

Application for OTIA or HBRR funding

Agency: Benton County
Bridge ID: ODOT Bridge No14122
Bridge Name: Belfountain Road (Oliver Creek) Bridge

Contents

- Project Prospectus
- Bridge Prospectus Cost Estimate
- Photos showing the Candidate Bridge from each approach, upstream and downstream sides and the underside of the bridge – See Load Rating Report
- Bridge Prospectus – Additional information
- Local Agency Funding Preference
- Vehicle and Truck Average Daily Traffic Data and Report
- Detour Map and Detour length
- Fire Truck Usage
- Regional Freight Corridor Analysis (Detour map identifies State Highways)
- Requested Changes to NBIS Date – Bridge has been posted>
- Agenda Item for Posting of the Bridge for 20 tons
- Load Rating Report
- Recent Bridge Inspection



PROJECT PROSPECTUS

Part 1 — Project Request (Page 1 of 2)

						Key Number:		Jurisdiction:						
Section: Bellfountain Rd (Oliver Cr) Bridge, ODOT Bridge 14122						Region: 2		Area:		District: 4				
State Highway No.: NA		Highway Name: NA				Mile Point		Length: (mi) (km)						
				From: 14.40 To: 14.42		0.02 mi								
<input type="checkbox"/> Urban <input checked="" type="checkbox"/> Rural		City: NA		MPO: NA		Within UGB: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		County: BENTON		Road/Street Name: Bellfountain Road at Benton County Milepost 14.4				
Route No.: Benton Co. # 25100		NHS: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		HPMS: NA		FC: 9		Applicant (if other than State): BENTON COUNTY						
US Congressional District: 4				State Senate District: 12				State Representative District: 23						
Cost Estimates (x \$ 1,000)			Project Components				Right Of Way							
Preliminary Engineering			\$96		Grading		<input checked="" type="checkbox"/>		Files		(#)	1		
Right Of Way			\$2		Paving		<input checked="" type="checkbox"/>		Hectares		(#)	0.5		
Utility Reimbursement					Structures		<input checked="" type="checkbox"/>		Relocations		(#)			
					Signing		<input checked="" type="checkbox"/>		Acquisitions		(#)			
Roadway			\$67		Signals		NA		Easements		(#)			
Structures			\$220		Illumination		NA		Work By: State / Consultant / Applicant					
Signals			\$0						Preliminary Engineering		(S,C,A)	C,A		
Illumination			\$0						Construction Engineering		(S,C,A)	C,A		
Temp. Protection			\$12						Right of Way Descriptions		(S,C,A)	A		
Const. Contingencies			\$84						Right Of Way Acquisitions		(S,C,A)	A		
Const. Engineering			\$50		Project Categories				Constructed By					
Remove Exist Bridge			\$10		Environmental Class		(1, 2, 3, PCE)		2		<input checked="" type="checkbox"/> Contract		<input checked="" type="checkbox"/> County Force	
Other			\$27		Design Category		(1-7)				<input type="checkbox"/> State Force		<input type="checkbox"/> Other	
Total CE and Construction:			\$471		Work Type Code		(1-13)				<input type="checkbox"/> City Force			
Total Estimate:			\$ 569		Primary \$TIP Work Type:									
Recommended Let Date By Federal Fiscal Year (Quarter-Year):						0002/2005								
PE Fund:			R/W Fund:			UR Fund:			CE-CN Fund:					
PE EA:			R/W EA:			UR EA:			CE-CN EA:					
Item		Existing	Proposed	Define The Problem:										
Travel Lanes		(#) 2	2	This bridge is functionally deficient even though the inventory does not presently list it as such. A recent review of this bridge has resulted in the posting of this bridge with a weight limit. This bridge timber structure was constructed in 1957 and needs to be replaced. The bridge was modified in 1994 with post tension rod bearing plates to increase the strength of the stringers. However, this assembly catches drift creating a potential flood hazard. The post tension rod assembly also becomes loose demonstrating steel fatigue so it is not an effective modification. The bridge crossing also experiences flooding which is partly caused by the post tensioning rod bearing plates catching debris. This is a significant transportation route for a county road.										
Structures		(#) 1	1											
Signals		(#) 0	0											
Bike Way		(#) NA	NA											
Average Daily Traffic		642	1000											
Year of ADT		2003	2010	Describe Proposed Solution: - Attach Sketch Map										
Throughway		Y/N	N									N		
				The existing timber bridge will be replaced with a prestressed concrete slab bridge. The existing backwalls will be removed to provide a naturalized river channel and eliminate a flooding problem. This will increase the existing bridge length from 29 ft to 50 ft. This bridge replacement will increase the load rating for commercial carriers and equipment. Guard rail and approach will be improved as required.										
Prepared By:			Date:			OTC Approval Date:			Program Year:		Funding Amount:			
X C. R. Knoll, P.E.			10/13/03											



PROJECT PROSPECTUS

Part 1 Project Request (Page 2 of 2)

Key Number:

Jurisdiction:

Section: Bellfountain Rd (Oliver Cr) Bridge, ODOT Bridge 14122

Region:
2

Area:
0

District:
4

Project Justification

This Bellfountain Road Bridge crosses Oliver Creek at Benton County Milepost 14.4. The bridge is listed as ODOT Bridge No. 14122 and Benton County Bridge No 2500-144. It is a timber bridge with wood deck and AC overlay built in 1957. A closure of the Oliver Creek Bridge would provide a lengthy detour of about 11.1 miles for emergency response, fire equipment, school buses and commercial carriers. Bellfountain Road provides a major commercial route for access to valuable natural resources located in an area of about 30,000 acres. The only economical alternative this bridges is replacement as nothing is salvageable due to the bridges condition and improper design for structure and hydraulics. The bridge serves about 640 vehicles per day. More traffic occurs during forest practices activity and periods of local agricultural activity. The deteriorated structure condition warrants replacement of the structure with a safer structure that is capable of accomodating larger loads and returning the stream channel to its naturalized condition. This bridge is in the process of being posted for a weight limit of 20 tons as the result of a recent structural evaluation of this bridge.

Additional Information For Project Requested By Local Jurisdictions

Responsible Local Office To Be Contacted For The Following Activities:

- | | | |
|--------------------------------------------|----------------|---------------|
| 1. Public Hearing /
Citizen Involvement | _____ (Office) | _____ (Phone) |
| 2. Environmental / Planning | _____ (Office) | _____ (Phone) |
| 3. Pre-Engineering | _____ (Office) | _____ (Phone) |

This Official Request is From:

City of:

and/or BENTON

County

By:

By:

C. R. Knoll
C. R. Knoll, PE, Senior Engineer

By:

By:

Roger Irvin, PE, Director of Public Works

By:

Applicable Intergovernmental Agreements:

IGA Number:

Jurisdiction Name:

Agreement Date:

Administrative Recommendation

Bridge Prospectus Cost Estimate

Applicant:		NBIS			
Project / Section		BENTON COUNTY		Bridge No.	
Bellfountain Rd (Oliver Cr)		Region:		Area:	
Bridge, ODOT Bridge 14122		2		0	
		District:		4	
New Bridge / Roadway Configuration:			Existing Bridge:		
Left Side Rail	1.5 feet	Bridge Length	29 feet		
Left Sidewalk	0 feet	Bridge Width	20.4 feet		
Shoulder	6 feet	Area	591.6 square ft.		
Lane 2	0 feet				
Lane 1	12 feet	New AC Top Width	36 feet		
---CL---	0 feet	New AC Depth	5 inches		
Lane 1	12 feet	New Base Depth	15 inches		
Lane 2	0 feet	Project Length	250 feet		
Shoulder	6 feet	Net Road Work Length	200 feet		
Right Sidewalk	0 feet	X-S Side Slope	4.00:1		
Right Side Rail	1.5 feet	AC Avg Width	24 feet		
		Base Avg Width	27 feet		
Bridge Length	50 feet	Asphalt Density	150 pounds/ cu ft		
Bridge Width	40 feet	Base Density	144 pounds/ cu ft		
New Area	2000 square ft.	New AC Received	187.5 tons		
		New Base Required	486 tons		
COST ESTIMATE:					
	Quantity	Unit	Price	Cost (\$x1000s)	
Right-of-Way	1	Acre	\$ 4,000	\$2	
==Roadway==					
Clear & Grub	\$ 4,000	lump sum		\$4	
General Excavation	400	cubic yards	\$ 19.00	\$8	
Embankment in Place	300	cubic yards	\$ 16.00	\$5	
Pavement Removal	2,000	square feet	\$ 2.00	\$4	
Aggregate Base	536	tons	\$ 18.00	\$10	
Asphalt Concrete	188	tons	\$ 49.00	\$9	
Riprap	100	cubic yards	\$ 40.00	\$4	
Guardrail, Type 2A		feet		\$0	
Guardrail, Type 3		feet		\$0	
Guardrail Trans		feet		\$0	
Flared Terminals	4	each	\$ 6,000.00	\$24	
Subtotal Roadway				\$67	
Structures	2,000	square feet	\$ 110.00	\$220	
Signals	\$ -	lump sum		\$0	
Illumination	\$ -	lump sum		\$0	
Temporary Protection	\$ 12,000	lump sum		\$12	
Remove Existing Bridge	\$ 592	square feet	17	\$10	
Mobilization (9%)	\$ 27,000	lump sum		\$27	
Other		lump sum		\$0	
Subtotal Structures				\$269	
Subtotal Construction				\$336	
==Engineering==					
Construction Engineering	15	percent of construction		\$50	
Contingency	25	percent of construction		\$84	
Subtotal Const. Eng.				\$135	
Preliminary Engineering					
Consultant	20	percent of construction		\$67	
State	-	percent of construction		\$0	
County	9	percent of construction		\$29	
Subtotal PE				\$96	
Total Estimate				\$569	

Bridge Project Prospectus Additional Bridge Information

Applicant: BENTON COUNTY		NBIS Bridge Number: 0							
Project Name / Section: Bellfountain Rd (Oliver Cr) Bridge, ODOT Bridge 14122		Region: 2	Area: 0 District: 4						
Funding Preferred Source: <input checked="" type="checkbox"/> OTIA III <input type="checkbox"/> Federal HBRR Acceptable Source: <input checked="" type="checkbox"/> OTIA III <input checked="" type="checkbox"/> Federal HBRR	Heavy Vehicle Usage <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Existing</th> <th style="width: 25%; text-align: center;">Proposed</th> </tr> </thead> <tbody> <tr> <td>Truck AADT:</td> <td style="text-align: center;">100</td> <td style="text-align: center;">200</td> </tr> </tbody> </table> Fire Truck Usage: <input type="checkbox"/> YES, at least 25% of trips use bridge. <input checked="" type="checkbox"/> No. Less than 25% of trips		Existing	Proposed	Truck AADT:	100	200	Detour Detour Route: Length: 10 miles Map: (Please attach map)	
	Existing	Proposed							
Truck AADT:	100	200							

Regional Freight Corridor Analysis:

This bridge is being posted for a 20 ton weight limit. This route is the only North-South alternate route for HWY 99W in Benton County. This will impair truck usage that will increase during periods of forestry management practice activity and agricultural harvesting activities. This is estimated to be as much as 200 trucks per day for over a 2 to 6 month period. An increase in this activity is expected to occur when timber sales occur in the forests managed by the BLM and USFS as well as private landowners. Bellfountain Road provides a major access to Highway 34 by way of Decker Road, Philomath and Corvallis and HWY 20/34 by way of Plymouth Road and Chapel Drive, and HWY 99W by way of 4 other county roads. The detour route of 11.1 miles consists of Bellfountain Road, Dawson Road, HWY 99W, to Alpine Road, and Bellfountain Road. There is a shorter detour route using McFarland Road. However, there is a steel truss bridge on this route that is restricted to Oregon Legal Loads not to exceed 40 tons. In addition, this road often becomes flooded during winter storm events since it is located in the floodplain. There is another bridge located at Benton County Milepost 14.3 on Bellfountain Road which supports Oregon Legal Loads.

Special Consideration:

Flooding: This bridge provides flow for both Reese Creek and Oliver Creek. A bridge located at Milepost 14.3 provides some flood overflow relief. Debris is routinely removed from rod tension truss supports that were attached to the bridge about 10 years ago. This road has experienced flooding and as a result temporary road closure at this bridge crossing. A longer bridge that will restore the natural width of the stream needs to be constructed with the removal of the existing bridge.

Traffic Study Information: A traffic study was conducted by Benton County Public Works in July 2003 to determine the amount and type of traffic that was present on Bellfountain Road at the Reese Creek Crossing. The average daily traffic was determined to be 642 vehicles per day with a 3.1% truck total. The truck total will increase with seasonal variations of agricultural and forest management activities.

Detour Route: A closure of Oliver Creek Bridge would provide a lengthy detour of about 11.1 miles for emergency response, fire equipment, school buses and commercial carriers. Bellfountain Road provides a major commercial route for access to valuable natural resources located in an area of about 30,000 acres in the Southern portion of Benton County and a Northern portion of Lane County. There are shorter detour routes available by way of McFarland Road, or Dykstra Road and Foster Road. However, these shorter detours provide a substandard road with a gravel surface.

Bridge Project Prospectus

Requested Changes to National Bridge Inventory System (NBIS) Data

(Form Optional)

Applicant: BENTON COUNTY	Bridge Number: 0		
Project Name / Section: Bellfountain Rd (Oliver Cr) Bridge, ODOT Bridge 14122	Region: 2	Area: 0	District: 4

This form must be completed if an agency is proposing a change to the data in the existing National Bridge Inventory System data. The information must be in conformance with the Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges, Report No. FHWA-PD-96-001, December 1995.

Changes proposed to the Detour Length, Average Daily Traffic and Truck Average Daily Traffic will be acquired from other parts of this application and used to compute updated Federal Sufficiency Ratings and in the calculation of the Technical Ranking Score.

The data listed below are used in the calculations of the Technical Ranking Score and proposed changes will be considered. For any changes proposed, attach backup data as to the reason for the change.

Item 26	Functional Classification	
Item 26	A Lanes on Structure	
Item 32	Approach Roadway Width	
Item 43	Structure Type, Main	
Item 51	Bridge Roadway Width	
Item 53	Vertical Clearance over Deck	
Item 54	Underclearance	
Item 55	Minimum Left	
Item 56	Minimum Right	
Item 100	Defense Highway Designation	

Items 58, 59, 60, 62, 67, 68, 69, 71 and 72 are used in the calculation of the Federal Sufficiency Rating. These data elements are supplied by ODOT and are not subject to corrections at this time.

The Inventory Rating (Item 66) must be provided by a Licensed Professional Engineer, based on calculations following ODOT's Load Rating Guidelines. The engineer's calculations must be included.

Item 66	Inventory Rating	18
---------	------------------	----

Bridge Project Prospectus

Required Data For Bridges Not Listed in the National Bridge Inventory System (NBIS)

(Form Optional)

Applicant: BENTON COUNTY	Bridge Number: 0		
Project Name / Section: Bellfountain Rd (Oliver Cr) Bridge, ODOT Bridge 14122	Region: 2	Area: 0	District: 4

This form must be completed for all bridges submitted that are not on the current National Bridge Inventory System (NBIS). The information must be in conformance with the Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges, Report No. FHWA-PD-95-001, December 1995.

Item 19	Detour Length	11.1
Item 26	Functional Classification	
Item 28	A Lanes on Structure	
Item 32	Approach Roadway Width	
Item 36	Traffic Safety Features	
Item 43	Structure Type, Main	
Item 51	Bridge Roadway Width	
Item 53	Vertical Clearance over Deck	
Item 54	Underclearance	
Item 55	Minimum Left	
Item 56	Minimum Right	
Item 100	Defense Highway Designation	

Items 58, 59, 60, 62, 67, 68, 69, 71 and 72 must be provided by a Certified Bridge Inspector, or a Licensed Professional Engineer. The inspector's evaluation must be included.

Item 58	Deck Condition	
Item 59	Superstructure Rating	5
Item 60	Substructure Rating	5
Item 62	Culverts	
Item 67	Structural Evaluation	
Item 68	Deck Geometry	
Item 69	Under-Clearance	
Item 71	Waterway Adequacy	3
Item 72	Approach Road Alignment	

The Inventory Rating (Item 66) must be provided by a Licensed Professional Engineer, based on calculations following ODOT's Load Rating Guidelines. The engineer's calculations must be included.

Item 66	Inventory Rating	18
---------	------------------	----



PUBLIC WORKS DEPARTMENT

360 SW Avery Avenue
Corvallis, OR 97333-1192

(541) 766-6821

FAX (541) 766-6891

www.co.benton.or.us/pw/index.html

Date: March 20, 2003

To: Bellfountain Road File- County Road No. 25100

From: Daineal Jennings

Re: Bridge traffic study conducted on Bellfountain Road at milepost 14.03.

Enclosed is a report of a traffic study conducted during the period of: 7/23/2003-7/30/2003. The site under investigation is located on Bellfountain Road, 0.44 miles South of Dawson Road.

The purpose of this traffic study is for bridge traffic, which requires information on truck percentages. The equipment used to conduct this study was a Unicorn TT 502 Vehicle Traffic Classifier. The vehicle traffic classifier records count, time and axle length. The data are compiled for each lane and for combined directions.

This traffic data indicates that the average daily traffic for this portion of Bellfountain Rd. to be 642 vehicles per day. This value is consistent with County records of past average daily traffic (ADT) counts. The most recent recorded count being 460 vehicles per day in 2001. These ADT records are stored in the Road Information System (RIS).

The traffic study report includes the following:

1. Vehicle classification and percentages
2. Map indicating placement of the classifier

Vehicle Classification and Percentages

Road Name	<u>Bellfountain Rd</u>	Location	<u>MP 14.03</u>
Road Number	<u>25100</u>	Dates beg	<u>7/23/2003</u>
City	<u>Bellfountain</u>	Dates end	<u>7/30/2003</u>
County	<u>Benton</u>	Direction	<u>Combined</u>

4491 Total vehicles
642 Average Daily Traffic

2.56% Motorcycles
57.87% Passenger cars
36.52% Other 2 axle, 4 tire vehicles (w/wo trailer)
0.00% Buses
0.40% 2 axle, 6 tire, single trailer trucks
1.18% 3 axle, single unit trucks
0.00% 4 axle, single unit trucks
0.36% 4 or less axle, single trailer trucks
0.71% 5 axle, single trailer truck
0.02% 6 or more axle, single trailer trucks
0.02% 5 axle, multi-trailer trucks
0.04% 6 axle, multi-trailer trucks
0.31% All other vehicles
3.05% All trucks total

2003 Bellfountain Bridge Study



AGENDA CHECKLIST
BENTON COUNTY BOARD OF COMMISSIONERS
 (Page 1 of 2)

This document must be completed for each agenda item submitted for consideration by the Board of Commissioners at any meeting where a Board quorum is expected.

Suggested Placement for this Agenda Item:
 BOC Tuesday Meeting
 Other _____

Suggested Agenda Date: October 28, 2003

Department Submitting: Public Works

Short Title of Agenda Item: Order Establishing a 20 - ton Weigh Restriction on Oliver Creek (Bellfountain Road) Bridge, County Bridge No. 25100-144

Contact Person: Chuck Knoll

Phone Extension: 6013

Person Attending BOC Meeting (REQUIRED):
Chuck Knoll, Roger Irvin

Person(s) Who Should Receive Signed Documents After Meeting: Debie Wyne, Public Works

This Item Involves: (Check all that apply for this meeting.)	
<input checked="" type="checkbox"/> Order/Resolution	<input type="checkbox"/> Appointments
<input type="checkbox"/> Ordinance/Public Hearing:	<input type="checkbox"/> Update on Project/Committee
<input type="checkbox"/> 1st Reading <input type="checkbox"/> 2nd Reading	<input type="checkbox"/> Discussion Only
<input type="checkbox"/> Public Comment Anticipated: _____ Estimated Time	<input checked="" type="checkbox"/> Discussion & Action <u>10 minutes</u> _____ Estimated Time
<input type="checkbox"/> Document Recording Required	<input type="checkbox"/> Special Report:
<input type="checkbox"/> Contract/Agreement/Notice of Intent	<input type="checkbox"/> Oral <input type="checkbox"/> Written

If appropriate, have Boards/Committees been involved? Yes No Not Applicable
 If yes, address under Salient Issues, page 2.

If appropriate, has this agenda/item been advertised? Yes No Not Applicable
 Names of Publications NA

Dates of Publication: _____

Reviewed By: (Signature and Date Required)

- | | |
|--------------------------------|-----------------------------------|
| _____ Department/Division Head | Required for all BOC meetings. |
| _____ BOC Office | Required for all BOC meetings. |
| _____ County Counsel | Required for all legal documents. |
| _____ Budget Office | If appropriate. |
| _____ CAO | Required for all BOC meetings |

G:\Avery ProjMgmt\BRIDGES\bellfountain144\bridge posting\Agenda Oliver Creek Bridge 03.doc
MATERIALS ATTACHED MUST BE "CAMERA READY"
Provide one original and 11 copies of documents larger than 8 1/2 X 11",
or documents in color that must be available to the Board in color
PLEASE DO NOT USE STAPLES

AGENDA CHECKLIST
BENTON COUNTY BOARD OF COMMISSIONERS
(Page 2 of 2)

DATE OF MEETING:

October 28, 2003

TITLE OF AGENDA ITEM:

Order Establishing a 20-ton Weight Restriction on Oliver Creek Bridge located on Bellfountain Road at Milepost 14.4, County Bridge No. 25100-144.

IDENTIFIED SALIENT ISSUES:

Benton County Public Works has an active program to monitor, maintain and improve the roads, bridges, and drainage systems associated with road crossings. The bridge on Bellfountain Road on Benton County Milepost 14.4 as it crosses Oliver Creek was modified in 1993 with tension rods to strengthen the stringers (support beams). The existing stringers were determined at the time to be too small to support Oregon Legal Loads without some additional support. A recent bridge inspection has demonstrated that the tension rods, which were installed to provide additional support, have become loose such that they do not effectively provide additional structural strength for the bridge.

A load rating analysis was completed for the bridge. This included a complete analysis of the stringers as well as the deck and the caps (cross support beam members). The load rating indicated that all of these structural members are not designed to support Oregon Legal Loads.

Therefore, it is recommended to post the bridge at 20 tons so as to prevent bridge failure. An attempt to obtain funding to replace the existing single-span bridge with a longer single span bridge accompanied by a widened and naturalized streambed is in progress. The longer bridge will eliminate a potential flooding hazard associated with this bridge crossing.

The posting for 20 tons is designed to prevent heavy truckloads with a short wheelbase from crossing the bridge. Heavier loads with a longer wheelbase such as a log truck would be able to cross the bridge as long as they did not exceed 33 tons. Annual permits will be provided to haulers for such instances. A full logging truckload is 40 tons.

This section of road receives on an average of 640 vehicles per day. The truck count has been determined to be only about 20 trucks per day. Alternate routes are available for trucks to bypass this bridge until it can be replaced.

OPTIONS:

Option 1 Approve the Order to post the bridge with a 20-ton weight limit. Benton County Public Works will also apply for State and Federal Funding to replace and improve this bridge crossing.

Option 2 Do not approve the Order.

FISCAL IMPACT:

Fiscal impact should be minimal if State or Federal Funding can be obtained to replace this bridge and improve this bridge crossing. Potential fiscal liability is significant should a bridge failure occur because the bridge was not posted.

STAFF RECOMMENDATIONS:

Staff recommends that the Board approve the Order to post the bridge for a 20-ton weight limit.

SUGGESTED MOTION(S):

I move to approve to post Oliver Creek Bridge on Bellfountain Road at Milepost 14.4 with a 20 - ton weight limit.

**BEFORE THE BOARD OF COUNTY COMMISSIONERS
FOR THE STATE OF OREGON, FOR THE COUNTY OF BENTON**

In the matter of the Posting of Oliver Creek
Bridge (County Bridge No. 25100-144)
And Establishing 20-ton Weight Limit

ORDER NO. _____

Pursuant to the general authority of the Benton County Board of Commissioners and
ORS Chapter 810 for the imposition of traffic restrictions and the erection of traffic signs
and signals it is,

HEREBY ORDERED that a 20-ton weight restriction be hereby established on
Oliver Creek Bridge (No. 25100-144) located on Bellfountain Rd at Benton County
Milepost 14.4.

IT IS FURTHER ORDERED that the County Public Works Department secure
and erect traffic devices in accordance with the provisions of the Manual on Uniform
Traffic Control Devices (MUTCD) as approved by the Federal Highway Administrator.

Approved for Traffic Engineering Requirements

County Engineer: _____

Adopted this _____ day of _____, 2003

Signed this _____ day of _____, 2003

BENTON COUNTY BOARD OF COMMISSIONERS

Chair

Commissioner

Commissioner

Posted by: _____

Date: _____



**Oregon Department of Transportation
Technical Services Branch**

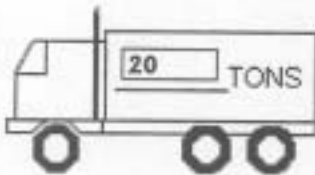
Bridge Engineering Section
Local Agency Bridge Load Rating
Posting Summary Sheet

Local Agency: BENTON COUNTY
Date: 10/14/2003

NBIS Bridge Number: 14122

Truck	Inventory	Operating	Posting Required
HS Equivalent	HS 10	HS 13	N/A
HS 20 (36 Ton)	18.4 Tons	24.1 Tons	N/A
Type 3 (25 Ton)		19.8 Tons	YES
Type 3S2 (40 Ton)		32.8 Tons	YES
Type 3-3 (40 Ton)		38.4 Tons	YES
Permit 5 (60.25 Ton)		39.2 Tons	N/A
Permit 6 (75.25 Ton)		44.4 Tons	N/A
Permit 7 (92.5 Ton)		60.1 Tons	N/A

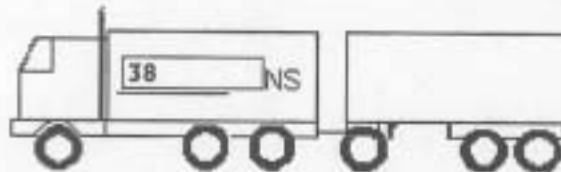
**OREGON LEGAL LOADS
RECOMMENDED POSTING**



TYPE 3



TYPE 3S2



TYPE 3-3

COMMENTS:

Load Rating and Recommended Posting does not include support provided by Temporary Tension Rods to Stiffen the Stringers. It is recommended to post bridge as determined by this evaluation since the tension rods are loose and may be a sign of metal fatigue.



Expires 6/30/05

LOAD RATING REPORT

TABLE OF CONTENTS

Bridge No. 14122
Bridge Name: Oliver Creek (Bellfountain Road)

<u>DESCRIPTION</u>	<u>PAGE</u>
POSTING SUMMARY SHEET	1
TABLE OF CONTENTS	2
LOAD RATING SUMMARY SPREADSHEETS	3
COMMENTS REGARDING REPORT AND INSPECTION	5
LATEST BRIDGE INSPECTION REPORT	6
PICTURES OF BRIDGE FROM OCTOBER 2003	10
LOAD RATING CALCULATIONS FOR STRINGERS	11
LOAD RATING CALCULATIONS FOR CAP	14
LOAD RATING CALCULATIONS FOR DECK	17

LOAD RATING REPORT

COMMENTS REGARDING REPORT AND INSPECTION

Bridge No. 14122
Bridge Name: Oliver Creek (Bellfountain Road)

On October 7, 2003, the bridge on Bellfountain Road @ Benton County Milepost 14.4 was inspected during low water flow conditions as a follow up on a review of the inspection provided by OBEC Engineering.

Pictures (Attached with report) were taken that demonstrate the debris collected during high water flow. The high amount of debris was brought to the attention of the Benton County Road Maintenance Supervisor so as to have the debris removed. The supervisor indicated that this bridge was a continual problem regarding collection of debris during high water flow during annual storm events. This bridge and road has experienced flooding during severe storm events.

The tension rods were also inspected. The tension rods on the outside stringers were tight while the tension rods on the inside stringers were very loose. It should be noted that the outside stringers are wider by two inches (6 to 8) and deeper by 1.5 inches (18.75 to 20). Therefore, the outside stringers would be stiffer and not require the tension rods in the first place. Since the inside tension rods were very loose it is expected that metal fatigue had occurred and the actual strength of these rods should be questionable.

With the questionable strength of the tension rods, a load rating was performed. OBEC Consulting Engineers last completed a load rating in 1993. The existing load rating provided similar results to that reported by OBEC Consulting Engineers except the rating factors were determined to be lower for the present bridge due to an additional inch of asphalt placed on the bridge.



C. R. Knoll, PE
Senior Engineer
Benton County Public Works

October 14, 2003



OREGON D.O.T. BRIDGE SECTION

LOAD RATING SUMMARY REPORT (PAGE 1)

For local agency bridges. Latest Revision 8/3/1999

BRIDGE DATA

BRIDGE #: 14122 NBI FEATURE: OLIVER CREEK
 BRIDGE NAME: OLIVER CREEK BRIDGE
 HIGHWAY NAME: BELLFOUNTAIN ROAD
 REGION: 2 DIST: 2A COUNTY: BENTON
 HIGHWAY #: 25100
 MILEPOST: 14.40

YEAR BUILT: 1907 DESIGN LOADING: H20 OWNER: BENTON COUNTY
 SPAN DESCR: 1 SIMPLE SPAN - 28.11
 OTHER DESCR: Two Lane Timber Bridge

LOAD RATING ENGINEER DATA

RATING DATE: 10/10/03 FIRM: Benton County Public Works ENGINEER: CRK

LATEST INSPECTION DATA

INSPECTION DATE: 11/25/02 ADT: 642 ACTT: 20
 DECK: 0 SUBSTR: 0
 CONDITION RATINGS: → 0

RATING DATA

LRFD FACTORS: IMPACT 1+I: NA γ_c : NA
 LOAD FACTOR LOAD RATINGS FOR N.B.L.: INVENTORY: HS OPERATING: HS
 INVENTORY CODE: (2+lane): 212 OPER. CODE: (2+lane): 215
 SECTIONS EVALUATED: 0 COMMENTS: Bridge Load Rating is based on single span stringer bridge without temporary tension rod stringer stiffener



CALCULATION BOOK: _____
 A.C. DEPTH, INCHES: 4.0
 WEARING SURFACE: _____
 NBI STATUS ITEMS:
 Operational Status (Item 41): A
 Bridge Posting Status (Item 70): 0
 Temporary Status (Item 100): T

LOAD:	← 1st rating control			→ 2nd rating control		
	R.F.	Limit State or V	MEMBER	R.F.	Limit State or V	MEMBER
DESIGN & LEGAL VEHICLES						
HS20 (72K)	0.67	M	Stringer	1.71	0.54	
TYPE 3 (50K)	0.79	M	"	"	0.54	
TYPE 3S2 MAX (80K)	0.82	M	"	"	0.54	
TYPE 3-3 (80K)	0.96	M	"	"	0.54	
AASHTO LANE LOAD						
PERMIT VEHICLES, MULTIPLE LANES, FULL IMPACT						
PERMIT-5 (120.5K)	0.65	M	Stringer	1.71	0.54	
PERMIT-6 (150.5K)	0.59	M	"	"	0.54	
PERMIT-7 (185.0K)	0.65	M	"	"	0.54	
SPECIAL-1						
SPECIAL-2						
PERMIT VEHICLES, SINGLE LANE, FULL IMPACT						
PERMIT-5 (120.5K)	0.55	M	Stringer	1.51	0.54	
PERMIT-6 (150.5K)	0.59	M	"	"	0.54	
PERMIT-7 (185.0K)	0.65	M	"	"	0.54	
SPECIAL-1						
SPECIAL-2						
PERMIT VEHICLES, SINGLE LANE, 10% IMPACT						
PERMIT-5 (120.5K)						
PERMIT-6 (150.5K)						
PERMIT-7 (185.0K)						
SPECIAL-1						
SPECIAL-2						

**OREGON D.O.T. BRIDGE SECTION
LOAD RATING WORKSHEET (PAGE 2)**

BRIDGE NO: 14122 RATING DATE: 10/10/2003
BRIDGE NAME: OLIVER CREEK BRIDGE

SECTION EVALUATED	1st	2nd	3rd	4th	5th	6th	7th	8th
LFRD Brass_OUT File Name: FORCE TYPE (+-M or V): PHI (Resistance Factor): MEMBER (eg. Int. girder): SPAN (eg. 1 of 4): LOCATION (eg. 0.1L): AASHTO Impact (1-4) P/S Only:	CAP M	CAP V	STRINGER M	STRINGER V	DECK M	DECK V		
NBI RATINGS (HS20 VEHICLE) INVENTORY (HS20) OPERATING (HS20)	Bent 1 & 2 0.5L	Bent 1 & 2 0.1L	STRINGER 1 of 1 0.5 L	STRINGER 1 of 1 0.1L	DECK 1 of 1 0.5L	DECK 1 of 1 0.1L		
DESIGN & LEGAL VEHICLES HS20 (72K) TYPE 3 (50K) TYPE 3S2 MAX (80K) TYPE 3-3 (80K) AASHTO LANE LOAD	1.09 Ser 1.42 Ser 1.39 Ser 1.57 Ser	0.65 Str 0.65 Str 0.83 Str 0.94 Str	0.67 Str 0.79 Str 0.82 Str 0.96 Str	2.26 Str 2.63 Str 2.56 Str 3.01 Str	0.41 Str 0.78 Str 0.78 Str 0.78 Str	0.43 Str		
PERMIT VEHICLES, MULTIPLE LANES, FULL IMPACT	1.13 Str 0.93 Str 1.03 Str	0.67 Str 0.55 Str 0.61 Str	0.65 Str 0.59 Str 0.65 Str	2.07 Str 1.92 Str 2.07 Str	0.61 Str 0.61 Str 0.61 Str	0.64 Str 0.64 Str 0.64 Str		
PERMIT VEHICLES, SINGLE LANE, FULL IMPACT	1.13 Str 0.93 Str 1.03 Str	0.67 Str 0.55 Str 0.61 Str	0.65 Str 0.59 Str 0.65 Str	2.07 Str 1.92 Str 2.07 Str	0.61 Str 0.61 Str 0.61 Str	0.64 Str 0.64 Str 0.64 Str		
PERMIT VEHICLES, SINGLE LANE, 10% IMPACT	0.00 Str 0.00 Str 0.00 Str	0.00 Str 0.00 Str 0.00 Str	0.00 Str 0.00 Str 0.00 Str	0.00 Str 0.00 Str 0.00 Str	0.00 Str 0.00 Str 0.00 Str	0.00 Str 0.00 Str 0.00 Str		

Approach 72 7 Better than present
Alignment minimum criteria

REMARKS

Element #	Bent/Span	Member ID	Deficiency Description
32	S1	DECK	ENDS OF DECK SOFT SPLIT & BEGINNING TO DECAY
111	S1	STRNGR	LOOSE TENSION RODS. STRINGERS HAVE SOME CHECKS, NEGATIVE CAMBER, SOME LARGE KNOTS; BUT NOW SUPPORTED WITH THE HELP OF TENSION RODS. DRIFT IN TENSION RODS. GIRDER 5 THROUGH CHECKED FULL LENGTH.
206	B2	PILE	PILE #4 IS ROTTEN. ALL SPLIT.
235	B1,2	CAP	MINOR CENTER ROT NEAR DRIFT PINS. DRIFT ON CAPS. B2 CAP SPLIT IN VARIOUS LOCATIONS.
990	B1,2	APPRO.	1" SETTLEMENT @ BOTH ENDS.
990	B1,2	BKWALL	SOME ROT IN BACKWALL AND WING BOARDS.
990	B2	EMBANK	EROSION @ B2 LT. & RT. & UNDER BACKWALL.
990	ALL	GRDRAIL	NOT TO STANDARDS.

MAINTENANCE RECOMMENDATIONS

Crew #	Work Order	Priority	Elem #	Bent/ Span	Member Work	Est Cost	Comp Date
	Routine/Schedule		111	S1	GIRDER TIGHTEN TENSION RODS	500	
	Routine/Schedule		206	B2	PILE REPLACE PILE #4 IN B2 & BAND SPLIT TOPS.	4000	
	Routine/Schedule		990	B2	EMBANKARMOR/RIPRAP LT. & RT. AND ALONG B2 BASE	5000	
	Routine/Schedule		990	B1,2	APPRO. PATCH SETTLED AC.	500	

LOAD RATING

Rating Date		Posting Req	(5) = or > legal
Design Load	H20	OR Method	No rating analysis performed
Operating Rating	33.0 ton	IR Method	No rating analysis performed
Inventory Rating	20.0 ton		

Truck	Operating Rating	Inventory Rating	% Below	Posting Required	Controlling Member	Actual Posting	Posting Date
-------	------------------	------------------	---------	------------------	--------------------	----------------	--------------

No load rating postings found.

LOAD RATING CONDITION COMPARISON CHART

Category	NBI #	Rating Condition	Current Condition
----------	-------	------------------	-------------------

Approach Condition			8 Very good
Deck Wearing Surface			8 Very good
Deck	58	6 Satisfactory	6 Satisfactory
Superstructure	59	7 Good	6 Satisfactory
Substructure	60	6 Satisfactory	6 Satisfactory
Temporary Repairs	103	No	Yes
Wearing Surface			4.0 in

INSPECTION SCHEDULE

Activity	Conducted On	Frequency	Next Inspection
Routine Inspection	11/05/02	Every 2 yr	10/01/04
Timber/Boring	10/12/96	Every 2 yr	10/25/02
X-Channel Profile	10/12/96	Every 10 yr	10/12/06

61.0 SUFF RATING	Functionally Obsolete	STRUCTURE AND INVENTORY APPRAISAL				BRIDGE NO 14122	INSP DATE 11/02
(122) HIGHWAY/CO RD.	025100	4	(43) STRUCT MAIN	7 Wood or Timber 02 Stringer/Multi-beam or Girder	(92) CRITICAL FEAT INSP	DATE	(93) DATE
(2) HIGHWAY DISTRICT				0 Other DO Not Applicable	(A) FRACTURE CRIT	n 00	2000
(3) COUNTY		3	(44) STRUCT APPR		(B) UNDERWATER INSP	n 00	2000
(4) CITY	00000		(45) NUMBER MAIN SPANS				
(5) INVENTORY ROUTE	141000000		(46) NUMBER APPR SPANS				
(6) FEATURES INT	OLIVER CREEK		(47) HORIZONTAL CLEARANCE		19.8	(94) COST OF IMPROVEMENT	47000.0
(7) FACILITY CARRIED	BELLFOUNTAIN RD		(48) MAXIMUM SPAN LENGTH		28.0	(95) ROADWAY IMPROVEMENT	4700.0
(8) STRUCTURE NUMBER	14122 251 01593		(49) STRUCTURE LENGTH		29.0	(96) PROJECT COST	75200.0
(9) LOCATION	1.6 MI NORTH OF CR45120		(50) SIDEWALK WDMTH	LT 0.0 RT 0.0		(97) YR OF IMPROVEMENT	2001-01-01 00:00:00
(10) VERT CLEARANCE	100.0 ft		(51) BRIDGE ROADWAY WDMTH		19.8	(98) BORDER BR ST-CODE	%
(11) MILEPOINT	14.40		(52) DECK WIDTH		20.4	(99) BORDER STRUCTURE NO	
(16) LATITUDE	44.3518 N		(53) VERT CLEAR OVER DECK		100.0 ft	(100) DEFENSE HIGHWAY	0
(17) LONGITUDE	123.3561 W		(54) VERT CLEAR UNDER DECK CD		0.00 ft	(101) PARALLEL STRUCTURE	N
(19) BYPASS DETOUR	4.0		(55) MIN LAT UNDERCLEAR CD	N RT 0.0		(102) DIRECTION OF TRAFFIC	2
(20) TOLL	3 On free road		(56) MIN LAT UNDERCLEAR	LT 0.0		(103) TEMPORARY STRUCTURE	1
(21) CUSTODIAN	02 County Highway Agency		*** CONDITION ***			(104) HIGHWAY SYSTEM	0
(22) OWNER	02 County Highway Agency					(106) YEAR RECONSTRUCTED	
(26) FUNC CLASS	07 Rural Major Collector		(58) DECK		6	(107) DECK STRUCTURE	6
(27) YEAR BUILT	1957		(59) SUPERSTRUCTURE		6	(108) WEARING SURFACE	600
(28) LANES ON	2 LANES UNDER 0		(60) SUBSTRUCTURE		6	(109) TRUCK ADT	10.0%
(29) AVERAGE DAILY TRAFFIC	500		(61) CHANNEL		N	(110) DESIGNATED NATIONAL NETWORK	0
(30) YEAR OF ADT	2002		(62) CULVERT		33.0	(111) PIER PROTECTION	
(31) DESIGN LOAD	4 H20		(64) OPERATING RATING		20.0	(112) NBIS BRIDGE LENGTH	Y
(32) APPROACH ROADWAY	22.0 ft		(66) INVENTORY RATING			(113) SCOUR CRITICAL BRIDGE	U
(33) BRIDGE MEDIAN	0 None		*** APPRAISAL ***			(114) FUTURE ADT	700.0
(34) SKEW			(67) STRUCTURE CONDITION		5	(115) YEAR OF FUTURE ADT	2022
(35) STRUCTURE FLARED			(68) DECK GEOMETRY		2	(116) VERT-LIFT CLEARANCE	
(36) TRAFFIC SAFETY FEATURE	1011		(69) UNDERCLEARANCE		N		
(37) HISTORICAL SIGNIFICANCE	5		(70) POSTING		5		
(38) NAVIGATION CONTROL	0		(71) WATERWAY ADEQUACY		5	*** STATE INFORMATION ***	
(39) NAVIGATION VERT CLEAR	0.0		(72) APPR RDWY ALIGNMENT		7	(117) EST MAINT COST	2700.0
(40) NAVIGATION HORZ CLEAR	0.0		(75) TYPE OF WORK	1 Done by contract		(118) CULVERT LENGTH	ft
(41) OPEN STATUS	A		(76) IMPROVEMENT LENGTH		29.0	(119) CULVERT INSIDE HEIGHT	ft
(42) TYPE SERVICE	1 Highway Waterway		(90) INSPECTION DATE		1102	(120) INSPECTOR NUMBER	Way, Tim (CT029)
(12) BASE HIGHWAY NETWORK			(91) INSPECTION FREQUENCY		24 MO	(121) MAINTENANCE NOTES	
(13) LRS INVENTORY ROUTE			(83) OPER RATING METHOD		5		
(105) FEDERAL LANDS			(85) INV RATING METHOD		5		

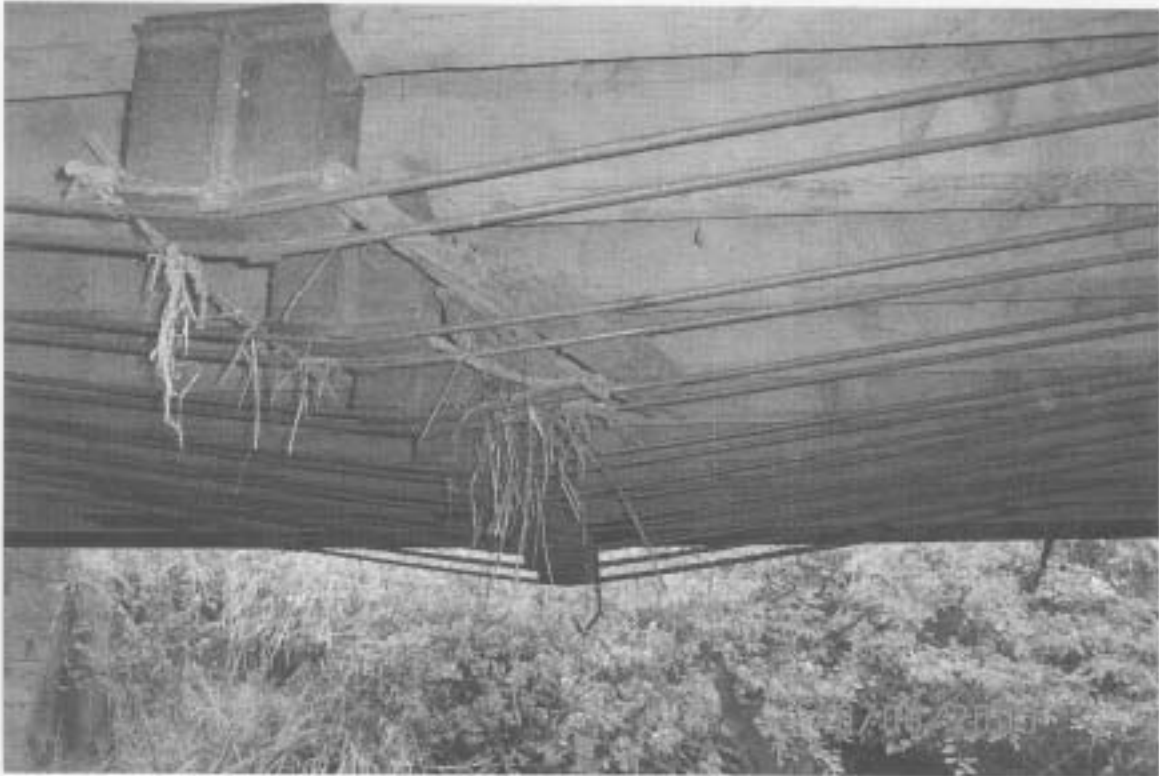
Belfountain Road (Oliver Creek) Bridge South Approach



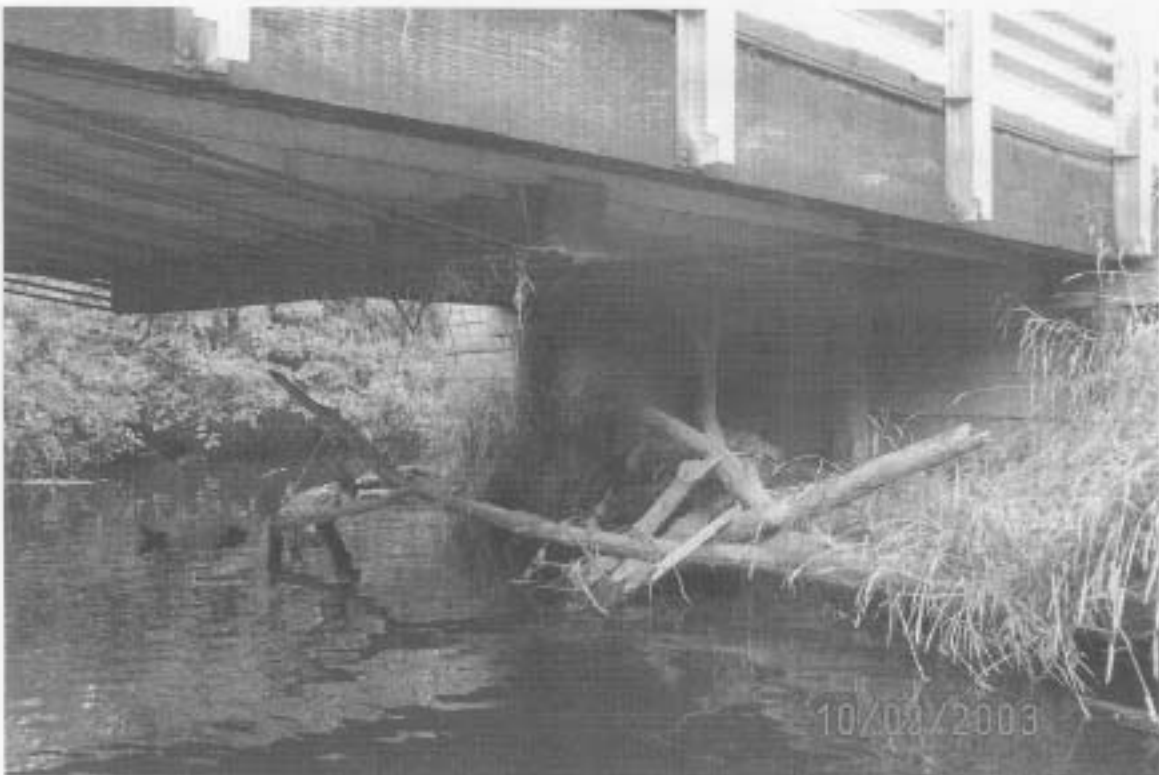
Belfountain Road (Oliver Creek) Bridge - Looking Upstream



Bellfountain Road (Oliver Creek) Bridge – Tension Rod Support



Bellfountain Road (Oliver Creek) Bridge – Under Bridge



Bellfountain Road (Oliver Creek) Bridge – Upstream of Bridge



Bellfountain Road (Oliver Creek) Bridge – Upstream of Bridge



Bellfountain Road (Oliver Creek) Bridge – North Approach



LOAD RATING REPORT

BRIDGE CONFIGURATION

BELLFOUNTAIN ROAD (OLIVER CREEK) BRIDGE
BENTON COUNTY BRIDGE NO 25100-14.4
ODOT BRIDGE NO. 14122

Bridge Length	28 ft	Span	26 ft oc	One Span
Stringer Size	6 in wide	18.75 in tall	Timber Type	Select
Deck	2.5" x 11.5"		Timber Type	No. 1
Running Deck	2" x 6" TG planks		Timber Type	No. 1
Cap	12" x 12"		Timber Type	No. 1
Piling	12" Dia @ 6 ft centers			
Surface	4' HMAC			

Foundation Evaluation of Bent 1 and Bent 2

Existing Foundation consists of timber piles and timber caps.
There are not any documented engineering drawings or calculations.
Inspection of the bridge did not provide any indication of failure of the piles.
The existing road surface is of asphalt and there were transverse cracks at in the pavement in the approaches indicating settlement of the approaches.
Cracks could also be due to the bending of the cap next to the bridge abutment.
The bridge was built in 1957

Properties of Stringers and Decking

Douglas Fir Structural Design Values (psi)

(AASHTO Table 13.5.1A)

	Select	No 1	
Bending F_b	1600	1350	
Tension Parallel to Grain, F_t	950	675	
Shear Parallel to Grain, F_v	85	85	
Compression Perpend. to grain	625	625	
Compression Parallel to grain	1100	925	
Modulus of Elasticity	1600000	160000	
Wet Service Factor, C_w	1.0		(AASHTO Table 13.5.1A note 2)
Moisture Content of Wood to be less than 19%			
Size Factors, C_p , for 3" x 12" to 4" x 12" lumber			(AASHTO Table 13.5.1A note 3)
	Select		
Fb	1.0		
Ft	1.0		
Fc	1.0		
Flat Use Factor - C_{fu}	1.1		(AASHTO Table 13.5.1A note 4)
2.5" thick decking with width > 10"			
Repetitive Member Factor			
C_r	1.15		(AASHTO Table 13.5.1A note 5)
To be used for deck only Not to be used for stringers			
Shear Stress Factor C_H	1.0		(AASHTO Table 13.5.1A note 6)
1.0 due to unknown condition of decking			
Load Duration Factor for Vehicle Live Load			
C_D	1.15		(AASHTO Table 13.5.4A)

Deadload Material Weights

2x6 TG running deck	8.33 psf
Decking 2.5"/12" x 50	10.41667 psf
Asphalt 4" x 12.5	50 psf
Stringers 6 x 18.75 x 50 / 144	39.0625 psf

Stringer Analysis

Stringer Properties

Dimensions	6" x 18.75	
Area		112.5 in ²
Section Modulus, $S = bd^2/6 =$		352 in ³
Moment of Inertia, $I = bd^3/12 =$		2786 in ⁴
Center to center spacing =		24 in

Allowable Moment

Operating Rating		
Base Value Allowable Bending Stress = $f_b =$	1600 psi	(AASHTO Table 13.5.1A)
Size Factor 6" x 18.75" $C_T =$	0.85	(AASHTO Table 13.6.4.2.2)
Repetitive Member Factor $C_r =$	1.0	(AASHTO Table 13.5.1A note 5)
Load Duration Factor $C_D =$	1.15	(AASHTO Table 13.5.4A)
Flat Use Factor $C_{fu} =$	1.0	(AASHTO Table 13.5.1A note 4)
Adjusted Allowable Bending Stress		
$F_b = f_b \times C_T \times C_r \times C_D \times C_{fu} =$	1751 psi	
Allowable Moment = $M_a = F_b \times S =$	51.3 k-ft	

Wheel Load Distribution

Multiple layered floors over 5" thick running perpendicular to each other		(AASHTO Table 3.23.1)
S = average stringer spacing	2 ft	Two lane bridge
Distribution Factor = $DF = S/4.0 =$	0.50	

Dead Load moment

$$M_d = w_d \times l^2/8$$

$w_d =$ Superimposed dead load per square foot x stringer spacing + self weight of stringer

$w_d =$	176.5558 plf
$M_d =$	14.9 k-ft

Live Load Moments

Moments are maximum values calculated as each truck would move across the span.
Moments are per wheel line

Truck	Live Load Moment (Without Impact)		Truck	Live Load Moment (With Impact)	
HS-20	111 k-ft	(Moment Tables)	HS-20	144 k-ft	(Moment Tables)
Type 3	94 k-ft	(Moment Tables)	Type 3	122 k-ft	(Moment Tables)
Type 3S2	90 k-ft	(Moment Tables)	Type 3S2	118 k-ft	(Moment Tables)
Type 3-3	78 k-ft	(Moment Tables)	Type 3-3	101 k-ft	(Moment Tables)
Permit 5	113.8235 k-ft	Hand Calculated	Permit 5	149.2353 k-ft	Hand Calculated
Permit 6	125.775 k-ft	Hand Calculated	Permit 6	162.8625 k-ft	Hand Calculated
Permit 7	113.8235 k-ft	Hand Calculated	Permit 7	149.2353 k-ft	Hand Calculated

Inventory and Operating Moment Load Rating

Rating factors for each truck is given by the equation below, the allowable moment minus the dead load moment divided by the distributed live load moment.

Ratio of Operating rating to inventory rating = 1.33 (5.4.7 Manual for Maintenance Inspection of Bridges)

$$RF = \frac{M_{allowable} - M_{DL}}{DF \times M_{LL}}$$

Truck	Rating Factor		LOADING, K		Truck	Rating Factor		LOADING, K	
	INV	OPR	INV	OPR		INV	OPR	INV	OPR
HS-20	0.88	0.67	47	63	HS-20	0.51	0.67	36	48
Type 3	0.77	1.03	39	51	Type 3	0.60	0.79	30	40
Type 3S2	0.81	1.06	65	86	Type 3S2	0.62	0.82	49	66
Type 3-3	0.93	1.24	75	99	Type 3-3	0.72	0.96	58	77
Permit 5	0.64	0.85	77	102	Permit 5	0.49	0.65	59	78
Permit 6	0.58	0.77	87	115	Permit 6	0.45	0.59	67	89
Permit 7	0.64	0.85	118	157	Permit 7	0.49	0.65	90	120

Note: The values including impact are comparable to the load rating completed in 1993 by OBEC

Allowable Shear Stress

Inventory Rating According to AASHTO 13.5.6

Shear Stress Parallel to Grain, F_v	170 psi	(AASHTO Table 13.5.1A)
Wet Surface Factor for Shear = C_w	1.0	(AASHTO Table 13.5.1A note 2)
Load Duration Factor = C_d	1.0	(AASHTO Table 13.5.4A)
Horizontal Shear Adjustment = C_H	1.0	(AASHTO Table 13.5.4A note 6)
Use 1.0 for conservative rating		
Allowable Shear Stress $F_v = F_v * C_w * C_d * C_H$	170.0 psi	
Allowable Shear in kips		
$F_v = 3V/2bd$ $V = 2bdF_v/3 =$	12.75 kips	(AASHTO 13-8)

Critical Section for Horizontal Shear L_c is the lesser of 3 times the member depth or one quarter of the span length

$3d = 3 * 17 \text{ in} =$	4.25 ft	(AASHTO 13.5.5.2)
$L/4 =$	6.50 ft	
$L/4 < 3d$ therefore $L_c =$	4.25 ft	

Dead Load Shear

$$V_{DL} = w_d * L/2 = w_d * L_c = 1.54 \text{ kips}$$

Live Load ShearDistributed live load shear determined at the critical section L_c , where V_{LL} is the shear per wheel line.

$$V_{LL} = 0.5(0.6 * V_{LL} + DF * V_{LL}) \quad (\text{AASHTO 13-9})$$

Truck	Live Load Shear
HS-20	6.60 kips
Type 3	5.67 kips
Type 3S2	5.83 kips
Type 3-3	4.95 kips
Permit 5	7.21 kips
Permit 6	7.76 kips
Permit 7	7.21 kips

Inventory and Operating Shear Load Rating

Rating factors for each truck is given by the equation below, the allowable shear minus the dead load shear divided by the distributed live load shear.

$$RF = \frac{V_{Allowable} - V_{DL}}{V_{LL}}$$

Truck	Rating Factor	
	INV	OPR
HS-20	1.70	2.26
Type 3	1.98	2.63
Type 3S2	1.92	2.56
Type 3-3	2.26	3.01
Permit 5	1.56	2.07
Permit 6	1.44	1.92
Permit 7	1.56	2.07



Prepared By: C. R. Knoll, PE
Date: October 14, 2003

LOAD RATING REPORT

BRIDGE CONFIGURATION

BELLFOUNTAIN ROAD (REESE CREEK) BRIDGE
BENTON COUNTY BRIDGE NO 25100-144
ODOT BRIDGE NO. 14121

Bridge Length	26 ft	Span	26 ft	cc	
Stringer Size	6 in wide	18.75 in tall	Timber Type	Select	
Deck	varies .47 TO .52 2.5" x 12"		Timber Type	No. 1	
Running Deck	1.5" x 8" planks		Timber Type	No. 1	
Foundation Type	Timber Pile		weight fir	50 lb/cf	
			Weight AC	144 lb/cf	
Pile Spacing	5.7 ft	On two outside spans, 4.3 ft on inside span			
Cap Size	12 in	12 in	Timber Type	No 1	

Cap Analysis

Inventory Stresses

Bending

Allowable Bending Stress (Inventory)

F_b 1500 psi (AASHTO Table 13.5.1A)

Wet Service Factor, C_w 1.0 (AASHTO Table 13.5.1A note 2)

Moisture Content of Wood to be less than 19%

Load Duration Factor for Vehicle Live Load

C_d 1.15 (AASHTO Table 13.5.4A)

Adjusted allowable bending stress

F_b 1725 psi

Allowable Moment (Inventory)

$b = 12$ in

$d = 12$ in

$S = bd^2/6 = 288$ in³

$M_{all} = F_b S = 41.4$ k-ft (Inventory)

Shear

Allowable Shear Stress (Inventory)

F_v 170 psi (NDS 2001, Table 4D)

Wet Service Factor, C_w 1.0 (AASHTO Table 13.5.1A note 2)

Moisture Content of Wood to be less than 19%

Load Duration Factor for Vehicle Live Load

C_d 1.15 (AASHTO Table 13.5.4A)

Adjusted Allowable Shear Stress (Inventory)

$F_v = F_v C_w C_d = 195.5$ psi

Allowable Shear

$V_{all} = (2/3)bdF_v = 18.8$ k (Inventory)

Dead Load from Span

Deadload Material Weights - Across End of Cap

T&G Deck 1.5"/12" x 50 x 26 ft span/2 87.5 plf

Decking 2.5"/12" x 50 x 26 ft span/2 145.8 plf

Asphalt (4"/12)"144lb/cf"26ft span/2 672.0 plf

Stringers 6"18.75"50"14"(11/20)(144) 300.8 plf

Cap (12"/12)"50 50.0 plf

Dead Load Reactions

1.26 kips/ft on each cap

Dead Load Moment at middle of span

due to dead load reactions

$M = (DL/R) * (cap span)^2/8 = 5.1$ k-ft

Allowable Moment minus Dead Load Moment

36.3 kft

Dead Load Shear

due to dead load reactions

$V = DL/R * cap span/2 = 3.58$ k

Allowable Shear minus Dead Load Shear

15.19 k

Vehicle Loads (With Impact)

For analysis of the cap the maximum reactions of the truck at each bent are used for a load rating analysis. The maximum values for shear are loads that act in the center of the stringer next to the piling. The maximum values for bending moment are positioned on the cap centered between the two pilings. Add 1.30 Factor for impact

Truck Load Effect Calculator

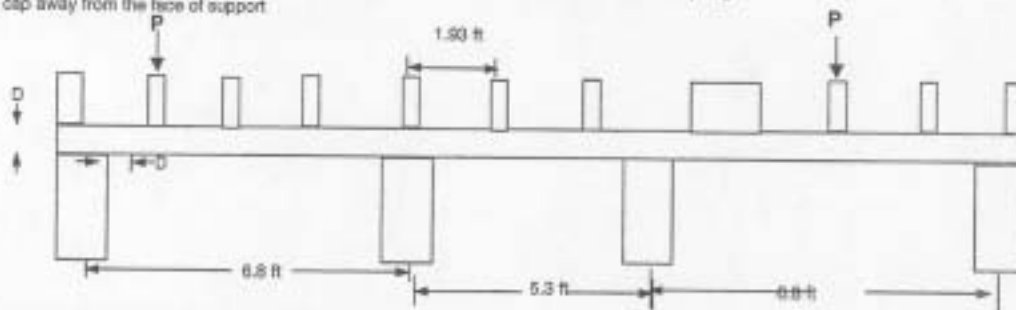
Bridge Span Length (BL) 26 ft
Cap Span Length between Piling 5.7 ft

Truck Type	Reaction (k)	Formula
HS-20	31.2	$=((32/2)+(32/2)*((BL-14)/(23)))^*1.3$
Type 3	23.9	$=((17/2)+(17/2)*((BL-4)/(BL)))+(16/2)*((BL-19)/(BL))^*1.3$
Type 3S2	24.4	$=((17/2)+(17/2)*((BL-4)/(BL)))+(12/2)*((BL-14)/(BL))^*1.3$
Type 3-3	21.5	$=((16/2)+(12/2)*((BL-6)/(BL)))+(12/2)*((BL-10)/(BL))^*1.3$
Permit 5	29.9	$=((21.5/2)+(21.5/2)*((BL-4.5)/(BL)))+(21.5/2)*((BL-19.5)/(BL))^*1.3$
Permit 6	36.5	$=((21.5/2)+(21.5/2)*((BL-6)/(BL)))+(21.5/2)*((BL-10)/(BL))+(15/2)*((BL-22)/(BL))^*1.3$
Permit 7	32.9	$=((21.5/2)+(21.5/2)*((BL-4.5)/(BL)))+(21.5/2)*((BL-18.5)/(BL))+(21.5/2)*((BL-23)/(BL))^*1.3$

Critical Load Positioning on Cap

Worst case for shear
Load P is positioned the thickness of the cap away from the face of support

Worst Case for moment
Load P is centered between two piling



Live Load Effects (with Impact) on Cap

Moment $M=PL/4$ for span between piling of 5.7 ft

Shear $V=P$

Truck Type	Moment, K-ft	Shear
HS-20	44.5	31.2
Type 3	34.0	23.9
Type 3S2	34.8	24.4
Type 3-3	30.7	21.5
Permit 5	42.7	29.9
Permit 6	52.1	36.5
Permit 7	46.9	32.9

Rating Factors (Inventory)

Truck Type	Moment	Weight, K	Shear	Weight, K
HS-20	0.82	58.8	0.486797	35.0
Type 3	1.07	53.4	0.636435	31.8
Type 3S2	1.04	83.4	0.621916	49.8
Type 3-3	1.18	94.8	0.705017	56.4
Permit 5	0.85	102.5	0.507175	61.1
Permit 6	0.70	105.0	0.415796	62.6
Permit 7	0.77	143.1	0.461085	85.3

The Operating Rating is the maximum allowable load for the bridge and is determined using an operating stress of 1.33 times the inventory stress.
(Manual for Maintenance Inspection of Bridges 5.4.7)

Rating Factors (Operating)

Truck Type	Moment	Weight, K	Shear	Weight, K
HS-20	1.09	70.2	0.65	46.8
Type 3	1.42	71.0	0.65	42.3
Type 3S2	1.39	111.0	0.83	66.2
Type 3-3	1.57	125.8	0.94	75.0
Permit 5	1.13	136.3	0.67	81.3
Permit 6	0.93	139.6	0.55	83.2
Permit 7	1.03	190.3	0.61	113.4

C. R. Knoll

LOAD RATING REPORT

BRIDGE CONFIGURATION

**BELLFOUNTAIN ROAD (OLIVER CREEK) BRIDGE
BENTON COUNTY BRIDGE NO 25100-14.4
ODOT BRIDGE NO. 14122**

Bridge Length	28 ft	Span	28 ft	One Span
Stringer Size	8 in wide	18.75 in tall	Timber Type	Select
Deck	2.5" x 11.5"		Timber Type	No. 1
Running Deck	2" x 6" TG planks		Timber Type	No. 1
Cap	12" x 12"		Timber Type	No. 1
Surface	4" HMAC			

Properties of Decking

**Douglas Fir Structural Design Values (psi)
(AASHTO Table 13.5.1A)**

	Select	No. 1	
Bending F_b	1450	1000	Deck is No. 1 Type Timber Values for No. 1 will be used for this deck evaluation
Tension Parallel to Grain, F_t	1000	875	
Shear Parallel to Grain, F_v	95	95	
Compression Perpend. to grain	825	825	
Compression Parallel to grain	1700	1450	
Modulus of Elasticity	1900000	1700000	

Wet Service Factor, C_w 1.0 (AASHTO Table 13.5.1A note 2)
Moisture Content of Wood to be less than 19%

Size Factors, C_F , for 2" x 12" to 4" x 12" lumber (AASHTO Table 13.5.1A note 3)
No. 1
 F_b 1.0
 F_t 1.0
 F_v 1.0

Flat Use Factor - C_{fu} 1.0 (AASHTO Table 13.5.1A note 4)
2.5" thick decking with width > 10"

Repetitive Member Factor
 C_r 1.15 (AASHTO Table 13.5.1A note 5)
To be used for deck only
Not to be used for stringers

Shear Stress Factor C_s 1.0 (AASHTO Table 13.5.1A note 6)
1.0 due to unknown condition of decking

Load Duration Factor for Vehicle Live Load
 C_d 1.15 (AASHTO Table 13.5.4A)

Deadload Material Weights

2x6 TG running deck	8.33 psf
Decking 2.5" x 11.5" x 50	10.41667 psf
Asphalt 4" x 12.5	50 psf

Decking Analyses for Operating Loads

Deck Properties

$b = \text{base}$	12 in	
$d = \text{width}$	2.5 in	
Area	30 in ²	
S	12.5 in ³	
L_s	20.5 inches	see 3.25.1.1

clear span plus one half stringer width
clear span is 17.5" on center

Bending Moment Stress

Allowable Inventory Bending Stress in decking
 $F_b = F_b \cdot C_m \cdot C_r \cdot C_t \cdot C_u \cdot C_{\phi}$ 1323 psi For No 1 Timbers

Allowable Inventory Moment $M_i = F_b \cdot S$
 Allowable bending stress, F_b 1323 psi
 $M_i =$ 1.38 ft-kips
 Ratio of Operating load to inventory load is 1.33

Allowable Operating Moment 1.83

Wheel load are distributed according to AASHTO 3.25.1 for timber decking
 Each wheel load is evenly distributed over a width of the of 16 inches. This yields a more accurately solution than lumping the wheel load into a single point.

Deadload Moment

$M = FDL \cdot L_s^2 / 8$
 $FDL =$ Deadload weight on Deck Member per foot
 $FDL =$ running deck + decking + asphalt
 Total $FDL = 66.74867$ lbs/ft 0.068747 kips/ft
 $MDL = 0.0251$ ft-kips

Liveload Moment

For worst case use wheel as a single point distributed over width of plank
 Single point will be in the center of the span between the two stringers

$M(liveload) = P_w \cdot L_s^2 / 8 = (P_w / W_w / 12) \cdot (L_s / 12)^2 \cdot L_s / 8$
 $P(\text{wheelload}) = 16,000$ lbs for a HS20 truck
 Therefore $M(liveload) = 4377.604$ ft-lbs 4.38 ft-kips

Rating Factors

Allowable Moment - Deadload Moment = 1.81 ft-kips

(Allowable Moment - Deadload Moment) / Liveload Moment = Operating Rating Factor
 Operating Rating Factor for HS20 truck 0.43

For a Type 3, Type 3S2, or Type 3-3 truck max wheel weight will be 8.5 kips
 Operating Rating Factor for Legal Loads 0.78

For Trucks of 64.5 Kips the maximum wheel weight will be 10.75 kips
 Operating Rating Factor for Type 3 truck 0.83

Conclusion - the operating rating factor for the deck is not adequate for short loads with heavy single axles or Oregon Legal Loads.
 Place a weight limit on the bridge that is 78% of Type 3 truck for deck loading.

Shear Stress

Maximum Stress is determined to be if the entire wheel load were placed on both sides of the span
 However, for a short span of 21' on center with a 16' clear span it will also be carried by the stringers
 Conservative estimate is to complete calculation with wheel not supported over stringer

The deck is multilayered with a 2.5" thick by 11.5" covered by 2x8 running deck.
 From Table 3.25.1 AASHTO - Wheel Load Distribution is Spans/4.0
 $Wheel\ Load\ Distribution = 24' / 4.0 = 6.0$

$Shear = F(\text{viewwheel}) \cdot HS20 = 16,000 \text{ lbs} / wheel\ load\ distribution = 8000$ lbs
 $F(\text{viewwheel}) \cdot Type\ 3 = 10,750 \text{ lbs} / wheel\ load\ distribution = 5375$ lbs

Allowable Shear Stress

$F_v = F_v \cdot C_m \cdot C_u$ (AASHTO 13.8.5.3)
 $F_v = 70$ psi $\times 1.15 \times 1.0 \times 1.0 = 109$ psi

Shear Allowable = $(2/3) \cdot \text{base} \cdot \text{width} \cdot F_v = (2/3) \cdot 9 \text{ in} \times 12 \text{ in} \times 170 \text{ psi} = 2622$ lbs

Inventory Rating Factor for HS20 Truck 0.39

Inventory Rating Factor for Permit 5, 6 & 7 Truck 0.49

Bearing Stress for decking

HS-20 load, one 16000# lbs directly over a stringer
 Allowable bearing stress is compression perpendicular to the grain
 $CS = 16,000 \text{ lbs} \times 12" = 222$ psi
 CS allowable 650 psi

Inventory Rating Factor For Bearing 2.93

Rating factor of 2.93 indicates that there is adequate bearing for the deck and stringer members to prevent crushing of the wood.

C.R. Keel