ATTACHMENT 1

INSPECTION REPORT

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

Inspection Report for B-40-281

W GRANTOSA DR EB over STH 145-W FOND DU LAC AV

Jul 21,2018

Type	Prior	Frequency (mos)	Performed
Routine	07-21-16	24	X
Deck Evaluation			X
SIA Review	07-21-16	48	

Start Coordinates		End Coordinates (optional)	
Latitude	43°06'43.17"N	Latitude	
Longitude	88°00'10.15"W	Longitude	
Owner	STATE HIGHWAY DEPT	Maintainer	STATE HIGHWAY DEPT

Time Log

Hours	Minutes
1	40

Team members

	Name	Number	Signature	Signature Date
Inspector	Zippel, William J	9605	William J Zippel E-signed by William Zippel(wzippel)	10-02-18

BRIDGE INSPECTION REPORT
Wisconsin Department of Transportation
DT2007 2003 s.84.17 Wis. Stats.

Identification & Location

Feature On: W GRANTOSA DR EB	Section Town Range: S34 T08N R21E	Structure Number: **B-40-281**
Feature Under: STH 145-W FOND DU LAC AV	County: MILWAUKEE	
Location 0.2M E JCT STH 181	Municipality: MILWAUKEE	Structure Name:

Geometry

measurements in feet, except where noted

Approach Roadway Width: 36	Bridge Roadway Width: 36.0	Total Length: 198.2
Approach Pavement Width: 36	Deck Width: 45.5	Deck Area (sq ft): 9018

Traffic

	Lanes	ADT	ADT year	Traffic Pattern
On	3	4000	2016	ONE WAY TRAFFIC
Under	8	27900	2015	TWO WAY TRAFFIC

Capacity

Load Rating

Inventory rating: HS14	Overburden depth (in): 2.0	Last rating date: 01-14-13	Controlling: INTERIOR DECK GIRDER Moment
Operating rating: HS24	Deck surface material: MICROSILICA MODIFIED CONC	Re-rate for capacity (Y/N):	Control location: 4.9 SPAN 2, 34.1
Posting:	Re-rate notes:		

Hydraulic

Classification

Scour Critical Code(113): (N) NO WATERWAY	Q100 (ft3/sec): 0	
High water elevation (ft): 0.0	Velocity (ft/sec): 0.0	Sufficiency #: 52.7

Span(s)

Span #	Material	Configuration	Depth (in)	Length (ft)	Main
1	CONT STEEL	DECK GIRDER		34.0	
2	CONT STEEL	DECK GIRDER		70.0	Y
3	CONT STEEL	DECK GIRDER		60.0	
4	CONT STEEL	DECK GIRDER		30.0	

Expansion joint(s)

Temperature: File: | New: 72

Joint #	Location	Type	Last inspection date	Last measure (in)	New measure (in)
1	EAST ABUTMENT	SSA-400L	07-15-14	0.9	0.6
2	WEST ABUTMENT	SSA-400L	07-15-14	1.0	0.6

Clearance

Item	File Measurement (ft)	File Date	New Measurement (ft)
Highway Min Vertical Under Cardinal	14.96		
Highway Min Vertical Under Non-Cardinal	15.22		
Horizontal Under Cardinal	52.0		
Horizontal Under Non-Cardinal	61.3		
Highway Min Vertical On Cardinal			
Horizontal On Cardinal			

Special Components

Component	Year	Work Performed	Note
DECK - IOWA MIX	1992	OVERLAY - CONCRETE	MICRO-SILICA MODIFIED CONCRETE OVERLAY

Construction History

Year	Work Performed	FOS id
0	NOT BUILT	0077-02-23
1993	ADD PED FENCING	1360-03-73
1992	OVERLAY - CONCRETE	1360-00-74
1965	NEW STRUCTURE	

Maintenance Items

Item	Priority	Recommended by	Status	Status change
IMP-Structure Replacement	MEDIUM	Sadowski, Jason (9593)	IDENTIFIED	07/21/14
Recommend 2020.				
IMP-Deck Replacement	MEDIUM	Tormey, Jeffrey T (9510)	IDENTIFIED	07/28/16
Schedule Deck Replacement				
Bearings - Reposition	MEDIUM	Zippel, William J (9605)	IDENTIFIED	10/01/18
Reposition east abutment expansion bearings.				
Deck - Repair Sidewalk	MEDIUM	Zippel, William J (9605)	IDENTIFIED	10/01/18
Repair sidewalk on bridge and on approaches.				
Bearings - Reposition	LOW	Tormey, Jeffrey T (9510)	IDENTIFIED	07/28/16
Modify Expansion Bearing hold downs to allow additional expansion				

Elements

Chk	Element	Defect	Description	UOM	Total	Quantity in Condition State 1	2	3	4
X	**12**		**Reinforced Concrete Deck** **Spans #'d West to East. Bays #'d from N to S.**	SF	9,018	8,528	446	44	0
		1080	Delamination - Spall - Patched Area Sp 1: 1 **S**ound full depth patch - 16 sf @ CS2, area of Delam in Bay 3 - 10sf @ CS**3**; Sp 2: Wet area in bay 3 E of P1 - CS1; Sp 3: **D**eck replaced in Bay 5 due to girder replacement - CS1; Sp 4: Area of delam - **3**0sf @ CS**3, and spalled area about 4 SF in Bay 4.**	SF		0	16	44	0
		1130	Cracking (RC) **Scattered transverse cracks with efflorescence throughout deck.** Sp 1: 60 **SF** CS2; Sp 2: 30 **SF** CS2; Sp 3: 30 **SF CS2 and** areas of narrow map cr**ac**king w/Lt Eff 100 sf CS2; Sp 4: 60 **SF CS2 and** areas of narrow map cr**ac**king w/Lt Eff 150 sf CS2;	SF		0	430	0	0
	8514		Concrete Overlay	SF	7,135	3,167	739	3,229	0
		8911	Abrasion, Wear, or Rutting (Wear. Surf.) **Span 1 - Plow abrasion at west joint, south half of roadway (24SF CS2).**	SF		0	24	0	0
		3210	Debonding/Spall/Patched Area/Pothole **May 2015 IR: "Numerous large delaminations throughout the deck." 30-35% Delam.** **Two 2 ft spalls at West Abut (Lane 1 and Lane 2).** **10SF Delam with concrete close to popping out Sp**an **3.**	SF		0	0	2,514	0
		3220	Crack (Wearing Surface) **Narrow to medium** longit **and map crack**ing **throughout deck. Some overlap with delams above.** **Approx 10% additional CS2** and **10% additional CS3.**	SF		0	715	715	0

X	**107**		**Steel Open Girder**	LF	1,170	35	1,075	60	0
			Spans #'d West to East. Girders **#'d** from **N** to **S.** 35 ft section of G6 (South) Span 3 replaced in 2001						
		1000	Corrosion	LF		0	1,075	60	0
			Lt to med edge rust at both flanges; Lt to med freckled rust at underside btm flg and at webs; Rust heavier over Rdwys **with approx 60LF CS3 corrosion.** New Girder Section **paint is** Scraped over Center Lane						
	8516		Painted Steel	SF	10,659	0	6,395	3,198	1,066
		3440	Effectiveness (Steel Protective Coatings)	SF		0	6,395	3,198	1,066
			Peeling paint at flg edges; lt bubbling/blistering at webs and at underside btm flg, condition worse over roadway**.** **Approximate 60%** CS2, **30% CS3, 10% CS4.**						
X	**205**		**Reinforced Concrete Column**	EA	9	5	1	3	0
			Piers #'d West to East. Columns #'d from N to S.						
		1080	Delamination - Spall - Patched Area	EA		0	1	3	0
			P1: Lg Delam Col 2 - 1 @ CS3**;** **P2: Lg Delam Col 1, Failed patch w/spall Col 2, S**ound patch at **C**ol 3, **- 1@CS2 and** 2 @ CS**3**; P3: **OK**						
		1130	Cracking (RC)	EA		0	0	0	0
			P1: **OK** P2: HL map crks at delams and patches **(Overlaps delam/spalls).** P3: **OK**						
X	**215**		**Reinforced Concrete Abutment**	LF	91	27	63	1	0
		1080	Delamination - Spall - Patched Area	LF		0	50	1	0
			W. Abut: 3 sound conc patches in body - 6' @ CS2, sound patches in bkwl 20' @ CS2, water in Bay 5 **and behind G1** from leaking expansion joint; E. Abut: 4 sound conc patches in body - 4' @ CS2, 20 sound patches in bkwl - 20' @ CS2; **Small spall at north end - 1 LF CS3.**						
		1130	Cracking (RC)	LF		0	13	0	0
			W. Abut: 3 **N**arrow vert crks in body - 3' @ CS2, 2 narrow vert crks in bkwl - 2' @ CS2; E. Abut: 4 **N**arrow vert & horiz crks in body - 4' @ CS2, 4 narrow vert crks in bkwl - 4' @ CS2;						
X	**234**		**Reinforced Concrete Cap**	LF	131	131	0	0	0
			Piers #'d West to East.						
		1130	Cracking (RC)	LF		5	0	0	0
			P2: HL vert crks, some extend thru both faces;						
X	**300**		**Strip Seal Expansion Joint**	LF	72	0	71	1	0
			Measurements: West Abut: 3/4" @ 80 Degrees East Abut: 3/4" @ 80 Degrees						
		2310	Leakage, Seal Adhesion, Damage,Cracking	LF		0	0	1	0
			West Abut: Spall at CL. 1 LF CS3.						
		2350	Debris Impaction	LF		0	71	0	0
			W. Abut: **F**illed w/debris - 36' CS2; E. Abut: **F**illed w/debris - 36' CS2						

X	**311**		**Moveable Bearing**	EA	24	0	15	9	0
			Located at both **A**butmetns and Piers 1 and 3**.** **Hold down assemblies at Girders 2-5 at both abutments.**						
		1000	Corrosion	EA		0	15	3	0
			W. Abut: Hvy Rust @ G1, Mod Rust on G2-6 masonry plates - 5 @ CS2, 1 @ CS3. **P1: Mod Rust - 6 @ CS2;** **P3: Lt Rust - 6 @ CS2;** **E. Abut: Mod/Hvy Rust - 4 @ CS2, 2 @ CS3;**						
		1020	Connection	EA		0	0	0	0
			East Abut: Broken keeper G1. **Pier 3: Broken keeper G6.** **West Abut: Broken keeper G1.** **Quantities overlap corrosion.**						
		2220	Alignment	EA		0	0	6	0
			E. Abut**:** Brgs **at or past** expansion limits**.**						
		2240	Loss of Bearing Area	EA		0	0	0	0
			E Abut: Hold down pins bearing at the back of slot. Bronze Plate loss of bearing 1/2" to 3/4".						
X	**313**		**Fixed Bearing**	EA	6	0	6	0	0
			Located at Pier 2						
		1000	Corrosion	EA		0	6	0	0
			Lt Rust - 6 @ CS2						
X	**331**		**Reinforced Concrete Bridge Rail**	LF	219	4	175	40	0
		1080	Delamination - Spall - Patched Area	LF		0	150	40	0
			N. Rail: **R**ust stains at shallow rebars - 50' @ CS2; delams at curb face - 50' @ CS2, Spalls w/exp rebar at curb face - **3**0' @ CS3 S. **R**ail: **R**ust stains, shallow delams at Front face - 50' CS2						
		1130	Cracking (RC)	LF		194	25	0	0
			N. rail: HL map and horiz. crks; S. rail: HL map and horiz. crks**. N**arrow vert. cr**ac**ks at posts - 25' CS2						
X	**8400**		**Integral Wingwall**	EA	4	3	1	0	0
		8903	Wall Deterioration	EA		3	1	0	0
			SW: **HL map crk - CS1** **NW: HL map crk - CS1** **SE: HL map crk - CS1** **SE: N**arrow map crk - CS2						

Assessments

Chk	Element	Defect	Description	UOM	Total	Quantity in Condition State 1	2	3	4
X	9001		**Drainage - Ends of Structure** All corners - Slopes - CS1	EA	4	4	0	0	0
X	9009		**Sidewalk** HL longit & trans crks, exist. patches, delams along curb face.	EA	1	0	1	0	0
X	9011		**Utilities** 6-4" dia Transite WE ducts in Bay 1, disconnected at both abuts, damaged just west of P2 - 1 @ CS3; 4" dia gas Line in Bay 4 - 1 @ CS1; 4- 3" dia Steel Police & Traffic Control Ducts in Bay 2, moderate rust in spans 2 & 3 - 1 @ CS2 Hangers in bay 2 corroded over rdwy, monitor. **Street lighting: Corroded conduits and some broken light shrouds.**	EA	4	1	1	2	0
X	9030		**Signs - Object Markers** @ NW corner at west end of north bridge rail, and NE corner on light pole in median	EA	2	2	0	0	0
X	9035		**Signs - Other** N-Hwy 145, Grantosa/Villard **at SW corner.**	EA	2	2	0	0	0
X	9042		**Slope Protection- Concrete** W. Abut: Cracks, SW corner heaved by dead tree - CS2; E. Abut: Cracks SE side settled - CS2; Lt vegetation at both	EA	2	0	2	0	0
X	9167		**Steel Diaphragm** Lt/Mod Rust, heavier over rdwy	EA	60	0	60	0	0
X	9323		**Approach Roadway - Asphalt** E. Appr: Distress @ Hdr Ln 1 & 3, slightly low, Lg spl in Ln 3 - 1 @ CS3; W. Appr: **Open transverse and longitudinal cracks. Spalls at PB and shoulder, sidewalk is cracked.** 1 @ CS3	EA	2	0	0	2	0
X	9335		**Decorative Rail** Lt rust on anchor bolts	EA	1	0	1	0	0
X	9336		**Luminaire Bases**	EA	2	2	0	0	0
X	9337		**Protective Screening** Peeling paint on galvanized posts and rails	EA	1	0	1	0	0

NBI Ratings

	File	New
Deck	4	4
Superstructure	6	5
Substructure	6	6
Culvert	N	N
Channel	N	N
Waterway	N	N

Structure Specific Notes

Deck replaced in 35-Ft section over S. beam in E. span.

Inspection Specific Notes

Inspector Site-Specific Safety Considerations

Structure Inspection Procedures

Access from shoulders.

Special Requirements

Chk	Hours	Cost	Comments

Routine

Document Comment/Description

Top of deck looking West

Routine

Document Comment/Description

RC Deck - Typ transv crack with efflorescence. Photo shows Span 2 Bay 5.

Routine

Document Comment/Description

RC Deck - Large area of delam with spalling. Span 4, Bay 4.

Routine

Document Comment/Description

Conc OL - Two 2 ft spalls at West Abut (Lane 1 and Lane 2).

Routine

Document Comment/Description

Conc OL - 10SF Delam with concrete close to popping out Span 3.

Routine

Document Comment/Description

Steel Open Girder - Rust heavier over Rdwys with approx 60LF CS3 corrosion. Photo shows Span 2, girder 2.

Routine

Document Comment/Description

RC Col - Large delam Col 2, Pier 1.

Routine

Document Comment/Description

RC Abut - E. Abut: Small spall at north end - 1 LF CS3.

Routine

Document Comment/Description

Strip Seal Exp Jt - West Abut: Spall at CL.

Routine

Document Comment/Description

Moveable bearing: E Abut, G1. Corrosion, broken inside keeper, and loss of bearing 3/4" above bronze plate.

Routine

Document Comment/Description

RC Bridge Rail - N. Rail: Rust stains at shallow rebars, delams at curb face, Spalls w/exp rebar at curb face. Photo near middle of bridge.

Routine

Document Comment/Description

Asphalt Appr: Cracks and potholes forming at west appr.

Non-Image Documents

Type	Document	Document Comment/Description	Attached
Deck Evaluation	b40-281_18_Kd1.pdf	May 2015 Deck Eval.	X

DECK INSPECTION SHEET

STRUCTURE NO.: B-40-281

FEATURE ON	MAINTAINER	COUNTY	ROADWAY WIDTH (FEET)	TOTAL LENGTH (FEET)
W. Grantosa Dr. (EB)	State	Milwaukee	36.0	198.2
FEATURE UNDER	**LOCATION**	**SKEW ANGLE**	**DECK AREA (sq.ft.)**	**RDWY AREA (sq.ft.)**
STH 145 - W. Fond du Lac Ave.	0.2 ME Jct STH 181	9 Left	9,018	7,135
STRUCTURE TYPE	**SPANS**	**LENGTHS**	**NO. OF LANES**	**NO. OF SHOULDERS**
Cont Steel Deck Girder	4	34.0, 70.0, 60.0, 30.0	3	0

CONSTRUCTION HISTORY	YEAR	WORK PERFORMED
	1965 1992	New Structure Concrete Overlay

INFRARED SURVEY RESULTS (LEVEL 1)

ESTIMATED % TOTAL DISTRESS* 30-35%

If <2% _____

DATE OF SURVEY	TOTAL ROADWAY AREA (sq. ft.)	AREA IN SHADE/DEBRIS (sq. ft.)	AREA INSPECTED (sq. ft.)
5/1/15	7,135	None	7,135

ESTIMATED % TOTAL DISTRESS IS THE DEFECT AREAS ONLY AND IS NOT THE ESTIMATED REHABILITATION AREA

TYPE OF DEFECT	PERCENT OF AREA INSPECTED					
	0-5	5-10	10-15	15-20	20-25	25+
Delamination						30-35%
Debonding	None					
Concrete Patching *	None					
Asphalt Patching	None					
Spalling	None					
PREVIOUS SURVEYS						
YEAR LEVEL (Total Defects)						
2010 1					X	
2005 1			X			
2001 1		X				

COMMENTS: * Concrete patch (≈ 120 ft.²) on east side of deck to traffic impact (2001). Not included in defect quantities.
- Numerous large delaminations throughout the deck.

 # PATCHES: 0 (see above)

 # OF CORES: 0 **RESULTS:** _____

PROJECT ID.: 1000-70-15

WORK ORDER: #2

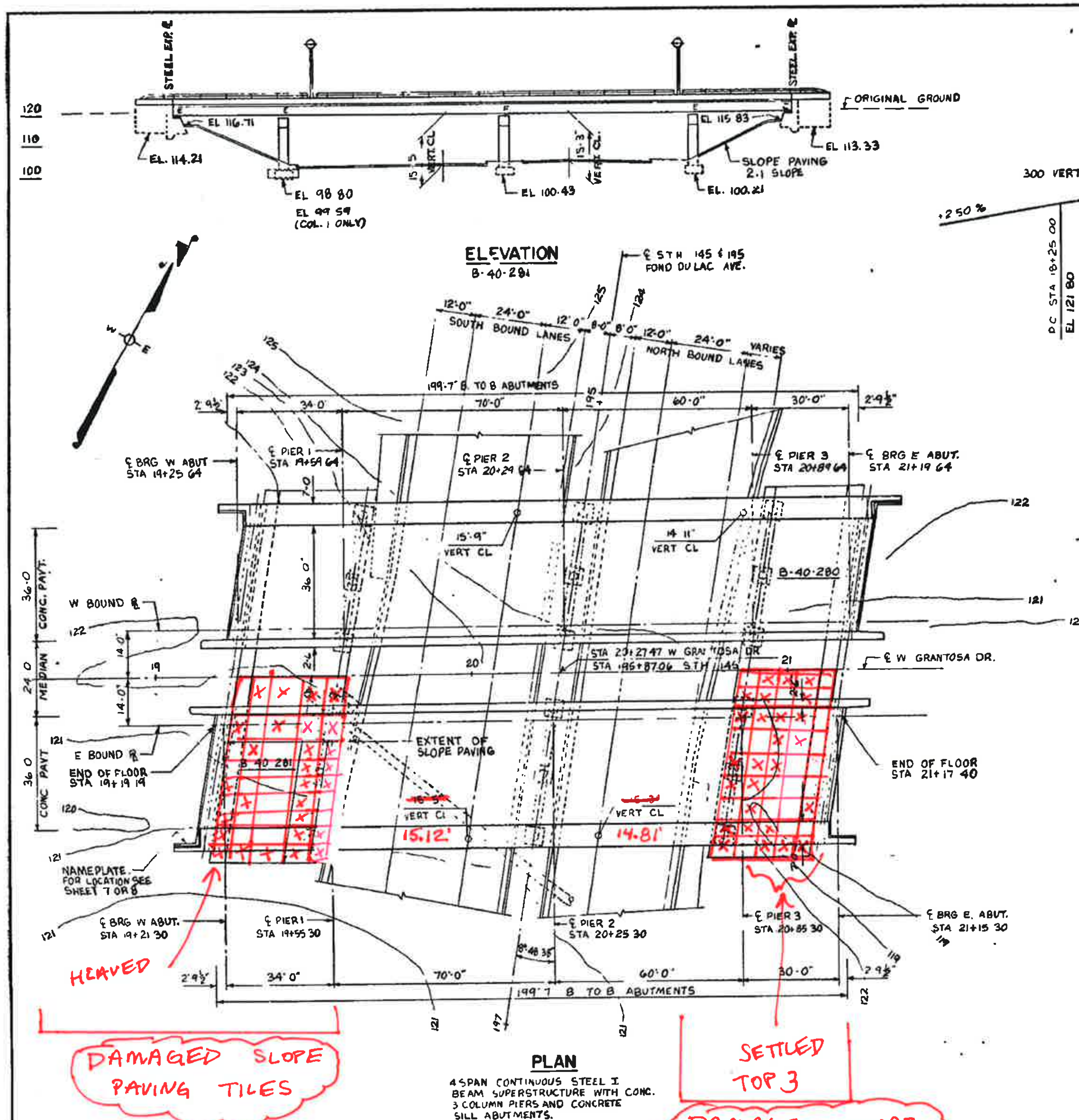
ATTACHMENT 2

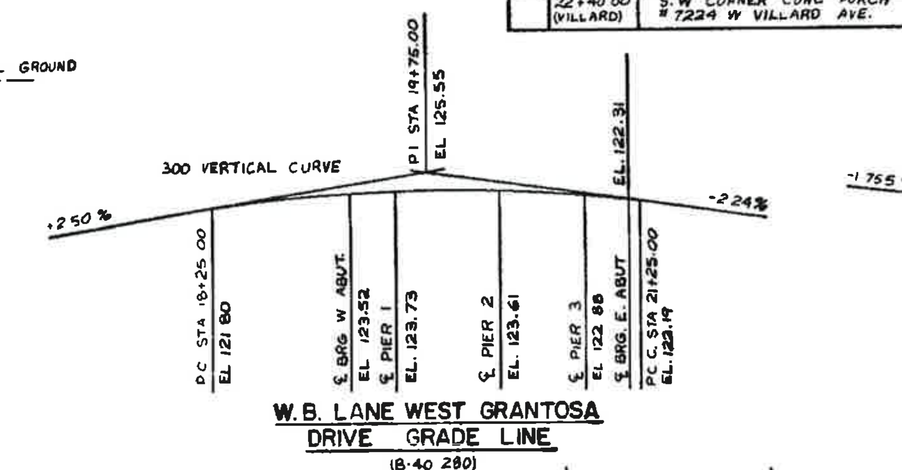
DEFICIENT AREAS

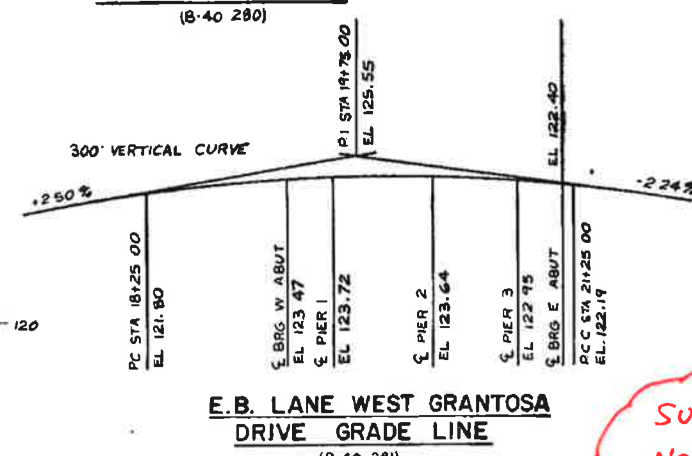
COUNTY & HIGHWAY	ROUTE & SECTION	CLASS & ADJUSTMENT STATE / FEDERAL	B P R DIVISION	PROJECT	SHEET NO	TOTAL SHEETS
40.1	27.1	22.6		F027-1(22)	185	383

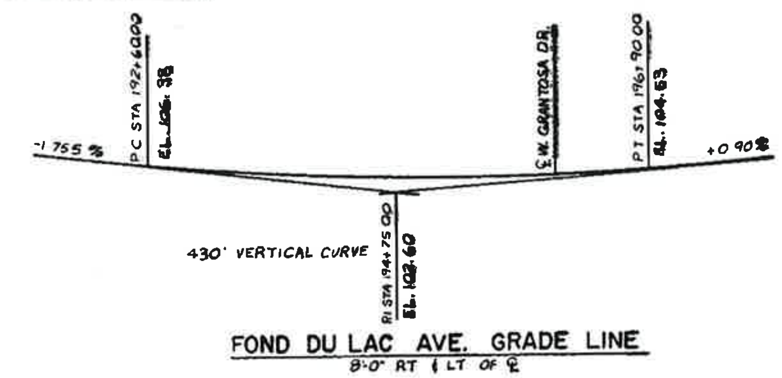
BENCH MARK

NO	STATION	DESCRIPTION	ELEV
	22+40.00 (VILLARD)	S.W. CORNER CONC PORCH # 7224 W VILLARD AVE.	121.53









GENERAL NOTES

DRAWINGS SHALL NOT BE SCALED.

ALL CONCRETE MASONRY SHALL BE GRADE A-A. f_c = 1400 PSI

HOT-POURED ELASTIC TYPE JOINT SEALER SHALL CONFORM TO ASTM DESIGNATION, D1190.

BEVEL EXPOSED EDGES OF CONCRETE 1" UNLESS OTHERWISE SHOWN OR NOTED.

IMBED ALL BAR STEEL 2" UNLESS OTHERWISE SHOWN.

ALL FIELD CONNECTIONS SHALL BE ¾" Ø RIVETS OR HIGH STRENGTH BOLTS UNLESS OTHERWISE SHOWN.

THE SLOPE IN FRONT OF THE ABUTMENTS SHALL BE COVERED WITH "SLOPE PAVING" AS SHOWN IN "PLAN" ON THIS SHEET AND IN "SECTION AA" ON SHEET 9 & 13.

ALL SPACES EXCAVATED AND NOT OCCUPIED BY THE STRUCTURE SHALL BE BACKFILLED WITH GRANULAR BACKFILL TO THE ELEVATION AND SECTION EXISTING PRIOR TO EXCAVATION.

SUPERSTRUCTURE CONDITION NOT FULLY DOCUMENTED BECAUSE REDECKING IS ANTICIPATED, SEE PHOTOS IN _OTH.pdf

TOTAL ESTIMATED QUANTITIES

BID ITEMS	UNIT	SUPER	W ABUT	PIER 1	PIER 2	PIER 3	E ABUT	TOTAL
EXCAVATION FOR STRUCTURES	C Y		145	75	70	60	140	490
GRANULAR BACKFILL	C Y	—	40	50	50	45	40	225
CONCRETE MASONRY	C Y	241 4	71 0	46.1	44.6	38.2	69 5	510 8
BAR STEEL REINFORCEMENT	L B	77,800	2,230	5,920	6,380	4,800	2,220	99,350
STRUCTURAL CARBON STEEL	L B	83,660		—		—	—	83,660
STRUCTURAL LOW ALLOY STEEL	L B	94,650	—	—	—		—	94,650
TUBULAR RAILING - TYPE B	L F	428 9	—	—	—	—	—	428 9
SLOPE PAVING - CONCRETE	S Y	—	260	—	—	—	240	500
LUBRICATED BRONZE PLATES	L B	276	—	—	—	—	—	276
BEARING PADS	S F	37	—	—	—	—	—	37
ELECTRICAL WORK (B-40-281)	L S	1	—	—	—	—	—	1
NON B.D. ITEMS								
½" ZINC OR ALUMINUM PLATES	S F	45	—	—	—	—	—	45

LIST OF DRAWINGS

1. GENERAL PLAN — X27878
2. SUPERSTRUCTURE — X27879
3. SUPERSTRUCTURE — X27880
4. LONG SECTION & BEARINGS — X27881
5. LONG SECTION & BEARINGS — X27882
6. EXPANSION JOINT — X27883
7. TUBULAR STEEL RAILING - TYPE B — X27884
8. TUBULAR ALUMINUM RAILING - TYPE B — X27885
9. WEST ABUTMENT — X27886
10. PIER 1 — X27887
11. PIER 2 — X27888
12. PIER 3 — X27889
13. EAST ABUTMENT — X27890
14. UTILITIES & LIGHTING DETAILS — X27891

FOR SUBSURFACE EXPLORATION SEE B-40-280

STATE HIGHWAY COMMISSION OF WISCONSIN

GENERAL PLAN

CO. MILWAUKEE | CITY MILWAUKEE | STA 20+27.47
SECTION 34 | TOWN 8 N | RANGE 21 E
DESIGN SPEC AASHO 61 | LOADING H20 S16 | CONST SPEC 1963
DATE 10-24-63 | DESIGN VGH | DRAWN UD | CKD

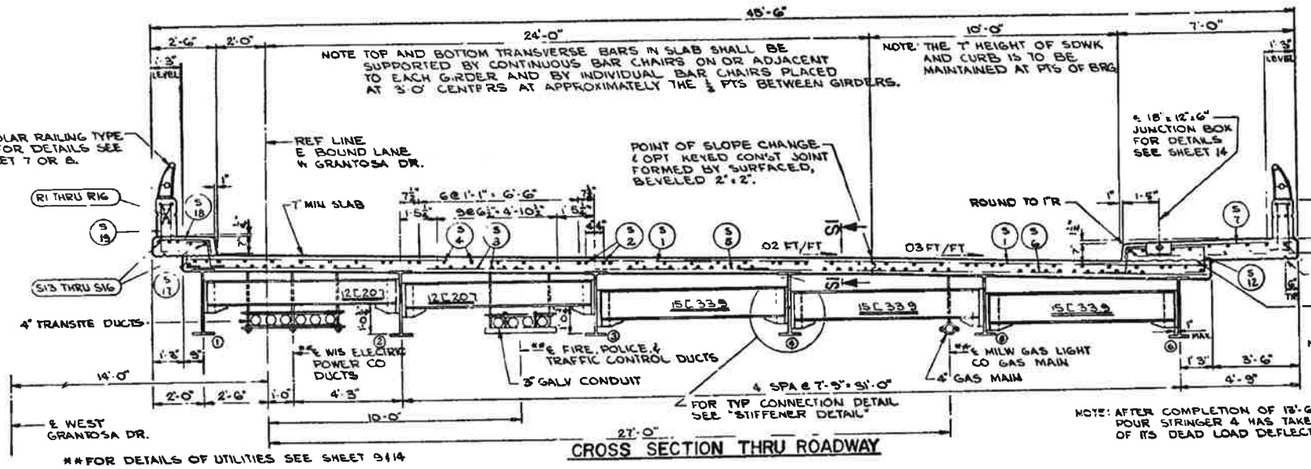
RECOMMENDED: [signature] ENGINEER OF BRIDGES
APPROVED: [signature] STATE HIGHWAY ENGINEER

STRUCTURE B - 40 - 281 | SHEET 1 OF 14

X27878

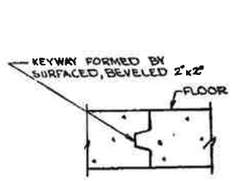
FORM E 8-12-68

B P R DIVISION	PROJECT	SHEET NO.	TOTAL SHEETS
4	F027-1(22)	186	383

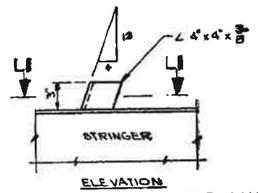


CROSS SECTION THRU ROADWAY

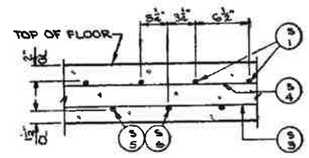
NOTE: AFTER COMPLETION OF 18'-6" POUR STRINGER 4 HAS TAKEN 21% OF ITS DEAD LOAD DEFLECTION.



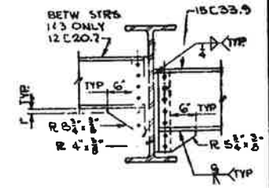
LONG. & TRANS. CONST. JT.
RUN STEEL THRU JOINT. BAR STEEL REINF NOT SHOWN



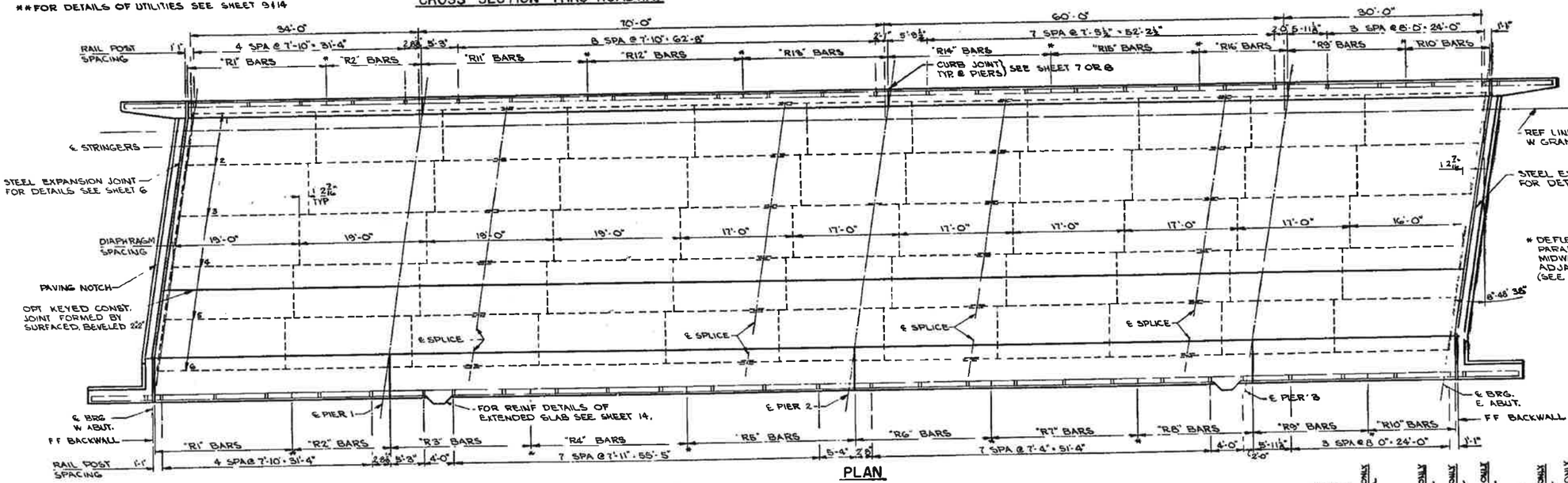
SHEAR LUG DETAIL



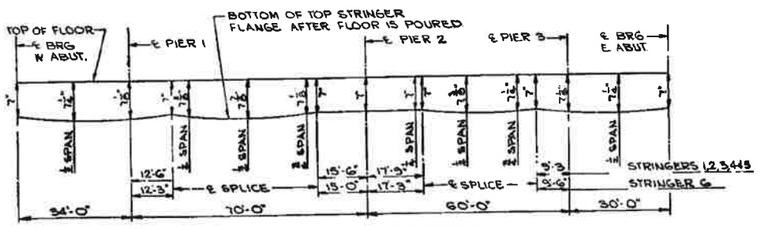
SECTION S1



STIFFENER DETAIL



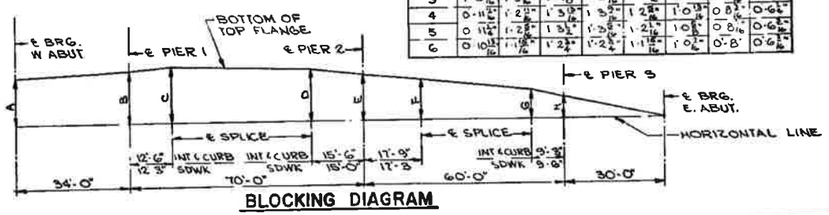
PLAN



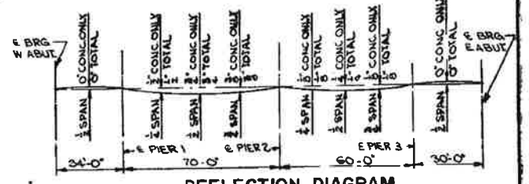
SLAB THICKNESS DIAGRAM

SLAB THICKNESSES SHOWN ARE THEORETICAL AND MAY NEED TO BE CHANGED TO COMPENSATE FOR CONSTRUCTION DISCREPANCIES.

BEAM	A	B	C	D	E	F	G	H
1	1'-1"	1'-3"	1'-4"	1'-4"	1'-2"	1'-1"	0'-8"	0'-6"
2	1'-0"	1'-3"	1'-4"	1'-4"	1'-2"	1'-1"	0'-8"	0'-6"
3	1'-0"	1'-3"	1'-4"	1'-3"	1'-2"	1'-1"	0'-8"	0'-6"
4	0'-11"	1'-2"	1'-3"	1'-3"	1'-2"	1'-0"	0'-8"	0'-6"
5	0'-11"	1'-2"	1'-3"	1'-3"	1'-2"	1'-0"	0'-8"	0'-6"
6	0'-10"	1'-2"	1'-2"	1'-2"	1'-1"	1'-0"	0'-8"	0'-6"



BLOCKING DIAGRAM



DEFLECTION DIAGRAM

STATE HIGHWAY COMMISSION OF WISCONSIN

SUPERSTRUCTURE

DESIGN SPEC A A S H O 'G1' LOADING H20 S16 CONST SPEC 1963
DATE 10 24 63 DES. JH V.G.H. DRAWN J.C.K. CHD.

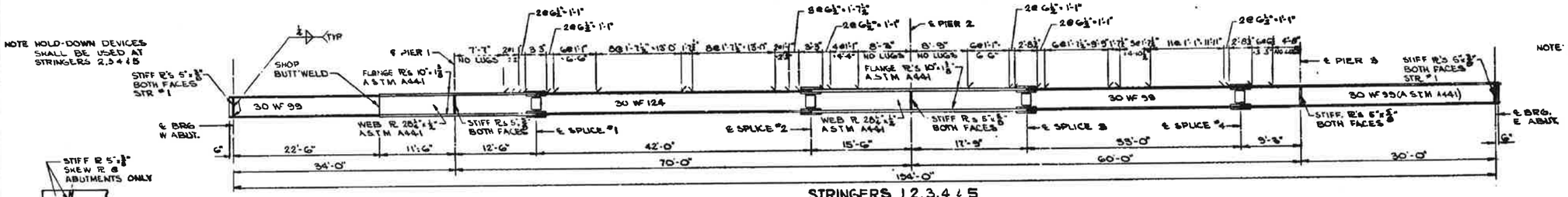
STRUCTURE B-40-281 SHEET 2 OF 14

X 27879

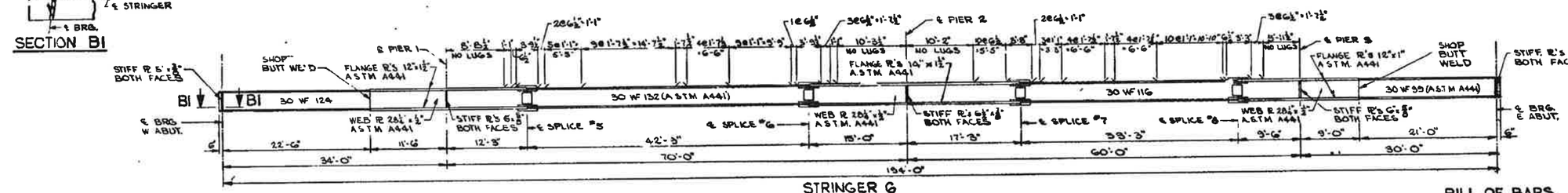
B P R DIVISION	PROJECT	SHEET NO	TOTAL SHEETS
4	F027-1(22)	187	383

NOTE HOLD-DOWN DEVICES SHALL BE USED AT STRINGERS 2,3 & 5

NOTE: HOLD DOWN DEVICES SHALL BE USED ON STR. 2,3,4 & 5 AT BOTH ABUTS.

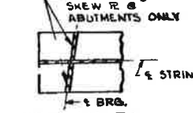


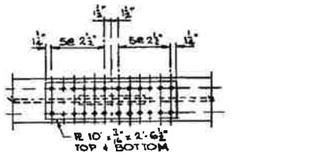
STRINGERS 1,2,3,4 & 5



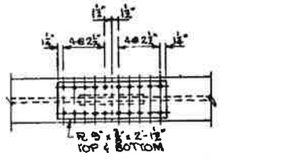
STRINGER 6
(SIDEWALK STR.)

SECTION B1



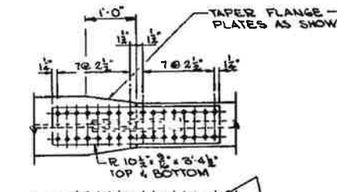


SPLICE 1 & 2

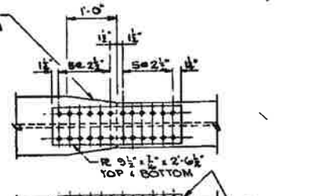


SPLICE 3 & 4

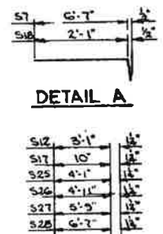
SPLICE #3 SHOWN SPLICE #4 SIMILIAR EXCEPT FOR NO SHIM R.



SPLICE 5 & 6
(STRUCT LOW ALLOY STEEL)



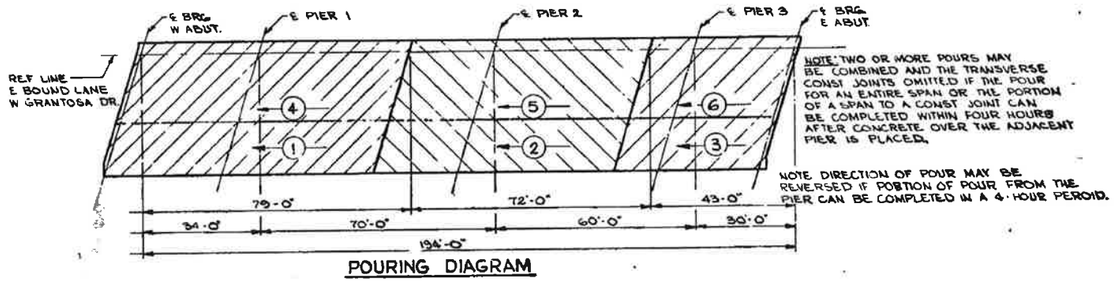
SPLICE 7 & 8



DETAIL A

DETAIL B

DETAIL C



POURING DIAGRAM

NOTE: TWO OR MORE POURS MAY BE COMBINED AND THE TRANSVERSE CONST JOINTS OMITTED IF THE POUR FOR AN ENTIRE SPAN OR THE PORTION OF A SPAN TO A CONST JOINT CAN BE COMPLETED WITHIN FOUR HOURS AFTER CONCRETE OVER THE ADJACENT PIER IS PLACED.

NOTE: DIRECTION OF POUR MAY BE REVERSED IF PORTION OF POUR FROM THE PIER CAN BE COMPLETED IN A 4-HOUR PERIOD.

BILL OF BARS

POUR	MARK	NO	SIZE	LENGTH	SPACING	LOCATION	DET
RAILING PARAPET	R1	8	6	20-0	"	" "	
	R2	8	5	14-0	"	" "	
	R3	4	6	20-9	"	" "	
	R4	4	5	23-3	"	" "	
	R5	4	5	24-9	"	" "	
	R6	4	5	20-6	"	" "	
	R7	4	5	21-6	"	" "	
	R8	4	5	16-6	"	" "	
	R9	8	5	17-6	"	" "	
	R10	6	5	12-6	"	" "	
	R11	4	6	24-6	"	" "	
	R12	4	6	23-0	"	" "	
	R13	4	5	21-3	"	" "	
	R14	4	5	24-0	"	" "	
	R15	4	5	22-0	"	" "	
	R16	4	5	12-9	"	" "	

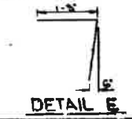
BILL OF BARS

77,800#

DIMENSIONS IN BENDING DETAILS ARE OUT TO OUT.

POUR	MARK	NO	SIZE	LENGTH	SPACING	LOCATION	DET
	S1	726	6	21-3	6½	FLOOR - TOP - TRANS.	
	S2	36	5	15-0	SHOWN	" - " - LONG - STM ABOUT ℄ PIERS	
	S3	312	5	33-9	6½	" - BOT - LONG	
	S4	210	5	33-9	1-1	" - TOP - LONG.	
	S6	342	6	19-0	6½	" - BOT - TRANS.	
	S8	342	6	24-0	6½	" - " - "	
	S7	195	6	7-0	1-0	SIDEWALK - TRANS.	A
	S8	9	5	34-6	SHOWN	" - - LONG - SPAN 1	
	S9	18	5	35-6	"	" - " - " - " - 2	
	S10	18	5	30-6	"	" - " - " - " - 3	
	S11	9	5	30-6	"	" - " - " - " - 4	
	S12	95	5	6-0	1-0	" - TRANS	B
	S13	5	6	34-6	SHOWN	CURB - LONG SPAN 1	
	S14	10	6	35-6	"	" - " - " - " - 2	
	S15	10	6	30-6	"	" - " - " - " - 3	
	S16	5	6	30-6	"	" - " - " - " - 4	
	S17	195	5	3-9	1-0	" - TRANS.	B
	S18	195	6	2-6	1-0	" "	A
	S19	390	6	6-0	1-6	RAILING PARAPET - SDWK & CURB	C
	S20	10	4	7-3	SHOWN	DIAPHRAGM @ ABUTS.	
	S21	50	5	2-6	1-6	" " @ "	
	S22	6	5	7-3	SHOWN	LIGHTING SUPPORTS	L
	S23	4	5	6-6	"	" "	
	S24	4	5	13-6	SHOWN	FLOOR @ LIGHTING SUPPORTS	L
	S25	4	5	7-0	"	" & SDWK @ LIGHTING SUPPORTS	B
	S26	4	5	7-9	"	" " " @ " "	B
	S27	4	5	8-3	"	" " " @ " "	B
	S28	4	5	9-6	"	" " " @ " "	B
	S29	36	6	5-9	10	" - TOP & BOT TRANS - @ LTG SUP.	
	S30	4	5	3-6	SHOWN	" - " " " - LONG @ LTG SUP	
	S31	4	5	6-3	"	" - " " " - " - @ " "	

DETAIL D

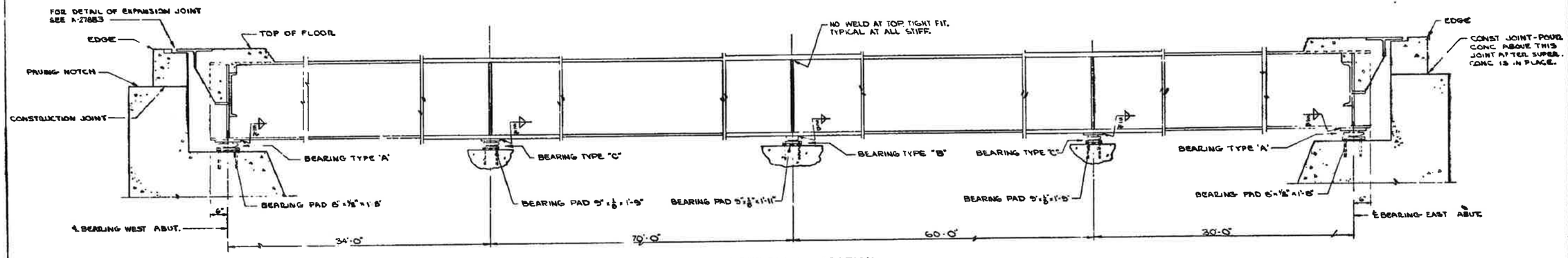


DETAIL E

REVISED	STATE HIGHWAY COMMISSION OF WISCONSIN
	SUPERSTRUCTURE
	DESIGN SPEC A A S H O 'G1' LOADING H 20 S16 CORRT SPEC 1963
	DATE 10 24 63 DESIGN V G H DRAWN J C K CKD
	STRUCTURE B-40-281 SHEET 3 OF 14 #

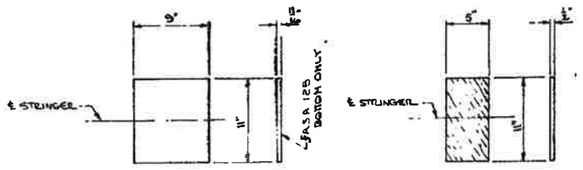
X27880

F027-1(22) 189 383



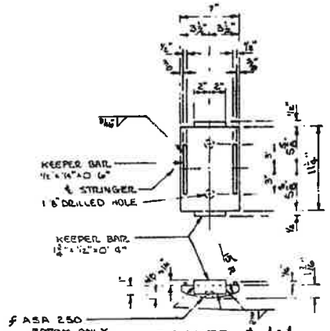
LONGITUDINAL SECTION

FOR LOCATION & DETAILS OF STRINGER SPLICE SEE X27880
SECTION IS PARALLEL TO STRINGER.

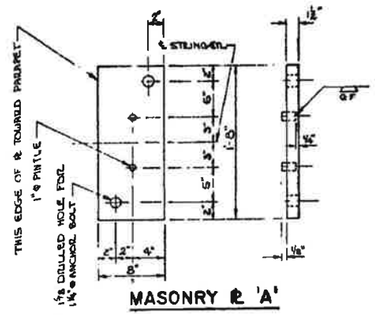


TOP ℄ 'A'

LUBRICATED BRONZE ℄



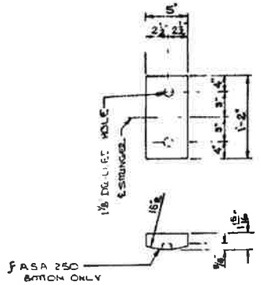
ROCKER ℄ 'A'



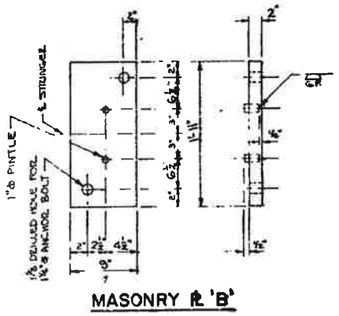
MASONRY ℄ 'A'

BEARING TYPE 'A'

2 REQ'D.



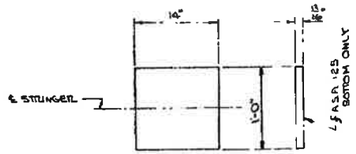
ROCKER ℄ 'B'



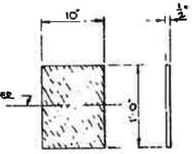
MASONRY ℄ 'B'

BEARING TYPE 'B'

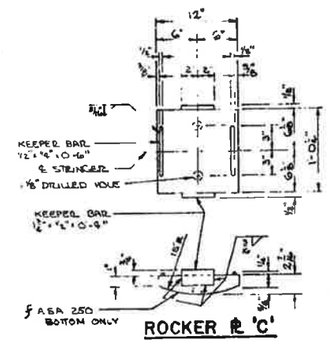
1 REQ'D.



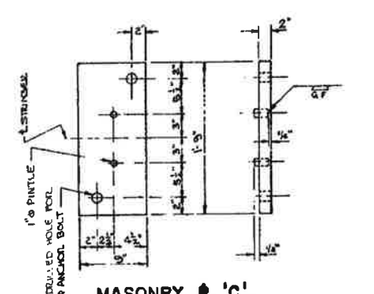
TOP ℄ 'C'



LUBRICATED BRONZE ℄



ROCKER ℄ 'C'



MASONRY ℄ 'C'

BEARING TYPE 'C'

2 REQ'D.

BEARING NOTES

- ALL STRUCTURAL STEEL BEARING PLATES SHALL BE FLAT ROLLED STEEL PLATES WITH ALL SURFACES SMOOTH & FREE FROM LAMP & ALL EDGES SMOOTH, STRAIGHT, & VERTICAL
- ALL PLATE CUTS SHALL BE MACHINE FLAME CUTS OR MACHINE CUTS.
- PINTLES SHALL BE MACHINED TO A DRIVING FIT. CHAMFER TOP OF PINTLE ⅛".
- LUBRICATE TOP SURFACES ONLY OF BRONZE PLATES.
- ANCHOR BOLTS TO BE 1¼"ø x 1'-9" LONG WITH ★ PROJECTION ABOVE TOP OF CONCRETE. PROVIDE ONE 1¼" STANDARD WROUGHT WASHER & ONE HEX NUT PER BOLT. THREAD BACK 3".
- ALL MATERIAL EXCLUDING ANCHOR BOLTS, NUTS, AND WASHERS SHALL BE MADE OF A242 STEEL WITH A CORROSIVE RESISTANCE OF 4 OR MORE TIMES THAT OF A36 STEEL.
- THE TOP 4½" OF ANCHOR BOLTS, WASHERS & NUTS SHALL BE GALVANIZED.
- ALL MATERIAL IN BEARINGS, EXCLUDING BRONZE PLATES AND BEARING PADS SHALL BE PAID FOR AT THE UNIT PRICE BID FOR STRUCTURAL LOW ALLOY STEEL.
- ALL SURFACES MARKED ℄ SHALL BE MACHINE FINISHED.

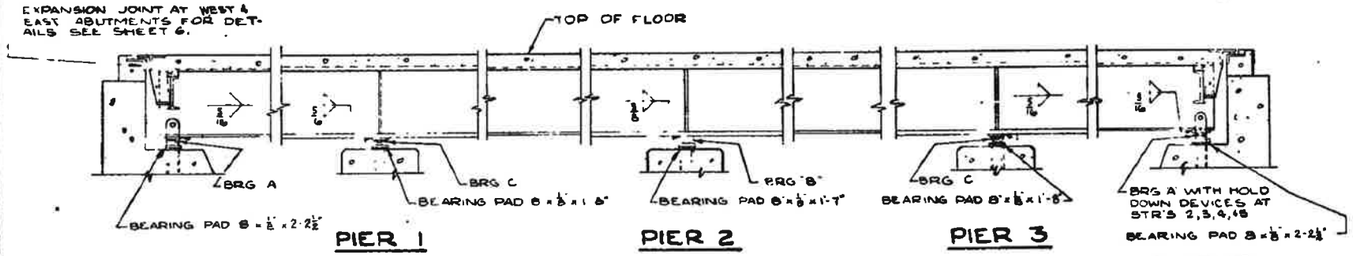
★ BRG. A - 3½"
BRG. B - 4½"
BRG. C - 4½"

STATE HIGHWAY COMMISSION OF WISCONSIN
LONG. SECTION & BEARINGS
STRINGER 6
DES. AASHO '61 - H 20 S16 DATE 1963
10-24-63 VGH JCK

STRUCTURE B 40 281 SHEET 4 OF 14

X27881

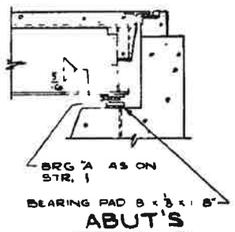
	PROJECT	SHT.
4	F027-1(22) 189	383



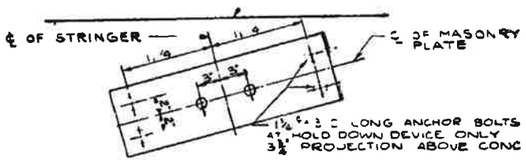
LONGITUDINAL SECTION

GENERAL NOTES

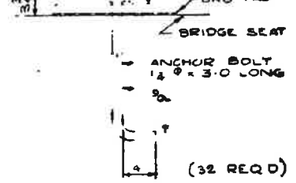
ALL STRUCTURAL STEEL BEARING PLATES SHALL BE FLAT ROLLED STEEL PLATES WITH ALL SURFACES SMOOTH & FREE FROM WARP & ALL EDGES SMOOTH, STRAIGHT & VERTICAL.
ALL PLANE CUTS SHALL BE MACHINE OR MACHINE FLAME CUTS.
ALL SURFACES MARKED ✓ SHALL BE MACHINE FINISHED TO A.S.A. 250.
ANCHOR BOLTS SHALL BE THREADED & PROVIDE ONE STD WROUGHT STEEL WASHER & ONE HEX. NUT PER BOLT.
LUBRICATE TOP SURFACE OF BRONZE PLATE ONLY.
MACHINE FINISH BOTTOM OF FLANGE PLATES A.S.A. 125 IN DIRECTION OF MOVEMENT (EXPANSION BRG ONLY)
ALL MATERIAL EXCEPT ANCHOR BOLTS, NUTS, AND WASHERS SHALL BE MADE OF A242 STEEL WITH A CORROSIVE RESISTANCE OF 4 OR MORE TIMES THAT OF A36 STEEL.
THE TOP 4½" OF ANCHOR BOLTS, WASHERS & NUTS SHALL BE GALVANIZED.
ALL MATERIAL IN BEARINGS EXCLUDING BRONZE PLATES AND BEARING PADS SHALL BE PAID FOR AT THE UNIT PRICE BID FOR STRUCTURAL LOW ALLOY STEEL.



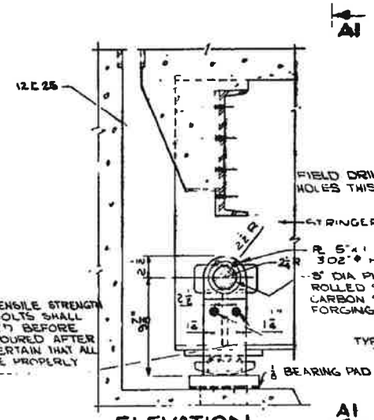
ABUT'S



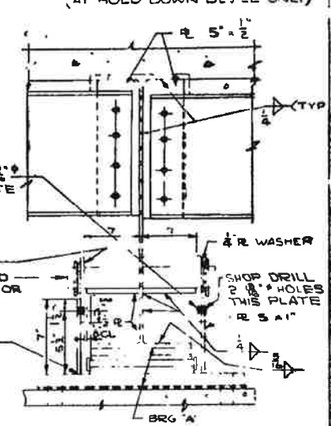
PRE-SET ANCHOR BOLT PLAN
(AT HOLD DOWN DEVICE ONLY)



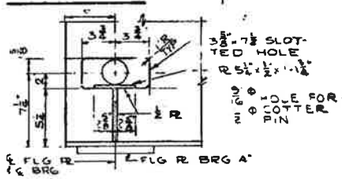
ANCHOR BOLT DETAIL
(AT HOLD DOWN DEVICE ONLY)



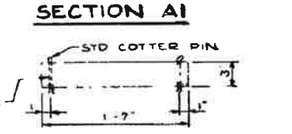
ELEVATION



SECTION A1

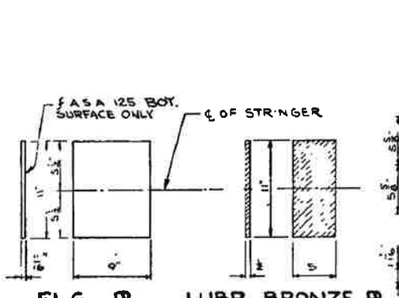


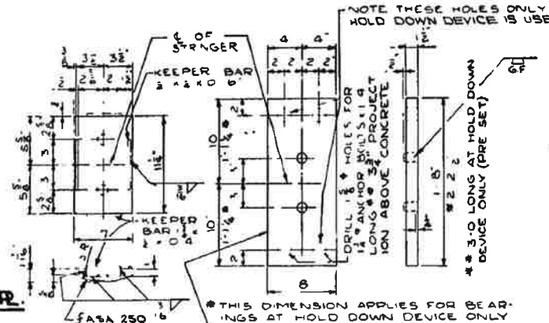
STRINGER DETAIL



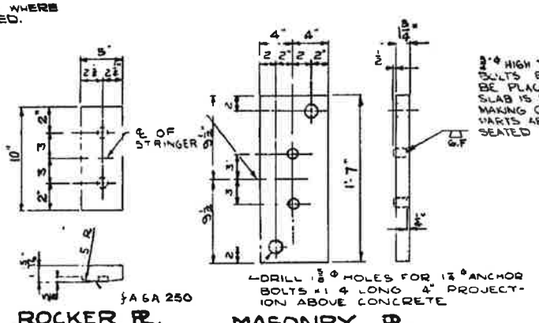
PIN DETAIL
(TO BE PAID FOR AS STRUCTURAL LOW ALLOY STEEL)

HOLD DOWN DEVICE DETAILS
(AT ABUT'S ONLY)
STRINGERS 2,3,4 & 5

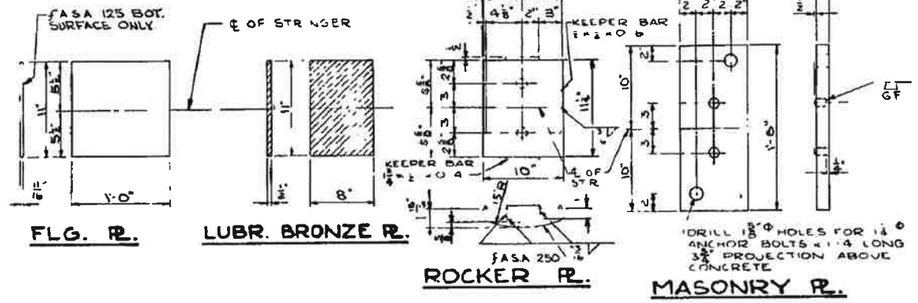




BEARING "A"
(10 REQ'D, 2 STD & 8 HOLD DOWN)



BEARING "B"
5 REQ'D



BEARING "C"
10 REQ'D

TYPICAL PINTLE DETAIL - ALL BRG'S.

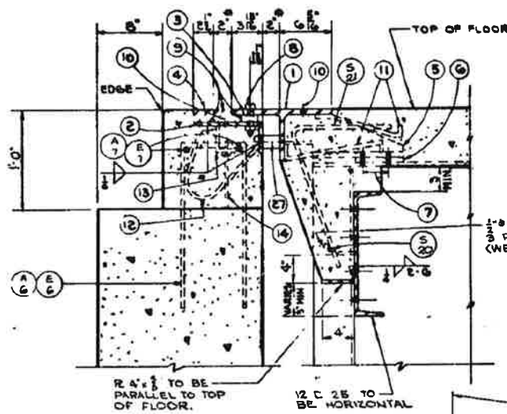
STATE HIGHWAY COMMISSION OF WYOMING	
LONG SECTION & BEARINGS STRINGERS 1 THRU 5	
DESIGN SPEC AASHO (1961) LOADING H 20 S16	DATE 1963
DATE 10-24-63 DRAWN V.G.H.	CHKD. J.C.K. APP'D.
STRUCTURE B-40-281	SHEET 5 OF 14

X27882

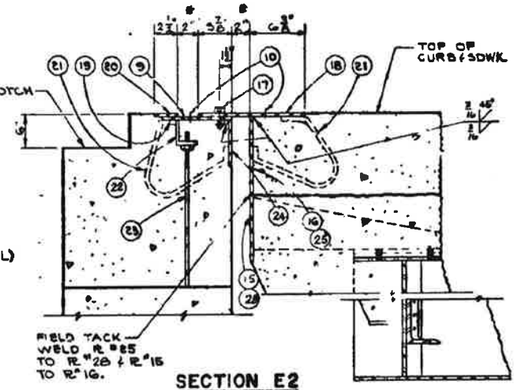
23-DEC-1997 10:14

DIVISION | PROJECT | SHEET NUMBER | TOTAL SHEETS
4 | F027-1(22) | 190 | 383

@ 2" @ 60° F.

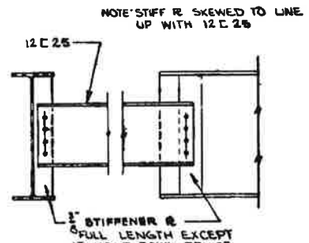


SECTION E1

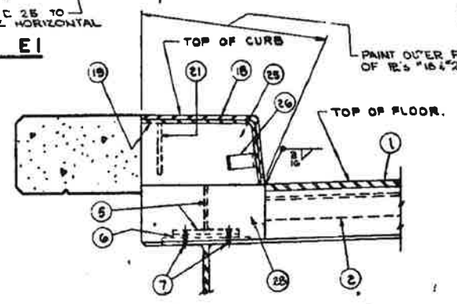


SECTION E2

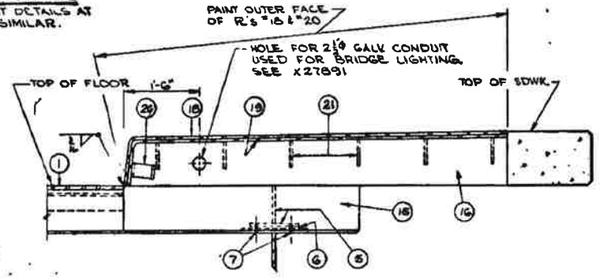
Exp. JOINT DETAILS AT CURB SIMILAR.



TYPICAL DIAPHRAGM DETAIL



SECTION THRU JOINT AT CURB



SECTION THRU JOINT AT SIDEWALK

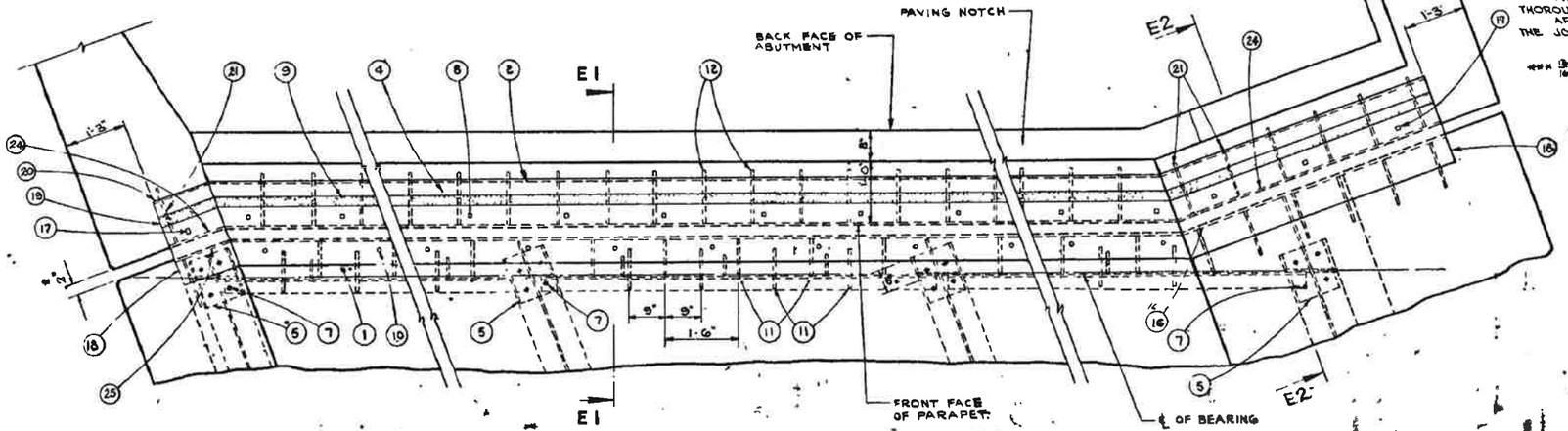
LEGEND

#1. S.T. @ WF 35.5# = RDWY. WIDTH.
#2 C 8"x 4" x 7/16" = RDWY. WIDTH.
#3. BAR 2"x 3/8" = RDWY. WIDTH. WELD TO ∠#2 WITH 2 LINES OF 3/8" FILLET WELD. 2 @ G.
#4 BAR 2 1/2"x 1 1/2" = RDWY. WIDTH. WELD TO ∠#2 WITH 2 LINES OF 1/4" FILLET WELD. 2 @ G.
5. FABRICATED FROM 3/8" WELDED PL. WELD TO STEM & FLG. OF ST#1 WITH 3/8" FILLET WELD NEAR SIDE & FAR SIDE. AND TO R#15 & R#26.
6 1/8" MIN. LAMINATED SHIM.(SLOTTED)
7 DRILL HOLES IN STRINGER FLANGE IN FIELD FOR 3/4" ϕ ERECTION BOLTS
#8 3/4" ϕ BOLT WITH SQ NUT @ 2'-0" CTRS TACK WELD NUT TO ∠#2 GREASE FOR EASY REMOVAL. 13/16" x 1 3/8" SLOTTED HOLE IN S.T #1. LONG DIMENSION OF SLOTTED HOLE TO BE PARALLEL TO ℄ RDWY
9 APPLY 1/16± COAT OF BITUMASTIC TO THIS SURFACE. AFTER CONCRETE HAS SET FILL WITH HOT POURED ELASTIC TYPE JOINT SEALER.
10 13/16" ϕ VENT HOLES @ 2'-0" CTRS ON ∠#2 & ST #1
11 5/8" ϕ BENT BAR @ 0'-9" ALTERNATE CTRS. BETWEEN STRINGERS. WELD TO S T #1. (1'-3" LG)
12 5/8" ϕ BENT BAR @ 1'-0" CTRS WELD TO ∠#2. (2'-0" LG)
13. ∠ 3"x 2 1/2" x 5/16" = 0'-3" APPROX 3'-0" CTRS. WELD TO ∠#2.
PROVIDE 3/4" ϕ HOLE IN 2 1/2" LEG FOR BOLT #14.
14 3/4" ϕ BOLT x 0'-9" LG. & NUT TACK WELD NUT TO ∠#13.
#15. PL CUT TO SDWK LIMITS AS SHOWN. SHOP WELD TO ST#1 & #8.
#16 PL CUT TO SDWK LIMITS AS SHOWN. FIELD WELD TO PL #15.
17 SAME AS BOLT #8 EXCEPT FOR LENGTH.
#18 PLATE — BEND DOWN FACE OF CURB & SDWK. LIMITS AS SHOWN. FIELD WELD TO S.T #1.
#19 PLATE - BEND DOWN FACE OF CURB & SDWK LIMITS AS SHOWN.
#20 R 2 1/2" x 3/8" BEND DOWN PACE OF CURB & SDWK LIMITS AS SHOWN. WELD TO R #19. FIELD WELD TO BAR #4.
21 1/2" ϕ BENT ANCHOR BAR. WELD TO R's #16 & #25, #18 & #16, & #19 & #24. (1'-6" LG)
22 ∠ 3"x 2 1/2" x 5/16" x 0'-3". WELD TO R #19. 5/16" FIL WELDS ALL AROUND.
23 1/2" ϕ BOLT & NUT. TACK WELD NUT TO ∠ #22 (1'-7" LG)
24 R 6"x 3/8" — WELD TO R #19 CUT TO CURB & SDWK LIMITS AS SHOWN.
#25 3/8" PLATE — CUT TO CONFORM TO SHAPE OF CURB. FIELD WELD TO PL #28.
26 BAR 2 1/2" x 3/8" x 1'-0" WELD TO R's #18 & #19.
27 BLOCK & BOLT FOR SHIPMENT WITH PIPE SLEEVE. AND 1/2" ϕ BOLT PROVIDE 3/4" ϕ HOLES @ 3'-0 CTRS IN ST #14 ∠#2 FOR 1/2" ϕ BOLT.
#28 3/8" PL CUT TO CURB LIMITS AS SHOWN. SHOP WELD TO ST#1 AND SUPPORT #5.

NOTES

EXPANSION JOINT SHALL BUILT TO CONFORM TO RDWY. SUPERELEVATION AND GRADE.
ONE FIELD SPLICE SHALL BE PERMITTED
ALL ITEMS MARKED # SHALL BE MADE OF A242 STEEL WITH A CORROSIVE RESISTANCE OF 4 OR MORE TIMES THAT OF A36 STEEL.
ALL MATERIAL IN EXPANSION JOINT SHALL BE PAID FOR AS STRUCTURAL LOW ALLOY STEEL.
AFTER CONCRETE HAS SET REMOVE BOLTS #8 & #17 AND FILL HOLES WITH HOT POURED ELASTIC TYPE JOINT SEALER.
NO PAINT SHALL BE APPLIED TO EXPANSION JOINT EXCEPT AS NOTED.
AFTER CONCRETE HAS SET THE JOINT OPENING SHALL BE THOROUGHLY CLEANED.
APPLY 1/16± COAT OF BITUMASTIC TO METAL SURFACES FORMING THE JOINT AND FILL WITH HOT POURED ELASTIC TYPE JOINT SEALER

HOLE IN BAR #3 & ∠#2.



PART PLAN

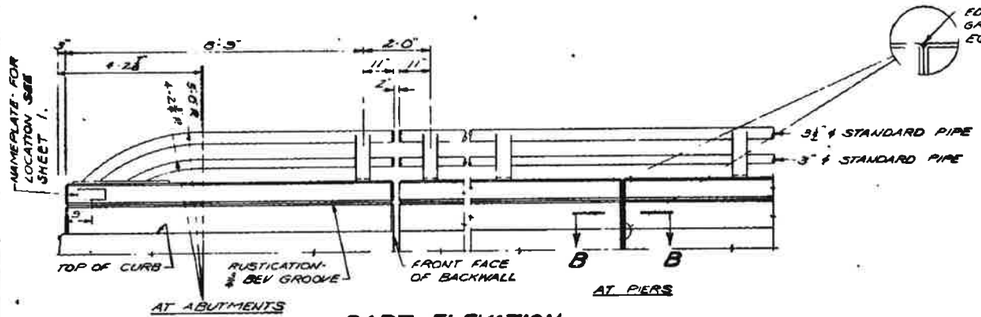
EAST ABUT SHOWN WEST ABUT SIMILAR EXCEPT SDWK & CURB ARE REVERSED TO OPPOSITE SIDES.

NOTE: CONC END DIAPHRAGM TO EXTEND BETWEEN WEBS OF FASCIA STRINGERS

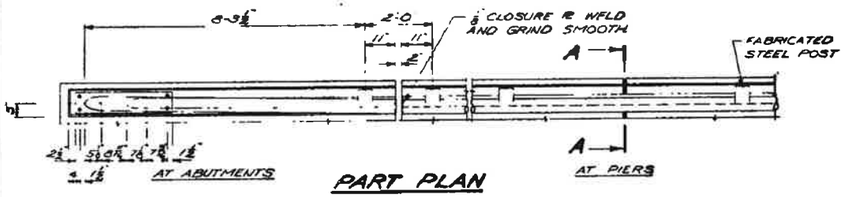
REVISED	STATE HIGHWAY COMMISSION OF WISCONSIN
	EXPANSION JOINT
DESIGN SPEC AASHO '61	LOADING H 20 S16	COUNTY SHEET 1963
DATE 10 24 97	DESIGN STD	DRAWN J C K	CHD
STRUCTURE B-40-281	SHEET 6 OF 14

X 27993

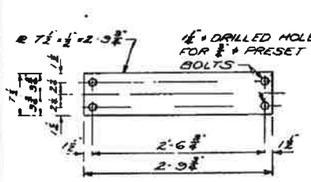
S P R DIVISION	PROJECT	SHEET NO.	TOTAL SHEETS
4	F027-1(22) 191		383



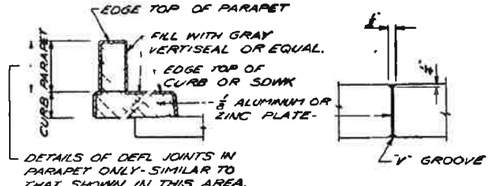
PART ELEVATION



PART PLAN

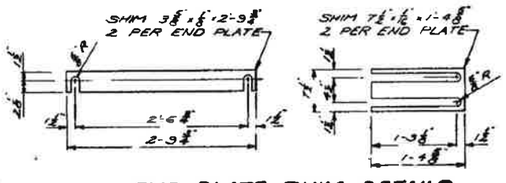


END PLATE

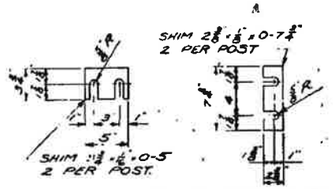


SECTION A

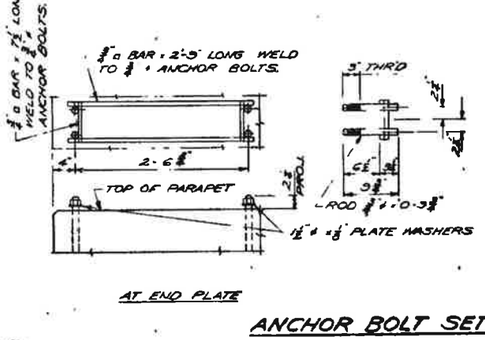
SECTION B

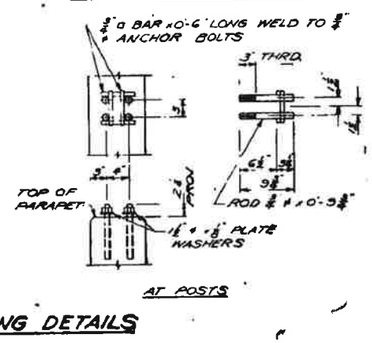


END PLATE SHIM DETAILS



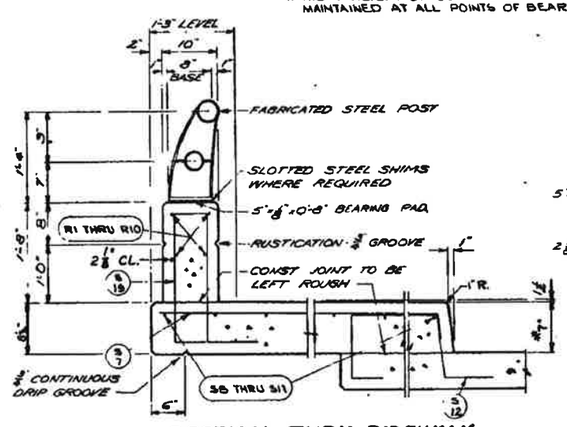
POST SHIM DETAILS



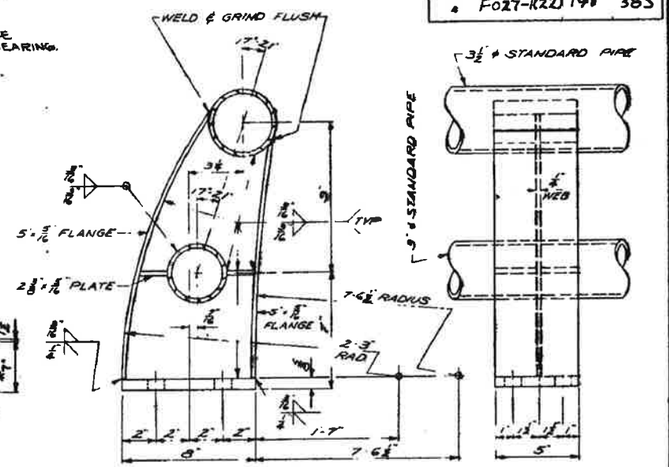


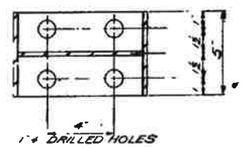
ANCHOR BOLT SETTING DETAILS

* THE "T" HEIGHT OF CURB IS TO BE MAINTAINED AT ALL POINTS OF BEARING.

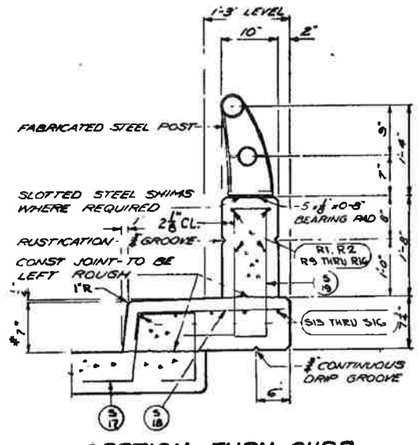


SECTION THRU SIDEWALK

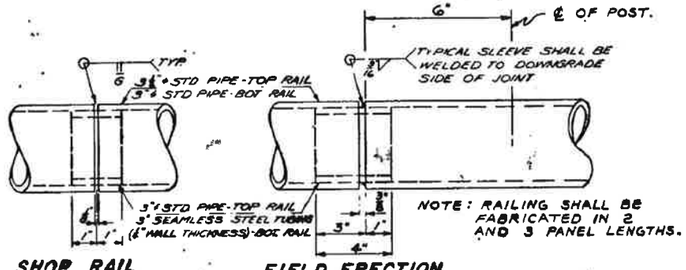




POST DETAILS

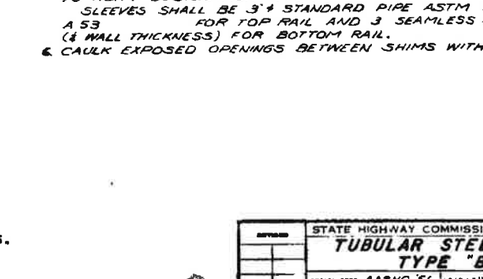


SECTION THRU CURB



SHOP RAIL SPLICE DETAIL

IF USED THE LOCATION OF THE SHOP SPLICE SHALL BE SHOWN ON THE SHOP DRAWINGS.



FIELD ERECTION JOINT DETAIL

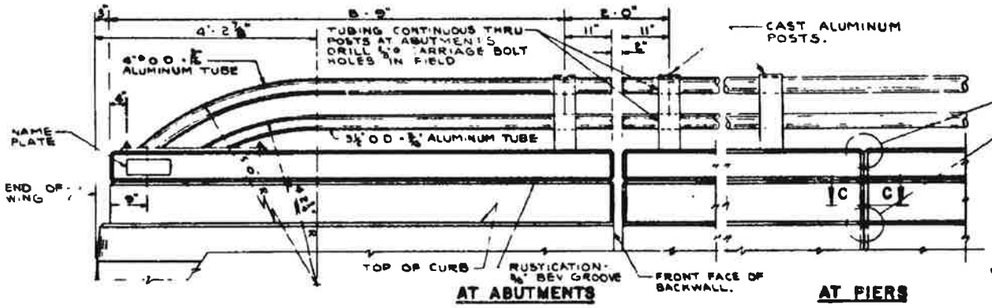
NOTES

1 STEEL RAIL POSTS SHALL BE SET NORMAL TO GRADE
2 RAILING SHALL BE FABRICATED IN LENGTHS AS SHOWN.
3 STEEL SHIMS SHALL BE USED UNDER POSTS AND UNDER END PLATES WHERE REQUIRED FOR ALIGNMENT.
4 WHEN PARAPETS AND CURBS ARE POURED CONTINUOUSLY FROM END TO END THEY SHALL BE SEPARATED AT THE DEFLECTION JOINTS BY A PIECE OF ⅛" ZINC OR ALUMINUM PLATE CUT AS SHOWN IN SECTION A BY SHADED AREA. IF CONSTRUCTION JOINTS IN PARAPETS AND CURBS ARE USED AT THE DEFLECTION JOINTS ONE SIDE OF JOINT SHALL BE COATED WITH BITUMINOUS PAINT AND PLATE SEPARATORS MAY BE OMITTED.
5 THE FOLLOWING MATERIALS SHALL BE USED:
TOP RAILING SHALL BE 3½" ϕ STANDARD PIPE ASTM DESIGNATION A53.
BOTTOM RAILING SHALL BE 3" ϕ STANDARD PIPE ASTM DESIGNATION A53.
POST SHALL BE FABRICATED FROM MATERIAL CONFORMING TO ASTM DESIGNATION A36.
ANCHOR BOLTS TO BE MADE FROM MATERIAL CONFORMING TO ASTM DESIGNATION A307.
SLEEVES SHALL BE 3" ϕ STANDARD PIPE ASTM DESIGNATION A53 FOR TOP RAIL AND 3 SEAMLESS STEEL TUBING (¼ WALL THICKNESS) FOR BOTTOM RAIL.
6 CAULK EXPOSED OPENINGS BETWEEN SHIMS WITH LEAD WOOL.

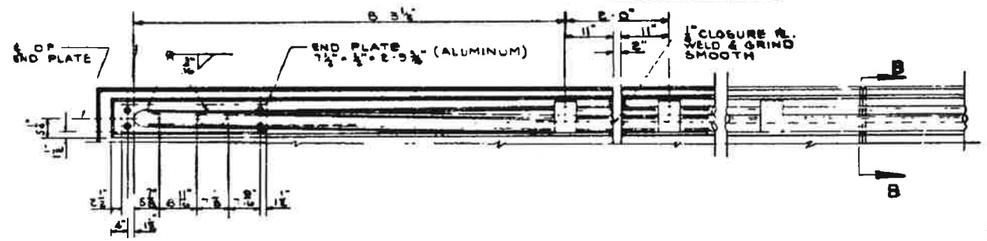
REVISED	STATE HIGHWAY COMMISSION OF WISCONSIN
	TUBULAR STEEL RAILING TYPE "B"
DESIGN SPEC AASHO '61	LOADING H 20 S16
DATE 10 24 63	DESIGN S.T.D. DRAWN J.C.K. CKD.
STRUCTURE B-40-281	SHEET 7 OF 14

X 27884

4	F027-1(22)	192	383

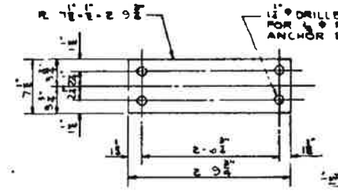


PART ELEVATION

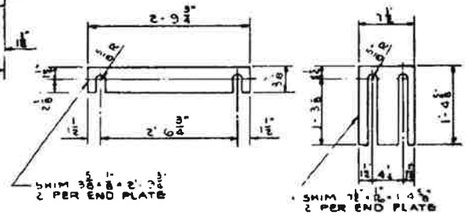


PART PLAN

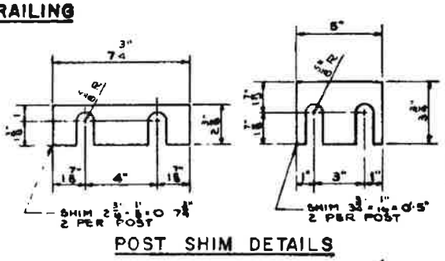
DOUBLE LINE ALUMINUM RAILING



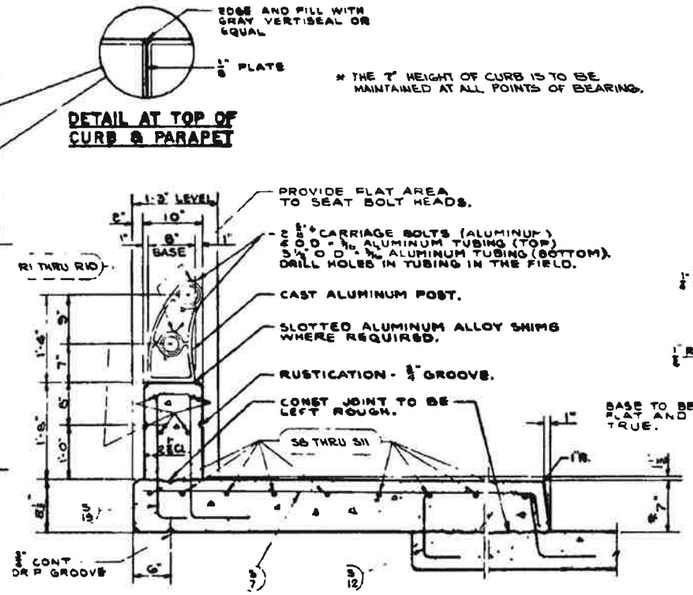
END PLATE
(ALUMINUM)



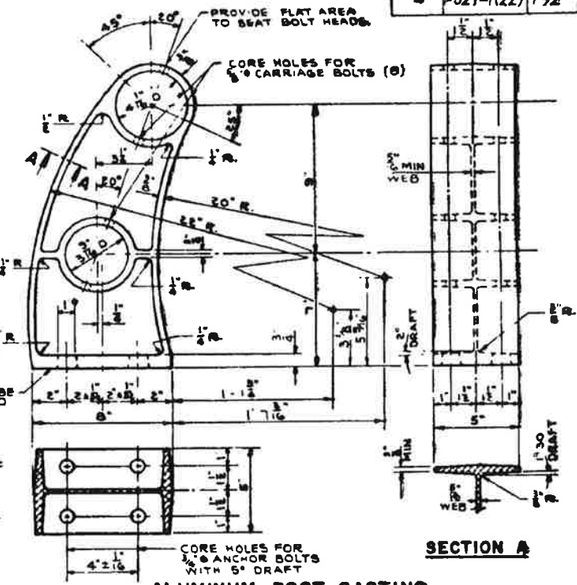
END PLATE SHIM DETAILS



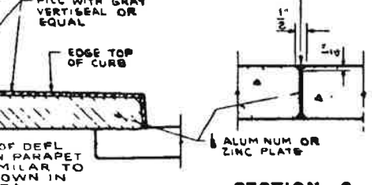
POST SHIM DETAILS



SECTION THRU SIDEWALK



ALUMINUM POST CASTING



SECTION B

SHOWING DEFLECTION JOINT IN CURB AND PARAPET AT PIERS

SECTION C

NOTES

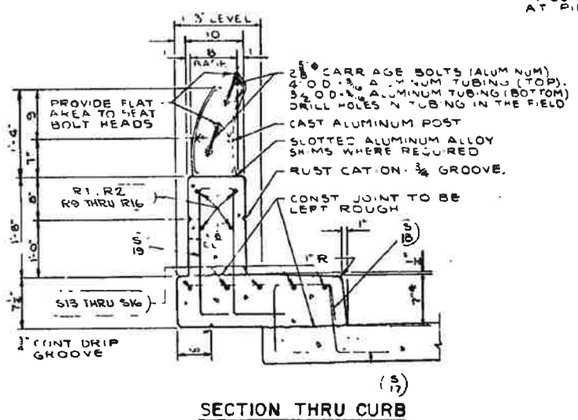
1 ALUMINUM RAILING POSTS TO BE SET NORMAL TO GRADE.

2 THE HEX NUTS, WASHERS AND THE UPPER 3" OF 3/4" - 9 3/4" LONG ANCHOR BOLTS SHALL BE GALVANIZED OR CADMIUM PLATED. THE ANCHOR BOLT HOLES, BASE OF RAILING POSTS AND ANCHOR BOLTS, NUTS AND WASHERS SHALL BE COATED WITH AN ALUMINUM IMPREGNATED CAULKING COMPOUND. ANCHOR BOLTS, HEX NUTS AND WASHERS TO BE STRUCTURAL CARBON STEEL.

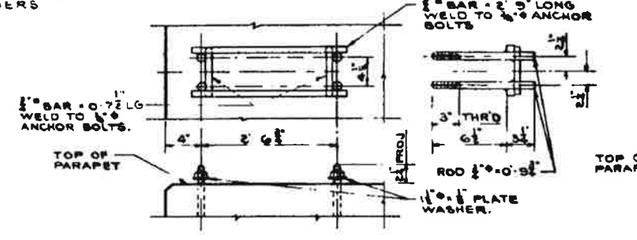
3 ALUMINUM TUBING SHALL BE FABRICATED IN 2 OR 3 PANEL LENGTHS

4 ALUMINUM ALLOY SHIMS SHALL BE USED UNDER POSTS AND UNDER END PLATES WHERE REQUIRED FOR ALIGNMENT.

5 WHEN PARAPETS AND CURBS ARE POURED CONTINUOUSLY FROM END TO END THEY SHALL BE SEPARATED AT THE DEFLECTION JOINTS BY A PIECE OF 1/8" ZINC OR ALUMINUM PLATE CUT AS SHOWN IN SECTION "B" BY THE SHADED AREA. IF CONSTRUCTION JOINTS IN PARAPETS AND CURBS ARE USED AT THE DEFLECTION JOINTS ONE SIDE OF JOINT SHALL BE COATED WITH BITUMINOUS PAINT AND PLATE SEPARATORS MAY BE OMITTED.



SECTION THRU CURB



ANCHOR BOLT SETTING DETAILS

REVISED	STATE HIGHWAY COMMISSION OF WISCONSIN	
	TUBULAR ALUMINUM RAILING TYPE B	
	DESIGN SPEC AASHTO 61	LOADING H20 S16
	DATE 10-24-63	DESIGN STD
	B-40-281	SHEET 8 OF 14

X 27885

23-DEC-1997 10:15

DIVISION 4 | PROJECT F027-1(22) | SHEET NO 193 | TOTAL SHEETS 383

3"x3'-6" OPENING FOR WIS ELECTRIC & POWER CO. DUCTS

6"x8'-6" OPENING FOR FIRE, POLICE & TRAFFIC CONTROL DUCTS.

1'x2' DELAM

1'x1' DELAM PATCH

2'x2' LEACHING

0.75'x3.5' DELAM

2'x1' MAP CRACK W/ LEACH

EL. 123.34 | EL 123 22 | EL 119.21 | 2½" ϕ CONDUIT | EL 119 48 | EL 122 95 | EL 119 69 | EL 119 96 | EL 120 02 | EL. 124 11 | EL 120.19 | EL. 114.21

ELEVATION

A

* DIMENSIONS AT FRONT FACE OF PARAPET

LEVEL | ¾" BEVELED RUSTICATION GROOVE | CONST JOINT TO BE LEFT ROUGH

SECTION THRU RAILING PARAPET

CONST. JOINT- POUR ALL CONCRETE ABOVE THIS JOINT AFTER SUPER IS IN PLACE. ¾" V GROOVE IN F.F OF WING

BILL OF BARS

2230#

DIMENSIONS IN BENDING DETAILS ARE OUT TO OUT

BAR MARK	NO	SIZE	LENGTH	SPACING	LOCATION	DET
A1	18	4	23-3	SHOWN	BODY - HORIZ	
A2	46	4	4-6	1-0	" - VERT	A
A3	6	6	23-6	SHOWN	" - HORIZ.	
A4	23	4	13-3	2-0	" - VERT	B
A5	6	4	12-9	SHOWN	PARAPET - HORIZ	
A6	35	5	4-9	1-0	" - VERT	C
A7	8	4	8-6	SHOWN	" - HORIZ DO NOT LAP	
A8	23	5	8-3	1-6	" - VERT	C
A9	16	4	6-6	8	PARAPET & SDWK	D
A10	10	4	4-9	SHOWN	BODY & WING	D
A11	3	4	16-0	1-6	WING 1	D
A12	6	4	8-3	1-6	" 1	
A13	8	4	8-9	1-6	" 1	
A14	6	4	11-0	1-6	" 2	D
A15	5	4	9-3	1-6	" 2	
A16	9	4	9-3	1-6	" 2	
A17	28	4	3-9	SHOWN	GRID	D
A18	20	4	4-0	SHOWN	"	
A19	8	5	9-3	SHOWN	RAILING PARAPET	
A20	20	5	6-0	1-0	" "	C
A21	8	4	10-9	1-6	WING 1	
A22	8	4	11-0	1-6	" 2	
A23	3	4	11-0	1-6	" 1	D
A24	16	4	3-3	4	PARAPET - VERT B.F & F.F	
A25	8	4	5-0	4	" - HORIZ " "	
A26	8	4	6-0	4	" " " "	

DETAIL A

DETAIL B

DETAIL C

DETAIL D

1-6 A9 | 1-3 A23 | 6-8 A11 | 1-0 A17 | 1-6 A14 | 1-9 A10

EDWK NOTCH | BACK FACE | 8" ϕ PIPE SLEEVE | 27'-0" ℄ OF OPENING FOR FIRE POLICE & TRAFFIC DUCTS | PAVING NOTCH | ℄ BEARING | PRESET ANCHOR BOLTS - SEE SHEET 5 | F F PARAPET | ℄ STRINGERS | TYP STR'S | TYP STR'S 2 THRU 5 | E BOUND & W GRANTOSA DRIVE | LEVEL | LEVEL TYP | ℄ OF STRINGERS | SLOPE | TYP

PLAN

2½" ϕ CONDUIT EXTEND 1'-0" BEYOND BACK OF ABUT. AND CAP.

E BOUND & W. GRANTOSA DRIVE

FOOTING PLAN

CONCRETE ABOVE THIS JOINT TO BE POURED AFTER SUPER STRUCTURE IS IN PLACE LEAVE JOINT ROUGH.

BETWEEN BRIDGE SEATS

TOP OF BERM EL 116.21

℄ BEARING

OPTIONAL KEYED CONST JOINT FORMED BY SURFACED, BEVELED 2 AG EXTEND THRU WINGS

SLOPE PAVING 2:1 SLOPE

SECTION A-A

SLOPE TOP AND FACE OF WING TO CONFORM TO CURB ON SUPER.

B.F

SECTION C-C

SECTION B-B

EL. 123.22 | CONST JOIN | EL. 123.74 | 3" TYP

ELEVATION WING 1

EL. 124.11 | EL. 124.01 | CONST JOINT

ELEVATION WING 2

REVISED	STATE HIGHWAY COMMISSION OF WISCONSIN
	WEST ABUTMENT
	DESIGNED AASHO 61	STRS H20-S16	1963
	PLANS 10 2463	VGH	CHP
STRUCTURE B 40-281	SHEET 9 OF 14

X 27886

FED. DIVISION	PROJECT	SHEET NO.	TOTAL SHEETS
4	F027-1(22)	194	383

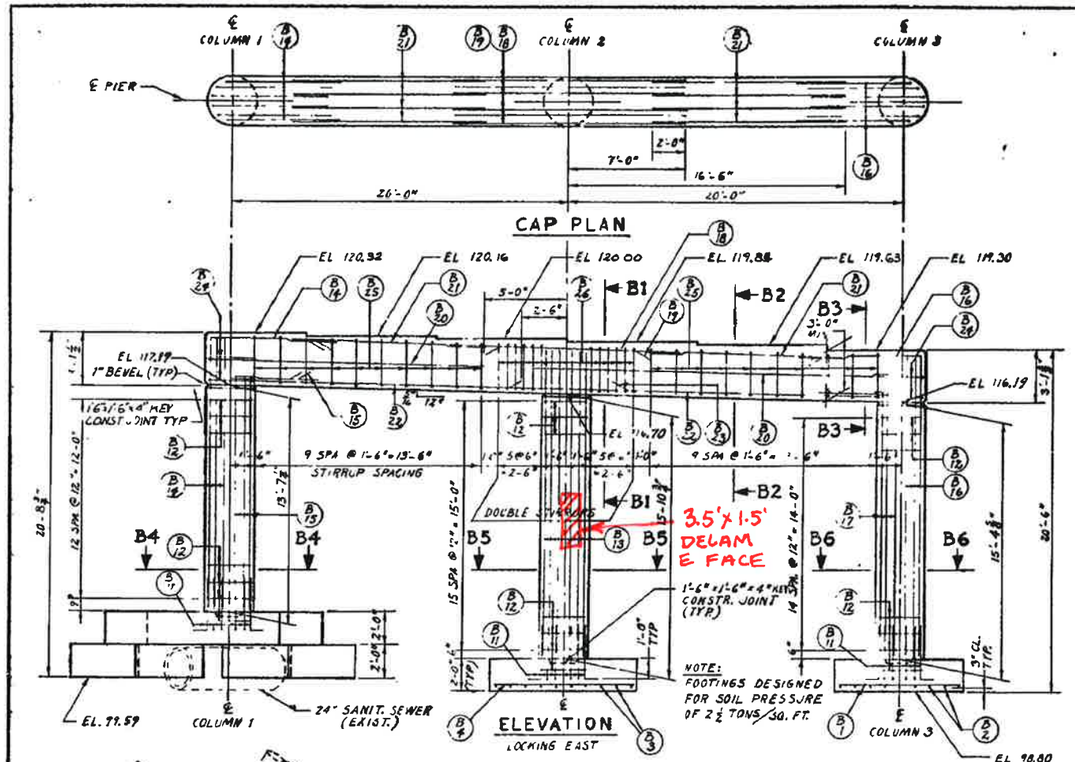
BILL OF BARS

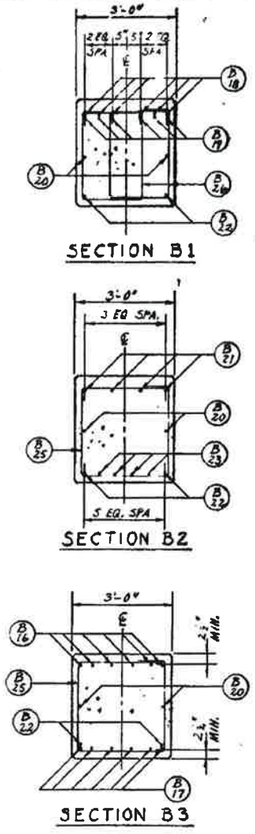
DIMENSIONS IN BENDING DETAILS ARE OUT TO OUT

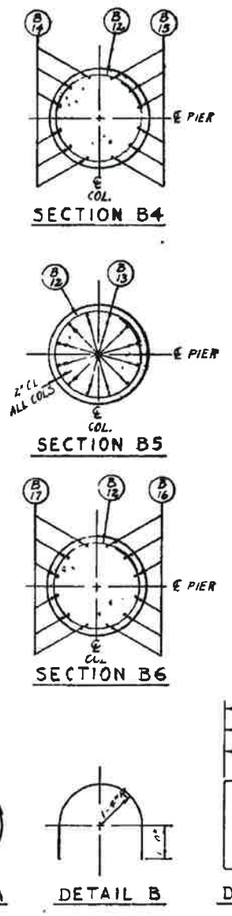
5,920 #

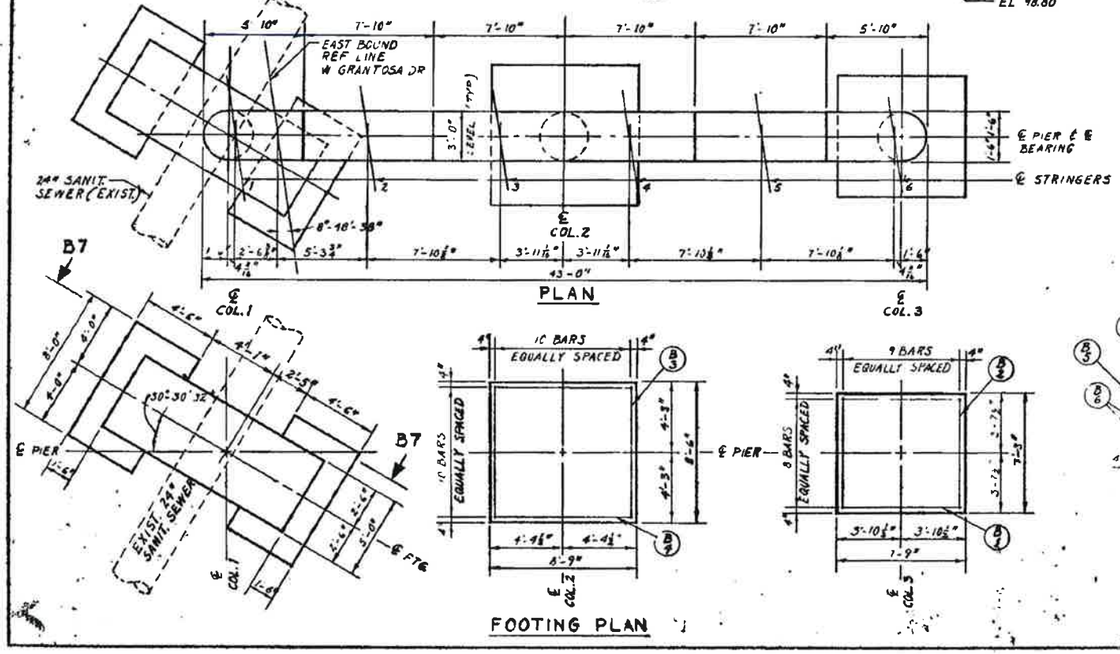
POUR	MARK	NO.	SIZE	LENGTH	SPACING	LOCATION	DET
FOOTINGS	B1	8	6	7-8	SHOWN	FOOTING 3	
	B2	9	5	6-9	"	" 3	
	B3	10	7	8-0	"	" 2	
	B4	10	7	8-3	"	" 2	
	B5	16	7	4-0	"	" 1	
	B6	10	4	7-6	"	" 1	
	B7	10	10	12-0	"	" 1	
	B8	4	4	12-0	"	" 1	
	B9	20	4	14-9	"	" 1 - STIRRUPS	C
	B10	26	4	10-9	"	" 1 - "	C
	B11	36	7	3-6	"	FOOTINGS - DOWELS *	D
	B12	3	4	9-6	"	" - HOOPS	A
CAP & COLUMNS	B12	44	4	9-6	SHOWN	COLUMNS - HOOPS	A
	B13	12	7	18-3	"	COLUMN 2	
	B14	6	7	23-0	"	" 1	L
	B15	6	7	17-9	"	" 1	D
	B16	6	7	25-0	"	" 3	D
	B17	6	7	19-6	"	" 3	D
	B18	6	10	14-0	"	CAP **	
	B19	6	10	10-0	"	" **	
	B20	4	4	20-0	"	"	
	B21	8	5	11-6	"	"	
	B22	4	11	20-0	"	"	
	B23	8	11	17-6	"	"	
	B24	4	4	6-3	"	" - BANDS	B
	B25	20	4	11-9	"	" - STIRRUPS	C
	B26	24	5	10-3	"	" - "	C

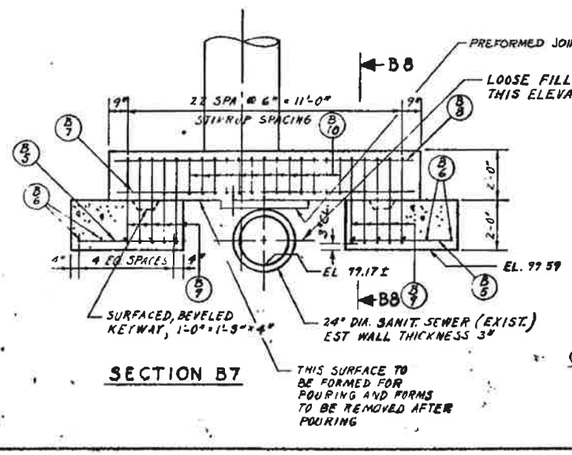
* SAME SPACING AS VERTICAL COLUMN BARS
** BUNDLED BARS

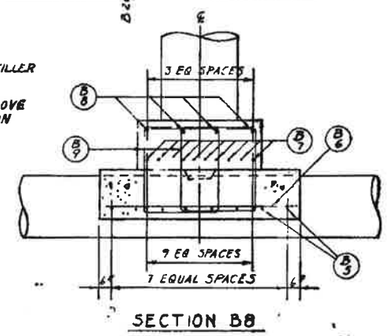


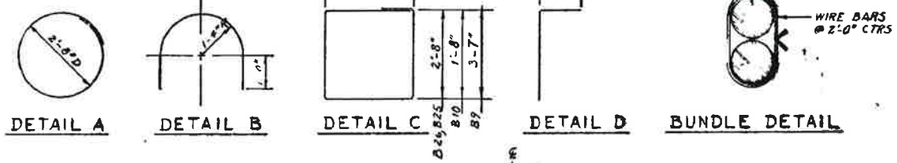












CONCRETE MASONRY

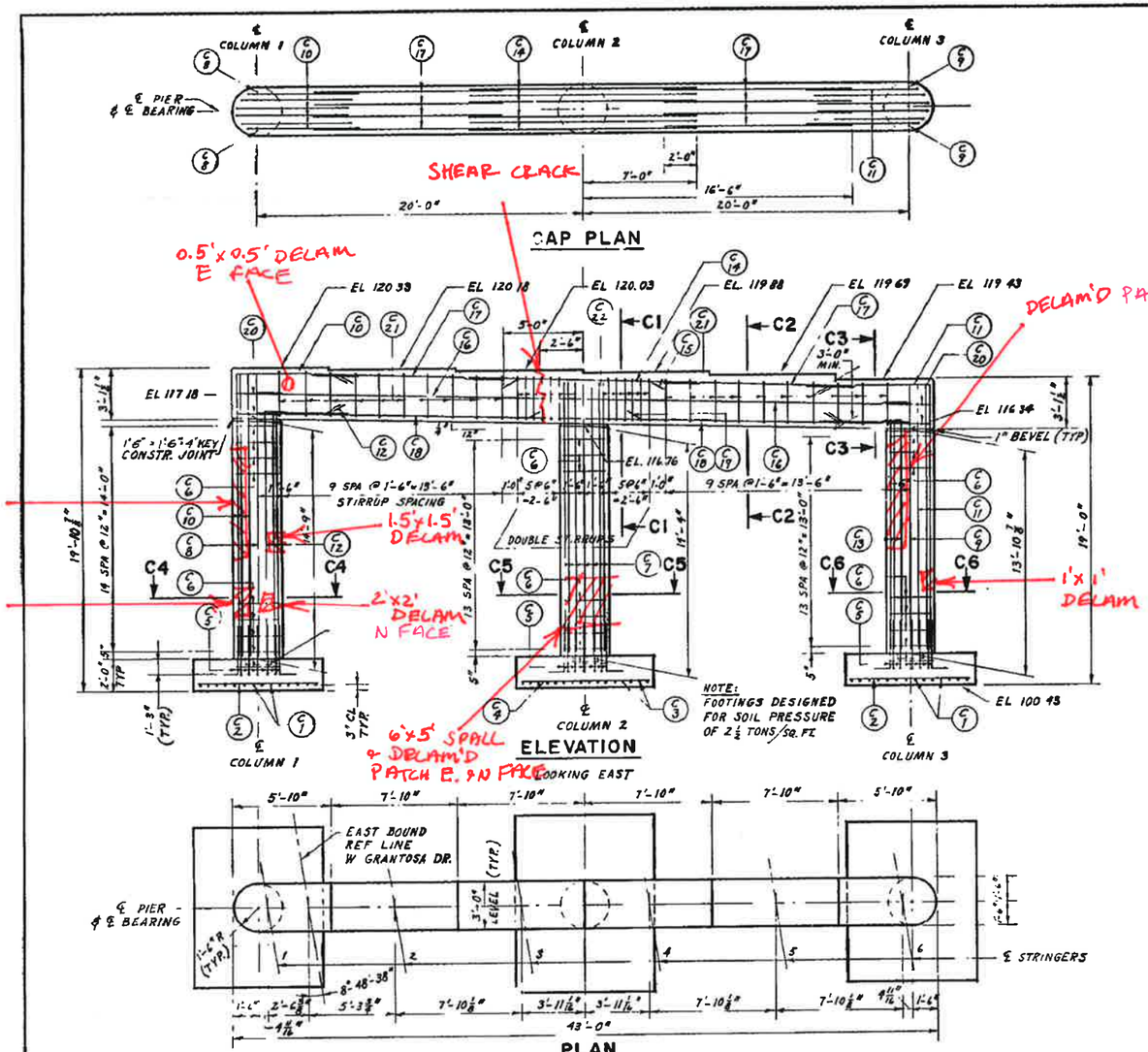
FOOTINGS	19.6 CY
COLUMNS	11.8 CY
CAP	14.7 CY
TOTAL	46.1 CY

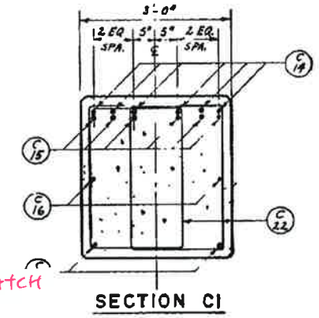
REVISED	STATE HIGHWAY COMMISSION OF WISCONSIN
	PIER 1
	DESIGN SPEC AASHO '61 LOADING H20 S16 CONST SPEC 1963
	DATE 10 24 63 DESIGN VGH DRAWN NFH CKD TAL
	STRUCTURE B-40-281 SHEET 10 OF 14

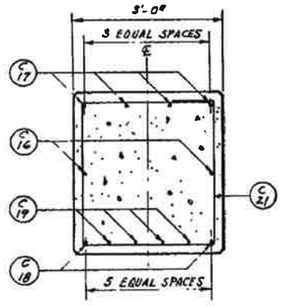
X 27887

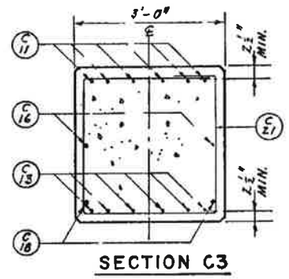
FORM E 8 12-62

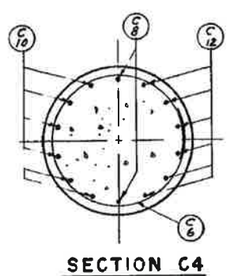
D.P.R. DIVISION	PROJECT	SHEET NO.	TOTAL SHEETS
4	F027-1(22) 195	383	

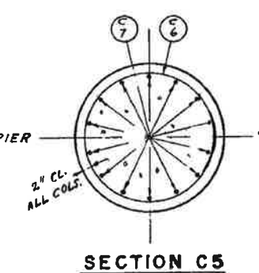


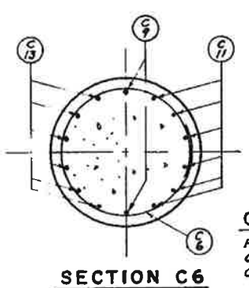












BILL OF BARS

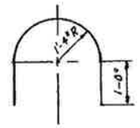
6,380 #

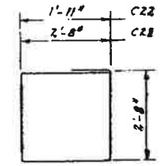
DIMENSIONS IN BENDING DETAILS ARE OUT TO OUT

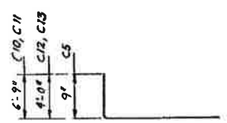
POUR	MARK	NO	SIZE	LENGTH	SPACING	LOCATION	DE*
FOOTINGS	C1	28	6	7-6	SHOWN	FOOTINGS - EXT.	
	C2	26	5	7-6	"	" - "	
	C3	16	7	10-6	"	" - INT.	
	C4	13	6	8-0	"	" - "	
	C5	42	8	4-0	"	" - DOWELS **	D
	C6	3	4	9-6	"	" - HOOPS	A
CAP & COLUMNS	C6	43	4	9-6	SHOWN	COLUMN - HOOPS	A
	C7	14	8	16-9	"	COLUMN 2	
	C8	2	8	17-3	"	" 1	
	C9	2	8	16-6	"	" 3	
	C10	6	8	24-3	"	" 1	D
	C11	6	8	23-6	"	" 3	D
	C12	6	8	19-0	"	" 1	D
	C13	6	8	18-3	"	" 3	D
	C14	6	10	14-0	"	CAP **	
	C15	6	10	10-0	"	" **	
	C16	4	4	20-0	"	"	
	C17	8	5	11-6	"	"	
	C18	4	11	20-0	"	"	
	C19	8	11	17-6	"	"	
	C20	4	4	6-3	"	" - BANDS	B
	C21	20	4	11-9	"	" - STIRRUPS	C
	C22	24	5	10-3	"	" - STIRRUPS	C

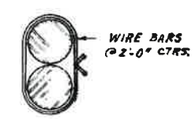
* SAME SPACING AS VERTICAL COLUMN BARS

** BUNDLED BARS









CONCRETE MASONRY

FOOTINGS	18.8 C.Y.
COLUMNS	11.3 C.Y.
CAP	14.5 C.Y.
TOTAL	44.6 C.Y.

REVISED	STATE HIGHWAY COMMISSION OF WISCONSIN
	PIER 2
	DESIGN SPEC. AASHO 61 LOADING H20-S16 CONST SPEC 1963
	DATE 10 24 63 DES'D VGH DRAWN HFH CKD JJL
STRUCTURE B-40 281	SHEET 11 OF 14

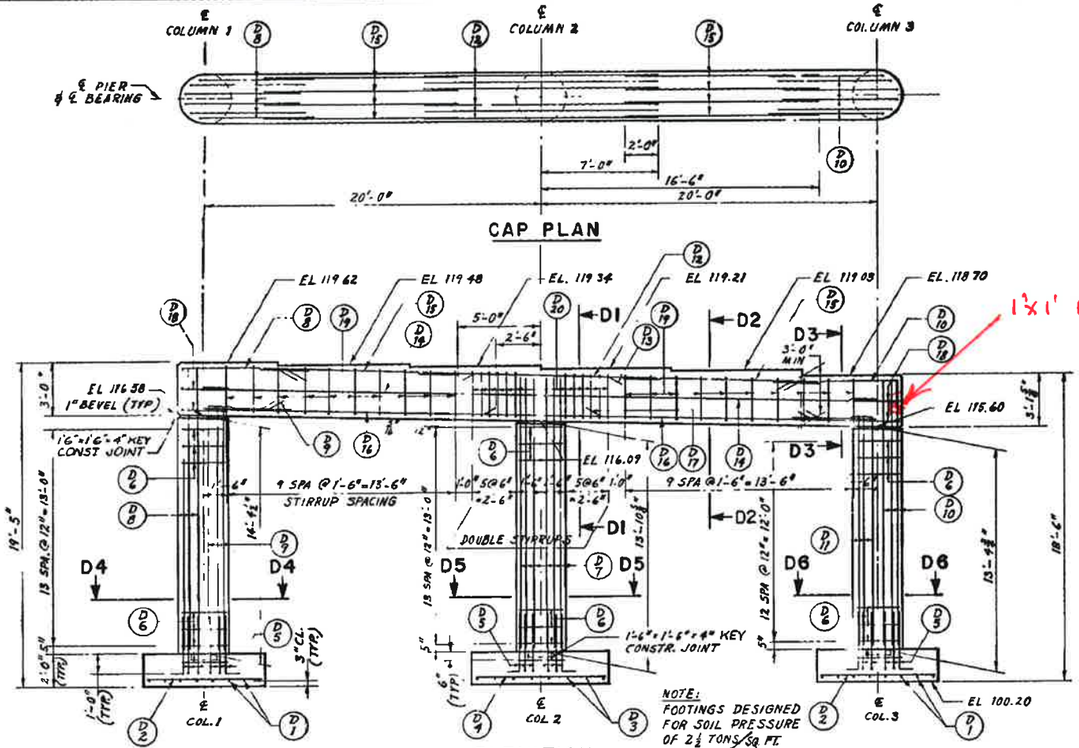
X 27888

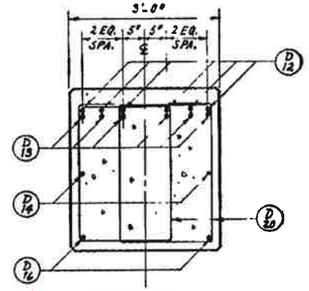
23-DEC-1997 10:16

Screenscan

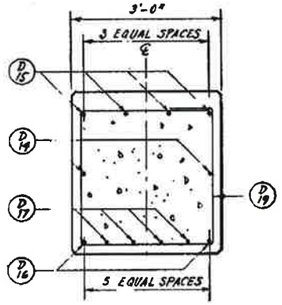
FORM E 8-12 62

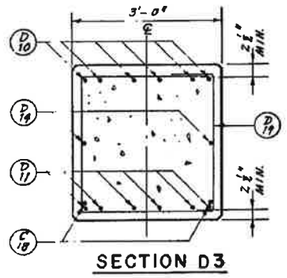
G P R DIVISION	PROJECT	SHEET NO.	TOTAL SHEETS
4	F027-1(22)	196	383





1'x1' DECAM





BILL OF BARS

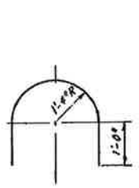
4,800 #

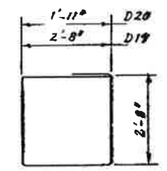
DIMENSIONS IN BENDING DETAILS ARE OUT TO OUT

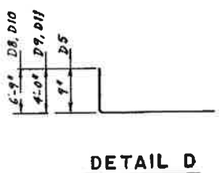
POUR	MARK	NO	SIZE	LENGTH	SPACING	LOCATION	DET
FOOTINGS	D1	16	5	4-3	SHOWN	FOOTINGS - EXT.	
	D2	16	5	6-9	"	" - "	
	D3	8	7	7-6	"	" - INT.	
	D4	8	7	7-9	"	" - "	
	D5	34	7	3-6	*	* - DOWELS #	D
	D6	3	4	9-6	*	* - HOOPS	A
CAP & COLUMNS	D6	41	4	9-6	SHOWN	COLUMN - HOOPS	A
	D7	12	7	16-6	"	" 2	
	D8	6	7	23-9	"	" 1	D
	D9	6	7	18-9	"	" 1	D
	D10	6	7	23-0	"	" 3	D
	D11	6	7	17-9	"	" 3	D
	D12	6	10	14-0	*	CAP **	
	D13	6	10	10-0	"	" **	
	D14	4	4	20-0	"	"	
	D15	8	5	11-6	"	"	
	D16	4	11	20-0	"	"	
	D17	8	11	17-6	"	"	
	D18	4	4	6-3	"	" - BANDS	B
	D19	20	4	11-9	"	" - STIRRUPS	C
	D20	24	5	10-3	"	" - STIRRUPS	C

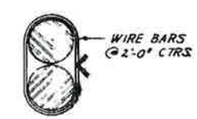
SAME SPACING AS VERTICAL COLUMN BARS

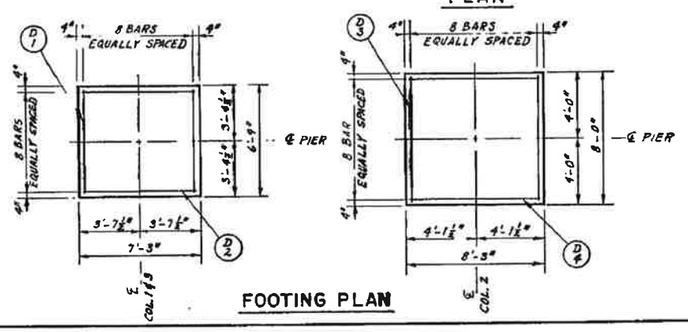
** BUNDLED BARS











CONCRETE MASONRY

FOOTINGS	12.1 C.Y.
COLUMNS	10.9 C.Y.
CAP	15.2 C.Y.
TOTAL	38.2 C.Y.

STATE HIGHWAY COMMISSION OF WISCONSIN

PIER 3

DESIGN SPEC A.A.S.H.O. | LOADING H20-S16 | CONST SPEC 1963

DATE 10 24 63 | DESIGN V.G.H. | DRAWN H.F.H. | CHD. J.M.L.

STRUCTURE B-40-281 | SHEET 12 OF 14

X 27889

23-DEC-1997 10:17

Screenscan

2'x1' SPALL

FULL LENGTH PATCH IN BACKWALL

1'x3' MAP CRACK

9"x2'-6" OPENING FOR WIS. ELECTRIC & POWER CO. DUCTS.

6"x2'-4" OPENING FOR FIRE, POLICE & TRAFFIC CONTROL DUCTS.

8"ϕ PIPE SLEEVE FOR MILW GAS LIGHT CO GAS MAIN.

2½" ϕ CONDUIT

EL 123.01 | EL 119.10 | EL 118.97 | EL 118.84 | EL 121.90 | EL 118.71 | EL 118.54 | EL 118.33 | EL 113.33

ELEVATION

34'-5"

0.5'x3.5' DECAM

2'x1' DECAM

* DIMENSIONS AT FRONT FACE OF PARAPET

CONST JOINT TO BE LEFT ROUGH

SECTION THRU RAILING PARAPET

CONST JOINT POUR ALL CONCRETE ABOVE THIS JOINT AFTER SUPER IS IN PLACE. ½" GROOVE IN FF OF WING.

BEVELED RUSTICATION GROOVE

BILL OF BARS

2220#

DIMENSIONS IN BENDING DETAILS ARE OUT TO OUT.

POUR	MARK	NO	SIZE	LENGTH	SPACING	LOCATION	DET
	E1	18	4	23-3	SHOWN	BODY - HORIZ	
	E2	46	4	9-6	1-0	" - VERT	A
	E3	6	6	23-6	SHOWN	" - HORIZ	
	E4	23	4	13-3	2-0	" - VERT	B
	E5	6	4	18-9	SHOWN	PARAPET - HORIZ	
	E6	35	5	4-9	1-0	" - VERT.	C
	E7	8	4	8-6	SHOWN	" - HORIZ DO NOT LAP	
	E8	23	5	8-3	1-6	" - VERT	C
	E9	8	4	10-9	8	PARAPET & SDWK	C
	E10	10	4	4-9	SHOWN	BODY & WING	D
	E11	3	4	16-3	1-6	WING 4 & PARAPET	D
	E12	7	4	8-3	1-6	" "	
	E13	7	4	8-9	1-6	" "	
	E14	6	4	11-0	1-6	WING 3	D
	E15	5	4	9-3	1-6	" "	
	E16	9	4	9-3	1-6	" "	
	E17	28	4	3-9	SHOWN	GRID	D
	E18	16	4	4-0	SHOWN	"	
	E19	8	5	9-3	SHOWN	RAILING PARAPET	
	E20	20	5	6-0	1-0	" "	C
	E21	8	4	11-6	1-6	WING 3	
	E22	8	4	12-9	1-6	WING 4	D
	E23	3	4	11-0	1-6	WING 4	
	E24	16	4	3-3	4	PARAPET- VERT. B.F & F.F	
	E25	8	4	5-0	4	" - HORIZ " "	
	E26	8	4	6-0	4	" " " "	

DETAIL "A"

DETAIL B

DETAIL C

DETAIL D

SLOPE TOP & FACE OF WING TO MATCH CURB ON SUPER

PLAN

FOOTING PLAN

SECTION A-A

SECTION B-B

SECTION C-C

ELEVATION WING 3

ELEVATION WING 4

CONCRETE ABOVE THIS JOINT TO BE POURED AFTER SUPERSTRUCTURE IS IN PLACE. LEAVE JOINT ROUGH.

OPTIONAL KEYED CONST JOINT FORMED BY SURFACED, BEVELED 2 x 6" EATEND THRU WINGS

2½" ϕ CONDUIT EXTEND 1'-0" BEYOND BACK OF ABUT AND CAP.

SLOPE PAVING 2:1 SLOPE

TOP OF BERM EL 115.83

STATE HIGHWAY COMMISSION OF WISCONSIN

EAST ABUTMENT

AASHO 61 | H20-S16 | 1963

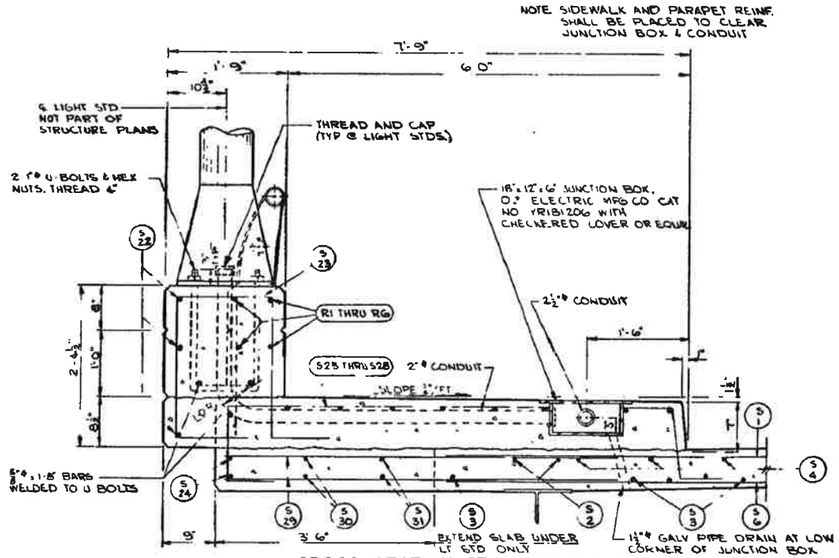
Ø 24 63 | V G H | C K P

STRUCTURE B 40 281 | SHEET 13 14

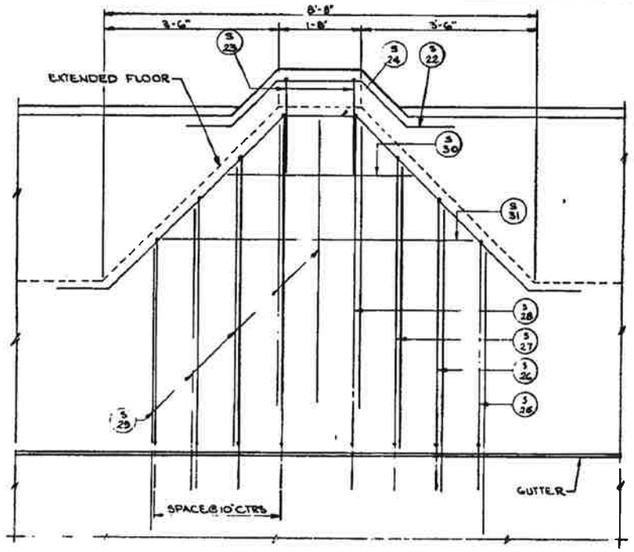
N 27890

D P R DIVISION	PROJECT	SHEET NO	TOTAL SHEETS
4	F027-1(22) 198	383	

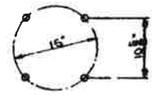
NOTE SIDEWALK AND PARAPET REINF. SHALL BE PLACED TO CLEAR JUNCTION BOX & CONDUIT



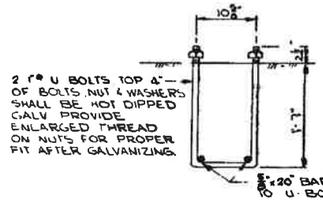
CROSS SECTION AT LIGHT STANDARD



REINFORCEMENT
PLAN AT LIGHT STANDARD

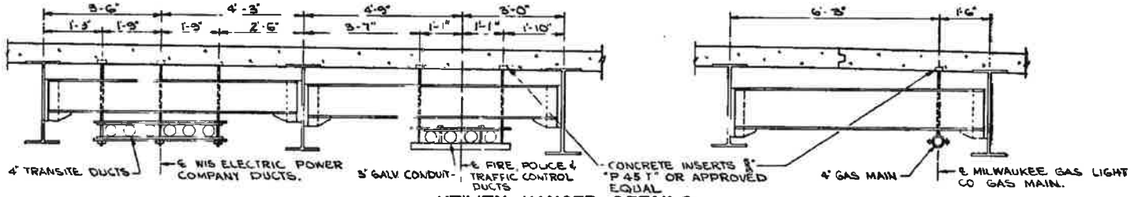


TRANSFORMER BASE BOLT LOCATION

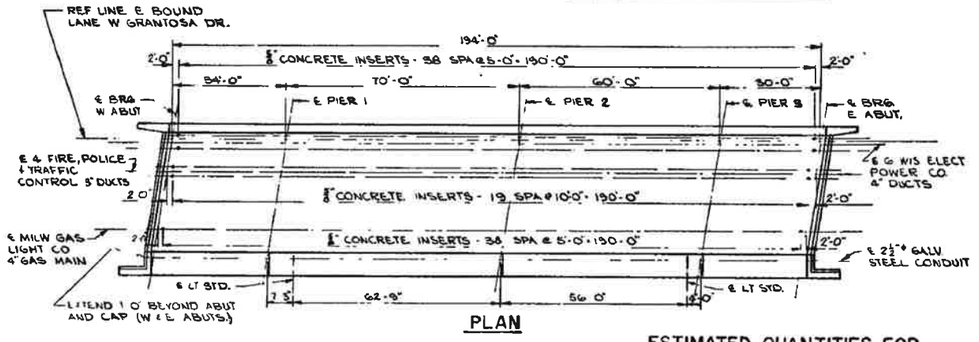


ANCHOR BOLT DETAIL

NOTE: ANCHOR ASSEMBLY TO BE INCLUDED IN BID ITEM "STRUCTURAL CARBON STEEL"



UTILITY HANGER DETAILS



PLAN

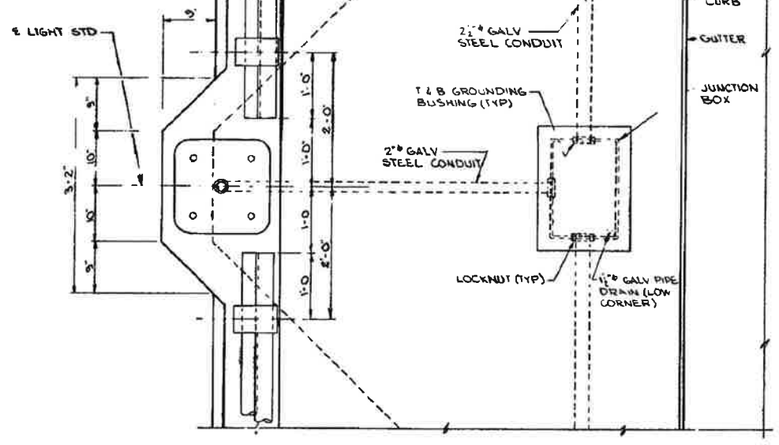
NOTES

PAINT ALL EMBEDDED CONDUIT FOR 18" ON EACH SIDE OF THE DEFLECTION JOINT IN SIDEWALK WITH A HEAVY COAT OF BITUMINOUS PAINT

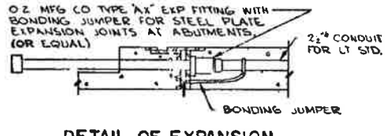
CONCRETE INSERT SPACING SHALL BE ADJUSTED WHERE NECESSARY SO THAT CLEAR DISTANCE BETWEEN HANGER AND DIAPHRAGM IS NOT LESS THAN 2" AND 1" CLEARANCE FROM REINFORCEMENT BARS IN THE DECK IS MAINTAINED.

ALL CONCRETE INSERTS TO BE FURNISHED AND PLACED BY THE RESPECTIVE UTILITIES.

ALL HANGERS, CONDUITS, AND DUCTS TO BE FURNISHED AND INSTALLED BY THE RESPECTIVE OWNERS



PLAN AT LIGHT STANDARD



DETAIL OF EXPANSION FITTING

ESTIMATED QUANTITIES FOR ELECTRICAL WORK

ITEM	UNIT	QUANTITY
2½"ℓ⁰ GALV STEEL CONDUIT	LF	702
2"ℓ⁰ GALV STEEL CONDUIT	LF	15
18"x12"x6" FLANGED JUNCTION BOX CAT NO YR 18120G	EACH	2
EXPANSION FITTING (2½"ℓ⁰) - TYPE AX	EACH	2
2½"ℓ⁰ GAL. PIPE CAPS	EACH	2
2"ℓ⁰ GALV PIPE CAPS	EACH	2

ONLY MAJOR ITEMS ARE LISTED IN ESTIMATED QUANTITIES FOR ELECTRICAL WORK AND ARE GIVEN FOR THE CONTRACTORS CONVENIENCE. THE CONTRACTOR SHALL VERIFY THEIR ACCURACY

REVISED	STATE HIGHWAY COMMISSION OF WISCONSIN
	UTILITIES & LIGHTING DETAILS
	DESIGN SPEC AASHO 61 LOADING H 20 S16 | COMPLETED 1963
	DATE 10 24 63 DES. - VGH DRAWN JCK CKD VL
STRUCTURE B 40-281	SHEET 14 OF 14

X27891

ATTACHMENT 3

ASBESTOS REPORT

708 Heartland Trail, Suite 3000
Madison, WI 53717

608.826.3600 PHONE
608.826.3941 FAX

www.TRCsolutions.com

Bridge Asbestos Inspection Report

WisDOT Project ID: 0656-50-30
Structure Number: B-40-0281
Structure Name: W. Grantosa Drive EB over STH 145/Fond du Lac Avenue
City/County: City of Milwaukee, Milwaukee County
Lat/Long Coordinates: 430643.17/ 880010.15
TRC Project Number: 283767.0000.0000
Date Inspected: July 20, 2017
Inspected By/License Number: Ross Hartwick, AII-195369

Findings:

Files available online for this bridge were reviewed, including the "As-built" drawings. The inspection to identify and collect samples of potential asbestos-containing material (ACM) was completed following WisDOT standard sampling procedure for bridge inspections found in FDM 21-35-45.

The gasket located under the railing attachment plates on the concrete parapet and the transite pipes under the bridge tested positive for asbestos greater than 1% and is therefore regulated ACM. If the ACM will be disturbed during the planned bridge rehabilitation, the ACM must be removed prior to any work. Standard Special Provision (STSP) 203-005 should be incorporated into the specifications. If the ACM will not be disturbed during the planned bridge rehabilitation, STSP 107-120 should be included in the specifications.

Sample Number	Sample Description	Sample Location	Analytical Results and Method	Friable/ Non-friable or No ACM	Quantity of ACM Material
EB-1	Black paint	Pedestrian fence, railing	PLM, non-detect	No ACM	0
EB-2	Black paint	Pedestrian fence, railing	PLM, non-detect	No ACM	
EB-3	Black paint	Pedestrian fence, railing	PLM, non-detect	No ACM	

Sample Number	Sample Description	Sample Location	Analytical Results and Method	Friable/ Non-friable or No ACM	Quantity of ACM Material
EB-4	Caulk	Parapet expansion joint, sidewalk joint	PLM, non-detect	No ACM	0
EB-5	Caulk	Parapet expansion joint, sidewalk joint	PLM, non-detect	No ACM	
EB-6	Caulk	Parapet expansion joint, sidewalk joint	PLM, non-detect	No ACM	
EB-7	Gasket	Under railing attachment plate	PLM, 3%	Non-friable	7.5”x34”x2 + 7.5”x7.5”x28 = 14.5 sq ft
EB-8	Gasket	Under railing attachment plate	Not analyzed, positive stop	--	
EB-9	Gasket	Under railing attachment plate	Not analyzed, positive stop	--	
EB-10	Tar	Bearing support pier	PLM, non-detect	No ACM	0
EB-11	Tar	Bearing support pier	PLM, non-detect	No ACM	
EB-12	Tar	Bearing support pier	PLM, non-detect	No ACM	
EB-13	Silver paint	Girder	PLM, non-detect	No ACM	0
EB-14	Silver paint	Girder	PLM, non-detect	No ACM	
EB-15	Silver paint	Girder	PLM, non-detect	No ACM	
EB-16	Transite	Piping	PLM, 20%	Friable	6 pipes x 4” diameter x 198’ long = 1,248 sq ft
EB-17	Transite	Piping	Not analyzed, positive stop	--	
EB-18	Transite	Piping	Not analyzed, positive stop	--	
EB-19	Pipe wrap	Utility Piping	PLM, non-detect	No ACM	0
EB-20	Pipe wrap	Utility Piping	PLM, non-detect	No ACM	
EB-21	Pipe wrap	Utility Piping	PLM, non-detect	No ACM	
EB-22	Paint	Galvanized metal conduit	PLM, non-detect	No ACM	0
EB-23	Paint	Galvanized metal conduit	PLM, non-detect	No ACM	
EB-24	Paint	Galvanized metal conduit	PLM, non-detect	No ACM	

If you have any questions, please contact me, at (608) 826-3628.

TRC Environmental Corporation

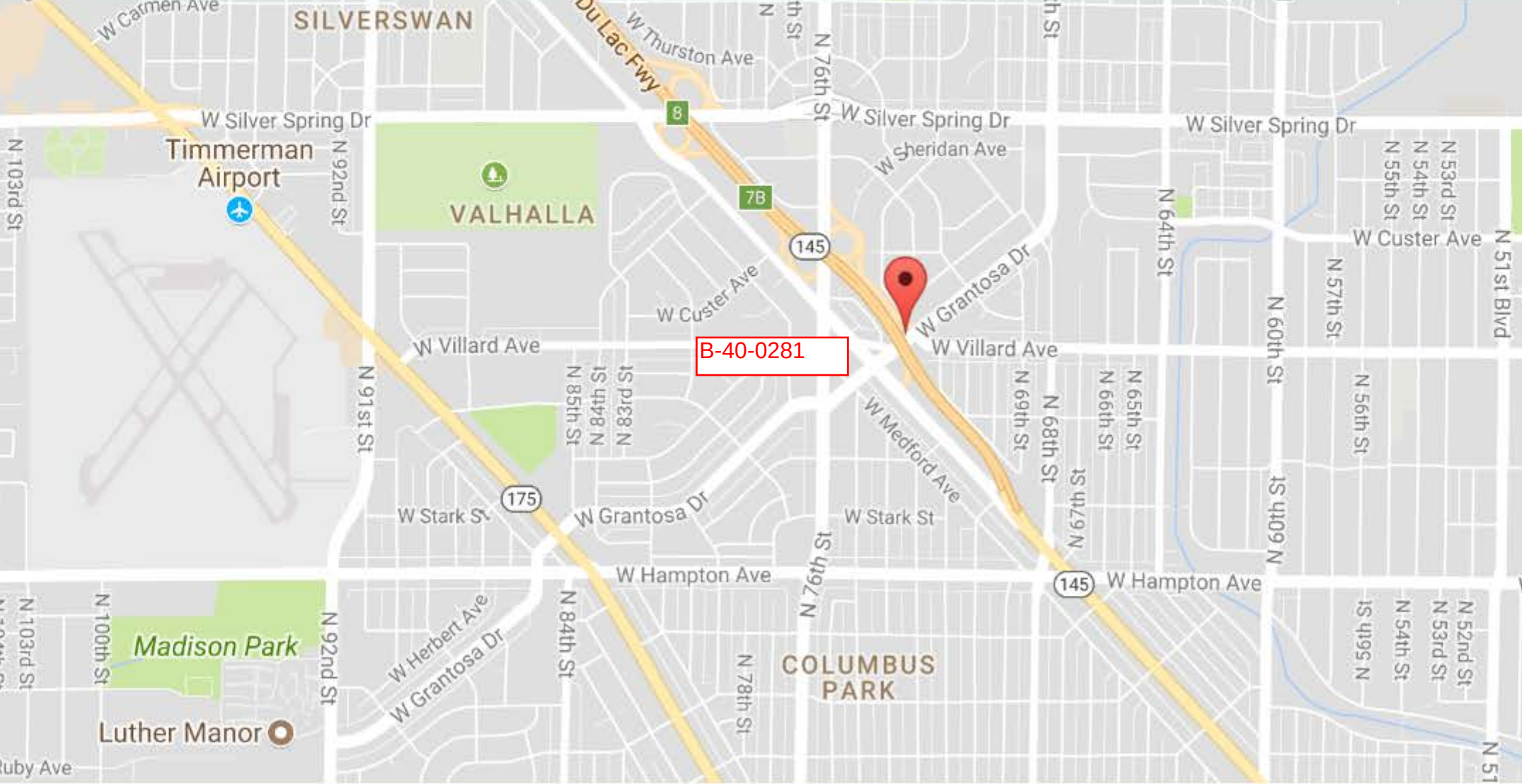
Daniel Haak
Project Manager

Ross Hartwick
Asbestos Inspector

Attachments: Location Map, Photos, and Laboratory Report

Report Distribution:

Recipient	Electronic (PDF) Copy	Paper Copy
BTS-ESS sharlene.tebeest@dot.wi.gov	X (via email)	X
REC Andrew.malsom@dot.wi.gov	X (via email)	
Project Manager jason.zemke@dot.wi.gov	X (via email)	
Other		


B-40-0281
SILVERSWAN
W Carmen Ave
W Thurston Ave
Du Lac Fwy
8
W Silver Spring Dr
Timmerman Airport
VALHALLA
7B
145
W Sheridan Ave
W Custer Ave
W Grantosa Dr
W Villard Ave
N 103rd St
N 92nd St
N 91st St
N 85th St
N 84th St
N 83rd St
N 76th St
N 64th St
N 60th St
N 57th St
N 56th St
N 55th St
N 54th St
N 53rd St
N 51st Blvd
W Medford Ave
N 69th St
N 68th St
N 67th St
N 66th St
N 65th St
175
W Stark St
W Hampton Ave
Madison Park
N 100th St
W Herbert Ave
N 84th St
N 78th St
COLUMBUS PARK
Luther Manor
N 52nd St
Ruby Ave

Bridge B-40-0281

Black paint on pedestrian fence and railing

Caulk in parapet expansion joint
and sidewalk joint

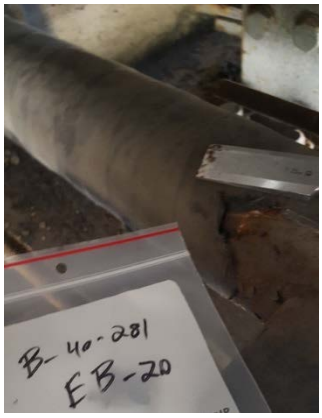
Gasket under railing attachment plate

Tar on bearing support piers

Silver paint on girder

Transite piping

Transite piping



Pipe wrap on utility piping

Paint on galvanized metal conduit

Industrial Hygiene Laboratory
21 Griffin Road North
Windsor, CT 06095
(860) 298-6308

TRC
Results you can rely on

BULK ASBESTOS ANALYSIS REPORT

CLIENT: Wisconsin Department of Transportation

Lab Log #: 0050964
Project #: 283673.0000.0000
Date Received: 07/21/2017
Date Analyzed: 07/21/2017

Site: Bridge Inspection, B-40-281

POLARIZED LIGHT MICROSCOPY by EPA 600/R-93/116

Sample No.	Color	Homogenous	Multi-Layered	Layer No.	Other Matrix Materials		Asbestos %	Asbestos Type
EB-01	Black (paint)	Yes	No	--		---	ND	None
EB-02	Black (paint)	Yes	No	--		---	ND	None
EB-03	Black (paint)	Yes	No	--		---	ND	None
EB-04	Grey (caulk)	Yes	No	--		---	ND	None
EB-05	Grey (caulk)	Yes	No	--		---	ND	None
EB-06	Grey (caulk)	Yes	No	--		---	ND	None
EB-07	Grey (gasket)	Yes	No	--		---	3%	Chrysotile
EB-08	--	--	--	--		--	NA/PS	--
EB-09	--	--	--	--		--	NA/PS	--
EB-10	Dark Grey (tar)	Yes	No	--	5%	cellulose	ND	None
EB-11	Dark Grey (tar)	Yes	No	--	5%	cellulose	ND	None
EB-12	Dark Grey (tar)	Yes	No	--	5%	cellulose	ND	None
EB-13	Grey (paint)	Yes	No	--		---	ND	None
EB-14	Grey (paint)	Yes	No	--		---	ND	None
EB-15	Grey (paint)	Yes	No	--		---	ND	None
EB-16	Grey (utility conduit)	Yes	No	--		---	20%	Chrysotile
EB-17	--	--	--	--		--	NA/PS	--

Industrial Hygiene Laboratory
21 Griffin Road North
Windsor, CT 06095
(860) 298-6308

TRC
Results you can rely on

POLARIZED LIGHT MICROSCOPY by EPA 600/R-93/116

Sample No.	Color	Homogenous	Multi-Layered	Layer No.	Other Matrix Materials	Asbestos %	Asbestos Type
EB-18	- -	- -	- -	- -	- -	NA/PS	- -
EB-19	Black (pipe wrap)	Yes	No	- -	- - -	ND	None
EB-20	Black (pipe wrap)	Yes	No	- -	- - -	ND	None
EB-21	Black (pipe wrap)	Yes	No	- -	- - -	ND	None
EB-22	Black (paint)	Yes	No	- -	- - -	ND	None
EB-23	Black (paint)	Yes	No	- -	- - -	ND	None
EB-24	Black (paint)	Yes	No	- -	- - -	ND	None

Reporting limit- asbestos present at 1%
ND - asbestos was not detected
Trace - asbestos was observed at level of less than 1%
NA/PS - Not Analyzed / Positive Stop
SNA- Sample Not Analyzed- See Chain of Custody for details

Note: Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. In those cases, EPA recommends, and certain states (e.g. NY) require, that negative results be confirmed by quantitative transmission electron microscopy.

The Laboratory at TRC follows the EPA's Interim Method for the Determination of Asbestos in Bulk Insulation 1982 (EPA 600/M4-82-020) Bulk Analysis Code 18/A01 and the EPA recommended Method for the Determination of Asbestos in Bulk Building Materials July 1993, R.L. Perkins and B.W. Harvey, (EPA/600/R-93/116) Bulk Analysis Code 18/A03, which utilize polarized light microscopy (PLM). Our analysts have completed an accredited course in asbestos identification. TRC's Laboratory is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP), for Bulk Asbestos Fiber Analysis, NVLAP Code 18/A01, effective through June 30, 2018. TRC is accredited by the AIHA Laboratory Accreditation Programs (AIHA-LAP), LLC in the Industrial Hygiene Program (IHLAP) for PLM effective through October 1, 2018. Asbestos content is determined by visual estimate unless otherwise indicated. Quality Control is performed in-house on at least 10% of samples and QC data related to the samples is available upon written request from client.

Analyzed by: K. Williamson
Kathleen Williamson, Laboratory Manager

Reviewed by: Cathryn Lemire
Cathryn Lemire, Approved Signatory

Date Issued
07/23/2017

ATTACHMENT 4

STRUCTURE ALTERNATIVE

REPORT & ASSOCIATED E-MAILS

One Honey Creek Corporate Center
125 South 84th Street, Suite 401
414 / 259 1500
414 / 259 0037 fax
www.graef-usa.com

GRAEF

collaborate / formulate / innovate

MEMORANDUM

TO: Roy Stollenwerk, P.E. & Christine Hanna, P.E.

FROM: GRAEF

DATE: October 26, 2018

SUBJECT: Bridge Alternative Life Cycle Cost Analysis
ID 1360-11-00
Grantosa Dr. over STH 145
Bridges B-40-280 and B-40-281
Milwaukee County

Construction is planned on two bridges over STH 145 as part of Project 1360-11-70. The project is scheduled for a PS&E date of May 1, 2020 and construction is currently scheduled for 2021.

The abutments on Bridges B-40-280 and B-40-281 are supported by spread footings. A site visit on March 23, 2018 indicated the east abutments of both bridges had slid towards STH 145, and possibly rotated. Although efforts to address the abutment movements were made in 1992 by way of lengthening the expansion slots of the hold-down bearings, at the time of GRAEF's inspection additional movements had taken place which had left the expansion bearings significantly out of alignment. As a result, alternatives to address the abutment movements were investigated.

Bridge improvement options include:

1. Conversion of the east and west abutments on both bridges to semi-expansion seats.
2. Replacement of the east and west abutments on both bridges
3. Complete bridge replacement using steel girders that match the existing substandard vertical clearance.
4. Complete bridge replacement using prestressed girders that raise the roadway profile to meet a minimum vertical clearance of 16'-4".

For each alternative, a construction and life cycle cost analysis has been prepared. A 75-year analysis period has been selected based on the anticipated design life of newly constructed bridges in Wisconsin, and an effective discount rate of 3.5% was assumed. Future major construction/rehabilitation activities were assumed at specified years beyond the initial construction. Recurring future maintenance items (such as bridge inspections) were not included as these were assumed to be the same for all alternatives. Construction unit costs used for the life cycle cost analysis are listed in Appendix A.

Conversion to Semi-Expansion Abutments

Semi-expansion abutments allow the girder ends to contract in cold temperatures, but provide restraint in hotter temperatures. Use of ½" thick elastomeric girder bearing pads placed on polyethylene sheets allow the girder ends to freely slide and result in a low maintenance bearing system. Conversion of the existing abutments to semi-expansion abutments will require temporary shoring of the existing bridge girders, existing abutment removal above the bearing seats, removal of the existing steel hold-down bearing devices, placing new elastomeric bearing pads under the girders, and casting a solid diaphragm to encase the ends of the bridge girders. Cleaning and flame metallizing the girder ends will help to protect the steel from future corrosion due to encasement in the concrete diaphragms

Use of semi-expansion bearings on steel girder bridges is limited to 150-ft which is less than the existing 194-ft bridge length. The Bureau of Structures Development Unit is willing to grant an exception to this provision given the shallow 30" girder depth.

Because the existing abutment bodies will be reused and the original bridge was designed for an H-20 load, the soil bearing pressure was checked for the additional dead load of the semi-expansion bearing's concrete end diaphragm and the HS-20 live loading used for load rating purposes. Preliminary results using service loads indicate that the maximum soil bearing press is approximately 2.9 ksf at the abutment toe under full dead plus live loads. This is less than the 5.0 ksf allowable soil bearing pressure indicated in the original abutment design calculations, and suggests abutment conversion is a feasible option.

A second feasibility check for this alternative was performed to address girder uplift. AASHTO Standard Specifications 3.17.1 was checked using results from an MDX line girder model. Preliminary calculations indicate that the end diaphragm will need to be extended 2.5-ft beyond the abutment front face to provide adequate dead load to resist uplift forces. See Figure 1.

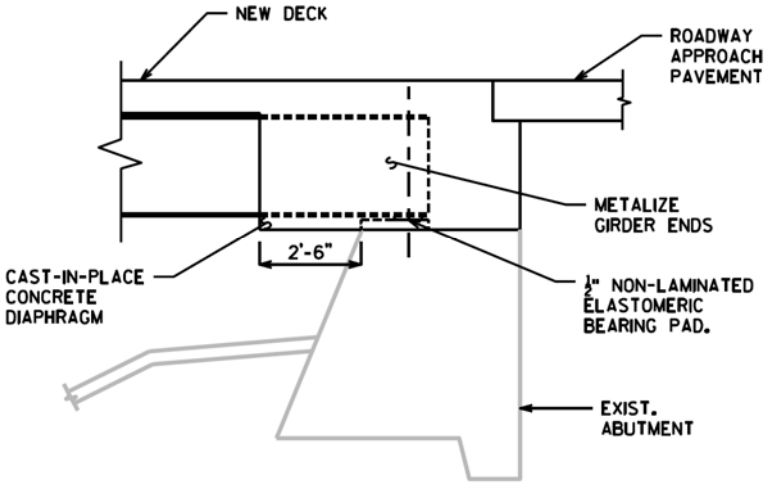


Figure 1: Conversion to Semi-expansion Abutment

For this alternative, the life cycle cost estimate considered that the existing bridge will be approximately 55 years old when rehabilitated. Appendix B lists the analysis details. Assumptions for major bridge construction activities for the 75-year analysis period include the following:

Year 0, bridge age 55 years - new deck construction, abutment conversion to semi-expansion bearings, steel girder repainting, and flame metallizing the steel girder ends. Miscellaneous repairs were assumed to cost 15% of the major rehabilitation items. Construction costs also include associated roadway approach work and contingencies.

Year 20, bridge age 75 years – concrete overlay, and miscellaneous repairs assumed to cost 20% of the major rehabilitation items.

Year 35, bridge age 90 years – demolition and construction of a new prestressed concrete girder bridge with structural approach slabs. The new bridge length is assumed to be 7% greater than the existing bridge to accommodate the new roadway profile. Construction costs also include roadway work to raise Grantosa Drive, acquire right-of-way, and associated contingencies.

Year 55, bridge age 20 years – concrete overlay, and miscellaneous repairs assumed to cost 10% of the major rehabilitation items.

Year 70, bridge age 35 years - new deck construction, and miscellaneous repairs assumed to cost 15% of the major rehabilitation items.

Year 75, bridge age 40 years – no major construction activities are anticipated at this stage. As part of the life cycle cost analysis, a residual value of the bridge was estimated to represent the remaining service life beyond year 75. It was estimated based on an anticipated NBI condition rating of 6 for a 40-year old bridge, prorated against an NBI rating of 9 when new and 3 at the end of its service life. The residual value is calculated as:

$$\frac{(\text{cost for a new bridge}) \times (NBI_{40} - NBI_{\text{service life}})}{(NBI_{new} - NBI_{\text{service life}})}$$

Abutment Replacements

For this alternative, type A3 pile supported abutments were assumed. Type A3 pile supported abutments have a minimum of 2 rows of piles with the front row battered to help resist lateral forces (see Figure 2). Current practice in Wisconsin is to generally use pile supported abutments to control vertical settlement. Replacement of the existing abutments will require temporary shoring of the existing bridge girders, existing abutment removal, pile driving, concrete placement for the new abutments and wingwalls, and installation of new hold-down expansion bearings under the girders. Given the age of the bridge, it was assumed that construction of new structure approach slabs would not be cost effective even though new abutments could be designed to handle these loads.

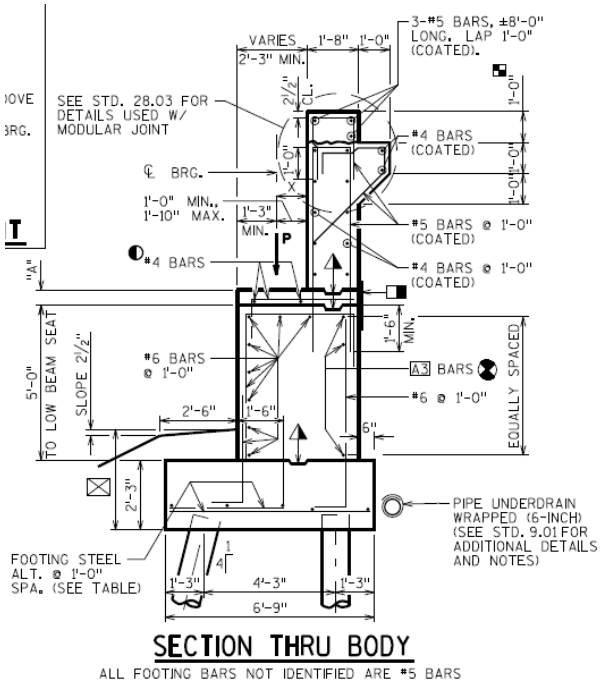


Figure 2: Standard A3 Abutment

Caution will be required while driving piles at the west abutment for bridge B-40-280 due to an existing 24" sanitary sewer passing underneath. This active sewer is located approximately 22-ft below the existing roadway and crosses the centerline of bearing at about a 30-degree angle.

For this alternative, the life cycle cost estimate considered that the existing bridge will be approximately 55 years old when rehabilitated. Appendix C lists the analysis details. Assumptions for major bridge construction activities for the 75-year analysis period include the following:

> Year 0, bridge age 55 years - new deck construction, drive piles, replace the abutments, steel girder repainting, and miscellaneous repairs assumed to cost 15% of the major rehabilitation items. Construction costs also include associated roadway approach work and contingencies.
>
> Year 20, bridge age 75 years – concrete overlay, and miscellaneous repairs assumed to cost 20% of the major rehabilitation items.

Year 35, bridge age 90 years – demolition and construction of a new prestressed concrete girder bridge with structural approach slabs. The new bridge length is assumed to be 7% greater than the existing bridge to accommodate the new roadway profile. Construction costs also include roadway work to raise Grantosa Drive, acquire right-of-way, and associated contingencies.

Year 55, bridge age 20 years – concrete overlay, and miscellaneous repairs assumed to cost 10% of the major rehabilitation items.

Year 70, bridge age 35 years - new deck construction, and miscellaneous repairs assumed to cost 15% of the major rehabilitation items.

Year 75, bridge age 40 years – no major construction activities are anticipated at this stage. As part of the life cycle cost analysis, a residual value of the bridge was estimated to represent the remaining service life beyond year 75. It was estimated using the same method for the semi-expansion abutment conversion alternative.

Complete Replacement with a New Steel Girder Bridge

This alternative replaces the existing structures with steel girder bridges at the same roadway profile as the existing. The current substandard vertical clearance will remain. For life cycle cost analysis purposes, a steel girder replacement bridge with the same total length, width, and substructure locations as the existing was assumed. This approach was judged to be feasible because the existing abutments and piers are founded on shallow footings and there are no existing piles to cause interferences. Caution must be exercised concerning pile design and driving to avoid the existing 24" sanitary sewer at the west abutment of B-40-280 and the west pier of B-40-281. Structure approach slabs were assumed to be constructed as part of the bridge replacement given the projected ADT on Grantosa Drive.

For this alternative, the life cycle cost estimate considered that the existing bridge will have a life span of 75 years. Appendix D lists the analysis details. Assumptions for major bridge construction activities for the 75-year analysis period include the following:

Year 0, bridge age 0 years – demolition and construction of a new steel girder bridge with structural approach slabs. The new bridge deck area is assumed to match the existing bridge.

Year 20, bridge age 20 years – concrete overlay, and miscellaneous repairs assumed to cost 10% of the major rehabilitation items.

Year 35, bridge age 35 years – new deck construction, and miscellaneous repairs assumed to cost 15% of the major rehabilitation items.

Year 55, bridge age 55 years – concrete overlay, and miscellaneous repairs assumed to cost 20% of the major rehabilitation items.

Year 75, bridge age 75 years – demolition and construction of a new prestressed concrete girder bridge is assumed, but these costs are not included in the life cycle analysis because the new bridge's service life falls beyond the 75-year study period. In addition, it is assumed that the existing bridge has no remaining usable service life and therefore no residual value.

Complete Replacement with a New Prestressed Concrete Girder Bridge

This alternative replaces the existing structures with 36" deep prestressed concrete girder bridges. Since this alternative requires raising the profile of Grantosa Drive, it is assumed the roadway profile is raised to attain the 16'-4" minimum vertical clearance required for STH 145. For life cycle cost analysis purposes, length of a prestressed concrete girder replacement bridge was approximated to be about 7% greater than the existing assuming a 3:1 embankment extension at the top of the existing. The bridge widths were assumed to be unchanged from the existing, as were the pier locations. This approach was judged to be feasible because the existing abutments and piers are founded on shallow footings and there are no existing piles to cause interference. Caution must be exercised concerning pile design and driving to avoid the existing 24" sanitary sewer at the west abutment of B-40-280 and the west pier of B-40-281. Structure approach slabs were assumed to be constructed as part of the bridge replacement given the projected ADT on Grantosa Drive.

Associated roadway improvements include raising the profile of Grantosa Drive approximately 2'-5" to attain a minimum vertical clearance of 16'-4" to meet FDM 11-35 requirements for new bridges. The required rise in roadway profile considers a 36W" prestressed concrete girder shape which has the capacity to span up to 100-ft. It is assumed that right-of-way acquisition will be required for the raised profile on Grantosa Drive.

For this alternative, the life cycle cost estimate considered that the existing bridge will have a life span of 75 years. Appendix E lists the analysis details. Assumptions for major bridge construction activities for the 75-year analysis period include the following:

Year 0, bridge age 0 years – demolition and construction of a new prestressed concrete girder bridge with structural approach slabs. The new bridge length is

assumed to be 7% greater than the existing bridge to accommodate the new roadway profile. Construction costs also include roadway work to raise Grantosa Drive, acquire right-of-way, and associated contingencies.

Year 20, bridge age 20 years – concrete overlay, and miscellaneous repairs assumed to cost 10% of the major rehabilitation items.

Year 35, bridge age 35 years – new deck construction, and miscellaneous repairs assumed to cost 15% of the major rehabilitation items.

Year 55, bridge age 55 years – concrete overlay, and miscellaneous repairs assumed to cost 20% of the major rehabilitation items.

Year 75, bridge age 75 years – demolition and construction of a new prestressed concrete girder bridge is assumed, but these costs are not included in the life cycle analysis because the new bridge's service life falls beyond the 75-year study period. In addition, it is assumed that the existing bridge has no remaining usable service life and therefore no residual value.

Conclusions

Results of the life cycle cost analyses are summarized in Table 1 below.

Table 1: Life Cycle Costs of Design Alternatives

Description	Initial Cost at Year 0	Life Cycle Cost at Present Value	Life Cycle Cost as an Annuity
Alternative 1 – Redeck and conversion to a semi-expansion abutment	$1,230,000 per bridge, *$2,460,000 total*	$2,320,000 per bridge, *$4,640,000 total*	$87,900/bridge/year, *$176,000 total/year*
Alternative 2 – Redeck and abutment replacement	$1,530,000 per bridge, *$3,060,000 total*	$2,630,000 per bridge, *$5,270,000 total*	$99,800/bridge/year, *$200,000 total/year*
Alternative 3 – Replacement with steel girder bridge	$1,950,000 per bridge, *$3,900,000 total*	$2,410,000 per bridge, *$4,820,000 total*	$91,100/bridge/year, *$182,000 total/year*
Alternative 4 – Replacement with prestressed concrete girder bridge	$3,090,000 per bridge, *$6,180,000 total*	$3,510,000 per bridge, *$7,020,000 total*	$133,000/bridge/year, *$266,000 total/year*

Recommendations

Results of the life cycle cost analysis show that Alternative 1, redeck and conversion to a semi-expansion abutment, has not only the lowest life cycle cost, but also the lowest first cost as part of the current project. This is a result of maximizing the existing bridge's

service life and original public investment, and of minimizing the amount of rehabilitation work needed to address the abutment movements.

A technical concern is the continued use of abutments experiencing excessive movements and hold-down bearings exhibiting uplift damage. These concerns are addressed by conversion to a semi-expansion abutment. Semi-expansion abutments by nature will provide lateral bracing against forces that tend to cause abutment sliding and overturning. In addition, final design to provide adequate dead load of the end diaphragms will eliminate undesirable live load uplift forces. A technical advantage offered by Alternative 1 is that pile driving is not needed, thereby eliminating the risk of damaging the existing 24" sanitary sewer.

Given the economic and technical benefits, we recommend that Alternative 1 be selected as the preferred option.

KGW:kgw
X:\ML\2017\20170145\Project_Information\Reports\Bridge Alternative Study\1360-11-00_STH 145 - Bridge Alternative Study Memo.docx

cc: File

APPENDIX A

Construction Unit Costs

Rehab Unit Prices from WisDOT Year End Structure Cost Summary Spreadsheets and the WisDOT Bridge Manaual

New Steel Bridge

Year	Unit Cost $/SF	Ave. Unit Cost $/SF	
2016	$147.09	$168.37	**Say $175/SF**
2015	$201.30		
2014	$182.81		
2013	$142.28		
Sum =	$673.48		

New PPC Bridge

Year	Unit Cost $/SF	Ave. Unit Cost $/SF	
2017	$123.10	$116.55	**Say $125/SF**
2016	$117.76		
2015	$132.82		
2014	$108.15		
2013	$100.92		
Sum =	$582.75		

Concrete Overlay (use total system values)

Year	Unit Cost $/SF	Ave. Unit Cost $/SF	
2017	$14.51	$18.86	**Say $20/SF**
2016	$23.89		
2015	$18.19		
Sum =	$56.59		

New Deck (use total system values)

Year	Unit Cost $/SF	Ave. Unit Cost $/SF	
2017	$85.13	$78.83	**Say $80/SF**
2016	$78.37		
2015	$73.00		
Sum =	$236.50		

Painting (use total system values)

Year	Unit Cost $/SF	Ave. Unit Cost $/SF	
2017	$16.29	$19.37	**Say $18/SF**
2016	$16.93		
2015	$24.90		
Sum =	$58.12		

GRĀEF collaborāte / formulāte / innovāte

APPENDIX B

Alternative 1 – Conversion to Semi-expansion Abutments

LIFE CYCLE COST ANALYSIS WORK SHEET

Project Name: Grantosa Ave. Bridge Alternative Analysis B-40-280/281
Project Number: 2017-0145.00
Date: 10/11/2018

OPTION: Alternate #1 - Convert (2) existing abutments to semi-expansion

Discount Rate (effective): **3.5%** (accounts for relative financial risk of investment)

Life Cycle: **75** years

Salvage (Residual) Value as a % of Replacement Cost: **50.0%** (assumes NBI = 9 new, 3 at end of service life, and 6 at end of analysis period)

Year	Description	Quantity	Unit	Unit Price	Extension (use present values)	Present Value
	INITIAL COSTS					
0	New deck on 55 year old bridge	9100	SF	$80	$728,000	$728,000
0	Convert 2 abutments to semi-expansion	2	EACH	$47,000	$94,000	$94,000
0	Steel girder repainting	10700	SF	$18	$192,600	$192,600
0	Misc. repairs (15% of major rehab items)	1	LS	$152,190	$152,190	$152,190
0	Roadway approach, mobilization, earthwork contingencies, etc. PER BRIDGE	1	LS	$66,000	$66,000	$66,000
0					$0	$0
	Subtotal - Initial Costs					**$1,232,790**
	FUTURE ITEMS (ONE TIME COSTS)					
20	Concrete overlay on 75 year old bridge	9100	SF	$20	$182,000	$91,467
20	Misc. repairs (20% of major rehab items)	1	LS	$36,400	$36,400	$18,293
20					$0	$0
20					$0	$0
35	Demo existing 90 year old bridge	9100	SF	$20	$182,000	$54,596
35	New PPC girder bridge	9750	SF	$125	$1,218,750	$365,597
35	New structure approach slabs	1	LS	$57,000	$57,000	$17,099
35	Raising Grantosa, mobilization, earthwork contingencies, etc. PER BRIDGE	1	LS	$1,400,000	$1,400,000	$419,968
35	ROW acquisition	1	LS	$180,000	$180,000	$53,996
55	Concrete overlay on 20 year old bridge	9750	SF	$20	$195,000	$29,398
55	Misc. repairs (10% of major rehab items)	1	LS	$19,500	$19,500	$2,940
55					$0	$0
55					$0	$0
70	New deck on 35 year old bridge	9750	SF	$80	$780,000	$70,189
70	Misc. repairs (15% of major rehab items)	1	LS	$117,000	$117,000	$10,528
70					$0	$0
70					$0	$0
75	Salvage (Residual) value - 40 year old bridge	1	LS	($609,375)	-$609,375	-$46,170
	Future Items (annual costs)					
	None anticipated			$0	$0	$0
	Total Life Cycle Costs					**$2,320,690**
	Annuity Cost/Year	*n =*	*75*	*years*		*$87,883*

APPENDIX C

Alternative 2 – Abutment Replacement

LIFE CYCLE COST ANALYSIS WORK SHEET

Project Name: Grantosa Ave. Bridge Alternative Analysis B-40-280/281
Project Number: 2017-0145.00
Date: 10/11/2018

OPTION: Alternate #2 - Replace (2) existing abutments

Discount Rate (effective): **3.5%** (accounts for relative financial risk of investment)

Life Cycle: **75** years

Salvage (Residual) Value as a % of Replacement Cost: **50.0%** (assumes NBI = 9 new, 3 at end of service life, and 6 at end of analysis period)

Year	Description	Quantity	Unit	Unit Price	Extension (use present values)	Present Value
	INITIAL COSTS					
0	New deck on 55 year old bridge	9100	SF	$80	$728,000	$728,000
0	Replace 2 abutment	2	EACH	$176,000	$352,000	$352,000
0	Steel girder repainting	10700	SF	$18	$192,600	$192,600
0	Misc. repairs (15% of major rehab items)	1	LS	$190,890	$190,890	$190,890
0	Roadway approach, mobilization, earthwork contingencies, etc. PER BRIDGE	1	LS	$66,000	$66,000	$66,000
0					$0	$0
	Subtotal - Initial Costs					**$1,529,490**
	FUTURE ITEMS (ONE TIME COSTS)					
20	Concrete overlay on 75 year old bridge	9100	SF	$20	$182,000	$91,467
20	Misc. repairs (20% of major rehab items)	1	LS	$36,400	$36,400	$18,293
20					$0	$0
20					$0	$0
35	Demo existing 90 year old bridge	9100	SF	$20	$182,000	$54,596
35	New PPC girder bridge	9750	SF	$125	$1,218,750	$365,597
35	New structure approach slab	2	EACH	$57,000	$114,000	$34,197
35	Raising Grantosa, mobilization, earthwork contingencies, etc. PER BRIDGE	1	LS	$1,400,000	$1,400,000	$419,968
35	ROW acquisition	1	LS	$180,000	$180,000	$53,996
55	Concrete overlay on 20 year old bridge	9750	SF	$20	$195,000	$29,398
55	Misc. repairs (10% of major rehab items)	1	LS	$19,500	$19,500	$2,940
55					$0	$0
55					$0	$0
70	New deck on 35 year old bridge	9750	SF	$80	$780,000	$70,189
70	Misc. repairs (15% of major rehab items)	1	LS	$117,000	$117,000	$10,528
70					$0	$0
70					$0	$0
75	Salvage (Residual) value - 40 year old bridge	1	LS	($609,375)	-$609,375	-$46,170
	Future Items (annual costs)					
	None anticipated			$0	$0	$0
	Total Life Cycle Costs					**$2,634,489**
	Annuity Cost/Year	*n =*	*75*	*years*		*$99,766*

GRAEF

collaborate / formulate / innovate

APPENDIX D

Alternative 3 – Steel Girder Bridge Replacement

LIFE CYCLE COST ANALYSIS WORK SHEET

Project Name: **Grantosa Ave. Bridge Alternative Analysis B-40-280/281**
Project Number: **2017-0145.00**
Date: **10/25/2018**

OPTION: **Alternate #3 - New steel girder bridge (200' x 45.5')**

Discount Rate (effective): **3.5%** (accounts for relative financial risk of investment)

Life Cycle: **75** years

Year	Description	Quantity	Unit	Unit Price	Extension (use present values)	Present Value
	INITIAL COSTS					
0	Demo existing bridge	9100	SF	$20	$182,000	$182,000
0	New steel girder bridge	9100	SF	$175	$1,592,500	$1,592,500
0	New structure approach slabs	2	EACH	$57,000	$114,000	$114,000
0	Roadway approach, mobilization, earthwork contingencies, etc. PER BRIDGE	1	LS	$66,000	$66,000	$66,000
0					$0	$0
	Subtotal - Initial Costs					**$1,954,500**
	FUTURE ITEMS (ONE TIME COSTS)					
20	Concrete overlay	9100	SF	$20	$182,000	$91,467
20	Misc. repairs (10% of major rehab items)	1	LS	$18,200	$18,200	$9,147
20					$0	$0
20					$0	$0
35	New deck	9100	SF	$80	$728,000	$218,383
35	Steel girder repainting	10700	SF	$18	$192,600	$57,776
35	Misc. repairs (15% of major rehab items)	1	LS	$138,090	$138,090	$41,424
35					$0	$0
35					$0	$0
55	Concrete overlay	9100	SF	$20	$182,000	$27,438
55	Misc. repairs (20% of major rehab items)	1	LS	$36,400	$36,400	$5,488
55					$0	$0
55					$0	$0
75					$0	$0
75					$0	$0
	Future Items (annual costs)					
	None anticipated			$0	$0	$0
	Total Life Cycle Costs					**$2,405,622**
	Annuity Cost/Year	*n =*	*75*	*years*		*$91,099*

GRAEF

collaborate / formulate / innovate

APPENDIX E

Alternative 4 – Prestressed Concrete Girder Bridge Replacement

LIFE CYCLE COST ANALYSIS WORK SHEET

Project Name: Grantosa Ave. Bridge Alternative Analysis B-40-280/281
Project Number: 2017-0145.00
Date: 10/25/2018

OPTION: Alternate #4 - New PPC girder bridge (214' x 45.5')

Discount Rate (effective): **3.5%** (accounts for relative financial risk of investment)

Life Cycle: **75** years

Year	Description	Quantity	Unit	Unit Price	Extension (use present values)	Present Value
	INITIAL COSTS					
0	Demo existing bridge	9100	SF	$20	$182,000	$182,000
0	New PPC girder bridge	**9750**	SF	$125	$1,218,750	$1,218,750
0	New structure approach slabs	2	EACH	$57,000	$114,000	$114,000
0	Raising Grantosa, mobilization, earthwork contingencies, etc. PER BRIDGE	1	LS	$1,400,000	$1,400,000	$1,400,000
0	ROW acquisition	1	LS	$180,000	$180,000	$180,000
	Subtotal - Initial Costs					**$3,094,750**
	FUTURE ITEMS (ONE TIME COSTS)					
20	Concrete overlay	**9750**	SF	$20	$195,000	$98,000
20	Misc. repairs (10% of major rehab items)	1	LS	$19,500	$19,500	$9,800
20					$0	$0
20					$0	$0
35	New deck	**9750**	SF	$80	$780,000	$233,982
35	Misc. repairs (15% of major rehab items)	1	LS	$117,000	$117,000	$35,097
35					$0	$0
35					$0	$0
55	Concrete overlay	**9750**	SF	$20	$195,000	$29,398
55	Misc. repairs (20% of major rehab items)	1	LS	$39,000	$39,000	$5,880
55					$0	$0
55					$0	$0
75					$0	$0
75						$0
	Future Items (annual costs)					
	None anticipated			$0	$0	$0
	Total Life Cycle Costs					**$3,506,907**
	Annuity Cost/Year	*n =*	*75*	*years*		*$132,804*

From:	Landini, Anthony P - DOT
To:	Stollenwerk, Roy T - DOT
Cc:	DOT 13601100 STH 145-Grantosa-Leon; Wood, Kevin; Schowalter, Steven; Hanna, Christine - DOT; Ksontini, Najoua - DOT; Pettit, Mary Beth
Subject:	RE: I.D. 1360-11-00 | STH 145 | Amendment for Alternatives Analysis at Grantosa B-40-280/281
Date:	Tuesday, October 30, 2018 10:25:50 AM
Attachments:	image001.png image002.png image003.png

Roy

The memorandum has been revised as per discussions with Consultant.

Tony

From: Pettit, Mary Beth [mailto:marybeth.pettit@graef-usa.com]
Sent: Friday, October 26, 2018 2:05 PM
To: Stollenwerk, Roy T - DOT <Roy.Stollenwerk@dot.wi.gov>; Landini, Anthony P - DOT <Anthony.Landini@dot.wi.gov>
Cc: DOT 13601100 STH 145-Grantosa-Leon <DOT13601100STH145-Grantosa-Leon@dot.wi.gov>; Wood, Kevin <kevin.wood@graef-usa.com>; Schowalter, Steve <steven.schowalter@graef-usa.com>; Hanna, Christine - DOT <Christine.Hanna@dot.wi.gov>; Ksontini, Najoua - DOT <najoua.ksontini@dot.wi.gov>
Subject: RE: I.D. 1360-11-00 | STH 145 | Amendment for Alternatives Analysis at Grantosa B-40-280/281

All,

Kevin and Tony have corresponded this week and the memorandum has been finalized and attached for your records.

Thank you to everyone for your help! We will incorporate the recommendation of the deck replacement with the conversion to semi-expansion abutments.

Thank you,
Mary Beth

From: Stollenwerk, Roy T - DOT [mailto:Roy.Stollenwerk@dot.wi.gov]
Sent: Tuesday, October 23, 2018 3:22 PM
To: Landini, Anthony P - DOT <Anthony.Landini@dot.wi.gov>
Cc: DOT 13601100 STH 145-Grantosa-Leon <DOT13601100STH145-Grantosa-Leon@dot.wi.gov>; Wood, Kevin <kevin.wood@graef-usa.com>; Pettit, Mary Beth <marybeth.pettit@graef-usa.com>; Schowalter, Steven <steven.schowalter@graef-usa.com>; Hanna, Christine - DOT <Christine.Hanna@dot.wi.gov>; Ksontini, Najoua - DOT <najoua.ksontini@dot.wi.gov>
Subject: RE: I.D. 1360-11-00 | STH 145 | Amendment for Alternatives Analysis at Grantosa B-40-280/281

Tony,

Thanks for your review and concurrence.

Kevin and Mary Beth – Please respond to Tony's comment regarding the LCC analysis for Alternatives 3 & 4 and resubmit is necessary. Thanks.

Roy Stollenwerk
30% Design Project Manager
Wisconsin Department of Transportation
PH: (262) 548-6474

From: Landini, Anthony P - DOT
Sent: Tuesday, October 23, 2018 12:43 PM
To: Stollenwerk, Roy T - DOT <Roy.Stollenwerk@dot.wi.gov>
Cc: DOT 13601100 STH 145-Grantosa-Leon <DOT13601100STH145-Grantosa-Leon@dot.wi.gov>; Wood, Kevin <kevin.wood@graef-usa.com>; Pettit, Mary Beth <marybeth.pettit@graef-usa.com>; Schowalter, Steve <steven.schowalter@graef-usa.com>; Hanna, Christine - DOT <Christine.Hanna@dot.wi.gov>; Ksontini, Najoua - DOT <najoua.ksontini@dot.wi.gov>
Subject: RE: I.D. 1360-11-00 | STH 145 | Amendment for Alternatives Analysis at Grantosa B-40-280/281

Roy

BOS concurs with recommended Alternative 1 – Re-deck and conversion to a semi-expansion abutments.

This is a nice report, but I believe there is a problem with the LCC analysis for Alternatives 3 & 4 that does not affect the recommendation. By adding the cost of a new bridge at year 75, which is the analysis period, the remaining service life of that new structure should be subtracted. If the Consultant agrees, I suggest the report be updated and resubmitted so we have the proper documentation.

Tony

From: Stollenwerk, Roy T - DOT
Sent: Tuesday, October 16, 2018 3:21 PM
To: Landini, Anthony P - DOT <Anthony.Landini@dot.wi.gov>
Cc: DOT 13601100 STH 145-Grantosa-Leon <DOT13601100STH145-Grantosa-Leon@dot.wi.gov>; Wood, Kevin <kevin.wood@graef-usa.com>; Pettit, Mary Beth <marybeth.pettit@graef-usa.com>; Schowalter, Steve <steven.schowalter@graef-usa.com>; Hanna, Christine - DOT <Christine.Hanna@dot.wi.gov>

Subject: RE: I.D. 1360-11-00 | STH 145 | Amendment for Alternatives Analysis at Grantosa

Tony,

GRAEF has submitted the attached Bridge Alternative Life Cycle Cost Analysis for the Grantosa Drive bridges of STH 145, Bridges B-40-280 and B-40-281. Their conclusion is that Alternative 1 – Redeck and conversion to a semi-expansion abutment has the lowest first cost and lowest life cycle cost. Please review the analysis and comment on their recommendation of Alternative 1 as the preferred option.

Thanks, and let us know if you have any questions.

Roy Stollenwerk
30% Design Project Manager
Wisconsin Department of Transportation
PH: (262) 548-6474

From: Landini, Anthony P - DOT
Sent: Thursday, September 06, 2018 3:25 PM
To: Stollenwerk, Roy T - DOT <Roy.Stollenwerk@dot.wi.gov>
Cc: Bonk, Aaron M - DOT <Aaron.Bonk@dot.wi.gov>; Shadewald, Laura - DOT <Laura.Shadewald@dot.wi.gov>
Subject: RE: I.D. 1360-11-00 | STH 145 | Amendment for Alternatives Analysis at Grantosa

Roy

The scope for ii should be to convert both abutments to semi-expansion.

Aaron and Laura have been more involved in man hour estimates so one of them may be willing to provide comments on that portion.

Tony

From: Stollenwerk, Roy T - DOT
Sent: Thursday, September 06, 2018 1:55 PM
To: Landini, Anthony P - DOT <Anthony.Landini@dot.wi.gov>
Cc: DOT 13601100 STH 145-Grantosa-Leon <DOT13601100STH145-Grantosa-Leon@dot.wi.gov>
Subject: FW: I.D. 1360-11-00 | STH 145 | Amendment for Alternatives Analysis at Grantosa

Tony,

GRAEF has submitted the attached draft amendment for the alternative analysis for the Grantosa Drive abutments that are tipping. We would like to get the amendment going as soon as possible so

that we can keep the project design on schedule. Could you please review the scope of work to make sure it includes the information that BOS is looking for. Your opinion on the cost of the amendment would also be appreciated.

Thanks for your help.

Roy Stollenwerk
30% Design Project Manager
Wisconsin Department of Transportation
PH: (262) 548-6474

From: Pettit, Mary Beth [mailto:marybeth.pettit@graef-usa.com]
Sent: Friday, August 31, 2018 2:59 PM
To: Stollenwerk, Roy T - DOT <Roy.Stollenwerk@dot.wi.gov>
Cc: Schowalter, Steve <steven.schowalter@graef-usa.com>; Wood, Kevin <kevin.wood@graef-usa.com>
Subject: [WARNING: ATTACHMENT(S) MAY CONTAIN MALWARE]I.D. 1360-11-00 | STH 145 | Amendment for Alternatives Analysis at Grantosa

Roy,

Per our discussion earlier this week, please find attached a draft of the amendment for the study and memo preparation for the alternatives at Grantosa. Most importantly, we need to be sure the scope the way it is written on page 2 covers what you believe should be in the report. We can discuss next steps with this amendment once you have had a chance to review.

We are planning to complete this work in approximately 3 weeks.

Please feel free to call with questions\concerns.

Thank you!

Mary Beth Pettit, P.E.
Principal

GRAEF
One Honey Creek Corporate Center
125 South 84th Street, Suite 401
Milwaukee, WI 53214-1407

414 / 259 1500 office
414 / 266 9175 direct
414 / 467 8912 mobile
414 / 259 0037 fax

marybeth.pettit@graef-usa.com

www.graef-usa.com

GRAEF is the trade name of Graef-USA Inc.

Please consider the environment before printing this page.