STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
NATIONAL BRIDGE ELEMENT
FINAL INSPECTION REPORT

Date of Inspection: May 06, 2015

Bridge Number: 001000190308146 Bridge Name: NANUE STRM

District Hawaii Route No: 00019 Milepost: 18 Facility: HAWAII BELT RD

NBI ITEM 36 - TRAFFIC SAFETY FEATURES			Indicate if feature meets currently acceptable standards. 0 - No 1 - Yes N - Not Applicable
36A	Bridge Railings	0	Bridge railing does not meet height requirement
36B	Transitions	1	
36C	Approach Guardrail	1	
36D	Approach Guardrail Ends	1	

ELEMENT INSPECTION

ELEM NO. / DEFECT	ELEMENT / DEFECT DESCRIPTION	ENV.	TOTAL QUANTITY	UNIT	CS 1 (Good)	CS 2 (Fair)	CS 3 (Poor)	CS 4 (Severe)
13	Pre Concrete Deck	1	16,896	sq.ft	16,896	0	0	0
510	Wearing Surfaces		12,672	sq.ft	12,672	0	0	0
_North and South approach deck joints has some damage with potholes evident and leakage along abutment walls. Refer to picture report for details.								
107	Steel Opn Girder/Beam	1	2,124	ft	2,087	37	0	0
1000	Corrosion		37	ft	0	37	0	0
515	Steel Protective Coating		25,344	sq ft	23 997	819	528	0
3410	Chalk(Steel Protect Coating		819	sq.ft	0	819	0	0
3440	Eff (Stl Protect Coat)		528	sq.ft	0	0	528	0
202	Steel Column	1	36	each	34	1	1	0
1000	Corrosion		1	each	0	1	0	0
7000	Damage		1	each	0	0	1	0
515	Steel Protective Coating		31,840	sq.ft	0	31,840	0	0
3410	Chalk(Steel Protect Coating		798	sq.ft	0	798	0	0
3440	Eff (Stl Protect Coat)		31,042	sq.ft	0	31,042	0	0
Steel columns are in fair condition with rust initiating, most corrosion is occurring on the east side of bridge and at the corners of the steel members. Bridge crews will continue to monitor any advancement.								
215	Re Conc Abutment	1	104	ft	104	0	0	0
301	Pourable Joint Seal	1	269	ft	0	193	76	0
2310	Leakage		26	ft	0	0	26	0
2330	Seal Damage		50	ft	0	0	50	0

311	Moveable Bearing	1	20	each	20	0	0	0
515	Steel Protective Coating		40	sq.ft	0	40	0	0
3440	Eff (Stl Protect Coat)		40	sq.ft	0	40	0	0
313	Fixed Bearing	1	24	each	24	0	0	0
515	Steel Protective Coating		48	sq.ft	0	48	0	0
3440	Eff (Stl Protect Coat)		48	sq.ft	0	48	0	0
331	Re Conc Bridge Railing	1	1,062	ft	1,062	0	0	0

NBI ITEM CONDITION RATINGS			Describe defects noted during bridge inspection. Provide sketches, diagrams, and photographs where possible.
58	Deck	7	
59	Superstructure	7	
60	Substructure	7	
61	Channel and Channel Protection	7	
62	Culvert	N	

NBI ITEM 93 - CRITICAL FEATURE INSPECTION		REQUIRED	FREQUENCY	LAST	DATE
93A	Fracture Critical Details	N			
93B	Underwater Inspection	Y	60	6/5/13	
93C	Other Special Inspection	N			

OTHER FEATURES			REMARKS
Bridge Posted?	(Provide Posted limit or 'N' if not applicable)	N	None
Signing for Posting Legible/Visible?	(Y or N)		
Riding Surface (Roughness) Rating	(3 - smooth, 2 - Avg, 1 - Poor)	3	
Bridge Requires Insp by Bridge Section Applies to in-house inspectors who aren't structural engineers	(Y or N)		

REPAIRS, IMPROVEMENTS AND RECOMMENDATIONS

List all work done to this bridge since last inspection (ie. structural repair work, cleaning, maintenance work, etc.)

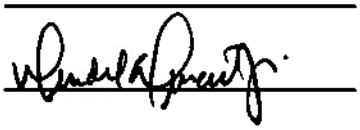
None

List proposed and/or recommended work for this bridge including estimated cost (ie. structural repair work, cleaning, maintenance, etc.)

Repairs are recommended on the deck joints, which have deep impressions and web cracks due to reciprocal traffic.
Trees and shrubs are being cut under bridge and should be done to address vegetation overgrowth. Refer to picture report for deficiencies.

Other comments or observations.

None

Inspector:	**Name:**	Wendell Vincent	**Title:**	HMS-1	
	Signature:		**Phone:**	808-933-0731	
Inspector:	**Name:**	Lloyd Leslie	**Title:**	BMS-1	
	Signature:		**Phone:**	808-933-0731	
Team Leader:	**Name:**	Salvador Panem	**Title:**	District Engineer	
	Signature:		**Phone:**	808-933-8866	

STATE OF HAWAII ROUTINE BRIDGE REPORTS
Nanue BRIDGE STREAM
BR. NO. 001000190308146 RT.19 MP.18.23
INSPECTED BY: WENDELL VINCENT AND LLOYD LESLIE
DATE OF INSPECTION: 05/05/2015

Nanue Bridge approach looking south

Nanue Bridge approach looking north

Outlet end of Nanue Bridge.

Intlet end of Nanue Bridge.

Nanue Bridge north abutment

Nanue Bridge south abutment

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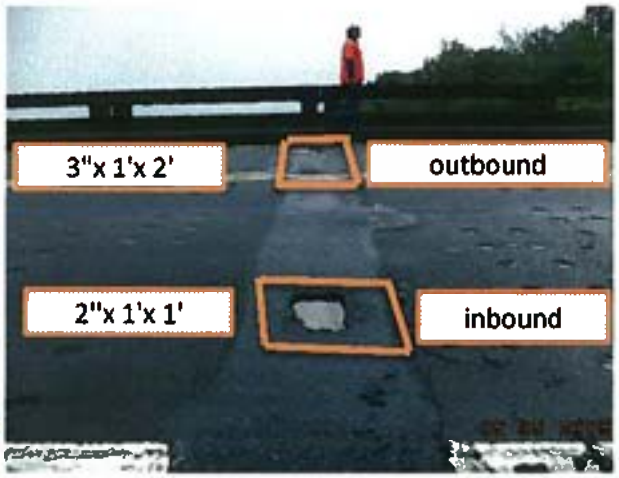
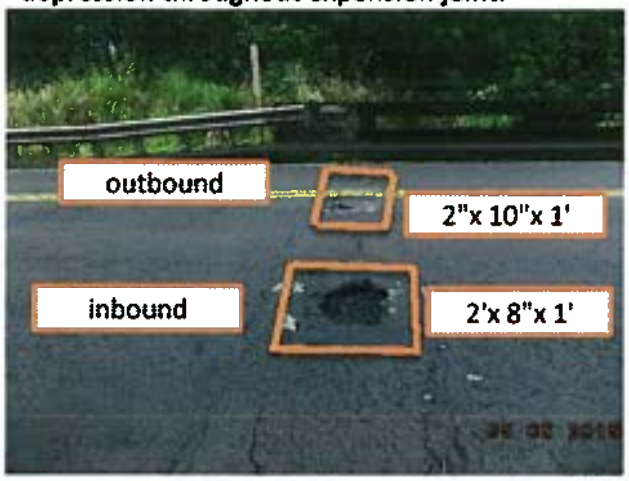
Both inbound outbound lanes south approach has depression throughout expension joint.



Second expension joint from south approach has holes,both inbound outbound.



North approach has holes on expension joint.

Bottom of bent 7 outlet end, column brace plates and lacings has corrosions.

Center up right brace betwwen bent 6 and 7 has corrosion on lacings.

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Picture 1.

Picture 2.

Picture 3.

Picture 4.

All four pictures shows damages done on angle brace between columns 6 & 7 were bolders.

Picture of bent 6 with a bolder wedged between piers.

Column 6 bottom brace has corrosion and missing lacings.

LIVE LOAD FACTORS AND DYNAMIC LOAD ALLOWANCE
LOAD RATING ANALYSIS (BRASS SOFTWARE)

LOADING TYPE	LL - CONDITIONS		LL - FACTOR
DESIGN LOADS: (HL-93)	Inventory Level Operating Level		1.75 1.35
LEGAL LOADS: (Type 3, Type 3S2, Type 3-3) (NRL, SU4, SU5, SU6, SU7)	ADTT Unknown ADTT ≥ 5000 ADTT ≤ 1000 Reinforced Concrete Box Culverts		1.45 1.45 (1) 1.30 (1) 2.00 (6)
PERMIT LOADS: (HP1, HP2, HP3)	Permit Type - Continuous Operation, All Structures except Reinforced Concrete Box Culverts Loading Condition - Mixed with Normal Traffic LRFD Distribution Factor - Two or More Lanes	ADTT > 5000 ADTT ≤ 1000	1.40 (1) 1.35 (1)
	Permit Type - Continuous Operation, Reinforced Concrete Box Culverts only Loading Condition - Mixed with Normal Traffic LRFD Distribution Factor - One Lane	All ADTTs	1.40 (2)
	Permit Type - Single Trip Loading Condition - Escorted with no other vehicles on the bridge LRFD Distribution Factor - One Lane		1.10 (2)
	Permit Type - Single Trip Loading Condition - Mixed with Normal Traffic LRFD Distribution Factor - One Lane	All ADTTs	1.20 (2)

LOADING TYPE	RIDING SURFACE CONDITIONS (5)	IM (3) (Spans ≤ 40 ft.)	IM (3) (Spans > 40 ft.)
DESIGN LOADS:	3	33%	33%
	2	33%	33%
	1	33%	33%
LEGAL LOADS:	3	33%	10%
	2	33%	20%
	1	33%	33%
PERMIT LOADS: (4)	3	33%	10%
	2	33%	20%
	1	33%	33%
REINFORCED CONCRETE BOX CULVERTS: (4)	IM = 33 (1.0 - 0.125D_E) ≥ 0%, where D_E is the minimum depth of earth cover above the structure (in feet).		

Notes:

(1) : Linear interpolate for ADTT values between 5,000 and 1,000.

(2) : When one-lane distribution factor is used, the built-in 1.20 multiple presence factor should be divided out.

(3) : Dynamic load allowance (IM) need not be applied to lane loads at the Design and Legal Load Rating and to wood components.

(4) : For slow moving (≤ 10 mph) permit vehicles, dynamic load allowance (IM) may be eliminated.

(5) : Riding surface conditions are defined as follows: 3 - smooth riding surface at approaches, bridge deck, and expansion joints; 2 - minor surface deviations or depressions; and 1 - approach and bridge deck conditions with bumps, sags, or other major surface deviations and discontinuities.

(6) : Multiple presence factor is not included and is not required for single-lane loading.

moffatt & nichol	CLIENT:	Hawaii Department of Transportation	JOB NO.:	8780-06	
	PROJECT:	HDOT Hwy Statewide Bridge Load Ratings	SHEET:		OF
	DESIGN FOR:	Nanue Stream Bridge	DESIGNER:	JU	DATE:
			CHECKER:		DATE:

Design References:

AASHTO LRFD Bridge Design Specifications, 2014 with 2015 Interim Revisions	(LRFD)
HDOT Design Criteria for Bridges and Structures, Second Edition, 2011	(HDOT)
AASHTO Manual for Bridge Evaluation, 2014	(MBE)
Nanue Bridge Record Drawings, April 1949	(RD 1949)
Nanue Bridge Erection Drawings, January 1950	(ED 1950)
Nanue Bridge Record Drawings, May 1996	(RD 1996)
Nanue Bridge Record Drawings, August 1999	(RD 1999)
Nanue Bridge Inspection Report, May 2015	(BIR 2015)
Hawaii State Historic Bridge Inventory and Evaluation, November 2013	(SHBIE 2013)

Summary

The Nanue Stream Bridge is a steel girder bridge with reinforced concrete deck constructed circa 1949. The steel girders were salvaged from the Kaula Bridge, Kealahaka Bridge, Laupahoehoe Bridge, and Maile Bridge according to erection drawings dated 1950. Drawings for the bridges where the steel girders were salvaged from were not provided. According to the Hawaii State Historic Bridge Inventory and Evaluation, Kaula Bridge was constructed circa 1928. There are no records for the other bridges but it is assumed that they were built around the same timeframe due to similarities in the salvaged girders.

From the 1949 Record Drawings, the Salvaged Girders were constructed out of the following members:

40 ft Girders A3, B3, G5, and G6
Top Flange: 2-L6x4x5/8
Web: PL 78x3/8
Bottom Flange: 2-L6x4x5/8
Girders G5 and G6 are indicated to have the same section properties as Girders A3 and B3.

50 ft Span Girders A2/A2X, A4/A4X, B2/B2X, B4/B4X;
51 ft Span Girders A1/A1X, B1/B1X, A1/A2, B1/B2, A5/A5X, B5/B5X
Top Flange: 2-L6x6x7/16
Web: PL 78x3/8
Bottom Flange: 2-L6x6x7/16
Top and Bottom Flange Cover Plates: PL 16x1/2 (The flange cover plates extend different lengths along both the top and bottom flanges.)
Section properties for girders A4/A4X and B4/B4X are provided in the 72 ft span girders.
Girders A1/A1X, A2X, A5/A5X, B1/B1X, B2X, and B5/B5X are indicated to have the same section properties as Girders A2 and B2.

72 ft Span Girders A4/A4X and B4/B4X
Top Flange: 2-L6x6x3/4
Web: PL 78x3/8
Bottom Flange: 2-L6x6x3/4
Top and Bottom Flange Cover Plates: 2-PL 16x1/2 (The flange cover plates extend different lengths along both the top and bottom flanges.)
Assumed section properties for A4X and B4X are the same as A4 and B4.

The drawings also indicate 7/8" diameter rivets were used for the connection in the salvaged girders.

The 2015 Bridge Inspection Report indictes a Superstructurer rating of 7 (GOOD CONDITION - no problems noted). The deficiencies noted are for the protective coatings. It was assumed that there is little to no section loss and full section properties were used.

The deck is not analyzed to be composite with the girders.

Two waterlines not indicated on the Record or Erection Drawings are visible in the 2015 Bridge Inspection Report. In past Load Ratings, HDOT has indicated that all utility pipes are assumed to be schedule 80 (thickness = 1/2 inch) steel pipes.

The substructure was not load rated. Per AASHTO MBE Section 6.1.5.2, Members of substructures need not be routinely checked for load capacity. Substructure elements such as pier caps and columns should be checked in situations where the Owner has reason to believe that their capacity may govern the load capacity of the entire bridge. The 2015 Bridge Inspection Report indicates a Substructure rating of 7 (GOOD CONDITION - no problems noted) with no comments on deficiences to the substructure. HDOT has not indicated the substructure requires a load rating.

Material Properties

Concrete Unit Weight		ω_c =	0.160 kcf	HDOT Sec. 2.04	P.8
Concrete Unit Weight to Calculate E_c		ω_c =	0.150 kcf	HDOT Sec. 2.04	P.8
Steel Unit Weight		ω_s =	0.490 kcf		
Class A-1 Concrete Strength	(Superstructure)	f'_c =	3.0 ksi	RD 1949	
Class B-2 Concrete Strength	(Piers)	f'_c =	2.5 ksi	RD 1949	
Steel Yield Strength	(No Grade Provided)	f_y =	30 ksi	MBE Tbl. 6A.6.2.1-1	P.6-34
Annual Average Ambient Relative Humidity		=	70 %	LRFD Fig. 5.4.2.3.3-1	P.5-18
Concrete Elastic Modulus	$E_c = 120{,}000K_1\omega_c^{2.0}(f'_c)^{0.33}$ =			LRFD Eqn. 5.4.2.4-1	P.5-18
Class A-1 Concrete		E_c =	3,880 ksi		
Class B-2 Concrete		E_c =	3,653 ksi		
Correction Factor for Source Aggregate		K_1 =	1	HDOT Sec. 2.09	P.9
Steel Elastic Modulus		E_s =	29,000 ksi	LRFD Sec. 5.4.3.2	P.5-20
Modular Ratio		$n = E_s/E_c$ =		LRFD Sec. 5.3	P.5-10
Class A-1 Concrete		n =	7.47		
Class B-2 Concrete		n =	7.94		

Condition Rating and System Factor

Superstructure Condition Rating (SI&A Item 59)		=	7	BIR 2015	
Condition Factor		ϕ_c =	1.00	HDOT Tbl 6A.4.2.3-1	P.18
System Factor		ϕ_s =	1.00	HDOT Tbl 6A.4.2.4-1	P.18

Control

Number of Spans	10	(Hilo End to Honokaa End)	ED 1950	P. E1E
Span 1	51.00 ft			
Span 2	50.00 ft			
Span 3	40.00 ft			
Span 4	72.00 ft			
Span 5	40.00 ft			
Span 6	72.00 ft			
Span 7	40.00 ft			
Span 8	72.00 ft			
Span 9	40.00 ft			
Span 10	51.00 ft			
Number of Girders	4			

moffatt & nichol	CLIENT:	Hawaii Department of Transportation	JOB NO.:	8780-06	
	PROJECT:	HDOT Hwy Statewide Bridge Load Ratings	SHEET:		OF
	DESIGN FOR:	Nanue Stream Bridge	DESIGNER:	JU	DATE:
			CHECKER:		DATE:

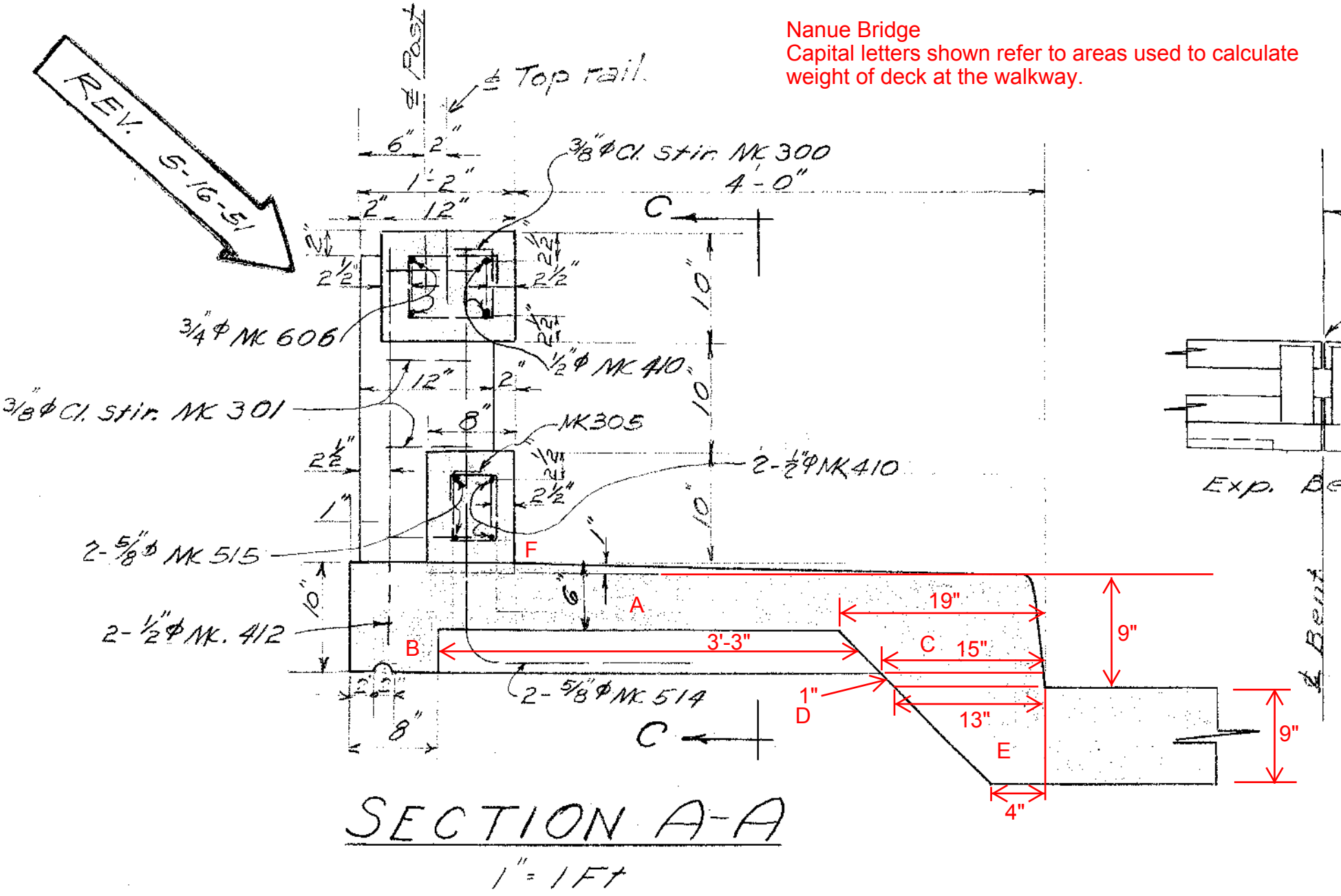
Deck Geometry

Slab Thickness	9.00 inches		RD 1949	P.3 of 11
Left Cantilever Length	6.50 ft	(Distance from End to Girder)		
Right Cantilever Length	6.50 ft			
Travelway Locations				
Distance to Left Edge	5.25 ft			
Distance to Right Edge	33.25 ft			
Sacrificial Topping	0.00 in			
Girder Spacing			RD 1949	P.3 of 11
Bay 1	9.00 ft			
Bay 2	7.50 ft			
Bay 3	9.00 ft			
Deck Width	38.50 ft		RD 1949	P.4 of 11

Deck Uniform Loads

Dead Load Group				ksf	Loc (ft)	Width (ft)
Assumed Uniform 9" Thickness		(1"/12 + 1'-2" + 4'-0") x 9"/12	3.938 sf			
Actual Weight		Total (Sum of Below)	4.167 sf			
	A	(1"/12 + 1'-2" + 4'-0") x 6"/12	2.625 sf			
	B	8"/12 x 4"/12	0.222 sf			
	C	(15"/12 + 19"/12)/2 x 4"/12	0.472 sf			
	D	(13"/12 + 15"/12)/2 x 1"/12	0.097 sf			
	E	(4"/12 + 13"/12)/2 x 9"/12	0.531 sf			
	F	0.5 x (1"/12 + 1'-2" + 4'-0") x 1"/12	0.219 sf			
Difference	Actual - Assumed		0.229 sf			
Additional Weight		0.160 kcf x Difference / (1"/12 + 1'-2" + 4'-0")	0.007 ksf			
Left Side Sidewalks		See Above	Class A-1 Concrete	0.0070	0.000	5.25
Left Side Shoulder		0.5 x 0.160 kcf x 0.5"/12	Class A-1 Concrete	0.0033	5.250	2.00
AC Pavement	(0.145 kcf)	0.145 x 1.5"/12	AC Pavement	0.0181	7.250	24.00
Right Side Shoulder		0.5 x 0.160 kcf x 0.5"/12	Class A-1 Concrete	0.0033	31.250	2.00
Right Side Sidewalks		0.160 kcf x 1"/12	Class A-1 Concrete	0.0070	33.250	5.25

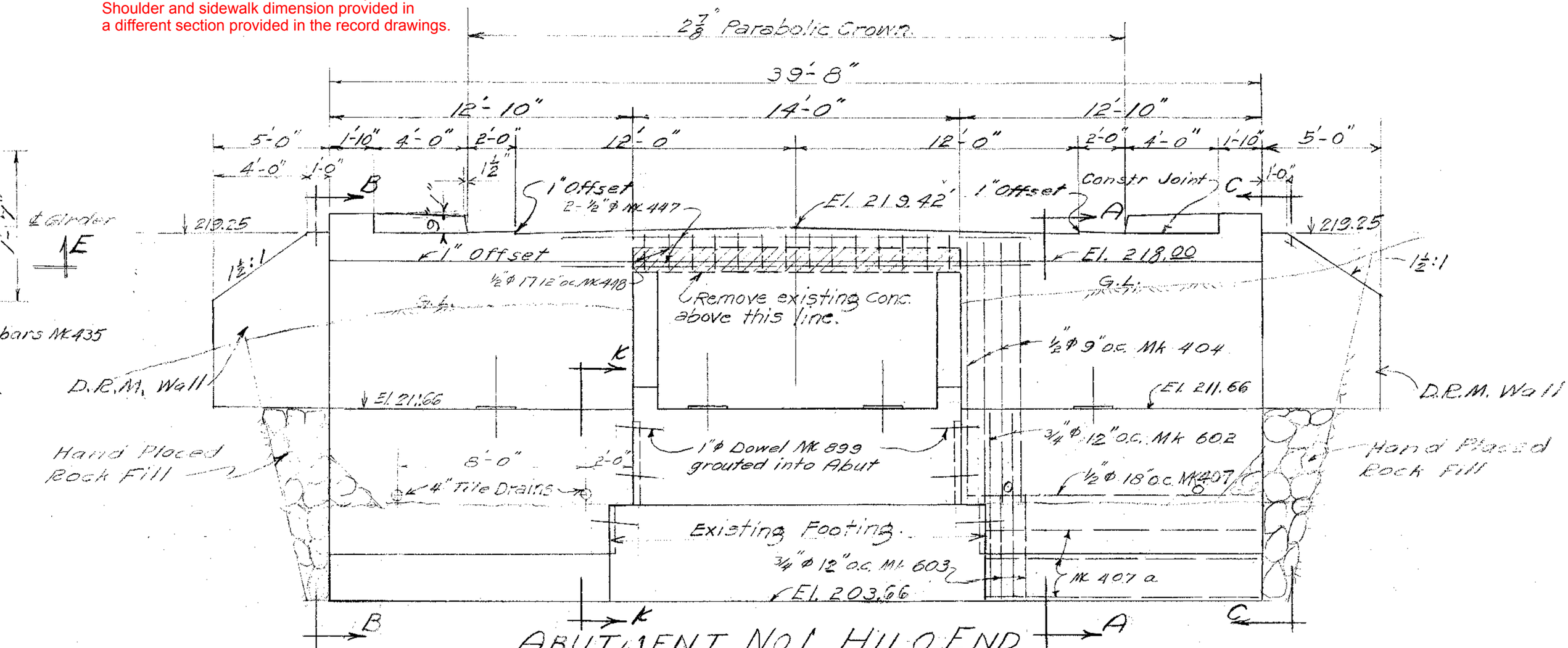
Nanue Bridge
Capital letters shown refer to areas used to calculate weight of deck at the walkway.



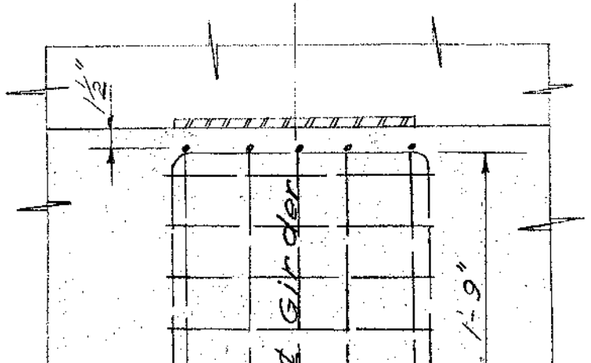
SECTION A-A

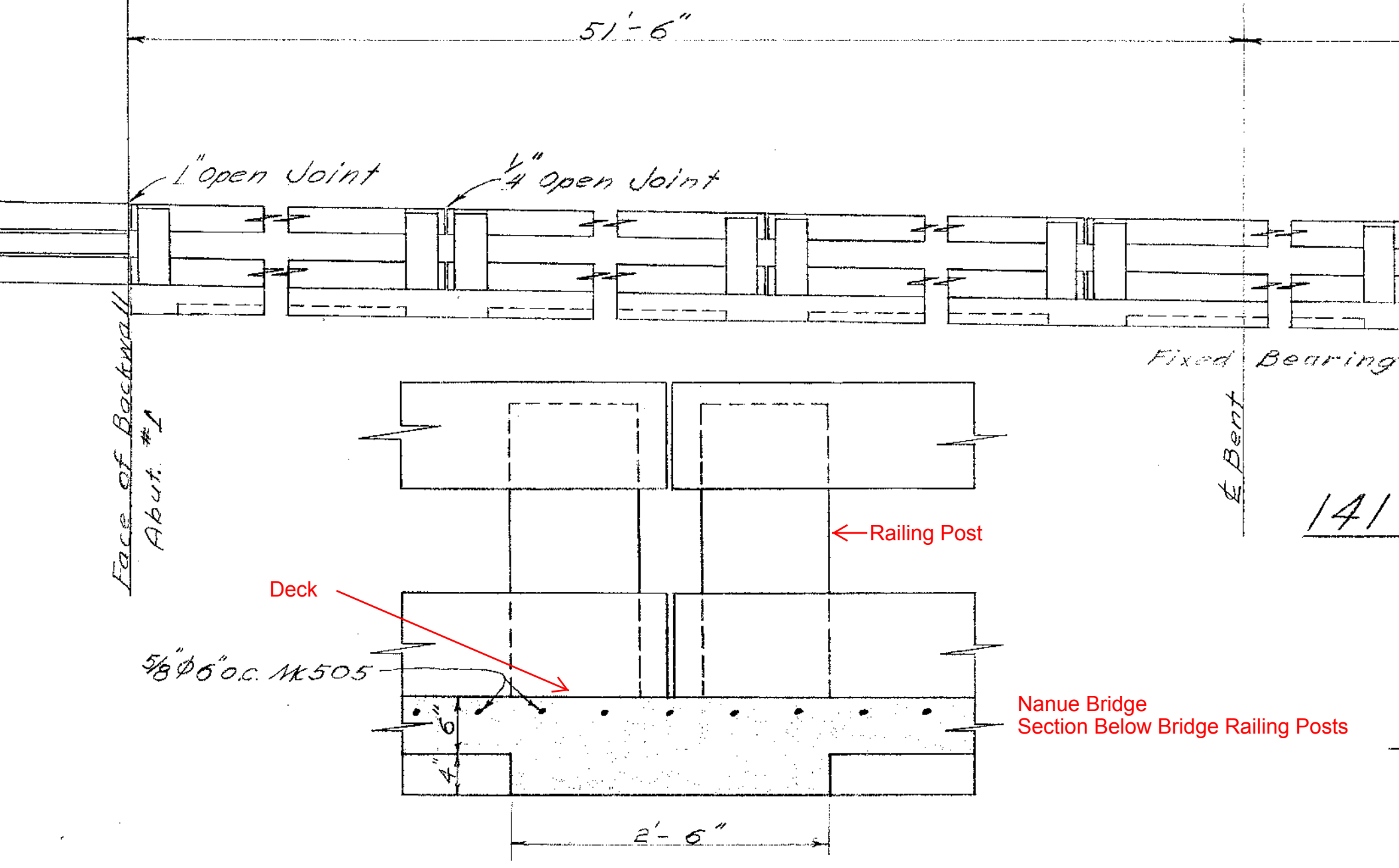
1" = 1 Ft

Nanue Bridge
No typical section of bridge deck was provided.
Used section at abutment for travelway width.
Shoulder and sidewalk dimension provided in
a different section provided in the record drawings.



ABUTMENT NO I HILO END
FRONT ELEVATION
¼" = 1 Ft.





SECTION C-C

1" = 1 Ft.

Nanue Bridge
Section Below Bridge Railing Posts

Deck Line Loads

Dead Load Group					kips/ft	Loc. (ft)
Left Side Railing*	Load = ΣWeights	Location = Σ(Weight x Location) / ΣWeights			0.3190	0.9232
Top Rail	0.160 kcf x 10"/12 x 12"/12		0.133	kips/ft 0.750 ft		
Bot Rail	0.160 kcf x 10"/12 x 8"/12		0.089	kips/ft 0.917 ft		
Post	0.160 kcf x 12" x 12" x 30" x 11 / 1728 / 72 ft		0.064	kips/ft 0.583 ft		
Thk Slab	0.160 kcf x 2'-6" x 4" x 3'-3" x 5.5 / 72 ft		0.033	kips/ft 2.292 ft		
Right Side Railing*	Load = ΣWeights	Location = Σ(Weight x Location) / ΣWeights			0.3190	37.5768
Top Rail	(Weights see above)			37.75 ft		
Bot Rail	(Weights see above)			37.58 ft		
Post	(Weights see above)			37.92 ft		
Thk Slab	(Weights see above)			36.21 ft		
Monorail (9 Supports Over 72 feet)		Load = ΣWeights	Location = Σ(Weight x Location) / ΣWeights		0.0163	34.0000
Hanger	0.490 kcf x 3"/12 x 0.5"/12 x 1'-8.5" x 9 / 72'		0.0011	kips/ft 34.00 ft		
Embeds	2 x 0.490 kcf x0.75"x0.75"x1'-3" x9 / 144 / 72'		0.0006	kips/ft 34.00 ft		
Side PL	2 x 0.490 kcf x 3"x0.375"x6.25"x9 / 72' / 1728		0.0005	kips/ft 34.00 ft		
Stiff PL	2 x 0.490 kcf x 3" x 0.5" x 3.375"x9 /72' /1728		0.0004	kips/ft 34.00 ft		
Brace	0.490 kcf x 3" x 0.5" x 1'-10" x 9 / 72' / 144		0.0012	kips/ft 34.00 ft		
7/8" Bolts	2 x 0.490 kcf x 0.601 in2 x2"x9/72'/ 1728		0.0001	kips/ft 34.00 ft		
6x25	12.5 plf / 1000		0.0125	kips/ft 34.00 ft		
2- 8" Waterlines	Load = ΣWeights				0.2236	38.5000
Schedule 80 Steel Pipe		0.180 kips/ft	2 x 90 plf / 1000			
Water Volume		0.044 kips/ft	2 x 62.4 pcf x pi x 11.374" x 11.374"/ 4 / 144 / 1000			
(Size assumed, seen in Inspection Report photos, not documented in drawings)						

51 ft Span Cover Plates

Member		Width (in)	Thick (in)	Support	Start (ft)	Length (ft)	End (ft)
Top Cover Plate		16	0.4375	1	8.3542	35.4167	43.7708
26'-0" - 17'-8 1/2"	8.2917						
24'-11 1/4" - 17'-8 1/2"	7.2292						
Bottom Cover Plate		16	0.4375	1	8.3542	35.4167	43.7708
26'-0" - 17'-8 1/2"	8.2917						
24'-11 1/4" - 17'-8 1/2"	7.2292						

51 ft Span Flanges

Member		V. Leg (in)	H. Leg (in)	Thick (in)	Support
Top Angle	2-L6x6x7/16	6.000	6.000	0.4375	1
Bottom Angle	2-L6x6x7/16	6.000	6.000	0.4375	1

50 ft Span Cover Plates

Member		Width (in)	Thick (in)	Support	Start (ft)	Length (ft)	End (ft)
Top Cover Plate		16	0.4375	1	7.2917	35.4167	42.7083
24'-11 1/4" - 17'-8 1/2"	7.2292						
24'-11 1/4" - 17'-8 1/2"	7.2292						
Bottom Cover Plate		16	0.4375	1	7.2917	35.4167	42.7083
24'-11 1/4" - 17'-8 1/2"	7.2292						
24'-11 1/4" - 17'-8 1/2"	7.2292						

50 ft Span Flanges

Member		V. Leg (in)	H. Leg (in)	Thick (in)	Support
Top Angle	2-L6x6x7/16	6.000	6.000	0.4375	1
Bottom Angle	2-L6x6x7/16	6.000	6.000	0.4375	1

40 ft Span Flanges

Member		V. Leg (in)	H. Leg (in)	Thick (in)	Support
Top Angle	2-L6x4x5/8	4.000	6.000	0.6250	1
Bottom Angle	2-L6x4x5/8	4.000	6.000	0.6250	1

72 ft Span Top Cover Plates

Member		Width (in)	Thick (in)	Support	Start (ft)	Length (ft)	End (ft)
Upper Top Cover Plate		16	0.50	1	17.9375	40.8750	58.8125
38'-3 3/4" - 20'-5 1/4"	17.875						
33'-6 3/4" - 20'-5 1/4"	13.125						
Lower Top Cover Plate (Touching Top Flange)		16	0.50	1	8.5000	55.0000	63.5000
38'-3 3/4" - 29'-10 1/2"	8.4375						
33'-6 3/4" - 25'-1 1/2"	8.4375						
Lower Top Cover Plate (Touching Top Flange)		16	0.5000	1	8.5000	9.4375	17.9375
Upper and Lower Top Plate		16	1.0000	1	17.9375	40.8750	58.8125
Lower Top Cover Plate (Touching Top Flange)		16	0.5000	1	58.8125	4.6875	63.5000

72 ft Span Bottom Cover Plates

Member		Width (in)	Thick (in)	Support	Start (ft)	Length (ft)	End (ft)
Upper Bottom Cover Plate (Touching Bottom Flange)		16	0.50	1	8.5000	55.0000	63.5000
38'-3 3/4" - 29'-10 1/2"	8.4375						
33'-6 3/4" - 25'-1 1/2"	8.4375						
Lower Bottom Cover Plate		16	0.50	1	17.9375	40.8750	58.8125
38'-3 3/4" - 20'-5 1/4"	17.875						
33'-6 3/4" - 20'-5 1/4"	13.125						
Upper Bottom Cover Plate (Touching Bottom Flange)		16	0.5000	1	8.5000	9.4375	17.9375
Upper and Lower Bottom Plate		16	1.0000	1	17.9375	40.8750	58.8125
Lower Bottom Cover Plate (Touching Bottom Flange)		16	0.5000	1	58.8125	4.6875	63.5000

72 ft Span Flanges

Member		V. Leg (in)	H. Leg (in)	Thick (in)	Support
Top Angle	2-L6x6x3/4	6.000	6.000	0.7500	1
Bottom Angle	2-L6x6x3/4	6.000	6.000	0.7500	1

51 ft Span Member (A1, B1, A1X, B1X) - Schedules - Bracing **Used these spacings for BRASS

Spacing	Support	Start Distance	Length	Notes
11.1667 ft	1	4.9063 ft	11.1667 ft	2 Members
14.4375 ft	1	35.9896 ft	14.4375 ft	2 Members

51 ft Span Member (A1, B1, A1X, B1X) - Schedules - Transverse Stiffeners **Used these spacings for BRASS

Spacing	Support	Start Distance	Length	Notes
1.3333 ft	1	0.0313 ft	1.3333 ft	2 Members
3.7500 ft	1	8.5729 ft	3.7500 ft	2 Members
3.9167 ft	1	19.9896 ft	3.9167 ft	2 Members
3.9167 ft	1	28.1563 ft	3.9167 ft	2 Members
3.6563 ft	1	39.7396 ft	7.3125 ft	3 Members

51 ft Span Member (A1, A2, B1, B2) - Schedules - Bracing **Did not use for BRASS

Spacing	Support	Start Distance	Length	Notes
11.1667 ft	1	4.9063 ft	11.1667 ft	2 Members
14.4375 ft	1	35.9896 ft	14.4375 ft	2 Members

51 ft Span Member (A1, A2, B1, B2) - Schedules - Transverse Stiffeners **Did not use for BRASS

Spacing	Support	Start Distance	Length	Notes
1.3542 ft	1	0.0313 ft	1.3542 ft	2 Members
4.0000 ft	1	4.5938 ft	20.0000 ft	6 Members
5.2500 ft	1	28.8854 ft	5.2500 ft	2 Members
4.1458 ft	1	38.1354 ft	8.2917 ft	3 Members

51 ft Span Member (A5, B5, A5X, B5X) - Schedules - Bracing **Did not use for BRASS

Spacing	Support	Start Distance	Length	Notes
14.4375 ft	1	0.6042 ft	14.4375 ft	2 Members
11.1667 ft	1	34.9583 ft	11.1667 ft	2 Members

51 ft Span Member (A5, B5, A5X, B5X) - Schedules - Transverse Stiffeners **Did not use for BRASS

Spacing	Support	Start Distance	Length	Notes
3.6563 ft	1	3.9479 ft	7.3125 ft	3 Members
3.9167 ft	1	18.9271 ft	3.9167 ft	2 Members
3.9167 ft	1	27.0938 ft	3.9167 ft	2 Members
3.7500 ft	1	38.6771 ft	3.7500 ft	2 Members
1.3333 ft	1	49.6354 ft	1.3333 ft	2 Members

50 ft Span Member (A2, A2X, B2, B2X) - Schedules - Bracing G3-2

Spacing	Support	Start Distance	Length	Notes
14.4375 ft	1	0.6875 ft	14.4375 ft	2 Members
14.4375 ft	1	34.8750 ft	14.4375 ft	2 Members

50 ft Span Member (A2, A2X, B2, B2X) - Schedules - Transverse Stiffeners G3-2

Spacing	Support	Start Distance	Length	Notes
3.6563 ft	1	3.9792 ft	7.3125 ft	3 Members
3.9167 ft	1	18.9583 ft	3.9167 ft	2 Members
3.9167 ft	1	27.1250 ft	3.9167 ft	2 Members
3.6563 ft	1	38.7083 ft	7.3125 ft	3 Members

50 ft Span Member (A4, A4X, B4, B4X) - Schedules - Bracing G4-2

Spacing	Support	Start Distance	Length	Notes
14.4375 ft	1	0.6875 ft	14.4375 ft	2 Members
14.4375 ft	1	34.8750 ft	14.4375 ft	2 Members

50 ft Span Member (A4, A4X, B4, B4X) - Schedules - Transverse Stiffeners G4-2 ***

Spacing	Support	Start Distance	Length	Notes
3.0000 ft	1	3.1042 ft	3.0000 ft	2 Members
4.0000 ft	1	6.6042 ft	4.0000 ft	2 Members
4.5069 ft	1	18.0417 ft	27.0417 ft	7 Members

40 ft Span Member (A3, B3, G5, G6) - Schedules - Bracing

Spacing	Support	Start Distance	Length	Notes
19.4167 ft	1	0.5833 ft	38.8333 ft	3 Members

40 ft Span Member (A3, B3, G5, G6) - Schedules - Transverse Stiffeners

Spacing	Support	Start Distance	Length	Notes
3.8750 ft	1	4.4583 ft	11.6250 ft	4 Members
3.8750 ft	1	23.8854 ft	11.6250 ft	4 Members

72 ft Span Member (A4, A4X, B4, B4X) - Schedules - Bracing

Spacing	Support	Start Distance	Length	Notes
17.4271 ft	1	0.5729 ft	34.8542 ft	3 Members
17.4375 ft	1	53.9583 ft	17.4375 ft	2 Members

72 ft Span Member (A4, A4X, B4, B4X) - Schedules - Transverse Stiffeners

Spacing	Support	Start Distance	Length	Notes
3.0000 ft	1	3.1042 ft	3.0000 ft	2 Members
4.0000 ft	1	9.5729 ft	4.0000 ft	2 Members
4.4167 ft	1	22.4688 ft	8.8333 ft	3 Members
4.3958 ft	1	40.6771 ft	8.7917 ft	3 Members
4.0000 ft	1	58.3646 ft	4.0000 ft	2 Members
3.0000 ft	1	65.8646 ft	3.0000 ft	2 Members

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	PROJECT:	HDOT Hwy Statewide Bridge Load Ratings	SHEET:		OF
	DESIGN FOR:	Nanue Stream Bridge	DESIGNER:	JU	DATE:
			CHECKER:		DATE:

51 ft Span Member - Dead Loads - Distributed

Distributed Load			Suppport	Start (ft)	Mag (klf)	End (ft)	Mag (klf)
Vertical Web Angles*	(Summation of weight below) x 14 / 51		1	0.0313	0.0187	50.9375	0.0187
L5x3.5x3/8 x6'-6 1/2"	0.068 kips						.
(10.4 plf) x 6'-6 1/2" / 1000	(Angle Size Assumed)						

51 ft Span Member - Dead Loads - Distributed (Interior Girders Only)

Distributed Load		Suppport	Start (ft)	Mag (klf)	End (ft)	Mag (klf)
Bottom Flange Bracing*	9.80 plf x 7.5 ft x (√2/1) x 9 / 51 ft / 2 / 1000	1	0.0313	0.0092	50.9375	0.0092
*Assumed L4x4x3/8 at 45º angle, plans show 87 members,						
loads carried by interior girders						

51 ft Span Member (A1, A1X, B1, BX) - Dead Loads - Concentrated **Used for BRASS

Concentrated Load				Suppport	Dist (ft)	Vert (kips)
Girder Bracing DB7-E	(Summation of weights below in kips) / 2			1	4.9063	0.1702
g, g 2 - L4x4x3/8 x9'-3 3/4"	0.183 kips	2 x (9.80 lb/ft) x 9'-3 3/4" / 1000				
a, ag 2-PL 12x3/8 x 1'-0.5"	0.032 kips	2 x 490 pcf x 12" x 3/8" x 1'-0.5" /1000/144				
c, ap 2-PL 12x3/8 x 1'-0.5"	0.032 kips	See Above				
f PL 9x3/8 x10"	0.010 kips	490 pcf x 9" x 3/8" x 10"/12 / 1000 / 144				
h L4x4x3/8 x8'-7 1/2"	0.085 kips	(9.80 lb/ft) x 8'-7 1/2" / 1000				
Girder Bracing DB8-E	(Summation of weights below in kips) / 2			1	16.0729	0.1641
g, g 2 - L4x4x3/8 x9'-3 3/4"	0.183 kips	2 x (9.80 lb/ft) x 9'-3 3/4" / 1000				
b, ah 2 - PL 12x5/16 x1'-0.5"	0.027 kips	2 x 490 pcf x 12" x (5/16") x 1'-0.5" /1000/144				
d, as 2 - PL 12x5/16 x1'-0.5"	0.027 kips	See Above				
af PL 9x5/16 x10"	0.008 kips	490 pcf x 9" x 5/16" x 10"/12 / 1000 / 144				
k L4x4x3/8 x8'-7 1/2"	0.085 kips	(9.80 lb/ft) x 8'-7 1/2" / 1000				
Girder Bracing DB8-E	See Above			1	35.9896	0.1641
Girder Bracing DB3-E	(Summation of weights below in kips) / 2			1	50.4271	0.1690
ad, ad 2 - L4x4x3/8 x9'-2 5/8"	0.181 kips	2 x (9.80 lb/ft) x 9'-2 5/8" / 1000				
ab, ab 2 - PL 12x3/8 x1'-0.5"	0.032 kips	2 x 490 pcf x 12" x (3/8") x 1'-0.5" /1000/144				
ac, ac 2 - PL 12x3/8 x1'-0.5"	0.032 kips	See Above				
ag PL 9x3/8 x10"	0.010 kips	490 pcf x 9" x (3/8") x 10"/12 / 1000 / 144				
af L4x4x3/8 x8'-6 3/4"	0.084 kips	(9.80 lb/ft) x 8'-7 1/2" / 1000				
Strut ST5-E	(Summation of weights below in kips) / 2			1	5.5833	0.0441
t L4x4x3/8 x 8'-7 1/2"	0.085 kips	9.80 lb/ft x 8'-7 1/2" / 1000				
k PL 5x3/8 x7"	0.004 kips	0.490 kcf x 5" x 0.375" x 7" / 1728				
Strut ST5-E	See Above			1	26.0313	0.0441
Strut ST5-E	See Above			1	43.2083	0.0441

51 ft Span Member (A1, A2, B1, B2, A5, A5X, B5, B5X) - Dead Loads - Concentrated **Not Used for BRASS

Concentrated Load				Suppport	Dist (ft)	Vert (kips)
Girder Bracing DB11-E	(Summation of weights below in kips) / 2			1	4.9063	0.1699
g, g	2 - L4x4x3/8 x9'-3 3/4"	0.183	kips	2 x (9.80 lb/ft) x 9'-3 3/4" / 1000		
v, v	2-PL 12x3/8 x 1'-0.5"	0.032	kips	2 x 490 pcf x 12" x 3/8" x 1'-0.5" /1000/144		
w, w	2-PL 12x3/8 x 1'-0.5"	0.032	kips	See Above		
f	PL 9x3/8 x10"	0.010	kips	490 pcf x 9" x 3/8" x 10"/12 / 1000 / 144		
aa	L4x4x3/8 x8'-6 3/4"	0.084	kips	(9.80 lb/ft) x 8'-6 3/4" / 1000		
Girder Bracing DB9-E	(Summation of weights below in kips) / 2			1	16.0729	0.1641
g, g	2 - L4x4x3/8 x9'-3 3/4"	0.183	kips	2 x (9.80 lb/ft) x 9'-3 3/4" / 1000		
m, ak	2 - PL 12x5/16 x1'-0.5"	0.027	kips	2 x 490 pcf x 12" x (5/16") x 1'-0.5" /1000/144		
s, at	2 - PL 12x5/16 x1'-0.5"	0.027	kips	See Above		
af	PL 9x5/16 x10"	0.008	kips	490 pcf x 9" x 5/16" x 10"/12 / 1000 / 144		
k	L4x4x3/8 x8'-7 1/2"	0.085	kips	(9.80 lb/ft) x 8'-7 1/2" / 1000		
Girder Bracing DB9-E	See Above			1	35.9896	0.1641
Girder Bracing DB10-E	(Summation of weights below in kips) / 2			1	50.4271	0.1702
g, g	2 - L4x4x3/8 x9'-3 3/4"	0.183	kips	2 x (9.80 lb/ft) x 9'-3 3/4" / 1000		
p, am	2 - PL 12x3/8 x1'-0.5"	0.032	kips	2 x 490 pcf x 12" x (3/8") x 1'-0.5" /1000/144		
t, av	2 - PL 12x3/8 x1'-0.5"	0.032	kips	See Above		
f	PL 9x3/8 x10"	0.010	kips	490 pcf x 9" x (3/8") x 10"/12 / 1000 / 144		
h	L4x4x3/8 x8'-7 1/2"	0.085	kips	(9.80 lb/ft) x 8'-7 1/2" / 1000		
Strut ST5-E	(Summation of weights below in kips) / 2			1	5.5833	0.0441
t	L4x4x3/8 x 8'-7 1/2"	0.085	kips	9.80 lb/ft x 8'-7 1/2" / 1000		
k	PL 5x3/8 x7"	0.004	kips	2 x 0.490 kcf x 5" x 0.375" x 7" / 1728		
Strut ST6-E	(Summation of weights below in kips) / 2			1	26.0313	0.0456
v	L4x4x3/8 x 8'-6 1/2"	0.084	kips	9.80 lb/ft x 8'-6 1/2" / 1000		
k	2-PL 5x3/8 x7"	0.007	kips	2 x 0.490 kcf x 5" x 0.375" x 7" / 1728		
Strut ST6-E	See Above			1	43.2083	0.0456

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	PROJECT:	HDOT Hwy Statewide Bridge Load Ratings	SHEET:		OF
	DESIGN FOR:	Nanue Stream Bridge	DESIGNER:	JU	DATE:
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50 ft Span Member - Dead Loads - Distributed

Distributed Load		Suppport	Start (ft)	Mag (klf)	End (ft)	Mag (klf)
Vertical Web Angles*	(Summation of weight below) x 14 / 50	1	0.0625	0.0190	49.875	
L5x3.5x3/8 x6'-6 1/2"	0.068 kips					.
(10.4 plf) x 6'-6 1/2" / 1000	(Angle Size Assumed)					

50 ft Span Member - Dead Loads - Distributed (Interior Girders Only)

Distributed Load		Suppport	Start (ft)	Mag (klf)	End (ft)	Mag (klf)
Bottom Flange Bracing*	9.80 plf x 7.5 ft x (√2/1) x 9 / 50 ft / 2 / 1000	1	0.0625	0.0094	49.875	
*Assumed L4x4x3/8 at 45º angle, plans show 87 members,						
loads carried by interior girders						

50 ft Span Member - Dead Loads - Concentrated

Concentrated Load			Suppport	Dist (ft)	Vert (kips)
Girder Bracing DB3-E	(Summation of weights below in kips) / 2		1	0.5729	0.1690
ad,ad 2-L4x4x3/8 x9'-2 5/8"	0.181 kips	2 x (9.80 lb/ft) x 9'-2 5/8" / 1000			
ab,ab 2 - PL 12x3/8 x1'-0.5"	0.032 kips	2 x 490 pcf x 12" x (3/8") x 1'-0.5" /1000/144			
ac,ac 2 - PL 12x3/8 x1'-0.5"	0.032 kips	See Above			
ag PL 9x3/8 x10"	0.010 kips	490 pcf x 9" x (3/8") x 10"/12 / 1000 / 144			
af L4x4x3/8 x8'-6 3/4"	0.084 kips	(9.80 lb/ft) x 8'-6 3/4" / 1000			
Girder Bracing DB6-E	(Summation of weights below in kips) / 2		1	11.2292	0.1690
t,t 2-L4x4x3/8 x9'-3 3/4"	0.183 kips	2 x (9.80 lb/ft) x 9'-3 3/4" / 1000			
p,ah 2 - PL 12x5/16 x1'-0.5"	0.027 kips	2 x 490 pcf x 12" x (5/16") x 1'-0.5" /1000/144			
s,ak 2 - PL 12x5/16 x1'-0.5"	0.027 kips	See Above			
b PL 9x5/16 x10"	0.008 kips	490 pcf x 9"/12 x (5/16")/12 x 10"/12 / 1000			
aa L4x4x3/8 x8'-7 1/2"	0.085 kips	(9.80 lb/ft) x 8'-7 1/2" / 1000			
Girder Bracing DB6-E	See Above		1	35.4375	0.1690
Girder Bracing DB3-E	See Above		1	49.8750	0.1690
Strut ST4-E	(Summation of weights below in kips) / 2		1	5.3281	0.0455
s L4x4x3/8 x 8'-6.375"	0.084 kips	9.80 lb/ft x 8'-6.375" / 1000			
k,k 2-PL 5x3/8 x7"	0.007 kips	2 x 0.490 kcf x 5" x 0.375" x 7" / 1728			
Strut ST4-E	See Above		1	23.3333	0.0455
Strut ST5-E	(Summation of weights below in kips) / 2		1	42.6563	0.0460
t L4x4x3/8 x 8'-7 1/2"	0.085 kips	9.80 lb/ft x 8'-7 1/2" / 1000			
k PL 5x3/8 x7"	0.007 kips	2 x 0.490 kcf x 5" x 0.375" x 7" / 1728			

40 ft Span Member - Dead Loads - Distributed

Distributed Load		Suppport	Start (ft)	Mag (klf)	End (ft)	Mag (klf)
Vertical Web Angles*	(Summation of weight below) x 11 / 40	1	0.0625	0.0187	39.875	
L5x3.5x3/8 x6'-6 1/2"	0.068 kips					.
(10.4 plf) x 6'-6 1/2" / 1000	(Angle Size Assumed)					

40 ft Span Member - Dead Loads - Distributed (Interior Girders Only)

Distributed Load		Suppport	Start (ft)	Mag (klf)	End (ft)	Mag (klf)
Bottom Flange Bracing*	9.80 plf x 7.5 ft x (√2/1) x 6 / 40 ft / 2 / 1000	1	0.0625	0.0078	39.875	
*Assumed L4x4x3/8 at 45º angle, plans show 87 members,						
loads carried by interior girders						

40 ft Span Member - Dead Loads - Concentrated

Concentrated Load			Suppport	Dist (ft)	Vert (kips)
Girder Bracing DB1-E	(Summation of weights below in kips) / 2		1	0.5833	0.1313
a,a 2 - L4x4x3/8 x9'-3 1/8"	0.182 kips	2 x (9.80 lb/ft) x 9'-3 1/8" / 1000			
k,k 2 - PL 12x3/8 x1'-2"	0.036 kips	2 x 490 pcf x 12" x (3/8") x 1'-2" /1000/144			
h,h 2 - PL 12x3/8 x1'-2"	0.036 kips	See Above			
ag PL 9x3/8 x10"	0.010 kips	490 pcf x 9" x (3/8") x 10"/12 / 1000 / 144			
m L4x4x3/8 x 8'-6.75"	0.084 kips	(9.80 lb/ft) x 8'-6 3/4" / 1000			
Girder Bracing DB2-E			1	20.0000	0.1313
a,a 2 - L4x4x3/8 x9'-3 1/8"	0.182 kips	2 x (9.80 lb/ft) x 9'-3 1/8" / 1000			
d,d 2 - PL 12x5/16 x1'-2"	0.030 kips	2 x 490 pcf x 12" x 5/16" x 1'-2" /1000 / 144			
c,c 2 - PL 12x5/16 x1'-2"	0.030 kips	See Above			
b PL 9x3/8 x10"	0.010 kips	490 pcf x 9" x (3/8") x 10"/12 / 1000 / 144			
g L4x4x3/8 x 8'-6.75"	0.084 kips	(9.80 lb/ft) x 8'-6 3/4" / 1000			
Girder Bracing DB1-E	See Above		1	39.9375	0.1313
Struts ST1-E	(Summation of weights below in kips) / 2		1	9.7083	0.0455
m L4x4x3/8 x 8'-6.25"	0.084 kips	9.80 lb/ft x 8'-6.25" / 1000			
k,k 2-PL 5x3/8 x7"	0.007 kips	2 x 0.490 kcf x 5" x 0.375" x 7" / 1728			
Struts ST1-E	See Above		1	29.9688	0.0455

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	PROJECT:	HDOT Hwy Statewide Bridge Load Ratings	SHEET:		OF
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72 ft Span Member - Dead Loads - Distributed

Distributed Load		Suppport	Start (ft)	Mag (klf)	End (ft)	Mag (klf)
Vertical Web Angles*	(Summation of weight below) x 19 / 72	1	0.0625	0.0180	71.8750	
L5x3.5x3/8 x6'-6 1/2"	0.068 kips					.
(10.4 plf) x 6'-6 1/2" / 1000	(Angle Size Assumed)					

72 ft Span Member - Dead Loads - Distributed (Interior Girders Only)

Distributed Load		Suppport	Start (ft)	Mag (klf)	End (ft)	Mag (klf)
Bottom Flange Bracing*	9.80 plf x 7.5 ft x (√2/1) x 12 / 72 ft / 2 / 1000	1	0.0625	0.0087	71.8750	
*Assumed L4x4x3/8 at 45º angle, plans show 87 members,						
loads carried by interior girders						

72 ft Span Member - Dead Loads - Concentrated

Concentrated Load			Suppport	Dist (ft)	Vert (kips)
Girder Bracing DB3-E	(Summation of weights below in kips) / 2		1	0.5729	0.1690
ad,ad 2 - L4x4x3/8 x9'-2 5/8"	0.181 kips	2 x (9.80 lb/ft) x 9'-2 5/8" / 1000			
ab,ab 2 - PL 12x3/8 x1'-0.5"	0.032 kips	2 x 490 pcf x 12" x (3/8") x 1'-0.5" /1000/144			
ac,ac 2 - PL 12x3/8 x1'-0.5"	0.032 kips	See Above			
ag PL 9x3/8 x10"	0.010 kips	490 pcf x 9" x (3/8") x 10" / 1000 / 1728			
af L4x4x3/8 x8'-6 3/4"	0.084 kips	(9.80 lb/ft) x 8'-7 1/2" / 1000			
Girder Bracing DB4-E	(Summation of weights below in kips) / 2		1	18.0104	0.1641
t,t 2-L4x4x3/8 x9'-3 3/4"	0.183 kips	2 x (9.80 lb/ft) x 9'-3 3/4" / 1000			
p,ah 2 - PL 12x5/16 x1'-0.5"	0.027 kips	2 x 490 pcf x 12" x (5/16") x 1'-0.5" /1000/144			
s,ak 2 - PL 12x5/16 x1'-0.5"	0.027 kips	See Above			
b PL 9x5/16 x10"	0.008 kips	490 pcf x 9"/12 x (5/16")/12 x 10"/12 / 1000			
v L4x4x3/8 x8'-7 1/2"	0.085 kips	(9.80 lb/ft) x 8'-7 1/2" / 1000			
Girder Bracing DB5-E	(Summation of weights below in kips) / 2		1	35.4271	0.1641
t,t 2-L4x4x3/8 x9'-3 3/4"	0.183 kips	2 x (9.80 lb/ft) x 9'-3 3/4" / 1000			
p,ah 2 - PL 12x5/16 x1'-0.5"	0.027 kips	2 x 490 pcf x 12" x (5/16") x 1'-0.5" /1000/144			
s,ak 2 - PL 12x5/16 x1'-0.5"	0.027 kips	See Above			
b PL 9x5/16 x10"	0.008 kips	490 pcf x 9"/12 x (5/16")/12 x 10"/12 / 1000			
w L4x4x3/8 x8'-7 1/2"	0.085 kips	(9.80 lb/ft) x 8'-7 1/2" / 1000			
Girder Bracing DB4-E	See Above		1	53.9271	0.1641
Girder Bracing DB3-E	See Above		1	71.3646	0.1690
Strut ST2-E	(Summation of weights below in kips) / 2		1	8.7188	0.0454
p L4x4x3/8 x 8'-6 1/8"	0.083 kips	9.80 lb/ft x 8'-10.25" / 1000			
k,k 2-PL 5x3/8 x7"	0.007 kips	2 x 0.490 kcf x 5" x 0.375" x 7" / 1728			
Strut ST3-E	(Summation of weights below in kips) / 2		1	26.7188	0.0471
ag L4x4x3/8 x 8'-10.25"	0.087 kips	9.80 lb/ft x 8'-10.25" / 1000			
m 2-PL 5x3/8 x7"	0.007 kips	2 x 0.490 kcf x 5" x 0.375" x 7" / 1728			
Strut ST3-E	See Above		1	44.6771	0.0471
Strut ST2-E	See Above		1	62.6458	0.0454