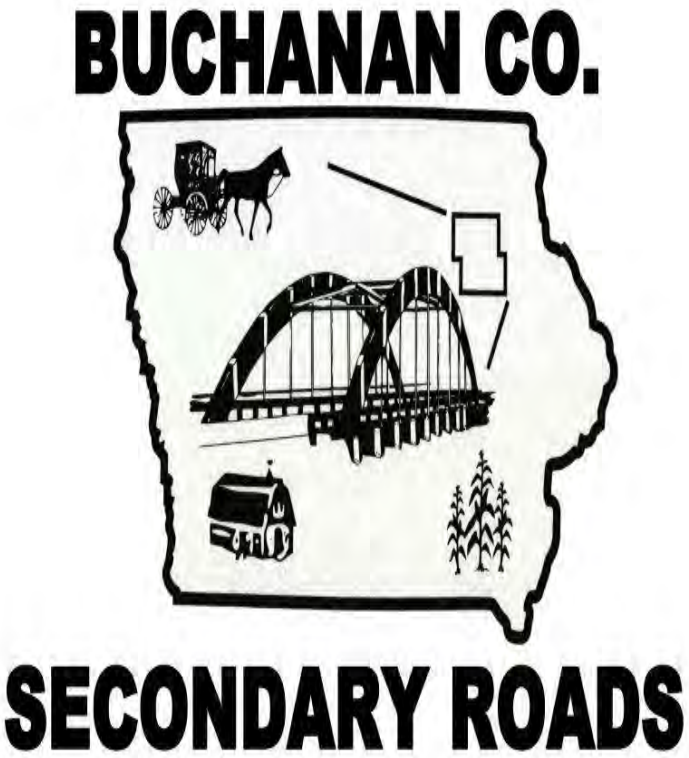
Brian P. Keierleber P.E.
County Engineers Association of California

Buchanan County Iowa



- 259 Bridges over 20’
- 27-Railcar Bridges
- 6-GRA-IBS Abutments
- 2-Cast on Site Slabs
- 1-Press Brake Tub Girder
- 3-UHPC
- 3- Glue –Laminated Bridges
- 3 Internal Curing Concrete Bridges
- Working on UHPC
- Working on Maher Tadros design
- Continue Using railcar bridges

Many of our bridges are old

New Construction Costs

- Receives about $382,000/Yr. for BRS/BROS
- 30x100 slab x $150/sf. or $450,000.

IMMEDIATE RELEASE January 14, 2014

Home » News » Press Release

Kansas Company Pays $372,750 For Destruction Of Protected Bird Eggs And Nests During Bridge Repair Project In Harper County Employee Pleads Guilty to Misdemeanor

Oklahoma City, Oklahoma – Wildcat Concrete Services, Inc. ("Wildcat"), a Kansas corporation, has paid $372,750 to the North American Wetlands Conservation Fund as part of a non-prosecution agreement with the United States arising from the destruction of cliff swallow nests during a bridge repair project, announced Sanford C. Coats, United States Attorney for the Western District of Oklahoma. In addition, Richard Lee Pool, 54, of Osage City, Kansas, an employee of Wildcat, pled guilty yesterday to one misdemeanor count of violating the Migratory Bird Treaty Act.

What we are faced with

Our System Cannot meet Today's Demands

12000 2TAHD Trailboss LowPro

4000Bu Grain Cart=240000Lb. +

Overloads Have A Cumulative Effect

We Have NOT kept up with Modern Agriculture

Postings Do Not Work unless I am there.

WE KNOW WHAT THE RESULTS WILL BE!

The world and our economy relies on Food

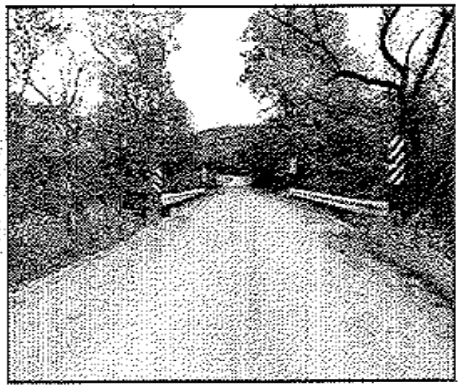
They did not care before

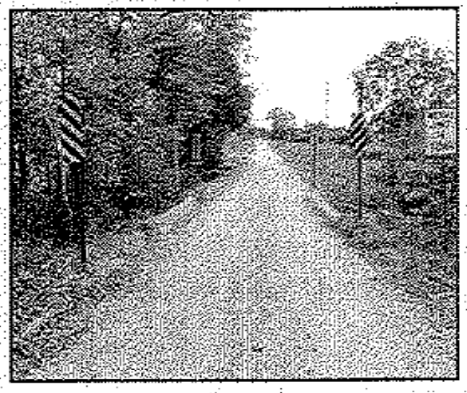
They always made it before

Access is essential for everyone

Low Water Crossings are NOT always Compatible with Modern Equipment

Most asked Question-Why not just throw in a pipe





Kansas
Department of Transportation

ECONOMIC IMPACT OF CLOSING LOW-VOLUME RURAL BRIDGES

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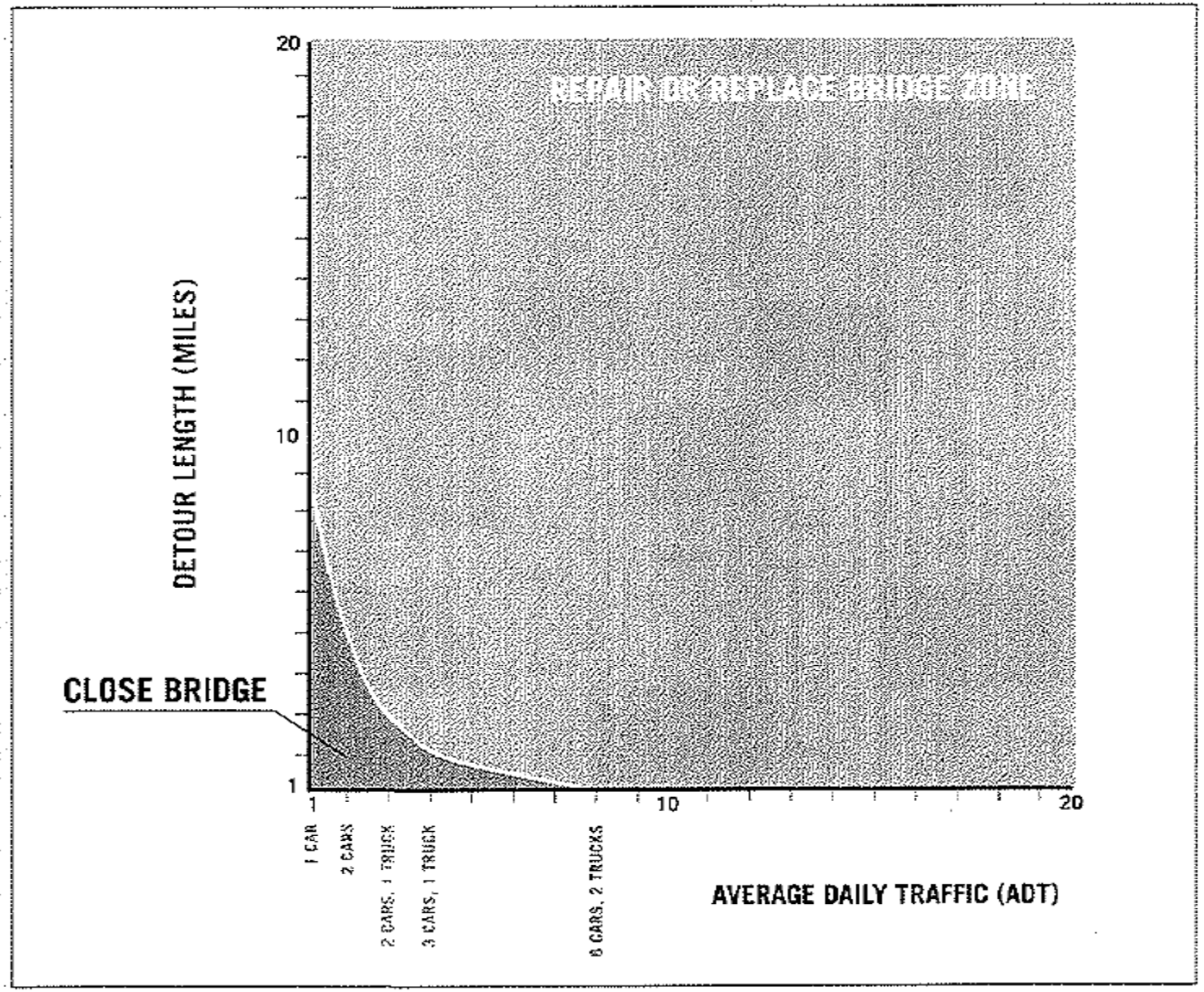
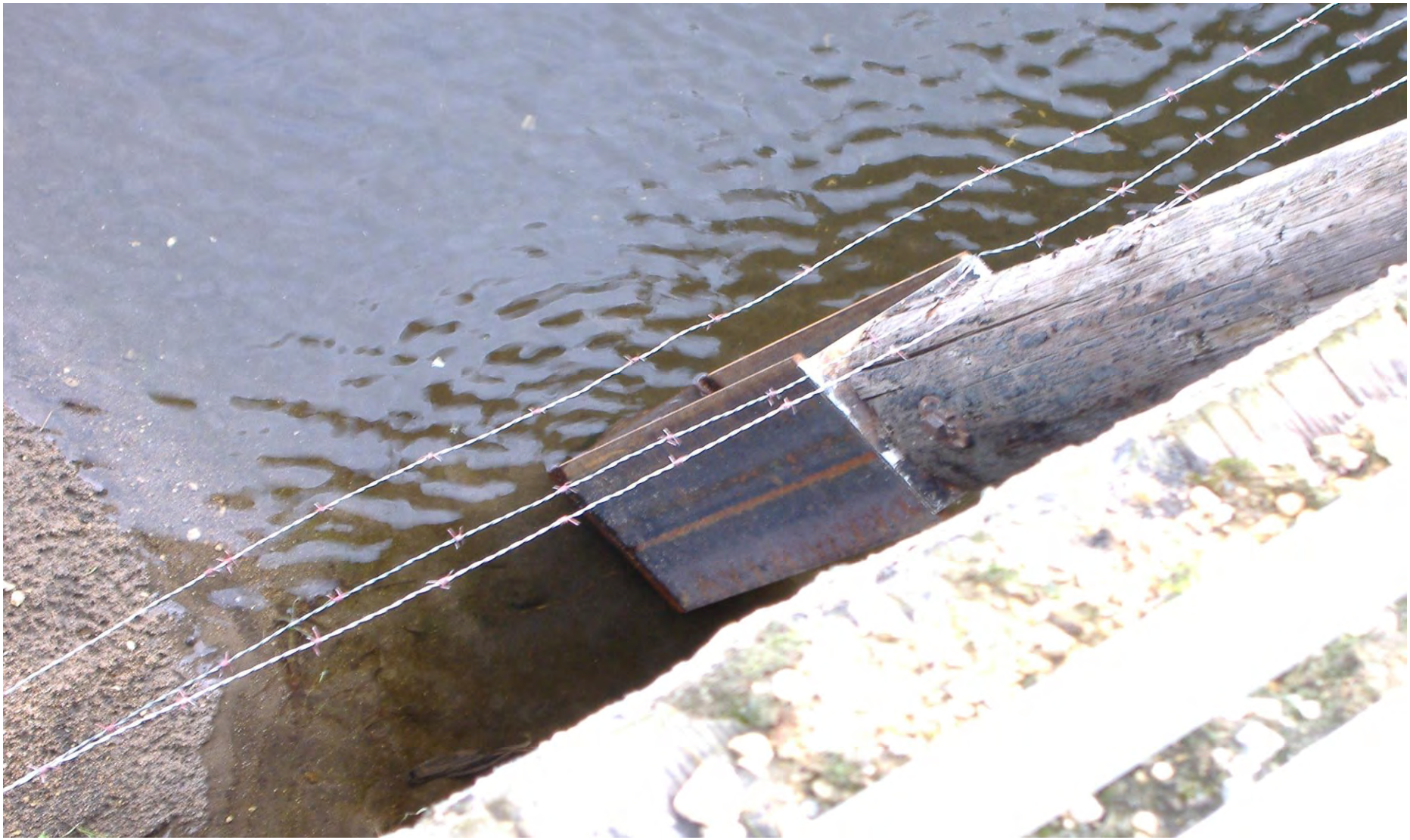


FIGURE 3. DETERMINING BRIDGE CLOSURE / REPAIR / REPLACE BASED ON ADT AND DETOUR LENGTH

SOME Repairs are Band-Aids



Asphalt Over Concrete

Road Salts are Harmful

Simplified Deck Overlaying

Simple and effective

Partial Timber encasement

Piling Encasements Deteriorating

Older encasements

Dough boy Bridge Commercial Repairs

Concrete Pier Repair

Over Time the backwall kicks out

A LONG TERM Solution

Encased Abutments

Old Method of Backwall Repair

Drive sheet piling behind the old abutment

Current Repair Method

Cut Out Bad Sections

Curve around for stability

Support the Abutment

Encase to Beams $12,000+materials

3Pier Encasements $17,360+ materials

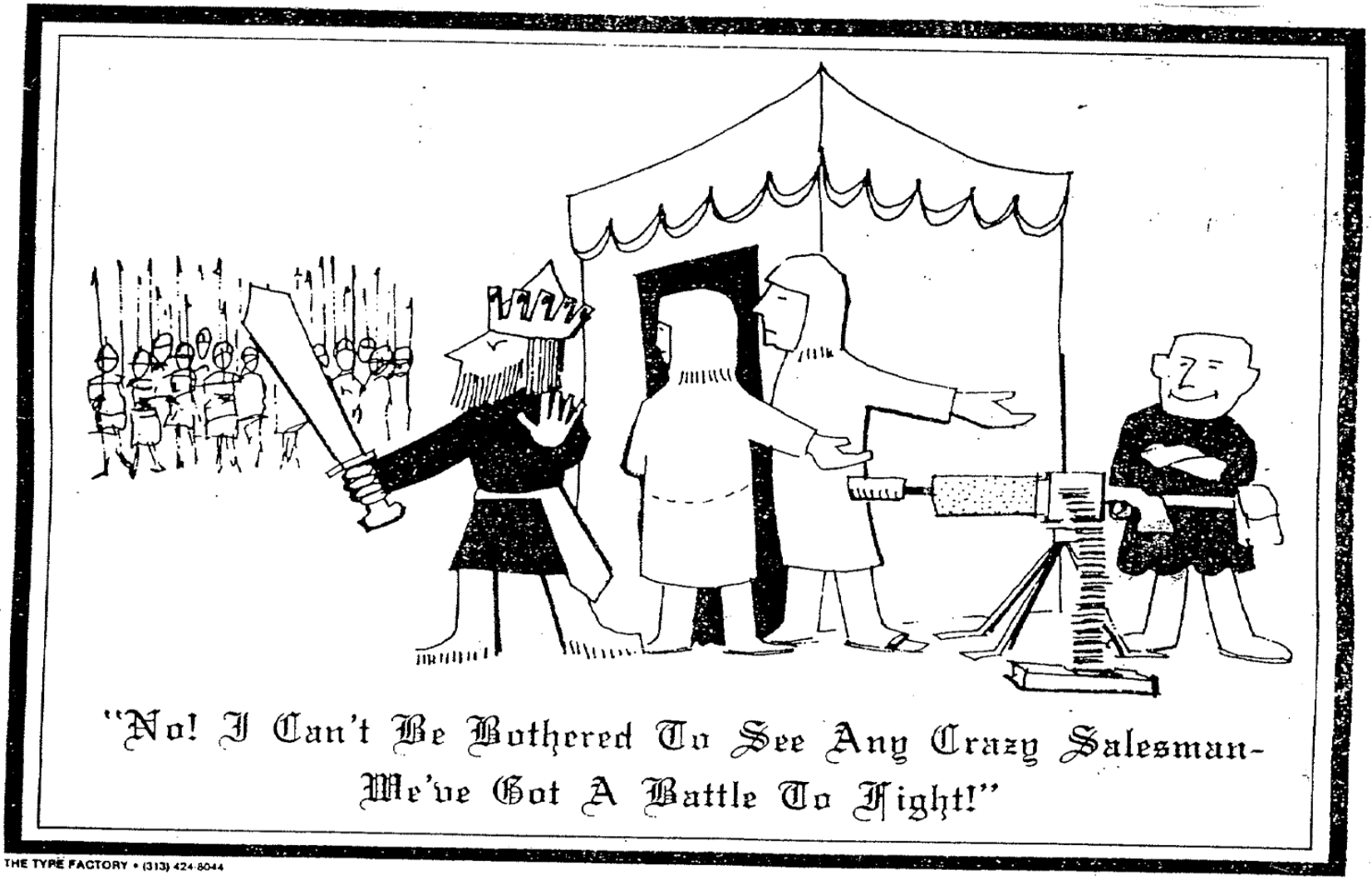
Pier encasement

My old repair Technique

Sometimes there are no GOOD repairs

We have constructed 3 with open grated decks

OVERCOME EXISTING PREJUDICES



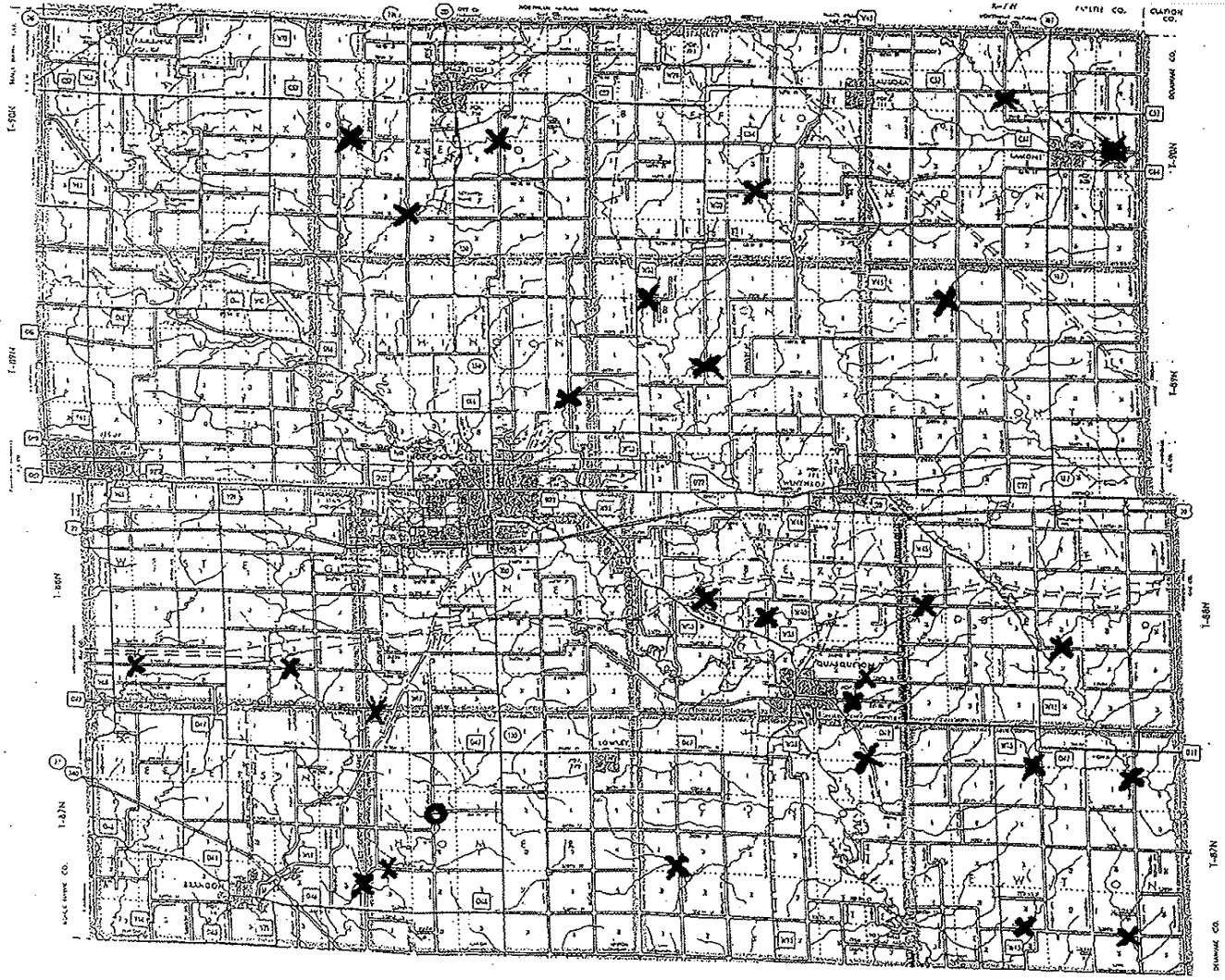
What I Envisioned

What My Employees Envisioned

The Final Result

Be Open To New Concepts

We have constructed 27 Bridges from Railroad Flatcars



HIGHWAY AND TRANSPORTATION MAP

BUCHANAN COUNTY

IOWA

Prepared by
Iowa Department of Transportation
In Cooperation With
United States Department of Transportation

JANUARY 1, 2009

LEGEND

O - CARS ON GROUND AWAITING CONSTRUCTION

What Do They Look Like?

68 Ft Railcar

89 Ft. Flatcar

Load Capacity

Figure 2. BCB5 RRFC Bridge Test (May 11, 2006)

- All our Bridges Carry LEGAL LOADS

Bowen Laboratory - Railroad Flatcar Bridge Fracture 2

Bowen Lab

.

Published on Oct 16, 2013

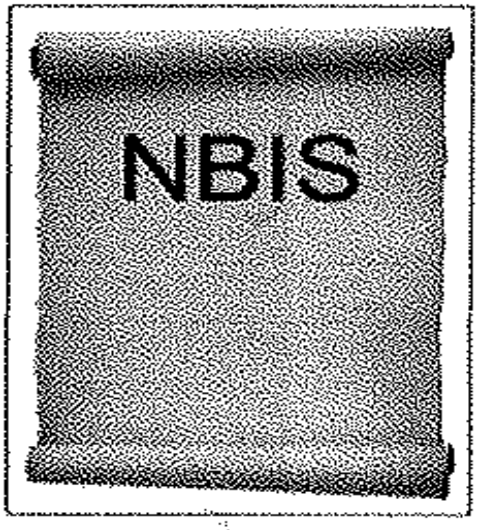
A full-scale railroad flatcar (RRFC) bridge was constructed in Bowen Laboratory. One objective of the research project was to determine if the system displayed adequate load redundancy after fracturing a primary member. The bottom flange and a portion of both webs of one of BOTH main girders at midspan were fractured under a controlled setting. This video displays the fracture of the second main girder. With BOTH main girders of the RRFC bridge fractured, the bridge was loaded to 190 kips.

Not Fracture Critical

National Bridge Inspection Standards

The **National Bridge Inspection Standards (NBIS)** are federal regulations establishing requirements for:

- Inspection Procedures
- Frequency of Inspections
- Qualifications of Personnel
- Inspection Reports
- Maintenance of Bridge Inventory



Stub Abutment With Sheet Piling

Galvanized sheetpiling

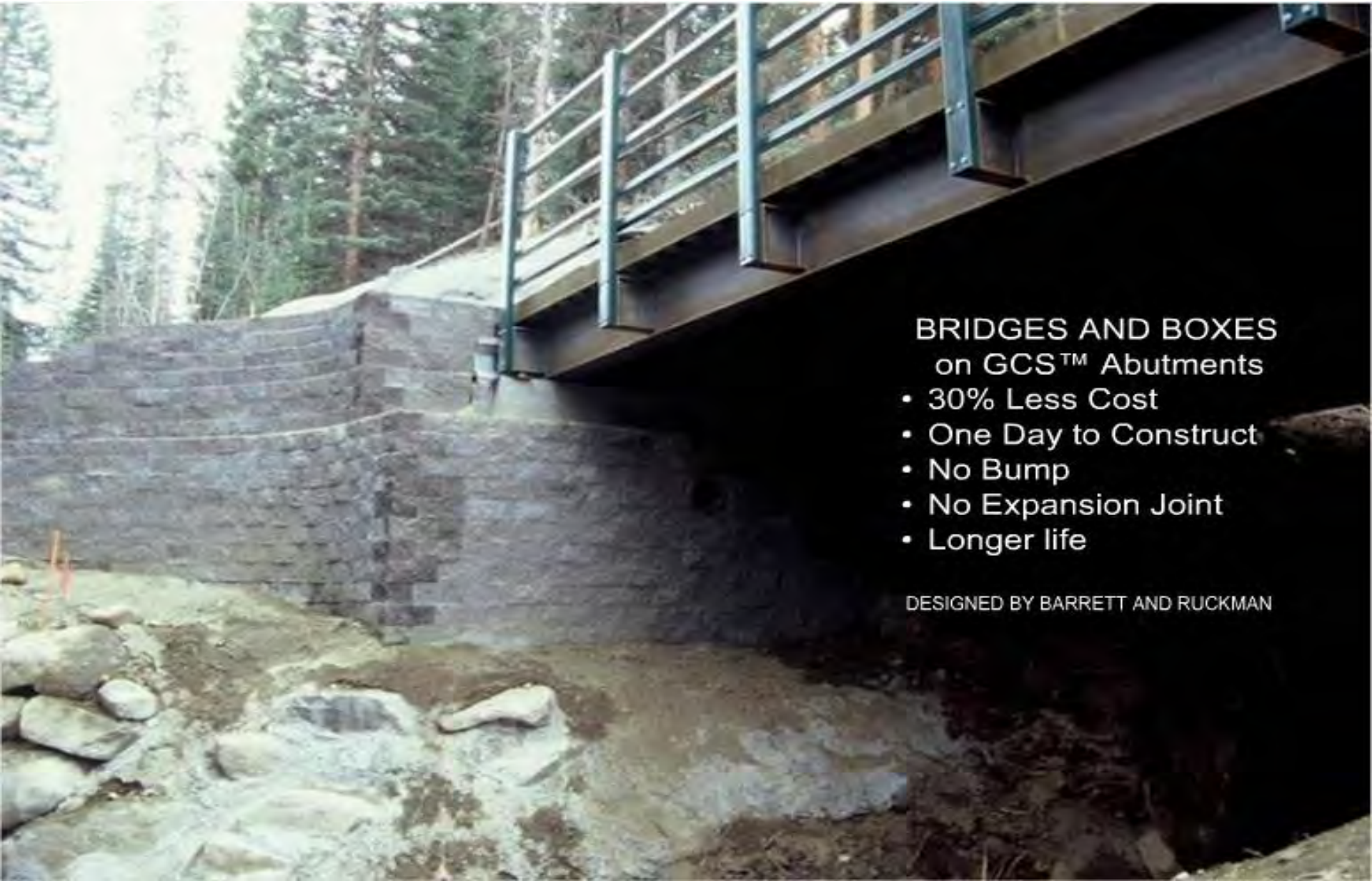
Use What you have $68,019

GRS Abutments

INFORMATION-QUESTIONS

http://www.operationsresearch.dot.state.ia.us/reports/ihrb_by_number/tr400plus.html

UTILIZE NEW TECHNOLOGIES



COMPLETE ONE SIDE

RIPRAP

COMPLETE BRIDGE

Steel

Concrete

Case Study Bridges: Side-by-Side Comparison

Audrain County, MO Bridge 411

Built 2012

Steel 4 Girders

47.5 ft Span, 24 ft Roadway Width

2 ft Structural Depth

No Skew

Audrain County, MO Bridge 336

Built 2012

Precast 6 Hollowcore Slab Girders

50.5 ft Span, 24 ft Roadway Width

2 ft Structural Depth

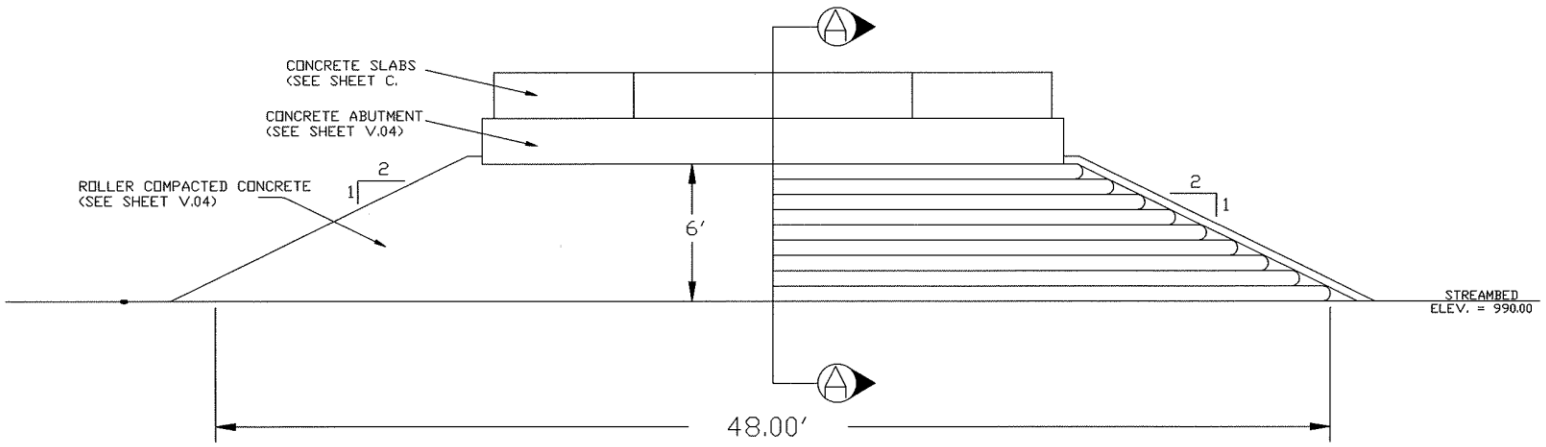
20^{o} Skew

Future Generations will Benefit

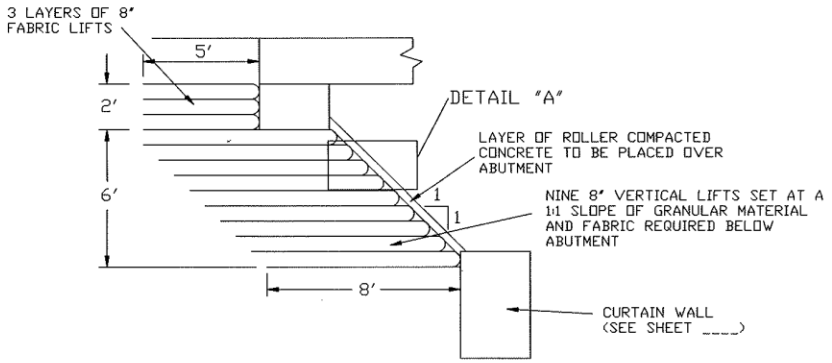
CAST ON SITE SLABS with INTERNAL CURING CONCRETE

Gerstenbergers Bridge

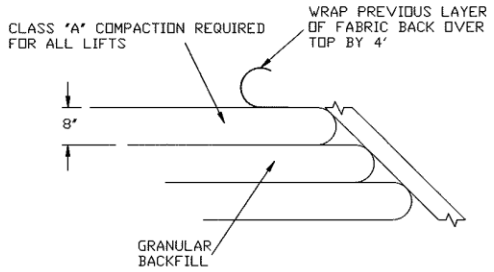
Constantly Improve The Methods



ELEVATION VIEW



SECTION A-A



DETAIL "A"

NOTES:
ALL COMPACTION SHALL MEET THE REQUIREMENTS OF CLASS "A" COMPACTION AS STATED IN THE 2009 STANDARD SPECIFICATIONS.

ROLLER COMPACTED CONCRETE IS TO BE PLACED OVER TOP OF FACES OF THE ABUTMENT AS WELL AS 10 FT BACK ON EITHER SIDE FROM THE ABUTMENT FACE.

GRANULAR BACKFILL TO CONSIST OF CLASS"A" CRUSHED STONE

52' 00" x 24' 00" C.O.S.S. Bridge
Located on Kentuckyr Ave. over Unnamed Creek
48' 00" SPAN
FOUNDATION DETAIL
STATION; 101+64.88 SKEW: 0° ahead
BUCHANAN COUNTY, IOWA FHWA # 82520

AD	BUCHANAN COUNTY	PROJECT NO.	U.01

Compacted Concrete on GRS

Angles can be decieving

2:1 sideslopes

Completed Abutment face on a 1:1

Completed Bridge

New ways to do things

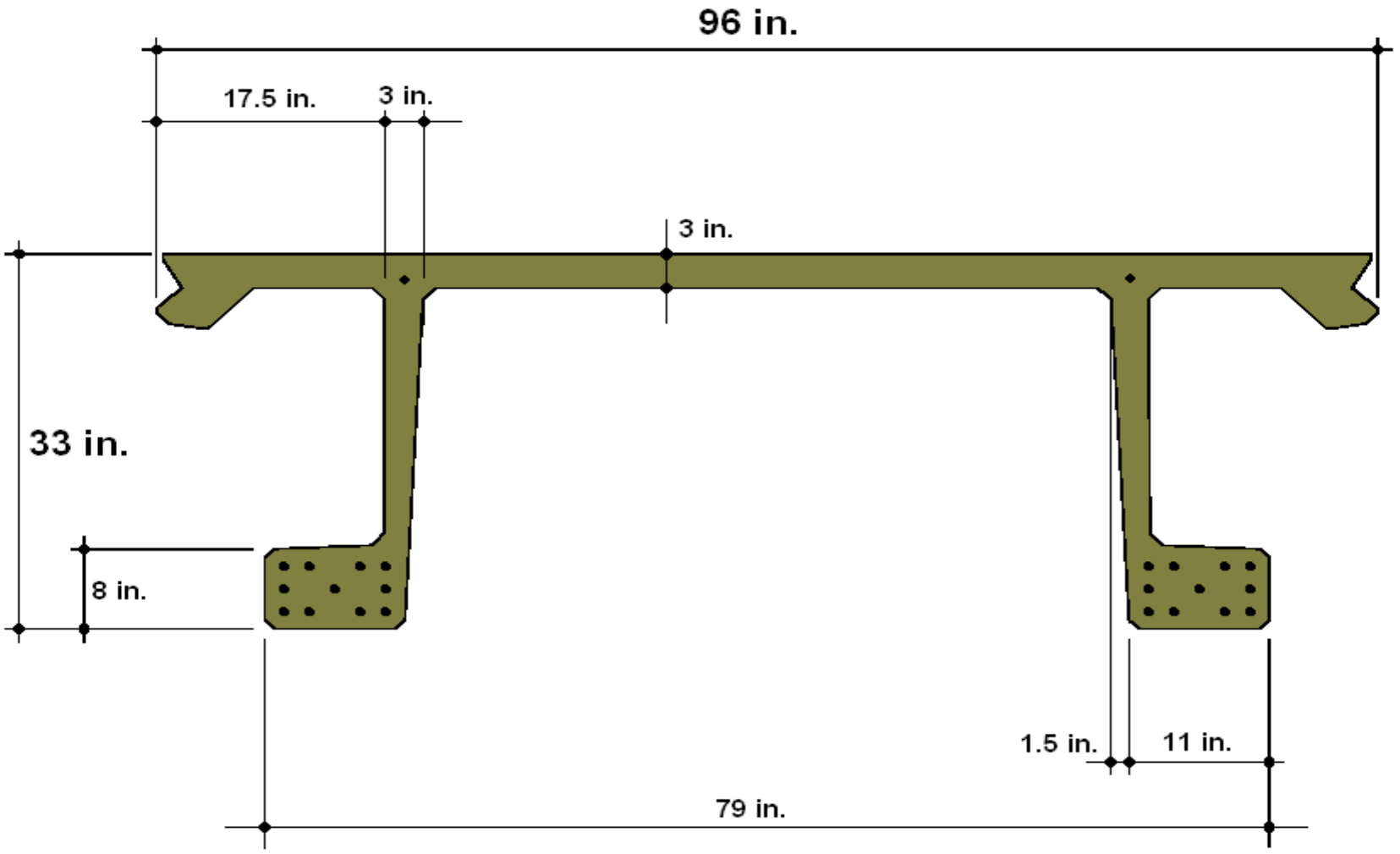
Completed Slattery Bridge

UHPC Bridges

Timber String/multi-beam or girder
32 x 23.3 (0ºSkew) Built 1899
SR=30 Scour=5
Last Insp: Jan 2015
Next Insp: Jan 2016 (12 mo cycle)

Dr. Joh, Mr. Keierleber, Dr. Kim ,Mr. Davis, Dr. Koh

Testing showed the Initial Designs Failed in Transverse Flexure and Local Stresses



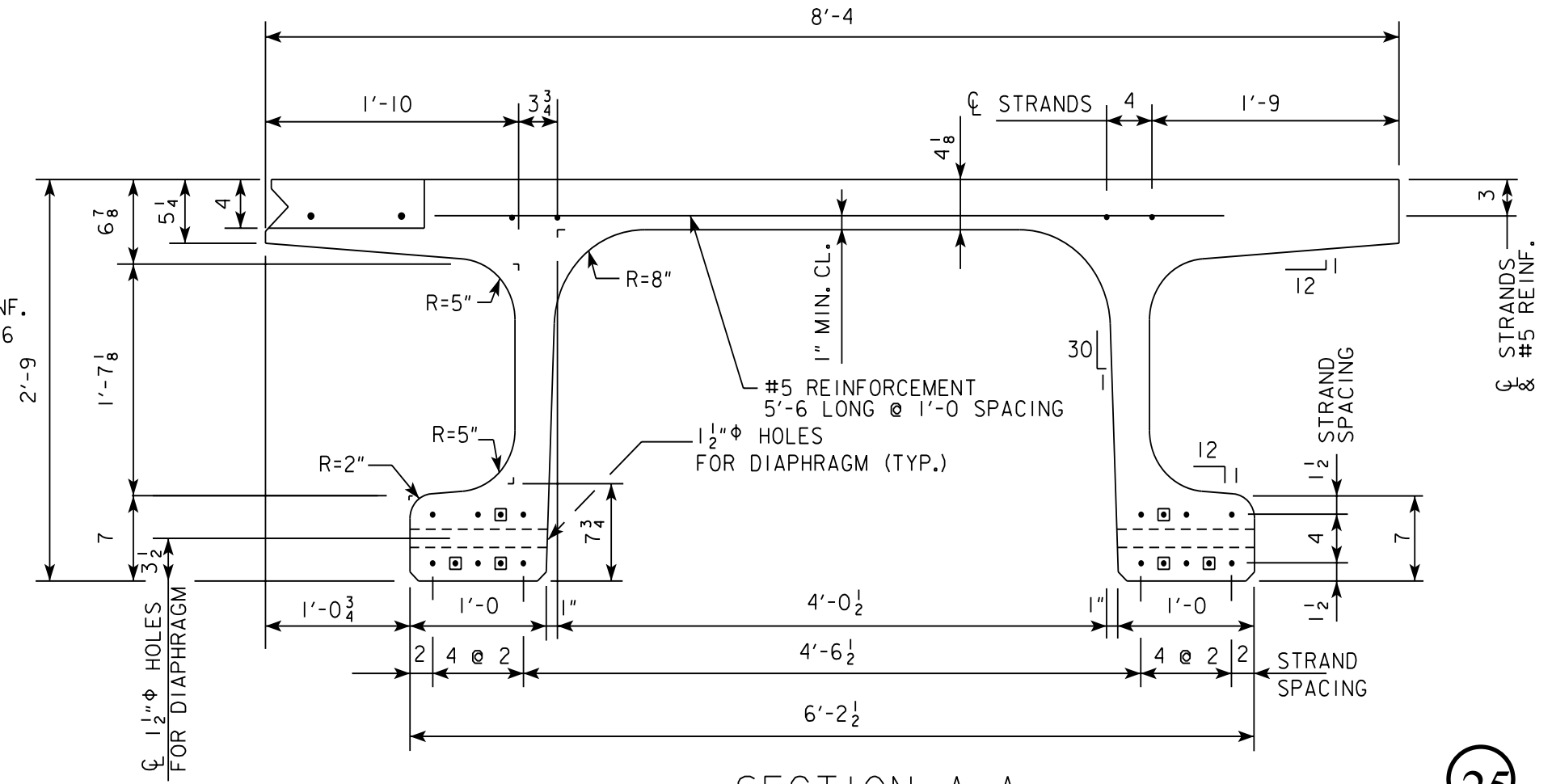
UHPC Design Data

- Modulus of elasticity final = 7,500 ksi
- Compressive strength at release = 14.5 ksi
- Compressive strength final = 21.5 ksi
- Tensile strength ~ 1.20 ksi

Jakway Park Bridge 2008

Jakway prior to construction

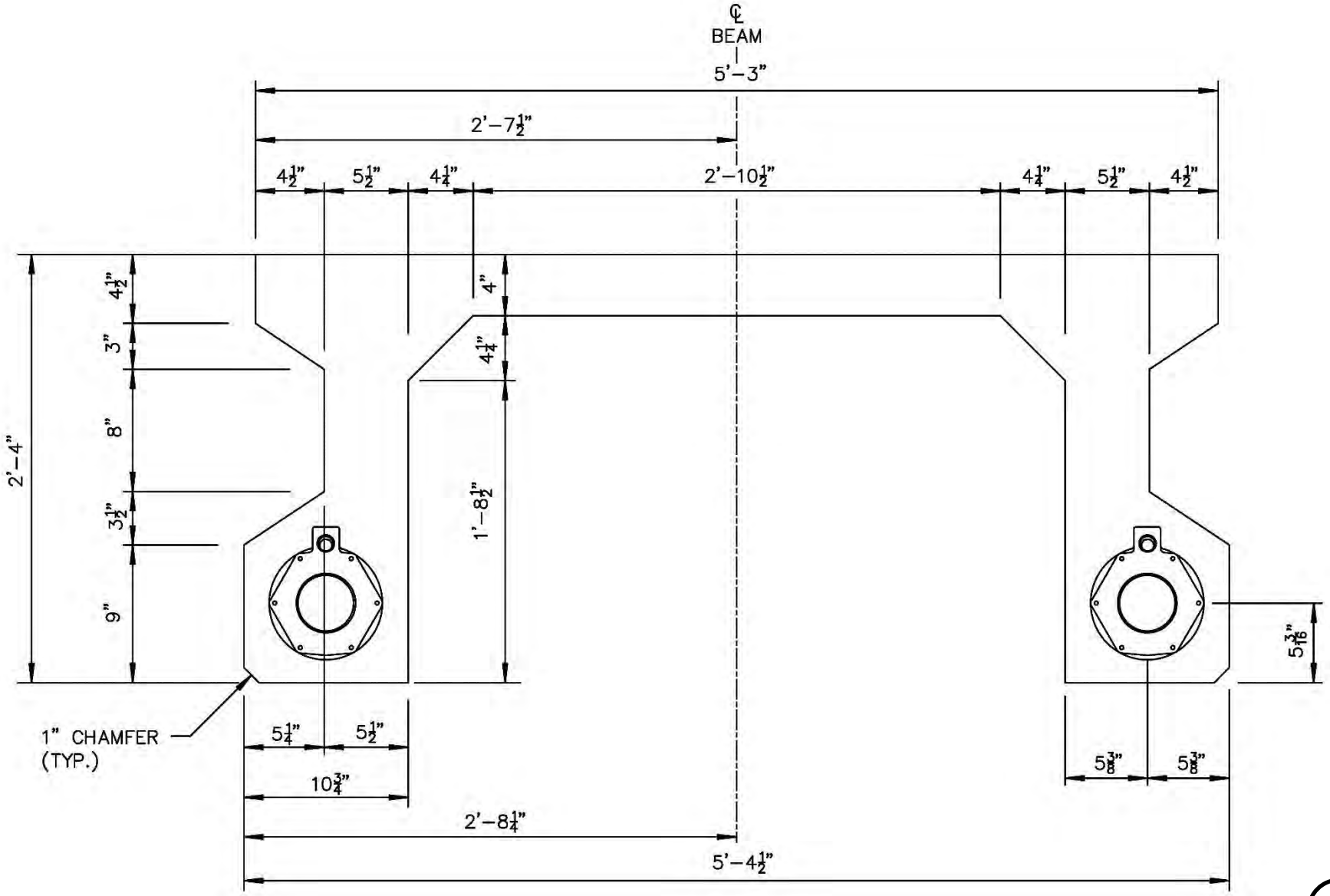
Final Section New detail



SECTION A-A

10 ROUGHENED CONCRETE

Korean UHPC Design



UHPC Material (Positive)

- Self Consolidating
- High compressive strength (30 ksi)
- Dense low permeability
- Low creep post-cured
- High durability
- Fibers post-cracking strength

Mix Design Comparison of Different Types of UHPC

Constituents	lb/yd^3 (kg/m^3)			% by weight		
	variation	UHPC		Variation	UHPC	
		UHPC	K-UHPC		UHPC	K-UHPC
Aggregate	1739 (1032)			42.70%		
Sand	1429 (848)	1720 (1020)	1462 (867)	35.10%	40.80%	35.30%
Cement	600 (356)	1200 (712)	1329 (789)	14.70%	28.50%	32.10%
Ground Quartz		355 (211)			8.40%	
Silica Fume		390 (231)			9.30%	
Water	300 (178)	184 (109)	311 (184)	7.40%	4.40%	7.50%
Superplasticizer		52 (31)	31 (18)		1.20%	0.70%
Accelerator		51 (30)			1.20%	
13.0mm fiber		263 (156)			6.20%	
16.3mm fiber			66 (39)			1.60%
19.5mm fiber			131 (78)			3.20%
Defoamer			1 (0.5)			0.02%
SRA			13 (8)			0.30%
Pre-mix*			797 (473)			19.30%
Total	4068 (2413)	4214 (2500)	4142 (2457)	100%	100%	100%

Mixing Proportions and Process

Mixing orders	SC180 KICT MIX	Total (lb/5.5CY)	Location	Mixing instruction
1	Pre-mix	4386	County	
2	Cement	7310	Ready Mix Plant	Mix for 10 min
3	Wet Sand (MC = 4.2%)	8041	Ready Mix Plant	Mix for 5 min
4	Water	1710	Ready Mix Plant	Rotate at 10 RPM and move to county shop
5	SRA	73	County	**After adding all liquid additives, Mix for 5 min at 10 RPM then,**
6	Defoamer	5	County	**Mix for 5 min at Maximum speed**
7	Superplasticizer	140	County	
8	Steel Fiber (0.63 inch long)	362	County	Add for 7 min at 10 RPM
9	Steel Fiber (0.78 inch long)	723	County	**Add for 13 min at 10 RPM then, Mix for 2 min. st maximum speed**

County Constructed Forms

2008 Placing Mixture into trucks

UHPC

Placing the K-UHPC into trucks

Placing Super plasticizer

Placing The Admixtures

K-UHP

Placing Steel Fibers in Canada

UHPC

We used a better method

We added a second vibrator

Pouring in Winnipeg

Pouring the Beams

K-UHP

Curing in Winnipeg

The Steam Curing Machine.

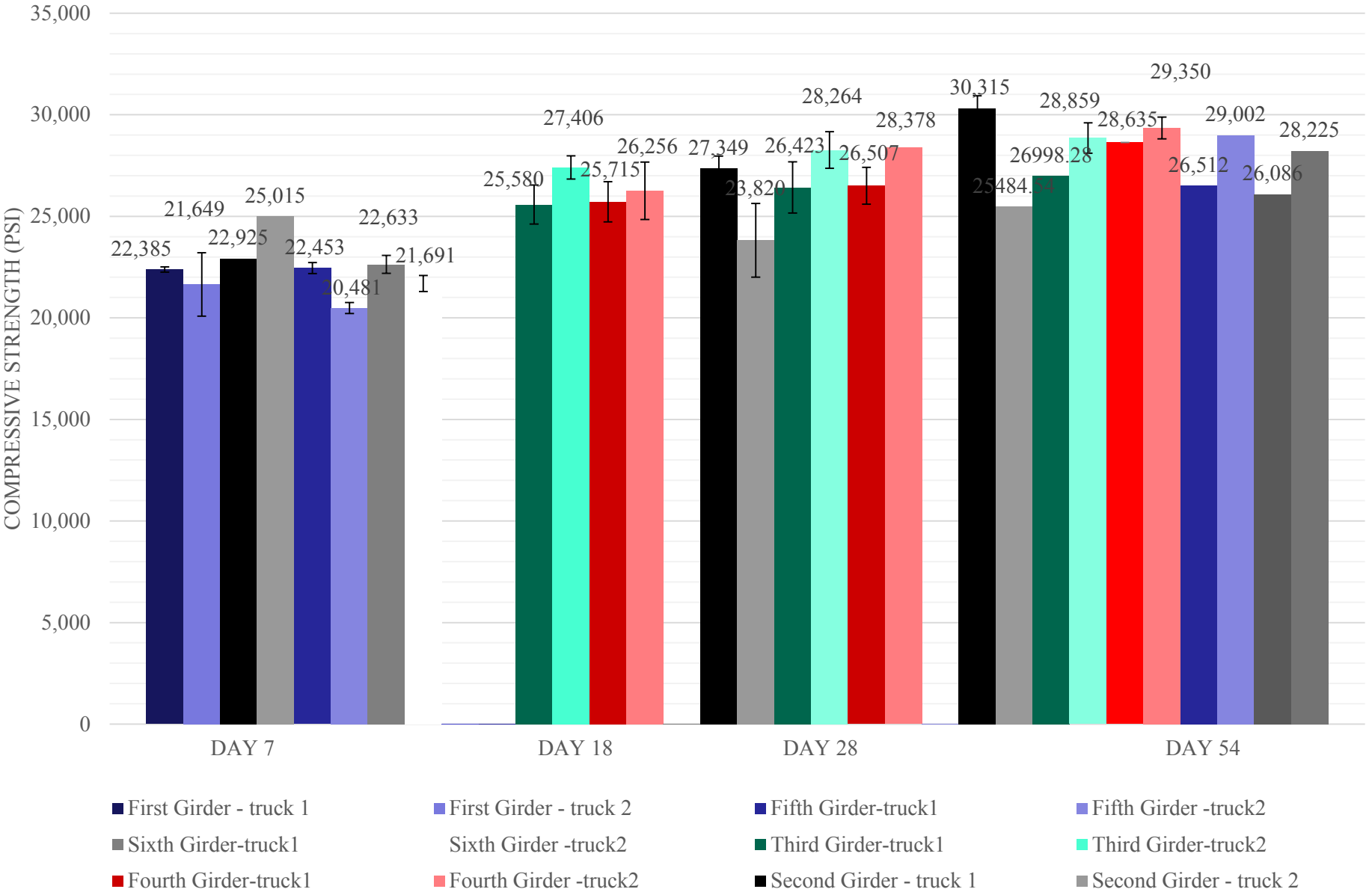
K-UHP

Steam Curing in our yard

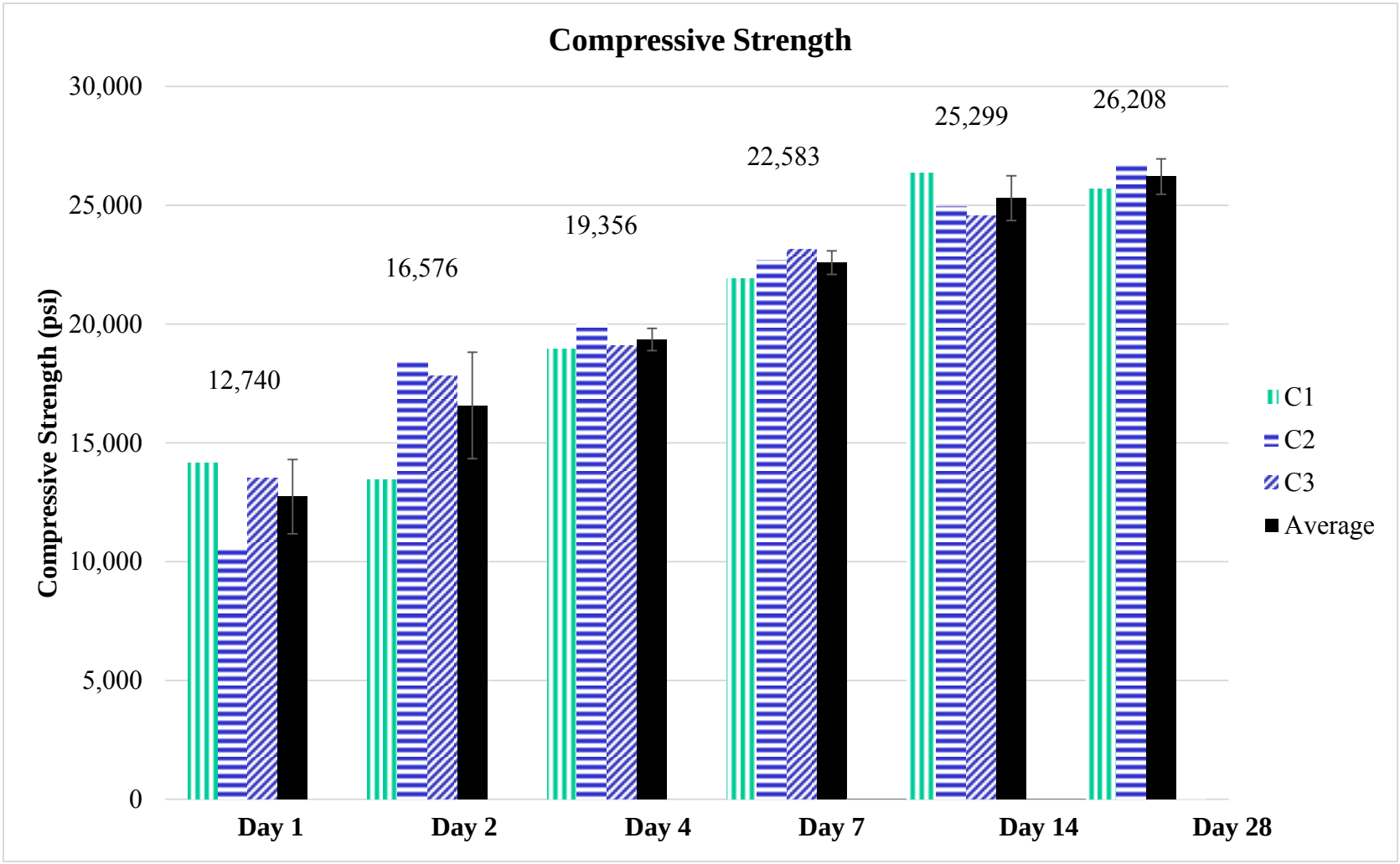
K-UHP

Compressive Strength Test

- Instron PRISM 5500 test machine with a capacity of 1.1 MN (247,290 lbf)


35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
COMPRESSIVE STRENGTH (PSI)
22,385
21,649
22,925
25,015
22,453
20,481
22,633
21,691
25,580
27,406
25,715
26,256
27,349
23,820
26,423
28,264
26,507
28,378
30,315
25484.54
26998.28
28,859
28,635
29,350
26,512
29,002
26,086
28,225
DAY 7
DAY 18
DAY 28
DAY 54
First Girder - truck 1
First Girder - truck 2
Fifth Girder-truck1
Fifth Girder -truck2
Sixth Girder-truck1
Sixth Girder -truck2
Third Girder-truck1
Third Girder-truck2
Fourth Girder-truck1
Fourth Girder -truck2
Second Girder - truck 1
Second Girder - truck 2

Compressive Strength



County Post Tensioning

Post Tensioning Check

Standard Abutments

Standard Slab Construction

Not all the joints were perfect.

Highway Departments Have old Signs

Lessons Learned

- Follow the Mixing instructions, Mix the Premix and the Portland prior to the sand
- Always have super plasticizer available to add as needed.
- High density and high viscosity create pressures we are not accustom to. (uplift pulled the screws through the 2x4's
- Post tensioning is easy

Completed K UHPC Bridge

Bridge Deck Overlay-Strengthening

Preparing for Deck Overlay

Preliminary Deck Preparation

Wire mesh in the negative moments

Mixing the UHPC

It places better perpendicular

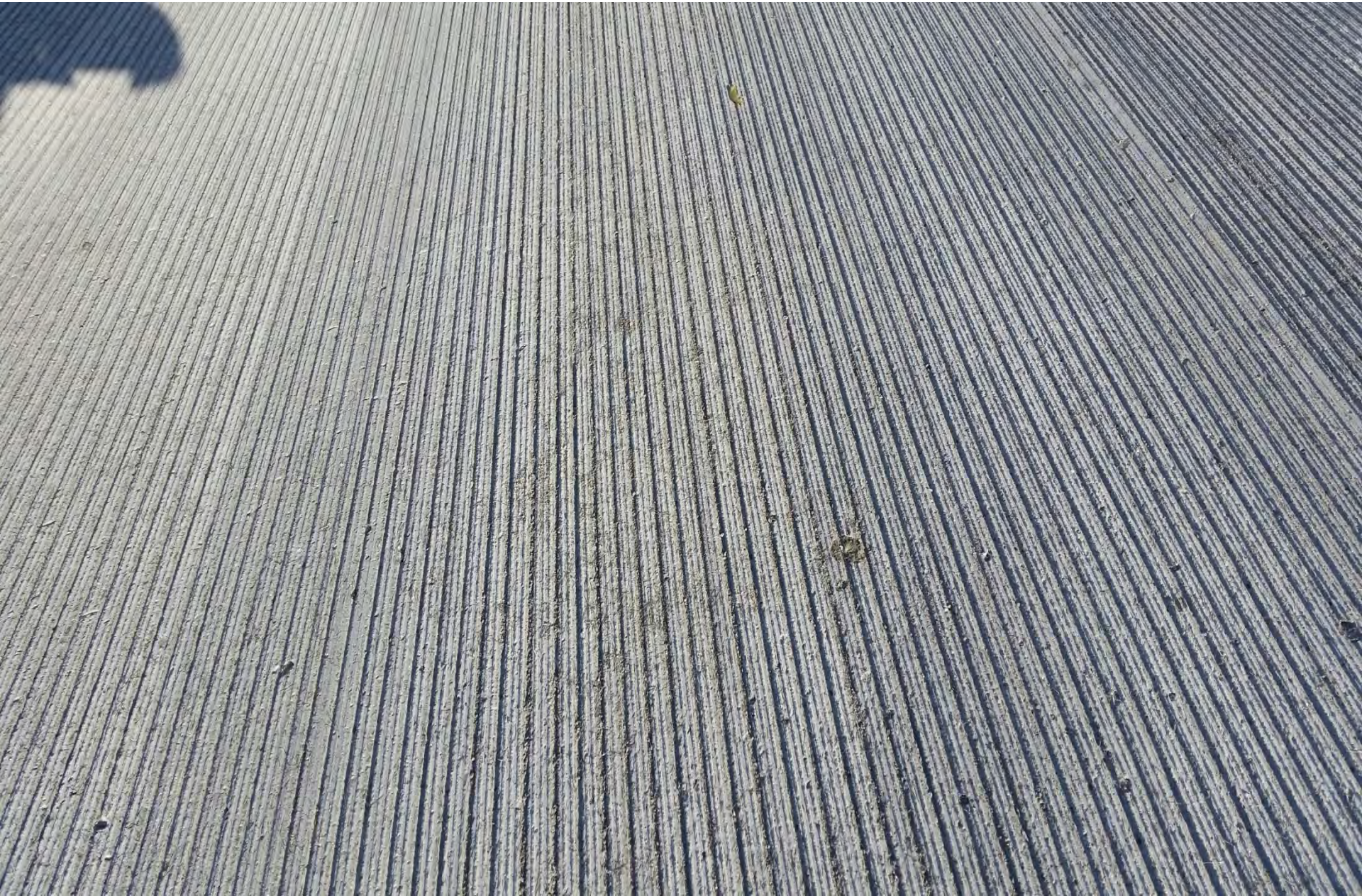
They Switched to placing perpendicular

Overlay prior to grinding

Grinding

Texture After Grinding

After Grooving



Finished Deck Overlay

Lessons Learned

- It Can be done on a 5% grade
- High Shear Mixers work well
- Grind After 4 days do not wait!!!
- Dump the Buggy perpendicular to the bridge

- What I did not try
- Would a bull float work if sprayed with Vegetable Oil?
- Would a roller screed work?
- Would a Bidwell Deck Paver work?

The New Design Processes Were Utilized

Plans For letting and constructing

BUCHANAN COUNTY SINGLE SPAN STEEL BEAM BRIDGE
Project Number: LFM-068910--7X-10 LETTING DATE

DRAWING APPROVAL
ALL SHOP DRAWINGS AND FALSEWORK DRAWINGS THAT REQUIRE APPROVAL SHALL BE APPROVED BY THE CONTRACTOR, THEN ACCEPTED BY THE BUCHANAN COUNTY ENGINEER.

THESE SHOP DRAWINGS SHALL NOT BE SENT TO I.D.O.T. OFFICE OF BRIDGES AND STRUCTURES.

IOWA
DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
PLANS OF PROPOSED IMPROVEMENT ON THE
FARM TO MARKET SYSTEM
BUCHANAN COUNTY
SINGLE SPAN STEEL BEAM BRIDGE
63'-00" X 40'-00" STEEL BEAM BRIDGE WITH A 0° SKEW
FHWA # 82270
Project Number: LFM-068910--7X-10

LOCATED ON BENSON-SHADY GROVE AVE. (V65) IN SECTION 6 OF WESTBURG TOWNSHIP, T-88-N, R-10-W. APPROX. ONE HALF MILES SOUTH OF JESUP OVER UNNAMED STREAM

" THE IOWA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, SERIES 2012, PLUS GENERAL SUPPLEMENTAL SPECIFICATIONS, AND APPLICABLE SUPPLEMENTAL SPECIFICATIONS, DEVELOPMENTAL SPECIFICATIONS, AND SPECIAL PROVISIONS, SHALL APPLY TO THE CONSTRUCTION ON THIS PROJECT."

TRAFFIC CONTROL PLAN:

THIS ROAD WILL BE CLOSED TO THROUGH TRAFFIC BUT OPEN TO LOCAL TRAFFIC DURING CONSTRUCTION AS PROVIDED FOR IN ARTICLE 1107.08, 2012 STANDARD SPECIFICATIONS PLUS CURRENT SUPPLEMENTAL SPECIFICATIONS. TRAFFIC CONTROL DEVICES, PROCEDURES,LAYOUTS,SIGNING AND PAVEMENT MARKINGS INSTALLED WITHIN THE LIMITS OF THIS PROJECT SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" AS ADOPTED BY THE DEPARTMENT PER 761 OF THE IOWA ADMINISTRATIVE CODE (IAC) CHAPTER 130."

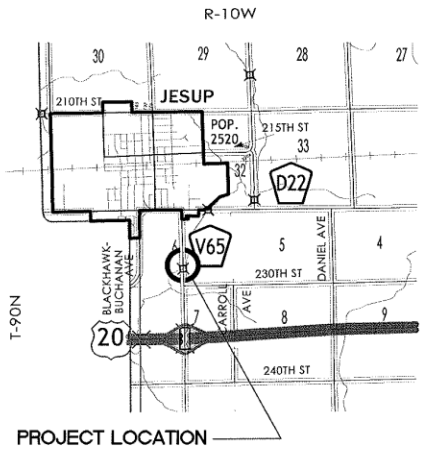
Project Number: LFM-068910--7X-10 FHWA # 82270

INDEX OF SHEETS

MILEAGE SUMMARY

Div.	Location	Lin. Ft.	Miles
	FROM STA. 312+50 TO STA. 313+67.72	117.72	0.0223
	FROM STA. 313+67.72 TO STA. 314+34.72 (BRIDGE)	67.00	0.0127
	FROM STA. 314+34.72 TO STA. 315+50	115.28	0.0218
	TOTAL	300.00	0.0568

LOCATION MAP SCALE
0 1 2 3



Scales: As Noted

IOWA ONE CALL 800 | 292-8989 TOLL FREE CALL - BEFORE - YOU - DIG

2009 AVERAGE ANNUAL DAILY TRAFFIC: 4360 VEHICLES PER DAY

LICENSED PROFESSIONAL ENGINEER
BRIAN PAUL KEIERLEBER
11142
IOWA
Official Seal

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

BRIAN KEIERLEBER, P.E. Date 8/26/13

My license renewal date is December 31, 2014

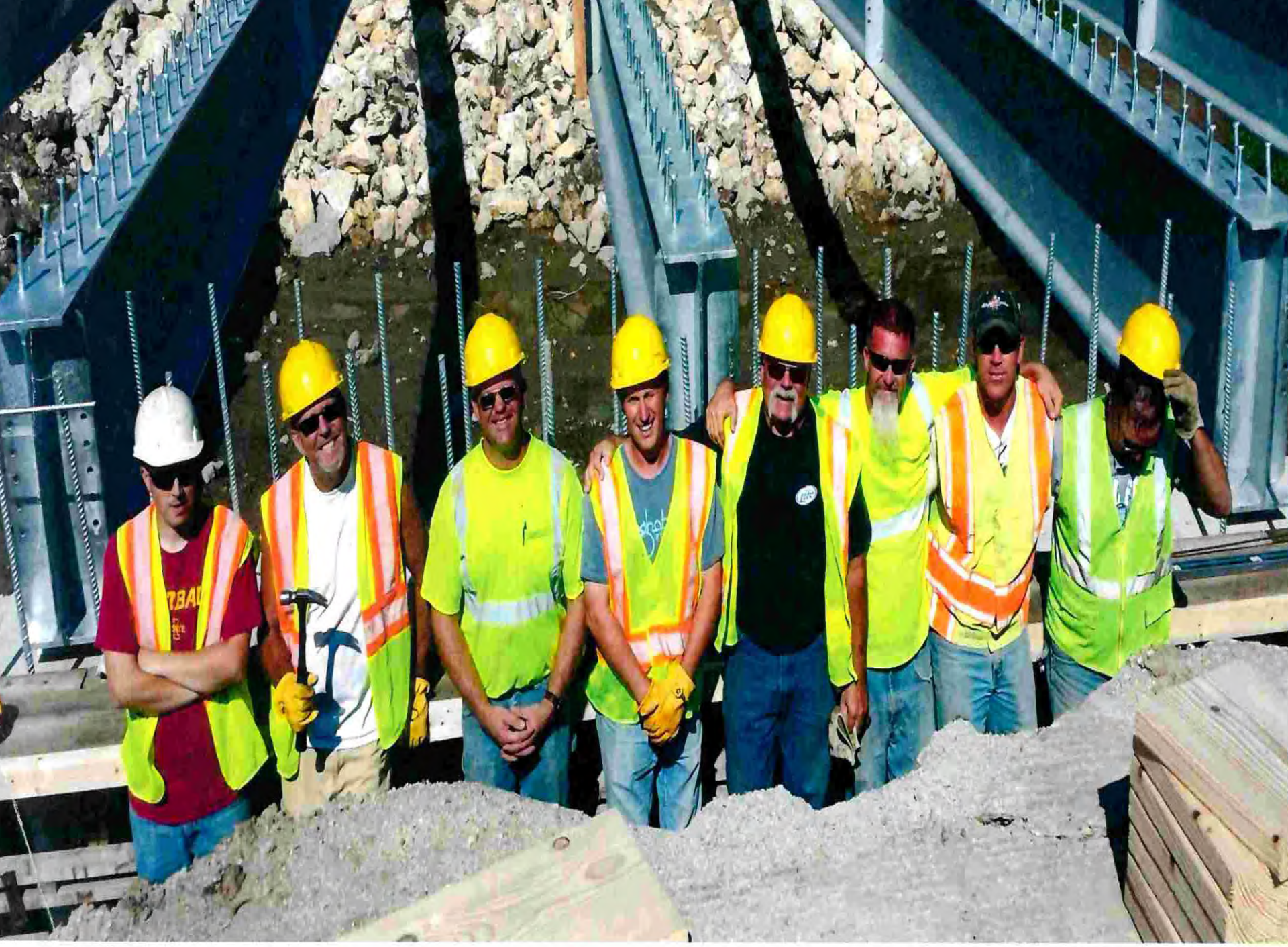
Pages or sheets covered by this seal:
All sheets in set

Approved BUCHANAN County Board of Supervisors

Ralph Kramer
Gary Russell
Ellen Haffner

We have done this before

Setting Beams Proposed Sept 15th set October 2nd



Bolting Diaphragms

Placing the stay in place metal decking

Decking 11 days planned 17 days

Crash Test Level 3

Tested at U of Nebraska

Incorporates many of the SHRP2 R-19 extended life concepts

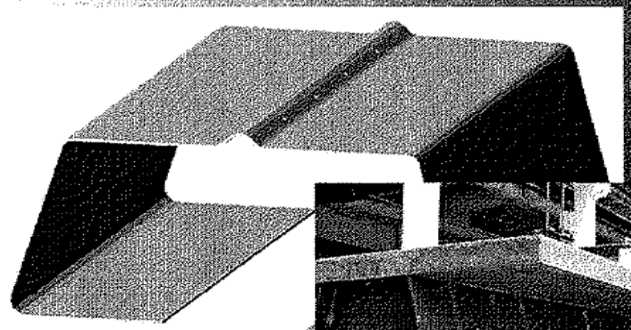
Jesup South Bridge

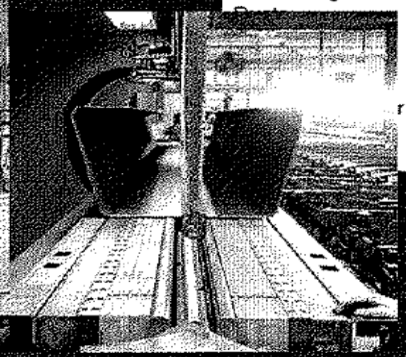
Folded Plate Steel Bridge Concepts

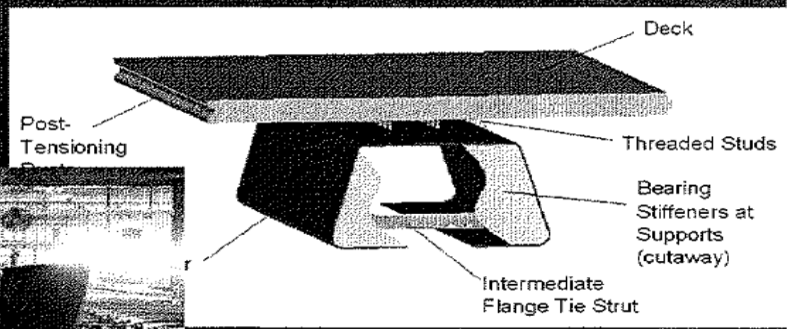
Folded Plate Bridge: Steel Alternative for Short Span Bridges

For more information visit

foldedplate.com

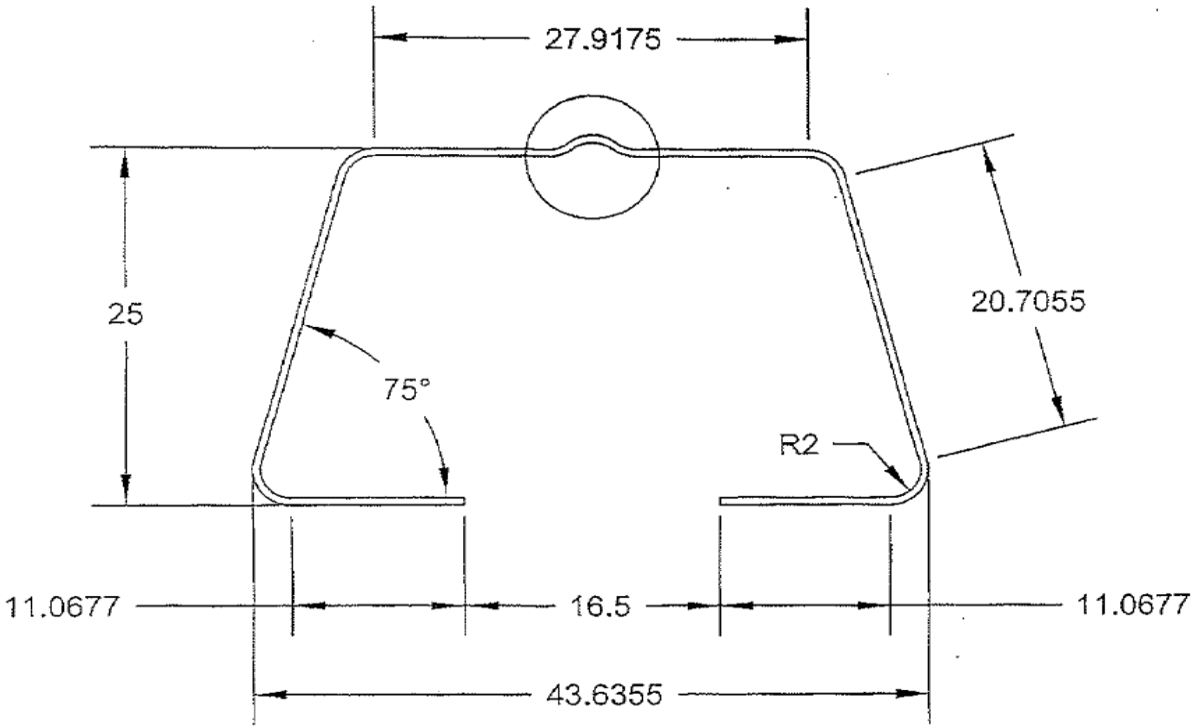


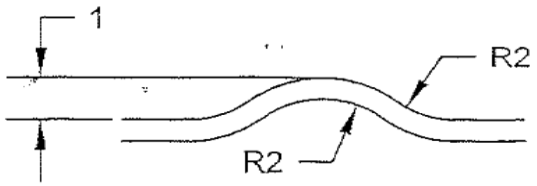




Atorod Azizinamini Process

Folded Plate Specime
Half Inch Plate





Detail A

Bending Dimensions

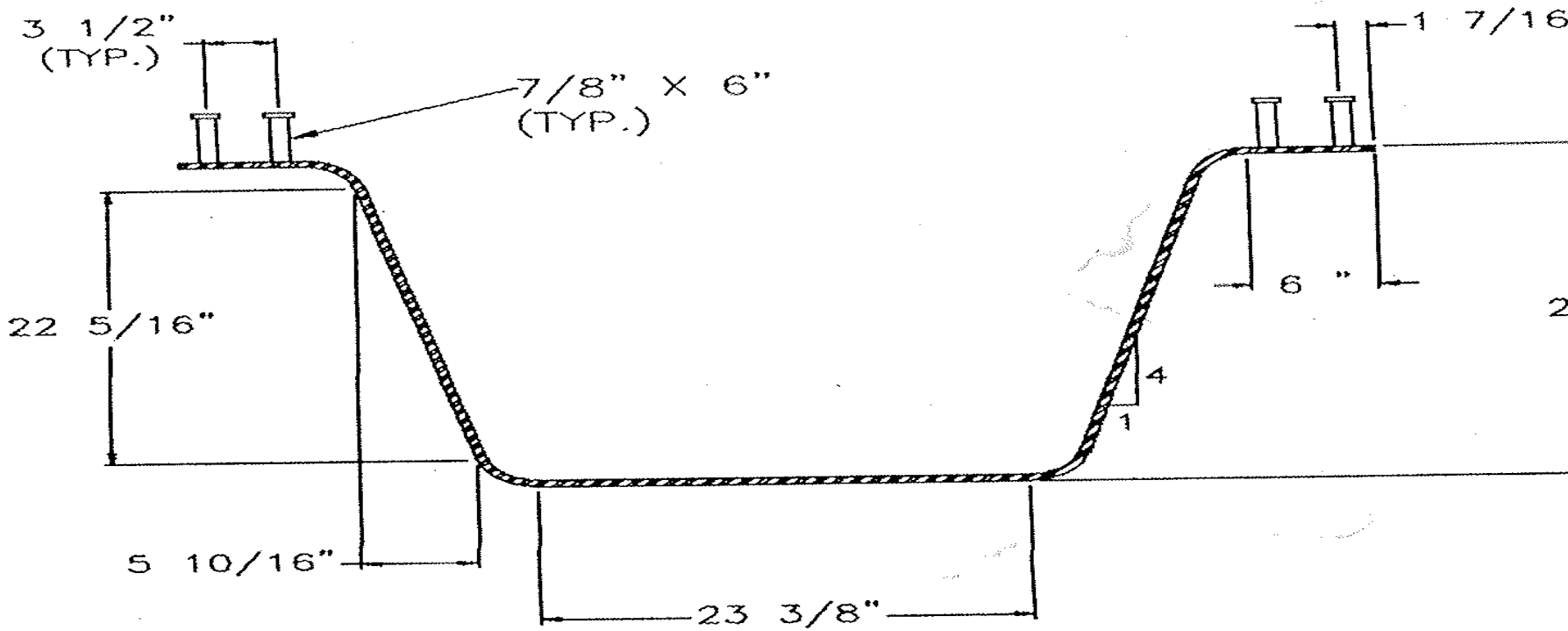
Total Plate Width = 105.6012

Dr.Karl Barth From

WestVirginiaUniversity

and Dr.Michael Barker From

The University of Wyoming

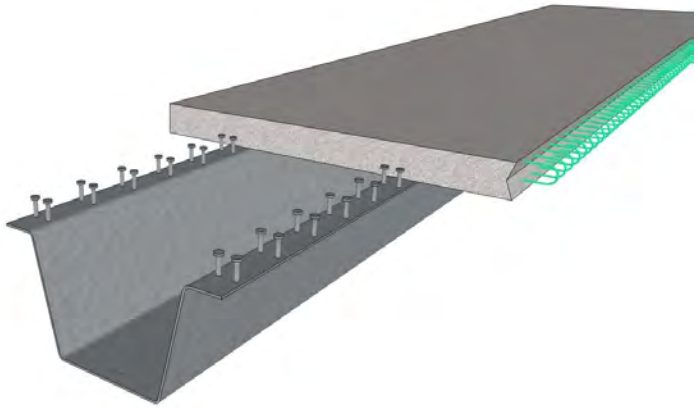


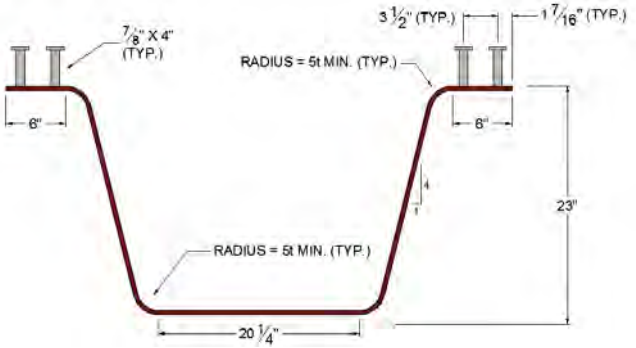
PRESS BRAKE TUB GIRDER

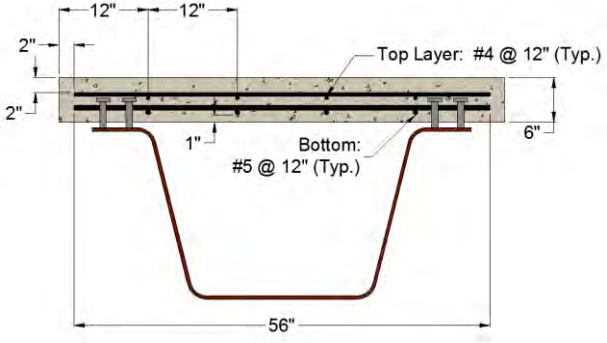
Initial tests are very promising

Press-Brake-Formed Steel Tub Girders

- Galvanized or weathering steel options.
  - Modules are joined using UHPC longitudinal closure pours
  - Modules can be shipped to site pre-topped or with a variety of deck options





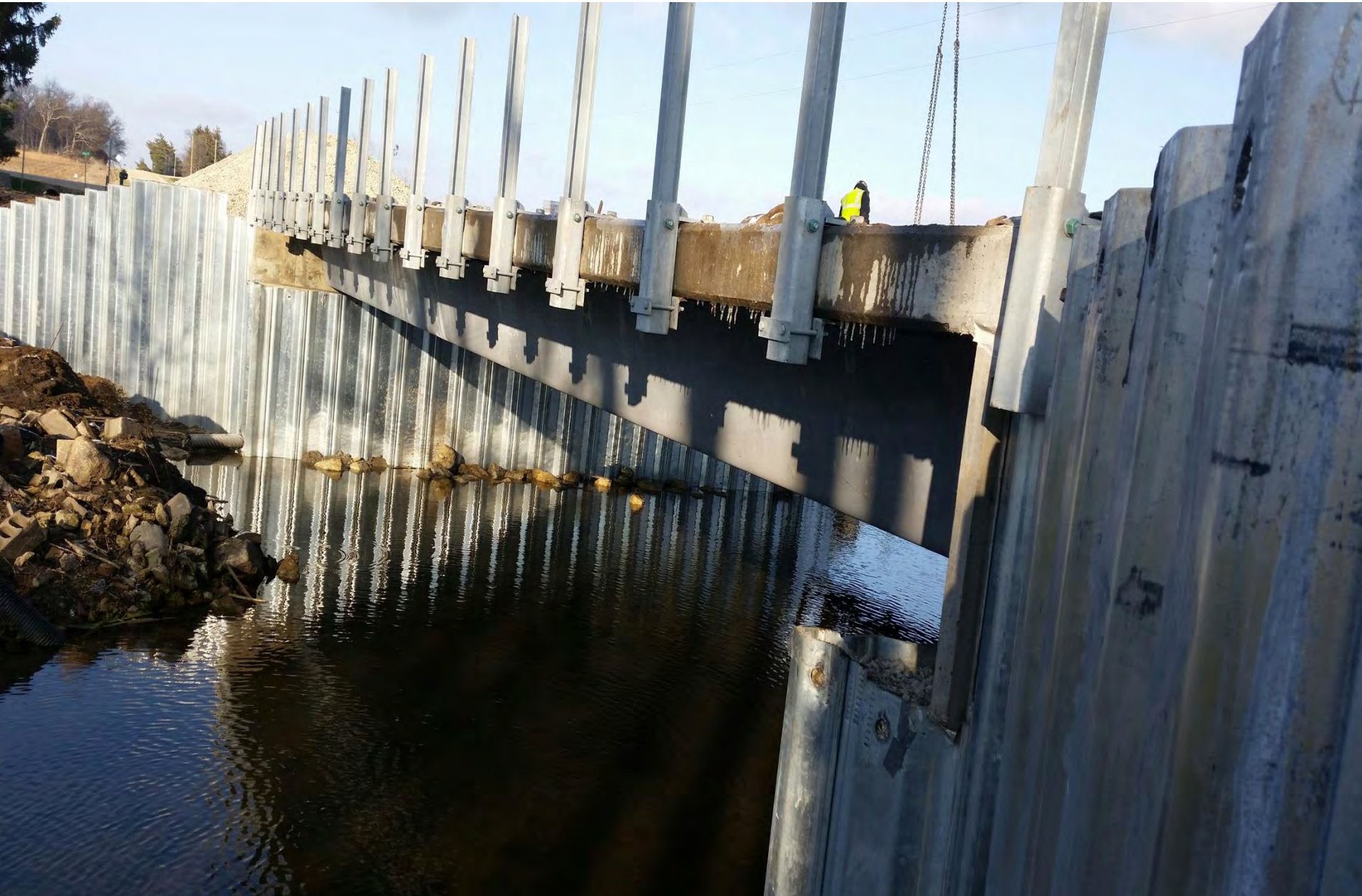


Find More ECONOMICAL Solutions

Stay in place decking and Galvanized rebar

Integral Abutments

MGS Guardrail



Clean Beautiful Structure

Press Brake Tub Girder Amish Sawmill

BURIED SOIL STRUCTURES

It looked something like this

A 42’ structure was constructed.

Low profiles are possible

Completed road view

1,000 of these exist

Re-use the old piling

20 Degrees and Gusts to 30 MPH

Simple

Small Crews and COLD Weather

2 FT. of Cover

The Finished Product

Sometimes go the extra distance

Completed South Abutment

Constructing the Stringers

Placing the Beams

Widened for a path

GRUEN WALD Glue Laminated Bridge

Catt Bridge

Setting The Beams

Placing the Deck

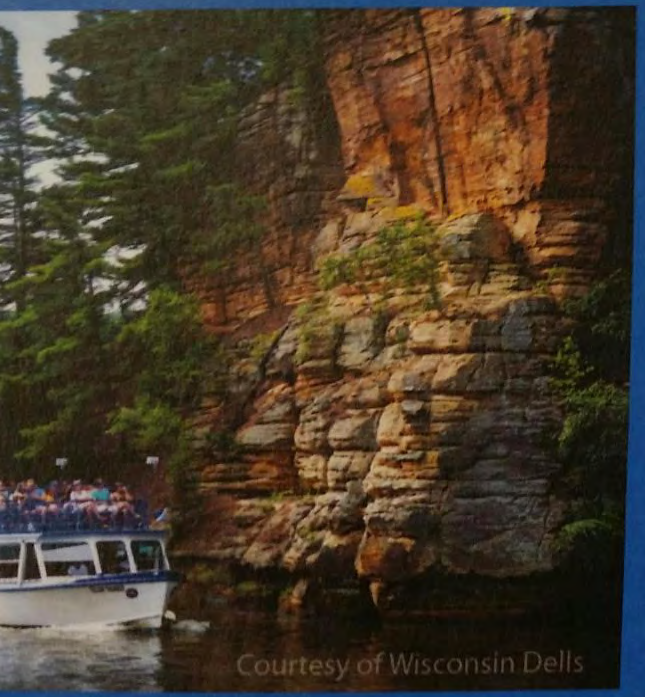
Placing The Backwall

US Forest Products Lab

Vibratory Piling Driver Clinton, Scott and Harrison Countys

PLAN NOW TO ATTEND!

THE LARGEST
EVENT OF COUNTY
INFRASTRUCTURE
PROFESSIONALS



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The Voice of County Road Officials

www.countyengineers.org

WISCONSIN COUNTY HIGHWAY ASSOCIATION

Any Questions????

THANK YOU