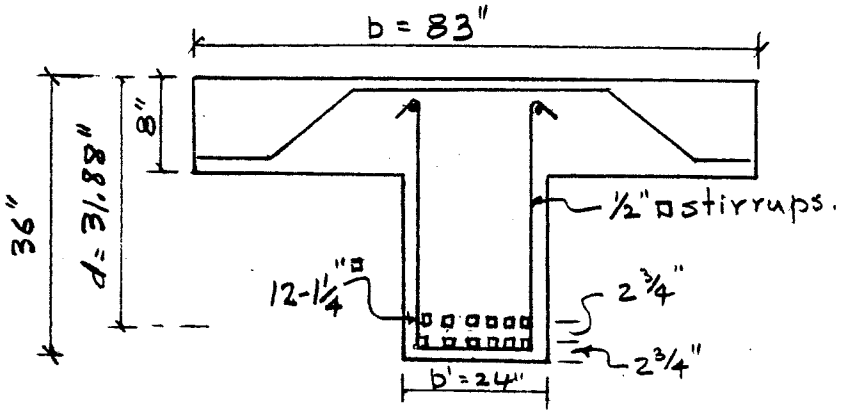
INTERIOR BEAMS APPROACH SPAN

$n = 15$

$1\frac{1}{4}" \square = 1.563\ IN^2$

$A_s = 12 \times 1.563 = 18.76\ IN^2$

$\frac{1.25}{2} = 0.63"$



$36 - 31.88 = 4.12$

$d \times 18.76 = 33.25 \times 9.38 + 30.50 \times 9.38$

$d = \frac{9.38(33.25 + 30.50)}{18.76} = 31.88"$

Effective Slab Width

1) c to c of span 6'-11" = 83"

2) ¼ span Length = ¼(46.5') = 139.5"

3) $(6t)2 = 12 \times 8 = 96"$

$m = q = \frac{nA_s}{bd} = \frac{15 \times 18.76}{24 \times 31.88} = 0.37$ use other method. $k = \sqrt{m^2 + 2q} - m = 0.566$ $kd = 0.566 \times 31.88 = 18.0 > 8"$

$m = \frac{nA_s}{b'd} + \frac{(b-b')t}{b'd} = \frac{15 \times 18.76}{24 \times 31.88}\ (0.368) + \frac{(83-24)8}{2 \times 31.88}\ (0.617) = 0.985$

$q = \frac{nA_s}{b'd} + \frac{(b-b')t}{b'd} \times \frac{t/2}{d} = 0.368 + 0.617 \times \frac{4}{31.88} = 0.445$

$k = \sqrt{m^2 + 2q} - m = \sqrt{0.985^2 + 2 \times 0.445} - 0.985 = 0.379$

$kd = 0.379 \times 31.88 = 12.08$ $t/kd = 8/12.08 = 0.66$ $y = 0.42$ (from table 9 ACI)

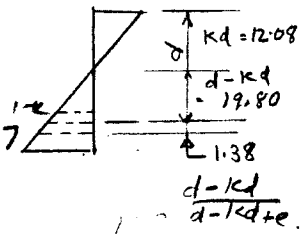
$\frac{1}{K} \times \frac{yt}{d} = \frac{0.42 \times 8}{12.08} = 0.278$

$\frac{1}{K} \frac{(D-b')t}{b'd} = \frac{0.617}{0.379} = 1.628$

$$z = \frac{1/6 + 1.628 \times 0.278 (1 - 0.278)}{1/2 + 1.628 (1 - 0.278)} = 0.295$$

$j = 1 - zk = 1 - 0.295 \times 0.379 = 0.888.$ $jd = 0.888 \times 31.88 = 28.31$

Moment Capacity $M = \frac{f_s A_s jd}{12,000}$.



INV $M_c = \frac{18,000}{12,000} \times 18.76 \times 28.31 = 796.6^{1-k} \times 0.9348 = 744.7^{1-k}$

OPER $M = \frac{25,000}{12,000} \times 18.76 \times 28.31 = 1106.4^{1-k} \times 0.9348 = 1034.3^{1-k}$

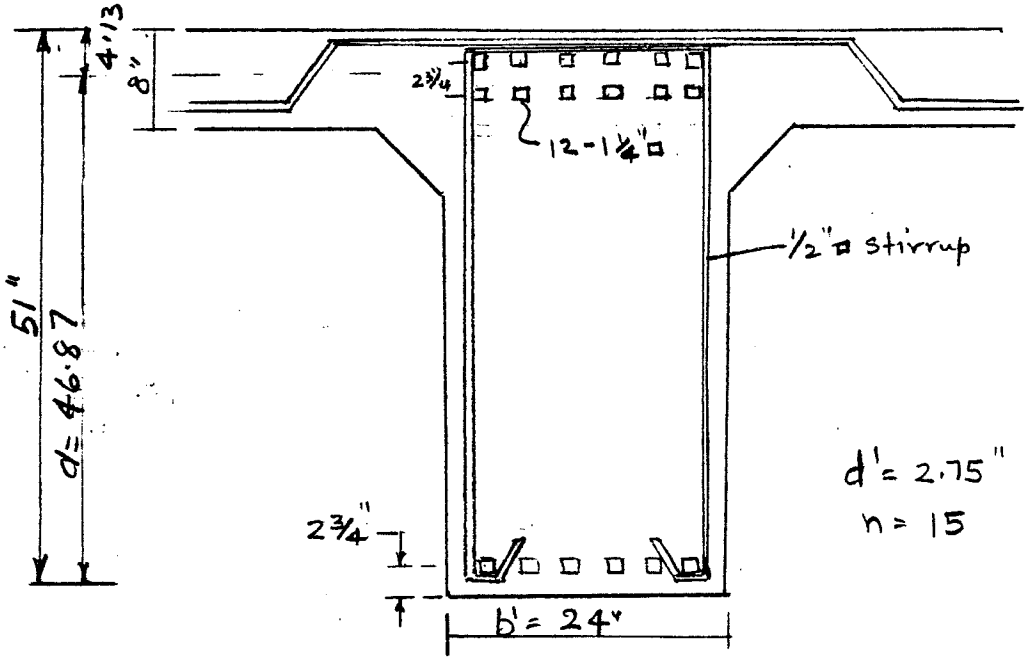
Concrete stress

INV $f_c = (f_s/n)\left(\frac{k}{1-k}\right) = \frac{18000}{15}\left(\frac{0.379}{1-0.379}\right) \times 0.9348 = 685 < 800$ psi

OPER $f_c = (f_s/n)\left(\frac{k}{1-k}\right) = \frac{25,000}{15}\left(\frac{0.379}{1-0.379}\right) \times 0.9348 = 951 < 1100$ psi

MOMENT CAPACITIES FOR SECTIONS.

NEGATIVE MOMENT AT SUPPORT- INTERIOR BEAMS



$1\frac{3}{8} + \frac{7}{8} + \frac{1}{2} + \frac{7}{8} + 1 = 4.13$

51.00
4.13
46.87

$A_s = 12 \times 1.563 = 18.76$

$A'_s = 2 \times 1.563 = 3.13$

$d' = 2.75"$

$n = 15$

$$m = \frac{nA_s}{b'd} + \frac{(2n-1)A'_s}{b'd} = \overset{0.250}{\frac{15 \times 18.76}{24 \times 46.87}} + \overset{0.081}{\frac{29 \times 3.13}{24 \times 46.87}} = 0.331$$

$$q = \frac{nA_s}{b'd} + \frac{(2n-1)A'_s}{b'd} \times \frac{d'}{d} = 0.250 + 0.081 \times \frac{2.75}{46.87} = 0.255$$

$$k = \sqrt{m^2 + 2q} - m = 0.456 \qquad \frac{1}{k}\frac{(2n-1)A'_s}{b'd} = \frac{0.081}{0.456} = 0.178$$

$$\frac{1}{k}\frac{d'}{d} = \frac{2.75}{0.456 \times 46.87} = 0.129$$

$kd = 0.456 \times 47.5 = 21.66$.

$$z = \frac{\frac{1}{6} + \frac{(2n-1)A'_s}{kb'd}\frac{d'}{kd}\left(1 - \frac{d'}{kd}\right)}{\frac{1}{2} + \frac{(2n-1)A'_s}{kb'd}\left(1 - \frac{d'}{kd}\right)} = \frac{\frac{1}{6} + 0.178 \times 0.129(1-0.129)}{\frac{1}{2} + 0.178(1-0.129)}$$

$z = 0.285 \qquad j = 1 - zk = 1 - 0.285 \times 0.456 = 0.870$

$jd = 0.87 \times 46.87 = 40.78$

Moment Capacity

INV $M_c = \frac{f_s A_s j d}{12000} = \frac{18000 \times 18.76 \times 40.78}{12000} = 1147^{1K}$ $\times \frac{800}{1005.9} = 912.2^{1K}$

$= 912.2^{1K}$

OPER $= \frac{25000 \times 18.76 \times 40.78}{12000} = 1594^{1K} \times \frac{1100}{1397.0}$

$= 1255.1^{1K}$

$= 1255.1^{1K}$

Concrete Stress

INV $f_c = \frac{1}{15} \times 18000 \times \frac{0.456}{1-0.456} = 1005.9 > 800$ psi

OPER $= \frac{1}{15} \times 25000 \times \frac{0.456}{1-0.456} = 1397.0 > 1100$ psi

$f_s = \frac{12000 \times 912.2}{18.76 \times 40.78} = 14308.4.$

$f's = 2 \times 14308.4 \times \frac{0.456 - \frac{2.75}{46.87}}{1-0.456} = 20901.1$

2nd Trial

$2n-1 = 29 \times \frac{18000}{20901} = 24.97.$

$m = \frac{nA_s}{b'd} + \frac{(2n-1)A's}{b'd} = 0.25 + \frac{24.97 \times 3.13}{24 \times 46.87}$ (0.069) $= 0.319$

$q = \frac{nA_s}{b'd} + \frac{(2n-1)A's}{b'd} \times \frac{d'}{d} = 0.25 + 0.069 \times \frac{2.75}{46.87} = 0.254$

$k = \sqrt{m^2+2q} - m = 0.462$ $\quad \frac{1}{k}\frac{(2n-1)A's}{b'd} = 0.069 \times \frac{1}{0.462} = 0.149$ $\quad kd = 21.65$

$\frac{1}{k}\frac{d'}{d} = \frac{2.75}{0.462 \times 46.87} = 0.127$

$z = \frac{\frac{1}{6} + 0.149 \times 0.127(1-0.127)}{\frac{1}{2} + 0.149(1-0.127)} = 296$ $\quad j = 1 - zk = 1 - 0.296 \times .462 =$

$jd = 0.863 \times 46.87 = 40.46$

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Moment Capacity

INV $M_c = \frac{f_s A_s j d}{12000} = \frac{18000 \times 18.76 \times 40.46}{12000} = 1139 \times \frac{800}{1030} = 885$

OPER $= \frac{25000 \times 18.76 \times 40.46}{12000} = 1581 \times \frac{1100}{1431} = 1216$

Concrete stress

INV $f_c = \frac{1/15 \times 18000 \times 0.462}{1 - .462} = 1030 > 800$

OPER $= \frac{1/15 \times 25000 \times 0.462}{1 - .462} = 1431 > 1100$

$f_s = \frac{12000 \times 885}{18.76 \times 40.46} = 13991$

$f_s = 1.72 \times 13991 \frac{0.462 - \frac{2.75}{46.87}}{1 - 0.462} = 18040$

SHEAR CAPACITIES FOR SECTIONS

AT PIER

$d = 51 - 2.75 = 48.25$ $j \cong 0.875$ $jd = 42.2$.

INVENTORY

Concrete capacity $V = vbjd = 60 \times 24 \times 42.2/1000 = 60.77$

Stirrups Capacity 2-½"@ 6" $V' = f_v A_v jd/s$

$= \frac{18{,}000 \times 0.5 \times 42.2}{1000 \times 6"} = \frac{63.30}{124.07}$

OPERATING

Concrete Capacity $V = 100 \times 24 \times 42.2/1000 = 101.28$

Stirrups Capacity $= \frac{25000 \times 0.5 \times 42.2}{1000 \times 6"} = \frac{87.92}{189.20}$

AT ABUTMENT

$d = 31.88$ $j = \cong 0.875$ $jd = 27.9$ $s = 8$

INV

Concrete Capacity $= 60 \times 24 \times 27.9/1000 = 40.18$

Stirrups Capacity $= \frac{18{,}000 \times 0.5 \times 27.9}{1000 \times 8} = \frac{31.39}{71.57}$

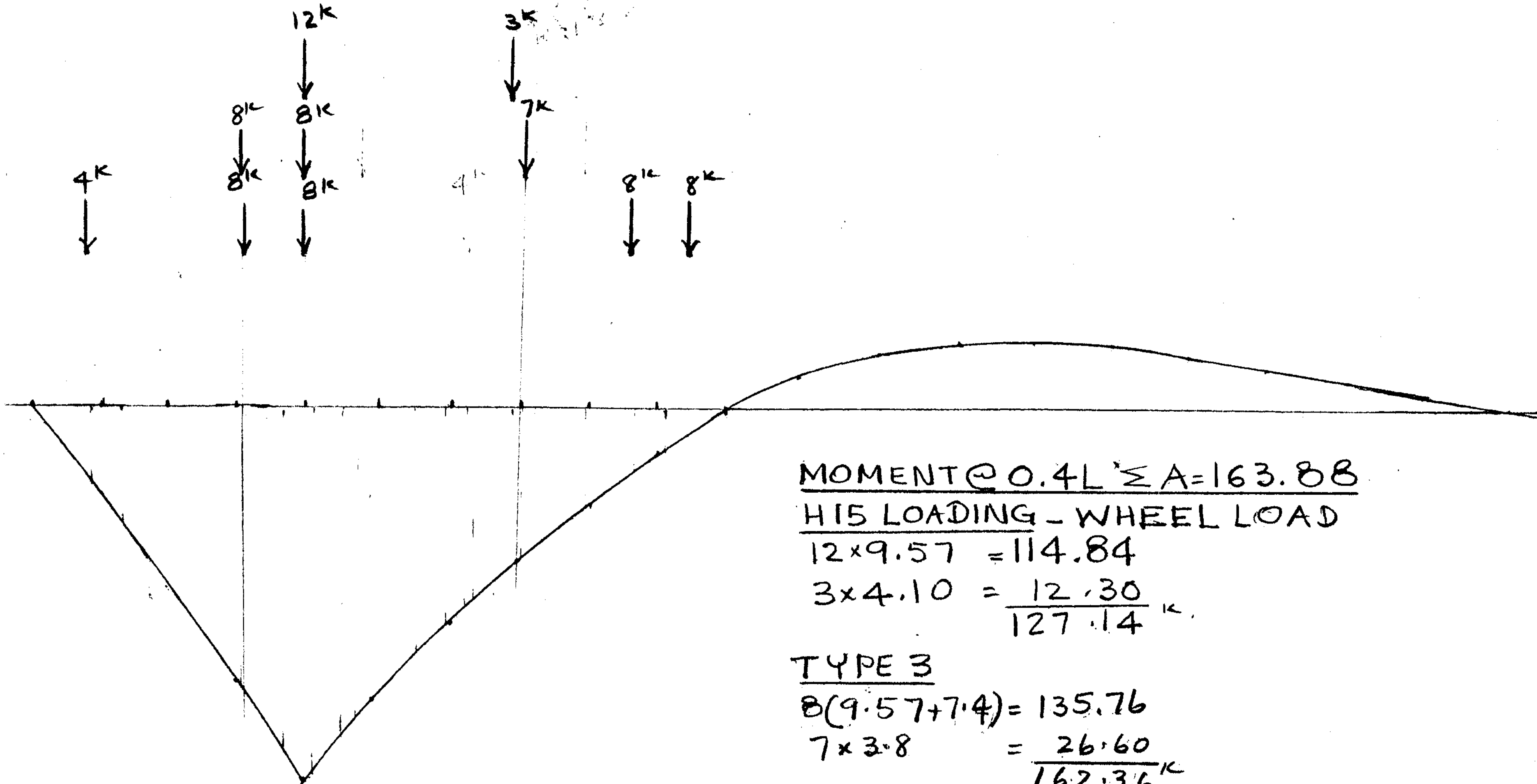
bent up bars Capacity $V' = A f_v \sin\alpha$ $= \frac{4 \times 1.563 \times 18{,}000 \times 0.707}{1000} = \frac{79.56}{151.13}$

OPERATING

Concrete Capacity $V = 100 \times 24 \times 27.9/1000 = 66.96$

Stirrups Capacity $= \frac{25000 \times 0.5 \times 27.9}{1000 \times 8} = \frac{43.59}{110.55}$

bent up bars Capacity $V' = A f_v \sin\alpha$ $= \frac{4 \times 1.563 \times 25000 \times 0.707}{1000} = \frac{110.50}{221.05}$



MOMENT @ 0.4L Σ A = 163.88

H15 LOADING - WHEEL LOAD

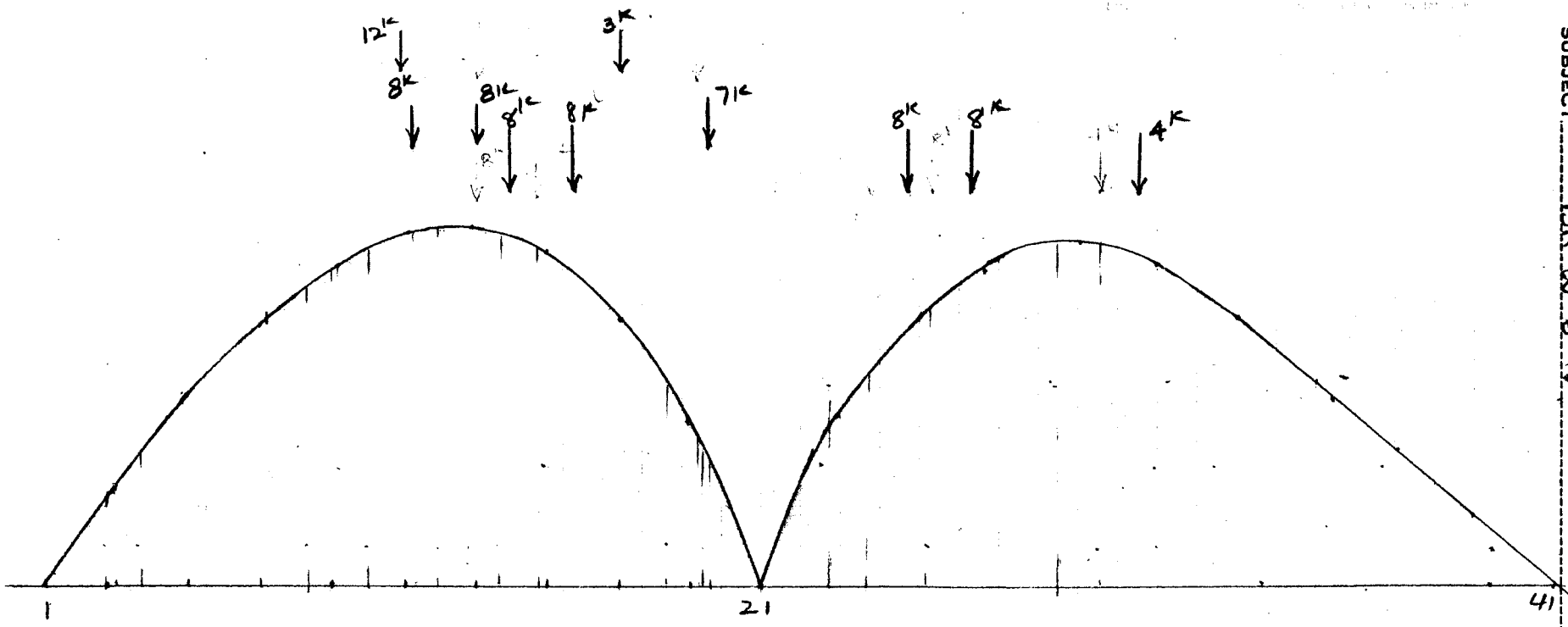
12×9.57 = 114.84
3×4.10 = 12.30
127.14 k

TYPE 3

8(9.57+7.4) = 135.76
7×3.8 = 26.60
162.36 k

TYPE 3S2

8(9.57+7.2+1.8+0.4) = 151.76
4×1.6 = 6.40
158.16



MOMENT @ 1.0L $\Sigma A = -238.99$

H 15 LOADING – WHEEL LOAD

$12 \times 4.50 = 54.0$

$3 \times 3.20 = 10.5$

64.5^{K}

TYPE 3

$8(4.55+4.5) = 72.4$

$7 \times 3.2 = 22.4$

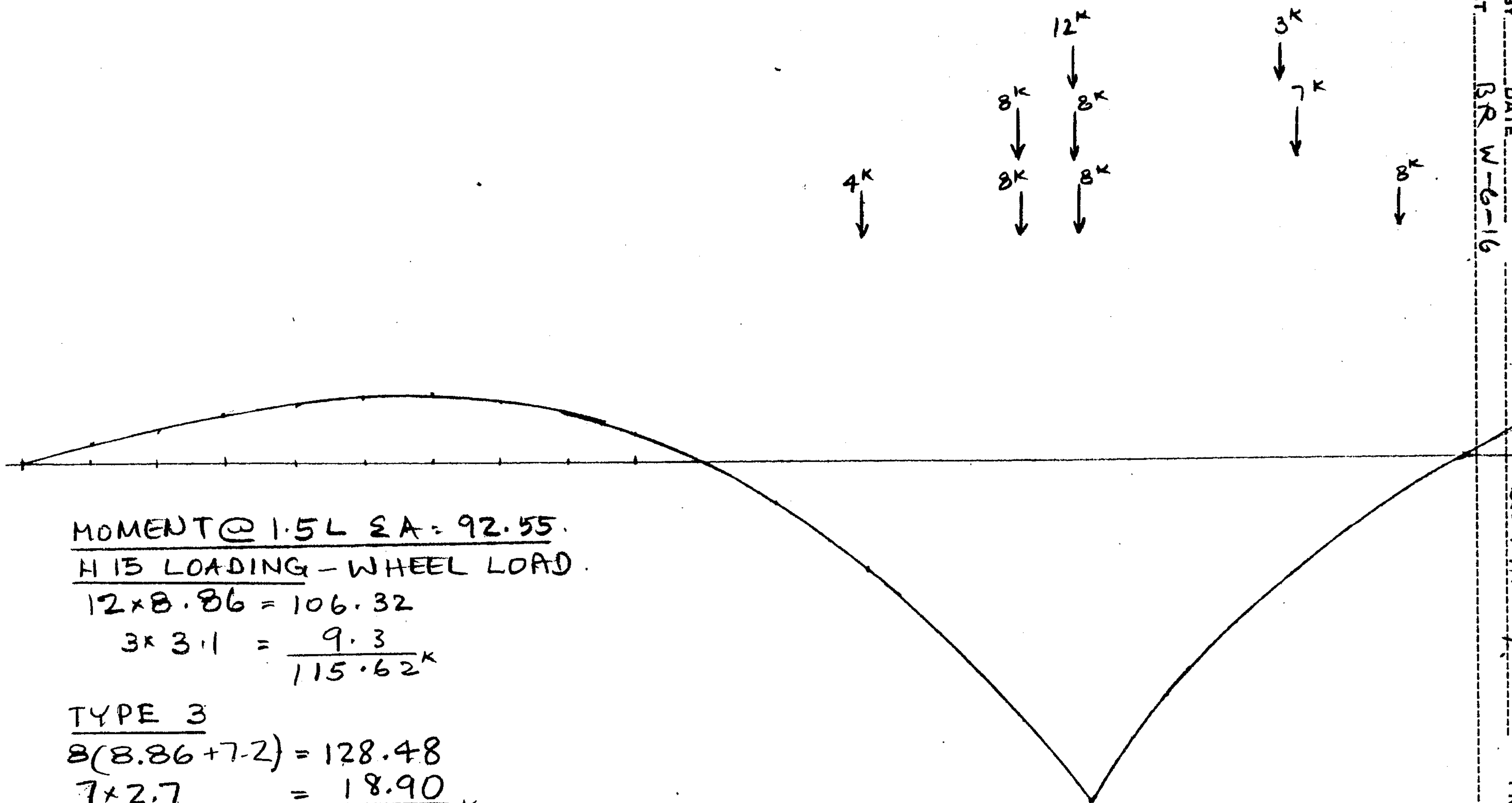
94.8^{K}

TYPE 352

$8(4.4+4.1+3.2+4.0) = 128.8$

$4 \times 4.1 = 16.4$

145.2^{K}



MOMENT @ 1.5L ΣA = 92.55.

H 15 LOADING – WHEEL LOAD.

12 × 8.86 = 106.32
3 × 3.1 = 9.3
= 115.62 K

TYPE 3

8(8.86 + 7.2) = 128.48
7 × 2.7 = 18.90
= 147.38 K

TYPE 3S2

8(8.86 + 7.2 + 0.8) = 134.88
4 × 2.8 = 11.20
= 146.08 K

DEAD LOAD MOMENTS POSITIVE

D.L. BEAM	$= \frac{24}{12} \times \frac{28}{12} \times 0.150$	$= 0.700$
HAUNCH	$= \frac{2 \times 3}{2} \frac{}{12} \times \frac{3}{12} \times 0.150$	$= 0.009$
S.W + Railing		$= 0.310$
SLAB + BIT	$= \frac{83}{12} \times 0.140$	$= 0.968$ K/LF @ MID SPAN
CONC @ SUPPORT	$= \frac{15}{12} \times \frac{24}{12} \times 0.150 = 0.375 \times \frac{14}{50}$	$= \frac{0.105}{2.092}$ K/LF @ SUPPORT

INTERIOR BEAM DEAD LOAD MOMENTS POSITIVE

Pt 9 $M = \Sigma A \times W = 163.88 \times 2.1092 = 342.84$ IK.

LL+I MOMENTS POSITIVE

WHEEL DIST. FACTOR $\frac{6.92}{6} = 1.15$ Impact I $= \frac{50}{L+125} = \frac{50}{46.5+125} = 0.29 = 29\%$

H-15 LOADING

At pt 9 $M = 127.14 \times 1.15 \times 1.29 = \underline{188.6}$ IK

TYPE-3 LOADING

$M = 162.36 \times 1.15 \times 1.29 = \underline{240.9}$ IK

TYPE-3S2 LOADING

$M = 158.16 \times 1.15 \times 1.29 = \underline{234.6}$ IK.

INTERIOR BEAM DEAD LOAD MOMENTS NEGATIVE

pt @ Support $M = -\Sigma A \times \omega = -238.99 \times 2.092 = -500.0^{1K}$

LL+I MOMENTS NEGATIVE

H-15 LOADING

At pt 21 $M = -64.5 \times 1.15 \times 1.29 = -95.7^{1K}$

TYPE 3 LOADING

$M = -94.8 \times 1.15 \times 1.29 = -140.64^{1K}$

TYPE-3S2 LOADING

$M = -145.2 \times 1.15 \times 1.29 = -215.40^{1K}$

INTERIOR BEAM DEAD LOAD MOMENTS POSITIVE

MID SPAN pt @ 1.5L. $M = \Sigma A \times \omega = 192.55 \times 2.092 = 193.6^{1K}$

LL+I MOMENTS

H-15 LOADING

@ pt 31 $M = 115.62 \times 1.15 \times 1.29 = 171.52^{1K}$

TYPE 3 LOADING

$M = 147.38 \times 1.15 \times 1.29 = 218.64^{1K}$

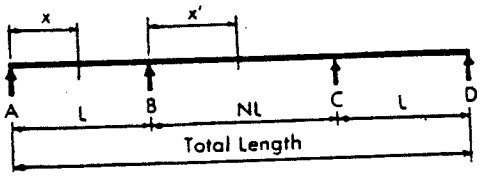
TYPE-3S2 LOADING

$M = 146.08 \times 1.15 \times 1.29 = 216.71^{1K}$

TABLE 3.1

Symmetrical three-span continuous beam.
Constant moment of inertia.
AASHO HS20-44 loading.

N=1.1



Total Length Ft.	Exter. Span Length "L"	Max. Reaction Kips.		Max. Shear Kips.		Max. Moment Kip.-ft.			Impact Coefficient				Dist.-Ft.	
		at A	at B	in AB at B	in BC at B or C	in AB at X	at B	in BC at X'	I	II	III	IV	X	X'
90	29.0	45.7	62.2	-52.0	51.1	219.1	-185.2	195.6	.300	.300	.300	.269	10.3	14.5
105	33.9	48.8	64.6	-55.7	54.4	275.9	-219.4	250.4	.300	.300	.300	.255	12.2	17.1
120	38.7	51.4	66.2	-58.3	56.9	338.2	-254.0	308.0	.300	.300	.298	.242	15.6	19.8
135	43.5	53.4	67.3	-60.2	58.8	406.2	-302.8	367.4	.297	.293	.289	.231	17.5	22.5
150	48.4	55.2	68.2	-61.7	60.4	475.0	-355.4	428.0	.288	.284	.281	.221	19.5	25.1
165	53.2	56.6	68.8	-62.9	61.6	544.3	-411.8	489.7	.281	.276	.272	.211	21.6	27.8
180	58.1	57.8	72.5	-63.8	62.7	614.2	-472.1	552.0	.273	.269	.265	.202	23.6	30.4
195	62.9	58.9	76.3	-64.6	63.5	684.3	-536.1	614.9	.266	.262	.257	.194	25.6	33.1
210	67.7	59.8	80.2	-65.3	64.2	754.7	-603.9	678.3	.259	.255	.251	.187	27.7	35.8
225	72.6	60.6	84.1	-65.8	64.8	825.3	-675.5	741.9	.253	.248	.244	.180	29.7	38.4
240	77.4	61.2	87.9	-66.3	65.4	896.1	-750.9	805.9	.247	.242	.238	.174	31.8	41.1
255	82.3	61.9	91.8	-66.7	65.8	967.0	-830.1	870.1	.241	.237	.232	.168	33.8	43.7
270	87.1	62.4	95.7	-67.1	66.2	1038.1	-913.2	934.5	.236	.231	.226	.162	35.9	46.4
285	91.9	62.9	99.5	-67.4	66.6	1109.2	-999.9	999.1	.230	.226	.221	.157	38.0	49.1
300	96.8	63.4	103.4	-67.7	66.9	1180.5	-1090.5	1063.8	.225	.221	.216	.152	40.0	51.7
315	101.6	63.8	107.3	-67.9	67.2	1251.8	-1184.9	1128.6	.221	.216	.211	.148	42.1	54.4
330	106.5	64.1	111.2	-68.7	68.5	1323.1	-1283.1	1193.6	.216	.211	.207	.143	44.2	57.1
345	111.3	64.5	115.0	-70.6	70.4	1394.5	-1385.1	1258.6	.212	.207	.202	.139	46.2	59.7
360	116.1	64.8	118.9	-72.6	72.3	1466.0	-1490.9	1323.7	.207	.202	.198	.136	48.3	62.4
Impact		I	IV	I	III	I	II	III						
Dead Load		.3900 x wL	1.1600 x wL	-.6100 x wL	.5500 x wL	.0761 x wL^2	-.1100 x wL^2	.0413 x wL^2					.3900 x L	.5500 x L

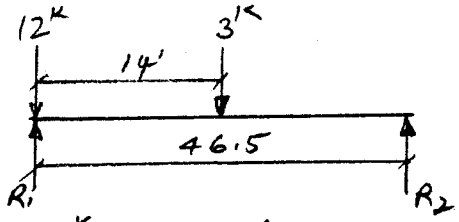
DEAD LOAD SHEAR

AT ABUTMENT INTERIOR BEAMS

$V = 0.39\,wL = 0.39 \times 2.134 \times 46.5 = 38.70^{K}$

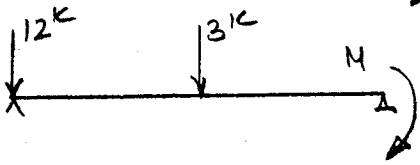
LL+I SHEAR

H 15 LOADING



$R_1 \times 46.5 = 12 \times 46.5 + 3 \times 32.5$

$R_1 = \dfrac{12 \times 46.5 + 3 \times 32.5}{46.5} = 14.10$



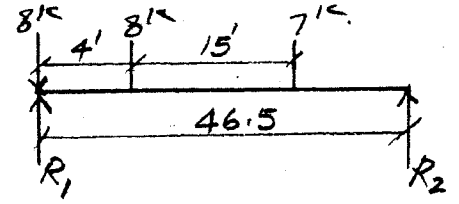
$M = 3 \times 3.4 = 10.2$

$V_M = \dfrac{10.2}{46.5} = 0.22$

13.88

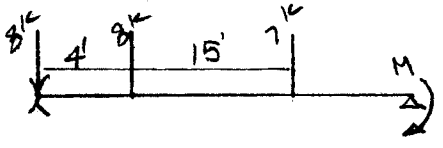
$V = 13.88 \times 1.15 \times 1.29 = \underline{20.59}$

TYPE 3 LOADING



$R_1 \times 46.5 = 8(46.5 + 42.5) + 7 \times 27.5$

$R_1 = 19.45$



$M = 8 \times 1.1 + 7 \times 4 = 36.8$

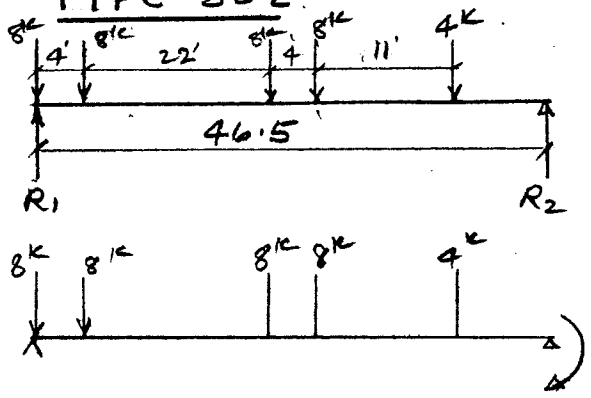
$V_M = \dfrac{36.8}{46.5} = .79$

18.66

$V = 18.66 \times 1.15 \times 1.29 = \underline{27.68^{K}}$

AT ABUTMENT INTERIOR BEAMS CONTD

TYPE 3S2



$R_1 \times 46.5 = 8(46.5+42.5+20.5+16.5)+4\times5.5$

$= 1030$

$R = \frac{1030}{46.5} = 22.15$

$M = 8(1.1+4.5+4.4) + 4\times2.6$

$= 90.4$

$V_M = \frac{90.4}{46.5} = \frac{1.94}{20.21}$

$V = 20.21 \times 1.15 \times 1.29 = \underline{29.98}^{K}$

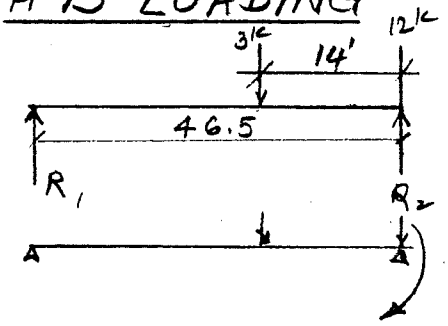
AT PIER APPROACH SPAN SIDE

DEAD LOAD SHEAR

$V = 0.61 \times 2.134 \times 46.5 = 60.53^{K}$

LL+I SHEAR

H 15 LOADING



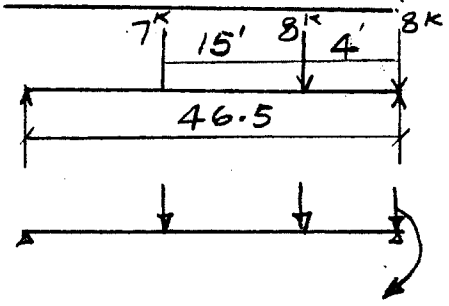
$R_2 = 14.10$

$M = 3 \times 4.2 = 12.6$

$V_M = \frac{12.6}{46.5}$ $= \frac{0.27}{14.37}$

$V = 14.37 \times 1.15 \times 1.29 = \underline{21.32}$

TYPE 3 LOADING



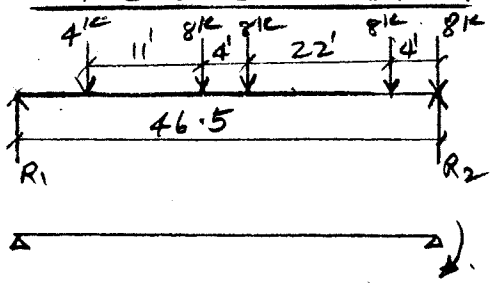
$R_2 = 19.45$

$M = 8 \times 1.9 + 7 \times 4.55 = 47.05$

$V_M = \frac{47.05}{46.5} = 1.01$ $= \frac{1.01}{20.46}$

$V = 20.46 \times 1.15 \times 1.29 = \underline{30.35}^{K}$

TYPE 3S2 LOADING



$R_2 = 22.15$

$M = 8(1.8 + 4.3 + 3.8) + 4 \times 1.7$
$= 86$

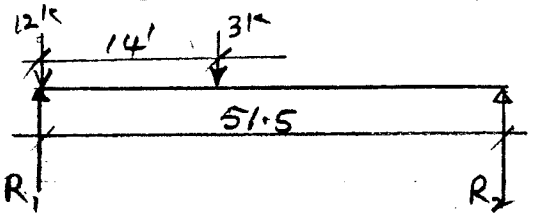
$V_M = \frac{86}{46.5}$ $= \frac{1.85}{24.00}$

$V = 24.00 \times 1.15 \times 1.29 = \underline{35.60}^{K}$

AT PIER CENTER SPAN

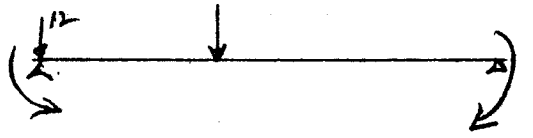
DEAD LOAD SHEAR

$V = 0.55 \times 2.134 \times 46.5 = 54.58^{K}$



$R_1 \times 51.5 = 12 \times 51.5 + 3 \times 37$

$R_1 = \frac{729}{51.5} = 14.16$

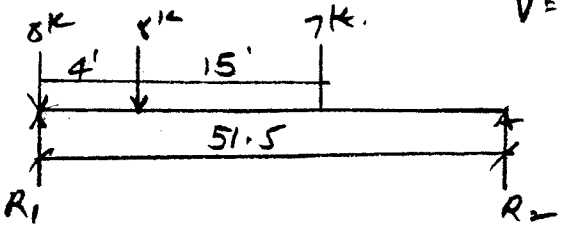


$M = -3 \times 4.1 + 3 \times 2.4 = -5.1$

$V_M = \frac{-5.1}{51.5} = .10$ (-)

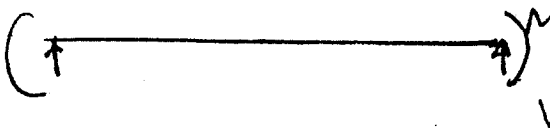
14.06

$V = 14.06 \times 1.15 \times 1.29 = \underline{20.86^{K}}$



$R_1 \times 51.5 = 8 \times 51.5 + 8 \times 47.5 + 7 \times 32.5$

$R_1 = \frac{1019.5}{51.5} = 19.80$

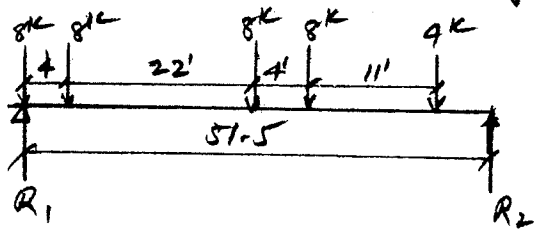


$M = -(8 \times 2 + 7 \times 4.4) + (8 \times 0.7 + 7 \times 3.1)$

$V_M = \frac{-19.5}{51.5} = 0.38$

19.42

$V = 19.42 \times 1.15 \times 1.29 = \underline{28.81^{K}}$



$R_1 \times 51.5 = 8(51.5 + 47.5 + 25.5 + 21.5) + 4 \times 10.5$

$R_1 = \frac{1210}{51.5} = 23.5$

-83.6

$M = [-8(1.8 + 4.1 + 3.6) + -4 \times 1.9] + [8(0.7 + 4.1 + 4.3) + 4 \times 3.4]$

86.4

$V_M = \frac{2.8}{51.5} = 0.05$

23.55

$V = 23.55 \times 1.15 \times 1.29 = \underline{34.94^{K}}$

RATING FOR INTERIOR BEAMS POSITIVE MOMENT

(Approach Span) @ 0.4

INV 744.7 − 342.8 = 401.9
OPER 1034.3 − 342.8 = 691.5

LOADING	INVENTORY	OPERATING
H-15	(401.9/188.6)15 = 32.0^T	(691.5/188.6)15 = 55^T
3	(401.9/240.9)23 = 38.4^T	(691.5/240.9)23 = 66.1^T
3S2	(401.9/234.6)36 = 61.7^T	(691.5/234.6)36 = 106.1^T

RATING FOR INTERIOR BEAMS NEGATIVE MOMENT AT PIER

@ 1.0 L.

INV 885.0 − 500.0 = 385.0
OPER 1216.0 − 500.0 = 716.0

LOADING	INVENTORY	OPERATING
H-15	(385.0/95.75)15 = 60.3^T	(716.0/95.7)15 = 112.2^T
3	(385.0/140.6)23 = 63.0^T	(716.0/140.6)23 = 117.1^T
3S2	(385.0/215.4)36 = 64.3^T	(716.0/215.4)36 = 119.7^T

RATING FOR INTERIOR BEAMS POSITIVE MOMENT @ 1.5L.

Center Span

INV 744.7 − 193.6 = 551.1^{1K}
OPER 1034.3 − 193.6 = 840.7^{1K}

LOADING	INVENITORY	OPERATING
H-15	(551.1/171.52)15 = 48.2^T	(840.7/171.52)15 = 73.5^T
3	(551.1/218.64)23 = 58.0^T	(840.7/218.64)23 = 88.4^T
3S2	(551.1/216.71)36 = 91.5^T	(840.7/216.71)36 = 139.7^T

RATING FOR SHEAR FOR INTERIOR BEAMS CONT'D

AT PIER ON APPROACH SPAN SIDE

INV 124.07 − 60.53 = 63.54
OPER 189.20 − 60.53 = 128.67

LOADING	INVENTORY	OPERATING
H-15	(63.5/21.32)15 = 44.7^T	(128.7/21.32)15 = 90.5^T
3	(63.5/30.35)23 = 48.2^T	(128.7/30.35)23 = 97.5^T
3S2	(63.5/35.60)36 = 64.3^T	(128.7/35.60)36 = 130.1^T

AT PIER ON CENTER SPAN SIDE

INV 124.07 − 54.58 = 69.5^T
OPER 189.20 − 54.58 = 134.6^T

LOADING	INVENTORY	OPERATING
H-15	(69.5/20.86)15 = 50.0^T	(134.6/20.86)15 = 96.8^T
3	(69.5/28.81)23 = 55.5^T	(134.6/28.81)23 = 107.5^T
3S2	(69.5/34.94)36 = 71.6^T	(134.6/34.94)36 = 138.7^T

RATING FOR SHEAR FOR INTERIOR BEAMS AT ABUTMENTS

INV 151.[illegible] − 38.7 = 112.4
OPER 221.[illegible] − 38.7 = 182.4

LOADING	INVENTORY	OPERATING
H-15	(112.4/20.59)15 = 81.9^T	(182.4/20.59)15 = 132.9^T
3	(112.4/27.68)23 = 93.4^T	(182.4/27.68)23 = 151.6^T
3S2	(112.4/29.98)36 = 135.0^T	(182.4/29.98)36 = 219.0^T

MDPW COMPUTER INPUT DATA

* 125 BR W-6-16 DEPT. REF. NO. 897 WAREHAM

a) Interior stringer 1957
b) Fascia stringer 1957

IR = 100 100% AASHTO IMPACT FOR INVENTORY LOADING
OR = 100 100% —11— OPERATING LOADING
SLC = 100 100% —11— FOR SAFE LOADING CAPACITY

SLC STRESS LEVEL a) 100 b) 125 100% for interior bm. 125% for fascia beam
SPLL BLANK NO SPECIAL LL DESIRED
MATERIAL S STEEL

FLOOR SYSTEM GGG MULTIPLE GIRDER SYSTEM
TIE PLATE BLANK NOT APPLICABLE
LOAD BLANK ALL STD. LOADINGS
BUG BLANK NOT USED
LANE BLANK NO LANE LOADING REQUIRED
INF a) 1 b) Blank Influence lines required (int bm only)
point of contraflexure est. $.25 \times 51.5 = 12.9'$
UNL 0
K 0
A 0 NO HOLES IN FLANGE

30WF108 $b = 10.484''$
Stress all $18150 - 6.3\left(\frac{12.9 \times 12}{10.484}\right)^2$

$18150 - 1374 = 16777$ psi
$16777 \times 1.20 = 20132$ psi > 18150 psi
use UNL = 0 for 18150 psi

BRIDGE CROSS SECTION AND LOADING

PARAPET & SIDEWALK WIDTH BLANK
GIRDER SPACING a) 6. b) 4.25 $6.0/2 + 1.25 = 4.25$
TO COMP. WGHT OF CONC. SLAB ONLY AT FASCIA GDR
DISTR. FACTOR a) .545 b) .545 a) $\frac{1}{2} \times \frac{6.0}{5.5} = .545$ S = 6.0
b)

Slab Thick. 7"

HAUNCH BLANK

Superimposed DL. a) .390 b) .390
k/Ft.

Superimposed DL

2½" Bit. conc. $.21 \times 13.58 \times .16 = .453$
Sidewalk $7.25 \times \frac{1.04+1.31}{2} = 8.52$
$- 4.0 \times .67 = -2.68$
$5.84 \times .15 = .876$
Partition tiles $.034 \times 4.0$ .136
Handrail say .100
1.565 k/LF
equally distr. to 4 GDRs $1.565/4 = .391$ k/LF
a & b say .390 k/LF

Hardware a) 17 b) 9
lbs/Ft

Hardware
a) Diaphragms $\frac{.0427 \times 6.0}{16} = .016$
Connectors 3% .001
.017 k/LF
b) $\frac{1}{2} \times .017 = .009$ k/LF

Sidewalk Live Load a) Blank b) 180
lbs/Ft.

Sidewalk LL.
$\frac{1}{2} \times 60 \times 6.0 = 180$ lbs/Ft.

F'_c 3 for 3000 psi conc.
n 10
SYMMETRY Y symmetry.

SPAN LENGTH

CONT.	C	FOR CONT. GDR
①	a)b) 46.5	SPAN 1
②	a)b) 51.5	SPAN 2
③	a)b) 46.5	SPAN 3

STEEL MEMBER PROPERTIES

	G
SPAN NO.	1
RANGE (FT)	46.5
MOMENT OF INERTIA (in^4)	4461
Area (in^2)	31.77
Depth (in)	29.82
web th. (in)	.548
Non composite	N
FY. ksi	33

Multigirder system

30 WF108 — $I = 4461.0\ in^4$, $A = 31.77\ in^2$, $d = 2982\ in$, web th = .548 in, Flange width = 10.484 in

Steel 33 KSI YIELD STRENGTH
STR. STEEL 1956

	G
SPAN NO	2
RANGE (FT)	51.5/2 = 25.75
MOMENT OF INERTIA	4461
Area	31.77
Depth	29.82
web th.	.548
Non compos	N
FY. ksi.	33

FOR SYMMETRY

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*125 BR W-6-16 DEPT. REF. NO. 897  WAREHAM
INTERIOR STEEL STRINGER 1957
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PROBLEM IDENTIFICATION

% OF AASHTO IMPACT FACTOR			SLC STRESS LEVEL	SP. LL.	MATERIAL	FLOOR SYSTEM	TIE PLATE	LOAD	BUG	LANE	INF	GIRDER			FLOORBEAM			STRINGER		
IR	OR	SLC										UNL	K	A	UNL	K	A	UNL	K	A
1.00	1.00	1.00	1.00		S	GGG					1	0.	0.	0.						

BRIDGE CROSS SECTION AND LOADING

PARAPET + SIDEWALK WIDTH	GIRDER OR TRUSS SPACING	CL. OF GIRDER OR TRUSS TO CURB	LEFT ROADWAY WIDTH	MEDIAN WIDTH	RIGHT ROADWAY WIDTH	DISTR FACTOR	SLAB THICK	HAUNCH	SUPER DEAD LOAD	HARD-WARE	SIDE-WALK LL	F'C	N	SYMMETRY	LL LOCAT.	EFFECTIVE LENGTH FACTOR, K	NO. OF PANELS	TR OUT
	6.					.545	7.		.390	.17		3.	1.0	Y				

SPAN LENGTHS

CONT.	1	2	3	4	5	6	7	8
C	46.5	51.5	46.5					

TRUSS ANALYSIS AND BRIDGE RATING

TRAFFIC LANE LOCATIONS

1			2			3			4			5			6		
DIST	WIDTH	% LL	DIST	WIDTH	% LL	DIST	WIDTH	% LL	DIST	WIDTH	% LL	DIST	WIDTH	% LL	DIST	WIDTH	% LL

PREPARED BY AFP DATE 9/27/79 SHEET 1 OF 4

5543

BRIDGE ANALYSIS AND RATING

STEEL MEMBER PROPERTIES

G F OR S	SPAN NO.	RANGE	WF BEAM OR WEB OF BUILT-UP SECTION		WF OR WEB PLATE				TOP PLATE		BOTTOM PLATE		COMPOSITE	FY
			MOMENT OF INERTIA	AREA	DEPTH LEFT	DEPTH RIGHT	V	THICK	WIDTH	THICK	WIDTH	THICK		
1	2	3	8	16	20	26	30	31	36	40	45	49	54	55 67
G	1	4,6.5	4,4,6,1.	3,1.7,7	29.82			.5,4,8,					N	33.
G	2	2,1.7,5	4,4,6,1.	3,1.7,7	29.82			.5,4,8,					N	33.

PREPARED BY AFP DATE 9/27/79 SHEET 2 OF 4

564 83

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*125 BR W-6-16 DEPT. REF. NO. 897  WAREHAM
 FASCIA STEEL STRINGER 1957
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PROBLEM IDENTIFICATION

% OF AASHTO IMPACT FACTOR			SLC STRESS LEVEL	SP. LL.	MATERIAL	FLOOR SYSTEM	TIE PLATE	LOAD	BDG	LANE	INF	GIRDER			FLOORBEAM			STRINGER		
IR	OR	SLC										UNL	K	A	UNL	K	A	UNL	K	A
1.00	1.00	1.00	1.25		S	GGG						0.	0.	0.						
1	4	7	10		15		19		24		26		31	35	38	43	47	50	55	59

BRIDGE CROSS SECTION AND LOADING

PARAPET + SIDEWALK WIDTH	GIRDER OR TRUSS SPACING	CL. OF GIRDER OR TRUSS TO CURB	LEFT ROADWAY WIDTH	MEDIAN WIDTH	RIGHT ROADWAY WIDTH	DISTR FACTOR	SLAB THICK	HAUNCH	SUPER DEAD LOAD	HARD-SHARE	SIDE-WALK LL	F'C	N	SYMMETRY	LL LOCAT.	EFFECTIVE LENGTH FACTOR, K	NO. OF PANELS	TR OUT
	5	9	13	17	21	25	29	33	37	41	44	47	51	53	54	56	58	63
	4.25					.545	7.		.390	9	18.0	3.	1.0	Y				

SPAN LENGTHS

CONT.	1	2	3	4	5	6	7	8
	5	9	13	17	22	27	32	37 41
C	46.5	51.5	46.5					

TRUSS ANALYSIS AND BRIDGE RATING

TRAFFIC LANE LOCATIONS

1			2			3			4			5			6		
DIST	WIDTH	% LL	DIST	WIDTH	% LL	DIST	WIDTH	% LL	DIST	WIDTH	% LL	DIST	WIDTH	% LL	DIST	WIDTH	% LL
	5	9	13	18	20	23	27	31	34	38	42	46	49	53	58	60	64 65

5744 83

PREPARED BY AFR DATE 9/27/79 SHEET 3 OF 4

BRIDGE ANALYSIS AND RATING

STEEL MEMBER PROPERTIES

G F OR S	SPAN NO.	RANGE	WF BEAM OR WEB OF BUILT-UP SECTION		WF OR WEB PLATE				TOP PLATE		BOTTOM PLATE		COMPOSITE	FY
			MOMENT OF INERTIA	AREA	DEPTH LEFT	DEPTH RIGHT	V	THICK	WIDTH	THICK	WIDTH	THICK		
1	2	3	8	16	20	26	30	31	38	40	46	49	64	65 67
G	1	46.5	4461.	317.7	29.82			.548					N	33.
G	2	25.75	4461.	317.7	29.82			.548					N	33.

PREPARED BY....AFP..... DATE..9.1.27.79. SHEET..1..OF..1..

* * * * * BRIDGE ANALYSIS AND RATING * * * * *
BR W-6-16 DEPT.REF.NO.897 WAREHAM INTERIOR STEEL STRINGER 1957

% OF AASHTO IMPACT FACTORS IR	OR	SLC	SLC STRESS LEVEL	SP. LL.	MATERIAL	FLOOR SYSTEM	TIE PLATE
100.	100.	100.	100.	0	S	GGG	

				GIRDER			FLOORBEAM			STRINGER		
LOAD	BUG	LANE	INF	UNL	K	A	UNL	K	A	UNL	K	A
	0.0	0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PARAPET PLUS SIDEWALK WIDTH	GIRDER OR TRUSS SPACING	CL.OF GIRDER OR TRUSS TO CURB	** ROADWAY WIDTH ** LEFT	MEDIAN	RIGHT
0.0	6.00	0.0	0.0	0.0	0.0

DISTR. FACTOR	SLAB THICKNESS	HAUNCH	SUPER DL	HARD-WARE	SIDEWALK LIVE LOAD	F'C	N	SYMMETRY
0.545	7.00	0.0	0.390	17.	0.	3.000	10.	Y

* * * * * SPAN LENGTHS * * * * *
(CONTINUOUS)

SPAN #	1	2	3	4	5	6	7	8
LENGTH	46.50	51.50	46.50					

* * * * * STEEL MEMBER PROPERTIES * * * * *

TYPE	SPAN	RANGE	WF BEAM OR WEB BUILT-UP SECTION INERTIA	AREA	WF OR WEB PLATE DEPTH LEFT	RIGHT	V	THICK	TOP PLATE WIDTH	THICK	BOTTOM PLATE WIDTH	THICK	COMP	FY
G	1	46.50	4461.0	31.77	29.82	0.0		0.5480	0.0	0.0	0.0	0.0	N	33.0
G	2	25.75	4461.0	31.77	29.82	0.0		0.5480	0.0	0.0	0.0	0.0	N	33.0

****
**** GIRDER RATINGS ****
****

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	1.4500
3	4.65	2.9027
4	6.97	4.3608
5	9.30	5.8268
6	11.62	7.3035
7	13.95	8.7936
8	16.27	7.9747
9	18.60	7.1744
10	20.92	6.3955
11	23.25	5.6407
12	25.57	4.9125
13	27.90	4.2136
14	30.22	3.5468
15	32.55	2.9147
16	34.87	2.3199
17	37.20	1.7652
18	39.52	1.2532
19	41.85	0.7866

20	44.17	0.3679
21	46.50	0.0
22	49.07	-0.3469
23	51.65	-0.6326
24	54.22	-0.8610
25	56.80	-1.0364
26	59.37	-1.1628
27	61.95	-1.2445
28	64.52	-1.2855
29	67.10	-1.2899
30	69.67	-1.2620
31	72.25	-1.2058
32	74.82	-1.1255
33	77.40	-1.0253
34	79.97	-0.9091
35	82.55	-0.7813
36	85.12	-0.6459
37	87.70	-0.5071
38	90.27	-0.3689
39	92.85	-0.2356
40	95.42	-0.1113
41	98.00	0.0
42	100.32	0.0867
43	102.65	0.1602
44	104.97	0.2209
45	107.30	0.2698
46	109.62	0.3073
47	111.95	0.3344
48	114.27	0.3516
49	116.60	0.3597
50	118.92	0.3593
51	121.25	0.3512
52	123.57	0.3361
53	125.90	0.3147
54	128.22	0.2877
55	130.55	0.2557
56	132.87	0.2196
57	135.20	0.1799
58	137.52	0.1374
59	139.85	0.0927
60	142.17	0.0467
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	1.3042
3	4.65	2.6115
4	6.97	3.9251
5	9.30	5.2479
6	11.62	6.5833
7	13.95	7.9342
8	16.27	9.3038
9	18.60	8.3701
10	20.92	7.4615
11	23.25	6.5808
12	25.57	5.7312
13	27.90	4.9159
14	30.22	4.1380
15	32.55	3.4005
16	34.87	2.7066
17	37.20	2.0594
18	39.52	1.4621
19	41.85	0.9177
20	44.17	0.4293

21	46.50	0.0
22	49.07	-0.4048
23	51.65	-0.7380
24	54.22	-1.0045
25	56.80	-1.2091
26	59.37	-1.3566
27	61.95	-1.4519
28	64.52	-1.4997
29	67.10	-1.5049
30	69.67	-1.4723
31	72.25	-1.4068
32	74.82	-1.3131
33	77.40	-1.1962
34	79.97	-1.0607
35	82.55	-0.9116
36	85.12	-0.7536
37	87.70	-0.5916
38	90.27	-0.4304
39	92.85	-0.2749
40	95.42	-0.1298
41	98.00	0.0
42	100.32	0.1012
43	102.65	0.1869
44	104.97	0.2577
45	107.30	0.3147
46	109.62	0.3585
47	111.95	0.3901
48	114.27	0.4102
49	116.60	0.4196
50	118.92	0.4192
51	121.25	0.4098
52	123.57	0.3922
53	125.90	0.3672
54	128.22	0.3356
55	130.55	0.2984
56	132.87	0.2561
57	135.20	0.2098
58	137.52	0.1602
59	139.85	0.1082
60	142.17	0.0545
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	1.1584
3	4.65	2.3203
4	6.97	3.4894
5	9.30	4.6691
6	11.62	5.8630
7	13.95	7.0748
8	16.27	8.3079
9	18.60	9.5659
10	20.92	8.5274
11	23.25	7.5209
12	25.57	6.5499
13	27.90	5.6182
14	30.22	4.7291
15	32.55	3.8863
16	34.87	3.0933
17	37.20	2.3537
18	39.52	1.6710
19	41.85	1.0487
20	44.17	0.4906
21	46.50	0.0

22	49.07	-0.4626
23	51.65	-0.8434
24	54.22	-1.1480
25	56.80	-1.3818
26	59.37	-1.5504
27	61.95	-1.6593
28	64.52	-1.7139
29	67.10	-1.7199
30	69.67	-1.6826
31	72.25	-1.6078
32	74.82	-1.5007
33	77.40	-1.3671
34	79.97	-1.2122
35	82.55	-1.0418
36	85.12	-0.8612
37	87.70	-0.6761
38	90.27	-0.4919
39	92.85	-0.3142
40	95.42	-0.1484
41	98.00	0.0
42	100.32	0.1157
43	102.65	0.2136
44	104.97	0.2946
45	107.30	0.3597
46	109.62	0.4098
47	111.95	0.4458
48	114.27	0.4688
49	116.60	0.4796
50	118.92	0.4791
51	121.25	0.4683
52	123.57	0.4482
53	125.90	0.4196
54	128.22	0.3836
55	130.55	0.3410
56	132.87	0.2927
57	135.20	0.2398
58	137.52	0.1831
59	139.85	0.1236
60	142.17	0.0623
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	1.0126
3	4.65	2.0291
4	6.97	3.0537
5	9.30	4.0902
6	11.62	5.1428
7	13.95	6.2154
8	16.27	7.3120
9	18.60	8.4366
10	20.92	9.5933
11	23.25	8.4610
12	25.57	7.3687
13	27.90	6.3205
14	30.22	5.3202
15	32.55	4.3721
16	34.87	3.4799
17	37.20	2.6479
18	39.52	1.8798
19	41.85	1.1798
20	44.17	0.5519
21	46.50	0.0
22	49.07	-0.5204

23	51.65	-0.9489
24	54.22	-1.2915
25	56.80	-1.5545
26	59.37	-1.7442
27	61.95	-1.8667
28	64.52	-1.9282
29	67.10	-1.9348
30	69.67	-1.8930
31	72.25	-1.8087
32	74.82	-1.6883
33	77.40	-1.5379
34	79.97	-1.3637
35	82.55	-1.1720
36	85.12	-0.9689
37	87.70	-0.7606
38	90.27	-0.5534
39	92.85	-0.3534
40	95.42	-0.1669
41	98.00	0.0
42	100.32	0.1301
43	102.65	0.2402
44	104.97	0.3314
45	107.30	0.4046
46	109.62	0.4610
47	111.95	0.5016
48	114.27	0.5274
49	116.60	0.5395
50	118.92	0.5390
51	121.25	0.5269
52	123.57	0.5042
53	125.90	0.4721
54	128.22	0.4315
55	130.55	0.3836
56	132.87	0.3293
57	135.20	0.2698
58	137.52	0.2060
59	139.85	0.1391
60	142.17	0.0701
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	0.8667
3	4.65	1.7379
4	6.97	2.6180
5	9.30	3.5113
6	11.62	4.4225
7	13.95	5.3560
8	16.27	6.3161
9	18.60	7.3073
10	20.92	8.3342
11	23.25	9.4011
12	25.57	8.1874
13	27.90	7.0227
14	30.22	5.9114
15	32.55	4.8579
16	34.87	3.8666
17	37.20	2.9421
18	39.52	2.0887
19	41.85	1.3109
20	44.17	0.6132
21	46.50	0.0
22	49.07	-0.5782
23	51.65	-1.0543

24	54.22	-1.4350
25	56.80	-1.7273
26	59.37	-1.9380
27	61.95	-2.0741
28	64.52	-2.1424
29	67.10	-2.1498
30	69.67	-2.1033
31	72.25	-2.0097
32	74.82	-1.8759
33	77.40	-1.7088
34	79.97	-1.5152
35	82.55	-1.3022
36	85.12	-1.0765
37	87.70	-0.8452
38	90.27	-0.6149
39	92.85	-0.3927
40	95.42	-0.1855
41	98.00	0.0
42	100.32	0.1446
43	102.65	0.2669
44	104.97	0.3682
45	107.30	0.4496
46	109.62	0.5122
47	111.95	0.5573
48	114.27	0.5860
49	116.60	0.5995
50	118.92	0.5989
51	121.25	0.5854
52	123.57	0.5602
53	125.90	0.5246
54	128.22	0.4795
55	130.55	0.4262
56	132.87	0.3659
57	135.20	0.2998
58	137.52	0.2289
59	139.85	0.1546
60	142.17	0.0779
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	-0.5915
3	4.65	-1.1742
4	6.97	-1.7390
5	9.30	-2.2773
6	11.62	-2.7799
7	13.95	-3.2381
8	16.27	-3.6428
9	18.60	-3.9853
10	20.92	-4.2566
11	23.25	-4.4478
12	25.57	-4.5501
13	27.90	-4.5545
14	30.22	-4.4522
15	32.55	-4.2343
16	34.87	-3.8919
17	37.20	-3.4159
18	39.52	-2.7976
19	41.85	-2.0281
20	44.17	-1.0986
21	46.50	0.0
22	49.07	-1.1565
23	51.65	-2.1086
24	54.22	-2.8699

25	56.80	-3.4545
26	59.37	-3.8760
27	61.95	-4.1482
28	64.52	-4.2849
29	67.10	-4.2997
30	69.67	-4.2066
31	72.25	-4.0194
32	74.82	-3.7518
33	77.40	-3.4176
34	79.97	-3.0305
35	82.55	-2.6044
36	85.12	-2.1531
37	87.70	-1.6903
38	90.27	-1.2298
39	92.85	-0.7854
40	95.42	-0.3709
41	98.00	0.0
42	100.32	0.2892
43	102.65	0.5339
44	104.97	0.7364
45	107.30	0.8992
46	109.62	1.0244
47	111.95	1.1146
48	114.27	1.1720
49	116.60	1.1989
50	118.92	1.1978
51	121.25	1.1708
52	123.57	1.1205
53	125.90	1.0491
54	128.22	0.9590
55	130.55	0.8525
56	132.87	0.7318
57	135.20	0.5995
58	137.52	0.4578
59	139.85	0.3091
60	142.17	0.1557
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	-0.2926
3	4.65	-0.5809
4	6.97	-0.8604
5	9.30	-1.1265
6	11.62	-1.3751
7	13.95	-1.6017
8	16.27	-1.8020
9	18.60	-1.9714
10	20.92	-2.1057
11	23.25	-2.2003
12	25.57	-2.2509
13	27.90	-2.2531
14	30.22	-2.2025
15	32.55	-2.0947
16	34.87	-1.9253
17	37.20	-1.6899
18	39.52	-1.3840
19	41.85	-1.0033
20	44.17	-0.5435
21	46.50	0.0
22	49.07	0.7027
23	51.65	1.5106
24	54.22	2.4210
25	56.80	3.4310

26	59.37	4.5380
27	61.95	5.7392
28	64.52	7.0318
29	67.10	8.4130
30	69.67	7.3052
31	72.25	6.2805
32	74.82	5.3361
33	77.40	4.4695
34	79.97	3.6777
35	82.55	2.9580
36	85.12	2.3077
37	87.70	1.7239
38	90.27	1.2041
39	92.85	0.7453
40	95.42	0.3449
41	98.00	0.0
42	100.32	-0.2659
43	102.65	-0.4909
44	104.97	-0.6771
45	107.30	-0.8268
46	109.62	-0.9420
47	111.95	-1.0249
48	114.27	-1.0776
49	116.60	-1.1024
50	118.92	-1.1013
51	121.25	-1.0765
52	123.57	-1.0303
53	125.90	-0.9646
54	128.22	-0.8818
55	130.55	-0.7838
56	132.87	-0.6729
57	135.20	-0.5512
58	137.52	-0.4210
59	139.85	-0.2842
60	142.17	-0.1432
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	-0.2553
3	4.65	-0.5067
4	6.97	-0.7505
5	9.30	-0.9827
6	11.62	-1.1995
7	13.95	-1.3972
8	16.27	-1.5718
9	18.60	-1.7196
10	20.92	-1.8368
11	23.25	-1.9193
12	25.57	-1.9635
13	27.90	-1.9654
14	30.22	-1.9213
15	32.55	-1.8272
16	34.87	-1.6794
17	37.20	-1.4741
18	39.52	-1.2074
19	41.85	-0.8752
20	44.17	-0.4741
21	46.50	0.0
22	49.07	0.6132
23	51.65	1.3193
24	54.22	2.1167
25	56.80	3.0042
26	59.37	3.9804

27	61.95	5.0439
28	64.52	6.1932
29	67.10	7.4271
30	69.67	8.7441
31	72.25	7.5679
32	74.82	6.4721
33	77.40	5.4554
34	79.97	4.5162
35	82.55	3.6533
36	85.12	2.8652
37	87.70	2.1507
38	90.27	1.5083
39	92.85	0.9366
40	95.42	0.4343
41	98.00	0.0
42	100.32	-0.3353
43	102.65	-0.6190
44	104.97	-0.8538
45	107.30	-1.0426
46	109.62	-1.1878
47	111.95	-1.2923
48	114.27	-1.3588
49	116.60	-1.3901
50	118.92	-1.3887
51	121.25	-1.3575
52	123.57	-1.2991
53	125.90	-1.2163
54	128.22	-1.1119
55	130.55	-0.9883
56	132.87	-0.8485
57	135.20	-0.6951
58	137.52	-0.5308
59	139.85	-0.3584
60	142.17	-0.1805
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	-0.2179
3	4.65	-0.4326
4	6.97	-0.6407
5	9.30	-0.8388
6	11.62	-1.0239
7	13.95	-1.1926
8	16.27	-1.3417
9	18.60	-1.4679
10	20.92	-1.5679
11	23.25	-1.6384
12	25.57	-1.6761
13	27.90	-1.6777
14	30.22	-1.6401
15	32.55	-1.5598
16	34.87	-1.4336
17	37.20	-1.2584
18	39.52	-1.0307
19	41.85	-0.7471
20	44.17	-0.4048
21	46.50	0.0
22	49.07	0.5237
23	51.65	1.1279
24	54.22	1.8125
25	56.80	2.5775
26	59.37	3.4228
27	61.95	4.3485

28	64.52	5.3547
29	67.10	6.4411
30	69.67	7.6081
31	72.25	8.8554
32	74.82	7.6081
33	77.40	6.4413
34	79.97	5.3547
35	82.55	4.3486
36	85.12	3.4228
37	87.70	2.5775
38	90.27	1.8125
39	92.85	1.1280
40	95.42	0.5238
41	98.00	0.0
42	100.32	-0.4047
43	102.65	-0.7471
44	104.97	-1.0305
45	107.30	-1.2583
46	109.62	-1.4336
47	111.95	-1.5598
48	114.27	-1.6400
49	116.60	-1.6777
50	118.92	-1.6761
51	121.25	-1.6384
52	123.57	-1.5679
53	125.90	-1.4681
54	128.22	-1.3420
55	130.55	-1.1929
56	132.87	-1.0241
57	135.20	-0.8389
58	137.52	-0.6407
59	139.85	-0.4326
60	142.17	-0.2179
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	-0.1806
3	4.65	-0.3584
4	6.97	-0.5309
5	9.30	-0.6950
6	11.62	-0.8483
7	13.95	-0.9881
8	16.27	-1.1116
9	18.60	-1.2162
10	20.92	-1.2991
11	23.25	-1.3574
12	25.57	-1.3887
13	27.90	-1.3901
14	30.22	-1.3589
15	32.55	-1.2923
16	34.87	-1.1878
17	37.20	-1.0426
18	39.52	-0.8540
19	41.85	-0.6190
20	44.17	-0.3354
21	46.50	0.0
22	49.07	0.4343
23	51.65	0.9366
24	54.22	1.5082
25	56.80	2.1507
26	59.37	2.8652
27	61.95	3.6532
28	64.52	4.5161

29	67.10	5.4552
30	69.67	6.4721
31	72.25	7.5679
32	74.82	8.7441
33	77.40	7.4271
34	79.97	6.1932
35	82.55	5.0439
36	85.12	3.9804
37	87.70	3.0043
38	90.27	2.1168
39	92.85	1.3193
40	95.42	0.6133
41	98.00	0.0
42	100.32	-0.4741
43	102.65	-0.8752
44	104.97	-1.2072
45	107.30	-1.4741
46	109.62	-1.6794
47	111.95	-1.8272
48	114.27	-1.9212
49	116.60	-1.9654
50	118.92	-1.9635
51	121.25	-1.9193
52	123.57	-1.8368
53	125.90	-1.7198
54	128.22	-1.5721
55	130.55	-1.3974
56	132.87	-1.1997
57	135.20	-0.9828
58	137.52	-0.7505
59	139.85	-0.5067
60	142.17	-0.2553
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	-0.1432
3	4.65	-0.2842
4	6.97	-0.4210
5	9.30	-0.5511
6	11.62	-0.6727
7	13.95	-0.7835
8	16.27	-0.8815
9	18.60	-0.9644
10	20.92	-1.0302
11	23.25	-1.0765
12	25.57	-1.1012
13	27.90	-1.1024
14	30.22	-1.0777
15	32.55	-1.0249
16	34.87	-0.9420
17	37.20	-0.8269
18	39.52	-0.6773
19	41.85	-0.4910
20	44.17	-0.2660
21	46.50	0.0
22	49.07	0.3448
23	51.65	0.7452
24	54.22	1.2039
25	56.80	1.7238
26	59.37	2.3076
27	61.95	2.9579
28	64.52	3.6776
29	67.10	4.4693

30	69.67	5.3361
31	72.25	6.2804
32	74.82	7.3051
33	77.40	8.4130
34	79.97	7.0317
35	82.55	5.7392
36	85.12	4.5380
37	87.70	3.4310
38	90.27	2.4210
39	92.85	1.5106
40	95.42	0.7027
41	98.00	0.0
42	100.32	-0.5435
43	102.65	-1.0033
44	104.97	-1.3839
45	107.30	-1.6898
46	109.62	-1.9252
47	111.95	-2.0947
48	114.27	-2.2024
49	116.60	-2.2531
50	118.92	-2.2509
51	121.25	-2.2002
52	123.57	-2.1056
53	125.90	-1.9715
54	128.22	-1.8022
55	130.55	-1.6019
56	132.87	-1.3753
57	135.20	-1.1266
58	137.52	-0.8604
59	139.85	-0.5809
60	142.17	-0.2926
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	0.1557
3	4.65	0.3090
4	6.97	0.4577
5	9.30	0.5997
6	11.62	0.7320
7	13.95	0.8528
8	16.27	0.9593
9	18.60	1.0495
10	20.92	1.1207
11	23.25	1.1710
12	25.57	1.1980
13	27.90	1.1991
14	30.22	1.1721
15	32.55	1.1147
16	34.87	1.0246
17	37.20	0.8991
18	39.52	0.7363
19	41.85	0.5338
20	44.17	0.2891
21	46.50	0.0
22	49.07	-0.3710
23	51.65	-0.7856
24	54.22	-1.2301
25	56.80	-1.6905
26	59.37	-2.1534
27	61.95	-2.6047
28	64.52	-3.0308
29	67.10	-3.4180
30	69.67	-3.7521

31	72.25	-4.0197
32	74.82	-4.2070
33	77.40	-4.2998
34	79.97	-4.2851
35	82.55	-4.1484
36	85.12	-3.8762
37	87.70	-3.4547
38	90.27	-2.8701
39	92.85	-2.1087
40	95.42	-1.1565
41	98.00	0.0
42	100.32	-1.0985
43	102.65	-2.0281
44	104.97	-2.7974
45	107.30	-3.4158
46	109.62	-3.8916
47	111.95	-4.2342
48	114.27	-4.4520
49	116.60	-4.5544
50	118.92	-4.5500
51	121.25	-4.4476
52	123.57	-4.2564
53	125.90	-3.9852
54	128.22	-3.6429
55	130.55	-3.2382
56	132.87	-2.7800
57	135.20	-2.2774
58	137.52	-1.7391
59	139.85	-1.1742
60	142.17	-0.5915
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	0.0779
3	4.65	0.1545
4	6.97	0.2288
5	9.30	0.2998
6	11.62	0.3660
7	13.95	0.4264
8	16.27	0.4796
9	18.60	0.5247
10	20.92	0.5604
11	23.25	0.5855
12	25.57	0.5990
13	27.90	0.5995
14	30.22	0.5860
15	32.55	0.5574
16	34.87	0.5123
17	37.20	0.4495
18	39.52	0.3681
19	41.85	0.2669
20	44.17	0.1445
21	46.50	0.0
22	49.07	-0.1855
23	51.65	-0.3928
24	54.22	-0.6151
25	56.80	-0.8453
26	59.37	-1.0767
27	61.95	-1.3024
28	64.52	-1.5154
29	67.10	-1.7090
30	69.67	-1.8761
31	72.25	-2.0098

32	74.82	-2.1035
33	77.40	-2.1499
34	79.97	-2.1426
35	82.55	-2.0742
36	85.12	-1.9381
37	87.70	-1.7273
38	90.27	-1.4350
39	92.85	-1.0544
40	95.42	-0.5782
41	98.00	0.0
42	100.32	0.6132
43	102.65	1.3110
44	104.97	2.0888
45	107.30	2.9421
46	109.62	3.8667
47	111.95	4.8579
48	114.27	5.9115
49	116.60	7.0228
50	118.92	8.1875
51	121.25	9.4012
52	123.57	8.3343
53	125.90	7.3074
54	128.22	6.3160
55	130.55	5.3559
56	132.87	4.4225
57	135.20	3.5113
58	137.52	2.6179
59	139.85	1.7379
60	142.17	0.8667
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	0.0701
3	4.65	0.1391
4	6.97	0.2059
5	9.30	0.2698
6	11.62	0.3294
7	13.95	0.3838
8	16.27	0.4317
9	18.60	0.4723
10	20.92	0.5043
11	23.25	0.5270
12	25.57	0.5391
13	27.90	0.5396
14	30.22	0.5274
15	32.55	0.5016
16	34.87	0.4611
17	37.20	0.4046
18	39.52	0.3313
19	41.85	0.2402
20	44.17	0.1301
21	46.50	0.0
22	49.07	-0.1670
23	51.65	-0.3535
24	54.22	-0.5536
25	56.80	-0.7607
26	59.37	-0.9690
27	61.95	-1.1721
28	64.52	-1.3639
29	67.10	-1.5381
30	69.67	-1.6884
31	72.25	-1.8089
32	74.82	-1.8931

33	77.40	-1.9349
34	79.97	-1.9283
35	82.55	-1.8668
36	85.12	-1.7443
37	87.70	-1.5546
38	90.27	-1.2915
39	92.85	-0.9489
40	95.42	-0.5204
41	98.00	0.0
42	100.32	0.5519
43	102.65	1.1799
44	104.97	1.8799
45	107.30	2.6479
46	109.62	3.4800
47	111.95	4.3721
48	114.27	5.3203
49	116.60	6.3205
50	118.92	7.3687
51	121.25	8.4611
52	123.57	9.5934
53	125.90	8.4366
54	128.22	7.3119
55	130.55	6.2153
56	132.87	5.1427
57	135.20	4.0902
58	137.52	3.0536
59	139.85	2.0291
60	142.17	1.0126
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	0.0623
3	4.65	0.1236
4	6.97	0.1831
5	9.30	0.2399
6	11.62	0.2928
7	13.95	0.3411
8	16.27	0.3837
9	18.60	0.4198
10	20.92	0.4483
11	23.25	0.4684
12	25.57	0.4792
13	27.90	0.4796
14	30.22	0.4688
15	32.55	0.4459
16	34.87	0.4098
17	37.20	0.3596
18	39.52	0.2945
19	41.85	0.2135
20	44.17	0.1156
21	46.50	0.0
22	49.07	-0.1484
23	51.65	-0.3142
24	54.22	-0.4920
25	56.80	-0.6762
26	59.37	-0.8613
27	61.95	-1.0419
28	64.52	-1.2123
29	67.10	-1.3672
30	69.67	-1.5008
31	72.25	-1.6079
32	74.82	-1.6828
33	77.40	-1.7199

34	79.97	-1.7141
35	82.55	-1.6594
36	85.12	-1.5505
37	87.70	-1.3819
38	90.27	-1.1480
39	92.85	-0.8435
40	95.42	-0.4626
41	98.00	0.0
42	100.32	0.4906
43	102.65	1.0488
44	104.97	1.6710
45	107.30	2.3537
46	109.62	3.0934
47	111.95	3.8863
48	114.27	4.7292
49	116.60	5.6182
50	118.92	6.5500
51	121.25	7.5210
52	123.57	8.5274
53	125.90	9.5659
54	128.22	8.3078
55	130.55	7.0747
56	132.87	5.8630
57	135.20	4.6691
58	137.52	3.4893
59	139.85	2.3203
60	142.17	1.1584
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	0.0545
3	4.65	0.1082
4	6.97	0.1602
5	9.30	0.2099
6	11.62	0.2562
7	13.95	0.2985
8	16.27	0.3358
9	18.60	0.3673
10	20.92	0.3922
11	23.25	0.4099
12	25.57	0.4193
13	27.90	0.4197
14	30.22	0.4102
15	32.55	0.3902
16	34.87	0.3586
17	37.20	0.3147
18	39.52	0.2577
19	41.85	0.1868
20	44.17	0.1011
21	46.50	0.0
22	49.07	-0.1299
23	51.65	-0.2749
24	54.22	-0.4305
25	56.80	-0.5917
26	59.37	-0.7537
27	61.95	-0.9117
28	64.52	-1.0608
29	67.10	-1.1963
30	69.67	-1.3132
31	72.25	-1.4069
32	74.82	-1.4724
33	77.40	-1.5050
34	79.97	-1.4998

35	82.55	-1.4519
36	85.12	-1.3567
37	87.70	-1.2091
38	90.27	-1.0045
39	92.85	-0.7380
40	95.42	-0.4048
41	98.00	0.0
42	100.32	0.4293
43	102.65	0.9177
44	104.97	1.4621
45	107.30	2.0595
46	109.62	2.7067
47	111.95	3.4005
48	114.27	4.1380
49	116.60	4.9160
50	118.92	5.7312
51	121.25	6.5808
52	123.57	7.4615
53	125.90	8.3702
54	128.22	9.3037
55	130.55	7.9341
56	132.87	6.5832
57	135.20	5.2479
58	137.52	3.9251
59	139.85	2.6115
60	142.17	1.3042
61	144.50	0.0

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	0.0467
3	4.65	0.0927
4	6.97	0.1373
5	9.30	0.1799
6	11.62	0.2196
7	13.95	0.2559
8	16.27	0.2878
9	18.60	0.3148
10	20.92	0.3362
11	23.25	0.3513
12	25.57	0.3594
13	27.90	0.3597
14	30.22	0.3516
15	32.55	0.3344
16	34.87	0.3074
17	37.20	0.2697
18	39.52	0.2209
19	41.85	0.1601
20	44.17	0.0867
21	46.50	0.0
22	49.07	-0.1113
23	51.65	-0.2357
24	54.22	-0.3690
25	56.80	-0.5072
26	59.37	-0.6460
27	61.95	-0.7814
28	64.52	-0.9092
29	67.10	-1.0254
30	69.67	-1.1256
31	72.25	-1.2059
32	74.82	-1.2621
33	77.40	-1.2899
34	79.97	-1.2856
35	82.55	-1.2445

36	85.12	-1.1629
37	87.70	-1.0364
38	90.27	-0.8610
39	92.85	-0.6326
40	95.42	-0.3469
41	98.00	0.0
42	100.32	0.3680
43	102.65	0.7866
44	104.97	1.2533
45	107.30	1.7653
46	109.62	2.3200
47	111.95	2.9147
48	114.27	3.5469
49	116.60	4.2137
50	118.92	4.9125
51	121.25	5.6407
52	123.57	6.3956
53	125.90	7.1744
54	128.22	7.9746
55	130.55	8.7935
56	132.87	7.3035
57	135.20	5.8268
58	137.52	4.3608
59	139.85	2.9027
60	142.17	1.4500
61	144.50	0.0

***** LIVE LOAD - H20 *****

THE LOCATION OF THE CRITICAL SECTION IS AT
27.90 FT. FROM THE LEFT END OF SPAN NO. 3.

* * * * * SECTION PROPERTIES * * * * *

	GROSS DEPTH	AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	BOTTOM
NON-COMPOSITE	29.82	31.77	4461.00	14.91	299.2	299.2

DL1 MOMENT	DL2 MOMENT	LL + IMPACT MOMENT FOR IR	OR	SLC	ALLOWABLE STRESSES FOR IR	OR	SLC	
1278.5	767.0	2847.1	2847.1	2847.1	18.150	24.750	18.150	TENSION
					18.150	24.750	18.150	COMPRESSION

	STRESSES DUE TO DL1	DL2	STRESSES DUE TO LL+I FOR IR	OR	SLC
TOP FIBER	4.273	2.564	9.516	9.516	9.516
BOTTOM FIBER	4.273	2.564	9.516	9.516	9.516

INVENTORY RATING 1.1889 x 20T = 23.78 T
OPERATING RATING 1.8825 x 20T = 37.65 T
SAFE LOAD CAPACITY 1.1889

25	56.80	-0.5072
26	59.37	-0.6460
27	61.95	-0.7814
28	64.52	-0.9092
29	67.10	-1.0254
30	69.67	-1.1256
31	72.25	-1.2059
32	74.82	-1.2621
33	77.40	-1.2899
34	79.97	-1.2856
35	82.55	-1.2445
36	85.12	-1.1629
37	87.70	-1.0364
38	90.27	-0.8610
39	92.85	-0.6326
40	95.42	-0.3469
41	98.00	0.0
42	100.32	0.3680
43	102.65	0.7866
44	104.97	1.2533
45	107.30	1.7653
46	109.62	2.3200
47	111.95	2.9147
48	114.27	3.5469
49	116.60	4.2137
50	118.92	4.9125
51	121.25	5.6407
52	123.57	6.3956
53	125.90	7.1744
54	128.22	7.9746
55	130.55	8.7935
56	132.87	7.3035
57	135.20	5.8268
58	137.52	4.3608
59	139.85	2.9027
60	142.17	1.4500
61	144.50	0.0

***** LIVE LOAD - HS20 *****

THE LOCATION OF THE CRITICAL SECTION IS AT
27.90 FT. FROM THE LEFT END OF SPAN NO. 3.

* * * * * SECTION PROPERTIES * * * * *

	DEPTH	GROSS AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	SECTION MODULUS BOTTOM
NON-COMPOSITE	29.82	31.77	4461.00	14.91	299.2	299.2

DL1 MOMENT	DL2 MOMENT	LL + IMPACT MOMENT FOR IR	OR	SLC	ALLOWABLE STRESSES FOR IR	OR	SLC	
1278.5	767.0	3786.5	3786.5	3786.5	18.150	24.750	18.150	TENSION
					18.150	24.750	18.150	COMPRESSION

	STRESSES DUE TO DL1	DL2	STRESSES DUE TO LL+I FOR IR	OR	SLC
TOP FIBER	4.273	2.564	12.656	12.656	12.656
BOTTOM FIBER	4.273	2.564	12.656	12.656	12.656

INVENTORY RATING	0.8939
OPERATING RATING	1.4154
SAFE LOAD CAPACITY	0.8939

***** LIVE LOAD - 3 *****

THE LOCATION OF THE CRITICAL SECTION IS AT
27.90 FT. FROM THE LEFT END OF SPAN NO. 3.

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* * * * * SECTION PROPERTIES * * * * *

	DEPTH	GROSS AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	SECTION MODULUS BOTTOM
NON-COMPOSITE	29.82	31.77	4461.00	14.91	299.2	299.2

DL1 MOMENT	DL2 MOMENT	LL + IMPACT MOMENT FOR ALLOWABLE STRESSES FOR IR	OR	SLC	IR	OR	SLC	
1278.5	767.0	2712.7	2712.7	2712.7	18.150	24.750	18.150	TENSION
					18.150	24.750	18.150	COMPRESSION

	STRESSES DUE TO DL1	DL2	STRESSES DUE TO LL+I FOR IR	OR	SLC
TOP FIBER	4.273	2.564	9.067	9.067	9.067
BOTTOM FIBER	4.273	2.564	9.067	9.067	9.067

INVENTORY RATING	1.2478	x 23T = 28.70T.
OPERATING RATING	1.9757	x 23T = 45.44T.
SAFE LOAD CAPACITY	1.2478	

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	1.4500
3	4.65	2.9027
4	6.97	4.3608
5	9.30	5.8268
6	11.62	7.3035
7	13.95	8.7936
8	16.27	7.9747
9	18.60	7.1744
10	20.92	6.3955
11	23.25	5.6407
12	25.57	4.9125
13	27.90	4.2136
14	30.22	3.5468
15	32.55	2.9147
16	34.87	2.3199
17	37.20	1.7652
18	39.52	1.2532
19	41.85	0.7866
20	44.17	0.3679
21	46.50	0.0
22	49.07	-0.3469
23	51.65	-0.6326
24	54.22	-0.8610
25	56.80	-1.0364
26	59.37	-1.1628
27	61.95	-1.2445
28	64.52	-1.2855
29	67.10	-1.2899
30	69.67	-1.2620
31	72.25	-1.2058
32	74.82	-1.1255
33	77.40	-1.0253
34	79.97	-0.9091

***** LIVE LOAD - 3S2 *****

THE LOCATION OF THE CRITICAL SECTION IS AT
46.50 FT. FROM THE LEFT END OF SPAN NO. 1.

* * * * * SECTION PROPERTIES * * * * *

	DEPTH	GROSS AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	SECTION MODULUS BOTTOM
NON-COMPOSITE	29.82	31.77	4461.00	14.91	299.2	299.2

DL1 MOMENT	DL2 MOMENT	LL + IMPACT MOMENT FOR IR	OR	SLC	ALLOWABLE STRESSES FOR IR	OR	SLC	
-1864.4	-1118.5	-2340.6	-2340.6	-2340.6	18.150	24.750	18.150	TENSION
					18.150	24.750	18.150	COMPRESSION

	STRESSES DUE TO DL1	DL2	STRESSES DUE TO LL+I FOR IR	OR	SLC
TOP FIBER	6.232	3.738	7.823	7.823	7.823
BOTTOM FIBER	6.232	3.738	7.823	7.823	7.823

INVENTORY RATING	1.0456	× 36 T = 37.64 T
OPERATING RATING	1.8893	× 36 T = 68.01 T
SAFE LOAD CAPACITY	1.0456	

MODIFIED INFLUENCE LINE

LOAD PT.	LOAD DIST.	INFLUENCE VALUE
1	0.0	0.0
2	2.32	1.4500
3	4.65	2.9027
4	6.97	4.3608
5	9.30	5.8268
6	11.62	7.3035
7	13.95	8.7936
8	16.27	7.9747
9	18.60	7.1744
10	20.92	6.3955
11	23.25	5.6407
12	25.57	4.9125
13	27.90	4.2136
14	30.22	3.5468
15	32.55	2.9147
16	34.87	2.3199
17	37.20	1.7652
18	39.52	1.2532
19	41.85	0.7866
20	44.17	0.3679
21	46.50	0.0
22	49.07	-0.3469
23	51.65	-0.6326
24	54.22	-0.8610
25	56.80	-1.0364
26	59.37	-1.1628
27	61.95	-1.2445
28	64.52	-1.2855
29	67.10	-1.2899
30	69.67	-1.2620
31	72.25	-1.2058
32	74.82	-1.1255
33	77.40	-1.0253
34	79.97	-0.9091
35	82.55	-0.7813

58	137.52	4.3608
59	139.85	2.9027
60	142.17	1.4500
61	144.50	0.0

***** LIVE LOAD - 3-3 *****

THE LOCATION OF THE CRITICAL SECTION IS AT
46.50 FT. FROM THE LEFT END OF SPAN NO. 1.

* * * * * SECTION PROPERTIES * * * * *

	DEPTH	GROSS AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	SECTION MODULUS BOTTOM
NON-COMPOSITE	29.82	31.77	4461.00	14.91	299.2	299.2

DL1 MOMENT	DL2 MOMENT	LL + IMPACT MOMENT FOR IR	OR	SLC	ALLOWABLE STRESSES FOR IR	OR	SLC	
-1864.4	-1118.5	-2268.5	-2268.5	-2268.5	18.150	24.750	18.150	TENSION
					18.150	24.750	18.150	COMPRESSION

	STRESSES DUE TO DL1	DL2	STRESSES DUE TO LL+I FOR IR	OR	SLC
TOP FIBER	6.232	3.738	7.582	7.582	7.582
BOTTOM FIBER	6.232	3.738	7.582	7.582	7.582

INVENTORY RATING	1.0789
OPERATING RATING	1.9494
SAFE LOAD CAPACITY	1.0789

* * * * * BRIDGE ANALYSIS AND RATING * * * * *

BR W-6-16 DEPT.REF.NO.897 WAREHAM FASCIA STEEL STRINGER 1957

% OF AASHTO IMPACT FACTORS IR	OR	SLC	SLC STRESS LEVEL	SP. LL.	MATERIAL	FLOOR SYSTEM	TIE PLATE
100.	100.	100.	125.	0	S	GGG	

				GIRDER			FLOORBEAM			STRINGER		
LOAD	BUG	LANE	INF	UNL	K	A	UNL	K	A	UNL	K	A
	0.0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PARAPET PLUS SIDEWALK WIDTH	GIRDER OR TRUSS SPACING	CL.OF GIRDER OR TRUSS TO CURB	** ROADWAY WIDTH ** LEFT	MEDIAN	RIGHT
0.0	4.25	0.0	0.0	0.0	0.0

DISTR. FACTOR	SLAB THICKNESS	HAUNCH	SUPER DL	HARD-WARE	SIDEWALK LIVE LOAD	F'C	N	SYMMETRY
0.545	7.00	0.0	0.390	9.	180.	3.000	10.	Y

* * * * * SPAN LENGTHS * * * * *

(CONTINUOUS)

SPAN #	1	2	3	4	5	6	7	8
LENGTH	46.50	51.50	46.50					

* * * * * STEEL MEMBER PROPERTIES * * * * *

TYPE	SPAN	RANGE	WF BEAM OR WEB BUILT-UP SECTION INERTIA	AREA	WF OR WEB PLATE DEPTH LEFT	RIGHT	V	THICK	TOP PLATE WIDTH	THICK	BOTTOM PLATE WIDTH	THICK	COMP	FY
G	1	46.50	4461.0	31.77	29.82	0.0		0.5480	0.0	0.0	0.0	0.0	N	33.0
G	2	25.75	4461.0	31.77	29.82	0.0		0.5480	0.0	0.0	0.0	0.0	N	33.0

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**** GIRDER RATINGS ****

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***** LIVE LOAD - H20 *****

THE LOCATION OF THE CRITICAL SECTION IS AT
27.90 FT. FROM THE LEFT END OF SPAN NO. 3.

* * * * * SECTION PROPERTIES * * * * *

	DEPTH	GROSS AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	BOTTOM
NON-COMPOSITE	29.82	31.77	4461.00	14.91	299.2	299.2

DL1 MOMENT	DL2 MOMENT	LL + IMPACT MOMENT FOR IR	OR	SLC	ALLOWABLE STRESSES FOR IR	OR	SLC	
961.7	1121.0	2847.1	2847.1	2847.1	18.150	24.750	22.687	TENSION
					18.150	24.750	22.687	COMPRESSION

	STRESSES DUE TO DL1	DL2	STRESSES DUE TO LL+I FOR IR	OR	SLC
TOP FIBER	3.214	3.747	9.516	9.516	9.516

BOTTOM FIBER	3.214	3.747	9.516	9.516	9.516

INVENTORY RATING 1.1759
OPERATING RATING 1.8694 × 20T = 37.39T
SAFE LOAD CAPACITY 1.6527 × 20T = 33.05T
125% Stress Level

***** LIVE LOAD - HS20 *****

THE LOCATION OF THE CRITICAL SECTION IS AT
27.90 FT. FROM THE LEFT END OF SPAN NO. 3.

* * * * * SECTION PROPERTIES * * * * *

	GROSS DEPTH	AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	BOTTOM
NON-COMPOSITE	29.82	31.77	4461.00	14.91	299.2	299.2

DL1 MOMENT	DL2 MOMENT	LL + IMPACT MOMENT FOR IR	OR	SLC	ALLOWABLE STRESSES FOR IR	OR	SLC	
961.7	1121.0	3786.5	3786.5	3786.5	18.150	24.750	22.687	TENSION
					18.150	24.750	22.687	COMPRESSION

	STRESSES DUE TO DL1	DL2	STRESSES DUE TO LL+I FOR IR	OR	SLC
TOP FIBER	3.214	3.747	12.656	12.656	12.656
BOTTOM FIBER	3.214	3.747	12.656	12.656	12.656

INVENTORY RATING 0.8841
OPERATING RATING 1.4056
SAFE LOAD CAPACITY 1.2426

***** LIVE LOAD - 3 *****

THE LOCATION OF THE CRITICAL SECTION IS AT
27.90 FT. FROM THE LEFT END OF SPAN NO. 3.

* * * * * SECTION PROPERTIES * * * * *

	GROSS DEPTH	AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	BOTTOM
NON-COMPOSITE	29.82	31.77	4461.00	14.91	299.2	299.2

DL1 MOMENT	DL2 MOMENT	LL + IMPACT MOMENT FOR IR	OR	SLC	ALLOWABLE STRESSES FOR IR	OR	SLC	
961.7	1121.0	2712.7	2712.7	2712.7	18.150	24.750	22.687	TENSION
					18.150	24.750	22.687	COMPRESSION

	STRESSES DUE TO DL1	DL2	STRESSES DUE TO LL+I FOR IR	OR	SLC
TOP FIBER	3.214	3.747	9.067	9.067	9.067
BOTTOM FIBER	3.214	3.747	9.067	9.067	9.067

INVENTORY RATING 1.2341
OPERATING RATING 1.9620 × 23T = 45.13T
SAFE LOAD CAPACITY 1.7345 × 23T = 39.89T
125% Stress Level

***** LIVE LOAD - 3S2 *****

THE LOCATION OF THE CRITICAL SECTION IS AT

46.50 FT. FROM THE LEFT END OF SPAN NO. 1.

* * * * * SECTION PROPERTIES * * * * *

	DEPTH	GROSS AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	SECTION MODULUS BOTTOM
NON-COMPOSITE	29.82	31.77	4461.00	14.91	299.2	299.2

DL1 MOMENT	DL2 MOMENT	LL + IMPACT MOMENT FOR IR	OR	SLC	ALLOWABLE STRESSES FOR IR	OR	SLC	
-1402.3	-1634.7	-2340.6	-2340.6	-2340.6	18.150	24.750	22.687	TENSION
					18.150	24.750	22.687	COMPRESSION

	STRESSES DUE TO DL1	DL2	STRESSES DUE TO LL+I FOR IR	OR	SLC
TOP FIBER	4.687	5.464	7.823	7.823	7.823
BOTTOM FIBER	4.687	5.464	7.823	7.823	7.823

INVENTORY RATING	1.0225	
OPERATING RATING	1.8662	× 36T = 67.18T
SAFE LOAD CAPACITY	1.6025	× 36T = 57.69T

125% stress level

***** LIVE LOAD - 3-3 *****

THE LOCATION OF THE CRITICAL SECTION IS AT
46.50 FT. FROM THE LEFT END OF SPAN NO. 1.

* * * * * SECTION PROPERTIES * * * * *

	DEPTH	GROSS AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	SECTION MODULUS BOTTOM
NON-COMPOSITE	29.82	31.77	4461.00	14.91	299.2	299.2

DL1 MOMENT	DL2 MOMENT	LL + IMPACT MOMENT FOR IR	OR	SLC	ALLOWABLE STRESSES FOR IR	OR	SLC	
-1402.3	-1634.7	-2268.5	-2268.5	-2268.5	18.150	24.750	22.687	TENSION
					18.150	24.750	22.687	COMPRESSION

	STRESSES DUE TO DL1	DL2	STRESSES DUE TO LL+I FOR IR	OR	SLC
TOP FIBER	4.687	5.464	7.582	7.582	7.582
BOTTOM FIBER	4.687	5.464	7.582	7.582	7.582

INVENTORY RATING	1.0550
OPERATING RATING	1.9255
SAFE LOAD CAPACITY	1.6535