FINDING OF ADVERSE EFFECT DOCUMENTATION FOR

ER 06-0965

S-

Due 4/1/08

REPLACEMENT OF BRIDGE NO. 88 ON RIDGE STREET OVER WINSTON-SALEM SOUTHBOUND RAILWAY ANSONVILLE ANSON COUNTY, NC

TIP #B-4861
WBS #38194.1.1
MUNICIPAL PROJECT
FEDERAL AID #BRZ-1002(21)

The HISTORIC ARCHITECTURE *Group*

NCDOT Historic Architecture
Human Environmental Unit
1583 Mail Service Center
Raleigh, NC 27699-1583
CS #51-31-00

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Prepared By:
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November 2007

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North Carolina Department of Cultural Resources

State Historic Preservation Office

Peter B. Sandbeck, Administrator

April 20, 2006

Stephanie D. Higdon, E. I.
TGS Engineers
107 – A Mica Avenue
Morganton, NC 28655

B-4861

Re: Replacement of Bridge No. 88 on Ridge Street over Winston-Salem Southbound Railway, Ansonville, ~~B-4971~~, Anson County, ER 06-0965

Dear Ms. Higdon:

Thank you for your letter of March 15, 2006, concerning the above project.

We have conducted a search of our maps and files and located the following structure of historical or architectural importance within the general area of this project:

- Bridge No. 88 has been determined eligible for the National Register of Historic Places. AN0599

We recommend that a Department of Transportation architectural historian identify and evaluate any structures over fifty years of age within the project area, and report the findings to us.

There are no known archaeological sites within the proposed project area. Based on our knowledge of the area, it is unlikely that any archaeological resources that may be eligible for conclusion in the National Register of Historic Places will be affected by the project. We, therefore, recommend that no archaeological investigation be conducted in connection with this project.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

Renee Gledhill-Earley

Peter Sandbeck

	Location	Mailing Address	Telephone/Fax
ADMINISTRATION	507 N. Blount Street, Raleigh NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-4763/733-8653
RESTORATION	515 N. Blount Street, Raleigh NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-6547/715-4801
SURVEY & PLANNING	515 N. Blount Street, Raleigh, NC	4617 Mail Service Center, Raleigh NC 27699-4617	(919)733-6545/715-4801

North Carolina Department of Cultural Resources

State Historic Preservation Office

Peter B. Sandbeck, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

April 5, 2008

MEMORANDUM

TO: Gregory Thorpe, Ph.D., Director
Project Development and Environmental Analysis Branch
NCDOT Division of Highways

FROM: Peter Sandbeck RSG for Peter Sandbeck

SUBJECT: MOA for the replacement of Bridge #88 on Ridge Street, B-4861, Ansonville, Anson County, ER 06-0965

On March 11, 2008, we received the Memorandum of Agreement for the above referenced undertaking. Dr. Jeffrey Crow, State Historic Preservation Officer, has signed the agreement and returns it to you for execution by the Federal Highway Administration.

Please note that we received two sets of digital proofs/thumbnail photographs, but not the CD specified in Appendix A. Please forward the CD to us for our files and storage of the photographs in the statewide survey.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above referenced tracking number.

cc: Mary Pope Furr/Sandbeck w/ MOA & set of proofs

bc: DOT
County

Location: 109 East Jones Street, Raleigh NC 27601 **Mailing Address**: 4617 Mail Service Center, Raleigh NC 27699-4617 **Telephone/Fax**: (919) 807-6570/807-6599

MEMORANDUM OF AGREEMENT
AMONG
THE FEDERAL HIGHWAY ADMINISTRATION
AND
NORTH CAROLINA STATE HISTORIC PRESERVATION OFFICER
FOR
TIP No. B-4861
BRIDGE NO. 88 REPLACEMENT
ANSONVILLE, ANSON COUNTY

WHEREAS, the Federal Highway Administration (FHWA) has determined that the replacement of Bridge No. 88 on Ridge Street over the Winston-Salem Southbound Railway in Ansonville, Anson County (the undertaking), will have an effect upon Bridge No. 88, a property determined eligible for listing in the National Register of Historic Places, and has consulted with the North Carolina State Historic Preservation Officer (SHPO) pursuant to 36 CFR Part 800, regulations implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470f); and

WHEREAS, the North Carolina Department of Transportation (NCDOT) participated in the consultation and has been invited to concur in this Memorandum of Agreement;

NOW, THEREFORE, FHWA and the North Carolina SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on the historic properties.

STIPULATIONS

FHWA will ensure that the following measures are carried out:

I. Bridge No. 88

A. Recordation: Prior to the demolition of Bridge No. 88, NCDOT shall record the existing condition of the bridge and its surroundings in accordance with the attached Historic Structures and Landscape Recordation Plan [Appendix A].

B. Bridge Plaques: Bridge No. 88's two plaques, one located at the bridge's southwestern corner, the other at its northeastern corner, identify the bridge as having been constructed in 1910 by the Virginia Bridge and Iron Company. One of these plaques should be given to Barry Moose, PE, in NCDOT Highway Division 10's Albemarle office. The other plaque should be given to the Ansonville Historical Society, care of their secretary, Priscilla Randall.

II. Dispute Resolution: Should the North Carolina SHPO object within (30) days to any plans or documentation provided for review pursuant to this agreement, FWHA shall consult with the North Carolina SHPO to resolve the objection. If FHWA or the North Carolina SHPO determines that the objection cannot be resolved, FHWA shall forward all documentation relevant to the dispute to the Advisory Council on Historic Preservation (Council). Within thirty (30) days after receipt of all pertinent documentation, the Council will either:

A. Provide FHWA with recommendations which FHWA will take into account in reaching a final decision regarding the dispute, or

B. Notify FHWA that it will comment pursuant to 36 CFR Section 800.7(c) and proceed to comment. Any Council comment provided in response to such a request will be taken into account by FHWA in accordance with 36 CFR Section 800.7 (c) (4) with reference to the subject of the dispute.

Any recommendation or comment provided by the Council will be understood to pertain only to the subject of the dispute; FHWA's responsibility to carry out all the actions under this agreement that are not the subject of the dispute will remain unchanged.

Execution of this Memorandum of Agreement by FHWA and the North Carolina SHPO, its subsequent filing with the Advisory Council on Historic Preservation, and implementation of its terms evidence that FHWA has afforded the Council an opportunity to comment on the replacement of Bridge No. 88 over Ridge Street, in the town of Ansonville, in Anson County, North Carolina and its effects on Bridge No. 88, and that FHWA has taken into account the effects of the undertaking on the historic property.

AGREE:

FEDERAL HIGHWAY ADMINISTRATION DATE

NORTH CAROLINA STATE HISTORIC PRESERVATION OFFICER 4/7/08 DATE

APPENDIX A

Historic Structures and Landscape Recordation Plan
For Replacement of Bridge No. 88
Ansonville, Anson County, North Carolina
TIP No. B-4861, WBS No. 38194.1.1
FA # BRZ-1002(21)

Documentary Research shall include

A brief history of the bridge, to be printed in the Finding of Adverse Effect Document, recounting:

- When built
- Type
- Designer/engineer
- Plan changes, renovation/repair records, if found

Photographic Requirements

Selected photographic views of Bridge No. 88 as a whole, and views of the structure and its setting, including:

- Overall views of the structure (elevations and oblique views)
- Overall views of the project area, showing the relationship of the structure to its setting

Photographic Format

Color digital images (all views). Images are to be shot on a SLR digital camera with a minimum resolution of 6 megabyte pixels, at a high quality (preferably RAW) setting, to be saved in TIF format as the archival masters.

Images should be catalogued to be easily cross-referenced with an accompanying inventory. These images are to be saved on two sets of CD-ROMs, one for NCDOT and one for NC-HPO. There should also be two sets of contact sheets, to be printed on coated inkjet paper, as well. The accompanying printed inventory of the images—including subject, location, date, and photographer information for each image—is to be completed according to Division of Archives and History standards, and must also be included in the CD-ROMs.

Because CD-ROMs are occasionally not stable, each institution, if feasible, should place these images on a server to be periodically backed up.

Copies

One (1) set of all abovementioned photographic documentation will be deposited with the North Carolina Division of Archives and History/State Historic Preservation Office to be made a permanent part of the statewide survey and iconographic collection. The other contact sheet shall be deposited in the files of the Historic Architecture Group of NCDOT.

Federal Aid # *TIP* B-4861 *County*: Anson

CONCURRENCE FORM FOR ASSESSMENT OF EFFECTS

Project Description: Replacement of Bridge No. 88 on Ridge Street over the Winston-Salem Southbound Railroad, Ansonville

On August 7, 2007, representatives of the

- [x] North Carolina Department of Transportation (NCDOT)
- [x] Federal Highway Administration (FHWA)
- [x] North Carolina State Historic Preservation Office (HPO)
- [ ] Other

Reviewed the subject project and agreed

- [ ] There are no effects on the National Register-listed property/properties located within the project's area of potential effect and listed on the reverse.
- [ ] There are no effects on the National Register-eligible property/properties located within the project's area of potential effect and listed on the reverse.
- [x] There is an effect on the National Register-listed property/properties located within the project's area of potential effect. The property/properties and the effect(s) are listed on the reverse.
- [x] There is an effect on the National Register-eligible property/properties located within the project's area of potential effect. The property/properties and effect(s) are listed on the reverse.

Signed:

Penne Sandbeck 8-7-2007

Representative, NCDOT Date

Donald E. Brown 8-7-07

FHWA, for the Division Administrator, or other Federal Agency Date

[illegible] 8-7-07

Representative, HPO Date

Renee Gledhill-Earley 8-7-07

State Historic Preservation Officer Date

B-4861 ANSON

TIP # R-2626 *County:* [redacted]

Properties within the area of potential effect for which there is no effect. Indicate if property is National Register-listed (NR) or determined eligible (DE).

Properties within the area of potential effect for which there is an effect. Indicate property status (NR or DE) and describe the effect.

The project is an adverse effect upon Bridge No. 88 (DE), as it will entail removing the bridge, a steel thru girder floorbeam bridge built circa 1910 by the Virginia Bridge and Iron Company (Roanoke, VA) for Henry Fries' Winston-Salem Southbound Railway. It is now the oldest extant example of this bridge type remaining in the state.

Reason(s) why the effect is not adverse (if applicable).

Initialed: NCDOT JPSS FHWA DB HPO SDM

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Due 4/1/08

REPLACEMENT OF BRIDGE NO. 88 ON RIDGE STREET OVER WINSTON-SALEM SOUTHBOUND RAILWAY ANSONVILLE ANSON COUNTY, NC

TIP #B-4861
WBS #38194.1.1
MUNICIPAL PROJECT
FEDERAL AID #BRZ-1002(21)

The HISTORIC ARCHITECTURE *Group*

NCDOT Historic Architecture
Human Environmental Unit
1583 Mail Service Center
Raleigh, NC 27699-1583
CS #51-31-00

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Prepared By:
Penne Sandbeck
November 2007

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psandbeck@dot.state.nc.us

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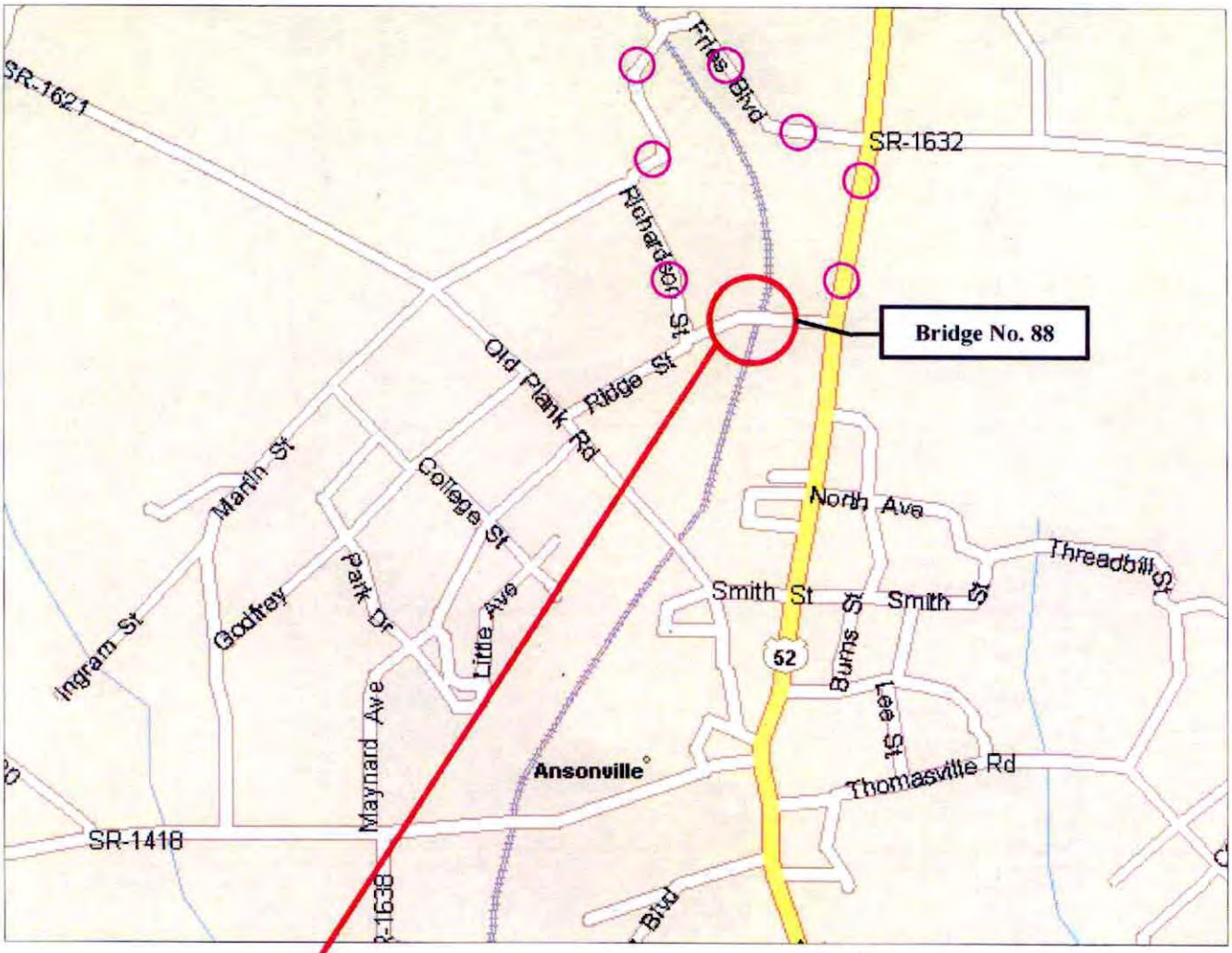
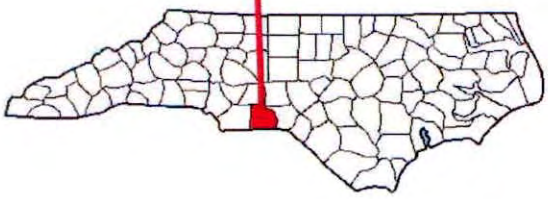
- Historic Architecture Survey Report - Abstract
- Detour Alignment - Plan
- Concurrence Form - Effects

Maps

Maps

- Project Vicinity and Location Map
- Area of Potential Effects Map





APPROXIMATE SCALE

0 1000

FEET

LEGEND

PROPOSED DETOUR ROUTE

	North Carolina Department of Transportation Project Development & Environmental Analysis Branch
ANSON COUNTY Bridge No. 88 on Ridge Street over Winston-Salem Southbound Railroad TIP No. B-4861	
March, 2006	**Figure 1**

Bridge No. 88 on Ridge Street: Area of Potential Effects (APE)

Key

Bridge No. 88

APE

Scale: 1" = approx. 200'
Source: Anson County GIS

Project Undertaking & Mitigation Measures

Project Undertaking & Mitigation Measures

1. Brief Description of the Undertaking

The replacement of Bridge No. 88 is included in the North Carolina Department of Transportation (NCDOT) Fiscal Year 2007-2013 Transportation Improvement Program (T.I.P.) as a municipal project for the Town of Ansonville. The NCDOT Bridge Maintenance Unit records indicate that Bridge No. 88 has a sufficiency rating of 24 out of 100 and is considered structurally deficient and functionally obsolete. Furthermore, the structure does not meet current railroad clearance standards. The replacement of this inadequate structure will result in safer and more efficient traffic operations, as well as greater pedestrian safety.

Bridge No. 88 is located on Ridge Street north of town center, and just west of US Highway 52, the town's primary thoroughfare. The bridge crosses over the ca. 1910 Winston-Salem Southbound Railroad (WSSB). Land use near the site is primarily residential. The bridge's east and west approaches border upon small woodlands, 1950s-1960s ranch houses, and, at the north side of the east approach, a manufactured house.

Constructed in 1910, the same year that the WSSB's tracks were laid in Ansonville, Bridge No. 88 is eligible for listing on the National Register of Historic Places under Criterion A for Transportation. The bridge is a steel thru girder-floorbeam bridge, a one-lane facility, 101 feet long, and three spans in length; road width is 16 feet.

2. Description of the Efforts to Identify Historic Properties

See the attached description of the historic resource determined eligible for the National Register: Bridge No. 88 of the Winston-Salem Southbound Railway, which was determined eligible for the National Register of Historic Places by the 2003 NCDOT Historic Bridge Inventory and Report executed by Lichtenstein Consulting Engineers, Inc. This information is derived from the aforesaid 2003 NCDOT Historic Bridge Inventory.

3. Description of the Affected Historic Properties

See above-referenced NCDOT Historic Bridge Inventory entry on Bridge No. 88, contained within this document.

4. Description of the Undertaking's Effects on the Historic Properties

Under the Recommended Alternative, Bridge No. 88 of the Winston-Salem Southbound Railway (determined eligible for the National Register) will be demolished and replaced with a new bridge. The Federal Highway Administration, in consultation with the North

Carolina State Historic Preservation Officer (SHPO), has determined that the recommended alternative will have an adverse effect on Bridge No. 88.

5. Description of any Proposed Mitigation Measures or Alternatives Considered to Deal with Undertaking's Effects on the Historic Property

Build Alternatives

Two build alternatives were studied for this project (1, 2). The alternatives are described below:

Alternative 1: Preferred

The preferred alternative would replace the existing bridge in-place. The existing bridge would be removed and a new bridge on the same horizontal and vertical alignment would be constructed in situ. The new bridge will have two lanes, each 12 feet wide with two-feet offsets on each side. There will also be five-foot, six-inch sidewalks on both sides of the structure.

During construction, Bridge No. 88 will be temporarily closed until the new structure is built. The proposed detour will route local traffic via US 52, Fries Boulevard, Richardson Street, and a section of the Old Plank Road, none of which has any adjacent historic properties. No road widenings or temporary alterations are being proposed for this offsite detour.

Proposed Measures to Mitigate Adverse Effect of Bridge No. 88 Removal

Recordation: Prior to the demolition of Bridge No. 88, NCDOT shall record the existing condition of the bridge and its surroundings in accordance with a Historic Structures and Landscape Recordation Plan. Written and photographic documentation will be deposited with the NC Division of Archives and History/SHPO to be made part of their permanent statewide survey and iconographic collection.

Artifacts: Bridge No. 88 has two plaques, one located at the southwest corner, the other at the northeast corner. One will be given to the Division 10 Office, NCDOT, the other to the Ansonville Historical Society, care of Priscilla Randall (Secretary of Ansonville Historical Society) when the bridge is taken down.

Alternative 2: Eliminated from Further Study (Replace Existing Bridge on New Alignment)

This alternative would erect a new bridge on new alignment immediately south of the existing bridge, the latter of which would be removed per the railroad's insistence. The alignment, including east-west approach, would extend 300 feet, nearly to Ridge Street's intersection with US 52. This alternative was not deemed feasible, due to that it would encroach upon adjacent residential properties.

6. Summary of the Views of the State Historic Preservation Office and Any Interested Parties

See attached Concurrence Forms for Assessment of Effects.

Historic Architecture Survey Report
- Abstract -

Historic Architecture Survey Report - Abstract -

Historic Architecture Abstract for B-4861

A survey was conducted in the project area in order to identify historic architectural resources located within the APE as part of the environmental studies conducted by NCDOT, and the project is documented by a Categorical Exclusion (CE). This project is subject to compliance with Section 106 of the National Historic Preservation Act of 1966, as amended and implemented by the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106, codified at 36 CFR Part 800. Section 106, as amended, 16 U. S. C. Section 470f, requires Federal agencies to take into account the effect of their undertakings (federally funded, licensed, or permitted) on properties included in or eligible for inclusion in the National Register of Historic Places and to afford the Advisory Council a reasonable opportunity to comment on such undertakings.

A Final Identification and Evaluation survey was conducted to determine the Area of Potential Effects (APE) for B-4861, and to identify and evaluate all structures over fifty years of age within the APE according to the Criteria of Evaluation for the National Register of Historic Places. On May 17, 2007, architectural historian Penne Sandbeck conducted a survey to identify historic architectural resources within the project's APE, and to identify any such resources along the proposed offsite detour. Upon consultation with NC-HPO on June 26, 2007, it was determined that there were no other historic resources in the project area, save Bridge No. 88.

Properties Listed on the National Register of Historic Places:
None

Properties Listed on the North Carolina Study List (designated by NC-HPO):
None

Properties Recommended Eligible for the National Register:
Bridge No. 88

Properties Evaluated and Recommended Eligible for the National Register:
None

Abstract

Taken from NCDOT Historic Bridge Inventory Report (ca. 2005) and NCDOT Historic Bridge Inventory for Bridge No. 88; footnotes account for additional material

Bridge No. 88, a one-lane, steel thru girder floorbeam bridge, was constructed in 1910 as a vehicular/pedestrian bridge, spanning a small ravine where the tracks for the Winston-Salem Southbound Railway (WSSB) had been newly laid. The railway was incepted in 1909-1910 as a joint venture by the Norfolk & Western (now Norfolk Southern) and Atlantic Coast Line (ACL, later Seaboard Air Line) railroads, an outgrowth of the successful Roanoke and Southern Railway.

In 1887, Francis Henry Fries, an heir to Winston-Salem's Fries Manufacturing Company, undertook building the Roanoke and Southern with the backing of R. J. Reynolds and other Winston-Salem concerns. The 122-mile railway was completed in 1891 and became part of Norfolk & Western the following year. Fries' next objective, a southbound line from Winston-Salem to Wadesboro, and onward to connect with South Carolina rails, was delayed due to the Panic of 1893 and the resulting financial instability for most of the 1890s.[1] The project, chartered in 1905, was fully revived with backing from Norfolk & Western and the ACL in 1909, with Fries' younger brother, Henry Elias Fries, at the helm. The younger Fries had the tracks completed to Wadesboro by November 25, 1910, and the trains, connecting North Carolina's western Piedmont to Charleston and its port, followed soon after.[2] Principal stops along the WSSB's 90 miles of track were Lexington, High Rock, Whitney, Badin, Albemarle, Norwood, and Ansonville; the railway connected with independent regional lines and the North Carolina Railroad along its route (**Figure 3**).[3] Initially, there were four passenger trains servicing the line but in 1933, having had only 2,652 passengers the previous year, the WSSB discontinued its passenger line. Most of the railroad's 85-pound rail lines were replaced with 100-pound rails in 1955. In 1963, the WSSB decided to lease their trains and line vehicles from ACL and Norfolk & Western.[4] Only the Albemarle and Lexington depots are known to survive. Other extant vehicular bridges are not known, although a 1910 steel trestle spanning Salem Creek is still in use.[5]

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[1] "Francis Henry Fries," in William Powell (ed.), *Dictionary of North Carolina Biography* (Chapel Hill: University of North Carolina Press, 1996), online at "Documenting the American South," UNC-Chapel Hill, http://docsouth.unc.edu/browse/bios/pn0000547_bio.html.

[2] Powell 1996; "Henry Elias Fries," from *History of North Carolina: North Carolina Biography*, Vol. 5 (Chicago and New York: Lewis Publishing Company, 1919), p. 5; Mary L. Medley, *History of Anson County, North Carolina, 1750-1976* (Wadesboro, NC: Anson County Historical Society, 1976), pp. 143-144.

[3] Catherine W. Bishir and Michael T. Southern, *A Guide to the Historic Architecture of Piedmont North Carolina* (Chapel Hill: The University of North Carolina Press, 2003), p. 47.

[4] "Frograil: Stanly County and its Railroads, Winston-Salem Southbound Railway," online at http://www.frograil.com/stanly/railroadHistory.htm. The webmaster cites Jeff Miller and Jim *Vaughn's The Winston-Salem Southbound Railway*, privately published in 1996 but now out of print, as a primary source.

[5] Heather Fearnbach, Edwards-Pitman Environmental, Inc., "Salem Creek Connector, Forsyth County, U-2925" (Phase II Historic Architectural Resources Report, NCDOT, August 2004), pp. B-37, B-131. The steel trestle, 693 feet long and 92 feet high, was completed February 20, 1910, but was built by the Pennsylvania Bridge Company instead of the Virginia Bridge and Iron Company, who built Bridge No. 88.

Presently, the WSSB remains operational; according to the company website, their freight includes coal, grain, sand, gravel, wood products, chemicals, iron, steel, and stone. Their two biggest clients are Corn Products Co. of Winston-Salem, corn syrup manufacturers, and Owens Brockway Glass Company of Eller, NC. The WSSB website states that it remains independently owned, but its stock is owned jointly by CSX and Norfolk Southern. According to another source, existing WSSB tracks are owned by the CSX Railroad and administration is handled by Norfolk-Southern. Two freight trains per day now run on this line.[6] Considered "a late-comer on the railroad scene that mainly served as a bridge route through North Carolina," WSSB's early adherents hoped for major economic growth from its running through their towns. At least two early twentieth-century plats for the village of Ansonville, "Richardson Heights" in 1926 and "West Side" in 1910, projected busy neighborhoods sprouting from its peaceful farmland and meadows—neighborhoods that, in the end, never came to pass (**Figures 4-6**).[7]

Besides its association with the WSSB, Bridge No. 88 is primarily significant as the oldest extant example of a steel thru girder floorbeam bridge, and one of North Carolina's ten oldest vehicular bridges still in service. It has furthermore been determined eligible for the National Register under Criterion C for Transportation. This three-span, 101-foot long, and 16-feet wide bridge has a center span of 40 feet long, flanked by 30-foot-long side spans. The bridge has built up girders, rolled floorbeams, steel stringers and a wood plank deck (**Figures 1, 2, 7, 8**). The two high pipe railings are set atop the girders, which are relatively shallow in depth and also serve as wheel guards. The bridge is supported on built-up lattice beams (**Figures 1, 2, 7, 8, 9**) framing into the rolled floorbeams, which also serve as bent caps. There are brackets where the columns meet the main girders, and bents are stiffened by angle crossbracing and a built-up strut. The end bents are concrete caps on steel piles (**Figure 9**). Plate has been welded to the base of the bent columns and high-strength bolts have replaced rivets at the floorbeam connections, but the bridge is otherwise nearly as it was when completed in 1910.[8]

According to research conducted by Patrick Harshbarger for the NCDOT Historic Bridge Inventory, metal girder-floorbeam technology dates to the mid-nineteenth century, and was primarily developed by and for the railroads, reaching its most mature, realized forms at century's end:

> [Metal girder-floorbeam design] proved to be efficient and economical for railroad spans, and it was the only serious competitor to truss technology for railroad use in the late nineteenth century. Most extant nineteenth-century girder-floorbeam bridges and many twentieth-century ones are associated with railroads,

---

[6] David Modlin, TGS Engineering, Inc., Cary, NC, electronic communication to Penne Sandbeck, NCDOT, 29 October 2007.

[7] Patrick Harshbarger, "Setting and Context" for NCDOT Historic Bridge Inventory Entry, Bridge No. 88; Anson County Register of Deeds, Plat Book 1, p. 7 (1910), and Plat Book 1, p. 20 (1926). Very little of "Richardson Heights" was ever developed, but Godfrey, College, Wilhoit streets, and Maynard Avenue run in north Ansonville, although differently than the 1910 plat.

[8] The technical description is taken nearly verbatim from Patrick Harshbarger's inventory entry for Bridge 88, NCDOT Historic Bridge Inventory.

> which had the equipment to transport and place the heavy girders prior to the development of rubber-tired motor trucks.[9]

At Bridge No. 88's northeast and southwest corners are two plaques reading "Built by Virginia Bridge And Iron Co., Roanoke, VA, 1910." (**Figure 10**) Established in 1889 as the American Bridge & Iron Works, the Roanoke, Virginia manufactory regrouped as the Virginia Bridge & Iron Company in 1895, becoming one of the South's main bridge builders and urban contracting firms into the 1930s.[10] The company was an industry quarter horse, a sturdy concern "not known as an innovative bridge builder," but rather, "turning out mostly the common bridge types/ designs of the period."[11]

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[9]. Patrick Harshbarger, Lichtenstein Consulting Engineers, Inc. NCDOT Historic Bridge Inventory, entry for Bridge 88.

[10] Ibid

[11] Ibid.

Figure 1: Bridge No. 88, view from west to east. NCDOT, February 2007

Figure 2: Bridge No. 88, north elevation, Penne Sandbeck/NCDOT, September 2007

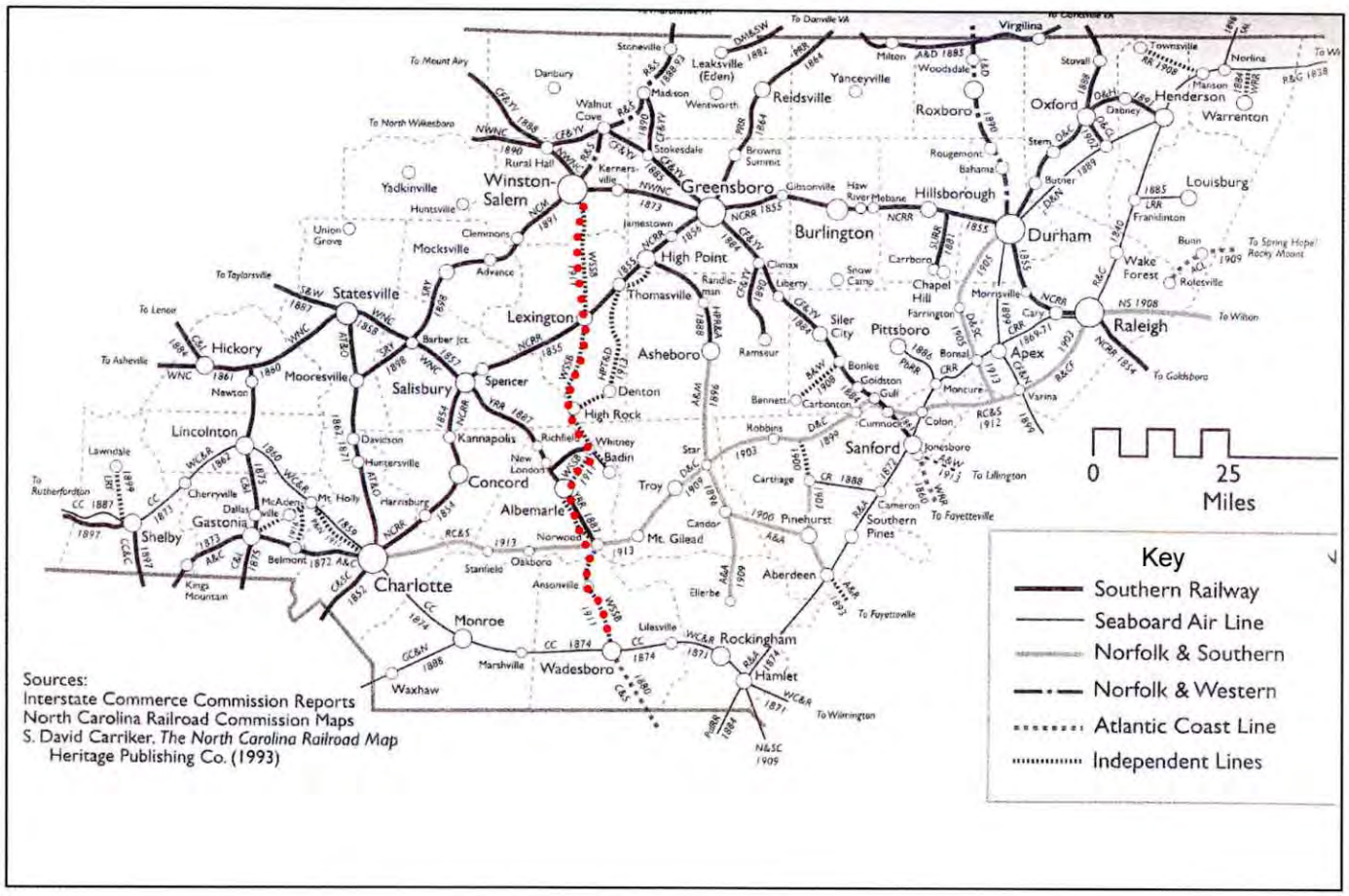


Figure 3: Michael T. Southern, "Principal Railroad Construction in Piedmont North Carolina to 1920" from *A Guide to the Historic Architecture of Piedmont North Carolina* (2003), p. 47. The Winston-Salem Southbound Railway is highlighted in red.

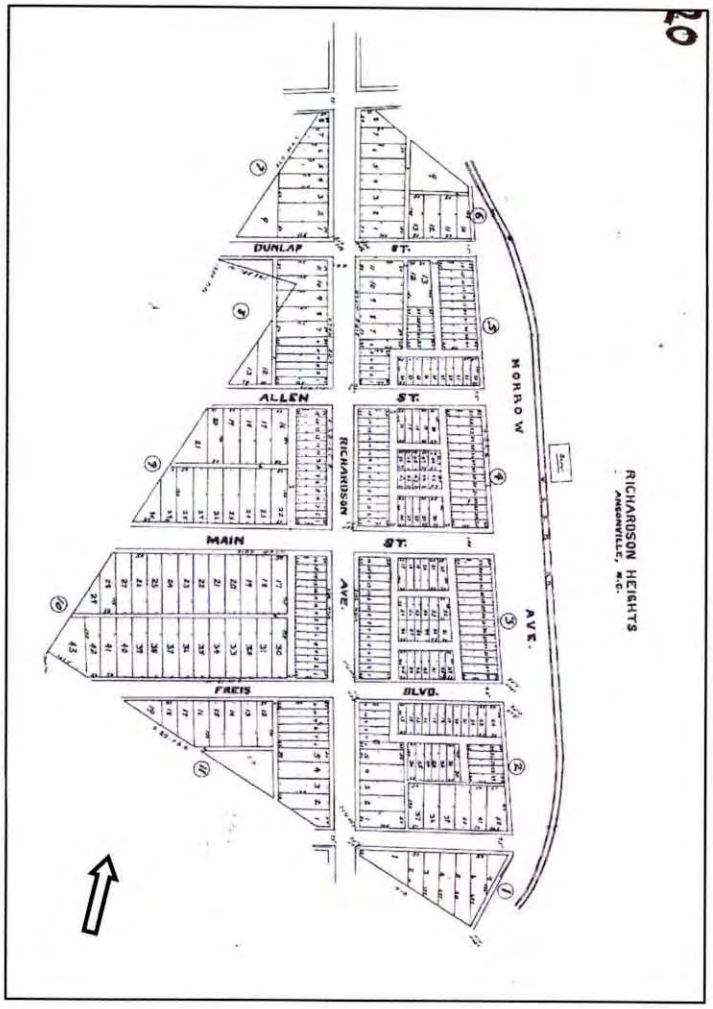


Figure 4:
"Richardson Heights" plat in Anson County Plat Book no. 1, p. 20 (1926)

Figure 5: Aerial of "Richardson Heights" plat area, 2007. Anson County GIS Internet Mapping System. Note that Richardson, Dunlap, Allen, and Main streets remain mostly undeveloped.

Figure 6: Richardson Street, north from Ridge Street intersection. Penne Sandbeck/NCDOT, May 2007.

Figure 7: Bridge No. 88, detail of substructure, north elevation. Penne Sandbeck/ NCDOT, September 2007.

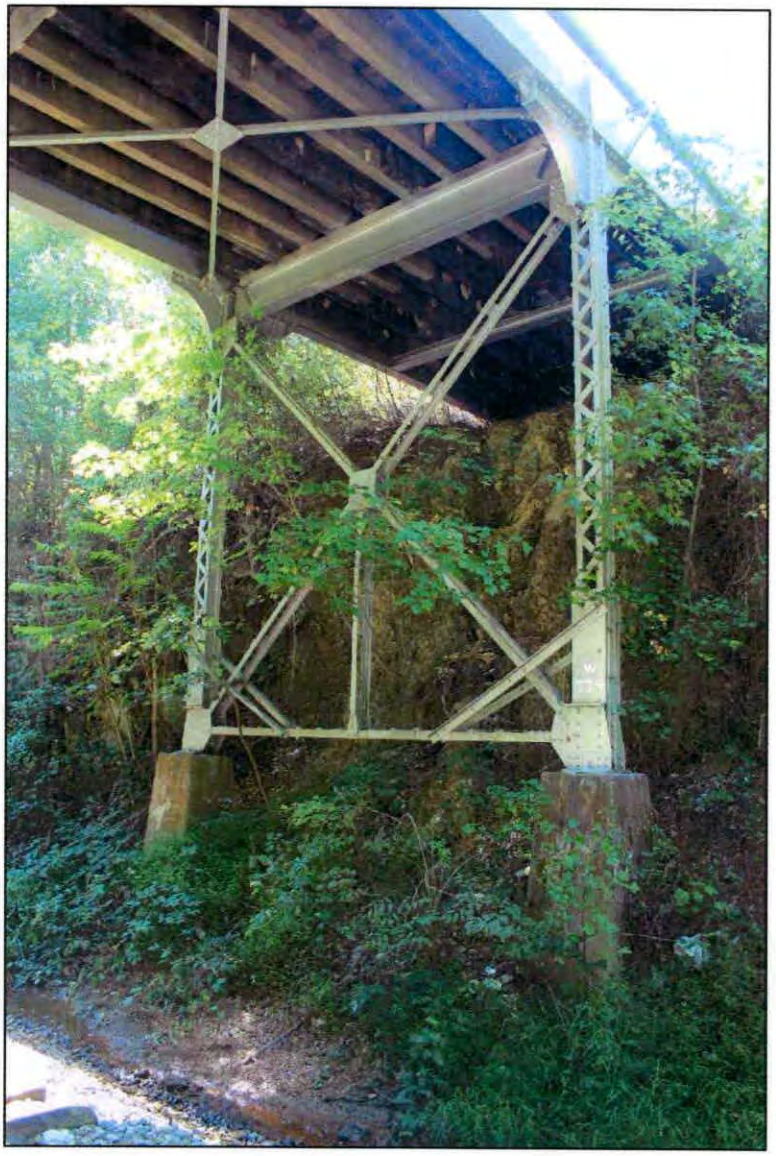


Figure 8: Bridge No. 88, detail of substructure and block piers.
Penne Sandbeck/NCDOT, September 2007.

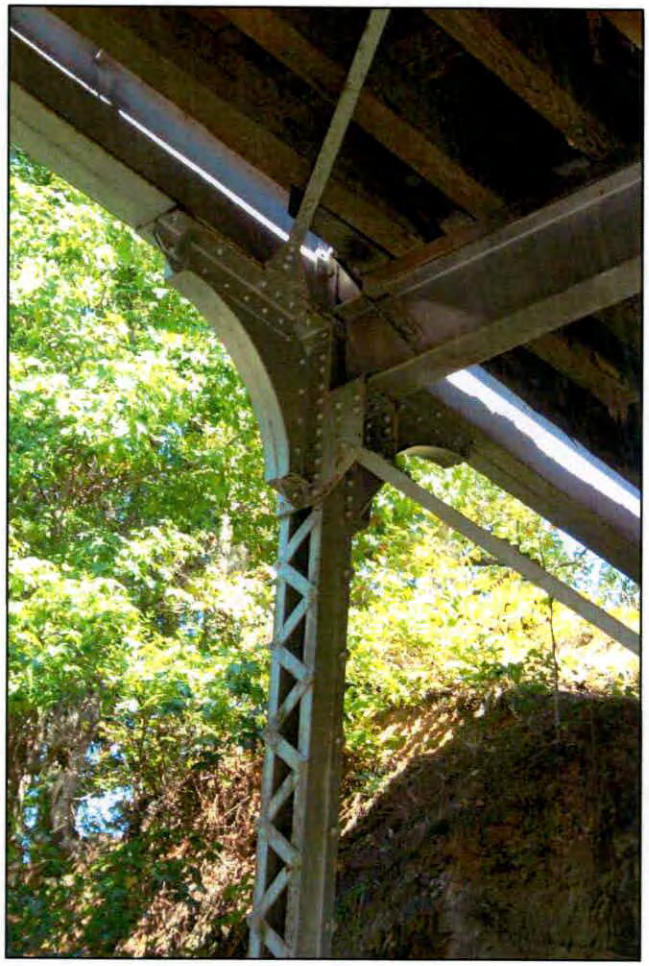


Figure 9: Bridge No. 88, detail of spandrel and riveting. Penne Sandbeck/ NCDOT, September 2007.

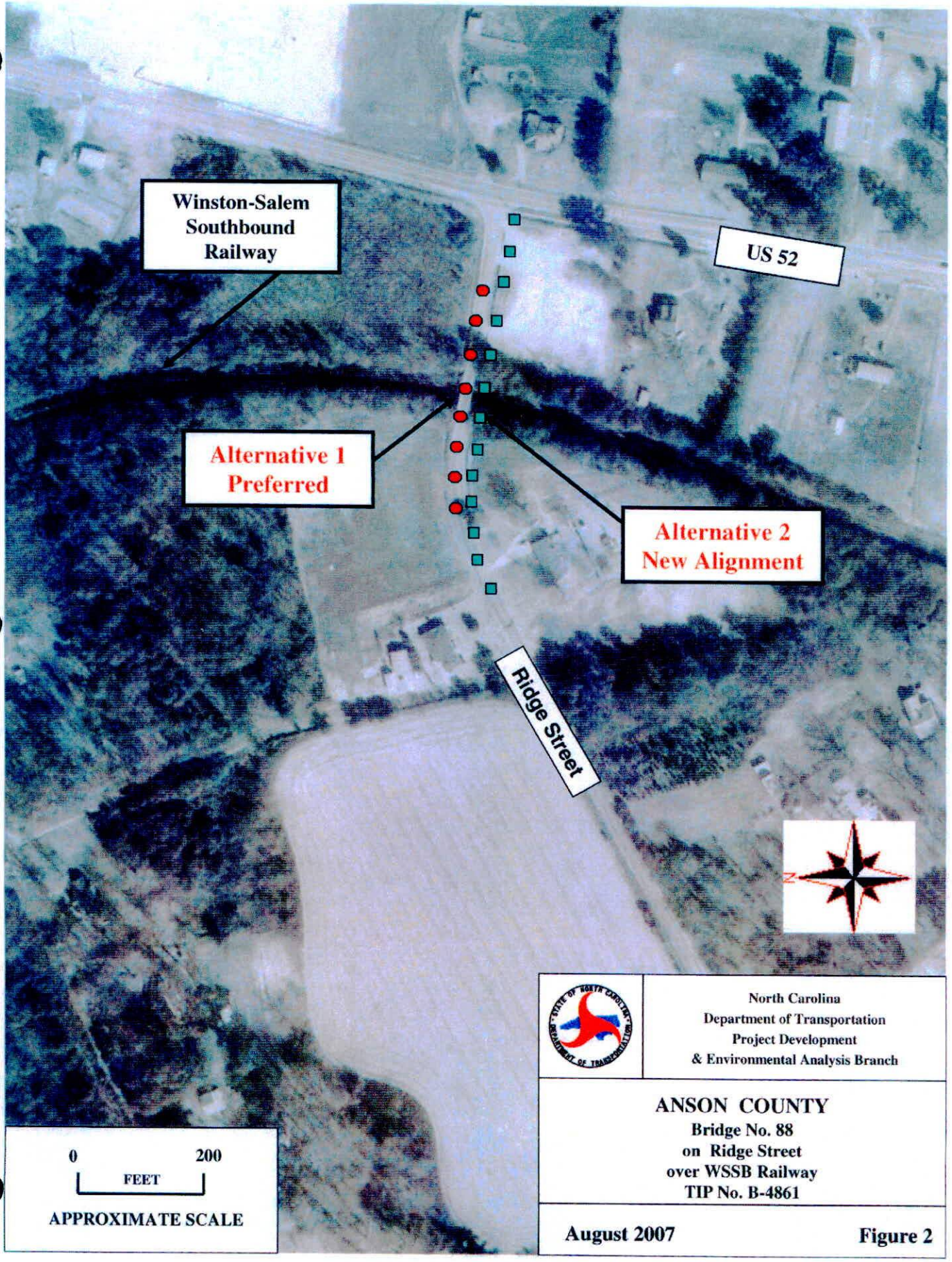
Figure 10: Bridge No. 88, plaque at northeast corner. Penne Sandbeck/NCDOT, September 2007.

Detour Alignment - Plan

Detour Alignment

-

Plan



North Carolina
Department of Transportation
Project Development
& Environmental Analysis Branch

ANSON COUNTY
Bridge No. 88
on Ridge Street
over WSSB Railway
TIP No. B-4861

August 2007 **Figure 2**

B-4861

CITY OF ANSONVILLE
ANSON COUNTY
NORTH CAROLINA

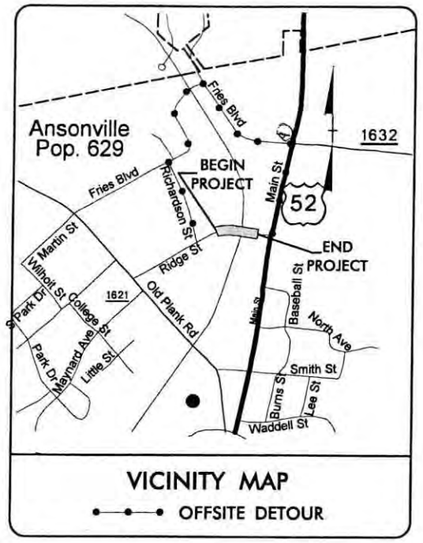
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4861	1	
T.I.P. NO.	R.A.P. PROJ. NO.	DESCRIPTION	
38194.1.1		PE	

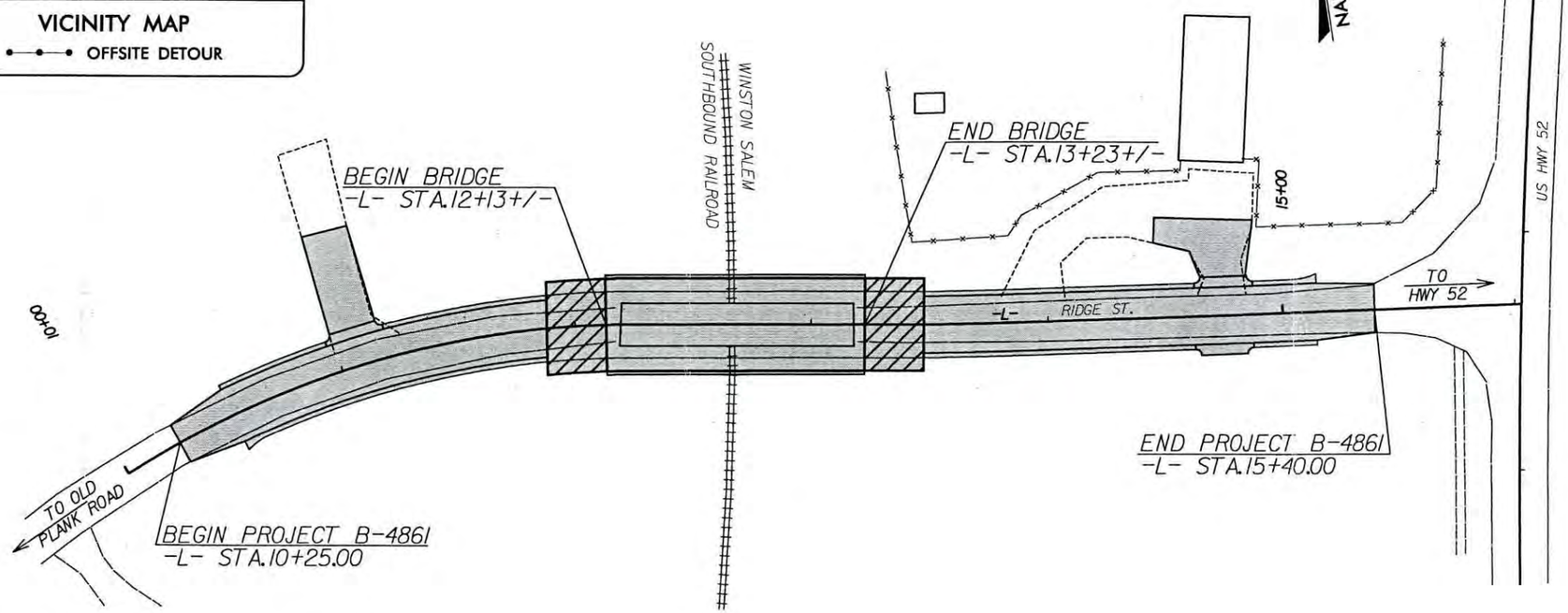
LOCATION: ***BRIDGE NO. 88 ON RIDGE STREET OVER WINSON SALEM SOUTHBOUND RAILROAD***

TYPE OF WORK: ***GRADING, DRAINAGE, PAVING, & STRUCTURE***

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

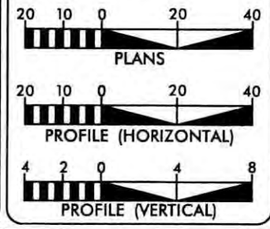
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION





CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

GRAPHIC SCALES



DESIGN DATA

ADT 2028 = 414
V = 40 MPH
TTST = 7%

HORIZONTAL DESIGN EXCEPTION NEEDED

PROJECT LENGTH

LENGTH ROADWAY PROJECT B-4861	=	0.077 MI
LENGTH STRUCTURE PROJECT B-4861	=	0.021 MI
TOTAL LENGTH PROJECT B-4861	=	0.098 MI

Plans Prepared By:
TGS ENGINEERS
SUITE 141
975 WALNUT STREET
CARY, NC 27511
PH (919) 319-8850

2006 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:
FFY 2007

LETTING DATE:
FFY 2008

Plans Prepared for:
CITY OF ANSONVILLE
P.O. BOX 958
LENOIR, NC 28645

CHARLES L. FLOWE, PE
PROJECT ENGINEER

W. CRAIG PARKER, PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER
P.E.
SIGNATURE:

ROADWAY DESIGN ENGINEER
P.E.
SIGNATURE:

MAYOR:

JOE M. ESTRIDGE SR.
P.O. BOX 437
ANSONVILLE, NC 28007
TEL. (704) 826-8404

CONTRACT: 7500004201

05/08/99
SYSTEM
DGN
USERNAME

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PROJECT REFERENCE NO.	SHEET NO.
B-4861	4
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

REVISIONS 8/17/99

NAD 83

WINSTON-SALEM SOUTHBOUND RAILROAD

EXISTING R/W

WOODS LINE

N 75°41'34" E 181.95'

EIP

N 03°45'03" W 158.14'

S 83°33'14" E 255.22'

(3) JOHN CARUSO DB 471 PG 162

2" RED MAPLE

3" JAP. MAPLE

(1) JAMES ARTHUR DEAN, II AND TAMMY KIKER DEAN DB 554 PG 71

(4) TRAVIS E. LISK DB 518 PG 1 PB 4 PG 89

S

HTR

-L- PC 10+00.00

-L- STA 10+00

+20.00 25.00 ft EXIST R/W

N 03°41'01" W 19.88'

RR SPIKE

5" BRADFORD PEAR

EIP

4 - 5" BRADFORD PEARS

GRAU 350

TYPE-III

15" RCP

20' DRIVE

GRAVEL DRIVE

+98.00 69.00 ft

+20.00 68.00 ft

BEGIN BRIDGE -L- STA 12+13+/-

+52.00 45.00 ft

+19.22 EXIST R/W

+20.69 EXIST R/W

REMOVE EXISTING BRIDGE

S 80° 50' 10.8" E NAIL

BRIDGE NO. 88 ON RIDGE ST. OVER WSSB RAILROAD

+15.81 EXIST R/W

+44.12 25.00 ft

+01.00 43.00 ft

+47.00 52.00 ft

+93.00 49.00 ft

+89.36 25.00 ft

+93.00 42.00 ft 25.00 ft

+05.00 42.00 ft 25.00 ft

+17.00 25.00 ft

+58.39 EXIST R/W

+16.88 EXIST R/W

END BRIDGE -L- STA 13+23+/-

48° CHL

60° CHL

15+00

PDE

15" CMP

+62.44

S 82° 48' 53.5" E

+55.93 EXIST R/W

+15.98 EXIST R/W

+44.12 25.00 ft

+14.29 EXIST R/W

+60.00 44.00 ft 25.00 ft

+89.36 25.00 ft

+26.00 43.00 ft

+02.00 39.00 ft

+31.00 25.00 ft

-L- PT 13+89.36

-L- PC 13+44.12

END PROJECT B-4861 -L- STA 15+40.00

+48.00 39.00 ft

+69.00 43.00 ft 25.00 ft

+09.82 EXIST R/W

+06.49 EXIST R/W

-L- PT 12+23.86

+20.00 25.00 ft EXIST R/W

+49.00 37.00 ft

24" PINE

12" MAPLE

BEGIN PROJECT B-4861 -L- STA 10+25.00

(2) CARY MOYE SULLIVAN AND EVELYN PONDS SULLIVAN DB 140 PG 108 DB 542 PG 174

CREPE MYRTLE

3 - 1" HOLLYS

CONC. DRIVE

2" TREE

42" OAK

CONC.

STEPS

SHRUBS

PORCH

ISBKD

(5) MICHAEL DALE LEE DB 200 PG 866

-L-

PI Sta 11+15.14	PI Sta 13+66.74
Δ = 33° 03' 27.8" (RT)	Δ = 1° 58' 42.7" (LT)
D = 14° 46' 01.0"	D = 4° 22' 25.4"
L = 223.86'	L = 45.24'
T = 115.14'	T = 22.62'
*R = 388.00'	R = 1,310.00'
SE = 0.04	SE = 0.04

*DESIGN EXCEPTION REQ'D FOR HORIZONTAL CURVATURE

SEE SHEET 5 FOR -L- GRADE

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Concurrence Form - Effects

Concurrence Form

-

Effects

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION of HIGHWAYS
BRIDGE MAINTENANCE UNIT

FA PROJECT NO. BRZ-NBIS (12)

URS

ATTENTION: FRACTURE CRITICAL

BRIDGE INSPECTION REPORT

MUNICIPALITY: ANSONVILLE TYPE INSPECTION: ROUTINE INSP. CYCLE: 2 YEAR

COUNTY: ANSON BRIDGE NO.: 030088 M.P. N/A

ROUTE: RIDGE STREET ACROSS: WSSB RAILROAD

LOCATION: 0.1 MILES WEST OF US 52

DESCRIPTION: THREE (3) SPAN TIMBER DECK AND TIMBER JOISTS ON STEEL FLOOR BEAMS AND PLATE GIRDERS ON REINFORCED CONCRETE AND STEEL SUBSTRUCTURE

TOTAL LENGTH OF BRIDGE F/F TO F/F = 103'-6"

PRESENT CONDITION: FAIR INVENTORY RATING: HS-4

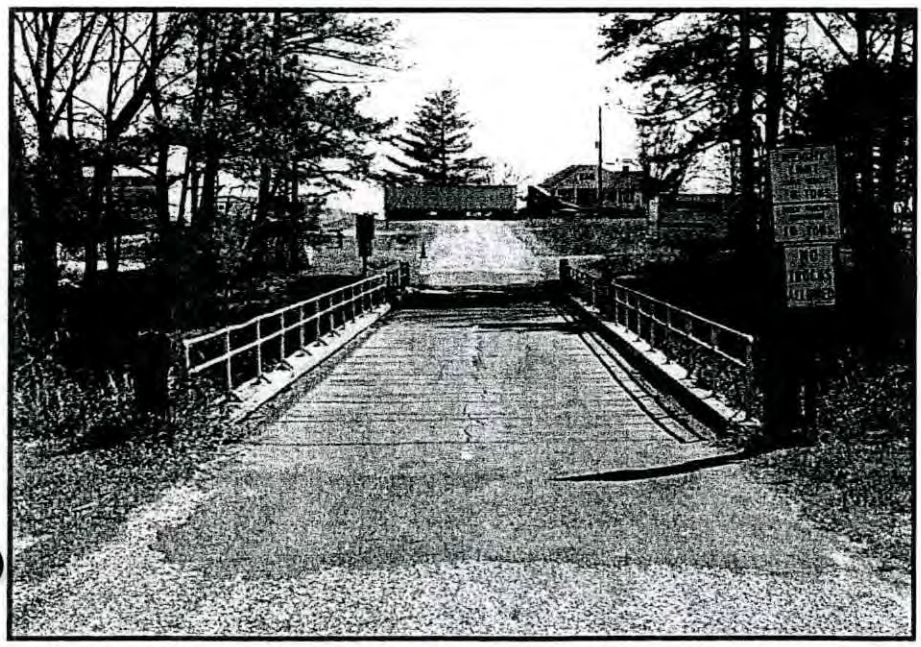
INSPECTION DATE: 3/15/2006 OPERATING RATING: HS-7

PRESENT POSTING: SV 8 TONS, TTST 10 TONS PROPOSED POSTING: RETAIN EXISTING

ANALYSIS DATE: 6/23/2006

COMPUTER UPDATE: 2-6-07 OTHER SIGNS PRESENT: (4) DELINEATORS
(2) ONE LANE BRIDGE
(2) NO TRUCKS ALLOWED

POSTING LETTER DATE: NONE



LOOKING EAST

LATITUDE: N 35°06'32.3"

LONGITUDE: W 80°06'29.5"

SPECIAL PERMIT: NONE

SIGN NOTICE ISSUED FOR		NUMBER REQ'D
NO	WEIGHT LIMIT	
NO	SPECIAL PERMIT	
NO	DELINEATORS	
NO	NARROW BRIDGE	
NO	ONE LANE BRIDGE	
NO	LOW CLEARANCE	

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

URS

COUNTY:	ANSON
BRIDGE NO.:	030088
WBS ELEMENT:	40489.1.3
FEDERAL AID NO.:	BRZ-NBIS (12)

INSPECTION
TEAM LEADER
AND FINAL REVIEW: Satrajit

SATRAJIT DAS, PE

NORTH CAROLINA PROFESSIONAL SEAL 30865 ENGINEER SATRAJIT DAS

30th DAY OF June, 2006

********** IDENTIFICATION **********
(1) STATE NAME - NORTH CAROLINA BRIDGE 030088
(8) STRUCTURE NUMBER (FEDERAL) 000000000070088
(5) INVENTORY ROUTE (ON/UNDER) - ON = 150000000
(2) STATE HIGHWAY DEPARTMENT DISTRICT 10
(3) COUNTY CODE 007 (4) PLACE CODE 1420
(6) FEATURES INTERSECTED - W.S.S.B. RAILROAD
(7) FACILITY CARRIED - RIDGE STREET
(9) LOCATION - 0.1MI.W.JCT.US 52
(11) MILEPOINT 000.000
(16) LAT 35 D 06 M 32.3S (17) LONG 080 D 06 M 29.5S
(98) BORDER BRIDGE STATE CODE PCT SHARE
(99) BORDER BRIDGE STRUCTURE NO. #

********** STRUCTURE TYPE AND MATERIAL **********
(43) STRUCTURE TYPE MAIN: STEEL
TYPE - GIRDER & FLRBEAM SYSTEM CODE 303
(44) STRUCTURE TYPE APPR: OTHER
TYPE - OTHER CODE 000
(45) NUMBER OF SPANS IN MAIN UNIT 003
(46) NUMBER OF APPROACH SPANS 0000
(107) DECK STRUCTURE TYPE - WOOD OR TIMBER CODE 8
(108) WEARING SURFACE / PROTECTIVE SYSTEM:
A) TYPE OF WEARING SURFACE - BITUMINOUS CODE 6
B) TYPE OF MEMBRANE - NONE CODE 0
C) TYPE OF DECK PROTECTION - NONE CODE 0

********** AGE AND SERVICE **********
(27) YEAR BUILT 1910
(106) YEAR RECONSTRUCTED 0000
(42) TYPE OF SERVICE: ON - HIGHWAY
UNDER - RAILROAD CODE 12
(28) LANES: ON STRUCTURE 01 UNDER STRUCTURE 00
(29) AVERAGE DAILY TRAFFIC 000200
(30) YEAR OF ADT 1981 (109) TRUCK ADT PCT 07
(19) BYPASS, DETOUR LENGTH 01 MI

********** GEOMETRIC DATA **********
(48) LENGTH OF MAXIMUM SPAN 0040 FT
(49) STRUCTURE LENGTH 000101 FT
(50) CURB OR SIDEWALK: LEFT 00.5 FT RIGHT 00.5 FT
(51) BRIDGE ROADWAY WIDTH CURB TO CURB 015.8 FT
(52) DECK WIDTH OUT TO OUT 017.0 FT
(32) APPROACH ROADWAY WIDTH (W/SHOULDERS) 016 FT
(33) BRIDGE MEDIAN - NO MEDIAN CODE 0
(34) SKEW 00 DEG (35) STRUCTURE FLARED NO
(10) INVENTORY ROUTE MIN VERT CLEAR 99 FT 99 IN
(47) INVENTORY ROUTE TOTAL HORIZ CLEAR 15.8 FT
(53) MIN VERT CLEAR OVER BRIDGE RDWY 99 FT 99 IN
(54) MIN VERT UNDERCLEAR REF - RAILROAD 22 FT 10 IN
(55) MIN LAT UNDERCLEAR RT REF - RAILROAD 14.5 FT
(56) MIN LAT UNDERCLEAR LT 00.0 FT

********** NAVIGATION DATA **********
(38) NAVIGATION CONTROL - N.A., NO WATERWAY CODE N
(111) PIER PROTECTION - NOT APPLICABLE CODE
(39) NAVIGATION VERTICAL CLEARANCE 000 FT
(116) VERT-LIFT BRIDGE NAV MIN VERT CLEAR FT
(40) NAVIGATION HORIZONTAL CLEARANCE 0000 FT

****

SUFFICIENCY RATING = 34.3
STATUS = STRUCTURALLY DEFICIENT

********** CLASSIFICATION ********** CODE
(112) NBIS BRIDGE LENGTH - YES
(104) HIGHWAY SYSTEM - NON NHS ROUTE 0
(26) FUNCTIONAL CLASS - LOCAL 19
(100) DEFENSE HIGHWAY - NOT DEFENSE HWY 0
(101) PARALLEL STRUCTURE - NONE EXISTS N
(102) DIRECTION OF TRAFFIC - 1 LANE BRG & 2-WAY TRAF 3
(103) TEMPORARY STRUCTURE - NOT TEMPORARY
(110) DESIGNATED NATIONAL NETWORK - NOT PART OF 0
(20) TOLL - ON FREE ROAD 3
(21) MAINTAIN - CITY OR MUNICIPAL HWY AGENCY 04
(22) OWNER - CITY OR MUNICIPAL HWY AGENCY 04
(37) HISTORICAL SIGNIFICANCE - NOT ELIGIBLE 5

********** CONDITION ********** CODE
(58) DECK 7
(59) SUPERSTRUCTURE 6
(60) SUBSTRUCTURE 6
(61) CHANNEL & CHANNEL PROTECTION N
(62) CULVERTS N

********** LOAD RATING AND POSTING ******** CODE
(31) DESIGN LOAD - OTHER/UNKNOWN 0
(64) OPERATING RATING - LF HS-07 112
(66) INVENTORY RATING - LF HS-04 107
(70) BRIDGE POSTING - POSTING REQUIRED 0
(41) STRUCTURE OPEN, POSTED, OR CLOSED P
DESCRIPTION - POSTED FOR LOAD

********** APPRAISAL ********** CODE
(67) STRUCTURAL EVALUATION 2
(68) DECK GEOMETRY 2
(69) UNDERCLEARANCES, VERTICAL & HORIZONTAL 6
(71) WATERWAY ADEQUACY N
(72) APPROACH ROADWAY ALIGNMENT 5
(36) TRAFFIC SAFETY FEATURES 0000
(113) SCOUR CRITICAL BRIDGES N

********** PROPOSED IMPROVEMENTS **********
(75) TYPE OF WORK - REPLACE FOR DEFICIENCY CODE 311
(76) LENGTH OF STRUCTURE IMPROVEMENT 000101 FT
(94) BRIDGE IMPROVEMENT COST $ 216.000
(95) ROADWAY IMPROVEMENT COST $ 54.000
(96) TOTAL PROJECT COST $ 324.000
(97) YEAR OF IMPROVEMENT COST ESTIMATE 2007
(114) FUTURE ADT 000400 (115) YEAR FUTURE ADT 2025

********** INSPECTIONS **********
(90) INSPECTION DATE 03/2006 (91) FREQUENCY 24 MO
(92) CRITICAL FEATURE INSPECTION: (93) CFI DATE
A) FRACTURE CRIT DETAIL - YES - 24 MO A) 03/2006
B) UNDERWATER INSP - NO - MO B)
C) OTHER SPECIAL INSP - NO - MO C)
SCOUR - NOT EVALUATED

BRIDGE I & A FORM 1(90) A
REV 3-28-2000

BRIDGE INSPECTION RECORD AND SUMMARY

INSPECTION TYPE: ROUTINE **INSPECTION DATE:** 3/15/2006 **COUNTY** ANSON
BRIDGE NO. 030088 **ROUTE:** RIDGE STREET **OVER:** WSSB RAILROAD
STRUCTURE TYPE: TIMBER DECK AND TIMBER JOISTS ON STEEL FLOOR BEAMS AND PLATE **YEAR BUILT** 1910
LENGTH: 103'-6" **ROUTE ORIENTATION:** W-E **FOR SPAN** 1,2,3 **OF** 3 **SPANS**
EVALUATION CODE: 0-2 CRITICAL, 3 & 4 POOR, 5 & 6 FAIR, 7-9 GOOD

INSPECTION ITEM			GRADE
DECK ITEMS			
1 WEARING SURFACE			5
2 DECK	a. CONCRETE		-
NO. OF EA	b. TIMBER	3	7
TYPE SPN.	c. STEEL PLANK		-
GRADE	d. OPEN GRID		-
RATES			-
SI & A ITEM			-
58			-
3 RAILING	a. CONCRETE		-
	b. TIMBER		-
	c. ALUMINUM		-
	d. STEEL		7
4 CURBS - WHEELGUARDS - PARAPETS - MEDIANS			7
5 WALKWAYS (ON OR ATTACHED TO STRUCTURE)			-
6 DECK EXP.	a. STEEL PL. OR FINGER PL.		-
JTS. OR	b. MISC. PREFAB DEVICES		-
DEVICES	c. COMPRESSION SEALS		-
NO. OF	d. STANDARD JOINTS		-
EACH	e. OPEN JOINTS		-
7 DECK DEBRIS (INCLUDE EXCESS SAND / GRAVEL)			7

SUPER. STR. (FM. 1 (90) B TRUSS) ITEM 59	
10 LONGITUDINAL BEAMS OR GIRDERS	5
11 LONGITUDINAL JOIST OR STRINGERS	7
12 INT. DIAP'S, X-FRAMES, BRACING, & CONN'S	6
13 END DIAP'S, CURTAIN WALLS, & CONN'S	-
14 FLOOR BEAMS AND CONNECTIONS	7
15 BEARINGS ASSEMBLIES (INCLUDE MISALIGN)	5
16 DRAINAGE SYSTEMS (ON STRUCTURES)	8
17 MOVABLE SPAN MACHINERY	-

SUB. STR ITEMS, ITEM 60 (INCLUDE SCOUR)		
35 TIM.	a. ABUT. & INT. BENT CAPS & RISERS	6
SUB.	b. PILES, POST, SILLS & BRACING	-
STR.	c. BULKHEADS, WINGS & TIE BACKS	-
36 CONC.	a. ABUT. & INT. BENT CAPS	6
SUB.	b. ABUT. & BENT COLS & BREASTWALLS	6
STR.	c. ABUT. & INT. BENT PILES	-
	d. BACKWALLS- WINGS - RETAIN. WALLS	7
	e. ABUT. AND BENT FOOTINGS & SILLS	5
37 STEEL	a. ABUT. & INT. BENT CAPS & RISERS	6
SUB. STR.	b. PILES AND BRACING AND BULKHEADS	-
38 FOUNDATION PILES TYPE MATERIAL		-
39 SLOPE PROT., RIP-RAP (INCLUDE DRAINAGE)		7
40 FENDER SYSTEMS		-
41 DRIFT		-

ITEM 61		GRADE
45 CHANNEL	a. WATERWAY	-
&	b. ALIGNMENT	-
CHANNEL	c. SCOUR	-
PROT.	d. SLOPE PROT. , RIP-RAP	-
	DIKES, ETC.	
50 APPROACH ROADWAY CONDITION		7
51 APPROACH SLABS		-
52 PAINT SYSTEMS	CODE (A)	7
53 UTILITIES		7
54 RESPONSE TO LIVE LOAD		7
55 ESTIMATED REMAINING LIFE (YRS)		12
		-
60 REGULATORY SIGN NOTICE ISSUED		N
61 PROMPT - ACTION NOTICE ISSUED		N
62 PRESENTLY POSTED		SV 8 TONS; TTST 10 TONS
63 TOT. FIELD INSP. TIME (INCLUDE WRITE UP) (M/H)		10
64 TOTAL SNOOPER INSP. TIME (HRS)		-
65 TOTAL TRAFFIC CONTROL TIME (M/H)		-

70 SI&A GENERAL CONDITION RATINGS		
a. DECK	ITEM 58	7
b. SUPERSTRUCTURE	ITEM 59	6
c. SUBSTRUCTURE	ITEM 60	6
d. CHANNEL & CHANNEL PROT.	ITEM 61	-

71 SI&A FIELD APPRAISAL RATINGS	
a. WATERWAY ADEQUACY	-
b. APPR. RDWY. ALIGNMENT	5
72 FIELD SCOUR EVALUATION	-

USE OF INSP. ACCESSIBILITY EQUIPMENT		
SNOOPER (CODE P, S, 4 or N)	Y/N	N
LADDER	Y/N	Y
OVERSIDE LADDER	Y/N	N
BUCKET TRUCK	Y/N	N
BOAT	Y/N	N
OTHER ( )	Y/N	N

SPECIAL INSPECTION REQUESTED FOR:

NOTE:

BELOW GROUND SUBSTRUCTURE ITEMS CANNOT BE DETERMINED

80 INSPECTED BY: S. DAS
81 REVIEWED BY: C. HALL

BRIDGE I & A FORM 1(90) A
REV 3-28-2000

BRIDGE INSPECTION RECORD AND SUMMARY

INSPECTION TYPE: ROUTINE **INSPECTION DATE:** 6/8/2004 **COUNTY** ANSON
BRIDGE NO.: 030088 **ROUTE:** RIDGE STREET **OVER:** WSSB RAILROAD
STRUCTURE TYPE: TIMBER DECK AND TIMBER JOISTS ON STEEL FLOOR BEAMS AND PLATE **YEAR BUILT** 1910
LENGTH: 101'-0" **ROUTE ORIENTATION:** W-E **FOR SPAN** A,B,C **OF** 3 **SPANS**
EVALUATION CODE: 0-2 CRITICAL, 3 & 4 POOR, 5 & 6 FAIR, 7-9 GOOD

INSPECTION ITEM			GRADE
DECK ITEMS			
1 WEARING SURFACE			5
2 DECK	a. CONCRETE		-
NO. OF EA	b. TIMBER	3	7
TYPE SPN.	c. STEEL PLANK		-
GRADE	d. OPEN GRID		-
RATES			-
SI & A ITEM			-
58			-
3 RAILING	a. CONCRETE		-
	b. TIMBER		-
	c. ALUMINUM		-
	d. STEEL		7
4 CURBS - WHEELGUARDS - PARAPETS - MEDIANS			7
5 WALKWAYS (ON OR ATTACHED TO STRUCTURE)			-
6 DECK EXP.	a. STEEL PL. OR FINGER PL.		-
JTS. OR	b. MISC. PREFAB DEVICES		-
DEVICES	c. COMPRESSION SEALS		-
NO. OF	d. STANDARD JOINTS		-
EACH	e. OPEN JOINTS		-
7 DECK DEBRIS (INCLUDE EXCESS SAND / GRAVEL)			7

SUPER. STR. (FM. 1 (90) B TRUSS) ITEM 59	
10 LONGITUDINAL BEAMS OR GIRDERS	5
11 LONGITUDINAL JOIST OR STRINGERS	7
12 INT. DIAP'S, X-FRAMES, BRACING, & CONN'S	6
13 END DIAP'S, CURTAIN WALLS, & CONN'S	-
14 FLOOR BEAMS AND CONNECTIONS	7
15 BEARINGS ASSEMBLIES (INCLUDE MISALIGN)	5
16 DRAINAGE SYSTEMS (ON STRUCTURES)	6
17 MOVABLE SPAN MACHINERY	-

SUB. STR ITEMS, ITEM 60 (INCLUDE SCOUR)		
35 TIM.	a. ABUT. & INT. BENT CAPS & RISERS	6
SUB.	b. PILES, POST, SILLS & BRACING	-
STR.	c. BULKHEADS, WINGS & TIE BACKS	-
36 CONC.	a. ABUT. & INT. BENT CAPS	6
SUB.	b. ABUT. & BENT COLS & BREASTWALLS	6
STR.	c. ABUT. & INT. BENT PILES	-
	d. BACKWALLS- WINGS - RETAIN. WALLS	7
	e. ABUT. AND BENT FOOTINGS & SILLS	5
37 STEEL	a. ABUT. & INT. BENT CAPS & RISERS	6
SUB. STR.	b. PILES AND BRACING AND BULKHEADS	-
38 FOUNDATION PILES TYPE MATERIAL		-
39 SLOPE PROT., RIP-RAP (INCLUDE DRAINAGE)		7
40 FENDER SYSTEMS		-
41 DRIFT		-

ITEM 61		GRADE
45 CHANNEL	a. WATERWAY	-
&	b. ALIGNMENT	-
CHANNEL	c. SCOUR	-
PROT.	d. SLOPE PROT., RIP-RAP	-
	DIKES, ETC.	
50 APPROACH ROADWAY CONDITION		7
51 APPROACH SLABS		-
52 PAINT SYSTEMS	CODE (A)	7
53 UTILITIES		7
54 RESPONSE TO LIVE LOAD		7
55 ESTIMATED REMAINING LIFE (YRS)		14
60 REGULATORY SIGN NOTICE ISSUED		N
61 PROMPT - ACTION NOTICE ISSUED		N
62 PRESENTLY POSTED		SV 8 TONS, TTST 10 TONS
63 TOT. FIELD INSP. TIME (INCLUDE WRITE UP) (M/H)		10
64 TOTAL SNOOPER INSP. TIME (HRS)		-
65 TOTAL TRAFFIC CONTROL TIME (M/H)		-

70 SI&A GENERAL CONDITION RATINGS		
a. DECK	ITEM 58	7
b. SUPERSTRUCTURE	ITEM 59	5
c. SUBSTRUCTURE	ITEM 60	6
d. CHANNEL & CHANNEL PROT.	ITEM 61	-

71 SI&A FIELD APPRAISAL RATINGS	
a. WATERWAY ADEQUACY	-
b. APPR. RDWY. ALIGNMENT	5
72 FIELD SCOUR EVALUATION	-

USE OF INSP. ACCESSIBILITY EQUIPMENT		
SNOOPER (CODE P, S, 4 or N)	Y/N	N
LADDER	Y/N	Y
OVERSIDE LADDER	Y/N	N
BUCKET TRUCK	Y/N	N
BOAT	Y/N	N
OTHER (HIPWADERS)	Y/N	N

SPECIAL INSPECTION REQUESTED FOR:

NOTE:

BELOW GROUND SUBSTRUCTURE ITEMS CANNOT BE DETERMINED

80 INSPECTED BY: GLENN G. WILLIAMS
81 REVIEWED BY: MICHAEL W. CRAIG, P.E.

BRIDGE I & A FORM 1(82) h *STATE OF NORTH CAROLINA* *DEPT. of TRANSPORTATION* *HIGHWAY SAFETY* BRIDGE MAINTENANCE UNIT BRIDGE INSPECTION SECTION	**FIELD INSPECTION REPORT** **BRIDGE INSPECTION & ANALYSIS**	**URS** BRIDGE NO.: 030088 ROUTE: RIDGE STREET COUNTY: ANSON

Team Leader: S. DAS Date: 3/15/2006

Assisted By: P. de PAOLI

Item No. / Rating		Description
1. WEARING SURFACE	5 - FAIR	SEVERAL TRANSVERSE 1/16" TO 3/8" CRACKS IN ALL SPANS AND SPACED AT 12" TO 24" APART. LONGITUDINAL 1/4" TO 3/8" CRACK ALONG THE CROWN OF THE ROADWAY. CRACKED AND BROKEN OUT PIECES OF ASPHALT WEARING SURFACE UP TO 18" x 9" x 2" DEEP IN SPAN B. ASPHALT WEARING SURFACE HAS BEEN PATCHED IN SPANS B AND C. VISIBLE SIGNS OF DETERIORATION IN ASPHALT WEARING SURFACE PATCHWORK.
2B. TIMBER DECK	7 - GOOD	DAMP IN PLACES DUE TO MOISTURE PENETRATION THROUGH CRACKS IN ASPHALT WEARING SURFACE. 2" x 12" PAVEMENT EDGE BOARDS HAVE SPLITS AND ARE SEPARATED 1" TO 2" ON THE NORTH SIDE OF SPANS A AND B, AND UP TO 3" ON THE NORTH SIDE OF SPAN C.
3D. STEEL RAIL	7 - GOOD	BROKEN RAIL WELDED AT NORTHWEST CORNER. TOP RAIL IS OUT OF ALIGNMENT.
7. DECK DEBRIS (INCLUDE EXCESS SAND/GRAVEL)	7 - GOOD	SAND, GRAVEL, AND PINE STRAW ON EDGE OF DECK IN SPAN C.
10. LONGITUDINAL BEAMS OR GIRDERS	5 - FAIR	GIRDERS HAVE BEEN INSPECTED AS FRACTURE CRITICAL. VARYING AMOUNTS OF PAINT PEEL AND RUST SCALE IN GIRDERS, FLOOR BEAMS AND CONNECTIONS AT BENTS. 1/8" TO 1/4" SECTION LOSS AT INSIDE TIP OF BOTTOM FLANGE OF GIRDERS AT CONNECTIONS WITH FLOOR BEAMS IN SPAN A. UP TO 1/8" SECTION LOSS AT SIMILAR LOCATION OF GIRDERS IN SPAN C. 1/16" TO 1/8" SECTION LOSS AT INSIDE TIP OF BOTTOM FLANGE OF GIRDER 1 AT BEARING STIFFENER AT BOTH ABUTMENTS. 1/16" SECTION LOSS FOR GIRDER 2 AT SIMILAR LOCATIONS. WARPED HAUNCH BRACKETS FOR GIRDER 2 IN SPAN B AT BENT 2.
11. LONGITUDINAL JOISTS OR STRINGERS	7 - GOOD	GENERALLY SOUND. HAVE SOME CHECKS AND SPLITS.
12. INT. DIAPS, X-FRAMES, BRACING & CONNS	6 - FAIR	PITTING AT FEW LOCATIONS IN LATERAL BRACING IN SPAN B.

BRIDGE I & A FORM 1(82) h *STATE OF NORTH CAROLINA* *DEPT. of TRANSPORTATION* *HIGHWAY SAFETY* BRIDGE MAINTENANCE UNIT BRIDGE INSPECTION SECTION	**FIELD INSPECTION REPORT** **BRIDGE INSPECTION & ANALYSIS**	**URS** BRIDGE NO.: 030088 ROUTE: RIDGE STREET COUNTY: ANSON

Team Leader: S. DAS Date: 3/15/2006

Assisted By: P. de PAOLI

Item No. / Rating		Description
14.	FLOOR BEAMS AND CONNECTIONS	7 - GOOD	RUST AND 1/16" SECTION LOSS AT SEVERAL LOCATIONS ON THE LEDGE OF FLOOR BEAMS SUPPORTING THE STRINGERS. PAINT PEEL AND SURFACE RUST UNDERNEATH THE TOP FLANGES.
15.	BEARING ASSEMBLIES (INCLUDE MISALIGN)	5 - FAIR	DIRT AND DEBRIS ACCUMULATED ON BEARINGS AT BOTH ABUTMENTS SUPPORTING GIRDERS AND STRINGERS.
16.	DRAINAGE SYSTEMS (ON STRUCTURES)	8 - GOOD	WATER DRAINS OFF EDGES.
35A.	TIMBER ABUT. & INT. BENT CAPS & RISERS	6 - FAIR	DECAY AT ENDS OF TIMBER CAPS AT BOTH ABUTMENTS. MOISTURE PENETRATION THROUGH CRACKS IN ASPHALT WEARING SURFACE.
36A.	CONCRETE ABUT. & INT. BENT CAPS	6 - FAIR	9" x 3" EDGE SPALLS IN CONCRETE CAP AT ABUTMENT 1. HEAVY SCALING ON CONCRETE ABUTMENTS CONSTRUCTED OF GRAVEL AGGREGATE.
36E.	CONCRETE ABUT. AND BENT FOOTINGS & SILLS	5 - FAIR	18" DIAGONAL 1/16" TO 1/8" CRACK WITH EFFLORESCENCE IN CONCRETE PEDESTAL AT COLUMN 1 IN BENT 1. RANDOM MAP CRACKING IN CONCRETE PEDESTAL AT INTERIOR BENTS.
37A.	STEEL ABUT. & INT. BENT CAPS & RISERS	6 - FAIR	RUST IN 1" DIAMETER HOLE THROUGH WEBS NEAR BASE OF COLUMN 1 AND COLUMN 2 IN BENT 1. RUST AND DEBRIS AT BASE OF COLUMNS IN BOTH BENTS. KINK IN BOTTOM STRUT OF SWAY BRACING AT BENT 2. 1/4" PITTING AT FEW LOCATIONS IN THE ANGLE AND LACING BARS OF BOTTOM STRUT OF SWAY BRACINGS AT BOTH BENTS.
39.	SLOPE PROT., RIP-RAP (INCLUDE DRAINAGE)	7 - GOOD	VERY STEEP AND MODERATELY UNSTABLE.
50.	APPROACH ROADWAY	7 - FAIR	SURFACE IS ROUGH AND EXHIBITS WEAR DUE TO TRAFFIC. BOTH APPROACHES HAVE TRANSVERSE 1/4" TO 3/8" CRACKS NEAR ABUTMENT FILL FACES. RANDOM MAP CRACKING IS OBSERVED IN FEW AREAS.

BRIDGE INSPECTOR'S RECOMMENDATIONS FOR MAINTENANCE REPAIRS

BRIDGE NO.: 030088 COUNTY: ANSON DATE: 3/15/2006

These repairs should be made within twelve months from the date of this inspection.

FUNCTION CODE	DESCRIPTION OF FUNCTION	UNIT	QUANTITY	REMARKS	EST. COST
578	GENERAL MAINTENANCE OF BRIDGE SUPERSTRUCTURE	MHS	80	REPAIR AREAS WITH SECTION LOSS DUE TO RUST ON BOTTOM FLANGES OF GIRDERS AT BEARINGS AND FLOOR BEAM CONNECTIONS.	
554	PARTIAL CLEANING & PARTIAL PAINTING OF STRUCTURAL	MHS	160	REMOVE DIRT/DEBRIS AND RUST SCALE ON BOTTOM GIRDER FLANGES AT BEARINGS AND STRUCTURAL CONNECTIONS AND REPAINT. CLEAN AND PAINT BENT COLUMNS.	

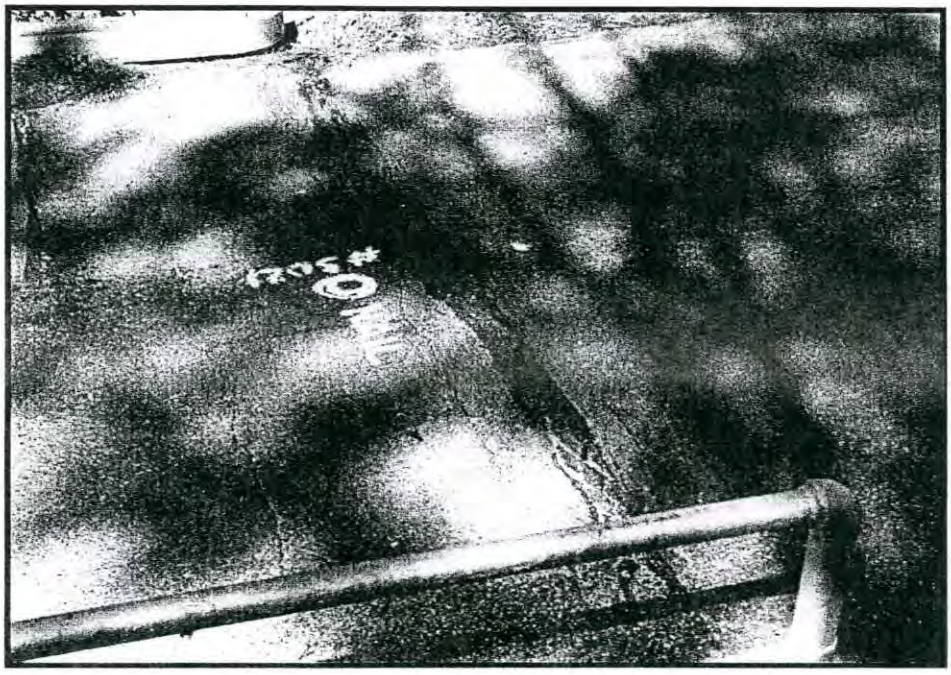
BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006

ASPHALT WEARING SURFACE IN SPAN A

ASPHALT WEARING SURFACE IN SPAN B

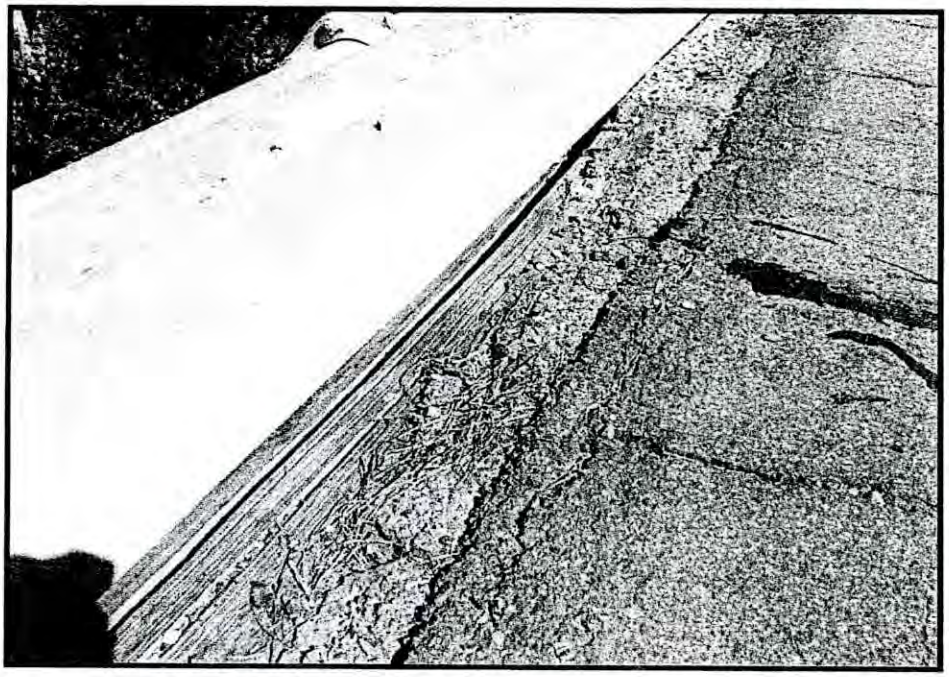
BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006

CRACK IN ASPHALT WEARING SURFACE AT ABUTMENT 1



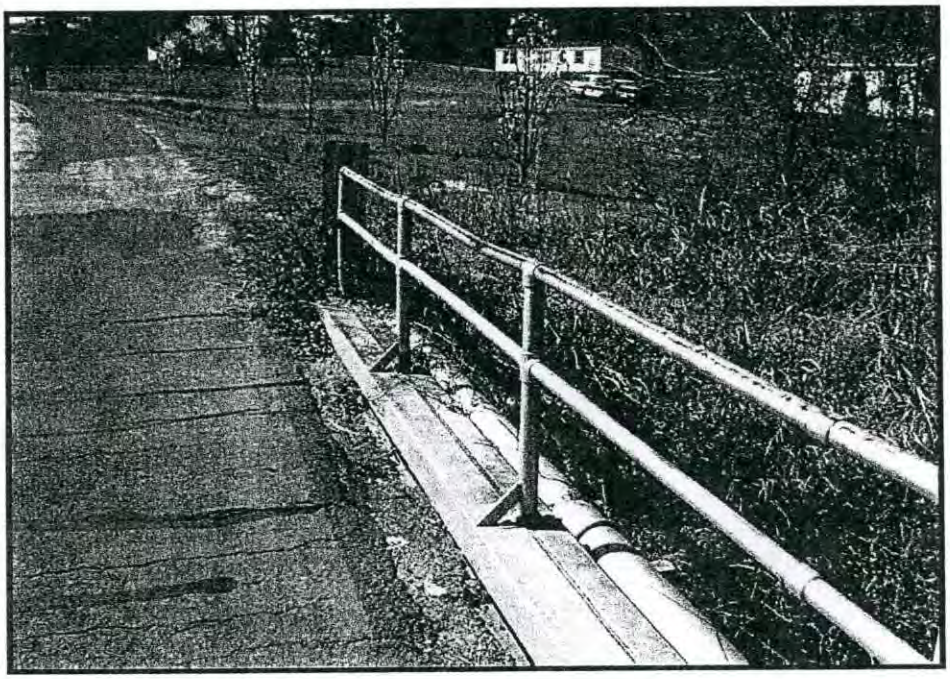
CRACK IN ASPHALT WEARING SURFACE AT ABUTMENT 2

URS

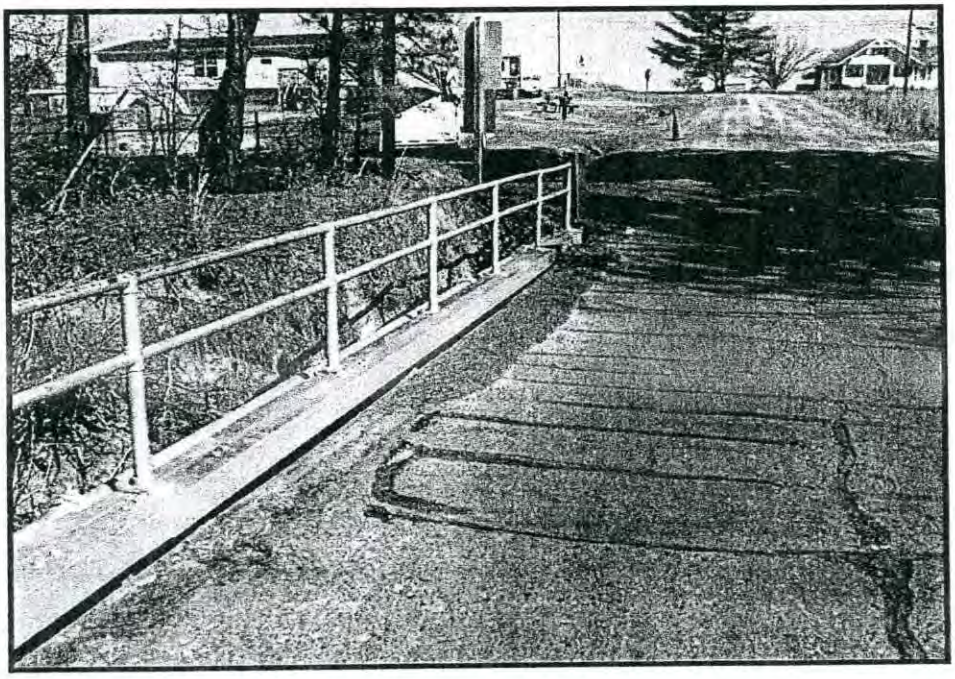


SPLIT DECK TIMBER ON NORTH SIDE OF SPANS A AND B AT BENT 1

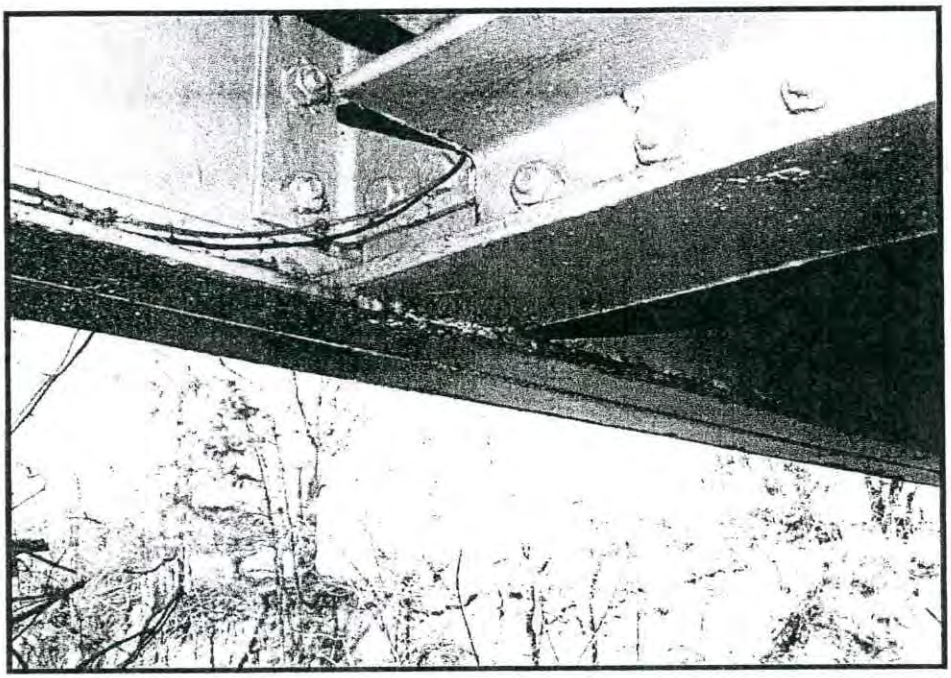
SPLIT DECK TIMBER ON NORTH SIDE OF SPAN C



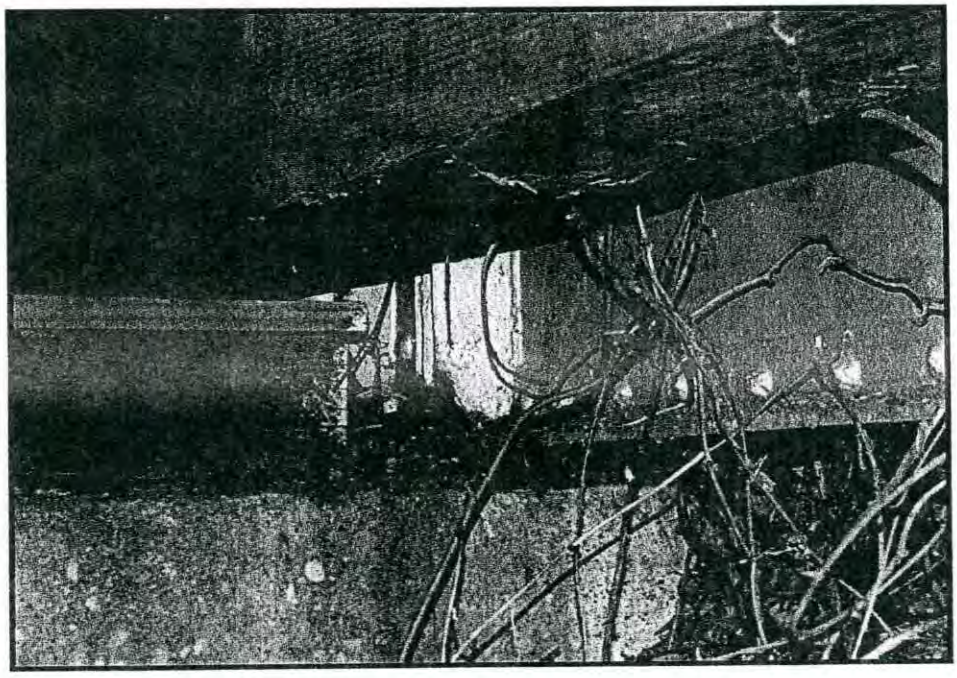
DAMAGED RAIL AT NORTHWEST CORNER OF SPAN A NEAR ABUTMENT 1



DECK DEBRIS IN SPAN C

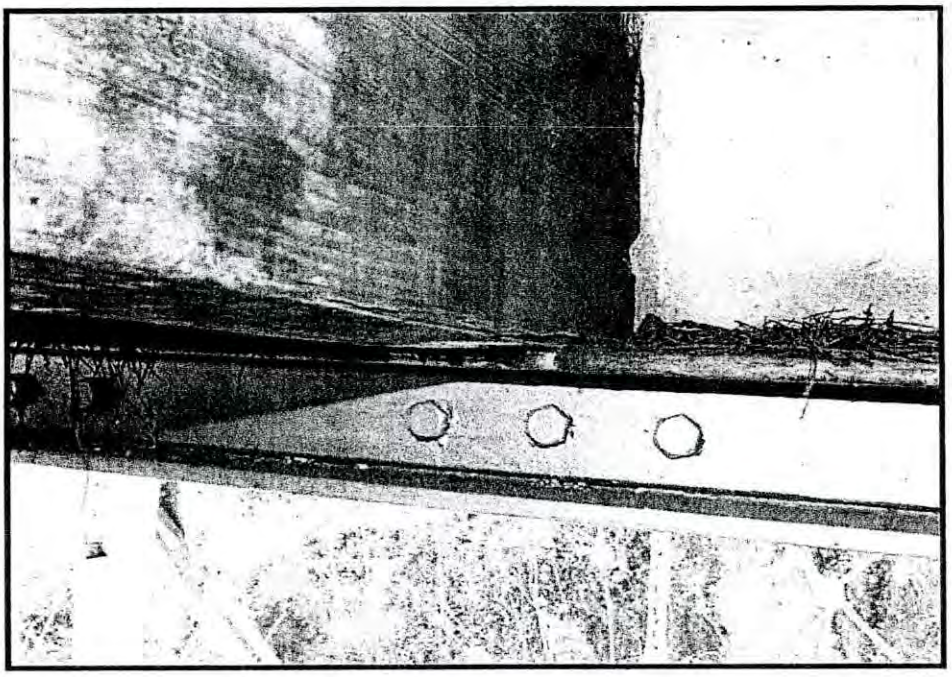


RUST AND SECTION LOSS IN BOTTOM FLANGE OF GIRDER 1 IN SPAN A



VEGETATION AROUND BEARING STIFFENER IN GIRDER 1 AT ABUTMENT 1

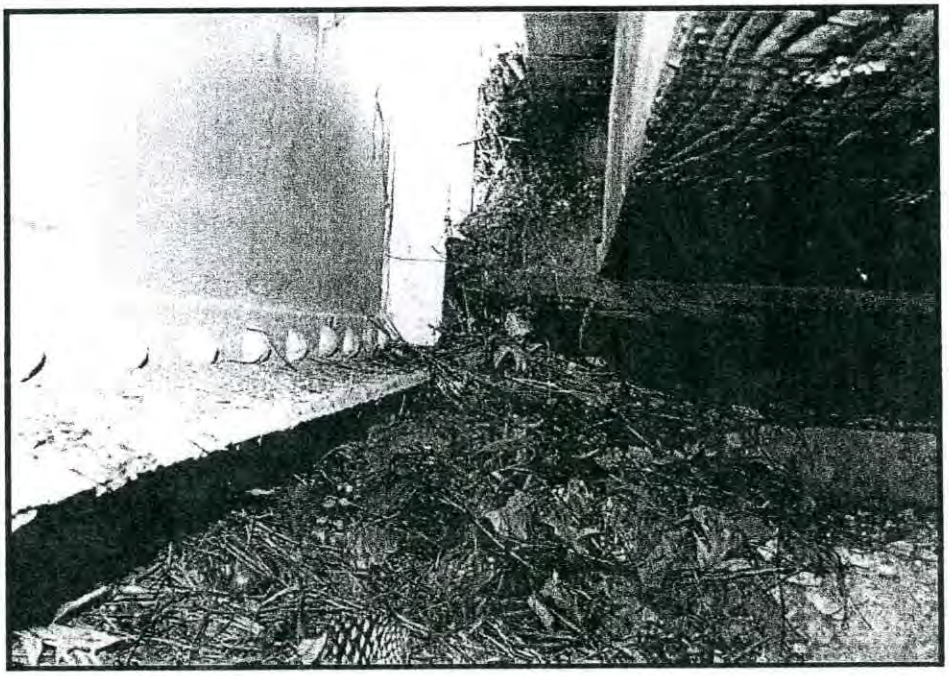
URS



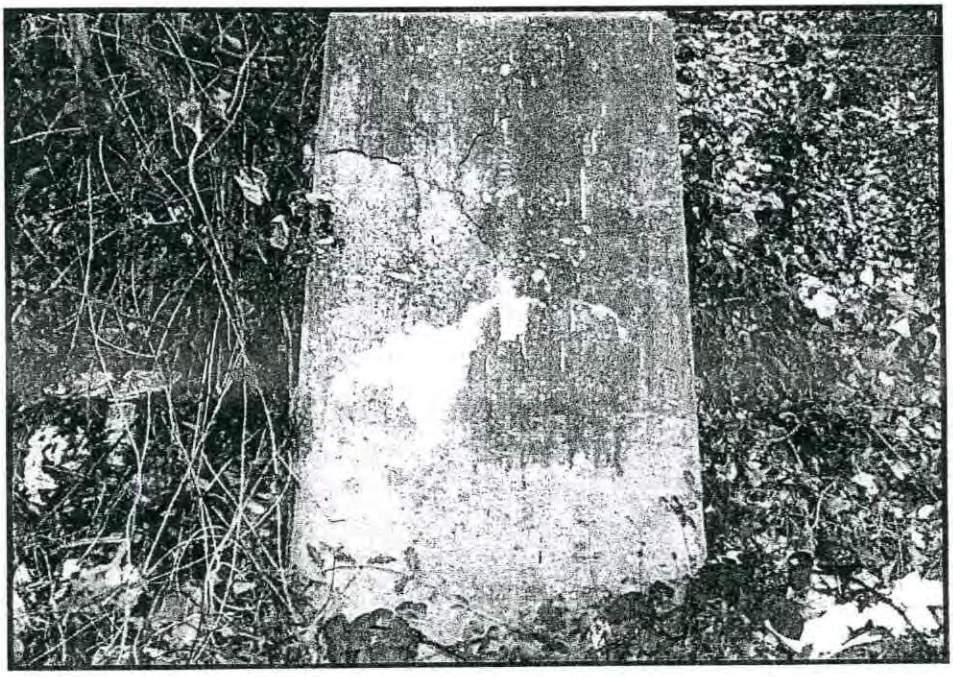
RUST ON STRINGER LEDGE AT FLOOR BEAM 1 IN SPAN C

SOIL ON BEARING UNDER GIRDER 2 AT ABUTMENT 2

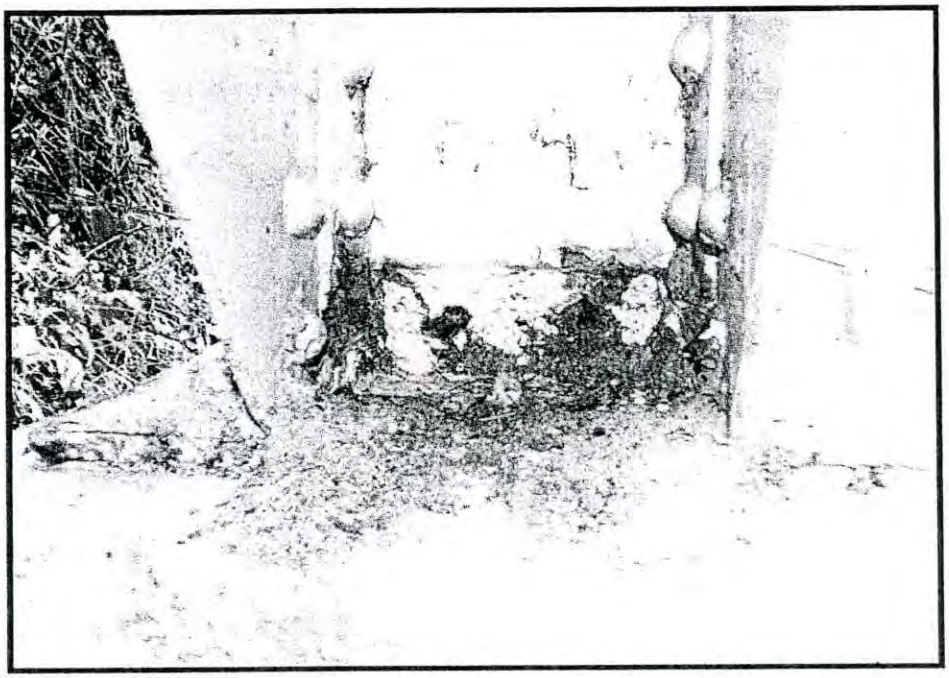
URS



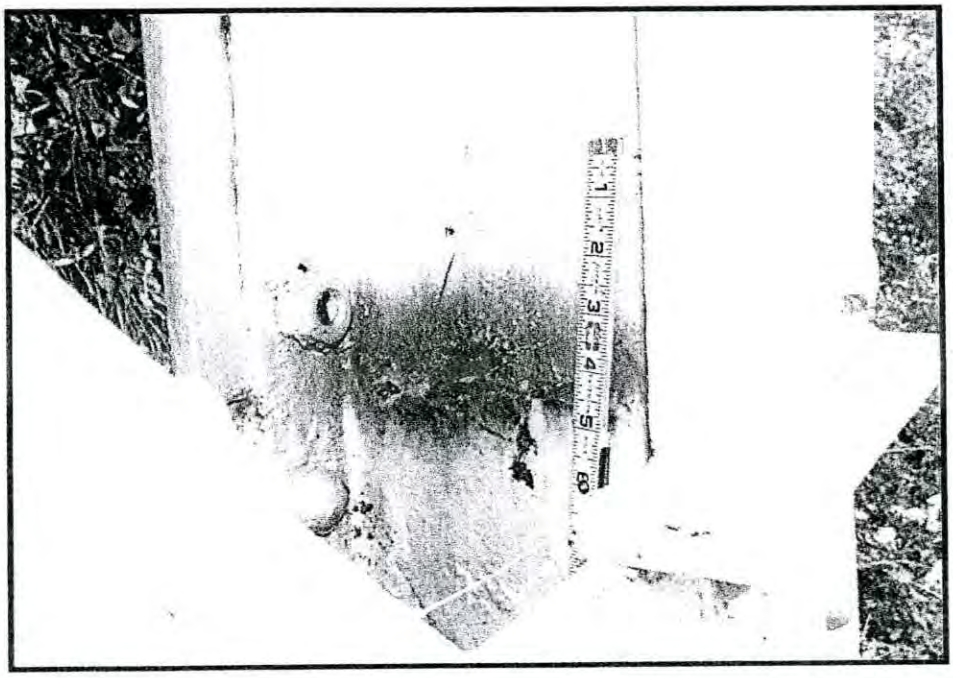
SOIL AND DEBRIS COVERING BEARING UNDER GIRDER 1 AT ABUTMENT 2



DIAGONAL CRACKS WITH EFFLORESCENCE IN CONCRETE PEDESTAL AT COLUMN 1 OF BENT 1

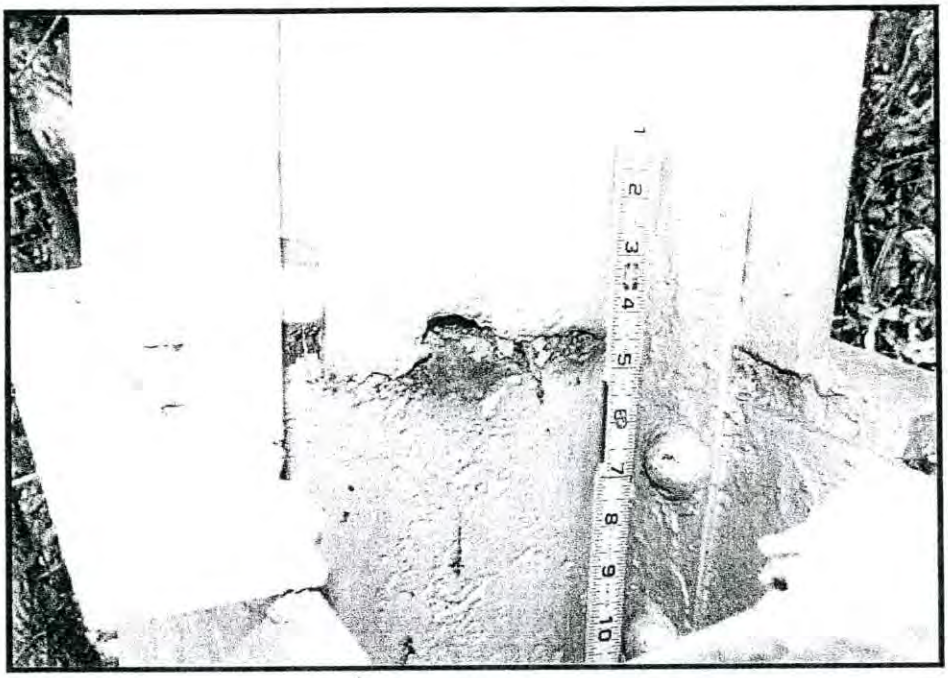


RUST AND DEBRIS AT BASE OF COLUMN 1 AT BENT 1

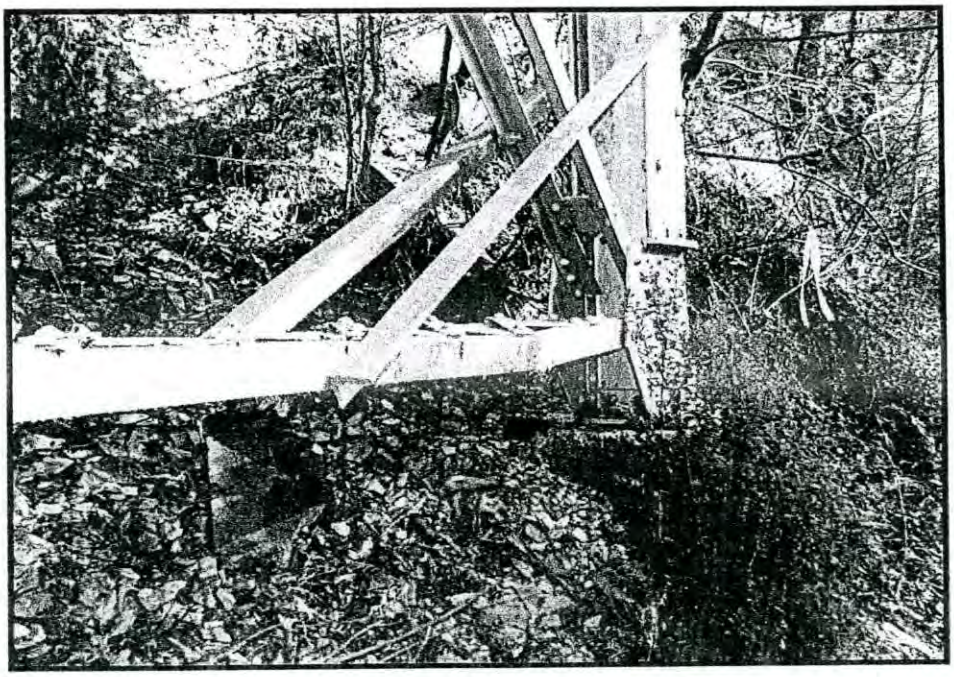


HOLE IN COLUMN WEBS AT BASE OF COLUMN 1 AT BENT 1

BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006

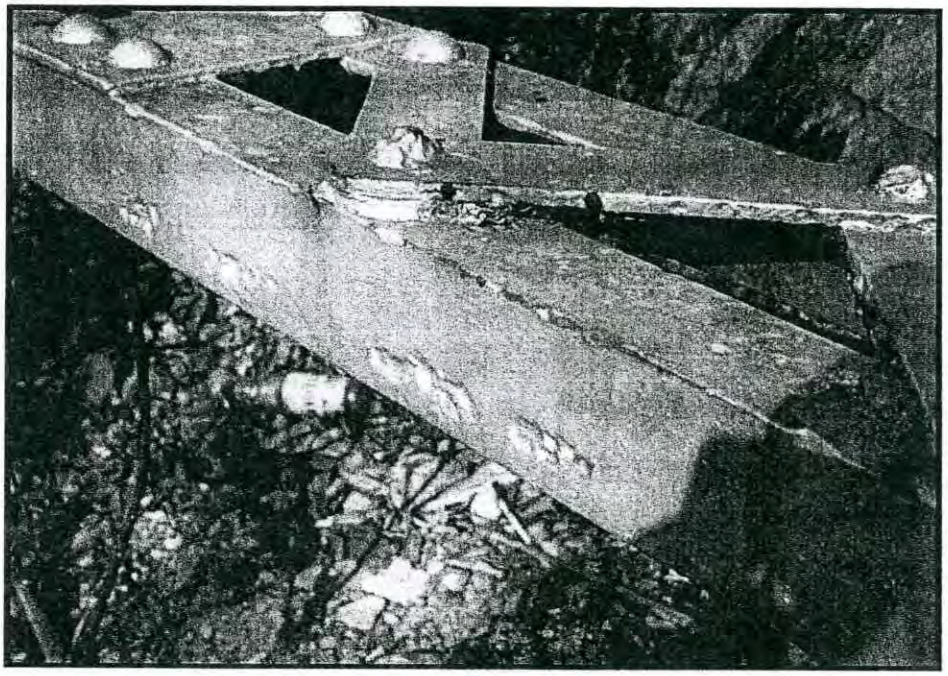


HOLE IN COLUMN WEBS AT BASE OF COLUMN 2 AT BENT 1

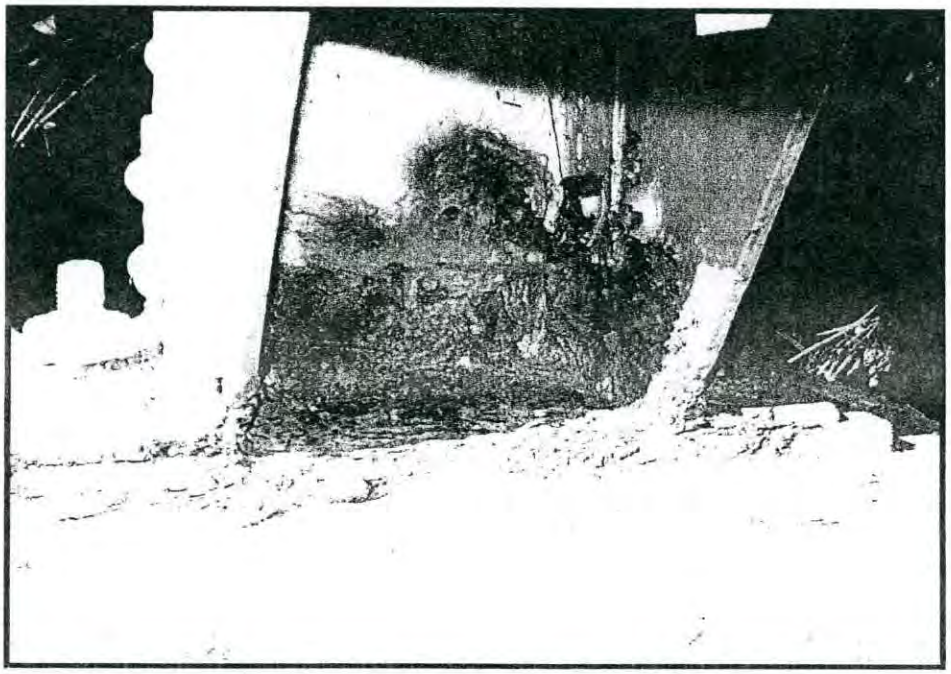


KINKED SWAY STRUT AT BASE OF BENT 2

URS

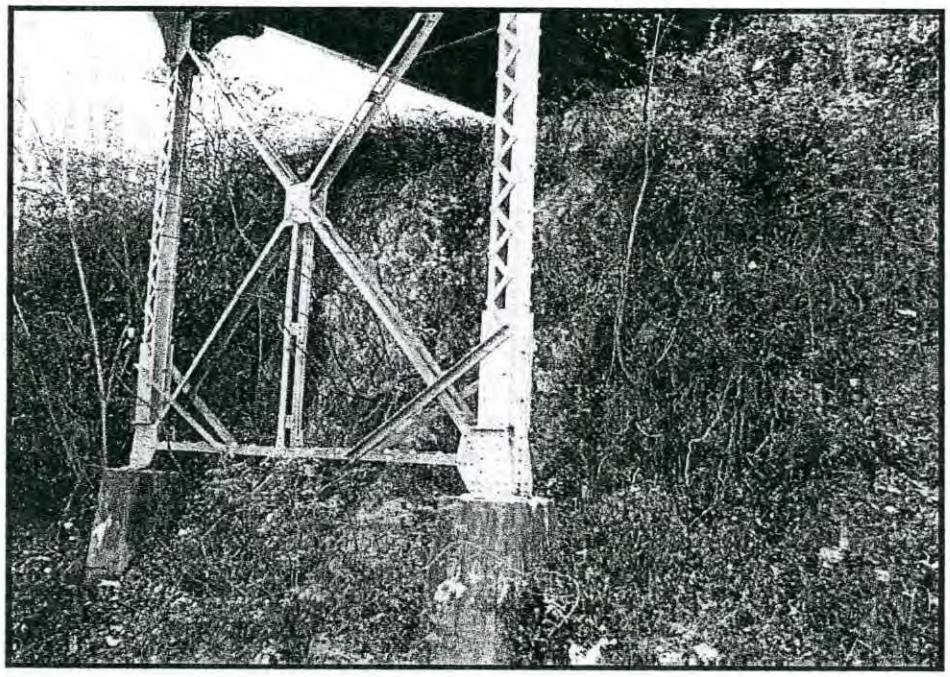


PITTED ANGLE AND LACING BARS ON SWAY STRUT AT BASE OF BENT 2

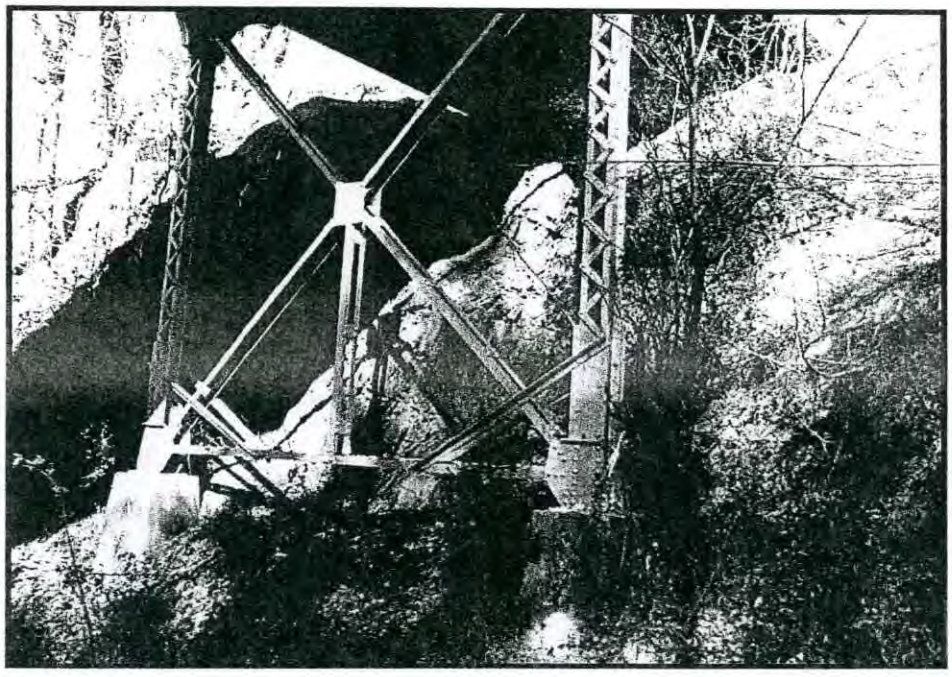


RUST ON COLUMN BASE PLATE UNDER COLUMN 1 OF BENT 2

URS



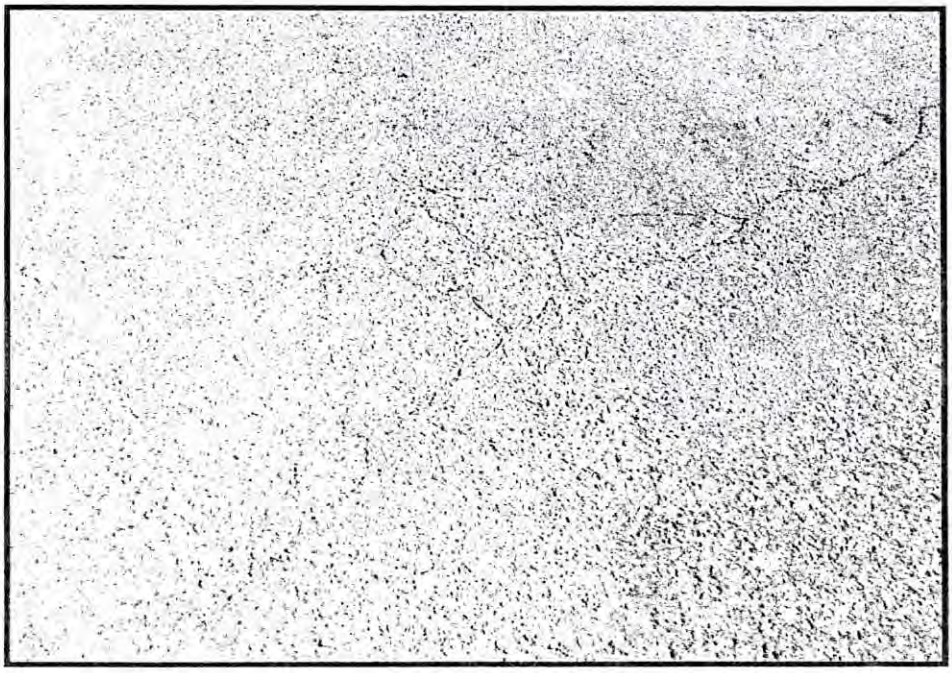
FRONT SLOPE AT ABUTMENT 1



FRONT SLOPE AT ABUTMENT 2

URS

TRANSVERSE CRACK IN ASPHALT WEARING SURFACE ON WEST APPROACH ROADWAY



MAP CRACKING IN ASPHALT WEARING SURFACE ON WEST APPROACH ROADWAY

NORTH CAROLINA
DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
BRIDGE MAINTENANCE UNIT

URS

STRUCTURE DATA FILE

COUNTY ANSON BRIDGE NO. 030088

CONTENTS:

- ☑ DATA CARD
- ☑ STRUCTURE DATA WORK SHEETS
- ☐ STREAM BED SOUNDINGS & PROFILE SKETCH
- ☐ FORM 501 OR 502
- ☐ FORM BMD - 9
- ☐ RETURNED PROMPT ACTION NOTICE SHOWING REPAIRS
- ☑ OTHER SKETCHES AND NOTES SHOWING STRUCTURE DETAILS
- ☑ PHOTOGRAPHS

NOTE: STRUCTURAL ANALYSIS - CHECK X YES OR NO _____

WHEN PLANS ARE AVAILABLE

FIELD INSPECTOR _____

PLAN SKETCH - REVISED
STRUCTURAL DATA SKETCHES - REVISED
FIELD SKETCH FOR VERT. AND HORIZ. CLEARANCES - REVISED
LOCATION SKETCH - REVISED

DATE: 3/15/2006 BY: S. DAS

B80028 BRIDGE MAINTENANCE UNIT RUN DATE 02/07/07
DATA ON EXISTING STRUCTURE

COUNTY:	DIV.:	DIST.:	STRUCTURE NUMBER:	LENGTH:
ANSON	10	3	03 0088	101 FEET

ROUTE CARRIED: RIDGE STREET

FEATURE INTERSECTED: W.S.S.B. RAILROAD

LOCATED: 0.1MI.W.JCT.US 52

BRIDGE NAME: ----------

FUNC. CLASS:	SYST.ON:	SYST.UNDER:	ADT & YR:	RAIL TYPE:
LU	NONFA	-----	200 81	LT 993 RT 993

BUILT:	BY:	PROJ:	FED.AID PROJ:	DESIGN LOAD:
1910	-----	---------	----------	OTH-UNKN

REHAB:	BY:	PROJ:	ALIGNMENT:	SKEW:	LANES:
----	-----	---------	TAN	090	ON 01 UNDER 00

NAVIGATION: VC --- FT HC ---- FT

HT.CRN.TO BED: --- FT

WATER DEPTH: --- FT

SUPERSTRUCTURE:
TIMBER FLOOR ON STL.GIRDER FLOORBEAM SYSTEM

SUBSTRUCTURE:
E.BTS:RC CAPS/STL.PILES;BTS:STL.CAP COLUMN/CONC.PEDESTAL

SPANS:
1@30'6;1@40';1@30'6

BEAMS OR GIRDERS:
31 GIRDERS & 12 JSTS./18 FLOORBEAMS

FLOOR:	ENCROACHMENTS:	DECK (OUT TO OUT):
TIM/3.5 AWS	----------	017.0

CLEAR ROADWAY:	BETWEEN RAILS:	SIDEWALK OR CURB:
015.8	016 .8	LT 00.5 RT 00.5

VERT.CL.OVER:	VERT.CL.UNDER:	HOR.CL.UNDER:	SPECIAL PERMIT:
99 FT 99 IN	22 FT 10 IN	00.0 FT	---

INV.RTG.:	OPE.RTG.:	CONTR.MEMBER:	POSTED:
HS- 4	HS- 7	GIRDER	SV 08 TTST 10 DATE 07 10 2000

SYSTEM:

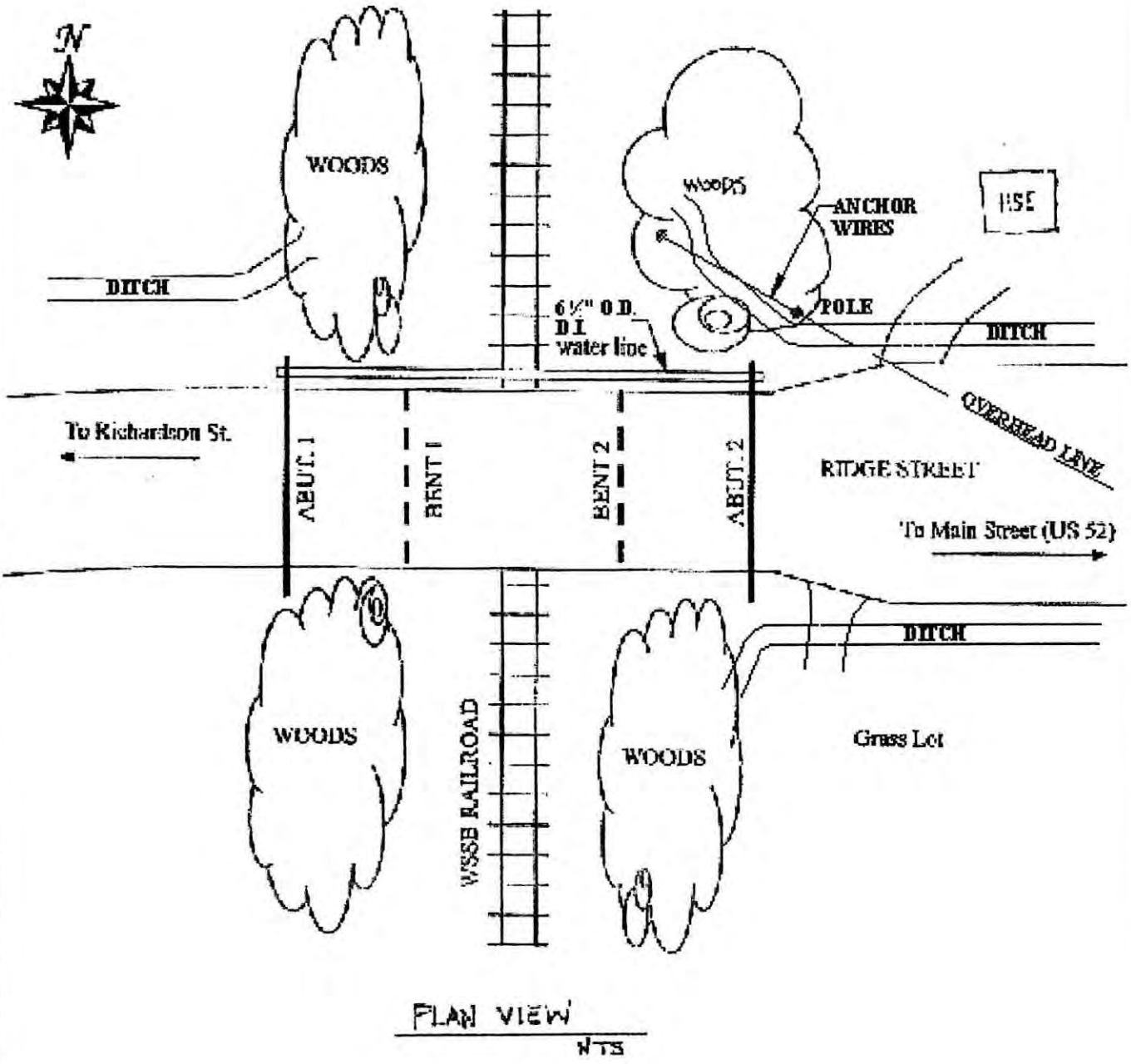
GREEN LINE ROUTE: NO

2ND OPENING:	3RD OPENING:	4TH OPENING:	5TH OPENING:
---- --------	---- --------	---- --------	---- --------

REMARKS: MAINTAINED BY THE CITY OF Ansonville

URS

BRIDGE NUMBER: 030088
COUNTY: ANSON
INSPECTION DATE: 3/15/2006
DRAWN BY COC CHECKED BY SD DATE: 4/20/2006

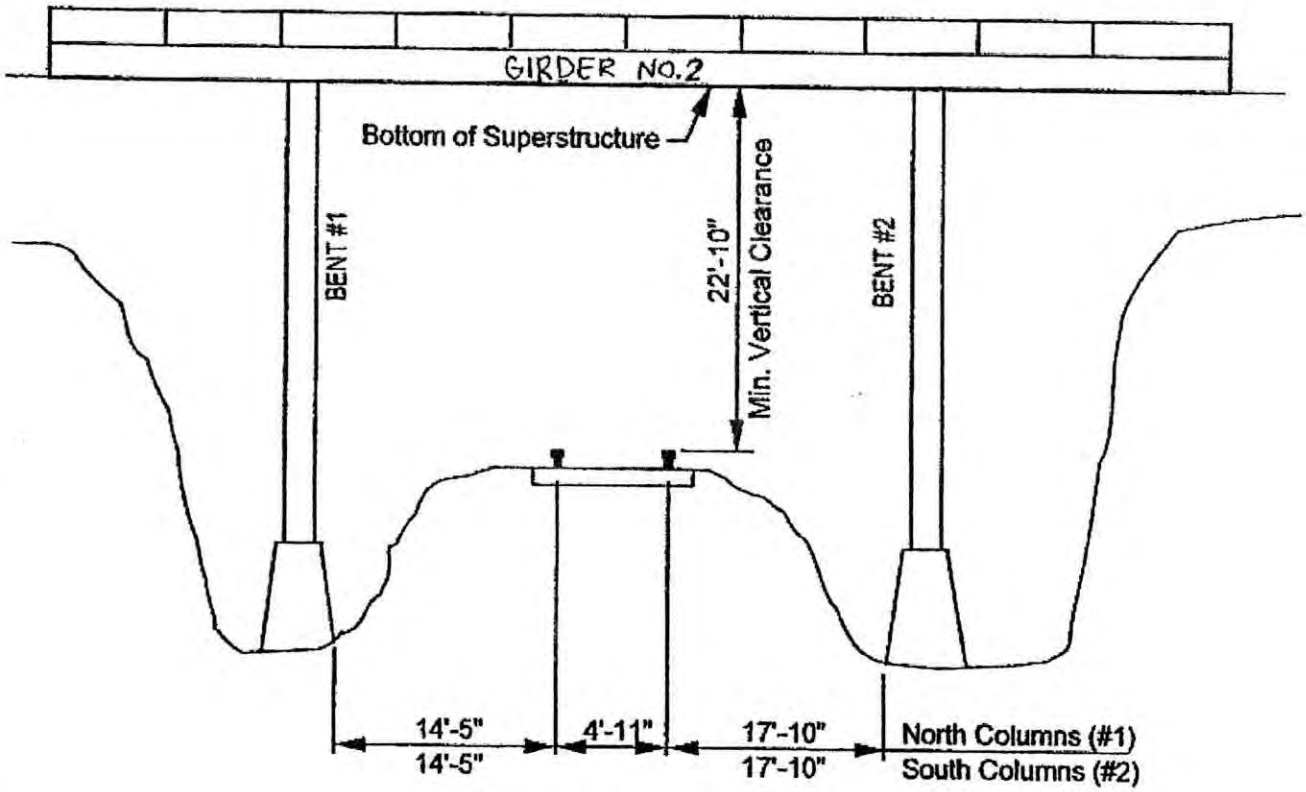


PLAN VIEW
NTS

URS

BRIDGE NUMBER: 030088
COUNTY: ANSON
INSPECTION DATE: 3/15/2006
DRAWN BY COC CHECKED BY SD DATE: 4/20/2006

UNDERCLEARANCE (SI & A ITEMS 10, 28, 38, 39, 40, 47, 54, 55, & 5

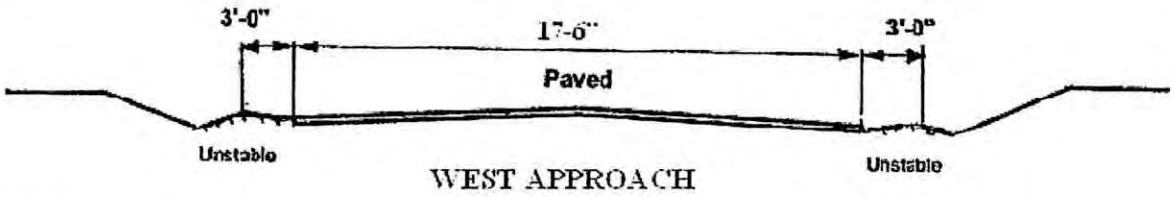


WSSB Railroad (Looking North)

VERTICAL CLEARANCE
NTS

URS

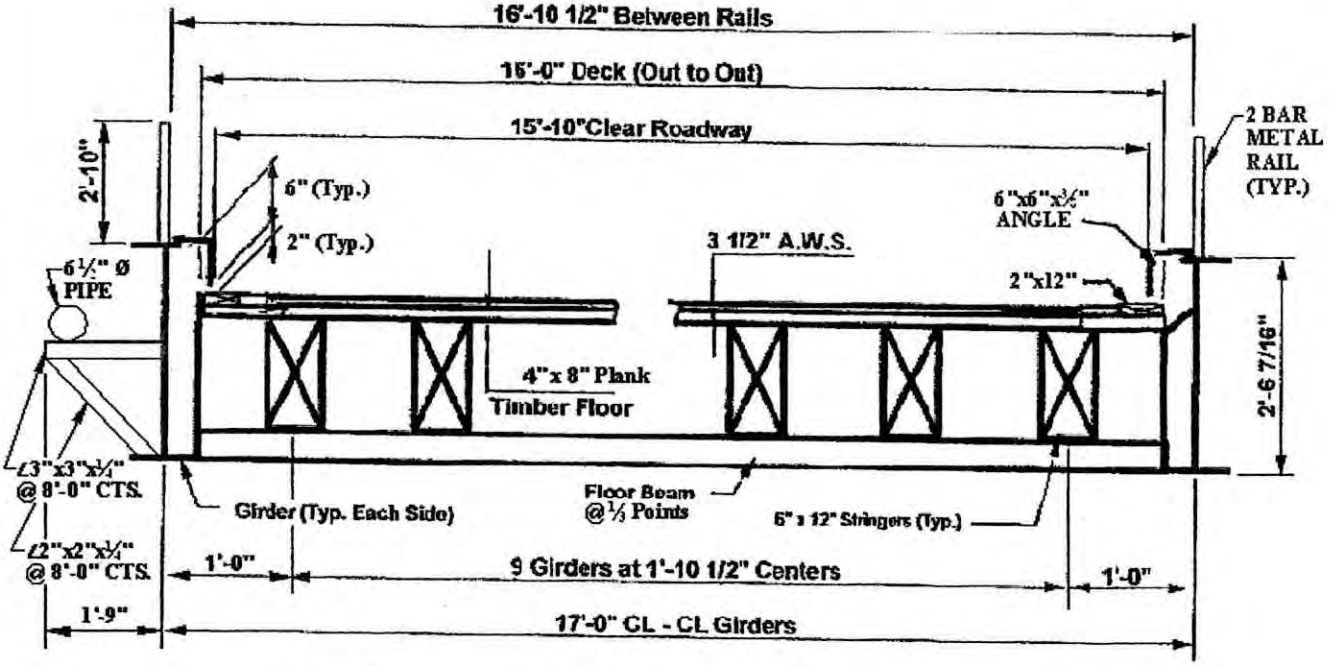
BRIDGE NUMBER: 030088
COUNTY: ANSON
INSPECTION DATE: 3/15/2006
DRAWN BY COC CHECKED BY SD DATE: 4/20/2006

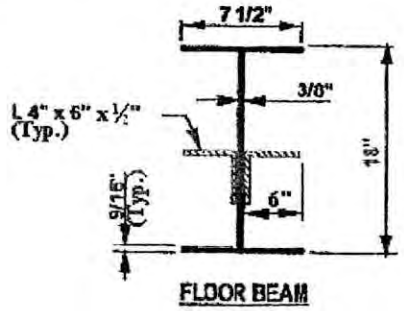


WEST APPROACH

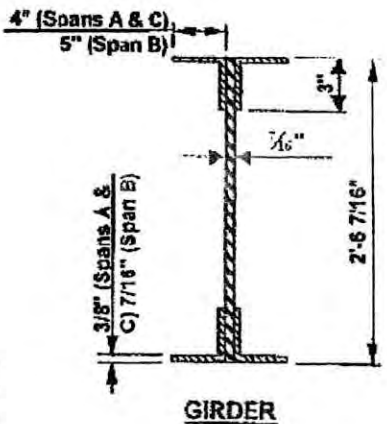
TYPICAL SECTION

Rail Type: Metal





FLOOR BEAM



GIRDER

Span	℄ Brg. to ℄ Brg.
A	29'-8"
B	40'-0"
C	29'-8"

URS

BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006

EAST APPROACH, LOOKING WEST

LOOKING NORTH

URS

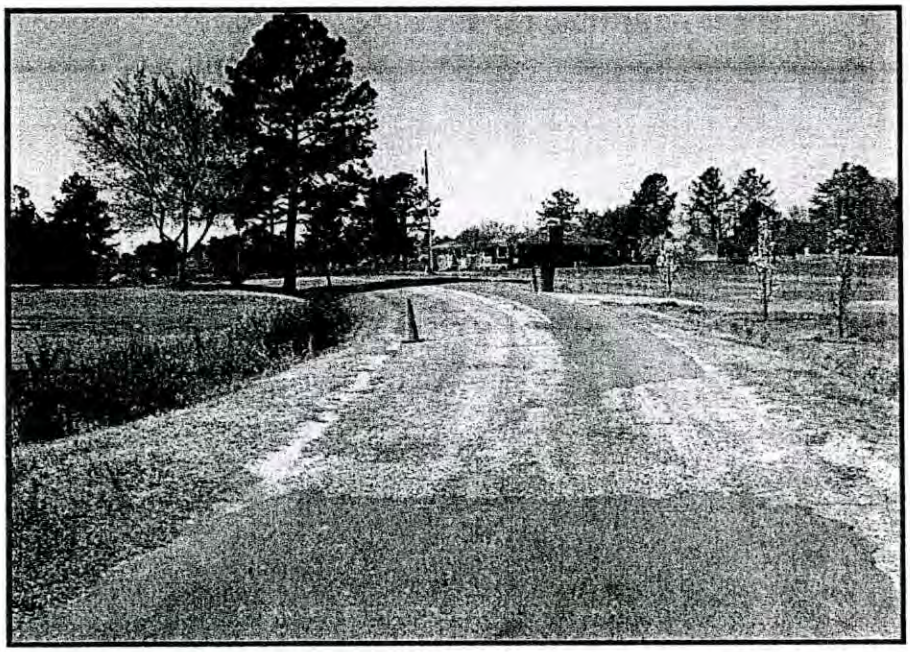
BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006

LOOKING SOUTH

EAST APPROACH, LOOKING EAST

URS

BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006

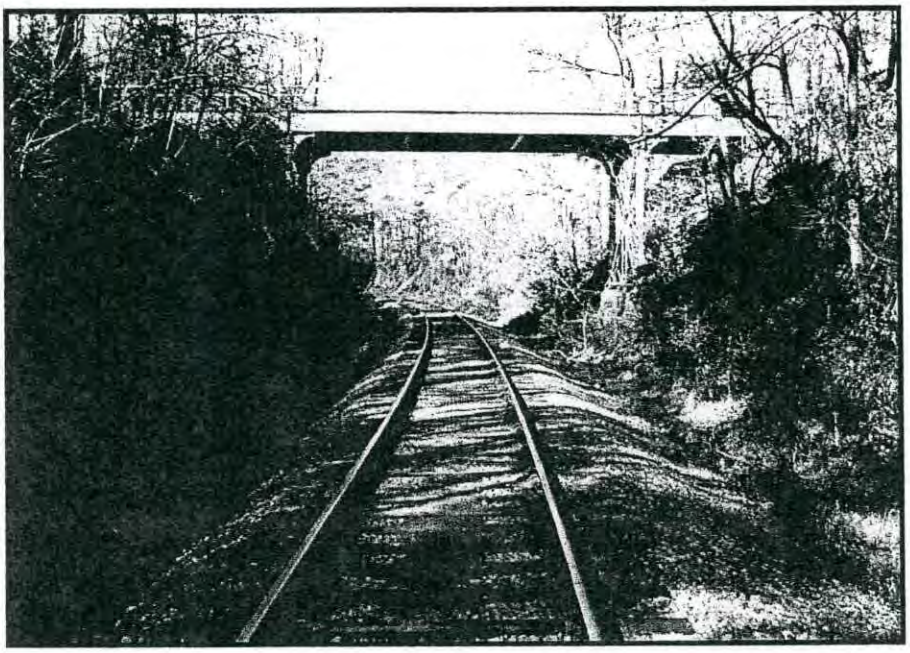


WEST APPROACH, LOOKING WEST

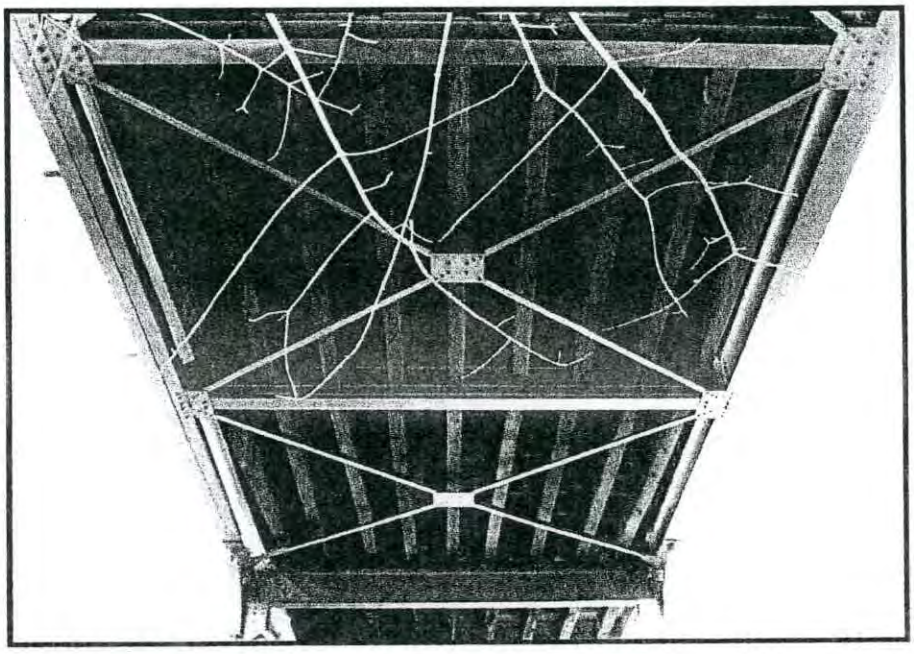
NORTH STRUCTURE PROFILE, LOOKING SOUTH

URS

BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006

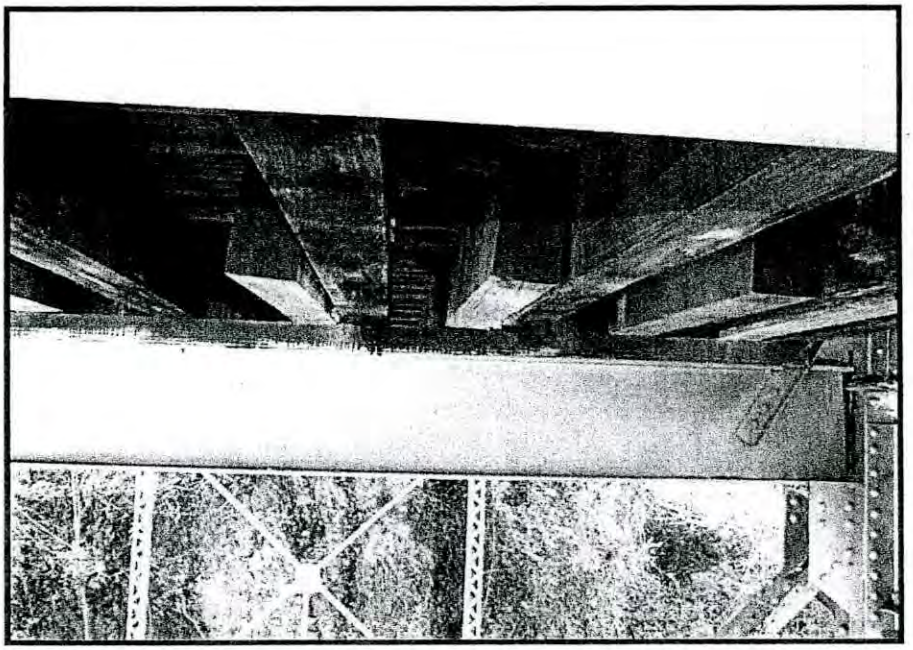


SOUTH STRUCTURE PROFILE, LOOKING NORTH

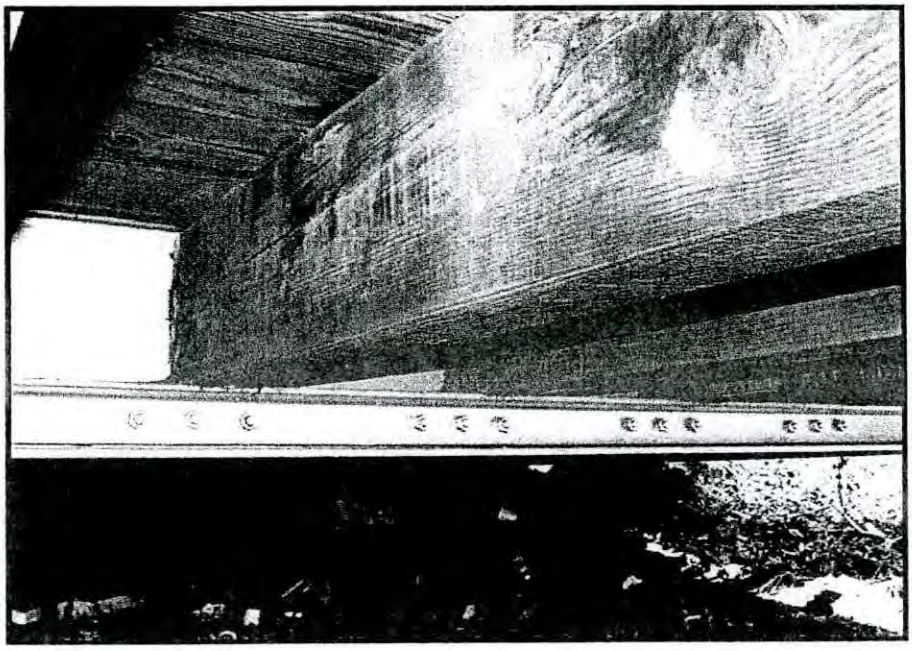


UNDERSIDE OF BRIDGE DECK

BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006



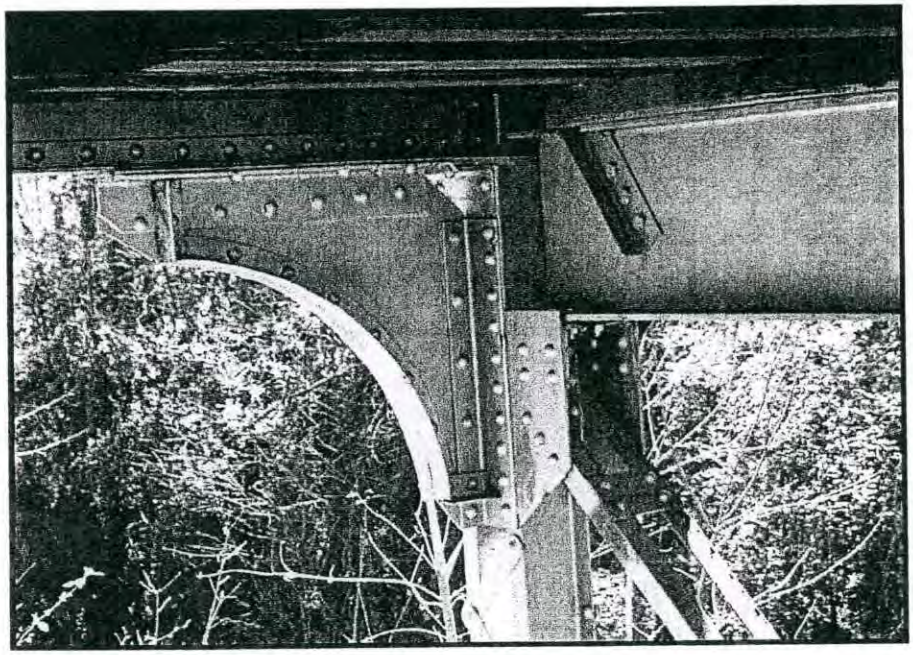
STEEL FLOOR BEAM IN SPAN B



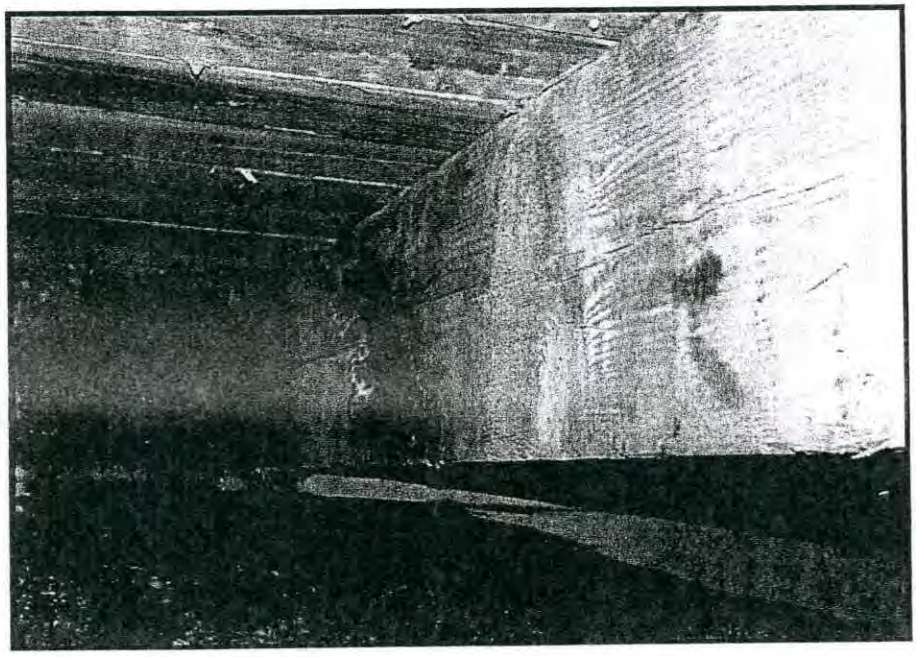
STEEL FLOOR BEAM IN SPAN C

URS

BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006



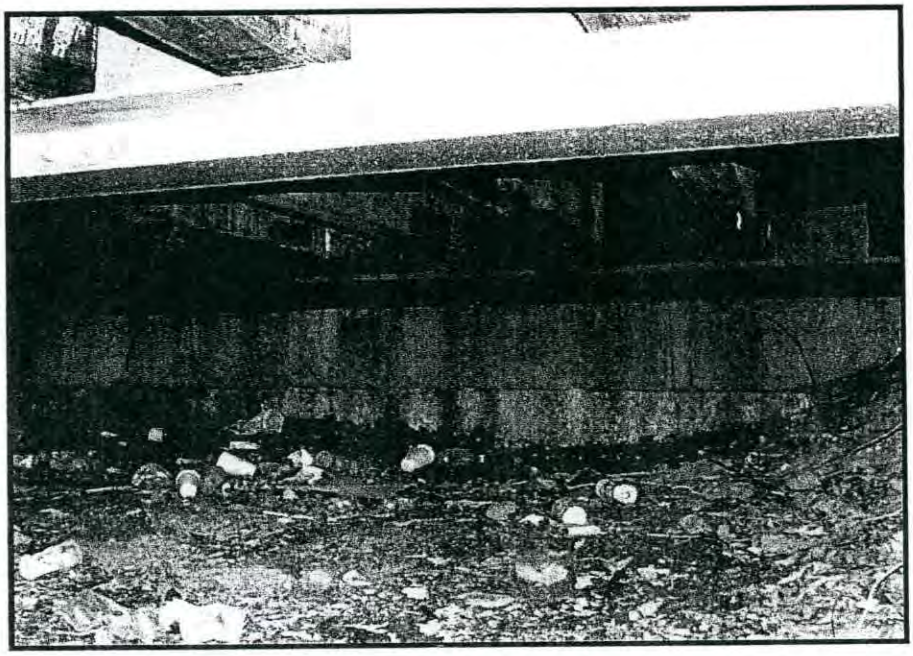
HAUNCH AT GIRDER 2 ON SPAN B SIDE OF BENT 2



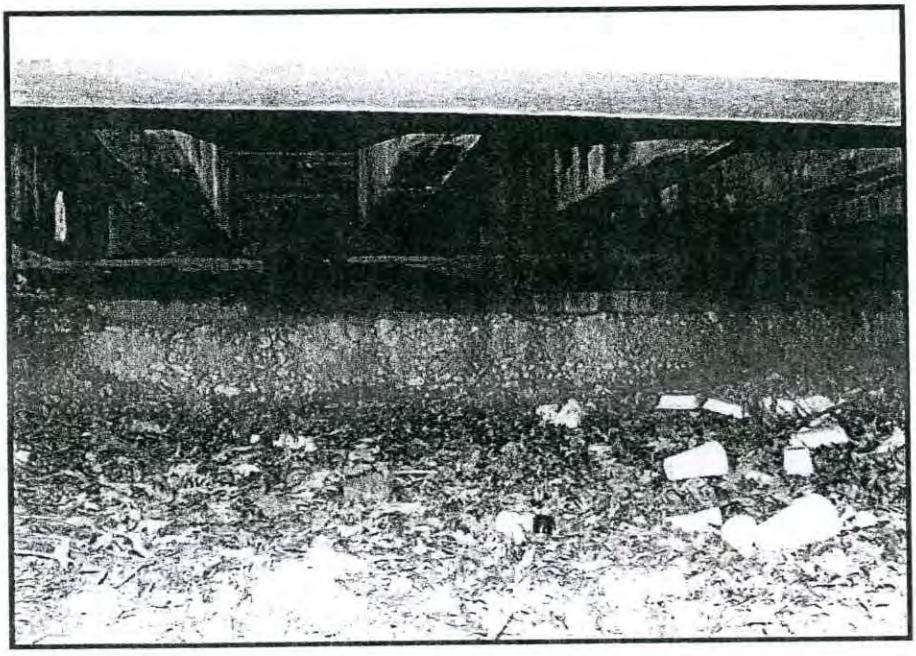
BEARING ASSEMBLY AT ABUTMENT 2 (TIMBER JOIST 5)

URS

BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006



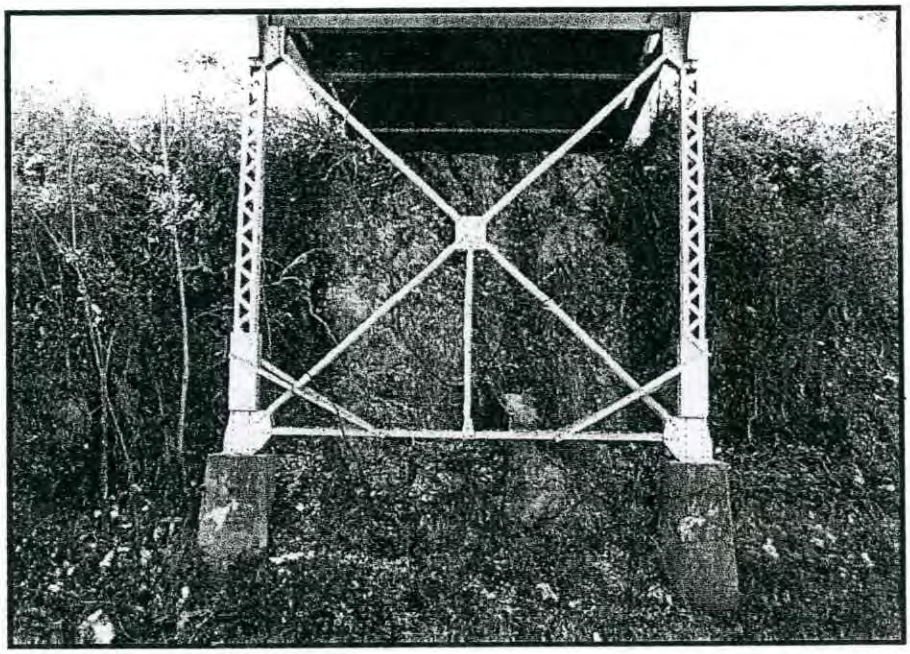
VIEW OF ABUTMENT 1



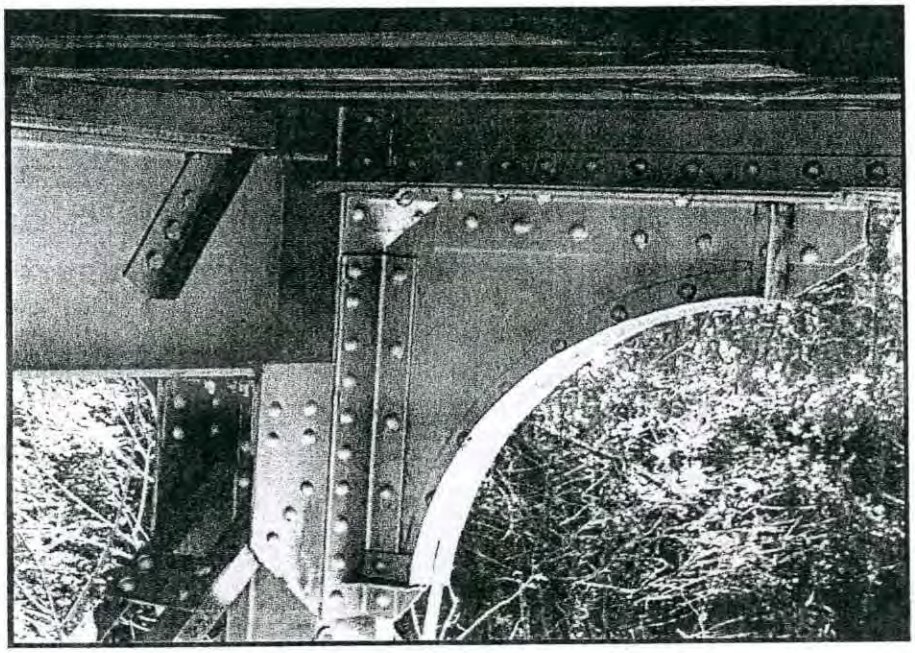
VIEW OF ABUTMENT 2

URS

BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006



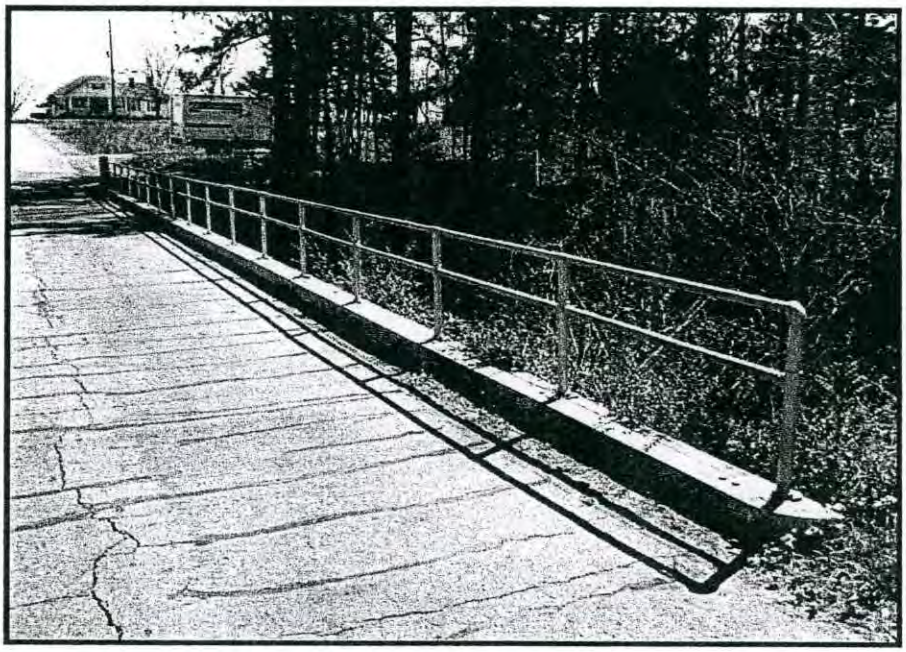
INTERIOR BENT 1



TRANSVERSE BENT CAP CONNECTION AT COLUMN 2 (BENT 1 SHOWN)

URS

BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006



RAIL ON SOUTH SIDE, LOOKING EAST

POSTING SIGN ON EAST APPROACH

URS

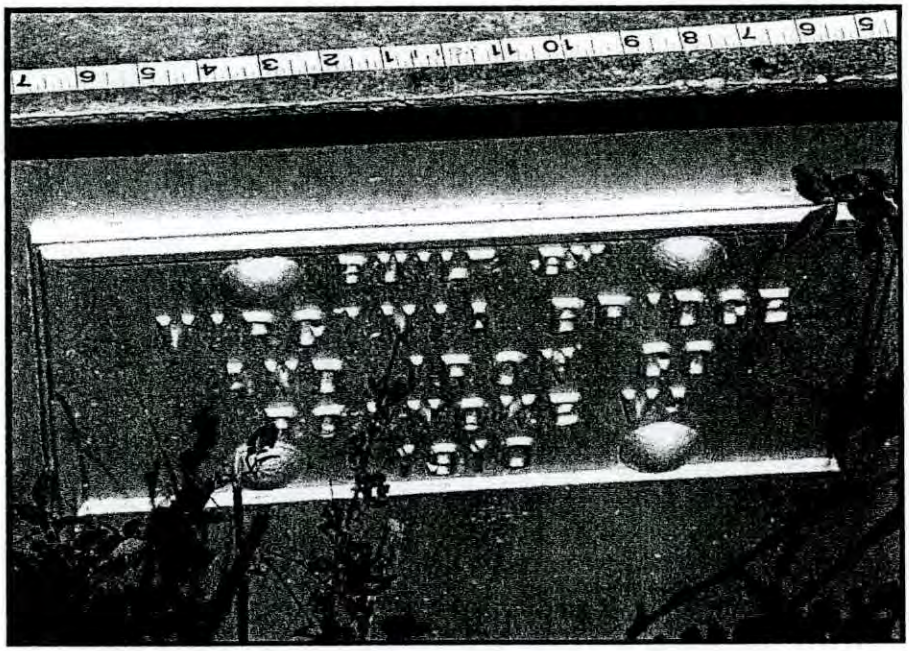
BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006

ONE LANE BRIDGE SIGN ON EAST APPROACH ROADWAY

UTILITY ON NORTH SIDE OF BRIDGE, LOOKING EAST

URS

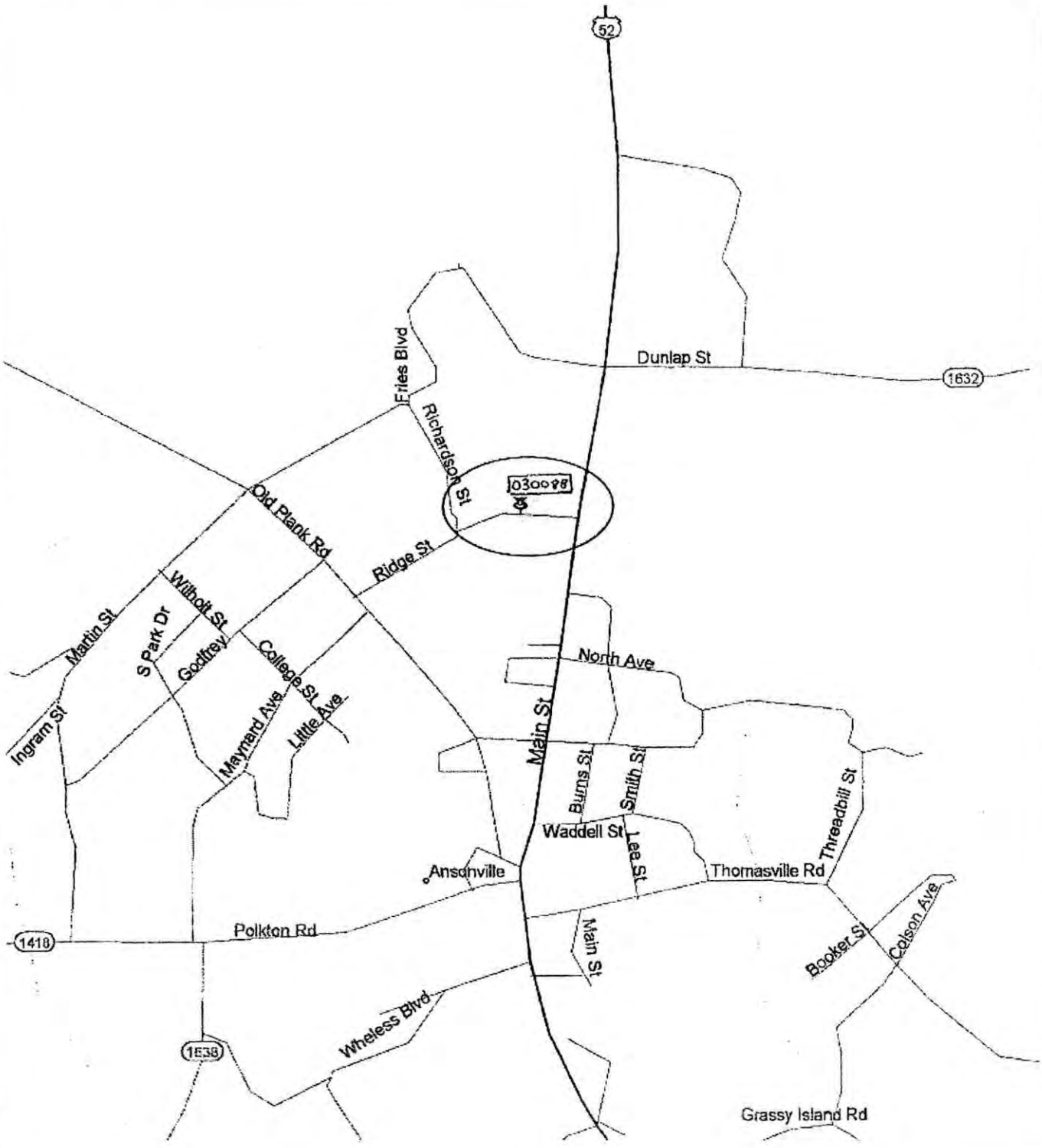
BRIDGE NO.: 030088
COUNTY: ANSON
DATE: 3/15/2006



BRIDGE PLATE ON RIGHT SIDE AT ABUTMENT 1

URS

BRIDGE NUMBER: 030088
COUNTY: ANSON
INSPECTION DATE: 3/15/2006
DRAWN BY COC CHECKED BY SD DATE: 4/20/2006



RATING SUMMARY SHEET

BRIDGE NUMBER: 030088 COMPILED BY: J. SLOAN DATE: 6/23/2006

COUNTY: ANSON CHECKED BY: J. BARCOMB DATE: 6/27/2006

For Interstate & NC Routes	MEMBER			TIMBER DECK	TIMBER JOIST	W18 X 50 STEEL FLOOR BEAM	STEEL GIRDER	
	Span Length			1.63 FT	13.33 FT	17.00 FT	40.00 FT	
	Beam Spacing			0.67 FT	1.88 FT	13.33 FT	17.00 FT	
	(C=Continuous)			C				
	HS Inventory Rating			44.4	14.9	16.1	4.6	
	HS Operating Rating			59.2	20.7	26.9	7.6	
Comments:		NSH	13.5	49.3 TONS	20.4 TONS	26.4 TONS	9.8 TONS	
		NGARB S2	20	70.1 TONS	28.3 TONS	36.6 TONS	11.7 TONS	
		NS3A	27.025	101.7 TONS	29.6 TONS	29.4 TONS	10.5 TONS	
		NCOTT S3	25.5	93.1 TONS	26.6 TONS	28.4 TONS	10.1 TONS	
		NAGGR S4	34.925	140.4 TONS	35.2 TONS	34.3 TONS	11.4 TONS	
		NS5A	35.55	133.8 TONS	35.7 TONS	33.7 TONS	11.3 TONS	
		NS6A	39.95	150.3 TONS	40.1 TONS	35.4 TONS	12.1 TONS	
		NS7B	42	158.0 TONS	42.1 TONS	36.6 TONS	12.1 TONS	
		NT4A	33.075	124.4 TONS	32.2 TONS	35.9 TONS	12.3 TONS	
		NAGRI T4	38	143.0 TONS	41.6 TONS	45.8 TONS	17.3 TONS	
		NT5B	37.2	140.0 TONS	40.7 TONS	39.8 TONS	12.4 TONS	
		NAGRI T5A	45	164.4 TONS	49.3 TONS	54.3 TONS	17.7 TONS	
		NAGRI T5B	45	169.3 TONS	49.3 TONS	54.3 TONS	19.8 TONS	
		NT6A	41.6	156.5 TONS	41.9 TONS	42.0 TONS	13.2 TONS	
		NT7A	42	158.0 TONS	46.0 TONS	43.9 TONS	13.6 TONS	
		NT7B	42	158.0 TONS	42.2 TONS	40.2 TONS	14.0 TONS	

Calculated Posting:	SV 9.8 TONS, TTST 12.3 TONS	Design Loading:	UNKNOWN
Controlling Member:	STEEL GIRDER	Inventory Rating:	HS-4
Existing Posting:	SV 8 TONS , TTST 10 TONS	Operating Rating:	HS-7
Recommended Posting:	RETAIN EXISTING	(T7A / T7B) Rating:	13.6 TONS

REASON FOR POSTING CHANGE:		YES	NO
	Overload Bridge Only:		
	HS Operating Dropped 3 Tons or More		X

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Project No: 31825150
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Checked By: J. Barcomb **Date:** 7/5/2006

Timber Plank Deck

Analysis and Rating References:

1. AASHTO, *Manual for Condition Evaluation of Bridges*, 1994, with Interims through 2000.
2. AASHTO, *Standard Specifications for Highway Bridges*, 2002.
3. American Institute of Timber Construction, *Timber Construction Manual*, 1966.

Structure Data:

Date Built: 1910 (2006 NBI - SI&A)

Asphalt Wearing Surface Thickness: $AWS := 3.5 \cdot in$

Girder Center-to-Center Spacing: $GS := 22.5 \cdot in$

Width of Girder or Timber Nailer: $GW := 6 \cdot in$

Timber Deck Clear Span: $TDCS := GS - GW$ $TDCS = 1.375\ ft$

Timber Plank Data :

Ref. 2006 Bridge Inspection Report

Plank Width: $bp := 8 \cdot in$

Plank Depth: $d := 4 \cdot in$

Total Depth of Timber Deck: $DEPTH := 4 \cdot in$

Section Modulus: $Sx := \frac{bp \cdot d^2}{6}$ $Sx = 21.333\ in^3$

Percent Effective: $PEFF := 0.85$

Continuous Flooring Factor: $CFF := 0.8$ (Ref. 2, Section 3.25.4)

Deck Span: $S := \min\left(TDCS + \frac{GW}{2}, TDCS + d\right)$ (Ref. 2, Section 3.25.1.2)

$S = 1.625\ ft$

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Checked By: J. Barcomb **Date:** 7/5/2006

Allowable Stresses:

(Ref. 1, Section 6.6.2.7)

Assume Deck is Southern Pine, Select Structural

Tabulated Allowable Bending Stress:	$Fb := 2300 \cdot psi$	(Ref. 2, Table 13.5.1.A)
Wet Service Factor:	$CM := 0.85$	(Ref. 2, Table 13.5.1.A, Footnote 2)
Load Duration Factor:	$CD := 1.15$	(Ref. 2, Sec. 13.5.5.2 & Table 13.5.5A)
Bending Size Factor:	$CF := 1.1$	(Ref. 2, Sec. 13.6.4.2 & Table 13.5.1A)
	$CF := \text{if}\left[CF = 0, \left(\frac{12}{\frac{d}{in}}\right)^{\frac{1}{9}}, CF\right]$	$CF = 1.100$
Volume Factor:	$CV := 1.0$	(Ref. 2, Sec. 13.6.4.3)
Beam Stability Factor:	$CL := 1.0$	(Ref. 2, Sec. 13.6.4.4)
Form Factor:	$Cf := 1.0$	(Ref. 2, Sec. 13.6.4.5)
Flat Use Factor:	$Cfu := 1.05$	(Ref. 2, Table 13.5.1.A, Footnote 4)
Repetitive Member Factor:	$Cr := 1.15$	(Ref. 2, Table 13.5.1.A, Footnote 5)
Inventory Allowable Bending Stress:	$F'bi := Fb \cdot CM \cdot CD \cdot CF \cdot CV \cdot CL \cdot Cf \cdot Cfu \cdot Cr$	$F'bi = 2986.238\ psi$
Operating Allowable Bending Stress:	$F'bo := F'bi \cdot \frac{4}{3}$	$F'bo = 3981.651\ psi$

Moment Capacities:

Inventory Moment Capacity:	$Mi := F'bi \cdot Sx \cdot PEFF$	$Mi = 4512.538\ lbf \cdot ft$
Operating Moment Capacity:	$Mo := F'bo \cdot Sx \cdot PEFF$	$Mo = 6016.717\ lbf \cdot ft$

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Checked By: J. Barcomb **Date:** 7/5/2006

Dead Load Data:

(Ref. 2, Section 3.3.6)

Asphalt Wearing Surface Unit Weight: $AWSWT := 144 \cdot \frac{lbf}{ft^3}$

Timber Plank Unit Weight: $TIMBERWT := 50 \cdot \frac{lbf}{ft^3}$

Dead Load Moments:

Deck Interior Spans: $b := bp$

Timber Plank Dead Load Moment: $Mplank := \frac{CFF \cdot b \cdot DEPTH \cdot TIMBERWT \cdot S^2}{8}$ $Mplank = 2.934\ ft \cdot lbf$

Wearing Surface Dead Load Moment: $Maws := \frac{CFF \cdot (b \cdot AWSWT \cdot AWS) \cdot S^2}{8}$ $Maws = 7.394\ ft \cdot lbf$

Total Dead Load Moment: $Mdl := Mplank + Maws$ $Mdl = 10.328\ ft \cdot lbf$

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Sample Live Load Moment Calculation using HS 20 Loading:

Live load moment calculated using the simple beam diagram for a partially distributed uniform load (Ref. 3, Section 7-34)

Impact Factor: $I := 0$ (Ref. 2, Section 3.8)

Wheel Loads: $P := 16000 \cdot lbf$

Truck Weight: $TW := 20 \cdot tonf$

Interior Deck Spans:

Tire Distribution Normal to Span: $DWNS := 10 \cdot in$ (Ref. 2, Section 3.25.1.1)

Tire Width: $DWAS := \sqrt{0.01 \cdot \frac{P}{lbf} \cdot 2.5 \cdot in}$ (Ref. 2, Section 3.30)

$DWAS = 1.667\ ft$

Distributed Wheel Load: $w := \frac{P}{DWAS}$ $w = 9600 \frac{lbf}{ft}$

Live Load Plus Impact Moment On a Single Plank: $MLL := CFF \cdot (1 + I) \cdot P \cdot \left(\frac{S}{4} - \frac{DWAS}{8} \right) \cdot \frac{b}{DWNS}$ $MLL = 2026.667\ lbf \cdot ft$

HS 20 Inventory Rating

Rating Factor: $RFINV := \frac{Mi - Mdl}{MLL}$ $RFINV = 2.221$

Rating: $INV := RFINV \cdot TW$ $INV = 44.43\ tonf$

HS 20 Operating Rating

Rating Factor: $RFOPER := \frac{Mo - Mdl}{MLL}$ $RFOPER = 2.964$

Rating: $OPER := RFOPER \cdot TW$ $OPER = 59.274\ tonf$

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TRUCK WEIGHTS AND WHEEL LOADS FOR ALL TRUCKS:

$i := 1 .. 18$

Rating Vehicles	$TW_i :=$	$P_i :=$
NSH	13.5·tonf	11000lbf
NGARB S2	20·tonf	11750lbf
NS3A	27.025·tonf	10500lbf
NCOTT S3	25.5·tonf	11000lbf
NAGGR S4	34.925·tonf	9500lbf
NS5A	35.55·tonf	10500lbf
NS6A	39.95·tonf	10500lbf
NS7B	42·tonf	10500lbf
NT4A	33.075·tonf	10500lbf
NAGRI T4	38·tonf	10500lbf
NT5B	37.2·tonf	10500lbf
NAGRI T5A	45·tonf	11000lbf
NAGRI T5B	45·tonf	10500lbf
NT6A	41.6·tonf	10500lbf
NT7A	42·tonf	10500lbf
NT7B	42·tonf	10500lbf
H-15	15·tonf	12000·lbf
HS-20	20·tonf	16000·lbf

$$DWAS_i := \sqrt{0.01 \cdot \frac{P_i}{lbf} \cdot 2.5 \cdot in}$$

$$MLL_i := CFF \cdot (1 + I) \cdot P_i \cdot \left(\frac{S}{4} - \frac{DWAS_i}{8} \right) \cdot \frac{b}{DWNS}$$

$$RFINV_i := \frac{Mi - Mdl}{MLL_i}$$

$$INV_i := RFINV_i \cdot TW_i$$

$$RFOPER_i := \frac{Mo - Mdl}{MLL_i}$$

$$OPER_i := RFOPER_i \cdot TW_i$$

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Checked By: J. Barcomb **Date:** 7/5/2006

TIMBER PLANK DECK RATINGS:

	TW_i =		MLL_i =		$RFINV_i$ =	INV_i =		$RFOPER_i$ =	$OPER_i$ =	
NSH	13.5	tonf	1.644	ft kip	2.739	36.973	tonf	3.654	49.325	tonf
NGARB S2	20		1.712		2.629	52.583		3.508	70.15	
NS3A	27.025		1.596		2.821	76.242		3.764	101.714	
NCOTT S3	25.5		1.644		2.739	69.838		3.654	93.17	
NAGGR S4	34.925		1.494		3.014	105.25		4.02	140.413	
NS5A	35.55		1.596		2.821	100.292		3.764	133.8	
NS6A	39.95		1.596		2.821	112.705		3.764	150.36	
NS7B	42		1.596		2.821	118.489		3.764	158.076	
NT4A	33.075		1.596		2.821	93.31		3.764	124.485	
NAGRI T4	38		1.596		2.821	107.204		3.764	143.021	
NT5B	37.2		1.596		2.821	104.947		3.764	140.01	
NAGRI T5A	45		1.644		2.739	123.243		3.654	164.418	
NAGRI T5B	45		1.596		2.821	126.952		3.764	169.367	
NT6A	41.6		1.596		2.821	117.36		3.764	156.57	
NT7A	42		1.596		2.821	118.489		3.764	158.076	
NT7B	42		1.596		2.821	118.489		3.764	158.076	
H-15	15		1.734		2.596	38.938		3.463	51.948	
HS-20	20		2.027		2.221	44.43		2.964	59.274	

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Rated By: J. Sloan **Date:** 6/23/06
Checked By: J. Barcomb **Date:** 7/5/2006

Timber Stringer

Analysis and Rating References:

1. AASHTO, *Manual for Condition Evaluation of Bridges*, 1994, with Interims through 2000.
2. AASHTO, *Standard Specifications for Highway Bridges*, 2002.
3. American Institute of Timber Construction, *Timber Construction Manual*, 1966.

Structure Data:

Ref. 2006 Bridge Inspection Report

Date Built: 1910 (2006 NBI - SI&A)

Span Length: $S := 13.33 \cdot ft$

Asphalt Wearing Surface Thickness: $AWS := 3.5 \cdot in$

Timber Deck Thickness: $TD := 4 \cdot in$

Timber Stringer Data :

Stringer Width: $b := 6 \cdot in$

Stringer Depth: $d := 12 \cdot in$

Stringer Spacing: $SPA := 22.5 \cdot in$

Section Modulus: $Sx := \frac{b \cdot d^2}{6}$ $Sx = 144\,in^3$

Stringer Percent Effectiveness: $PEFF := 0.90$

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Allowable Stresses:

(Ref. 1, Section 6.6.2.7)

Assume Stringer is Southern Pine, Dense Select Structural

Tabulated Allowable Bending Stress:	$Fb := 1750 \cdot psi$	(Ref. 2, Table 13.5.1.A)
Wet Service Factor:	$CM := 1.0$	(Ref. 2, Table 13.5.1.A, Footnote 2)
Load Duration Factor:	$CD := 1.15$	(Ref. 2, Sec. 13.5.5.2 & Table 13.5.5A)
Bending Size Factor:	$CF := 1.0$	(Ref. 2, Sec. 13.6.4.2 & Table 13.5.1A)
	$CF := \text{if}\left[CF = 0, \left(\frac{12}{\frac{d}{in}}\right)^{\frac{1}{9}}, CF\right]$	$CF = 1.000$
Volume Factor:	$CV := 1.0$	(Ref. 2, Sec. 13.6.4.3)
Beam Stability Factor:	$CL := 1.0$	(Ref. 2, Sec. 13.6.4.4)
Form Factor:	$Cf := 1.0$	(Ref. 2, Sec. 13.6.4.5)
Flat Use Factor:	$Cfu := 1.0$	(Ref. 2, Table 13.5.1.A, Footnote 4)
Repetitive Member Factor:	$Cr := 1.0$	(Ref. 2, Table 13.5.1.A, Footnote 5)
Inventory Allowable Bending Stress:	$F'bi := Fb \cdot CM \cdot CD \cdot CF \cdot CV \cdot CL \cdot Cf \cdot Cfu \cdot Cr$	$F'bi = 2012.5\ psi$
Operating Allowable Bending Stress:	$F'bo := F'bi \cdot \frac{4}{3}$	$F'bo = 2683.333\ psi$

Moment Capacities:

Inventory Moment Capacity:	$Mi := F'bi \cdot Sx \cdot PEFF$	$Mi = 21735\ lbf \cdot ft$
Operating Moment Capacity:	$Mo := F'bo \cdot Sx \cdot PEFF$	$Mo = 28980\ lbf \cdot ft$

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Dead Load Data:

Asphalt Wearing Surface Unit Weight: $AWSWT := 144 \cdot \frac{lbf}{ft^3}$ (Ref. 2, Section 3.3.6)

Timber Unit Weight: $TIMBERWT := 50 \cdot \frac{lbf}{ft^3}$

Dead Load Moments:

Timber Plank Dead Load Moment: $Mplank := \frac{TD \cdot SPA \cdot TIMBERWT \cdot S^2}{8}$ Mplank = 694.097 ft·lbf

Wearing Surface Dead Load Moment: $Maws := \frac{(SPA \cdot AWSWT \cdot AWS) \cdot S^2}{8}$ Maws = 1749.125 ft·lbf

Stringer Dead Load Moment: $Mstr := \frac{(b \cdot d \cdot TIMBERWT) \cdot S^2}{8}$ Mstr = 555.278 ft·lbf

Total Dead Load Moment: $Mdl := Mplank + Maws + Mstr$ Mdl = 2998.5 ft·lbf

Equivalent Uniform Dead Load: $UNIFDL := \frac{Mdl \cdot 8}{S^2}$ UNIFDL = 135 plf

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Sample Live Load Moment Calculation using HS 20 Loading:

Impact Factor: $I := 1.0$ (Ref. 2, Section 3.8)

Distribution Factor: $DF := \frac{SPA}{4 \cdot ft} \cdot \frac{1}{2}$ (Ref. 2, Section 3.23.2.2, table 3.23.1)

$DF = 0.234$

HS 20 Truck Weight: $TW := 20 \cdot tonf$

HS 20 Live Load Moment Per Lane: $Mlane := 106.6 \cdot kip \cdot ft$ (From Prior Calculations in Microsoft Excel)

Live Load Plus Impact Moment per Stringer: $MLL := DF \cdot I \cdot Mlane$ $MLL = 24984.375\ lbf \cdot ft$

HS 20 Inventory Rating

Rating Factor: $RFINV := \frac{Mi - Mdl}{MLL}$ $RFINV = 0.75$

Rating: $INV := RFINV \cdot TW$ $INV = 14.999\ tonf$

HS 20 Operating Rating

Rating Factor: $RFOPER := \frac{Mo - Mdl}{MLL}$ $RFOPER = 1.04$

Rating: $OPER := RFOPER \cdot TW$ $OPER = 20.798\ tonf$

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TRUCK WEIGHTS AND LANE MOMENTS FOR ALL TRUCKS:

$i := 1 .. 18$

Lane Moments Input from Microsoft Excel

Placing Appropriate Units on Lane Moments

$Mlane_i := Mlan_i \cdot kip \cdot ft$

Rating Vehicles	$TW_i :=$	$Mlan_i :=$	$Mlane_i =$
NSH	13.5·tonf	73.3	73.3 ft kip
NGARB S2	20·tonf	78.3	78.3
NS3A	27.025·tonf	101.1	101.1
NCOTT S3	25.5·tonf	106.0	106
NAGGR S4	34.925·tonf	109.9	109.9
NS5A	35.55·tonf	110.3	110.3
NS6A	39.95·tonf	110.4	110.4
NS7B	42·tonf	110.4	110.4
NT4A	33.075·tonf	101.1	101.1
NAGRI T4	38·tonf	101.1	101.1
NT5B	37.2·tonf	101.1	101.1
NAGRI T5A	45·tonf	101.1	101.1
NAGRI T5B	45·tonf	101.1	101.1
NT6A	41.6·tonf	109.9	101.1
NT7A	42·tonf	101.1	109.9
NT7B	42·tonf	110.2	101.15
H-15	15·tonf	80.0	110.203
HS-15	15·tonf	80.0	80
			80

$$MLL_i := DF \cdot I \cdot Mlane_i$$

$$RFINV_i := \frac{Mi - Mdl}{MLL_i} \qquad INV_i := RFINV_i \cdot TW_i$$

$$RFOPER_i := \frac{Mo - Mdl}{MLL_i} \qquad OPER_i := RFOPER_i \cdot TW_i$$

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TIMBER STRINGER RATINGS FOR ALL TRUCKS:

	TW_i =		MLL_i =		$RFINV_i$ =	INV_i =		$RFOPER_i$ =	$OPER_i$ =	
NSH	13.5	tonf	17.18	ft kip	1.091	14.723	tonf	1.512	20.417	tonf
NGARB S2	20		18.35		1.021	20.42		1.416	28.315	
NS3A	27.025		23.7		0.791	21.369		1.096	29.632	
NCOTT S3	25.5		24.84		0.754	19.231		1.046	26.668	
NAGGR S4	34.925		25.76		0.727	25.405		1.009	35.228	
NS5A	35.55		25.85		0.725	25.766		1.005	35.729	
NS6A	39.95		25.88		0.724	28.928		1.004	40.114	
NS7B	42		25.88		0.724	30.413		1.004	42.173	
NT4A	33.075		23.7		0.791	26.153		1.096	36.266	
NAGRI T4	38		23.7		0.791	30.048		1.096	41.666	
NT5B	37.2		23.7		0.791	29.415		1.096	40.789	
NAGRI T5A	45		23.7		0.791	35.583		1.096	49.342	
NAGRI T5B	45		23.7		0.791	35.583		1.096	49.342	
NT6A	41.6		25.76		0.727	30.26		1.009	41.961	
NT7A	42		23.71		0.79	33.194		1.096	46.03	
NT7B	42		25.83		0.725	30.467		1.006	42.248	
H-15	15		18.75		0.999	14.989		1.386	20.785	
HS-15	15		18.75		0.999	14.989		1.386	20.785	

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Interior W18x50 Floor Beam:

Analysis and Rating References:

1. AASHTO, *Manual for Condition Evaluation of Bridges*, 1994, with Interims through 1998.
2. AASHTO, *Standard Specifications for Highway Bridges*, 2002.

Structure Data:

Beam Span Length:	SPAN := 17·ft	
Floor Beam Spacing:	S := 13.330·ft	
Timber Deck Thickness:	DECKT := 4·in	
Asphalt Wearing Surface Thickness:	AWS := 3.5·in	
Clear Roadway Width: (Between Curbs/Sidewalks)	CLRROAD := 15.83·ft	
Number of Live Load Lanes:	NLANES := if(CLRROAD < 16·ft, 1, 2)	
	NLANES = 1	
Total Sidewalk Width:	SIDEW := 0·ft	
Sidewalk Thickness:	SIDET := 0·in	
Rail Type:	Type 993	
Rail Width:	RAILW := 1.0·ft	
Date Built:	1910	(2004 Bridge Inspection Report)

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Steel Beam Data:

(Ref. AISC, Historical Record of Rolled Shapes)

Structural Steel Yield Strength: $Fy := 36000 \cdot psi$ (Ref. 1, Section 6.6.2.1)

Steel Beam Properties: W18X50

Number of Girders: $NG := 1$

Flange Width: $bf := 7.5 \cdot in$

Flange Thickness: $tf := 0.57 \cdot in$

Beam Depth: $d := 18 \cdot in$

Web Thickness: $tw := 0.355 \cdot in$

Plastic Section Modulus: $Zx := 101 \cdot in^3$

$$Zx := if\left[Zx = 0 \cdot in^3, bf \cdot tf \cdot (d - tf) + \frac{(d - 2 \cdot tf)^2 \cdot tw}{4}, Zx\right]$$

$$Zx = 101\ in^3$$

Elastic Section Modulus: $Sx := 88.9 \cdot in^3$

Unbraced Length of Compression Flange: $Lb := 1.875 \cdot ft$

Radius of Gyration About Vertical Axis: $ry := 1.65 \cdot in$

Beam Weight: $BEAMWT := 50 \cdot \frac{lbf}{ft}$

Percent Effective: $PEFF := 0.95$

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Dead Load Data:

Timber Unit Weight:

$$TIMBWT := 50 \cdot \frac{lbf}{ft^3}$$

Concrete Unit Weight:

$$CONCWT := 150 \cdot \frac{lbf}{ft^3}$$

Asphalt Wearing Surface Unit Weight:

$$AWSWT := 144 \cdot \frac{lbf}{ft^3}$$

Rail Weight (All Rails): (distributed to all beams)

$$RAILWT := 40 \cdot \frac{lbf}{ft}$$

Additional Uniform Load on Deck: (distributed to all beams)

$$AULD := 0 \cdot \frac{lbf}{ft^2}$$

Additional Line Load on Deck: (distributed to all beams)

$$ALLD := 0 \cdot \frac{lbf}{ft}$$

Additional Load on Beam: (distributed to one beam)

$$ALG := 291 \cdot \frac{lbf}{ft}$$

Diaphragm Weight:

$$Pdiaph := 0 \cdot \frac{lbf}{ft}$$

Diaphragm Location (SPAN/XDiaph):

$$XDiaph := 0$$

$$XD := \text{if}(XDiaph = 2, 4, \text{if}(XDiaph = 3, 3, 2))$$

$$XD = 2$$

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Dead Load Data, Cont'd:

Uniform Dead Loads Applied to Beam:

Deck Weight: $DECKWT := S \cdot DECKT \cdot TIMBWT$ $DECKWT = 222 \frac{1}{ft} lbf$

Beam Weight: $BEAMWT = 50 \frac{lbf}{ft}$

Asphalt Wearing Surface: $AWSW := \frac{S \cdot AWS \cdot AWSWT}{NG}$ $AWSW = 560 \frac{lbf}{ft}$

Rail Weight: $RAILW := \frac{RAILWT}{NG}$ $RAILW = 40 \frac{lbf}{ft}$

Sidewalk Weight: $SIDEWT := \frac{SIDEW \cdot SIDET \cdot CONCWT}{NG}$ $SIDEWT = 0 \frac{lbf}{ft}$

Additional Uniform Loads: $AULDWT := \frac{AULD \cdot S}{NG}$ $AULDWT = 0 \frac{lbf}{ft}$

Additional Line Loads: $ALLDWT := \frac{ALLD}{NG}$ $ALLDWT = 0 \frac{lbf}{ft}$

Additional Girder Loads: $ALG = 291 \frac{lbf}{ft}$

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Dead Load Data, Cont'd:

Total Uniform Dead Load:

$$UNIFDL := DECKWT + BEAMWT + AWSW + RAILW + SIDEWT + AULDWT + ALLDWT + ALG$$

$$UNIFDL = 1163.027 \frac{lbf}{ft}$$

Uniform Dead Load Moment:

$$Mdlu := \frac{UNIFDL \cdot SPAN^2}{8} \qquad Mdlu = 42014.338\ lbf \cdot ft$$

Diaphragm Dead Load Moment:

$$Mdld := \frac{Pdiaph \cdot S \cdot SPAN}{XD} \qquad Mdld = 0\ lbf \cdot ft$$

Total Dead Load Moment:

$$Mdl := Mdlu + Mdld \qquad Mdl = 42014.338\ lbf \cdot ft$$

Live Load Factors:

Impact Factor:

$Imax := 1.30$ (Ref. 2, Section 3.8)

$$I := 1 + \frac{50}{\frac{SPAN}{ft} + 125} \qquad I = 1.352$$

$I := if(I > Imax, Imax, I)$

$I = 1.3$

Distribution Factor: (Ref. 2, Section 3.23, Table 3.23.1)

$DF := 1.0$ $DF = 1$

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Live Load Moments:

$i := 1 .. 18$

$W_i :=$

$Mwheel_i :=$ (Ft-Kips)

$Mll_i := Mwheel_i \cdot I \cdot DF \cdot 1000$

$Mll_i =$ (Ft-Lbs)

Rating Vehicles	$W_i :=$	$Mwheel_i :=$ (Ft-Kips)	$Mll_i =$ (Ft-Lbs)
NSH	13.5·ton	63.100	82030
NGARB S2	20·ton	67.400	87620
NS3A	27.025·ton	113.600	$1.477 \cdot 10^5$
NCOTT S3	25.5·ton	110.800	$1.44 \cdot 10^5$
NAGGR S4	34.925·ton	125.500	$1.631 \cdot 10^5$
NS5A	35.55·ton	130.000	$1.69 \cdot 10^5$
NS6A	39.95·ton	139.300	$1.811 \cdot 10^5$
NS7B	42·ton	141.800	$1.843 \cdot 10^5$
NT4A	33.075·ton	113.600	$1.477 \cdot 10^5$
NAGRI T4	38·ton	102.400	$1.331 \cdot 10^5$
NT5B	37.2·ton	115.400	$1.5 \cdot 10^5$
NAGRI T5A	45·ton	102.400	$1.331 \cdot 10^5$
NAGRI T5B	45·ton	102.400	$1.331 \cdot 10^5$
NT6A	41.6·ton	122.200	$1.589 \cdot 10^5$
NT7A	42·ton	118.200	$1.537 \cdot 10^5$
NT7B	42·ton	129.000	$1.677 \cdot 10^5$
H15	15·ton	68.900	89570
HS15	15·ton	68.900	89570

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Section Capacities:

(Ref. 2, Section 10.42)

Compact Section Check: (Ref. 2, Section 10.48.1)

Projecting Compression Flange Elements:

(Ref. 2, Eqn. 10-93)

$$PCFE := \frac{bf}{tf} \qquad PCFE = 13.158$$

$$PCFEall := \frac{4110}{\sqrt{\frac{Fy}{psi}}} \qquad PCFEall = 21.662$$

$$PCFEcheck := \frac{PCFE}{PCFEall} \qquad PCFEcheck = 0.607$$

Web Thickness:
(Ref. 2, Eqn. 10-94)

$$WT := \frac{d - 2 \cdot tf}{tw} \qquad WT = 47.493$$

$$WTall := \frac{19230}{\sqrt{\frac{Fy}{psi}}} \qquad WTall = 101.351$$

$$WTcheck := \frac{WT}{WTall} \qquad WTcheck = 0.469$$

Flange and Web Interaction:
(Ref. 2, Eqn. 10-95)

$$FWI := if[(PCFEcheck > 0.75) \cdot (WTcheck > 0.75), (WT + 9.35 \cdot PCFE), 0]$$

$$FWIall := \frac{33650}{\sqrt{\frac{Fy}{psi}}}$$

FWI = 0

FWIall = 177.351

$$FWIcheck := \frac{FWI}{FWIall} \qquad FWIcheck = 0$$

Lateral Bracing:
(Ref. 2, Eqn. 10-96)

(Assume M1/Mu = 1.0)

$$LB := \frac{Lb}{ry} \qquad LB = 13.636 \qquad LBall := \frac{[3.6 - 2.2 \cdot (1.0)] \cdot 10^6}{\frac{Fy}{psi}} \qquad LBall = 38.889$$

$$LBcheck := \frac{LB}{LBall} \qquad LBcheck = 0.351$$

Compact Section Capacity:

$$Muc := if[(PCFEcheck > 1.0) + (WTcheck > 1.0) + (FWIcheck > 1.0) + (LBcheck > 1.0), 0 \cdot lbf \cdot ft, Fy \cdot Zx \cdot PEFF]$$

$$Muc = 2.878 \times 10^5 \ lbf \cdot ft$$

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Section Capacities Cont'd:

Braced Non-Compact Section Check: (Ref. 2, Section 10.48.2)

Projecting Compression Flange Elements:
(Ref. 2, Section 10.48.2)

$$PCFE := \frac{bf}{tf} \qquad PCFE = 13.158$$

$$PCFEall := \frac{4400}{\sqrt{\frac{Fy}{psi}}} \qquad PCFEall = 23.19$$

$$PCFEcheck := \frac{PCFE}{PCFEall} \qquad PCFEcheck = 0.567$$

Web Thickness:
(Ref. 2, Section 10.48.2.1)

$$WT := tw \qquad WT = 0.03\ ft$$

$$WTmin := \frac{d - 2\cdot(tf)}{150} \qquad WTmin = 0.009\ ft$$

$$WTcheck := \frac{WT}{WTmin} \qquad WTcheck = 3.158$$

Lateral Bracing:
(Ref. 2, Eqn. 10-101)

$$LB := Lb \qquad LB = 1.875\ ft$$

$$LBall := \frac{(20000000)\cdot bf\cdot tf}{\frac{Fy}{psi}\cdot d} \qquad LBall = 10.995\ ft$$

$$LBcheck := \frac{LB}{LBall} \qquad LBcheck = 0.171$$

Braced Non-Compact Section Capacity:

$$Munc := if[(PCFEcheck > 1.0) + (WTcheck < 1.0) + (LBcheck > 1.0), 0\cdot lbf\cdot ft, Fy\cdot Sx\cdot PEFF]$$

$$Munc = 2.534 \times 10^5\ lbf\cdot ft$$

Maximum Section Capacity:

$$Mu := if[(Muc > 0\cdot lbf\cdot ft), Muc, Munc] \qquad Mu = 2.878 \times 10^5\ lbf\cdot ft$$

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Live Load Rating:

(Ref. 1, Section 6.5)

Maximum Strength Rating:

Rating Factors:

$\gamma := 1.3$ $\quad \beta dl := 1.0$ $\quad \beta ll := \frac{5}{3}$

$A1 := \gamma \cdot \beta dl$ $\quad A2inv := \gamma \cdot \beta ll$ $\quad A2opr := \gamma \cdot 1.0$

$A1 = 1.3$ $\quad A2inv = 2.167$ $\quad A2opr = 1.3$

$C := \frac{Mu}{lbf \cdot ft}$ $\quad C = 2.878 \times 10^5$ $\quad D := \frac{Mdl}{lbf \cdot ft}$ $\quad D = 42014.338$

$L_i := Mll_i$

$RFinv_i := \frac{C - A1 \cdot D}{A2inv \cdot L_i}$ $\quad RFopr_i := \frac{C - A1 \cdot D}{A2opr \cdot L_i}$

$RTinv_i := RFinv_i \cdot \frac{W_i}{ton}$ $\quad RTopr_i := RFopr_i \cdot \frac{W_i}{ton}$

Rating Vehicles:

	$W_i :=$	$L_i =$	$RFinv_i =$	$RTinv_i =$	$RFopr_i =$	$RTopr_i =$
NSH	13.5·ton	82030	1.312	17.716	2.187	29.526
NGARB S2	20·ton	87620	1.229	24.571	2.048	40.952
NS3A	27.025·ton	$1.477 \cdot 10^5$	0.729	19.699	1.215	32.831
NCOTT S3	25.5·ton	$1.44 \cdot 10^5$	0.747	19.057	1.246	31.761
NAGGR S4	34.925·ton	$1.631 \cdot 10^5$	0.66	23.043	1.1	38.405
NS5A	35.55·ton	$1.69 \cdot 10^5$	0.637	22.644	1.062	37.74
NS6A	39.95·ton	$1.811 \cdot 10^5$	0.594	23.747	0.991	39.579
NS7B	42·ton	$1.843 \cdot 10^5$	0.584	24.526	0.973	40.876
NT4A	33.075·ton	$1.477 \cdot 10^5$	0.729	24.109	1.215	40.181
NAGRI T4	38·ton	$1.331 \cdot 10^5$	0.809	30.728	1.348	51.213
NT5B	37.2·ton	$1.5 \cdot 10^5$	0.718	26.692	1.196	44.487
NAGRI T5A	45·ton	$1.331 \cdot 10^5$	0.809	36.388	1.348	60.647
NAGRI T5B	45·ton	$1.331 \cdot 10^5$	0.809	36.388	1.348	60.647
NT6A	41.6·ton	$1.589 \cdot 10^5$	0.678	28.189	1.129	46.981
NT7A	42·ton	$1.537 \cdot 10^5$	0.701	29.423	1.168	49.038
NT7B	42·ton	$1.677 \cdot 10^5$	0.642	26.959	1.07	44.932
H15	15·ton	89570	1.202	18.027	2.003	30.045
HS15	15·ton	89570	1.202	18.027	2.003	30.045

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Live Load Rating:

(Ref. 2, Section 10.57)

Overload Rating:

Rating Factors:

$A1ol := 1.0$ $\quad Col := \frac{0.8 \cdot Fy \cdot Sx \cdot PEFF}{lbf \cdot ft}$ $\quad Col = 2.027 \times 10^{5}$

$$RFinv\_ol_i := \frac{Col - A1ol \cdot D}{\left(\frac{A2inv}{1.3}\right) \cdot L_i} \qquad RFopr\_ol_i := \frac{Col - A1ol \cdot D}{\left(\frac{A2opr}{1.3}\right) \cdot L_i}$$

$$RTinv\_ol_i := RFinv\_ol_i \cdot \frac{W_i}{ton} \qquad RTopr\_ol_i := RFopr\_ol_i \cdot \frac{W_i}{ton}$$

Rating Vehicles

	$W_i :=$	$L_i =$	$RFinv\_ol_i =$	$RTinv\_ol_i =$	$RFopr\_ol_i =$	$RTopr\_ol_i =$
NSH	13.5·ton	82030	1.175	15.866	1.959	26.443
NGARB S2	20·ton	87620	1.1	22.006	1.834	36.676
NS3A	27.025·ton	$1.477 \cdot 10^5$	0.653	17.642	1.088	29.404
NCOTT S3	25.5·ton	$1.44 \cdot 10^5$	0.669	17.067	1.116	28.445
NAGGR S4	34.925·ton	$1.631 \cdot 10^5$	0.591	20.637	0.985	34.396
NS5A	35.55·ton	$1.69 \cdot 10^5$	0.57	20.28	0.951	33.799
NS6A	39.95·ton	$1.811 \cdot 10^5$	0.532	21.268	0.887	35.447
NS7B	42·ton	$1.843 \cdot 10^5$	0.523	21.965	0.872	36.609
NT4A	33.075·ton	$1.477 \cdot 10^5$	0.653	21.592	1.088	35.986
NAGRI T4	38·ton	$1.331 \cdot 10^5$	0.724	27.52	1.207	45.867
NT5B	37.2·ton	$1.5 \cdot 10^5$	0.643	23.906	1.071	39.843
NAGRI T5A	45·ton	$1.331 \cdot 10^5$	0.724	32.589	1.207	54.316
NAGRI T5B	45·ton	$1.331 \cdot 10^5$	0.724	32.589	1.207	54.316
NT6A	41.6·ton	$1.589 \cdot 10^5$	0.607	25.246	1.011	42.076
NT7A	42·ton	$1.537 \cdot 10^5$	0.627	26.351	1.046	43.918
NT7B	42·ton	$1.677 \cdot 10^5$	0.575	24.145	0.958	40.241
H15	15·ton	89570	1.076	16.145	1.794	26.908
HS15	15·ton	89570	1.076	16.145	1.794	26.908

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Steel Beam Data:

(Ref. AISC, Historical Record of Rolled Shapes)

Structural Steel Yield Strength: $Fy := 33000 \cdot psi$ (Ref. 1, Section 6.6.2.1)

Steel Beam Properties: Builtup

Number of Girders: $NG := 2$

Flange Width: $bf := 10 \cdot in$

Flange Thickness: $tf := 0.4375 \cdot in$

Beam Depth: $d := 30.4 \cdot in$

Web Thickness: $tw := 0.4 \cdot in$

Plastic Section Modulus: $Zx := 264 \cdot in^3$

$$Zx := \text{if}\left[Zx = 0 \cdot in^3, bf \cdot tf \cdot (d - tf) + \frac{(d - 2 \cdot tf)^2 \cdot tw}{4}, Zx\right]$$

$Zx = 264\ in^3$

Elastic Section Modulus: $Sx := 232 \cdot in^3$

Unbraced Length of Compression Flange: $Lb := 0 \cdot ft$

Radius of Gyration About Vertical Axis: $ry := 6.2 \cdot in$

Beam Weight: $BEAMWT := 45 \cdot \frac{lbf}{ft}$

Percent Effective: $PEFF := 0.88$

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Dead Load Data:

Concrete Unit Weight:

$$CONCWT := 150 \cdot \frac{lbf}{ft^3}$$

Timber Unit Weight:

$$TIMBWT := 50 \cdot \frac{lbf}{ft^3}$$

Asphalt Wearing Surface Unit Weight:

$$AWSWT := 144 \cdot \frac{lbf}{ft^3}$$

Rail Weight (All Rails): (distributed to all beams)

$$RAILWT := 80 \cdot \frac{lbf}{ft}$$

Additional Uniform Load on Deck: (distributed to all beams)

$$AULD := 0 \cdot \frac{lbf}{ft^2}$$

Additional Line Load on Deck: (distributed to all beams)

$$ALLD := 0 \cdot \frac{lbf}{ft}$$

Additional Load on Beam: (distributed to one beam)

$$ALG := 173.8 \cdot \frac{lbf}{ft}$$

(Stringers, Floor Beam, Brackets, other)

Diaphragm Weight:

$$Pdiaph := 0 \cdot lbf$$

Diaphragm Location (SPAN/XDiaph):

$$XDiaph := 0$$

$$XD := if(XDiaph = 2, 4, if(XDiaph = 3, 3, 2))$$

$$XD = 2$$

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Municipality: Ansonville, NC
Rated By: K. Pace **Date:** 6/22/2006
Checked By: J. Barcomb **Date:** 7/5/2006

Dead Load Data, Cont'd:

Uniform Dead Loads Applied to Beam:

Deck Weight: $DECKWT := \left(\frac{DECKW}{2} + SO\right) \cdot DECKT \cdot TIMBWT$ $DECKWT = 133 \frac{lbf}{ft}$

Beam Weight: $BEAMWT = 45 \frac{lbf}{ft}$

Asphalt Wearing Surface: $AWSW1 := \left(\frac{S}{2} + SO - RAILW - \frac{SIDEW}{2}\right) \cdot AWS \cdot AWSWT$

$AWSW1 = 315 \frac{lbf}{ft}$

$AWSW2 := \frac{CLRROAD \cdot AWS \cdot AWSWT}{NG}$ $AWSW2 = 332 \frac{lbf}{ft}$

$AWSW := if(AWSW1 > AWSW2, AWSW1, AWSW2)$

$AWSW = 332 \frac{lbf}{ft}$

Rail Weight: $RAILWT := \frac{RAILWT}{NG}$ $RAILWT = 40 \frac{lbf}{ft}$

Sidewalk Weight: $SIDEWT := \frac{SIDEW \cdot SIDET \cdot CONCWT}{NG}$ $SIDEWT = 0 \frac{lbf}{ft}$

Additional Uniform Loads: $AULDWT := \frac{AULD \cdot S}{NG}$ $AULDWT = 0 \frac{lbf}{ft}$

Additional Line Loads: $ALLDWT := \frac{ALLD}{NG}$ $ALLDWT = 0 \frac{lbf}{ft}$

Additional Girder Loads: $ALG = 173.8 \frac{lbf}{ft}$

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Dead Load Data:

Total Uniform Dead Load:

$$UNIFDL := DECKWT + BEAMWT + AWSW + RAILWT + SIDEWT + AULDWT + ALLDWT + ALG$$

$$UNIFDL = 724.563 \frac{lbf}{ft}$$

Uniform Dead Load Moment: $Mdlu := \frac{UNIFDL \cdot SPAN^2}{8}$ $Mdlu = 1.449 \times 10^5 \, lbf \cdot ft$

Diaphragm Dead Load Moment: $Mdld := \frac{Pdiaph \cdot SPAN}{XD}$ $Mdld = 0 \, lbf \cdot ft$

Total Dead Load Moment: $Mdl := Mdlu + Mdld$ $Mdl = 1.449 \times 10^5 \, lbf \cdot ft$

Live Load Factors:

Impact Factor: $Imax := 1.30$ (Ref. 2, Section 3.8)

$$I := 1 + \frac{50}{\frac{SPAN}{ft} + 125}$$ $I = 1.303$

$I := if(I > Imax, Imax, I)$

$I = 1.3$

Distribution Factor:

$DFW := 2.5 \cdot ft$ (Distance to first wheel)

$WS := 6 \cdot ft$ (Wheel Spacing)

$$DF := \frac{(S - DFW) + (S - WS - DFW)}{S}$$ $DF = 1.353$

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Live Load Moments:

$i := 1 .. 18$

$W_i :=$

$Mlane_i :=$ (Ft-Kips)

$Mll_i := Mlane_i \cdot I \cdot DF \cdot 1000$

$Mll_i =$ (Ft-Lbs)

Rating Vehicles	W_i	$Mlane_i$	Mll_i
NSH	13.5·ton	236.100	$4.153 \cdot 10^5$
NGARB S2	20·ton	293.200	$5.157 \cdot 10^5$
NS3A	27.025·ton	444.300	$7.814 \cdot 10^5$
NCOTT S3	25.5·ton	434.600	$7.644 \cdot 10^5$
NAGGR S4	34.925·ton	528.200	$9.29 \cdot 10^5$
NS5A	35.55·ton	539.500	$9.489 \cdot 10^5$
NS6A	39.95·ton	570.100	$1.003 \cdot 10^6$
NS7B	42·ton	595.800	$1.048 \cdot 10^6$
NT4A	33.075·ton	461.900	$8.124 \cdot 10^5$
NAGRI T4	38·ton	379.100	$6.668 \cdot 10^5$
NT5B	37.2·ton	517.500	$9.102 \cdot 10^5$
NAGRI T5A	45·ton	438.900	$7.719 \cdot 10^5$
NAGRI T5B	45·ton	393.000	$6.912 \cdot 10^5$
NT6A	41.6·ton	541.400	$9.522 \cdot 10^5$
NT7A	42·ton	531.600	$9.35 \cdot 10^5$
NT7B	42·ton	515.500	$9.067 \cdot 10^5$
H15	15·ton	259.500	$4.564 \cdot 10^5$
HS15	15·ton	337.400	$5.934 \cdot 10^5$

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Section Capacities:

Compact Section Check: (Ref. 2, Section 10.42)

Projecting Compression Flange Elements: (Ref. 2, Section 10.48.1)

$$PCFE := \frac{bf}{2 \cdot tf} \qquad PCFE = 11.429$$

(Ref. 2, Eqn. 10-93)

$$PCFEall := \frac{2055}{\sqrt{\frac{Fy}{psi}}} \qquad PCFEall = 11.312$$

$$PCFEcheck := \frac{PCFE}{PCFEall} \qquad PCFEcheck = 1.01$$

Web Thickness:
(Ref. 2, Eqn. 10-94)

$$WT := \frac{d - 2 \cdot tf}{tw} \qquad WT = 73.812$$

$$WTall := \frac{19230}{\sqrt{\frac{Fy}{psi}}} \qquad WTall = 105.858$$

$$WTcheck := \frac{WT}{WTall} \qquad WTcheck = 0.697$$

Flange and Web Interaction:
(Ref. 2, Eqn. 10-95)

$$FWI := if[(PCFEcheck > 0.75) \cdot (WTcheck > 0.75), (WT + 9.35 \cdot PCFE), 0]$$

$$FWIall := \frac{33650}{\sqrt{\frac{Fy}{psi}}}$$

FWI = 0
FWIall = 185.237

$$FWIcheck := \frac{FWI}{FWIall} \qquad FWIcheck = 0$$

Lateral Bracing:
(Ref. 2, Eqn. 10-96)
(Assume M1/Mu = 1.0)

$$LB := \frac{Lb}{ry} \qquad LB = 0 \qquad LBall := \frac{[3.6 - 2.2 \cdot (1.0)] \cdot 10^6}{\frac{Fy}{psi}} \qquad LBall = 42.424$$

$$LBcheck := \frac{LB}{LBall} \qquad LBcheck = 0$$

Compact Section Capacity:

$$Muc := if[(PCFEcheck > 1.0) + (WTcheck > 1.0) + (FWIcheck > 1.0) + (LBcheck > 1.0), 0 \cdot lbf \cdot ft, Fy \cdot Zx \cdot PEFF]$$

$$Muc = 0\ lbf \cdot ft$$

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Section Capacities Cont'd:

Braced Non-Compact Section Check: (Ref. 2, Section 10.48.2)

Projecting Compression Flange Elements:
(Ref. 2, Eqn. 10-99)

$$PCFE := \frac{bf}{2 \cdot tf} \qquad PCFE = 11.429$$

$$PCFEall := \frac{2200}{\sqrt{\frac{Fy}{psi}}} \qquad PCFEall = 12.111$$

$$PCFEcheck := \frac{PCFE}{PCFEall} \qquad PCFEcheck = 0.944$$

Web Thickness:
(Ref. 2, Section 10.48.2.1)

$$WT := \frac{d - 2 \cdot tf}{2 \cdot tw} \qquad WT = 36.906$$

$$WTall := \frac{15400}{\sqrt{\frac{Fy}{psi}}} \qquad WTall = 84.774$$

$$WTcheck := \frac{WT}{WTall} \qquad WTcheck = 0.435$$

Lateral Bracing:
(Ref. 2, Eqn. 10-101)

$$LB := Lb \qquad LB = 0\,ft$$

$$LBall := \frac{(20000000) \cdot bf \cdot tf}{\frac{Fy}{psi} \cdot d} \qquad LBall = 7.268\,ft$$

$$LBcheck := \frac{LB}{LBall} \qquad LBcheck = 0$$

Braced Non-Compact Section Capacity:

$$Munc := if[(PCFEcheck > 1.0) + (WTcheck > 1.0) + (LBcheck > 1.0), 0 \cdot lbf \cdot ft, Fy \cdot Sx \cdot PEFF]$$

$$Munc = 5.614 \times 10^5\ lbf \cdot ft$$

Maximum Section Capacity:

$$Mu := if[(Muc > 0 \cdot lbf \cdot ft), Muc, Munc] \qquad Mu = 5.614 \times 10^5\ lbf \cdot ft$$

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Live Load Rating:

(Ref. 1, Section 6.5)

Maximum Strength Rating: $\gamma := 1.3$ $\beta dl := 1.0$ $\beta ll := \frac{5}{3}$

Rating Factors:

$A1 := \gamma \cdot \beta dl$ $A2inv := \gamma \cdot \beta ll$ $A2opr := \gamma \cdot 1.0$

$A1 = 1.3$ $A2inv = 2.167$ $A2opr = 1.3$

$C := \frac{Mu}{lbf \cdot ft}$ $C = 5.614 \times 10^5$ $D := \frac{Mdl}{lbf \cdot ft}$ $D = 1.449 \times 10^5$

$L_i := Mll_i$

$RFinv_i := \frac{C - A1 \cdot D}{A2inv \cdot L_i}$ $RFopr_i := \frac{C - A1 \cdot D}{A2opr \cdot L_i}$

$RTinv_i := RFinv_i \cdot \frac{W_i}{ton}$ $RTopr_i := RFopr_i \cdot \frac{W_i}{ton}$

Rating Vehicles $i := 1 .. 18$ (Ft-Kips)

	$W_i :=$	$Mll_i =$	$RFinv_i =$	$RTinv_i =$	$RFopr_i =$	$RTopr_i =$
NSH	13.5·ton	$4.153 \cdot 10^5$	0.415	5.598	0.691	9.329
NGARB S2	20·ton	$5.157 \cdot 10^5$	0.334	6.678	0.556	11.129
NS3A	27.025·ton	$7.814 \cdot 10^5$	0.22	5.955	0.367	9.924
NCOTT S3	25.5·ton	$7.644 \cdot 10^5$	0.225	5.744	0.375	9.573
NAGGR S4	34.925·ton	$9.29 \cdot 10^5$	0.185	6.473	0.309	10.788
NS5A	35.55·ton	$9.489 \cdot 10^5$	0.181	6.451	0.302	10.751
NS6A	39.95·ton	$1.003 \cdot 10^6$	0.172	6.86	0.286	11.433
NS7B	42·ton	$1.048 \cdot 10^6$	0.164	6.901	0.274	11.501
NT4A	33.075·ton	$8.124 \cdot 10^5$	0.212	7.01	0.353	11.683
NAGRI T4	38·ton	$6.668 \cdot 10^5$	0.258	9.813	0.43	16.354
NT5B	37.2·ton	$9.102 \cdot 10^5$	0.189	7.037	0.315	11.728
NAGRI T5A	45·ton	$7.719 \cdot 10^5$	0.223	10.037	0.372	16.728
NAGRI T5B	45·ton	$6.912 \cdot 10^5$	0.249	11.209	0.415	18.682
NT6A	41.6·ton	$9.522 \cdot 10^5$	0.181	7.522	0.301	12.537
NT7A	42·ton	$9.35 \cdot 10^5$	0.184	7.734	0.307	12.891
NT7B	42·ton	$9.067 \cdot 10^5$	0.19	7.976	0.317	13.293
H15	15·ton	$4.564 \cdot 10^5$	0.377	5.659	0.629	9.431
HS15	15·ton	$5.934 \cdot 10^5$	0.29	4.352	0.484	7.254

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Live Load Rating:

(Ref. 2, Section 10.57)

Overload Rating:

Rating Factors: $A1ol := 1.0$ $Col := \frac{0.8 \cdot Fy \cdot Sx \cdot PEFF}{lbf \cdot ft}$ $Col = 4.492 \times 10^5$

$i := 1 .. 18$

$$RFinv\_ol_i := \frac{Col - A1ol \cdot D}{\left(\frac{A2inv}{1.3}\right) \cdot L_i} \qquad RFopr\_ol_i := \frac{Col - A1ol \cdot D}{\left(\frac{A2opr}{1.3}\right) \cdot L_i}$$

$$RTinv\_ol_i := RFinv\_ol_i \cdot \frac{W_i}{ton} \qquad RTopr\_ol_i := RFopr\_ol_i \cdot \frac{W_i}{ton}$$

Rating Vehicles

	$W_i :=$	$L_i =$	$RFinv\_ol_i =$	$RTinv\_ol_i =$	$RFopr\_ol_i =$	$RTopr\_ol_i =$
NSH	13.5·ton	$4.153 \cdot 10^5$	0.44	5.934	0.733	9.891
NGARB S2	20·ton	$5.157 \cdot 10^5$	0.354	7.08	0.59	11.799
NS3A	27.025·ton	$7.814 \cdot 10^5$	0.234	6.313	0.389	10.522
NCOTT S3	25.5·ton	$7.644 \cdot 10^5$	0.239	6.09	0.398	10.149
NAGGR S4	34.925·ton	$9.29 \cdot 10^5$	0.196	6.863	0.327	11.438
NS5A	35.55·ton	$9.489 \cdot 10^5$	0.192	6.839	0.321	11.398
NS6A	39.95·ton	$1.003 \cdot 10^6$	0.182	7.273	0.303	12.122
NS7B	42·ton	$1.048 \cdot 10^6$	0.174	7.316	0.29	12.194
NT4A	33.075·ton	$8.124 \cdot 10^5$	0.225	7.432	0.374	12.386
NAGRI T4	38·ton	$6.668 \cdot 10^5$	0.274	10.403	0.456	17.339
NT5B	37.2·ton	$9.102 \cdot 10^5$	0.201	7.461	0.334	12.434
NAGRI T5A	45·ton	$7.719 \cdot 10^5$	0.236	10.641	0.394	17.735
NAGRI T5B	45·ton	$6.912 \cdot 10^5$	0.264	11.884	0.44	19.807
NT6A	41.6·ton	$9.522 \cdot 10^5$	0.192	7.975	0.32	13.291
NT7A	42·ton	$9.35 \cdot 10^5$	0.195	8.2	0.325	13.667
NT7B	42·ton	$9.067 \cdot 10^5$	0.201	8.456	0.336	14.093
H15	15·ton	$4.564 \cdot 10^5$	0.4	5.999	0.667	9.999
HS15	15·ton	$5.934 \cdot 10^5$	0.308	4.614	0.513	7.69

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