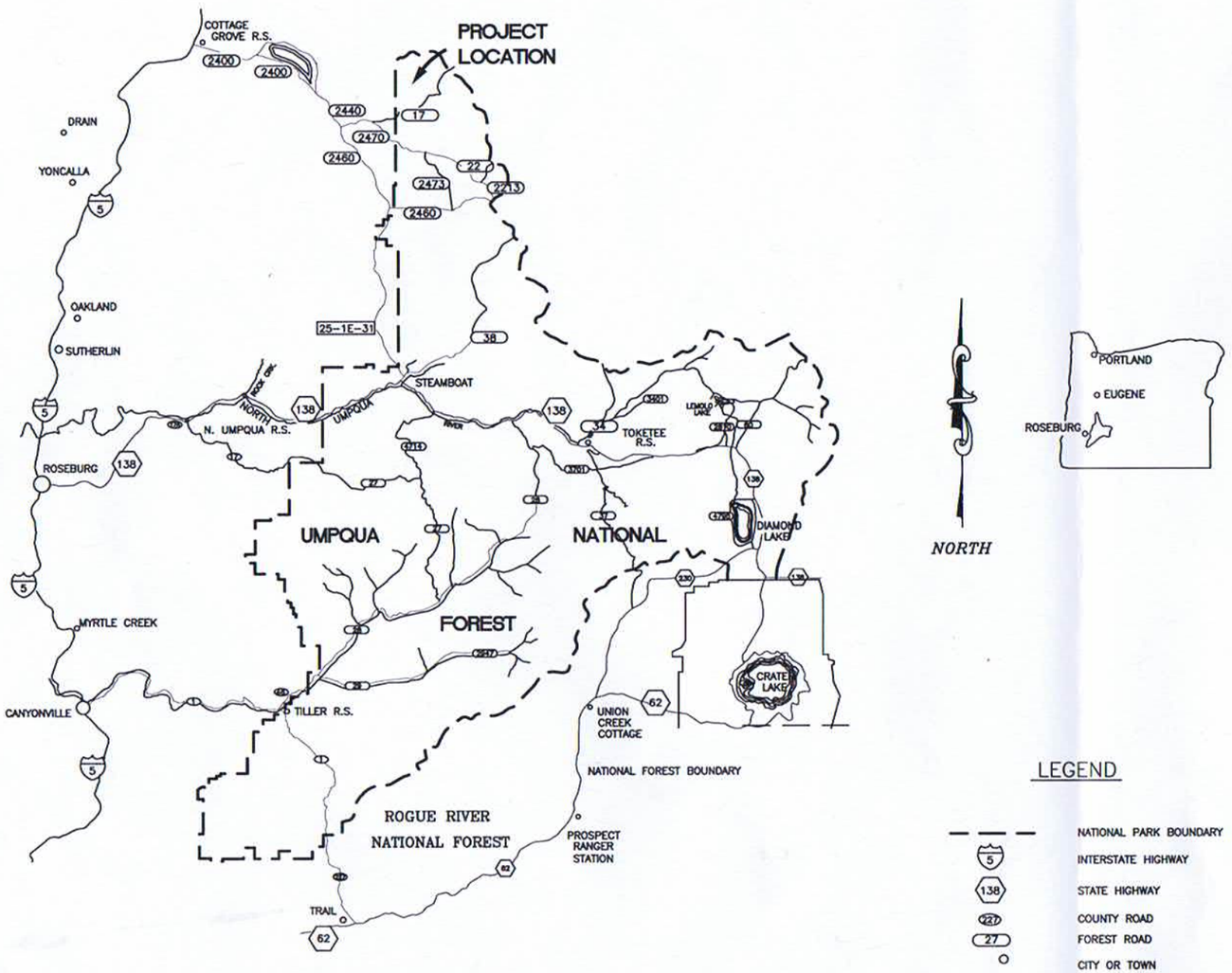
U.S. DEPARTMENT of AGRICULTURE
FOREST SERVICE
UMPQUA NATIONAL FOREST
COTTAGE GROVE RANGER DISTRICT

REGION SIX

VICINITY MAP



INDEX

PROPOSED PROJECT

ROAD NUMBER	LENGTH	TYPE OF WORK
1700	0.10 MILES	RECONSTRUCTION
1721-542	0.10 MILES	RECONSTRUCTION

RECOMMENDED BY: for TRANSPORTATION ENGINEER DATE: 4/25/12

APPROVED BY: FOREST ENGINEER DATE: 4/27/12

DISTRICT RANGER: DATE: 5/2/12

DESIGNED BY: Juliet Jackson-Merritt

PLAN IN HAND BY: 5/2/12

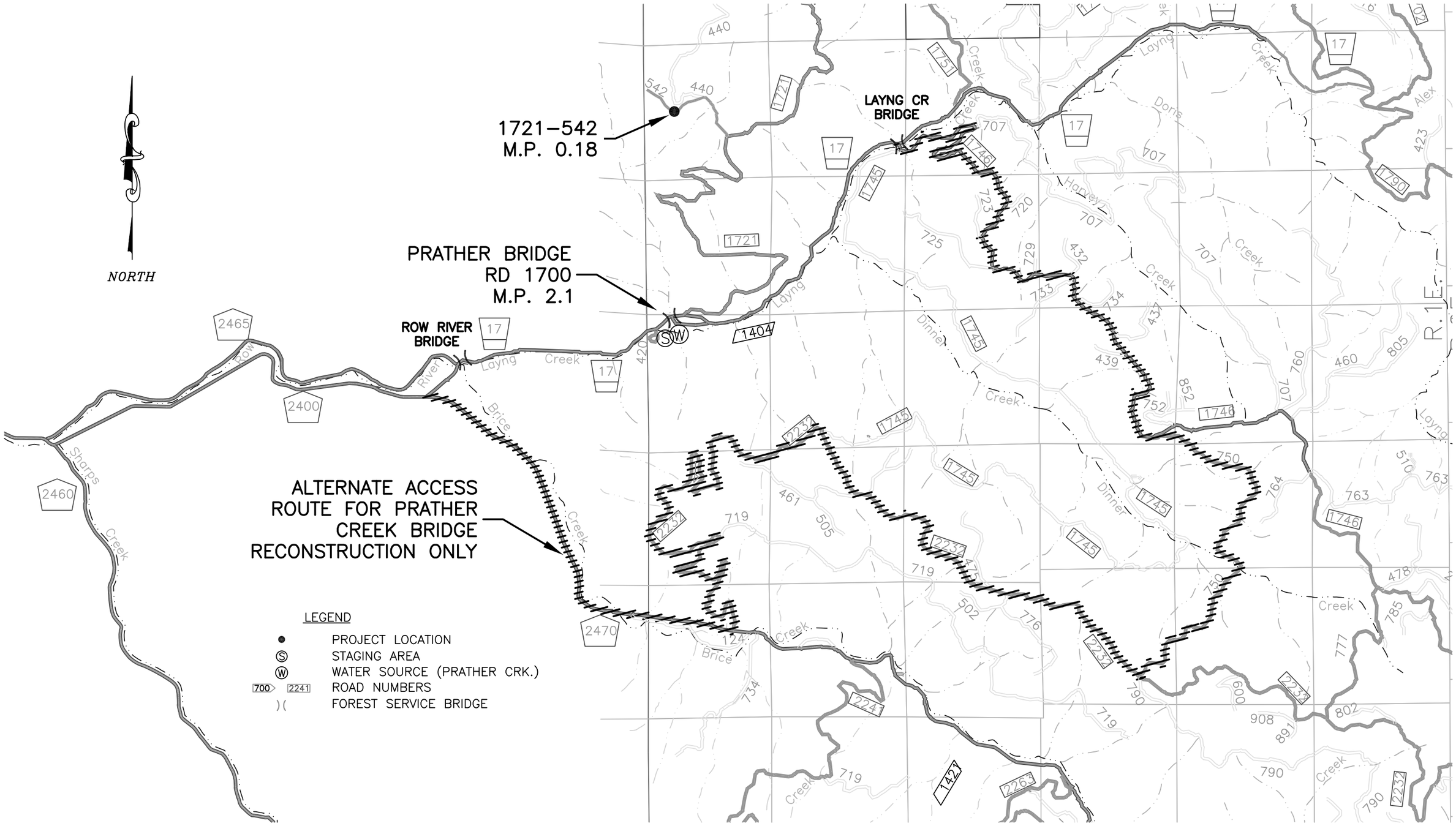
REVIEWED BY: DATE: 5/3/12 PROJECT TEAM LEADER/DISTRICT ENGINEER

ENGINE TIMBER SALE

SHT 1 of 21

DWG	2
OF	21

UMPQUA NATIONAL FOREST
COTTAGE GROVE RANGER DISTRICT



ENGINE TIMBER SALE

ESTIMATE OF QUANTITIES

NOTES:

1. All volume Unit Pay items are measured in-place. All reference to quantities of excavated volumes refer to original (prior to excavation) volume.

2. See worklists and vicinity map for further description and location of work.

3. Units are measured as Actual Quantity unless denoted by an asterisk *, which means items are Contract Quantities.

Road No.	1700-000	1721-542
Project Length	0.10 Mile	0.10 Mile
M.P.	2.1	0.18
Work Type	Bridge Reconstruction	Reconstruction

NOTES CONTINUED:

4. Known utility at the site is Century Link Phone Co. (Joe Ellis 541-484-7783). Verify that the utility has been relocated. If not, coordinate with the utility company for the relocation.

5. This project is exempt from DSL and Corps of Engineers permits.

Pay Item	Description	Pay Unit	Quantity		Total Quantities	Remarks
151-01	Mobilization	Lump Sum	All Required			Excludes paving mobilization. Soil Erosion and Pollution Control are paid indirectly
152-01	Construction Survey and Staking. Method 1. Tolerance A.	Lump Sum	All		All	
202-07	Removal of Individual Trees, Disposal of Tops & Limbs Scatter, Logs Deck	Each	5		5	Removal of trees designated by FS at Prather Creek Bridge
203-01	Removal of Ditch Relief Culvert	Each		1	1	
203-04	Removal & Disposal of Existing Asphalt, Disposal Method A	Lump Sum	All		All	Includes minor clearing & grubbing and excavation to new subgrade elevation
203-05	Removal of Structures & Obstructions, Disposal Method A	Lump Sum	All		All	Salvage of 10 stringers is indirect
251-10.1	Hand Placed Riprap, Class 1	* Cubic Yard		3	3	Rock from Commercial Source
251-10.2	Hand Placed Riprap, Class 2	* Cubic Yard		3	3	Rock from Commercial Source
251-01.5	Placed Riprap, Class 5	* Cubic Yard	7		7	Rock from Commercial Source, excavation is paid indirectly
322-03	Aggregate Base, Grading D, Compaction Method C	* Cubic Yard	34		34	Rock from Commercial Source, for base and shoulders
403-51	State of Oregon DOT HMAC, 1/2" dense graded, PG-64-22, level 3	Ton	40		40	Waterproof Membrane, Mastic and mobilization are paid for indirectly. Apply tack coat to areas between existing and new asphalt. Tack is paid indirectly.
552-01	Structural Concrete Class A (AE)	* Cubic Yard	9.2		9.2	
554-01	Reinforcing Steel	* Pound	1122		1122	
556-01	Timber Bridge Railing	Linear Foot	74		74	
557-06	Treated Structural Timber, Glued Laminated Longitudinal Deck, 16.25" depth X 52.5" width X 32'-0" long. (6 Panels)	Lump Sum	All		All	All hardware, bearing pads, deck expansion joint filler, and stiffeners are indirect
602-50.24	24 inch Corrugated Metal Pipe. 0.064 inch thickness for steel 0.060 inch thickness for Aluminum. Method B	Linear Foot		38	38	Furnish and placing bedding from Commercial Source is paid indirectly.
617-01	Bridge Approach Rail System, Type A, Class 1	Linear Foot	175		175	Transition from bridge rail, Terminal ends, Object markers, and all hardware are paid indirectly.
634-01	Painted Traffic Marking, Type A - Striping -Yellow	Linear Foot	288		288	2 coats, 4 inch wide, double yellow strips
635-01	Temporary Traffic Control	Lump Sum	All		All	

LOCATION AND CULVERT LENGTHS						INSTALLATION DETAILS AND SPECIAL SECTIONS									RIPRAP REQUIREMENTS												DWG 4 OF 21
DESIGNED			AS BUILT			CORRUGATED METAL PIPE			SPILLWAYS			BEVELED DROP INLET			HEADWALL			SPLASH APRON			SLOPE PROTECTION			SUBGRADE REINFORCEMENT			ENGINE TIMBER SALE DRAINAGE LISTING
MP	STA. (FT)	LENGTH (FT)	MP	STA. (FT)	LENGTH (FT)	DIA. (IN)	TH. (IN)	TYPE	DOWN-DRAIN LENGTH (FT)	ANCHORS (EA)	ELBOW	DIA (INCH)	LENGTH (FT)	"B" ANGLE	CY	CLASS	TYPE	CY	CLASS	TYPE	CY	CLASS	TYPE	CY	CLASS	TYPE	
Road #1721-542																											Remarks
0.18		38				24	0.064	3							3	1	H	3	2	M							Replace existing CMP
Road #1700-000																											
2.10																					7	5	M				Bridge work, footing protection

Note:

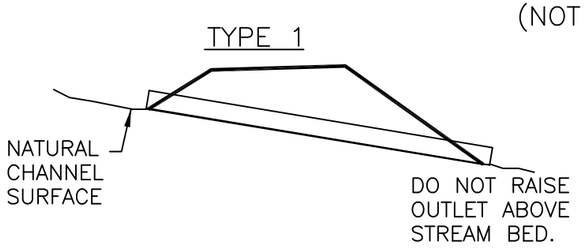
1) Staking for culverts has been completed by the Forest Service. Culvert lengths and locations are based on as-staked conditions. Install culverts as staked.
2) Excavations for new culverts and culvert replacements are generally deeper than existing culvert installations. Excavation of solid rock may be required in some locations.
3) Dimpled bands shall not be used on downpipes, elbows, or pipes laid on grades greater than 15%.
4) Unless shown otherwise, where cover heights exceed 11' , culverts shall be cambered an amount equal to 0.5% of the culvert length.
5) Riprap shall be placed to the minimum dimensions shown on typical section drawings.
6) Riprap type abbreviations: D - Dumped (Mechanical in FP-03 Sec 251), H - Hand Placed, M - Machine Placed.
7) Minimum one foot subgrade cover over culvert installation.
8) Clearing limits shall be maximum of 3 ft. beyond the excavation limits unless otherwise approved.
9) Laying Creek Work Center and water district area adjacent to Forest Service Road 1700 M.P. 2.0 may be used for temporary stockpile and staging site for the duration of the project. Upon completion of the project, areas used shall be reshaped to their original ground conditions. Maintain access for Water District Personnel.

PROJECT	DWG	OF
ENGINE TIMBER SALE	5	21

CULVERT CONSTRUCTION DETAILS

(NOT TO SCALE. ALSO REFER TO WORKLISTS.)

TYPE 1



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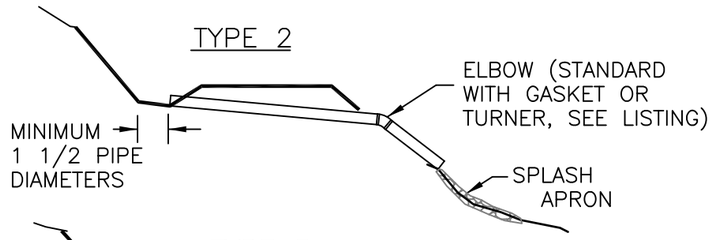

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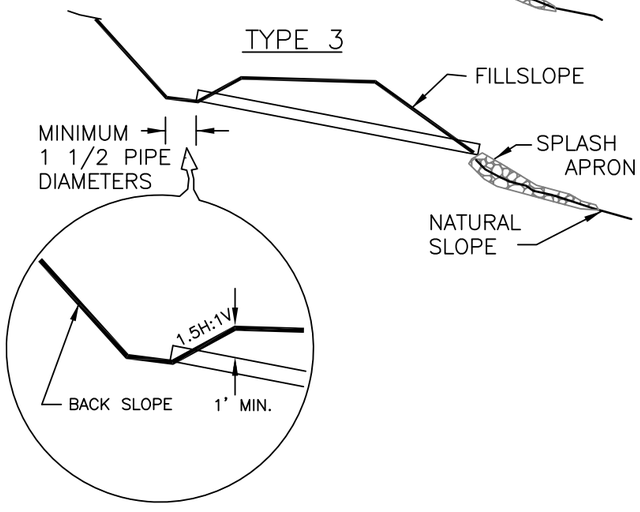
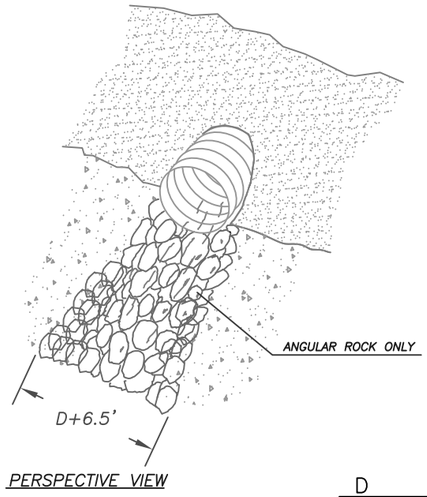
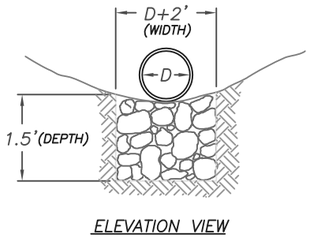


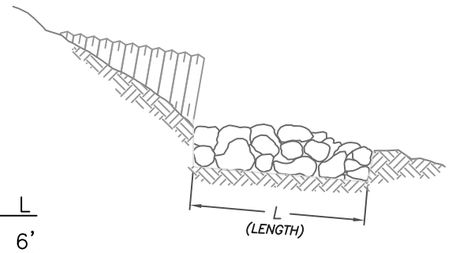


PERSPECTIVE VIEW



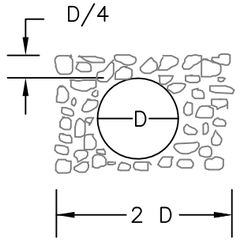
ELEVATION VIEW

D	L
18"	6'
24"	8'
36"	10'



CROSS SECTION VIEW

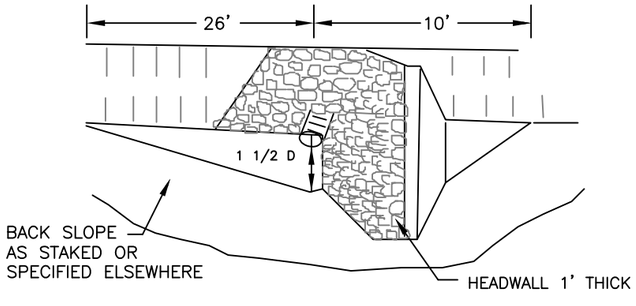
HEADWALLS FOR TYPE 1



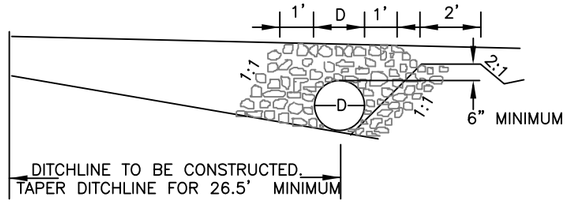
NOTE:
ADJUST RIPRAP TO FIT ORIGINAL STREAM BANKS IN NARROW CHANNELS.

CATCH BASIN DETAIL FOR TYPE 2 & 3

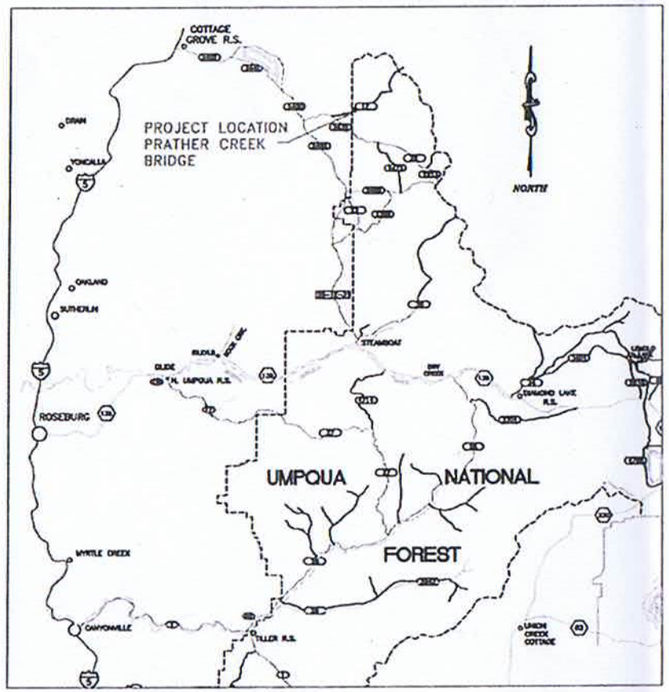
HEADWALL – PLAN VIEW

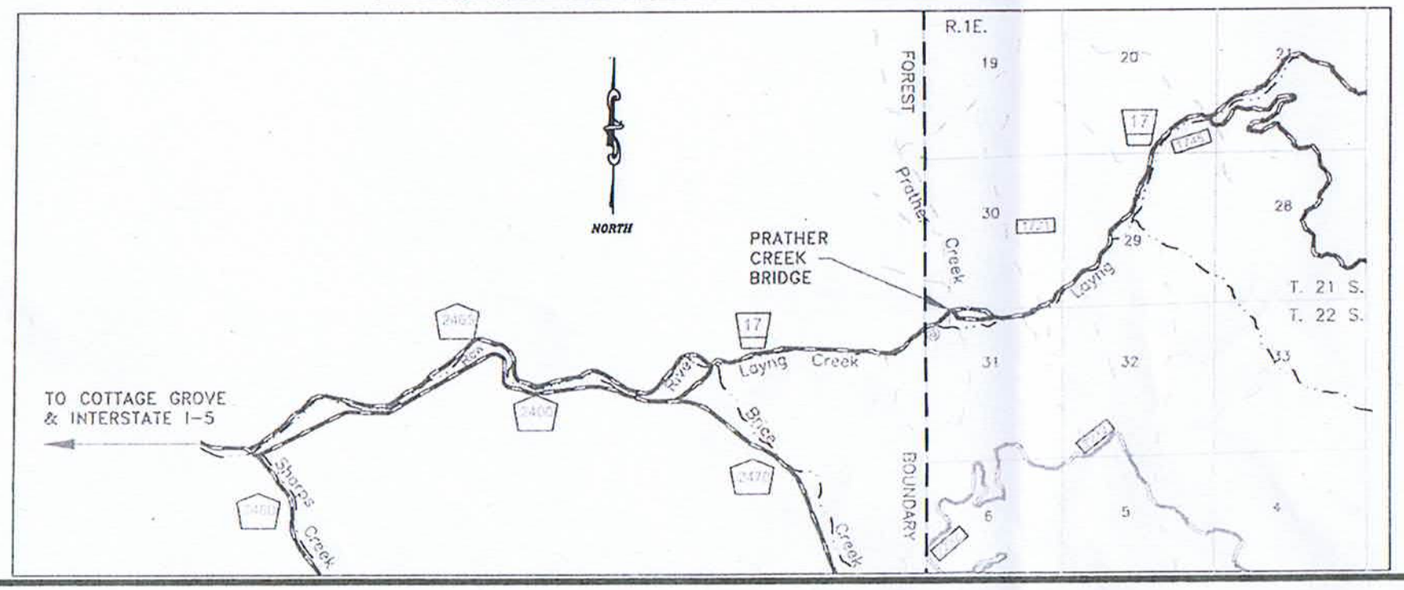


HEADWALL – INLET PROFILE VIEW



PRATHER CREEK BRIDGE RECONSTRUCTION
ROAD 17, MP 2.1
UMPQUA NATIONAL FOREST
COTTAGE GROVE DISTRICT
T21S, R1E, SEC. 31



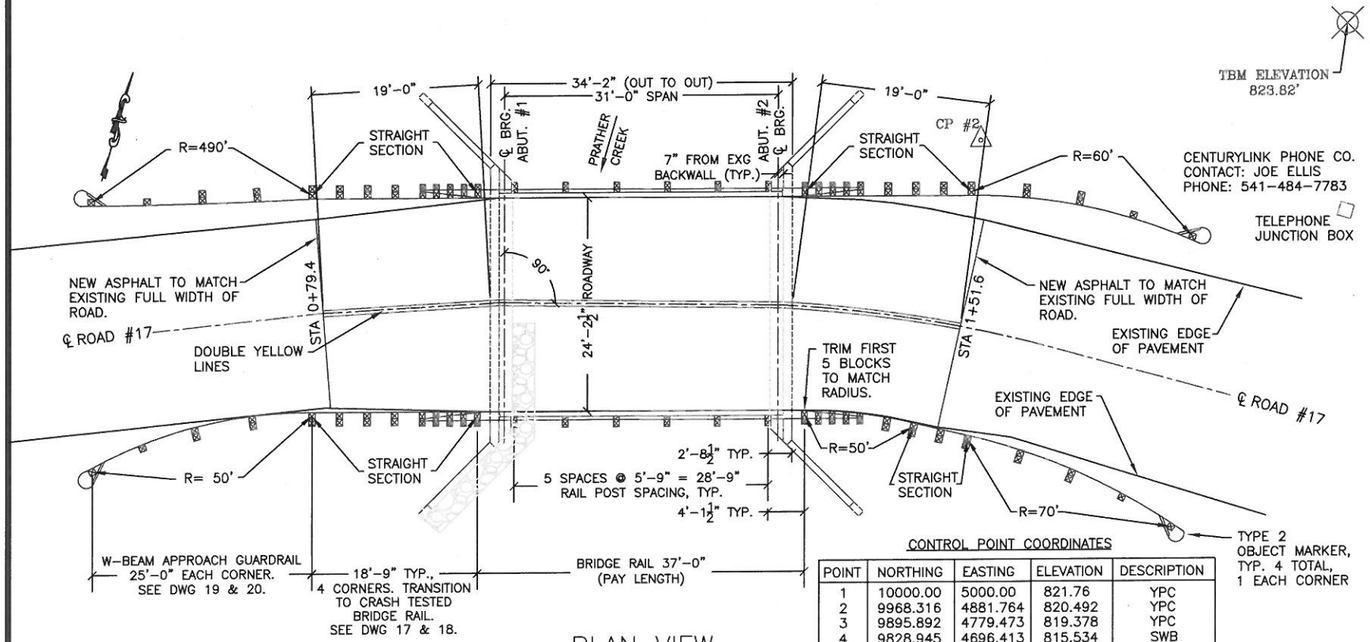


INDEX OF BRIDGE DRAWINGS	
NO.	DESCRIPTION
6	R34805 (1/5) PRATHER BRIDGE RECONSTRUCTION TITLE SHEET
7	R34805 (2/5) BRIDGE GENERAL LAYOUT
8	R34805 (3/5) EXISTING STRUCTURE REMOVAL
9	R34805 (4/5) DETAILS
10	R34805 (5/5) ABUTMENT RETROFIT AND DETAILS
11	(1/6) STD. LONGITUDINAL GLULAM PANEL DECKS
12	(2/6) STD. LONGITUDINAL GLULAM PANEL DECKS
13	(3/6) STD. LONGITUDINAL GLULAM PANEL DECKS
14	(4/6) STD. LONGITUDINAL GLULAM PANEL DECKS
15	(5/6) STD. LONGITUDINAL GLULAM PANEL DECKS
16	(6/6) STD. LONGITUDINAL GLULAM PANEL DECKS
17	(1/2 CRASH-TESTED BRIDGE RAIL FOR LONGITUDINAL WOOD DECKS
18	(2/2) CRASH-TESTED BRIDGE RAIL FOR LONGITUDINAL WOOD DECKS
19	(1/2) RS152 STD 37'-6" APPROACH RAIL W-BEAM
20	(2/2) RS152 STD 37'-6" APPROACH RAIL W-BEAM
21	RECONSTRUCTION WORKLIST

SCOPE OF BRIDGE RECONSTRUCTION WORK
(1) REMOVE EXISTING ASPHALT PAVEMENT, BRIDGE RAIL, DECK, AND SILL.
(2) REMOVE ALL STRINGERS. SALVAGE/STOCKPILE 10 INTERIOR STRINGERS.
(3) PLACE RIPRAP.
(4) PARTIALLY REMOVE BACKWALL. CONSTRUCT BACKWALL & BEARING SEAT.
(5) PLACE NEW GLULAM DECK PANELS, BRIDGE AND APPROACH RAILING.
(6) PLACE AGGREGATE BASE. PAVE APPROACHES & BRIDGE.

BRIDGE NOTES
1) EACH OF THE 6 LONGITUDINAL DECK PANELS HAVE 16.25" DEPTH BY 52.5" WIDE BY 32'-0" LONG. THE TWO LANE BRIDGE HAS 0 DEG. SKEW.
2) COMPLETE DECK PANEL FABRICATION, INCLUDING RAILING DRILL HOLES AND NOTCHES, PRIOR TO PRESERVATIVE TREATMENT.
3) PRIOR TO DELIVERY OF TREATED TIMBER, COMPLETE PROJECT SPECIFIC BMP'S FOR TREATED WOOD.
4) SUBMIT SHOP DRAWINGS & PAVING MEMBRANE, INCLUDING INSTALLATION PROCEDURE, A MINIMUM OF 30 DAYS PRIOR TO START OF WORK.
5) ELEVATIONS AND DIMENSIONS ARE TAKEN FROM EXISTING PLANS. CONTRACTOR TO VERIFY DIMENSIONS IN THE FIELD.

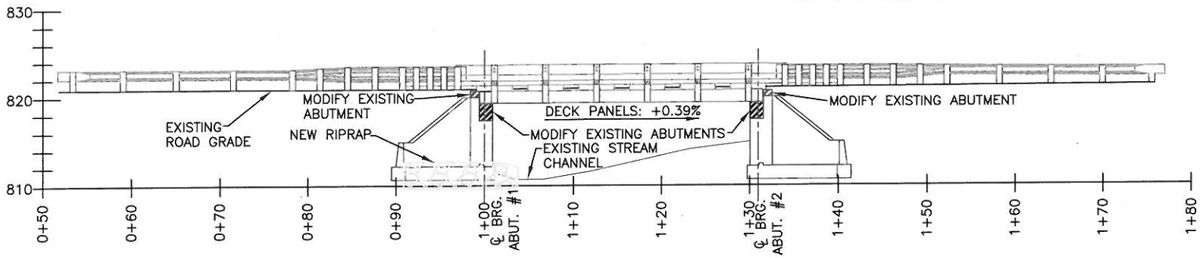
DESIGNED BY: Gabe Jackson-Messett / FOREST BRIDGE ENGINEER		4/18/2012 DATE
BRIDGE DESIGN APPROVED BY: Kathryn L. VanHecke / REGIONAL STRUCTURES ENGINEER		4/25/2012 DATE
PROJECT APPROVED BY: FOR Cecile Martin / DIRECTOR OF ENGINEERING		4/25/12 DATE
RECOMMENDED BY: Miles R. Backhurst / ASSISTANT FOREST ENGINEER		4/18/2012 DATE
APPROVED BY: / REALM STAFF OFFICE / FOREST ENGINEER		4/27/12 DATE
APPROVED BY: Deanna Gronert / DISTRICT RANGER		5/2/12 DATE



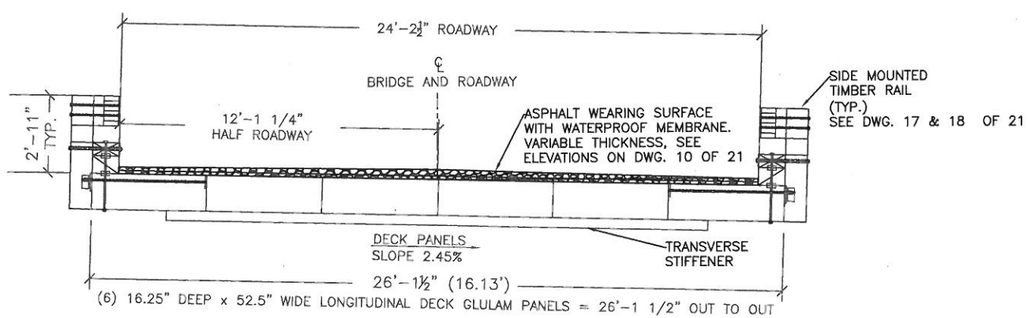
PLAN VIEW

CONTROL POINT COORDINATES

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	10000.00	5000.00	821.76	YPC
2	9968.316	4881.764	820.492	YPC
3	9895.892	4779.473	819.378	YPC
4	9828.945	4696.413	815.534	SWB
5	10066.48	4920.897	825.142	YPC
TMB			823.82	Spike in Tree



ELEVATION VIEW



TYPICAL SECTION

GENERAL NOTES

SPECIFICATIONS:
DESIGN: "AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 1996 WITH INTERIM REVISIONS THRU 1998."
CONSTRUCTION: "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF ROADS AND BRIDGES ON FEDERAL HIGHWAY PROJECTS, FP-03" WITH FOREST SERVICE SUPPLEMENTAL SPECIFICATIONS.

DESIGN:
DEAD LOAD: TIMBER AT 50 PCF, CONCRETE AT 150 PCF, STEEL AT 490 PCF, EARTH AT 120 PCF, LATERAL EARTH PRESSURE AT AN EQUIVALENT FLUID WEIGHT OF 36 PCF, ASPHALT AT 150 PCF.
LIVE LOAD: AASHTO HS20-44 LOADING INCREASED 25 PERCENT ("HS25") WITH IMPACT.
ALLOWABLE STRESSES: ALLOWABLE STRESSES IN ACCORDANCE WITH DESIGN SPECIFICATIONS ABOVE.

MATERIALS:
CONCRETE: AIR ENTRAINED CLASS A REINFORCED CONCRETE WITH A 28 DAY COMPRESSIVE STRENGTH OF 3500 PSI. FLOAT FINISH ABUTMENTS AND APPLY THE TYPES OF SURFACE TEXTURES CALLED FOR IN THE SPECIFICATIONS. APPLY CLASS 2, RUBBED FINISH TO VERTICAL FACES OF NEW SUBSTRUCTURE, APPLY CLASS 1, ORDINARY SURFACE FINISH TO ALL OTHER SURFACES. CHAMFER ALL EXPOSED EDGES AND FILLET ALL RE-ENTRANT ANGLES, 3/4 INCH OR AS APPROVED.
REINFORCING STEEL: CONFORM TO AASHTO M31 GRADE 60. CONCRETE COVER TO BE 2 INCHES, EXCEPT AS NOTED.
STRUCTURAL STEEL: FURNISH STRUCTURAL STEEL CONFORMING TO ASTM A36. HOT DIP GALVANIZE IN ACCORDANCE WITH AASHTO M111. FURNISH BOLTS AND LAG SCREWS IN ACCORDANCE WITH REQUIREMENTS OF ANSI/ASME STD B18.2.1-1981, GRADE 2 AND GALVANIZE, UNLESS OTHERWISE NOTED.
ELASTOMERIC BEARING PADS: CONFORM TO AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, DIVISION II, SECTION 18 AND THE SPECIFICATIONS.
GLUED LAMINATED TIMBER: AITC 117-2004, TABLE 8.2; DOUGLAS FIR SPECIES, COMBINATION 3 OR 5 FOR DECK PANELS. SEE OTHER DRAWINGS FOR RAILING AND POST REQUIREMENTS.
FABRICATION: FABRICATION AND QUALITY CONTROL OF STRUCTURAL GLUED-LAMINATED TIMBER CONFORMING TO THE DRAWINGS AND IN ACCORDANCE WITH ANSI/AITC A190.1. MANUFACTURE MEMBERS AS INDUSTRIAL APPEARANCE GRADE, FOR WET USE CONDITIONS, USING A PHENOL-RESORCINOL RESIN TYPE ADHESIVE THROUGHOUT.
TREATMENT: FURNISH PRESERVATIVE TREATED MATERIALS IN ACCORDANCE WITH THE CURRENT AMERICAN WOOD PROTECTION ASSOCIATION (AWPA) SPECIFICATIONS USING THE TREATMENT MATERIALS LISTED BELOW FOR ALL TREATED MEMBERS. COMPLY WITH THE REQUIREMENTS OF THE CURRENT EDITION OF WESTERN WOOD PRESERVERS INSTITUTE (WWPI) "BEST MANAGEMENT PRACTICES FOR THE USE OF TREATED WOOD IN AQUATIC AND OTHER SENSITIVE ENVIRONMENTS". PRIOR TO DELIVERY TO THE JOB SITE. ENSURE THE FOLLOWING POST-TREATMENT PROCEDURES ARE COMPLETE:
1) USE "EMPTY CELL" PROCESS FOLLOWED BY EXPANSION BATH OR STEAMING.
2) ALLOW 30 TO 45 DAYS OF WARM WEATHER FOR CURING.
REJECT MEMBERS THAT DEVELOP AREAS OF BLEEDING OR ARE NOT CLEAN, DRY AND RESIDUE-FREE. COMPLETELY AND ACCURATELY FABRICATE ALL MEMBERS INCLUDING DRILLING OF BOLT HOLES AND NOTCHES PRIOR TO TREATMENT. INCISE MEMBERS AFTER FABRICATION AND TREAT IN ACCORDANCE WITH AWPA USE CATEGORY SYSTEM (U1) FOR USE CATEGORY 4B GROUND CONTACT-HEAVY DUTY (UC4B) WITH PENTACHLOROPHENOL IN LIGHT OIL (TYPE C SOLVENT), PCP-C.
INSPECTION AND CERTIFICATION: MARK GLUED-LAMINATED TIMBER AS REQUIRED BY ANSI/AITC A190.1. FURNISH ONE COPY OF THE FOLLOWING COMPLIANCE CERTIFICATES UPON DELIVERY OF THE MATERIAL AND BEFORE INSTALLATION:
1. SUPPLIER CERTIFICATION THAT ALL WOOD MEETS THE SPECIFICATION & GRADING REQUIREMENTS, AND BEST MANAGEMENT PRACTICES AS CALLED FOR IN SPECIFICATION SECTIONS 557 AND 716.
2. LOT CERTIFICATION OF EACH CHARGE FOR THE PRESERVATIVE TYPE, PENETRATION IN INCHES, AND RETENTION IN POUNDS PER CUBIC FOOT (ASSAY METHOD) BY AN INDEPENDENT TESTING AND INSPECTION AGENCY ACCREDITED BY THE ALSC.
3. CERTIFICATION FROM A QUALIFIED INDEPENDENT TESTING AND INSPECTION AGENCY THAT ALL GLUED-LAMINATED MEMBERS CONFORM TO THE REQUIREMENTS OF ANSI/AITC A190.1. ALSO FURNISH AN AITC CERTIFICATE.
FIELD TREATMENT: NO FIELD CUTTING IS PERMITTED UNLESS APPROVED BY THE ENGINEER. CAREFULLY CLEAN OR TRIM AS APPROPRIATE, ALL ABRASIONS, CUTS, HOLES AND OTHER MODIFICATION TO TREATED TIMBER. TREAT WITH THREE BRUSH COATS OF COPPER NAPHTHENATE (OR APPROVED EQUIVALENT) MEETING AWPA P8 (MINIMUM 2% COPPER METAL SOLUTION). PLUG PLUG UNUSED HOLES WITH TIGHT FITTING TREATED PLUGS AFTER FIELD TREATMENT.
HARDWARE AND FASTENERS: FURNISH GALVANIZED NUTS, BOLTS AND WASHERS CONFORMING TO ASTM A307, UNLESS OTHERWISE NOTED.

DO NOT SCALE DRAWING

REV.	DESCRIPTION	APPROVED	DATE

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
THE PACIFIC NORTHWEST REGION (R-6)

PRATHER CREEK BRIDGE RECONSTRUCTION
GENERAL LAYOUT

Forest: UMPQUA
Bridge No.: 1700000-2.1
Location: S31,T21S,R1E
Loading: HS25
Length: 31'-0"(SPAN)
Width: 24'-2.5"(ROADWAY)

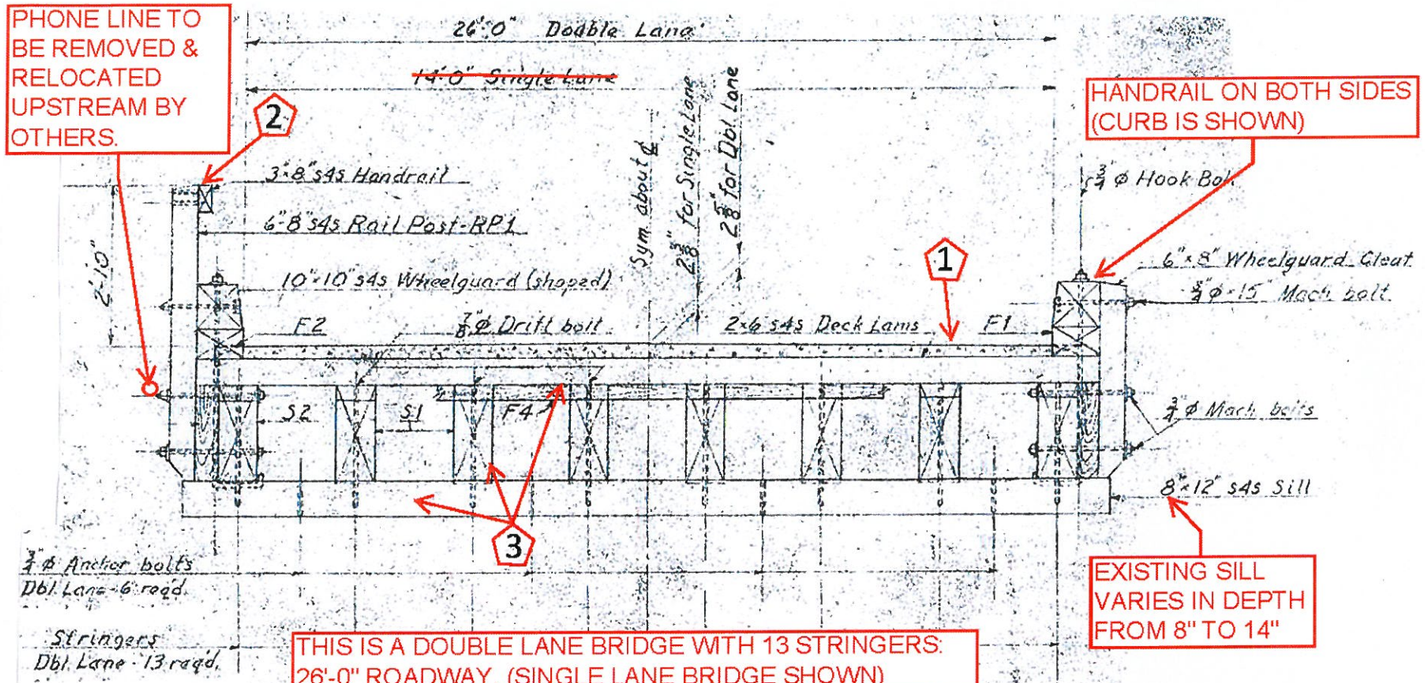
Designed: J.MERRITT Drawn: PSR Checked: MIS

Approved: Kathryn J. VanHecke
REGIONAL BRIDGE ENGINEER
Date: 4/25/2012

SHEET 2 of 5 | DWG.No. R34805

PHONE LINE TO BE REMOVED & RELOCATED UPSTREAM BY OTHERS.

HANDRAIL ON BOTH SIDES (CURB IS SHOWN)



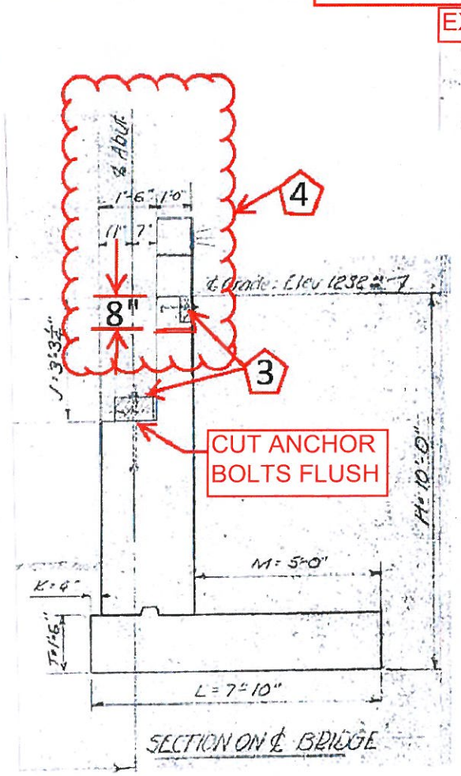
THIS IS A DOUBLE LANE BRIDGE WITH 13 STRINGERS: 26'-0" ROADWAY. (SINGLE LANE BRIDGE SHOWN)

EXISTING STRINGERS ARE 8" X 24"

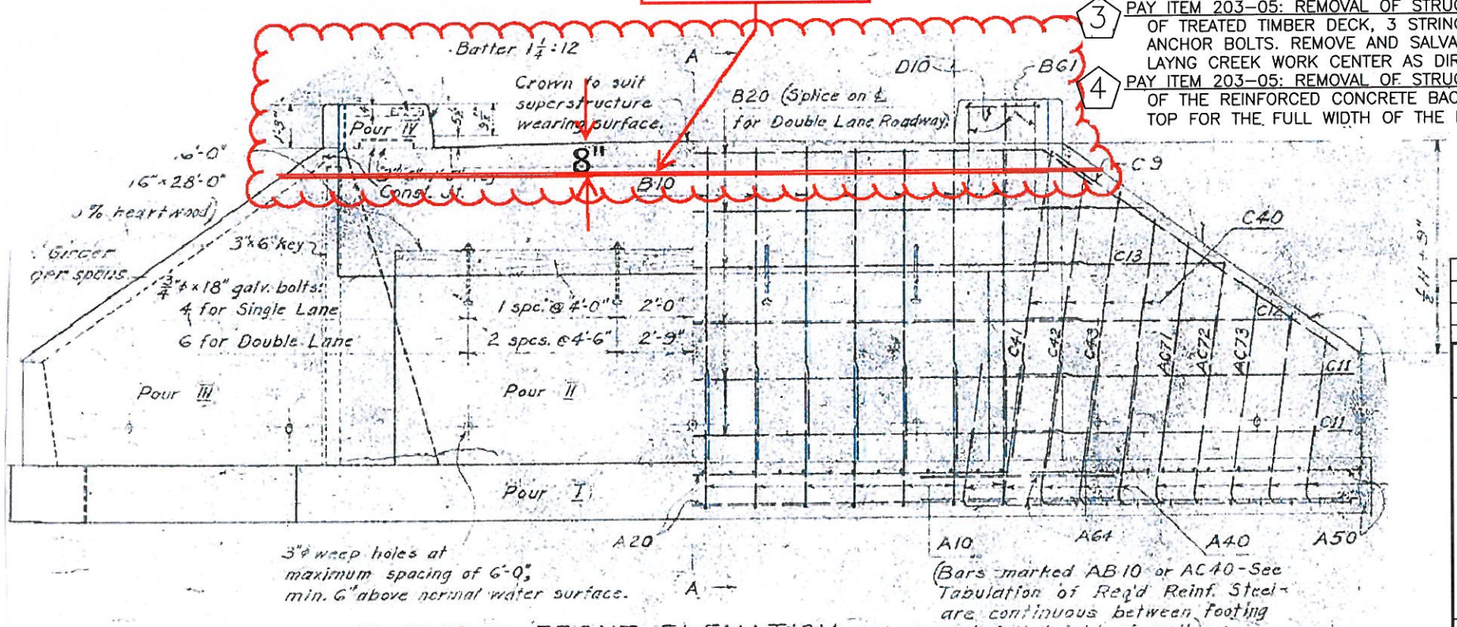
EXISTING SILL VARIES IN DEPTH FROM 8" TO 14"

END VIEW

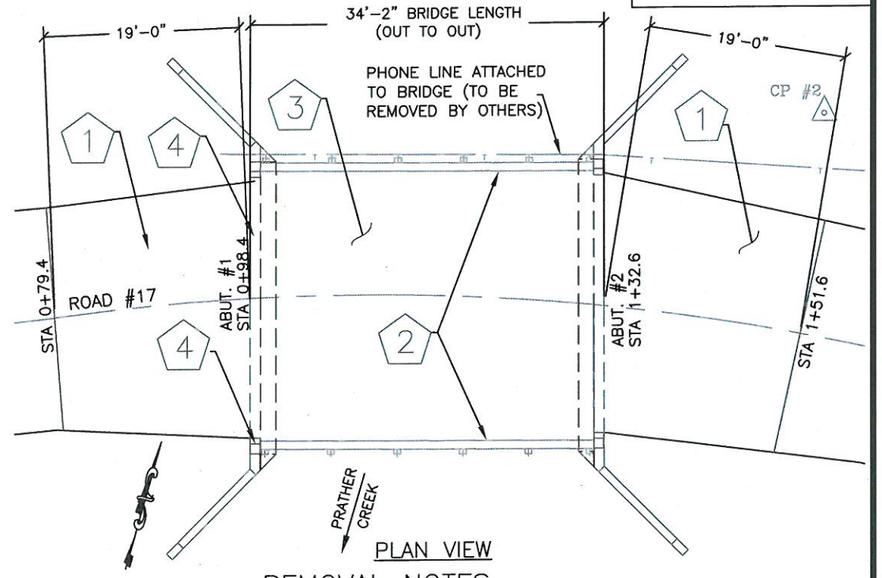
Single Lane with 8"x20" stringers — with & without handrails shown.



4 SAW CUT. REMOVE TOP 8" OF BACKWALL



ABUTMENT FRONT ELEVATION



PLAN VIEW

REMOVAL NOTES

DISPOSE OF MATERIAL OFF OF NATIONAL FOREST LANDS & IN ACCORDANCE WITH DEQ REGULATIONS, UNLESS OTHERWISE NOTED.

1. PAY ITEM 203-04: REMOVAL & DISPOSAL OF EXISTING ASPHALT CUT ASPHALT AT 90° FROM ROAD CENTERLINE. SAW CUT FULL WIDTH AND DEPTH OF ASPHALT PAVEMENT 19 FEET PRIOR TO AND 19 FEET PAST THE BACK OF ABUTMENT BACKWALL. REMOVE & DISPOSE OF ALL ASPHALT BETWEEN THE CUT LINES, INCLUDING ASPHALT ON THE BRIDGE. EXISTING ASPHALT DEPTH IS APPROX. 8 INCHES. EXCAVATE TO NEW SUBGRADE ELEVATION.
2. PAY ITEM 203-05: REMOVAL OF STRUCTURES & OBSTRUCTIONS REMOVE AND DISPOSE OF ENTIRE BRIDGE RAILING SYSTEM, INCLUDING ALL TIMBER AND HARDWARE.
3. PAY ITEM 203-05: REMOVAL OF STRUCTURES & OBSTRUCTIONS REMOVE AND DISPOSE OF TREATED TIMBER DECK, 3 STRINGERS AND SILLS, AND ALL HARDWARE. CUT ANCHOR BOLTS. REMOVE AND SALVAGE 10 INTERIOR STRINGERS & STOCKPILE AT LAYNG CREEK WORK CENTER AS DIRECTED BY ER.
4. PAY ITEM 203-05: REMOVAL OF STRUCTURES & OBSTRUCTIONS SAW CUT BOTH SIDES OF THE REINFORCED CONCRETE BACKWALL AT A DEPTH OF 8 INCHES FROM THE TOP FOR THE FULL WIDTH OF THE BACKWALL. REMOVE & DISPOSE OF MATERIAL.

DO NOT SCALE DRAWING

REV.	DESCRIPTION	APPROVED	DATE

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
THE PACIFIC NORTHWEST REGION (R-6)

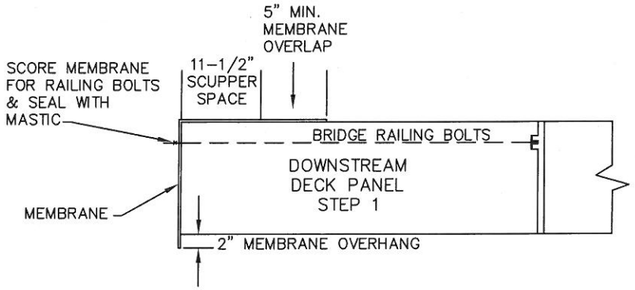
PRATHER CREEK BRIDGE
RECONSTRUCTION
EXISTING STRUCTURE REMOVAL

Forest: UMPQUA
Bridge No.: 1700000-2.1
Location: S31,T21S,R1E
Loading: HS25
Length: 31'-0"(SPAN)
Width: 24'-2.5"(ROADWAY)

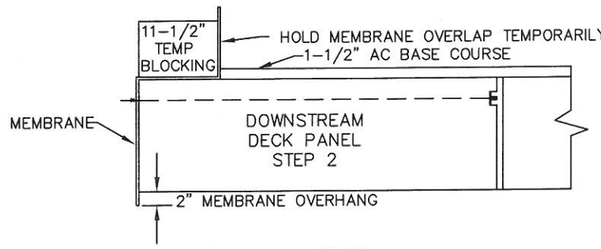
Designed: J.MERRITT Drawn: PSR Checked: MIS

Approved: Kathryn J. VanHecke REGIONAL BRIDGE ENGINEER Date: 4/25/2012

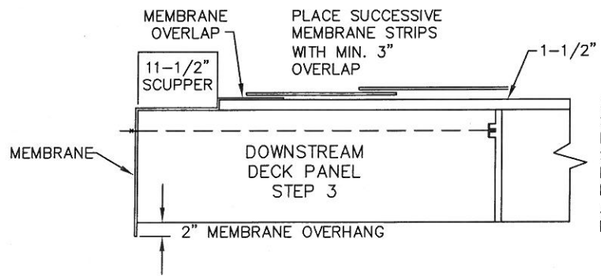
SHEET 3 of 5 | DWG. No. R34805



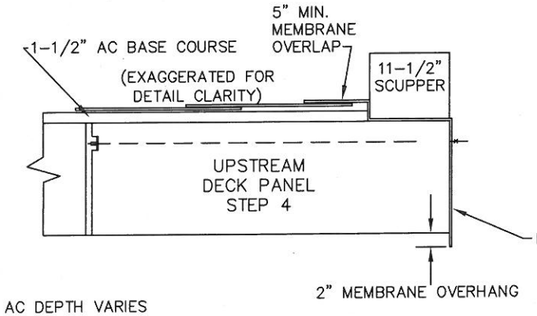
1. ON BOTH SIDES OF DECK, ADHERE MEMBRANE STRIP TO DECK EDGE. SCORE MEMBRANE OF BRIDGE RAILING BOLTS AND SEAL WITH MASTIC. ADHERE MEMBRANE TO DECK THE WIDTH OF SCUPPER. DO NOT ADHERE OVERLAP STRIP TO DECK. OVERLAP STRIP MUST BE AT LEAST 5". MEMBRANE MUST EXTEND BEYOND BEGINNING AND END OF BRIDGE BY 3'.



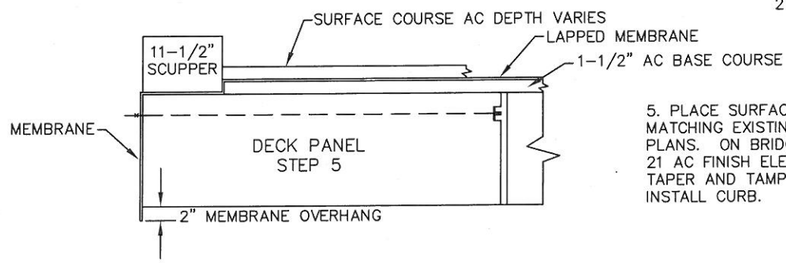
2. INSTALL TEMPORARY BLOCKING SAME WIDTH AS SCUPPER AND FULL LENGTH OF BRIDGE. TEMPORARILY HOLD MEMBRANE STRIP AGAINST VERTICAL FACE OF BLOCKING. PLACE 1-1/2" BASE COURSE AC ON BRIDGE, PLACE FULL WIDTH UP TO EDGE OF TEMPORARY BLOCKING.



3. REMOVE TEMPORARY BLOCKING, DRILL AND SEAL HOLES FOR SCUPPER AND CURB BOLTS. INSTALL SCUPPERS ACCORDING TO PLANS. STARTING AT DOWNSTREAM SIDE, ADHERE MEMBRANE OVERLAP TO AC BASE COURSE. PLACE SUCCESSIVE MEMBRANE WITH MINIMUM 3" OVERLAP ON TOP, SHINGLE STYLE. SEAL MEMBRANE EDGES WITH MASTIC.



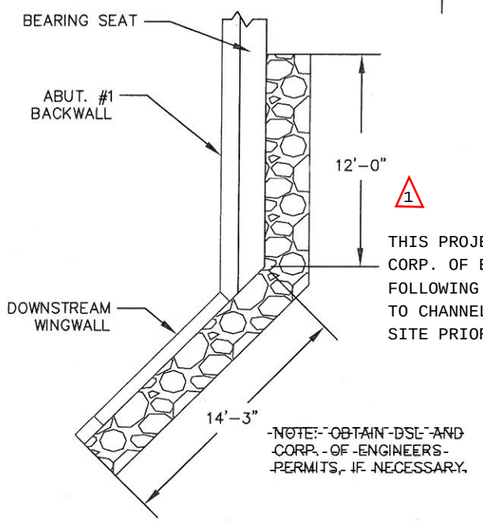
4. PLACE THE "OVERLAP" MEMBRANE STRIP ON THE UPSTREAM SIDE OF BRIDGE ON TOP OF THE LAST LAID MEMBRANE. SEAL MEMBRANE EDGES WITH MASTIC. ADHERE MEMBRANE TO THE BASE COURSE ON APPROACHES.



5. PLACE SURFACE COURSE OF AC MATCHING EXISTING AC ACCORDING TO PLANS. ON BRIDGE USE DRAWING 10 OF 21 AC FINISH ELEVATIONS. TAPER AND TAMP AC BETWEEN SCUPPERS. INSTALL CURB.

MEMBRANE INSTALLATION

FURNISH WATERPROOF AND STRESS-RELIEVING PAVING MEMBRANE IN ACCORDANCE WITH FP-03 SECTION 415. SUBMIT PRODUCT INFORMATION AND INSTALLATION INSTRUCTIONS PRIOR TO ORDERING THE MATERIALS. AC = HMAC (ASPHALT PAVEMENT), PAY ITEM 403-51

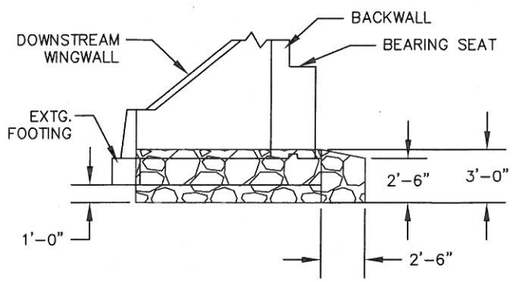


THIS PROJECT IS EXEMPT FROM DSL AND CORP. OF ENGINEERS PERMITS UNDER THE FOLLOWING CONDITIONS: MINIMIZE DISTURBANCE TO CHANNEL & BANKS, AND DEWATER THE SITE PRIOR TO AND DURING THE WORK.

~~NOTE: OBTAIN DSL AND CORP. OF ENGINEERS PERMITS, IF NECESSARY.~~

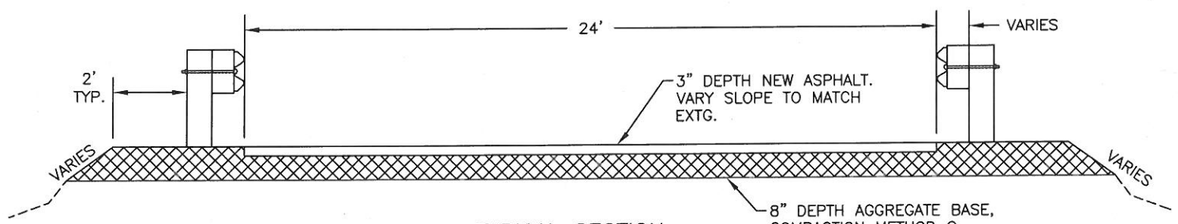
RIPRAP PLACEMENT PLAN DETAIL

CLASS 5 AT ABUTMENT #1



RIPRAP PLACEMENT ELEVATION DETAIL

CLASS 5 AT ABUTMENT #1



TYPICAL SECTION FINISHED APPROACH ROADWAY

DO NOT SCALE DRAWING

REV.	DESCRIPTION	APPROVED	DATE
1	Clarify Permits	JJM	6/5/12

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
THE PACIFIC NORTHWEST REGION (R-6)

PRATHER CREEK BRIDGE RECONSTRUCTION DETAILS

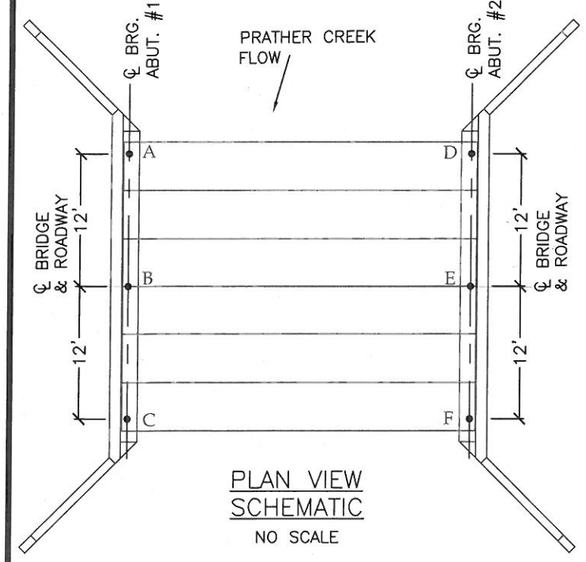
Forest: UMPQUA
Bridge No.: 1700000-2.1
Location: S31,T21S,R1E

Loading: HS25
Length: 31'-0"(SPAN)
Width: 24'-2.5"(ROADWAY)

Designed: J.MERRITT Drawn: PSR Checked: MIS

Approved: Kathryn L. VanHecke REGIONAL BRIDGE ENGINEER Date: 9/25/2012

SHEET 4 of 5 | DWG. No. R34805



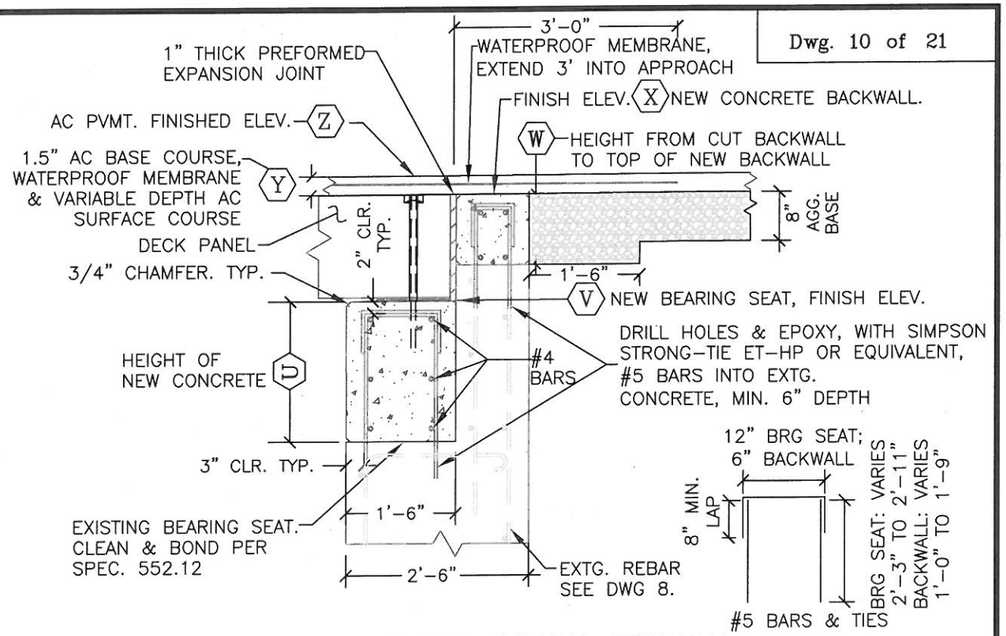
PLAN VIEW SCHEMATIC

NO SCALE

ABUTMENT SECTIONS ⬡						
FINISHED ELEV. SHOWN		BEARING SEAT ELEV.		BACK-WALL ELEV.		AC FINISH ELEV.
SECTION/POINT	U	V	W	X	Y	Z
ABUT. 1 PT. A	2'-5 1/2"	819.59'	1'-3"	820.99'	3 1/4"	821.26
ABUT. 1 PT. B	2'-2"	819.30'	11 1/2"	820.70'	4 3/8"	821.06
ABUT. 1 PT. C	1'-10 1/2"	819.00'	8"	820.40'	3"	820.65
ABUT. 2 PT. D	2'-6 1/2"	819.71'	1'-4 1/2"	821.11'	3"	821.36
ABUT. 2 PT. E	2'-3"	819.42'	1'-1"	820.82'	4 7/8"	821.22
ABUT. 2 PT. F	1'-11 1/2"	819.12'	9 1/2"	820.52'	3 1/3"	820.80

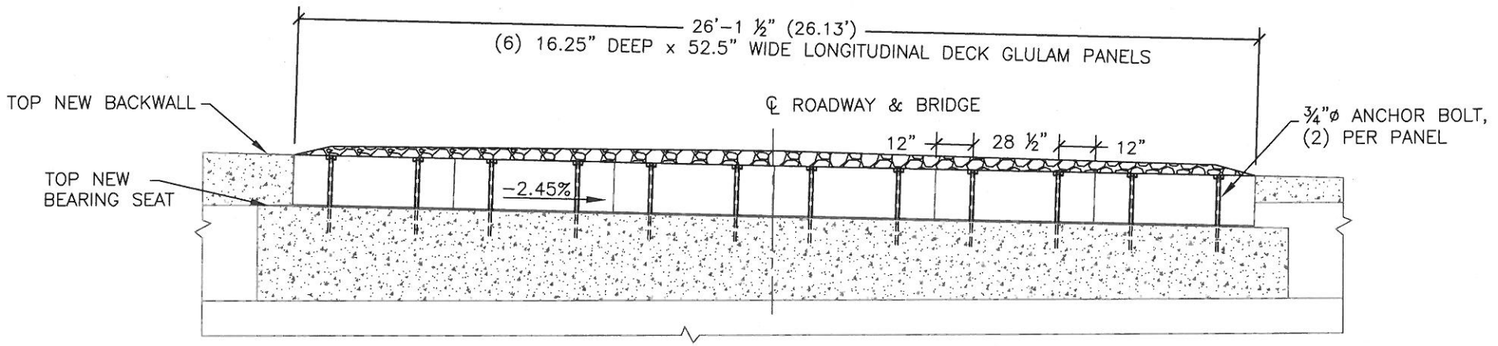
NOTE: DIMENSIONS ARE APPROXIMATE.
USE ELEVATIONS FOR CONTROL.

ABUTMENT RETROFIT TABLE



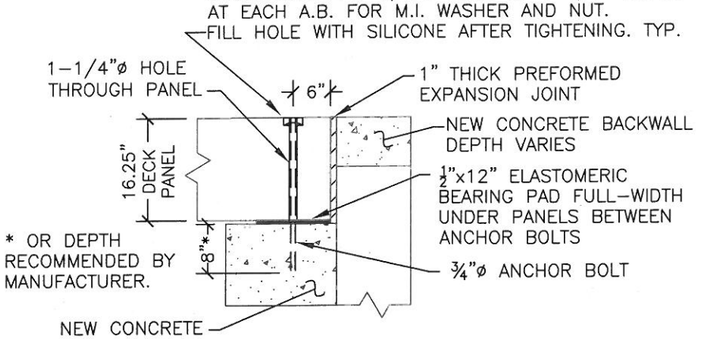
ABUTMENT TYPICAL SECTION

SCALE: 1/2" = 1'-0"



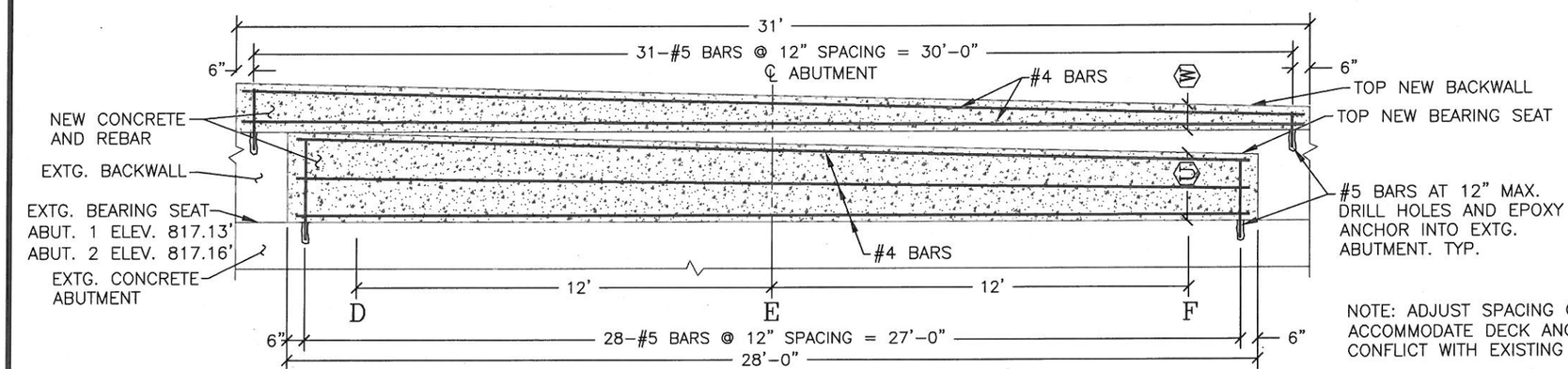
ABUTMENT 2 ELEVATION – PANEL PLACEMENT

LOOKING AHEAD ON STATION. ABUTMENT 1 OPPOSITE LOOKING BACK ON STATION (MIRRORED)



BEARING DETAIL

SCALE: 1/2" = 1'-0"



ABUTMENT 2 ELEVATION

LOOKING AHEAD ON STATION. ABUTMENT 1 OPPOSITE LOOKING BACK ON STATION (MIRRORED.)
SCALE: ¼" = 1'-0"

NOTE: ADJUST SPACING OF #5 BARS TO ACCOMMODATE DECK ANCHOR BOLTS OR CONFLICT WITH EXISTING REBAR.

REV.	DESCRIPTION	APPROVED	DATE

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
THE PACIFIC NORTHWEST REGION (R-6)

PRATHER CREEK BRIDGE
RECONSTRUCTION
ABUTMENT RETROFIT & DETAILS

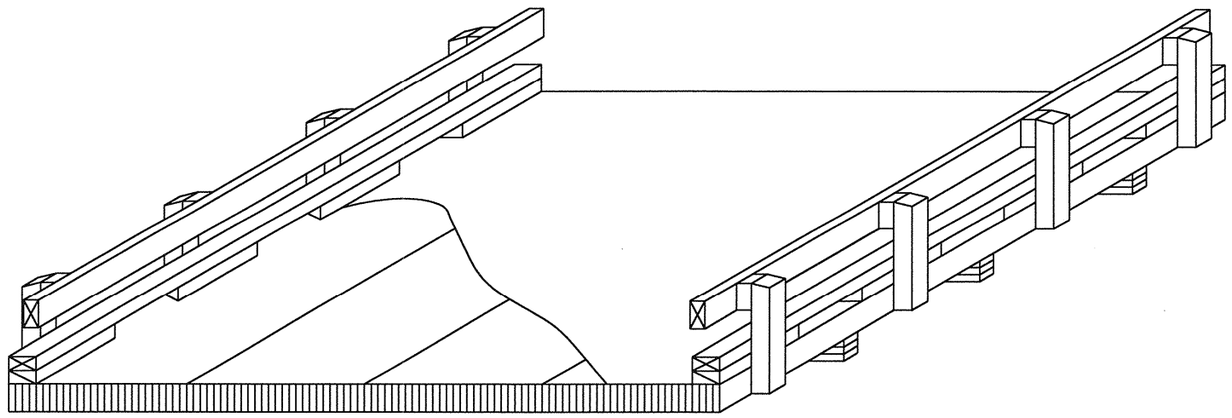
Forest: UMPQUA
Bridge No.: 1700000-2.1
Location: S31,T21S,R1E
Loading: HS25
Length: 31'-0"(SPAN)
Width: 24'-2.5"(ROADWAY)

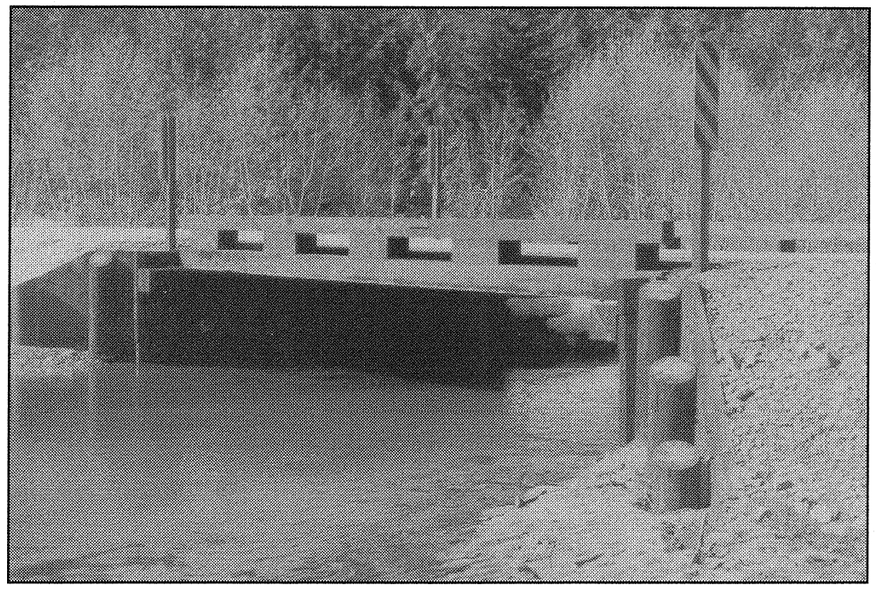
Designed: J.MERRITT Drawn: PSR Checked: MIS

Approved: Kathleen A. Van Heeke
REGIONAL BRIDGE ENGINEER
Date: 4/25/2012

SHEET 5 of 5 | DWG.No. R34805

Longitudinal Deck Systems:
Longitudinal Glulam Panel Decks

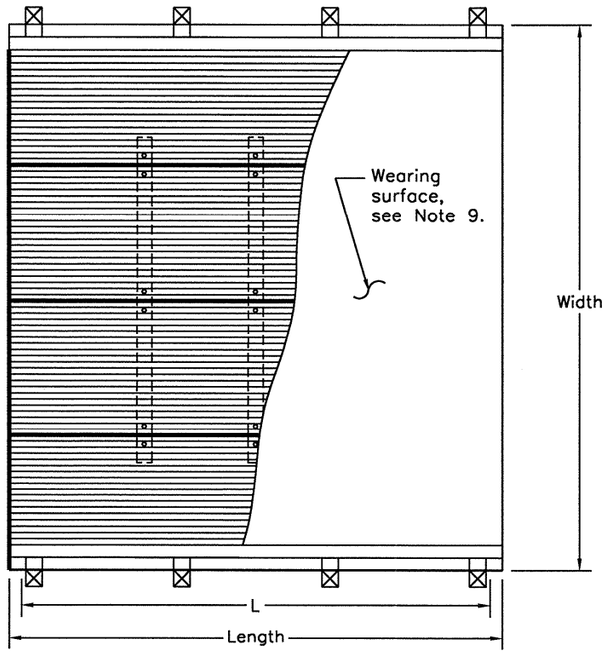




The bridge superstructures depicted on these drawings were developed under a cooperative research agreement between the Federal Highway Administration, the USDA Forest Service, Forest Products Laboratory, and Laminated Concepts, Inc.

Longitudinal Glulam Panel Decks		Title Page
Standard Plans for Timber Bridge Superstructures	December 2000	Sheet 1 of 6

Plan, Profile, and Section Views

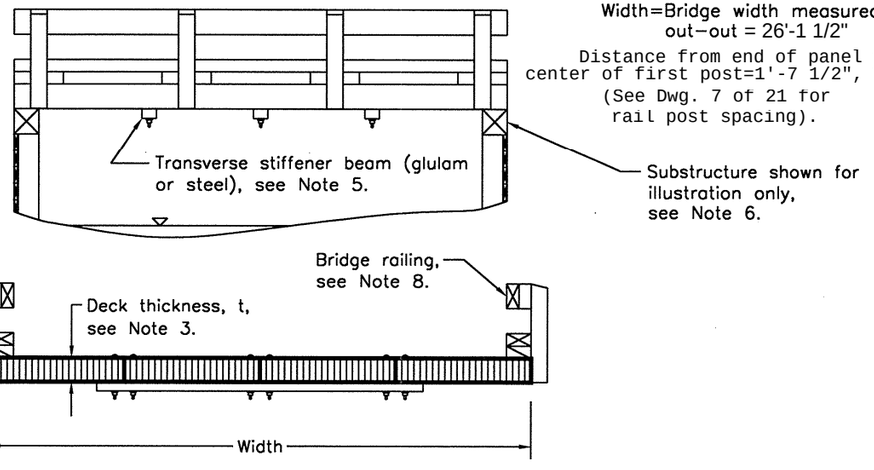


L=Bridge span measured c–c of bearings = 31'-0"

Length=Bridge length measured out–out = 32'-0"

Width=Bridge width measured out–out = 26'-1 1/2"

Distance from end of panel to center of first post=1'-7 1/2", Typ. (See Dwg. 7 of 21 for rail post spacing).



General Notes

Dwg. 12 of 21

DESIGN

1. These drawings are for longitudinal glulam timber decks. The decks consist of a series of glulam panels that are placed side–by–side between supports and interconnected with transverse stiffener beams. The designs are applicable for single– and double–lane and unskewed and skewed bridges up to 38–ft long. Design truck loading is AASHTO HS20–44 or HS25–44, with live load deflection limits of L/360 or L/500.

2. The designs comply with the 1996 *Standard Specifications for Highway Bridges*, with 1998 Interims, published by the American Association of State Highway and Transportation Officials (AASHTO), except where noted. Load distribution is based on a load fraction (as specified in AASHTO) applied to each panel based on the panel width and bridge span. Deck panels with multiple–piece laminations are assumed to have unbonded edges.

3. Minimum required timber design values are provided for single–span bridge lengths of 12– to 38–ft in 2–ft increments. Deck thicknesses are specified for standard Southern Pine and Western Species glulam sizes ranging from 8–1/2 to 16–1/4 in. The required minimum deck thickness for a specific bridge length can be selected from tables on Sheet 5 of 6 and Sheet 6 of 6, based on material, loading, and deflection requirements.

4. Design calculations are based on actual deck panel widths of 42–in. for single–lane bridges and 50.9–in. for double–lane bridges. Bridge widths are variable by adjusting the number and width of deck panels as shown on Sheet 3 of 6.

5. Deck panels are interconnected with glulam or steel–channel transverse stiffener beams through–bolted to the panel undersides. Refer to Sheet 4 of 6 for transverse stiffener beam layout and connection details.

6. The design assumes a uniform bearing length of 12–in. at both bridge ends and a span length, L, measured center–to–center of bearings. A longer bearing length will result in a slightly more conservative design. Substructure connection details are provided on ~~Page 34~~. Dwg. 10 of 21.

7. Multiple span bridges may be constructed using a series of simple spans based on the designs presented in these drawings. Multiple span continuous bridges are also commonly used and may be more economical but require site–specific design. Refer to Page 34 for intermediate support connection details for both simple and continuous spans.

8. Bridge rail and curb drawings are for illustration purposes only and must be designed based on site specific requirements. Deck designs are based on an assumed dead load of 10 lb/ft^2 for the rail and curb system. Crashworthy rail designs are available in *Plans for Crash–Tested Bridge Railings for Longitudinal Wood Decks* (Ritter et al.1995) and *Plans for Crash–Tested Bridge Railings for Longitudinal Wood Decks on Low–Volume Roads* (Ritter et al. 1998). See Dwg.17 & 18 for Railing System. Note "Detail A" during panel fabrication & assembly.

9. An asphalt wearing surface with a geotextile fabric or membrane is recommended for most timber bridge applications. Deck designs are based on an assumed dead load of 38 lb/ft^2 for an asphalt wearing surface (approximately 3–in.). Refer to ~~Page 53 for recommended~~ asphalt wearing surface construction details. Dwg. 9 & 10 of 21.

10. These designs are intended for informational purposes only and, due to potential variations in design requirements and use conditions, should be verified by a qualified professional engineer.

MATERIAL AND FABRICATION

Wood

11. Glulam deck panels shall comply with the requirements of AASHTO M168 and ANSI/AITC A190.1 and shall be manufactured to an Industrial appearance using wet–use adhesives.

12. Any species of glulam may be used provided it is treatable with wood preservatives and tabulated design values are provided in the AASHTO *Standard Specifications for Highway Bridges*. Deck panel glulam combinations should be selected from the tables for "members stressed primarily in axial tension or compression".

13. Insofar as is practical, all glulam shall be cut, drilled, and completely fabricated prior to pressure treatment with preservatives. Refer to Sheet 3 of 6 and Sheet 4 of 6 for layout details.

Preservative Treatment

14. All glulam shall be treated in accordance with AASHTO M133 and AWPA Standard C14 with one of the following preservatives: See General Layout Dwg. 7 of 21.

~~a. Coal tar creosote conforming to AWPA Standard P1/P13~~

b. Suitable oil borne preservatives conforming to AWPA Standard P8 in hydrocarbon solvent, ~~Type A~~ or Type C.

15. Treated material shall follow post–treatment requirements summarized in *Best Management Practices for the Use of Treated Wood in Aquatic Environments* ~~(WWPI 1998)~~ to ensure all surfaces are free of excess preservative and chemicals are fixated in the wood.

16. Preservative treatment shall be inspected and certified in accordance with AASHTO M133 and AWPA Standard M2.

Steel Fasteners and Hardware

17. Steel plates and shapes shall comply with the requirements of ASTM A36.

18. Bolts and lag screws shall comply with the requirements of ANSI/ASME Standard B18.2.1–1981, Grade 2.

19. All steel components and fasteners shall be galvanized in accordance with AASHTO M111 or AASHTO M232 or otherwise protected from corrosion.

20. Washers shall be provided under bolt and lag screw heads and under nuts that are in contact with wood. Washers may be omitted under heads of special timber bolts or dome–head bolts when the size and strength of the head is sufficient to develop connection strength without wood crushing.

CONSTRUCTION

21. Longitudinal glulam decks are typically constructed by placing the center panels first, then placing the outside panels. Stiffener beams should be attached as the panels are placed, but connecting bolts should not be tightened beyond hand tight until all panels are in place.

22. Glulam panels may swell slightly in the transverse direction due to moisture content increases in–service. In constructing supports, space should be left at the bridge edges to allow for possible lateral expansion. Provisions for longitudinal expansion, parallel to traffic, are not required since little expansion will occur in this direction.

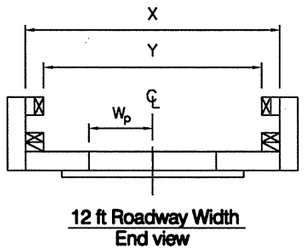
23. All wood and metal components shall be handled and stored carefully so as not to damage the material. If damage does occur, exposed, untreated wood shall be field treated in accordance with AASHTO M133. Damage to galvanized surfaces shall be repaired with a cold galvanizing compound or other approved coating.

24. The application of a bituminous sealer is recommended to prevent excessive wood checking in areas where the wood end grain is exposed. Vertical joint surfaces, between glulam panels, should also be coated to minimize moisture penetration. Any commercially available roofing cement is effective.

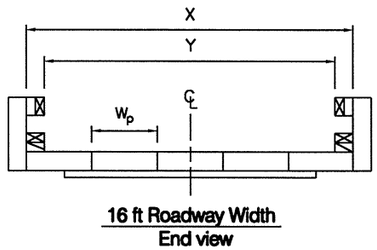
The bridge superstructures depicted on these drawings were developed under a cooperative research agreement between the Federal Highway Administration, the USDA Forest Service, Forest Products Laboratory, and Laminated Concepts, Inc.

Deck Panel Layouts

Single-Lane Bridges



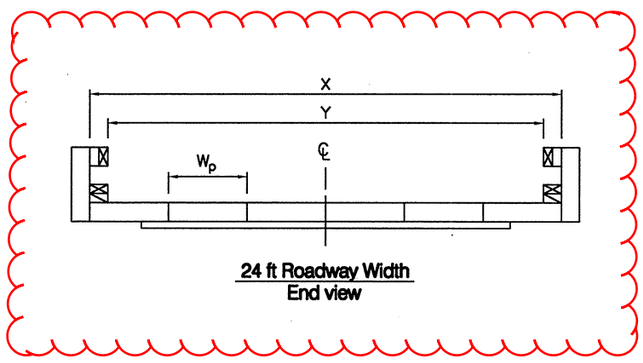
12 ft Roadway Width
End view



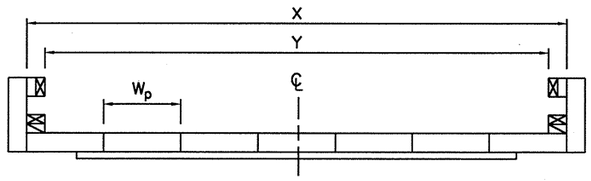
16 ft Roadway Width
End view

X = Nominal bridge width (out–out)
Y = Nominal roadway width
W_p = Deck panel width

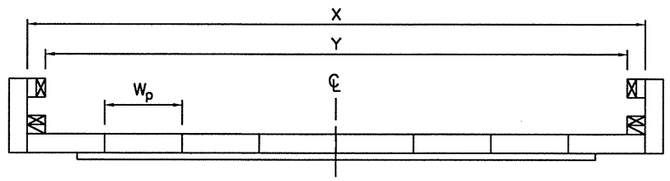
Double-Lane Bridges



24 ft Roadway Width
End view



28 ft Roadway Width
End view



32 ft Roadway Width
End view

Notes

1. Deck panel layouts on this sheet are for single–lane bridges of nominal 12– and 16–ft roadway widths and double–lane bridges of nominal 24–, 28–, and 32–ft roadway widths. Actual bridge widths vary slightly from nominal widths depending on the panel width, which is a multiple of the standard lamination thickness.

2. Actual bridge widths are given in Table 5.1 based on 1–1/2–in.–thick laminations for Western Species glulam and 1–3/8–in.–thick laminations for Southern Pine glulam. The nominal bridge width (X) assumes a 1–ft wide curb/railing along each deck edge.

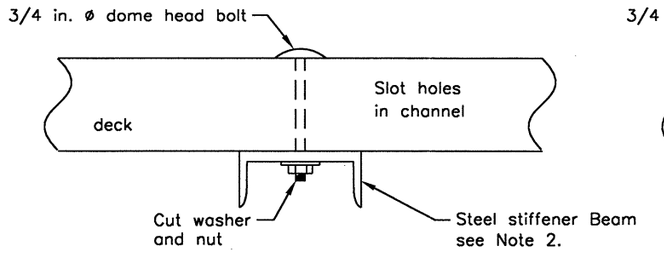
3. Load distribution for longitudinal glulam deck panels is a function of the panel width. These designs are based on a panel width of 42–in. for single–lane bridges and 50.9–in. for double–lane bridges. Panel widths larger than the assumed values result in a slightly more conservative design which is typically negligible for the widths given in Table 5.1.

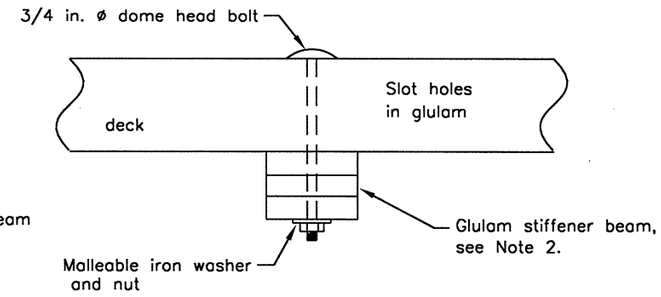
4. Refer to Sheet 4 of 6 for transverse stiffener beam layouts and Sheet 5 of 6 and Sheet 6 of 6 for deck thickness requirements.

Table 5.1 – Deck Panel Summary

Nominal Roadway Width, Y (ft)	Nominal Bridge Width, X (ft)	Total Number of Panels	Western Species Glulam (1–1/2 in. thick laminations)		Southern Pine Glulam (1–3/8 in. thick laminations)	
			Panel Width, W_p (in.)	Bridge Width Out–Out (ft)	Panel Width, W_p (in.)	Bridge Width Out–Out (ft)
12	14	4	42.0	14.00	42.6	14.20
16	18	5	43.5	18.13	44.0	18.33
24	26	6	52.5	26.13	52.3	26.13
28	30	7	51.0	29.75	52.3	30.47
32	34	8	51.0	34.00	50.9	33.92

Transverse Stiffener Beam Layout





Notes

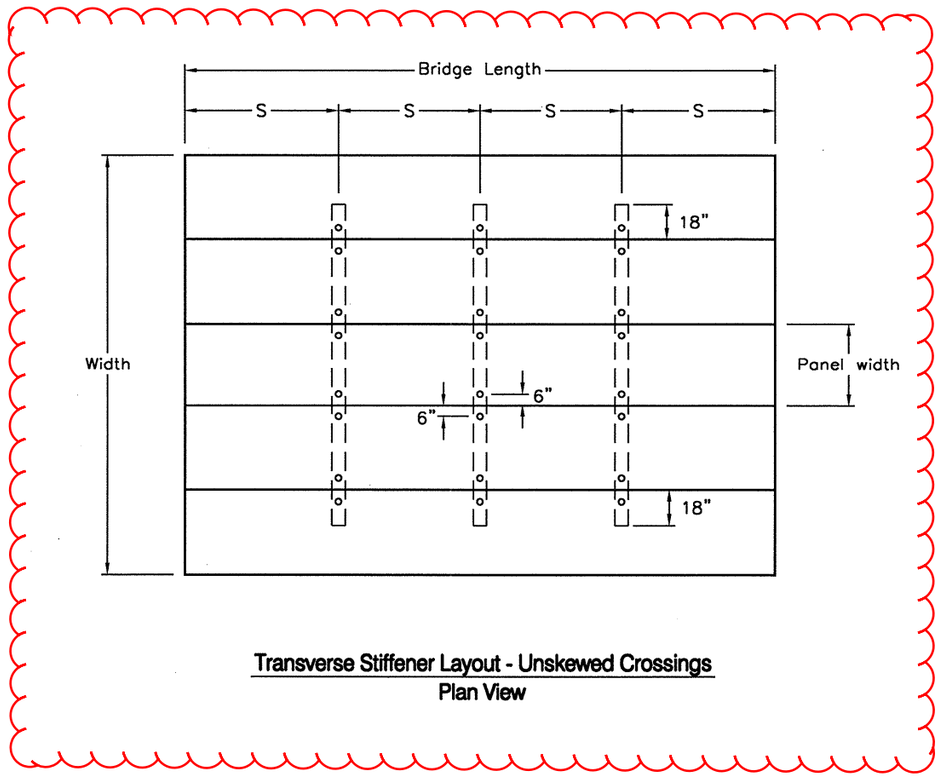
1. Transverse stiffener beams shall be attached to the deck underside to transfer loads between adjacent panels. Transverse stiffener beams are placed at midspan and at intermediate locations, while not exceeding a 10–ft spacing (see Table 5.2). For unskewed and skewed crossings, stiffener beams shall be placed parallel to the abutments.

2. Transverse stiffener beams shall be manufactured of glulam timber or steel. For Western Species glulam, a Combination 2 beam measuring 6–3/4–in.–wide and 4–1/2–in.–deep may be used. For Southern Pine glulam, a Combination 48 beam, 5–in.–wide and 5–1/2–in.–deep may be used. For steel, a miscellaneous channel (MC6x15.1) beam may be used. Other glulam combinations or steel shapes may be used provided they are of sufficient size and stiffness to provide a minimum E'I of 80,000 lb–in^2.

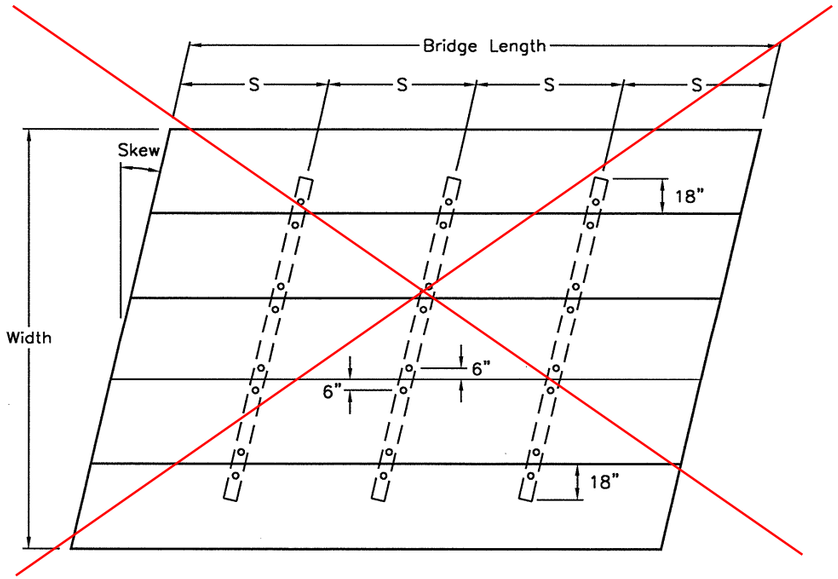
3. Transverse stiffener beams shall be attached to the deck panels with 3/4–in.–diameter through–bolts placed approximately 6–in. from panel edges. For the exterior panels, the transverse stiffener beam shall extend a minimum of 18–in. beyond the panel interface. Bolt holes in the transverse stiffener beams shall be slotted (twice bolt diameter) in the direction of the stiffener beam length to allow for possible deck panel swelling.

Steel Channel Connection
Side View

Glulam Beam Connection
Side View



Transverse Stiffener Layout - Unskewed Crossings
Plan View



Transverse Stiffener Layout - Skewed Crossings
Plan View

Table 5.2 – Stiffener Requirements

Bridge Length (ft)	Number of Stiffeners	Stiffener Spacing, S (ft)
12	1	6.0
14	1	7.0
16	1	8.0
18	1	9.0
20	3	5.0
22	3	5.5
24	3	6.0
26	3	6.5
28	3	7.0
30	3	7.5
32	3	8.0
34	3	8.5
36	3	9.0
38	3	9.5

S – Transverse stiffener beam spacing

The bridge superstructures depicted on these drawings were developed under a cooperative research agreement between the Federal Highway Administration, the USDA Forest Service, Forest Products Laboratory, and Laminated Concepts, Inc.

Table 5.3 — Longitudinal Glulam Deck Design Table for Single Lane Bridges

Bridge Length (ft)	Span L (ft)	Required Value	AASHTO HS20–44 Loading: Minimum Required F_b' (lb/in^2) and E′ (x10^6 lb/in^2) Values for Actual Deck Thickness[a] (t) Ranging from 8–½ to 16–¼–in.							AASHTO HS25–44 Loading: Minimum Required F_b' (lb/in^2) and E′ (x10^6 lb/in^2) Values for Actual Deck Thickness[a] (t) Ranging from 8–½ to 16–¼–in.						
			8½	8¾	10½	10¾	12¼	14¼	16¼	8½	8¾	10½	10¾	12¼	14¼	16¼
12	11	F_b'	891	842						1,088	1,028	720	688			
		E′ for L/360	0.73	0.67						0.92	0.84	0.49	0.45			
		E′ for L/500	1.02	0.93						1.27	1.17	0.68	0.63			
14	13	F_b'	1,061	1,003	705	674				1,290	1,220	855	817	635		
		E′ for L/360	1.01	0.93	0.54	0.50				1.26	1.15	0.67	0.62	0.42		
		E′ for L/500	1.41	1.29	0.75	0.70				1.75	1.60	0.93	0.86	0.58		
16	15	F_b'	1,235	1,168	822	786	612			1,496	1,413	993	948	737		
		E′ for L/360	1.32	1.21	0.70	0.65	0.44			1.65	1.52	0.88	0.82	0.55		
		E′ for L/500	1.83	1.68	0.97	0.91	0.61					1.22	1.14	0.77		
18	17	F_b'	1,411	1,335	941	900	702				1,609	1,132	1,082	842	631	
		E′ for L/360	1.67	1.53	0.89	0.83	0.56				1.92	1.11	1.04	0.70	0.44	
		E′ for L/500			1.23	1.15	0.78					1.54	1.44	0.97	0.62	
20	19	F_b'		1,505	1,063	1,017	794					1,273	1,217	948	712	
		E′ for L/360		1.89	1.09	1.02	0.69					1.37	1.27	0.86	0.55	
		E′ for L/500			1.52	1.41	0.96					1.90	1.77	1.20	0.76	
22	21	F_b'			1,188	1,136	889	670				1,417	1,354	1,057	795	621
		E′ for L/360			1.32	1.23	0.83	0.53				1.65	1.53	1.04	0.66	0.44
		E′ for L/500			1.83	1.70	1.15	0.73						1.44	0.91	0.62
24	23	F_b'			1,316	1,259	986	745						1,167	879	688
		E′ for L/360			1.74	1.62	1.09	0.69						1.37	0.87	0.58
		E′ for L/500					1.52	0.96							1.20	0.81

a — Western species glulam sizes are 8 ¾, 10 ¾, 12 ¼, 14 ¼, and 16 ¼–in.; Southern pine glulam sizes are 8 ½, 10 ½, 12 ¼, 14 ¼, and 16 ¼–in.

Bridge Length (ft)	Span L (ft)	Required Value	Table Continued: HS20-44 Minimum Required Values for Actual Deck Thickness[a] (t) Ranging from 8–½ to 16–¼–in.			HS25-44 Minimum Required Values for Actual Deck Thickness[a] (t) Ranging from 8–½ to 16–¼–in.		
			12¼	14¼	16¼	12¼	14¼	16¼
26	25	F_b'	1,114	842	663	1,315	991	777
		E′ for L/360	1.41	0.90	0.60	1.76	1.12	0.76
		E′ for L/500	1.96	1.24	0.84		1.56	1.05
28	27	F_b'	1,268	959	755		1,127	884
		E′ for L/360	1.75	1.11	0.75		1.39	0.94
		E′ for L/500		1.54	1.04		1.93	1.30
30	29	F_b'		1,078	849		1,265	993
		E′ for L/360		1.35	0.91		1.68	1.13
		E′ for L/500		1.87	1.26			1.57
32	31	F_b'		1,199	945		1,404	1,103
		E′ for L/360		1.59	1.07		1.99	1.34
		E′ for L/500			1.49			1.86
34	33	F_b'		1,322	1,042			1,214
		E′ for L/360		1.84	1.24			1.55
		E′ for L/500			1.72			
36	35	F_b'			1,147			1,333
		E′ for L/360			1.42			1.78
		E′ for L/500			1.97			
38	37	F_b'			1,267			
		E′ for L/360			1.61			
		E′ for L/500						

Table Instructions

The table on this sheet is for determining the required deck thickness for longitudinal glulam timber decks for single–lane bridges (14– and 18–ft nominal widths). The criteria for selecting deck thickness are based on span length, vehicle loading, live load deflection limit, and the material properties of the glulam panels. The table provides the minimum required allowable design values for bending strength (F_b') and modulus of elasticity (E') based on the vehicle live load, deck dead load, and an assumed dead load of 10 lb/ft^2 for the railing/curb and 38 lb/ft^2 for the asphalt wearing surface. Allowable design values for horizontal shear (F_v') are not listed because horizontal shear is not critical for shallow deck sections. Blank cells in the table denote cases where the required design values exceed those typically available or that result in excessively conservative designs.

The table may be used in two ways. When the combination and material species of glulam are known, the designer must determine the allowable design values for the material, then compare them to the values given in the table. The allowable design values must be greater than or equal to the table values based on the selected deck thickness, span length, vehicle loading, and deflection limit. Alternatively, when the combination and material species are unknown, minimum required F_b' and E' values may be obtained from the table based on the span length, deck thickness, loading, and deflection limit. A combination and species of glulam that meets these minimum allowable design values may then be selected. The following procedures are recommended for table use:

Material Combination and Species Known

1. Determine the required design criteria for
   a. span length measured center–to–center of bearings;
   b. vehicle loading, AASHTO HS20–44 or HS25–44; and
   c. live load deflection limit, L/360 or L/500.

2. Compute the allowable design values for the glulam combination and species using the following equations:

$$F_b' = F_b C_M C_F C_D \qquad E' = E C_M$$

where F_b' = allowable bending stress (lb/in^2); F_b = tabulated bending stress (lb/in^2); E' = allowable modulus of elasticity (lb/in^2); C_F = size factor; E = tabulated modulus of elasticity (lb/in^2); C_M = wet service factor; C_D = load duration factor

3. Enter the table and select a deck thickness based on the design criteria and allowable material properties previously determined. The allowable material property values for F_b' and E' must be greater than or equal to the corresponding table values for the deck thickness selected. If they are not, the design criteria and/or material properties must be revised until acceptable values are achieved.

Material Combination and Species Unknown

1. Determine the required design criteria for
   a. span length measured center–to–center of bearings;
   b. vehicle loading, AASHTO HS20–44 or HS25–44; and
   c. live load deflection limit, L/360 or L/500.

2. Enter the table and select a deck thickness based on the design criteria. Note the required minimum allowable values for F_b' and E'.

3. Select a Glulam Combination that provides the minimum allowable design values. Glulam combinations should be selected from the "members stressed primarily in axial tension or compression" table.

The bridge superstructures depicted on these drawings were developed under a cooperative research agreement between the Federal Highway Administration, the USDA Forest Service, Forest Products Laboratory, and Laminated Concepts, Inc.

Table 5.4 — Longitudinal Glulam Deck Design Table for Double–Lane Bridges

Bridge Length (ft)	Span L (ft)	Required Value	AASHTO HS20–44 Loading: Minimum Required F_b' (lb/in²) and E′ (x10⁶ lb/in²) Values for Actual Deck Thickness[a] (t) Ranging from 8–½ to 16–¼–in.							AASHTO HS25–44 Loading: Minimum Required F_b' (lb/in²) and E′ (x10⁶ lb/in²) Values for Actual Deck Thickness[a] (t) Ranging from 8–½ to 16–¼–in.						
			8½	8¾	10½	10¾	12¼	14¼	16¼	8½	8¾	10½	10¾	12¼	14¼	16¼
12	11	F_b'	986	932	653	624				1,207	1,140	798	762			
		E′ for L/360	0.82	0.75	0.44	0.41				1.03	0.94	0.54	0.51			
		E′ for L/500	1.14	1.05	0.61	0.56				1.43	1.31	0.76	0.71			
14	13	F_b'	1,170	1,106	776	742				1,426	1,348	944	902	700		
		E′ for L/360	1.13	1.04	0.60	0.56				1.41	1.29	0.75	0.70	0.47		
		E′ for L/500	1.57	1.44	0.83	0.78				1.96	1.79	1.04	0.97	0.65		
16	15	F_b'	1,356	1,282	902	862	671			1,647	1,556	1,092	1,043	811	606	
		E′ for L/360	1.47	1.35	0.78	0.73	0.49			1.85	1.69	0.98	0.91	0.62	0.39	
		E′ for L/500		1.88	1.09	1.01	0.68					1.36	1.27	0.86	0.54	
18	17	F_b'	1,545	1,461	1,029	983	766					1,241	1,186	922	690	
		E′ for L/360	1.87	1.71	0.99	0.92	0.62					1.24	1.15	0.78	0.50	
		E′ for L/500			1.38	1.28	0.87					1.72	1.60	1.08	0.69	
20	19	F_b'			1,158	1,107	864	650				1,392	1,330	1,036	776	606
		E′ for L/360			1.22	1.13	0.77	0.49				1.52	1.42	0.96	0.61	0.41
		E′ for L/500			1.69	1.57	1.06	0.68					1.97	1.33	0.85	0.57
22	21	F_b'			1,290	1,233	964	726				1,544	1,476	1,150	864	674
		E′ for L/360			1.46	1.36	0.92	0.58				1.83	1.70	1.15	0.73	0.49
		E′ for L/500				1.89	1.28	0.81						1.60	1.02	0.69
24	23	F_b'			1,424	1,362	1,065	803	630					1,266	952	745
		E′ for L/360			1.92	1.79	1.21	0.77	0.52					1.51	0.96	0.65
		E′ for L/500					1.68	1.07	0.72						1.34	0.90

a — Western species glulam sizes are 8 ¾, 10 ¾, 12 ¼, 14 ¼, and 16 ¼–in.;
Southern pine glulam sizes are 8 ½, 10 ½,12 ¼, 14 ¼, and 16 ¼–in.

Bridge Length (ft)	Span L (ft)	Required Value	Table Continued — HS20-44: Minimum Required Values for Actual Deck Thickness[a] (t)			HS25-44: Minimum Required Values for Actual Deck Thickness[a] (t)		
			12¼	14¼	16¼	12¼	14¼	16¼
26	25	F_b'	1,201	907	712	1,424	1,071	839
		E′ for L/360	1.56	0.99	0.67	1.95	1.24	0.84
		E′ for L/500		1.38	0.93		1.72	1.16
28	27	F_b'	1,364	1,031	810		1,216	953
		E′ for L/360	1.94	1.23	0.83		1.54	1.04
		E′ for L/500		1.71	1.15			1.44
30	29	F_b'		1,156	909		1,362	1,068
		E′ for L/360		1.49	1.00		1.85	1.25
		E′ for L/500			1.39			1.74
32	31	F_b'		1,284	1,010			1,184
		E′ for L/360		1.75	1.18			1.48
		E′ for L/500			1.64			
34	33	F_b'			1,112			1,301
		E′ for L/360			1.37			1.71
		E′ for L/500			1.90			
36	35	F_b'			1,222			1,427
		E′ for L/360			1.56			1.95
		E′ for L/500						
38	37	F_b'			1,349			
		E′ for L/360			1.77			
		E′ for L/500						

The panels shall be Timber Species of Douglas Fir, Combination Symbol 3 or 5.

Table Instructions

The table on this sheet is for determining the required deck thickness for longitudinal glulam decks for double–lane bridges (26–, 30–, and 34–ft nominal widths). The criteria for selecting deck thickness are based on span length, vehicle loading, live load deflection limit, and the material properties of the glulam panels. The table provides the minimum required allowable design values for bending strength (F_b') and modulus of elasticity (E') based on the vehicle live load, deck dead load, and an assumed dead load of 10 lb/ft² for the railing/curb and 38 lb/ft² for the asphalt wearing surface. Allowable design values for horizontal shear (F_v') are not listed because horizontal shear is not critical for shallow deck sections. Blank cells in the table denote cases where the required design values exceed those typically available or that result in excessively conservative designs.

The table may be used in two ways. When the combination and material species of glulam are known, the designer must determine the allowable design values for the material, then compare them to the values given in the table. The allowable design values must be greater than or equal to the table values based on the selected deck thickness, span length, vehicle loading, and deflection limit. Alternatively, when the combination and material species are unknown, minimum required F_b' and E' values may be obtained from the table based on the span length, deck thickness, loading, and deflection limit. A grade and species of glulam that meets these minimum allowable design values may then be selected. The following procedures are recommended for table use:

Material Combination and Species Known

1. Determine the required design criteria for
   a. span length measured center–to–center of bearings;
   b. vehicle loading, AASHTO HS20–44 or HS25–44; and
   c. live load deflection limit, L/360 or L/500.

2. Compute the allowable design values for the combination and species of the glulam using the following equations:

$$F_b' = F_b C_M C_F C_D \qquad E' = E C_M$$

where F_b' = allowable bending stress (lb/in²); F_b = tabulated bending stress (lb/in²); E' = allowable modulus of elasticity (lb/in²); E = tabulated modulus of elasticity (lb/in²); C_D = load duration factor; C_F = size factor; C_M = wet service factor

3. Enter the table and select a deck thickness based on the design criteria and allowable material properties previously determined. The allowable material property values for F_b' and E' must be greater than or equal to the corresponding table values for the deck thickness selected. If they are not, the design criteria and/or material properties must be revised until acceptable values are achieved.

Material Combination and Species Unknown

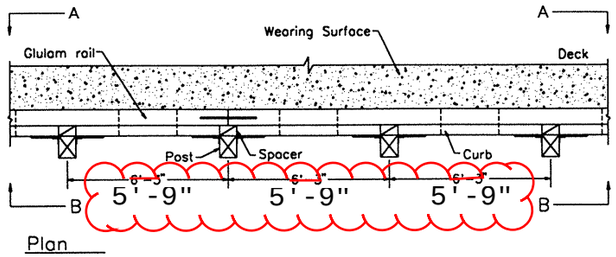
1. Determine the required design criteria for
   a. span length measured center–to–center of bearings;
   b. vehicle loading, AASHTO HS20–44 or HS25–44; and
   c. live load deflection limit, L/360 or L/500.

2. Enter the table and select a deck thickness based on the design criteria. Note the required minimum allowable values for F_b' and E'.

3. Select a Glulam Combination that provides the minimum allowable design values. Glulam combinations should be selected from the "members stressed primarily in axial tension or compression" table.

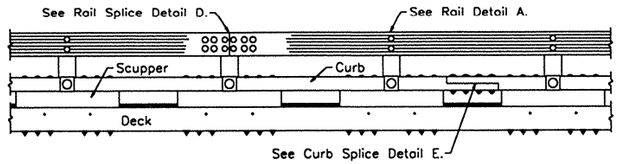
The bridge superstructures depicted on these drawings were developed under a cooperative research agreement between the Federal Highway Administration, the USDA Forest Service, Forest Products Laboratory, and Laminated Concepts, Inc.

General Configuration



Plan

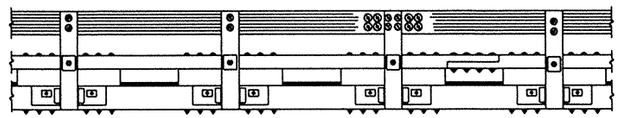
Section A–A



Front Elevation

Refer to Sheet 2 for Approach Rail Transition.

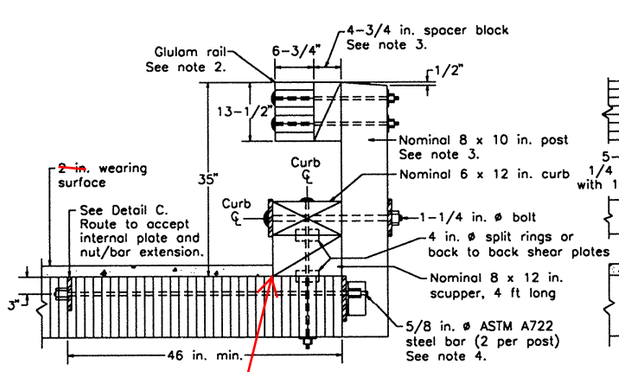
Section B–B



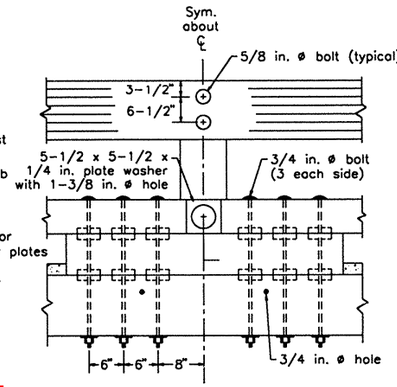
Back Elevation

A Railing Details

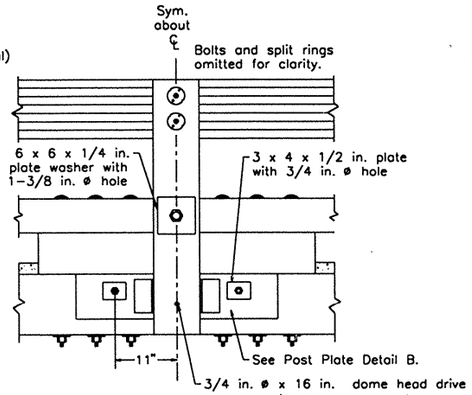
For stress–laminated decks, omit internal plate, post plates, and ASTM A722 steel bars.



End View

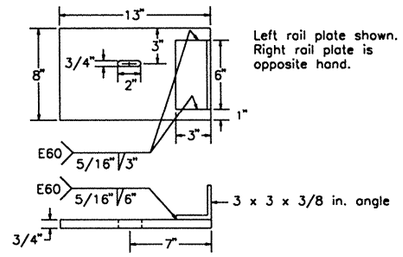


Front View

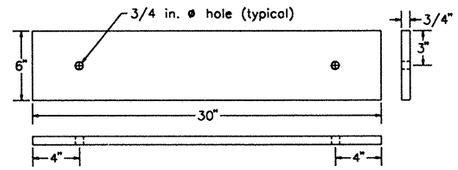


Back View

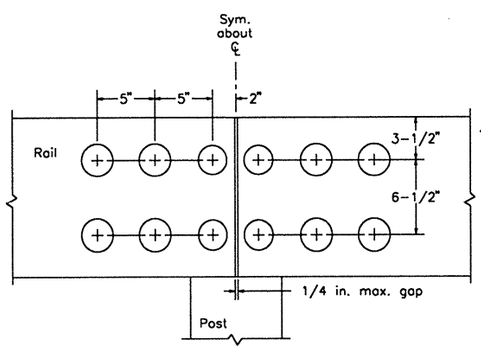
B Steel Post Plate



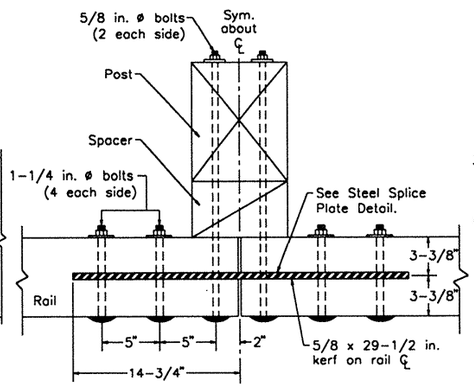
C Internal Steel Plate



D Rail Splice Details

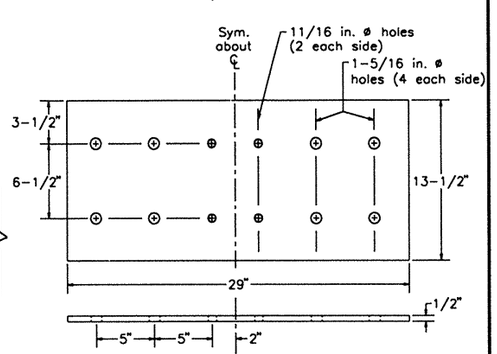


Front View

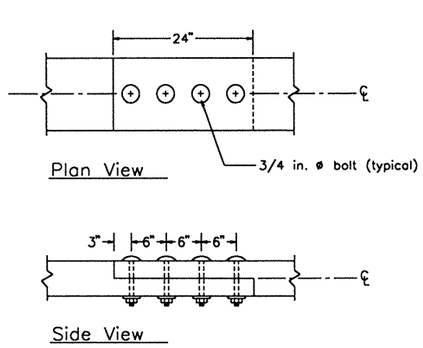


Plan View

Steel Splice Plate



E Curb Splice Detail



Plan View

Side View

DESIGN

1. This bridge rail was successfully crash tested to the requirements for Test Level 4 (TL–4), as outlined in NCHRP Report 350. In addition, the rail meets crash test requirements for Performance Level 2 (PL–2), as outlined in the 1989 AASHTO Guide Specifications for Bridge Railings. It is adaptable to longitudinal stress–laminated, spike–laminated, nail–laminated, and glued laminated timber decks which are 10–1/2 in. or greater in actual thickness.

2. Dimensions given for glued laminated timber rails are actual dimensions. The depth of the glulam timber rail may be increased to a maximum of 13–3/4 in. to allow for other standard glulam timber sizes. In such cases detail dimensions shall be verified and modified accordingly.

3. Dimensions for wood posts, curbs, and scuppers are given as nominal dimensions. Actual dimensions may be a maximum of 1/2 in. less than the stated nominal dimensions depending on material surfacing. Dimensions for spacer block depth are actual dimensions.

4. Steel deck reinforcing bars shall be 5/8 in. diameter ASTM A722 bars.

5. Curb and rail splices shall be located so that curb and rail members are continuous over not less than 2 posts. Curb splices shall be located a minimum of 1.5 post spacings away from rail splices. It is recommended that glulam rails be continuous over the bridge length.

MATERIALS

6. Sawn lumber and glued laminated timber shall comply with the requirements of AASHTO M168 and shall be pressure treated with wood preservative in accordance with AASHTO M133.

7. The bridge rail shall be horizontally laminated glued laminated timber; visually graded Western Species Combination No. 2 or visually graded Southern Pine Combination No. 48. Other species and grades of glued laminated timber may be used provided that the minimum tabulated values are not less than the following:
   F_{byy} = 1,800 lb/in² E = 1,800,000 lb/in²

8. Posts, curbs, scuppers, and spacer blocks may be sawn lumber or glued laminated timber. When sawn lumber is used, material shall be visually graded No. 1 Southern Pine or visually graded No. 1 Douglas Fir–Larch. Glued laminated timber and other species and grades of sawn lumber may be used provided that the minimum tabulated values are not less than the following:
   F_b = 1,350 lb/in² E = 1,500,000 lb/in²

9. Steel plates and shapes shall comply with the requirements of ASTM A36.

10. Bolts shall comply with the requirements ASTM A307, Grade 2 and should preferably be dome head timber bolts. Bolts on traffic face of rail shall be dome head.

11. Split rings shall be manufactured from SAE 1010 hot rolled carbon steel. Shear plates shall be malleable iron manufactured according to ASTM A47, Grade 32510.

12. All steel components and fasteners shall be galvanized in accordance with AASHTO M111 or AASHTO M232 or shall otherwise be provided with adequate corrosion protection. Galvanizing of high–strength steel bars shall follow the recommendations of the bar manufacturer so as not to adversely affect the mechanical properties of the steel. Galvanize steel components after welding.

FABRICATION AND CONSTRUCTION

13. To the extent possible, all wood shall be cut, drilled, and completely fabricated prior to pressure treatment with preservatives. When field fabrication of wood is required or if wood is damaged, all cuts, bore holes, and damage shall be immediately field treated with wood preservative in accordance with AASHTO M133.

14. Unless noted, malleable iron washers shall be provided under bolt heads and under nuts that are in contact with wood. Washers may be omitted under heads of dome–head timber bolts when the size and strength of the head is sufficient to develop connection strength without wood crushing.

15. The tops of rail posts and the top of the rail splice plate kerf shall be sealed with roofing cement or otherwise protected from direct exposure to weather.

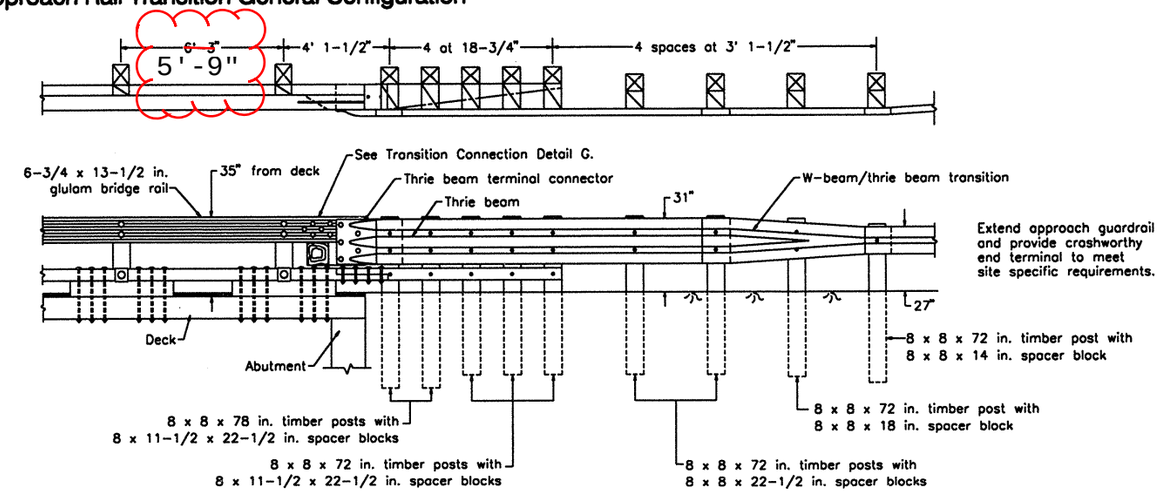
The bridge railings depicted on these drawings were developed and crash tested under a cooperative research agreement between the Midwest Roadside Safety Facility of the University of Nebraska-Lincoln, the USDA Forest Service, Forest Products Laboratory and the Federal Highway Administration.

University of Nebraska Lincoln

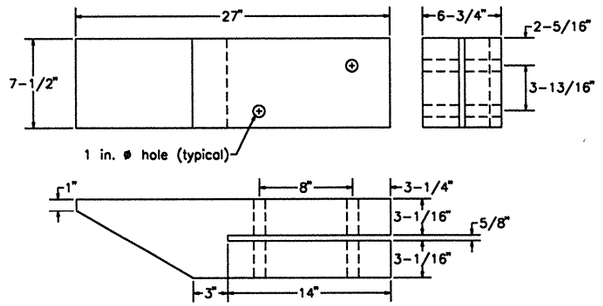
Crash-Tested Bridge Rails for Longitudinal Wood Decks

Glulam Timber Rail with Curb NCHRP 350 Test Level 4	September 1995	Sheet 1 of 2

Approach Rail Transition General Configuration



F Curb Transition Block

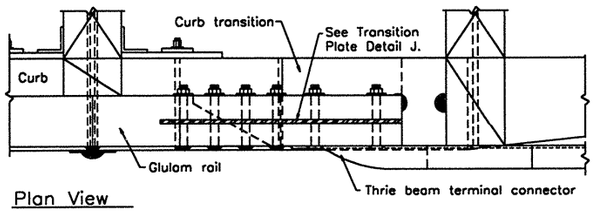


Depth of transition block is based on rail depth of 13-1/2 in. and dressed curb and scupper (5-1/2 and 7-1/2 in. in height, respectively). If dimensions of any components increase, depth of transition block must be verified and reduced as necessary.

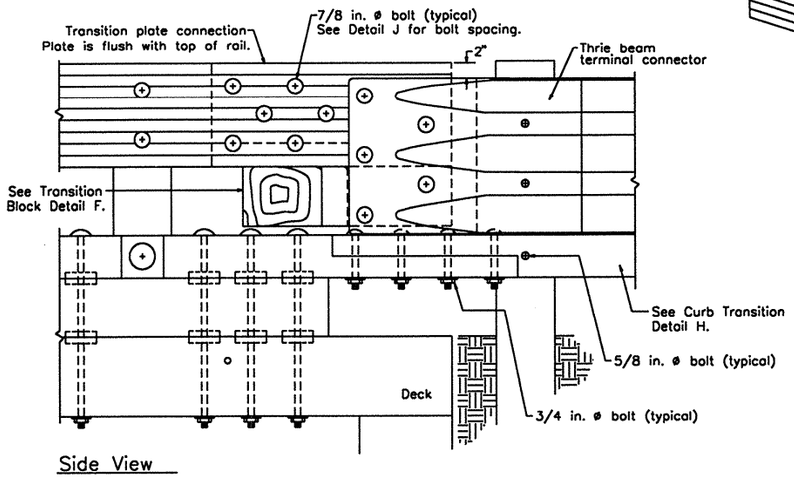
In addition to the notes on Sheet 1, the following apply to the approach rail transition:

1. The approach rail transition was successfully crash tested to the requirements for Service Level 2 (SL-2), as outlined in NCHRP Report 230.
2. Thrie beam and thrie beam terminal connector shall be 10 gage. W-beam/thrie beam transition and w-beam shall be 12 gage. All shall comply with the requirements of AASHTO M180.
3. W-beam and thrie beam rail splice bolts and post bolts shall comply with AASHTO M180.

G Transition Connection Details

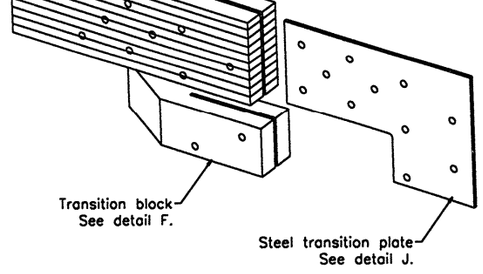


Plan View

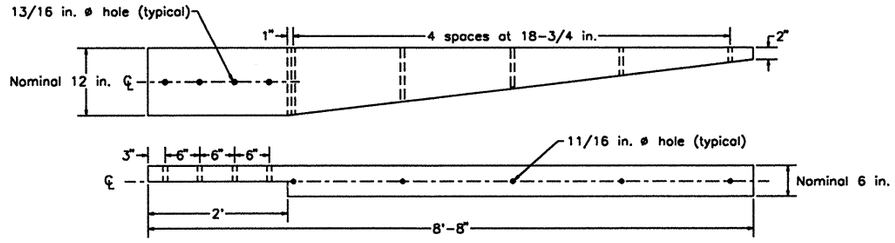


Side View

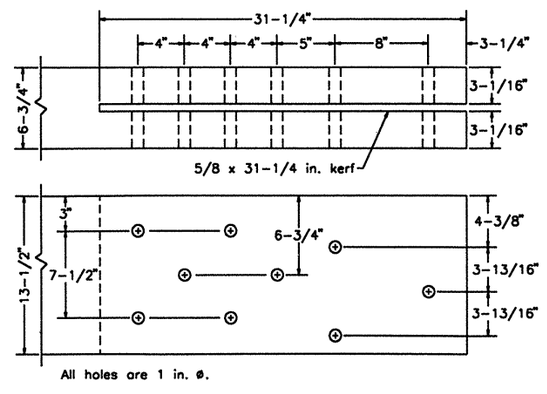
3 Dimensional Explosion of Transition Connection



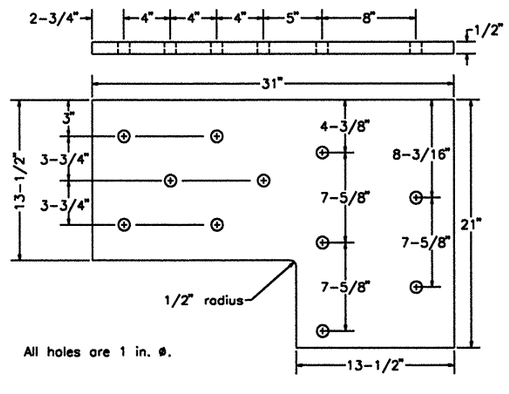
H Curb Transition



I Transition Glulam Rail Boring Detail



J Transition Plate



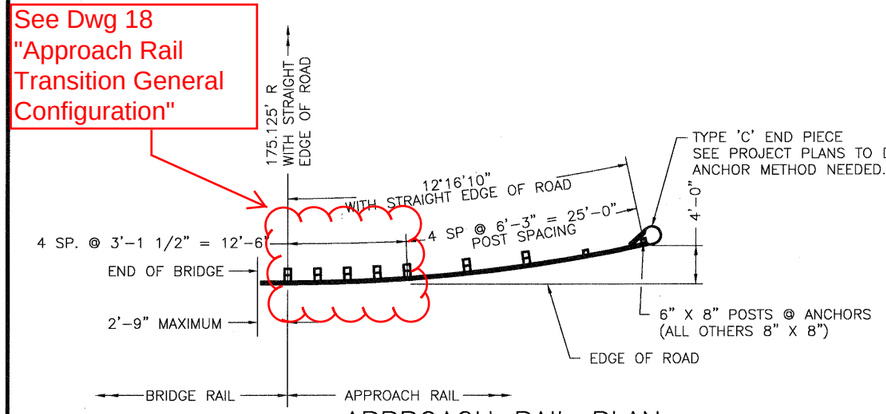
The bridge railings depicted on these drawings were developed and crash tested under a cooperative research agreement between the Midwest Roadside Safety Facility of the University of Nebraska-Lincoln, the USDA Forest Service, Forest Products Laboratory and the Federal Highway Administration.

University of Nebraska Lincoln

Crash-Tested Bridge Rails for Longitudinal Wood Decks

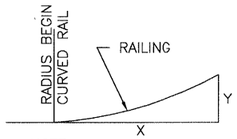
Glulam Timber Rail with Curb NCHRP 350 Test Level 4	September 1995	Sheet 2 of 2

See Dwg 18 "Approach Rail Transition General Configuration"

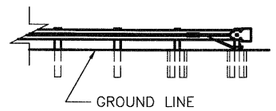


APPROACH RAIL PLAN

SCALE: 1/8" = 1'-0"
RS152B1

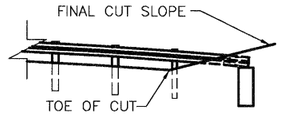


NOTE:
WHEN EDGE OF ROAD IS CURVED,
RADIUS OF RAIL WILL BE APPROXIMATELY X ²/2Y.



METHOD "A" ANCHOR RAILING ON GRADE OR FILL

SCALE: 1/8" = 1'-0"
RS152C1



METHOD "B" ANCHOR RAILING TERMINATES IN CUT

SCALE: 1/8" = 1'-0"
RS152D1

APPROACH RAIL ANCHOR METHODS

GENERAL NOTES

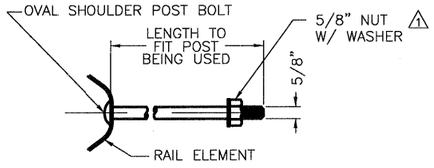
MATERIALS: STEEL SHAPES, PLATES AND BARS SHALL BE STRUCTURAL STEEL CONFORMING TO AASHTO M183 (ASTM A36). W-BEAM RAIL SHALL CONFORM TO AASHTO M180 CLASS A TYPE I OR II UNLESS OTHER WISE SPECIFIED. RAIL ELEMENTS MAY BE EITHER 25'-0" OR 12'-6" IN LENGTH. IF NOT COVERED BY 1 INCH OR MORE OF CONCRETE, ALL STEEL SHAPES, PLATES AND BARS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M111 (ASTM A123) UNLESS PAINTING OR WEATHERING STEEL IS SPECIFIED. NUTS, BOLTS AND WASHERS FOR RAIL SYSTEM SHALL CONFORM TO AASHTO M180 UNLESS OTHERWISE NOTED, AND SHALL BE GALVANIZED, PAINTED OR WEATHERING, USING THE SAME CRITERIA GIVEN ABOVE FOR STRUCTURAL STEEL. GALVANIZING SHALL BE IN ACCORDANCE WITH AASHTO M232 (ASTM A153). ANCHOR CABLE SHALL BE 3/4 INCH, PREFORMED, 6 X 19, INDEPENDENT WIRE ROPE CORE, IMPROVED PLOW STEEL WIRE ROPE, GALVANIZED, CONFORMING TO AASHTO M30, TYPE II MINIMUM BREAKING STRENGTH OF 42,800 POUNDS. CABLE CLIPS SHALL BE COMMERCIAL QUALITY DROP FORGED GALVANIZED STEEL. POSTS SHALL BE NO. 1 STRUCTURAL GRADE DOUGLAS FIR-LARCH OR HEM-FIR CONFORMING TO AASHTO M168 FULL SAWN EXCEPT WHERE NOTED AND SHALL BE TREATED WITH EITHER PENTACHLOROPHENOL OR CREOSOTE IN ACCORDANCE WITH AASHTO M133. CONCRETE FOR ANCHORS SHALL BE IN ACCORDANCE WITH SECTION 552 OR SECTION 602, METHOD A OR B. OBJECT MARKERS SHALL CONFORM TO MUTCD TYPE 2.

FABRICATION: STRUCTURAL STEEL SHALL BE SHOP FABRICATED.
IF RAIL CURVATURE IS LESS THAN 150 FEET RADIUS IT SHALL BE FACTORY CURVED TO THE SPECIFIED RADIUS. WELDING SHALL CONFORM TO THE AWS STRUCTURAL WELDING CODE, ANSI/AWS D1,1, AND SHALL BE BY A CERTIFIED WELDER. ALL STEEL SHALL BE FABRICATED BEFORE BEING GALVANIZED OR PAINTED, EXCEPT MINOR SHOP CUTTING, DRILLING, AND WELDING IS PERMITTED ON GALVANIZED METAL, PROVIDED THESE AREAS ARE CLEANED AND REPAIRED WITH 2 COATS OF ZINC DUST-ZINC OXIDE PAINT MEETING FEDERAL SPECIFICATION TT-P-641 OR MILITARY SPECIFICATION DOD-P-21035. THE CABLE ASSEMBLY SHALL DEVELOP A MINIMUM TENSILE STRENGTH OF 40,000 POUNDS.

PAINTING: WHEN PAINTING OF RAILING IS SPECIFIED, ALL METAL SURFACES NOT EMBEDDED IN CONCRETE SHALL BE CLEANED AND PAINTED AS SPECIFIED. PAINT SYSTEM AND FINAL COLOR SHALL BE AS SPECIFIED.

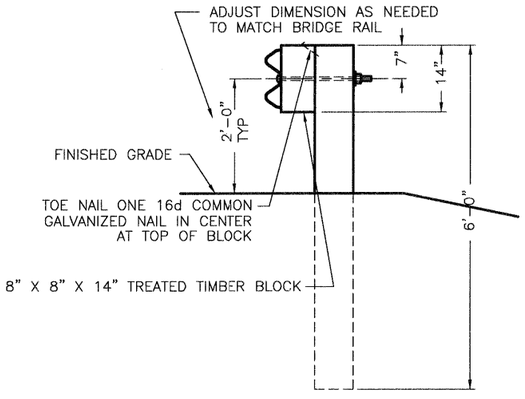
ERECTION: NO FIELD CUTTING OR WELDING IS PERMITTED ON GALVANIZED METAL UNLESS APPROVED BY THE CO. 2
ALL RAIL POSTS SHALL BE SET VERTICALLY AND THE RAILING ERECTED PARALLEL TO GRADE. THE COMPLETED INSTALLATION SHALL NOT REFLECT ANY UNEVENNESS. USE A RECTANGULAR WASHER ON THE LAST POST AT THE RAIL END PIECE. AFTER ERECTION BURR THREADS OF ALL RODS AND BOLTS TO PREVENT BACKING OFF OF NUTS. ALL DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED WITH 2 COATS OF ZINC PAINT AS SPECIFIED IN THE FABRICATION NOTE ABOVE. CABLE CLIPS SHALL BE TORQUED TO 130 FOOT POUNDS MINIMUM.

CERTIFICATIONS AND SUBMITTALS: SEE THE SPECIFICATIONS FOR REQUIRED SUBMITTALS AND CERTIFICATIONS. RS151E1



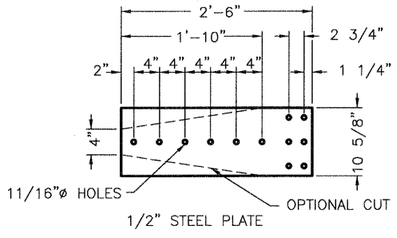
POST BOLT ASSEMBLY

SCALE: 3" = 1'-0"
RS152M1

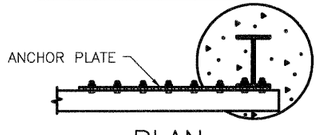


TYPICAL GUARDRAIL CROSS SECTION

SCALE: 3/4" = 1'-0"
RS152J1

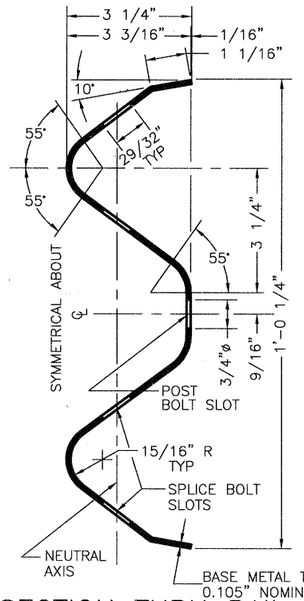


ANCHOR PLATE



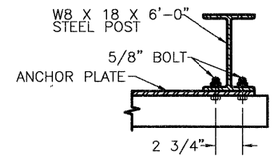
PLAN

SCALE: 1" = 1'-0"
RS152H1



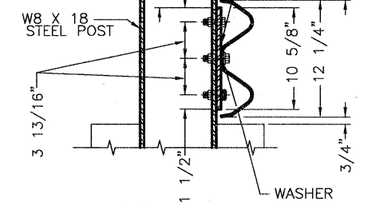
SECTION THRU RAIL ELEMENT

SCALE: 6" = 1'-0"
RS152K1



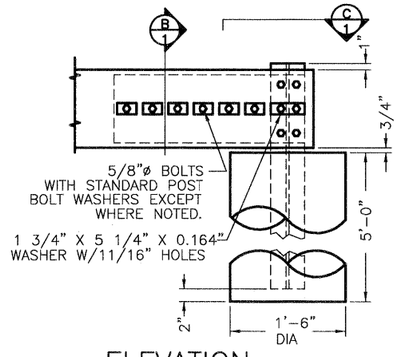
SECTION C

SCALE: 1 1/2" = 1'-0"
RS152F1



SECTION B

SCALE: 1 1/2" = 1'-0"
RS152G1



ELEVATION METHOD "B" ANCHOR

SCALE: 1" = 1'-0"
RS152I1

DO NOT SCALE DRAWING

REV.	DESCRIPTION	APPROVED	DATE
2	REVISED APPROVAL TERMINOLOGY FROM ENGINEER TO CO (FP-03)	KLV	5/1/06
1	5/8" NUT W/WASHER WAS MI WASHER	KLV	4/26/04

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
THE PACIFIC NORTHWEST REGION (R-6)

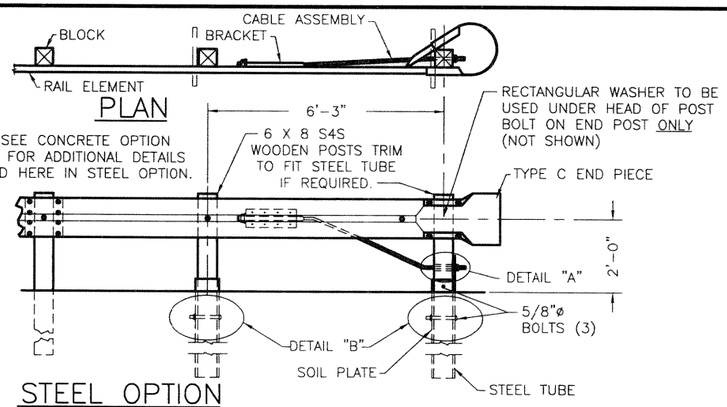
STANDARD BRIDGE W-BEAM APPROACH GUARDRAIL 37'-6", LONG BCT TERMINAL

Forest: **Loading:**
Bridge No.: **Length:**
Location: **Width:**

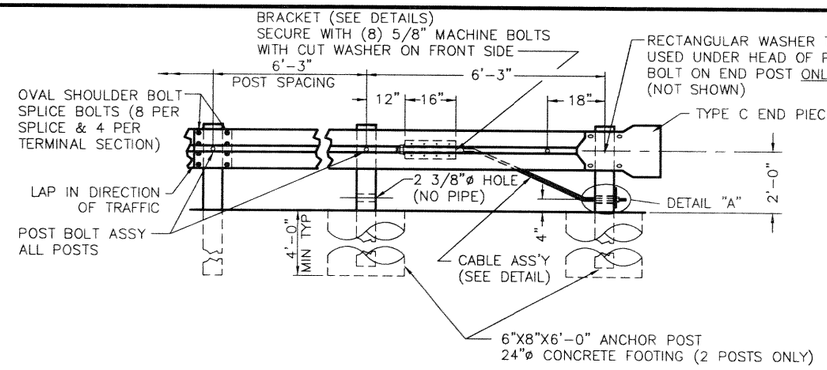
Designed: KLV **Drawn:** L.McNEAL **Checked:** KLV

Approved: /s/ Mervin O. Eriksson **Date:** 3/28/2003
REGIONAL BRIDGE ENGINEER

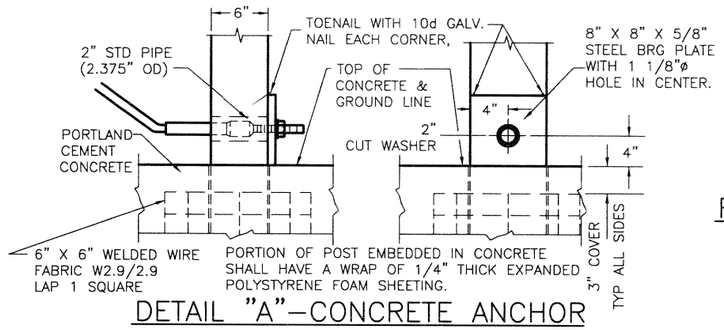
SHEET 1 of 2 | **DWG.No. RS152**



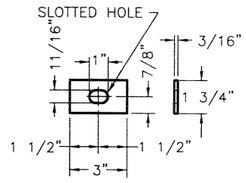
STEEL OPTION
SCALE: 1/2" = 1'-0"
RS152D2



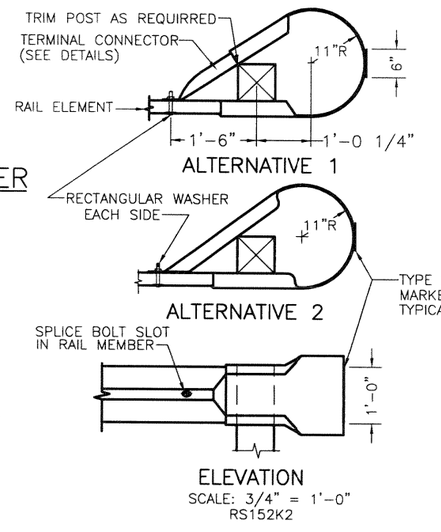
METHOD "A" ANCHOR – CONCRETE OPTION
ELEVATION
SCALE: 1/2" = 1'-0"
RS152A2



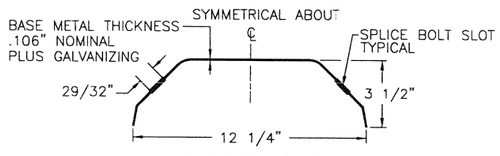
DETAIL "A"–CONCRETE ANCHOR
SCALE: 1 1/2" = 1'-0"
RS152 E2



RECTANGULAR WASHER
SCALE: 3" = 1'-0"
RS152J2

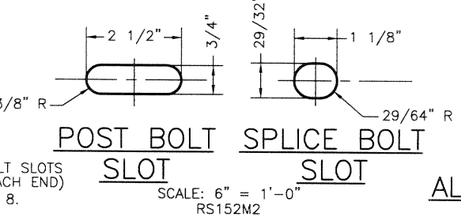


SCALE: 3/4" = 1'-0"
RS152K2

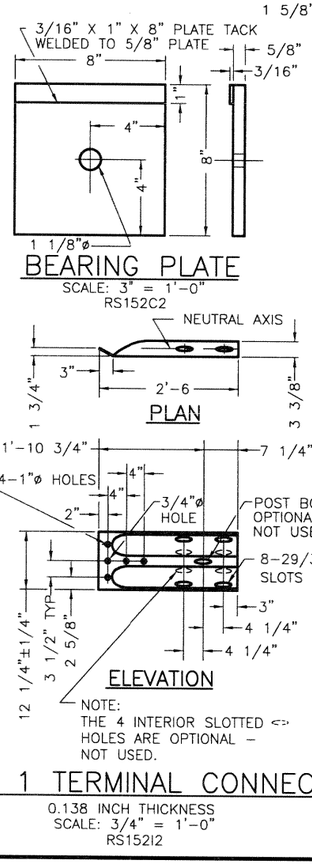


SECTION C–C
SCALE: 3" = 1'-0"
RS152N2

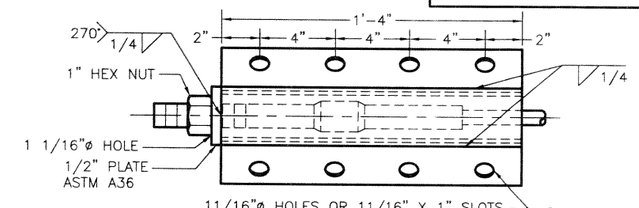
TYPE C END PIECE



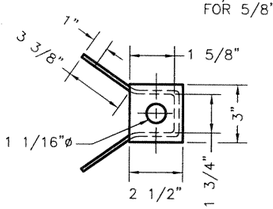
POST BOLT SLOT
SPLICE BOLT SLOT
SCALE: 6" = 1'-0"
RS152M2



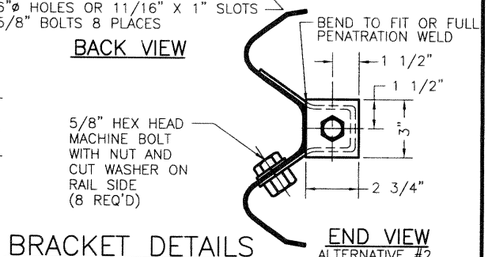
BEARING PLATE
SCALE: 3" = 1'-0"
RS152C2



BACK VIEW

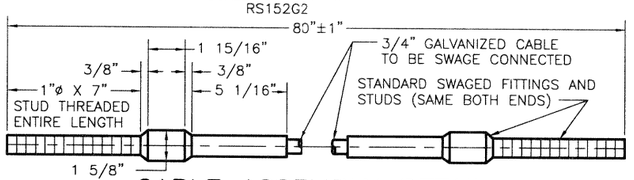


END VIEW
ALTERNATIVE #1

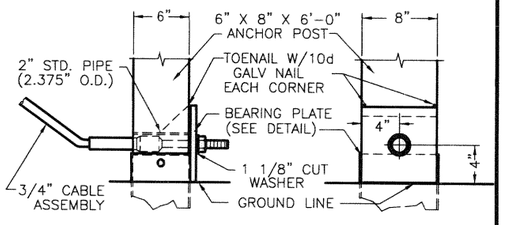


BRACKET DETAILS
SCALE: 3" = 1'-0"
RS152G2

END VIEW
ALTERNATIVE #2



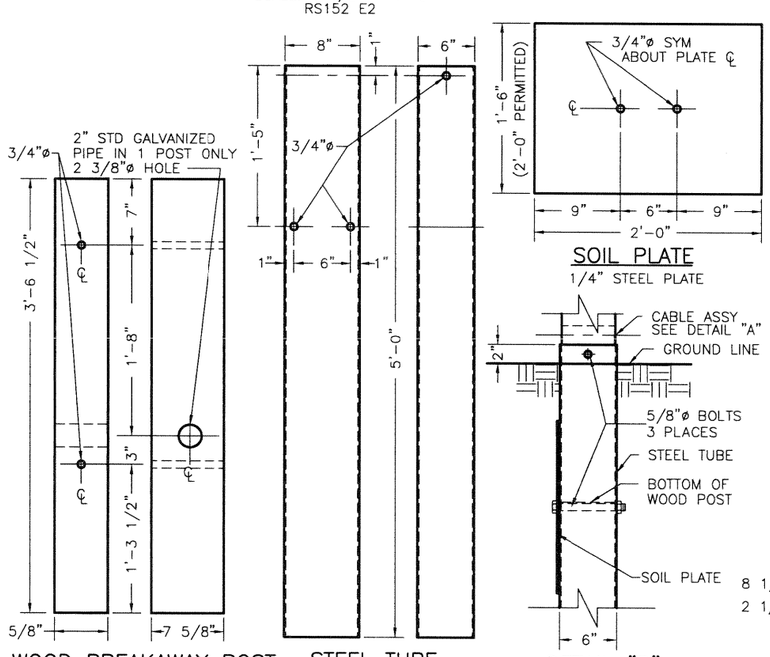
CABLE ASSEMBLY DETAIL
SCALE: 3" = 1'-0"
RS152F2



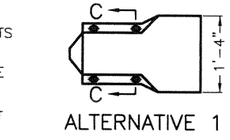
DETAIL "A"
SCALE: 1 1/2" = 1'-0"
RS152H2

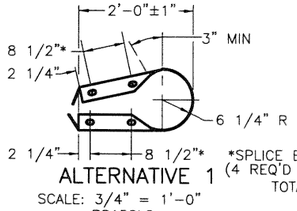
PLAN

ALT 1 TERMINAL CONNECTOR
0.138 INCH THICKNESS
SCALE: 3/4" = 1'-0"
RS152I2



METHOD "A" ANCHOR – STEEL OPTION
SCALE: 1 1/2" = 1'-0"
RS152B2





SCALE: 3/4" = 1'-0"
RS152L2

*SPLICE BOLT SLOTS (4 REQ'D EACH END) TOTAL 8.

DO NOT SCALE DRAWING

REV.	DESCRIPTION	APPROVED	DATE
1	ADD TYPE 2 OBJECT MARKER IDENTIFIER "OM2-2V"	/s/	3/28/04

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
THE PACIFIC NORTHWEST REGION (R-6)

STANDARD BRIDGE W–BEAM APPROACH GUARDRAIL 37'–6", LONG BCT TERMINAL

Forest: **Loading:**
Bridge No.: **Length:**
Location: **Width:**

Designed: KLV **Drawn:** L.McNEAL **Checked:** KLV

Approved: /s/ Mervin O. Eriksson **Date:** 3/28/2003
REGIONAL BRIDGE ENGINEER

SHEET 2 of 2 | **DWG.No. RS152**

MILE POST	DESCRIPTION	PAY ITEM	QUANTITY	
Reconstruction Worklist for Road 1721-542				
0.18	Remove existing culvert and replace with a new 24"x38' CMP as staked by the Forest Service. Salvage existing aggregate (indirectly paid by item 602-50.24) over the pipe, then place aggregate and compact over the new installation. Construct headwall and splash apron.	203-01 251-10.2 251-10.1 602-50.24	1 3 3 38	EA CY CY LF
Reconstruction Worklist for Road 1700				
2.10	Begin Prather Creek Bridge work. Saw cut and remove existing asphalt. Remove existing bridge superstructure. Saw cut and remove concrete backwall (see dwg 8 of 21). Install Class 5 Riprap. Form and place rebar and concrete for abutment retrofit. Install glued laminated deck panels. Place aggregate base, pave asphalt wearing surface base course, and install waterproof membrane. Install scupper blocks and pave asphalt top course. Install bridge and approach railings. Place shoulder rock and paint double yellow line stripes.	151-01 152-01 202-07 203-04 203-05 251-01.5 322-03 403-51 522-01 554-01 556-01 557-06 617-01 634-01 635-01	All All 5 All All 7 34 40 9.2 1122 74 All 175 288 All	LS LS Each LS LS CY CY TON CY LBS LF LS LF LF LS