State of California – Natural Resources Agency

Memorandum

Date : August 6, 2014

To : Lisa Manget, Acting Director
Department of Parks & Recreation

From : Kathy Amann/Lori Murchison/Chris Moenig
Acquisiion & Development Division
Department of Parks & Recreation

Subject : Pilarcitos Bridge Structural Condition Assessment
Half Moon Bay State Beach

Lisa,

Beuhler & Beuhler (B&B) Structural Engineers performed a Structural Condition Assessment of the Pilarcitos Bridge and produced an extensive report dated July 20, 2014. A&D has reviewed this assessment and agrees with the information put forward by B&B, which includes the recommended replacement of the bridge. B&B has made the assumption in this assessment and in their estimate that the existing concrete bridge piers & abutments can be re-used for the new bridge. If further testing proves the piers and/or the abutments to be structurally inadequate, the replacement cost will increase.

B&B's subconsultant, Sierra West Group, produced an estimate for the construction (hard) cost only of this bridge, based on current assumptions, which totals $1.34 Million. In addition to the hard cost, A&D has estimated the construction contingency (for anticipated change orders) and the internal "soft" cost to be an additional $460,000, for a total estimated project cost of approximately $1.8 Million. The soft cost includes change order contingency, B&B consultant engineering design, internal engineering review of design documents, RFI's, submittal review, geotechnical investigation, environmental documents (CEQA), permit fees, resource monitoring, project management, construction management, internal estimating, constructability review and project inspection during construction.

We anticipate a CEQA Notice of Exemption (NOE), if piers/abutments are re-used, along with a California Coastal Development Permit (CDP).

If re-use of these existing sub-structures is not possible, then a Mitigated Negative Declaration (MND) will be necessary. Under this scenario, in addition to a CDP, the following permits will be necessary:

- Dept of Fish & Game Streambed Alteration Permit
- Federal Army Corps of Engineers 404 Permit (Discharge of dredged or fill materials)
- Regional Water Quality Control Board 401 Permit (Dredge/fill & wetlands program)

If you have any questions, please feel free to contact either Lori Murchison or Chris Moenig.

Lori Murchison, Construction Supervisor III
(916) 445-8965

Chris Moenig, Construction Supervisor II
(916) 445-8060

BUEHLER & BUEHLER
structural engineers

HALF MOON BAY STATE BEACH
PILARCITOS BRIDGE

STRUCTURAL CONDITION ASSESSMENT
FINAL REPORT

Half Moon Bay, CA

Project Manager, Lawrence E. Jones, S.E.
B&B Job No. 2014-0140.

July 10, 2014

BUEHLER & BUEHLER
structural engineers

600 Q Street, Suite 200
Sacramento, CA 95811
tel 916.443.0303 fax 916.443.0313
www.bbse.com

July 10, 2014

Mr. Chris Moenig
Project Manager
California Department of Parks and Recreation
100 Capitol Mall, Suite 400
Sacramento, CA 95814

Subject: Half Moon Bay State Beach – Pilarcitos Bridge Structural Assessment

Dear Chris,

Scope of Work

The project consists of a structural condition assessment of an 8-foot wide x 400-foot long, four span, steel truss pedestrian bridge with a wood plank deck. The bridge was closed to pedestrian and bicycle use due to collapse of a portion of the floor deck on the west end of the bridge. Our scope of work is to include a structural assessment of the components of the bridge and make recommendations in regards to potential repairs or replacement of the bridge structure, and associated construction costs.

Project Description

The pedestrian bridge was constructed over the Pilarcitos Creek wetlands in 1993 for the City of Half Moon Bay as part of a Coastal Trail project. The bridge deck is approximately 8'-0" wide, constructed of transverse 3x pressure treated douglas fir solid wood planking over TS4x3x1/8" longitudinal stringers at 30"on center spanning to TS6x4x1/4" transverse floor beams at 5'-0" centers. Floor beams span to steel TS parallel chord trusses with TS6x6x1/4 chords and TS3x2x1/8" diagonals and TS6x6x1/4" posts. Trusses have 20 panel spaces at 5'-0" on center to span 100'-0" to X-braced galvanized steel wide flange pier and abutment elements. Supports rest on two 8" diameter pipe helix shafts spaced at 8'-0" centers that are braced laterally at the ground level by splayed helix tiebacks at a 45 degree angle in both directions.
As-built drawings were provided including: plan and detail sheets 3 and 4 by Collander Associates, dated April 30, 1992; Steel shop drawings for the bridge piers by Baron Welding and Iron Works, sheets 1 through 3, dated August 17, 1993; and bridge shop drawings by Continental Bridge, sheets 1 through 3, dated June 11, 1993.

Condition of the Structure

On July 1, 2014, we visited the site and observed the condition of the bridge and its components. We performed some non-destructive testing by drilling bridge members to establish corrosion rates and hammer sounding of members to verify section resilience and continuity at connections. Photographs of components and decay discovered are also contained in the

Appendix. The bridge has four spans that are labelled from west (beach) to east, Truss Spans No. 1 to No. 4. Each truss has two panel points that are also labelled from west to east from 1 to 20. Abutments and mid-piers are labelled from No. 1 to No. 5, again west to east. N, S, E, W indicates direction reference of multiple members.
Cindy Begbie, Parks Maintenance Supervisor arrived during our visit to go over our initial findings. Several members of the public attempted to use the bridge during my site visit, but were discouraged.

Truss Span No. 1:

Initial Observations: The corrosion noted on the bridge seemed to be more pronounced toward the west end of the spans, closer to the ocean. We began our survey at the west end and noted the obvious failures in the floor support beams and stringers for the first seven panel points of the truss. Floor beams were completely corroded and detached from the truss and sagging between 8 inches to 12 inches below the correct position on the north side of the deck. Floor beams were still attached to the south truss but member sections were also severely corroded.
Abutment No. 1: Steel galvanized beams and post were visible on the north side only. Members and connections appeared to be in good condition. The lower beam was partially buried in soil. Truss connection plates to galvanized plates were in poor condition with up to 50% corrosion in a 5/8 inch thick base plate.
Deck Observations: The bridge deck planks had signs of aging wear, checking and cracking but did not have signs of microbial decay. All screw fasteners appeared to have moderate to severe corrosion. Many fasteners were complexly corroded.
Floor Stringers: The longitudinal TS stringers appeared in poor condition with severe corrosion. Corrosion was in excess of 75% in some cases.
Floor Bracing: Bracing members had severe corrosion. Member failures due to section corrosion and end connection failure were prevalent.
Floor Beams: Floor beams at west end bays 1 throuh 7 were 100% corroded and detached at the north truss. Other beams were still attached at the truss but had end corrosion 75% to 95%.
Truss Bottom Chord: We drilled the bottom chord member at Panel 3. Member section reduction was 30%. We also drilled Panel 1 on the north side and noted same 30% reduction. Hammer sounding on top of the tube indicated a corrosion flaking on the interior. End connection Panel 1 space at the west bearing was 75% corroded with a large hole through the entire bottom and sides of the tube section. The top of the bottom chord had much debris collection. Connection corrosion occurred mainly on the floor deck side behind the toe kick plate. Several holes were noted at panels 1, 2 and 3. Severe corrosion was noted at Panel 10 at the bottom chord splice. Sounding indicated interior flaking corrosion at connection plate bolts to 50%.
Truss Diagonals: We drilled the diagonal at Panel 3S and 1N. Section reduction was 20%. Connections at the top chord appeared adequate. Connections at the bottom chord were corroded severely.
Truss Vertical Posts: We drilled posts at Panels 3S, 1N and 2N. We noted air pressure relief in drilling at panel 3S where corrosion was 10%. Corrosion was up to 50% primarily at the attachment points of the guard rail angles.
Truss Top Chord: The top chord appeared in generally good condition with the exception of the splice plate at mid-span. Corrosion was evident in the joint area inside the tube and at the bolted splice plate.
Guard rail Angles: Guard rail angles were 100% corroded at the west half of the span and around 50% to 75% at the remainder.

Interior Pier No. 2: Galvanized beams and bracing appeared to be in good condition. The pier was located close to the top of the slope at the creek embankment. Corrosion was noted on the galvanized plate at the attachment to the 1 inch bridge bearing plate. Bridge bearing plates were corroded up to 50% on the inside faces.

Truss Span No. 2:
This bridge section had similar issues to Span No. 1. Panels 1 to 2 indicated moderate corrosion at the bottom chord. Floor beams, stringers and bracing had corrosion from 50% to 75% again more severe to the north side of the bridge. The end diagonal had severe corrosion at the end connection to the bottom chord at Panel 1. The diagonal bolted splice at Panel 10 was corroded 100% at the bolted plate with severe flaking at the bottom chord connection.
Interior Pier No. 3: The stream bed has scoured into the embankment at the north pier post exposing the diagonal tieback rod in the stream bed. The soil face appeared to be within 2'-0" of the vertical face of the 10-foot plus embankment

Truss Spans No. 3 and No. 4:
These bridge sections have similar issues to other spans. Mud debris was noted in open ended floor beams. Span No. 4 had 75% corrosion to floor beams. Debris on the bottom chord has caused severe corrosion of the truss connections behind the toe kick plate.
Interior Pier No. 4: Galvanized steel members, bracing and connections appeared in good condition.
Abutment Pier No. 5: Galvanized steel members, bracing and connections appeared in good condition as visible on the west side only. The lower beam was partially buried in soil.

Summary of Observations
There is evidence showing the bridge was subject to flooding at the level of the floor deck and was likely a yearly occurrence. Vegetation growth under and around the bridge may have also contributed to an accelerated decay process. The bridge floor beams that support occupant loading have collapsed or are in danger of collapse in many areas of the spans. Severe atmospheric corrosion was evident on smaller members and moderate corrosion was observed on truss elements above the deck level. Severe corrosion has occurred on critical members and connections that were in the submerged zone at the deck level. This corrosion has exceeded the acceptable performance range of the bridge super-structure. Truss members are currently at their capacity to support simple gravity structure dead loads. The entire bridge structure has exceeded its useful life and should be replaced with a new structure.

Recommendations
The following is a list of recommendations:

1. Bridges should be replaced with new pre-manufactured bridge elements.
2. Safety measures should be taken to protect the public from using the spans. We suggest the immediate removal of floor deck members from the abutments at each end to at least 30 to 40 feet onto each of the end spans. The remaining elevated deck should be barricaded/ fenced at that point to keep the public from climbing onto the bridge deck.
3. Bridge materials should be selected to take into consideration the proximity to the ocean in regard to salt exposure. FRP is a likely choice for the coastal environment. Self-weathering steel would only be considered if the steel wall thickness was increased on all members to provide an acceptable life expectancy of the structure. A corrosion expert should be consulted if this approach is considered.

4. Existing galvanized steel helix pier foundation supports and tiebacks appear to be in good condition. These elements can be evaluated for re-use.
5. Existing cathodic protection system has been disabled and should be repaired as soon as practical to protect foundation elements from further damage.
6. Replacement bridge height should be adjusted to keep bridge from exposure to water during flood stages. A Hydrological study will likely be needed to establish at least 100 year flood levels and to provide at least a 24" freeboard height to protect from floating debris.
7. Scour counter-measures will need to be investigated and designed at Pier No. 3 and possibly Pier No. 2.
8. Further study of abutments and foundations is recommended and is beyond the scope of this report. A geotechnical engineer will be necessary to confirm load capacity and to expose buried members for evaluation and design information.
9. Lateral wind and seismic design considerations are beyond the scope of this study. These issues should be evaluated in a replacement scenario.
10. Future maintenance should always include annual removal of all vegetation within 5-foot of the bridge structure to allow for proper air circulation.

Conclusion Summary

The bridge was inspected and remediation of the existing bridge members is not feasible. Consequently, the entire bridge superstructure needs to be replaced. The original foundation pier elements are likely capable of modification to be used with the new structure. Verification will be necessary by a geotechnical engineer during the replacement design.

Cost Estimates

See Appendix for estimated construction cost breakdown.

Limitations

Results and recommendations made in this report were based on limited visual observations, hammer soundings and periodic drilling of structural members to check section thickness. No excavation or material testing was done on the abutments or piers. Further material studies may be required to provide a more comprehensive evaluation. The report was produced under the constraints of time and budget and to the standard of care for similar condition studies. No warranty is expressed or implied.

Sincerely,

Lawrence E. Jones, S.E., LEED® A.P.
Vice President
BUEHLER & BUEHLER
Structural Engineers, Inc.

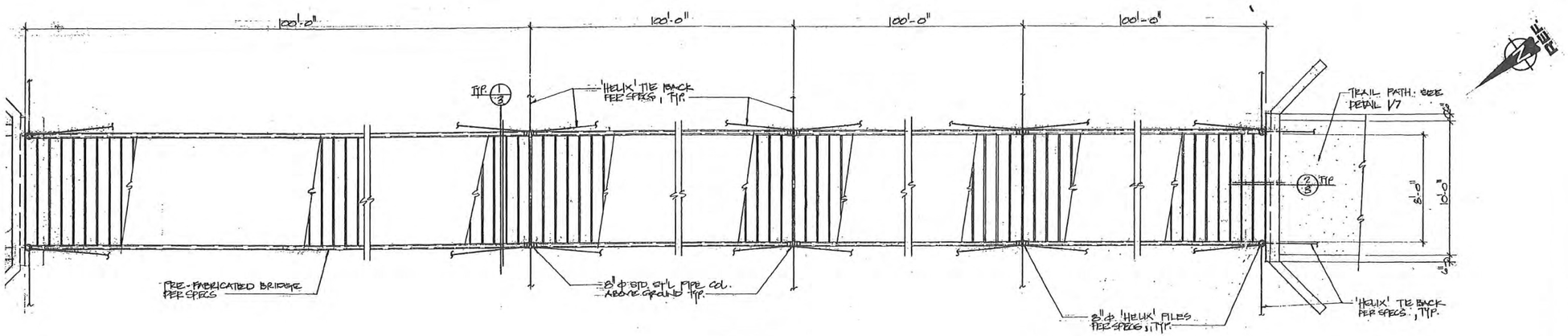
Appendix

Site Map

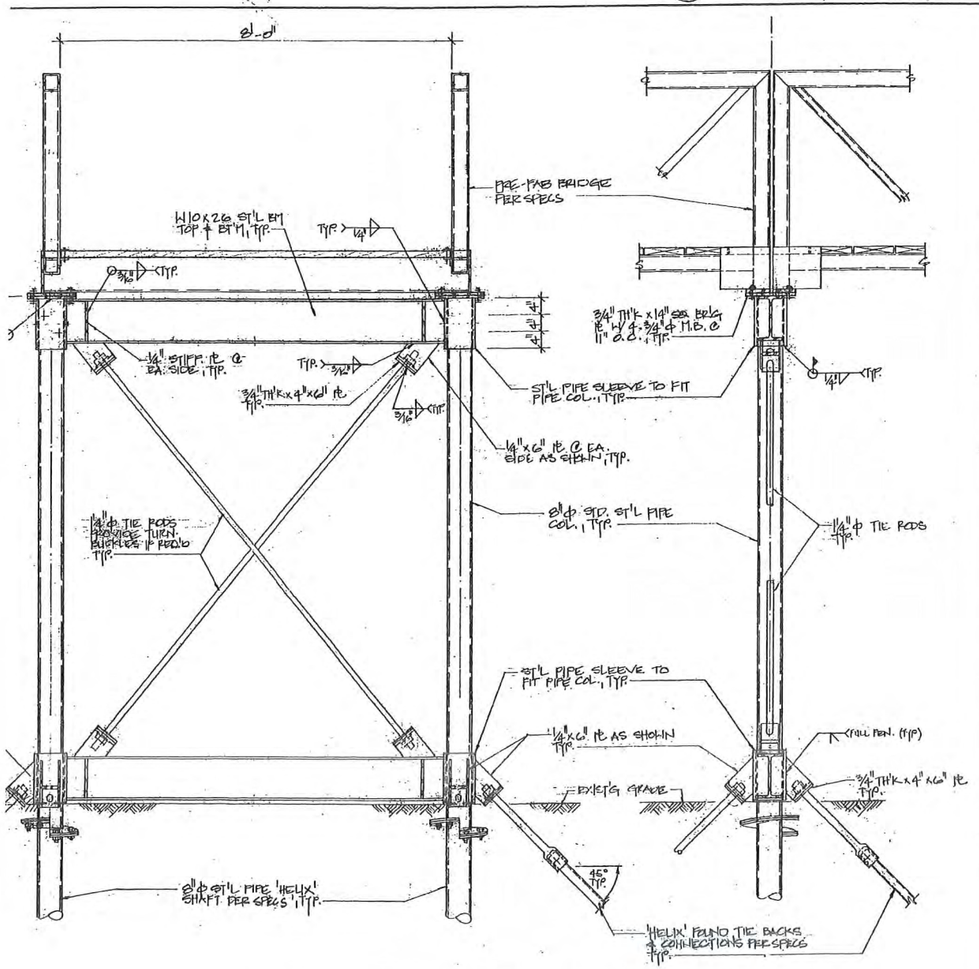
Halfmoon Bay State Beach Site Map
Pilarcitos Bridge

Figure 1

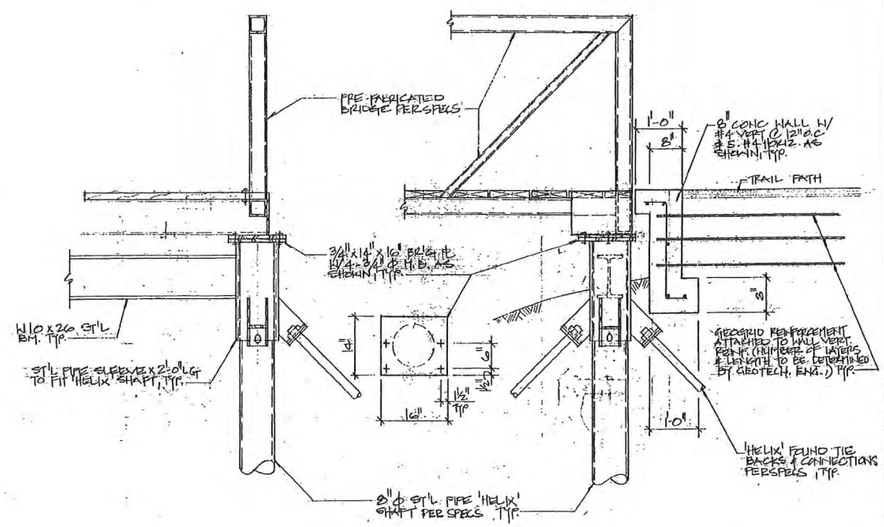
Original Plans



3/3 BRIDGE PLAN 1/4"=1'-0"



INTERMEDIATE BRIDGE SUPPORT DETAIL 1/3
3/4" = 1'-0"



END BRIDGE SUPPORT DETAIL 2/3

Callander Associates
Landscape Architecture
Park and Recreation Design
Watershed Planning
Land Planning

311 Seventh Avenue
San Mateo, CA 94401
(415) 375-1313
Fax (415) 344-3290
Co Lic #1158

299 Cannery Row
Monterey, CA 93940
(408) 646-1383
Fax (408) 373-8653
Co Lic #1099

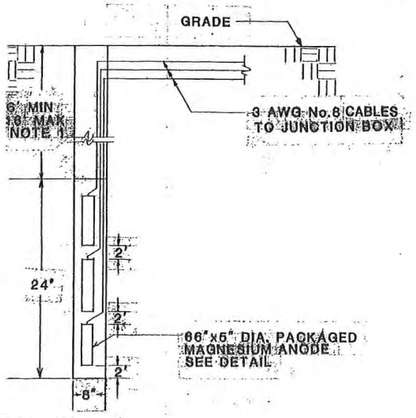
Revisions
~~SBHL 11/5/92~~
BID SET 8/30/93

Roberto/Hoojan Associates, Inc.
Engineering Consultants
(415) 361-1303
1791 Broadway, Suite 202
Redwood City, California 94063

PROJECT # 92-102

PILARCITOS CREEK CROSSING
COASTSIDE TRAIL
City of Half Moon Bay, California

Date ~~4/30/92~~
Scale AS SHOWN
Drawn F.K.
Checked KS
Project No. [illegible]
Sheet No. 3
of 7



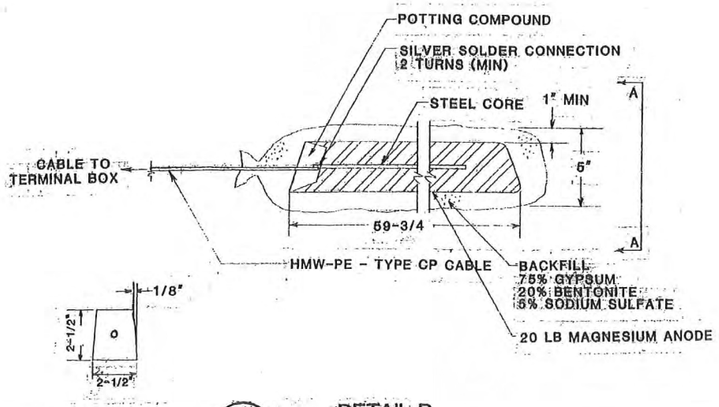
NOTES:

1- ADJUST DEPTH IN ACCORDANCE WITH FIELD CONDITIONS.

HOLE SHALL EXTEND A MINIMUM OF 5 FEET INTO SUBGRADE BEARING SOILS.

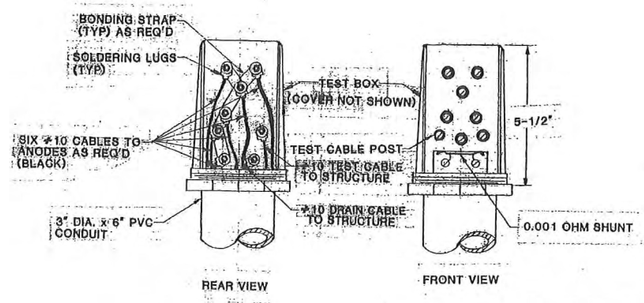
1/4 DETAIL A

CATHODIC PROTECTION ANODE BED



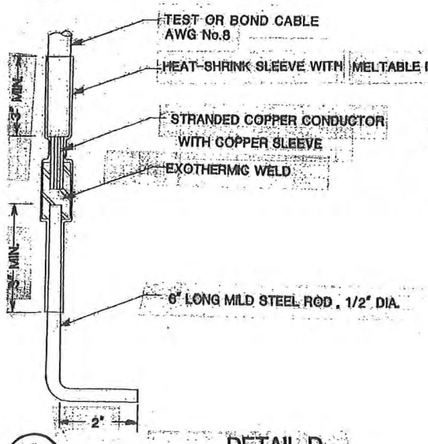
2/4 DETAIL B

MAGNESIUM ANODE



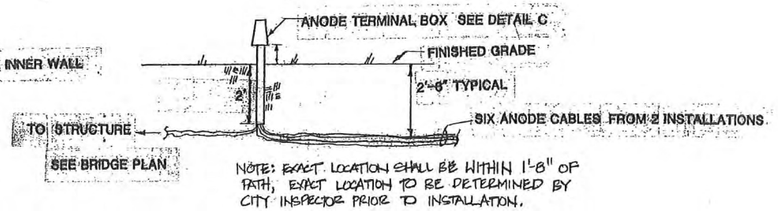
3/4 DETAIL C

ANODE TERMINAL BOX



4/4 DETAIL D

CABLE-TO-ROD CONNECTION



NOTE: EXACT LOCATION SHALL BE WITHIN 1'-8" OF PATH, EXACT LOCATION TO BE DETERMINED BY CITY INSPECTOR PRIOR TO INSTALLATION.

5/4 DETAIL E

CATHODIC PROTECTION TEST STATION

Callander Associates
Landscape Architecture
Park and Recreation Design
Watershed Planning
Land Planning

311 Seventh Avenue
San Mateo, CA 94401
(415) 375-1313
Fax (415) 344-5290

299 Cannery Row
Monterey, CA 93940
(408) 646-1383
Fax (408) 373-8653

Revisions

BID SET 3/20/93

CORROSION CONTROL DETAIL SHEET

PILARCITOS CREEK CROSSING

COASTSIDE TRAIL

City of Half Moon Bay, California

Date ~~2-10-93~~

Scale NTS

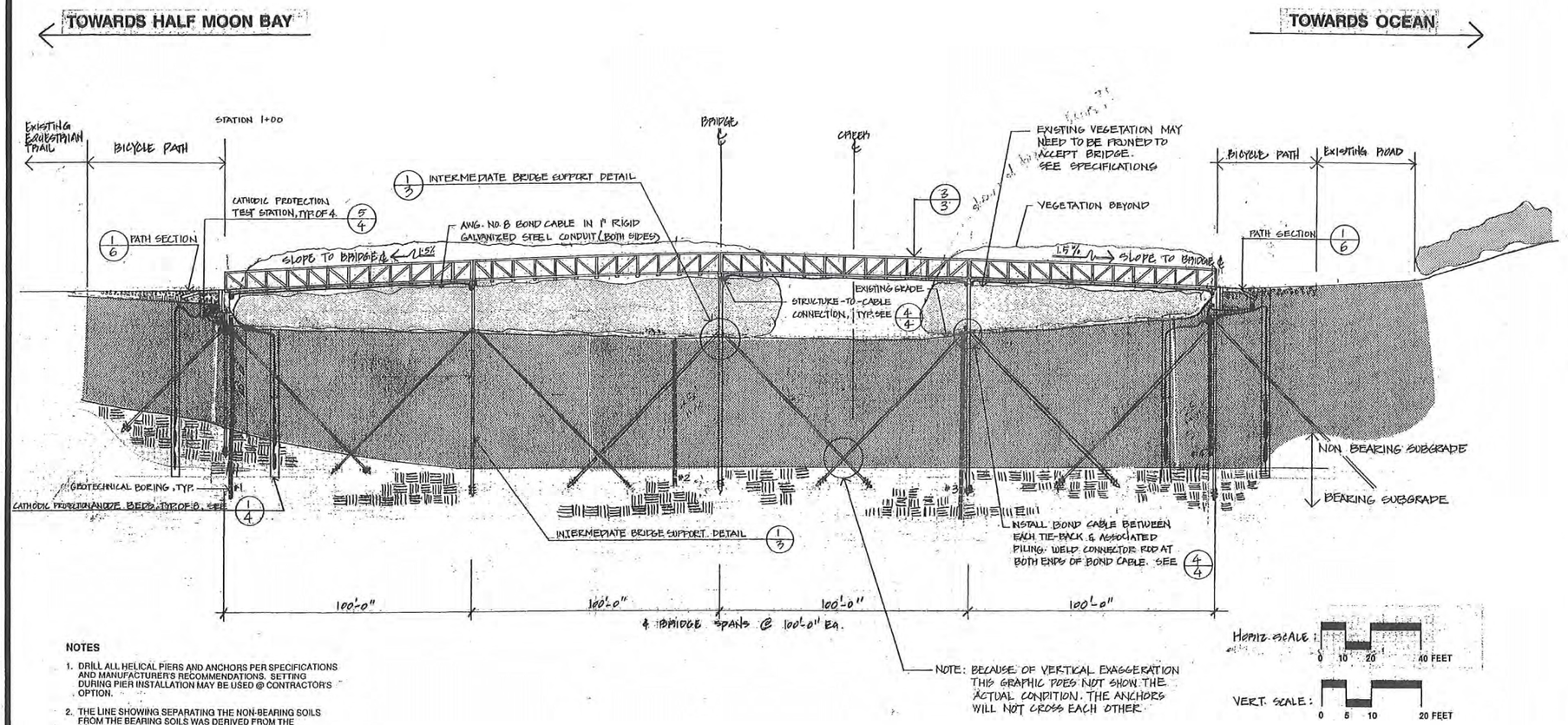
Drawn JB

Checked NJM

Project No. 91.081

Sheet No. 4

of 7



NOTES

1. DRILL ALL HELICAL PIERS AND ANCHORS PER SPECIFICATIONS AND MANUFACTURER'S RECOMMENDATIONS. SETTING DURING PIER INSTALLATION MAY BE USED @ CONTRACTOR'S OPTION.
2. THE LINE SHOWING SEPARATING THE NON-BEARING SOILS FROM THE BEARING SOILS WAS DERIVED FROM THE GEOTECHNICAL'S BORING LOGS AND WILL VARY. SEE APPENDIX "A" IN SPECIFICATIONS. ACTUAL DEPTH OF 'HELIX' PIER SHALL BE DETERMINED BY THE STRUCTURAL ENGINEER. SEE SPECIFICATIONS. FOR BIDDING PURPOSES CONTRACTOR SHALL INCLUDE IN HIS BID ALL PIERS DRILLED TO A 40 FOOT DEPTH.

1/5 BRIDGE ELEVATION

Callander Associates
Landscape Architecture
Park and Recreation Design
Waterfront Planning
Land Planning

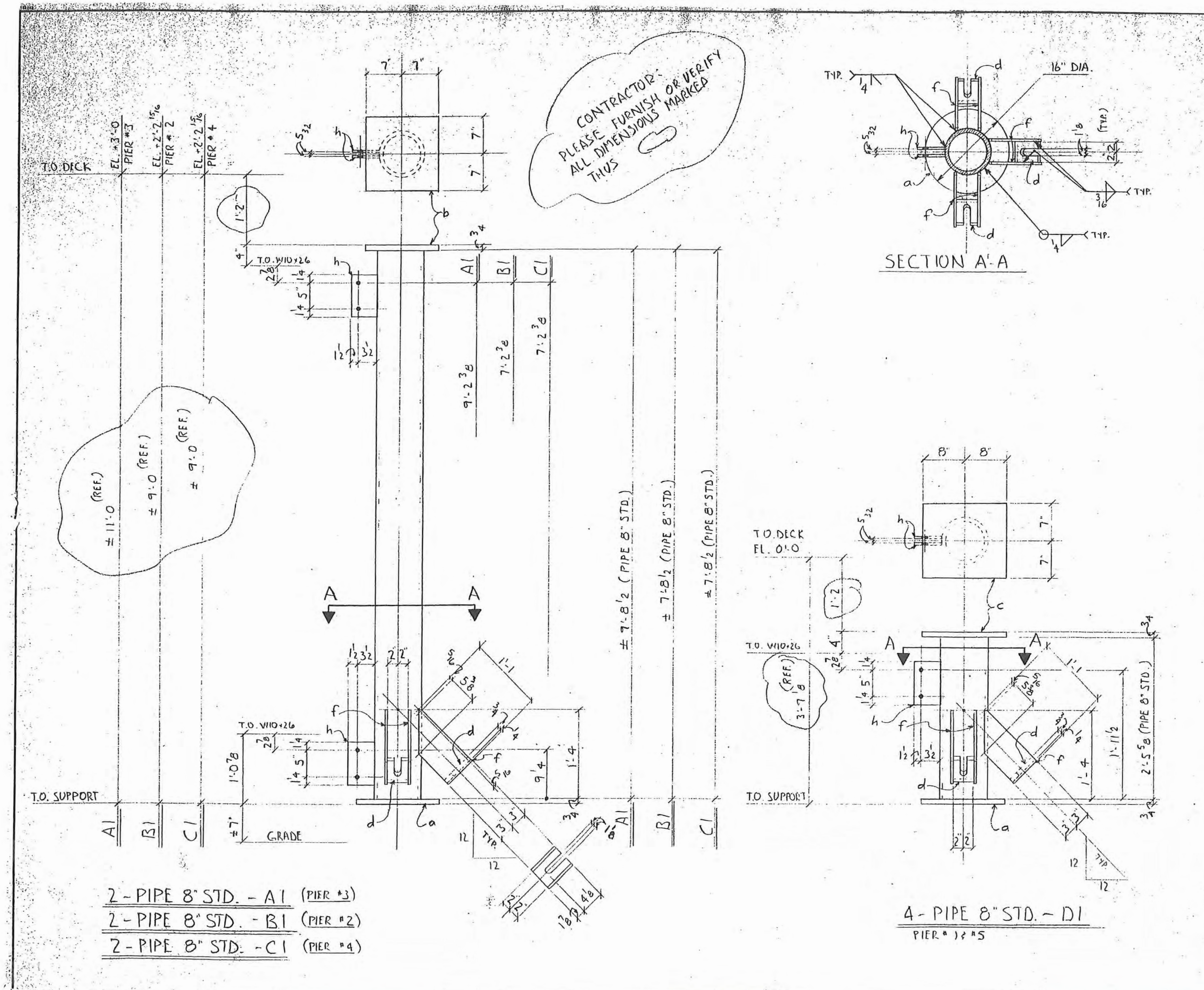
311 Seventh Avenue
San Mateo, CA 94401
(415) 375-1315
Fax (415) 344-3290
Calsurf.com

299 Cannery Row
Monterey, CA 93940
(408) 646-1333
Fax (408) 373-0653
Calsurf.com

Revisions
~~GEN'L 11/5/92~~
~~BID SET 3/30/93~~

CONSTRUCTION DETAILS
PILARCITOS CREEK CROSSING
COASTSIDE TRAIL
City of Half Moon Bay, California

Date ~~1/30/92~~
Scale AS SHOWN
Drawn AB
Checked RG
Project No. 91.091
Sheet No. 5
of 7



QTY.	DESCRIPTION	LENGTH FT.	LENGTH IN.	MARK	REMARK	P.O. STOCK
2	PIPE 8" STD. ±	9	8 1/2	A1		
8	F.B. 5 × 1/4	0	7 1/2	h		
2	PL 3/4 × 16"Φ			a		
2	PL 3/4 × 14	1	2	b		
6	F.B. 4 × 3/4	0	6	d		
12	F.B. 6 × 1/4	1	1	f		
2	PIPE 8" STD. ±	7	8 1/2	B1		
12	F.B. 6 × 1/4	1	1	f		
8	F.B. 5 × 1/4	0	7 1/2	h		
2	PL 3/4 × 16Φ			a		
2	PL 3/4 × 14	1	2	b		
6	F.B. 4 × 3/4	0	6	d		
2	PIPE 8" STD. ±	7	8 1/2	C1		
6	F.B. 4 × 3/4	0	6	d		
12	F.B. 6 × 1/4	1	1	f		
8	F.B. 5 × 1/4	0	7 1/2	h		
2	PL 3/4 × 16"Φ			a		
2	PL 3/4 × 14	1	2	b		
4	PIPE 8" STD.	2	5 5/8	D1		
4	PL 3/4 × 16"Φ			a		
4	PL 3/4 × 14"	1	4	c		
12	F.B. 4 × 3/4	0	6	d		
24	F.B. 6 × 1/4	1	1	f		
8	F.B. 5 × 1/4	0	7 1/2	h		

FIELD MATERIAL

MATERIAL: A36, A53-B

FINISH: GALVANIZED

OPEN HOLES (U.N.O.): 13/16 Φ

NO.	DATE	REVISION	BY
△			
△			
△			
△			

Baron Welding & Iron Works, Inc., WBE
255 Demeter Street East Palo Alto, CA 94303
(415) 321-9533 FAX (415) 321-7618
Calif. Contr. Lic. No. 565384

PROJECT: PEDESTRIAN BRIDGE – PILARCITOS CREEK

LOCATION: HALF MOON BAY, CA

DESCRIPTION: BRIDGE SUPPORTS

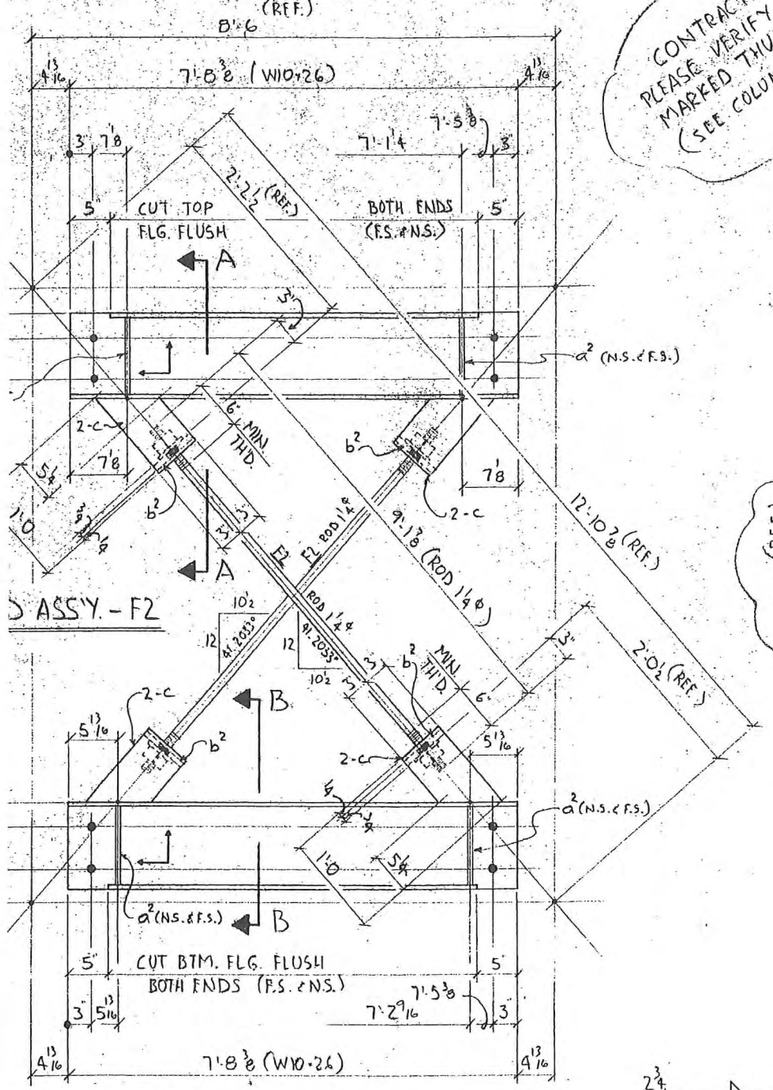
ARCHITECT: COLLANDER ASSOCIATES

CONTRACTOR: POWER ENGINEERING

DRAWN BY: JM	DATE: 8-17-93	JOB NO. 2933
CHECKED BY:	DATE:	DWG. NO. 1 △
ITEM #		

ONE - W10 x 26 - A2

(W: 10 3/8 x 1/4, F: 5 3/4 x 7/16, k: 7/8)



ONE - W10 x 26 - C2

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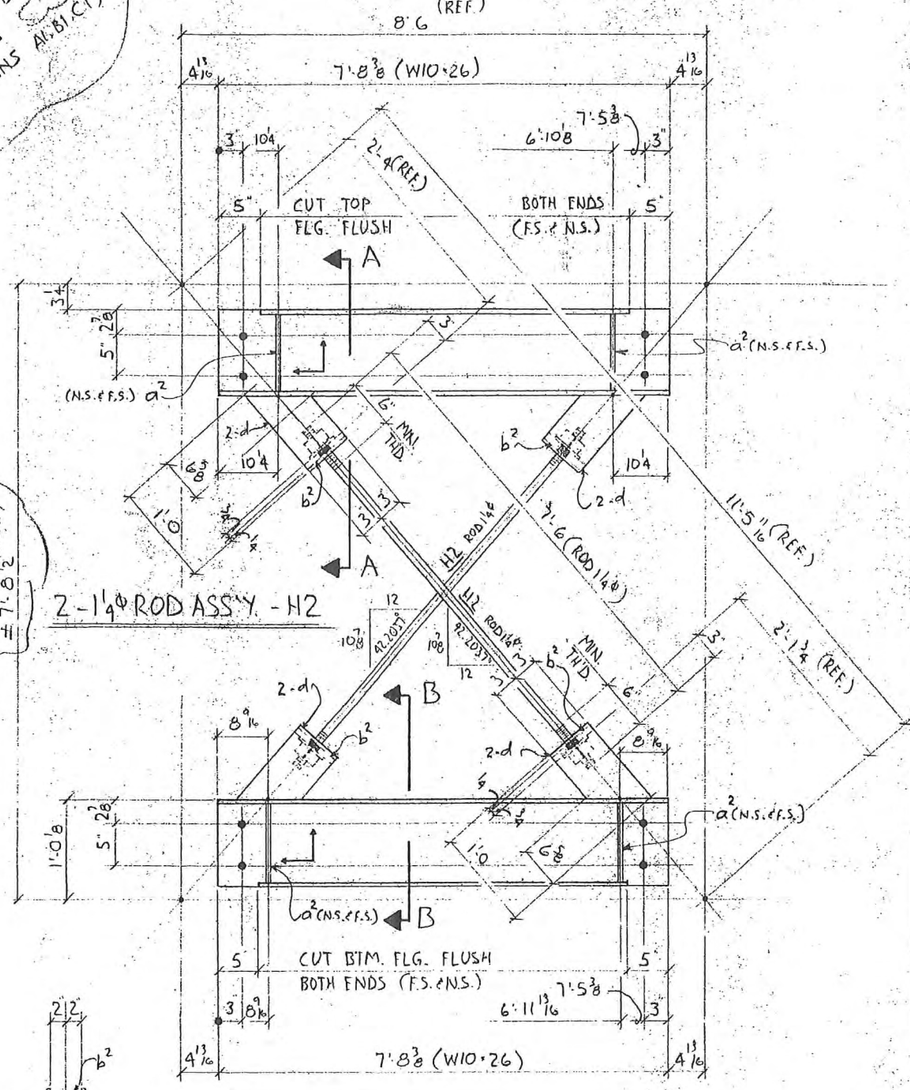

± 7'-8 1/2 (REF.)

2 - 1 1/4 Φ ROD ASS'Y. - F2

2 - 1 1/4 Φ ROD ASS'Y. - H2

ONE - W10 x 26 - B2

PIER #3

(W: 10 3/8 x 1/4, F: 5 3/4 x 7/16, k: 7/8)

ONE - W10 x 26 - D2

PIER #2

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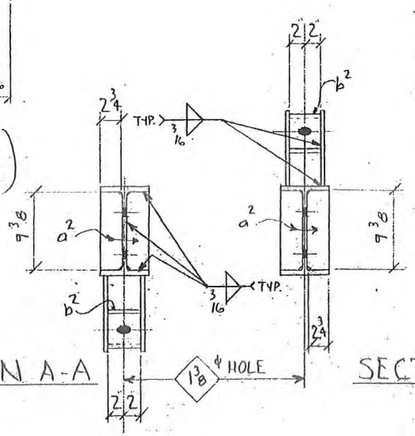

SECTION A-A

SECTION B-B

QTY.	DESCRIPTION	LENGTH FT.	LENGTH IN.	MARK	REMARK	P.O. STOCK
ONE	W10x26	7	8 3/8	A2		
4	PL 1/4 x 2 3/4	0	9 3/8	a²		
4	F.B. 6 x 1/4	1	0	c		
2	F.B. 4 x 3/4	0	6	b²		
ONE	W10x26	7	8 3/8	B2		
4	PL 1/4 x 2 3/4	0	9 3/8	a²		
4	F.B. 6 x 1/4	1	0	c		
2	F.B. 4 x 3/4	0	6	b²		
ONE	W10x26	7	8 3/8	C2		
4	PL 1/4 x 2 3/4	0	9 3/8	a²		
4	F.B. 6 x 1/4	1	0	d		
2	F.B. 4 x 3/4	0	6	b²		
ONE	W10x26	7	8 3/8	D2		
4	PL 1/4 x 2 3/4	0	9 3/8	a²		
4	F.B. 6 x 1/4	1	0	d		
2	F.B. 4 x 3/4	0	6	b²		
2	ROD 1 1/4 Φ	9	1 7/8	F2	TH'D. 2 ENDS	
2	ROD 1 1/4 Φ	7	6	H2	TH'D. 2 ENDS	
8	1 1/4 Φ NUT				A307-GALV.	
8	1 1/4 Φ FLAT WASH					

FIELD MATERIAL

16	3/4 Φ M.B. W/NUT	0	2		A307-GALV.

MATERIAL: A36

FINISH: GALVANIZED

OPEN HOLES (U.N.O.): 13/16 Φ

NO.	DATE	REVISION	BY
1			
2			
3			
4			

BARON WELDING INCORPORATED IRON WORKS

Baron Welding & Iron Works, Inc. WBE
255 Demeter Street · East Palo Alto, CA 94303
(415) 321-9533 FAX (415) 321-7618
Calif. Contr. Lic. No. 565384

PROJECT: PEDESTRIAN BRIDGE - PILARCITOS CREEK

LOCATION: HALF MOON BAY, CA

DESCRIPTION: BRIDGE SUPPORTS

ARCHITECT: COLLANDER ASSOCIATES

CONTRACTOR: POWER ENGINEERING

DRAWN BY: JM DATE: 8-17-93 JOB NO. 2933

CHECKED BY: DATE: DWG. NO. 2

ITEM #

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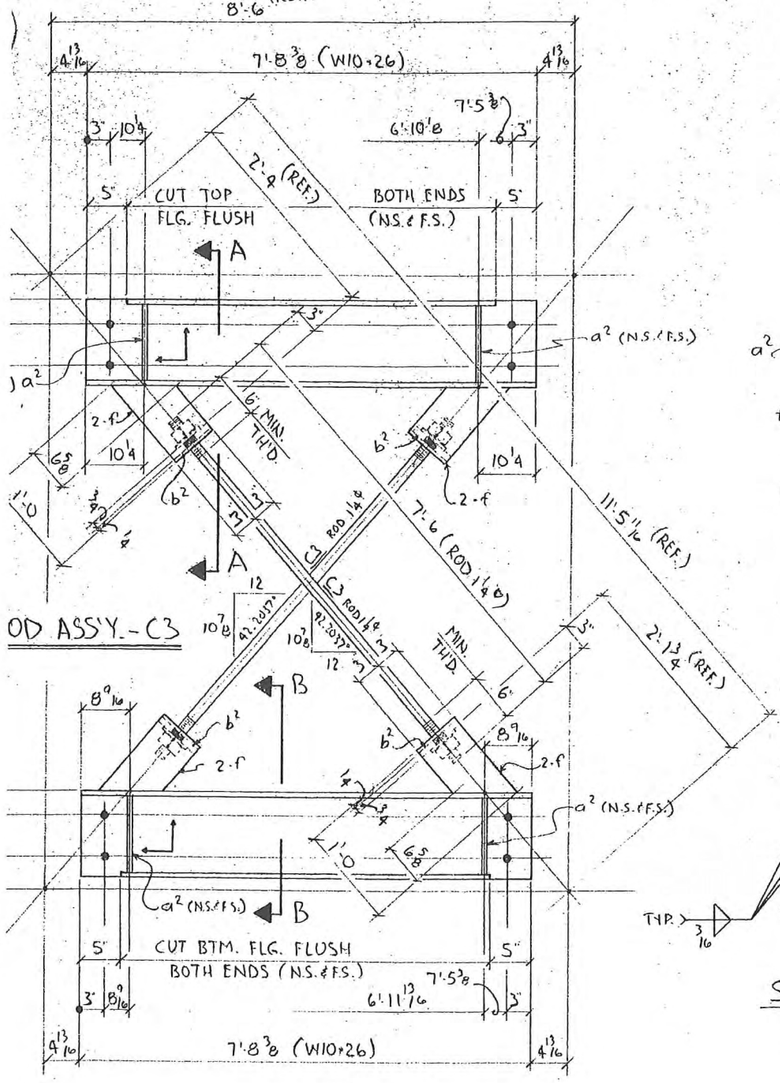
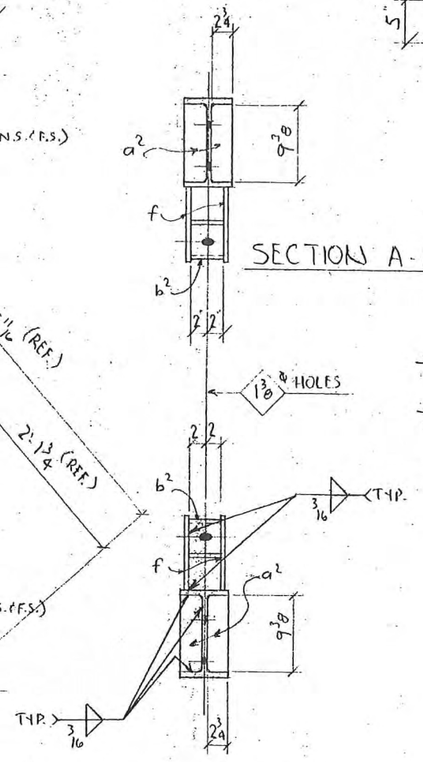


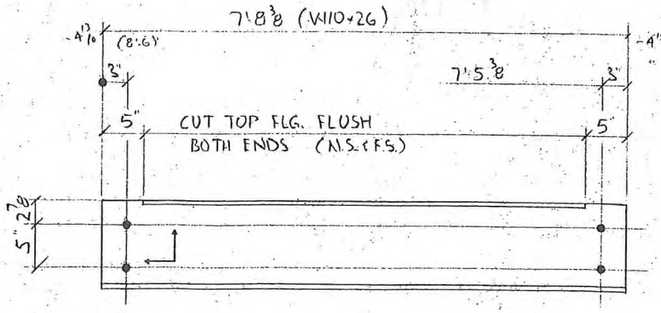
OD ASS'Y. - C3

ONE - W10 x 26 - B3

PIER # 4

(W: 10 3/8 x 1/4, F: 5 3/4 x 7/16, k: 7/8)

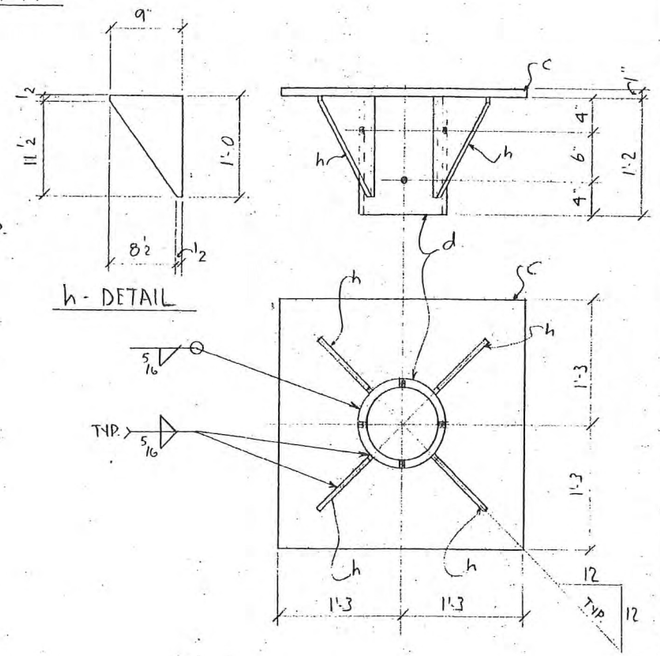




2 - W10 x 26 - D3

PIER #1, #5

(W: 10 3/8 x 1/4, F: 5 3/4 x 7/16, k: 7/8)



10 - SUPPORTS - F3

QTY.	DESCRIPTION	LENGTH FT.	LENGTH IN.	MARK	REMARK	P.O. STOCK
ONE	W10 x 26	7	8 3/8	A3		
4	PL 1/4 x 2 3/4	0	9 3/8	a²		
2	F.B. 4 x 3/4	0	6	b²		
4	F.B. 6 x 1/4	1	0	f		
ONE	W10 x 26	7	8 3/8	B3		
4	PL 1/4 x 2 3/4	0	9 3/8	a²		
2	F.B. 4 x 3/4	0	6	b²		
4	F.B. 6 x 1/4	1	0	f		
2	ROD 1 1/4 Φ	7	6	C3	TH'D. 2 ENDS	
4	1 1/4 Φ NUT				A307 GALV	
4	1 1/4 Φ FLAT WASH.					
2	W10 x 26	7	8 3/8	D3		
10	SUPPORTS			F3		
10	PL 1" x 30"	2	6	c		
10	PIPE 10", SCH. 60	1	2	d		
40	F.B. 9 x 5/8	1	0	h		

FIELD MATERIAL

20	3/4 Φ H.S.B. W/NUT & WASH.	1	0		A325 GALV.	
16	3/4 Φ M.B. W/NUT	0	2		A307 - GALV.	

MATERIAL: A36

FINISH: GALVANIZED

OPEN HOLES (U.N.O.): 13/16 Φ

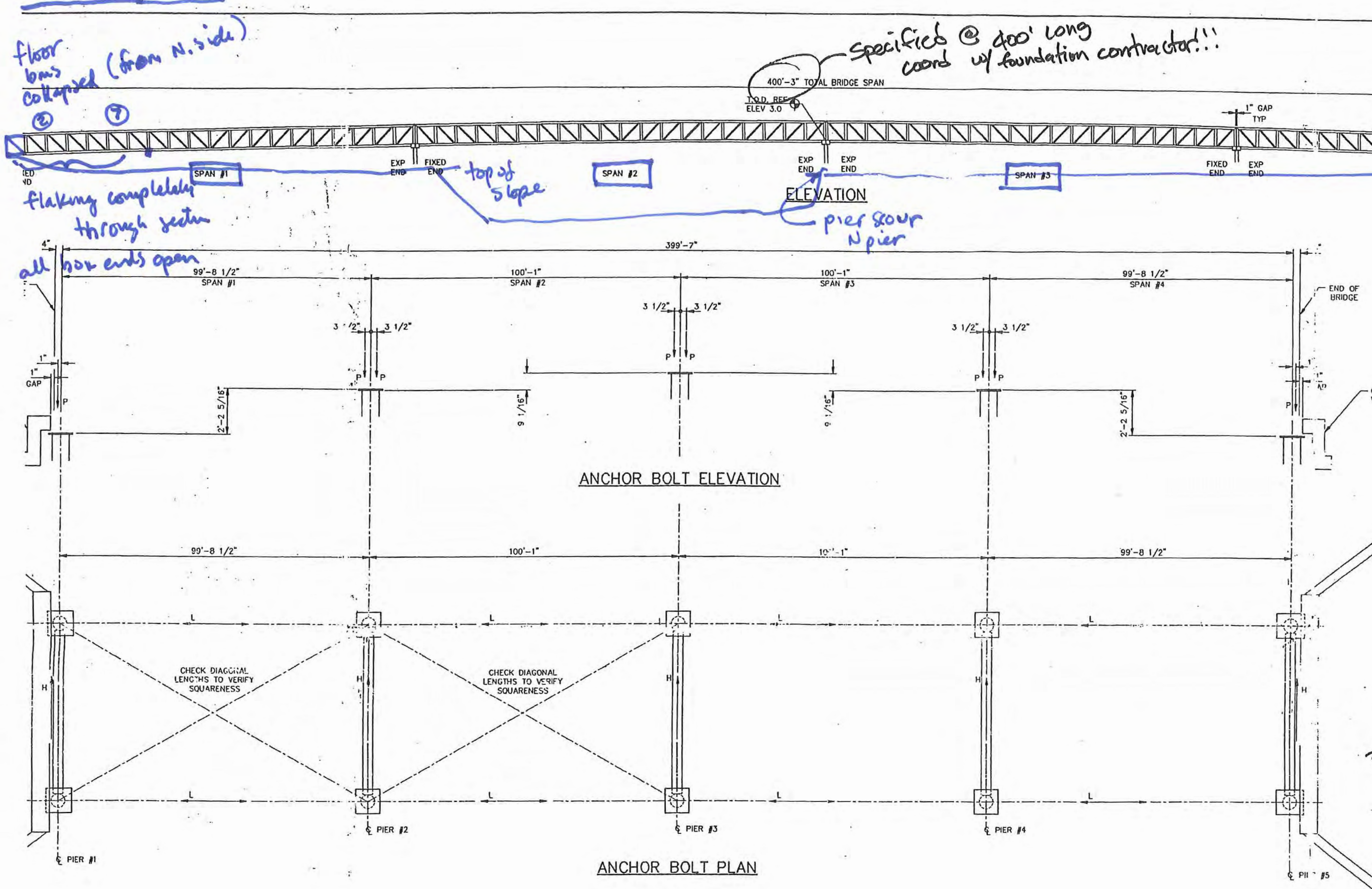
NO.	DATE	REVISION	BY
1			
2			
3			
4			

BARON WELDING INCORPORATED IRON WORKS

Baron Welding & Iron Works, Inc., WBE
255 Demeter Street East Palo Alto, CA 94303
(415) 321-9533 FAX (415) 321-7618
Calif. Contr. Lic. No. 565364

PROJECT: PEDESTRIAN BRIDGE - PILARCITOS CREEK
LOCATION: HALF MOON BAY, CA
DESCRIPTION: BRIDGE SUPPORTS
ARCHITECT: COLLANDER ASSOCIATES
CONTRACTOR: POWER ENGINEERING
DRAWN BY: JM DATE: 8-17-93
CHECKED BY: DATE:
ITEM #
JOB NO. 2933
DWG. NO. 3

observations 7/1/14



See Section 13100 PART 1-1.4
- NO Schedule
- NO Piles
- NO Anchors
- NO Connections to Piles & Anchors

DOCUMENT REVIEW

- ☐ NO EXCEPTIONS TAKEN
- ☒ MAKE CORRECTIONS NOTED
- ☐ AMEND & RESUBMIT
- ☐ REJECTED - SEE REMARKS

BY: RS DATE: 7/21/93

GENERAL NOTES

1. DESIGN STRESSES ARE IN ACCORDANCE WITH THE MANUAL ... ADO... (AISC), NINTH EDITION. ✓
2. BRIDGE MEMBERS ARE FABRICATED FROM HIGH STRENGTH, SELF-WEATHERING, LOW ALLOY, ATMOSPHERIC CORROSION RESISTANT ASTM A847 COLD-FORMED WELDED SQUARE AND RECTANGULAR TUBING, AND ASTM A588, ASTM A605, OR ASTM A242 PLATE AND STRUCTURAL SHAPES (FY = 50,000 P.S.I.) ✓ COR-TEN
3. BRIDGE DECKING NOMINAL 3-INCH THICK SELECT STRUCTURAL FIR (Fb = 1400 PSI MIN). TIMBER DECK MATERIAL SHALL BE TREATED WITH ~~CHROMATED COPPER ARSENATE (CCA) TO A PCF RETENTION OR TO REFUSAL~~. Chemonite see specs
4. E80 SERIES ELECTRODES FOR WELDING. ? E70
5. ALL TOP AND BOTTOM CHORD SHOP SPLICES TO BE COMPLETE PENETRATION TYPE WELDS. WELD BETWEEN TOP CHORD AND END VERTICAL SHALL BE PARTIAL PENETRATION.
6. UNLESS OTHERWISE NOTED, WELDED CONNECTIONS SHALL BE FILLET WELDS (OR HAVE THE EFFECTIVE THROAT OF A FILLET WELD) OF A SIZE EQUAL TO THE THICKNESS OF THE LIGHTEST GAGE MEMBER IN THE CONNECTION. WELDS SHALL BE APPLIED AS FOLLOWS:
   - A) BOTH ENDS OF VERTICALS, DIAGONALS, AND FLOOR BEAMS SHALL BE WELDED ALL AROUND.
   - B) BRACE DIAGONALS WILL BE WELDED FOR FULL LENGTH OF TOP, BOTTOM AND OUTSIDE VERTICAL FACES.
   - C) BOTTOM OF STRINGERS WILL BE STITCH WELDED TO TOP OF FLOOR BEAMS.
   - D) MISCELLANEOUS NON-STRUCTURAL MEMBERS WILL BE STITCH WELDED TO THEIR SUPPORTING MEMBERS.
7. BRIDGE DESIGN WAS ONLY BASED ON COMBINATIONS OF THE FOLLOWING LOADS WHICH WILL PRODUCE MAXIMUM CRITICAL MEMBER STRESSES.
   - A) 100 PSF UNIFORM LIVE LOADING ON THE FULL DECK AREA OR ONE 10,000 POUND VEHICLE LOAD PLUS IMPACT. THE LOAD SHALL BE DISTRIBUTED AS A FOUR-WHEEL VEHICLE WITH 80% OF LOAD ON THE REAR WHEELS. THE WHEELS SHALL BE SPACED FOR A PICKUP TRUCK DRIVING DOWN THE CENTER OF THE BRIDGE.
   - B) 75 PSF WIND LOAD ON THE FULL HEIGHT OF THE BRIDGE, AS IF ENCLOSED.
   - C) 20 PSF UPWARD FORCE APPLIED AT THE WINDWARD QUARTER POINT OF THE TRANSVERSE BRIDGE WIDTH (AASHTO 3.15.3).
   - D) SEISMIC LOADING FOR ZONE 4 (COMBINE WITH DEAD LOAD ONLY).
8. CLEANING: ALL EXPOSED SURFACES OF STEEL SHALL BE CLEANED IN ACCORDANCE WITH STEEL STRUCTURES PAINTING COUNCIL SURFACES PREPARATION SPECIFICATIONS NO. 6 COMMERCIAL BLAST CLEANING. SSPC-SP6-LATEST EDITION.

Redesign to UBC windload calcs. eliminate ~~Section~~ paragraph 1.2, A of Section # 13100.

NOTE: THIS BRIDGE HAS BEEN DESIGNED FOR SEISMIC FORCES BASED ON THE STATIC FORCE PROCEDURE IN THE 1988 UNIFORM BUILDING CODE. THE DESIGN BASE SHEAR (28% OF THE DEAD LOAD) WAS BASED ON A SEISMIC ZONE 4 FACTOR (Z) OF 0.4, IMPORTANCE FACTOR (I) OF 1.0, MAXIMUM C VALUE OF 2.75, AND AN Rw VALUE OF 4. IT SHALL BE THE RESPONSIBILITY OF THE FOUNDATION ENGINEER TO DETERMINE THE FORCES WHICH ARE USED FOR FOUNDATION DESIGN, VERIFICATION OF ANCHOR BOLT SIZES, AND DESIGN OF ANCHOR BOLT EMBEDMENTS IN THE FOUNDATION. THESE FORCES ARE DETERMINED BASED ON LOCAL SITE CONDITIONS, THE FOUNDATION SYSTEM USED, AND THE BRIDGE DEAD LOAD; HOWEVER, THEY SHOULD IN NO CASE BE LESS THAN THE FORCES USED TO DESIGN THE BRIDGE, WHICH ARE LISTED HERE IN THE REACTION TABLE.

COMBINE REACTIONS AS PER LOCAL OR GOVERNING BUILDING CODES AS REQUIRED

BRIDGE REACTIONS (+ DOWNWARD LOAD, – UPWARD LOAD)

	P (LBS)	H (LBS)	L (LBS)
DEAD LOAD	7400		
UNIFORM LIVE LOAD	20000		
VEHICLE LOAD	5250		
WIND UPLIFT 20 PSF	-6750		
WIND	±7125	20800	
THERMAL			2590
SEISMIC	(SEE NOTE)		

"P" – VERTICAL LOAD EACH BASE PLATE (4 PER BRIDGE)
"H" – HORIZONTAL LOAD EACH FOOTING (2 PER BRIDGE)
"L" – LONGITUDINAL LOAD EACH BASE PLATE (4 PER BRIDGE)

BRIDGE LIFTING WEIGHT: 29,600 LBS

SHOP DRAWING REVIEW

☒ REVIEWED ☐ REVISE AND RESUBMIT
☐ REJECTED ☒ FURNISH AS CORRECTED

Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

ROBELO/KOCJAN ASSOCIATES, INC.
Date 7/21/93 By F.J.R.

CONTINENTAL BRIDGE — ALEXANDRIA, MN — 612-852-7500

DATE: | LEVEL: | REVISION:

REGISTERED PROFESSIONAL ENGINEER No. 874 Exp. 12-31-96 STRUCTURAL STATE OF CALIFORNIA

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.

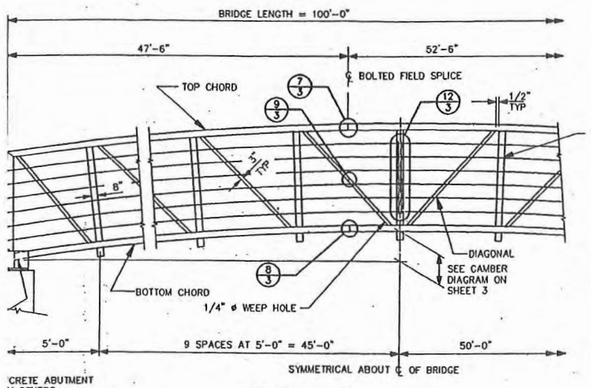
DATE: 6-17-93 REG. NO.

THESE PLANS, AS INSTRUMENTS OF SERVICE, ARE PROPERTY SOLELY OF CONTINENTAL BRIDGE. THEY ARE NOT TO BE REPRODUCED FOR ANY PURPOSE OR USED IN ANY OTHER LOCATION WITHOUT WRITTEN AUTHORIZATION.

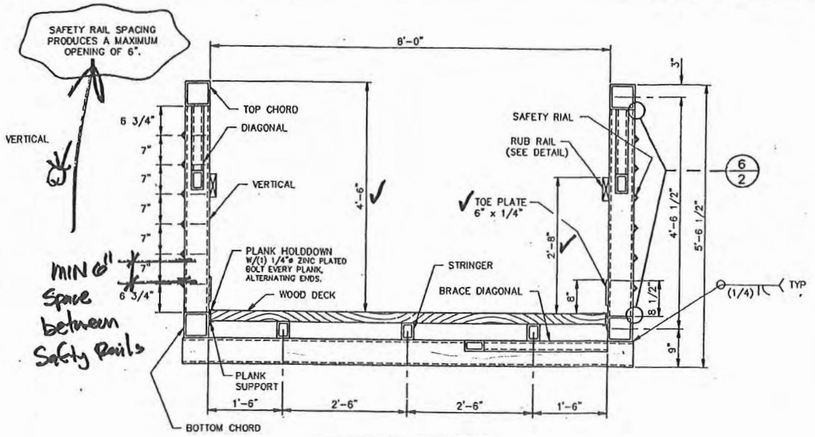
DRAWN BY: RJP
CHECKED BY: DGR
DATE: 6/11/93

400'-3" X 8'-0" (4 SPAN) PEDESTRIAN BRIDGE
HALF MOON BAY, CA

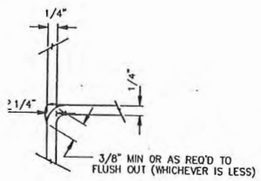
SHEET NO. 1 OF 3 JOB # 931_0



ELEVATION

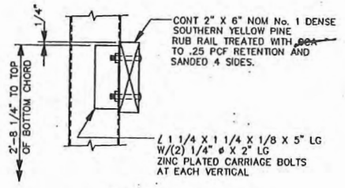


1/2 BRIDGE SECTION

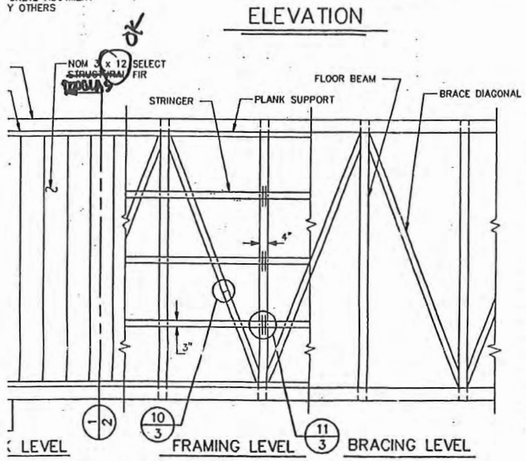


MATCHED EDGES OF VERTICALS TO BOTH CHORDS TO BE PARTIAL PENETRATION WELDS

6/2 WELD DETAIL



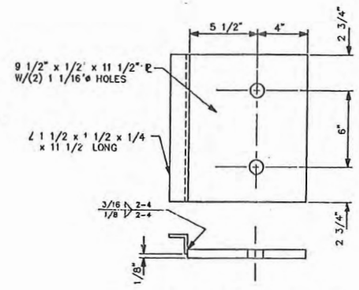
RUB RAIL DETAIL



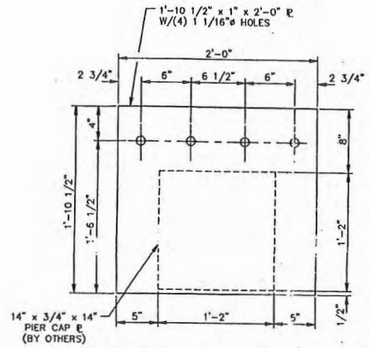
BRIDGE PLAN

SCHEDULE OF MEMBER SIZES		
TOP CHORD	TS 6 x 6 x 1/4	
BOTTOM CHORD	TS 6 x 6 x 1/4	
VERTICAL	TS 6 x 6 x 1/4	*
DIAGONAL	TS 3 x 2 x 1/8	**
BRACE DIAGONAL	TS 2 1/2 x 2 1/2 x 1/8	***
FLOOR BEAM	TS 6 x 4 x 1/4	
END FLOOR BEAM	TS 10 x 6 x 1/4	
SAFETY RAIL	L 1 1/4 x 1 1/4 x 1/8	
PLANK HOLDDOWN	L 1 1/4 x 1 1/4 x 1/8	
STRINGER	TS 4 x 3 x 1/8	
PLANK SUPPORT	L 1 1/4 x 1 1/4 x 1/8	

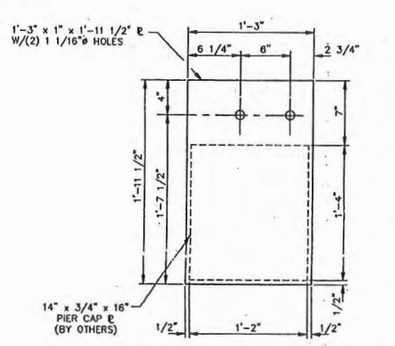
* USE TS 8 x 6 x 1/4 FOR FIRST VERTICAL, TYP EACH END.
** USE TS 4 x 3 x 1/8 FOR END BAY, TYP EACH END
USE TS 3 x 3 x 1/8 FOR NEXT 2 BAYS, TYP EACH END.
*** USE TS 3 x 3 x 1/8 FOR END 3 BAYS, TYP EACH END.



HOLDDOWN PLATE ASS'Y
(8 REQ'D)

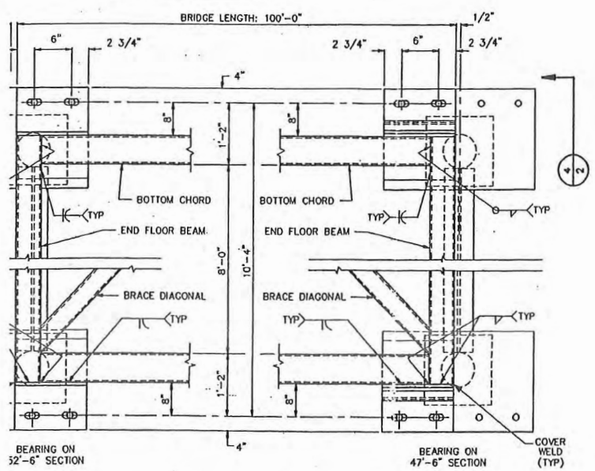


PIER SETTING PLATE DETAIL
TYP AT PIER #2, #3, #4
(6 REQ'D)

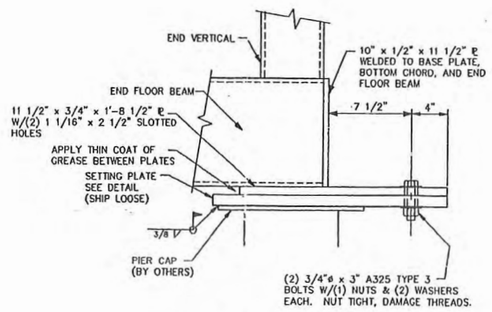


PIER SETTING PLATE DETAIL
TYP AT PIER #1, #5
(4 REQ'D)

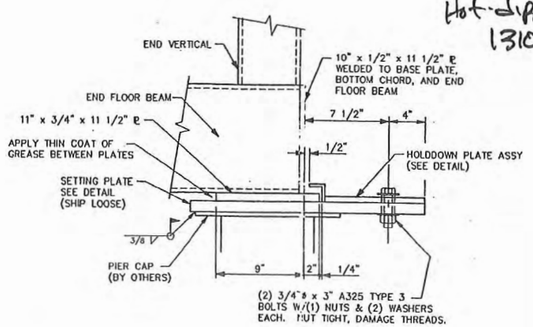
All Bolts shall be Double Hot-dipped Galv. See section 13100 - Part 2 - 2.4.



2/2 PLAN - BEARING ASSEMBLY



3/2 SECTION
FIXED END



4/2 SECTION
EXPANSION END

CONTINENTAL BRIDGE — ALEXANDRIA, MN — 612-852-7500

DATE:	LEVEL:	REVISION:

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.

DATE: 6-17-93 REG. NO.

DRAWN BY:	RJP
CHECKED BY:	DGR
DATE:	6/11/93

100'-0" X 8'-0"
PEDESTRIAN BRIDGE
HALF MOON BAY, CA

SHEET NO. 2 OF 3 — JOB # 93150

Photos

Trail Approach from the West

Truss Span looking East

Collapsing Portion of Deck – Span 1 (Note Public Use)

Typical Corrosion at Guardrail Runners

Truss Vertical – Span 1, Panel 3

[25% Loss of Section at Drilled Holes]

Bottom Chord Section Loss – Abutment 1

Collapsed Deck – Span 1

Truss Vertical at Guardrail Attachment

[Section Compromised]

Bottom Chord Corrosion at Midspan Splice – Span 2

[50% Section Loss]

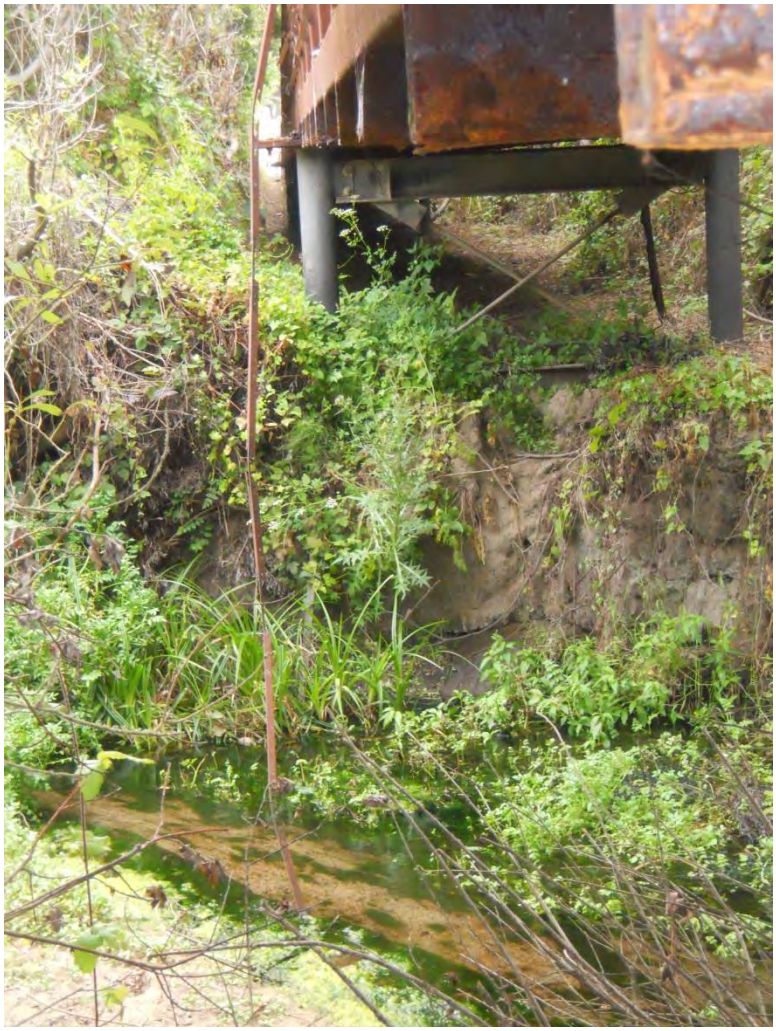
Truss End Diagonal Corrosion Hole – Span 1

[50% Loss of Section]

Floor Beam Corrosion Failure – Span 1, Panel 2

Bearing Plate Corrosion – Pier 2

Bearing Plate Corrosion – Pier 3



Stream Scour – Pier 3

Truss Midspan Diagonal Splice – Span 3

Floor Beam Corrosion – Pier 3

[100% Loss of Section]

Typical Floor Beam and Brace Connection Corrosion – Span 4

[75% Loss of Section]

Truss Diagonal Section Loss at Connection

to Bottom Chord at Deck Kick Plate – Span 4

Bridge Dedication Plaque

Cost Estimate

Half Moon Bay State Beach
Pillarcitos Bridge
Rough Order of Magnitude Estimate

Sierra West Group
CONSTRUCTION CONSULTANTS

Engineer: **Buehler & Buehler**

LINEAR FOOT 400
DATE: 11-Jul-14
BY: J. Moreno

DETAILED ESTIMATE

TRADE	SYSTEM	DESCRIPTION	QUAN.	UNIT	UNIT COST	TOTAL	COST/GSF
		SAWCUT AC PAVING	40	LF	$5.00	$200	$0.50
		REMOVE (E) AC PAVING	2000	SF	$1.50	$3,000	$7.50
		REMOVE (E) BASE ROCK - STOCK PILE	40	CYDS	$25.00	$1,000	$2.50
		REMOVE (E) BRIDGE	3200	SF	$15.00	$48,000	$120.00
		MISCELLANEOUS DEMOLITION	1	LOT	$7,500.00	$7,500	$18.75
205.0	**1.0**	**SUBTOTAL-DEMOLITION**	**400**	**LF**		**$59,500**	**$148.75**
		SITE CUT AND FILL					
		CLEAR AND GRUB	4,000	SF	$0.25	$1,000	$2.50
		BACKFILL TO ABUTMENTS W. GEO GRID AT 1' LIFTS	72	CYDS	$85.00	$6,120	$15.30
		FILL TO ROADWAY	256	CYDS	$65.00	$16,640	$41.60
		FINISH GRADE/ COMPACTION @ PAVING	2,000	SF	$0.50	$1,000	$2.50
		EROSION CONTROL					
		FIBER ROLL / WATTLES - EROSION CONTROL	800	LF	$5.00	$4,000	$10.00
		SILT FENCING	200	LF	$10.00	$2,000	$5.00
		NETTING	400	LF	$25.00	$10,000	$25.00
		SCOUR PROTECTION	80	TONS	$125.00	$10,000	$25.00
220.0	**14.0**	**SUBTOTAL-EXCAVATION, FILL AND GRADING**	**400**	**LF**		**$50,760**	**$126.90**

Half Moon Bay State Beach
Pillarcitos Bridge
Rough Order of Magnitude Estimate

Sierra West Group
CONSTRUCTION CONSULTANTS

Engineer: **Buehler & Buehler**

LINEAR FOOT 400
DATE: 11-Jul-14
BY: J. Moreno

DETAILED ESTIMATE

TRADE	SYSTEM	DESCRIPTION	QUAN.	UNIT	UNIT COST	TOTAL	COST/GSF
		BRIDGE STRUCTURE W. PEDESTRIAN WALKWAY - 8'W	3200	SF	$165.63	$530,000	$1,325.00
		CATHODIC PROTECTION	1	LS	$5,000.00	$5,000	$12.50
		FOUNDATION SUPPORT/ ABUTMENTS MODIFICATIONS	9.6	CY	$1,500.00	$14,400	$36.00
		BUILD UP PIERS TO ADD THE REQUIRED FREEBOARD	3	LOC	$5,000.00	$15,000	$37.50
		SUPERSTRUCTURE ERECTION/ CONSTRUCTION	400	LF	$300.00	$120,000	$300.00
		(N) PAVING	1600	SF	$10.00	$16,000	$40.00
		ADA RAMPS - 1:20	700	SF	$115.00	$80,500	$201.25
		(N) REMOVABLE BOLLARDS	8	EA	$550.00	$4,400	$11.00
		REPAIR/ REPLACE LANDSCAPE	1	LOT	$15,000.00	$15,000	$37.50
299.0	**16.0**	**SUBTOTAL-GENERAL SITE WORK**	**400**	**LF**		**$800,300**	**$2,000.75**
		BLDG SUBTOTAL				**$910,660**	
		GENERAL CONDITIONS		10.0%		$91,066	
		OVERHEAD & PROFIT		10.0%		$100,173	
		BONDS AND INSURANCE		2.5%		$27,547	
		CONTINGENCY		10.0%		$112,945	
		ESCALATION TO BID DATE - 24MOS		10.0%		$91,066	
		SUBTOTAL OF MARK UP				**$422,797**	
	ALTERNATE	ADD CONCRETE O/ METAL METAL				ALTERNATE - $36,500	
		TOTAL MARK UP PERCENTAGE		46.43%			
		TOTAL ON BID DAY - (DOES NOT INCLUDE THE ALTERNATES)				**$1,333,457**	**$3,333.64**