DRAFT:
DATE SUBMITTED: August 15, 2008

ROUTINE AND FRACTURE CRITICAL BRIDGE INSPECTION REPORT

Mn/DOT CONTRACT NO. 91600

BRIDGE # 9090
THE JOHN F. KENNEDY MEMORIAL BRIDGE
US HIGHWAY 2 over the RED RIVER OF THE NORTH
EAST GRAND FORKS, POLK COUNTY
DISTRICT 2

Start Date of Inspection: 06/24/2008
Finish Date of Inspection: 06/28/2008

Prepared For
Minnesota Department of Transportation
Office of Bridges and Structures

Prepared By:

PB
100 YEARS

PB
510 First Avenue North
Suite 550
Minneapolis, MN 55403

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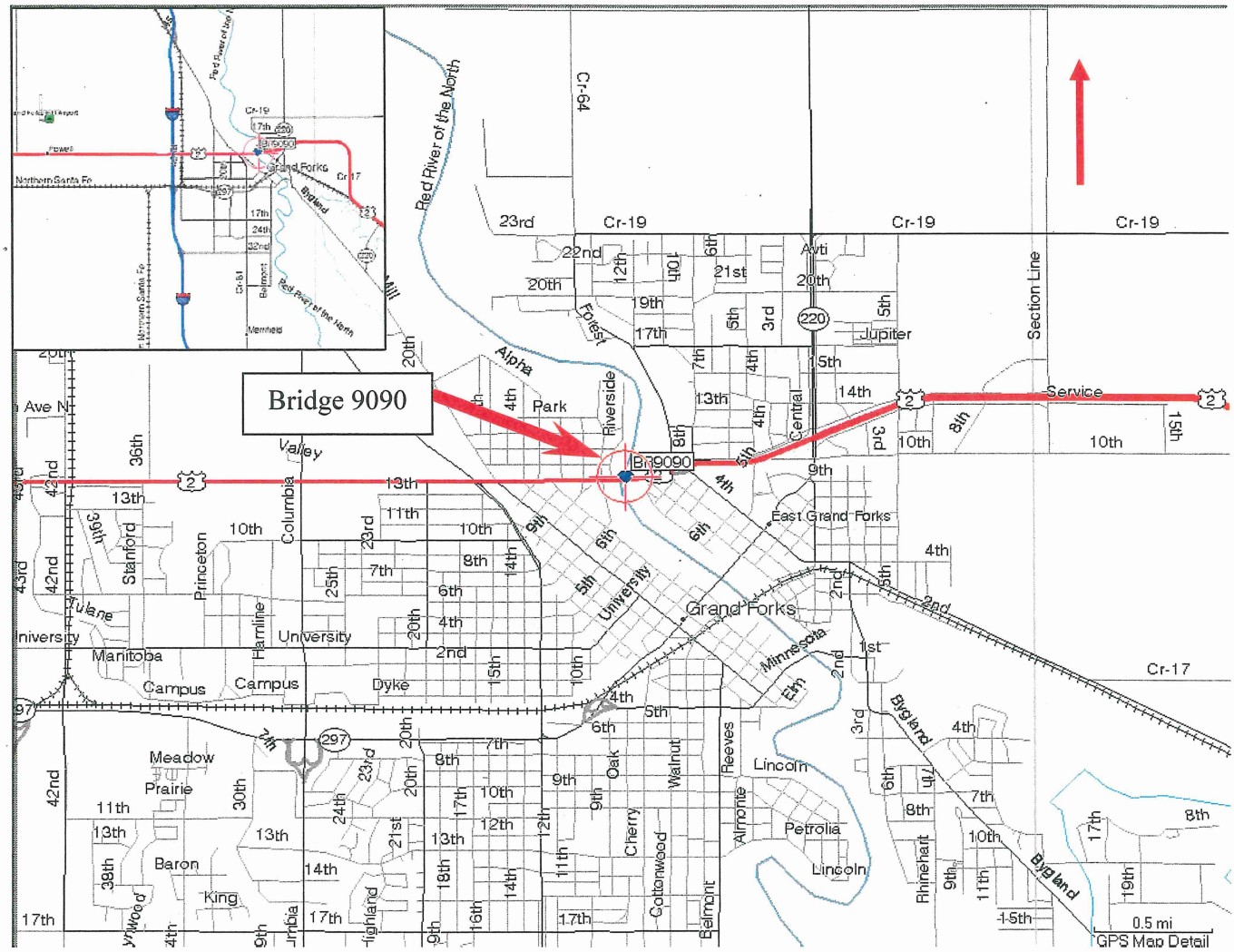
LOCATION MAP

(Located in Grand Forks, SD)



EAST GRAND FORKS, POLK COUNTY

I. Executive Summary

This report documents the findings of the routine and fracture critical inspection of Mn/DOT Bridge No. 9090 – US TH 2 over the Red River of the North in East Grand Forks, Polk County, Township, Minnesota.

The inspection started on June 24, 2008 and was completed on June 28, 2008. No underwater inspection was performed.

A. SIGNIFICANT FINDINGS

1. A crack was found during the 2007 inspection at Panel Point L0 on the south truss of the west span, in the lower right corner of the gusset plate. The crack was approximately 2" long. The gusset plate at this location is welded to the bottom and the top chord member. The crack was totally removed by grinding and extended completely through the outer chord plate (Photo 18).

   Recommendation: Monitor area of gusset plate where crack was removed for further cracking on a yearly basis.

2. At several panel points on each truss (Panel Points L1A, L1, L1'), the gusset plates are stiffened with angles along the unsupported portion of the plate. These angles are only tack weld to the gusset plate. At L1A' on the north truss of the east span, pack rust has caused random tack welds to crack (Photo 12). One of the angles on the east side of the inner plate was easily removed by hand during the inspection.

   Recommendation: Analysis shall be performed to determine if stiffening angles are required at these locations. If required, existing cracked welds shall be removed and more permanent welds shall be used to re-attach stiffening angles to gusset plates.

3. At the end Panel Points for each truss, there is an area above the bottom chord that is completely enclosed by steel members that has trapped a significant amount of moisten laden dirt and debris (Photo 14).

   Recommendation: These areas shall be flush clean of moisten laden dirt and debris, and holes shall be drilled in batten plates (top and bottom) just above the bottom chord to allow for drainage of water off the top surface of the bottom chord.

4. There are pins and hangers located in Spans 1 to 3 and 9 to 12 (Photo 20). The nuts have been tack welded to the channel hanger at two locations on each nut. The majority of these tack welds on the lower pin have cracked (Photo 16). There is no evidence that the crack has propagated into the base metal.

   Recommendation: The movement of the hangers has caused these tack welds to crack. Thus, these tack welds should be removed to allow free rotation and movement of the pin and hanger system.

5. The rocker bearings at Piers 6 are excessively expanded, approximately 8.4 degrees to the west, at a temperature of 81°F (Photo 21). The pintles are partially exposed.

   Recommendation: The rocker bearings on Pier 6 should be continued to be monitored for movement and an interim inspection should be performed during the winter months when temperatures are significantly lower for signs of movement.

6. There are sliding plate bearing in Spans 5 and 8. The keeper plates for several of these bearings have cracked due to pack rust (Photo 22).

   Recommendation: Where keeper plates have cracked, the keeper plate shall be removed, the pack rust removed and the keeper plate re-welded back into place.

7. Pier 6 has diagonal cracks on both faces of the pier (Photo 23). However, these cracks go in the opposite direction of each other and could indicate movement of the pier causing torsion or twisting of the pier wall.

   Recommendation: Monitoring of Pier 6 for additional cracking and movement should be performed. A detail survey of Pier 6 setting up control point should be established to detect any future movement of the pier.

For additional recommendations, refer to Section V, Conclusions and Recommendations.

B. CONDITION SUMMARY

The results of the inspection indicate that the bridge is overall in satisfactory condition. There were no significant noticeable changes in any of the structural components since the last inspection. The paint system is in generally good condition. There is some random areas where the paint has peeled and several locations where pack rust is evident between the bottom horizontal connection plate and the floorbeams.

The deck is in satisfactory condition. There are random spalls along the concrete curb face and parapet.

The 2007 Inspection report indicated that the superstructure was in fair condition however the SI&A sheet indicate the superstructure to be in good condition. Based on the finding of this inspection, the superstructure is considered to be in satisfactory condition. The lower truss members within region of splash zones have isolated areas of minor corrosion on the splice connection, gusset plates and horizontal connecting plates. At several panel points pack rust has developed between the bottom horizontal connection plate and the bottom flange of the floorbeams. No significant section losses were noted. The floorbeams are in satisfactory condition with no significant

deterioration or defects noted. The stringers are in good condition for both the truss spans and all 11 approach spans. There are isolated areas of peeling paint and minor surface rust. No pitting or section loss has occurred. There is an area of minor collision damage in Span 12 to Stringers 1 and 2. The bottom flange of Stringer 1 has been bent upward 1 ½".

There are pins and hangers in Spans 1 to 3 and Spans 9 to 12. The nuts have been tack welded to the channel hanger. The majority of these tack welds on the lower pin have cracked. There is no evidence that the crack has propagated into the base metal.

The rocker bearings at Pier 6 are excessively expanded at a temperature of 81 degrees. At Pier 6, the rockers have shifted approximately 8.4 degrees to the west and the pintles are exposed. At Pier 7, the rocker bearings on the south truss have shift in opposite directions. There are sliding plate bearing in Spans 5 and 8. The keeper plates for several of these bearings are cracked due to pack rust.

The substructure is in satisfactory condition. Pier 6 has diagonal cracks on both faces of the pier. However, these cracks go in the opposite direction of each other and could indicate torsion or twisting of the pier. At Bent 5, there is some erosion of the soil around the foundation. The steel pier columns at Bents 2 to 5 and 9 to 13, exhibit some surface rust but not significant loss of section.

II. Introduction

The focus of this report is the presentation of the routine inspection findings and fracture critical evaluation for Mn/DOT Bridge No. 9090, US TH 2 over the Red River of the North in East Grand Forks located in Polk County, Minnesota.

The bridge was inspected on June 24, 2008 to June 28, 2008..

The inspection team was comprised of Jeff Moore, P.E. (TL), Dave Haxton, P.E. (TL), Kyle Stanley (ATL) and Kevin Clark (ATL).

In addition, as specified in the contract, red line markups of the previous Mn/DOT Structure Inventory Reports and Mn/DOT PONTIS Bridge Inspection Reports have been provided as separate attachments to this report.

Bridge Description

Bridge 9090 is a 13-span structure consisting of two Park style high truss main spans and eleven (11) steel multi-beam approach spans (Photo 1). The trusses are constructed of built-up members assembled with a combination of welding and high strength bolts. The structure was built in 1963 and has a total structure length of 1,261 feet.

The main truss spans are supported by concrete piers and span 279 feet each. The approach spans have concrete abutments and hinged steel bents. The bridge runs east to west on US TH 2 over the Red River of the North at the North Dakota state line. It carries 4 lanes of traffic, two in each direction.

Inspection Access

The hands-on and visual Fracture Critical and Routine inspection was performed using a UB-50 to inspect the underside of the deck, floorbeams and lower chord members. A 45 foot manlift was used to access the upper portion of the truss (above the deck), and all sway frames and top horizontal and diagonal bracing members. The abutments, wingwalls and lower portions of the piers were inspected from the ground .

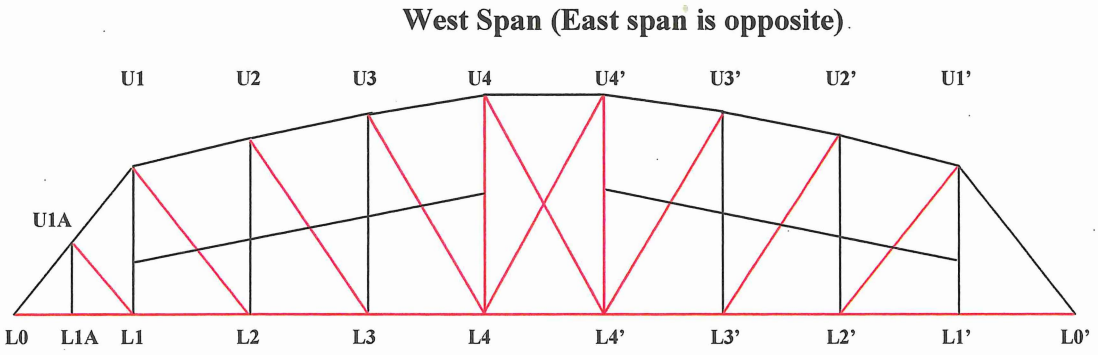
Fracture Critical Members on this bridge are the tension members of the non-redundant trusses and the floorbeams.

Additional bridge data can be found in the MNDOT Structure Inventory Report.

Prior to the inspection of the bridge, advance notification to the appropriate authorities was required prior to performing any lane closures. Minnesota DOT provided single lane closures during the inspection.

III. Fracture Critical Members and Fatigue-Prone Details

Fracture Critical Members on this bridge are the tension members of the non-redundant trusses and the floorbeams. The riveted, built up truss connections are classified as Fatigue Category D in accordance with AASHTO LRFD Bridge Design Specification, 4th Edition, Table 6.6.1.2.3-1.



Truss diagram showing Panel Point numbering system
Fracture Critical tension Members shown in **Bolded Red** (per previous cycle report)

V. Inspection Findings

Deck Elements

The deck element is in satisfactory condition.

Wearing Surface: The concrete deck is covered with a low slump overlay. The overlay is in generally good condition with only minor random transverse cracks (Photo 3). In Span 10, there is a concrete fracture (1'x2.5') in the overlay surface in the right lane of the EB roadway. The concrete edge along the deck joints exhibit minor chipping and spalls. There are also several locations in Spans 11 and 12 that have been repaired with a concrete patch.

Underside of deck: The underside of the deck is in satisfactory condition (Photo 6). There are random transverse cracks with light efflorescence in each span. In Span 10, bay1, there is a large area (5'x10') where deck exhibit moisture contamination with map cracking and efflorescence (Photo 8). In addition, the overhang areas along the approach spans exhibit random spalls, fractures and in some locations expose and rust reinforcing steel(Photo 7) . In the two main truss spans, the sides of the deck slab have spalled directly over the floorbeams. The deck is also pumping (moving up and down) over the floorbeams most evident at each end and under the longitudinal joint (Photo 24).

Bridge Railing: The approach spans have a concrete bridge railing along both safetywalks. The crack posts are randomly cracked and spalled in each span. At some locations there is exposed rebar (Photo 5). The metal railing on top of the concrete railing has been damage at two locations at the northeast end of the bridge.

Curbs: The concrete curbs are in fair condition. The curbs are randomly riddled with small spalls, fractures, cracks and exposed rebar (Photo 4). It appears in most cast these spalls have been caused by insufficient concrete cover over the reinforcing steel. In several of the spans the deterioration to the curb is substantial and can be found at the following locations:

Span 1	North curb	4'-0" long
Span 5	Median curb, south side mid span	14'-0" long
Span 7	Median curb both sides (Riddle with Spalls)	Full length
Span 9	North curb	5-0" long
Span 11	North curb	25'-0" long

Joints: All joints on the bridge are in generally good condition. The strip seal joints are all in tack and partially cover with dirt and debris but functioning. The strip seal joint over Pier 2 in the median area has a missing joint plate cover on the north face. The finger joints over Piers 6 and 8 exhibits no visible problems and has sufficient space to expand and contract. The rubber drainage trough under the finger joints is in tack and functioning. The hot poured joints in the deck slab are in good condition.

Deck Drainage: The drain outlets are located on each side of deck along the gutterline and are positioned between floorbeams. Outlets are all clear of debris and functioning. The drain pipes in Spans 6 and 7 (truss spans) extends below the bottom chord and are supported by a steel strap that is welded directly to the bottom chord. At these locations there is significant corrosion and pack rust between the strap and the side of the bottom chord. In additional, there were several locations in the truss spans where the drainage pipe was missing allow water runoff to outlet onto the bottom chord (Photo 7).

Superstructure

The superstructure elements are in satisfactory condition.

Trusses: The **Upper Chords** members are in good condition (Photo 9). The paint system is in tack and there are no significant signs of rust (Photo 11). At some enclosed panel point locations, pigeons have nested and there is a significant amount of debris that has caused some rust stains on the surface of the paint (Photo 10).

The **Lower Chords** are in satisfactory condition. The paint system has minor areas of peeling paint and isolated locations of rusts in the splash zones. In general, there appears to be more rust exhibit at either ends of the each truss (L0 and L0') and at the splice connections (Photos 13 & 15). At all four corners of each truss (L0 and L0') there is an enclosed area on the top of the bottom chord that traps water and debris (Photo 14). This water and debris is causing corrosion to the top of the bottom chord and the inner surface of the vertical gusset plates.

At panel points L1A, L1A', L2' and L2, the vertical gusset plates are stiffened with angles long the unsupported length. These angles are only tack welded to the gusset plate and the space between welds has allowed moisture and rust to develop between the angle and the gusset plate. This rust has caused in many locations the tack welds to crack. At L1A' on the north truss, east span, the stiffening angles was removed by hand from the gusset plate (Photo 12).

It should also be noted that at random floorbeam locations, pack rust has developed between the horizontal connection plate and the bottom of the floorbeam. This pack rust is a maximum ¼" at random locations and has slight distort the plates (Photo 25). At L3N west span, the bottom connection plate appear to have been bent upward during construction in order to connect to the bottom flange of the floorbeam which appears to be slight higher then the bottom of the lower chord.

Vertical and Diagonal Members have very minor random corrosion in the splash zone region. This area normally encompasses the bottom third of the members.

Floorbeams: The Floorbeams are in good condition. There are brown stains typically found on each floorbeam on the top flange and web surface at each end and under the longitudinal joint (Photo 24). This is due to the deck pumping directly above the

floorbeam. There is also some minor random rust at the floorbeam connection to the bottom chord.

Stringers (Truss Spans): The stringers are in good condition. The paint system is in good condition with only several minor areas where paint has peeled and there are not significant defects.

Secondary members: The Top and Bottom Lateral Bracings and Sway Frames are in good condition.

Approach Spans: The approach spans consist of 8 - 36" rolled stringers (4 lines of stringers in each direction). The stringers are in good condition with no significant corrosion or section loss. The paint system on the bottom flange in random spans has deteriorated and the surface rust has developed. There is some minor collision damage in Span 12 to stringers 1 and 2 (Photo 17).

There are pins and hangers in Spans 2, 3, 4, 9, 10, 11 and 12 (Photo 20). There are tack welds between the nut and the hanger at both top and bottom pins. It was observed that most tack welds on the bottom pins have cracked (Photo 16). Cracks have not propagated into the base metal of the hanger. There are also rotation pins at the centerline. At some locations, there is significant corrosion exhibited in and around these pins.

Bearings: There are fixed bearing on Pier 7 supporting the north trusses and rocker bearings on Piers 6, 7 and 8 supporting the end of both trusses. At Pier 6, the rockers have shifted approximately 8 degrees to the west and the pintles are exposed (Photo 21). At Pier 7, the rocker bearings on the south truss have shift in opposite directions.

There are sliding plate bearing in Spans 5 and 8. The keeper plates for several of these bearings have cracked due to pack rust (Photo 22).

Substructure

The substructure elements are in satisfactory condition.

East and West Abutments: The abutments have no significant defects. There is some minor cracking and spalls on the backwall.

Pier 6 has diagonal cracks on both faces of the pier (Photo 23). However, these cracks go in the opposite direction of each other and could indicate torsion or twisting of the pier. At Bent 5, there is some erosion of the soil around the foundation.

The steel pier columns at Bents 2 to 5 and 9 to 13, exhibit some surface rust but not significant loss of section. The embankment on the west side of the river appears to be unstable and erosion of the soil is evident. The fixed hinges that support the stringers on top of the steel pier bents are securely attached to the top of the bent. There are several missing cotter pins on Bent 4 (from west) (Photo 19).

Miscellaneous

Approach Pavements: The approach pavements at both ends of bridge appear to be in good condition. There are a few minor cracks in the concrete surface. The westbound roadway in the west approach is overlaid with asphalt (Photo 2).

Approach Guardrails: There are no approach guiderails.

Load posting: None noted

V. Conclusions and Recommendations

The overall condition of the bridge is satisfactory due to the condition of the superstructure and substructure.

The deck is in satisfactory condition. The underside of the deck slab has numerous random fractures and spalls with exposed rebar in the overhang area of the deck. The deck is also pumping (moving) about the floorbeams, most evident at the end of each span.

The superstructure is in satisfactory condition. The paint system is in generally good condition throughout the bridge. However, there are random areas on the approach stringers where the paint has failed on the bottom flange of the fascia stringers. There is also some minor rust at bottom chord splice connections and at each panel point.

Pack rust is starting to develop and is randomly located between the bottom flange of the floorbeams and the lower chord connection plate, and was evident at the rotational pin in the approach spans.

The substructure is in satisfactory condition and has no significant defects or deterioration. Pier 6 exhibits diagonal cracks on either side of the concrete pier wall. These cracks go in opposite direction and need to be monitored.

Recommendations:

We recommend that the following safety improvements, repairs or rehabilitation and/or monitoring should be made, to retard further deterioration, preserve the structural integrity of the bridge and extend its useful life:

1. **Priority for Repair:** Analysis shall be performed to determine if stiffening angles are required at Panel Points L1A' U1A', L2' east span and L1A, U1A, L2 in the west span. If required, existing cracked tack welds shall be removed and more permanent welds shall be used to secure stiffening angles to gusset plates. At L1A' where the stiffener has fall off, stiffener needs to be welded back into place (Photo 12).
2. **Priority for Repair:** At the end Panel Points for each truss, these areas shall be flush clean of moisten laden dirt and debris, and holes shall be drilled in batten plates (top and bottom) just above the bottom chord to allow for drainage of water off the top surface of the bottom chord (Photo 14).
3. **Priority for Repair:** Where keeper plates have cracked on the sliding plate bearings in Span 5 (Str. 1, 2, 3, 5 and 7) and Span 8 (str. 5), the keeper plate shall be removed, the pack rust removed and the keeper plate re-welded back into place (Photo 22).

4. Since there are no approach guardrails and the blunt end of the barrier curb is exposed on both approach roadways, it is recommended that MnDOT and North Dakota conduct a review of design criteria for guardrails to determine the need for them at this location.
5. The rocker bearings on Pier 6 should be continued to be monitored for movement and an interim inspection should be performed during the winter months when temperatures are significantly lower for signs of movement (Photo 21).
6. Monitoring of Pier 6 for additional cracking and movement should be performed. A detail survey of Pier 6 setting up control point should be established to detect any future movement of the pier (Photo 23).
7. The movement of the hangers has caused these tack welds to crack. Thus, these tack welds should be removed to allow free rotation and movement of the pin and hanger system (Photo 16).
8. Monitor area of gusset plate at Panel Point L0 on the south truss of the west span where crack was removed for further cracking on a yearly basis (Photo 18).

Appendix A

Inspection Photographs

Photo 1 – South Elevation looking north.

Photo 2 – West Approach looking west.

Photo 3 – General view of top of deck, looking east.

Photo 4 – Span 11, north curb line, approximately 25 feet of spalled curb with exposed rebar.

Photo 5 – Span 7, concrete spall in parapet post with exposed rebar, looking south. Cracking of concrete and insufficient concrete cover has caused spalls to develop at random location along each parapet.

Photo 6 – Typical condition of longitudinal deck joint along center line of structure. Looking west.

Photo 7 – East Truss Span (Span 7), random spall with exposed rebar in north soffit area. Note there is no downspout extension connected to deck outlet pipe. Looking up and west.

Photo 8 – Span 10, underside of deck slab between Stringers S1 and S2 exhibits an area of moisture contaminate deck, 5'x10'. Looking up and east.

Photo 9 – General view of upper chord members, looking east.

Photo 10 – At random locations inside the upper chord members, birds have nested. This nest is located in the lateral bracing adjacent to panel point U4'N.

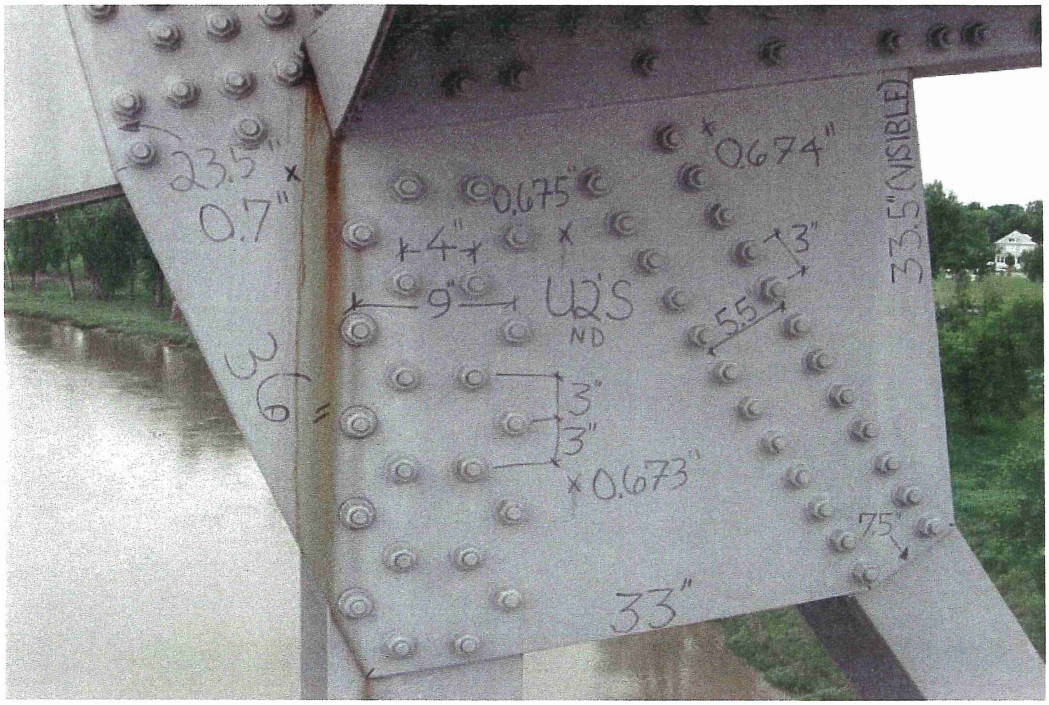


Photo 11 – Panel Point U2'S, inner gusset plate. Looking south.

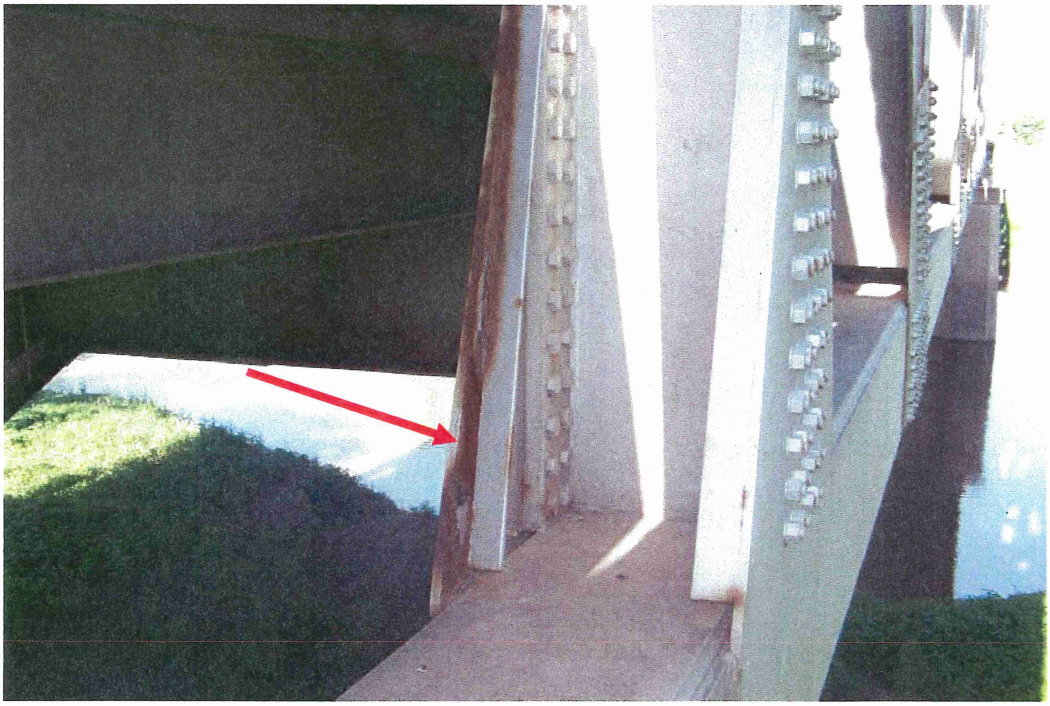


Photo 12 – North Truss, East Span (Span 7), east side of panel point L1A', looking west. Note stiffening angles is partial detached from inner gusset plate. This stiffener was removed by inspector by hand. Looking west.

Photo 13 – North truss, west span, panel point L0'. Top batten plate has heavy pack rust between plates causing bending of the out portion of the plate. Looking southwest.

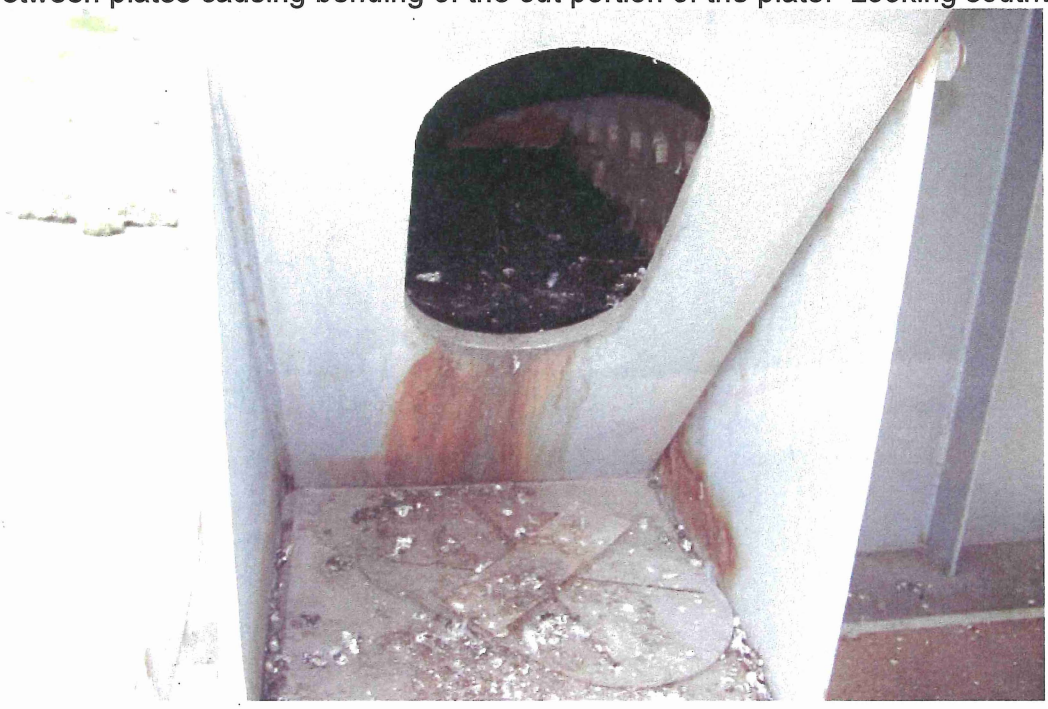


Photo 14 – East Truss Span (Span 7), panel point L0 on the south truss. Note that water and debris has accumulated inside of diagonal member. This is a typical condition at all end panels. Looking west.

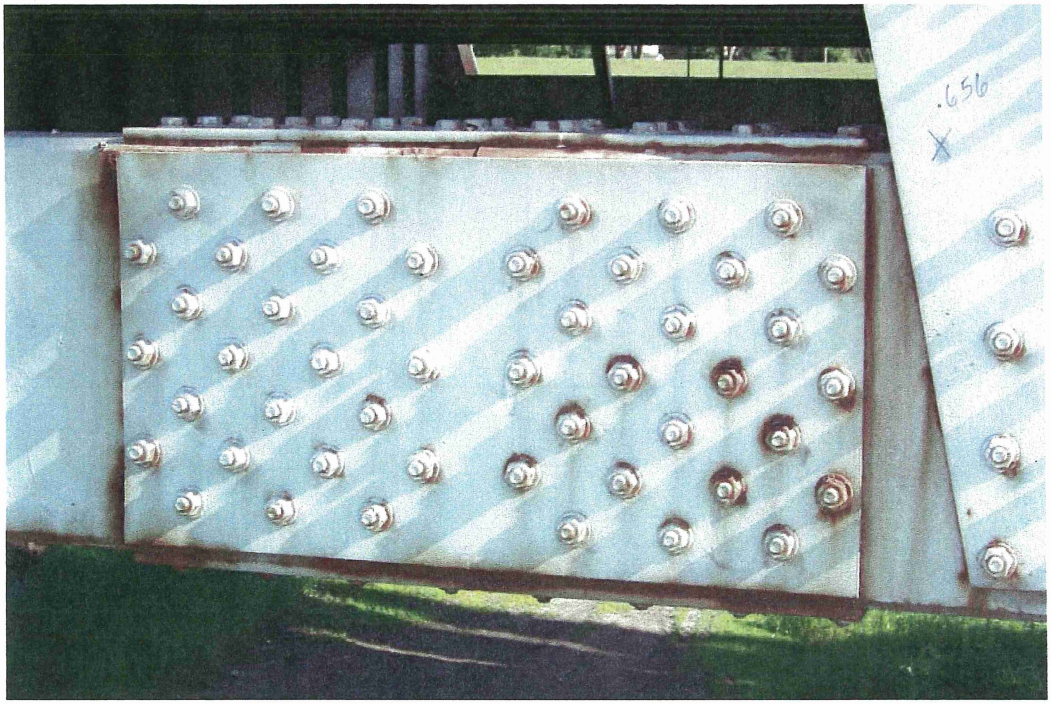


Photo 15 – West Truss Span (Span 6), south truss, typical lower chord splice connection. Rust is developing between splice plates and lower chord members. Looking north.

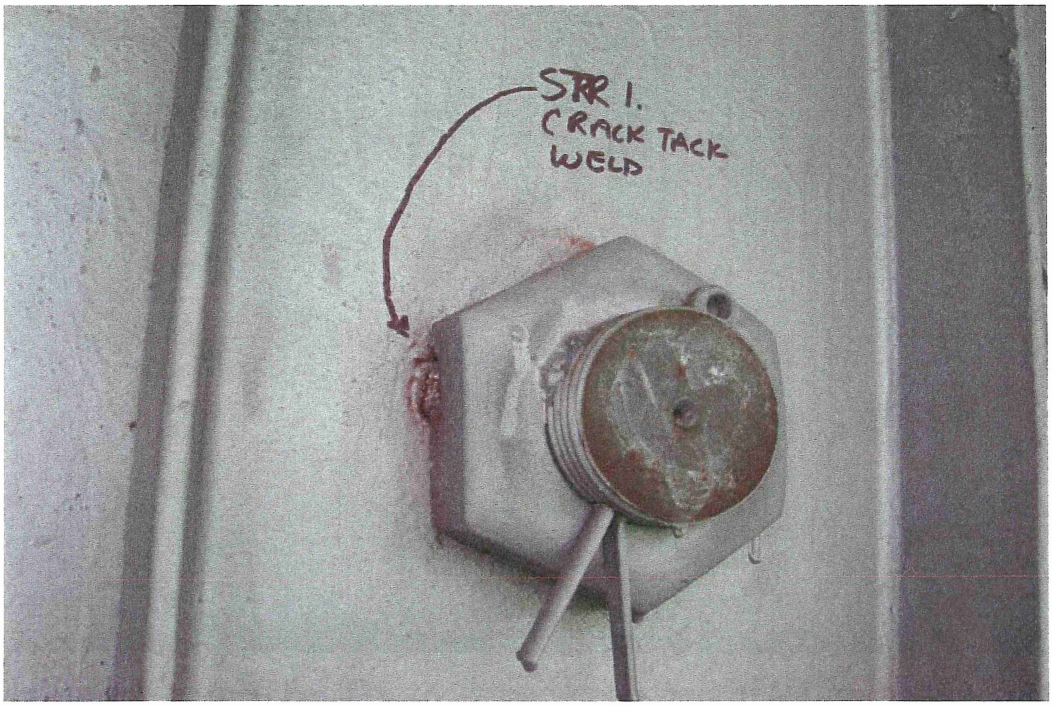


Photo 16 – Span 9, Stringer 1, crack tack weld between nut and hanger. Looking North.

Photo 17 – Span 12, south fascia, impact damage to bottom flange. Bottom flange has been bent upward 2". Looking northeast.

Photo 18 – West span, south truss, panel point L0. Location where crack was previous removed by grinding and caulked. Note visible signs of new cracks. Looking north.

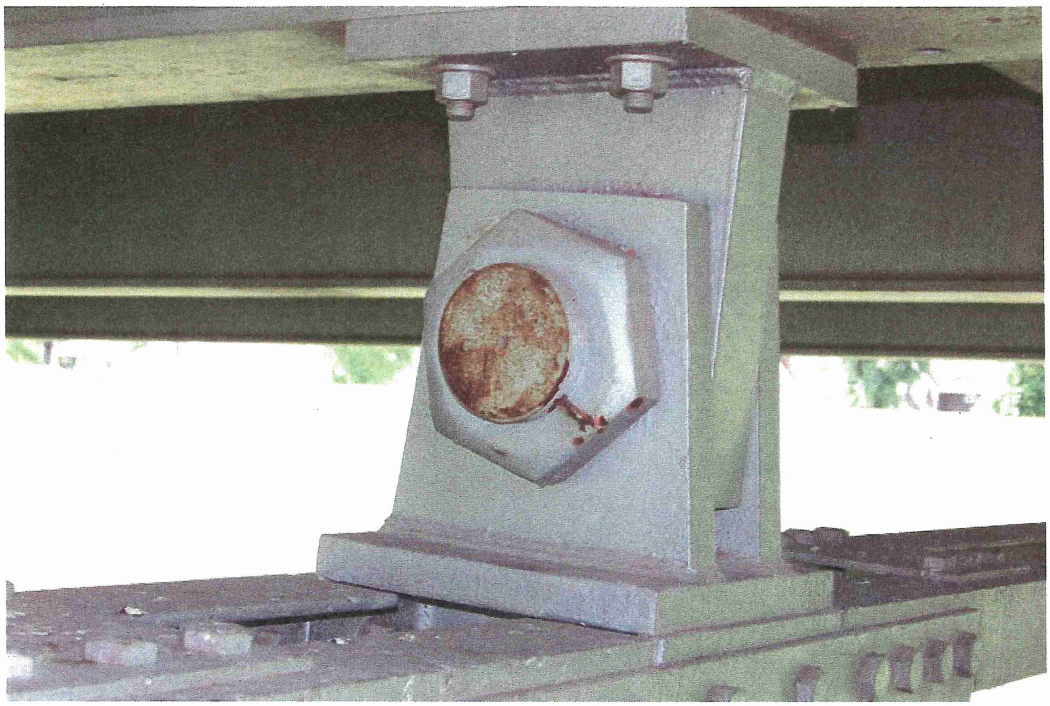


Photo 19 – Typical fixed support over Bents 2 to 5, and 9 to 13. Photo taken at Bent 5, Stringer 6, missing cotter pin on south side.

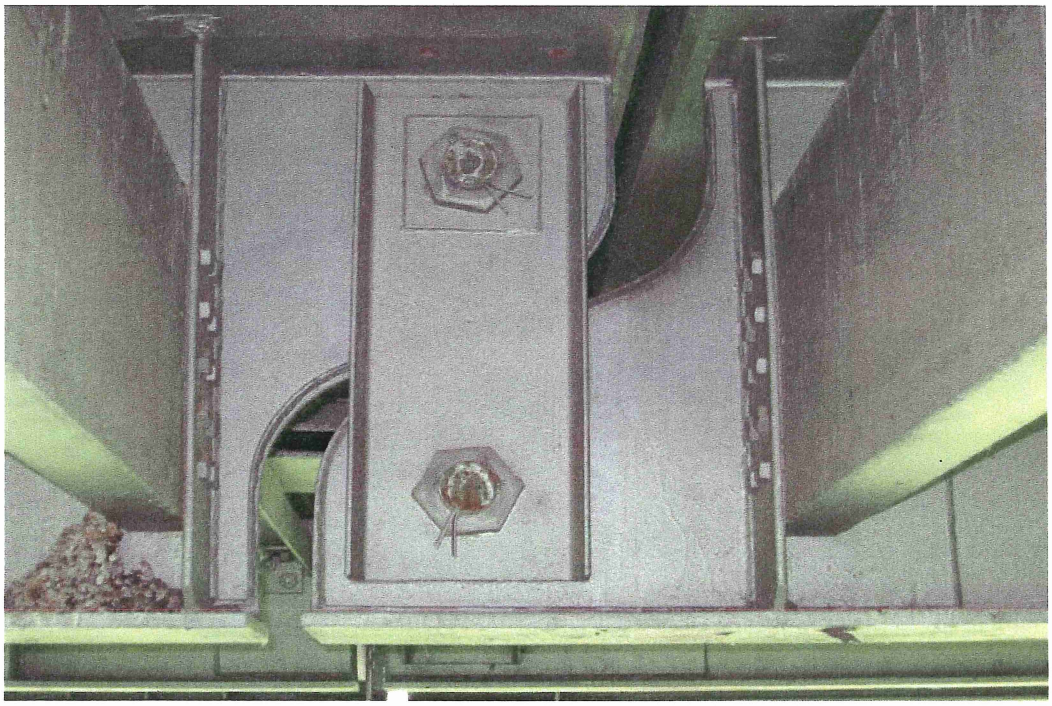


Photo 20 – Typical condition of pin and hanger.

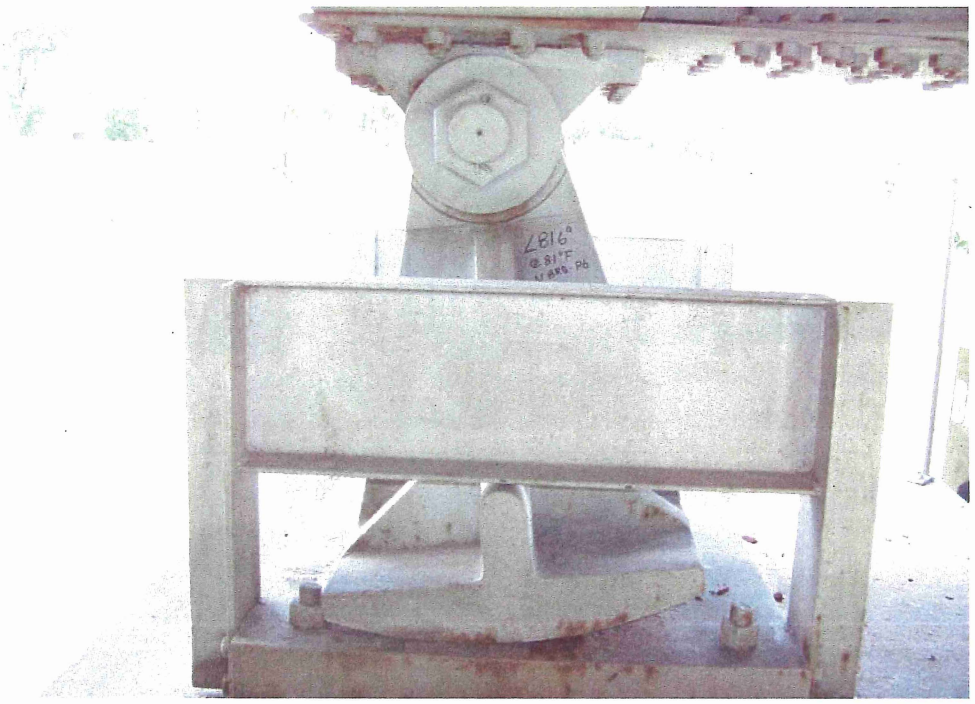


Photo 21 – Pier 6, north rocker bearing. Rocker bearing has rotated 8.4° to the west with an air temperature of 81 degrees. Looking north. Pintles are exposed.

Photo 22 – Span 5, Stringer 1, cracked keeper plate weld.

Photo 23 – Bent 6, east face, note 1/8" diagonal cracks in pier face. Similar cracks noted on west face however going in the opposite direction.

Photo 24 – Typical pumping of deck above floorbeams in truss spans. Pumping of deck is most evident at either end of floorbeam and at mid span.

Photo 25 – East Truss Span (Span 7), north truss at panel point L3'. Note pack rust (3/8") between lower horizontal connection plate to bottom flange of floorbeam. This condition is randomly found throughout the truss spans.

Appendix B

Field Inspection Notes

Appendix C

Structure Inventory Report (SIR) and Pontis Redlines

Mn/DOT Structure Inventory Report

Bridge ID: 9090 US 2 over RED RIVER & CITY ST

Jeffrey A. moore
Jeffrey A Moore (T4) 7-15-08

Date: ~~06/11/2008~~

+ GENERAL +	
Agency Br. No.	
District	2
Maint. Area	2B
County	60 - POLK
City	EAST GRAND FORKS
Township	
Desc. Loc.	AT N DAKOTA STATE LINE
Sect., Twp., Range	02 - 151N - 50W
Latitude	47d 55m 59.78s
Longitude	97d 02m 13.84s
Custodian	STATE HWY
Owner	STATE HWY
Inspection By	DISTRICT 2
BMU Agreement No.	
Year Built	1963
Year Fed Rehab	
Year Remodeled	
Temp	
Plan Avail.	CENTRAL

+ STRUCTURE +	
Service On	HWY;PED
Service Under	HWY;STREAM
Main Span Type	STEEL HIGH TRUSS
Main Span Detail	PARKER
Appr. Span Type	STEEL BM SPAN
Appr. Span Detail	
Skew	
Culvert Type	
Barrel Length	
Number of Spans	
MAIN: 2 APPR: 11 TOTAL: 13	
Main Span Length	279.0 ft
Structure Length	1,261.0 ft
Deck Width	65.0 ft
Deck Material	C-I-P CONCRETE
Wear Surf Type	LOW SLUMP CONC
Wear Surf Install Year	1984
Wear Course/Fill Depth	0.17 ft
Deck Membrane	NONE
Deck Rebars	N/A
Deck Rebars Install Year	
Structure Area	81,965 sq ft
Roadway Area	70,611 sq ft
Sidewalk Width - L/R	2.5 ft 2.5 ft
Curb Height - L/R	0.75 ft 0.75 ft
Rail Codes - L/R	19 19

+ ROADWAY +	
Bridge Match ID (TIS)	1
Roadway O/U Key	1-ON
Route Sys/Nbr	USTH 2
Roadway Name or Description	
US 2	
Roadway Function	MAINLINE
Roadway Type	2 WAY TRAF
Control Section (TH Only)	6018
Ref. Point (TH Only)	000+00.000
Date Opened to Traffic	01-01-1963
Detour Length	2 mi.
Lanes	4 Lanes ON Bridge
ADT (YEAR)	21,500 (2004)
HCADT	1,935
Functional Class.	URB/OTH PR ART

+ RDWY DIMENSIONS +		
If Divided	NB-EB	SB-WB
Roadway Width	28.0 ft	28.0 ft
Vertical Clearance	19.9 ft	19.9 ft
Max. Vert. Clear.	19.9 ft	19.9 ft
Horizontal Clear.	28.0 ft	28.0 ft
Lateral Clr. - Lt/Rt		
Appr. Surface Width	60.0 ft	
Roadway Width	56.0 ft	
Median Width	4.0 ft	

+ MISC. BRIDGE DATA +	
Structure Flared	NO
Parallel Structure	NONE
Field Conn. ID	RIVETED
Cantilever ID	PIN & HANGER
Foundations	
Abut.	CONC - FTG PILE
Pier	STEEL - FTG PILE

+ PAINT +			
Year Painted	1996	Pct. Unsound	5 %
Painted Area	183,102 sf		
Primer Type	OTHER		
Finish Type	URETHANE		

+ BRIDGE SIGNS +	
Posted Load	NOT REQUIRED
Traffic	NOT REQUIRED
Horizontal	OBJECT MARKERS
Vertical	NOT REQUIRED

+ INSPECTION +	
Deficient Status	ADEQ
Sufficiency Rating	83.4
Last Inspection Date	~~06-09-2007~~ 6-28-2008
Inspection Frequency	12
Inspector Name	~~DISTRICT2~~ PB
Structure	A-OPEN

+ CONDITION CODES +	
Deck	6
Superstructure	~~7~~ 6
Substructure	6
Channel	7
Culvert	N

+ APPRAISAL RATINGS +	
Structure Evaluation	6
Deck Geometry	5
Underclearances	4
Waterway Adequacy	6
Approach Alignment	7

+ SAFETY FEATURES +	
Bridge Railing	1-MEETS STANDARDS
Appr. Guardrail	1-MEETS STANDARDS
GR Transition	1-MEETS STANDARDS
GR Termini	1-MEETS STANDARDS

+ IN DEPTH INSP. +			
Frac. Critical	Y	24 mo	~~09/2007~~ 04/2008
Underwater	Y	60 mo	07/2004
Pinned Asbly.	Y	48 mo	06/2007
Spec. Feat.			

+ WATERWAY +	
Drainage Area	
Waterway Opening	29000 sq ft
Navigation Control	NO PRMT REQD
Pier Protection	
Nav. Vert./Horz. Clr.	
Nav. Vert. Lift Bridge Clear.	
MN Scour Code	L-STBL;LOW RISK
Scour Evaluation Year	1997

+ CAPACITY RATINGS +	
Design Load	HS20
Operating Rating	HS 35.4
Inventory Rating	HS 21.3
Posting	
Rating Date	11-13-1995
Mn/DOT Permit Codes	
A: 1 B: 1 C: 1	

STRUCTURE INVENTORY REPORT V2009

06/11/2008

Mn/DOT BRIDGE INSPECTION REPORT

Inspector: ~~DISTRICT2~~ PB 6-28-2008

BRIDGE 9090 **US 2 OVER RED RIVER & CITY ST** **INSP. DATE: ~~05-09-2007~~**

County: POLK | Location: AT N DAKOTA STATE LINE | Length: 1,261.0 ft
City: EAST GRAND FORKS | Route: USTH 2 Ref. Pt.: 000+00.000 | Deck Width: 65.0 ft
Township: | Control Section: 6018 Maint. Area: 2B | Rdwy. Area / Pct. Unsnd: 70,611 sq ft
Section: 02 Township: 151N Range: 50W | Local Agency Bridge Nbr: | Paint Area/ Pct. Unsnd: 183,102 sq ft 5 %
Span Type: STEEL HIGH TRUSS | Culvert N/A
NBI Deck: 6 Super: ~~7~~ 6 Sub: 6 Chan: 7 Culv: N | Open, Posted, Closed: OPEN
Appraisal Ratings - Approach: 7 Waterway: 6 | MN Scour Code: L-STBL;LOW RISK | Def. Stat: ADEQ | Suff. Rate: 83.4
Required Bridge Signs - Load Posting: NOT REQUIRED | Traffic: NOT REQUIRED
Horizontal: OBJECT MARKERS | Vertical: NOT REQUIRED

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
			06-28-2008	81,965 SF	0	81,965	0	0	0
22	LS O/L (CONC DECK)	2	05-09-2007	81,965 SF	0	81,965	0	0	0
			05-08-2006	81,965 SF	0	81,965	0	0	0
	Notes: Cracks in overlay at west finger jt. Small spall in median concrete on bottom side @ E. abut. br/wall w/rbar exposed. Some deterioration of overhangs w/rust staining on appr. spans. Concrete spalling at the ends of many floorbeams.There appears to be a dip at the joint above the second bent from the west. There is a large hole in the deck 3.5' X 5' patched with bituminous. on the EBL in the right driving lane. on the ND side. ** This spall was patched with concrete on 7/11/07. DSH								
			06-28-2008	700 LF	700	0	0	N/A	N/A
300	STRIP SEAL JOINT	2	05-09-2007	700 LF	700	0	0	N/A	N/A
			05-08-2006	700 LF	700	0	0	N/A	N/A
	Notes:								
			06-28-2008	1,400 LF	1,400	0	0	N/A	N/A
301	POURED DECK JOINT	2	05-09-2007	1,400 LF	1,400	0	0	N/A	N/A
			05-08-2006	1,400 LF	1,400	0	0	N/A	N/A
	Notes: **Re-did all poured jts. w/hot rubber in 06 . DSH								
			06-28-2008	140 LF	140	0	0	N/A	N/A
303	ASSEMBLY DECK JOINT	2	05-09-2007	140 LF	140	0	0	N/A	N/A
			05-08-2006	140 LF	140	0	0	N/A	N/A
	Notes: < none >								
			06-28-2008	4 EA	4	0	0	0	N/A
321	CONC APPROACH SLAB	2	05-09-2007	2 EA	2	0	0	0	N/A
			05-08-2006	2 EA	2	0	0	0	N/A
	Notes: < none >								
			06-28-2008	2,522 LF	2274	250	0	N/A	N/A
333	RAILING - OTHER	2	05-09-2007	8,274 LF	8,274	0	0	N/A	N/A
			05-08-2006	8,274 LF	8,274	0	0	N/A	N/A
	Notes: Minor spalls in rails. Minor spall in South rail @ West end w/rbar exposed. Two rail anchor castings on NE end have been hit & are broken. Several spalls on the bottom of the railposts.								
			06-28-2008	5280	5280	0	0	0	0
107	PAINTED STEEL GIRDER	2	05-09-2007	5,600 LF	5,600	0	0	0	0
			05-08-2006	5,600 LF	5,600	0	0	0	0
	Notes: Rust Beginning to Form. Several of the centerline rotational pins appear to be frozen due to corrosion. There is a bend in the bottom flange of the south fascia beam, span 12, no cracks present.								
			06-28-2008	4,464	4208	0	256	0	0
113	PAINT STEEL STRINGER	2	05-09-2007	97 LF	97	0	0	0	0
			05-08-2006	97 LF	97	0	0	0	0
	Notes: Rust Beginning to Form.								

Mn/DOT BRIDGE INSPECTION REPORT

Inspector: DISTRICT2

BRIDGE 9090 **US 2 OVER RED RIVER & CITY ST** **INSP. DATE: 05-09-2007**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
985	SLOPES	2	05-09-2007	1 EA	0	1	0	N/A	N/A
			05-08-2006	1 EA	0	1	0	N/A	N/A
	Notes: Major transverse cracking in slope paving @ West end w/some heaving. Erosion at the 3rd bent from the west. The Dike on the MN side has been removed.		06-28-2008	1 EA	0	1	0	N/A	N/A
986	CURB & SIDEWALK	2	05-09-2007	1 EA	0	1	0	N/A	N/A
			05-08-2006	1 EA	0	1	0	N/A	N/A
	Notes: cracks are present		06-28-2008	1 EA	0	1	0	N/A	N/A
988	MISCELLANEOUS	2	05-09-2007	1 EA	1	0	0	N/A	N/A
			05-08-2006	1 EA	1	0	0	N/A	N/A
	Notes: < none >		06-28-2008	1 EA	1	0	0	N/A	N/A
422	PAINTED BEAM ENDS	1	05-09-2007	2 EA	2	0	0	0	0
	Notes:		06-28-2008	2 EA	2	0	0	0	0

General Notes:

	NORTH	SOUTH
BENT 13	2-1/2"	0"
BENT 12	2"	1-1/2"
BENT 11	0"	1-1/2"
BENT 10	3/4	2"
BENT 9	1"	1-1/2"
PIER 8	1-3/4	1-3/4"
PIER 7	1-1/2"	2-1/4"
PIER 6	2"	6-1/2"
BENT 5	4"	3-1/4"
BENT 4	0"	0"
BENT 3	2-3/4"	0"
BENT 2	1 1/2"	3"

Inspector's Signature

Reviewer's Signature / Date

Mn/DOT BRIDGE INSPECTION REPORT

Inspector: DISTRICT2

BRIDGE 9090 **US 2 OVER RED RIVER & CITY ST** **INSP. DATE: 05-09-2007**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
234	CONCRETE CAP	2	05-09-2007	210 LF	210	0	0	0	N/A
			05-08-2006	210 LF	210	0	0	0	N/A
	Notes: Cracks in the west pier are at 1/16 inch wide.		06-28-2008	210 LF	210	0	0	0	N/A
387	CONCRETE WINGWALL	2	05-09-2007	4 EA	4	0	0	0	N/A
			05-08-2006	4 EA	4	0	0	0	N/A
	Notes: < none >		06-28-2008	4 EA	4	0	0	0	N/A
357	PACK RUST	2	05-09-2007	1 EA	1	0	0	0	N/A
			05-08-2006	1 EA	1	0	0	0	N/A
	Notes: < none >		06-28-2008	1 EA	1	0	0	0	N/A
358	CONC DECK CRACKING	2	05-09-2007	1 EA	1	0	0	0	N/A
			05-08-2006	1 EA	1	0	0	0	N/A
	Notes: Deck is cracked with leaching, and have been epoxied.		06-28-2008	1 EA	1	0	0	0	N/A
359	CONC DECK UNDERSIDE	2	05-09-2007	1 EA	0	0	0	1	0
			05-08-2006	1 EA	0	0	0	1	0
	Notes: Spalling aat numerous places in the approach spans @ CenterLine @ 2nd Floor Beam W. of E. pier. Concrete spalling out over Floor Beams @ the 3rd and 4th from W. pier with rebar exposed. Large spalls in deck soffet boh sides east approach span.		06-28-2008	1 EA	0	1	0	0	0
360	SETTLEMENT	2	05-09-2007	1 EA	1	0	0	N/A	N/A
			05-08-2006	1 EA	1	0	0	N/A	N/A
	Notes: Appears south end of west main pier has moved toward the river. There appears to be a dip at the joint above the second bent from the west. Is this Bent Footing settleing? This needs to be checked out.		06-28-2008	1 EA	1	0	0	N/A	N/A
363	SECTION LOSS	2	05-09-2007	1 EA	0	1	0	0	N/A
			05-08-2006	1 EA	0	1	0	0	N/A
	Notes: ***The through trusses were blasted & painted in 1996. The % rated down is to denote existing sect loss. This problem will be evaluated at the next snooper inspection.***		06-28-2008	1 EA	0	1	0	0	N/A
964	CRITICAL FINDING	2	05-09-2007	1 EA	1	0	N/A	N/A	N/A
			05-08-2006	1 EA	1	0	N/A	N/A	N/A
	Notes: DO NOT DELETE THIS CRITICAL FINDING SMART FLAG.		06-28-2008	1 EA	1	0	N/A	N/A	N/A
966	FRACTURE CRITICAL	2	05-09-2007	1 EA	1	0	0	N/A	N/A
			05-08-2006	1 EA	1	0	0	N/A	N/A
	Notes: Do Not Remove. See in-depth report for location of F/C members.		06-28-2008	1 EA	1	0	0	N/A	N/A
981	SIGNING	2	05-09-2007	1 EA	1	0	0	0	0
			05-08-2006	1 EA	1	0	0	0	0
	Notes:		06-28-2008	1 EA	1	0	0	0	0
982	GUARDRAIL	2	05-09-2007	1 EA	1	0	0	N/A	N/A
			05-08-2006	1 EA	1	0	0	N/A	N/A
	Notes: Minor damage to SE connection plate.		06-28-2008	1 EA	0	0	1	N/A	N/A
984	DRAINAGE	2	05-09-2007	1 EA	0	1	0	N/A	N/A
			05-08-2006	1 EA	0	1	0	N/A	N/A
	Notes: Downspouts missing on NE corner of the main span. Slope washouts @ E. River bank.		06-28-2008	1 EA	0	1	0	N/A	N/A

Mn/DOT BRIDGE INSPECTION REPORT

Inspector: DISTRICT2

BRIDGE 9090 **US 2 OVER RED RIVER & CITY ST** **INSP. DATE: 05-09-2007**

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
121	P/STL THRU TRUSS/BOT	2	05-09-2007	1,116 LF	1,116	0	0	0	0
			05-08-2006	1,116 LF	1,116	0	0	0	0
	Notes: Rust is beginning to form. There is scattered areas of surface pitting on the bottom cords and minor section loss with moderate pitting at the bottom panel point connections on the gusset plates and truss members (see photo 2003 FC report). Pack rust is forming at the gusset plates and batten plates on the bottom of the chords. The bolting plate @ the bottom of the 4th vert chord in the NW cor of the trusses is twisted down approx 1in. where cross brace ties in. The cross brace coming into this plate is also twisted. 3 cross bracing hanger rods are bent. The X-bracing on the SW cor of truss is also bent. Bott chord boxes are infested with pigeons. Several interior welds of the lower chord box members were inspected after blasting & cleaning-no defects were noted. There are some nuts missing on diag bracing hanger rods. Two broken hanger rods 1 at MN (east) Pier, 1 at ND (west) pier. ***The lower chord was blasted & painted in 1996. **A crack was detected by the FC inspectors on 9/12/07 @ SW corner of truss (gusset plate) @ lower cord. Consulted w/CO & was instructed to grind out crack and prime & apply Dow 888 to prevent rusting. Continue to monitor next 3 & 6 mos. Re-inspect in December 07 & again in March of 08. DSH.***Ground out crack was re-inspected on 11/19/07 by DSH and found to have no further propagation. 06-28-2008 1,116 837 279 0 0 0									
			06-28-2008	1,116 LF	1,116	0	0	0	0
126	P/STL THRU TRUSS/TOP	2	05-09-2007	1,116 LF	1,116	0	0	0	0
			05-08-2006	1,116 LF	1,116	0	0	0	0
	Notes: Rust Beginning to Form. Minimal sect loss on top chord verticals & diagonals. Pigeons nesting in upper chord box members. There are broken welds on the angle stiffeners on top of the inside gusset plates (deck height) @ the 1st panel points W of the NE & SE end posts. ***The through trusses were blasted & painted in 1996. ***								
152	PAINT STL FLOORBEAM	2	05-09-2007	1,380 LF	690	690	0	0	0
			05-08-2006	1,380 LF	690	690	0	0	0
	Notes: Rust Beginning to Form.Rust Beginning to Form. Rust stains on top flange of Flr Bm @ E pier. ***Floor beams were blasted & painted in 1996*** 06-28-2008 1,380 690 690 0 0 0 Top Flanges of the floor beam are rusting.								
161	PIN & HANGER-PAINTED	2	05-09-2007	56 EA	56	0	0	0	0
			05-08-2006	56 EA	56	0	0	0	0
	Notes: Rust Beginning to Form. Crack in Tack Weld on Nut to Hanger bottom pin 4th beam from north, 4th bent from the east. 2003 ultrasonic with no indications. 06-28-2008 56 EA 56 0 0 0 0								
311	EXPANSION BEARING	2	05-09-2007	148 EA	146	0	2	N/A	N/A
			05-08-2006	148 EA	146	0	2	N/A	N/A
	Notes: SW rocker is tipped all of the way toward the west. East rockers tipped slightly to the E. Base plates 3rd Beam from the N.@ E. expansion jt. & 3rd Beam from S. on N side @ W. expansion all are fractured. Bearings @ peirs 6, 7, & 8 have been blasted & painted. Rockers need adjusting. W. Pier rockers tipped away from river @ 40 degrees Base plate on No. one beam @ W. finger jt. also fractured on inside face. Two west bents have dirt piled up around the lower rackers, should be cleaned and greased. Bearings and pins need cleaning and greasing. Bearing holder plate is broken loose, crack between beam and Bearing Holder east finger Jt. 06-28-2008 110 102 8 0 N/A N/A								
313	FIXED BEARING	2	05-09-2007	18 EA	18	0	0	N/A	N/A
			05-08-2006	18 EA	18	0	0	N/A	N/A
	Notes: Abutment Bearings have been blasted and painted. 06-28-2008 18 EA 18 0 0 N/A N/A								
202	PAINT STL COLUMN	2	05-09-2007	72 EA	36	18	18	0	0
			05-08-2006	72 EA	36	18	18	0	0
	Notes: Four cotter keys missing 4th bent from the west, two cotter keys missing at the south facial beam 4th bent from the east. There appears to be a dip at the joint above the second bent from the west. is this bent settled? Needs an evaluation.								
210	CONCRETE PIER WALL	2	05-09-2007	210 LF	210	0	0	0	N/A
			05-08-2006	210 LF	210	0	0	0	N/A
	Notes: Cracks in Pier walls in the E & W piers. There is 6 feet of debris and soft silt at the bottom of the pier - 2004 underwater inspection. 06-28-2008 210LF 210 0 0 0 N/A								
215	CONCRETE ABUTMENT	2	05-09-2007	140 LF	140	0	0	0	N/A
			05-08-2006	140 LF	140	0	0	0	N/A
	Notes: Minor Hairline cracks @ W. abut. 1 sq. ft. of spall & deteriorated concrete @ S. end of W. Br/wall. 6 in X 6 in. X 2 in. deep spall in W. conc. flr. Bm @ S. end. Patch is coming out of conc. flr. Bm. @ N. end of SW. Bm. Water leaking through poured joint over parapets some cracking w/leaching of E. parapet. Horz. crack in S. half of W b/wall. Small spall in top of E. br./wall w/rebar expsed. 06-28-2008 140 LF 140 0 0 0 N/A								

FORM RC-TH Revised Apr 07	**Mn/DOT BRIDGE RATING AND LOAD POSTING REPORT FOR TRUNK HIGHWAYS**

Bridge Location and Description

Hwy. No. 2 (over) under RED RIVER + CITY ST. **Bridge No.** 9090

Year Built 1963 Year Remodeled _____ Replaces Br. _____

Type 303 County POLK Ref. Pt. _____

Description 2 TRUSS SPANS, 11 APPROACH SPANS, NO SKEW, TWO 28'-0" ROADWAYS, CONC. PARAPET BASE W/ 2 LINES OF METAL PIPE RAILING, NO SIDEWALKS, 4'-0" MEDIAN

Location EAST GRAND FORKS

Data for Basis of Report (Check all that apply.)

- ☐ Bridge Inventory File
- ☐ Previous Bridge Rating and Load Posting Report
- ☒ Bridge Plans
  - ☐ New ☒ Overlay (¼" SCARIFY AND 2" OVERLAY IN 1984)
  - ☐ Repair/Reconstruction _____
  - ☐ Other Dead Load Modifications _____
- ☐ Bridge Inspection Report, by _____ ,date _____
  - ☐ Damaged Component _____
  - ☐ Deteriorated Component _____

Type of Analysis:

☐ Manual ☒ Computer* ☐ BARS ☒ Virtis, V. 5.6.0 ☐ Other*

* TRUSS ANALYZED USING TRAP SOFTWARE
VIRTIS USED FOR FLOOR SYSTEM

Method of Rating (Check appropriate box)

- ☒ Load Factor (LF)
- ☐ Allowable Stress (AS)
- ☐ Load & Resistance Factor (LRFR)
- ☐ Load Testing
- ☐ No Rating Computations performed

Design Load HS - 20

Design Method ASD

Summary of Rating and Load Posting Analysis

Load Posting	Required ☐ / Not Required ☒			Bridge Rating	
Sign	TONS			Inventory	Operating
R12-1A ☐				15.2	25.4
R12-5 ☐	M3	M3S2	M3-3	Overweight Permit Code	
R12-X11 ☐		45		A 1	B 1 C 2

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature: Jon W. Siiter Date: 2/13/08

Typed or Printed Name: JON W. SIITER Reg. No. 25128

Revised on March, 08

Void 6/16 8/22/08

FORM RD-TH Revised Apr 07	**BRIDGE RATING DETAILS**

Bridge Type 303 | Bridge No. 9090

Rating Method LFD | Design Load: HS-20

Roadway Width 28'-0", 28'-0" | Inventory Rating: 15.2

☐ Curved, ☐ Tapered | Operating Rating: 25.4

Beam Spacing N/A | Rated RAM Checked JWS

Live Load Distribution Lane Width | Date 2/19/08

Single LEVER RULE Multiple _____ | Sheet 2 of 5

SEE SHEET 3 OF 5 FOR TRUSS ELEVATION AND LABELING.

MEMBER L6-U5 CONTROLS

BEAM ELEVATION ②

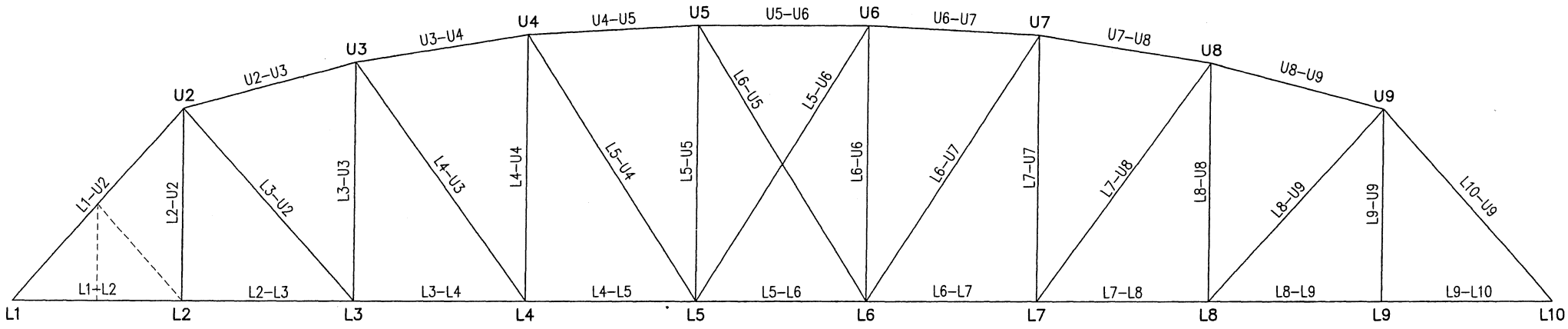
Show span lengths, structure / beam depths.

Truck	Rating Factor	Location	Limit State ①	Notes / Comments
HS 20 Inventory	0.76	1.0	COMPRESSION	
HS 20 Operating	1.27	↓	↓	
Standard A	1.16	↓	↓	
Standard B	1.04	↓	↓	
Standard C ③	0.98	↓	↓	
Standard P 411 ③	0.95	↓	↓	
Standard P 413 ③	0.91	↓	↓	

① Choose from: service or ultimate; shear or moment

② Elevation may be on back or another sheet if it won't fit here.

③ If the bridge needs posting, change these trucks to the posting trucks.


U2
U3
U4
U5
U6
U7
U8
U9
U2–U3
U3–U4
U4–U5
U5–U6
U6–U7
U7–U8
U8–U9
L1–U2
L2–U2
L3–U2
L3–U3
L4–U3
L4–U4
L5–U4
L5–U5
L6–U5
L5–U6
L6–U6
L6–U7
L7–U7
L7–U8
L8–U8
L8–U9
L9–U9
L10–U9
L1+L2
L2–L3
L3–L4
L4–L5
L5–L6
L6–L7
L7–L8
L8–L9
L9–L10
L1
L2
L3
L4
L5
L6
L7
L8
L9
L10

Form TusssR	Bridge Rating Details		Bridge No: 9090
		Rated RAM	Date 2/13/08
		Checked JWS	Sheet 4 of 5

Member	Inventory	Operating	Location / Comments
Stringer			
FASCIA	1.25	2.09	
INTERIOR	1.06	1.78	
Floor Beam			
END F.B. 1	1.54	2.57	
INT. F.B.'s	0.92	1.54	
END F.B. 10	1.52	2.54	
Truss			
L1-L2	8.01	13.36	
L2-L3	2.71	4.53	
L3-L4	1.12	1.87	
L4-L5	1.13	1.88	
L5-L6	1.18	1.97	
L6-L7	1.13	1.89	
L7-L8	1.13	1.89	
L8-L9	2.28	3.80	
L9-L10	2.28	3.80	
U2-U3	1.23	2.06	
U3-U4	1.10	1.84	
U4-U5	1.19	1.98	
U5-U6	1.20	2.00	
U6-U7	1.19	1.99	
U7-U8	1.11	1.85	
U8-U9	1.25	2.08	
L2-U2	3.36	5.62	
L3-U3	2.22	3.71	
L4-U4	3.60	6.01	
L5-U5	4.64	7.74	
L6-U6	24.26	40.49	
L7-U7	3.57	5.95	
L8-U8	2.20	3.67	

Form TusssR	Bridge Rating Details		Bridge No: 9090
		Rated RAM	Date 2/13/08
		Checked JWS	Sheet 5 of 5

Member	Inventory	Operating	Location / Comments
Stringer			
Floor Beam			
Truss			
L9-U9	2.48	4.14	
L1-U2	1.01	1.68	
L3-U2	2.76	4.61	
L4-U3	2.16	3.60	
L5-U4	2.36	3.94	
L5-U6	N/A	N/A	
L6-U5	0.76	1.27	
L6-U7	1.74	2.90	
L7-U8	1.49	2.50	
L8-U9	1.20	2.01	
L10-U9	0.89	1.48	

Mn/DOT Structure Inventory Report

Bridge ID: 9090 **US 2 over RED RIVER & CITY ST** Date: 02/22/2008

+ GENERAL +

Agency Br. No.
District 2 **Maint. Area** 2B
County 60 - POLK
City EAST GRAND FORKS
Township
Desc. Loc. AT N DAKOTA STATE LINE
Sect., Twp., Range 02 - 151N - 50W
Latitude 47d 55m 59.78s
Longitude 97d 02m 13.84s
Custodian STATE HWY
Owner STATE HWY
Inspection By DISTRICT 2
BMU Agreement No.
Year Built 1963
Year Fed Rehab
Year Remodeled
Temp
Plan Avail. CENTRAL

+ STRUCTURE +

Service On HWY;PED
Service Under HWY;STREAM
Main Span Type STEEL HIGH TRUSS
Main Span Detail PARKER
Appr. Span Type STEEL BM SPAN
Appr. Span Detail
Skew
Culvert Type
Barrel Length
Number of Spans
MAIN: 2 APPR: 11 TOTAL: 13
Main Span Length 279.0 ft
Structure Length 1,261.0 ft
Deck Width 65.0 ft
Deck Material C-I-P CONCRETE
Wear Surf Type LOW SLUMP CONC
Wear Surf Install Year 1984
Wear Course/Fill Depth 0.17 ft
Deck Membrane NONE
Deck Rebars N/A
Deck Rebars Install Year
Structure Area 81,965 sq ft
Roadway Area 70,611 sq ft
Sidewalk Width - L/R 2.5 ft 2.5 ft
Curb Height - L/R 0.75 ft 0.75 ft
Rail Codes - L/R 19 19

+ ROADWAY +

Bridge Match ID (TIS) 1
Roadway O/U Key 1-ON
Route Sys/Nbr USTH 2
Roadway Name or Description
US 2
Roadway Function MAINLINE
Roadway Type 2 WAY TRAF
Control Section (TH Only) 6018
Ref. Point (TH Only) 000+00.000
Date Opened to Traffic 01-01-1963
Detour Length 2 mi.
Lanes 4 Lanes ON Bridge
ADT (YEAR) 21,500 (2004)
HCADT 1,935
Functional Class. URB/OTH PR ART

+ RDWY DIMENSIONS +

If Divided	NB-EB	SB-WB
Roadway Width	28.0 ft	28.0 ft
Vertical Clearance	19.9 ft	19.9 ft
Max. Vert. Clear.	19.9 ft	19.9 ft
Horizontal Clear.	28.0 ft	28.0 ft
Lateral Clr. - Lt/Rt		
Appr. Surface Width	60.0 ft	
Roadway Width	56.0 ft	
Median Width	4.0 ft	

+ MISC. BRIDGE DATA +

Structure Flared NO
Parallel Structure NONE
Field Conn. ID RIVETED
Cantilever ID PIN & HINGE
Foundations
Abut. CONC - FTG PILE
Pier STEEL - FTG PILE

+ PAINT +

Year Painted 1996 **Pct. Unsound** 5 %
Painted Area 183,102 sf
Primer Type OTHER
Finish Type URETHANE

+ BRIDGE SIGNS +

Posted Load NOT REQUIRED
Traffic NOT REQUIRED
Horizontal OBJECT MARKERS
Vertical NOT REQUIRED

+ INSPECTION +

Deficient Status ADEQ
Sufficiency Rating 83.4
Last Inspection Date 05-09-2007
Inspection Frequency 12
Inspector Name DISTRICT2
Structure A-OPEN

+ CONDITION CODES +

Deck	6
Superstructure	7
Substructure	6
Channel	7
Culvert	N

+ APPRAISAL RATINGS +

Structure Evaluation	6
Deck Geometry	5
Underclearances	4
Waterway Adequacy	6
Approach Alignment	7

+ SAFETY FEATURES +

Bridge Railing	1-MEETS STANDARDS
Appr. Guardrail	1-MEETS STANDARDS
GR Transition	1-MEETS STANDARDS
GR Termini	1-MEETS STANDARDS

+ IN DEPTH INSP. +

Frac. Critical	Y	24 mo	06/2007
Underwater	Y	60 mo	07/2004
Pinned Asbly.	Y	48 mo	06/2007
Spec. Feat.			

+ WATERWAY +

Drainage Area
Waterway Opening 29000 sq ft
Navigation Control NO PRMT REQD
Pier Protection
Nav. Vert./Horz. Clr.
Nav. Vert. Lift Bridge Clear.
MN Scour Code L-STBL;LOW RISK
Scour Evaluation Year 1997

+ CAPACITY RATINGS +

Design Load HS20
Operating Rating HS 35.4
Inventory Rating HS 21.3
Posting
Rating Date 11-01-1995
Mn/DOT Permit Codes
A: 1 B: 1 C: 1

Overall Summary

FINAL RATING SUMMARY TABLE FOR BRIDGE NO. 9090 (USING A 95% MnDOT MODIFIER, Ψ)							COMPLETED BY: RAM DATE: 03-12-08		CHECKED BY: CJM DATE: 03-20-08	
Bridge Members	**HS Inventory**	**HS Operating**	**Standard A**	**Standard B**	**Standard C**	**P411**	**P413**	**Type M3**	**Type M3-S2**	**Type M3-3**
End Floorbeam @ L1	1.43	2.39	2.65	2.04	1.91	1.94	2.06	3.09	3.30	3.45
Int. Floorbeam @ L2-L9	0.82	1.37	1.26	1.11	1.04	0.96	1.03	1.84	1.94	1.94
End Floorbeam @ L10	1.41	2.36	2.65	2.02	1.93	1.94	2.03	3.09	3.27	3.42
Fascia Stringer	1.17	1.96	1.85	1.45	1.35	1.51	1.45	2.27	2.47	2.30
Interior Stringer	1.00	1.66	1.57	1.23	1.15	1.28	1.23	1.93	2.09	1.95
Truss (Member L6-U5)	0.80	1.34	1.22	1.10	1.03	1.00	0.96	2.01	1.54	1.46

COMPUTED BY VIRTIS SOFTWARE

5% CRF is for truss only

Floor beams and stringers have good condition based on 2007 FCM report, no LOS were recorded. YG @ 9/3/08

bridge controlled by Truss

USING 100% MNDOT MODIFIER

FINAL RATING SUMMARY TABLE FOR BRIDGE NO. 9090

							COMPLETED BY: RAM		CHECKED BY: CJM	
							DATE: 01-31-08		DATE: 02-13-08	
Bridge Members	**HS Inventory**	**HS Operating**	**Standard A**	**Standard B**	**Standard C**	**P411**	**P413**	**Type M3**	**Type M3-S2**	**Type M3-3**
End Floorbeam @ L1	1.54	2.57	2.85	2.20	2.05	2.09	2.21	3.32	3.55	3.71
Int. Floorbeam @ L2-L9	0.92	1.54	1.41	1.24	1.16	1.07	1.15	2.06	2.18	2.17
End Floorbeam @ L10	1.52	2.54	2.85	2.17	2.08	2.09	2.18	3.32	3.51	3.67
Fascia Stringer	1.25	2.09	1.98	1.55	1.45	1.61	1.55	2.43	2.64	2.46
Interior Stringer	1.06	1.78	1.68	1.32	1.23	1.37	1.32	2.06	2.24	2.09
~~Truss (Member L6-U5)~~	~~0.76~~	~~1.27~~	~~1.16~~	~~1.04~~	~~0.98~~	~~0.95~~	~~0.91~~	~~1.91~~	~~1.46~~	~~1.39~~

COMPUTED BY VIRTIS SOFTWARE

used for final rating. YG @ 9/20/08

Yihong Gao - RE: 9090

From: "Jon Siiter" <Jon.Siiter@lhbcorp.com>
To: "Yihong Gao" <Yihong.Gao@dot.state.mn.us>
Date: 9/3/2008 9:05 AM
Subject: RE: 9090
CC: "Joe Litman" <Joe.Litman@lhbcorp.com>

Hi, Yihong. Regarding your question on Bridge 9090 (Kennedy Bridge in East Grand Forks): We believe those additional members were fabricated in the position shown as a temporary bearing location at L 1/2 to aid in field erection of the bridge. In fact, we modeled the truss with support at L ½ & L0' and were able to match the loads in the truss members very closely. With supports at L0 and L0' (as the truss exists currently), there is very little load in those additional members. It appears the design intent was for symmetrical behavior in the final position.

If you look through the old plans you will notice that the adjacent members (bottom chord from L0 to L1, for instance) are much heavier than their counterparts on the opposite end of the bridge. Since the bridge is mostly geometrically symmetrical it behaves symmetrical when the supports are at L0 & L0'. Leaving those additional members out of the final analysis gives us conservative results at the L0 end, and the results at the L0' end control anyway since those members are smaller sections. It also allows for symmetrical assumption for coincidental load calculations as the influence ordinates for members in similar positions are the same.

Sorry for the long explanation, but I hope this helps. You are correct in recalling that we discussed this in our meeting last spring. It was towards the end, though, and we may not have held a clear discussion at the time. Give me a call with any further questions. Thanks.

From: Yihong Gao [mailto:Yihong.Gao@dot.state.mn.us]
Sent: Wednesday, September 03, 2008 8:03 AM
To: Jon Siiter
Subject: 9090

Hi Jon,

I am making a summary for each truss bridge and working on 9090 right now. I have a question on members at mid point of L1-L2 and L1-U2. You ignore these two members in the model for DL and LL but it seems these two members were carrying the loads for original design. I think we had a discussion on this issue but can not remember what was the reason for excluding them. Do you remember the reason? Thanks

Yihong

Yihong Gao, PE
Design Engineer
Bridge Office
Minnesota Department of Transportation
T... 651)366-4492
Fa... (651)366-4509

FINAL RATING SUMMARY TABLE FOR BRIDGE NO. 9090 (USING A 85% MnDOT MODIFIER, Ω)							COMPLETED BY: RAM DATE: 03-12-08		CHECKED BY: CJM DATE: 03-20-08	
Bridge Members	**HS Inventory**	**HS Operating**	**Standard A**	**Standard B**	**Standard C**	**P411**	**P413**	**Type M3**	**Type M3-S2**	**Type M3-3**
End Floorbeam @ L1	1.22	2.03	2.26	1.74	1.62	1.65	1.75	2.62	2.81	2.93
Int. Floorbeam @ L2-L9	0.63	1.04	0.96	0.84	0.79	0.73	0.78	1.40	1.48	1.47
End Floorbeam @ L10	1.20	2.01	2.26	1.72	1.65	1.65	1.73	2.62	2.78	2.91
Fascia Stringer	0.96	1.60	1.51	1.18	1.11	1.23	1.19	1.85	2.02	1.88
Interior Stringer	0.81	1.36	1.28	1.00	0.94	1.04	1.00	1.56	1.70	1.59
Truss (Member L6-U5)	0.72	1.19	1.09	0.98	0.92	0.89	0.86	1.79	1.38	1.31

COMPUTED BY VIRTIS SOFTWARE

LOAD AND RATING SUMMARY TABLE FOR BRIDGE NO. 9090 (USING A 95% MnDOT MODIFIER, Ψ)

COMPLETED BY: RAM | DATE: 03-12-08 | CHECKED BY: CJM | DATE: 03-20-08

NOTE THAT NODE AND MEMBER LABELS DO NOT MATCH ORIGINAL PLAN - SOFTWARE USED REQUIRES FIRST NODE TO BE L1 INSTEAD OF L0. SEE ANALYSIS DATA FOR DRAWING SHOWING MEMBER/JOINT LABELS USED BELOW.

	BOTTOM CHORD									TOP CHORD							VERTICAL MEMBERS								DIAGONAL MEMBERS							
Members	L1-L2	L2-L3	L3-L4	L4-L5	L5-L6	L6-L7	L7-L8	L8-L9	L9-L10	U2-U3	U3-U4	U4-U5	U5-U6	U6-U7	U7-U8	U8-U9	L2-U2	L3-U3	L4-U4	L5-U5	L6-U6	L7-U7	L8-U8	L9-U9	L1-U2	L3-U2	L4-U3	L5-U4	L5-U6	L6-U5	L6-U7	L7-U8	L8-U9	L10-U9
Gross Area (in^2)	114.50	58.25	58.25	67.25	73.25	67.25	58.25	58.25	58.25	67.25	73.25	79.25	79.25	79.25	73.25	67.25	28.22	28.22	28.22	28.22	28.22	28.22	28.22	28.22	73.25	41.01	22.63	18.80	18.80	18.80	18.80	18.80	28.22	73.25
Net Area (in^2)	107.50	49.38	49.38	56.88	61.88	56.88	49.38	49.38	49.38	67.25	73.25	79.25	79.25	79.25	73.25	67.25	28.22	28.22	28.22	24.90	24.90	28.22	28.22	24.90	73.25	31.60	19.31	16.06	16.06	16.06	16.06	16.06	24.90	73.25
Steel Yield Strength (ksi)	36.0	36.0	36.0	36.0	36.0	36.0	36.0	33.0	33.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	42.0	36.0	40.0	40.0	33.0	33.0	33.0	40.0	36.0	40.0
Steel Tensile Strength (ksi)	58.0	58.0	58.0	58.0	58.0	58.0	58.0	60.0	60.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	63.0	58.0	60.0	60.0	60.0	60.0	60.0	60.0	58.0	63.0
KL/r	55.61	42.49	42.49	41.75	42.33	41.75	42.49	42.49	42.49	43.23	42.87	42.01	41.95	42.01	42.87	43.23	77.49	95.94	107.01	110.70	110.70	107.01	95.94	77.49	63.83	101.64	161.45	178.51	182.90	182.90	178.51	165.64	103.52	63.83
Impact	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.267	1.300 1.138	1.250 1.153	1.217 1.168	1.145	1.250 1.153	1.300 1.138	1.267	1.124	1.138 1.300	1.152 1.250	1.168 1.216		1.189 1.189	1.168 1.216	1.152 1.250	1.138 1.300	1.124
Service Dead Load (kips)	735.90	735.90	1036.00	1193.50	1282.30	1190.90	1031.60	729.60	729.60	-1072.80	-1208.90	-1284.20	-1281.50	-1283.40	-1206.30	-1068.20	179.50	-162.30	-44.00	40.50	39.20	-47.10	-165.40	172.70	-1109.90	452.70	270.60	164.50	0.00	-1.50	167.70	273.90	455.40	-1100.50
Service Live Load + Impact (kips)																																		
HS-20 (max.)	159.08	159.08	224.87	259.20	278.39	259.20	224.87	159.08	159.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	114.57	66.53	71.08	68.76	15.00	71.08	66.53	114.57	0.00	124.26	99.45	90.80	0.00	73.64	90.80	99.45	124.26	0.00
HS-20 (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-232.84	-262.55	-278.79	-278.39	-278.79	-262.55	-232.84	0.00	-65.01	-53.94	-51.17	0.00	-53.94	-65.01	0.00	-257.81	-38.17	-56.74	-61.03	0.00	-73.64	-61.03	-56.74	-38.17	-257.81
Standard A Truck (max.)	152.49	152.49	215.10	247.49	265.26	247.49	215.10	152.49	152.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	118.31	71.77	78.65	77.20	14.29	78.65	71.77	118.31	0.00	120.85	100.30	95.07	0.00	80.53	95.07	100.30	120.85	0.00
Standard A Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-222.73	-250.68	-265.65	-265.26	-265.65	-250.68	-222.73	0.00	-68.45	-59.53	-57.46	0.00	-59.53	-68.45	0.00	-240.96	-37.41	-60.84	-67.44	0.00	-80.53	-67.44	-60.84	-37.41	-240.96
Standard B Truck (max.)	168.21	168.21	237.16	273.06	292.25	273.06	237.16	168.21	168.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124.97	78.20	87.22	86.34	15.75	87.22	78.20	124.97	0.00	133.48	111.25	105.77	0.00	89.76	105.77	111.25	133.48	0.00
Standard B Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-245.57	-276.59	-292.68	-292.25	-292.68	-276.59	-245.57	0.00	-76.40	-66.71	-64.26	0.00	-66.71	-76.40	0.00	-264.67	-39.11	-66.04	-74.68	0.00	-89.76	-74.68	-66.04	-39.11	-264.67
Standard C Truck (max.)	178.80	178.80	252.17	290.14	310.38	290.14	252.17	178.80	178.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	128.75	81.24	92.53	92.13	16.72	92.53	81.24	128.75	0.00	141.90	118.41	112.60	0.00	95.40	112.60	118.41	141.90	0.00
Standard C Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-261.11	-293.89	-310.83	-310.38	-310.83	-293.89	-261.11	0.00	-81.61	-71.30	-68.42	0.00	-71.30	-81.61	0.00	-280.64	-40.79	-68.62	-79.00	0.00	-95.40	-79.00	-68.62	-40.79	-280.64
P411 Truck (max.)	194.90	194.90	274.55	313.64	334.41	313.64	274.55	194.90	194.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	133.83	76.90	91.49	95.71	18.02	91.49	76.90	133.83	0.00	153.38	127.03	119.22	0.00	98.72	119.22	127.03	153.38	0.00
P411 Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-284.29	-317.68	-334.90	-334.41	334.90	-317.68	-284.29	0.00	-87.88	-75.64	-70.47	0.00	-75.64	-87.88	0.00	-304.93	-42.21	-64.73	-77.62	0.00	-98.72	-77.62	-64.73	-42.21	-304.93
P413 Truck (max.)	211.13	211.13	296.00	338.77	362.16	338.77	296.00	211.13	211.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	129.39	79.24	92.36	99.19	19.51	92.36	79.24	129.39	0.00	164.92	135.75	126.33	0.00	102.22	126.33	135.75	164.92	0.00
P413 Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-306.49	-343.14	-362.69	-362.16	-362.69	-343.14	-306.49	0.00	-93.97	-79.78	-72.95	0.00	-79.78	-93.97	0.00	-329.41	-39.97	-66.73	-78.37	0.00	-102.22	-78.37	-66.73	-39.97	-329.41
Type M3 Vehicle (max.)	71.92	71.92	101.21	115.98	124.31	115.98	101.21	71.92	71.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	85.10	47.86	50.47	48.54	6.70	50.47	47.86	85.10	0.00	58.90	52.41	53.30	0.00	48.99	53.30	52.41	58.90	0.00
Type M3 Vehicle (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-104.80	-117.47	-124.49	-124.31	-124.49	-117.47	-104.80	0.00	-38.11	-35.80	-36.12	0.00	-35.80	-38.11	0.00	-108.47	-28.83	-40.82	-43.34	0.00	-48.99	-43.34	-40.82	-28.83	-108.47
Type M3S2 Vehicle (max.)	98.75	98.75	138.22	159.02	169.94	159.02	138.22	98.75	98.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	87.43	55.11	63.19	63.19	9.16	63.19	55.11	87.43	0.00	80.30	70.75	70.94	0.00	63.79	70.94	70.75	80.30	0.00
Type M3S2 Vehicle (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-143.12	-161.08	-170.19	-169.94	-170.19	-161.08	-143.12	0.00	-51.44	-47.65	-47.03	0.00	-47.65	-51.44	0.00	-148.94	-24.52	-46.75	-54.26	0.00	-63.79	-54.26	-46.75	-24.52	-148.94
Type M3-3 Vehicle (max.)	107.19	107.19	149.87	171.00	183.39	171.00	149.87	107.19	107.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.95	54.60	65.22	66.69	9.88	65.22	54.60	81.95	0.00	86.84	76.13	75.77	0.00	67.32	75.77	76.13	86.84	0.00
Type M3-3 Vehicle (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-155.19	-173.21	-183.65	-183.39	-183.65	-173.21	-155.19	0.00	-55.35	-50.89	-49.63	0.00	-50.89	-55.35	0.00	-161.67	-24.18	-45.75	-56.01	0.00	-67.32	-56.01	-45.75	-24.18	-161.67
Factored Dead Load Stress (ksi)	8.36	16.42	23.12	23.07	22.76	23.02	23.02	16.28	16.28	-20.74	-21.45	-21.07	-21.02	-21.05	-21.41	-20.65	8.27	-7.48	-2.03	1.87	1.81	-2.17	-7.62	7.96	-19.70	14.35	15.54	11.38	0.00	-0.10	11.60	18.94	20.98	-19.53
Factored Live Load Stresses (ksi)																																		
HS-20 Inventory	3.01	5.93	8.38	8.36	8.25	8.36	8.38	5.93	5.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.81	5.12	5.47	5.29	1.15	5.47	5.12	8.81	0.00	6.58	9.54	10.48	0.00	8.50	10.48	11.48	9.56	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-7.51	-7.78	-7.63	-7.62	-7.63	-7.78	-7.51	0.00	-5.00	-4.15	-3.93	0.00	-4.15	-5.00	0.00	-7.64	-2.02	-5.44	-7.04	0.00	-8.50	-7.04	-6.55	-2.94	-7.64
HS-20 Operating	1.81	3.55	5.02	5.01	4.94	5.01	5.02	3.55	3.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.28	3.06	3.27	3.17	0.69	3.27	3.06	5.28	0.00	3.94	5.71	6.28	0.00	5.09	6.28	6.88	5.72	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-4.50	-4.66	-4.57	-4.57	-4.57	-4.66	-4.50	0.00	-2.99	-2.48	-2.36	0.00	-2.48	-2.99	0.00	-4.58	-1.21	-3.26	-4.22	0.00	-5.09	-4.22	-3.92	-1.76	-4.58
Standard A Truck	1.73	3.40	4.80	4.78	4.71	4.78	4.80	3.40	3.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.45	3.31	3.62	3.56	0.66	3.62	3.31	5.45	0.00	3.83	5.76	6.57	0.00	5.57	6.57	6.94	5.57	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-4.31	-4.45	-4.36	-4.35	-4.36	-4.45	-4.31	0.00	-3.15	-2.74	-2.65	0.00	-2.74	-3.15	0.00	-4.28	-1.19	-3.50	-4.66	0.00	-5.57	-4.66	-4.21	-1.72	-4.28
Standard B Truck	1.91	3.75	5.29	5.28	5.19	5.28	5.29	3.75	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.76	3.60	4.02	3.98	0.73	4.02	3.60	5.76	0.00	4.23	6.39	7.31	0.00	6.21	7.31	7.69	6.15	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-4.75	-4.91	-4.80	-4.79	-4.80	-4.91	-4.75	0.00	-3.52	-3.07	-2.96	0.00	-3.07	-3.52	0.00	-4.70	-1.24	-3.79	-5.16	0.00	-6.21	-5.16	-4.57	-1.80	-4.70
Standard C Truck	2.03	3.99	5.63	5.61	5.51	5.61	5.63	3.99	3.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.93	3.74	4.26	4.24	0.77	4.26	3.74	5.93	0.00	4.50	6.80	7.79	0.00	6.60	7.79	8.19	6.54	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5.05	-5.22	-5.10	-5.09	-5.10	-5.22	-5.05	0.00	-3.76	-3.28	-3.15	0.00	-3.28	-3.76	0.00	-4.98	-1.29	-3.94	-5.46	0.00	-6.60	-5.46	-4.75	-1.88	-4.98
P411 Truck	2.21	4.35	6.13	6.06	5.93	6.06	6.13	4.35	4.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.17	3.54	4.21	4.41	0.83	4.21	3.54	6.17	0.00	4.86	7.30	8.24	0.00	6.83	8.24	8.78	7.07	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5.50	-5.64	-5.49	-5.49	5.49	-5.64	-5.50	0.00	-4.05	-3.48	-3.25	0.00	-3.48	-4.05	0.00	-5.41	-1.34	-3.72	-5.37	0.00	-6.83	-5.37	-4.48	-1.94	-5.41
P413 Truck	2.40	4.71	6.61	6.55	6.43	6.55	6.61	4.71	4.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.96	3.65	4.25	4.57	0.90	4.25	3.65	5.96	0.00	5.23	7.80	8.74	0.00	7.07	8.74	9.39	7.60	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5.92	-6.09	-5.95	-5.94	-5.95	-6.09	-5.92	0.00	-4.33	-3.68	-3.36	0.00	-3.68	-4.33	0.00	-5.85	-1.27	-3.83	-5.42	0.00	-7.07	-5.42	-4.61	-1.84	-5.85
Type M3 Vehicle	0.82	1.61	2.26	2.24	2.21	2.24	2.26	1.61	1.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92	2.20	2.32	2.24	0.31	2.32	2.20	3.92	0.00	1.87	3.01	3.69	0.00	3.39	3.69	3.62	2.71	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-2.03	-2.08	-2.04	-2.04	-2.04	-2.08	-2.03	0.00	-1.76	-1.65	-1.66	0.00	-1.65	-1.76	0.00	-1.93	-0.91	-2.34	-3.00	0.00	-3.39	-3.00	-2.82	-1.33	-1.93
Type M3S2 Vehicle	1.12	2.20	3.08	3.07	3.02	3.07	3.08	2.20	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.03	2.54	2.91	2.91	0.42	2.91	2.54	4.03	0.00	2.55	4.06	4.91	0.00	4.41	4.91	4.89	3.70	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-2.77	-2.86	-2.79	-2.79	-2.79	-2.86	-2.77	0.00	-2.37	-2.20	-2.17	0.00	-2.20	-2.37	0.00	-2.64	-0.78	-2.69	-3.75	0.00	-4.41	-3.75	-3.23	-1.13	-2.64
Type M3-3 Vehicle	1.22	2.39	3.34	3.31	3.25	3.31	3.34	2.39	2.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.78	2.52	3.00	3.07	0.46	3.00	2.52	3.78	0.00	2.75	4.37	5.24	0.00	4.66	5.24	5.26	4.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-3.00	-3.07	-3.01	-3.01	-3.01	-3.07	-3.00	0.00	-2.55	-2.34	-2.29	0.00	-2.34	-2.55	0.00	-2.87	-0.77	-2.63	-3.87	0.00	-4.66	-3.87	-3.16	-1.11	-2.87
Member Capacity Gross Tension (kips) (.95*Fy*Ag*Ψ)	3720.11	1892.54	1892.54	2184.95	2379.89	2184.95	1892.54	1734.83	1734.83	2549.11	2776.54	3003.97	3003.97	3003.97	2776.54	2549.11	1069.68	840.46	840.46	840.46	840.46	840.46	840.46	840.46	2776.54	1332.41	816.94	678.68	559.91	559.91	559.91	678.68	916.87	2644.33
Member Capacity Gross Compression (kips) (.85*Fcr*Ag*Ψ)	3004.85	1597.21	1597.20	1847.81	2009.40	1847.81	1597.20	1471.44	1471.44	2124.42	2316.78	2513.75	2514.24	2513.75	2316.78	2124.42	746.25	552.48	503.78	486.37	486.37	503.78	552.48	621.84	2112.96	804.90	200.65	136.36	129.89	129.89	136.36	158.37	608.62	2029.18
Member Capacity Net Tension (kips) (.8*Fu*An*Ψ)	4738.60	2176.67	2176.67	2507.27	2727.67	2507.27	2176.67	2251.73	2251.73	3219.93	3507.21	3794.49	3794.49	3794.49	3507.21	3219.93	1351.17	1286.83	1286.83	1135.44	1135.44	1286.83	1286.83	1135.44	3507.21	1392.93	880.54	732.34	732.34	732.34	732.34	732.34	1097.59	3507.21
Member Capacity Net Compression (kips)																																		
Rating Factors																																		
HS-20 (inv.)	8.01	2.71	1.12	1.13	1.18	1.13	1.13	2.28	2.28	1.44	1.31	1.40	1.40	1.40	1.31	1.46	3.36	2.42	3.82	4.85	24.26	3.78	2.39	2.48	1.20	2.76	2.16	2.36	n/a	0.80	1.74	1.49	1.20	1.07
HS-20 (oper.)	13.36	4.53	1.87	1.88	1.97	1.89	1.89	3.80	3.80	2.41	2.18	2.33	2.34	2.33	2.19	2.43	5.62	4.04	6.37	8.10	40.49	6.31	3.99	4.14	2.00	4.61	3.60	3.94	n/a	1.34	2.90	2.50	2.01	1.79
Standard A Truck (a)	13.94	4.72	1.95	1.97	2.07	1.98	1.97	3.97	3.97	2.52	2.29	2.44	2.46	2.45	2.30	2.54	5.44	3.84	5.77	7.22	42.50	5.72	3.79	4.00	2.14	4.74	3.57	3.76	n/a	1.22	2.77	2.47	2.07	1.91
Standard B Truck (a)	12.64	4.28	1.77	1.78	1.88	1.79	1.79	3.60	3.60	2.29	2.07	2.22	2.23	2.22	2.08	2.30	5.15	3.44	5.15	6.45	38.56	5.10	3.40	3.79	1.95	4.29	3.22	3.38	n/a	1.10	2.49	2.23	1.87	1.74
Standard C Truck (a)	11.89	4.03	1.66	1.68	1.77	1.69	1.68	3.38	3.38	2.15	1.95	2.09	2.10	2.09	1.96	2.17	5.00	3.22	4.82	6.06	36.32	4.77	3.18	3.68	1.84	4.03	3.02	3.18	n/a	1.03	2.34	2.10	1.76	1.64
P411 Truck (a)	10.91	3.69	1.53	1.55	1.64	1.56	1.55	3.10	3.10	1.97	1.80	1.94	1.95	1.94	1.81	1.99	4.81	2.99	4.54	5.88	33.70	4.50	2.95	3.54	1.69	3.73	2.82	3.00	n/a	1.00	2.21	1.95	1.63	1.51
P413 Truck (a)	10.07	3.41	1.42	1.44	1.51	1.45	1.43	2.86	2.86	1.83	1.67	1.79	1.80	1.79	1.68	1.85	4.97	2.80	4.31	5.68	31.13	4.27	2.76	3.66	1.56	3.47	2.64	2.83	n/a	0.96	2.08	1.83	1.52	1.40
Type M3 Vehicle	29.56	10.01	4.15	4.20	4.41	4.22	4.19	8.41	8.41	5.36	4.88	5.22	5.25	5.22	4.90	5.40	7.56	6.89	9.60	11.48	90.64	9.51	6.81	5.57	4.75	9.72	6.83	6.71	n/a	2.01	4.93	4.74	4.24	4.24
Type M3S2 Vehicle	21.53	7.29	3.04	3.06	3.23	3.08	3.07	6.13	6.13	3.92	3.56	3.82	3.84	3.82	3.57	3.95	7.36	5.11	7.21	8.82	66.30	7.14	5.05	5.42	3.46	7.13	5.06	5.04	n/a	1.54	3.71	3.51	3.11	3.09
Type M3-3 Vehicle	19.83	6.72	2.80	2.85	2.99	2.86	2.83	5.64	5.64	3.62	3.31	3.54	3.56	3.54	3.32	3.65	7.85	4.75	6.75	8.35	61.47	6.69	4.69	5.78	3.19	6.59	4.70	4.72	n/a	1.46	3.47	3.26	2.88	2.85
Controlling Condition	Tension	Tension	Tension	Tension	Tension	Tension	Tension	Tension	Tension	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Tension	Comp.	Comp.	Comp.	Tension	Comp.	Comp.	Tension	Comp.	Tension	Tension	Tension	n/a	Comp.	Tension	Tension	Tension	Comp.
Inventory Rating	160.1	54.2	22.4	22.5	23.6	22.6	22.6	45.6	45.6	28.9	26.2	27.9	28.1	27.9	26.3	29.1	67.3	48.4	76.3	97.1	485.1	75.6	47.8	49.6	24.0	55.2	43.1	47.2	n/a	16.0	34.7	29.9	24.1	21.4
Operating Rating	267.3	90.5	37.3	37.6	39.4	37.8	37.7	76.0	76.0	48.2	43.7	46.6	46.9	46.6	43.9	48.6	112.3	80.8	127.4	162.1	809.7	126.2	79.9	82.7	40.0	92.1	72.0	78.8	n/a	26.7	57.9	49.9	40.2	35.7

(a) Indicates the lane closest to the truss occupied by a permit truck and remaining three lanes occupied by HS trucks

LOAD AND RATING SUMMARY TABLE FOR BRIDGE NO. 9090 (USING A 85% MnDOT MODIFIER, Ω)

COMPLETED BY: RAM | DATE: 03-12-08 | CHECKED BY: CJM | DATE: 03-20-08

NOTE THAT NODE AND MEMBER LABELS DO NOT MATCH ORIGINAL PLAN - SOFTWARE USED REQUIRES FIRST NODE TO BE L1 INSTEAD OF L0. SEE ANALYSIS DATA FOR DRAWING SHOWING MEMBER/JOINT LABELS USED BELOW.

	BOTTOM CHORD									TOP CHORD							VERTICAL MEMBERS								DIAGONAL MEMBERS								
Members	L1-L2	L2-L3	L3-L4	L4-L5	L5-L6	L6-L7	L7-L8	L8-L9	L9-L10	U2-U3	U3-U4	U4-U5	U5-U6	U6-U7	U7-U8	U8-U9	L2-U2	L3-U3	L4-U4	L5-U5	L6-U6	L7-U7	L8-U8	L9-U9	L1-U2	L3-U2	L4-U3	L5-U4	L5-U6	L6-U5	L6-U7	L7-U8	L8-U9	L10-U9
Gross Area (in^2)	114.50	58.25	58.25	67.25	73.25	67.25	58.25	58.25	58.25	67.25	73.25	79.25	79.25	79.25	73.25	67.25	28.22	28.22	28.22	28.22	28.22	28.22	28.22	28.22	73.25	41.01	22.63	18.80	18.80	18.80	18.80	18.80	28.22	73.25
Net Area (in^2)	107.50	49.38	49.38	56.88	61.88	56.88	49.38	49.38	49.38	67.25	73.25	79.25	79.25	79.25	73.25	67.25	28.22	28.22	28.22	24.90	24.90	28.22	28.22	24.90	73.25	31.60	19.31	16.06	16.06	16.06	16.06	16.06	24.90	73.25
Steel Yield Strength (ksi)	36.0	36.0	36.0	36.0	36.0	36.0	36.0	33.0	33.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	42.0	36.0	40.0	40.0	33.0	33.0	33.0	40.0	36.0	40.0
Steel Tensile Strength (ksi)	58.0	58.0	58.0	58.0	58.0	58.0	58.0	60.0	60.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	63.0	58.0	60.0	60.0	60.0	60.0	60.0	60.0	58.0	63.0
KL/r	55.61	42.49	42.49	41.75	42.33	41.75	42.49	42.49	42.49	43.23	42.87	42.01	41.95	42.01	42.87	43.23	77.49	95.94	107.01	110.70	110.70	107.01	95.94	77.49	63.83	101.64	161.45	178.51	182.90	182.90	178.51	165.64	103.52	63.83
Impact	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.267	1.300 1.138	1.250 1.153	1.217 1.168	1.145	1.250 1.153	1.300 1.138	1.267	1.124	1.138 1.300	1.152 1.250	1.168 1.216		1.189 1.189	1.168 1.216	1.152 1.250	1.138 1.300	1.124
Service Dead Load (kips)	735.90	735.90	1036.00	1193.50	1282.30	1190.90	1031.60	729.60	729.60	-1072.80	-1208.90	-1284.20	-1281.50	-1283.40	-1206.30	-1068.20	179.50	-162.30	-44.00	40.50	39.20	-47.10	-165.40	172.70	-1109.90	452.70	270.60	164.50	0.00	-1.50	167.70	273.90	455.40	-1100.50
Service Live Load + Impact (kips)																																		
HS-20 (max.)	159.08	159.08	224.87	259.20	278.39	259.20	224.87	159.08	159.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	114.57	66.53	71.08	68.76	15.00	71.08	66.53	114.57	0.00	124.26	99.45	90.80	0.00	73.64	90.80	99.45	124.26	0.00
HS-20 (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-232.84	-262.55	-278.79	-278.39	-278.79	-262.55	-232.84	0.00	-65.01	-53.94	-51.17	0.00	-53.94	-65.01	0.00	-257.81	-38.17	-56.74	-61.03	0.00	-73.64	-61.03	-56.74	-38.17	-257.81
Standard A Truck (max.)	152.49	152.49	215.10	247.49	265.26	247.49	215.10	152.49	152.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	118.31	71.77	78.65	77.20	14.29	78.65	71.77	118.31	0.00	120.85	100.30	95.07	0.00	80.53	95.07	100.30	120.85	0.00
Standard A Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-222.73	-250.68	-265.65	-265.26	-265.65	-250.68	-222.73	0.00	-68.45	-59.53	-57.46	0.00	-59.53	-68.45	0.00	-240.96	-37.41	-60.84	-67.44	0.00	-80.53	-67.44	-60.84	-37.41	-240.96
Standard B Truck (max.)	168.21	168.21	237.16	273.06	292.25	273.06	237.16	168.21	168.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124.97	78.20	87.22	86.34	15.75	87.22	78.20	124.97	0.00	133.48	111.25	105.77	0.00	89.76	105.77	111.25	133.48	0.00
Standard B Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-245.57	-276.59	-292.68	-292.25	-292.68	-276.59	-245.57	0.00	-76.40	-66.71	-64.26	0.00	-66.71	-76.40	0.00	-264.67	-39.11	-66.04	-74.68	0.00	-89.76	-74.68	-66.04	-39.11	-264.67
Standard C Truck (max.)	178.80	178.80	252.17	290.14	310.38	290.14	252.17	178.80	178.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	128.75	81.24	92.53	92.13	16.72	92.53	81.24	128.75	0.00	141.90	118.41	112.60	0.00	95.40	112.60	118.41	141.90	0.00
Standard C Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-261.11	-293.89	-310.83	-310.38	-310.83	-293.89	-261.11	0.00	-81.61	-71.30	-68.42	0.00	-71.30	-81.61	0.00	-280.64	-40.79	-68.62	-79.00	0.00	-95.40	-79.00	-68.62	-40.79	-280.64
P411 Truck (max.)	194.90	194.90	274.55	313.64	334.41	313.64	274.55	194.90	194.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	133.83	76.90	91.49	95.71	18.02	91.49	76.90	133.83	0.00	153.38	127.03	119.22	0.00	98.72	119.22	127.03	153.38	0.00
P411 Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-284.29	-317.68	-334.90	-334.41	334.90	-317.68	-284.29	0.00	-87.88	-75.64	-70.47	0.00	-75.64	-87.88	0.00	-304.93	-42.21	-64.73	-77.62	0.00	-98.72	-77.62	-64.73	-42.21	-304.93
P413 Truck (max.)	211.13	211.13	296.00	338.77	362.16	338.77	296.00	211.13	211.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	129.39	79.24	92.36	99.19	19.51	92.36	79.24	129.39	0.00	164.92	135.75	126.33	0.00	102.22	126.33	135.75	164.92	0.00
P413 Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-306.49	-343.14	-362.69	-362.16	-362.69	-343.14	-306.49	0.00	-93.97	-79.78	-72.95	0.00	-79.78	-93.97	0.00	-329.41	-39.97	-66.73	-78.37	0.00	-102.22	-78.37	-66.73	-39.97	-329.41
Type M3 Vehicle (max.)	71.92	71.92	101.21	115.98	124.31	115.98	101.21	71.92	71.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	85.10	47.86	50.47	48.54	6.70	50.47	47.86	85.10	0.00	58.90	52.41	53.30	0.00	48.99	53.30	52.41	58.90	0.00
Type M3 Vehicle (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-104.80	-117.47	-124.49	-124.31	-124.49	-117.47	-104.80	0.00	-38.11	-35.80	-36.12	0.00	-35.80	-38.11	0.00	-108.47	-28.83	-40.82	-43.34	0.00	-48.99	-43.34	-40.82	-28.83	-108.47
Type M3S2 Vehicle (max.)	98.75	98.75	138.22	159.02	169.94	159.02	138.22	98.75	98.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	87.43	55.11	63.19	63.19	9.16	63.19	55.11	87.43	0.00	80.30	70.75	70.94	0.00	63.79	70.94	70.75	80.30	0.00
Type M3S2 Vehicle (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-143.12	-161.08	-170.19	-169.94	-170.19	-161.08	-143.12	0.00	-51.44	-47.65	-47.03	0.00	-47.65	-51.44	0.00	-148.94	-24.52	-46.75	-54.26	0.00	-63.79	-54.26	-46.75	-24.52	-148.94
Type M3-3 Vehicle (max.)	107.19	107.19	149.87	171.00	183.39	171.00	149.87	107.19	107.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.95	54.60	65.22	66.69	9.88	65.22	54.60	81.95	0.00	86.84	76.13	75.77	0.00	67.32	75.77	76.13	86.84	0.00
Type M3-3 Vehicle (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-155.19	-173.21	-183.65	-183.39	-183.65	-173.21	-155.19	0.00	-55.35	-50.89	-49.63	0.00	-50.89	-55.35	0.00	-161.67	-24.18	-45.75	-56.01	0.00	-67.32	-56.01	-45.75	-24.18	-161.67
Factored Dead Load Stress (ksi)	8.36	16.42	23.12	23.07	22.76	23.02	23.02	16.28	16.28	-20.74	-21.45	-21.07	-21.02	-21.05	-21.41	-20.65	8.27	-7.48	-2.03	1.87	1.81	-2.17	-7.62	7.96	-19.70	14.35	15.54	11.38	0.00	-0.10	11.60	18.94	20.98	-19.53
Factored Live Load Stresses (ksi)																																		
HS-20 Inventory	3.01	5.93	8.38	8.36	8.25	8.36	8.38	5.93	5.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.81	5.12	5.47	5.29	1.15	5.47	5.12	8.81	0.00	6.58	9.54	10.48	0.00	8.50	10.48	11.48	9.56	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-7.51	-7.78	-7.63	-7.62	-7.63	-7.78	-7.51	0.00	-5.00	-4.15	-3.93	0.00	-4.15	-5.00	0.00	-7.64	-2.02	-5.44	-7.04	0.00	-8.50	-7.04	-6.55	-2.94	-7.64
HS-20 Operating	1.81	3.55	5.02	5.01	4.94	5.01	5.02	3.55	3.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.28	3.06	3.27	3.17	0.69	3.27	3.06	5.28	0.00	3.94	5.71	6.28	0.00	5.09	6.28	6.88	5.72	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-4.50	-4.66	-4.57	-4.57	-4.57	-4.66	-4.50	0.00	-2.99	-2.48	-2.36	0.00	-2.48	-2.99	0.00	-4.58	-1.21	-3.26	-4.22	0.00	-5.09	-4.22	-3.92	-1.76	-4.58
Standard A Truck	1.73	3.40	4.80	4.78	4.71	4.78	4.80	3.40	3.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.45	3.31	3.62	3.56	0.66	3.62	3.31	5.45	0.00	3.83	5.76	6.57	0.00	5.57	6.57	6.94	5.57	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-4.31	-4.45	-4.36	-4.35	-4.36	-4.45	-4.31	0.00	-3.15	-2.74	-2.65	0.00	-2.74	-3.15	0.00	-4.28	-1.19	-3.50	-4.66	0.00	-5.57	-4.66	-4.21	-1.72	-4.28
Standard B Truck	1.91	3.75	5.29	5.28	5.19	5.28	5.29	3.75	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.76	3.60	4.02	3.98	0.73	4.02	3.60	5.76	0.00	4.23	6.39	7.31	0.00	6.21	7.31	7.69	6.15	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-4.75	-4.91	-4.80	-4.79	-4.80	-4.91	-4.75	0.00	-3.52	-3.07	-2.96	0.00	-3.07	-3.52	0.00	-4.70	-1.24	-3.79	-5.16	0.00	-6.21	-5.16	-4.57	-1.80	-4.70
Standard C Truck	2.03	3.99	5.63	5.61	5.51	5.61	5.63	3.99	3.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.93	3.74	4.26	4.24	0.77	4.26	3.74	5.93	0.00	4.50	6.80	7.79	0.00	6.60	7.79	8.19	6.54	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5.05	-5.22	-5.10	-5.09	-5.10	-5.22	-5.05	0.00	-3.76	-3.28	-3.15	0.00	-3.28	-3.76	0.00	-4.98	-1.29	-3.94	-5.46	0.00	-6.60	-5.46	-4.75	-1.88	-4.98
P411 Truck	2.21	4.35	6.13	6.06	5.93	6.06	6.13	4.35	4.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.17	3.54	4.21	4.41	0.83	4.21	3.54	6.17	0.00	4.86	7.30	8.24	0.00	6.83	8.24	8.78	7.07	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5.50	-5.64	-5.49	-5.49	5.49	-5.64	-5.50	0.00	-4.05	-3.48	-3.25	0.00	-3.48	-4.05	0.00	-5.41	-1.34	-3.72	-5.37	0.00	-6.83	-5.37	-4.48	-1.94	-5.41
P413 Truck	2.40	4.71	6.61	6.55	6.43	6.55	6.61	4.71	4.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.96	3.65	4.25	4.57	0.90	4.25	3.65	5.96	0.00	5.23	7.80	8.74	0.00	7.07	8.74	9.39	7.60	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-5.92	-6.09	-5.95	-5.94	-5.95	-6.09	-5.92	0.00	-4.33	-3.68	-3.36	0.00	-3.68	-4.33	0.00	-5.85	-1.27	-3.83	-5.42	0.00	-7.07	-5.42	-4.61	-1.84	-5.85
Type M3 Vehicle	0.82	1.61	2.26	2.24	2.21	2.24	2.26	1.61	1.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92	2.20	2.32	2.24	0.31	2.32	2.20	3.92	0.00	1.87	3.01	3.69	0.00	3.39	3.69	3.62	2.71	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-2.03	-2.08	-2.04	-2.04	-2.04	-2.08	-2.03	0.00	-1.76	-1.65	-1.66	0.00	-1.65	-1.76	0.00	-1.93	-0.91	-2.34	-3.00	0.00	-3.39	-3.00	-2.82	-1.33	-1.93
Type M3S2 Vehicle	1.12	2.20	3.08	3.07	3.02	3.07	3.08	2.20	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.03	2.54	2.91	2.91	0.42	2.91	2.54	4.03	0.00	2.55	4.06	4.91	0.00	4.41	4.91	4.89	3.70	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-2.77	-2.86	-2.79	-2.79	-2.79	-2.86	-2.77	0.00	-2.37	-2.20	-2.17	0.00	-2.20	-2.37	0.00	-2.64	-0.78	-2.69	-3.75	0.00	-4.41	-3.75	-3.23	-1.13	-2.64
Type M3-3 Vehicle	1.22	2.39	3.34	3.31	3.25	3.31	3.34	2.39	2.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.78	2.52	3.00	3.07	0.46	3.00	2.52	3.78	0.00	2.75	4.37	5.24	0.00	4.66	5.24	5.26	4.00	0.00
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-3.00	-3.07	-3.01	-3.01	-3.01	-3.07	-3.00	0.00	-2.55	-2.34	-2.29	0.00	-2.34	-2.55	0.00	-2.87	-0.77	-2.63	-3.87	0.00	-4.66	-3.87	-3.16	-1.11	-2.87
Member Capacity Gross Tension (kips) (.95*Fy*Ag*Ω)	3328.52	1693.33	1693.33	1954.96	2129.38	1954.96	1693.33	1552.22	1552.22	2280.78	2484.27	2687.76	2687.76	2687.76	2484.27	2280.78	957.08	751.99	751.99	751.99	751.99	751.99	751.99	751.99	2484.27	1192.16	730.95	607.24	500.97	500.97	500.97	607.24	820.36	2365.98
Member Capacity Gross Compression (kips) (.85*Fcr*Ag*Ω)	2688.55	1429.08	1429.07	1653.30	1797.89	1653.30	1429.07	1316.55	1316.55	1900.79	2072.91	2249.14	2249.59	2249.14	2072.91	1900.79	667.70	494.32	450.75	435.17	435.17	450.75	494.32	556.38	1890.54	720.17	179.53	122.00	116.22	116.22	122.00	141.70	544.56	1815.58
Member Capacity Net Tension (kips) (.8*Fu*An*Ω)	4239.80	1947.55	1947.55	2243.35	2440.55	2243.35	1947.55	2014.70	2014.70	2880.99	3138.03	3395.07	3395.07	3395.07	3138.03	2880.99	1208.94	1151.38	1151.38	1015.92	1015.92	1151.38	1151.38	1015.92	3138.03	1246.30	787.85	655.25	655.25	655.25	655.25	655.25	982.06	3138.03
Member Capacity Net Compression (kips)																																		
Rating Factors																																		
HS-20 (inv.)	6.87	2.13	0.71	0.72	0.77	0.72	0.72	1.75	1.75	1.00	0.88	0.96	0.97	0.96	0.89	1.01	2.91	2.01	3.36	4.39	21.54	3.33	1.98	2.12	0.80	2.24	1.76	2.00	n/a	0.72	1.44	1.16	0.85	0.69
HS-20 (oper.)	11.47	3.56	1.19	1.20	1.28	1.21	1.20	2.92	2.92	1.67	1.47	1.60	1.61	1.60	1.48	1.69	4.86	3.35	5.61	7.33	35.95	5.55	3.30	3.54	1.34	3.74	2.93	3.33	n/a	1.19	2.40	1.94	1.41	1.15
Standard A Truck (a)	11.96	3.72	1.24	1.25	1.34	1.26	1.26	3.05	3.05	1.75	1.54	1.68	1.69	1.68	1.55	1.77	4.71	3.18	5.09	6.53	37.74	5.03	3.14	3.43	1.43	3.84	2.91	3.18	n/a	1.09	2.29	1.93	1.45	1.23
Standard B Truck (a)	10.85	3.37	1.12	1.14	1.22	1.15	1.14	2.76	2.76	1.59	1.39	1.52	1.54	1.53	1.40	1.60	4.45	2.85	4.54	5.84	34.24	4.49	2.81	3.25	1.30	3.48	2.62	2.86	n/a	0.98	2.06	1.74	1.32	1.12
Standard C Truck (a)	10.20	3.17	1.06	1.07	1.15	1.08	1.07	2.60	2.60	1.49	1.31	1.43	1.45	1.44	1.32	1.51	4.32	2.67	4.25	5.48	32.25	4.20	2.63	3.15	1.23	3.27	2.46	2.69	n/a	0.92	1.93	1.63	1.24	1.06
P411 Truck (a)	9.36	2.91	0.97	0.99	1.06	1.00	0.99	2.38	2.38	1.37	1.21	1.33	1.34	1.33	1.22	1.39	4.16	2.48	4.00	5.32	29.93	3.96	2.44	3.03	1.13	3.03	2.30	2.54	n/a	0.89	1.83	1.52	1.15	0.97
P413 Truck (a)	8.64	2.68	0.90	0.92	0.98	0.92	0.92	2.20	2.20	1.27	1.12	1.23	1.24	1.23	1.13	1.29	4.30	2.32	3.79	5.14	27.64	3.76	2.29	3.14	1.05	2.82	2.15	2.40	n/a	0.86	1.72	1.42	1.07	0.90
Type M3 Vehicle	25.37	7.88	2.63	2.68	2.86	2.70	2.68	6.46	6.46	3.72	3.28	3.58	3.61	3.59	3.31	3.76	6.54	5.72	8.46	10.39	80.49	8.37	5.64	4.77	3.17	7.88	5.57	5.68	n/a	1.79	4.08	3.69	2.98	2.73
Type M3S2 Vehicle	18.48	5.74	1.93	1.95	2.09	1.97	1.96	4.70	4.70	2.72	2.39	2.62	2.64	2.62	2.41	2.75	6.37	4.24	6.35	7.98	58.87	6.29	4.18	4.64	2.31	5.78	4.12	4.27	n/a	1.38	3.07	2.73	2.19	1.99
Type M3-3 Vehicle	17.02	5.29	1.78	1.81	1.94	1.83	1.81	4.33	4.33	2.51	2.23	2.43	2.45	2.43	2.24	2.54	6.79	3.94	5.95	7.56	54.58	5.89	3.88	4.95	2.13	5.35	3.83	3.99	n/a	1.31	2.87	2.54	2.02	1.83
Controlling Condition	Tension	Tension	Tension	Tension	Tension	Tension	Tension	Tension	Tension	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Tension	Comp.	Comp.	Comp.	Tension	Comp.	Comp.	Tension	Comp.	Tension	Tension	Tension	n/a	Comp.	Tension	Tension	Tension	Comp.
Inventory Rating	137.4	42.7	14.2	14.3	15.3	14.5	14.4	35.0	35.0	20.0	17.6	19.2	19.3	19.2	17.7	20.3	58.2	40.2	67.2	87.9	430.7	66.6	39.6	42.4	16.0	44.8	35.1	39.9	n/a	14.3	28.7	23.3	16.9	13.8
Operating Rating	229.4	71.2	23.7	23.9	25.6	24.1	24.1	58.4	58.4	33.4	29.4	32.0	32.3	32.0	29.6	33.8	97.2	67.1	112.2	146.7	719.0	111.1	66.1	70.8	26.7	74.7	58.7	66.7	n/a	23.9	47.9	38.9	28.3	23.0

HS

(a) Indicates the lane closest to the truss occupied by a permit truck and remaining three lanes occupied by HS trucks

USING 100% MNDOT MODIFIER

LOAD AND RATING SUMMARY TABLE FOR BRIDGE NO. 9090

COMPLETED BY: RAM	CHECKED BY: CJM
DATE: 01-31-08	DATE: 02-13-08

NOTE THAT NODE AND MEMBER LABELS DO NOT MATCH ORIGINAL PLAN - SOFTWARE USED REQUIRES FIRST NODE TO BE L1 INSTEAD OF L0. SEE ANALYSIS DATA FOR DRAWING SHOWING MEMBER/JOINT LABELS USED BELOW.

BOTTOM CHORD

Members	L1-L2	L2-L3	L3-L4	L4-L5	L5-L6	L6-L7	L7-L8	L8-L9	L9-L10
Gross Area (in^2)	114.50	58.25	58.25	67.25	73.25	67.25	58.25	58.25	58.25
Net Area (in^2)	107.50	49.38	49.38	56.88	61.88	56.88	49.38	49.38	49.38
Steel Yield Strength (ksi)	36.0	36.0	36.0	36.0	36.0	36.0	36.0	33.0	33.0
Steel Tensile Strength (ksi)	58.0	58.0	58.0	58.0	58.0	58.0	58.0	60.0	60.0
KL/r	55.61	42.49	42.49	41.75	42.33	41.75	42.49	42.49	42.49
Impact	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124	1.124
Service Dead Load (kips)	735.90	735.90	1036.00	1193.50	1282.30	1190.90	1031.60	729.60	729.60
Service Live Load + Impact (kips)									
HS-20 (max.)	159.08	159.08	224.87	259.20	278.39	259.20	224.87	159.08	159.08
HS-20 (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard A Truck (max.)	152.49	152.49	215.10	247.49	265.26	247.49	215.10	152.49	152.49
Standard A Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard B Truck (max.)	168.21	168.21	237.16	273.06	292.25	273.06	237.16	168.21	168.21
Standard B Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard C Truck (max.)	178.80	178.80	252.17	290.14	310.38	290.14	252.17	178.80	178.80
Standard C Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P411 Truck (max.)	194.90	194.90	274.55	313.64	334.41	313.64	274.55	194.90	194.90
P411 Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P413 Truck (max.)	211.13	211.13	296.00	338.77	362.16	338.77	296.00	211.13	211.13
P413 Truck (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type M3 Vehicle (max.)	71.92	71.92	101.21	115.98	124.31	115.98	101.21	71.92	71.92
Type M3 Vehicle (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type M3S2 Vehicle (max.)	98.75	98.75	138.22	159.02	169.94	159.02	138.22	98.75	98.75
Type M3S2 Vehicle (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type M3-3 Vehicle (max.)	107.19	107.19	149.87	171.00	183.39	171.00	149.87	107.19	107.19
Type M3-3 Vehicle (min.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Factored Dead Load Stress (ksi)	8.36	16.42	23.12	23.07	22.76	23.02	23.02	16.28	16.28
Factored Live Load Stresses (ksi)									
HS-20 Inventory	3.01	5.93	8.38	8.36	8.25	8.36	8.38	5.93	5.93
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HS-20 Operating	1.81	3.55	5.02	5.01	4.94	5.01	5.02	3.55	3.55
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard A Truck	1.73	3.40	4.80	4.78	4.71	4.78	4.80	3.40	3.40
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard B Truck	1.91	3.75	5.29	5.28	5.19	5.28	5.29	3.75	3.75
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard C Truck	2.03	3.99	5.63	5.61	5.51	5.61	5.63	3.99	3.99
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P411 Truck	2.21	4.35	6.13	6.06	5.93	6.06	6.13	4.35	4.35
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P413 Truck	2.40	4.71	6.61	6.55	6.43	6.55	6.61	4.71	4.71
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type M3 Vehicle	0.82	1.61	2.26	2.24	2.21	2.24	2.26	1.61	1.61
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type M3S2 Vehicle	1.12	2.20	3.08	3.07	3.02	3.07	3.08	2.20	2.20
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type M3-3 Vehicle	1.22	2.39	3.34	3.31	3.25	3.31	3.34	2.39	2.39
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Member Capacity Gross Tension (kips)	3720.11	1892.54	1892.54	2184.95	2379.89	2184.95	1892.54	1734.83	1734.83
Member Capacity Gross Compression (kips)	2854.60	1517.35	1517.34	1755.42	1908.93	1755.42	1517.34	1397.87	1397.87
Member Capacity Net Tension (kips)	4501.67	2067.84	2067.84	2381.91	2591.29	2381.91	2067.84	2139.14	2139.14
Member Capacity Net Compression (kips)									
Rating Factors									
HS-20 (inv.)	8.01	2.71	1.12	1.13	1.18	1.13	1.13	2.28	2.28
HS-20 (oper.)	13.36	4.53	1.87	1.88	1.97	1.89	1.89	3.80	3.80
Standard A Truck (a)	13.94	4.72	1.95	1.97	2.07	1.98	1.97	3.97	3.97
Standard B Truck (a)	12.64	4.28	1.77	1.78	1.88	1.79	1.79	3.60	3.60
Standard C Truck (a)	11.89	4.03	1.66	1.68	1.77	1.69	1.68	3.38	3.38
P411 Truck (a)	10.91	3.69	1.53	1.55	1.64	1.56	1.55	3.10	3.10
P413 Truck (a)	10.07	3.41	1.42	1.44	1.51	1.45	1.43	2.86	2.86
Type M3 Vehicle	29.56	10.01	4.15	4.20	4.41	4.22	4.19	8.41	8.41
Type M3S2 Vehicle	21.53	7.29	3.04	3.06	3.23	3.08	3.07	6.13	6.13
Type M3-3 Vehicle	19.83	6.72	2.80	2.85	2.99	2.86	2.83	5.64	5.64
Controlling Condition	Tension	Tension	Tension	Tension	Tension	Tension	Tension	Tension	Tension
Inventory Rating	160.1	54.2	22.4	22.5	23.6	22.6	22.6	45.6	45.6
Operating Rating	267.3	90.5	37.3	37.6	39.4	37.8	37.7	76.0	76.0

TOP CHORD

Members	U2-U3	U3-U4	U4-U5	U5-U6	U6-U7	U7-U8	U8-U9
Gross Area (in^2)	67.25	73.25	79.25	79.25	79.25	73.25	67.25
Net Area (in^2)	67.25	73.25	79.25	79.25	79.25	73.25	67.25
Steel Yield Strength (ksi)	42.0	42.0	42.0	42.0	42.0	42.0	42.0
Steel Tensile Strength (ksi)	63.0	63.0	63.0	63.0	63.0	63.0	63.0
KL/r	43.23	42.87	42.01	41.95	42.01	42.87	43.23
Impact	1.124	1.124	1.124	1.124	1.124	1.124	1.124
Service Dead Load (kips)	-1072.80	-1208.90	-1284.20	-1281.50	-1283.40	-1206.30	-1068.20
Service Live Load + Impact (kips)							
HS-20 (max.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HS-20 (min.)	-232.84	-262.55	-278.79	-278.39	-278.79	-262.55	-232.84
Standard A Truck (max.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard A Truck (min.)	-222.73	-250.68	-265.65	-265.26	-265.65	-250.68	-222.73
Standard B Truck (max.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard B Truck (min.)	-245.57	-276.59	-292.68	-292.25	-292.68	-276.59	-245.57
Standard C Truck (max.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard C Truck (min.)	-261.11	-293.89	-310.83	-310.38	-310.83	-293.89	-261.11
P411 Truck (max.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P411 Truck (min.)	-284.29	-317.68	-334.90	-334.41	334.90	-317.68	-284.29
P413 Truck (max.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P413 Truck (min.)	-306.49	-343.14	-362.69	-362.16	-362.69	-343.14	-306.49
Type M3 Vehicle (max.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type M3 Vehicle (min.)	-104.80	-117.47	-124.49	-124.31	-124.49	-117.47	-104.80
Type M3S2 Vehicle (max.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type M3S2 Vehicle (min.)	-143.12	-161.08	-170.19	-169.94	-170.19	-161.08	-143.12
Type M3-3 Vehicle (max.)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Type M3-3 Vehicle (min.)	-155.19	-173.21	-183.65	-183.39	-183.65	-173.21	-155.19
Factored Dead Load Stress (ksi)	-20.74	-21.45	-21.07	-21.02	-21.05	-21.41	-20.65
Factored Live Load Stresses (ksi)							
HS-20 Inventory	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-7.51	-7.78	-7.63	-7.62	-7.63	-7.78	-7.51
HS-20 Operating	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-4.50	-4.66	-4.57	-4.57	-4.57	-4.66	-4.50
Standard A Truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-4.31	-4.45	-4.36	-4.35	-4.36	-4.45	-4.31
Standard B Truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-4.75	-4.91	-4.80	-4.79	-4.80	-4.91	-4.75
Standard C Truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-5.05	-5.22	-5.10	-5.09	-5.10	-5.22	-5.05
P411 Truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-5.50	-5.64	-5.49	-5.49	5.49	-5.64	-5.50
P413 Truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-5.92	-6.09	-5.95	-5.94	-5.95	-6.09	-5.92
Type M3 Vehicle	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-2.03	-2.08	-2.04	-2.04	-2.04	-2.08	-2.03
Type M3S2 Vehicle	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-2.77	-2.86	-2.79	-2.79	-2.79	-2.86	-2.77
Type M3-3 Vehicle	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	-3.00	-3.07	-3.01	-3.01	-3.01	-3.07	-3.00
Member Capacity Gross Tension (kips)	2549.11	2776.54	3003.97	3003.97	3003.97	2776.54	2549.11
Member Capacity Gross Compression (kips)	2018.20	2200.94	2388.06	2388.53	2388.06	2200.94	2018.20
Member Capacity Net Tension (kips)	3058.93	3331.85	3604.77	3604.77	3604.77	3331.85	3058.93
Member Capacity Net Compression (kips)							
Rating Factors							
HS-20 (inv.)	1.23	1.10	1.19	1.20	1.19	1.11	1.25
HS-20 (oper.)	2.06	1.84	1.98	2.00	1.99	1.85	2.08
Standard A Truck (a)	2.15	1.93	2.08	2.10	2.08	1.94	2.17
Standard B Truck (a)	1.95	1.75	1.89	1.90	1.89	1.76	1.97
Standard C Truck (a)	1.84	1.65	1.78	1.79	1.78	1.66	1.85
P411 Truck (a)	1.69	1.52	1.65	1.66	1.65	1.53	1.70
P413 Truck (a)	1.57	1.41	1.52	1.53	1.53	1.42	1.58
Type M3 Vehicle	4.58	4.12	4.44	4.47	4.45	4.14	4.62
Type M3S2 Vehicle	3.35	3.01	3.25	3.27	3.25	3.02	3.38
Type M3-3 Vehicle	3.09	2.80	3.01	3.03	3.01	2.81	3.12
Controlling Condition	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.
Inventory Rating	24.7	22.1	23.8	23.9	23.8	22.2	24.9
Operating Rating	41.2	36.9	39.7	39.9	39.7	37.1	41.6

VERTICAL MEMBERS

Members	L2-U2	L3-U3	L4-U4	L5-U5	L6-U6	L7-U7	L8-U8	L9-U9
Gross Area (in^2)	28.22	28.22	28.22	28.22	28.22	28.22	28.22	28.22
Net Area (in^2)	28.22	28.22	28.22	24.90	24.90	28.22	28.22	24.90
Steel Yield Strength (ksi)	42.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
Steel Tensile Strength (ksi)	63.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
KL/r	77.49	95.94	107.01	110.70	110.70	107.01	95.94	77.49
Impact	1.267	1.300 1.138	1.250 1.153	1.217 1.168	1.145	1.250 1.153	1.300 1.138	1.267
Service Dead Load (kips)	179.50	-162.30	-44.00	40.50	39.20	-47.10	-165.40	172.70
Service Live Load + Impact (kips)								
HS-20 (max.)	114.57	66.53	71.08	68.76	15.00	71.08	66.53	114.57
HS-20 (min.)	0.00	-65.01	-53.94	-51.17	0.00	-53.94	-65.01	0.00
Standard A Truck (max.)	118.31	71.77	78.65	77.20	14.29	78.65	71.77	118.31
Standard A Truck (min.)	0.00	-68.45	-59.53	-57.46	0.00	-59.53	-68.45	0.00
Standard B Truck (max.)	124.97	78.20	87.22	86.34	15.75	87.22	78.20	124.97
Standard B Truck (min.)	0.00	-76.40	-66.71	-64.26	0.00	-66.71	-76.40	0.00
Standard C Truck (max.)	128.75	81.24	92.53	92.13	16.72	92.53	81.24	128.75
Standard C Truck (min.)	0.00	-81.61	-71.30	-68.42	0.00	-71.30	-81.61	0.00
P411 Truck (max.)	133.83	76.90	91.49	95.71	18.02	91.49	76.90	133.83
P411 Truck (min.)	0.00	-87.88	-75.64	-70.47	0.00	-75.64	-87.88	0.00
P413 Truck (max.)	129.39	79.24	92.36	99.19	19.51	92.36	79.24	129.39
P413 Truck (min.)	0.00	-93.97	-79.78	-72.95	0.00	-79.78	-93.97	0.00
Type M3 Vehicle (max.)	85.10	47.86	50.47	48.54	6.70	50.47	47.86	85.10
Type M3 Vehicle (min.)	0.00	-38.11	-35.80	-36.12	0.00	-35.80	-38.11	0.00
Type M3S2 Vehicle (max.)	87.43	55.11	63.19	63.19	9.16	63.19	55.11	87.43
Type M3S2 Vehicle (min.)	0.00	-51.44	-47.65	-47.03	0.00	-47.65	-51.44	0.00
Type M3-3 Vehicle (max.)	81.95	54.60	65.22	66.69	9.88	65.22	54.60	81.95
Type M3-3 Vehicle (min.)	0.00	-55.35	-50.89	-49.63	0.00	-50.89	-55.35	0.00
Factored Dead Load Stress (ksi)	8.27	-7.48	-2.03	1.87	1.81	-2.17	-7.62	7.96
Factored Live Load Stresses (ksi)								
HS-20 Inventory	8.81	5.12	5.47	5.29	1.15	5.47	5.12	8.81
	0.00	-5.00	-4.15	-3.93	0.00	-4.15	-5.00	0.00
HS-20 Operating	5.28	3.06	3.27	3.17	0.69	3.27	3.06	5.28
	0.00	-2.99	-2.48	-2.36	0.00	-2.48	-2.99	0.00
Standard A Truck	5.45	3.31	3.62	3.56	0.66	3.62	3.31	5.45
	0.00	-3.15	-2.74	-2.65	0.00	-2.74	-3.15	0.00
Standard B Truck	5.76	3.60	4.02	3.98	0.73	4.02	3.60	5.76
	0.00	-3.52	-3.07	-2.96	0.00	-3.07	-3.52	0.00
Standard C Truck	5.93	3.74	4.26	4.24	0.77	4.26	3.74	5.93
	0.00	-3.76	-3.28	-3.15	0.00	-3.28	-3.76	0.00
P411 Truck	6.17	3.54	4.21	4.41	0.83	4.21	3.54	6.17
	0.00	-4.05	-3.48	-3.25	0.00	-3.48	-4.05	0.00
P413 Truck	5.96	3.65	4.25	4.57	0.90	4.25	3.65	5.96
	0.00	-4.33	-3.68	-3.36	0.00	-3.68	-4.33	0.00
Type M3 Vehicle	3.92	2.20	2.32	2.24	0.31	2.32	2.20	3.92
	0.00	-1.76	-1.65	-1.66	0.00	-1.65	-1.76	0.00
Type M3S2 Vehicle	4.03	2.54	2.91	2.91	0.42	2.91	2.54	4.03
	0.00	-2.37	-2.20	-2.17	0.00	-2.20	-2.37	0.00
Type M3-3 Vehicle	3.78	2.52	3.00	3.07	0.46	3.00	2.52	3.78
	0.00	-2.55	-2.34	-2.29	0.00	-2.34	-2.55	0.00
Member Capacity Gross Tension (kips)	1069.68	840.46	840.46	840.46	840.46	840.46	840.46	840.46
Member Capacity Gross Compression (kips)	708.94	524.86	478.59	462.05	462.05	478.59	524.86	590.75
Member Capacity Net Tension (kips)	1283.61	1222.49	1222.49	1078.67	1078.67	1222.49	1222.49	1078.67
Member Capacity Net Compression (kips)								
Rating Factors								
HS-20 (inv.)	3.36	2.22	3.60	4.64	24.26	3.57	2.20	2.48
HS-20 (oper.)	5.62	3.71	6.01	7.74	40.49	5.95	3.67	4.14
Standard A Truck (a)	5.44	3.53	5.45	6.89	42.50	5.39	3.48	4.00
Standard B Truck (a)	5.15	3.16	4.86	6.16	38.56	4.81	3.12	3.79
Standard C Truck (a)	5.00	2.96	4.55	5.79	36.32	4.50	2.92	3.68
P411 Truck (a)	4.81	2.75	4.29	5.62	33.70	4.24	2.71	3.54
P413 Truck (a)	4.97	2.57	4.06	5.43	31.13	4.02	2.54	3.66
Type M3 Vehicle	7.56	6.34	9.05	10.96	90.64	8.97	6.25	5.57
Type M3S2 Vehicle	7.36	4.69	6.80	8.42	66.30	6.74	4.63	5.42
Type M3-3 Vehicle	7.85	4.36	6.37	7.98	61.47	6.31	4.31	5.78
Controlling Condition	Tension	Comp.	Comp.	Comp.	Tension	Comp.	Comp.	Tension
Inventory Rating	67.3	44.5	72.0	92.7	485.1	71.3	43.9	49.6
Operating Rating	112.3	74.3	120.2	154.7	809.7	119.0	73.3	82.7

DIAGONAL MEMBERS

Members	L1-U2	L3-U2	L4-U3	L5-U4	L5-U6	L6-U5	L6-U7	L7-U8	L8-U9	L10-U9
Gross Area (in^2)	73.25	41.01	22.63	18.80	18.80	18.80	18.80	18.80	28.22	73.25
Net Area (in^2)	73.25	31.60	19.31	16.06	16.06	16.06	16.06	16.06	24.90	73.25
Steel Yield Strength (ksi)	42.0	36.0	40.0	40.0	33.0	33.0	33.0	40.0	36.0	40.0
Steel Tensile Strength (ksi)	63.0	58.0	60.0	60.0	60.0	60.0	60.0	60.0	58.0	63.0
KL/r	63.83	101.64	161.45	178.51	182.90	182.90	178.51	165.64	103.52	63.83
Impact	1.124	1.138 1.300	1.152 1.250	1.168 1.216		1.189 1.189	1.168 1.216	1.152 1.250	1.138 1.300	1.124
Service Dead Load (kips)	-1109.90	452.70	270.60	164.50	0.00	-1.50	167.70	273.90	455.40	-1100.50
Service Live Load + Impact (kips)										
HS-20 (max.)	0.00	124.26	99.45	90.80	0.00	73.64	90.80	99.45	124.26	0.00
HS-20 (min.)	-257.81	-38.17	-56.74	-61.03	0.00	-73.64	-61.03	-56.74	-38.17	-257.81
Standard A Truck (max.)	0.00	120.85	100.30	95.07	0.00	80.53	95.07	100.30	120.85	0.00
Standard A Truck (min.)	-240.96	-37.41	-60.84	-67.44	0.00	-80.53	-67.44	-60.84	-37.41	-240.96
Standard B Truck (max.)	0.00	133.48	111.25	105.77	0.00	89.76	105.77	111.25	133.48	0.00
Standard B Truck (min.)	-264.67	-39.11	-66.04	-74.68	0.00	-89.76	-74.68	-66.04	-39.11	-264.67
Standard C Truck (max.)	0.00	141.90	118.41	112.60	0.00	95.40	112.60	118.41	141.90	0.00
Standard C Truck (min.)	-280.64	-40.79	-68.62	-79.00	0.00	-95.40	-79.00	-68.62	-40.79	-280.64
P411 Truck (max.)	0.00	153.38	127.03	119.22	0.00	98.72	119.22	127.03	153.38	0.00
P411 Truck (min.)	-304.93	-42.21	-64.73	-77.62	0.00	-98.72	-77.62	-64.73	-42.21	-304.93
P413 Truck (max.)	0.00	164.92	135.75	126.33	0.00	102.22	126.33	135.75	164.92	0.00
P413 Truck (min.)	-329.41	-39.97	-66.73	-78.37	0.00	-102.22	-78.37	-66.73	-39.97	-329.41
Type M3 Vehicle (max.)	0.00	58.90	52.41	53.30	0.00	48.99	53.30	52.41	58.90	0.00
Type M3 Vehicle (min.)	-108.47	-28.83	-40.82	-43.34	0.00	-48.99	-43.34	-40.82	-28.83	-108.47
Type M3S2 Vehicle (max.)	0.00	80.30	70.75	70.94	0.00	63.79	70.94	70.75	80.30	0.00
Type M3S2 Vehicle (min.)	-148.94	-24.52	-46.75	-54.26	0.00	-63.79	-54.26	-46.75	-24.52	-148.94
Type M3-3 Vehicle (max.)	0.00	86.84	76.13	75.77	0.00	67.32	75.77	76.13	86.84	0.00
Type M3-3 Vehicle (min.)	-161.67	-24.18	-45.75	-56.01	0.00	-67.32	-56.01	-45.75	-24.18	-161.67
Factored Dead Load Stress (ksi)	-19.70	14.35	15.54	11.38	0.00	-0.10	11.60	18.94	20.98	-19.53
Factored Live Load Stresses (ksi)										
HS-20 Inventory	0.00	6.58	9.54	10.48	0.00	8.50	10.48	11.48	9.56	0.00
	-7.64	-2.02	-5.44	-7.04	0.00	-8.50	-7.04	-6.55	-2.94	-7.64
HS-20 Operating	0.00	3.94	5.71	6.28	0.00	5.09	6.28	6.88	5.72	0.00
	-4.58	-1.21	-3.26	-4.22	0.00	-5.09	-4.22	-3.92	-1.76	-4.58
Standard A Truck	0.00	3.83	5.76	6.57	0.00	5.57	6.57	6.94	5.57	0.00
	-4.28	-1.19	-3.50	-4.66	0.00	-5.57	-4.66	-4.21	-1.72	-4.28
Standard B Truck	0.00	4.23	6.39	7.31	0.00	6.21	7.31	7.69	6.15	0.00
	-4.70	-1.24	-3.79	-5.16	0.00	-6.21	-5.16	-4.57	-1.80	-4.70
Standard C Truck	0.00	4.50	6.80	7.79	0.00	6.60	7.79	8.19	6.54	0.00
	-4.98	-1.29	-3.94	-5.46	0.00	-6.60	-5.46	-4.75	-1.88	-4.98
P411 Truck	0.00	4.86	7.30	8.24	0.00	6.83	8.24	8.78	7.07	0.00
	-5.41	-1.34	-3.72	-5.37	0.00	-6.83	-5.37	-4.48	-1.94	-5.41
P413 Truck	0.00	5.23	7.80	8.74	0.00	7.07	8.74	9.39	7.60	0.00
	-5.85	-1.27	-3.83	-5.42	0.00	-7.07	-5.42	-4.61	-1.84	-5.85
Type M3 Vehicle	0.00	1.87	3.01	3.69	0.00	3.39	3.69	3.62	2.71	0.00
	-1.93	-0.91	-2.34	-3.00	0.00	-3.39	-3.00	-2.82	-1.33	-1.93
Type M3S2 Vehicle	0.00	2.55	4.06	4.91	0.00	4.41	4.91	4.89	3.70	0.00
	-2.64	-0.78	-2.69	-3.75	0.00	-4.41	-3.75	-3.23	-1.13	-2.64
Type M3-3 Vehicle	0.00	2.75	4.37	5.24	0.00	4.66	5.24	5.26	4.00	0.00
	-2.87	-0.77	-2.63	-3.87	0.00	-4.66	-3.87	-3.16	-1.11	-2.87
Member Capacity Gross Tension (kips)	2776.54	1332.41	816.94	678.68	559.91	559.91	559.91	678.68	916.87	2644.33
Member Capacity Gross Compression (kips)	2007.31	764.65	190.62	129.54	123.39	123.39	129.54	150.45	578.19	1927.72
Member Capacity Net Tension (kips)	3331.85	1323.28	836.51	695.72	695.72	695.72	695.72	695.72	1042.71	3331.85
Member Capacity Net Compression (kips)										
Rating Factors										
HS-20 (inv.)	1.01	2.76	2.16	2.36	n/a	0.76	1.74	1.49	1.20	0.89
HS-20 (oper.)	1.68	4.61	3.60	3.94	n/a	1.27	2.90	2.50	2.01	1.48
Standard A Truck (a)	1.80	4.74	3.57	3.76	n/a	1.16	2.77	2.47	2.07	1.59
Standard B Truck (a)	1.64	4.29	3.22	3.38	n/a	1.04	2.49	2.23	1.87	1.44
Standard C Truck (a)	1.55	4.03	3.02	3.18	n/a	0.98	2.34	2.10	1.76	1.36
P411 Truck (a)	1.42	3.73	2.82	3.00	n/a	0.95	2.21	1.95	1.63	1.25
P413 Truck (a)	1.32	3.47	2.64	2.83	n/a	0.91	2.08	1.83	1.52	1.16
Type M3 Vehicle	4.00	9.72	6.83	6.71	n/a	1.91	4.93	4.74	4.24	3.53
Type M3S2 Vehicle	2.92	7.13	5.06	5.04	n/a	1.46	3.71	3.51	3.11	2.57
Type M3-3 Vehicle	2.69	6.59	4.70	4.72	n/a	1.39	3.47	3.26	2.88	2.37
Controlling Condition	Comp.	Tension	Tension	Tension	n/a	Comp.	Tension	Tension	Tension	Comp.
Inventory Rating	20.2	55.2	43.1	47.2	n/a	15.2	34.7	29.9	24.1	17.8
Operating Rating	33.7	92.1	72.0	78.8	n/a	25.4	57.9	49.9	40.2	29.7

(a) Indicates the lane closest to the truss occupied by a permit truck and remaining three lanes occupied by HS trucks

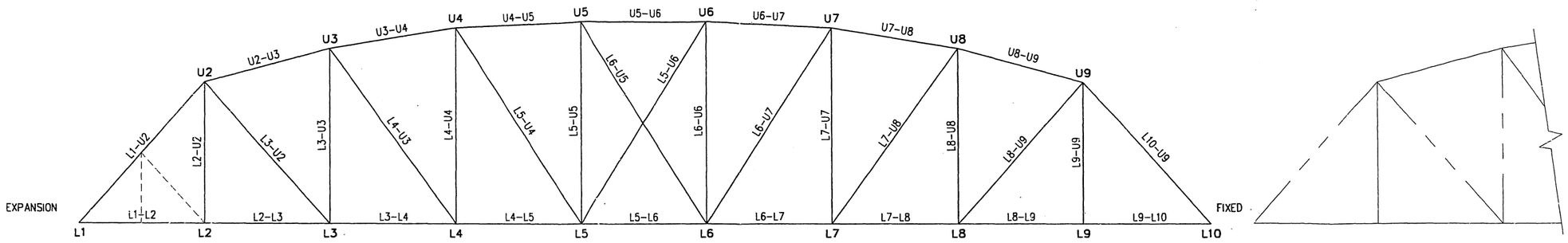
φ=.95 φc=.95

φc=.95 depend on FD .85 HS already

.95

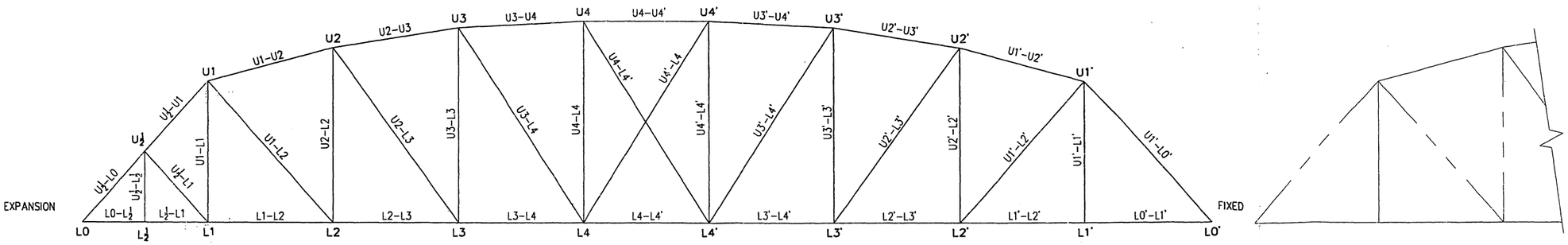
φ=.95 for T φc=.95 φ.φc=.9025

φc=.95



BRIDGE NO. 9090 – TRUSS MEMBER AND JOINT LABELS USED IN RATING ANALYSIS

SCALE: 0 15'



BRIDGE NO. 9090 – TRUSS MEMBER AND JOINT LABELS USED IN ORIGINAL PLAN

SCALE: 0 15'

TITLE: TRUSS ELEVATION	DES: RAM	DR: RAM	APPROVED:	Bridge No. 9090
	CHK: JWS	CHK: JWS		
	Sheet No. 1 of 1 Sheet			

Member Data

TABLE 1.6 MEMBER DATA

MEM NO	LCTN FRM	LCTN TO	MEM REL	LOADED MEM SEQ NO	LOADED MEM DEK LCN (FT)	MIN R GYRATON (IN)	MEM DEPTH (IN)	MEMBER AREA GROSS (SQIN)	MEMBER AREA NET (SQIN)	YIELD STRSS (KSI)	INF LIN OPT	EFF LNG FAC	TEMP CHNG
1	L 1	L 2	0	1	0.00	6.02	26.50	114.5	0.0	36.0	1	0.90	0.0
2	L 2	L 3	0	0	0.00	7.88	24.75	58.3	0.0	36.0	1	0.90	0.0
3	L 3	L 4	0	0	0.00	7.88	24.75	58.3	0.0	36.0	1	0.90	0.0
4	L 4	L 5	0	0	0.00	8.02	24.75	67.2	0.0	36.0	1	0.90	0.0
5	L 5	L 6	0	0	0.00	7.91	24.75	73.3	0.0	36.0	1	0.90	0.0
6	L 6	L 7	0	0	0.00	8.02	24.75	67.2	0.0	36.0	1	0.90	0.0
7	L 7	L 8	0	0	0.00	7.88	24.75	58.3	0.0	36.0	1	0.90	0.0
8	L 8	L 9	0	0	0.00	7.88	24.75	58.3	0.0	33.0	1	0.90	0.0
9	L 9	L10	0	0	0.00	7.88	24.75	58.3	0.0	33.0	1	0.90	0.0
10	U 2	U 3	0	0	0.00	8.02	25.25	67.2	0.0	42.0	1	0.90	0.0
11	U 3	U 4	0	0	0.00	7.91	25.25	73.3	0.0	42.0	1	0.90	0.0
12	U 4	U 5	0	0	0.00	7.98	25.25	79.2	0.0	42.0	1	0.90	0.0
13	U 5	U 6	0	0	0.00	7.98	25.25	79.2	0.0	42.0	1	0.90	0.0
14	U 6	U 7	0	0	0.00	7.98	25.25	79.2	0.0	42.0	1	0.90	0.0
15	U 7	U 8	0	0	0.00	7.91	25.25	73.3	0.0	42.0	1	0.90	0.0
16	U 8	U 9	0	0	0.00	8.02	25.25	67.2	0.0	42.0	1	0.90	0.0
17	L 2	U 2	0	2	0.00	2.71	18.16	28.2	0.0	42.0	1	0.50	0.0
18	L 3	U 3	0	3	0.00	2.71	18.16	28.2	0.0	33.0	1	0.50	0.0
19	L 4	U 4	0	4	0.00	2.71	18.16	28.2	0.0	33.0	1	0.50	0.0
20	L 5	U 5	0	5	0.00	2.71	18.16	28.2	0.0	33.0	1	0.50	0.0
21	L 6	U 6	0	6	0.00	2.71	18.16	28.2	0.0	33.0	1	0.50	0.0
22	L 7	U 7	0	7	0.00	2.71	18.16	28.2	0.0	33.0	1	0.50	0.0
23	L 8	U 8	0	8	0.00	2.71	18.16	28.2	0.0	33.0	1	0.50	0.0
24	L 9	U 9	0	9	0.00	2.71	18.16	28.2	0.0	33.0	1	0.50	0.0
25	L 1	U 2	0	0	0.00	7.91	25.25	73.3	0.0	42.0	1	0.90	0.0
26	L 3	U 2	0	0	0.00	2.76	18.48	41.0	0.0	36.0	1	0.50	0.0
27	L 4	U 3	0	0	0.00	1.98	18.16	22.6	0.0	40.0	1	0.50	0.0
28	L 5	U 4	0	0	0.00	1.93	17.87	18.8	0.0	40.0	1	0.50	0.0
29	L 5	U 6	1	0	0.00	1.93	17.87	18.8	0.0	33.0	1	0.50	0.0
30	L 6	U 5	0	0	0.00	1.93	17.87	18.8	0.0	33.0	1	0.50	0.0
31	L 6	U 7	0	0	0.00	1.93	17.87	18.8	0.0	33.0	1	0.50	0.0
32	L 7	U 8	0	0	0.00	1.93	17.87	18.8	0.0	40.0	1	0.50	0.0
33	L 8	U 9	0	0	0.00	2.71	18.16	28.2	0.0	36.0	1	0.50	0.0
34	L10	U 9	0	10	0.00	7.91	25.25	73.3	0.0	42.0	1	0.90	0.0

Allowable Force Summary

TABLE 15.1 ALLOWABLE FORCE SUMMARY FOR LOWER CHORD MEMBERS (L F D)

MEMBER	INVENTORY AASHTO TENS.	INVENTORY AASHTO COMP.	OPERATING AASHTO TENS.	OPERATING AASHTO COMP.	POSTING STA. VEH. TENS.	POSTING STA. VEH. COMP.	POSTING SPE. TR. TENS.	POSTING SPE. TR. COMP.
L 1 L 2	4122.00	3162.94	4122.00	3162.94	4122.00	3162.94	4122.00	3162.94
L 2 L 3	2097.00	1681.28	2097.00	1681.28	2097.00	1681.28	2097.00	1681.28
L 3 L 4	2097.00	1681.28	2097.00	1681.28	2097.00	1681.28	2097.00	1681.28
L 4 L 5	2421.00	1945.09	2421.00	1945.09	2421.00	1945.09	2421.00	1945.09
L 5 L 6	2637.00	2115.19	2637.00	2115.19	2637.00	2115.19	2637.00	2115.19
L 6 L 7	2421.00	1945.09	2421.00	1945.09	2421.00	1945.09	2421.00	1945.09
L 7 L 8	2097.00	1681.28	2097.00	1681.28	2097.00	1681.28	2097.00	1681.28
L 8 L 9	1922.25	1548.90	1922.25	1548.90	1922.25	1548.90	1922.25	1548.90
L 9 L10	1922.25	1548.90	1922.25	1548.90	1922.25	1548.90	1922.25	1548.90

TABLE 15.2 ALLOWABLE FORCE SUMMARY FOR UPPER CHORD MEMBERS (L F D)

MEMBER	INVENTORY AASHTO		OPERATING AASHTO		POSTING STA. VEH.		POSTING SPE. TR.	
	TENS.	COMP.	TENS.	COMP.	TENS.	COMP.	TENS.	COMP.
U 2 U 3	2824.50	2236.26	2824.50	2236.26	2824.50	2236.26	2824.50	2236.26
U 3 U 4	3076.50	2438.69	3076.50	2438.69	3076.50	2438.69	3076.50	2438.69
U 4 U 5	3328.50	2646.00	3328.50	2646.00	3328.50	2646.00	3328.50	2646.00
U 5 U 6	3328.50	2646.53	3328.50	2646.53	3328.50	2646.53	3328.50	2646.53
U 6 U 7	3328.50	2646.00	3328.50	2646.00	3328.50	2646.00	3328.50	2646.00
U 7 U 8	3076.50	2438.69	3076.50	2438.69	3076.50	2438.69	3076.50	2438.69
U 8 U 9	2824.50	2236.26	2824.50	2236.26	2824.50	2236.26	2824.50	2236.26

TABLE 15.4 ALLOWABLE FORCE SUMMARY FOR VERTICAL MEMBERS (L F D)

MEMBER	INVENTORY AASHTO		OPERATING AASHTO		POSTING STA. VEH.		POSTING SPE. TR.	
	TENS.	COMP.	TENS.	COMP.	TENS.	COMP.	TENS.	COMP.
L 2 U 2B	1185.24	785.53	1185.24	785.53	1185.24	785.53	1185.24	785.53
L 3 U 3B	931.26	581.59	931.26	581.59	931.26	581.59	931.26	581.59
L 4 U 4B	931.26	530.33	931.26	530.33	931.26	530.33	931.26	530.33
L 5 U 5B	931.26	511.96	931.26	511.96	931.26	511.96	931.26	511.96
L 6 U 6B	931.26	511.96	931.26	511.96	931.26	511.96	931.26	511.96

TABLE 15.4 ALLOWABLE FORCE SUMMARY FOR VERTICAL MEMBERS (L F D)

MEMBER	INVENTORY AASHTO		OPERATING AASHTO		POSTING STA. VEH.		POSTING SPE. TR.	
	TENS.	COMP.	TENS.	COMP.	TENS.	COMP.	TENS.	COMP.
L 7 U 7B	931.26	530.33	931.26	530.33	931.26	530.33	931.26	530.33
L 8 U 8B	931.26	581.59	931.26	581.59	931.26	581.59	931.26	581.59
L 9 U 9B	931.26	654.57	931.26	654.57	931.26	654.57	931.26	654.57

TABLE 15.5 ALLOWABLE FORCE SUMMARY FOR DIAGONAL MEMBERS (L F D)

MEMBER	INVENTORY AASHTO		OPERATING AASHTO		POSTING STA. VEH.		POSTING SPE. TR.	
	TENS.	COMP.	TENS.	COMP.	TENS.	COMP.	TENS.	COMP.
L 1 U 2	3076.50	2224.09	3076.50	2224.09	3076.50	2224.09	3076.50	2224.09
U 2 L 3	1476.36	847.25	1476.36	847.25	1476.36	847.25	1476.36	847.25
U 3 L 4	905.20	211.22	905.20	211.22	905.20	211.22	905.20	211.22
U 4 L 5	752.00	143.55	752.00	143.55	752.00	143.55	752.00	143.55
L 5 U 6	620.40	136.74	620.40	136.74	620.40	136.74	620.40	136.74
U 5 L 6	620.40	136.74	620.40	136.74	620.40	136.74	620.40	136.74
L 6 U 7	620.40	143.55	620.40	143.55	620.40	143.55	620.40	143.55
L 7 U 8	752.00	166.73	752.00	166.73	752.00	166.73	752.00	166.73
L 8 U 9	1015.92	572.57	1015.92	572.57	1015.92	572.57	1015.92	572.57
U 9 L10	3076.50	2224.09	3076.50	2224.09	3076.50	2224.09	3076.50	2224.09

Service Dead Loads

TABLE 3.9 DEAD LOAD FORCES AND ADJUSTED LENGTHS IN LOWER CHORD (UNFACTORED)

MEMBER	TOTAL STEEL		TOTAL DEAD LOAD	
	FORCE (K)	ADJ LENGTH (FT)	FORCE (K)	ADJ LENGTH (FT)
L 1 L 2	735.9	31.0069	735.9	31.0069
L 2 L 3	735.9	31.0135	735.9	31.0135
L 3 L 4	1036.0	31.0190	1036.0	31.0190
L 4 L 5	1193.5	31.0190	1193.5	31.0190
L 5 L 6	1282.3	31.0187	1282.3	31.0187
L 6 L 7	1190.9	31.0189	1190.9	31.0189
L 7 L 8	1031.6	31.0189	1031.6	31.0189
L 8 L 9	729.6	31.0134	729.6	31.0134
L 9 L 10	729.6	31.0134	729.6	31.0134

TABLE 3.10 DEAD LOAD FORCES AND ADJUSTED LENGTHS IN UPPER CHORD (UNFACTORED)

MEMBER	TOTAL STEEL		TOTAL DEAD LOAD	
	FORCE (K)	ADJ LENGTH (FT)	FORCE (K)	ADJ LENGTH (FT)
U 2 U 3	-1072.8	32.0820	-1072.8	32.0820
U 3 U 4	-1208.9	31.3828	-1208.9	31.3828
U 4 U 5	-1284.2	31.0276	-1284.2	31.0276
U 5 U 6	-1281.5	30.9827	-1281.5	30.9827
U 6 U 7	-1283.4	31.0276	-1283.4	31.0276
U 7 U 8	-1206.3	31.3828	-1206.3	31.3828
U 8 U 9	-1068.2	32.0821	-1068.2	32.0821

TABLE 3.12 DEAD LOAD FORCES AND ADJUSTED LENGTHS IN VERT. MEMBERS (UNFACTORED)

MEMBER	TOTAL STEEL FORCE TOP (K)	TOTAL STEEL FORCE BOTTOM (K)	TOTAL STEEL ADJ LENGTH (FT)	TOTAL DEAD LOAD FORCE TOP (K)	TOTAL DEAD LOAD FORCE BOTTOM (K)	TOTAL DEAD LOAD ADJ LENGTH (FT)
L 2 U 2	179.5	179.5	34.9923	179.5	179.5	34.9923
L 3 U 3	-162.3	-162.3	43.3386	-162.3	-162.3	43.3386
L 4 U 4	-44.0	-44.0	48.3326	-44.0	-44.0	48.3326
L 5 U 5	40.5	40.5	49.9975	40.5	40.5	49.9975
L 6 U 6	39.2	39.2	49.9976	39.2	39.2	49.9976
L 7 U 7	-47.1	-47.1	48.3328	-47.1	-47.1	48.3328
L 8 U 8	-165.4	-165.4	43.3388	-165.4	-165.4	43.3388
L 9 U 9	172.7	172.7	34.9926	172.7	172.7	34.9926

TABLE 3.13 DEAD LOAD FORCES AND ADJUSTED LENGTHS IN DIAG. MEMBERS (UNFACTORED)

MEMBER	TOTAL STEEL		TOTAL DEAD LOAD	
	FORCE (K)	ADJ LENGTH (FT)	FORCE (K)	ADJ LENGTH (FT)
L 1 U 2	-1109.9	46.7303	-1109.9	46.7303
U 2 L 3	452.7	46.7725	452.7	46.7725
U 3 L 4	270.6	53.2994	270.6	53.2994
U 4 L 5	164.5	57.4350	164.5	57.4350
L 5 U 6	0.0	58.8303	0.0	58.8303
U 5 L 6	-1.5	58.8301	-1.5	58.8301
L 6 U 7	167.7	57.4353	167.7	57.4353
L 7 U 8	273.9	53.3042	273.9	53.3042
L 8 U 9	455.4	46.7807	455.4	46.7807
U 9 L 10	-1100.5	46.7305	-1100.5	46.7305

Service Live Loads

TABLE 5.1 MAXIMUM LIVE LOAD FORCE IN LOWER CHORDS (UNFACTORED)

ASSHTO LOADING RESULTS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 L 2	141.56	159.08	L	0.00	0.00	
L 2 L 3	141.56	159.08	L	0.00	0.00	
L 3 L 4	200.10	224.87	L	0.00	0.00	
L 4 L 5	230.66	259.20	L	0.00	0.00	
L 5 L 6	247.73	278.39	L	0.00	0.00	
L 6 L 7	230.66	259.20	L	0.00	0.00	
L 7 L 8	200.10	224.87	L	0.00	0.00	
L 8 L 9	141.56	159.08	L	0.00	0.00	
L 9 L10	141.56	159.08	L	0.00	0.00	

TABLE 5.2 MAXIMUM LIVE LOAD FORCE IN UPPER CHORDS (UNFACTORED)

ASSHTO LOADING RESULTS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
U 2 U 3	0.00	0.00		-207.20	-232.84	L
U 3 U 4	0.00	0.00		-233.64	-262.55	L
U 4 U 5	0.00	0.00		-248.09	-278.79	L
U 5 U 6	0.00	0.00		-247.73	-278.39	L
U 6 U 7	0.00	0.00		-248.09	-278.79	L
U 7 U 8	0.00	0.00		-233.64	-262.55	L
U 8 U 9	0.00	0.00		-207.20	-232.84	L

TABLE 5.4 MAXIMUM LIVE LOAD FORCE IN VERTICAL MEMBERS (UNFACTORED)

ASSHTO LOADING RESULTS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 2 U 2 T	90.40	114.57	HS	0.00	0.00	
L 2 U 2 B	0.00	0.00		0.00	0.00	
L 3 U 3 T	51.18	66.53	HS	-57.12	-65.01	L
L 3 U 3 B	21.98	28.58	HS	-75.31	-85.71	L
L 4 U 4 T	56.86	71.08	HS	-46.80	-53.94	L
L 4 U 4 B	36.92	46.15	HS	-64.02	-73.78	L
L 5 U 5 T	56.52	68.76	HS	-43.80	-51.17	HS
L 5 U 5 B	42.23	51.37	HS	-58.96	-68.89	L
L 6 U 6 T	13.10	15.00	L	0.00	0.00	
L 6 U 6 B	8.63	9.88	L	-81.98	-104.38	HS
L 7 U 7 T	56.86	71.08	HS	-46.80	-53.94	L
L 7 U 7 B	36.92	46.15	HS	-64.02	-73.78	L
L 8 U 8 T	51.18	66.53	HS	-57.12	-65.01	L
L 8 U 8 B	21.98	28.58	HS	-75.31	-85.71	L
L 9 U 9 T	90.40	114.57	HS	0.00	0.00	
L 9 U 9 B	0.00	0.00		0.00	0.00	

TABLE 5.5 MAXIMUM LIVE LOAD FORCE IN DIAGONAL MEMBERS (UNFACTORED)

ASSHTO LOADING RESULTS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 U 2	0.00	0.00		-229.42	-257.81	L
U 2 L 3	109.18	124.26	L	-29.36	-38.17	HS
U 3 L 4	86.30	99.45	L	-45.39	-56.74	HS
U 4 L 5	77.71	90.80	L	-50.17	-61.03	HS
L 5 U 6	0.00	0.00		0.00	0.00	
U 5 L 6	61.91	73.64	L	-61.91	-73.64	L
L 6 U 7	77.71	90.80	L	-50.17	-61.03	HS
L 7 U 8	86.30	99.45	L	-45.39	-56.74	HS
L 8 U 9	109.18	124.26	L	-29.36	-38.17	HS
U 9 L10	0.00	0.00		-229.42	-257.81	L

TABLE 5.1 MAXIMUM LIVE LOAD FORCE IN LOWER CHORDS (UNFACTORED)

ASSHTO LOADING RESULTS FOR 3 LANES TO BE ADDED TO ONE LANE OF PERMIT TRUCKS (A, B, C, P411, P413)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 L 2	86.83	97.57	L	0.00	0.00	
L 2 L 3	86.83	97.57	L	0.00	0.00	
L 3 L 4	122.74	137.93	L	0.00	0.00	
L 4 L 5	141.48	158.99	L	0.00	0.00	
L 5 L 6	151.95	170.75	L	0.00	0.00	
L 6 L 7	141.48	158.99	L	0.00	0.00	
L 7 L 8	122.74	137.93	L	0.00	0.00	
L 8 L 9	86.83	97.57	L	0.00	0.00	
L 9 L10	86.83	97.57	L	0.00	0.00	

TABLE 5.2 MAXIMUM LIVE LOAD FORCE IN UPPER CHORDS (UNFACTORED)

ASSHTO LOADING RESULTS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
U 2 U 3	0.00	0.00		-127.09	-142.82	L
U 3 U 4	0.00	0.00		-143.31	-161.04	L
U 4 U 5	0.00	0.00		-152.17	-171.00	L
U 5 U 6	0.00	0.00		-151.95	-170.75	L
U 6 U 7	0.00	0.00		-152.17	-171.00	L
U 7 U 8	0.00	0.00		-143.31	-161.04	L
U 8 U 9	0.00	0.00		-127.09	-142.82	L

TABLE 5.4 MAXIMUM LIVE LOAD FORCE IN VERTICAL MEMBERS (UNFACTORED)

ASSHTO LOADING RESULTS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 2 U 2 T	55.45	70.27	HS	0.00	0.00	
L 2 U 2 B	0.00	0.00		0.00	0.00	
L 3 U 3 T	31.39	40.81	HS	-35.03	-39.87	L
L 3 U 3 B	13.48	17.53	HS	-46.19	-52.57	L
L 4 U 4 T	34.88	43.60	HS	-28.71	-33.08	L
L 4 U 4 B	22.64	28.31	HS	-39.27	-45.25	L
L 5 U 5 T	34.67	42.17	HS	-26.86	-31.39	HS
L 5 U 5 B	25.90	31.51	HS	-36.16	-42.25	L
L 6 U 6 T	8.03	9.20	L	0.00	0.00	
L 6 U 6 B	5.29	6.06	L	-50.28	-64.02	HS
L 7 U 7 T	34.88	43.60	HS	-28.71	-33.08	L
L 7 U 7 B	22.64	28.31	HS	-39.27	-45.25	L
L 8 U 8 T	31.39	40.81	HS	-35.03	-39.87	L
L 8 U 8 B	13.48	17.53	HS	-46.19	-52.57	L
L 9 U 9 T	55.45	70.27	HS	0.00	0.00	
L 9 U 9 B	0.00	0.00		0.00	0.00	

TABLE 5.5 MAXIMUM LIVE LOAD FORCE IN DIAGONAL MEMBERS (UNFACTORED)

ASSHTO LOADING RESULTS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 U 2	0.00	0.00		-140.72	-158.13	L
U 2 L 3	66.97	76.22	L	-18.01	-23.41	HS
U 3 L 4	52.93	61.00	L	-27.84	-34.80	HS
U 4 L 5	47.67	55.69	L	-30.77	-37.43	HS
L 5 U 6	0.00	0.00		0.00	0.00	
U 5 L 6	37.97	45.17	L	-37.97	-45.17	L
L 6 U 7	47.67	55.69	L	-30.77	-37.43	HS
L 7 U 8	52.93	61.00	L	-27.84	-34.80	HS
L 8 U 9	66.97	76.22	L	-18.01	-23.41	HS
U 9 L10	0.00	0.00		-140.72	-158.13	L

TABLE 9.1 MAXIMUM LIVE LOAD FORCE IN LOWER CHORDS (UNFACTORED)

(FOR TRUCK 4) STANDARD A ONE LANE TO BE ADDED TO THREE LANES OF HS TRUCKS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 L 2	48.87	54.92	S1	0.00	0.00	S1
L 2 L 3	48.87	54.92	S1	0.00	0.00	S1
L 3 L 4	68.67	77.17	S1	0.00	0.00	S1
L 4 L 5	78.75	88.50	S1	0.00	0.00	S1
L 5 L 6	84.10	94.51	S1	0.00	0.00	S1
L 6 L 7	78.75	88.50	S1	0.00	0.00	S1
L 7 L 8	68.67	77.17	S1	0.00	0.00	S1
L 8 L 9	48.87	54.92	S1	0.00	0.00	S1
L 9 L10	48.87	54.92	S1	0.00	0.00	S1

TABLE 9.2 MAXIMUM LIVE LOAD FORCE IN UPPER CHORDS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
U 2 U 3	0.00	0.00	S1	-71.11	-79.91	S1
U 3 U 4	0.00	0.00	S1	-79.77	-89.64	S1
U 4 U 5	0.00	0.00	S1	-84.23	-94.65	S1
U 5 U 6	0.00	0.00	S1	-84.10	-94.51	S1
U 6 U 7	0.00	0.00	S1	-84.23	-94.65	S1
U 7 U 8	0.00	0.00	S1	-79.77	-89.64	S1
U 8 U 9	0.00	0.00	S1	-71.11	-79.91	S1

TABLE 9.4 MAXIMUM LIVE LOAD FORCE IN VERTICAL MEMBERS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 2 U 2 T	37.90	48.04	S1	0.00	0.00	S1
L 2 U 2 B	0.00	0.00	S1	0.00	0.00	S1
L 3 U 3 T	23.82	30.96	S1	-25.11	-28.58	S1
L 3 U 3 B	8.06	10.48	S1	-29.36	-33.41	S1
L 4 U 4 T	28.04	35.05	S1	-22.95	-26.45	S1
L 4 U 4 B	16.95	21.18	S1	-27.74	-31.97	S1
L 5 U 5 T	28.80	35.03	S1	-22.31	-26.07	S1
L 5 U 5 B	20.76	25.26	S1	-28.37	-33.15	S1
L 6 U 6 T	4.45	5.09	S1	0.00	0.00	S1
L 6 U 6 B	3.38	3.87	S1	-33.43	-42.56	S1
L 7 U 7 T	28.04	35.05	S1	-22.95	-26.45	S1
L 7 U 7 B	16.95	21.18	S1	-27.74	-31.97	S1
L 8 U 8 T	23.82	30.96	S1	-25.11	-28.58	S1
L 8 U 8 B	8.06	10.48	S1	-29.36	-33.41	S1
L 9 U 9 T	37.90	48.04	S1	0.00	0.00	S1
L 9 U 9 B	0.00	0.00	S1	0.00	0.00	S1

TABLE 9.5 MAXIMUM LIVE LOAD FORCE IN DIAGONAL MEMBERS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 U 2	0.00	0.00	S1	-73.70	-82.83	S1
U 2 L 3	39.22	44.63	S1	-10.77	-14.00	S1
U 3 L 4	34.11	39.30	S1	-20.84	-26.04	S1
U 4 L 5	33.70	39.38	S1	-24.67	-30.01	S1
L 5 U 6	0.00	0.00	S1	0.00	0.00	S1
U 5 L 6	29.73	35.36	S1	-29.73	-35.36	S1
L 6 U 7	33.70	39.38	S1	-24.67	-30.01	S1
L 7 U 8	34.11	39.30	S1	-20.84	-26.04	S1
L 8 U 9	39.22	44.63	S1	-10.77	-14.00	S1
U 9 L10	0.00	0.00	S1	-73.70	-82.83	S1

TABLE 9.1 MAXIMUM LIVE LOAD FORCE IN LOWER CHORDS (UNFACTORED)

(FOR TRUCK 4) STANDARD B ONE LANE TO BE ADDED TO THREE LANES OF HS TRUCKS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 L 2	62.86	70.64	S1	0.00	0.00	S1
L 2 L 3	62.86	70.64	S1	0.00	0.00	S1
L 3 L 4	88.30	99.23	S1	0.00	0.00	S1
L 4 L 5	101.51	114.07	S1	0.00	0.00	S1
L 5 L 6	108.12	121.50	S1	0.00	0.00	S1
L 6 L 7	101.51	114.07	S1	0.00	0.00	S1
L 7 L 8	88.30	99.23	S1	0.00	0.00	S1
L 8 L 9	62.86	70.64	S1	0.00	0.00	S1
L 9 L10	62.86	70.64	S1	0.00	0.00	S1

TABLE 9.2 MAXIMUM LIVE LOAD FORCE IN UPPER CHORDS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
U 2 U 3	0.00	0.00	S1	-91.44	-102.75	S1
U 3 U 4	0.00	0.00	S1	-102.82	-115.55	S1
U 4 U 5	0.00	0.00	S1	-108.28	-121.68	S1
U 5 U 6	0.00	0.00	S1	-108.12	-121.50	S1
U 6 U 7	0.00	0.00	S1	-108.28	-121.68	S1
U 7 U 8	0.00	0.00	S1	-102.82	-115.55	S1
U 8 U 9	0.00	0.00	S1	-91.44	-102.75	S1

TABLE 9.4 MAXIMUM LIVE LOAD FORCE IN VERTICAL MEMBERS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 2 U 2 T	43.16	54.70	S1	0.00	0.00	S1
L 2 U 2 B	0.00	0.00	S1	0.00	0.00	S1
L 3 U 3 T	28.76	37.39	S1	-32.10	-36.53	S1
L 3 U 3 B	9.04	11.75	S1	-37.67	-42.87	S1
L 4 U 4 T	34.90	43.62	S1	-29.18	-33.63	S1
L 4 U 4 B	20.32	25.41	S1	-35.46	-40.86	S1
L 5 U 5 T	36.31	44.17	S1	-28.14	-32.87	S1
L 5 U 5 B	25.77	31.35	S1	-36.08	-42.15	S1
L 6 U 6 T	5.72	6.55	S1	0.00	0.00	S1
L 6 U 6 B	4.26	4.87	S1	-37.42	-47.65	S1
L 7 U 7 T	34.90	43.62	S1	-29.18	-33.63	S1
L 7 U 7 B	20.32	25.41	S1	-35.46	-40.86	S1
L 8 U 8 T	28.76	37.39	S1	-32.10	-36.53	S1
L 8 U 8 B	9.04	11.75	S1	-37.67	-42.87	S1
L 9 U 9 T	43.16	54.70	S1	0.00	0,00	S1
L 9 U 9 B	0.00	0.00	S1	0.00	0.00	S1

TABLE 9.5 MAXIMUM LIVE LOAD FORCE IN DIAGONAL MEMBERS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 U 2	0.00	0.00	S1	-94.81	-106.54	S1
U 2 L 3	50.32	57.26	S1	-12.08	-15.70	S1
U 3 L 4	43.60	50.25	S1	-24.99	-31.24	S1
U 4 L 5	42.86	50.08	S1	-30.62	-37.25	S1
L 5 U 6	0.00	0.00	S1	0.00	0.00	S1
U 5 L 6	37.49	44.59	S1	-37.49	-44.59	S1
L 6 U 7	42.86	50.08	S1	-30.62	-37.25	S1
L 7 U 8	43.60	50.25	S1	-24.99	-31.24	S1
L 8 U 9	50.32	57.26	S1	-12.08	-15.70	S1
U 9 L10	0.00	0.00	S1	-94.81	-106.54	S1

TABLE 9.1 MAXIMUM LIVE LOAD FORCE IN LOWER CHORDS (UNFACTORED)

(FOR TRUCK 4) STANDARD C ONE LANE TO BE ADDED TO THREE LANES OF HS TRUCKS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 L 2	72.29	81.23	S1	0.00	0.00	S1
L 2 L 3	72.29	81.23	S1	0.00	0.00	S1
L 3 L 4	101.66	114.24	S1	0.00	0.00	S1
L 4 L 5	116.71	131.15	S1	0.00	0.00	S1
L 5 L 6	124.25	139.63	S1	0.00	0.00	S1
L 6 L 7	116.71	131.15	S1	0.00	0.00	S1
L 7 L 8	101.66	114.24	S1	0.00	0.00	S1
L 8 L 9	72.29	81.23	S1	0.00	0.00	S1
L 9 L10	72.29	81.23	S1	0.00	0.00	S1

TABLE 9.2 MAXIMUM LIVE LOAD FORCE IN UPPER CHORDS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
U 2 U 3	0.00	0.00	S1	-105.26	-118.29	S1
U 3 U 4	0.00	0.00	S1	-118.22	-132.85	S1
U 4 U 5	0.00	0.00	S1	-124.43	-139.83	S1
U 5 U 6	0.00	0.00	S1	-124.25	-139.63	S1
U 6 U 7	0.00	0.00	S1	-124.43	-139.83	S1
U 7 U 8	0.00	0.00	S1	-118.22	-132.85	S1
U 8 U 9	0.00	0.00	S1	-105.26	-118.29	S1

TABLE 9.4 MAXIMUM LIVE LOAD FORCE IN VERTICAL MEMBERS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 2 U 2 T	46.15	58.48	S1	0.00	0.00	S1
L 2 U 2 B	0.00	0.00	S1	0.00	0.00	S1
L 3 U 3 T	31.10	40.43	S1	-36.68	-41.74	S1
L 3 U 3 B	10.01	13.01	S1	-43.20	-49.16	S1
L 4 U 4 T	39.14	48.93	S1	-33.17	-38.22	S1
L 4 U 4 B	22.01	27.51	S1	-40.52	-46.69	S1
L 5 U 5 T	41.07	49.96	S1	-31.69	-37.03	S1
L 5 U 5 B	28.76	34.99	S1	-41.00	-47.90	S1
L 6 U 6 T	6.57	7.52	S1	0.00	0.00	S1
L 6 U 6 B	4.80	5.49	S1	-39.61	-50.43	S1
L 7 U 7 T	39.14	48.93	S1	-33.17	-38.22	S1
L 7 U 7 B	22.01	27.51	S1	-40.52	-46.69	S1
L 8 U 8 T	31.10	40.43	S1	-36.68	-41.74	S1
L 8 U 8 B	10.01	13.01	S1	-43.20	-49.16	S1
L 9 U 9 T	46.15	58.48	S1	0.00	0.00	S1
L 9 U 9 B	0.00	0.00	S1	0.00	0.00	S1

TABLE 9.5 MAXIMUM LIVE LOAD FORCE IN DIAGONAL MEMBERS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 U 2	0.00	0.00	S1	-109.02	-122.51	S1
U 2 L 3	57.71	65.68	S1	-13.37	-17.38	S1
U 3 L 4	49.82	57.41	S1	-27.06	-33.82	S1
U 4 L 5	48.71	56.91	S1	-34.17	-41.57	S1
L 5 U 6	0.00	0.00	S1	0.00	0.00	S1
U 5 L 6	42.23	50.23	S1	-42.23	-50.23	S1
L 6 U 7	48.71	56.91	S1	-34.17	-41.57	S1
L 7 U 8	49.82	57.41	S1	-27.06	-33.82	S1
L 8 U 9	57.71	65.68	S1	-13.37	-17.38	S1
U 9 L10	0.00	0.00	S1	-109.02	-122.51	S1

TABLE 9.1 MAXIMUM LIVE LOAD FORCE IN LOWER CHORDS (UNFACTORED)

(FOR TRUCK 4) P411 ONE LANE TO BE ADDED TO THREE LANES OF HS TRUCKS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 L 2	86.61	97.33	S1	0.00	0.00	S1
L 2 L 3	86.61	97.33	S1	0.00	0.00	S1
L 3 L 4	121.57	136.62	S1	0.00	0.00	S1
L 4 L 5	137.61	154.65	S1	0.00	0.00	S1
L 5 L 6	145.63	163.66	S1	0.00	0.00	S1
L 6 L 7	137.61	154.65	S1	0.00	0.00	S1
L 7 L 8	121.57	136.62	S1	0.00	0.00	S1
L 8 L 9	86.61	97.33	S1	0.00	0.00	S1
L 9 L10	86.61	97.33	S1	0.00	0.00	S1

TABLE 9.2 MAXIMUM LIVE LOAD FORCE IN UPPER CHORDS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
U 2 U 3	0.00	0.00	S1	-125.89	-141.47	S1
U 3 U 4	0.00	0.00	S1	-139.39	-156.64	S1
U 4 U 5	0.00	0.00	S1	-145.84	-163.90	S1
U 5 U 6	0.00	0.00	S1	-145.63	-163.66	S1
U 6 U 7	0.00	0.00	S1	-145.84	-163.90	S1
U 7 U 8	0.00	0.00	S1	-139.39	-156.64	S1
U 8 U 9	0.00	0.00	S1	-125.89	-141.47	S1

TABLE 9.4 MAXIMUM LIVE LOAD FORCE IN VERTICAL MEMBERS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 2 U 2 T	50.15	63.56	S1	0.00	0.00	S1
L 2 U 2 B	0.00	0.00	S1	0.00	0.00	S1
L 3 U 3 T	27.76	36.09	S1	-42.18	-48.01	S1
L 3 U 3 B	10.83	14.07	S1	-50.75	-57.76	S1
L 4 U 4 T	38.31	47.89	S1	-36.93	-42.56	S1
L 4 U 4 B	19.47	24.34	S1	-46.60	-53.70	S1
L 5 U 5 T	44.02	53.54	S1	-33.45	-39.08	S1
L 5 U 5 B	27.81	33.83	S1	-45.77	-53.47	S1
L 6 U 6 T	7.70	8.82	S1	0.00	0.00	S1
L 6 U 6 B	5.05	5.78	S1	-42.95	-54.68	S1
L 7 U 7 T	38.31	47.89	S1	-36.93	-42.56	S1
L 7 U 7 B	19.47	24.34	S1	-46.60	-53.70	S1
L 8 U 8 T	27.76	36.09	S1	-42.18	-48.01	S1
L 8 U 8 B	10.83	14.07	S1	-50.75	-57.76	S1
L 9 U 9 T	50.15	63.56	S1	0.00	0.00	S1
L 9 U 9 B	0.00	0.00	S1	0.00	0.00	S1

TABLE 9.5 MAXIMUM LIVE LOAD FORCE IN DIAGONAL MEMBERS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 U 2	0.00	0.00	S1	-130.63	-146.80	S1
U 2 L 3	67.80	77.16	S1	-14.46	-18.80	S1
U 3 L 4	57.30	66.03	S1	-23.95	-29.93	S1
U 4 L 5	54.37	63.53	S1	-33.04	-40.19	S1
L 5 U 6	0.00	0.00	S1	0.00	0.00	S1
U 5 L 6	45.02	53.55	S1	-45.02	-53.55	S1
L 6 U 7	54.37	63.53	S1	-33.04	-40.19	S1
L 7 U 8	57.30	66.03	S1	-23.95	-29.93	S1
L 8 U 9	67.80	77.16	S1	-14.46	-18.80	S1
U 9 L10	0.00	0.00	S1	-130.63	-146.80	S1

TABLE 9.1 MAXIMUM LIVE LOAD FORCE IN LOWER CHORDS (UNFACTORED)

(FOR TRUCK 4) P413 ONE LANE TO BE ADDED TO THREE LANES OF HS TRUCKS

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 L 2	101.06	113.56	S1	0.00	0.00	S1
L 2 L 3	101.06	113.56	S1	0.00	0.00	S1
L 3 L 4	140.66	158.07	S1	0.00	0.00	S1
L 4 L 5	159.98	179.78	S1	0.00	0.00	S1
L 5 L 6	170.33	191.41	S1	0.00	0.00	S1
L 6 L 7	159.98	179.78	S1	0.00	0.00	S1
L 7 L 8	140.66	158.07	S1	0.00	0.00	S1
L 8 L 9	101.06	113.56	S1	0.00	0.00	S1
L 9 L10	101.06	113.56	S1	0.00	0.00	S1

TABLE 9.2 MAXIMUM LIVE LOAD FORCE IN UPPER CHORDS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
U 2 U 3	0.00	0.00	S1	-145.65	-163.67	S1
U 3 U 4	0.00	0.00	S1	-162.04	-182.10	S1
U 4 U 5	0.00	0.00	S1	-170.58	-191.69	S1
U 5 U 6	0.00	0.00	S1	-170.33	-191.41	S1
U 6 U 7	0.00	0.00	S1	-170.58	-191.69	S1
U 7 U 8	0.00	0.00	S1	-162.04	-182.10	S1
U 8 U 9	0.00	0.00	S1	-145.65	-163.67	S1

TABLE 9.4 MAXIMUM LIVE LOAD FORCE IN VERTICAL MEMBERS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 2 U 2 T	46.65	59.12	S1	0.00	0.00	S1
L 2 U 2 B	0.00	0.00	S1	0.00	0.00	S1
L 3 U 3 T	29.56	38.43	S1	-47.53	-54.10	S1
L 3 U 3 B	9.54	12.40	S1	-58.34	-66.40	S1
L 4 U 4 T	39.01	48.76	S1	-40.52	-46.70	S1
L 4 U 4 B	20.77	25.97	S1	-52.75	-60.79	S1
L 5 U 5 T	46.87	57.02	S1	-35.57	-41.56	S1
L 5 U 5 B	28.33	34.46	S1	-50.89	-59.46	S1
L 6 U 6 T	9.01	10.31	S1	0.00	0.00	S1
L 6 U 6 B	5.27	6.04	S1	-38.88	-49.50	S1
L 7 U 7 T	39.01	48.76	S1	-40.52	-46.70	S1
L 7 U 7 B	20.77	25.97	S1	-52.75	-60.79	S1
L 8 U 8 T	29.56	38.43	S1	-47.53	-54.10	S1
L 8 U 8 B	9.54	12.40	S1	-58.34	-66.40	S1
L 9 U 9 T	46.65	59.12	S1	0.00	0.00	S1
L 9 U 9 B	0.00	0.00	S1	0.00	0.00	S1

TABLE 9.5 MAXIMUM LIVE LOAD FORCE IN DIAGONAL MEMBERS (UNFACTORED)

(FOR TRUCK 4)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 U 2	0.00	0.00	S1	-152.41	-171.28	S1
U 2 L 3	77.93	88.70	S1	-12.74	-16.56	S1
U 3 L 4	64.86	74.75	S1	-25.54	-31.93	S1
U 4 L 5	60.46	70.64	S1	-33.66	-40.94	S1
L 5 U 6	0.00	0.00	S1	0.00	0.00	S1
U 5 L 6	47.97	57.05	S1	-47.97	-57.05	S1
L 6 U 7	60.46	70.64	S1	-33.66	-40.94	S1
L 7 U 8	64.86	74.75	S1	-25.54	-31.93	S1
L 8 U 9	77.93	88.70	S1	-12.74	-16.56	S1
U 9 L10	0.00	0.00	S1	-152.41	-171.28	S1

TABLE 6.1 MAXIMUM LIVE LOAD FORCE IN LOWER CHORDS (UNFACTORED)

(FOR TRUCK 1) TYPE M3

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 L 2	64.00	71.92	T1	0.00	0.00	T1
L 2 L 3	64.00	71.92	T1	0.00	0.00	T1
L 3 L 4	90.06	101.21	T1	0.00	0.00	T1
L 4 L 5	103.20	115.98	T1	0.00	0.00	T1
L 5 L 6	110.62	124.31	T1	0.00	0.00	T1
L 6 L 7	103.20	115.98	T1	0.00	0.00	T1
L 7 L 8	90.06	101.21	T1	0.00	0.00	T1
L 8 L 9	64.00	71.92	T1	0.00	0.00	T1
L 9 L10	64.00	71.92	T1	0.00	0.00	T1

TABLE 6.2 MAXIMUM LIVE LOAD FORCE IN UPPER CHORDS (UNFACTORED)

(FOR TRUCK 1)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
U 2 U 3	0.00	0.00	T1	-93.26	-104.80	T1
U 3 U 4	0.00	0.00	T1	-104.54	-117.47	T1
U 4 U 5	0.00	0.00	T1	-110.78	-124.49	T1
U 5 U 6	0.00	0.00	T1	-110.62	-124.31	T1
U 6 U 7	0.00	0.00	T1	-110.78	-124.49	T1
U 7 U 8	0.00	0.00	T1	-104.54	-117.47	T1
U 8 U 9	0.00	0.00	T1	-93.26	-104.80	T1

TABLE 6.4 MAXIMUM LIVE LOAD FORCE IN VERTICAL MEMBERS (UNFACTORED)

(FOR TRUCK 1)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 2 U 2 T	67.15	85.10	T1	0.00	0.00	T1
L 2 U 2 B	0.00	0.00	T1	0.00	0.00	T1
L 3 U 3 T	36.82	47.86	T1	-33.48	-38.11	T1
L 3 U 3 B	16.60	21.58	T1	-38.74	-44.09	T1
L 4 U 4 T	40.38	50.47	T1	-31.06	-35.80	T1
L 4 U 4 B	26.56	33.20	T1	-36.99	-42.62	T1
L 5 U 5 T	39.90	48.54	T1	-30.92	-36.12	T1
L 5 U 5 B	29.99	36.48	T1	-38.40	-44.86	T1
L 6 U 6 T	5.85	6.70	T1	0.00	0.00	T1
L 6 U 6 B	4.68	5.36	T1	-61.22	-77.95	T1
L 7 U 7 T	40.38	50.47	T1	-31.06	-35.80	T1
L 7 U 7 B	26.56	33.20	T1	-36.99	-42.62	T1
L 8 U 8 T	36.82	47.86	T1	-33.48	-38.11	T1
L 8 U 8 B	16.60	21.58	T1	-38.74	-44.09	T1
L 9 U 9 T	67.15	85.10	T1	0.00	0.00	T1
L 9 U 9 B	0.00	0.00	T1	0.00	0.00	T1

TABLE 6.5 MAXIMUM LIVE LOAD FORCE IN DIAGONAL MEMBERS (UNFACTORED)

(FOR TRUCK 1)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 U 2	0.00	0.00	T1	-96.52	-108.47	T1
U 2 L 3	51.75	58.90	T1	-22.17	-28.83	T1
U 3 L 4	45.48	52.41	T1	-32.66	-40.82	T1
U 4 L 5	45.62	53.30	T1	-35.63	-43.34	T1
L 5 U 6	0.00	0.00	T1	0.00	0.00	T1
U 5 L 6	41.19	48.99	T1	-41.19	-48.99	T1
L 6 U 7	45.62	53.30	T1	-35.63	-43.34	T1
L 7 U 8	45.48	52.41	T1	-32.66	-40.82	T1
L 8 U 9	51.75	58.90	T1	-22.17	-28.83	T1
U 9 L10	0.00	0.00	T1	-96.52	-108.47	T1

TABLE 7.1 MAXIMUM LIVE LOAD FORCE IN LOWER CHORDS (UNFACTORED)

(FOR TRUCK 2) TYPE M3-S2

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 L 2	87.88	98.75	T2	0.00	0.00	T2
L 2 L 3	87.88	98.75	T2	0.00	0.00	T2
L 3 L 4	122.99	138.22	T2	0.00	0.00	T2
L 4 L 5	141.51	159.02	T2	0.00	0.00	T2
L 5 L 6	151.23	169.94	T2	0.00	0.00	T2
L 6 L 7	141.51	159.02	T2	0.00	0.00	T2
L 7 L 8	122.99	138.22	T2	0.00	0.00	T2
L 8 L 9	87.88	98.75	T2	0.00	0.00	T2
L 9 L10	87.88	98.75	T2	0.00	0.00	T2

TABLE 7.2 MAXIMUM LIVE LOAD FORCE IN UPPER CHORDS (UNFACTORED)

(FOR TRUCK 2)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
U 2 U 3	0.00	0.00	T2	-127.36	-143.12	T2
U 3 U 4	0.00	0.00	T2	-143.34	-161.08	T2
U 4 U 5	0.00	0.00	T2	-151.45	-170.19	T2
U 5 U 6	0.00	0.00	T2	-151.23	-169.94	T2
U 6 U 7	0.00	0.00	T2	-151.45	-170.19	T2
U 7 U 8	0.00	0.00	T2	-143.34	-161.08	T2
U 8 U 9	0.00	0.00	T2	-127.36	-143.12	T2

TABLE 7.4 MAXIMUM LIVE LOAD FORCE IN VERTICAL MEMBERS (UNFACTORED)

(FOR TRUCK 2)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 2 U 2 T	68.99	87.43	T2	0.00	0.00	T2
L 2 U 2 B	0.00	0.00	T2	0.00	0.00	T2
L 3 U 3 T	42.39	55.11	T2	-45.20	-51.44	T2
L 3 U 3 B	14.12	18.36	T2	-52.81	-60.11	T2
L 4 U 4 T	50.56	63.19	T2	-41.35	-47.65	T2
L 4 U 4 B	30.42	38.02	T2	-49.93	-57.54	T2
L 5 U 5 T	51.95	63.19	T2	-40.25	-47.03	T2
L 5 U 5 B	37.55	45.67	T2	-51.11	-59.71	T2
L 6 U 6 T	8.00	9.16	T2	0.00	0.00	T2
L 6 U 6 B	6.09	6.97	T2	-60.95	-77.60	T2
L 7 U 7 T	50.56	63.19	T2	-41.35	-47.65	T2
L 7 U 7 B	30.42	38.02	T2	-49.93	-57.54	T2
L 8 U 8 T	42.39	55.11	T2	-45.20	-51.44	T2
L 8 U 8 B	14.12	18.36	T2	-52.81	-60.11	T2
L 9 U 9 T	68.99	87.43	T2	0.00	0.00	T2
L 9 U 9 B	0.00	0.00	T2	0.00	0.00	T2

TABLE 7.5 MAXIMUM LIVE LOAD FORCE IN DIAGONAL MEMBERS (UNFACTORED)

(FOR TRUCK 2)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 U 2	0.00	0.00	T2	-132.54	-148.94	T2
U 2 L 3	70.55	80.30	T2	-18.86	-24.52	T2
U 3 L 4	61.39	70.75	T2	-37.40	-46.75	T2
U 4 L 5	60.72	70.94	T2	-44.61	-54.26	T2
L 5 U 6	0.00	0.00	T2	0.00	0.00	T2
U 5 L 6	53.63	63.79	T2	-53.63	-63.79	T2
L 6 U 7	60.72	70.94	T2	-44.61	-54.26	T2
L 7 U 8	61.39	70.75	T2	-37.40	-46.75	T2
L 8 U 9	70.55	80.30	T2	-18.86	-24.52	T2
U 9 L10	0.00	0.00	T2	-132.54	-148.94	T2

TABLE 8.1 MAXIMUM LIVE LOAD FORCE IN LOWER CHORDS (UNFACTORED)

(FOR TRUCK 3) TYPE M3-3

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 L 2	95.39	107.19	T3	0.00	0.00	T3
L 2 L 3	95.39	107.19	T3	0.00	0.00	T3
L 3 L 4	133.37	149.87	T3	0.00	0.00	T3
L 4 L 5	152.17	171.00	T3	0.00	0.00	T3
L 5 L 6	163.19	183.39	T3	0.00	0.00	T3
L 6 L 7	152.17	171.00	T3	0.00	0.00	T3
L 7 L 8	133.37	149.87	T3	0.00	0.00	T3
L 8 L 9	95.39	107.19	T3	0.00	0.00	T3
L 9 L10	95.39	107.19	T3	0.00	0.00	T3

TABLE 8.2 MAXIMUM LIVE LOAD FORCE IN UPPER CHORDS (UNFACTORED)

(FOR TRUCK 3)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
U 2 U 3	0.00	0.00	T3	-138.10	-155.19	T3
U 3 U 4	0.00	0.00	T3	-154.13	-173.21	T3
U 4 U 5	0.00	0.00	T3	-163.43	-183.65	T3
U 5 U 6	0.00	0.00	T3	-163.19	-183.39	T3
U 6 U 7	0.00	0.00	T3	-163.43	-183.65	T3
U 7 U 8	0.00	0.00	T3	-154.13	-173.21	T3
U 8 U 9	0.00	0.00	T3	-138.10	-155.19	T3

TABLE 8.4 MAXIMUM LIVE LOAD FORCE IN VERTICAL MEMBERS (UNFACTORED)

(FOR TRUCK 3)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 2 U 2 T	64.66	81.95	T3	0.00	0.00	T3
L 2 U 2 B	0.00	0.00	T3	0.00	0.00	T3
L 3 U 3 T	42.00	54.60	T3	-48.63	-55.35	T3
L 3 U 3 B	13.92	18.10	T3	-57.12	-65.01	T3
L 4 U 4 T	52.18	65.22	T3	-44.16	-50.89	T3
L 4 U 4 B	29.76	37.20	T3	-53.72	-61.91	T3
L 5 U 5 T	54.82	66.69	T3	-42.48	-49.63	T3
L 5 U 5 B	38.75	47.14	T3	-54.59	-63.78	T3
L 6 U 6 T	8.63	9.88	T3	0.00	0.00	T3
L 6 U 6 B	6.43	7.36	T3	-55.93	-71.21	T3
L 7 U 7 T	52.18	65.22	T3	-44.16	-50.89	T3
L 7 U 7 B	29.76	37.20	T3	-53.72	-61.91	T3
L 8 U 8 T	42.00	54.60	T3	-48.63	-55.35	T3
L 8 U 8 B	13.92	18.10	T3	-57.12	-65.01	T3
L 9 U 9 T	64.66	81.95	T3	0.00	0.00	T3
L 9 U 9 B	0.00	0.00	T3	0.00	0.00	T3

TABLE 8.5 MAXIMUM LIVE LOAD FORCE IN DIAGONAL MEMBERS (UNFACTORED)

(FOR TRUCK 3)

MEMBER	MAX TENSILE FORCE			MAX COMPRESSIVE FORCE		
	LL (K)	LL+I (K)	LOAD TYPE	LL (K)	LL+I (K)	LOAD TYPE
L 1 U 2	0.00	0.00	T3	-143.87	-161.67	T3
U 2 L 3	76.30	86.84	T3	-18.60	-24.18	T3
U 3 L 4	66.06	76.13	T3	-36.60	-45.75	T3
U 4 L 5	64.85	75.77	T3	-46.04	-56.01	T3
L 5 U 6	0.00	0.00	T3	0.00	0.00	T3
U 5 L 6	56.60	67.32	T3	-56.60	-67.32	T3
L 6 U 7	64.85	75.77	T3	-46.04	-56.01	T3
L 7 U 8	66.06	76.13	T3	-36.60	-45.75	T3
L 8 U 9	76.30	86.84	T3	-18.60	-24.18	T3
U 9 L10	0.00	0.00	T3	-143.87	-161.67	T3

Factored Force Summary

TABLE 10.1 DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS (FACTORED)

AASHTO LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 L 2	956.65	344.67	L	0.00		1301.32	L	956.65	
L 2 L 3	956.66	344.67	L	0.00		1301.32	L	956.66	
L 3 L 4	1346.82	487.21	L	0.00		1834.04	L	1346.82	
L 4 L 5	1551.52	561.61	L	0.00		2113.13	L	1551.52	
L 5 L 6	1667.00	603.17	L	0.00		2270.17	L	1667.00	
L 6 L 7	1548.23	561.61	L	0.00		2109.84	L	1548.23	
L 7 L 8	1341.05	487.21	L	0.00		1828.26	L	1341.05	
L 8 L 9	948.54	344.67	L	0.00		1293.21	L	948.54	
L 9 L10	948.54	344.67	L	0.00		1293.21	L	948.54	

TABLE 10.2 DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS (FACTORED)

AASHTO LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
U 2 U 3	-1394.60	0.00		-504.50	L	-1394.60		-1899.10	L
U 3 U 4	-1571.57	0.00		-568.87	L	-1571.57		-2140.44	L
U 4 U 5	-1669.42	0.00		-604.04	L	-1669.42		-2273.46	L
U 5 U 6	-1665.94	0.00		-603.17	L	-1665.94		-2269.11	L
U 6 U 7	-1668.36	0.00		-604.04	L	-1668.36		-2272.40	L
U 7 U 8	-1568.24	0.00		-568.87	L	-1568.24		-2137.10	L
U 8 U 9	-1388.62	0.00		-504.50	L	-1388.62		-1893.11	L

TABLE 10.4 DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS (FACTORED)

AASHTO LOADING RESULTS

MEMBER LCT	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 2 U 2 T	233.39	248.23	HS	0.00		481.62	HS	233.39	
L 2 U 2 B	233.39	0.00		0.00		233.39		233.39	
L 3 U 3 T	-210.98	144.15	HS	-140.85	L	-66.84	HS	-351.84	L
L 3 U 3 B	-210.98	61.92	HS	-185.71	L	-149.07	HS	-396.70	L
L 4 U 4 T	-57.26	154.00	HS	-116.86	L	96.74	HS	-174.12	L
L 4 U 4 B	-57.26	99.99	HS	-159.85	L	42.73	HS	-217.11	L
L 5 U 5 T	52.67	148.97	HS	-110.87	HS	201.64	HS	-58.20	HS
L 5 U 5 B	52.67	111.30	HS	-149.25	L	163.97	HS	-96.58	L
L 6 U 6 T	50.90	32.49	L	0.00		83.39	L	50.90	
L 6 U 6 B	50.90	21.40	L	-226.15	HS	72.31	L	-175.25	HS
L 7 U 7 T	-61.21	154.00	HS	-116.86	L	92.79	HS	-178.07	L
L 7 U 7 B	-61.21	99.99	HS	-159.85	L	38.78	HS	-221.06	L
L 8 U 8 T	-215.01	144.15	HS	-140.85	L	-70.86	HS	-355.86	L
L 8 U 8 B	-215.01	61.92	HS	-185.71	L	-153.09	HS	-400.72	L
L 9 U 9 T	224.53	248.23	HS	0.00		472.76	HS	224.53	
L 9 U 9 B	224.53	0.00		0.00		224.53		224.53	

TABLE 10.5 DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS (FACTORED)

AASHTO LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 U 2	-1442.84	0.00		-558.60	L	-1442.84		-2001.44	L
U 2 L 3	588.46	269.23	L	-82.71	HS	857.69	L	505.75	HS
U 3 L 4	351.79	215.48	L	-122.94	HS	567.27	L	228.85	HS
U 4 L 5	213.89	196.73	L	-132.23	HS	410.62	L	81.66	HS
L 5 U 6	0.00	0.00		0.00		0.00		0.00	
U 5 L 6	-2.01	159.55	L	-159.55	L	157.54	L	-161.56	L
L 6 U 7	218.02	196.73	L	-132.23	HS	414.75	L	85.79	HS
L 7 U 8	356.07	215.48	L	-122.94	HS	571.55	L	233.13	HS
L 8 U 9	591.98	269.23	L	-82.71	HS	861.21	L	509.27	HS
U 9 L10	-1430.60	0.00		-558.60	L	-1430.60		-1989.20	L

TABLE 10.1 DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS (FACTORED)

AASHTO LOADING RESULTS FOR THREE LANES TO BE ADDED TO ONE LANE OF PERMIT TRUCKS (A, B, C, P411, P413)

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 L 2	956.65	211.41	L	0.00		1168.06	L	956.65	
L 2 L 3	956.66	211.41	L	0.00		1168.06	L	956.66	
L 3 L 4	1346.82	298.84	L	0.00		1645.66	L	1346.82	
L 4 L 5	1551.52	344.47	L	0.00		1895.99	L	1551.52	
L 5 L 6	1667.00	369.96	L	0.00		2036.96	L	1667.00	
L 6 L 7	1548.23	344.47	L	0.00		1892.70	L	1548.23	
L 7 L 8	1341.05	298.84	L	0.00		1639.89	L	1341.05	
L 8 L 9	948.54	211.41	L	0.00		1159.95	L	948.54	
L 9 L10	948.54	211.41	L	0.00		1159.95	L	948.54	

TABLE 10.2 DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS (FACTORED)

AASHTO LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
U 2 U 3	-1394.60	0.00		-309.44	L	-1394.60		-1704.04	L
U 3 U 4	-1571.57	0.00		-348.92	L	-1571.57		-1920.50	L
U 4 U 5	-1669.42	0.00		-370.50	L	-1669.42		-2039.92	L
U 5 U 6	-1665.94	0.00		-369.96	L	-1665.94		-2035.90	L
U 6 U 7	-1668.36	0.00		-370.50	L	-1668.36		-2038.85	L
U 7 U 8	-1568.24	0.00		-348.92	L	-1568.24		-1917.16	L
U 8 U 9	-1388.62	0.00		-309.44	L	-1388.62		-1698.06	L

TABLE 10.4 DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS (FACTORED)

AASHTO LOADING RESULTS

MEMBER	LCT	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 2 U 2 T		233.39	152.25	HS	0.00		385.64	HS	233.39	
L 2 U 2 B		233.39	0.00		0.00		233.39		233.39	
L 3 U 3 T		-210.98	88.42	HS	-86.39	L	-122.57	HS	-297.38	L
L 3 U 3 B		-210.98	37.98	HS	-113.91	L	-173.01	HS	-324.89	L
L 4 U 4 T		-57.26	94.46	HS	-71.68	L	37.20	HS	-128.94	L
L 4 U 4 B		-57.26	61.33	HS	-98.05	L	4.07	HS	-155.31	L
L 5 U 5 T		52.67	91.37	HS	-68.00	HS	144.04	HS	-15.33	HS
L 5 U 5 B		52.67	68.27	HS	-91.55	L	120.94	HS	-38.88	L
L 6 U 6 T		50.90	19.93	L	0.00		70.83	L	50.90	
L 6 U 6 B		50.90	13.13	L	-138.71	HS	64.03	L	-87.81	HS
L 7 U 7 T		-61.21	94.46	HS	-71.68	L	33.25	HS	-132.89	L
L 7 U 7 B		-61.21	61.33	HS	-98.05	L	0.12	HS	-159.26	L
L 8 U 8 T		-215.01	88.42	HS	-86.39	L	-126.60	HS	-301.40	L
L 8 U 8 B		-215.01	37.98	HS	-113.91	L	-177.03	HS	-328.92	L
L 9 U 9 T		224.53	152.25	HS	0.00		376.78	HS	224.53	
L 9 U 9 B		224.53	0.00		0.00		224.53		224.53	

TABLE 10.5 DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS (FACTORED)

AASHTO LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 U 2	-1442.84	0.00		-342.62	L	-1442.84		-1785.47	L
U 2 L 3	588.46	165.13	L	-50.73	HS	753.60	L	537.73	HS
U 3 L 4	351.79	132.17	L	-75.41	HS	483.96	L	276.38	HS
U 4 L 5	213.89	120.66	L	-81.11	HS	334.56	L	132.78	HS
L 5 U 6	0.00	0.00		0.00		0.00		0.00	
U 5 L 6	-2.01	97.86	L	-97.86	L	95.85	L	-99.87	L
L 6 U 7	218.02	120.66	L	-81.11	HS	338.69	L	136.92	HS
L 7 U 8	356.07	132.17	L	-75.41	HS	488.24	L	280.66	HS
L 8 U 9	591.98	165.13	L	-50.73	HS	757.12	L	541.25	HS
U 9 L10	-1430.60	0.00		-342.62	L	-1430.60		-1773.23	L

TABLE 14.1 DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS STANDARD A FOR ONE LANE TO BE ADDED TO THREE LANES OF HS TRUCKS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 L 2	956.65	71.39	S1	0.00	S1	1028.05	S1	956.65	S1
L 2 L 3	956.66	71.39	S1	0.00	S1	1028.05	S1	956.66	S1
L 3 L 4	1346.82	100.32	S1	0.00	S1	1447.15	S1	1346.82	S1
L 4 L 5	1551.52	115.05	S1	0.00	S1	1666.57	S1	1551.52	S1
L 5 L 6	1667.00	122.87	S1	0.00	S1	1789.87	S1	1667.00	S1
L 6 L 7	1548.23	115.05	S1	0.00	S1	1663.28	S1	1548.23	S1
L 7 L 8	1341.05	100.32	S1	0.00	S1	1441.37	S1	1341.05	S1
L 8 L 9	948.54	71.39	S1	0.00	S1	1019.93	S1	948.54	S1
L 9 L10	948.54	71.39	S1	0.00	S1	1019.93	S1	948.54	S1

TABLE 14.2 DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
U 2 U 3	-1394.60	0.00	S1	-103.88	S1	-1394.60	S1	-1498.48	S1
U 3 U 4	-1571.57	0.00	S1	-116.54	S1	-1571.57	S1	-1688.11	S1
U 4 U 5	-1669.42	0.00	S1	-123.05	S1	-1669.42	S1	-1792.46	S1
U 5 U 6	-1665.94	0.00	S1	-122.87	S1	-1665.94	S1	-1788.81	S1
U 6 U 7	-1668.36	0.00	S1	-123.05	S1	-1668.36	S1	-1791.40	S1
U 7 U 8	-1568.24	0.00	S1	-116.54	S1	-1568.24	S1	-1684.77	S1
U 8 U 9	-1388.62	0.00	S1	-103.88	S1	-1388.62	S1	-1492.50	S1

TABLE 14.4 DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER LCT	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 2 U 2 T	233.39	62.45	S1	0.00	S1	295.84	S1	233.39	S1
L 2 U 2 B	233.39	0.00	S1	0.00	S1	233.39	S1	233.39	S1
L 3 U 3 T	-210.98	40.25	S1	-37.15	S1	-170.74	S1	-248.13	S1
L 3 U 3 B	-210.98	13.63	S1	-43.44	S1	-197.36	S1	-254.42	S1
L 4 U 4 T	-57.26	45.57	S1	-34.38	S1	-11.69	S1	-91.64	S1
L 4 U 4 B	-57.26	27.54	S1	-41.56	S1	-29.72	S1	-98.81	S1
L 5 U 5 T	52.67	45.54	S1	-33.89	S1	98.21	S1	18.78	S1
L 5 U 5 B	52.67	32.83	S1	-43.09	S1	85.50	S1	9.58	S1
L 6 U 6 T	50.90	6.62	S1	0.00	S1	57.52	S1	50.90	S1
L 6 U 6 B	50.90	5.02	S1	-55.33	S1	55.93	S1	-4.42	S1
L 7 U 7 T	-61.21	45.57	S1	-34.38	S1	-15.64	S1	-95.59	S1
L 7 U 7 B	-61.21	27.54	S1	-41.56	S1	-33.67	S1	-102.76	S1
L 8 U 8 T	-215.01	40.25	S1	-37.15	S1	-174.76	S1	-252.16	S1
L 8 U 8 B	-215.01	13.63	S1	-43.44	S1	-201.38	S1	-258.45	S1
L 9 U 9 T	224.53	62.45	S1	0.00	S1	286.98	S1	224.53	S1
L 9 U 9 B	224.53	0.00	S1	0.00	S1	224.53	S1	224.53	S1

TABLE 14.5 DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 U 2	-1442.84	0.00	S1	-107.67	S1	-1442.84	S1	-1550.51	S1
U 2 L 3	588.46	58.03	S1	-18.21	S1	646.49	S1	570.26	S1
U 3 L 4	351.79	51.10	S1	-33.86	S1	402.89	S1	317.94	S1
U 4 L 5	213.89	51.19	S1	-39.01	S1	265.08	S1	174.88	S1
L 5 U 6	0.00	0.00	S1	0.00	S1	0.00	S1	0.00	S1
U 5 L 6	-2.01	45.97	S1	-45.97	S1	43.96	S1	-47.98	S1
L 6 U 7	218.02	51.19	S1	-39.01	S1	269.22	S1	179.02	S1
L 7 U 8	356.07	51.10	S1	-33.86	S1	407.17	S1	322.21	S1
L 8 U 9	591.98	58.03	S1	-18.21	S1	650.01	S1	573.78	S1
U 9 L10	-1430.60	0.00	S1	-107.67	S1	-1430.60	S1	-1538.27	S1

TABLE 14.1 DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS STANDARD B ONE LANE TO BE ADDED TO THREE LANES OF HS TRUCKS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 L 2	956.65	91.83	S1	0.00	S1	1048.49	S1	956.65	S1
L 2 L 3	956.66	91.83	S1	0.00	S1	1048.49	S1	956.66	S1
L 3 L 4	1346.82	129.00	S1	0.00	S1	1475.83	S1	1346.82	S1
L 4 L 5	1551.52	148.30	S1	0.00	S1	1699.81	S1	1551.52	S1
L 5 L 6	1667.00	157.95	S1	0.00	S1	1824.95	S1	1667.00	S1
L 6 L 7	1548.23	148.30	S1	0.00	S1	1696.53	S1	1548.23	S1
L 7 L 8	1341.05	129.00	S1	0.00	S1	1470.05	S1	1341.05	S1
L 8 L 9	948.54	91.83	S1	0.00	S1	1040.37	S1	948.54	S1
L 9 L10	948.54	91.83	S1	0.00	S1	1040.37	S1	948.54	S1

TABLE 14.2 DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
U 2 U 3	-1394.60	0.00	S1	-133.58	S1	-1394.60	S1	-1528.18	S1
U 3 U 4	-1571.57	0.00	S1	-150.21	S1	-1571.57	S1	-1721.78	S1
U 4 U 5	-1669.42	0.00	S1	-158.18	S1	-1669.42	S1	-1827.60	S1
U 5 U 6	-1665.94	0.00	S1	-157.95	S1	-1665.94	S1	-1823.89	S1
U 6 U 7	-1668.36	0.00	S1	-158.18	S1	-1668.36	S1	-1826.54	S1
U 7 U 8	-1568.24	0.00	S1	-150.21	S1	-1568.24	S1	-1718.45	S1
U 8 U 9	-1388.62	0.00	S1	-133.58	S1	-1388.62	S1	-1522.20	S1

TABLE 14.4 DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	LCT	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 2 U 2	T	233.39	71.11	S1	0.00	S1	304.50	S1	233.39	S1
L 2 U 2	B	233.39	0.00	S1	0.00	S1	233.39	S1	233.39	S1
L 3 U 3	T	-210.98	48.60	S1	-47.49	S1	-162.38	S1	-258.48	S1
L 3 U 3	B	-210.98	15.28	S1	-55.73	S1	-195.70	S1	-266.71	S1
L 4 U 4	T	-57.26	56.71	S1	-43.72	S1	-0.55	S1	-100.98	S1
L 4 U 4	B	-57.26	33.03	S1	-53.12	S1	-24.23	S1	-110.38	S1
L 5 U 5	T	52.67	57.43	S1	-42.74	S1	110.09	S1	9.93	S1
L 5 U 5	B	52.67	40.76	S1	-54.80	S1	93.43	S1	-2.13	S1
L 6 U 6	T	50.90	8.51	S1	0.00	S1	59.41	S1	50.90	S1
L 6 U 6	B	50.90	6.34	S1	-61.94	S1	57.24	S1	-11.04	S1
L 7 U 7	T	-61.21	56.71	S1	-43.72	S1	-4.50	S1	-104.93	S1
L 7 U 7	B	-61.21	33.03	S1	-53.12	S1	-28.18	S1	-114.33	S1
L 8 U 8	T	-215.01	48.60	S1	-47.49	S1	-166.41	S1	-262.50	S1
L 8 U 8	B	-215.01	15.28	S1	-55.73	S1	-199.73	S1	-270.74	S1
L 9 U 9	T	224.53	71.11	S1	0.00	S1	295.64	S1	224.53	S1
L 9 U 9	B	224.53	0.00	S1	0.00	S1	224.53	S1	224.53	S1

TABLE 14.5 DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 U 2	-1442.84	0.00	S1	-138.50	S1	-1442.84	S1	-1581.34	S1
U 2 L 3	588.46	74.44	S1	-20.41	S1	662.90	S1	568.05	S1
U 3 L 4	351.79	65.32	S1	-40.61	S1	417.11	S1	311.18	S1
U 4 L 5	213.89	65.10	S1	-48.42	S1	278.99	S1	165.47	S1
L 5 U 6	0.00	0.00	S1	0.00	S1	0.00	S1	0.00	S1
U 5 L 6	-2.01	57.97	S1	-57.97	S1	55.96	S1	-59.98	S1
L 6 U 7	218.02	65.10	S1	-48.42	S1	283.12	S1	169.60	S1
L 7 U 8	356.07	65.32	S1	-40.61	S1	421.39	S1	315.46	S1
L 8 U 9	591.98	74.44	S1	-20.41	S1	666.43	S1	571.57	S1
U 9 L10	-1430.60	0.00	S1	-138.50	S1	-1430.60	S1	-1569.10	S1

TABLE 14.1 DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS STANDARD C ONE LANE TO BE ADDED TO THREE LANES OF HS TRUCKS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 L 2	956.65	105.60	S1	0.00	S1	1062.26	S1	956.65	S1
L 2 L 3	956.66	105.60	S1	0.00	S1	1062.26	S1	956.66	S1
L 3 L 4	1346.82	148.51	S1	0.00	S1	1495.33	S1	1346.82	S1
L 4 L 5	1551.52	170.50	S1	0.00	S1	1722.02	S1	1551.52	S1
L 5 L 6	1667.00	181.52	S1	0.00	S1	1848.52	S1	1667.00	S1
L 6 L 7	1548.23	170.50	S1	0.00	S1	1718.73	S1	1548.23	S1
L 7 L 8	1341.05	148.51	S1	0.00	S1	1489.56	S1	1341.05	S1
L 8 L 9	948.54	105.60	S1	0.00	S1	1054.14	S1	948.54	S1
L 9 L10	948.54	105.60	S1	0.00	S1	1054.14	S1	948.54	S1

TABLE 14.2 DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
U 2 U 3	-1394.60	0.00	S1	-153.78	S1	-1394.60	S1	-1548.38	S1
U 3 U 4	-1571.57	0.00	S1	-172.70	S1	-1571.57	S1	-1744.27	S1
U 4 U 5	-1669.42	0.00	S1	-181.78	S1	-1669.42	S1	-1851.20	S1
U 5 U 6	-1665.94	0.00	S1	-181.52	S1	-1665.94	S1	-1847.46	S1
U 6 U 7	-1668.36	0.00	S1	-181.78	S1	-1668.36	S1	-1850.13	S1
U 7 U 8	-1568.24	0.00	S1	-172.70	S1	-1568.24	S1	-1740.94	S1
U 8 U 9	-1388.62	0.00	S1	-153.78	S1	-1388.62	S1	-1542.39	S1

TABLE 14.4 DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	LCT	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 2 U 2	T	233.39	76.03	S1	0.00	S1	309.42	S1	233.39	S1
L 2 U 2	B	233.39	0.00	S1	0.00	S1	233.39	S1	233.39	S1
L 3 U 3	T	-210.98	52.57	S1	-54.27	S1	-158.42	S1	-265.25	S1
L 3 U 3	B	-210.98	16.91	S1	-63.91	S1	-194.07	S1	-274.90	S1
L 4 U 4	T	-57.26	63.61	S1	-49.69	S1	6.35	S1	-106.95	S1
L 4 U 4	B	-57.26	35.76	S1	-60.70	S1	-21.50	S1	-117.96	S1
L 5 U 5	T	52.67	64.95	S1	-48.14	S1	117.61	S1	4.53	S1
L 5 U 5	B	52.67	45.49	S1	-62.27	S1	98.16	S1	-9.60	S1
L 6 U 6	T	50.90	9.78	S1	0.00	S1	60.68	S1	50.90	S1
L 6 U 6	B	50.90	7.14	S1	-65.56	S1	58.04	S1	-14.66	S1
L 7 U 7	T	-61.21	63.61	S1	-49.69	S1	2.40	S1	-110.90	S1
L 7 U 7	B	-61.21	35.76	S1	-60.70	S1	-25.45	S1	-121.91	S1
L 8 U 8	T	-215.01	52.57	S1	-54.27	S1	-162.45	S1	-269.28	S1
L 8 U 8	B	-215.01	16.91	S1	-63.91	S1	-198.10	S1	-278.92	S1
L 9 U 9	T	224.53	76.03	S1	0.00	S1	300.56	S1	224.53	S1
L 9 U 9	B	224.53	0.00	S1	0.00	S1	224.53	S1	224.53	S1

TABLE 14.5 DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 U 2	-1442.84	0.00	S1	-159.27	S1	-1442.84	S1	-1602.11	S1
U 2 L 3	588.46	85.38	S1	-22.59	S1	673.84	S1	565.87	S1
U 3 L 4	351.79	74.64	S1	-43.97	S1	426.43	S1	307.82	S1
U 4 L 5	213.89	73.98	S1	-54.04	S1	287.87	S1	159.85	S1
L 5 U 6	0.00	0.00	S1	0.00	S1	0.00	S1	0.00	S1
U 5 L 6	-2.01	65.30	S1	-65.30	S1	63.28	S1	-67.31	S1
L 6 U 7	218.02	73.98	S1	-54.04	S1	292.01	S1	163.98	S1
L 7 U 8	356.07	74.64	S1	-43.97	S1	430.71	S1	312.10	S1
L 8 U 9	591.98	85.38	S1	-22.59	S1	677.36	S1	569.39	S1
U 9 L10	-1430.60	0.00	S1	-159.27	S1	-1430.60	S1	-1589.87	S1

TABLE 14.1 DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS P411 FOR ONE LANE TO BE ADDED TO THREE LANES OF HS TRUCKS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 L 2	956.65	126.53	S1	0.00	S1	1083.18	S1	956.65	S1
L 2 L 3	956.66	126.53	S1	0.00	S1	1083.19	S1	956.66	S1
L 3 L 4	1346.82	177.61	S1	0.00	S1	1524.43	S1	1346.82	S1
L 4 L 5	1551.52	201.04	S1	0.00	S1	1752.56	S1	1551.52	S1
L 5 L 6	1667.00	212.76	S1	0.00	S1	1879.76	S1	1667.00	S1
L 6 L 7	1548.23	201.04	S1	0.00	S1	1749.27	S1	1548.23	S1
L 7 L 8	1341.05	177.61	S1	0.00	S1	1518.65	S1	1341.05	S1
L 8 L 9	948.54	126.53	S1	0.00	S1	1075.07	S1	948.54	S1
L 9 L10	948.54	126.53	S1	0.00	S1	1075.07	S1	948.54	S1

TABLE 14.2 DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
U 2 U 3	-1394.60	0.00	S1	-183.91	S1	-1394.60	S1	-1578.51	S1
U 3 U 4	-1571.57	0.00	S1	-203.64	S1	-1571.57	S1	-1775.21	S1
U 4 U 5	-1669.42	0.00	S1	-213.06	S1	-1669.42	S1	-1882.48	S1
U 5 U 6	-1665.94	0.00	S1	-212.76	S1	-1665.94	S1	-1878.70	S1
U 6 U 7	-1668.36	0.00	S1	-213.06	S1	-1668.36	S1	-1881.42	S1
U 7 U 8	-1568.24	0.00	S1	-203.64	S1	-1568.24	S1	-1771.87	S1
U 8 U 9	-1388.62	0.00	S1	-183.91	S1	-1388.62	S1	-1572.52	S1

TABLE 14.4 DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	LCT	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 2 U 2	T	233.39	82.63	S1	0.00	S1	316.02	S1	233.39	S1
L 2 U 2	B	233.39	0.00	S1	0.00	S1	233.39	S1	233.39	S1
L 3 U 3	T	-210.98	46.91	S1	-62.41	S1	-164.07	S1	-273.40	S1
L 3 U 3	B	-210.98	18.30	S1	-75.09	S1	-192.69	S1	-286.07	S1
L 4 U 4	T	-57.26	62.25	S1	-55.33	S1	5.00	S1	-112.59	S1
L 4 U 4	B	-57.26	31.65	S1	-69.82	S1	-25.61	S1	-127.07	S1
L 5 U 5	T	52.67	69.61	S1	-50.81	S1	122.28	S1	1.86	S1
L 5 U 5	B	52.67	43.98	S1	-69.51	S1	96.65	S1	-16.84	S1
L 6 U 6	T	50.90	11.46	S1	0.00	S1	62.36	S1	50.90	S1
L 6 U 6	B	50.90	7.52	S1	-71.09	S1	58.42	S1	-20.19	S1
L 7 U 7	T	-61.21	62.25	S1	-55.33	S1	1.05	S1	-116.54	S1
L 7 U 7	B	-61.21	31.65	S1	-69.82	S1	-29.56	S1	-131.03	S1
L 8 U 8	T	-215.01	46.91	S1	-62.41	S1	-168.10	S1	-277.42	S1
L 8 U 8	B	-215.01	18.30	S1	-75.09	S1	-196.72	S1	-290.10	S1
L 9 U 9	T	224.53	82.63	S1	0.00	S1	307.16	S1	224.53	S1
L 9 U 9	B	224.53	0.00	S1	0.00	S1	224.53	S1	224.53	S1

TABLE 14.5 DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 U 2	-1442.84	0.00	S1	-190.84	S1	-1442.84	S1	-1633.68	S1
U 2 L 3	588.46	100.31	S1	-24.44	S1	688.77	S1	564.02	S1
U 3 L 4	351.79	85.84	S1	-38.91	S1	437.64	S1	312.88	S1
U 4 L 5	213.89	82.58	S1	-52.25	S1	296.48	S1	161.64	S1
L 5 U 6	0.00	0.00	S1	0.00	S1	0.00	S1	0.00	S1
U 5 L 6	-2.01	69.61	S1	-69.61	S1	67.60	S1	-71.62	S1
L 6 U 7	218.02	82.58	S1	-52.25	S1	300.61	S1	165.78	S1
L 7 U 8	356.07	85.84	S1	-38.91	S1	441.91	S1	317.16	S1
L 8 U 9	591.98	100.31	S1	-24.44	S1	692.29	S1	567.54	S1
U 9 L10	-1430.60	0.00	S1	-190.84	S1	-1430.60	S1	-1621.44	S1

TABLE 14.1 DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS P413 FOR ONE LANE TO BE ADDED TO THREE LANES OF HS TRUCKS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 L 2	956.65	147.63	S1	0.00	S1	1104.29	S1	956.65	S1
L 2 L 3	956.66	147.63	S1	0.00	S1	1104.29	S1	956.66	S1
L 3 L 4	1346.82	205.49	S1	0.00	S1	1552.31	S1	1346.82	S1
L 4 L 5	1551.52	233.71	S1	0.00	S1	1785.23	S1	1551.52	S1
L 5 L 6	1667.00	248.84	S1	0.00	S1	1915.84	S1	1667.00	S1
L 6 L 7	1548.23	233.71	S1	0.00	S1	1781.94	S1	1548.23	S1
L 7 L 8	1341.05	205.49	S1	0.00	S1	1546.53	S1	1341.05	S1
L 8 L 9	948.54	147.63	S1	0.00	S1	1096.17	S1	948.54	S1
L 9 L10	948.54	147.63	S1	0.00	S1	1096.17	S1	948.54	S1

TABLE 14.2 DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
U 2 U 3	-1394.60	0.00	S1	-212.78	S1	-1394.60	S1	-1607.38	S1
U 3 U 4	-1571.57	0.00	S1	-236.73	S1	-1571.57	S1	-1808.30	S1
U 4 U 5	-1669.42	0.00	S1	-249.20	S1	-1669.42	S1	-1918.62	S1
U 5 U 6	-1665.94	0.00	S1	-248.84	S1	-1665.94	S1	-1914.78	S1
U 6 U 7	-1668.36	0.00	S1	-249.20	S1	-1668.36	S1	-1917.56	S1
U 7 U 8	-1568.24	0.00	S1	-236.73	S1	-1568.24	S1	-1804.97	S1
U 8 U 9	-1388.62	0.00	S1	-212.78	S1	-1388.62	S1	-1601.39	S1

TABLE 14.4 DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER LCT	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 2 U 2 T	233.39	76.85	S1	0.00	S1	310.25	S1	233.39	S1
L 2 U 2 B	233.39	0.00	S1	0.00	S1	233.39	S1	233.39	S1
L 3 U 3 T	-210.98	49.96	S1	-70.33	S1	-161.03	S1	-281.31	S1
L 3 U 3 B	-210.98	16.12	S1	-86.32	S1	-194.87	S1	-297.30	S1
L 4 U 4 T	-57.26	63.39	S1	-60.71	S1	6.13	S1	-117.96	S1
L 4 U 4 B	-57.26	33.76	S1	-79.03	S1	-23.50	S1	-136.29	S1
L 5 U 5 T	52.67	74.12	S1	-54.03	S1	126.79	S1	-1.36	S1
L 5 U 5 B	52.67	44.80	S1	-77.29	S1	97.47	S1	-24.63	S1
L 6 U 6 T	50.90	13.41	S1	0.00	S1	64.31	S1	50.90	S1
L 6 U 6 B	50.90	7.85	S1	-64.36	S1	58.75	S1	-13.45	S1
L 7 U 7 T	-61.21	63.39	S1	-60.71	S1	2.18	S1	-121.91	S1
L 7 U 7 B	-61.21	33.76	S1	-79.03	S1	-27.45	S1	-140.24	S1
L 8 U 8 T	-215.01	49.96	S1	-70.33	S1	-165.05	S1	-285.34	S1
L 8 U 8 B	-215.01	16.12	S1	-86.32	S1	-198.90	S1	-301.33	S1
L 9 U 9 T	224.53	76.85	S1	0.00	S1	301.39	S1	224.53	S1
L 9 U 9 B	224.53	0.00	S1	0.00	S1	224.53	S1	224.53	S1

TABLE 14.5 DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS (FACTORED)

STATE VEHICLE S1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 U 2	-1442.84	0.00	S1	-222.66	S1	-1442.84	S1	-1665.50	S1
U 2 L 3	588.46	115.31	S1	-21.53	S1	703.77	S1	566.93	S1
U 3 L 4	351.79	97.17	S1	-41.51	S1	448.97	S1	310.29	S1
U 4 L 5	213.89	91.83	S1	-53.22	S1	305.72	S1	160.67	S1
L 5 U 6	0.00	0.00	S1	0.00	S1	0.00	S1	0.00	S1
U 5 L 6	-2.01	74.17	S1	-74.17	S1	72.16	S1	-76.18	S1
L 6 U 7	218.02	91.83	S1	-53.22	S1	309.85	S1	164.80	S1
L 7 U 8	356.07	97.17	S1	-41.51	S1	453.25	S1	314.56	S1
L 8 U 9	591.98	115.31	S1	-21.53	S1	707.29	S1	570.46	S1
U 9 L10	-1430.60	0.00	S1	-222.66	S1	-1430.60	S1	-1653.26	S1

TABLE 11.1 DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS (FACTORED)

STATE VEHICLE T1 LOADING RESULTS TYPE M3

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 L 2	956.65	93.49	T1	0.00	T1	1050.15	T1	956.65	T1
L 2 L 3	956.66	93.49	T1	0.00	T1	1050.15	T1	956.66	T1
L 3 L 4	1346.82	131.57	T1	0.00	T1	1478.40	T1	1346.82	T1
L 4 L 5	1551.52	150.77	T1	0.00	T1	1702.29	T1	1551.52	T1
L 5 L 6	1667.00	161.60	T1	0.00	T1	1828.60	T1	1667.00	T1
L 6 L 7	1548.23	150.77	T1	0.00	T1	1699.00	T1	1548.23	T1
L 7 L 8	1341.05	131.57	T1	0.00	T1	1472.62	T1	1341.05	T1
L 8 L 9	948.54	93.49	T1	0.00	T1	1042.03	T1	948.54	T1
L 9 L10	948.54	93.49	T1	0.00	T1	1042.03	T1	948.54	T1

TABLE 11.2 DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS (FACTORED)

STATE VEHICLE T1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
U 2 U 3	-1394.60	0.00	T1	-136.24	T1	-1394.60	T1	-1530.84	T1
U 3 U 4	-1571.57	0.00	T1	-152.72	T1	-1571.57	T1	-1724.29	T1
U 4 U 5	-1669.42	0.00	T1	-161.83	T1	-1669.42	T1	-1831.25	T1
U 5 U 6	-1665.94	0.00	T1	-161.60	T1	-1665.94	T1	-1827.54	T1
U 6 U 7	-1668.36	0.00	T1	-161.83	T1	-1668.36	T1	-1830.19	T1
U 7 U 8	-1568.24	0.00	T1	-152.72	T1	-1568.24	T1	-1720.95	T1
U 8 U 9	-1388.62	0.00	T1	-136.24	T1	-1388.62	T1	-1524.86	T1

TABLE 11.4 DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS (FACTORED)

STATE VEHICLE T1 LOADING RESULTS

MEMBER	LCT	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 2 U 2	T	233.39	110.63	T1	0.00	T1	344.02	T1	233.39	T1
L 2 U 2	B	233.39	0.00	T1	0.00	T1	233.39	T1	233.39	T1
L 3 U 3	T	-210.98	62.22	T1	-49.54	T1	-148.76	T1	-260.52	T1
L 3 U 3	B	-210.98	28.05	T1	-57.32	T1	-182.93	T1	-268.31	T1
L 4 U 4	T	-57.26	65.62	T1	-46.54	T1	8.36	T1	-103.80	T1
L 4 U 4	B	-57.26	43.16	T1	-55.41	T1	-14.10	T1	-112.67	T1
L 5 U 5	T	52.67	63.10	T1	-46.96	T1	115.77	T1	5.71	T1
L 5 U 5	B	52.67	47.43	T1	-58.32	T1	100.09	T1	-5.66	T1
L 6 U 6	T	50.90	8.71	T1	0.00	T1	59.61	T1	50.90	T1
L 6 U 6	B	50.90	6.96	T1	-101.34	T1	57.86	T1	-50.44	T1
L 7 U 7	T	-61.21	65.62	T1	-46.54	T1	4.41	T1	-107.75	T1
L 7 U 7	B	-61.21	43.16	T1	-55.41	T1	-18.05	T1	-116.62	T1
L 8 U 8	T	-215.01	62.22	T1	-49.54	T1	-152.79	T1	-264.55	T1
L 8 U 8	B	-215.01	28.05	T1	-57.32	T1	-186.96	T1	-272.33	T1
L 9 U 9	T	224.53	110.63	T1	0.00	T1	335.16	T1	224.53	T1
L 9 U 9	B	224.53	0.00	T1	0.00	T1	224.53	T1	224.53	T1

TABLE 11.5 DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS (FACTORED)

STATE VEHICLE T1 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 U 2	-1442.84	0.00	T1	-141.01	T1	-1442.84	T1	-1583.85	T1
U 2 L 3	588.46	76.57	T1	-37.47	T1	665.03	T1	550.99	T1
U 3 L 4	351.79	68.13	T1	-53.07	T1	419.93	T1	298.73	T1
U 4 L 5	213.89	69.29	T1	-56.34	T1	283.18	T1	157.55	T1
L 5 U 6	0.00	0.00	T1	0.00	T1	0.00	T1	0.00	T1
U 5 L 6	-2.01	63.69	T1	-63.69	T1	61.68	T1	-65.70	T1
L 6 U 7	218.02	69.29	T1	-56.34	T1	287.31	T1	161.68	T1
L 7 U 8	356.07	68.13	T1	-53.07	T1	424.20	T1	303.00	T1
L 8 U 9	591.98	76.57	T1	-37.47	T1	668.56	T1	554.51	T1
U 9 L10	-1430.60	0.00	T1	-141.01	T1	-1430.60	T1	-1571.61	T1

TABLE 12.1 DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS (FACTORED)

STATE VEHICLE T2 LOADING RESULTS TYPE M3-S2

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 L 2	956.65	128.38	T2	0.00	T2	1085.03	T2	956.65	T2
L 2 L 3	956.66	128.38	T2	0.00	T2	1085.03	T2	956.66	T2
L 3 L 4	1346.82	179.68	T2	0.00	T2	1526.50	T2	1346.82	T2
L 4 L 5	1551.52	206.73	T2	0.00	T2	1758.25	T2	1551.52	T2
L 5 L 6	1667.00	220.93	T2	0.00	T2	1887.93	T2	1667.00	T2
L 6 L 7	1548.23	206.73	T2	0.00	T2	1754.96	T2	1548.23	T2
L 7 L 8	1341.05	179.68	T2	0.00	T2	1520.73	T2	1341.05	T2
L 8 L 9	948.54	128.38	T2	0.00	T2	1076.92	T2	948.54	T2
L 9 L10	948.54	128.38	T2	0.00	T2	1076.92	T2	948.54	T2

TABLE 12.2 DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS (FACTORED)

STATE VEHICLE T2 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
U 2 U 3	-1394.60	0.00	T2	-186.05	T2	-1394.60	T2	-1580.66	T2
U 3 U 4	-1571.57	0.00	T2	-209.40	T2	-1571.57	T2	-1780.97	T2
U 4 U 5	-1669.42	0.00	T2	-221.25	T2	-1669.42	T2	-1890.67	T2
U 5 U 6	-1665.94	0.00	T2	-220.93	T2	-1665.94	T2	-1886.87	T2
U 6 U 7	-1668.36	0.00	T2	-221.25	T2	-1668.36	T2	-1889.60	T2
U 7 U 8	-1568.24	0.00	T2	-209.40	T2	-1568.24	T2	-1777.64	T2
U 8 U 9	-1388.62	0.00	T2	-186.05	T2	-1388.62	T2	-1574.67	T2

TABLE 12.4 DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS (FACTORED)

STATE VEHICLE T2 LOADING RESULTS

MEMBER	LCT	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 2 U 2	T	233.39	113.66	T2	0.00	T2	347.05	T2	233.39	T2
L 2 U 2	B	233.39	0.00	T2	0.00	T2	233.39	T2	233.39	T2
L 3 U 3	T	-210.98	71.64	T2	-66.87	T2	-139.35	T2	-277.85	T2
L 3 U 3	B	-210.98	23.86	T2	-78.14	T2	-187.12	T2	-289.13	T2
L 4 U 4	T	-57.26	82.15	T2	-61.94	T2	24.89	T2	-119.20	T2
L 4 U 4	B	-57.26	49.42	T2	-74.80	T2	-7.83	T2	-132.06	T2
L 5 U 5	T	52.67	82.15	T2	-61.14	T2	134.82	T2	-8.47	T2
L 5 U 5	B	52.67	59.38	T2	-77.63	T2	112.05	T2	-24.96	T2
L 6 U 6	T	50.90	11.90	T2	0.00	T2	62.80	T2	50.90	T2
L 6 U 6	B	50.90	9.06	T2	-100.88	T2	59.97	T2	-49.98	T2
L 7 U 7	T	-61.21	82.15	T2	-61.94	T2	20.94	T2	-123.15	T2
L 7 U 7	B	-61.21	49.42	T2	-74.80	T2	-11.78	T2	-136.01	T2
L 8 U 8	T	-215.01	71.64	T2	-66.87	T2	-143.37	T2	-281.88	T2
L 8 U 8	B	-215.01	23.86	T2	-78.14	T2	-191.15	T2	-293.15	T2
L 9 U 9	T	224.53	113.66	T2	0.00	T2	338.19	T2	224.53	T2
L 9 U 9	B	224.53	0.00	T2	0.00	T2	224.53	T2	224.53	T2

TABLE 12.5 DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS (FACTORED)

STATE VEHICLE T2 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 U 2	-1442.84	0.00	T2	-193.62	T2	-1442.84	T2	-1636.46	T2
U 2 L 3	588.46	104.39	T2	-31.88	T2	692.85	T2	556.58	T2
U 3 L 4	351.79	91.97	T2	-60.77	T2	443.77	T2	291.02	T2
U 4 L 5	213.89	92.22	T2	-70.54	T2	306.12	T2	143.35	T2
L 5 U 6	0.00	0.00	T2	0.00	T2	0.00	T2	0.00	T2
U 5 L 6	-2.01	82.93	T2	-82.93	T2	80.92	T2	-84.94	T2
L 6 U 7	218.02	92.22	T2	-70.54	T2	310.25	T2	147.48	T2
L 7 U 8	356.07	91.97	T2	-60.77	T2	448.04	T2	295.30	T2
L 8 U 9	591.98	104.39	T2	-31.88	T2	696.37	T2	560.11	T2
U 9 L10	-1430.60	0.00	T2	-193.62	T2	-1430.60	T2	-1624.22	T2

TABLE 13.1 DL+LL+I FORCE SUMMARY FOR LOWER CHORD MEMBERS (FACTORED)

STATE VEHICLE T3 LOADING RESULTS TYPE M3-3

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 L 2	956.65	139.35	T3	0.00	T3	1096.01	T3	956.65	T3
L 2 L 3	956.66	139.35	T3	0.00	T3	1096.01	T3	956.66	T3
L 3 L 4	1346.82	194.84	T3	0.00	T3	1541.66	T3	1346.82	T3
L 4 L 5	1551.52	222.30	T3	0.00	T3	1773.82	T3	1551.52	T3
L 5 L 6	1667.00	238.40	T3	0.00	T3	1905.40	T3	1667.00	T3
L 6 L 7	1548.23	222.30	T3	0.00	T3	1770.53	T3	1548.23	T3
L 7 L 8	1341.05	194.84	T3	0.00	T3	1535.88	T3	1341.05	T3
L 8 L 9	948.54	139.35	T3	0.00	T3	1087.89	T3	948.54	T3
L 9 L10	948.54	139.35	T3	0.00	T3	1087.89	T3	948.54	T3

TABLE 13.2 DL+LL+I FORCE SUMMARY FOR UPPER CHORD MEMBERS (FACTORED)

STATE VEHICLE T3 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
U 2 U 3	-1394.60	0.00	T3	-201.75	T3	-1394.60	T3	-1596.35	T3
U 3 U 4	-1571.57	0.00	T3	-225.17	T3	-1571.57	T3	-1796.75	T3
U 4 U 5	-1669.42	0.00	T3	-238.75	T3	-1669.42	T3	-1908.17	T3
U 5 U 6	-1665.94	0.00	T3	-238.40	T3	-1665.94	T3	-1904.34	T3
U 6 U 7	-1668.36	0.00	T3	-238.75	T3	-1668.36	T3	-1907.10	T3
U 7 U 8	-1568.24	0.00	T3	-225.17	T3	-1568.24	T3	-1793.41	T3
U 8 U 9	-1388.62	0.00	T3	-201.75	T3	-1388.62	T3	-1590.37	T3

TABLE 13.4 DL+LL+I FORCE SUMMARY FOR VERTICAL MEMBERS (FACTORED)

STATE VEHICLE T3 LOADING RESULTS

MEMBER	LCT	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 2 U 2	T	233.39	106.54	T3	0.00	T3	339.93	T3	233.39	T3
L 2 U 2	B	233.39	0.00	T3	0.00	T3	233.39	T3	233.39	T3
L 3 U 3	T	-210.98	70.98	T3	-71.95	T3	-140.01	T3	-282.94	T3
L 3 U 3	B	-210.98	23.53	T3	-84.51	T3	-187.46	T3	-295.49	T3
L 4 U 4	T	-57.26	84.79	T3	-66.16	T3	27.53	T3	-123.41	T3
L 4 U 4	B	-57.26	48.37	T3	-80.49	T3	-8.89	T3	-137.74	T3
L 5 U 5	T	52.67	86.70	T3	-64.52	T3	139.37	T3	-11.85	T3
L 5 U 5	B	52.67	61.28	T3	-82.91	T3	113.95	T3	-30.24	T3
L 6 U 6	T	50.90	12.84	T3	0.00	T3	63.74	T3	50.90	T3
L 6 U 6	B	50.90	9.57	T3	-92.58	T3	60.47	T3	-41.68	T3
L 7 U 7	T	-61.21	84.79	T3	-66.16	T3	23.58	T3	-127.37	T3
L 7 U 7	B	-61.21	48.37	T3	-80.49	T3	-12.84	T3	-141.70	T3
L 8 U 8	T	-215.01	70.98	T3	-71.95	T3	-144.04	T3	-286.96	T3
L 8 U 8	B	-215.01	23.53	T3	-84.51	T3	-191.48	T3	-299.52	T3
L 9 U 9	T	224.53	106.54	T3	0.00	T3	331.07	T3	224.53	T3
L 9 U 9	B	224.53	0.00	T3	0.00	T3	224.53	T3	224.53	T3

TABLE 13.5 DL+LL+I FORCE SUMMARY FOR DIAGONAL MEMBERS (FACTORED)

STATE VEHICLE T3 LOADING RESULTS

MEMBER	TOTAL DEAD LOAD (K)	MAXIMUM TENSION LL+I (K)	TYPE	MAXIMUM COMPRESSION LL+I (K)	TYPE	MAXIMUM MEMBER FORCE DL+LL+I (K)	TYPE	MINIMUM MEMBER FORCE DL+LL+I (K)	TYPE
L 1 U 2	-1442.84	0.00	T3	-210.17	T3	-1442.84	T3	-1653.01	T3
U 2 L 3	588.46	112.89	T3	-31.43	T3	701.35	T3	557.03	T3
U 3 L 4	351.79	98.96	T3	-59.47	T3	450.76	T3	292.33	T3
U 4 L 5	213.89	98.50	T3	-72.81	T3	312.39	T3	141.08	T3
L 5 U 6	0.00	0.00	T3	0.00	T3	0.00	T3	0.00	T3
U 5 L 6	-2.01	87.52	T3	-87.52	T3	85.51	T3	-89.53	T3
L 6 U 7	218.02	98.50	T3	-72.81	T3	316.52	T3	145.22	T3
L 7 U 8	356.07	98.96	T3	-59.47	T3	455.04	T3	296.60	T3
L 8 U 9	591.98	112.89	T3	-31.43	T3	704.88	T3	560.55	T3
U 9 L10	-1430.60	0.00	T3	-210.17	T3	-1430.60	T3	-1640.78	T3

Rating Factory
Summary

TABLE 16.7 SUMMARY OF INVENTORY AND OPERATING RATING (L F D)

AASHTO LIVE LOADING

INVENTORY RATING DATA			OPERATING RATING DATA			MILITARY LOADING
AASHTO LOAD NAME			AASHTO LOAD NAME			YES OR NO
HS-20	0.55	0.60				
+			HS-20	0.75	0.90	
+						NO

RATING ANALYSIS SUMMARY

INVENTORY RATING RESULTS			OPERATING RATING RESULTS		
RATING FACTOR	CRITICAL MEMBER	CONTROLLING LIVE LOAD	RATING FACTOR	CRITICAL MEMBER	CONTROLLING LIVE LOAD
0.84	U 5 L 6	L			
+			1.41	U 5 L 6	L

NOTE: For capacity less than force due to dead load, rating will be 0

TABLE 16.8 SUMMARY OF POSTING VEHICLE RATING (L F D)

STATE VEHICULAR LOADING - T1

VEHICLE NAME	SAFE LOAD CAPACITY FACTOR	CRITICAL MEMBER
TYPE 3	2.12	U 5 L 6

STATE VEHICULAR LOADING - T2

VEHICLE NAME	SAFE LOAD CAPACITY FACTOR	CRITICAL MEMBER
TYPE 3S2	1.62	U 5 L 6

STATE VEHICULAR LOADING - T3

VEHICLE NAME	SAFE LOAD CAPACITY FACTOR	CRITICAL MEMBER
TYPE 3-3	1.54	U 5 L 6

SPECIAL TRUCK LOADING - S1

VEHICLE DESCRIPTION			RATING RESULTS	
VEHICLE NAME	NO OF AXLES	TOTAL WEIGHT (K or KN)	SAFE LOAD CAPACITY FACTOR	CRITICAL MEMBER
	0	0.00	99.00	L 1 L 2

NOTE: For capacity less than force due to dead load, rating will be 0

TABLE 16.1 DL+LL+I RATING SUMMARY FOR LOWER CHORD MEMBERS (L F D)

MEMBER	INVENTORY AASHTO MAX T & C	OPERATING AASHTO MAX T & C	STATE VEHICLE 1 MAX T & C	STATE VEHICLE 2 MAX T & C	STATE VEHICLE 3 MAX T & C	SPECIAL VEHICLE 1 MAX T & C	SPECIAL VEHICLE 2 MAX T & C
L 1 L 2	9.18	15.31	33.86	24.66	22.71	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 2 L 3	3.31	5.51	12.20	8.88	8.18	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 3 L 4	1.54	2.57	5.70	4.18	3.85	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 4 L 5	1.55	2.58	5.77	4.21	3.91	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 5 L 6	1.61	2.68	6.00	4.39	4.07	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 6 L 7	1.55	2.59	5.79	4.22	3.93	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 7 L 8	1.55	2.59	5.75	4.21	3.88	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 8 L 9	2.83	4.71	10.41	7.58	6.99	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 9 L10	2.83	4.71	10.41	7.58	6.99	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00

TABLE 16.2 DL+LL+I RATING SUMMARY FOR UPPER CHORD MEMBERS (L F D)

MEMBER	INVENTORY AASHTO MAX T & C	OPERATING AASHTO MAX T & C	STATE VEHICLE 1 MAX T & C	STATE VEHICLE 2 MAX T & C	STATE VEHICLE 3 MAX T & C	SPECIAL VEHICLE 1 MAX T & C	SPECIAL VEHICLE 2 MAX T & C
U 2 U 3	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	1.67	2.78	6.18	4.52	4.17	99.00	0.00
U 3 U 4	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	1.52	2.54	5.68	4.14	3.85	99.00	0.00
U 4 U 5	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	1.62	2.69	6.03	4.41	4.09	99.00	0.00
U 5 U 6	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	1.63	2.71	6.07	4.44	4.11	99.00	0.00
U 6 U 7	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	1.62	2.70	6.04	4.42	4.09	99.00	0.00
U 7 U 8	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	1.53	2.55	5.70	4.16	3.87	99.00	0.00
U 8 U 9	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	1.68	2.80	6.22	4.56	4.20	99.00	0.00

TABLE 16.4 DL+LL+I RATING SUMMARY FOR VERTICAL MEMBERS (L F D)

MEMBER	INVENTORY AASHTO MAX T & C	OPERATING AASHTO MAX T & C	STATE VEHICLE 1 MAX T & C	STATE VEHICLE 2 MAX T & C	STATE VEHICLE 3 MAX T & C	SPECIAL VEHICLE 1 MAX T & C	SPECIAL VEHICLE 2 MAX T & C
L 2 U 2T	3.83	6.39	8.60	8.37	8.93	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 2 U 2B	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 3 U 3T	2.57	4.28	5.96	5.17	5.22	99.00	0.00
	2.63	4.39	7.48	5.54	5.15	99.00	0.00
L 3 U 3B	99.00	9.98	99.00	99.00	99.00	99.00	0.00
	2.00	3.33	6.47	4.74	4.39	99.00	0.00
L 4 U 4T	6.42	10.70	15.06	12.03	11.66	99.00	0.00
	4.05	6.75	10.17	7.64	7.15	99.00	0.00
L 4 U 4B	99.00	16.48	99.00	99.00	99.00	99.00	0.00
	2.96	4.93	8.54	6.32	5.88	99.00	0.00
L 5 U 5T	5.90	9.83	13.92	10.69	10.13	99.00	0.00
	5.09	8.49	18.71	9.24	8.75	99.00	0.00
L 5 U 5B	99.00	13.16	99.00	99.00	99.00	99.00	0.00
	3.78	6.31	9.68	7.27	6.81	99.00	0.00
L 6 U 6T	27.09	45.16	99.00	73.97	68.55	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 6 U 6B	99.00	68.55	99.00	99.00	99.00	99.00	0.00
	2.49	4.15	5.55	5.58	6.08	99.00	0.00

TABLE 16.4 DL+LL+I RATING SUMMARY FOR VERTICAL MEMBERS (L F D)

MEMBER	INVENTORY AASHTO MAX T & C	OPERATING AASHTO MAX T & C	STATE VEHICLE 1 MAX T & C	STATE VEHICLE 2 MAX T & C	STATE VEHICLE 3 MAX T & C	SPECIAL VEHICLE 1 MAX T & C	SPECIAL VEHICLE 2 MAX T & C
L 7 U 7T	6.44	10.74	15.13	12.08	11.71	99.00	0.00
	4.01	6.69	10.08	7.57	7.09	99.00	0.00
L 7 U 7B	99.00	16.54	99.00	99.00	99.00	99.00	0.00
	2.93	4.89	8.47	6.27	5.83	99.00	0.00
L 8 U 8T	2.54	4.24	5.89	5.12	5.16	99.00	0.00
	2.60	4.34	7.40	5.48	5.09	99.00	0.00
L 8 U 8B	99.00	9.87	99.00	99.00	99.00	99.00	0.00
	1.97	3.29	6.40	4.69	4.34	99.00	0.00
L 9 U 9T	2.85	4.75	6.39	6.22	6.63	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
L 9 U 9B	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00

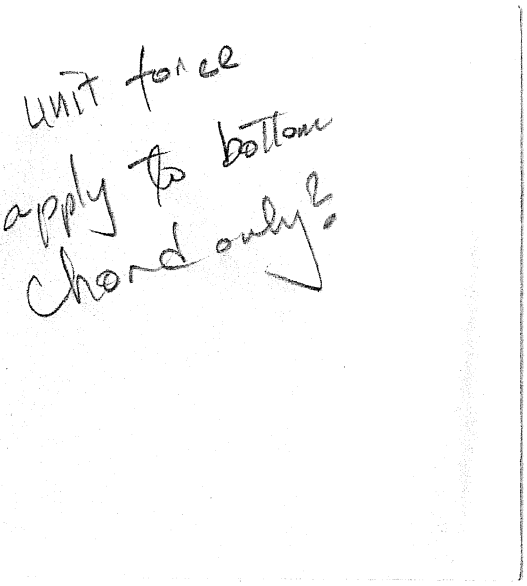
TABLE 16.5 DL+LL+I RATING SUMMARY FOR DIAGONAL MEMBERS (L F D)

MEMBER	INVENTORY AASHTO MAX T & C	OPERATING AASHTO MAX T & C	STATE VEHICLE 1 MAX T & C	STATE VEHICLE 2 MAX T & C	STATE VEHICLE 3 MAX T & C	SPECIAL VEHICLE 1 MAX T & C	SPECIAL VEHICLE 2 MAX T & C
L 1 U 2	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	1.40	2.33	5.54	4.03	3.72	99.00	0.00
U 2 L 3	3.30	5.50	11.60	8.51	7.87	99.00	0.00
	10.74	17.89	23.69	27.85	28.25	99.00	0.00
U 3 L 4	2.57	4.28	8.12	6.02	5.59	99.00	0.00
	4.50	7.50	10.43	9.11	9.31	99.00	0.00
U 4 L 5	2.74	4.56	7.77	5.83	5.46	99.00	0.00
	4.07	6.78	9.55	7.63	7.39	99.00	0.00
L 5 U 6	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	99.00	99.00	99.00	99.00	99.00	99.00	0.00
U 5 L 6	3.90	6.50	9.77	7.51	7.11	99.00	0.00
	0.84	1.41	2.12	1.62	1.54	99.00	0.00
L 6 U 7	2.05	3.41	5.81	4.36	4.09	99.00	0.00
	3.04	5.07	7.14	5.70	5.53	99.00	0.00
L 7 U 8	1.84	3.06	5.81	4.30	4.00	99.00	0.00
	3.22	5.37	7.46	6.52	6.66	99.00	0.00
L 8 U 9	1.57	2.62	5.54	4.06	3.76	99.00	0.00
	5.13	8.54	11.31	13.30	13.49	99.00	0.00
U 9 L10	99.00	99.00	99.00	99.00	99.00	99.00	0.00
	1.42	2.37	5.63	4.10	3.78	99.00	0.00

RATING FACTORS FOR PERMIT TRUCKS CALCULATED MANUALLY. REFER TO LOAD AND RATING SUMMARY SPREADSHEET FOR INFORMATION.

member Influence
Live values

next PAGE →



LHB

Project: Mn/DOT Truss Ratings
Bridge No. 9090 - TH 2 Over Red River - Grand Forks
LHB Project No: 070745.30

UNIT FORCE INFLUENCE LINES

	Members	PANEL POINTS									
		1	2	3	4	5	6	7	8	9	10
BOTTOM CHORD	L1-L2	0.000	0.787	0.689	0.590	0.492	0.394	0.295	0.197	0.098	0.000
	L2-L3	0.000	0.787	0.689	0.590	0.492	0.394	0.295	0.197	0.098	0.000
	L3-L4	0.000	0.556	1.113	0.954	0.795	0.636	0.477	0.318	0.159	0.000
	L4-L5	0.000	0.428	0.855	1.283	1.069	0.855	0.641	0.428	0.214	0.000
	L5-L6	0.000	0.344	0.689	1.033	1.378	1.102	0.827	0.551	0.276	0.000
	L6-L7	0.000	0.214	0.428	0.641	0.855	1.069	1.283	0.855	0.428	0.000
	L7-L8	0.000	0.159	0.318	0.477	0.636	0.795	0.954	1.113	0.556	0.000
	L8-L9	0.000	0.098	0.197	0.295	0.394	0.492	0.590	0.689	0.787	0.000
	L9-L10	0.000	0.098	0.197	0.295	0.394	0.492	0.590	0.689	0.787	0.000
TOP CHORD	U2-U3	0.000	-0.576	-1.152	-0.988	-0.823	-0.659	-0.494	-0.329	-0.165	0.000
	U3-U4	0.000	-0.433	-0.866	-1.299	-1.083	-0.866	-0.650	-0.433	-0.217	0.000
	U4-U5	0.000	-0.345	-0.690	-1.035	-1.380	-1.104	-0.828	-0.552	-0.276	0.000
	U5-U6	0.000	-0.276	-0.551	-0.827	-1.102	-1.378	-1.033	-0.689	-0.344	0.000
	U6-U7	0.000	-0.276	-0.552	-0.828	-1.104	-1.380	-1.035	-0.690	-0.345	0.000
	U7-U8	0.000	-0.217	-0.433	-0.650	-0.866	-1.083	-1.299	-0.866	-0.433	0.000
	U8-U9	0.000	-0.165	-0.329	-0.494	-0.659	-0.823	-0.988	-1.152	-0.576	0.000
VERTICAL MEMBERS	L2-U2	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	L3-U3	0.000	0.261	0.521	-0.410	-0.342	-0.274	-0.205	-0.137	-0.068	0.000
		0.000	0.261	-0.479	-0.410	-0.342	-0.274	-0.205	-0.137	-0.068	0.000
	L4-U4	0.000	0.180	0.360	0.540	-0.383	-0.307	-0.230	-0.153	-0.077	0.000
		0.000	0.180	0.360	-0.460	-0.383	-0.307	-0.230	-0.153	-0.077	0.000
	L5-U5	0.000	0.130	0.259	0.389	0.519	-0.385	-0.289	-0.193	-0.096	0.000
		0.000	0.130	0.259	0.389	-0.481	-0.385	-0.289	-0.193	-0.096	0.000
	L6-U6	0.000	0.015	0.030	0.045	0.059	0.074	0.056	0.037	0.019	0.000
		0.000	0.015	0.030	0.045	0.059	-0.926	0.056	0.037	0.019	0.000
	L7-U7	0.000	-0.077	-0.153	-0.230	-0.307	-0.383	0.540	0.360	0.180	0.000
		0.000	-0.077	-0.153	-0.230	-0.307	-0.383	-0.460	0.360	0.180	0.000
	L8-U8	0.000	-0.068	-0.137	-0.205	-0.274	-0.342	-0.410	0.521	0.261	0.000
		0.000	-0.068	-0.137	-0.205	-0.274	-0.342	-0.410	-0.479	0.261	0.000
	L9-U9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000
		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DIAGONAL MEMBERS	L1-U2	0.000	-1.187	-1.039	-0.891	-0.742	-0.594	-0.445	-0.297	-0.148	0.000
	L3-U2	0.000	-0.348	0.640	0.548	0.457	0.365	0.274	0.183	0.091	0.000
	L4-U3	0.000	-0.221	-0.443	0.565	0.471	0.377	0.283	0.188	0.094	0.000
	L5-U4	0.000	-0.154	-0.308	-0.462	0.572	0.457	0.343	0.229	0.114	0.000
	L5-U6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	L6-U5	0.000	-0.131	-0.261	-0.392	-0.523	0.523	0.392	0.261	0.131	0.000
	L6-U7	0.000	0.114	0.229	0.343	0.457	0.572	-0.462	-0.308	-0.154	0.000
	L7-U8	0.000	0.094	0.188	0.283	0.377	0.471	0.565	-0.443	-0.221	0.000
	L8-U9	0.000	0.091	0.183	0.274	0.365	0.457	0.548	0.640	-0.348	0.000
	L10-U9	0.000	-0.148	-0.297	-0.445	-0.594	-0.742	-0.891	-1.039	-1.187	0.000

Unit force load applied to the top chord for information only

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 1 L 2

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.787	3	0.689	4	0.590	5	0.492
6	0.394	7	0.295	8	0.197	9	0.098	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 2 L 3

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.787	3	0.689	4	0.590	5	0.492
6	0.394	7	0.295	8	0.197	9	0.098	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 3 L 4

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.556	3	1.113	4	0.954	5	0.795
6	0.636	7	0.477	8	0.318	9	0.159	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 4 L 5

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.428	3	0.855	4	1.283	5	1.069
6	0.855	7	0.641	8	0.428	9	0.214	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 5 L 6

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.344	3	0.689	4	1.033	5	1.378
6	1.102	7	0.827	8	0.551	9	0.276	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 6 L 7

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.214	3	0.428	4	0.641	5	0.855
6	1.069	7	1.283	8	0.855	9	0.428	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 7 L 8

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.159	3	0.318	4	0.477	5	0.636
6	0.795	7	0.954	8	1.113	9	0.556	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 8 L 9

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.098	3	0.197	4	0.295	5	0.394
6	0.492	7	0.590	8	0.689	9	0.787	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 9 L10

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.098	3	0.197	4	0.295	5	0.394
6	0.492	7	0.590	8	0.689	9	0.787	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 2 U 3

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.576	3	-1.152	4	-0.988	5	-0.823
6	-0.659	7	-0.494	8	-0.329	9	-0.165	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 3 U 4

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.433	3	-0.866	4	-1.299	5	-1.083
6	-0.866	7	-0.650	8	-0.433	9	-0.217	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 4 U 5

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.345	3	-0.690	4	-1.035	5	-1.380
6	-1.104	7	-0.828	8	-0.552	9	-0.276	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 5 U 6

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.276	3	-0.551	4	-0.827	5	-1.102
6	-1.378	7	-1.033	8	-0.689	9	-0.344	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 6 U 7

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.276	3	-0.552	4	-0.828	5	-1.104
6	-1.380	7	-1.035	8	-0.690	9	-0.345	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 7 U 8

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.217	3	-0.433	4	-0.650	5	-0.866
6	-1.083	7	-1.299	8	-0.866	9	-0.433	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 8 U 9

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.165	3	-0.329	4	-0.494	5	-0.659
6	-0.823	7	-0.988	8	-1.152	9	-0.576	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 2 U 2

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	1.000	3	0.000	4	0.000	5	0.000
6	0.000	7	0.000	8	0.000	9	0.000	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 2 U 2

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.000	3	0.000	4	0.000	5	0.000
6	0.000	7	0.000	8	0.000	9	0.000	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 3 U 3

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.261	3	0.521	4	-0.410	5	-0.342
6	-0.274	7	-0.205	8	-0.137	9	-0.068	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 3 U 3

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.261	3	-0.479	4	-0.410	5	-0.342
6	-0.274	7	-0.205	8	-0.137	9	-0.068	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 4 U 4

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.180	3	0.360	4	0.540	5	-0.383
6	-0.307	7	-0.230	8	-0.153	9	-0.077	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 4 U 4

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.180	3	0.360	4	-0.460	5	-0.383
6	-0.307	7	-0.230	8	-0.153	9	-0.077	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 5 U 5

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.130	3	0.259	4	0.389	5	0.519
6	-0.385	7	-0.289	8	-0.193	9	-0.096	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 5 U 5

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.130	3	0.259	4	0.389	5	-0.481
6	-0.385	7	-0.289	8	-0.193	9	-0.096	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 6 U 6

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.015	3	0.030	4	0.045	5	0.059
6	0.074	7	0.056	8	0.037	9	0.019	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 6 U 6

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.015	3	0.030	4	0.045	5	0.059
6	-0.926	7	0.056	8	0.037	9	0.019	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 7 U 7

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.077	3	-0.153	4	-0.230	5	-0.307
6	-0.383	7	0.540	8	0.360	9	0.180	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 7 U 7

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.077	3	-0.153	4	-0.230	5	-0.307
6	-0.383	7	-0.460	8	0.360	9	0.180	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 8 U 8

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.068	3	-0.137	4	-0.205	5	-0.274
6	-0.342	7	-0.410	8	0.521	9	0.261	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 8 U 8

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.068	3	-0.137	4	-0.205	5	-0.274
6	-0.342	7	-0.410	8	-0.479	9	0.261	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 9 U 9

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.000	3	0.000	4	0.000	5	0.000
6	0.000	7	0.000	8	0.000	9	1.000	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 9 U 9

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.000	3	0.000	4	0.000	5	0.000
6	0.000	7	0.000	8	0.000	9	0.000	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 1 U 2

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-1.187	3	-1.039	4	-0.891	5	-0.742
6	-0.594	7	-0.445	8	-0.297	9	-0.148	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 2 L 3

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.348	3	0.640	4	0.548	5	0.457
6	0.365	7	0.274	8	0.183	9	0.091	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 3 L 4

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.221	3	-0.443	4	0.565	5	0.471
6	0.377	7	0.283	8	0.188	9	0.094	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 4 L 5

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.154	3	-0.308	4	-0.462	5	0.572
6	0.457	7	0.343	8	0.229	9	0.114	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 5 U 6

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.000	3	0.000	4	0.000	5	0.000
6	0.000	7	0.000	8	0.000	9	0.000	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 5 L 6

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.131	3	-0.261	4	-0.392	5	-0.523
6	0.523	7	0.392	8	0.261	9	0.131	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 6 U 7

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.114	3	0.229	4	0.343	5	0.457
6	0.572	7	-0.462	8	-0.308	9	-0.154	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 7 U 8

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.094	3	0.188	4	0.283	5	0.377
6	0.471	7	0.565	8	-0.443	9	-0.221	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER L 8 U 9

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	0.091	3	0.183	4	0.274	5	0.365
6	0.457	7	0.548	8	0.640	9	-0.348	10	0.000

TABLE 4.1 MEMBER INFLUENCE LINE VALUES

INFLUENCE LINE ORDINATES FOR TRUSS MEMBER U 9 L10

PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE	PP NO	ORDINATE
1	0.000	2	-0.148	3	-0.297	4	-0.445	5	-0.594
6	-0.742	7	-0.891	8	-1.039	9	-1.187	10	0.000

Coincidental Member Loads

BRIDGE NO. 9090 - COINCIDENT MEMBER LOADS AT TRUSS JOINTS - HS20 LOADING

COMPLETED BY: JWS	CHECKED BY: JDL
DATE: 02-12-08	DATE: 02-12-08

COINCIDENT MEMBER LOADS - SERVICE LOAD WITH IMPACT INCLUDED (BOLD NUMBERS ARE MAXIMUM LOAD AT JOINT)

NOTE THAT NODE AND MEMBER LABELS DO NOT MATCH ORIGINAL PLAN - SOFTWARE USED REQUIRES FIRST NODE TO BE L1 INSTEAD OF L0. SEE ANALYSIS DATA FOR DRAWING SHOWING MEMBER/JOINT LABELS USED BELOW.

JOINT NUMBER	NUMBER OF MEMBERS AT JOINT	MEMBER LOADS - BOTTOM CHORD (KIPS)									MEMBER LOADS - TOP CHORD (KIPS)							MEMBER LOADS - VERTICAL MEMBERS (KIPS)								MEMBER LOADS - DIAGONAL MEMBERS (KIPS)									
		L1-L2	L2-L3	L3-L4	L4-L5	L5-L6	L6-L7	L7-L8	L8-L9	L9-L10	U2-U3	U3-U4	U4-U5	U5-U6	U6-U7	U7-U8	U8-U9	L2-U2	L3-U3	L4-U4	L5-U5	L6-U6	L7-U7	L8-U8	L9-U9	L1-U2	L3-U2	L4-U3	L5-U4	L5-U6	L6-U5	L6-U7	L7-U8	L8-U9	L10-U9
L1	2	159.1																								-239.9									
		159.1																								-257.8									
L2	3	159.1	159.1															71.3																	
		159.1	159.1															71.3																	
		90.1	90.1															114.6																	
L3	4		159.1	206.0															-15.6								70.8								
			155.7	224.3															-6.8								104.3								
			138.9	221.0															-10.0								124.3								
			86.3	60.9															-28.6								38.2								
			108.4	142.6															66.5								51.6								
			98.9	159.9															65.0								91.8								
L4	4			224.3	244.8															9.6									34.1							
				219.5	259.2															15.7									68.3							
				146.9	169.2															71.1									38.3							
				119.9	161.2															53.9									71.0							
				177.3	234.9															2.9									99.5							
				142.5	109.5															46.1									56.7							
L5	5				259.2	266.8															25.7									13.9	0 (A)					
					252.0	278.4															30.1									49.0	0 (A)					
					162.8	182.9															68.8									37.4	0 (A)					
					113.5	146.3															51.2									60.7	0 (A)					
					180.0	229.1															8.5									90.8	0 (A)					
					169.3	136.4															51.3									61.0	0 (A)					
L6	5					278.4	244.8															14.5									-17.7	45.1			
						259.8	259.2															14.4									13.3	13.9			
						264.6	264.1															15.0									13.5	14.2			
						167.4	198.0															11.1									73.6	15.2			
						206.2	129.9															9.0									-73.6	69.4			
						231.3	180.0															12.3									-4.5	90.8			
						109.1	169.3															7.4									51.7	61.0			
L7	4						259.2	219.5															15.7									68.3		
							244.8	224.9															9.6									34.1		
							168.9	146.7															71.1									38.2		
							163.4	121.5															53.9									72.0		
							234.4	176.6															2.9									99.5		
							109.6	142.5															46.1									56.7		
L8	4							224.9	155.8															-6.8									104.3	
								206.0	159.1															-15.6									70.8	
								142.6	108.4															66.5									51.6	
								162.9	100.8															65.0									93.6	
								221.0	138.9															-10.0									124.3	
								60.9	86.3															28.6									38.2	
L9	3								159.1	159.1															71.3										
									159.1	159.1															71.3										
									90.1	90.1															114.6										
L10	2									159.1																								-239.9
										159.1																								257.8

BRIDGE NO. 9090 - COINCIDENT MEMBER LOADS AT TRUSS JOINTS - HS20 LOADING

COMPLETED BY: JWS	CHECKED BY: JDL
DATE: 02-12-08	DATE: 02-12-08

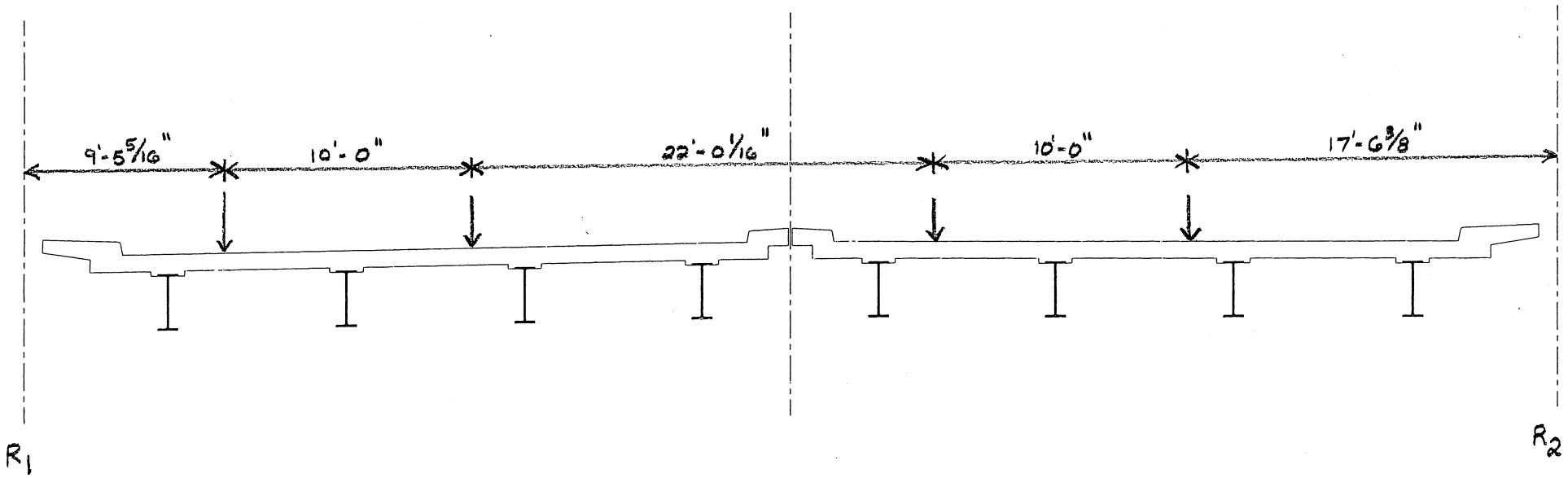
COINCIDENT MEMBER LOADS - SERVICE LOAD WITH IMPACT INCLUDED (BOLD NUMBERS ARE MAXIMUM LOAD AT JOINT)

NOTE THAT NODE AND MEMBER LABELS DO NOT MATCH ORIGINAL PLAN - SOFTWARE USED REQUIRES FIRST NODE TO BE L1 INSTEAD OF L0. SEE ANALYSIS DATA FOR DRAWING SHOWING MEMBER/JOINT LABELS USED BELOW.

JOINT NUMBER	NUMBER OF MEMBERS AT JOINT	MEMBER LOADS - BOTTOM CHORD (KIPS)									MEMBER LOADS - TOP CHORD (KIPS)							MEMBER LOADS - VERTICAL MEMBERS (KIPS)								MEMBER LOADS - DIAGONAL MEMBERS (KIPS)									
		L1-L2	L2-L3	L3-L4	L4-L5	L5-L6	L6-L7	L7-L8	L8-L9	L9-L10	U2-U3	U3-U4	U4-U5	U5-U6	U6-U7	U7-U8	U8-U9	L2-U2	L3-U3	L4-U4	L5-U5	L6-U6	L7-U7	L8-U8	L9-U9	L1-U2	L3-U2	L4-U3	L5-U4	L5-U6	L6-U5	L6-U7	L7-U8	L8-U9	L10-U9
U2	4										-232.8							37.4								-234.9	104.3								
											-222.0							86.4								-257.8	65.6								
											-65.9							114.6								-135.9	-39.8								
											-229.3							4.7								-222.8	124.3								
											-63.1							109.6								-130.1	-38.2								
U3	4										-232.8	-247.9							-6.8									34.1							
											-227.3	-262.6							-38.3									68.3							
											-110.7	-115.4							66.5									-56.7							
											-165.5	-214.6							-65.0									90.1							
											-182.8	-237.4							-65.0									99.5							
											-147.6	-110.9							66.5									-56.7							
U4	4											-262.6	-267.2							15.7										13.9						
												-255.3	-278.8							-15.6										49.0						
												-176.3	-140.4							71.1										-61.0						
												-172.3	-214.7							-53.9										82.1						
												-189.0	-236.1							-53.9										90.8						
												-171.5	-136.6							71.1										-61.0						
U5	4												-278.8	-269.1							30.1										-17.7				
													-269.5	-278.4							-0.6										17.7				
													-187.3	-149.6							68.8										-71.0				
													-143.9	-179.6							-51.2										68.1				
													-167.7	-206.2							-51.2										73.6				
													-206.6	-167.5							68.8										-73.6				
U6	4													-278.4	-278.4							15.0								0 (A)					
														-278.4	-278.8							15.0								0 (A)					
														-278.4	-278.8							15.0								0 (A)					
U7	4														-278.8	-255.3							-15.6								49.0				
															-267.2	-262.6							15.7								13.9				
															-136.5	-171.3							71.1								-60.9				
															-205.3	-163.0							53.9								81.6				
															-229.4	-182.5							-59.7								90.8				
															-136.6	-171.5							71.1								-61.0				
U8	4															-262.6	-227.3							-38.3									68.3			
																-247.9	-232.8							-6.8									34.1			
																-110.9	-147.6							66.5									-56.7			
																-214.6	-165.5							65.0									89.5			
																-237.4	-182.8							-65.0									99.5			
																-110.9	-147.6							66.5									56.7			
U9	4																-232.8								37.4									104.3	-234.9
																	-222.0								86.4									65.6	-257.8
																	-65.9								114.6									-39.8	-135.9
																	-228.8								4.7									124.3	-209.5
																	-63.1								109.6									38.2	-130.1

(A) - LOADS ARE ZERO SINCE "COUNTER" WAS MODELED AS INACITIVE TO APPROXIMATE ORIGINAL DESIGN INTENT. FOR GUSSET PLATE ANALYSIS LOAD RANGES AS LISTED FOR MEMBER L6-U5 SHOULD BE CONSIDERED.

Calculations



$$R_1 = \frac{17'\text{-}6\frac{3}{8}" + 27'\text{-}6\frac{3}{8}" + 49'\text{-}6\frac{7}{16}" + 59'\text{-}6\frac{7}{16}"}{69'\text{-}0"} = 2.234$$

D.F. = 2.234 x .75 = 1.676

TO DATE TRUSS DEAD LOAD SUMMARY																
Loads	Stringers	Floorbeam	Diaphragms	Deck	Railing	Vertical Gusset Plates	Bottom Chord Horizontal Gusset Plates	Top Chord Horizontal Gusset Plates	Bottom Lateral Bracing	Top lateral Bracing	Vertical Bracing (sway)	Portal	Toal Load Entire Bridge	Dead Load Detail Factor	Total Load with DL Factor	**TOTAL PER TRUSS (KIPS)**
Point Load Loc.																
L1	12276	23299.6	911.6	128623.7	7750	2845	350		2306.2				178362.1	0.05	179103.2	89.6
L2	24552	21325.5	1823.2	257247.3	15500	2845	220		4612.4				328125.4	0.05	328935.8	164.5
L3	24552	21325.5	1823.2	257247.3	15500	2845	220		4612.4				328125.4	0.05	328935.8	164.5
L4	24552	21325.5	1823.2	257247.3	15500	2845	220		4612.4				328125.4	0.05	328935.8	164.5
L5	24552	21325.5	1823.2	257247.3	15500	2845	220		5320.9				328833.9	0.05	329679.7	164.8
L6	24552	21325.5	1823.2	257247.3	15500	2845	220		5320.9				328833.9	0.05	329679.7	164.8
L7	24552	21325.5	1823.2	257247.3	15500	2845	220		4612.4				328125.4	0.05	328935.8	164.5
L8	24552	21325.5	1823.2	257247.3	15500	2845	220		4612.4				328125.4	0.05	328935.8	164.5
L9	24552	21325.5	1823.2	257247.3	15500	2845	220		4612.4				328125.4	0.05	328935.8	164.5
L10	12276	21110.8	911.6	128623.7	7750	2845	350		2306.2				176173.3	0.05	176870.6	88.4
U2						2845		1110		3862.7	17356.0	10857.3	36031.0	0.05	37832.6	18.9
U3						2845		1110		7660.7	18411.7		30027.4	0.05	31528.8	15.8
U4						2845		1110		7563.1	19211.0		30729.1	0.05	32265.6	16.1
U5						2845		1110		8681.4	19005.3		31641.7	0.05	33223.8	16.6
U6						2845		1110		8681.4	19005.3		31641.7	0.05	33223.8	16.6
U7						2845		1110		7563.1	19211.0		30729.1	0.05	32265.6	16.1
U8						2845		1110		7660.7	18411.7		30027.4	0.05	31528.8	15.8
U9						2845		1110		3862.7	17356.0	10857.3	36031.0	0.05	37832.6	18.9

FLOORBEAMS HAVE DEAD LOAD DETAIL FACTOR (2%)
GUSSET PLATES AND BRACING HAVE THE DEAD LOAD DETAIL FACTOR (5%)

LHB
21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT BRIDGE NO. 9090

PROJECT # 070745.3 DATE 1/29/08 BY RAM SHEET NO. 2 OF 2

CJM 2/13/08

REVISIONS TO POINT LOADS AT L1 AND L2

PER PLAN MEMBER L½ - U½

$DL = (64.68\ in^2)(17'-6")(490\ PCF) = 3852\ LB + 5\%$ DETAIL FACTOR

$= 4045\ LB$

PER PLAN L1 - U½

$DL = (39.25\ in^2)(23'-5")(490\ PCF) = 3128\ LB + 5\%$ DETAIL FACTOR

$= 3285\ LB$

TOTAL = 7330 LB

= 3665 LB TO L1 AND
3665 LB TO L2

FROM SHEET 1

L1 = 89.6 K + 3.665 K = 93.3 K

L2 = 164.5 K + 3.665 K = 168.2 K

NOTE: DEAD LOAD COMPUTATIONS WERE INDEPENTLY VERIFIED BY MEANS OF COMPARISON OF DEAD LOAD MEMBER LOADS TO TTHOSE SHOWN IN ORIGINAL DESIGN DRAWINGS. JWS 2-14-08

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21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
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612 338-2029
Fax 612 338-2088

PROJECT BRIDGE NO. 9090

PROJECT # 070745.3 DATE 1/11/08 BY RAM SHEET NO. 1 OF 6

CJM 2/13/08

NODE NUMBERS MATCH ORIGINAL PLAN USED RAM DEAD LOADS IN TRUSS ANALYSIS.

FLOOR SYSTEM DEAD LOADS (AT FLOORBEAM L1)

STRINGERS

= (99 LB/FT)(8)(31'-0") 1/2 = 12,276 LB

FLOORBEAM

WEB = (66")(7/16")(67'-4 5/8")(490 PCF) = 6621 LB
FLANGES = 2(1'-10")(1")(17'-3 3/8")(490 PCF) = 2587.4 LB
FLANGES = 2(1'-10")(1 3/4")(50'-0")(490 PCF) = 13,100.7 LB
STIFFENERS = (66")(5")(3/8")(490 PCF)(17) = 596.5 LB
END STIFFENER = 2(66")(1'-0")(5/8")(490 PCF) = 280.7 LB
CONNECTION ANGLE = (8.5 LB/FT)(1'-8")(8) = 113.3 LB

DIAPHRAGMS

=(33.9 LB/FT)(8'-0")(6) 1/2 = 813.6 LB
STIFFENERS = (9.8 LB/FT)(1'-8")(12) 1/2 = 98 LB

DECK (FROM AUTOCAD DRAWING)

= 2(27.661 FT²)(31'-0")(150 PCF) 1/2 = 128,623.7 LB

RAILING (ASSUMED)

= (1'-6")(1'-0")(150 PCF) + 25 PLF = (250 LB/FT)(31'-0") 2 (1/2) = 7,750 LB

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21 West Superior Street, Suite 500
Duluth, Minnesota 55802
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www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT BRIDGE NO. 9090

PROJECT # 070745.3 DATE 1/10/08 BY RAM SHEET NO. 2 OF 6

CJM 2/13/08

FLOOR SYSTEM DEAD LOADS (FOR TYPICAL BAY)

STRINGERS

= (99 LB/FT)(8 STRINGERS)(31'-0") = 24,552 LB

FLOOR BEAM

WEB = (66")(7/16")(67'-4 5/8")(490 PCF) = 6621 LB
FLANGES = 2(1'-9")(1")(21'-3 3/8")(490 PCF) = 3041.4 LB
STIFFENERS = (66")(5")(3/8")(490 PCF)(34) = 1193.1 LB
FLANGES = 2(1'-9")(1 1/2")(46'-0")(490 PCF) = 9861.3 LB
CONNECTION ANGLES = (12.3 LB/FT)(1'-8")(8)(2) = 328 LB
END STIFFENERS = 2(66")(1'-0")(5/8")(490 PCF) = 280.7 LB

DIAPHRAGMS

= (33.9 LB/FT)(8'-0")(6) = 1627.2 LB
STIFFENERS = (9.8 LB/FT)(1'-8")(12) = 196 LB

DECK (FROM AUTOCAD DRAWING)

= 2(27.661 FT^2)(31'-0")(150 PCF) = 257,247.3 LB

RAILING (ASSUMED)

= (1'-6")(1'-0")(150 PCF) + 25 PLF = (250 LB/FT)(31'-0")2 = 15,500 LB

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Duluth, Minnesota 55802
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250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
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PROJECT BRIDGE NO. 9090

PROJECT # 070745.3 DATE 1/11/08 BY RAM SHEET NO. 3 OF 6

CJM 2/13/08

FLOOR SYSTEM DEAD LOADS (AT FLOORBEAM L11)

STRINGERS

= (99 LB/FT)(8)(31'-0") 1/2 = 12,276 LB

FLOORBEAM

WEB = (66")(7/16")(67'-4 5/8")(490 PCF) = 6621 LB
FLANGES = 2(1'-9")(1")(21'-3 3/8")(490 PCF) = 3041.4 LB
FLANGES = 2(1'-9")(1 1/2")(46'-0")(490 PCF) = 9861.3 LB
STIFFENERS = (66")(5")(3/8")(490 PCF)(34) = 1193.1 LB
END STIFFENER = 2(66")(1'-0")(5/8")(490 PCF) = 280.7 LB
CONNECTION ANGLE = (8.5 LB/FT)(1'-8")(8) = 113.3 LB

DIAPHRAGMS

= (33.9 LB/FT)(8'-0")(6) 1/2 = 813.6 LB
STIFFENERS = (9.8 LB/FT)(1'-8")(12) 1/2 = 98 LB

DECK (FROM AUTOCAD DRAWING)

= 2(27.661 FT²)(31'-0")(150 PCF) 1/2 = 128,623.7 LB

RAILING

= (1'-6")(1'-0")(150 PCF) + 25 PLF = (250 LB/FT)(31'-0")(2) 1/2 = 7,750 LB

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250 3rd Avenue North, Suite 450
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PROJECT BRIDGE NO. 9090

PROJECT # 070745.3 DATE 1/11/08 BY RAM SHEET NO. 4 OF 6

CJM 2/13/08

TRUSS DEAD LOADS

BOTTOM LATERALS (TYPICAL PANEL)

= (32.5 LB/FT)(35.48')(4) = 4612.4 LB

BOTTOM LATERALS (CENTER PANEL)

= (32.5 LB/FT)(46.38')(4) = 6029.4 LB

TOP LATERALS

PANEL 2 = (53 LB/FT)(36.44')(4) = 7725.3 LB (PANEL 8)
PANEL 3 = (53 LB/FT)(35.83')(4) = 7596 LB (PANEL 7)
PANEL 4 = (53 LB/FT)(35.52')(4) = 7530.2 LB (PANEL 6)
PANEL 5 = (53 LB/FT)(46.38')(4) = 9832.6 LB

VERTICAL BRACING (AT U6 AND U7)

DIAGONALS = (53 LB/FT)(29.88')(4) = 6334.6 LB

TOP HORIZONTAL

= 2(42.7 LB/FT)(69'-0") = 5892.6 LB
BOT. PLATE = (1'-0" X 3/8")(69'-0")(490 PCF) = 1056.6 LB
(ASSUMED) TOP PLATE = (1'-0")(3/8")(69'-0" - 6'-11" x 2)(490 PCF) = 844.7 LB

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PROJECT BRIDGE NO. 9090

PROJECT # 070745.3 DATE 1/11/08 BY RAM SHEET NO. 5 OF 6

CJM 2/13/08

BOTTOM HORIZONTAL

= 2(20.7 LB/FT)(69'-0") = 2856.6 LB

BOT. PLATE = (1'-2")(3/8")(69'-0")(490 PCF) = 1232.7 LB

TOP PLATE = (1'-2")(3/8")(44'-1")(490 PCF) = 787.5 LB

VERTICAL BRACING (AT U5 AND U8)

DIAGONALS = (53 LB/FT)(28.19')(4) = 5976.3 LB

BOTTOM HORIZONTAL = 4876.8 LB

TOP HORIZONTAL

= 2(42.7 LB/FT)(69'-0") = 5892.6 LB

TOP PLATE = (1'-6")(3/8")(69'-0")(490 PCF) = 1584.8 LB

BOTTOM PLATE = (10")(3/8")(69'-0")(490 PCF) = 880.5 LB

VERTICAL BRACING (AT U4 AND U9)

DIAGONALS = (53 LB/FT)(24.42')(4) = 5177 LB

BOTTOM HORIZONTAL = 4876.8 LB

TOP HORIZONTAL = 8357.9 LB

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Fax 612 338-2088

PROJECT BRIDGE NO. 9090

PROJECT # 070745.3 DATE 1/11/08 BY RAM SHEET NO. 6 OF 6

CJM 2/13/08

VERTICAL BRACING (AT U3 AND U10)

DIAGONALS = (53 LB/FT)(19.44')(4) = 4121.3 LB

BOTTOM HORIZONTAL = 4876.8 LB

TOP HORIZONTAL = 8357.9 LB

PORTAL BRACING

= (94 LB/FT)(69'-0") = 6486 LB

= (45 LB/FT)(16.19')(6) = 4371.3 LB

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PROJECT Bridge #9090

PROJECT # 070745.30 DATE 1-15-08 BY CJM SHEET NO. 1 OF 11

RAM 2-13-08

Node Numbers match original plan, used RAM Dead Loads in Truss Analysis

Dead load - Floor system @ L1

Stringer - 30 WF 99

8 · 99 lb/ft · 31' · 1/2 = 12276 lb

Floor beam

Flange - 2 · 17' 3 3/8" · 1' 10" · 1" · 490 lb/ft³ = 2587.38 lb

Flange - 2 · 50' - 1' 10" · 1 3/4" · 490 lb/ft³ = 13100.69 lb

web - 66" · 67' 4 5/8" · 7/16" · 490 lb/ft³ = 6620.96 lb

Stiffeners - 17 · 66" · 5" * 3/8" · 490 lb/ft³ = 596.55 lb

End stiffener - 2 · 1' · 5/8" · 66" · 490 lb/ft³ = 280.73 lb

Connection plate = 20" · 8.5 lb/ft · 8 = 113.33 Lb

↳ L3 1/2 x 3 1/2 · 3/8

Diaphrams - 15 W 33.9

6 · 8' · 33.9 lb/ft = 1627.2 lb · 1/2 = 813.6 lb

Stiffeners - 12 · 9.8 lb/ft · 1' 8" = 196 lb · 1/2 = 98 lb

↳ L 4x4x 3/8

Bridge Deck

2 · 27.66 ft² · 150 lb/ft³ · 31' · 1/2 = 128,619 lb

Railing (assumed)

1'6" · 1'0" · 150pcf + 25 plf = 250 lb/ft · 31' · 2 · 1/2

= 7,750 Lb

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PROJECT Bridge # 9090

PROJECT # 070745.30 DATE 1-15-07 BY CJM SHEET NO. 2 OF 11

RAM 2-13-08

Dead Load - Typical Floor beam

Stringer - 30 WF 99

8 · 99 lb/ft · 31 ft = 24552 Lb

Floor beam

Flange - 2 · 21' 3 3/8" · 1' 9" · 1" · 490 lb/ft3 = 3,041.45 Lb

Flange - 2 · 46' · 1' 9" · 1 1/2" · 490 lb/ft3 = 9,861.25 Lb

Web - 66" · 67' 4 5/8" · 7/16" · 490 lb/ft3 = 6620.96 Lb

Stiffeners - 34 · 5" · 3/8" · 66" · 490 lb/ft3 = 1193.10 Lb

End stiffeners - 2 · 5/8" · 66" · 1' · 490 lb/ft3 = 280.73 Lb

Connection plate - 12.3# lb/ft · 20" · 8 = 164 Lb · 2 sides = 328 Lb

↳ L 5x5x3/8

Diaphram - 15 U 33.9

6 · 8' · 33.9 lb/ft = 1627.2 lb

Stiffeners - 12 · 9.8 lb/ft · 1' 8" = 196 lb

↳ L 4x4x3/8

Bridge Deck

2 · 27.66 ft2 · 31' · 150 lb/ft3 = 257,238 Lb

Railing (assumed)

250 Lb/ft · 31' · 2 = 15,500 Lb

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PROJECT Bridge #9090

PROJECT # 070745.30 DATE 1-15-08 BY CJM SHEET NO. 3 OF 11

RAM 2-B-08

Dead Load - Floor System @ L11

Stringers - 30 WF 99

8 · 99 lb/ft · 31' · 1/2 = 12,276 Lb

Floor beam

Flange - 2 · 21' 3 3/8" · 1'9" · 1" · 490 Lb/ft3 = 3041.45 Lb

Flange - 2 · 46 · 1'9" · 1 1/2" · 490 Lb/ft3 = 9861.25 Lb

Web - 66" · 67' 4 5/8" · 7/16" · 490 Lb/ft3 = 6620.97 Lb

Stiffeners - 34 · 5" · 3/8" · 66" · 490 Lb/ft3 = 1193.10 Lb

End stiffeners - 2 · 66" · 1' 5/8" · 490 Lb/ft3 = 280.73 Lb

connection plate - 8 · 8.5 Lb/ft · 20" = 113.33 Lb

↳ L 3 1/2 x 3 1/2 x 3/8

Diaphram - 15 U 33.9

6 · 33.9 Lb/ft · 8' = 1627.2 Lb · 1/2 = 813.6 Lb

stiffeners - 9.8 Lb/ft · 20" · 12 = 196 · 1/2 = 98 Lb

↳ L 4x4x3/8

Bridge deck

2 sides · 27.66 ft2/side · 150 Lb/ft3 · 31' · 1/2 = 128,619 Lb

Railing (assumed)

250 Lb/ft · 31' · 2 · 1/2 = 7,750 Lb

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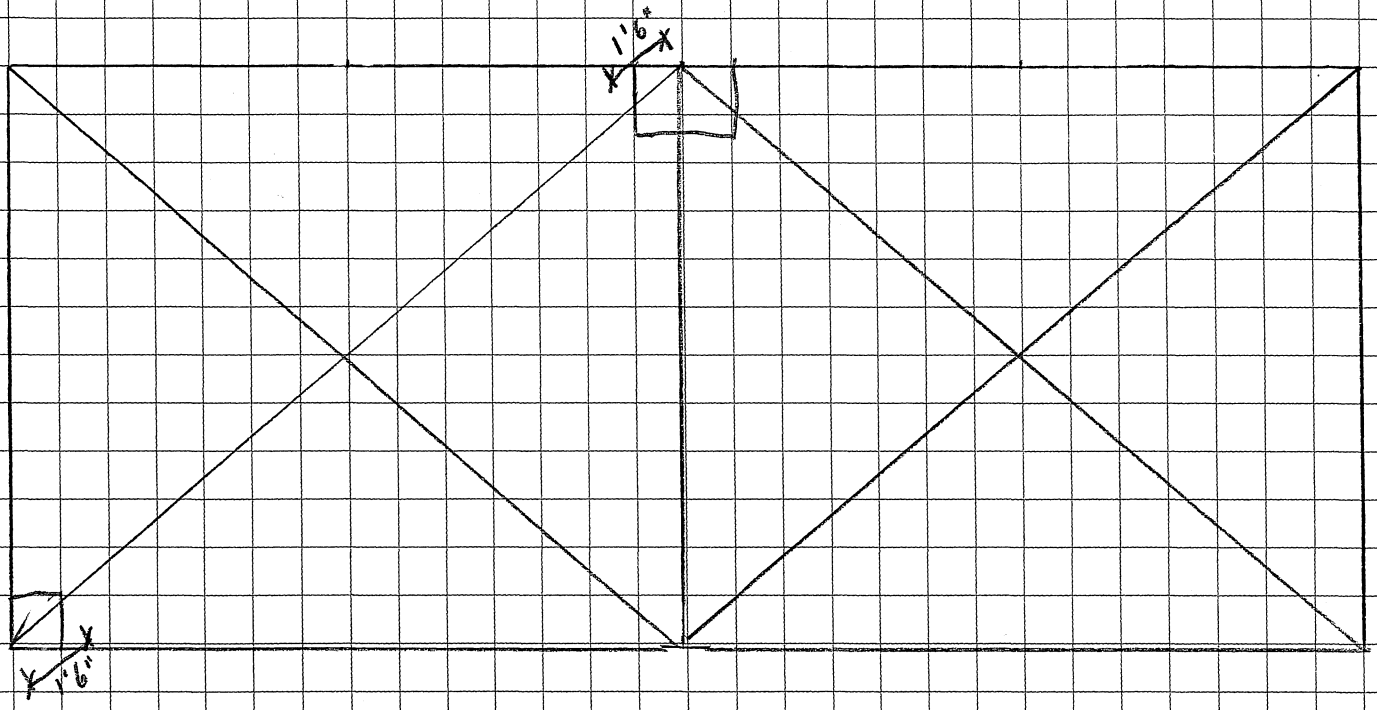
PROJECT Bridge #9090

PROJECT # 070745.30 DATE 1-15-08 BY CJM SHEET NO. 4 OF 11

RAM 2-13-08

Bottom Laterals

Center Bay - Node to Node - 46.38 ft - 2(1'6") = 43.38'



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PROJECT Bridge #9090

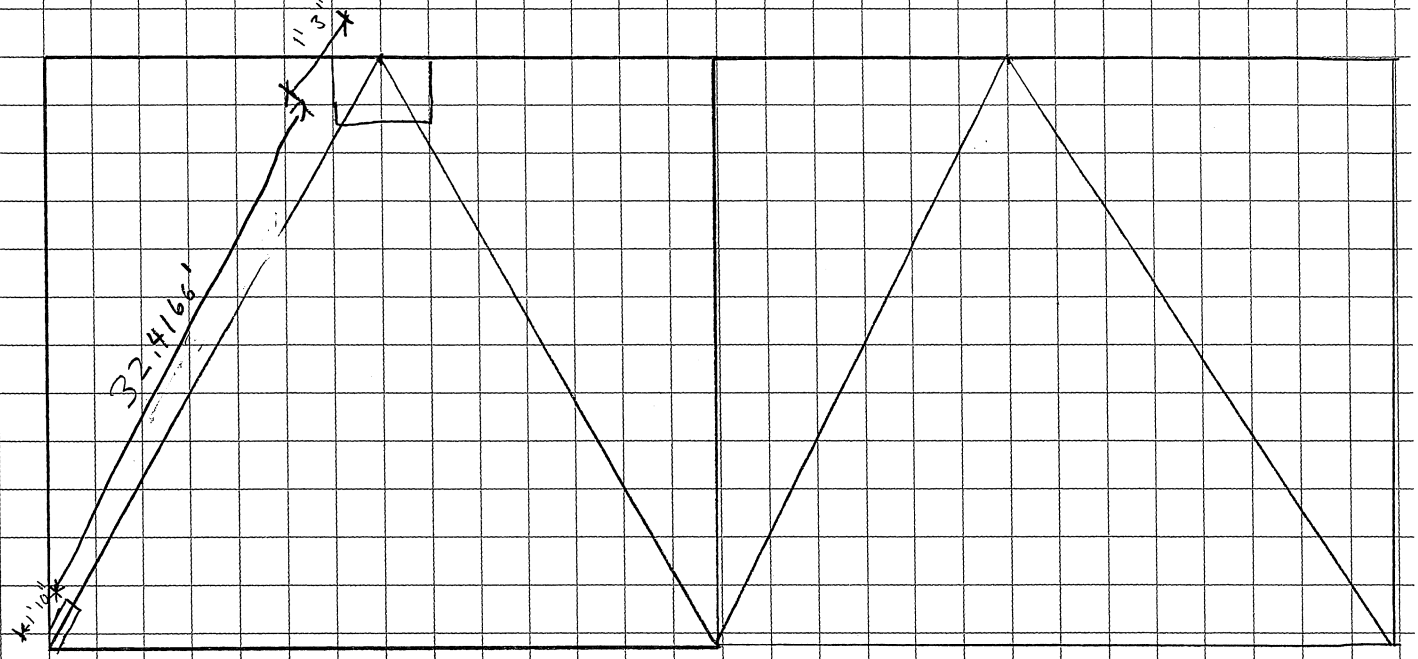
PROJECT # 070745.30 DATE 1-15-08 BY CJM SHEET NO. 5 OF 11

RAM 2-13-08

Bottom Laterals

Typical Bay - Node to Node - 35.48 ft - 1.25' - $1\frac{10}{12}$'

= 32.4 ft



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PROJECT Bridge #9090

PROJECT # 070745.30 DATE 1-15-08 BY CJM SHEET NO. 6 OF 11

RAM 2-13-08

Truss dead Load

Bottom Laterals (Typical panel)

32.5 Lb/ft • 32.4 ft • 4 = 4212 Lb

Bottom Laterals (center panel)

32.5 Lb/ft • 43.38 ft • 4 = 5622.05 Lb

Top Laterals - 12 BP 53

node to node length - 36.44' - Panel 2
length short - 2@ 7'8"
2@ 4'2"

Panel 2 (36.44 • 4 - 2•7'8" - 2•4'2") • 53 lb/ft
= 6470.95 Lb

Panel 3 node to node - 35.83'

= (35.83•4 - 2•7'8" - 2•4'2") • 53 Lb/ft
= 6,341.63 Lb

Panel 4 node to node - 35.52'
= (35.52 - 2•7'8" - 2•4'2") 53 Lb/ft
= 6275.91 Lb

Panel 5 node to node - 46.38'
=(46.38•4 - 4•2'10") • 53 Lb/ft = 9231.89 Lb

Panel 6 = Panel 4 = 6275.91 Lb
Panel 7 = Panel 3 = 6341.63 Lb
Panel 8 = Panel 2 = 6470.95 Lb

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PROJECT Bridge #9090

PROJECT # 070745.30 DATE 1-15-08 BY CJM SHEET NO. 7 OF 11

RAM 2-13-08

Vertical Bracing (U6 + U7)

Diagonals - Node to Node length = 29.88' - 12 BP 53

$= [4(29.88') - 2(2'6") - 2(19")] \cdot 53^{lb/ft} = 5901.73 lb$

Top Horizontal - 2 - 18 U 42.7 + 2 plates

$2(42.7^{lb/ft})(69') = 5892.6 lb$

Bottom plate $-(1')(3/8")(69')(490^{lb/ft^3}) = 1056.56 lb$

Top Plate $-(1')(3/8")(69' - 2 \cdot 4')(490^{lb/ft^3}) = 934.06 lb$

Total = 7883.22 Lb

Bottom Horizontal - 2 - 12 U 20.7 + 2 plates

$2(20.7^{lb/ft})(69') = 2856.6 lb$

Bottom plate $-(1'2")(69')(3/8")(490^{lb/ft^3}) = 1232.66 lb$

Top plate $-(1'2")(3/8")(69' - 2 \cdot 1' - 3')(490^{lb/ft^3}) = 1143.33 lb$

Total = 5232.59 Lb

Vertical Bracing (U5 + U8)

Diagonals - Node to Node length - 28.19'

$= [4(28.19') - 2(2'6") - 2(19")] \cdot 53^{lb/ft} = 5543.45 lb$

Top Horizontals = 7883.22 Lb

Bottom Horizontals = 5232.59 Lb

Vertical Bracing (U4 + U9)

Diagonal - Node to Node length - 24.43'

$= [4(24.43) - 2(2'6") - 2(19")] \cdot 53^{lb/ft} = 4746.33 lb$

Top Horizontal = 7883.22 Lb

Bottom Horizontal = 5232.59

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PROJECT Bridge #9090

PROJECT # 070745.30 DATE 1-15-08 BY CJM SHEET NO. 8 OF 11

RAM 2-13-08

Vertical Bracing (U3 + U10)

Diagonal - Node to Node Length - 19.44'

$=[4(19.44') - 2(2'6") - 2(19")] \cdot 53^{Lb/ft} = 3688.45\ Lb$

Top Horizontal = 7883.22 Lb

Bottom Horizontal = 5232.59 Lb

Portal Bracing

Diagonal - 6 - 18 WF 45# Node to Node length = 16.19'

$[6(16.19') + 2(5'9") - 4(3'2")] \cdot 45^{Lb/FT} = 3283.8\ Lb$

Horizontal - 24 WF 94

$69' \cdot 94^{Lb/ft} = 6486\ Lb$

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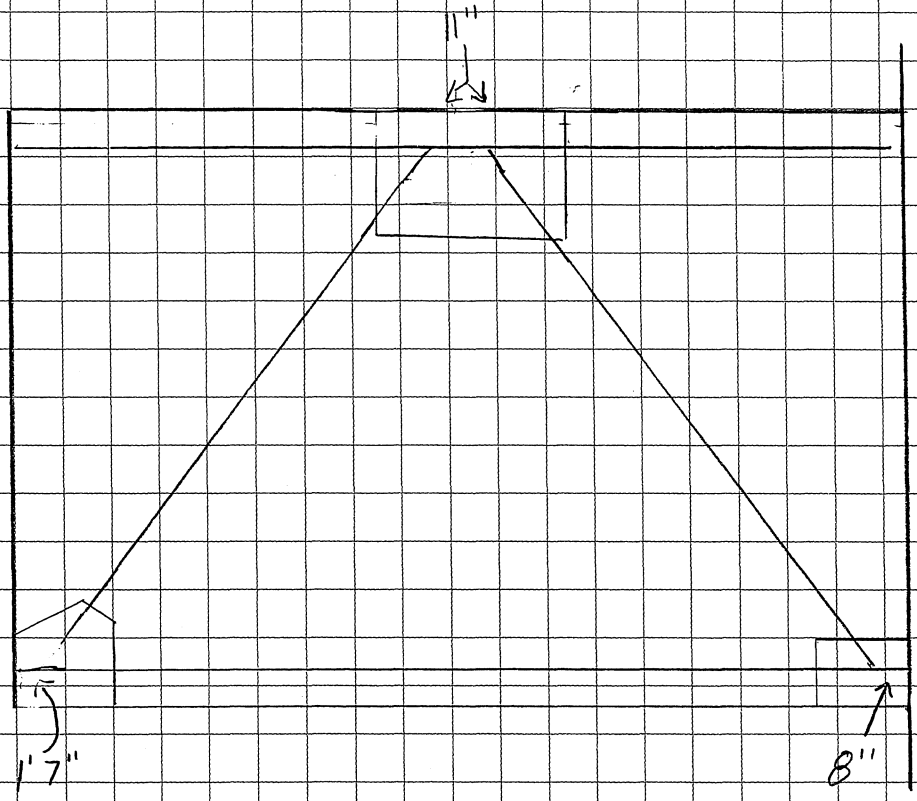
PROJECT Bridge #9090

PROJECT # 070745.30 DATE 1-16-08 BY CJM SHEET NO. 9 OF 11

RAM 2-13-08

Sway Bracing Subtractions - scaled from drawings



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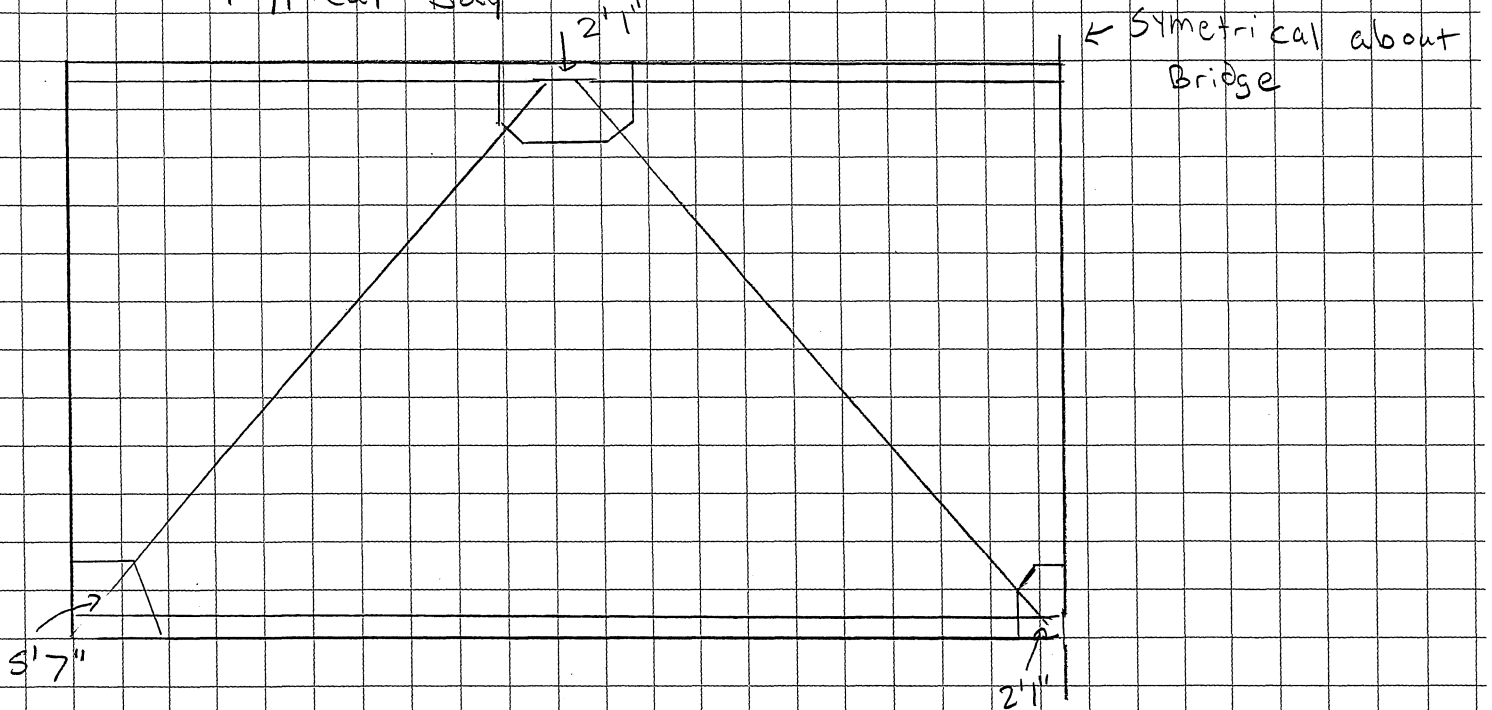
PROJECT Bridge #9090

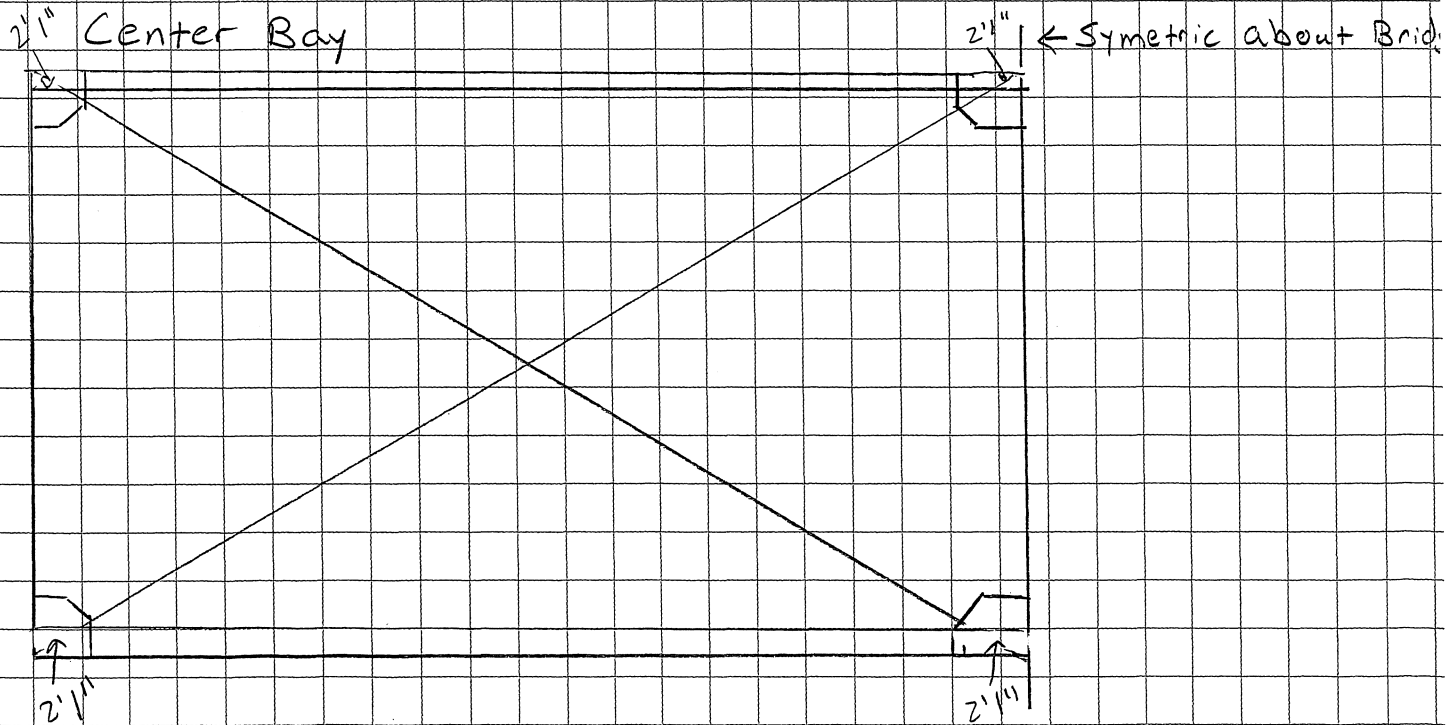
PROJECT # 070745.30 DATE 1-16-08 BY CJM SHEET NO. 10 OF 11

RAM 2-13-08

Top Lateral Subtractions - Scaled from drawings

Typical Bay





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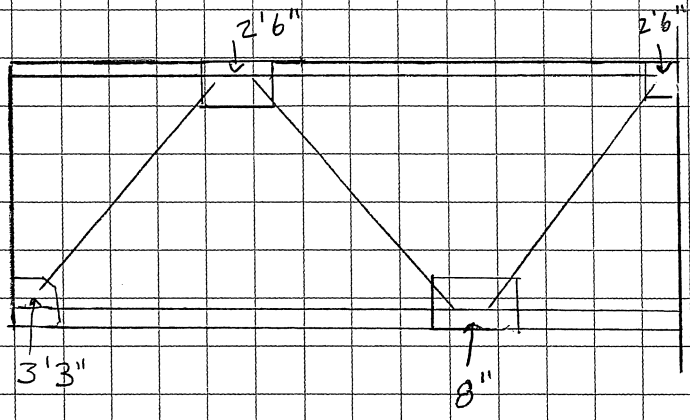
PROJECT Bridge #9090

PROJECT # 070745.30 DATE 1-16-08 BY CJM SHEET NO. 11 OF 11

RAM 2-13-08

Portal Subtractions - Scaled from drawings



← Symetric about bridge

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PROJECT BRIDGE NO. 9090

PROJECT # 070745.3 DATE 2/13/08 BY RAM SHEET NO. 1 OF 1

✓ JWS 2-13-08

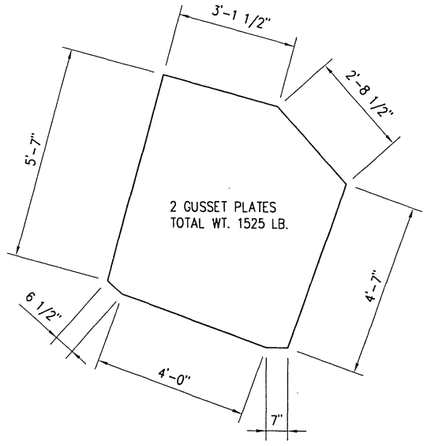
DETERMINE YIELD STRENGTH OF STEEL

BOTTOM CHORD => $.55(\text{AREA})F_y$ = ALLOWABLE STRESS PER EXISTING PLAN

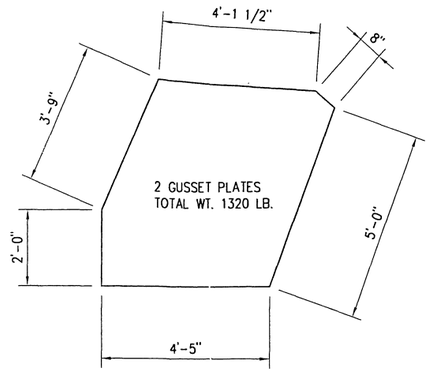
TOP CHORD = $\frac{F_y}{2.17}\left[1 - \frac{\left(\frac{KL}{r}\right)^2 F_y}{4\pi^2 E}\right]$ = ALLOWABLE STRESS PER EXISTING PLAN

VERTICAL AND DIAGONALS IN TENSION = $.55(A_g)F_y$ = ALLOWABLE STRESS PER EXISTING PLAN

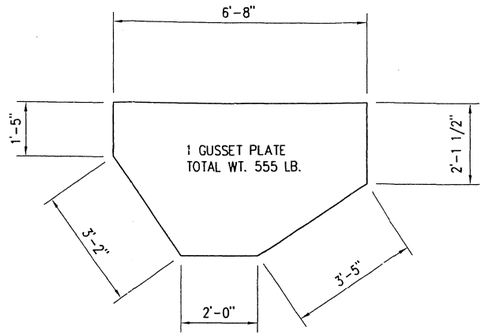
VERTICAL AND DIAGONALS IN COMPRESSION SAME FORMULA AS TOP CHORD



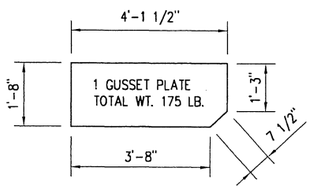
VERTICAL GUSSET PLATE AT U3 & U10



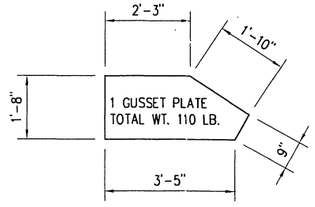
VERTICAL GUSSET PLATE AT L4 & L9



HORIZONTAL GUSSET PLATE AT U3 & U10



HORIZONTAL GUSSET PLATE AT L1 – L11



HORIZONTAL GUSSET PLATE AT L2 – L10

TITLE: EXISTING GUSSET PLATES	DES: RAM	DR: RAM	APPROVED:	Bridge No. 9090
	CHK: JWS	CHK: JWS		
	Sheet No. 1 of 1 Sheets			

Original Plans

MINNESOTA DEPARTMENT OF TRANSPORTATION

CONSTRUCTION PLAN FOR DECK REPAIR AND OVERLAY, BRIDGE 9090 (MN.) BRIDGE 2-358.22 (N.D.)

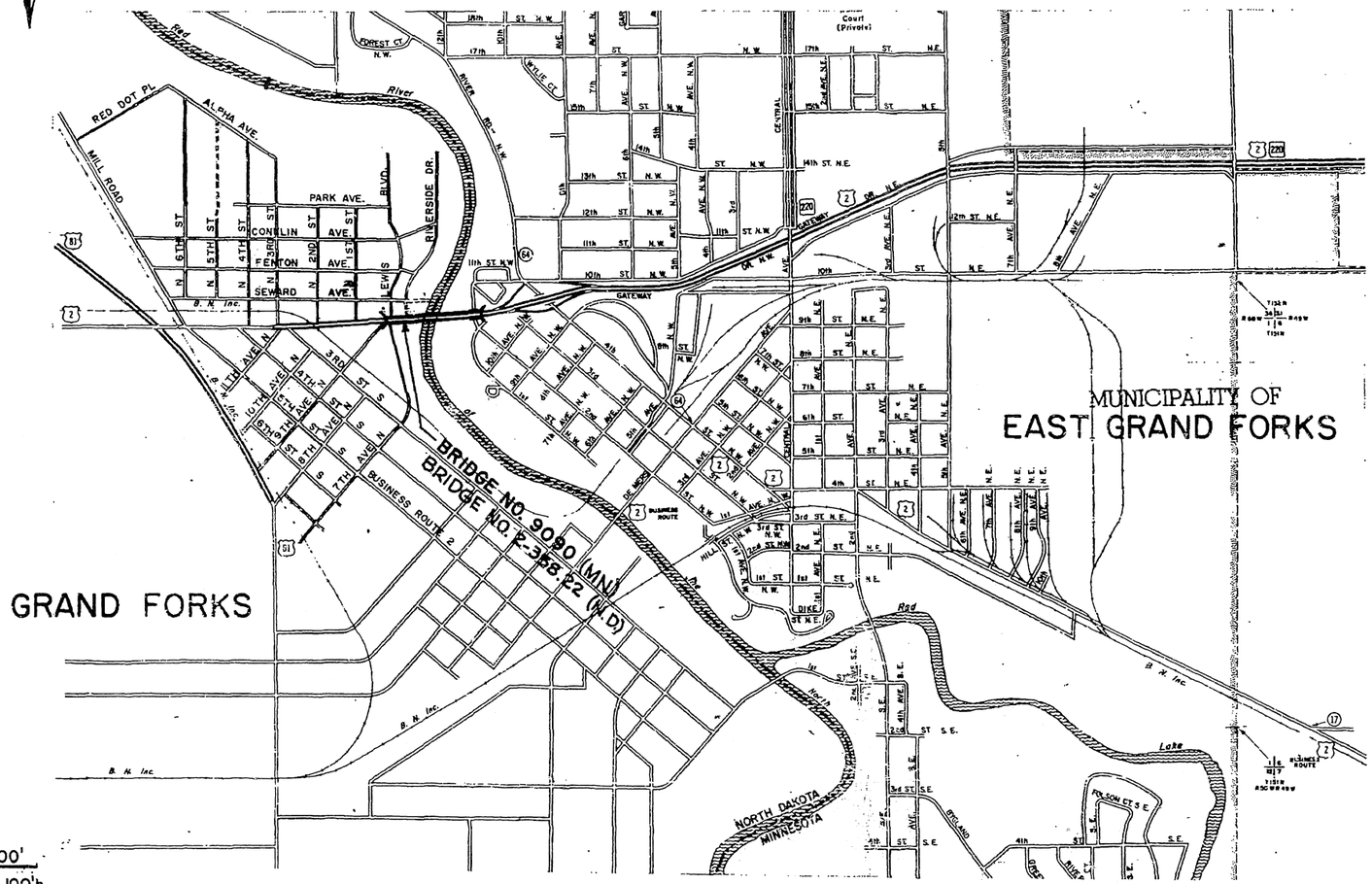
LOCATED ON T.H. 2 OVER RED RIVER OF THE NORTH BETWEEN EAST GRAND FORKS AND GRAND FORKS

STATE PROJ. NO. 6018-9090
MINN. PROJ. NO. _____

GROSS LENGTH	1436.0	FEET	MILES
BRIDGES-LENGTH	1261.0	FEET	MILES
EXCEPTIONS-LENGTH	0	FEET	MILES
NET LENGTH		FEET	MILES
MILE POINT		TO MILE POINT	

STATE PROJ. NO. _____
MINN. PROJ. NO. _____

GROSS LENGTH		FEET	MILES
BRIDGES-LENGTH		FEET	MILES
EXCEPTIONS-LENGTH		FEET	MILES
NET LENGTH		FEET	MILES
MILE POINT		TO MILE POINT	



SCALES

PLAN	100'
PROFILE	10'v, 100'h
INDEX MAP	800'
GENERAL LAYOUT	±50'

PLAN REVISIONS		
DATE	SHEET NO.	APPROVED BY

DESIGN DESIGNATION

ADT (Current Year) 1982	=	15,800	Design Speed ____ MPH
ADT (Future Year)	=	____	Based on ____ Sight Distance
DHV (Design Hr. Vol.)	=	____	Height of eye ____ Height of object ____
D (Directional Distr.)	=	____ %	Design Speed not achieved at:
T (Heavy Commercial)	=	____ %	STA. ____ TO STA. ____ MPH
			STA. ____ TO STA. ____ MPH

PROJECT LOCATION
POLK COUNTY
2 DISTRICT

FOR PLANS AND UTILITIES SYMBOLS SEE TECHNICAL MANUAL

STATE PROJ. NO.	AREA NO.	JOB NO.
6018-9090 (2-307)	20	856

FED. PROJ. NO. F-6-002 (25) 358 NORTH DAKOTA
FED. PROJ. NO. F008-1 (62) MINNESOTA

GOVERNING SPECIFICATIONS

THE 1983 EDITION OF THE MINNESOTA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR CONSTRUCTION" SHALL GOVERN.

INDEX

THIS PLAN CONTAINS 16 SHEETS

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

DATE Jan 16, 1984 REG. NO. 7176 ENGR. Mark Lonsa

DESIGN SQUAD Roger Bachmann with B.P.S. and K.W.P.

Right of Way Approval _____ 1-26 19 84
DIRECTOR, RIGHT OF WAY OPERATIONS

Recommended for Approval _____ 19 ____
DISTRICT ENGINEER

Recommended for Approval _____ 19 ____
TRANSPORTATION PLANS ENGINEER

Recommended for Approval _____ 19 ____
DESIGN SERVICES DIRECTOR

Recommended for Approval A. E. Hamboe 1-26, 19 84
for BRIDGE ENGINEER

Approved 1/26 1984 Leo A Hardt
ASSISTANT DIVISION DIRECTOR

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
APPROVED
_____ _____
DIVISION ADMINISTRATOR DATE

I HEREBY CERTIFY THAT THE FINAL FIELD REVISIONS, IF ANY, OF THIS PLAN WERE MADE BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

DATE _____ REG. NO. _____

STATE PROJ. NO. 6018-9090 (T.H. 2-307) **SHEET NO.** 1 **OF** 16 **SHEETS**

THE FOLLOWING STANDARD PLATES, APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION, SHALL APPLY ON THIS PROJECT.	
PLATE NO.	DESCRIPTION
0004A	SPECIFICATION REFERENCE TO STANDARD PLATES
1016G	CONCRETE PAVEMENT NON-REINFORCED
1018B	CONCRETE PAVEMENT WITH STEEL FABRIC REINFORCEMENT
1100N	EXPANSION JOINTS
1103 I	TYPICAL DOWEL BAR ASSEMBLY
1120R	CONTRACTION JOINTS
1140R	LONGITUDINAL JOINTS
1141C	PAVEMENT KEYWAY
3142A	OUTLET SCREEN FOR C.M. PIPE
4010F	CONCRETE ADJUSTING RING
7020J	CONCRETE CURB
7035J	CONCRETE WALK
7100F	CONCRETE CURB & GUTTER
8000H	STANDARD BARRICADES
8333A	TEMPORARY PORTABLE PRECAST CONCRETE BARRIER, DESIGN 8333A

CONSTRUCTION NOTES:

IMMEDIATELY PRIOR TO PLACING NEW CONCRETE AGAINST ANY ORIGINAL CONCRETE A BONDING GROUT SHALL BE APPLIED TO THE VERTICAL CONTACT SURFACES OF THE INPLACE CONCRETE.

NO CUTTING WILL BE PERMITTED UNTIL THE CUTTING LIMITS HAVE BEEN OUTLINED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER. REMOVAL AND RECONSTRUCTION SHALL CONFORM TO MN.D.O.T. 2433.

PREFORMED JOINT FILLER MATERIALS ARE INCIDENTAL. PAYMENT TO BE INCLUDED IN PRICE BID FOR OTHER ITEMS.

PROVIDE SAW CUT IN CONCRETE WEARING COURSE OVER ALL CONSTRUCTION JOINTS IN EXISTING SLAB AND SEAL WITH CONCRETE JOINT SEALER PER SPEC. 3723.

CONTRACTOR SHALL MAKE FIELD MEASUREMENTS AS NECESSARY, PRIOR TO FABRICATION OF THE WATERPROOF EXPANSION JOINT DEVICES AND CURB PLATES, TO ASSURE PROPER FIT IN THE FINAL WORK.

THE FIRST DIGIT OF THE FIRST TWO DIGITS OF EACH BAR MARK INDICATES BAR SIZE.

BARS MARKED WITH THE SUFFIX "E" SHALL BE EPOXY COATED.

FIELD CUTTING OF NO. 4 REINFORCEMENT BARS WILL BE REQUIRED IN ORDER TO MEET MINIMUM 1'-0" LAP REQUIREMENTS FOR LONGITUDINAL DECK REBAR EXTENSIONS IN FIXED JOINT RECONSTRUCTIONS.

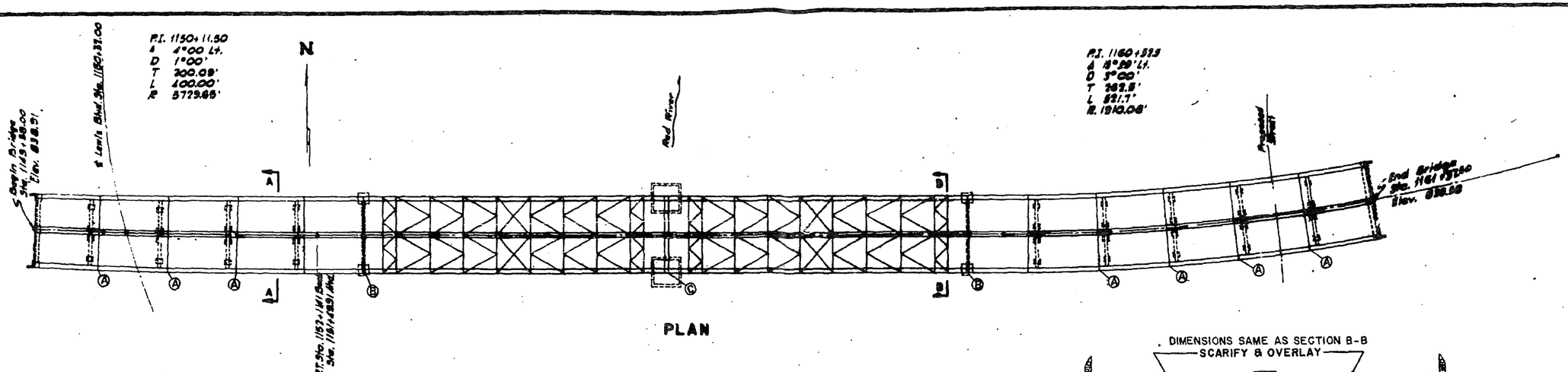
PLANS OF THE INPLACE BRIDGE NO. 9090 ARE AVAILABLE AT THE MINNESOTA DEPARTMENT OF TRANSPORTATION, BEMIDJI AND ST. PAUL. THEY ARE ALSO AVAILABLE AT THE NORTH DAKOTA STATE HIGHWAY DEPARTMENT IN GRAND FORKS AND BISMARCK.

STATEMENT OF ESTIMATED QUANTITIES

	ITEM NO.	ITEMS WITHOUT ALTERNATES	UNIT	ESTIMATED QUANTITIES	FINAL QUANTITIES
	2021.501	MOBILIZATION	LUMP SUM	1	
	2031.503	FIELD LABORATORY, TYPE DX	EACH	1	
	2104.501	REMOVE CURB AND GUTTER	LIN. FT.	640	
	2104.503	REMOVE SIDEWALK	SQ. FT.	104	
	2104.505	REMOVE CONCRETE PAVEMENT	SQ. YD.	416	
	2104.505	REMOVE BITUMINOUS PAVEMENT	SQ. YD.	94	
	2104.505	REMOVE CONCRETE APPROACH PANELS	SQ. YD.	200	
	2105.501	COMMON EXCAVATION	CU. YD.	346 (P)	
(7)	2211.501	AGGREGATE BASE, CLASS 3 (MOD)	TON	351	
	2211.501	AGGREGATE BASE, CLASS 5	TON	241	
	2301.501	CONCRETE PAVEMENT	SQ. YD.	494	
	2301.511	STRUCTURAL CONCRETE	CU. YD.	132	
	2301.521	PAVEMENT REINF. TYPE B12-D4.9 XD4.0	SQ. YD.	403	
	2301.551	BRIDGE APPROACH PANEL, DESIGN C	EACH	2	
	301.604	CLEAN & SEAL CONCRETE JOINTS	LIN. FT.	314	
	2331.504	BITUMINOUS MATERIAL FOR MIXTURE	TON	4.5	
	2331.508	WEARING COURSE MIXTURE	TON	49	
	2401.511	STRUCTURE CONCRETE (3X33)	SQ. FT.	600	
	2401.512	BRIDGE SLAB CONCRETE (3X33)	SQ. FT.	616	
	2401.541	REINFORCEMENT BARS	POUND	22185 (P)	
	2401.541	REINFORCEMENT BARS (EPOXY COATED)	POUND	2205 (P)	
	401.612	SILICONE RAIL TREATMENT	SQ. FT.	17969 (P)	
	2402.591	EXPANSION JOINT DEVICE, TYPE 3.0	LIN. FT.	642	
	402.601	DRAINAGE SYSTEM	LUMP SUM	1	
(1) (2)	ALTERNATE 1-1 404.602	CONCRETE OVERLAY 3U17A	CU. YD.	532	
(1) (2)	ALTERNATE 1-2 404.602	CONCRETE OVERLAY LATEX	CU. YD.	416	
	2433.505	REMOVE SLAB, TYPE 1	SQ. FT.	2400	
	2433.505	REMOVE SLAB, TYPE 3	SQ. FT.	600	
(3)	2433.505	REMOVE CONCRETE BRIDGE DECK	SQ. FT.	616 (P)	
(4)	2433.507	REMOVE DEBRIS	LUMP SUM	1	
	433.601	SCARIFY BRIDGE DECK	SQ. FT.	70000	
	433.601	SCARIFY CONCRETE APPROACHES	SQ. FT.	4480	
	433.607	RECONSTRUCT FIXED JOINT, TYPE D	LIN. FT.	470	
	433.607	RECONSTRUCT FIXED JOINT, TYPE E	LIN. FT.	134	
	433.607	RECONSTRUCT FIXED JOINT, TYPE F	LIN. FT.	67	
	433.607	RAISE EXPANSION JOINT DEVICE	LIN. FT.	134	
	433.607	RECONSTRUCT MEDIAN JOINT (TYPE I)	LIN. FT.	1261	
(5)	2476.502	CLEAN STRUCTURAL STEEL	SQ. FT.	36100	
(5)	2476.502	PRIME COAT STRUCTURAL STEEL	SQ. FT.	36100	
(5)	2476.502	FINISH COAT STRUCTURAL STEEL	SQ. FT.	18000	
	404.603	WEARING COURSE FINISH	SQ. FT.	75488	
	2506.522	ADJUST FRAME & RING CASTING	EACH	1	
	2514.501	CONCRETE SLOPE PAVING	SQ. YD.	333	
(6)	2521.501	4" CONCRETE WALK	SQ. FT.	504	
	2531.501	CONCRETE CURB & GUTTER, DESIGN B824	LIN. FT.	536	
	2531.502	CONCRETE CURB, DESIGN BR 6-10	LIN. FT.	136	
	554.603	CONCRETE MED. BARRIER DESIGN 8333A	LIN. FT.	2150	
	563.601	TRAFFIC CONTROL	LUMP SUM	1	

(1) SEE TABULATION ON SHEET 4 FOR ESTIMATED QUANTITIES OF LOW SLUMP AND LATEX OPTIONS.
(2) SEE TABULATION ON SHEET 10 FOR ESTIMATED QUANTITIES OF LOW SLUMP AND LATEX.
(3) 5' - 6" REMOVABLE SLABS AT EACH ABUTMENT, INCLUDES CURBS.
(4) SEE SPECIAL PROVISIONS.
(5) CONFINED TO STEEL MEMBERS BELOW AND WITHIN CONCRETE REMOVAL LIMITS.
(6) INCLUDES APPROXIMATELY 400 SQ. FT. OF SPLASH PADS UNDER EXPANSION JOINT TROUGHS.
(7) INCLUDES 39 TONS FOR SLOPE PAVING FOUNDATION PREPARATION.

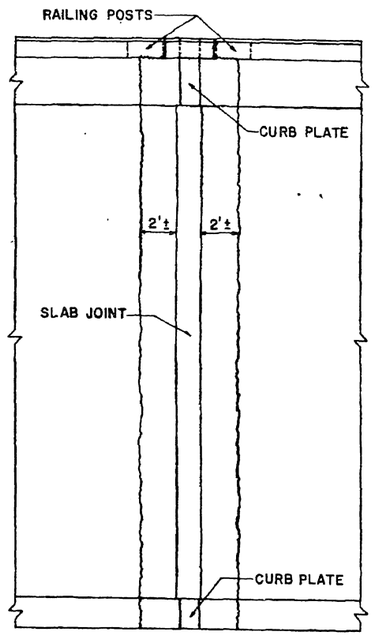
TITLE:	DES:	DR:	APPROVED:	Bridge No.
ESTIMATED QUANTITIES	CHK:	CHK:	1-26-84	9090
	Sheet No. 2 of 16 Sheets			



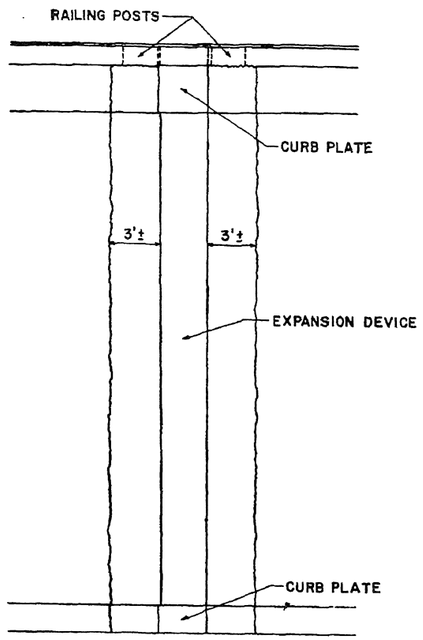
B.M. ELEV. 833.527 (6019 A)
M.H.D. DISK LOCATED ON THE SOUTHEAST WINGWALL OF BRIDGE 60001 ON T.H. 2, MILEPOST 0.24 (1965)

TITLE: GENERAL PLAN & ELEVATION	DES:	DR:	APPROVED: 1-26-84	Bridge No. 9090
	CHK:	CHK:		
	Sheet No. 3 of 16 Sheets			

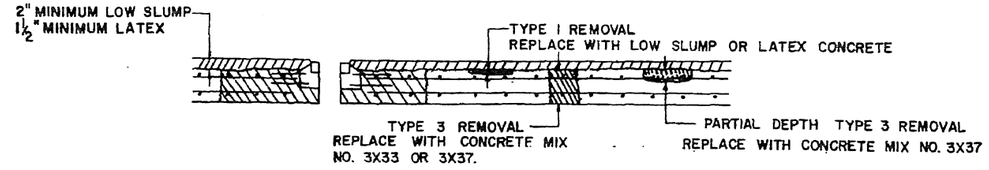
REMOVAL AT INPLACE SLAB JOINTS (7 SWIVEL APPROACH SPANS) (PIER NO. 7) (ENDS OF HIGH TRUSS)



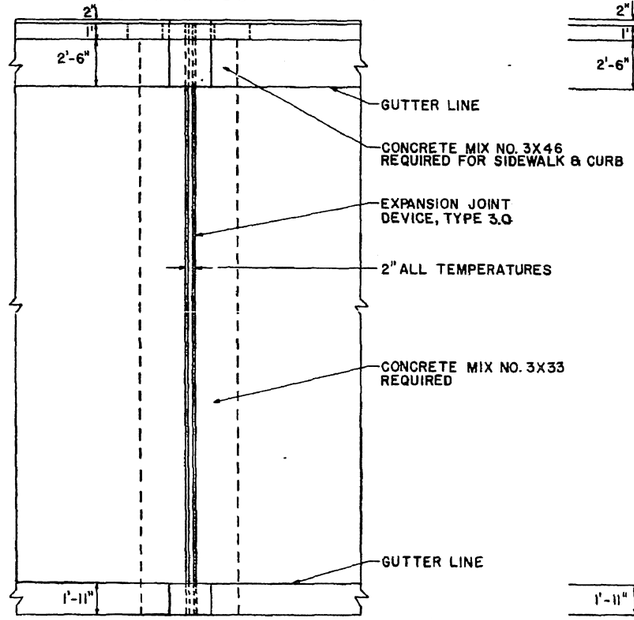
REMOVAL AT INPLACE EXPANSION DEVICES



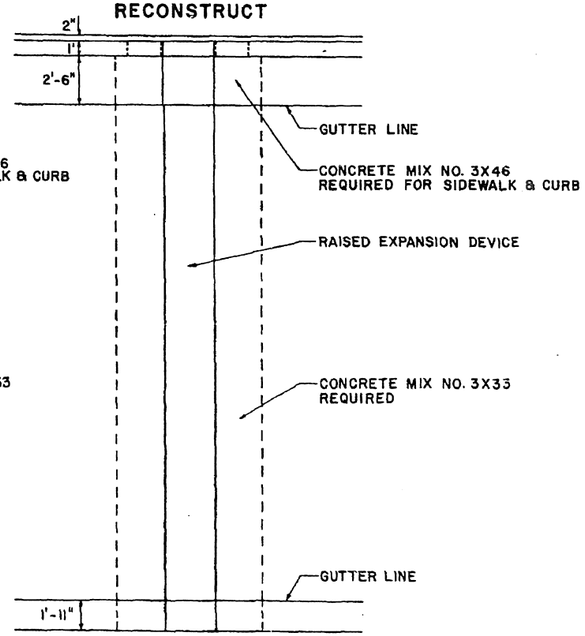
TYPES OF REMOVAL



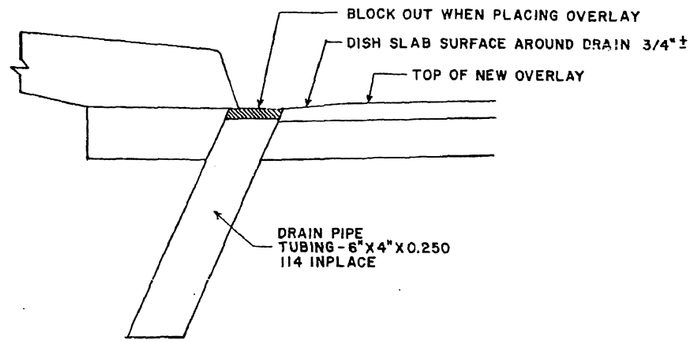
RECONSTRUCT



RECONSTRUCT



SECTION AT DRAINS

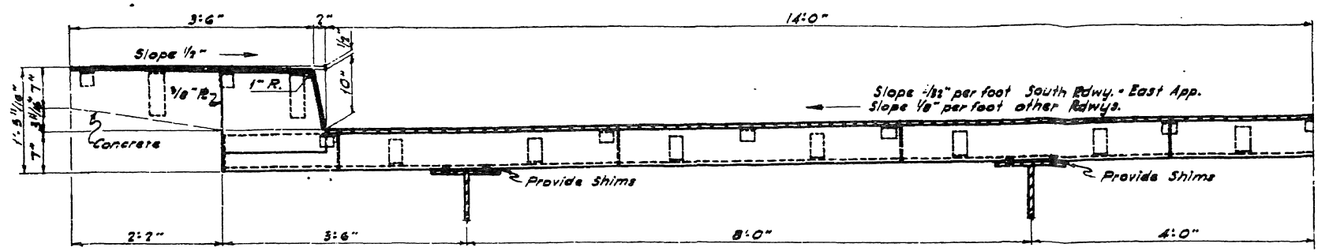


NOTE: WORK REQUIRED AT DRAINS WILL BE INCIDENTAL TO THE PLACEMENT OF THE CONCRETE OVERLAY

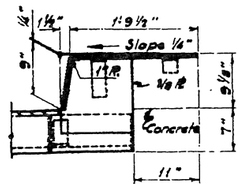
APPROXIMATELY 490 CU.YDS. OF CONCRETE MIX NO. 3U17A (LOW SLUMP) WILL BE REQUIRED FOR THE BRIDGE DECK OR 381 CU.YDS. OF LATEX OVERLAY.
LOW SLUMP COMPUTED AT 2¼" THICK
LATEX COMPUTED AT 1¾" THICK

TITLE: REMOVAL & RECONSTRUCT AT SLAB JOINTS — TYPES OF REMOVAL — DRAIN DIAGRAM	DES: / CHK:	DR: / CHK:	APPROVED: 1-26-84
Sheet No. 4 of 16 Sheets			Bridge No. 9090

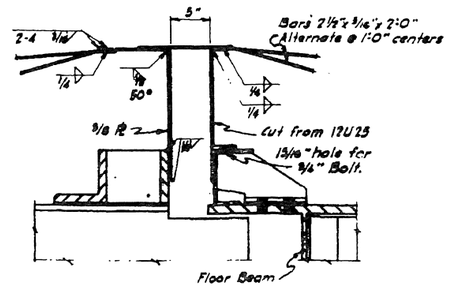
INPLACE SLAB JOINTS AT SWIVEL END OF TRUSS (2) TYPE "E"



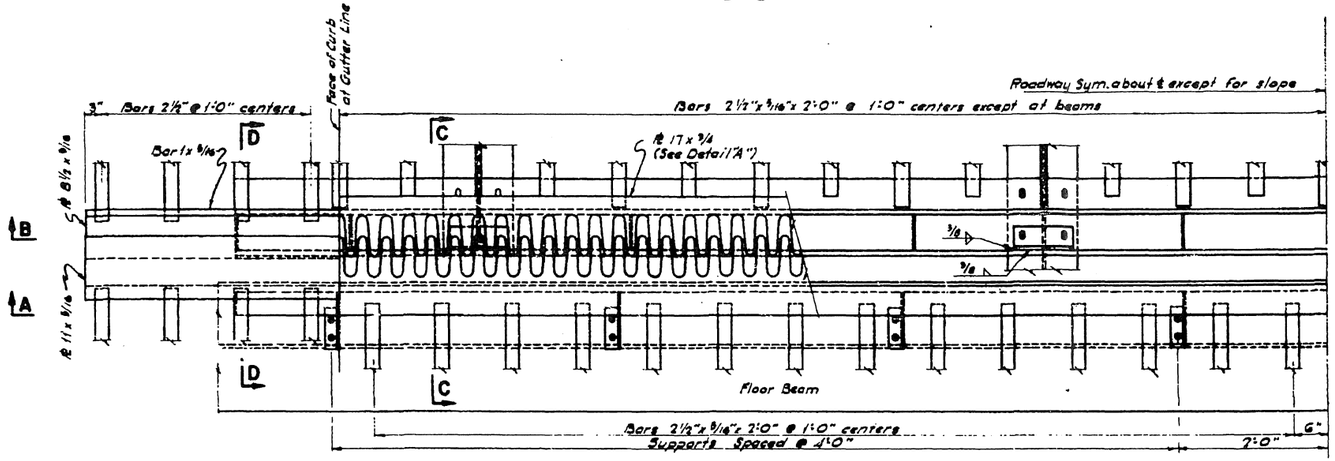
B - B



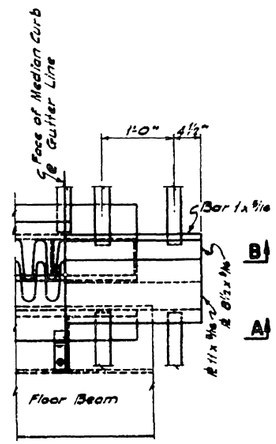
MEDIAN



D - D



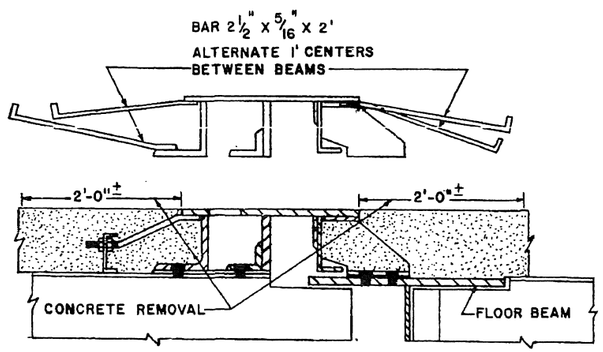
HALF PLAN



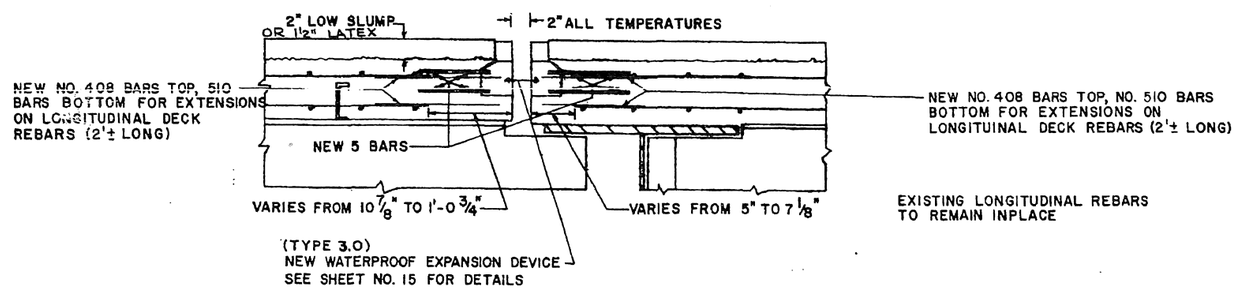
MEDIAN

CONSTRUCTION NOTE: FIELD CUTTING OF NO. 408 & 510 REBARS WILL BE REQUIRED IN ORDER TO MEET MINIMUM 1'-0" LAP FOR LONGITUDINAL DECK REBAR EXTENSIONS.

C-C REMOVAL



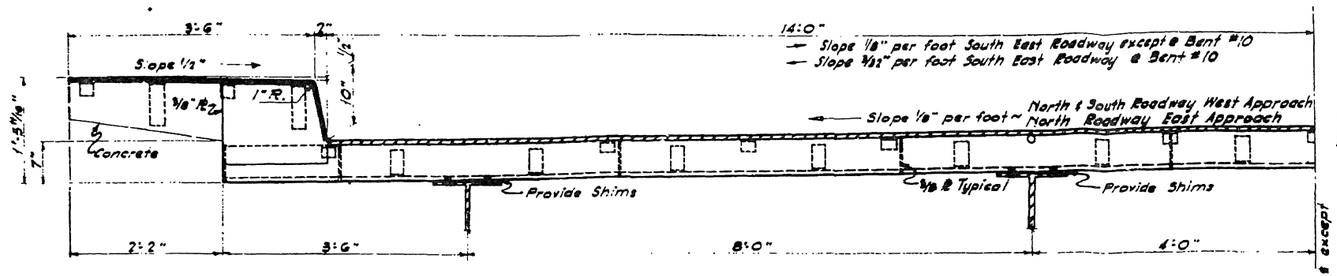
CONSTRUCT



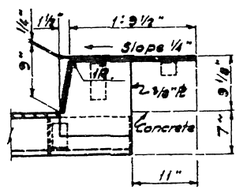
EXISTING LONGITUDINAL REBARS TO REMAIN INPLACE

TITLE: RECONSTRUCT SLAB JOINT AT SWIVEL (END OF TRUSS ONLY)	DES:	DR: R.L.B.	APPROVED: 1-26-84
	CHK:	CHK:	Bridge No. 9090
	Sheet No. 5 of 16 Sheets		

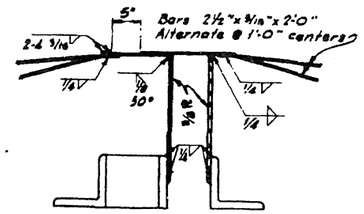
INPLACE SLAB JOINTS AT SWIVEL APPROACH SPANS (7) TYPE "D"



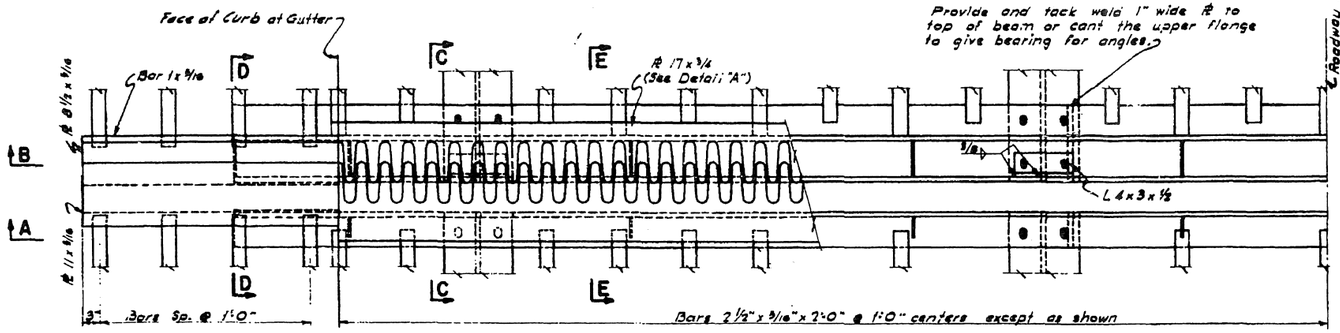
B-B



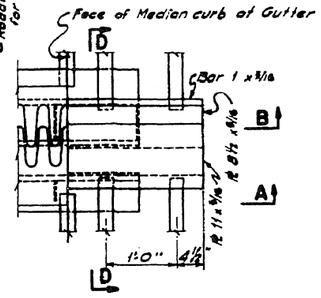
MEDIAN



D-D



HALF PLAN

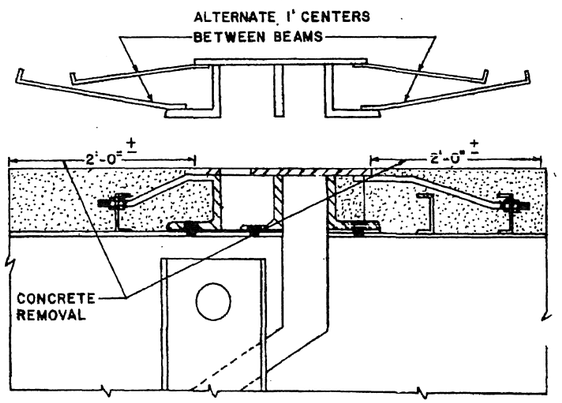


MEDIAN

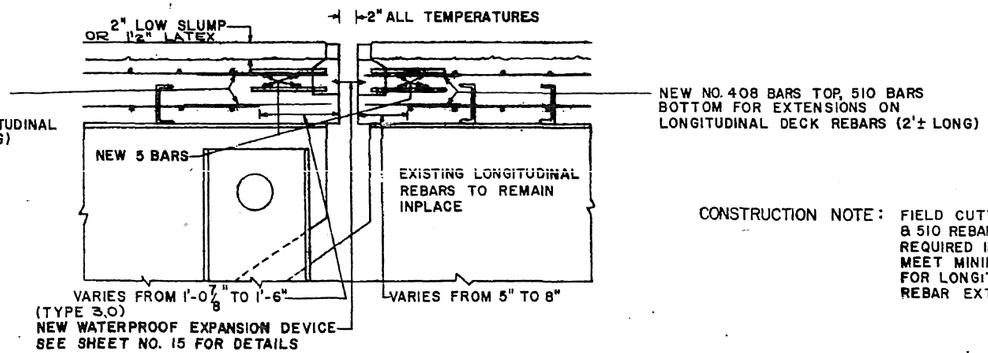
℄ Roadway Sym. about & except for sloped surface

C-C REMOVAL

BAR $2\frac{1}{2}" \times \frac{5}{16}" \times 2'$



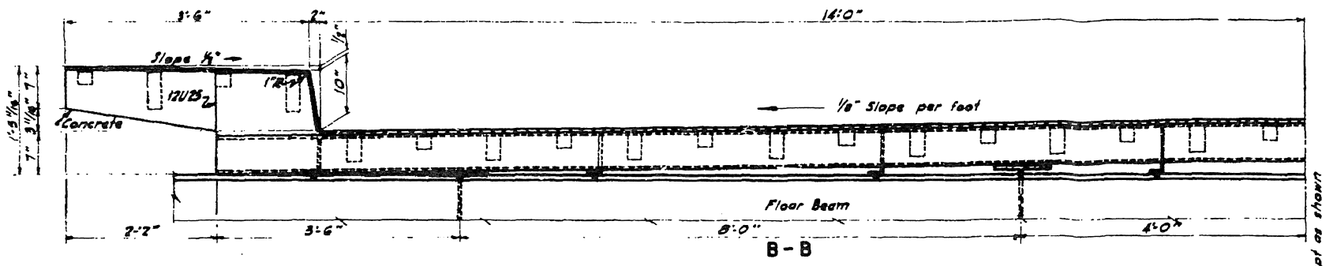
CONSTRUCT



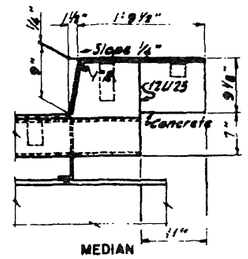
CONSTRUCTION NOTE: FIELD CUTTING OF NO. 408 & 510 REBARS WILL BE REQUIRED IN ORDER TO MEET MINIMUM 1'-0" LAP FOR LONGITUDINAL DECK REBAR EXTENSIONS.

TITLE: RECONSTRUCT SLAB JOINT AT SWIVEL (APPROACH SPANS)	DES:	DR: R.L.B	APPROVED: 1-26-84
	CHK:	CHK:	Bridge No. 9090
	Sheet No. 6 of 16 Sheets		

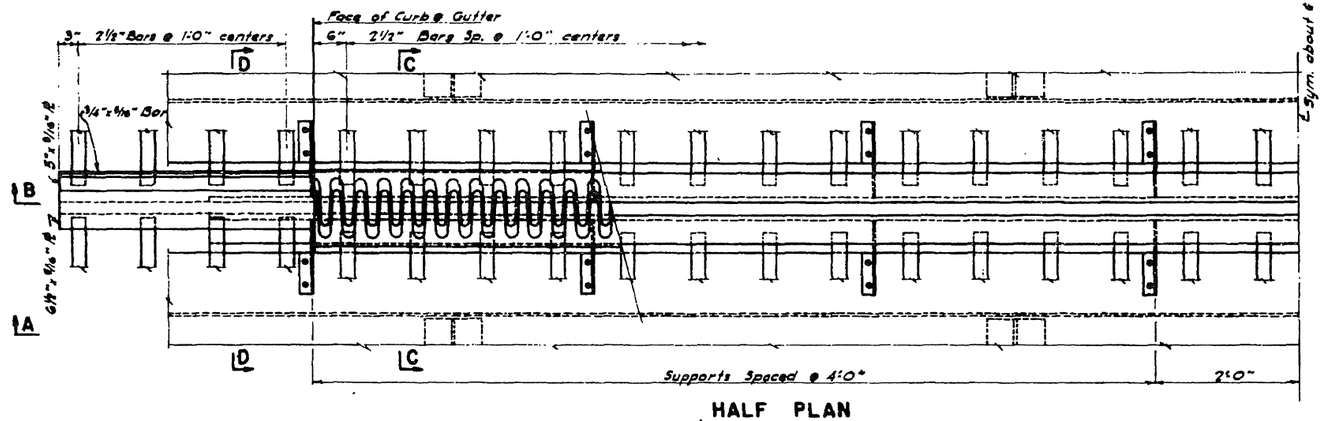
INPLACE SLAB JOINT AT PIER NUMBER 7 (1)
TYPE "F"



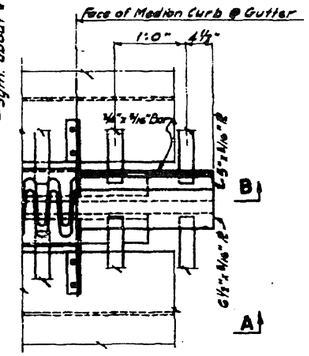
B-B



MEDIAN

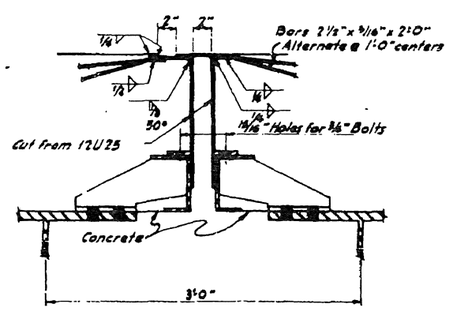


HALF PLAN



MEDIAN

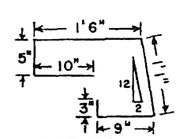
℄ Sym. about ℄ except as shown



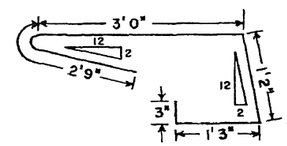
D-D

BILL OF REINFORCEMENT				
BAR	NO.	LENGTH	SHAPE	LOCATION
505	524	30.17	STR.	SLAB TRANSVERSE
506	94	8.00	BENT	SIDEWALK
407	94	4.83	BENT	MEDIAN CURB
408	65	20.00	STR.	SLAB, MED. CURB & S.W. LONG.
609	6	20.00	STR.	MED. CURB & S.W. LONG.
510	75	20.00	STR.	SLAB LONG.

NOTE:
1) 506 AND 407 REBARS SHALL BE USED IN MEDIAN CURB AND SIDEWALK AS REQUIRED.
2) 408, 609 AND 510 REBARS SHALL BE CUT IN THE FIELD.

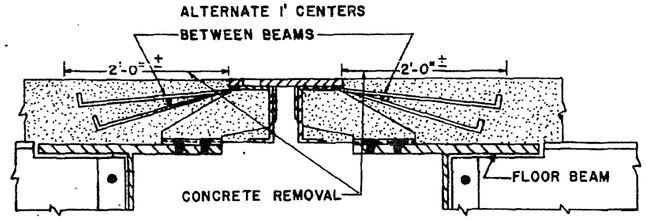


407 BAR

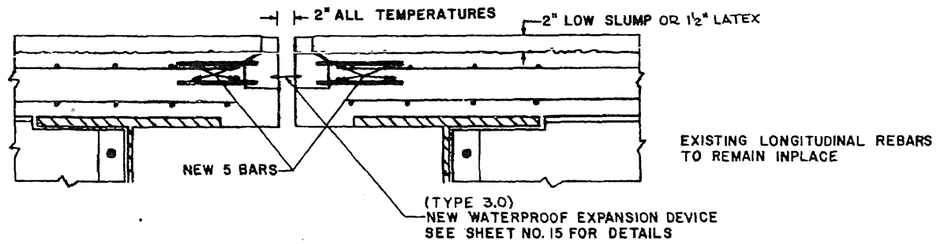


506 BAR

C-C REMOVAL
BAR 2½" X 5/16" X 2'
ALTERNATE 1' CENTERS

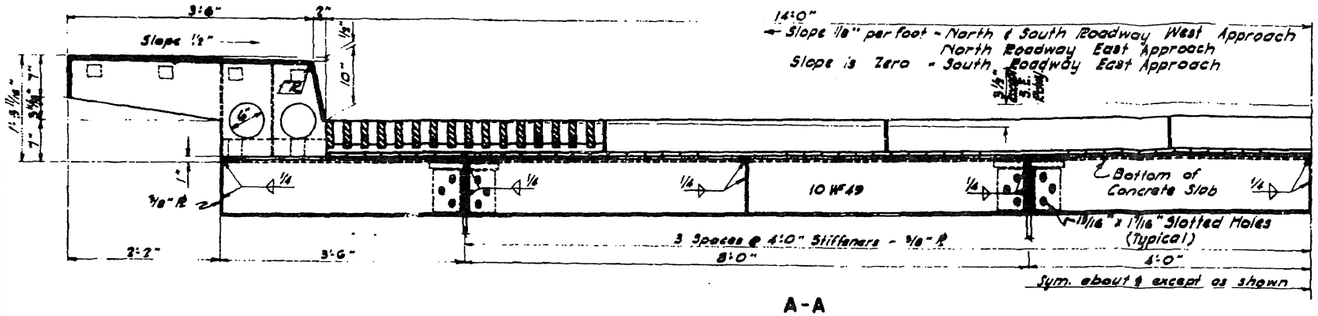


CONSTRUCT

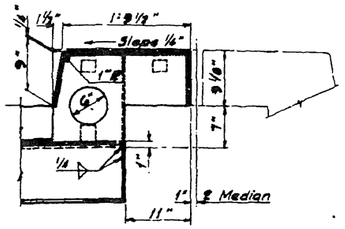


TITLE: RECONSTRUCT SLAB JOINT AT PIER NO. 7	DES:	DR: R.L.B.	APPROVED: 1-26-84	Bridge No. 9090
	CHK:	CHK:		
	Sheet No. 7 of 16 Sheets			

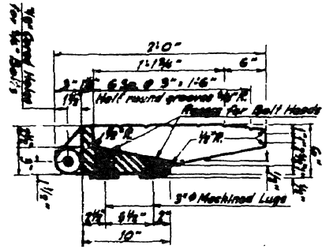
INPLACE EXPANSION DEVICE

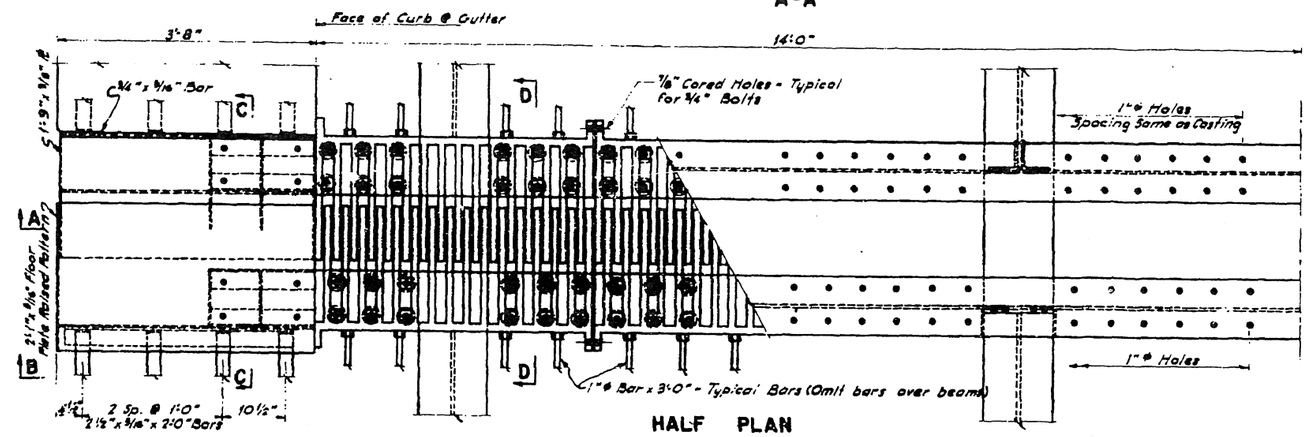


A-A

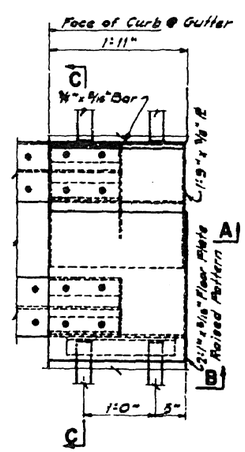


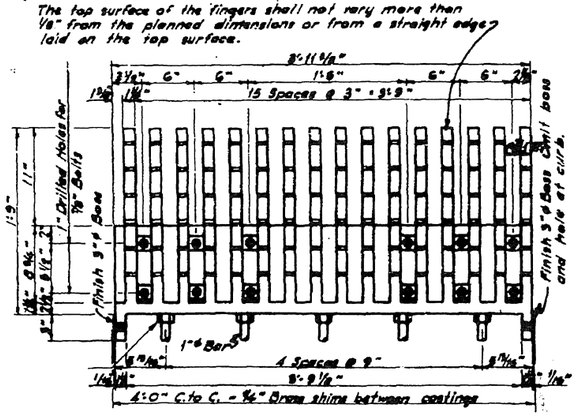
MEDIAN



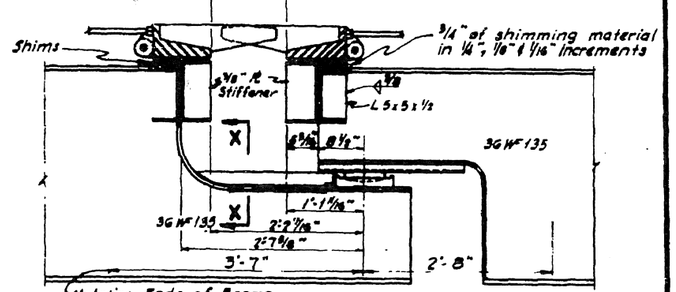


HALF PLAN

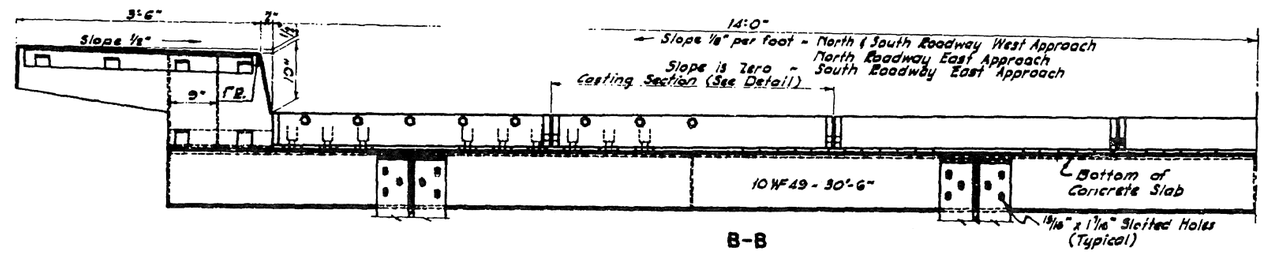




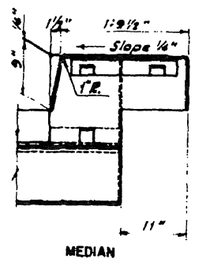
DETAIL OF STEEL CASTING



D-D

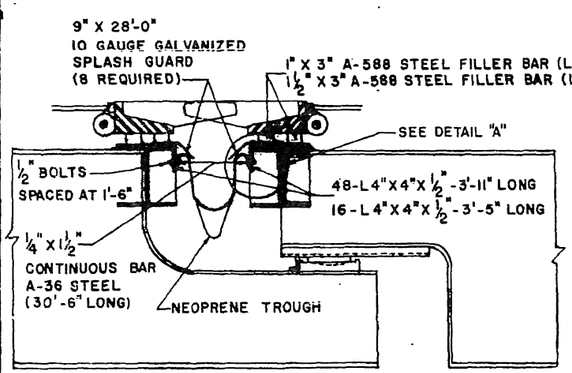


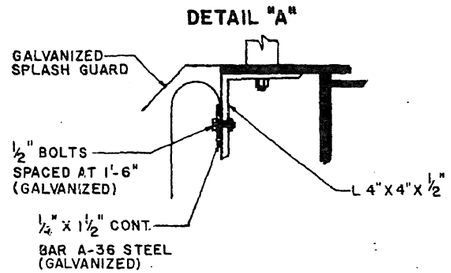
B-B

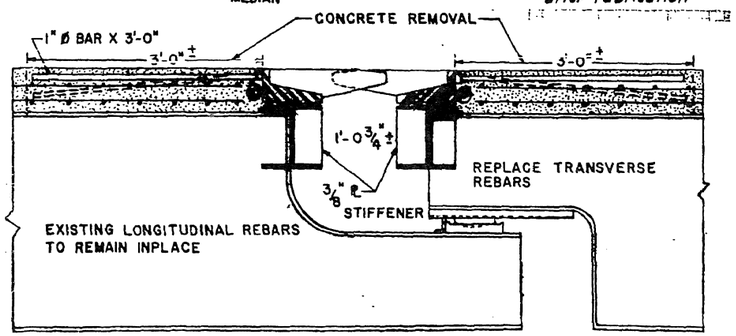


MEDIAN

RAISED EXPANSION DEVICE



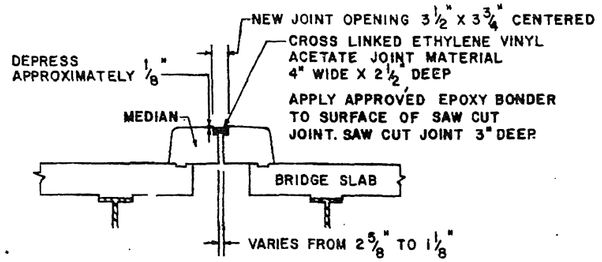




CONSTRUCTION NOTES

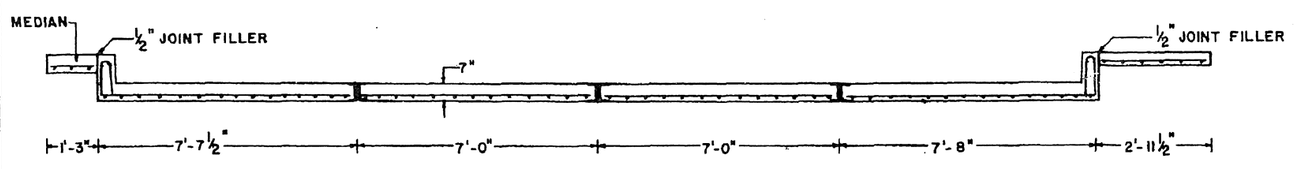
① COVER PLATES ON SIDEWALK & CURB FOR EXPANSION DEVICES WILL BE CUT OFF NECESSARY TO RAISE EXPANSION DEVICE AND REWELDED AND GALVANIZED.

TITLE: RAISE EXPANSION DEVICE	DES:	DR: R.L.B.	APPROVED: 1-26-84
	CHK:	CHK:	Bridge No. 9090
	Sheet No. 8 of 16 Sheets		

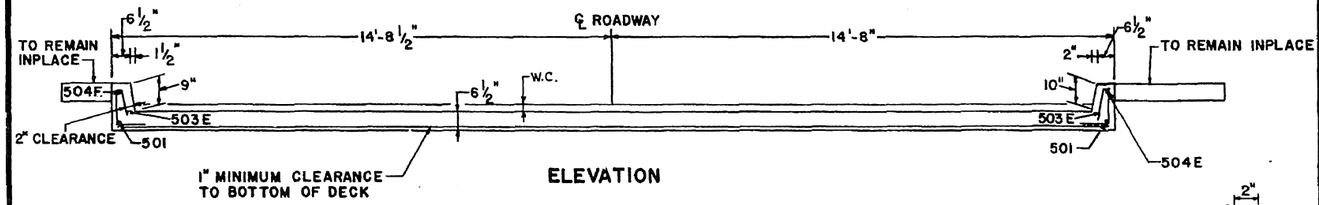


RECONSTRUCT MEDIAN JOINT TYPE I

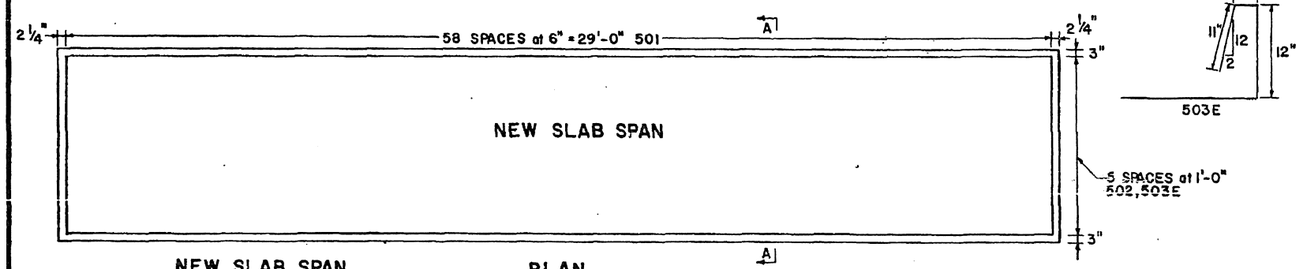
5'-6" REMOVABLE SPANS ON BOTH ENDS OF THE BRIDGE



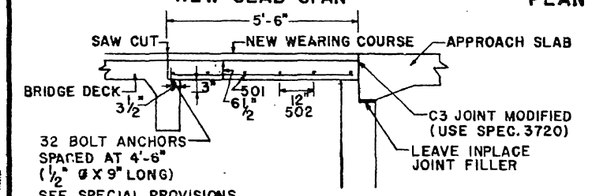
INPLACE



ELEVATION



NEW SLAB SPAN **PLAN**



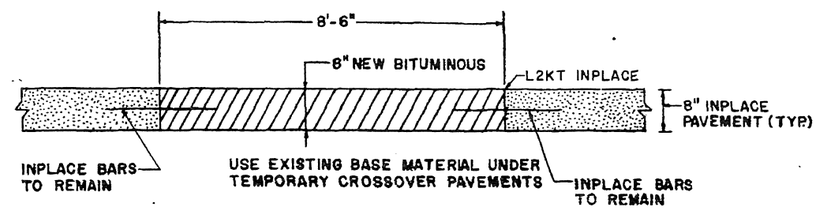
SECTION A-A

BAR LIST				
MARK	NO.	SIZE	LENGTH	SHAPE
501	236	5	5'-2"	STRAIGHT
502	24	5	28'-10"	STRAIGHT
503E	48	5	3'-4"	BENT
504E	8	5	5'-2"	STRAIGHT

QUANTITIES	
CONCRETE MIX 3X33	14 C.Y.
REINFORCEMENT BARS	2110 LBS.

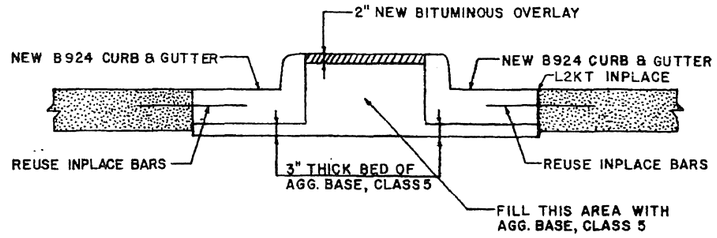
NOTE: REMOVE ALL EXPOSED JOINT FILLER WHEN INPLACE SLAB IS REMOVED EXCEPT AS NOTED.

INPLACE



SECTION TO BE BUILT ACROSS MEDIAN FOR TRAFFIC CROSSOVERS

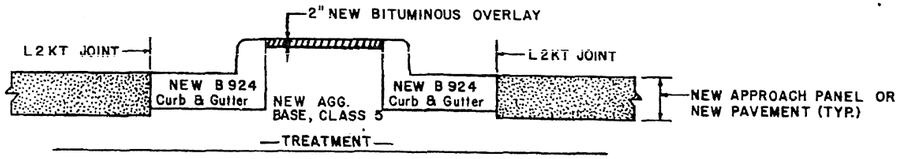
(SECTION SHOWN WITH MEDIAN AND B924 CURBS REMOVED)



NEW SECTION THROUGH MEDIAN

(USE TO REPLACE MEDIAN IN AREAS OF ABANDONED TRAFFIC CROSSOVERS)

SUMMARY OF QUANTITIES FOR TRAFFIC CROSSOVERS		
BIT. MAT'L. FOR MIXTURE (PAVEMENT)	3.5	TON
WEARING COURSE MIXTURE (PAVEMENT)	42	TON
AGGREGATE BASE, CLASS 5	32	TON
CONCRETE CURB & GUTTER, DESIGN B 924	200	LIN.FT.
BIT. MAT'L. FOR MIXTURE (2" OVERLAY)	0.5	TON
WEARING COURSE MIXTURE (2" OVERLAY)	4	TON
REMOVE BITUMINOUS PAVEMENT	94	SQ.YD.



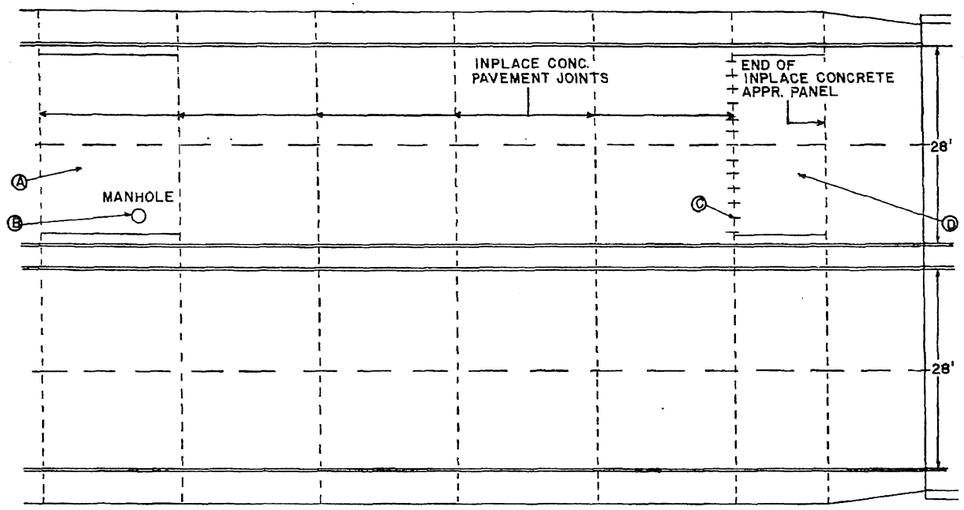
NEW SECTION THROUGH MEDIAN

(USE IN AREA OF NEW APPROACH PANELS AND NEW PAVEMENT)

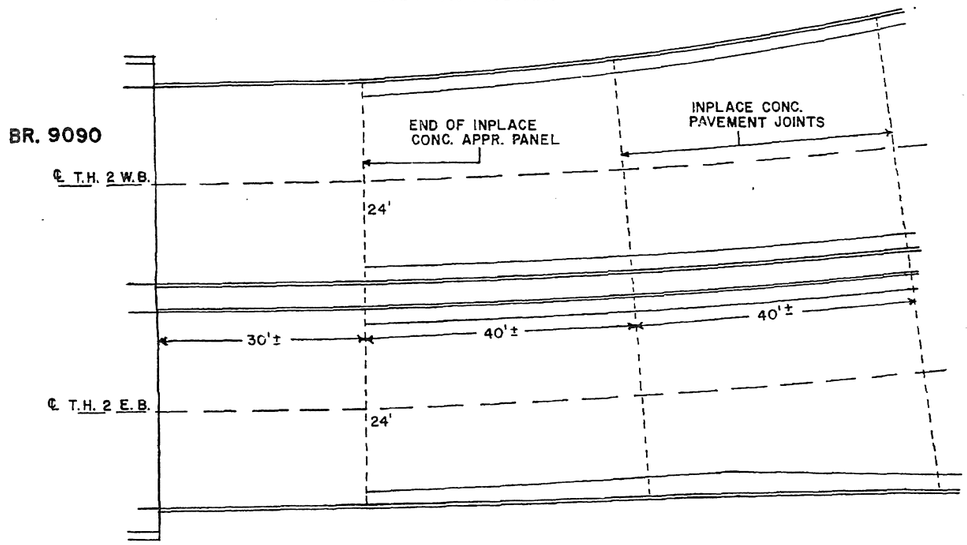
TITLE: DETAILS ON NEW BRIDGE MEDIAN JOINT & 5'6" REMOVABLE END SPANS	DES:	DR:	APPROVED: 1-26-84	Bridge No. 9090
DETAILS ON APPROACH MEDIANS	CHK:	CHK:	Sheet No. 9 of 16 Sheets	

INPLACE

WEST APPROACH



EAST APPROACH



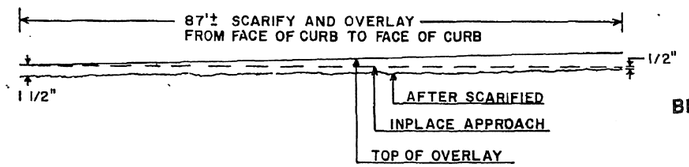
Ⓐ REMOVE PAVEMENT PANEL AND REPLACE, SEE SHEET NO. 11 FOR DETAILS. CURB & GUTTER TO REMAIN INPLACE.

Ⓑ ADJUST MANHOLE TO PROPER ELEVATION. DETERMINED BY ENGINEER IN FIELD.

Ⓒ EXPANSION JOINT DOWEL ASSEMBLY. TO REMAIN INPLACE.

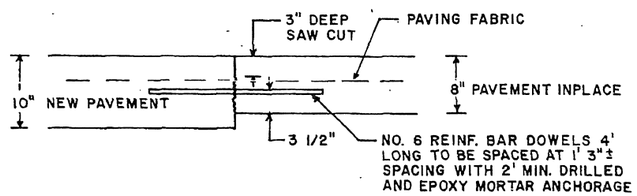
Ⓓ REMOVE PAVEMENT PANEL AND REPLACE, SEE SHEET NO. 11 FOR DETAILS. CURB & GUTTER TO REMAIN INPLACE.

CONSTRUCT

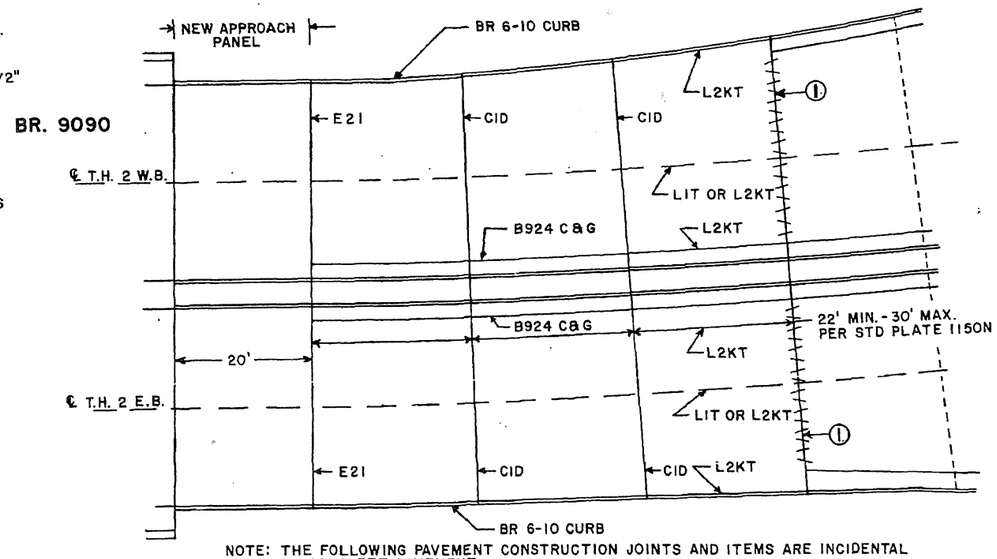


NOTE: APPROXIMATLY 42 CU. YDS. CONC. MIX 3U17A REQ'D FOR BOTH ROADWAYS SAW CUT AND SEAL (SPEC. 3723) OVERLAY OVER EXSISTING JOINTS APPROXIMATELY 35 CU.YDS. LATEX IF LATEX OPTION IS USED

Ⓘ RECONSTRUCT PAVEMENT JOINT



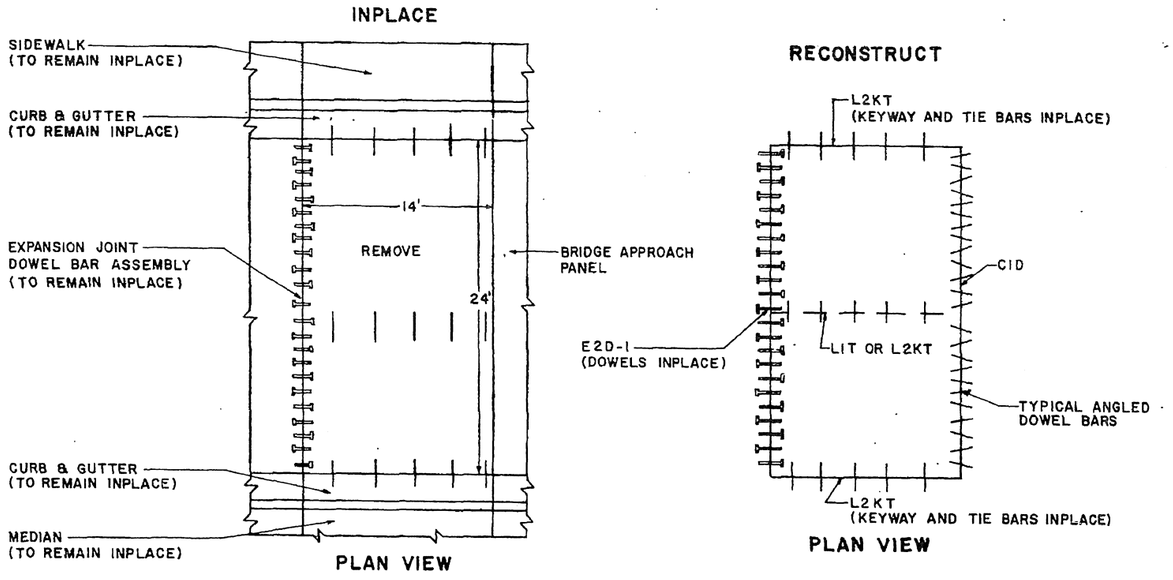
NOTE: RECONSTRUCT PAVEMENT JOINT INCLUDES THE FOLLOWING ITEMS (EXACT LOCATION TO BE DETERMINED BY ENGINEER IN THE FIELD)
1. SAW CUT-PARTIAL DEPTH
2. DRILLED AND GROUTED NO. 6 BARS, 4' LONG
3. APPROVED EPOXY GROUT MIXTURE
4. 1" MAXIMUM Ø HOLES DRILLED FOR NO. 6 DOWEL BARS
5. DOWEL BARS ANGLED 20°± FROM NORMAL



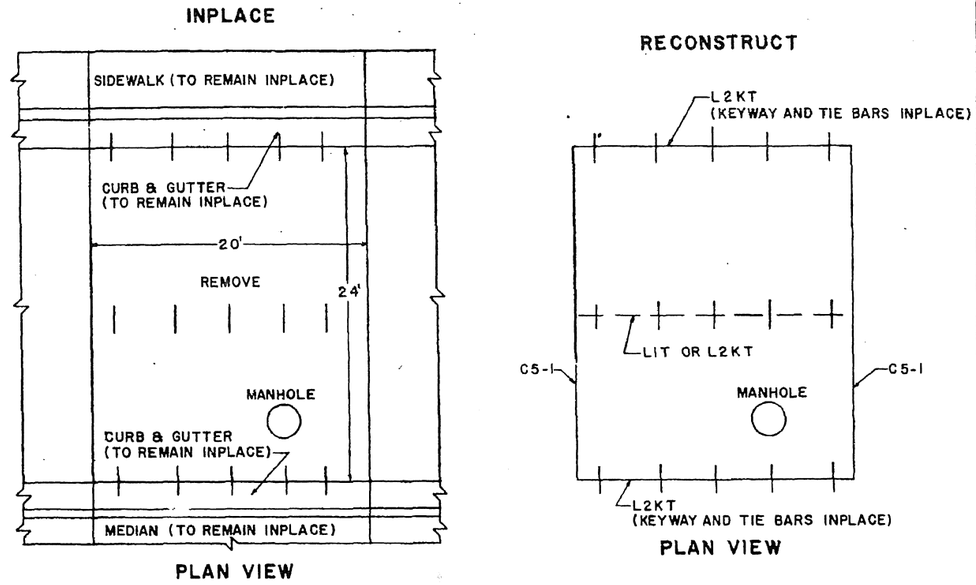
NOTE: THE FOLLOWING PAVEMENT CONSTRUCTION JOINTS AND ITEMS ARE INCIDENTAL TO CONCRETE PAVEMENT:
1. Ⓘ RECONSTRUCT PAVEMENT JOINT
2. L1T
3. L2KT
4. CID
5. ALL PAVEMENT SECTIONS TO BE 10" THICK
6. E41
7. L3
8. C4

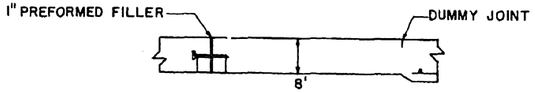
TITLE:	DES:	DR:	APPROVED:	Bridge No.
APPROACHES	CHK:	CHK:	1-26-84	9090
	Sheet No. 10 of 16 Sheets			

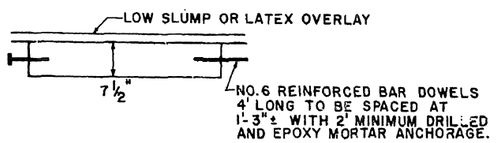
PAVEMENT PANEL NEXT TO BRIDGE APPROACH PANEL WEST BOUND ROADWAY, WEST END OF BRIDGE

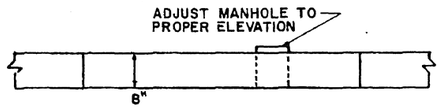


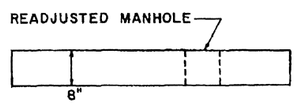
6TH PAVEMENT PANEL FROM THE BRIDGE APPROACH PANEL WEST BOUND ROADWAY, WEST END OF BRIDGE











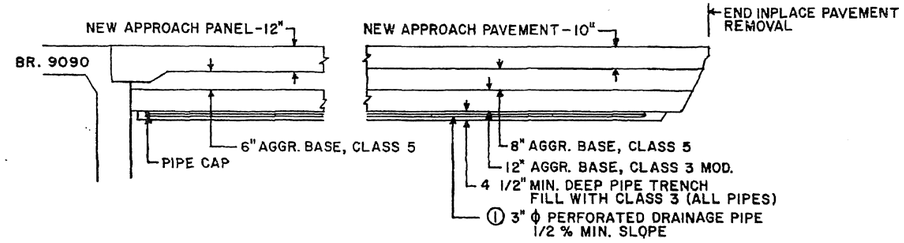
NOTE: THE FOLLOWING PAVEMENT CONSTRUCTION JOINTS AND ITEMS ARE INCIDENTAL TO CONCRETE PAVEMENT:
1. LIT
2. L2KT
3. C1D
4. ALL PAVEMENT SECTIONS TO BE 8" THICK
5. RECONSTRUCT EXPANSION JOINT E2D-1

CONSTRUCTION NOTES:

1. DOWEL BARS TIEING CURB AND GUTTER TO PAVEMENT TO REMAIN INPLACE.
2. FREE ENDS ON DOWEL BAR ASSEMBLIES WILL REQUIRE TO BE COVERED WITH GREASE.
3. 1" MAXIMUM Ø HOLES DRILLED FOR NO. 6 BARS.
4. NO. 6 DOWEL BARS ARE TO BE ANGLED 20°± FROM NORMAL.
5. APPROXIMATELY 20 CU. YDS. OF CONCRETE MIX 3A41 IS REQUIRED.

TITLE:	DES:	DR:	APPROVED:	Bridge No.
APPROACHES	CHK:	CHK:	1-26-84	9090
	Sheet No. 11 of 16 Sheets			

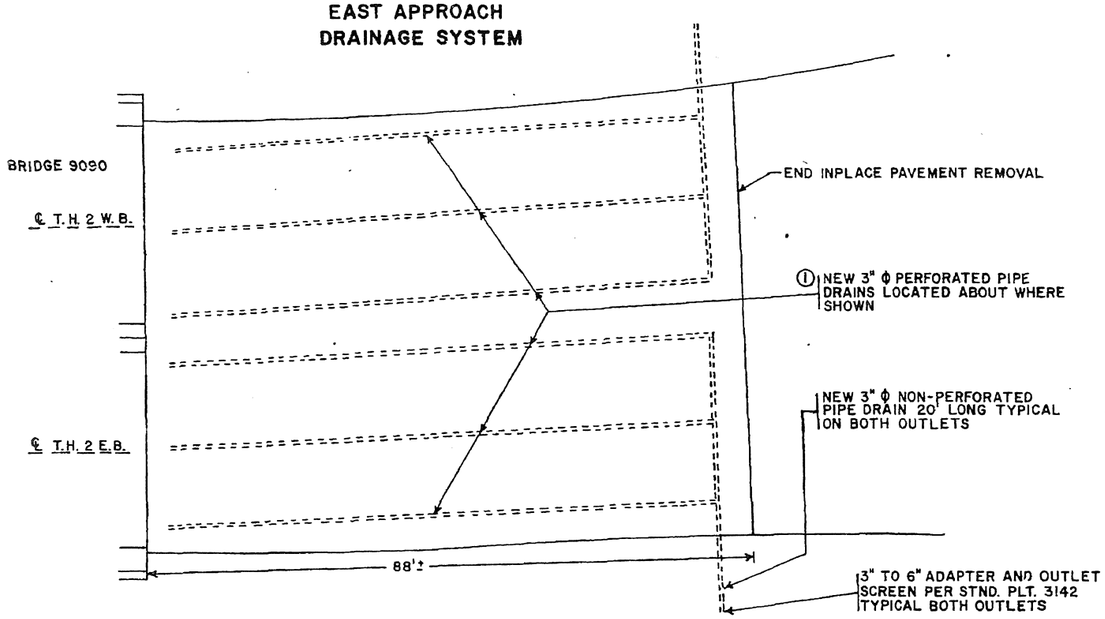
LONGITUDITINAL SECTION OF EAST APPROACH DRAINAGE SYSTEM



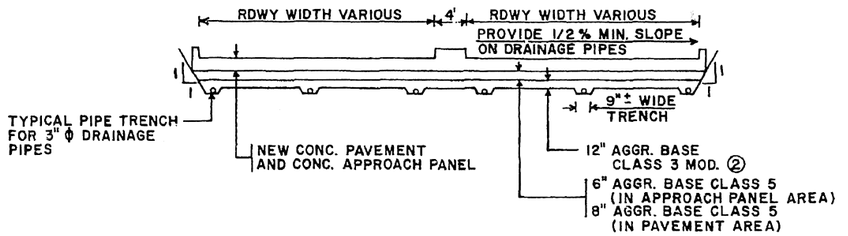
③ SUMMARY OF QUANTITIES FOR DRAINAGE SYSTEM	
3" ϕ PERFORATED PIPE DRAIN (WRAPPED)	540 LIN. FT.
3" ϕ NON-PERFORATED PIPE DRAIN	40 LIN. FT.
3" PIPE ELBOWS	2 REQ'D
3" PIPE TEES	4 REQ'D
3" PIPE CAPS	6 REQ'D
6" OUTLET SCREENS	2 REQ'D
3" TO 6" ADAPTER	2 REQ'D

③ THE SUMMARY OF QUANTITIES FOR THE "DRAINAGE SYSTEM" IS AS SHOWN. ANY ADDITIONAL MINOR ITEMS AND SLIGHT CHANGES OF QUANTITIES REQUIRED SHALL BE FURNISHED BY THE CONTRACTOR WITH NO ADDITIONAL COMPENSATION.

EAST APPROACH DRAINAGE SYSTEM



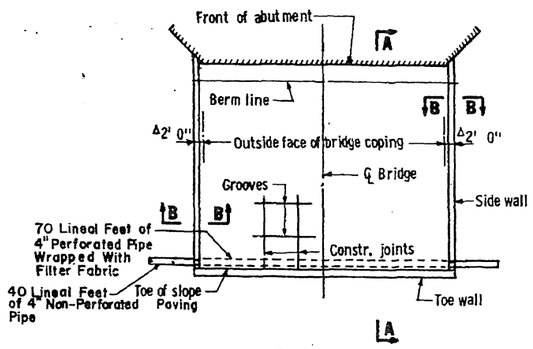
TRANSVERSE SECTION OF EAST APPROACH DRAINAGE SYSTEM



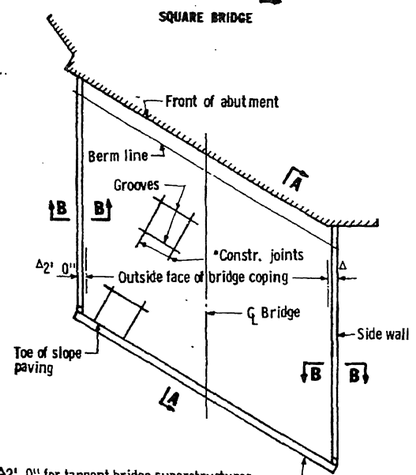
① PERFORATED PIPE SHALL BE WRAPPED WITH AN APPROVED WRAPPING. SEE SPECIAL PROVISIONS.

② ALL AGGREGATE BASE, CLASS 3, SHALL BE MODIFIED TO 0-5 % PASSING NO. 200 OR FINE FILTER AGGREGATE, SPEC. 3149.2J

TITLE: APPROACH DRAINAGE SYSTEM	DES:	DR:	APPROVED: 1-26-84	Bridge No. 9090
	CHK:	CHK:		
	Sheet No. 12 of 16 Sheets			



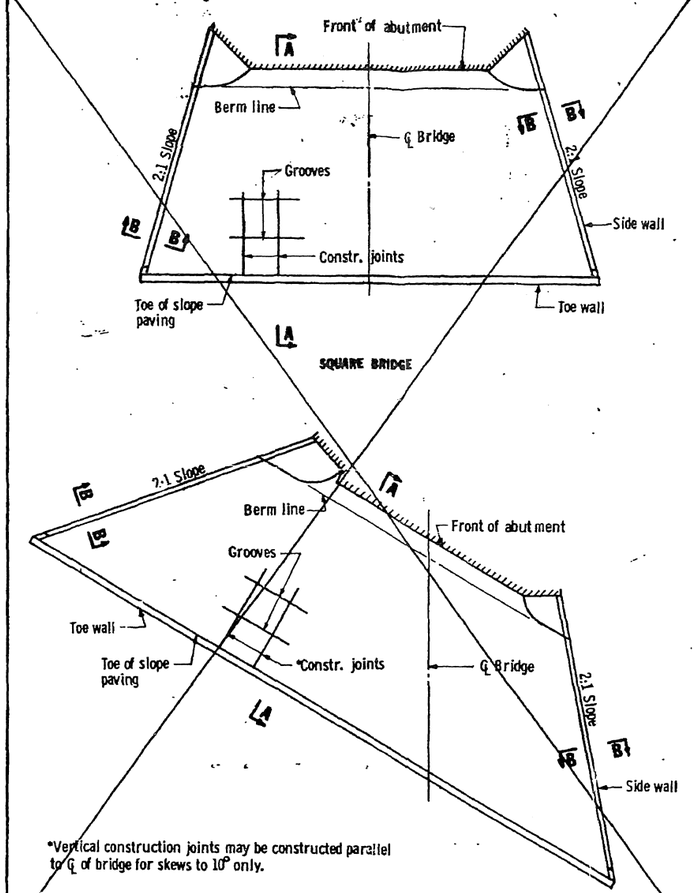
SQUARE BRIDGE



Δ2' 0" for tangent bridge superstructures. Varies 2' 0" minimum for curved bridge superstructures.
*Vertical construction joints may be constructed parallel to ℄ of bridge for skews to 10° only.

SKEWED BRIDGE

LAYOUTS FOR SLOPES 2:1 OR FLATTER

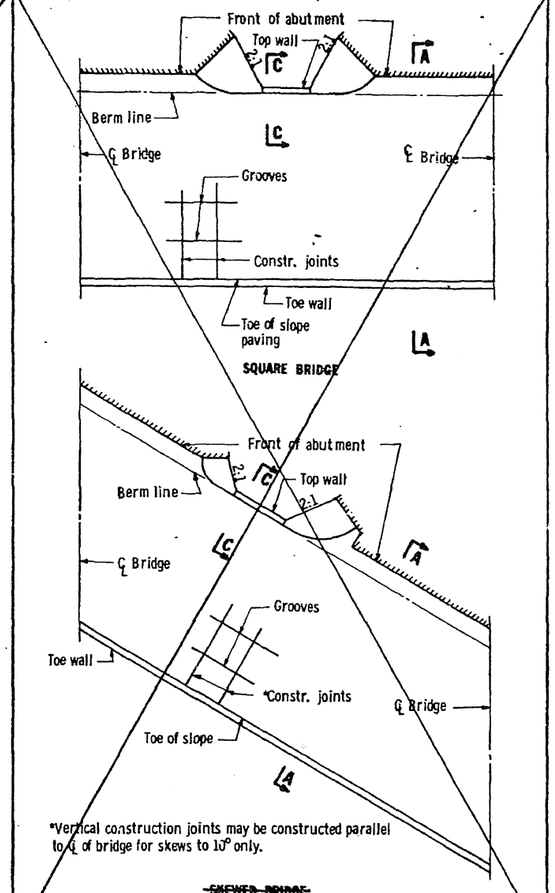


SQUARE BRIDGE

*Vertical construction joints may be constructed parallel to ℄ of bridge for skews to 10° only.

~~SKEWED BRIDGE~~

~~**LAYOUTS FOR SLOPES STEEPER THAN 2:1**~~

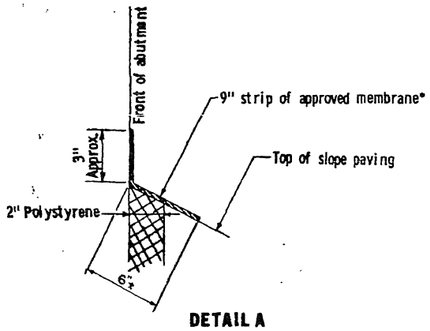


SQUARE BRIDGE

*Vertical construction joints may be constructed parallel to ℄ of bridge for skews to 10° only.

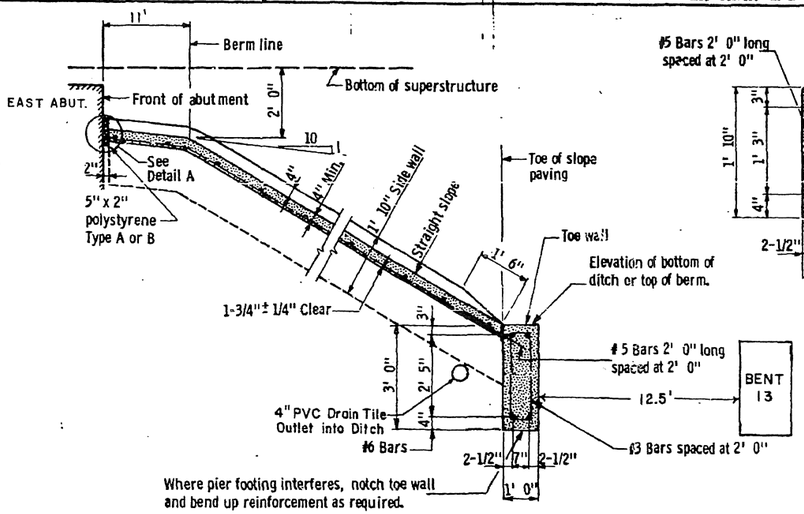
~~SKEWED BRIDGE~~

~~**LAYOUTS FOR SLOPES STEEPER THAN 2:1 BETWEEN BRIDGES**~~



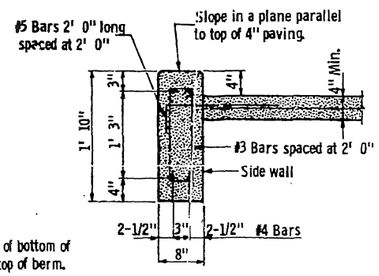
DETAIL A

*Membrane shall be a rubberized asphalt integrally bonded to polyethylene sheeting or approved equal. Material shall be placed in accordance with manufacturers recommendations.

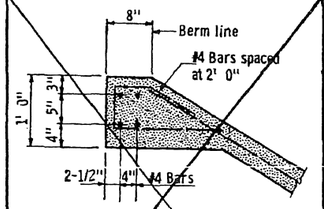


Where pier footing interferes, notch toe wall and bend up reinforcement as required.

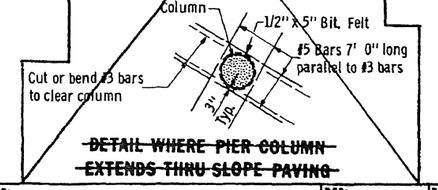
SECTION A-A



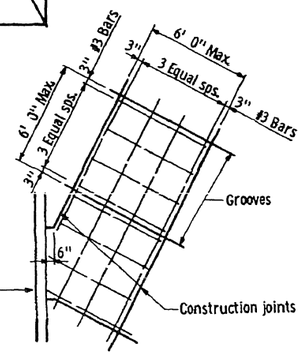
SECTION B-B (SIDE WALL)
Normal to slope



SECTION C-C (TOP WALL)



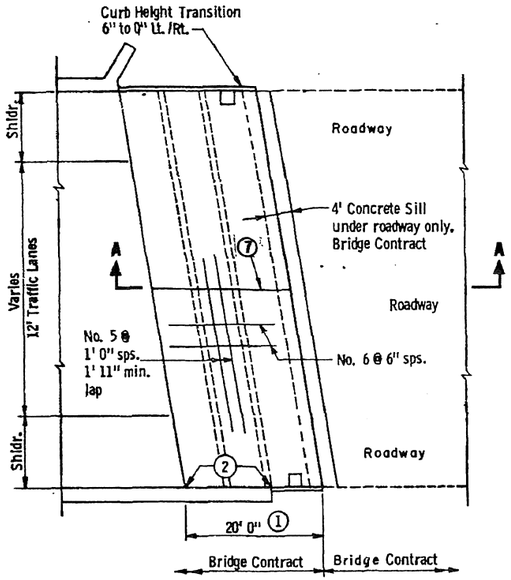
~~**DETAIL WHERE PIER COLUMN EXTENDS THRU SLOPE PAVING**~~



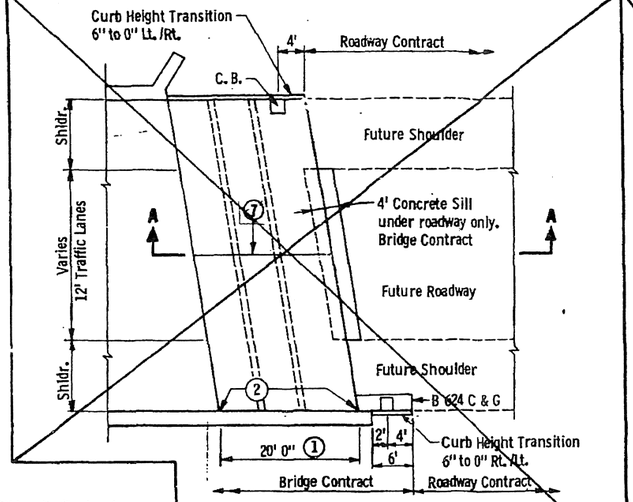
PAVING DETAIL

Fig. 5-397.301
Feb. 25, 1974

TITLE:	DES:	DR:	APPROVED:	Bridge No.
CLASS B SLOPE PAVING UNDER BRIDGES	CHK:	CHK:	1-26-84	9090
	Sheet No. 13 of 16 Sheets			

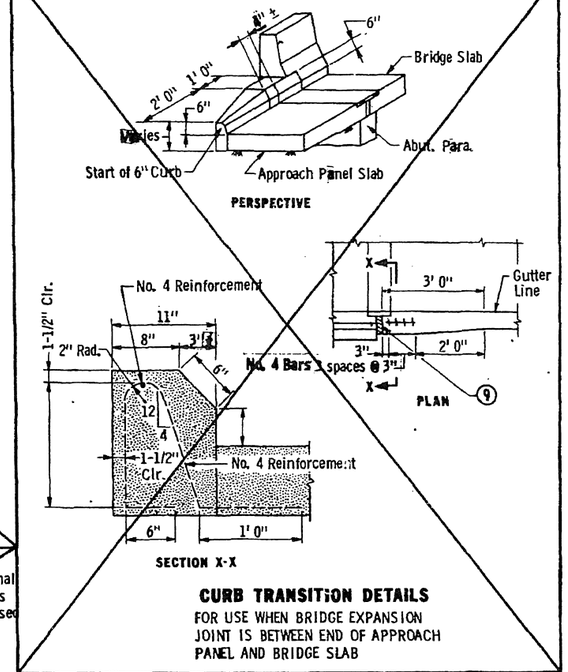


CONCRETE ROADWAY
PARALLEL WINGWALLS LESS THAN 15 FT. ± IN LENGTH

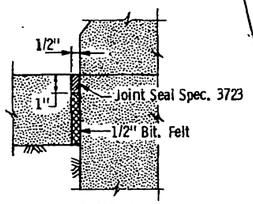


CONCRETE ROADWAY
PARALLEL WINGWALLS 20 FT. AND OVER

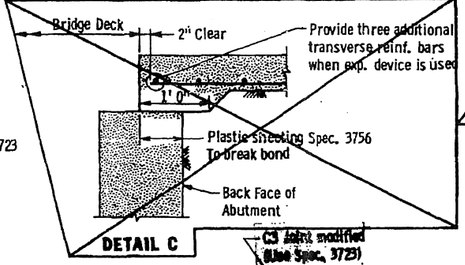
① Use No. 6 @ 6" longitudinal and No. 5 @ 1' 0" transverse reinforcement.
② See Joint Detail



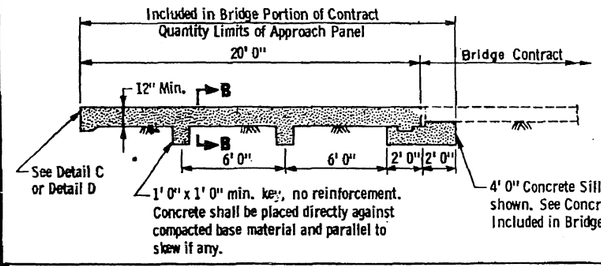
CURB TRANSITION DETAILS
FOR USE WHEN BRIDGE EXPANSION JOINT IS BETWEEN END OF APPROACH PANEL AND BRIDGE SLAB

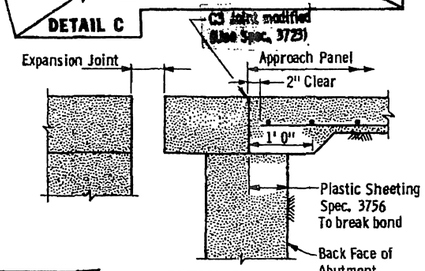


JOINT DETAIL

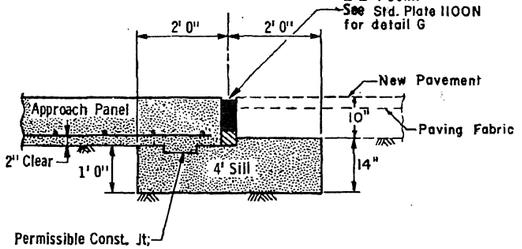


DETAIL C

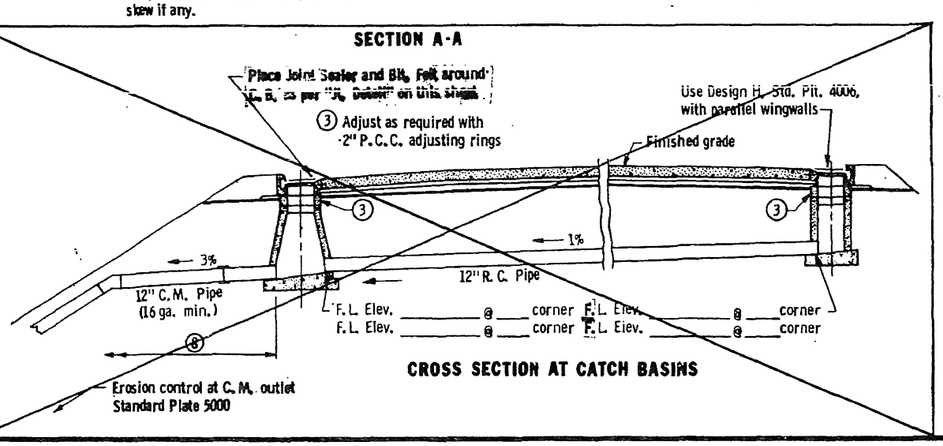




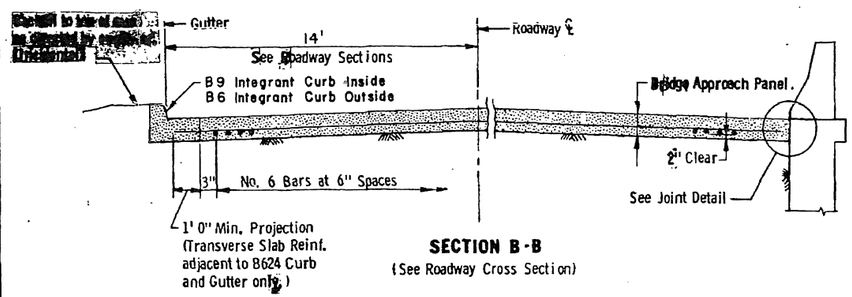
DETAIL D



CONCRETE SILL DETAIL



CROSS SECTION AT CATCH BASINS



SECTION B-B
(See Roadway Cross Section)

The summary of quantities for approach panel is as shown below. Any additional minor items and slight changes of quantities required shall be furnished by the contractor with no additional compensation, except as noted.

ITEM	*MANUAL REFERENCE
Sodding at Pipe Culverts	Std. Plts. 9102
Riprap at CMP Outlets	Std. Plts. 3134
Metal Apron for CM Pipe	Std. Plts. 3123
Curb and Gutter	Std. Plt. 7100
Catch Basin Details	Std. Plt. 4002
Catch Basin Details	Std. Plt. 4006
Precast Concrete Base	Std. Plt. 4011
Catch Basin Frame	Std. Plt. 4129
Catch Basin Curb Box	Std. Plt. 4160
Catch Basin Grate	Std. Plt. 4151
Catch Basin Installation	Std. Plt. 7111
Metal Pipe Flume	Std. Plt. 5000
Conc. Adjusting Ring	Std. Plt. 4010
Integrant Curb	Std. Plt. 7000
Contracton Joint	Std. Plt. 1120
Longitudinal Joints	Std. Plt. 1140

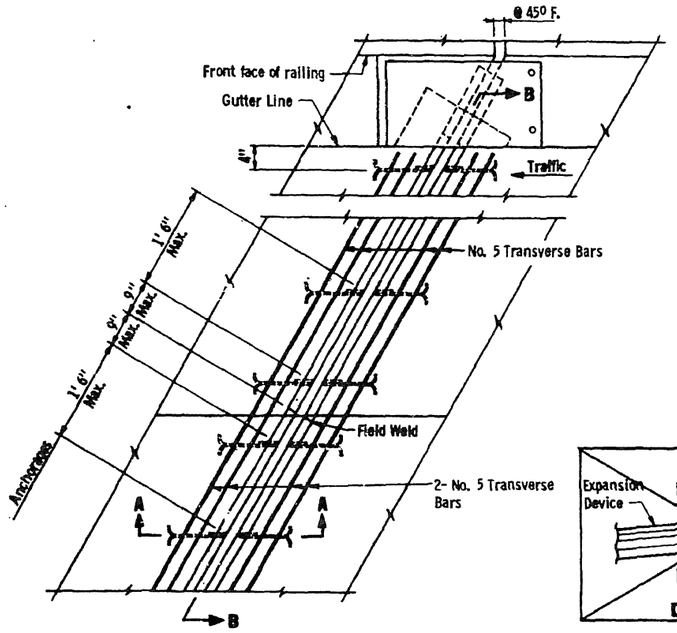
*Specification Ref. Std. Plts. 0001 & 0002
Reinforcement shall be lapped as per Spec. 2472.3D

④ SUMMARY OF QUANTITIES FOR BRIDGE APPROACH PANELS	
⑤ Concrete Mix No. 3X42	58 Cu. Yd.
⑥ ~~Catch Basins~~	~~NONE Req'd.~~
~~Metal Apron~~	~~NONE Req'd.~~
Reinforcement Bars	2436 Lbs.
⑧ ~~12" C.M. Pipe Drain~~	~~Lin. Ft.~~
Curb, Design B6 Integrant	40 Lin. Ft.
~~12" R.C. Pipe Drain~~	~~Lin. Ft.~~
Curb, Design B9 Integrant	40 Lin. Ft.
~~Sod~~	~~Sq. Yd.~~
~~Random Riprap Class "A"~~	~~Cu. Yd.~~

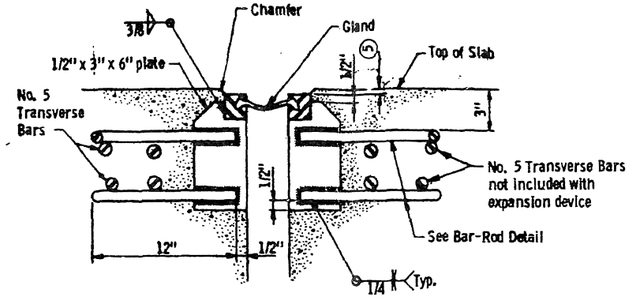
④ Quantities listed are for approach panels at East end of bridge.
~~Payment will be included in the single lump sum price bid for "Bridge Approach Concrete".~~
⑤ The volume of concrete shown is based on an average slab depth of 12" plus the volume of keys and sills as dimensioned. (Concrete for Curb Design B6 B9 is not included in this quantity.)
⑥ ~~Includes all concrete work and all castings and appurtenances necessary to construct the catch basins as shown and noted.~~
⑦ Permissible L2KT longitudinal joint. See Standard Plan Sheet 5-297.221
⑧ ~~Pipe drains in location shown to be paid for by the lineal foot as a seperate item.~~
⑨ Leave a void between junction of bridge railing and curb (1" min.). Fill void with polystyrene.

Revised: July 22, 1982
Approved: December 28, 1977
Fig. 5-397.306

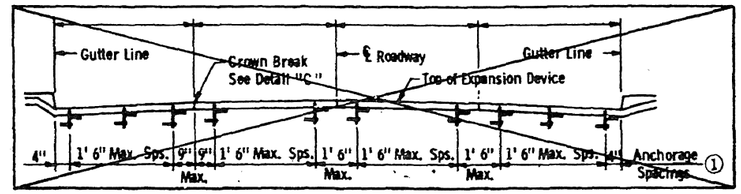
TITLE: BRIDGE APPROACH PANEL ALL SKEWS (CONCRETE PAVEMENT)	DES:	DR:	APPROVED: 1-26-84	Bridge No. 9090
	CHK:	CHK:	Sheet No. 14 of 16 Sheets	



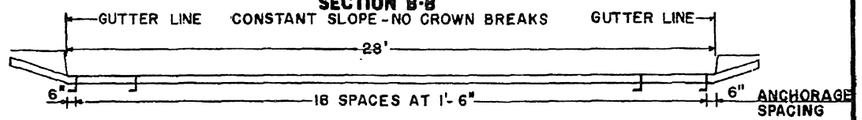
PLAN VIEW AT EXPANSION DEVICE
STRAIGHT EXPANSION DEVICE SHOWN

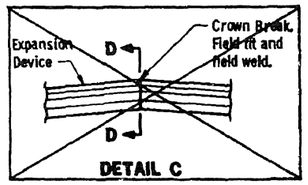


SECTION A-A
ANCHORAGE WITH ROD OPTION SHOWN

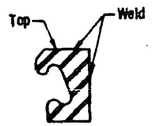


SECTION B-B

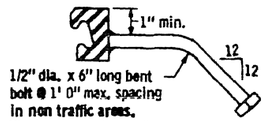




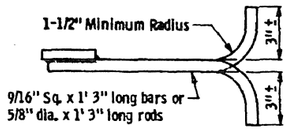
DETAIL C



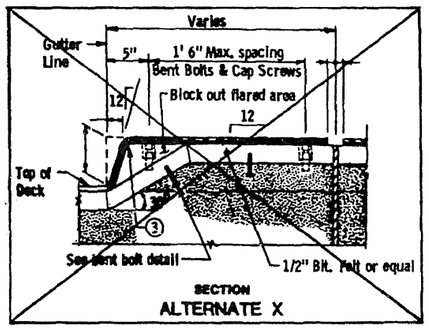
SECTION D-D



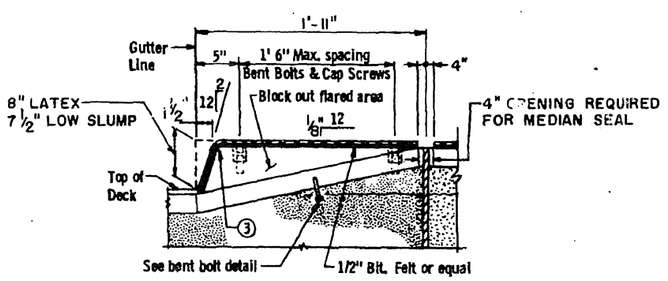
BENT BOLT DETAIL



BAR-ROD DETAIL

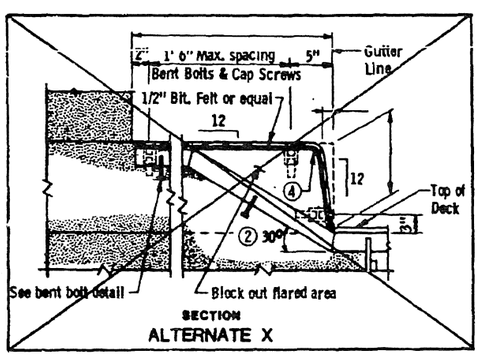


SECTION
ALTERNATE X

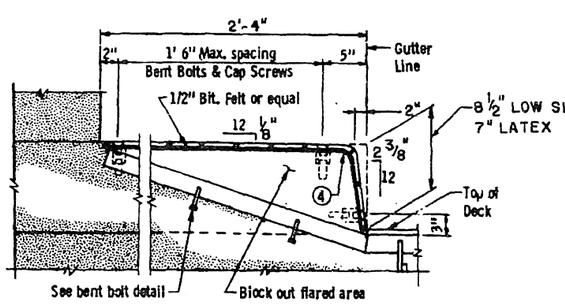


SECTION
ALTERNATE Y

RAISED MEDIAN DETAILS

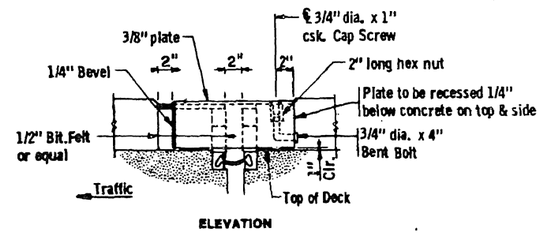


SECTION
ALTERNATE X

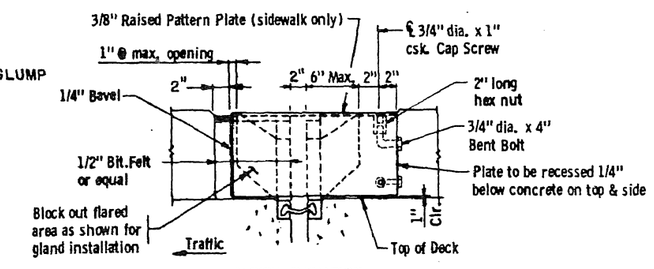


SECTION
ALTERNATE Y

SIDEWALK DETAILS



ELEVATION



INSIDE ELEVATION

NOTES:

Galvanize structural steel after fabrication as per Spec. 3394.

Joints in roadway plate or extrusion shall be located at breaks in transverse profile and as otherwise required. Joints shall be close fit and welded. Repair after welding as per Spec. 2471.3L.

Structural steel shall comply with Spec. 3306, Spec. 3307 & Spec. 3309.

Expansion device shall be straightened to a tolerance of 1/8" in 10 ft.

Cap screws shall be countersunk 1/16" below top of plate.

Galvanize screws and nuts as per Spec. 3392.

New reinforcement bars are to have the same treatment as the inplace slab reinforcement.

When expansion devices are used at ends of bridge, the bridge contractor shall furnish expansion device and gland. The roadway contractor shall install the part of the expansion device which includes the gland as shown on this sheet.

① Dimension along centerline of joint.

② For roadway skews over 25° use 45°.

③ 1" outside radius of steel plate

④ 1" outside radius of steel plate

⑤ 1/2" (5/8" max.) when Snowplow Fingers are used. 1/8" (1/4" max.) when Snowplow Fingers are not used.

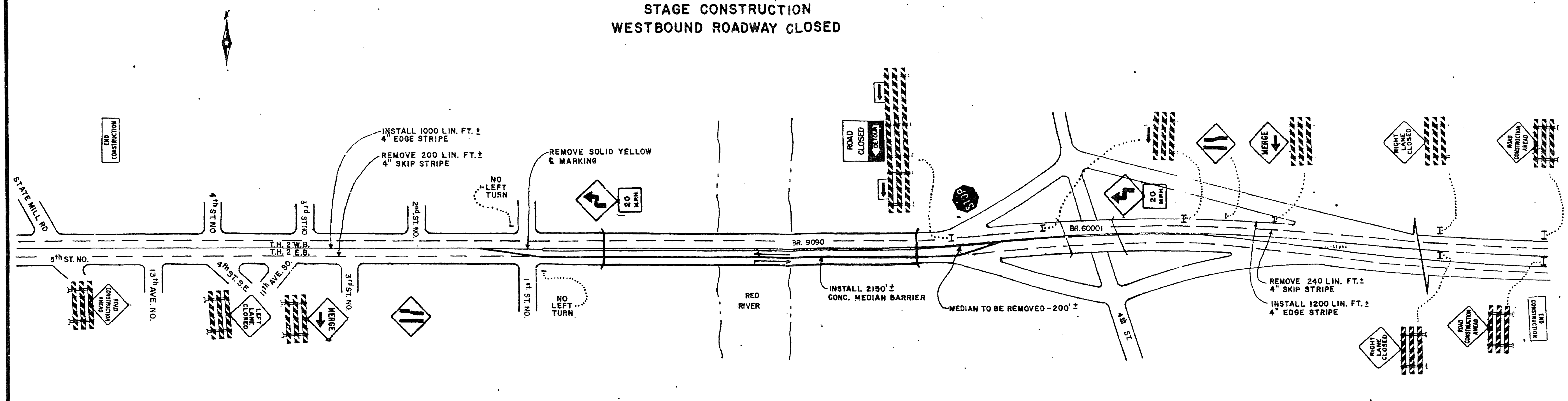
FIG. 5-397.631

Revised: January 20, 1983 Approved: July 16, 1982

WATERPROOF EXPANSION DEVICE FOR REPAIR WORK
WITH SIDEWALK OR RAISED MEDIAN

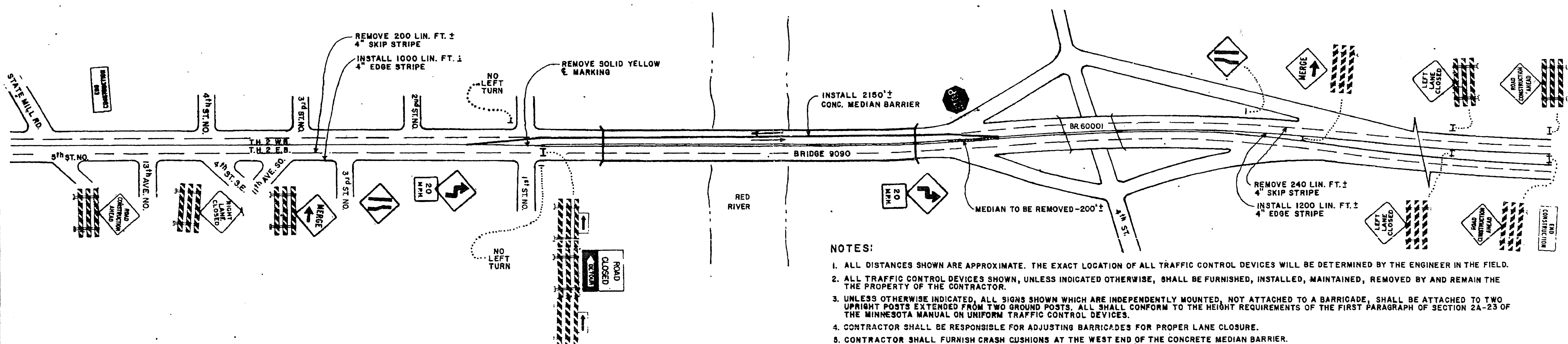
DES:	DR:	APPROVED: 1-26-84	Bridge No. 9090
CHK:	CHK:	Sheet No. 15 of 16 Sheets	

STAGE CONSTRUCTION
WESTBOUND ROADWAY CLOSED



SCALE 1" = 200'

STAGE CONSTRUCTION
EASTBOUND ROADWAY CLOSED



NOTES:

1. ALL DISTANCES SHOWN ARE APPROXIMATE. THE EXACT LOCATION OF ALL TRAFFIC CONTROL DEVICES WILL BE DETERMINED BY THE ENGINEER IN THE FIELD.
2. ALL TRAFFIC CONTROL DEVICES SHOWN, UNLESS INDICATED OTHERWISE, SHALL BE FURNISHED, INSTALLED, MAINTAINED, REMOVED BY AND REMAIN THE THE PROPERTY OF THE CONTRACTOR.
3. UNLESS OTHERWISE INDICATED, ALL SIGNS SHOWN WHICH ARE INDEPENDENTLY MOUNTED, NOT ATTACHED TO A BARRICADE, SHALL BE ATTACHED TO TWO UPRIGHT POSTS EXTENDED FROM TWO GROUND POSTS. ALL SHALL CONFORM TO THE HEIGHT REQUIREMENTS OF THE FIRST PARAGRAPH OF SECTION 2A-23 OF THE MINNESOTA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING BARRICADES FOR PROPER LANE CLOSURE.
5. CONTRACTOR SHALL FURNISH CRASH CUSHIONS AT THE WEST END OF THE CONCRETE MEDIAN BARRIER.
6. INSTALL TYPE "B" HIGH INTENSITY FLASHING WARNING LIGHTS ON "ROAD CONSTRUCTION AHEAD" BARRICADES. (2 ON EACH)
7. INSTALL TYPE "A" LOW INTENSITY FLASHING WARNING LIGHTS ON ALL OTHER BARRICADES. (2 ON EACH)
8. INSTALL TYPE "A" LOW INTENSITY FLASHING WARNING LIGHTS ON ALL POST MOUNTED SIGNS. (1 ON EACH)
9. INSTALL TYPE "C" STEADY BURN LIGHTS AT 100' INTERVALS ON THE CONCRETE MEDIAN BARRIER.

TITLE:	DES:	DR:	APPROVED:	Bridge No.
TRAFFIC CONTROL LAYOUT	CHK:	CHK:	1-26-84	9090
	Sheet No. 16 of 16 Sheets			

FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N. D.	F-708(11)		25	43

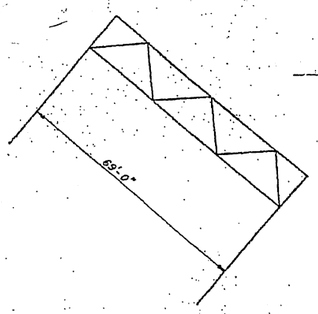
STRESSES AND SECTIONS

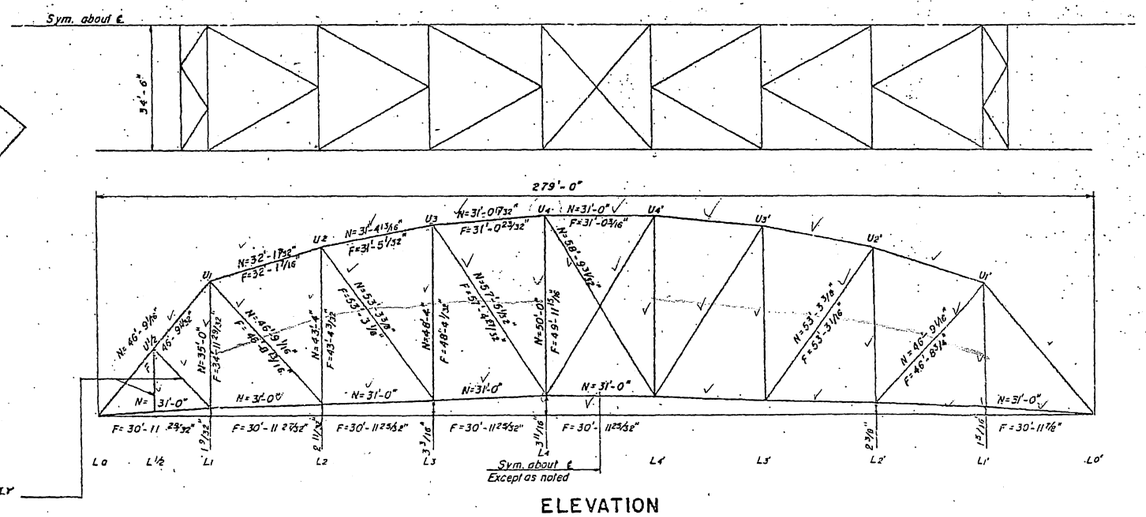
LINE	MEMBER		BOTTOM CHORD						TOP CHORD						DIAGONALS										VERTICALS							
			L_0-L_1	L_1-L_2	L_2-L_3	L_3-L_4	L_4-L_4'	$L_5'-L_0'$	L_0-U_1	$U_1'-U_2'$	$U_2'-U_3'$	$U_3'-U_4'$	U_4-U_4'	$U_1'-L_0'$	$U_{1/2}'-L_{1/2}$	U_1-L_2	U_2-L_3	U_3-L_4	U_4-L_4'	$U_4'-L_4$	$U_3'-L_3'$	$U_2'-L_2'$	$U_1'-L_1'$	$U_{1/2}-L_{1/2}$	U_1-L_1	U_2-L_2	U_3-L_3	$U_4'-L_4$	$U_3'-L_3'$	$U_2'-L_2'$	$U_1'-L_1'$	
1	DEAD LOAD (Kips)		668.4T.	668.4T.	944.8T.	1,069.1T.	1,169.8T.	668.4T.	1008.1C.	978.4C.	1,103.1C.	1,171.4C.	1,169.8C.	1008.1C.	668.4T	590.8T.	338.6T	226.4T	65.3T.	0.0	143.4T	248.0T	419.7T.	1,000.1C.	310.7C	253.5C.	103.1C.	62.9T.	13.0C.	183.3C.	188.7T.	1
2	LIVE LOAD (Kips)	REGULAR	143.6T.	143.6T.	203.0T.	234.0T.	251.3T.	143.6T.	232.7C.	210.2C.	237.0C.	251.6C.	251.3C.	232.7C.	159.6T.	149.0T.	110.0T.	93.6T.	74.5T.	67.2T.	83.2T.	91.7T.	114.5T.	238.7C.	99.0C.	88.0C.	68.0C.	66.6T.	55.7C.	66.6C.	77.9T.	2
3		REVERSE													14.4C.	31.4C.	42.8C.	58.8C.			51.6C.	42.0C.	26.0C.	1	41.3T.	36.9T.	30.0T.	49.5C.	60.3T.	49.4T.		3
4	IMPACT	REGULAR	17.8T.	17.8T.	25.2T.	29.0T.	31.2T.	17.8T.	28.9C.	26.1C.	29.4C.	31.2C.	31.2C.	28.9C.	45.0T.	41.7T.	30.8T.	26.2T.	20.6T.	8.3T.	10.3T.	11.4T.	14.2T.	66.0C.	27.7C.	24.6C.	19.0C.	8.3T.	6.9C.	8.3C.	9.7T.	4
5		REVERSE														4.0C.	8.8C.	12.0C.	16.5C.		6.4C.	5.2C.	3.2C.		11.6T.	10.3T.	14.0T.	6.1C.	7.5T.	6.1T.		5
6	ADD FOR REVERSAL																												33.9T.C.			6
7	LINES 1+2+4+6		829.8T.	829.8T.	1,173.0T.	1,352.1T.	1,452.3T.	829.8T.	1269.7C.	1214.7C.	1369.5C.	1454.2C.	1,452.3C.	1,269.7C.	873.0T.	781.5T.	499.3T	346.2T	160.6T.	75.5T.	242.9T.	351.1T.	548.4T.	1306.6C.	437.4C.	366.1C.	190.1C.	137.8T.	109.5C.	198.2C.	276.3T.	7
8	DESIGN FOR (Kips)		829.8T	829.8T.	1,173.0T.	1,352.1T.	1,452.3T.	829.8T.	1,269.7C	1,214.7C.	1,369.5C.	1,454.2C	1,452.3C.	1,269.7C.	△ 873.0T.	△ 781.5T.	△ 499.3T	△ 346.2T	△ 160.6T.	75.5T.	242.9T.	351.1T.	548.4T.	△ 1306.6C.	△ 437.4C.	△ 366.1C.	△ 190.1C.	137.8T.	109.5C.	198.2C.	276.3T.	8
9	SECTION		BOX SIDE PL 7/8 x 24 COVER PL 2-5/8 x 17 WEB-1/4 x 24 Q&T	BOX SIDE PL 7/8 x 24 COVER PL 5/8 x 17 Q&T, L.A.	BOX SIDE PL 7/8 x 24 COVER PL 5/8 x 17 LA	BOX SIDE PL 1/4 x 24 COVER PL 5/8 x 17 LA	BOX SIDE PL 13/16 x 24 COVER PL 5/8 x 17 LA	BOX SIDE PL 7/8 x 24 COVER PL 5/8 x 17 CARBON	BOX SIDE PL 13/16 x 24 COVER PL 5/8 x 17 LA	BOX SIDE PL 13/16 x 24 COVER PL 5/8 x 17 LA	BOX SIDE PL 13/16 x 24 COVER PL 5/8 x 17 LA	BOX SIDE PL 13/16 x 24 COVER PL 5/8 x 17 LA	BOX SIDE PL 13/16 x 24 COVER PL 5/8 x 17 LA	BOX SIDE PL 13/16 x 24 COVER PL 5/8 x 17 LA	△ WELDED I GIRDER FL 14 x 18 WEB 13/16 x 16 5/8 LA	△ 18WF 114 & PL 3/8 x 5'-1 x 5'-6" LA	△ 18WF 77 LA	△ 18WF 64 LA	△ 18WF 64 CARBON	△ 18WF 64 CARBON	△ 18WF 64 CARBON	△ 18WF 64 LA	△ 18WF 96 LA	△ WELDED I GIRDER FL 16 x 14 WEB 18 x 15 1/8 LA	△ 18WF 96 LA	△ 18WF 96 CARBON	△ 18WF 96 CARBON	△ 18WF 96 CARBON	△ 18WF 96 CARBON	△ 18WF 96 CARBON	△ 18WF 96 CARBON	9
10	GROSS AREA (Sq. in.)		114.50	38.25	38.25	67.25	73.25	58.25	73.25	67.25	73.25	79.25	79.25	73.25	33.25	41.01	22.63	18.80	18.80	18.80	18.80	28.22	64.68	28.22	28.22	28.22	28.22	28.22	28.22	28.22	10
11	NET AREA (Sq. in.)		107.50	49.38	49.38	56.88	61.88	49.38	73.25	67.25	73.25	79.25	79.25	73.25	33.25	31.60	19.31	16.06	16.06	16.06	16.06	24.90	64.68	28.22	28.22	28.22	24.90	28.22	28.22	24.90	11
12	LENGTH (INCHES)		372.00	372.00	372.00	372.00	372.00	744.00	561.00	385.22	376.81	372.53	372.00	561.00	281.00	561.06	639.36	669.04	706.00	706.00	689.04	639.36	561.06	210.00	420.00	520.00	580.00	600.00	580.00	520.00	420.00	12
13	PLANE UNSUPPORTED LENGTH		186.00	372.00	372.00	372.00	372.00	372.00	280.50	385.22	376.81	372.53	372.00	561.00	281.00	280.53	319.68	344.52	353.00	353.50	344.52	319.68	280.50	210.00	210.00	260.00	290.00	300.00	290.00	260.00	210.00	13
14	PARALLEL RADIUS OF GYRATION		9.45	8.70	8.70	8.50	8.38	8.70	8.38	8.50	8.38	8.29	8.29	8.38	2.55	2.76	1.98	1.93	1.93	1.93	1.93	1.93	2.71	2.98	2.71	2.71	2.71	2.71	2.71	2.71	2.71	14
15	TO TRUSS L_t		19.70	42.70	42.80	43.80	44.40	42.80	33.50	45.32	44.97	44.94	44.87	66.95	106.04	101.54	161.50	178.50	182.50	182.90	178.50	169.60	103.51	70.50	77.50	95.94	107.01	110.70	107.00	95.94	77.50	15
16	PLANE UNSUPPORTED LENGTH		372.00	372.00	372.00	372.00	372.00	372.00	415.69	385.22	376.81	372.53	372.00	415.69	281.00	561.06	639.36	689.04	706.00	706.00	689.04	639.36	561.06	210.00	325.13	325.13	325.13	325.13	310.00	324.75	324.75	16
17	PERP. TO RADIUS OF GYRATION		6.02	7.88	7.88	8.02	7.91	7.86	7.91	8.02	7.91	7.98	7.98	7.91	7.00	7.79	7.54	7.46	7.46	7.46	7.46	7.46	7.70	7.18	7.70	7.70	7.70	7.70	7.70	7.70	7.70	17
18	TRUSS L_t		61.79	47.20	47.20	46.40	47.00	47.20	52.60	48.03	47.63	46.68	46.62	52.60	40.14	72.00	84.80	92.40	94.60	94.60	92.40	85.70	72.86	29.20	42.20	42.20	42.20	42.20	40.30	42.20	42.20	18
19	BASIC UNIT STRESS (Kips/Sq. in.)	ALLOWABLE*	53.5	23.4	23.4	23.3	23.3	17.4	18.4	18.4	18.5	18.5	17.6	⊕ 25.8	⊕ 24.5	⊕ 25.6	26.1	17.1	17.1	17.1	26.2	23.6	⊕ 19.5	17.2	12.7	18.1	18.0	12.1	12.7	18.0	19
20		ACTUAL	7.3	16.8	23.8	23.8	23.5	16.8	17.3	18.1	18.7	18.4	18.3.	17.3	26.3	24.6	25.9	21.6	10.0	4.6	15.1	21.9	22.0	20.2	15.5	13.0	6.7	5.3	3.9	7.0	11.1	20
21	CAPACITY (Kips)		6,130.0T.	1,153.5T.	1,153.5T.	1,326.5T.	1,443.0T.	857.2T.	1,344.9C.	1,237.4C.	1,347.8C.	1,462.2C.	1,462.2C.	1,287.0C.	857.9T.	778.8T.	494.0T.	419.5T.	274.6T.	274.6T.	275.0T.	420.5T.	587.6T.	1261.3C.	486.5C.	358.4C.	342.6C.	448.2T.	341.5C.	358.4C.	448.2T.	21
22	DESIGN CONNECTION FOR		998.7	998.7	1,173.0	1352.1	1443.0	843.8	1307.3	1,226.1	1,369.5	1458.2	1,457.2	1,278.4	873.0	761.5	499.3	382.9	217.6	206.0	258.9	385.8	568.0	1306.6	462.0	366.2	266.3	356.2	256.1	276.3	362.3	22

*ADJUSTED TO COMPENSATE FOR FLEXURAL STRESSES DUE TO THE WEIGHT OF THE MEMBER

△ MAXIMUM WHEN END BEARING MOVED TO $L_{1/2}$

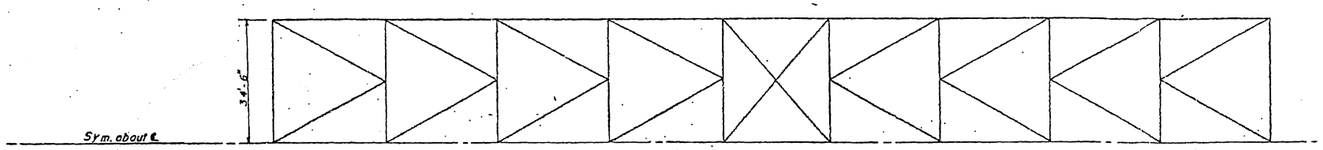
⊕ ALLOWING 10% OVERSTRESS





THESE TWO MEMBERS, ONE END OF TRUSS ONLY

ELEVATION



NOTES.

L_0' end of each truss shall be located on Pier No. 7

The top figure on each truss member is its normal length, with no stress and bottom chord horizontal.

The bottom figure is the adjusted length to which the member shall be fabricated to account for dead load deflection, except that a deduction of 1/16" for draw shall be made in the center diagonals.

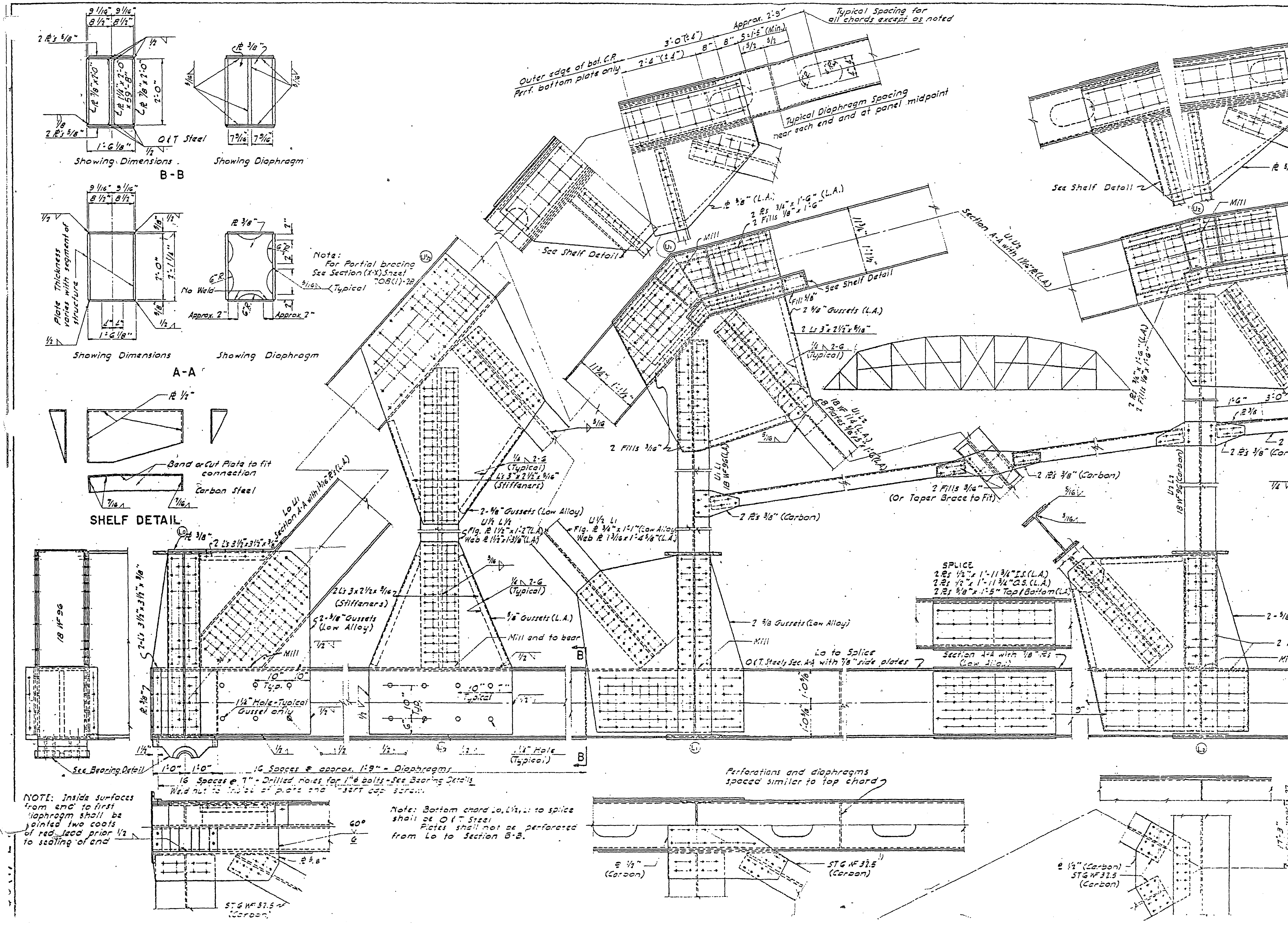
RED RIVER BRIDGE
SKIDMORE AVE.
GRAND FORKS, N.D.-E. GRAND FORKS, MINN.

279 FT. TRUSSES

STRESSES AND CAMBER

2 3 4 5 6 7 8 9

FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N. D.	F-7080)		26	43



TRUSS QUANTITIES (Entire Bridge)	
Structural Steel	591,320 lbs.
Structural Low Alloy Steel	1,370,680 lbs.
Structural Quenched & Tempered Steel	70,000 lbs.

RED RIVER BRIDGE
SKIDMORE AVE.
GRAND FORKS, N. D. - E. GRAND FORKS, MINN.

TRUSS DETAILS

FILE NAME	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N.D.	F-[illegible]		27	43

CHECKED BY

U3 U4
Section A-A with 1 9/16" Rs (L.A.)

U4 U4'
Section A-A with 1 9/16" Rs (L.A.)

U4
See Joint U4

See Shelf Detail Sheet 708(1)-24

2 Rs 5/8" (L.A.)

Mill

2 Fills 1/8"

U3 U5
Section A-A with 1 9/16" Rs (L.A.)

2 Rs 7/8" x 1'-6" (L.A.)

Fill 5/8"

2 Fills 1/8"

2 Rs 1 1/8" x 1'-6" (L.A.)

2 5/8" Gussets (L.A.)

2 Fills 1/8"

2 Rs 5/8" (Carbon)

2 Rs 3/8" (Carbon)

2 Lr 5" x 3" x 3/8" (Carbon)
Stay Rs 3/8"

2 3/8" Rs (Carbon)

2 Fills 1/8"

2 3/8" Rs (Carbon)

U2 L3
18 WF 77 (L.A.)

U3 L3
18 WF 96 (Carbon)

U3 L4
18 WF 96 (Carbon)

U4 L4
18 WF 96 (Carbon)

U3 L4
18 WF 64 (L.A.)

U4 L4'
18 WF 64 (Carbon)

U4 L4'
18 WF 96 (Carbon)

U3' L4'
18 WF 64 (Carbon)

1 1/2" Rigid Conduit

Flexible Conduit from Stringer this location on West Truss only

℄ Truss

SPLICE
4 Rs 5/8" x 1'-11 3/4" (L.A.)
2 Rs 5/8" x 1'-5" (L.A.)
2 Fills 1/8"

2 Fills 1/8"

2 Fills 1/8"

2 5/8" Gussets (Carbon)

Mill to bear

6" Max.

2 Fills 1/8"

2 Fills 1/8"

2 5/8" Gussets (Carbon)

Mill to bear

L4 L4'
Section A-A with 1 9/16" Rs (L.A.)

Rs 1/2" (Carbon)

STG WF 37.5 (Carbon)

Rs 1/2" (Carbon)

℄ Bridge ℄

STG WF 37.5 (Carbon)

D-D

60°
1/8"
60°

D D

60°
1/8"
℄

L2 L3
Section A-A with 1 1/16 Rs (L.A.)
Section A-A with 7/8" Rs (L.A.)

L3 L4
Section A-A with 1 1/16" Rs (L.A.)
Section A-A with 1 9/16" Rs (L.A.)

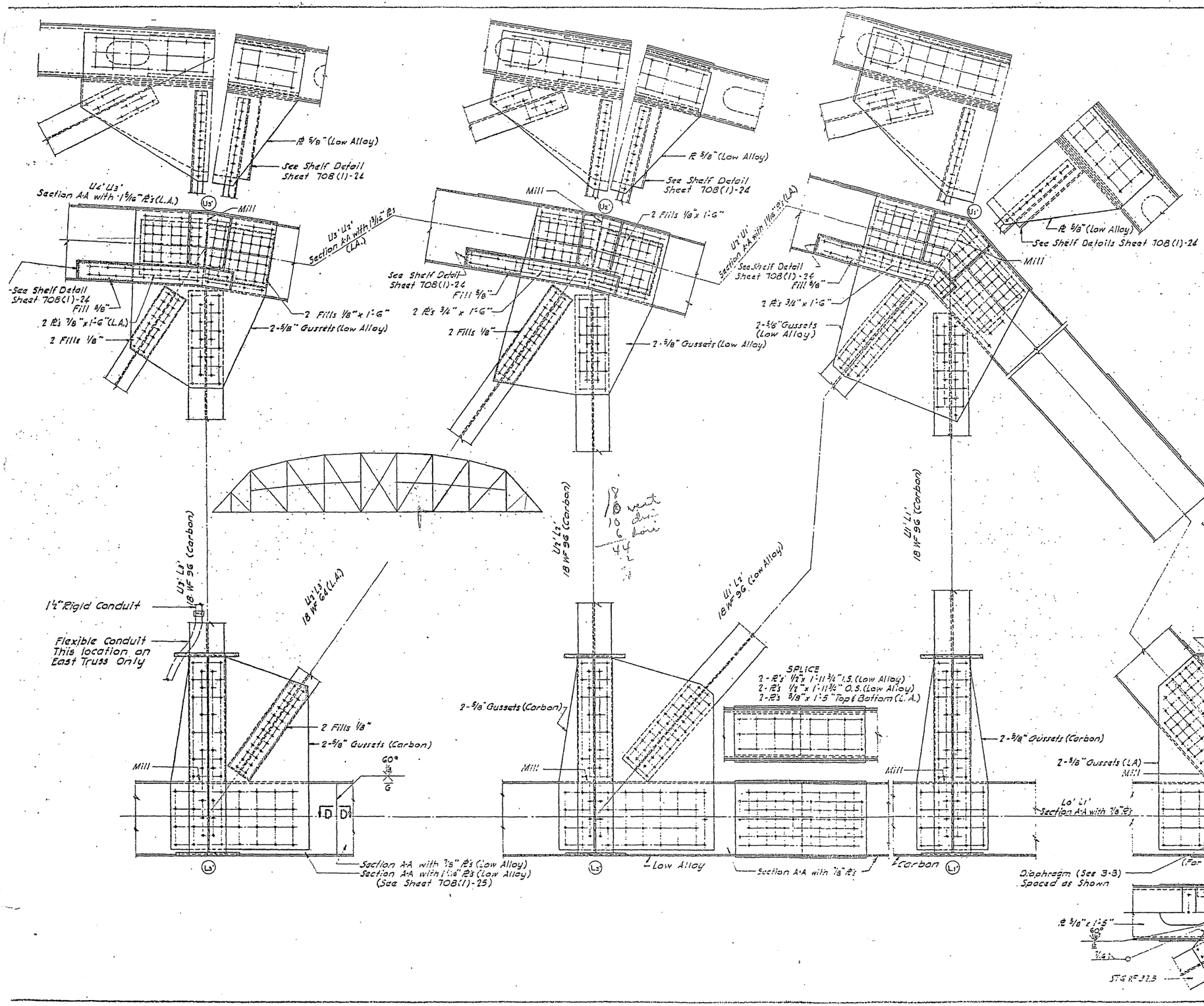
L3' L4'
(See L3 L4)

10%

RED RIVER BRIDGE
SKIDMORE AVE.
GRAND FORKS, N.D. - E. GRAND FORKS, MINN.

TRUSS DETAILS

FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N. D.	F-708(1)		28	43



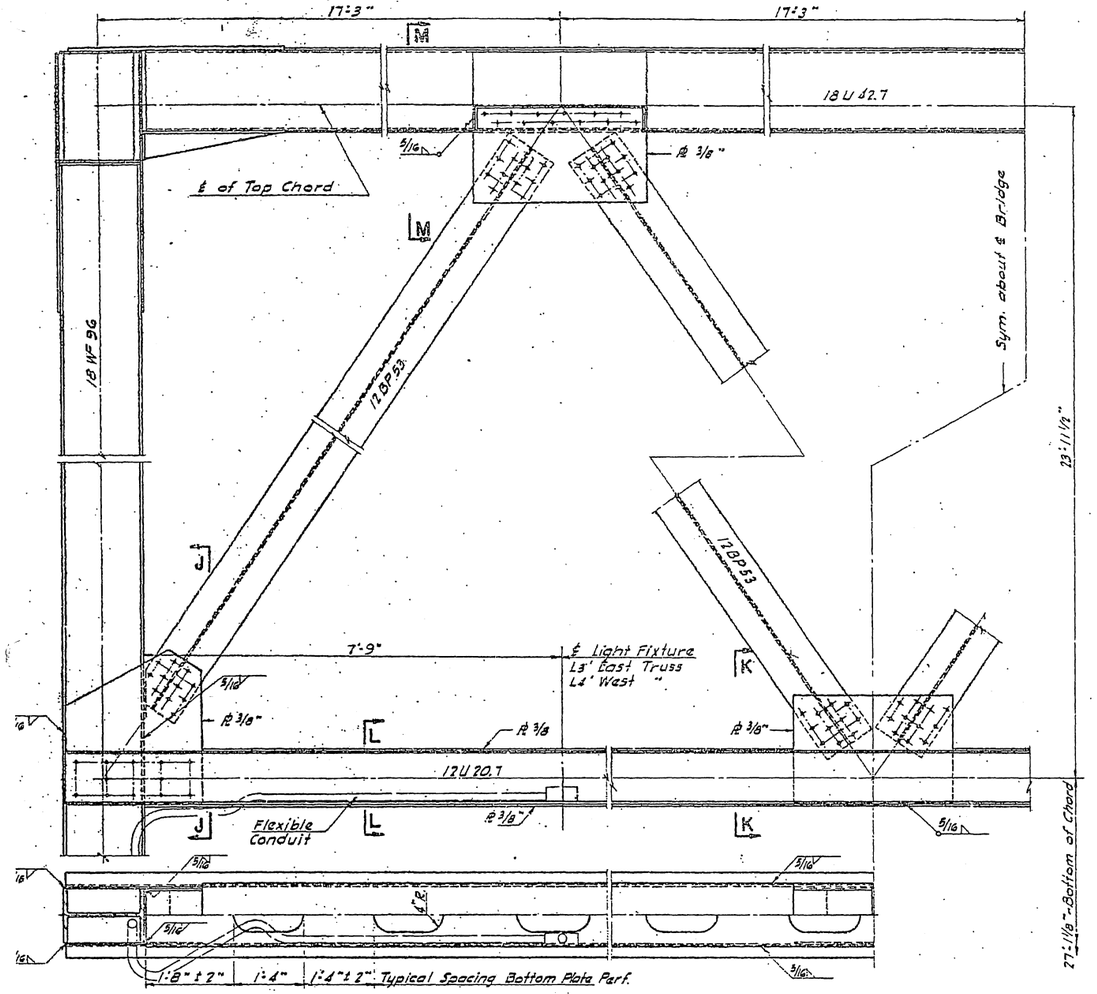
RED RIVER BRIDGE

SKIDMORE AVE.

GRAND FORKS, N.D.-E. GRAND FORKS, MINN.

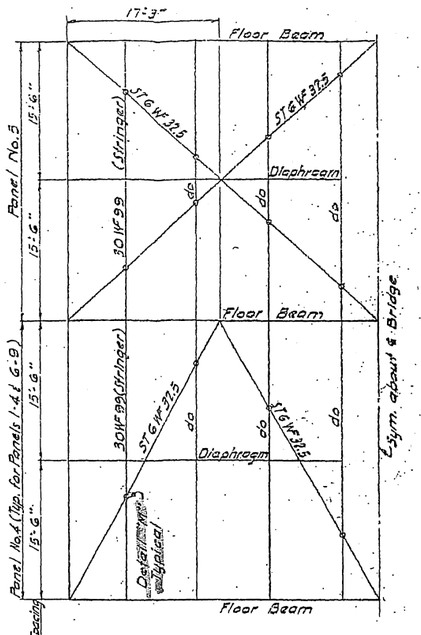
TRUSS DETAILS

FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N. D.	F-708(1)		29	43



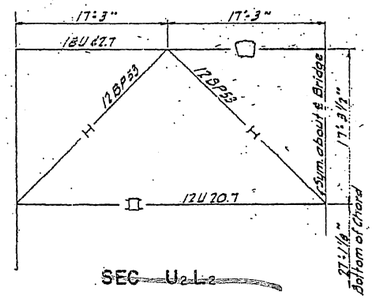
SWAY BRACING

(Section @ U1L1 Shown- Connections Typical)

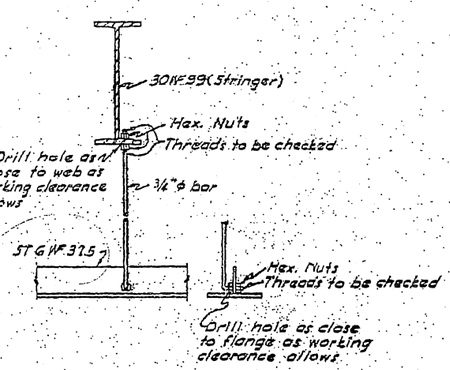


PLAN VIEW

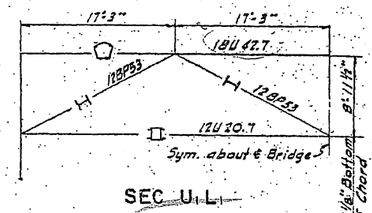
Showing Location of Hangers for Bottom Laterals



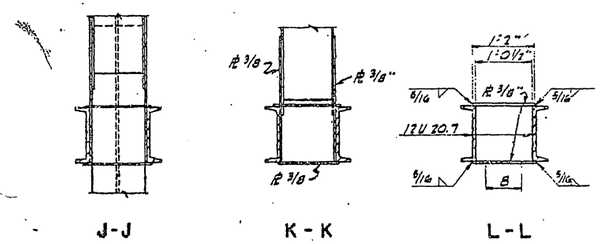
SEC U2L2



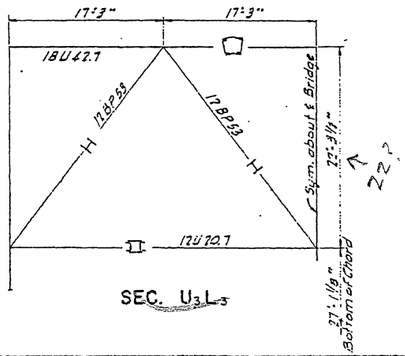
DETAIL "M"



SEC U1L1



J-J K-K L-L



SEC. U3L3

1.7 L-D

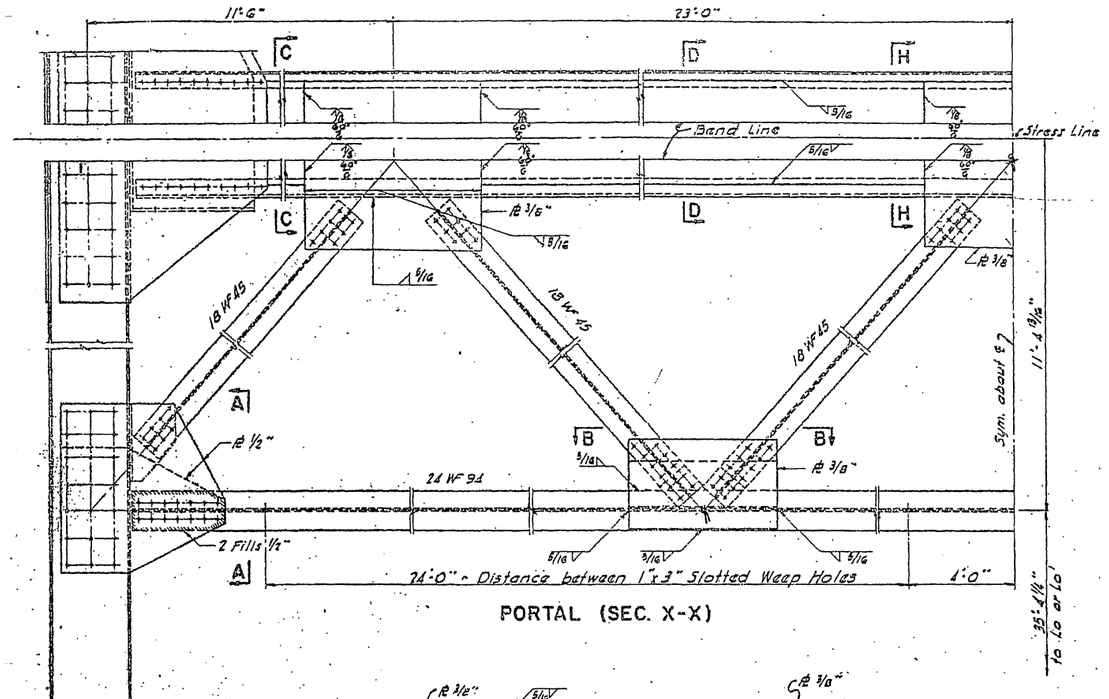
RED RIVER BRIDGE

SKIDMORE AVE.

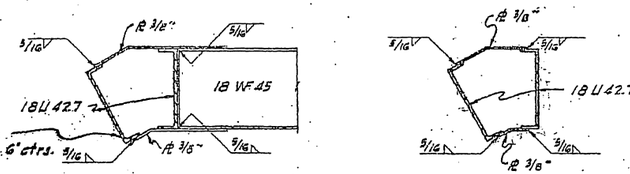
GRAND FORKS, N.D.-E. GRAND FORKS, MINN.

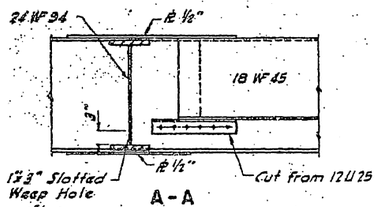
SWAY BRACING

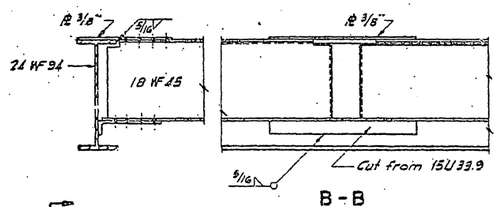
FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N. D.	F-708(1)		20	43

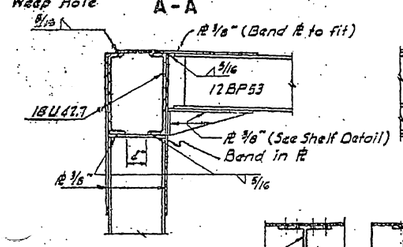


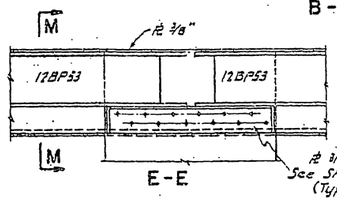
PORTAL (SEC. X-X)

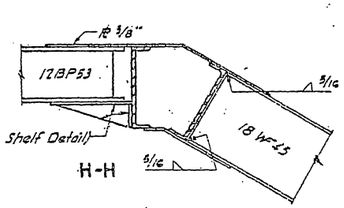


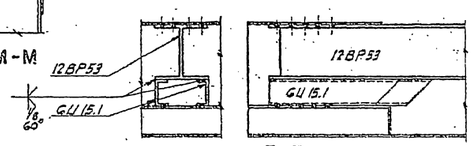




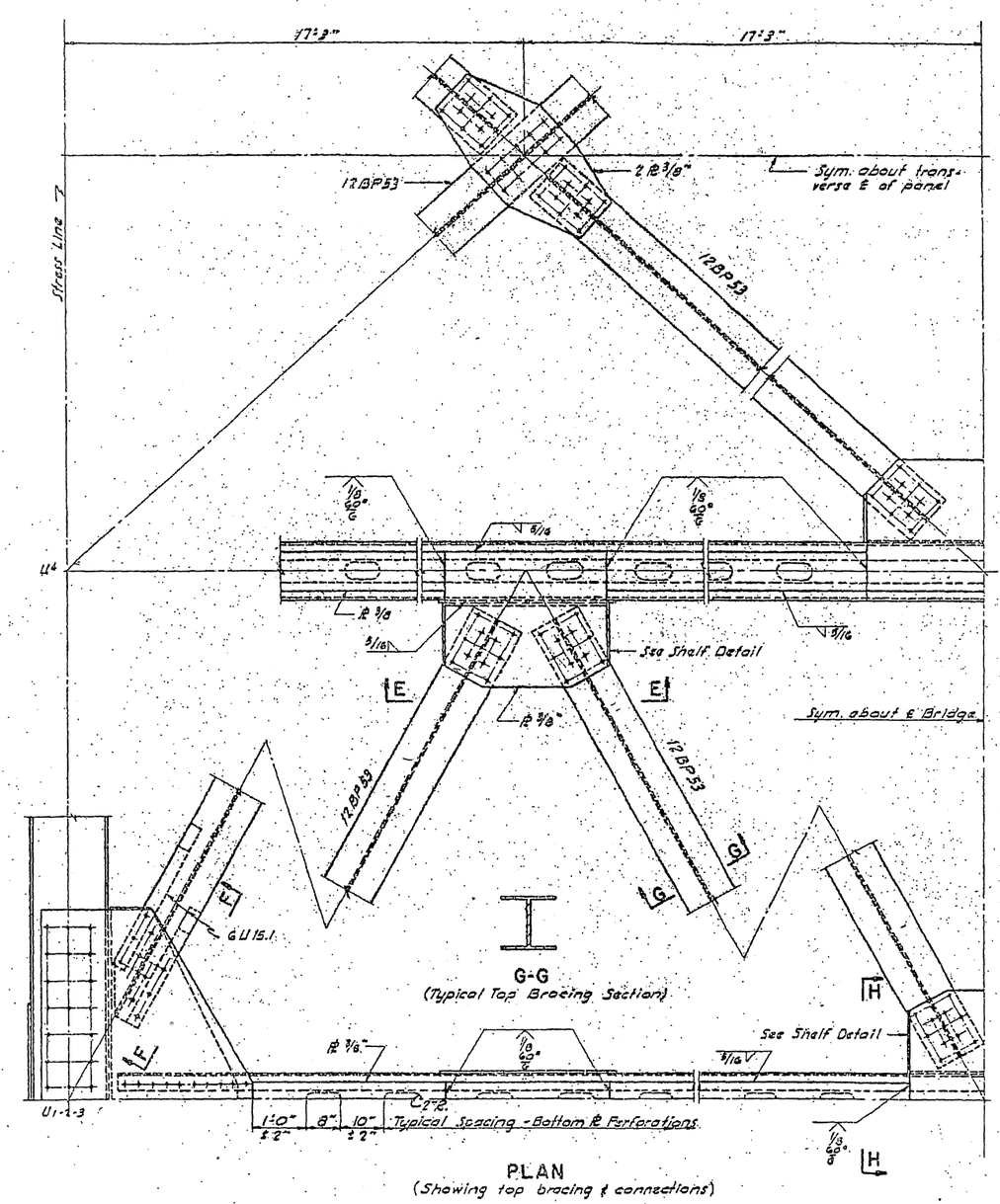








(Typical Top Bracing to Chord Connection)



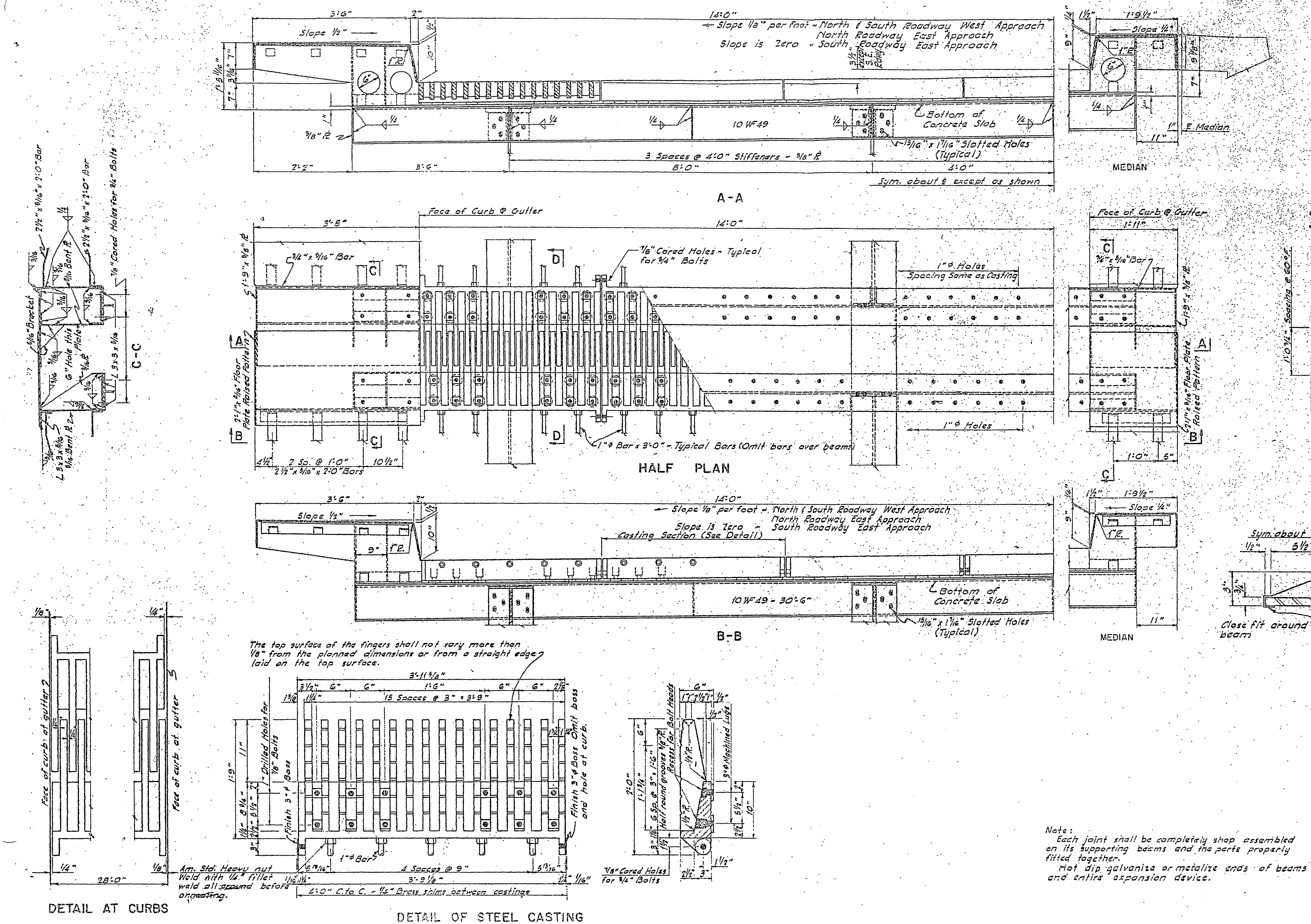
G-G
(Typical Top Bracing Section)

PLAN
(Showing top bracing & connections)

RED RIVER BRIDGE
SKIDMORE AVE.
GRAND FORKS, N.D.-E. GRAND FORKS, MINN.

PORTAL &
TOP LATERAL TRUSS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N.D.	F-708(1)		31	43



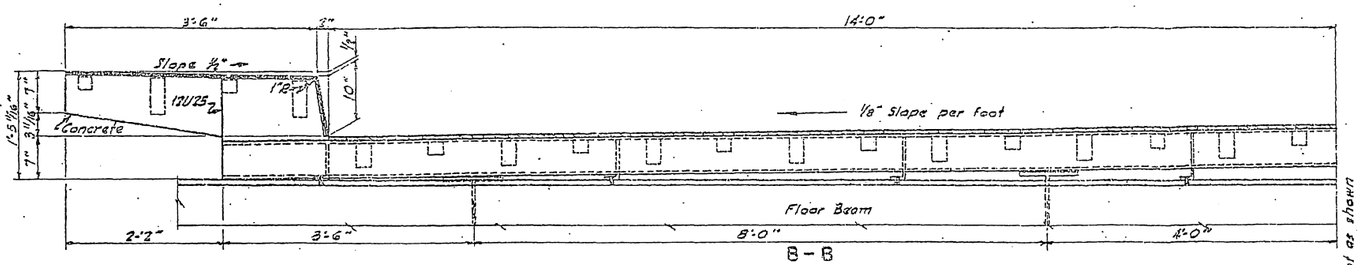
Note:
Each joint shall be completely shop assembled on its supporting beams and the parts properly fitted together.
Hot dip galvanize or metalize ends of beams and entire expansion device.

QUANTITIES

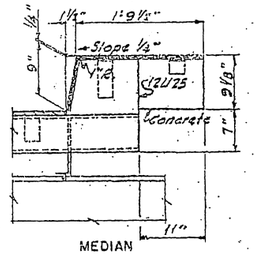
RED RIVER BRIDGE
SKIDMORE AVE.
GRAND FORKS, N.D.-E. GRAND FORKS, MINN.

EXPANSION DEVICE

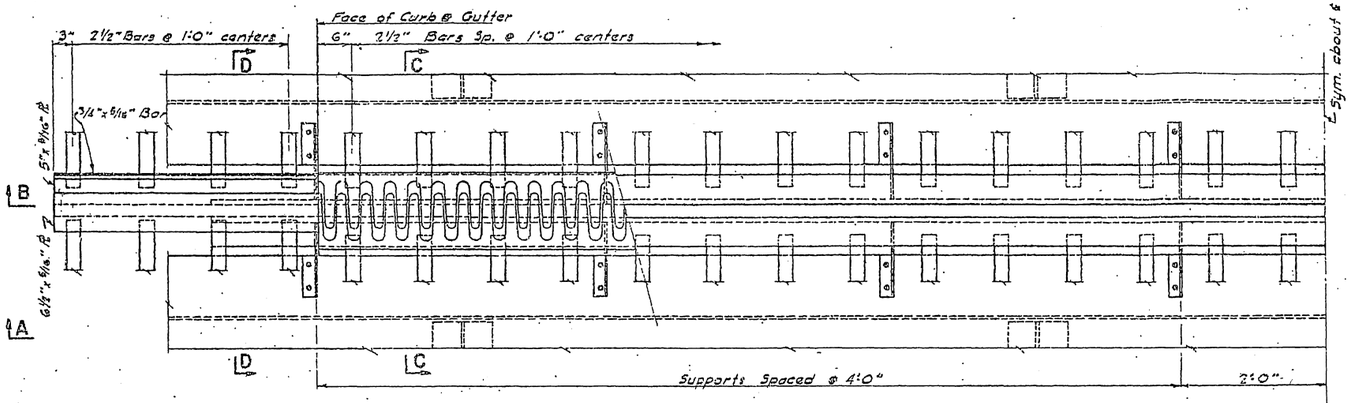
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N.D.	F-708(1)		32	43



B – B

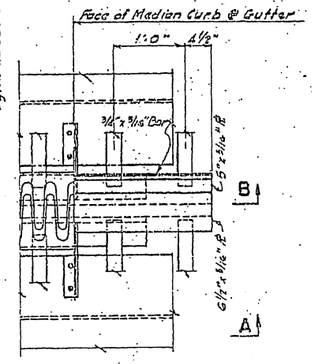


MEDIAN

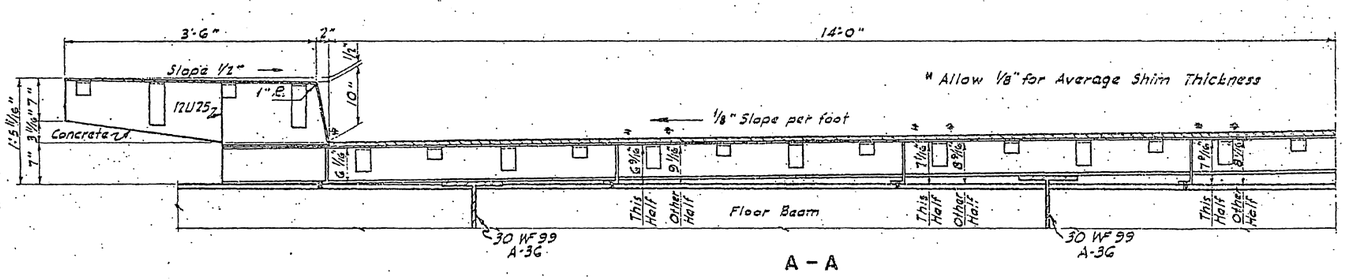


HALF PLAN

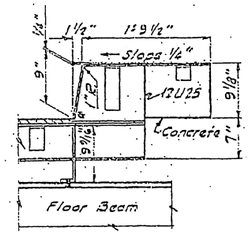
℄ Sym. about ℄ except as shown



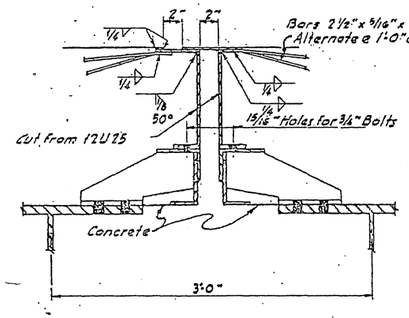
MEDIAN



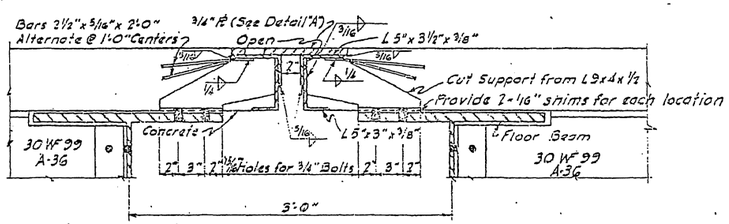
A – A



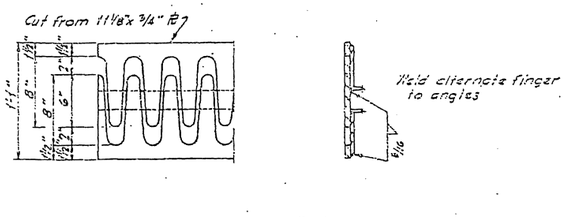
MEDIAN



D – D



C – C



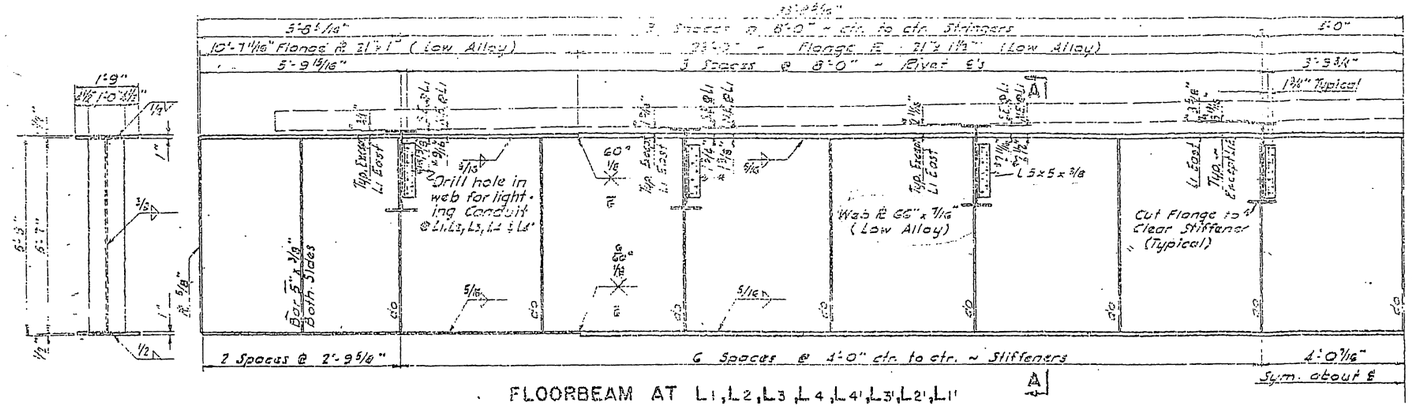
DETAIL "A"

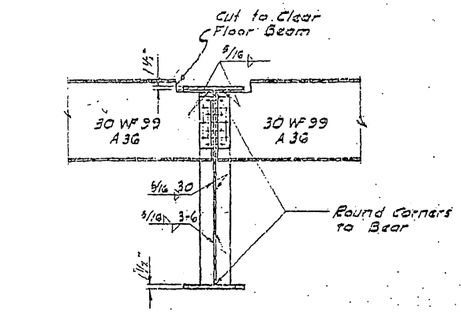
QUANTITIES

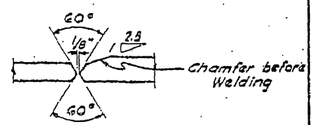
RED RIVER BRIDGE
SKIDMORE AVE.
GRAND FORKS, N.D. - E. GRAND FORKS, MINN.

SLAB JOINT AT PIER #7

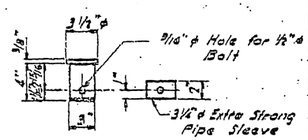
FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N. D.	F-708(1)		33	43



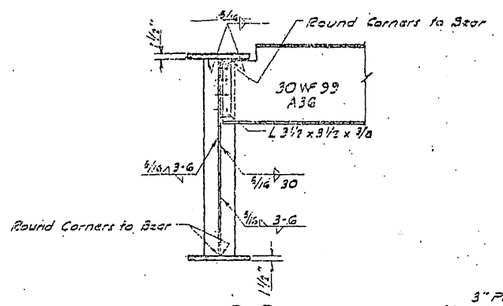


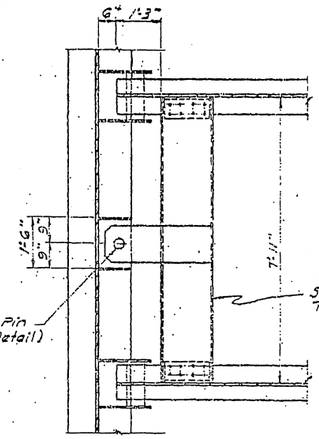


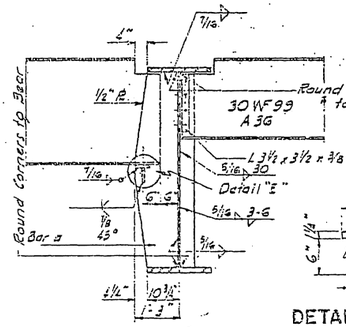
WELDING DETAIL
Shop Flange Splice

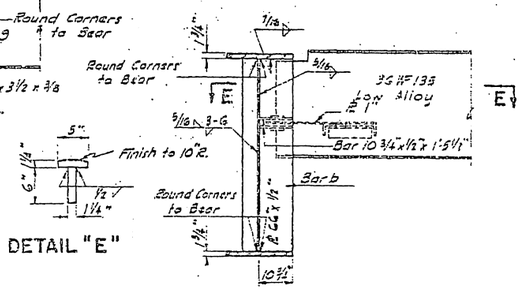


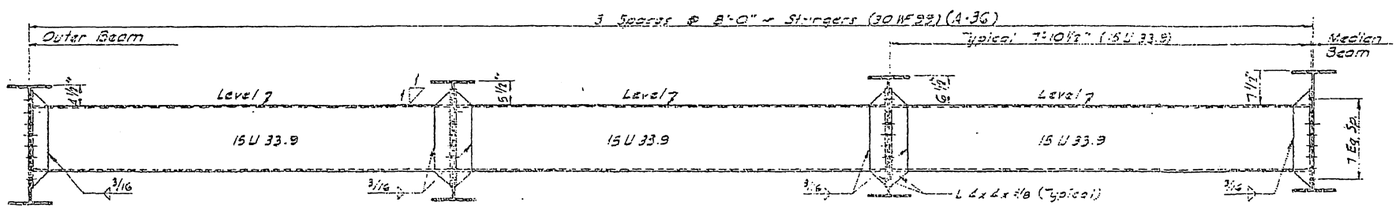
PIN DETAIL











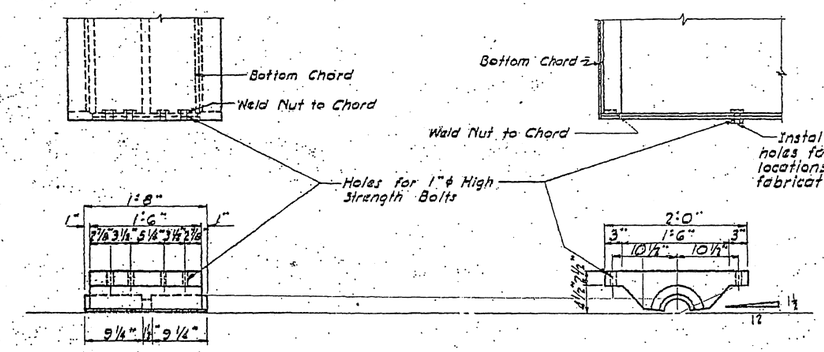
TRUSS FLOOR SYSTEM
Section Showing Diaphragms - Spaced @ Mid Panel - See Plan View Sheet 708(1):17

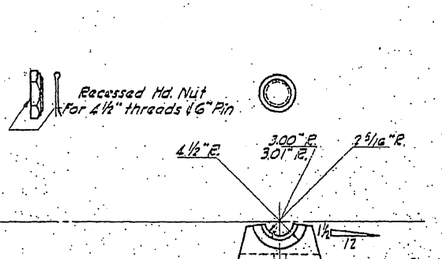
* Includes Dead Load Deflections

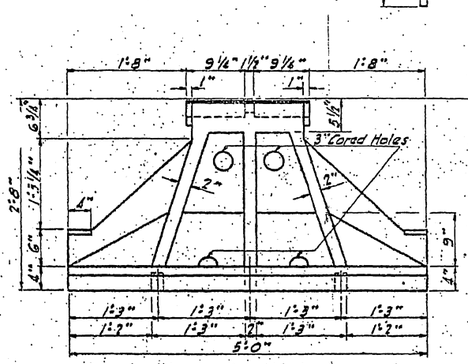
RED RIVER BRIDGE
SKIDMORE AVE.
GRAND FORKS, N.D.-E. GRAND FORKS, MINN.

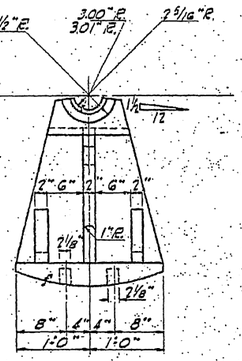
FLOORBEAMS AND FLOOR SYSTEM DETAILS

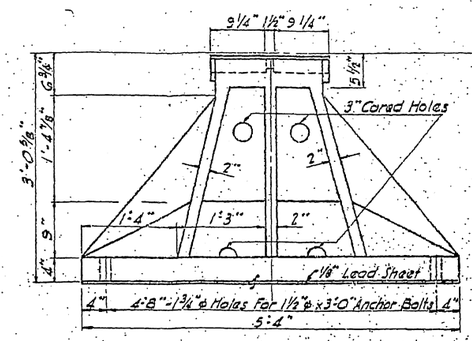
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N.D.	F-709(1)		34	43

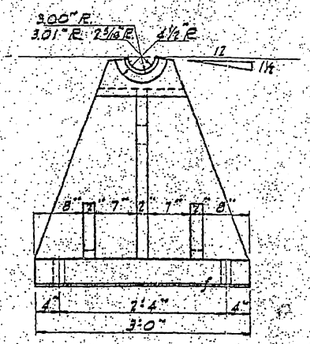






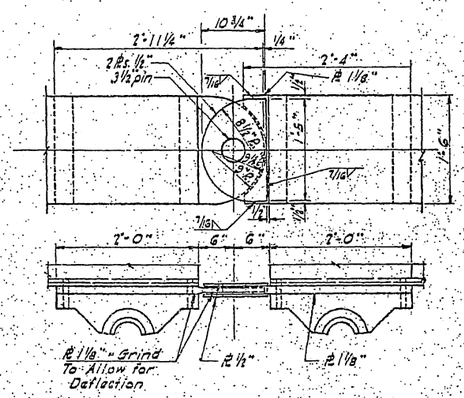




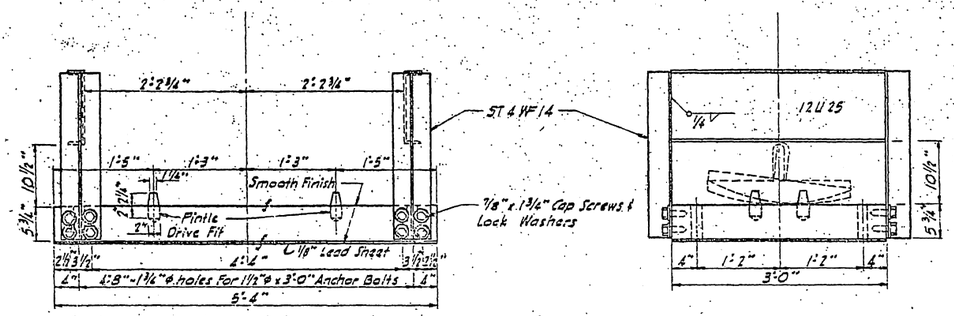


BEARING DETAILS RIVER PIER #7
(North Side Only)

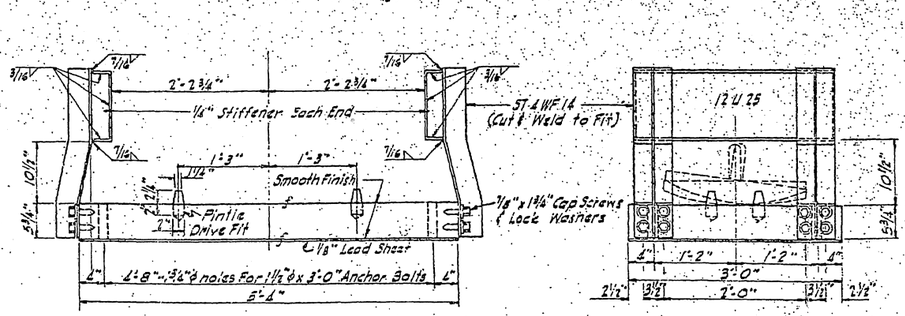
MATERIALS:
Masonry plates for expansion bearing shall be rolled steel plates.
Expansion rockers and fixed shoes shall be cast steel.
Top bolsters may be cast steel or cut from rolled steel plates. In either case the pay weight will be computed as castings.
Lead sheets shall be paid for by the pound as structural steel.
Cast steel shall conform to A.A.S.H.O. M-192, Class 70-36.



SWIVEL DETAILS RIVER PIER #7
(North Side Only)



BEARING DETAILS PIER #6 & #8



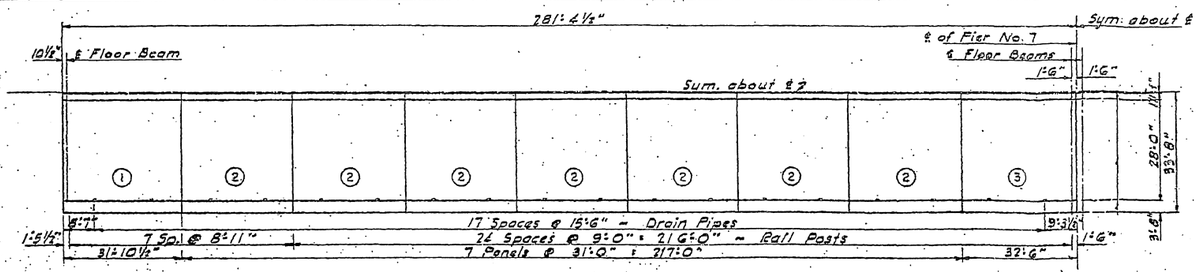
BEARING DETAILS PIER #7
(South Side Only)

QUANTITIES

RED RIVER BRIDGE
SKIDMORE AVE.
GRAND FORKS, N.D.-E. GRAND FORKS, MINN.

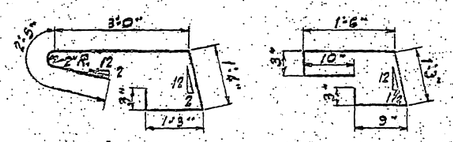
TRUSS BEARINGS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5	N.D.	F-7061		35	43



QUARTER DECK PLAN

SCALE 1" = 20'-0"

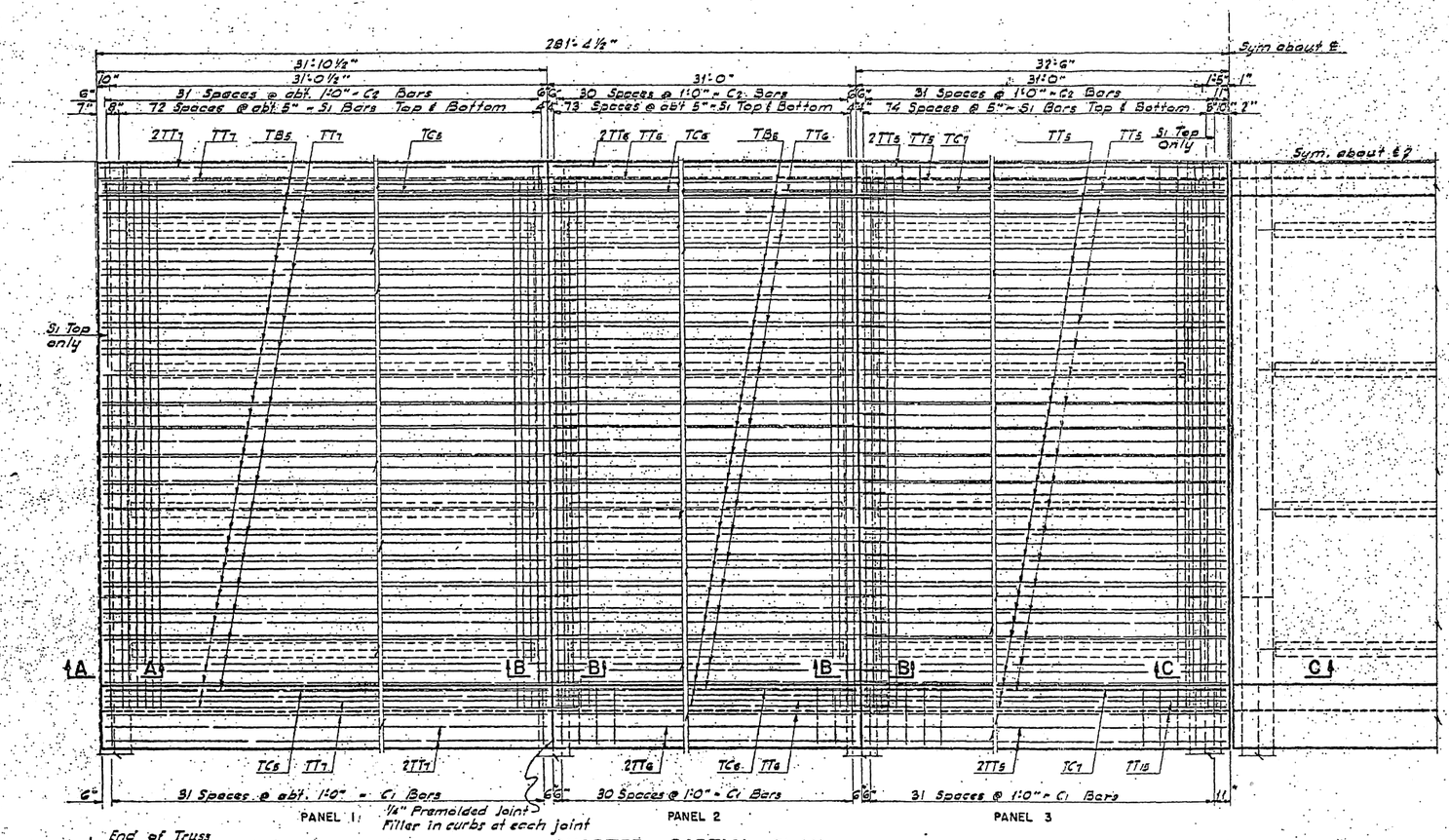


C1 BAR C2 BAR

BENT BAR DETAILS

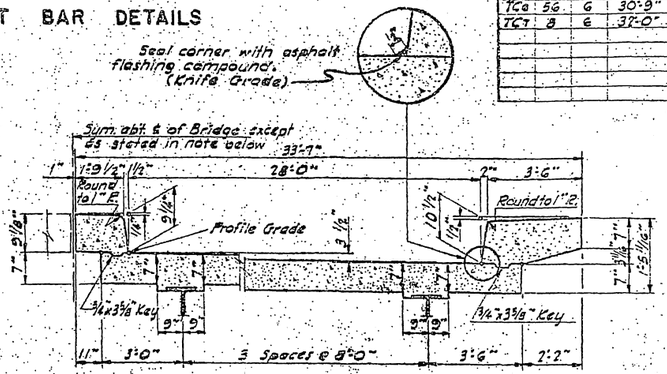
BAR LIST

MARK	NO.	SIZE	LENGTH	SHAPE
C1	1124	5	8'-3"	Bent
C2	1124	4	4'-10"	"
S1	5336	5	30'-2"	Str.
TBs	1124	4	32'-6"	Str.
TTs	116	4	32'-0"	"
TTa	812	4	30'-9"	"
TT1	116	4	31'-6"	"
TCs	8	6	31'-6"	"
TCa	56	6	30'-9"	"
TC1	8	6	32'-0"	"



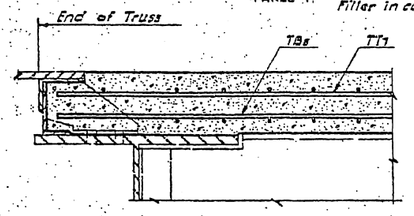
QUARTER PARTIAL PLAN

SCALE ¾" = 1'-0"

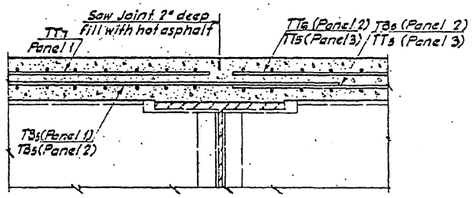


SLAB SECTION

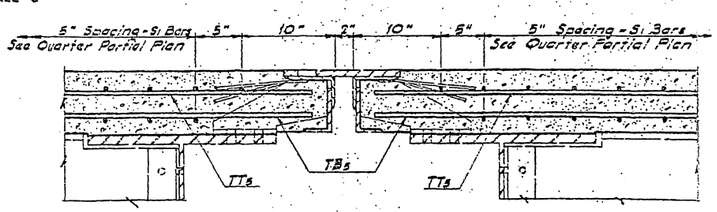
Showing Dimensions



A-A



B-B



C-C

Slab section showing reinforcing steel in truss is the same as the approach spans shown on sheet 708(1)-22.

The south roadway from Sta. 1136+93.5 to Sta. 1137+93.5 shall be warped according to the profile grade and south gutter grade as shown on sheet 708(1)-22.

A camber of ¼" shall be added to the profile grades at the mid-point of all stringers to account for dead load deflection.

The truss floor slab, ½ width (30'-6") shall be poured continuously from end to end of truss.

Contraction joints, located at each floor beam, shall be sawed, preferably, within 18 hours of the time the concrete is poured, but not before the concrete has hardened to the extent that tearing and ravelling is prevented.

Note: For deck drains and quantities see sheet 708(1)-22

QUANTITIES

Concrete Class AE-2	970.0 C.Y.
Reinforcing Steel	232,730 Lbs.

RED RIVER BRIDGE

SKIDMORE AVE.

GRAND FORKS, N.D.-E. GRAND FORKS, MINN.

TRUSS SLAB

Yihong Gao - BR 9090 Update and final summary/ documentation

From: Joe Litman <Joe.Litman@lhbcorp.com>
To: "Yihong Gao" <Yihong.Gao@dot.state.mn.us>
Date: Wednesday, September 09, 2009 5:41 PM
Subject: BR 9090 Update and final summary/ documentation
CC: "Lisa Marynik" <Lisa.Marynik@lhbcorp.com>

Yihong,

Attached for your records is our final summary and checked documentation for the BR 9090 analysis work associated with the bearing location at L0. Though the result has not changed (a move of 7" more for total from original move of 14" for the bearing is still verified acceptable) the numbers herein vary from what you were emailed previously due to a couple more items we found and investigated while final checking and assembling. The primary change is an increase in the floor beam dead load contribution at joint L0. This increase is due to two items, the first being the need to include the dead load from the first truss panel which is shared 50/50 between joint L1 floorbeam and joint LO floor beam but was not included in our earlier run and the second being an increase in the back (approach) span dead load for the span leading to the truss as our initial calculation utilized a 7" deck and we believe the approach span was also overlayed to a 9" slab just as the truss was so have adjusted that dead load accordingly. Note that truck load loading cases have also been removed as they do not govern for any instance. In the end as I mentioned previously though the rating factors etc do change the result as to what adjustment in the bearing location can be made remains the same. In any case it is important the records reflect our best interpretation/ analysis of the conditions which is what these now reflect.

I have also put a hard copy of all this in the mail to you so you will not have to print out and assemble this. Also, I'll give you a call to make sure you have no further questions and that the revisions are understood.

Thanks, Joe

21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

September 9, 2009

Yihong Gao
Minnesota Department of Transportation
Office of Bridges and Structures, MS 610
3485 Hadley Avenue North
Oakdale, MN 55128-3307

Bridge 9090
Bearing Location/ L0 Gusset Check

Yihong,

Enclosed please find a copy of our hand and electronic file calculations for the review of the joint L0 gusset of Bridge 9090. As requested our review was performed to assess the impacts of the currently located support bearing, which is 7" from original location and to assess if the bearing could be moved an additional 7" or further. The results of our analysis work are detailed in the enclosed calculations consisting of:

10 pages of hand calculations and joint geometry/ loading diagrams
15 pages of hand calculations and program output summarizing loads used
12 pages of excel Gusset Check file output

In summary the findings indicate the controlling ratings for the joint L0 gusset are relatively unchanged for bearing position at the original location, the current 7" moved location and for an additional move of up to 7" (resulting in a total move from original construction of 14". The analysis does however indicate that a total move from original beyond 14" (7" from existing) cannot be accommodated and would result in very unsatisfactory ratings for the gusset. As an example for a capacity reduction of 5% to account for age/ deterioration the Critical Operating Rating Factors are as follows:

Bearing Location	**Joint L0 Critical Operating RF (CRF = .95)**
Original Const. Loc.	1.38
7" from original Loc.	1.41
14" from original Loc.	1.41
21" from original Loc.	0.42

As you review these items please do not hesitate to call if you have any questions.

Sincerely
LHB, Inc.

Joseph D. Litman P.E.

Enclosures
c: LHB Project No. 070745.3

21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
Fax 612 338-2088

PROJECT BR 9090 - JOINT L0 GUSSET - ORIGINAL POSITION

PROJECT # 070745/090173 DATE 08/31/09 BY LMM SHEET NO. 01 OF 10

✓ 9/3/09 JDL

① BRIDGE INFORMATION:
- BUILT IN 1963
- GUSSET PLATE = LOW ALLOY STEEL (ϕF_y = 50 KSI, F_u = 75 KSI)
- CHORD MEMBERS: ϕF_y = 36 KSI (Bottom chord @ L0 is Q&T steel, higher yield insig. though) JDL
- HIGH STRENGTH BOLTS (ϕF_s = 25 KSI)
  - NO BOLT INFO FOUND - ASSUME DIA = 7/8", HOLE DIA = 1"
- SEE SHEETS 4 AND 5 FOR GEOMETRY AND LOADING.
  - LANE LOAD CREATES THE MAXIMUM LIVE LOAD IN THE TRUSS MEMBERS

CASE LN1: - WHEN THE CONCENTRATED LOAD IS PLACED AT L0, MAXIMUM BEARING RXN IS ACHIEVED ✓

CASE LN2 - WHEN THE CONCENTRATED LOAD IS PLACED AT L1, MAXIMUM LIVE LOAD IN TRUSS MEMBERS IS ACHIEVED. ✓

- RATINGS RECORDED BASED ON 5% SECTION LOSS

② TENSION - NO CHECK
- THE BOTTOM CHORD IS THE ONLY TENSION MEMBER. IT IS FULLY WELDED TO THE GUSSET PLATE AND NOT SPLICED AT THE CENTER OF THE JOINT. ✓

③ FLEXURE:

A-A - LOAD CASE LN1 CREATES LOWEST RATING ON A-A ✓

$A_g = 2 \times (0.625") \times (59.75") = 74.7\ in^2$ $\quad y = \frac{1}{2}(59.75") = 29.9"$

$I_g = 2\left(\frac{1}{12}\right)(0.625")(59.75")^3 = 22220\ in^4$

USING THE LOADS ABOVE THE CUT: (T-LN1)

$P_{DL} = 255.5^k + 830.2^k = 1085.7^k$

$P_{LL} = 118.0^k + 149.6^k = 267.6^k$

$M_{DL} = 255.5^k(29.9" - 12") + 830.2^k(29.9" - 25") = 8614.3\ k\text{-in}$ ✓

$M_{LL} = 118.0^k(29.9" - 12") + 149.6^k(29.9" - 25") = 2838.6\ k\text{-in}$

$RF_{INV} = 0.84$ $\quad RF_{OP} = 1.41$ ✓

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21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
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612 338-2029
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PROJECT BR 9098 - JOINT L0 GUSSET - ORIGINAL POSITION

PROJECT # 070745/090173 DATE 08/31/09 BY LMM SHEET NO. 02 OF 10

9/3/09 JDL

SECTION A-A (CONTINUED)

USING THE LOADS BELOW THE CUT: (B-LN1)

$P_{DL} = 1085.7^K$

$P_{LL} = 267.6^K$

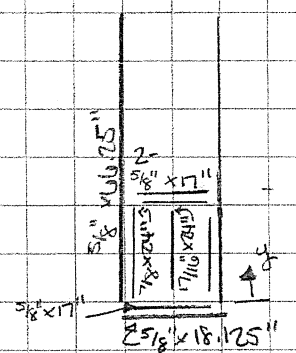
$M_{DL} = (1085.7^K)(29.9" - 12") - 735.9^K(14.5") = 8736.3\ K\text{-IN}$

$M_{LL} = (267.6^K)(29.9" - 12") - 133.0^K(14.5") = 2854.9\ K\text{-IN}$

$RF_{INV} = 0.183$ $RF_{TOP} = 1.38$ ✓

SECTION B-B · USING LOAD CASE LN1, AND THE LOADS TO THE RIGHT OF THE CUT

· SECTION IS COMPOSED OF GUSSETS AND BOT. CHORD BUT NOT WF ABOVE CHORD



SECTION PROPERTIES CALCULATED IN EXCEL WKSHT

$y = 21.1"$ (FROM BOTTOM) $A = 193.98\ IN^2$

$I = 62698\ IN^4$

$P_{DL} = 736.6^K - 735.9^K = 0.7^K$ $M_{DL} = 0.7(21.1" - 12") = 6.4\ K\text{-IN}$

$P_{LL} = |132.7 - 133.0|^K = 0.3^K$ $M_{LL} = 0.3(21.1" - 12") = 2.7\ K\text{-IN}$

$RF_{INV} = 6390$ $RF_{TOP} = 10667$ ✓

(using conserv. Chord F_y of 36 ksi)

SECTION C-C · USE LN2 LOADS

$y = \frac{1}{2}(35.75" + 29") = \frac{1}{2}(64.75") = 32.4\ IN$

$A = 2(0.625")(64.75") = 80.9\ IN^2$ $I = 2(\frac{1}{12})(0.625")(64.75")^3 = 28278\ IN^4$

$P_{DL} = (\frac{45}{78})1109.9^K = 640.3^K$ $M_{DL} = 640.3^K(32.4" - 29") = 2161\ K\text{-IN}$

$P_{LL} = (\frac{45}{78})257.8^K = 148.7^K$ $M_{LL} = 148.7^K(32.4" - 29") = 502\ K\text{-IN}$

$RF_{INV} = 6.49$ $RF_{TOP} = 10.84$ ✓

21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
612 338-2029
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PROJECT BR 9090 - JOINT L0 GUSSET - ORIGINAL POSITION

PROJECT # 070745/090173 DATE 08/31/09 BY LMM SHEET NO. 03 OF 10
✓ 9-3-09 JOL

(4) SHEAR: ⊕ CONSERVATIVE CALCULATION

D-D: - END ANGLE AND PLATE ARE IGNORED AS WELL AS WELDING OF GUSSET TO MEMBER
- LOADS ARE TAKEN BELOW THE CUT

(Load Case LN2)

P_{DL} = 735.9 k t_g = 5/8" N_R = 1 (ANGLE)

P_{LL} = 159.1 k W_g = 60"

RF_{INV} = 1.44 RF_{OP} = 2.40 ✓

E-E: DO NOT CHECK
- NO SPLICE IN BOTTOM CHORD THROUGH SECTION

(5) BLOCK SHEAR: NO CHECK - TENSION MEMBER WELDED

(6) EDGE BUCKLING:

RIGHT EDGE: b = 23", NO STIFFENING REQUIRED ✓

(7) BUCKLING: NO CHECK
- VERT. & DIAG. MEMB'S MILLED TO BEAR ON L0-L1

(8) RIVETS (0% SECTION LOSS)

L0-U1: P_{DL} = 1109.9 k N_S = 78 $L_C = 3\frac{3}{8}" - 1" = 2\frac{3}{8}"$

P_{LL} = 257.8 k N_{DS} = 0 ✓

RF_{INV} = 1.61 RF_{OP} = 2.69

SUMMARY:

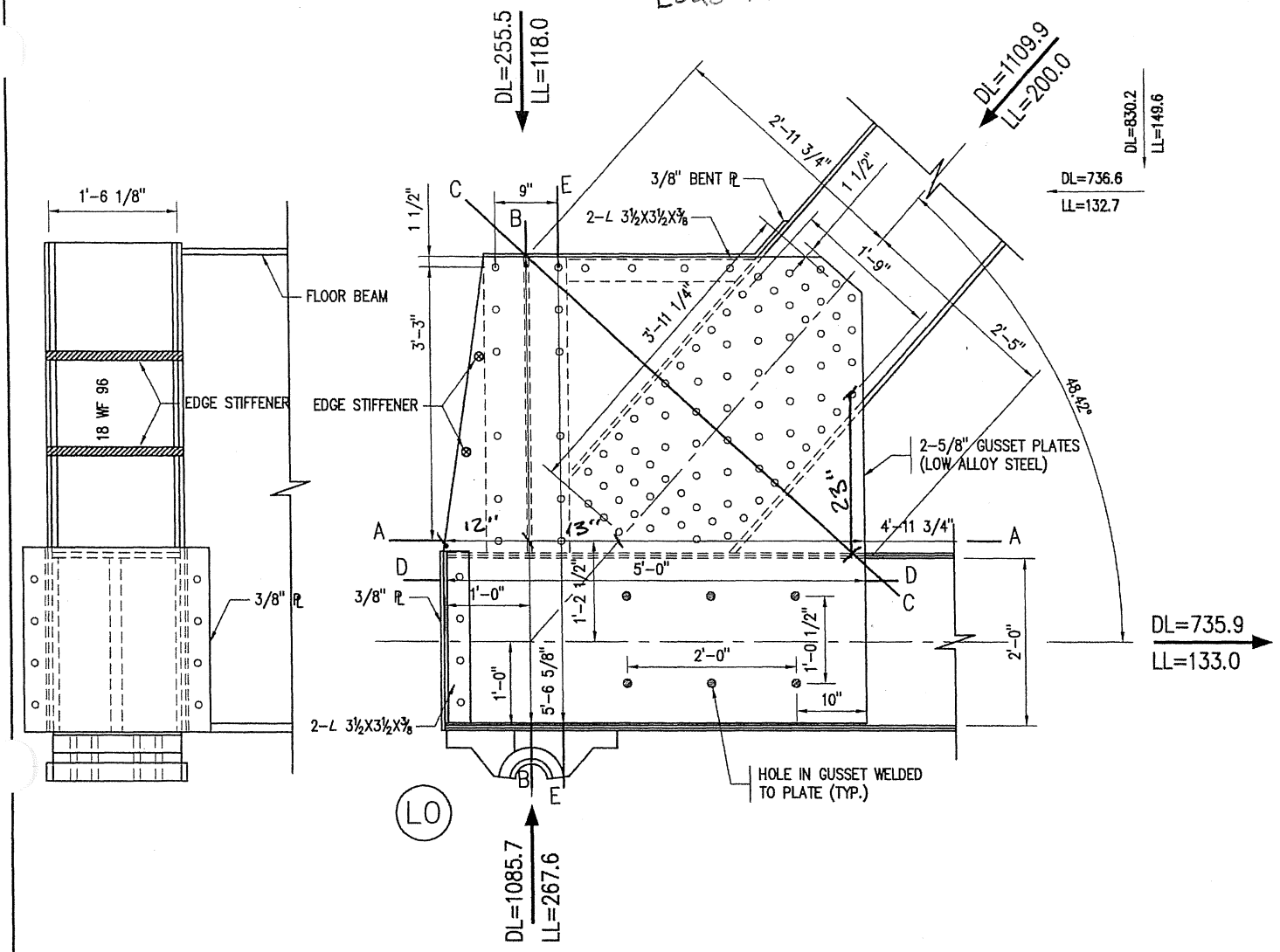
FLEXURE SECTION A-A CONTROLS (LOAD CASE LN1)
RF_{INV} = 0.83 RF_{OP} = 1.38 ✓

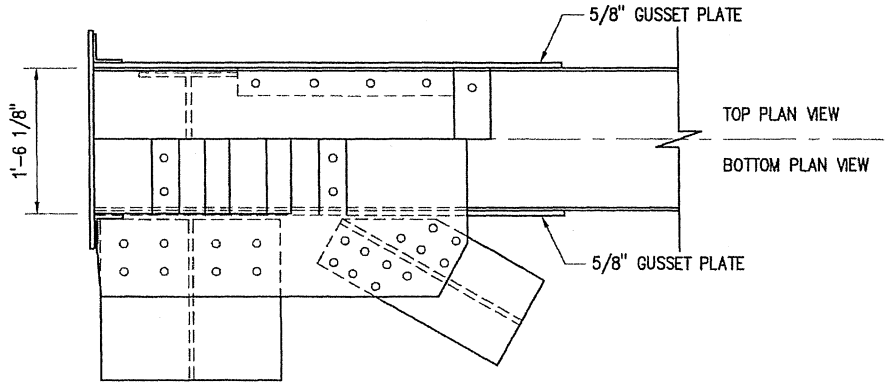
FLEXURE SECTION (A-A)
FLEXURE SECTION (B-B)

LOAD CASE LN1

4/10

Lane Load Conc.
Load Placed at L0





JOINT L0

SCALE: 0 2'

VJOL 9/3/09

DATE: 08/31/09

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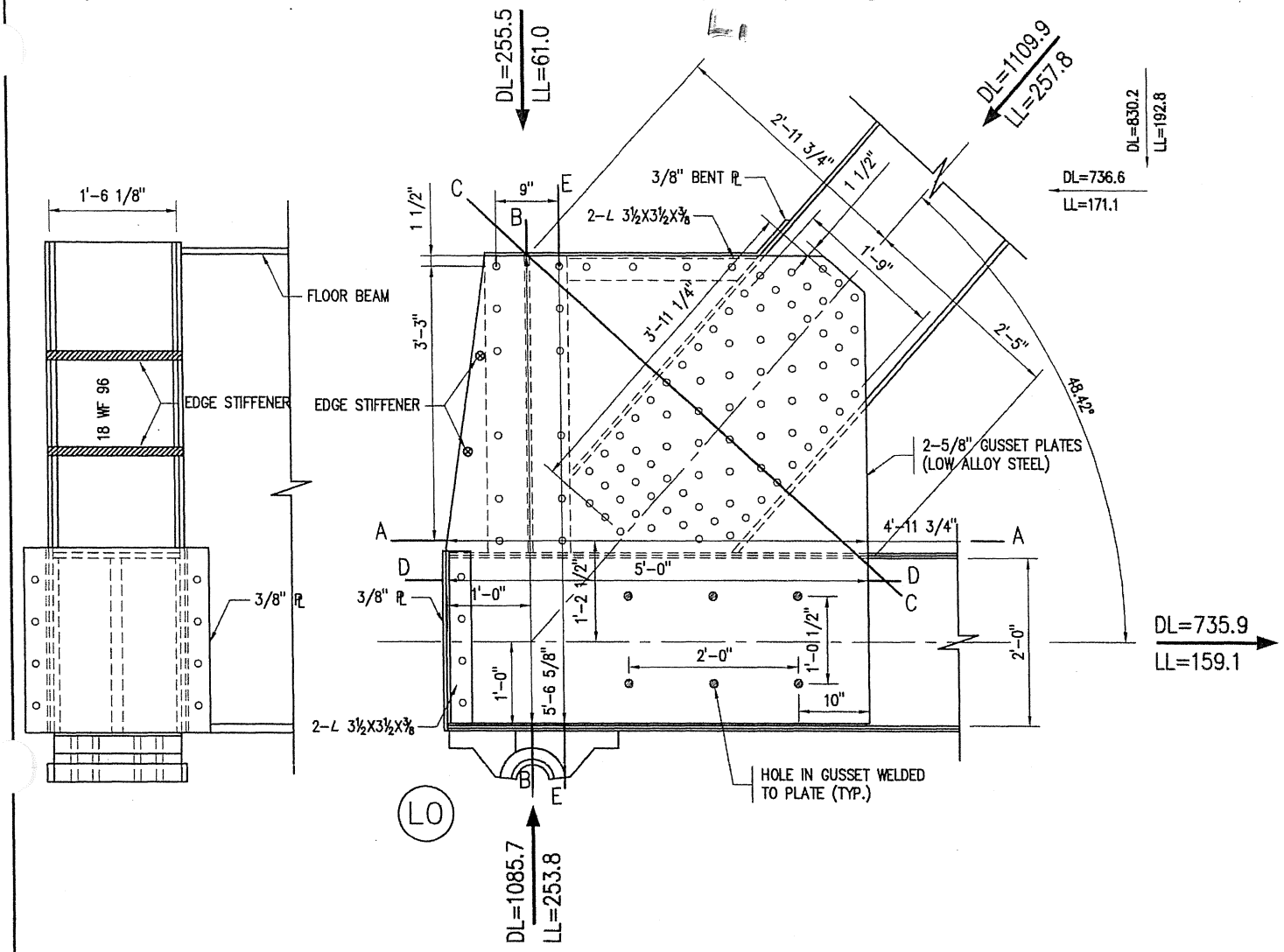
TITLE:			
JOINT L0 (ORIGINAL POSITION - LANE LOAD W/ CONC. LOAD @ L0)	DR: LMM CHK: JDL	APPROVED:	Bridge No. 9090
	Sheet No. 04 of 10 Sheets		

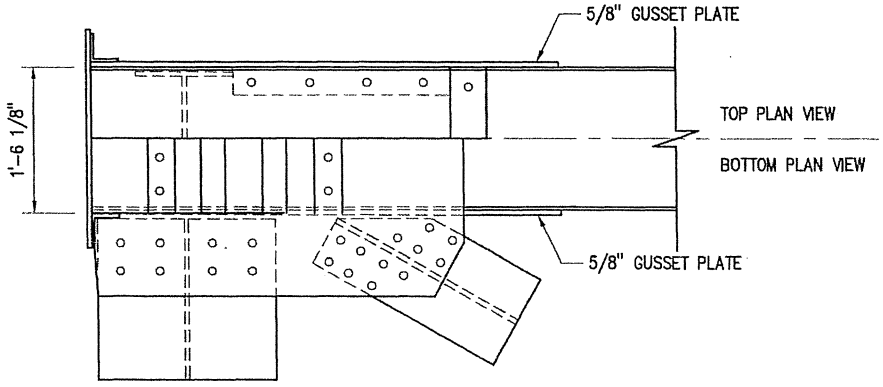
FLEXURE SECTION C-C
SHEAR SECTION D-D
RIVETS (LO-U1)

LOAD CASE LN2

5/10

Lane Load Conc.
Load Placed at
L1





JOINT LO

SCALE: 0 2'

VJDL 9/3/09

DATE: 08/31/09

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TITLE:			
JOINT LO (ORIGINAL POSITION – LANE LOAD W/ CONC. LOAD @ L1)	DR: LMM CHK: JDL	APPROVED:	Bridge No. 9090
	Sheet No. 05 of 10 Sheets		

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218 727-8446
Fax 218 727-8456
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612 338-2029
Fax 612 338-2088

PROJECT BR 9090 - JOINT LO GUSSET - MOVED BEARING

PROJECT # 070745/090173 DATE 08/31/09 BY LMM SHEET NO. 06 OF 10

✓ 9/3/09 JDL

- BEARING WAS MOVED 7" FROM ITS ORIGINAL POSITION
- MN/DOT DESIRES TO MOVE IT 7" MORE, AND POTENTIALLY 7" AFTER THAT ✓

- THE FLEXURE SECTIONS A-A (B-LN1) AND B-B (LN1) ARE THE ONLY RATINGS THAT WILL BE AFFECTED
  - REFER TO SHEET 02 FOR ORIGINAL CALCULATION.

SECTION A-A (ONLY MOMENTS CHANGE FROM ORIG.)

7" MOVE: $M_{DL} = (1085.7^K)(29.9" - 19") - 735.9^K(14.5") = 1136.4\ K\cdot IN$ ✓
$M_{LL} = (267.6^K)(29.9" - 19") - 133.0^K(14.5") = 981.7\ K\cdot IN$

$RF_{INV} = 2.50$ $RF_{OP} = 4.18$

14" MOVE: $M_{DL} = -(1085.7^K)(29.9" - 26") + 735.9^K(14.5") = 6463.5\ K\cdot IN$
$M_{LL} = -(267.6^K)(29.9" - 26") + 133.0^K(14.5") = 891.6\ K\cdot IN$

$RF_{INV} = 1.81$ $RF_{OP} = 3.01$ ✓

21" MOVE: $M_{DL} = (-1085.7^K)(29.9 - 33") + 735.9(14.5") = 14063\ K\cdot IN$
$(-267.6^K)(29.9 - 33") + 133.0^K(14.5") = 2765\ K\cdot IN$

$RF_{INV} = 0.25$ $RF_{OP} = 0.42$ ✓

SECTION B-B (ASSUME $P_{DL} = P_{LL} = 0$, LOADS SHOULD CANCEL)

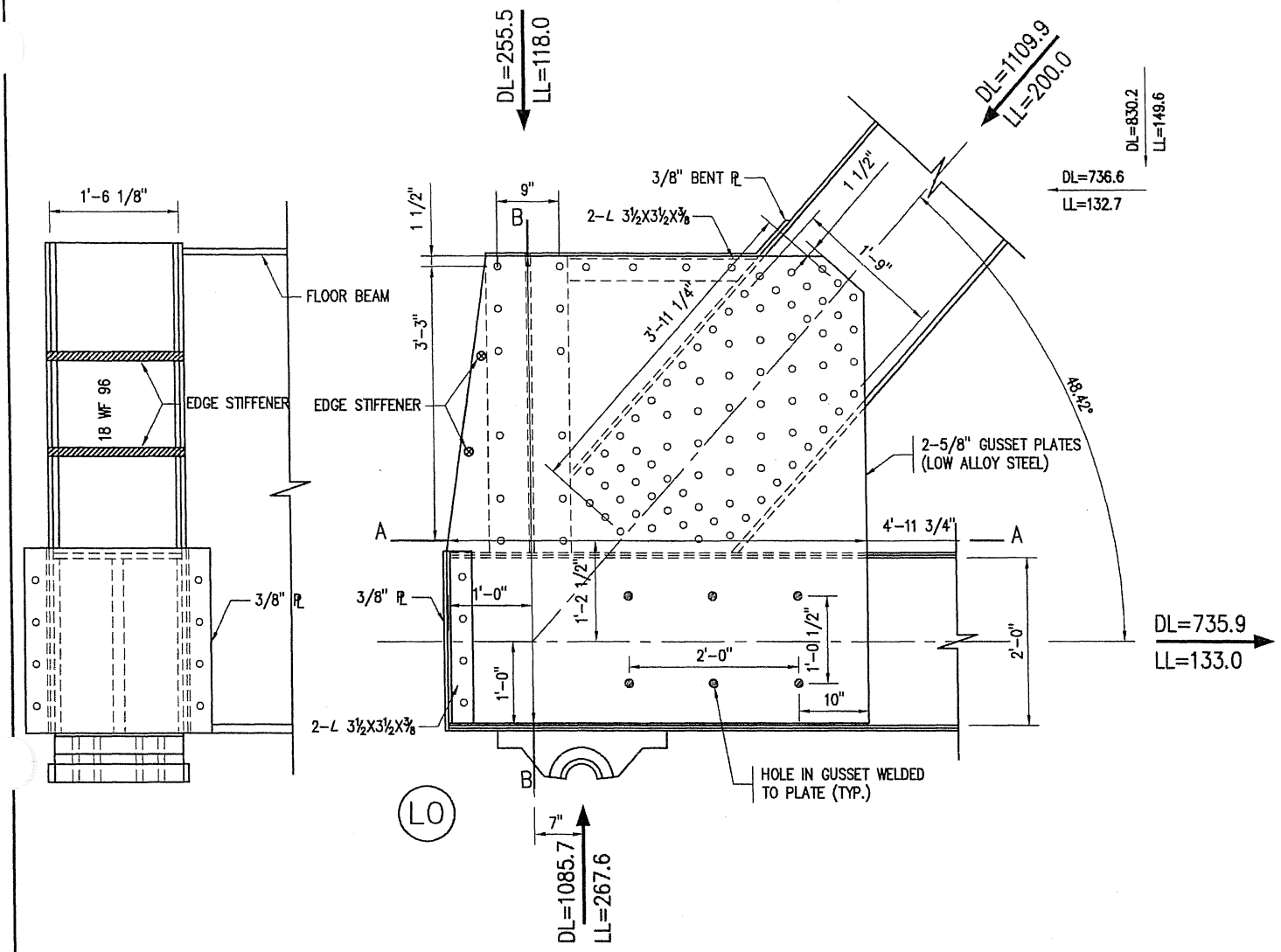
7" MOVE: $M_{DL} = 1085.7^K(7") = 7600\ K\cdot IN$
$M_{LL} = 267.6^K(7") = 1873\ K\cdot IN$ $RF_{INV} = 22.57$ $RF_{OP} = 57.67$ ✓

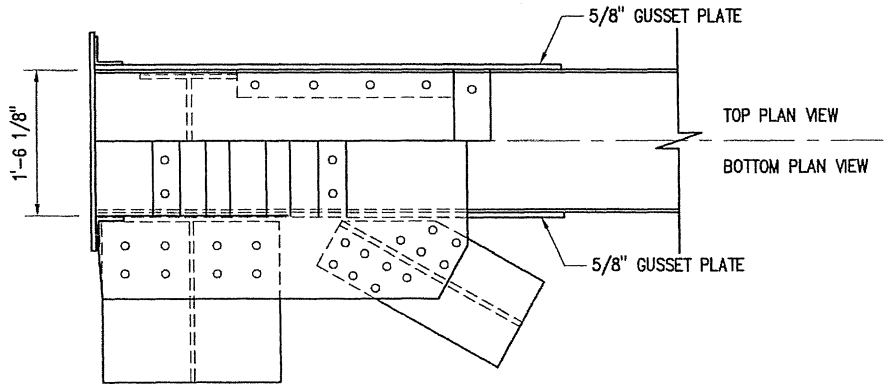
14" MOVE: $M_{DL} = 1085.7^K(14") = 15200\ K\cdot IN$
$M_{LL} = 267.6^K(14") = 3746\ K\cdot IN$ $RF_{INV} = 10.07$ $RF_{OP} = 16.81$ ✓

21" MOVE: $M_{DL} = 1085.7^K(21") = 22800\ K\cdot IN$
$M_{LL} = 267.6^K(21") = 5620\ K\cdot IN$ $RF_{INV} = 5.90$ $RF_{OP} = 9.85$

FLEXURE A-A
" B-B

LOAD CASE LN1
7/10





JOINT LO

SCALE: 0 2'

DATE: 08/31/09

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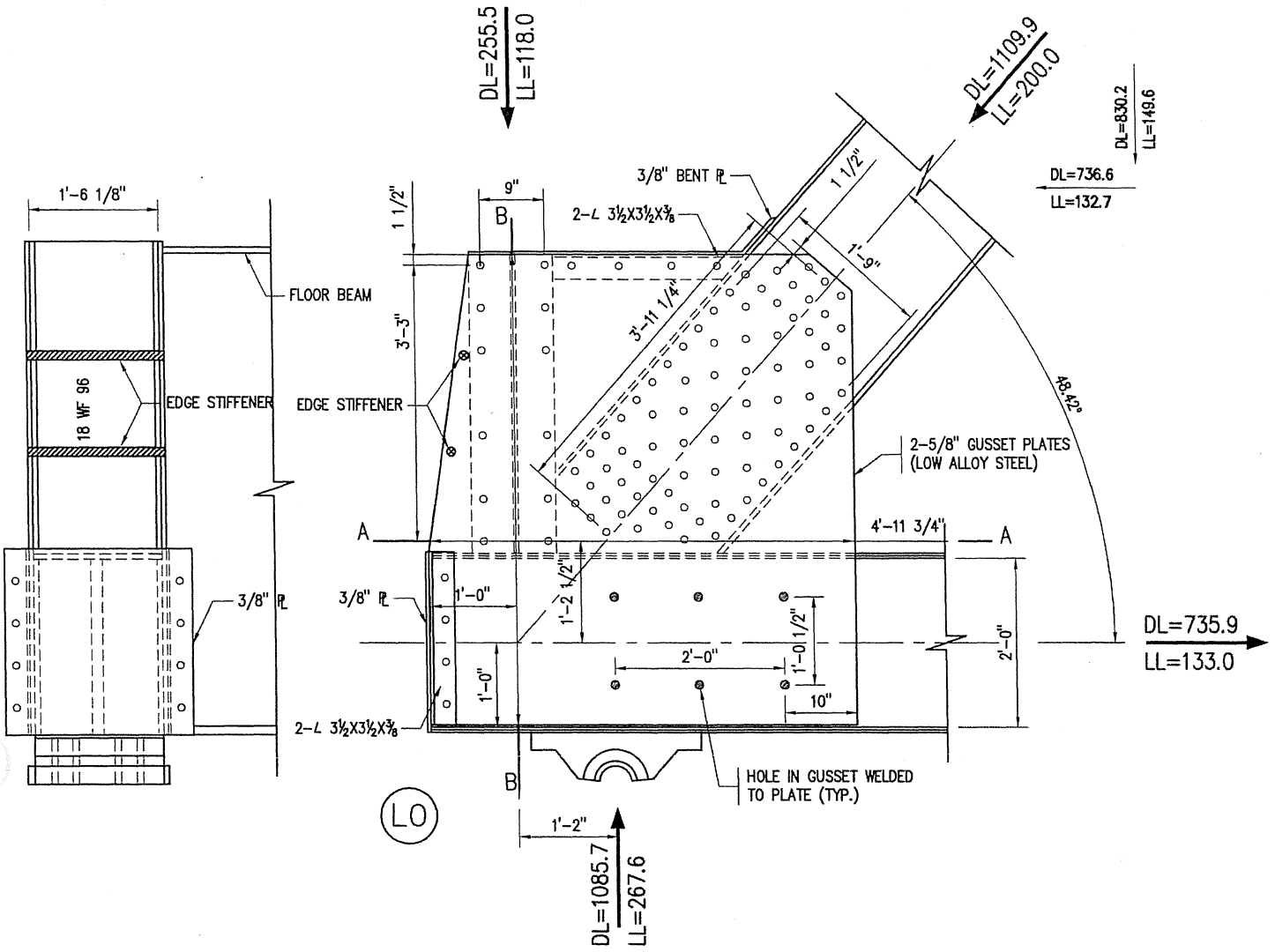
DULUTH ▫ MINNEAPOLIS
21 W. Superior St., Ste. 500, DULUTH, MN 55802
TEL 218/727-8446 ▫ FAX 218/727-8456

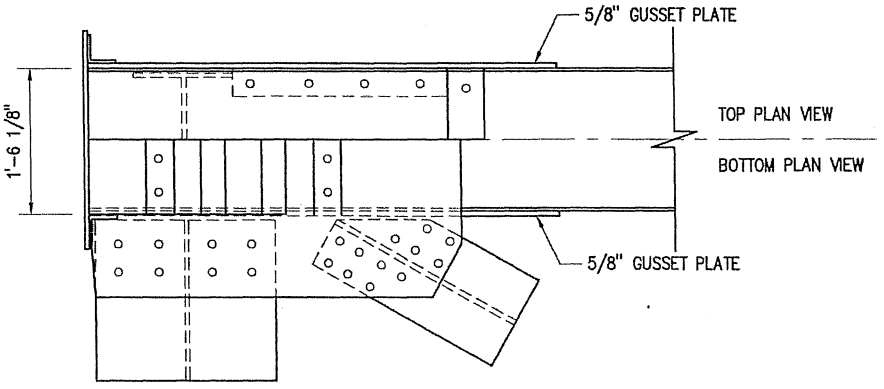
TITLE:			
JOINT LO (BEARING MOVED 7" - LANE LOAD W/ CONC. LOAD @ LO)	DR: LMM CHK: JDL	APPROVED:	Bridge No. 9090
	Sheet No. 07 of 10 Sheets		

FLEXURE A-A
" B-B

LOAD CASE LN1

8/10





JOINT LO

SCALE: 0 2'

√JDL 9/3/09

DATE: 08/31/09

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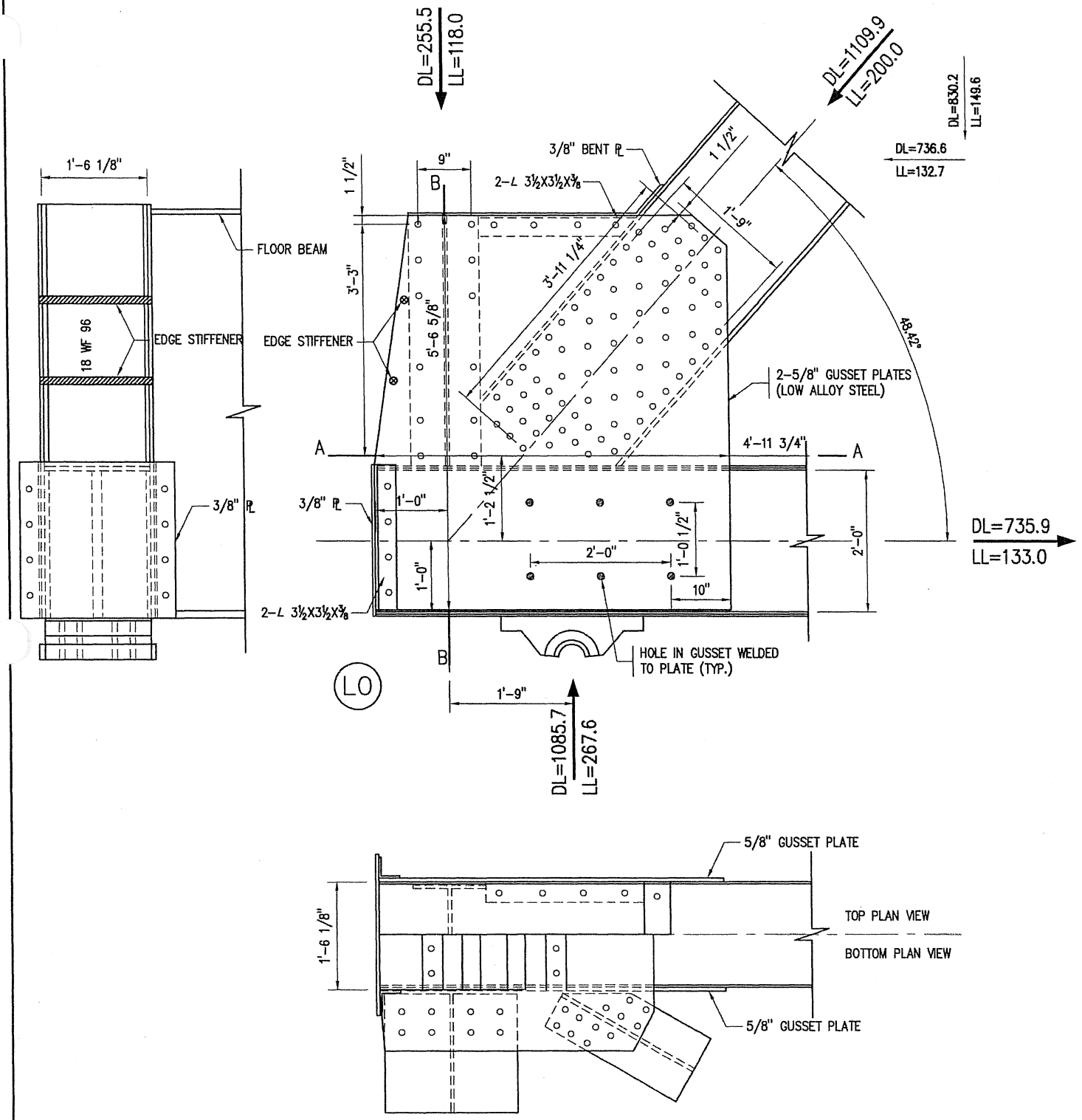
DULUTH ▫ MINNEAPOLIS
21 W. Superior St., Ste. 500, DULUTH, MN 55802
TEL 218/727-6446 ▫ FAX 218/727-6456

TITLE:			
JOINT LO (BEARING MOVED 14" – LANE LOAD W/ CONC. LOAD @ LO)	DR: LMM CHK: JDL	APPROVED:	Bridge No. 9090
	Sheet No. 08 of 10 Sheets		

FLEXURE A-A
" B-B

LOAD CASE LN1

9/10



JOINT LO

SCALE: 0 2'

JDL 9/3/09

DATE: 08/31/09

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TITLE:			
JOINT LO (BEARING MOVED 21" – LANE LOAD W/ CONC. LOAD @ LO)	DR: LMM CHK: JDL	APPROVED:	Bridge No. 9090
	Sheet No. 09 of 10 Sheets		

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Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
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PROJECT BR 9090 - GUSSET LO

PROJECT # 070745/090173 DATE 08/31/09 BY LMM SHEET NO. 10 OF 10

9/3/09 JDL

SUMMARY:

- FLEXURE SECTION A-A CONTROLS THE PLATE
- IT IS NOT RECOMENDED TO MOVE THE BEARING MORE THAN AN ADDITIONAL 7" (14" FROM ORIG. POSITION)
- THE RATING FOR THE PLATE AFTER THIS MOVE WILL BE AS FOLLOWS:

5% SECTION LOSS	10% SECTION LOSS
$RF_{INV} = 0.84$	$RF_{INV} = 0.53$
$RF_{OP} = 1.141$	$RF_{OP} = 0.89$

- NOTE THAT THESE RATING FACTORS ARE CALCULATED USING THE LOADS ABOVE THE SECTION CUT AND NOT THE LOADS FROM THE BEARING RXN.

21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

250 3rd Avenue North, Suite 450
Minneapolis, Minnesota 55401
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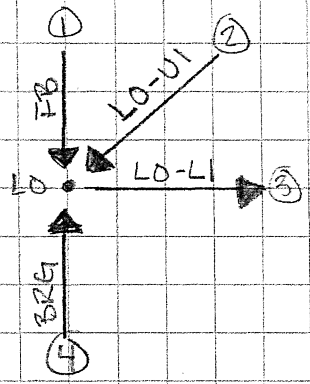
PROJECT BR.9090 - JOINT L0 LOAD SUMMARY

PROJECT # 070745 DATE 08/31/09 BY LMM SHEET NO. 01 OF 09

V 9/3/09 JOL



DEAD AND LIVE LOAD REACTIONS HAVE BEEN CALCULATED FOR JOINT L0.
THERE ARE 4 REACTIONS AT THIS JOINT

1) FB = FLOORBEAM REACTION, WHICH INCLUDES LOADS FROM THE FIRST BAY OF THE TRUSS AS WELL AS THE BACKSPAN
2) L0-U1 = LOAD IN TRUSS MEMBER
3) L0-L1 = " " " "
4) BRG = BEARING REACTION

DEAD LOAD

- TWO SETS OF CALCULATIONS WERE PERFORMED FOR FLOORBEAM
  - REFER TO SHEETS 02 TO 04 FOR CALC'S
- MEMBER LOADS WERE OBTAINED FROM TRAP MODEL
  - REFER TO OUTPUT ON SHEETS 05 AND 06 and 09
- REACTION FORCES WERE DETERMINED BY SUMMATION OF FORCES

1) FB = $93.7^k + 161.8^k = 255.5^k$

2) L0-U1 = 1109.9^k, $\angle = 48.42°$ ($x = 736.6^k$, $y = 830.2^k$)

3) L0-L1 = 735.9^k

4) BRG = $255.5^k + 830.2^k = 1085.7^k$

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LOAD SUMMARY
02 OF 09

PROJECT BRIDGE 9090

PROJECT # 070745 DATE 8/24/09 BY JWJ SHEET NO. 02 OF 09
V 9/3/09 JDL

COMPUTE DEAD LOAD APPLIED @ L_o

⇒ FROM 1ST BAY OF TRUSS SYSTEM (31' BAYS)
- REFERENCE RAM CALCULATIONS (1/11/08)

STRINGERS	12276#	-
FLOOR BEAM	23570	-
DIAPH'S/STIFF	912	-
GUSSET'S/Bracing	5500	-
	42,258# STEEL	-

CONC DECK	128,624#	-
RAILS	7750	-
	136,374# CONC	-

Detail/Misc. wt. factors

TOTAL @ L_o = [23570(1.02) + 18688(1.05) + 136,374] 1/2 + 3.665 K/ft truss wt.
FROM TRUSS = 93,684# ✓

⇒ FROM BACKSPAN ~56.5' SPAN
- REF. RAM CALC (8/14/09) (EXCEPT AS NOTED)

BEAMS =	61 290
STIFF =	3154
CHANN =	2658
DIAPH =	6394
	73496# STEEL ✓

THIS ASSUMES 9" DECK AS WAS ASSUMED IN TRUSS ANALYSIS. RAM USED 7" IN THIS CALC. ON 8/14

CONC DECK = 2(27.66)(56.5)(150)(1/2) = 234,420
RAILS 250 PLF (56.5)(2)(1/2) = 14,125
248,545# CONC

TOTAL @ L_o FROM BACKSPAN = [73496(1.02) + 248545] 1/2 = 161,755# ✓

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218 727-8446
Fax 218 727-8456
www.LHBcorp.com

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LOAD SUMMARY
03 OF 09

PROJECT BRIDGE NO. 9090

PROJECT # 070745.3 DATE 1/11/08 BY RAM SHEET NO. 1 OF 6

✓CJM 2/13/08

NODE NUMBERS MATCH ORIGINAL PLAN USED RAM DEAD LOADS IN TRUSS ANALYSIS.

FLOOR SYSTEM DEAD LOADS (AT FLOORBEAM LI)

STRINGERS

= (99 LB/FT)(8)(31'-0") 1/2 = 12,276 LB

FLOORBEAM

WEB = (66"X7/16")(67'-4 5/8")(490 PCF) = 6621 LB
FLANGES = 2(1'-10")(1")(17'-3 3/8")(490 PCF) = 2587.4 LB
FLANGES = 2(1'-10")(1 3/4")(50'-0")(490 PCF) = 13,100.7 LB
STIFFENERS = (66")(5")(3/8")(490 PCF)(17) = 596.5 LB
END STIFFENER = 2(66"X1'-0")(5/8")(490 PCF) = 280.7 LB
CONNECTION ANGLE = (5.5 LB/FT)(1'-8")(8) = 113.3 LB

DIAPHRAGMS

=(33.9 LB/FT)(5'-0")(6) 1/2 = 813.6 LB
STIFFENERS = (9.8 LB/FT)(1'-8")(12) 1/2 = 98 LB

NECK (FROM AUTOCAD DRAWING)

= 2(27.661 FT²)(31'-0")(150 PCF) 1/2 = 128,623.7 LB

RAILING (ASSUMED)

= (1'-6")(1'-0")(150 PCF) + 25 PLF = (250 LB/FT)(31'-0") 2 (1/2) = 7,750 LB

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LOAD SUMMARY
04 OF 09

PROJECT BRIDGE NO. 9090

PROJECT # _____ DATE 8/14/09 BY RAM ✓ LMM SHEET NO. 1 OF 1

APPROACH SPAN BEAM LOADS

BEAMS = (135 LB/FT)(56'-9")(8) = 61,290 LB

STIFFENERS = (6½" x ½" x 33.92")(490 PCF) 8→6 (8) = 2000.7 LB (1500.5)

= (5" x ½" x 33.92")(490 PCF) 6 (8) = 1154.2 LB

CHANNELS = (7.25 LB/FT)(10")(53→55)(8) = 2561.7 LB (2456.3)

DIAPHRAGMS = (42.7 LB/FT)(8'-0")(16) = 5465.6 LB

= (58 LB/FT)(8'-0")2 = 928 LB

TOTAL STEEL = 73,400.2 LB + 10% = 80,740.2 LB (72,996.4 / 80,296.3) Δ = 1/2% OK

DECK = (9"/12")(56'-9')(150 LB/FT)(31'-0" x 2) = ~~207,860.6 LB~~ 395,831.3

OVERHANG = (8.5")(3'-6")(56'-9")(150 LB/FT) 2 = 42,207.8 LB

MEDIAN = (9")(1'-11")(56'-9")(150 LB/FT) 2 = 24,473.4 LB

½ (SUM) = 231,257.3 ✓ COMPARE TO LWS D.L. CALC. = 234 K ON 8/24 OK LMM

RAIL = (1'-6")(1'-6")(56'-9")(150 LB/FT) 2 = 25,537.5 LB

METAL = (80 LB/FT)(56'-9") 2 = 3405 LB

TOTAL = ~~484,232.5 LB~~ (572,195.2) ÷ 2 = ~~242,116.3 LB~~ (286,097.6) ÷ 2 = ~~121,058.1 LB/GUS. R~~ (143,048.8) = ~~121~~ K = 143 K

143.04K + (½)(⅝)(80)(40.2) = 163K COMPARE TO LWS 162K OK

TABLE 3.13 DEAD LOAD FORCES AND ADJUSTED LENGTHS IN DIAG. MEMBERS (UNFACTORED)

MEMBER	TOTAL STEEL		TOTAL DEAD LOAD	
	FORCE (K)	ADJ LENGTH (FT)	FORCE (K)	ADJ LENGTH (FT)
MnDOT Lo U1				
L 1 U 2	-1109.9	46.7303	-1109.9	46.7303
U 2 L 3	452.7	46.7725	452.7	46.7725
U 3 L 4	270.6	53.2994	270.6	53.2994
U 4 L 5	164.5	57.4350	164.5	57.4350
L 5 U 6	0.0	58.8303	0.0	58.8303
U 5 L 6	-1.5	58.8301	-1.5	58.8301
L 6 U 7	167.7	57.4353	167.7	57.4353
L 7 U 8	273.9	53.3042	273.9	53.3042
L 8 U 9	455.4	46.7807	455.4	46.7807
U 9 L 10	-1100.5	46.7305	-1100.5	46.7305

TABLE 3.9 DEAD LOAD FORCES AND ADJUSTED LENGTHS IN LOWER CHORD (UNFACTORED)

MEMBER (MnDOT LoL,)	TOTAL STEEL FORCE (K)	TOTAL STEEL ADJ LENGTH (FT)	TOTAL DEAD LOAD FORCE (K)	TOTAL DEAD LOAD ADJ LENGTH (FT)
L 1 L 2	735.9	31.0069	735.9	31.0069
L 2 L 3	735.9	31.0135	735.9	31.0135
L 3 L 4	1036.0	31.0190	1036.0	31.0190
L 4 L 5	1193.5	31.0190	1193.5	31.0190
L 5 L 6	1282.3	31.0187	1282.3	31.0187
L 6 L 7	1190.9	31.0189	1190.9	31.0189
L 7 L 8	1031.6	31.0189	1031.6	31.0189
L 8 L 9	729.6	31.0134	729.6	31.0134
L 9 L 10	729.6	31.0134	729.6	31.0134

21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

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PROJECT BR 9090 - JOINT LO - LOAD SUMMARY

PROJECT # 070754 DATE 08/31/09 ✓9-3-09 JDL BY LMM SHEET NO. 07 OF 09

LIVE LOADS ✓

- REFER TO SHEET 01 FOR LOAD DIAGRAM / EXPLANATION

- MAXIMUM LIVE LOAD REACTIONS IN MEMBERS WERE ALL RESULTS OF LANE LOADING

LN1

- THE MAXIMUM REACTION AT THE FLOORBEAM OCCURS WHEN THE CONCENTRATED LOAD IS APPLIED AT LO.
  - SEE SHEET 08 (LOAD CASE B)

1) FB = 118.0^K ✓
2) LO-U1 = 200.0^K ($x = 132.7^K$, $y = 149.6^K$) ✓
3) LO-L1 = 133.0^K ✓
4) BRG = 118.0^K + 149.6^K = 267.6^K ✓

LN2

- THE MAXIMUM REACTION IN THE TRUSS MEMBER LO-U1 OCCURS WHEN THE CONCENTRATED LOAD IS APPLIED TO JOINT L1
  - SEE SHEET 09 FOR COINCIDENT MEMBER LOADS

1) FB = $[0.640^K/FT (56.5 FT)(\frac{1}{2}) + 0.640^K/FT (31')(\frac{1}{2})] \times 1.626 \times 1.3$
   = 61.0^K ✓
2) LO-U1 = 257.8^K ($x = 171.0^K$, $y = 192.8^K$) ✓
3) LO-L1 = 159.1^K
4) BRG = 61.0^K + 192.8^K = 253.8^K ✓

- GUSSET PLATE CALCULATIONS WILL REFER TO THE TWO ABOVE LOAD CASES AS LN1 AND LN2

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Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

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Minneapolis, Minnesota 55401
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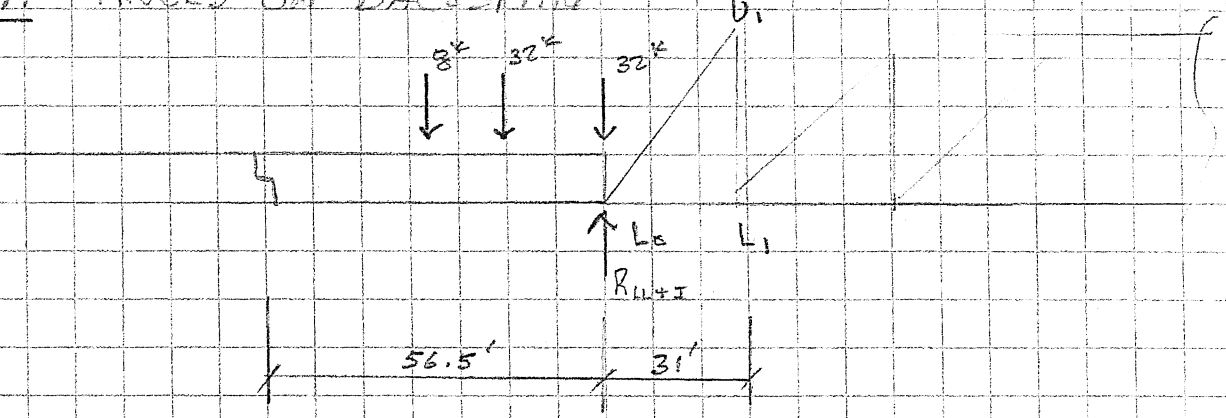
PROJECT BR. 9090

PROJECT # 070745 DATE 8/14/09 BY JWS SHEET NO. 1 OF 1

✓RAM 8/14/09
✓JDL 9/3/09

CASE A - TRUCKS ON BACKSPAN



R_{LL+I} @ L_0 = $\left[32^K + 32\left(\frac{42.5}{56.5}\right) + 8\left(\frac{28.5}{56.5}\right)\right] \times 1.676$ LANES $\times$ 1.28 impact = 129^K ✓

(NO LOAD IN TRUSS MEMBERS)

CASE B - LANE LOAD HINGE TO L_1

$R_{LL+I} = \left[0.640(56.5)(1/2) + 0.640(31)(1/2)\right] \times 1.3 \times 1.676 + 26(1.3)(1.676) = 118^K$

LOAD IN L_0-L_1 = 34^K (133^K IF LANE LOAD TO END OF TRUSS)
LOAD IN L_0-U_1 = -51^K (-200^K IF LANE LOAD TO END OF TRUSS)

See attached sheets 08a through 08d for lane load member force computations.

CASE C - TRUCK ON TRUSS @ L_0

$R_{LL+I} = \left[32 + 32(17/31) + 8(3/31)\right] \times 1.676 \times 1.124 = 95^K$

LOAD IN L_0-L_1 = 32^K
LOAD IN L_0-U_1 = -49^K

LHB

Project: Mn/DOT - Truss Ratings
Project Number: 070745.30
Description: Truss Member Force Calculations

This template computes truss member live loads at a selected truss node.
Enter variables below shaded in grey. Regions or results in yellow self-compute.
Live Load is for HS-20 Lane Load with Concentrated Load for Flexure.

Note that this template reads external "excel" data files. These files must be properly linked to this worksheet for accurate function.

MN/DOT BRIDGE NO: 9090 - TH 2 over Red River in Grand Forks

IMPACT := 1.124 — Input Impact Factor Based on Truss Length

DIST_FACTOR := 1.676 — Input Distribution Factor for Truss, Including any Applicable Reduction for Multiple Lanes

MEMBER_TYPE := "D" — Input "D" for Diagonal, "V" for Vertical or "C" for Chord.

PANEL_POINT := "L1" — Input Loaded Panel Point Under Consideration

MEMBER_NO := "L1L2" — Input Member Number Under Consideration

Member **Lo-Ll** (MnDOT Numbering)

FOR VERTICAL MEMBERS, ENTER USING "L2U2T" AND "L2UTB"FOR FORCES

- Computation for Live Load Force in member Lo-L1 bot. chord for lane loading with Conc. load placed at Lo (MnDOT Numbering).

AT TOP AND BOTTOM OF MEMBER, WHICHEVER IS DESIRED

08 b.

MEMBER_LOADLANE := AA·BB·IMPACT·DIST_FACTOR

MEMBER_LOADTRUCK := AA·CC·IMPACT·DIST_FACTOR

MEMBER_LOADLANE = 132.249 ✓ MnDOT Member Lo-L1

MEMBER_LOADTRUCK = 21.497

X := 0 , 1 .. 10

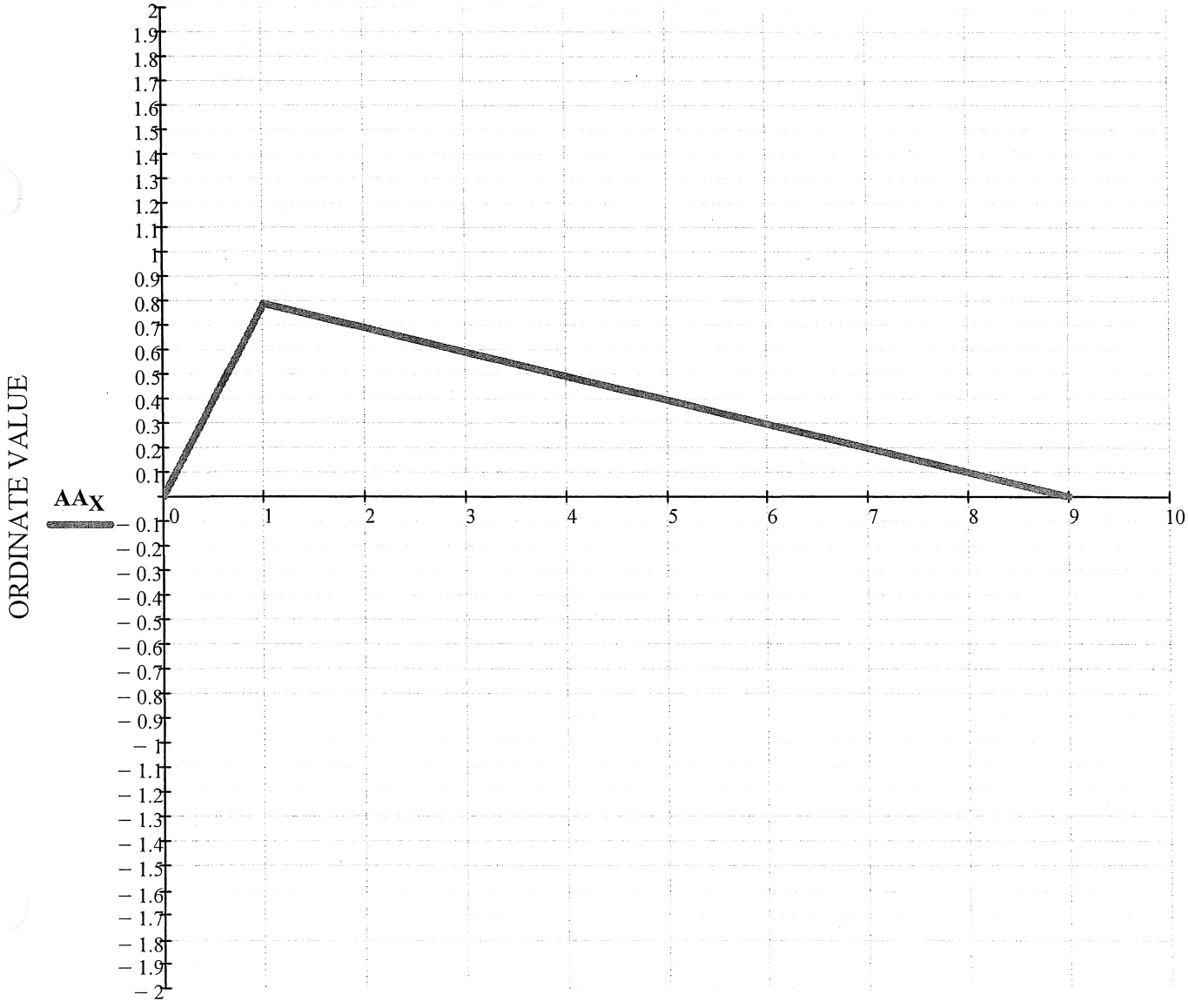
AA =

	0
0	0
1	0.787
2	0.689
3	0.59
4	0.492
5	0.394
6	0.295
7	0.197
8	0.098
9	0

This shows influence line ordinates for the member selected above

08c.

INFLUENCE LINE



LHB

Project: Mn/DOT - Truss Ratings
Project Number: 070745.30
Description: Truss Member Force Calculations

This template computes truss member live loads at a selected truss node.
Enter variables below shaded in grey. Regions or results in yellow self-compute.
Live Load is for HS-20 Lane Load with Concentrated Load for Flexure.

Note that this template reads external "excel" data files. These files must be properly linked to this worksheet for accurate function.

MN/DOT BRIDGE NO: 9090 - TH 2 over Red River in Grand Forks

IMPACT := 1.124 — Input Impact Factor Based on Truss Length

DIST_FACTOR := 1.676 — Input Distribution Factor for Truss, Including any Applicable Reduction for Multiple Lanes

MEMBER_TYPE := "D" — Input "D" for Diagonal, "V" for Vertical or "C" for Chord.

PANEL_POINT := "L1" — Input Loaded Panel Point Under Consideration

MEMBER_NO := "L1U2" — Input Member Number Under Consideration

Member L0-U1 (MnDOT Numbering)

FOR VERTICAL MEMBERS, ENTER USING "L2U2T" AND "L2UTB"FOR FORCES

— Computation for Live Load Force in member L_0-U_1 diagonal for Lane Loading w/ Conc. load placed at L_0 (MnDOT Numbering).

08e.

MEMBER_LOADLANE := AA·BB·IMPACT·DIST_FACTOR

MEMBER_LOADTRUCK := AA·CC·IMPACT·DIST_FACTOR

MEMBER_LOADLANE = −199.494 ✓ (MnDOT Member L_0-U_1)

MEMBER_LOADTRUCK = −32.423

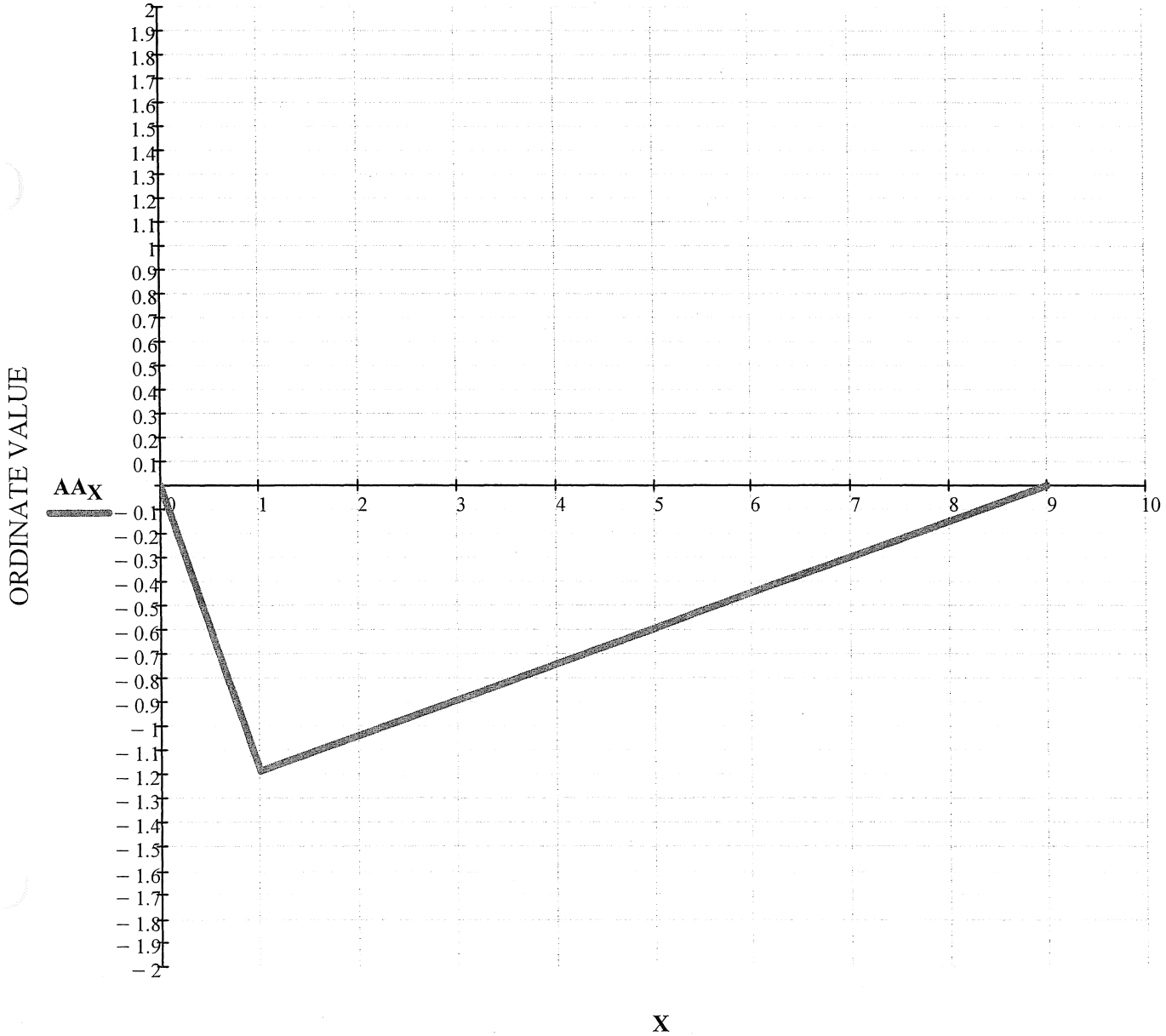
X := 0 , 1 .. 10

AA =

	0
0	0
1	-1.187
2	-1.039
3	-0.891
4	-0.742
5	-0.594
6	-0.445
7	-0.297
8	-0.148
9	0

This shows influence line ordinates for the member selected above

INFLUENCE LINE



BRIDGE NO. 9090 - COINCIDENT MEMBER LOADS AT TRUSS JOINTS - HS20 LOADING

COMPLETED BY: JWS | CHECKED BY: JDL

DATE: 02-12-08 | DATE: 02-12-08

COINCIDENT MEMBER LOADS - SERVICE LOAD WITH IMPACT INCLUDED (BOLD NUMBERS ARE MAXIMUM LOAD AT JOINT)

NOTE THAT NODE AND MEMBER LABELS DO NOT MATCH ORIGINAL PLAN - SOFTWARE USED REQUIRES FIRST NODE TO BE L1 INSTEAD OF L0. SEE ANALYSIS DATA FOR DRAWING SHOWING MEMBER/JOINT LABELS USED BELOW.

JOINT NUMBER	NUMBER OF MEMBERS AT JOINT	MEMBER LOADS - BOTTOM CHORD (KIPS)									MEMBER LOADS - TOP CHORD (KIPS)							MEMBER LOADS - VERTICAL MEMBERS (KIPS)								MEMBER LOADS - DIAGONAL MEMBERS (KIPS)									
		L1-L2	L2-L3	L3-L4	L4-L5	L5-L6	L6-L7	L7-L8	L8-L9	L9-L10	U2-U3	U3-U4	U4-U5	U5-U6	U6-U7	U7-U8	U8-U9	L2-U2	L3-U3	L4-U4	L5-U5	L6-U6	L7-U7	L8-U8	L9-U9	L1-U2	L3-U2	L4-U3	L5-U4	L5-U6	L6-U5	L6-U7	L7-U8	L8-U9	L10-U9
L1	2	**159.1**																								-239.9									
		159.1																								**-257.8**									
L2	3	**159.1**	159.1															71.3																	
		159.1	**159.1**															71.3																	
		90.1	90.1															**114.6**																	
L3	4		**159.1**	206.0															-15.6								70.8									
			155.7	**224.9**															-6.8								104.3									
			138.9	221.0															-10.0								**124.3**									
			86.3	60.9															-28.6								**-38.2**									
			108.4	142.6															**66.5**								51.6									
			98.9	159.9															**-65.0**								91.8									
L4	4			**224.9**	244.8															9.6								34.1								
				219.5	**259.2**															15.7								68.3								
				146.9	169.2															**71.1**								38.3								
				119.9	161.2															**-53.9**								71.0								
				177.3	234.9															2.9								**99.5**								
				142.5	109.5															46.1								**-56.7**								
L5	5				**259.2**	266.8															25.7								13.9	0 (A)						
					252.0	**278.4**															30.1								49.0	0 (A)						
					162.8	182.9															**68.8**								37.4	0 (A)						
					113.5	146.3															**-51.2**								60.7	0 (A)						
					180.0	229.1															8.5								**90.8**	0 (A)						
					169.3	136.4															51.3								**-61.0**	0 (A)						
L6	5					**278.4**	244.8															14.5								-17.7	45.1					
						259.8	**259.2**															14.4								13.3	13.9					
						264.6	264.1															**15.0**								13.5	14.2					
						167.4	198.0															11.1								**73.6**	15.2					
						206.2	129.9															9.0								**-73.6**	69.4					
						231.3	180.0															12.3								-4.5	**90.8**					
						109.1	169.3															7.4								51.7	**-61.0**					
L7	4						**259.2**	219.5															15.7								68.3			
							244.8	**224.9**															9.6								34.1			
							168.9	146.7															**71.1**								38.2			
							163.4	121.5															**-53.9**								72.0			
							234.4	176.6															2.9								**99.5**			
							109.6	142.5															46.1								**-56.7**			
L8	4							**224.9**	155.8															-6.8								104.3	
								206.0	**159.1**															-15.6								70.8	
								142.6	108.4															**66.5**								51.6	
								162.9	100.8															**-65.0**								93.6	
								221.0	138.9															-10.0								**124.3**	
								60.9	86.3															28.6								**-38.2**	
L9	3								**159.1**	159.1															71.3									
									159.1	**159.1**															71.3									
									90.1	90.1															**114.6**									
L10	2									**159.1**																							-239.9
										159.1																							**-257.8**

Truss Joint Review Summary - Lower Joints

Bridge Number 9090

DeadLoad =Original +1.5" Overlay in 1984

LiveLoad = HS20

Date: 08/31/09

Prepared By: LMM

Checked By: JDL (09-04-09)

	Buckling K=1.0				
	[1] CRF = 0.95		[2] CRF = 0.85		
Joint	Critical RF_{inv}	Critical RF_{op}	Critical RF_{inv}	Critical RF_{op}	Comments
ORIGINAL POSITON					
L0	0.83	1.38	0.52	0.86	FLEXURE CONTROLS A-A (B-LN1)
BEARING MOVED 7" RIGHT					
L0	0.84	1.41	0.53	0.89	FLEXURE CONTROLS A-A (T-LN1)
BEARING MOVED 14" RIGHT					
L0	0.84	1.41	0.53	0.89	FLEXURE CONTROLS A-A (T-LN1)
BEARING MOVED 21" RIGHT					
L0	0.25	0.42	-0.06	-0.10	FLEXURE CONTROLS A-A (B-LN1)

[1] CRF= 1.00 for Rivet Check

[2] CRF= 0.95 for Rivet Check

B = Loads below the section cut are used

T = Loads above the section cut are used

LN1 = Live Lane Load Case 1 (Concentrated Load at L0)

LN2 = Live Lane Load Case 2 (Concentrated Load at L1)

Truss Joint Review Summary - Lower Joints

Date: 08/31/09
Prepared By: LMM
Checked By: JDL (09-04-09)

Bridge Number 9090

DeadLoad =Original +1.5" Overlay in 1984
LiveLoad = HS20

	Buckling K=0.75				
	[1] CRF = 0.95		[2] CRF = 0.85		
Joint	Critical RF_{inv}	Critical RF_{op}	Critical RF_{inv}	Critical RF_{op}	Comments
ORIGINAL POSITON					
L0	0.83	1.38	0.52	0.86	FLEXURE CONTROLS A-A (B-LN1)
BEARING MOVED 7" RIGHT					
L0	0.84	1.41	0.53	0.89	FLEXURE CONTROLS A-A (T-LN1)
BEARING MOVED 14" RIGHT					
L0	0.84	1.41	0.53	0.89	FLEXURE CONTROLS A-A (T-LN1)
BEARING MOVED 21" RIGHT					
L0	0.25	0.42	-0.06	-0.10	FLEXURE CONTROLS A-A (B-LN1)

[1] CRF= 1.00 for Rivet Check
[2] CRF= 0.95 for Rivet Check

B = Loads below the section cut are used
T = Loads above the section cut are used
LN1 = Live Lane Load Case 1 (Concentrated Load at L0)
LN2 = Live Lane Load Case 2 (Concentrated Load at L1)

Tension in Gusset Plate (LRFD 6.13.5.2 and 6.8.2.1)

Bridge Number 9090

Date: 08/31/09
Prepared By: LMM
Checked By: JDL (09-04-09)

DL = dead load force in the member

LL+ I = live load plus impact force in the member

Ped LL = pedestrian live load force in the member

designates input field

F_y = minimum yield strength of gusset plate material

F_u = minimum tensile strength of gusset plate material

t_g = thickness of gusset plate before section loss

w1 = width between outsided rivets/bolts in 1st row

d2 = distance from 1st row of rivets/bolts to last row of rivets

N_{sides} = number of sides of member with 30 degree distribution

$W_{wh} = w1 + d2 \cdot (\tan 30) \cdot N_{sides}$ (Whitmore effective width, see Figure 9-1 in *AISC Steel Construction Manual 13th Edition)*

N_{riv} = number of rivets/bolts crossed by whitmore effective width

Loss = percentage of section loss in plates

A_{gg} = gross area of gusset plates with section loss

A_{ng} = net area of gusset plates with section loss

A_{gspl} = gross area of splice plates with section loss

A_{nspl} = net area of splice plates with section loss

A_{gtb} = gross area of top and bottom plates with section loss

A_{ntb} = net area of top and bottom plates with section loss

A_g = gross area of all plates with section loss

A_n = net area of all plates with section loss

$\phi_y \cdot P_{ny} = \phi_y F_y A_g$)

$\phi_u \cdot P_{nu} = \phi_u F_u A_n$)---> ϕP_n is the smaller of $\phi_y \cdot P_{ny}$ and $\phi_u \cdot P_{nu}$

CRF = capacity reduction factor

$RF_{inv} = (\phi P_n - 1.3 \cdot DL - 2.17 \cdot Ped\ LL) / (2.17 \cdot LL+I)$

$RF_{op} = (\phi P_n - 1.3 \cdot DL - 1.3 \cdot Ped\ LL) / (1.3 \cdot LL+I)$

dia_{riv} = 0.875 in (diameter of rivet/bolt)

(No check required - Bot chord is only tension member & their is no splice)

Location		Member Force			Gusset Plate Data											Splice Plates		Top/Bot Plates		Total Area		Tension Capacity		CRF = 0.95		CRF = 0.85	
Joint	Member	DL k	LL+ I k	Ped LL k	F_y ksi	F_u ksi	t_g in	w1 in	d2 in	N_{sides}	W_{wh} in	N_{riv}	Loss %	A_{gg} in^2	A_{ng} in^2	A_{gspl} in^2	A_{nspl} in^2	A_{gtb} in^2	A_{ntb} in^2	A_g in^2	A_n in^2	$\phi_y \cdot P_{ny}$ k	$\phi_u \cdot P_{nu}$ k	RF_{inv}	RF_{op}	RF_{inv}	RF_{op}
L0	L0-L1				50.0	75.0	0.625				0.0			0.0	0.0					0.0	0.0	0	0	#####	#DIV/0!	#DIV/0!	#DIV/0!
											0.0			0.0	0.0					0.0	0.0	0	0	#####	#DIV/0!	#DIV/0!	#DIV/0!
											0.0			0.0	0.0					0.0	0.0	0	0	#####	#DIV/0!	#DIV/0!	#DIV/0!

Flexure in Gusset Plate (Truss Bridge Guide Specs. 1.11 and LRFD 6.14.2.8)

P_{DL} = axial force due to DL acting on the section

P_{LL+I} = axial force due to LL+I acting on the section

$P_{ped\ LL}$ = axial force due to pedestrian live load acting on the section

M_{DL}= moment due to DL acting on the section

M_{LL+I} = moment due to LL+I acting on the section

$M_{ped\ LL}$ = moment due to pedestrian live load acting on the section

Loss = percentage of section loss in plates

A_g = gross area of section cut through gusset plate with section loss

y = distance from c.g. of section to outside edge of gusset plate

I_g= moment of inertia of gross section cut through gusset plate with section loss

Bridge Number **9090**

designates input field

Date: 08/31/09

Prepared By: LMM

Checked By: JDL (09-04-09)

f_{DL} = stress at edge of section due to DL

f_{LL+I} = stress at edge of section due to LL+I

$f_{ped\ LL}$ = stress at edge of section due to pedestrian live load

CRF = capacity reduction factor

$RF_{inv} = (\phi F_y - 1.3 \cdot f_{DL} - 2.17 \cdot f_{ped\ LL}) / (2.17 \cdot f_{LL+I})$

$RF_{op} = (\phi F_y - 1.3 \cdot f_{DL} - 1.3 \cdot f_{ped\ LL}) / (1.3 \cdot f_{LL+I})$

ϕF_y = 50 ksi ϕF_y = 36 ksi, section B-B combined bot chord and gusset

															CRF = 0.95		CRF = 0.85		
Joint	Section	P_{DL} k	P_{LL+I} k	$P_{ped\ LL}$ k	M_{DL} k-in	M_{LL+I} k-in	$M_{ped\ LL}$ k-in	Loss %	A_g in^2	y in	I_g in^4	f_{DL} ksi	f_{LL+I} ksi	$f_{ped\ LL}$ ksi	RF_{inv}	RF_{op}	RF_{inv}	RF_{op}	
L0	A-A(T-LN1)	1085.7	267.6		8614.3	2838.6			74.7	29.9	22220	26.1	7.4	0.0	0.84	1.41	0.53	0.89	
L0	A-A(B-LN1)	1085.7	267.6		8736.3	2854.9			74.7	29.9	22220	26.3	7.4	0.0	0.83	1.38	0.52	0.86	
L0	B-B (LN1)	0.7	0.3		6.4	2.7			194.0	21.1	62698	0.0	0.0	0.0	6390.47	10667.18	5717.64	9544.07	*
L0	C-C (LN2)	640.3	148.7		2161.1	502.0			80.9	32.4	28278	10.4	2.4	0.0	6.49	10.84	5.54	9.25	
L0-7	A-A(T-LN1)	1085.7	267.6		8614.3	2838.6			74.7	29.9	22220	26.1	7.4	0.0	0.84	1.41	0.53	0.89	Θ
L0-7	A-A(B-LN1)	1085.7	267.6		1136.4	981.7			74.7	29.9	22220	16.1	4.9	0.0	2.50	4.18	2.03	3.39	
L0-7	B-B (LN1)	0.0	0.0		7599.9	1873.2			194.0	21.1	62698	2.6	0.6	0.0	22.57	37.67	19.94	33.28	*
L0-7	C-C (LN2)	640.3	148.7		2161.1	502.0			80.9	32.4	28278	10.4	2.4	0.0	6.49	10.84	5.54	9.25	Θ
L0-14	A-A(T-LN1)	1085.7	267.6		8614.3	2838.6			74.7	29.9	22220	26.1	7.4	0.0	0.84	1.41	0.53	0.89	Θ
L0-14	A-A(B-LN1)	1085.7	267.6		6463.5	891.6			74.7	29.9	22220	23.2	4.8	0.0	1.67	2.78	1.19	1.98	
L0-14	B-B (LN1)	0.0	0.0		15199.8	3746.4			194.0	21.1	62698	5.1	1.3	0.0	10.07	16.81	8.75	14.61	*
L0-14	C-C (LN2)	640.3	148.7		2161.1	502.0			80.9	32.4	28278	10.4	2.4	0.0	6.49	10.84	5.54	9.25	Θ
L0-21	A-A(T-LN1)	1085.7	267.6		8614.3	2838.6			74.7	29.9	22220	26.1	7.4	0.0	0.84	1.41	0.53	0.89	Θ
L0-21	A-A(B-LN1)	1085.7	267.6		14063.4	2764.8			74.7	29.9	22220	33.4	7.3	0.0	0.25	0.42	-0.06	-0.10	
L0-21	B-B (LN1)	0.0	0.0		22799.7	5619.6			194.0	21.1	62698	7.7	1.9	0.0	5.90	9.85	5.02	8.39	*
L0-21	C-C (LN2)	640.3	148.7		2161.1	502.0			80.9	32.4	28278	10.4	2.4	0.0	6.49	10.84	5.54	9.25	Θ

Load Description on Section

B = Loads below the section cut are used

T = Loads above the section cut are used

LN1 = Live Lane Load Case 1 (Concentrated Load at L0)

LN2 = Live Lane Load Case 2 (Concentrated Load at L1)

* = Based on ϕFy = 36 ksi using lesser strength of bottom chord

Θ = Not affected by movement of bearing

SECTION PROPERTIES AT L0, SECTION B-B

FLEXURAL SECTION CONSISTS OF 2 GUSSET PLATES AND BOTTOM CHORD

(0% section loss assumed in all plates)

	B	D	Y_{top}	A	Y_{top}·A	Y_{tot}-Y_{top}	I_{part}	AD^2
GUSSET	0.625	66.625	33.31	41.64	1387.15	-12.21	15403	6207
GUSSET	0.625	66.625	33.31	41.64	1387.15	-12.21	15403	6207
SIDE PLATE	0.875	24.000	12.00	21.00	252.00	9.10	1008	1740
SIDE PLATE	0.875	24.000	12.00	21.00	252.00	9.10	1008	1740
diaph. plate	1.063	24.000	12.00	25.50	306.00	9.10	1224	2113
TOP PLATE	17.000	0.625	24.31	10.63	258.29	-3.21	0	109
TOP PLATE	17.000	0.625	24.94	10.63	264.99	-3.84	0	156
BOT. PLATE	17.000	0.625	-0.31	10.63	-3.32	21.42	0	4873
BOT. PLATE	18.125	0.625	-0.94	11.33	-10.62	22.04	0	5503
	d =	66.625	A_{tot} =	193.98	4093.65		34047.8	28649.85
				Y_{tot} =	21.10 in		I_{tot} =	62698

Note: If this section property spreadsheet is copied and edited for use with other joints, you MUST revise Y_{tot}-Y_{top} equation

Shear in Gusset Plate (Truss Bridge Guide Specs. 1.11 and AISC 13th Edition J4.2)

Bridge Number **9090**

designates input field

Date: 08/31/09

Prepared By: LMM

Checked By: JDL (09-04-09)

V_{DL} = shear force due to DL acting on the section

V_{LL+I} = shear force due to LL+I acting on the section

$V_{ped\ LL}$ = shear force due to pedestrian live load acting on the section

F_y = minimum yield strength of gusset plate material

F_u = minimum tensile strength of gusset plate material

t_g = thickness of gusset plate before section loss

w_g = width of the gusset plate at the cut section

Loss = percentage of section loss in gusset plates

A_g = gross area of 2 gusset plates including section loss

N_{rivets} = number of rivets/bolts crossed by whitmore effective width

A_{net} = net area of 2 gusset plates including section loss

ϕV_{ny} = shear yield capacity at cut section = $\phi_{vy} \cdot 0.74 \cdot (0.58 \cdot F_y) \cdot A_g$, where ϕ_{vy} = 0.95 (per FHWA draft guidance)

ϕV_{nu} = shear rupture capacity at cut section = $\phi_{vu} \cdot (0.58 \cdot F_u) \cdot A_n$, where ϕ_{vu} = 0.80 (per modified FHWA draft guidance)

ϕV_n = smaller of ϕV_{ny} and ϕV_{nu}

CRF = capacity reduction factor

$RF_{inv} = (\phi V_n - 1.3 \cdot V_{DL} - 2.17 \cdot V_{ped\ LL}) / (2.17 \cdot V_{LL+I})$

$RF_{op} = (\phi V_n - 1.3 \cdot V_{DL} - 1.3 \cdot V_{ped\ LL}) / (1.3 \cdot V_{LL+I})$

dia_{riv} = 0.875 in (diameter of rivet/bolt)

															CRF = 0.95		CRF = 0.85	
Joint	Section	V_{DL} k	V_{LL+I} k	$V_{ped\ LL}$ k	F_y ksi	F_u ksi	t_g in	w_g in	Loss %	A_g in^2	N_{rivets}	A_{net} in^2	ϕV_{ny} k	ϕV_{nu} k	RF_{inv}	RF_{op}	RF_{inv}	RF_{op}
L0	D-D (LN2)	735.9	159.1		50.0	75.0	0.625	60.0		75.0	1.0	73.8	1529	2567	1.44	2.40	0.99	1.66

Shear in Gusset Plate (Truss Bridge Guide Specs. 1.11 and AISC 13th Edition J4.2)

Bridge Number **9090**

designates input field

Date: 08/31/09
Prepared By: LMM
Checked By: JDL (09-04-09)

V_{DL} = shear force due to DL acting on the section

V_{LL+I} = shear force due to LL+I acting on the section

$V_{ped\ LL}$ = shear force due to pedestrian live load acting on the section

F_y = minimum yield strength of gusset plate material

F_u = minimum tensile strength of gusset plate material

t_g = thickness of gusset plate before section loss

w_g = width of the gusset plate at the cut section

Loss = percentage of section loss in gusset plates

A_g = gross area of 2 gusset plates including section loss

N_{rivets} = number of rivets/bolts crossed by whitmore effective width

A_{net} = net area of 2 gusset plates including section loss

ϕV_{ny} = shear yield capacity at cut section = $\phi_{vy} \cdot 0.74 \cdot (0.58 \cdot F_y) \cdot A_g$, where ϕ_{vy} = 0.95 (per FHWA draft guidance)

ϕV_{nu} = shear rupture capacity at cut section = $\phi_{vu} \cdot 0.74 \cdot (0.58 \cdot F_u) \cdot A_n$, where ϕvu = 0.80 (per FHWA draft guidance)

ϕV_n = smaller of ϕV_{ny} and ϕV_{nu}

CRF = capacity reduction factor

$RF_{inv} = (\phi V_n - 1.3 \cdot V_{DL} - 2.17 \cdot V_{ped\ LL}) / (2.17 \cdot V_{LL+I})$

$RF_{op} = (\phi V_n - 1.3 \cdot V_{DL} - 1.3 \cdot V_{ped\ LL}) / (1.3 \cdot V_{LL+I})$

dia_{riv} = 0.875 in (diameter of rivet/bolt)

															CRF = 0.95		CRF = 0.85	
Joint	Section	V_{DL} k	V_{LL+I} k	$V_{ped\ LL}$ k	F_y ksi	F_u ksi	t_g in	w_g in	Loss %	A_g in^2	N_{rivets}	A_{net} in^2	ϕV_{ny} k	ϕV_{nu} k	RF_{inv}	RF_{op}	RF_{inv}	RF_{op}
L0	D-D	735.9	159.1		50.0	75.0	0.625	60.0		75.0	1.0	73.8	1529	1899	1.44	2.40	0.99	1.66

Block Shear in Gusset Plate (LRFD 6.13.4)

Bridge Number 9090

Date: 08/31/09

designates input field

Prepared By: LMM

Checked By: JDL (09-04-09)

DL = dead load force in the member

LL+ I = live load plus impact force in the member

Ped LL = pedestrian live load force in the member

F_y = minimum yield strength of gusset plate material

F_u = minimum tensile strength of gusset plate material

t_g = thickness of gusset plate before section loss

L_t = total length of all tension rupture lines in 1 gusset plate

N_{triv} = fractional number of rivets/bolts crossed by tension rupture lines in 1 gusset plate

Loss = percentage of section loss in plates

A_{tgadd} = gross area of section in any additional plates resisting tension with section loss

A_{tnadd} = net area of section in any additional plates resisting tension with section loss

A_{tg} = gross area of section in 2 gusset plates resisting tension with section loss

A_{tn} = net area of section in 2 gusset plates resisting tension with section loss

L_v = total length of all shear rupture lines in 1 gusset plate

N_{vriv} = fractional number of rivets/bolts crossed by shear rupture lines in 1 gusset plate

A_{vgadd} = gross area of section in any additional plates resisting shear with section loss

A_{vnadd} = net area of section in any additional plates resisting shear with section loss

A_{vg} = gross area of section in 2 gusset plates resisting shear with section loss

A_{vn} = net area of section in 2 gusset plates resisting shear with section loss

R_r = factored block shear rupture resistance for 2 gusset plates

CRF = capacity reduction factor

$RF_{inv} = (R_r - 1.3 \cdot DL - 2.17 \cdot Ped\ LL) / (2.17 \cdot LL+I)$

$RF_{op} = (R_r - 1.3 \cdot DL - 1.3 \cdot Ped\ LL) / (1.3 \cdot LL+I)$

dia_{riv} = 0.875 in (diameter of rivet/bolt)

(No check Req'd)

																						CRF = 0.95		CRF = 0.85	
Joint	Member	DL k	LL+I k	Ped LL k	F_y ksi	F_u ksi	t_g in	L_t in	N_{triv}	Loss %	A_{tgadd} in^2	A_{tnadd} in^2	A_{tg} in^2	A_{tn} in^2	L_v in	N_{vriv}	A_{vgadd} in^2	A_{vnadd} in^2	A_{vg} in^2	A_{vn} in^2	A_{tn} / A_{vn} k	R_r k	RF_{inv}	RF_{op}	RF_{inv}	RF_{op}
L0	L0-L1				50.0	75.0	0.625						0.0	0.0					0.0	0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
													0.0	0.0					0.0	0.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Edge Buckling in Gusset Plate (Truss Bridge Guide Specs. 1.11)

Bridge Number 9090

b = length of unsupported gusset plate edge

t_g = thickness of gusset plate before section loss

Loss = percentage of section loss in plates

F_y = minimum yield strength of gusset plate material

designates input field

Date: 08/31/09
Prepared By: LMM

Checked By: JDL (09-04-09)

Joint	b in	t_g in	Loss %	F_y psi	b/t_g	$11000 / \sqrt{F_y}$	Stiffening Requirements
L0-R	23.00	0.625		50000	36.8	49.2	No stiffening required
					#DIV/0!	#DIV/0!	#DIV/0!

Buckling in Gusset Plate (Std. Specs. 10.54.1.1)

Bridge Number 9090

Date: 08/31/09

Prepared By: LMM

Checked By: JDL (09-04-09)

designates input field

DL = dead load force in the member

LL+ I = live load plus impact force in the member

Ped LL = pedestrian live load force in the member

t_g = thickness of gusset plate before section loss

Loss = percentage of section loss in plates

w1 = width between outside rivets/bolts in 1st row

d2 = distance from 1st row of rivets/bolts to last row of rivets

N_{sides} = number of sides of member with 30 degree distribution

$W_{wh} = w1 + d2 \cdot (\tan 30) \cdot N_{sides}$ (Whitmore effective width, see Figure 9-1 in *AISC Steel Construction Manual 13th Edition)*

A_{column} = area of a single 1 inch wide "column" of unsupported gusset plates acting to resist buckling with section loss

L_c = unsupported length of gusset

r = radius of gyration for single 1 inch wide "column" of gusset plate

$C_c = \sqrt{2\pi^2 E/F_y}$

F_{cr} = buckling stress

P_u = maximum column strength

p_{DL} = DL acting on a single 1 inch wide "column"

p_{LL+I} = LL+ I acting on a single 1 inch wide "column"

$p_{ped\ LL}$ = pedestrian LL acting on 1 inch wide "column"

CRF = capacity reduction factor

$RF_{inv} = (\phi P_u - 1.3 \cdot p_{DL} - 2.17 \cdot p_{ped\ LL}) / (2.17 \cdot p_{LL+I})$ where $\phi = 1.0$

$RF_{op} = (\phi P_u - 1.3 \cdot p_{DL} - 1.3 \cdot p_{ped\ LL}) / (1.3 \cdot p_{LL+I})$ where $\phi = 1.0$

K = 1.00 (effective length factor)

E = 29000 ksi

(No Check Req'd.)

CRF = 0.95 CRF = 0.85

Joint	Member	DL k	LL+I k	Ped LL k	F_y ksi	t_g in	Loss %	w1 in	d2 in	N_{sides}	W_{wh} in	A_{column} in^2	L_c in	r in	KL_c/r	C_c	F_{cr} ksi	P_u k	p_{DL} k/in	p_{LL+I} k/in	$p_{ped\ LL}$ k/in	RF_{inv}	RF_{op}	RF_{inv}	RF_{op}
L0	L0-U1				50.0	0.625					0.0	0.63		0.180	0.0	107.0	50.0	26.6	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
											0.0	0.00		0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Buckling in Gusset Plate (Std. Specs. 10.54.1.1)

Bridge Number 9090

DL = dead load force in the member

LL+ I = live load plus impact force in the member

Ped LL = pedestrian live load force in the member

t_g = thickness of gusset plate before section loss

Loss = percentage of section loss in plates

w1 = width between outside rivets/bolts in 1st row

d2 = distance from 1st row of rivets/bolts to last row of rivets

N_{sides} = number of sides of member with 30 degree distribution

$W_{wh} = w1 + d2 \cdot (\tan 30) \cdot N_{sides}$ (Whitmore effective width, see Figure 9-1 in *AISC Steel Construction Manual 13th Edition)*

A_{column} = area of a single 1 inch wide "column" of unsupported gusset plates acting to resist buckling with section loss

L_c = unsupported length of gusset

r = radius of gyration for single 1 inch wide "column" of gusset plate

$C_c = \sqrt{2\pi^2 E/F_y}$

F_{cr} = buckling stress

P_u = maximum column strength

p_{DL} = DL acting on a single 1 inch wide "column"

p_{LL+I} = LL+ I acting on a single 1 inch wide "column"

$p_{ped\ LL}$ = pedestrian LL acting on 1 inch wide "column"

CRF = capacity reduction factor

$RF_{inv} = (\phi P_u - 1.3 \cdot p_{DL} - 2.17 \cdot p_{ped\ LL}) / (2.17 \cdot p_{LL+I})$ where $\phi = 1.0$

$RF_{op} = (\phi P_u - 1.3 \cdot p_{DL} - 1.3 \cdot p_{ped\ LL}) / (1.3 \cdot p_{LL+I})$ where $\phi = 1.0$

K = 0.75 (effective length factor)

E = 29000 ksi

designates input field

Date: 08/31/09

Prepared By: LMM

Checked By: JDL (09-04-09)

(No check Req'd.)

CRF = 0.95 CRF = 0.85

Joint	Member	DL k	LL+I k	Ped LL k	F_y ksi	t_g in	Loss %	w1 in	d2 in	N_{sides}	W_{wh} in	A_{column} in^2	L_c in	r in	KL_c/r	C_c	F_{cr} ksi	P_u k	p_{DL} k/in	p_{LL+I} k/in	$p_{ped\ LL}$ k/in	RF_{inv}	RF_{op}	RF_{inv}	RF_{op}
L0	L0-U1				50.0	0.625					0.0	0.63		0.180	0.0	107.0	50.0	26.6	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
											0.0	0.00		0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Bearing and Shear Check of Rivets/Bolts (Std. Specs. 10.56.1.3)

Bridge Number 9090

Date: 08/31/09
Prepared By: LMM
Checked By: JDL (09-04-09)

designates input field

DL = dead load force in the member
LL+ I = live load plus impact force in the member
Ped LL = pedestrian live load force in the member
F_u = minimum tensile strength of gusset plate material
SS N_{riv} = number of rivets/bolts in single shear in the member to gusset plate connection
DS N_{riv} = number of rivets/bolts in double shear in the member to gusset plate connection
SS p_{DL} = DL per rivet/bolt for rivets in single shear
SS p_{LL+I} = LL+ I per rivet/bolt for rivets in single shear
SS $p_{ped\ LL}$ = pedestrian live load per rivet/bolt for rivets in single shear
DS p_{DL} = DL per rivet/bolt for rivets in double shear
DS p_{LL+I} = LL+ I per rivet/bolt for rivets in double shear
DS $p_{ped\ LL}$ = pedestrian live load per rivet/bolt for rivets in double shear
SS t_g = thickness of gusset plate before loss
DS t_g = total thickness of plates before loss that rivets in double shear bear on
Loss = percentage of section loss in plates
L_c = smaller of clear distance between holes or clear distance between hole and edge of plate
d = rivet/bolt diameter
SS ϕR_b = factored bearing resistance for rivets in single shear
DS ϕR_b = factored bearing resistance for rivets in double shear
ϕR_s = factored total shear resistance for all rivets
CRF = capacity reduction factor
RF_{inv} = minimum of $(\phi R - 1.3 \cdot p_{DL}) / (2.17 \cdot p_{LL+I})$ for bearing and shear
RF_{op} = minimum of $(\phi R - 1.3 \cdot p_{DL}) / (1.3 \cdot p_{LL+I})$ for bearing and shear

dia_{riv} = 0.875 in (diameter of rivet/bolt)
ϕF_s = 25.000 ksi (shear capacity for rivet/bolt)

CRF = 1.00 CRF = 0.95

Joint	Member	DL k	LL+I k	Ped LL k	F_u ksi	SS N_{riv}	DS N_{riv}	SS p_{DL} k/rivet	SS p_{LL+I} k/rivet	SS $p_{ped\ LL}$ k/rivet	DS p_{DL} k/rivet	DS p_{LL+I} k/rivet	DS $p_{ped\ LL}$ k/rivet	SS t_g in	DS t_g in	Loss %	L_c in	SS ϕR_b k	DS ϕR_b k	ϕR_s k	RF_{inv}	RF_{op}	RF_{inv}	RF_{op}
L0	L0-U1(LN2)	1109.9	257.8		75.0	78		7.1	1.7	0.0	0.0	0.0	0.0	0.625			2.38	73.8	0.0	2345	1.61	2.69	1.53	2.56
								#DIV/0!	#DIV/0!	#DIV/0!	0.0	0.0	0.0					0.0	0.0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

Recieved 3/24/08

March 21, 2008

Yihong Gao
Minnesota Department of Transportation
Office of Bridges and Structures, MS 610
3485 Hadley Avenue North
Oakdale, MN 55128-3307

Rating Submittal
Bridge 9090- TH 2 over Red River
Updated Summary Sheets

Enclosed please find copies of the updated truss member, floor beam and stringer rating sheets for Bridge No. 9090. As we have discussed these sheets have been updated to reflect the 0.95 and 0.85 Mn/DOT modifiers as well as to incorporate headings which indicate what formulas and factors have been utilized in creating the reports.

Sincerely
LHB, Inc.

Joseph D. Litman P.E.

Enclosures

c: LHB Project No. 070745.3

LHB
21 West Superior Street, Suite 500
Duluth, Minnesota 55802
218 727-8446
Fax 218 727-8456
www.LHBcorp.com

February 13, 2008

Yihong Gao
Minnesota Department of Transportation
Office of Bridges and Structures, MS 610
3485 Hadley Avenue North
Oakdale, MN 55128-3307

Rating Submittal
Bridge 9090- TH 2 over Red River

Enclosed please find our submittal for the rating of Bridge No. 9090. As you review please let us know if you would like any additional detail or if you would like us to present any of this information in a different format. We also are available to meet at any time should you wish to go over in person.

We are proceeding with work on Bridge 9030 and will keep you informed as to our progress.

Sincerely
LHB, Inc.

Joseph D. Litman P.E.

Enclosures

c: LHB Project No. 070745.3

BRIDGE 9090 – ELECTRONIC FILES

There are 26 files contained on this CD. Below is a description of each file:

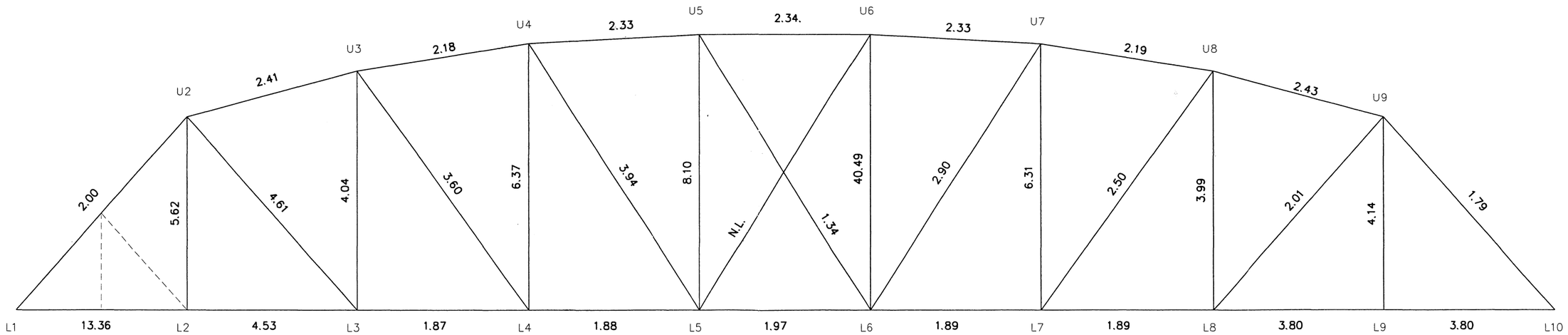
File Name	File Type	Description
2008-HS & Posting Trucks.dat	TRAP Data	Dead & Live load analysis input – four lanes HS 20 and Posting Trucks including dead load
2008-HS & Posting Trucks.res	TRAP Results	Dead & Live load analysis results – four lanes HS 20 and Posting Trucks including dead load
2008-P411 Truck.dat	TRAP Data	Live load analysis input – P411 Permit Truck
2008-P411 Truck.res	TRAP Results	Live load analysis results – P411 Permit Truck
2008-P413 Truck.dat	TRAP Data	Live load analysis input – P413 Permit Truck
2008-P413 Truck.res	TRAP Results	Live load analysis results – P413 Permit Truck
2008-Std A Truck.dat	TRAP Data	Live load analysis input – Standard A Permit Truck
2008-Std A Truck.res	TRAP Results	Live load analysis results – Standard A Permit Truck
2008-Std B Truck.dat	TRAP Data	Live load analysis input – Standard B Permit Truck
2008-Std B Truck.res	TRAP Results	Live load analysis results – Standard B Permit Truck
2008-Std C Truck.dat	TRAP Data	Live load analysis input – Standard C Permit Truck
2008-Std C Truck.res	TRAP Results	Live load analysis results – Standard C Permit Truck
COINCIDENTAL MEMBER LOADS – FINAL.xls	MS Excel	Tabulation of coincidental loads at truss node locations.
Dead Loads for Current Bridge.xls	MS Excel	Truss dead load calculations for current bridge.
Dead Loads for Original Bridge.xls	MS Excel	Truss dead load calculations for original bridge.
Final Summary Table AT 85%.xls	MS Excel	Final truss rating summary using Mn/DOT strength modifier of 85%.
Final Summary Table AT 95%.xls	MS Excel	Final truss rating summary using Mn/DOT strength modifier of 95%.
Final Tabulation at 85%.xls	MS Excel	Final truss member rating data using Mn/DOT strength modifier of 85%.
Final Tabulation at 95%.xls	MS Excel	Final truss member rating data using Mn/DOT strength modifier of 95%.
Influence Line Table.xls	MS Excel	Influence line tabulation for all members. This file is linked to the MathCad file listed below.
MEMBER FORCES - BRIDGE 9090.xmcd	MathCad	Program for computing coincidental member loads. Note that the program references the excel data file above (influence line table.xls) and will not function unless the file location is correctly specified in the matrix function named "AA" located to the far right inside the MathCad document. The file path will have to be changed manually in each line. Contact Jon Siiter, LHB at 218-727-8446 with questions.
Original Bridge – L1.dat	Trap Data	Dead load analysis input – original truss loads with support at node L1. Used as QA comparison to plan member loads.

Original Bridge – L1.res	Trap Results	Dead load analysis results – original truss loads with support at node L1. Used as QA comparison to plan member loads.
Original Bridge – L2.dat	Trap Data	Dead load analysis data – original truss loads with support at node L2. Used as QA comparison to plan member loads.
Original Bridge – L2.res	Trap Results	Dead load analysis results – original truss loads with support at node L2. Used as QA comparison to plan member loads.
READ ME.doc	MS Word	This document, describing files.

BRIDGE NO. 9090 – T.H. 2 OVER RED RIVER IN EAST GRAND FORKS

HS20 OPERATING RATING FACTORS

0.95 MnDOT STRENGTH MODIFIER



N.L. – NO LOAD IN MEMBER

TITLE: HS20 OPERATING RF	DES: CJM	DR: CJM	APPROVED:	Bridge No. 9090
	CHK: JWS	CHK: JWS		
	Sheet No. 1 of 1 Sheet			