

CITY OF DAYTON
Wastewater System Facilities Plan Dayton, Oregon

Ferry Street Bridge Technical Memorandum
Ferry Street Bridge As-Built Drawings

Appendix E

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Technical Memo

To: Sue Hollis, City Manager, Dayton

CC: Denny Muchmore, P.E., Westech Engineering

From: Jason Kelly, P.E., Field Engineer

Date: July 11, 2008

Re: Life Expectancy and Cost Analysis for
City of Dayton's Ferry Street Pedestrian/Utility Bridge, Yamhill River
OBEC Job No. 299-5

Introduction

The Ferry Street Bridge is a 540-foot-long suspension bridge comprised of timber glulam stringers, columns, and caps; solid timbers; and steel support rods. The initial construction date of the bridge is unknown to OBEC Consulting Engineers (OBEC), but is estimated to be 1975. A rehabilitation project was performed in 1987 to realign and brace the structure along with new channel protection measures. OBEC has been involved with inspection and engineering of this bridge since the year 2000. OBEC was initially hired to inspect this structure and then to provide repair designs and related construction engineering management.

The structure carries pedestrian traffic and supports utilities vital to the Cities of Dayton and Lafayette. Utilities supported by this bridge include: water, pressure sanitary sewer, and telecommunication lines. This bridge is a substantial structure given the span and is an essential piece of infrastructure for the City.

The following technical memo has been compiled to satisfy Task 11 of the 2008 Construction Engineering (CE) contract between OBEC and the City of Dayton pertaining to the Ferry Street Pedestrian Bridge. Task 11 states OBEC will provide a technical memo identifying the theoretical life expectancy of the bridge and supply maintenance and cost estimates.

Findings

A design life of 35 years is a common industry standard for timber structures. However, this life can vary greatly given the type of material, treatment, environmental conditions and maintenance of the structure. The approximate age of the structure is currently 33-years-old and some members are at the end of their life. The Ferry Street Bridge was originally constructed of high quality materials; however, given the harsh, wet environment of the Northwest the expected life is still only 35 to 40 years.

The following is a description of each element, current condition, estimate of remaining life and replacement costs, starting with the element with the worst condition state.

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Ferry Street Bridge
OBEC Job No. 299-5

- *Timber Glulam Decking:* The decking is currently in fair to poor condition with numerous panels showing signs of decay. In June 2008, seven of the most severely decayed deck panels were replaced with new glulam panels. The timber deck sections that bridged the steel rods at Bents 3 and 5 were replaced. These repairs have corrected any immediate danger of local failures and safety concerns. However, I estimate the deck to continue to decay at an accelerated rate and repairs to continue over the next ten years until the deck is completely replaced. Replacement of additional portions of the deck should be scheduled within the next 3 to 5 years. Based on current unit costs of the 2008 contract, the City can expect to spend at least \$200,000 to replace the entirety of the remaining deck.
- *Timber Bridge Rail:* The timber bridge rail is currently in satisfactory condition with signs of surface wear. The rail will continue to wear and decay with the possibility of individual posts and rails breaking and fasteners failing. The condition of the rail is not as much of a concern as is the design; it should be noted that the rail does not comply with current safety design standards. The rail has been modified previously with the addition of chain link fencing on the lower third. To repair damaged and decayed section will cost approximately \$5,000, at current prices, every 5 years. If the City were to upgrade the rail to current design standards you could expect to spend \$200/ft. for a steel-backed timber rail for a total cost of \$300,000.
- *Timber Glulam Columns, Caps and Girders:* The elements that support the bridge, the columns, caps and girders, are in fair condition with only minor signs of wear. The City can expect 10 to 20 years of life out of these members under current conditions. These members are an integral part of the structure and estimating the cost of repair is difficult, but is expected to be over \$200,000. However, replacing these members with new steel members would be very costly, requiring heavy equipment and temporary shoring.
- *Steel Suspension Rods:* The suspension rods are in good condition with minor paint loss on the ends and chalking throughout. This element has the most remaining life out of any element of the bridge and required major maintenance or repairs are not anticipated in the next 20 years. On-going maintenance should include cleaning and painting any exposed metal to prevent any corrosion loss that would affect the strength of the member. Budgeting a few hundred dollars on an annual basis should be sufficient to maintain the paint system.
- *On-going Inspections:* Given the material type, state of deck and the age of the bridge, we recommend this bridge be inspected on a two year cycle. Budgeting \$3,000 per inspection should be sufficient.

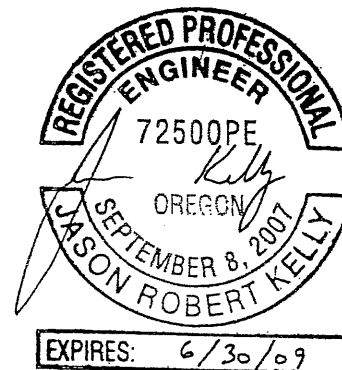
Conclusion

This structure has many timber elements that are nearing the end of their safe and useful life. Recognizing that this structure is a vital piece of city infrastructure, it is recommended that maintenance and/or replacement funds be a high priority. No matter which course of action the City takes in the management of this bridge, it will be costly given the length and height of the structure. As stated in the letter by Kevin Boyle dated January 11, 2008 that quoted new replacement bridge costs: preliminary cost estimates range from \$6.9 million for a signature bridge to \$3.8 million for a simple girder bridge.

Sources

Information used to arrive at theoretical cost estimates came from the most current project sources from OBEC and ODOT. Actual costs from OBEC's numerous construction projects, including the most recent rehabilitation of this bridge, as well as restoration projects in Benton and Polk County were used. ODOT's webpage containing 2007 and 2008 average bid item prices from Region 2 (Northwest Oregon) were used.

Inspection condition ratings were based on the 2008 ODOT Bridge Inspection Manual and current National Bridge Inventory System (NBIS) standards. Inspection procedures and practices follow industry Best Management Practices, specifically ODOT inspection guidelines as well as guidelines accepted by the US Forest Services outlined in their Timber Bridges Design, Construction, Inspection and Maintenance Manual.



INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
2	Plan And Elevation
3	Cable Spreader Details
4	Brace Rod Details - Bents 2 & 5
5	Bents 2 & 5 Elevation
6	Bent 3 Details
7	Rail & Deck Repair Details

CITY OF DAYTON, OREGON

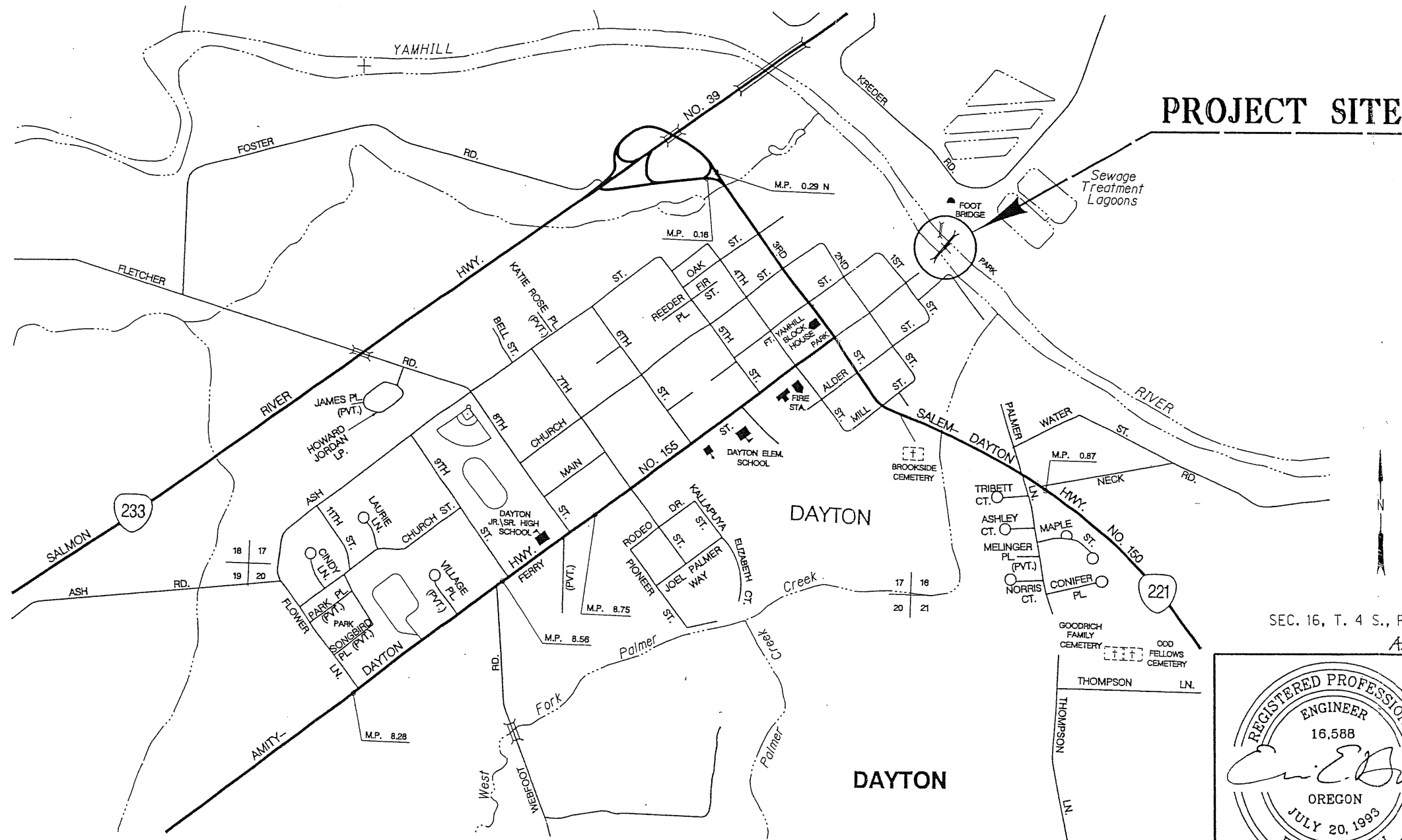
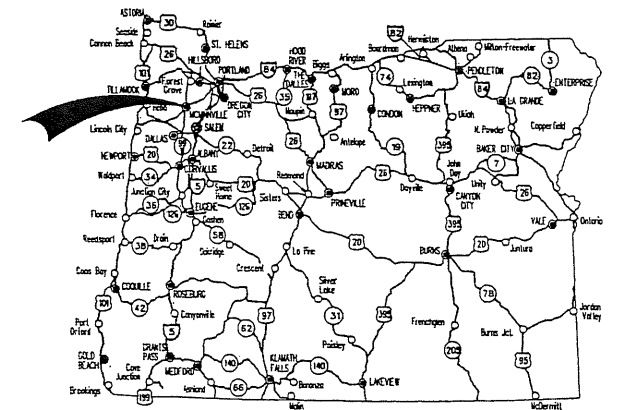
PUBLIC WORKS DEPARTMENT

PLANS FOR PROPOSED PROJECT

STRUCTURE REPAIRS

DAYTON PEDESTRIAN BRIDGE

YAMHILL COUNTY
DECEMBER, 2007



PROJECT SITE

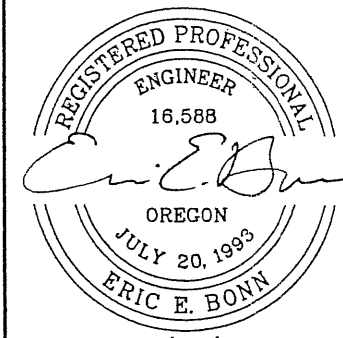
ATTENTION:
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0010 Through OAR 952-001-0090. You May Obtain Copies Of The Rules By Calling The Center. (Note: The Telephone Number For The Oregon Utility Center Is (503) 232-1987.)

LET'S ALL
WORK TOGETHER
TO MAKE THIS
JOB SAFE

CITY OF DAYTON
CONTACT INFORMATION
SUE HOLLIS, CITY MANAGER
PHONE: 503-864-2221

SEC. 16, T. 4 S., R. 3 W., W.M.

As Constructed JRK 6/30/08

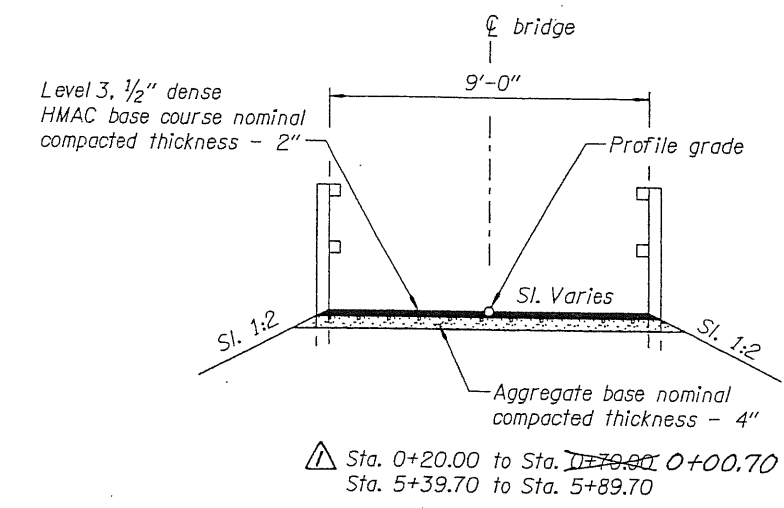
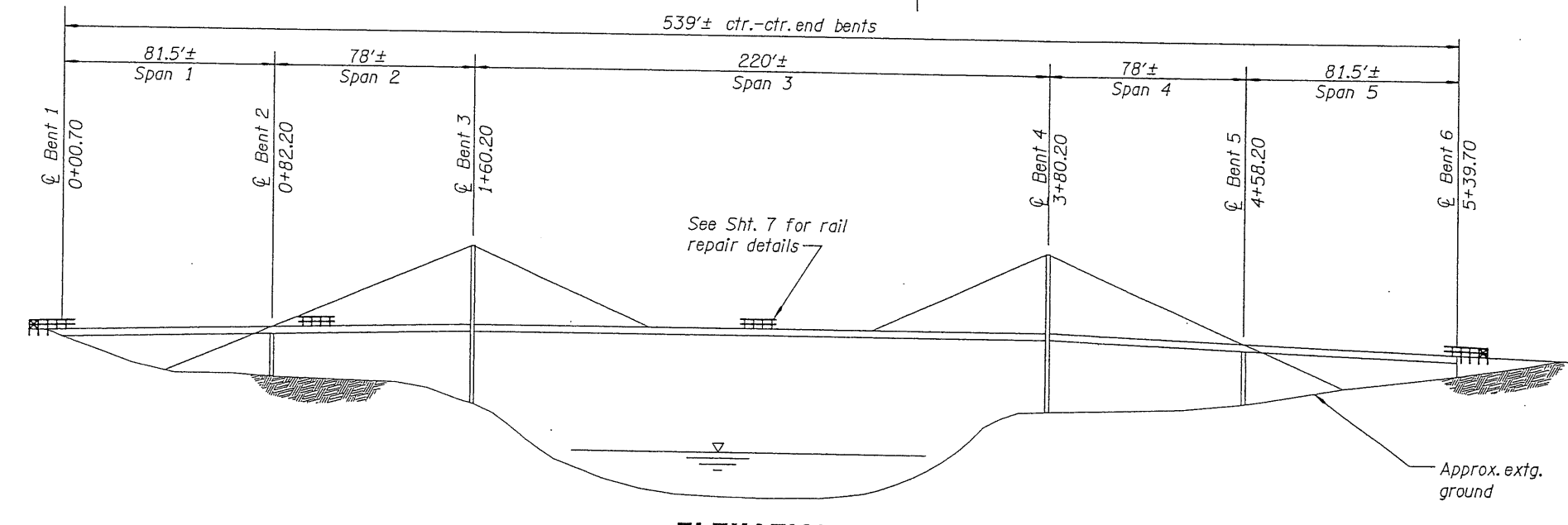
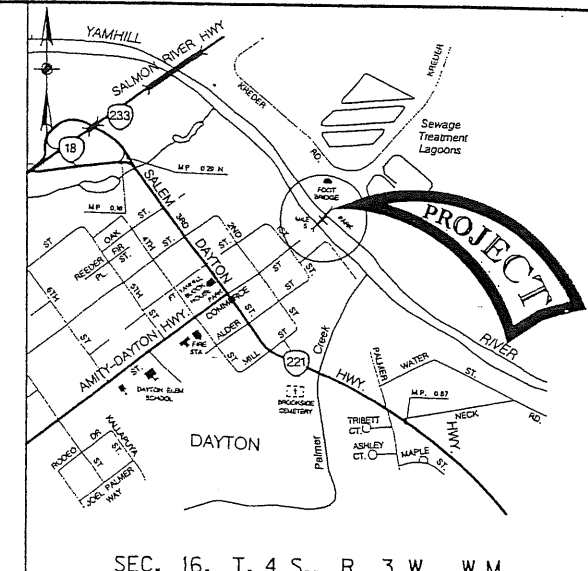
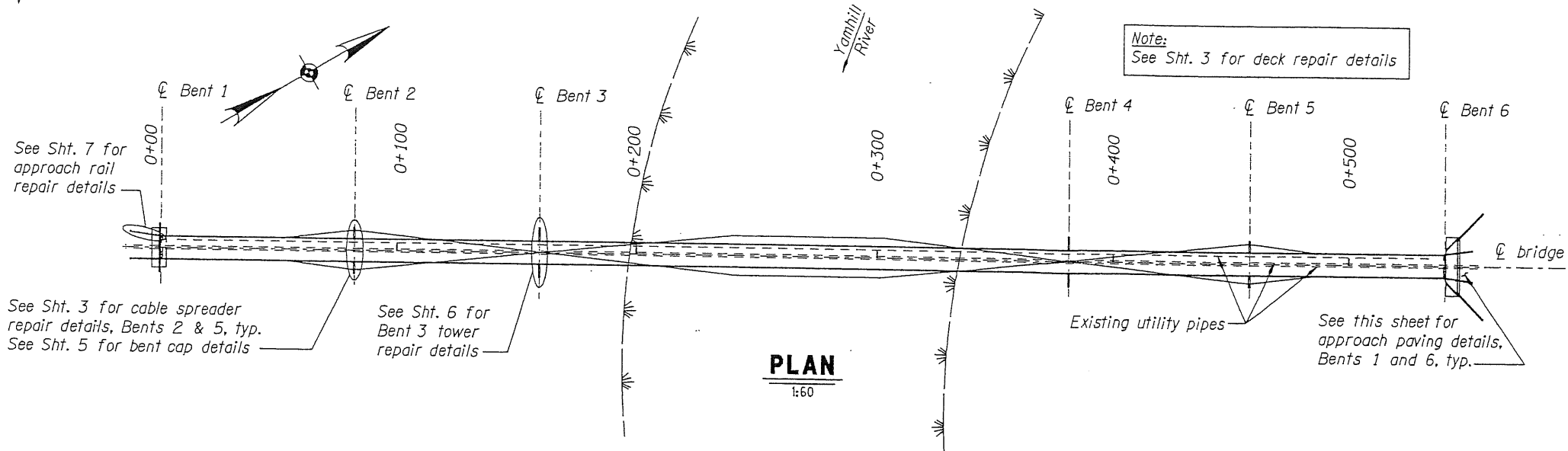


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Corporate Office: 380 COUNTRY CLUB ROAD, SUITE 100B EUGENE, OREGON 97401-8208
5205 SW MEADOWS ROAD, SUITE 120 LAKE OSWEGO, OREGON 97035-4288
2225 MISSION STREET SE, SUITE 100 SALEM, OREGON 97302-1286
1325 POPLAR DRIVE MEDFORD, OREGON 97504-8207

DAYTON PEDESTRIAN BRIDGE
CITY OF DAYTON
YAMHILL COUNTY
Design Team Leader - Sam Grossberg
Designed By - Eric Bonn
Drafted By - Yoshii Ishii

TITLE SHEET
SHEET NO. 1

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12/28/2007
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General Notes:

Provide all materials and work according to the 2002 Oregon Standard Specifications for Construction, the 2006 Oregon Supplemental Standard Specifications for Construction, and the Special Provisions.

The bridge deck repairs are designed for a live load of 85 psf.

All bolts shall be ASTM A325 unless noted otherwise. All structural steel, bolts, nuts and washers shall be hot-dip galvanized after fabrication. Nuts for bolts shall be tapped oversize in accordance with the provisions of ASTM Specification A563.

All glulam timber members shall be Douglas Fir-Larch conforming to ANSI AITC 117-2004 combination symbol 16F-V3. All other timber members shall be Douglas Fir-Larch, No. 1 or better. The glulam members shall use wet-use adhesive.

All timber members shall be completely and accurately fabricated before treatment. After fabrication, timber members shall be incised and shall receive a pressure preservative treatment in accordance with APWA C28 for glue-laminated members. Preservative treatment shall be Pentachlorophenol meeting APWA P8, in a P9 Type hydrocarbon solvent, to a minimum retention of 0.4 pcf. All treated members shall have clean, dry residue free surface when delivered to the job. Materials which develop areas of bleeding or does not meet the clean and dry criteria at the time of installation shall be rejected.

No field cutting of timber members is permitted unless approved by the Engineer. All abrasions, cuts, holes, and other modifications to the treated timber shall be carefully cleaned or trimmed as appropriate, and treated with three brush coats of copper naphthanate meeting AWPA P8 (minimum 2% copper metal solution).

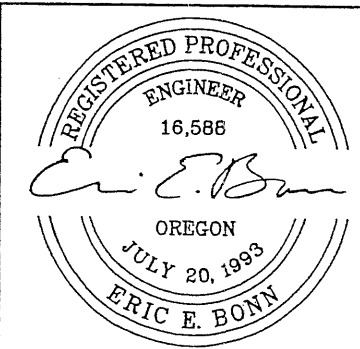
All steel plate shall conform to AASHTO M183 (ASTM A36). All hollow structural shapes (HSS) shall conform to ASTM Specification A500, Grade B or A501.

Oregon law requires the rules adopted by the Oregon Utilities Notification Center to be observed. These rules are set forth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of the rules by calling the Center at (503) 252-1987.

WARNING:
IF THIS BAR DOES NOT MEASURE 1/2" THEN DRAWING IS NOT TO SCALE.



APPROVED BY <i>Adam Cronberg Br Mgr</i>		DATE
REV.	DESCRIPTION	BY DATE
1	As Constructed	JRK 9/30/08



EXPIRES: 12/31/09

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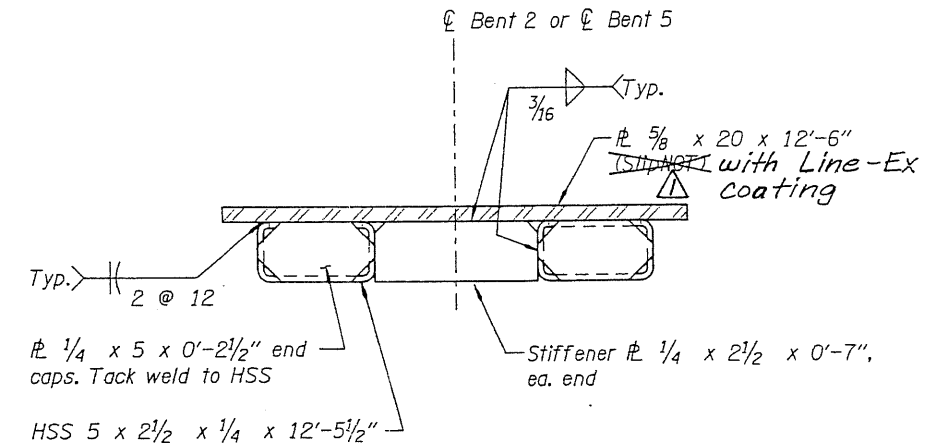
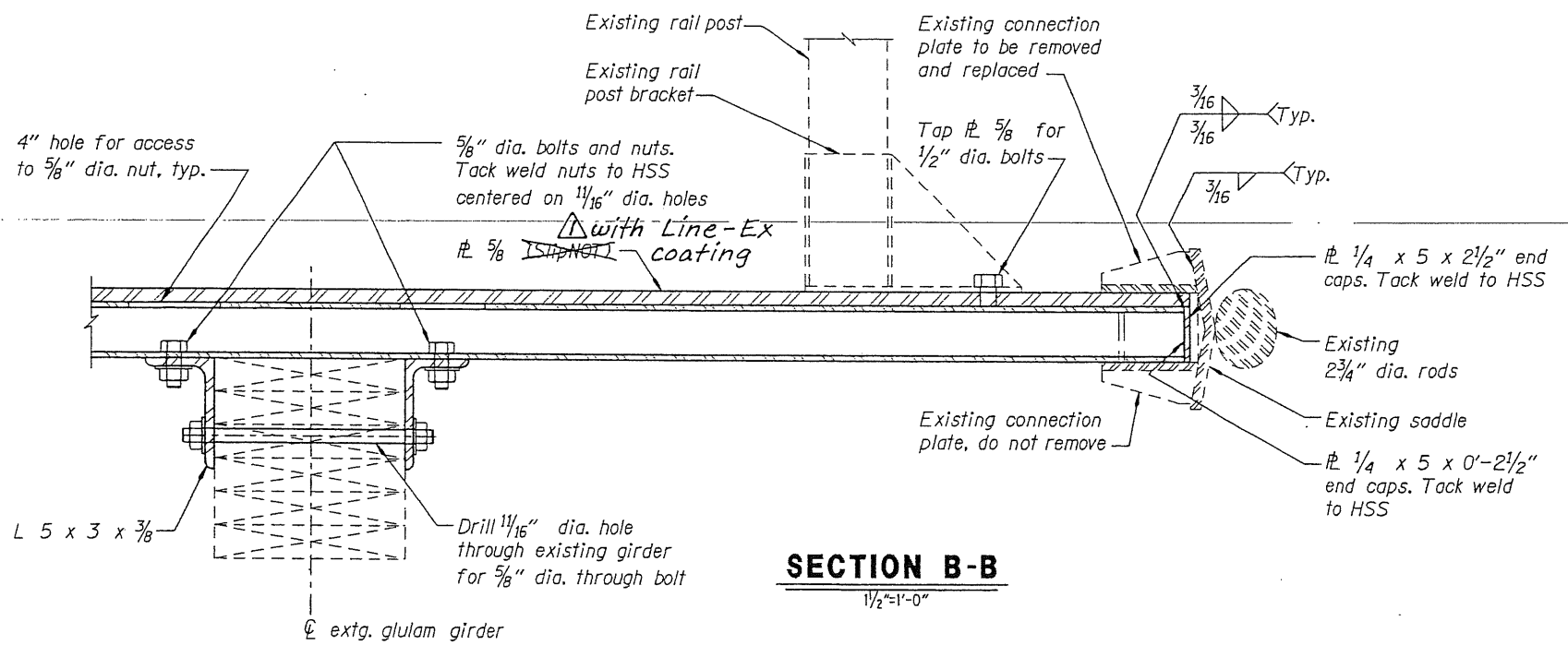
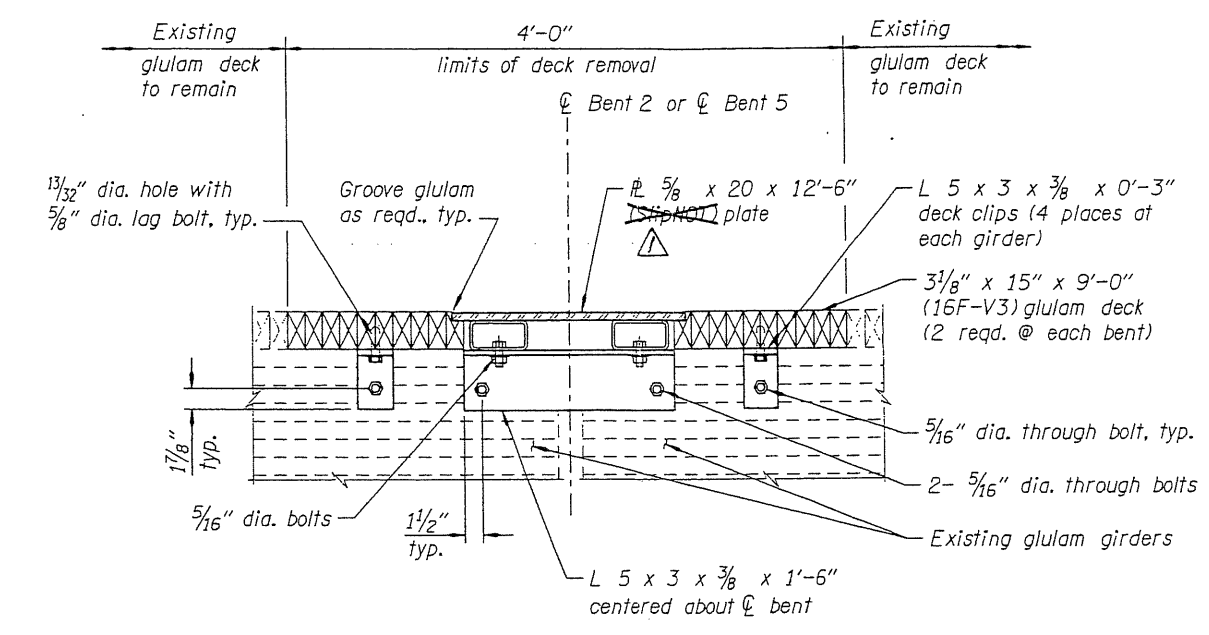
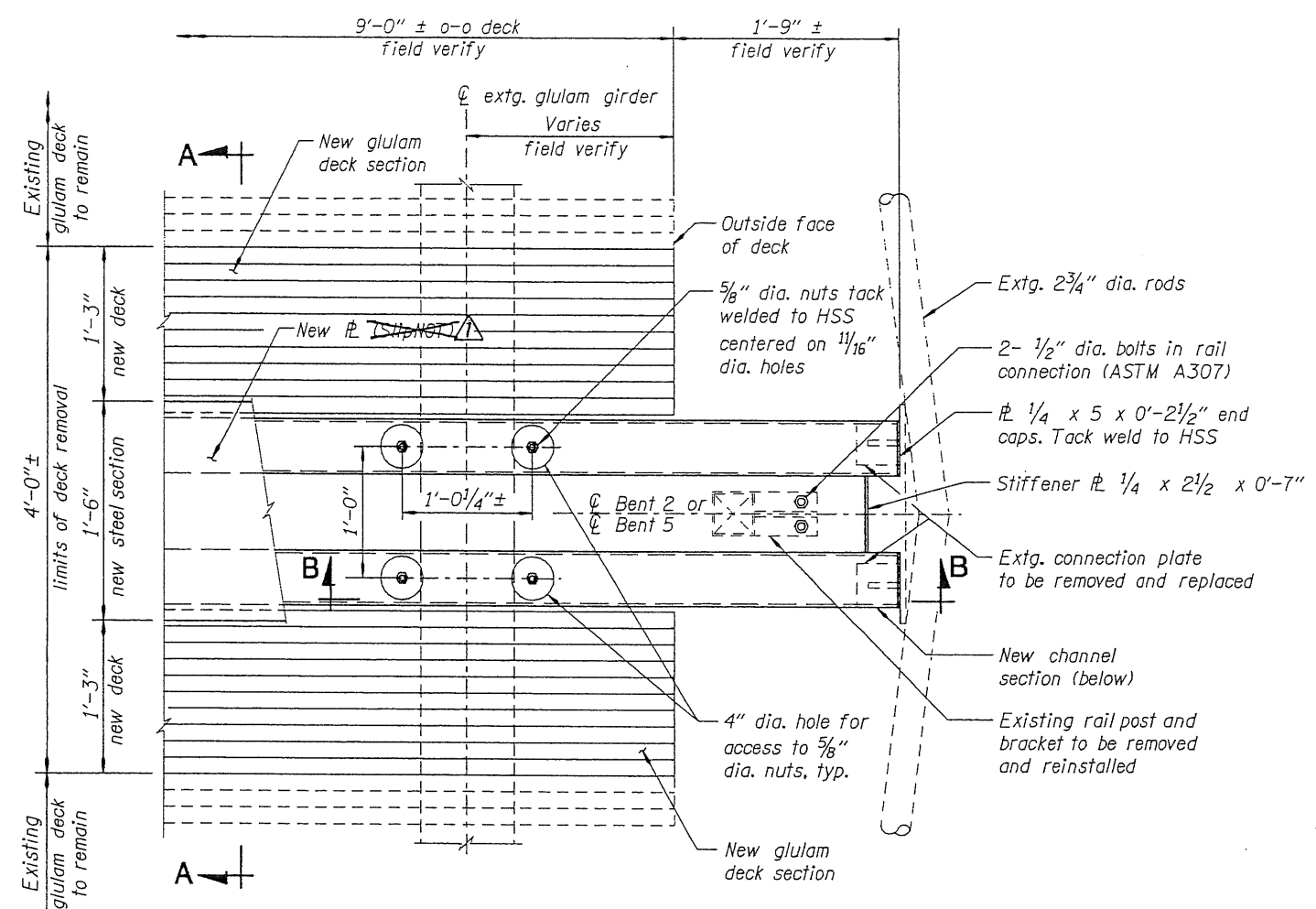
1335 POPLAR DRIVE
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DAYTON PEDESTRIAN BRIDGE
CITY OF DAYTON
YAMHILL COUNTY OREGON

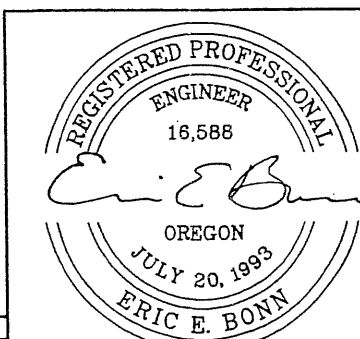
PLAN AND ELEVATION

DESIGNED: ERIC E. BONN, P.E. PRD.J. NO. 299-5 SHT. 2 OF 7
DRAWN: HMS/RG CHK'D: FILE NO. 18496 DATE: DEC. 07

09:17 AM
 12/28/2007
 J:\Projects\299\299005\Cad\Station\299005_02 CABLE SPREADER DTLS.dgn



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CABLE SPREADER DETAILS

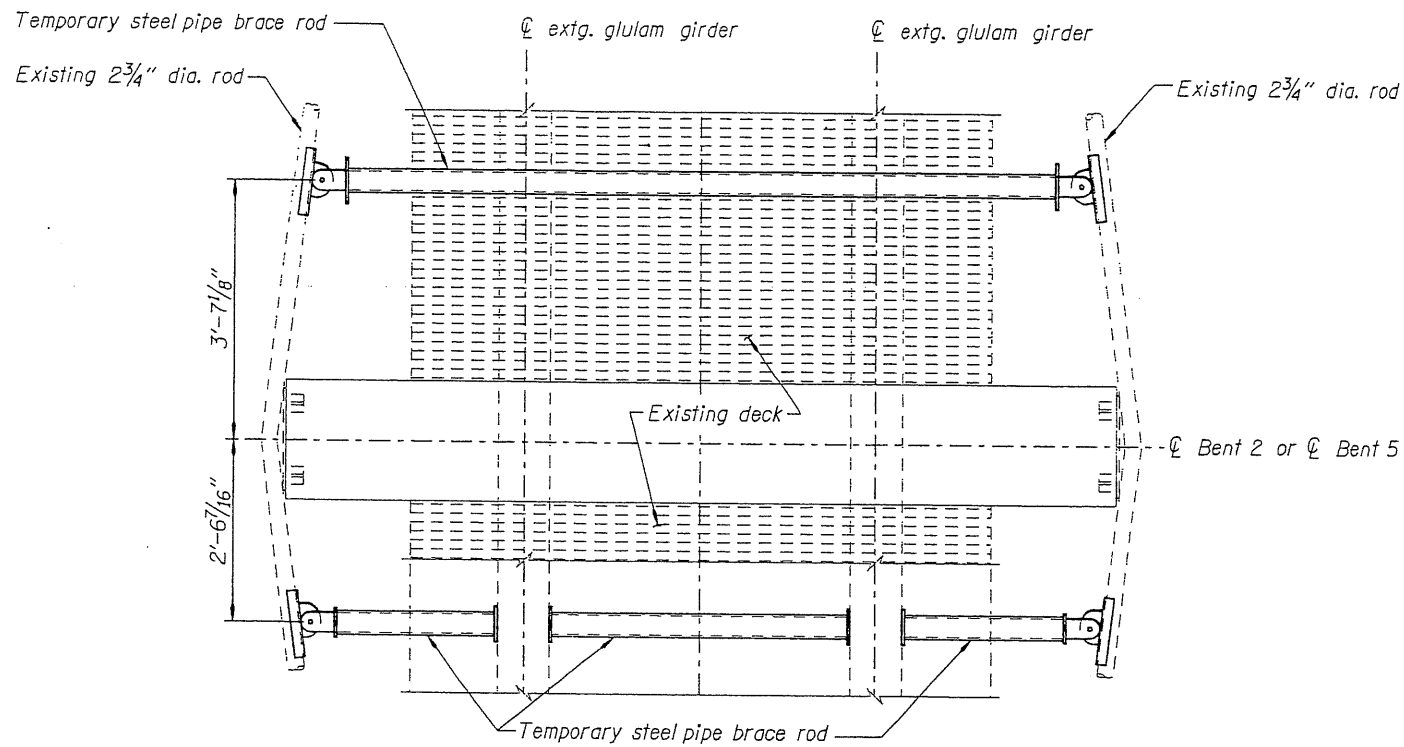
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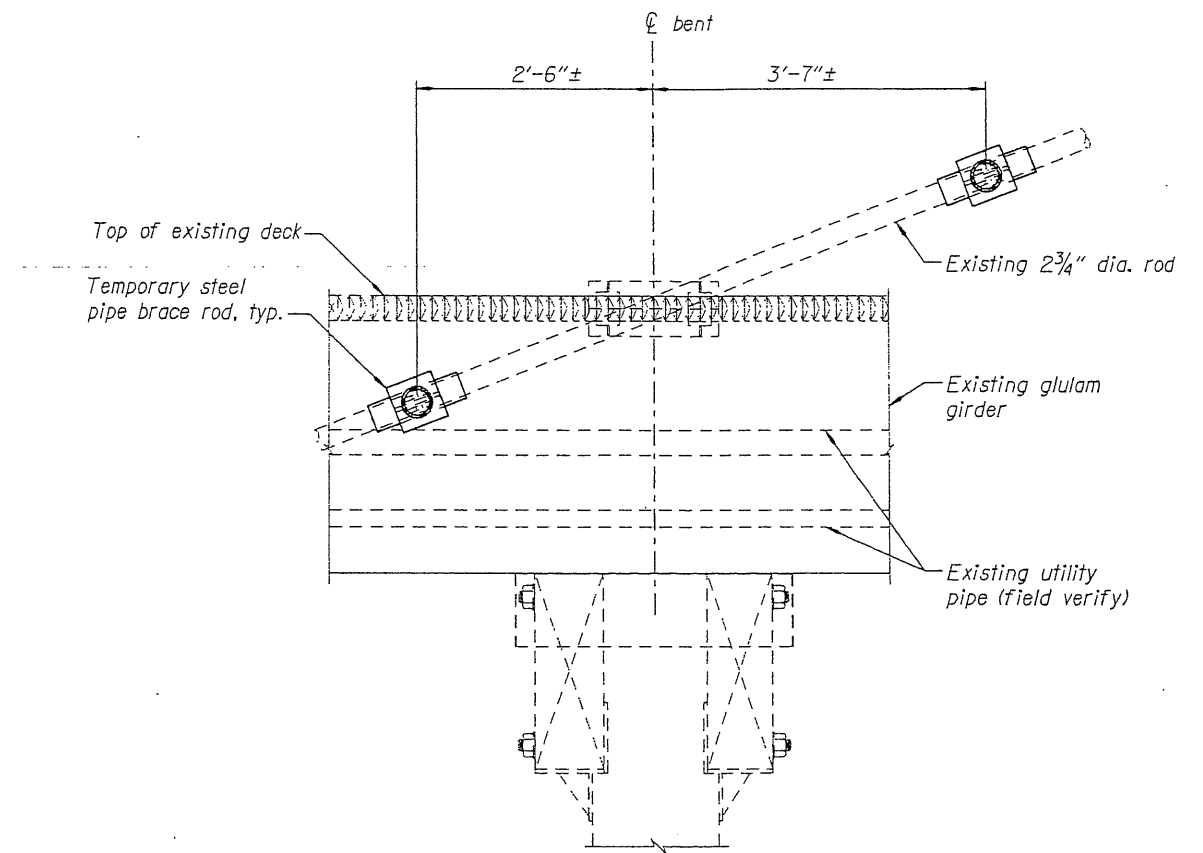
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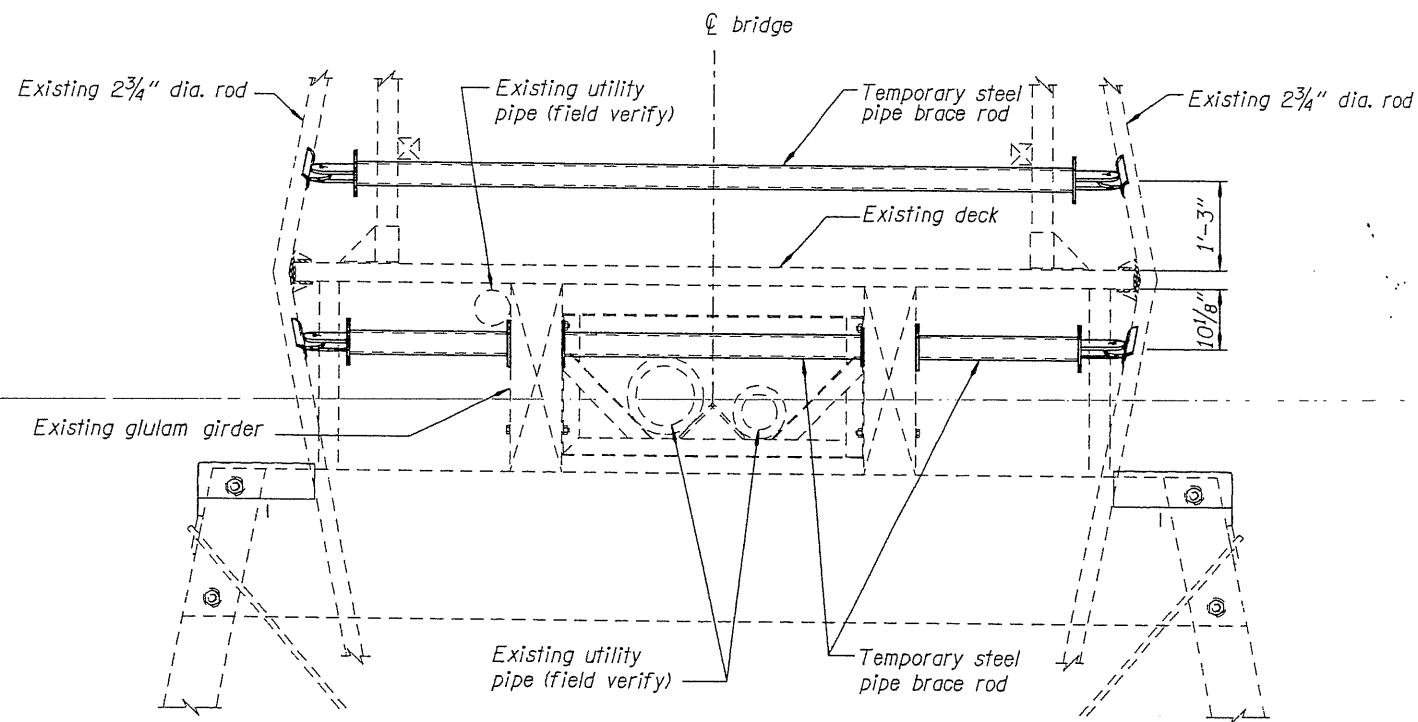
PLAN - BRACE RODS AT BENTS 2 & 5

3/8"=1'-0"



BRACE ROD SECTION

1/2"=1'-0"

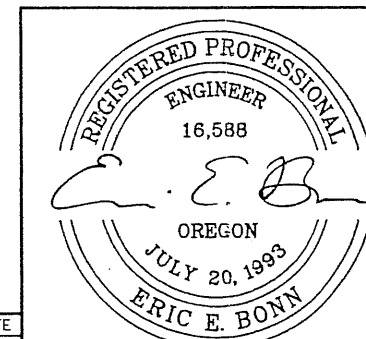


ELEVATION - BRACE RODS AT BENTS 2 & 5

3/8"=1'-0"

Notes:
 See Sht. 3 for cable spreader repair details.
 See Special Provisions for brace rod requirements.

WARNING:
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CITY of DAYTON

YAMHILL COUNTY

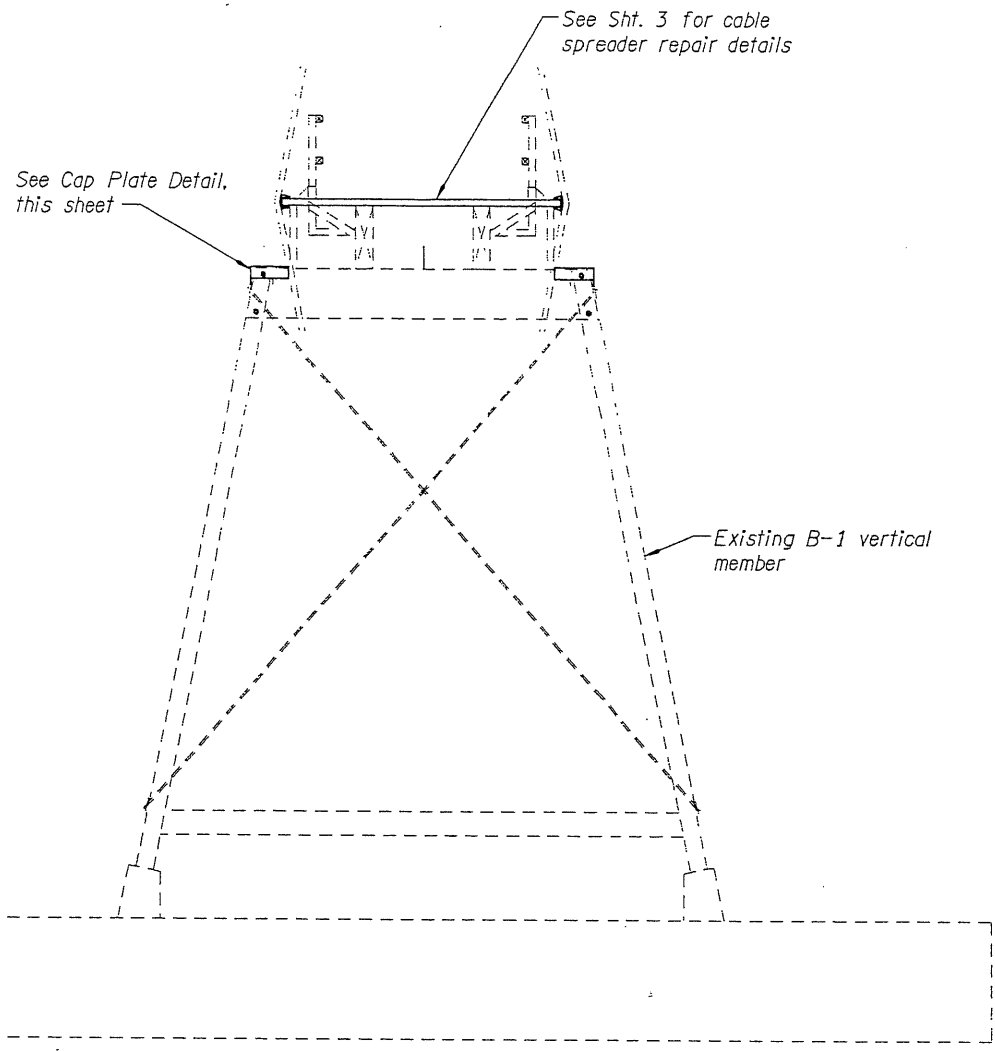
OREGON

BRACE ROD DETAILS - BENTS 2 & 5

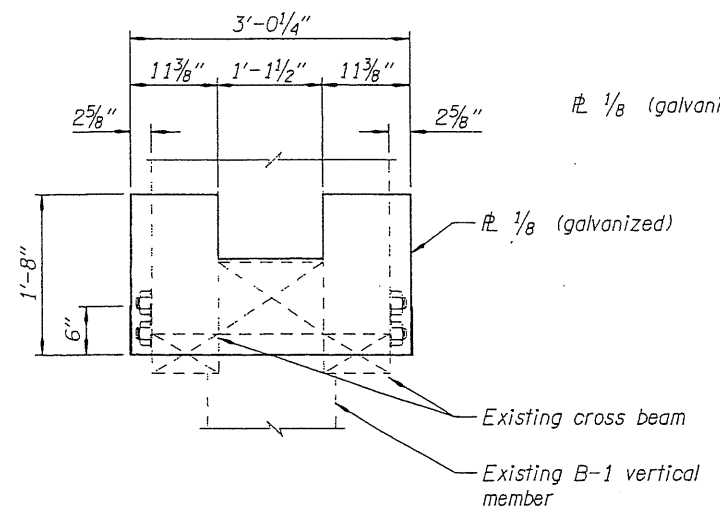
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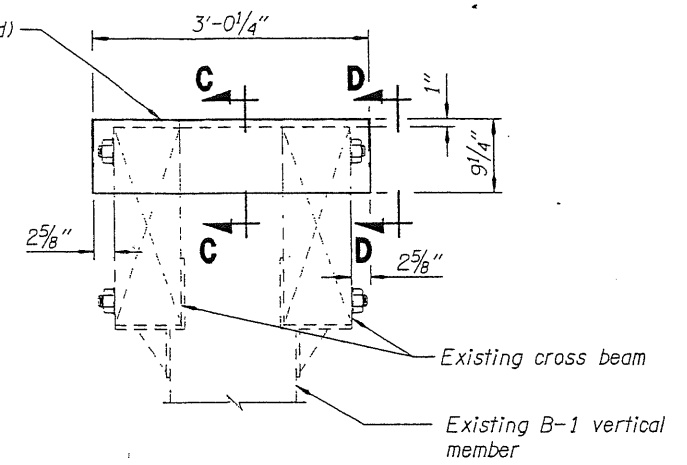
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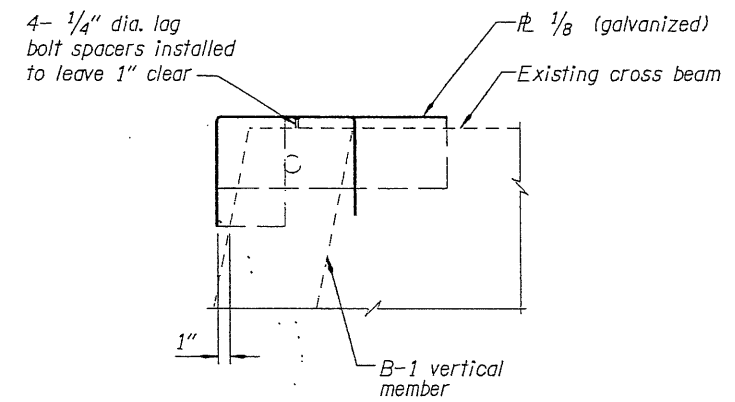
ELEVATION - BENTS 2 & 5
 $\frac{1}{8}''=1'-0''$



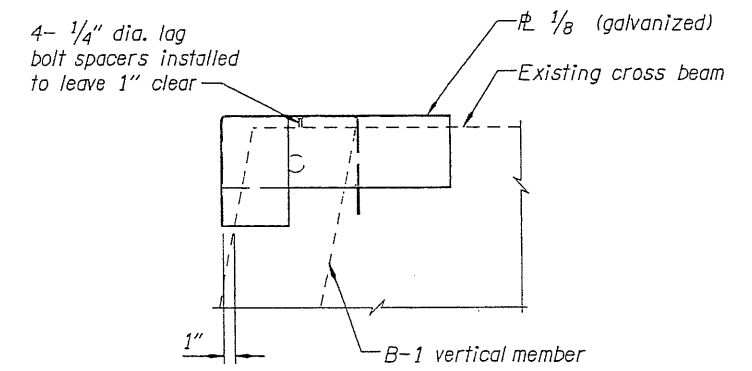
CAP PLATE PLAN
 $\frac{1}{2}''=1'-0''$



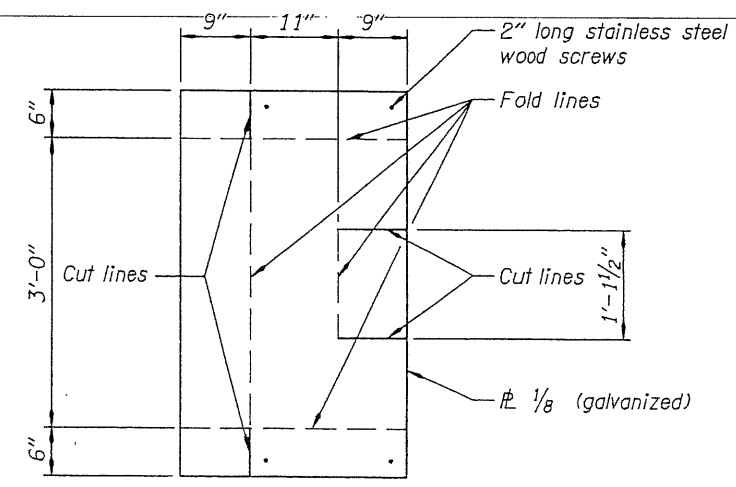
CAP PLATE SIDE
 $\frac{1}{2}''=1'-0''$



SECTION C-C
 $\frac{3}{4}''=1'-0''$



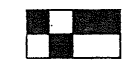
SECTION D-D
 $\frac{3}{4}''=1'-0''$



CAP PLATE DETAIL
 $\frac{1}{2}''=1'-0''$

Note:
See Sht. 3 for cable spreader repair details.

WARNING:
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 LAKE OSWEGO, OREGON 97035-4288
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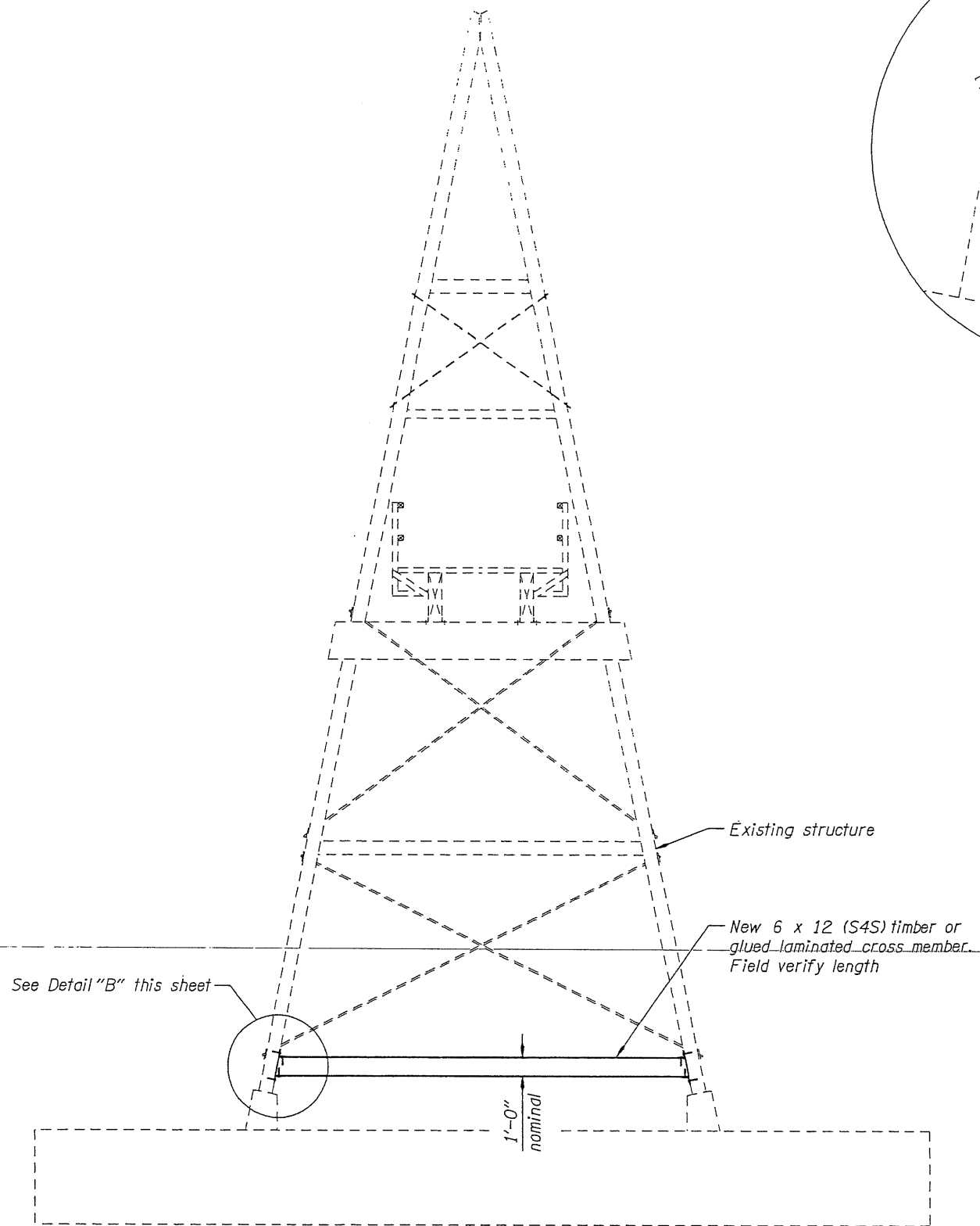
DAYTON PEDESTRIAN BRIDGE
 CITY OF DAYTON

YAMHILL COUNTY OREGON

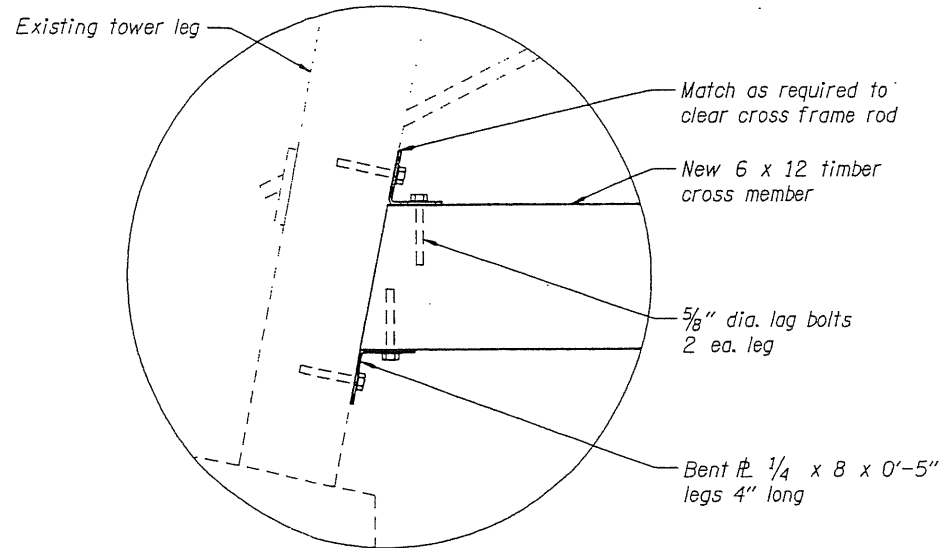
BENTS 2 & 5 ELEVATION

REV.	DESCRIPTION	BY	DATE
	As Constructed	JRK	12/29/08

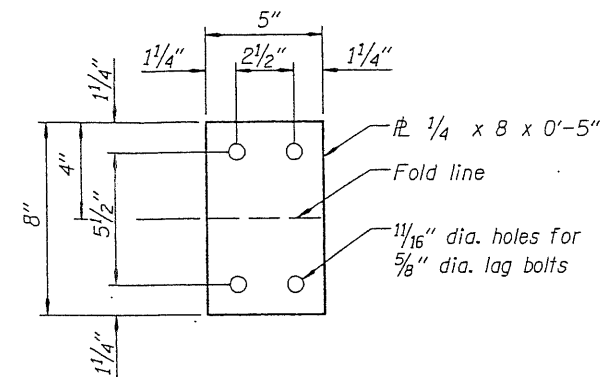
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DRAWN: HMS/RG	CHK'D:	FILE NO. 18499
		DATE: DEC. 07



ELEVATION - BENT 3
 $\frac{1}{8}''=1'-0''$

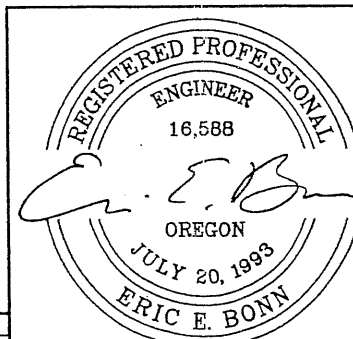


DETAIL "B"
 $\frac{3}{4}''=1'-0''$



BEND PLATE DETAIL
 $\frac{1}{2}''=1'-0''$

WARNING:
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REV.	DESCRIPTION	BY	DATE
	As Constructed	JRK	12/28/07



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DAYTON PEDESTRIAN BRIDGE

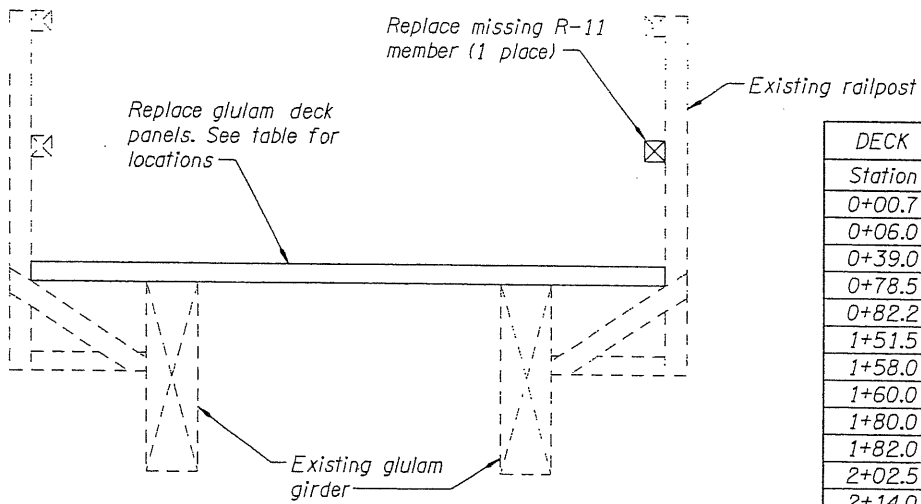
CITY of DAYTON

YAMHILL COUNTY

OREGON

BENT 3 DETAILS

DESIGNED: ERIC E. BONN, P.E. PROJ. NO. 299-5 SHT. 6 OF 7
 DRAWN: HMS/RG CHK'D: FILE NO. 18500 DATE: DEC. 07

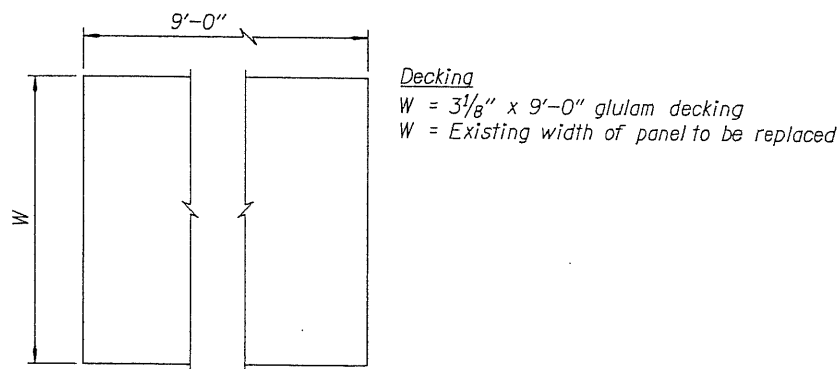


ELEVATION - RAIL AT DECK

3/8"=1'-0"

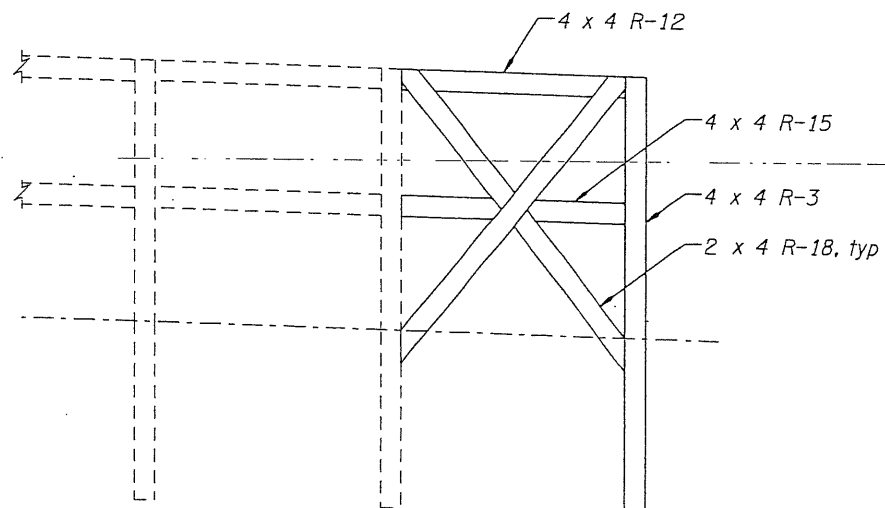
DECK REPLACEMENT TABLE	
Station	#Decayed Sections*
0+00.7	3
0+06.0	2
0+39.0	4
0+78.5	3
0+82.2	Centerline Bent 2
1+51.5	4
1+58.0	3
1+60.0	Centerline Bent 3
1+80.0	1
1+82.0	3
2+02.5	2
2+14.0	4
2+25.0	2
2+26.0	3
2+38.5	3
2+67.0	2
2+68.0	2
3+18.0	2
3+62.0	3
3+80.2	Centerline Bent 4
4+19.0	3
4+35.0	1
4+58.0	Centerline Bent 5
4+68.0	1
5+14.0	3
5+40.3	Bent 6 face of backwall

*Sections = individual 2 x 4's within panel.
Replace 1'-6" panel in its entirety.



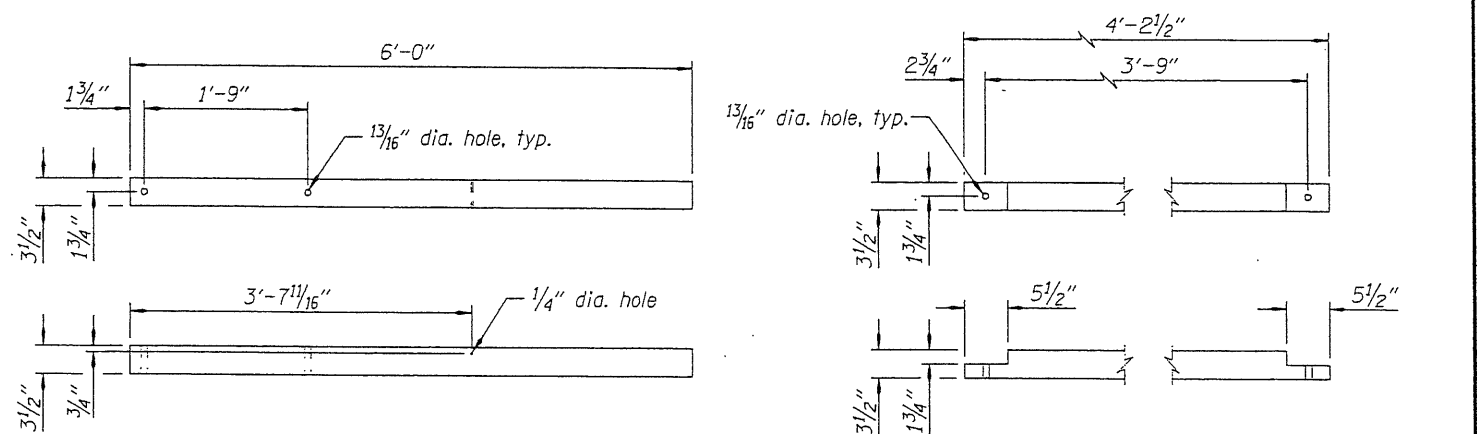
GLULAM DECK PANEL DETAIL

No Scale



ELEVATION - APPROACH RAIL

3/8"=1'-0"

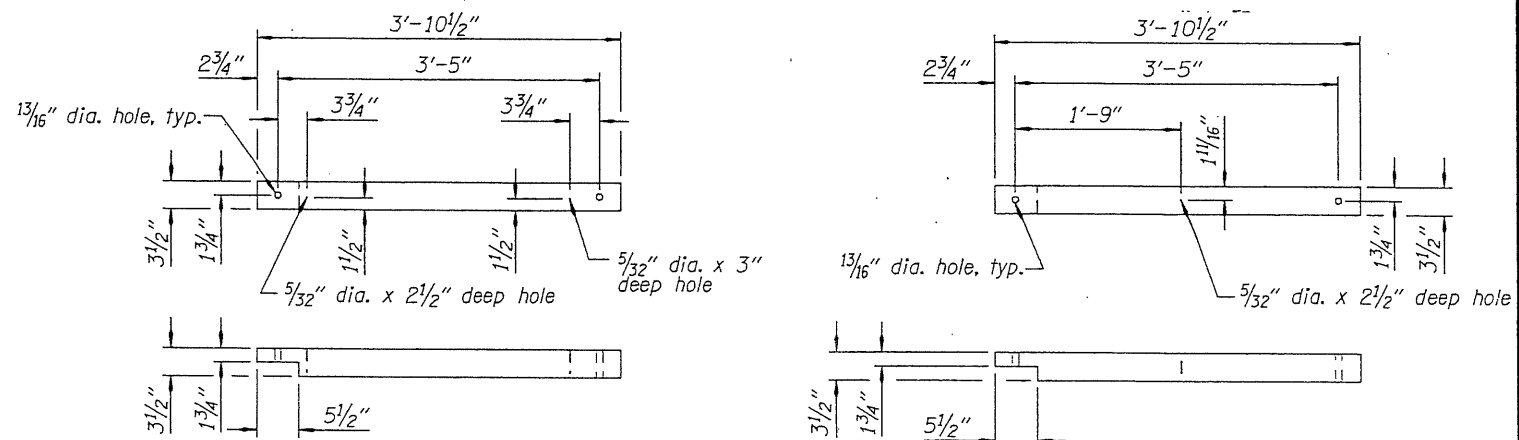


R-3 END POST

1/2"=1'-0"

R-11 RAIL

1/2"=1'-0"

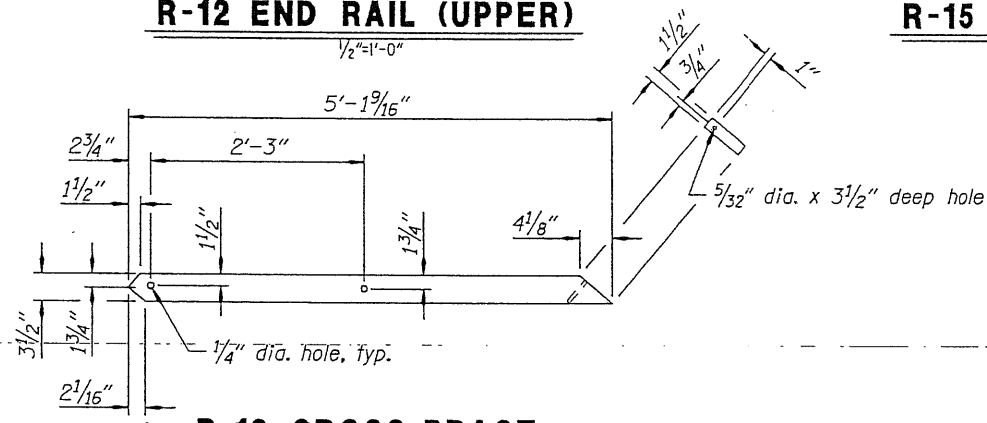


R-12 END RAIL (UPPER)

1/2"=1'-0"

R-15 END RAIL (LOWER)

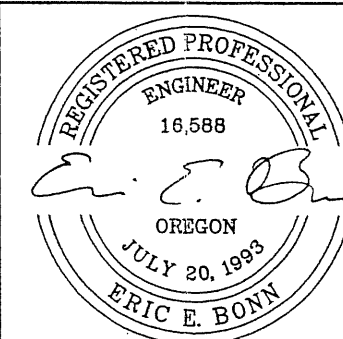
1/2"=1'-0"



R-18 CROSS-BRACE

1/2"=1'-0"

WARNING:
IF THIS BAR DOES
NOT MEASURE 1/2"
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REV.	DESCRIPTION	BY	DATE
	As Constructed	JRK	9/30/08

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EUGENE, OREGON 97401-6089

1335 POPLAR DRIVE
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YAMHILL COUNTY OREGON

RAIL & DECK REPAIR DETAILS

DESIGNED: ERIC E. BONN, P.E. PROJ. NO. 299-5 SHT. 7 OF 7
DRAWN: HMS/RG CHK'D: FILE NO. 18501 DATE: DEC. 07