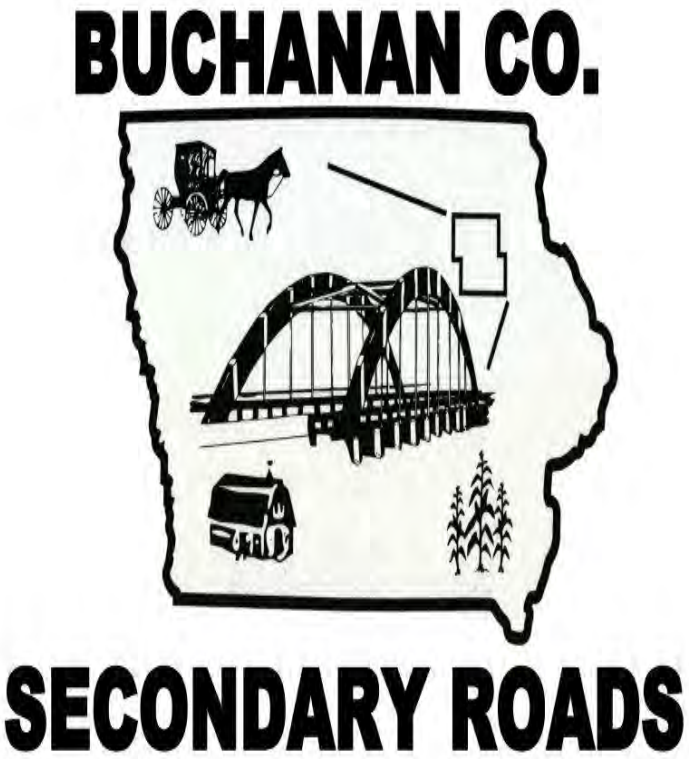
Brian P. Keierleber P.E.
Alabama
Bridge Repairs and Replacements

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

10/09/10 & 10/14/10 & 10/10/18/10

Overloads Have A Cumulative Effect

Without Enforcement and legislation our problems will grow

Avalanche® Double-Auger Grain Carts - Brent Grain Handling

Product Specifications

Model	2094	1594	1394	1194
Capacity-bushels (mt)	2,000 (51)	1,500 (38)	1,300 (33)	1,100 (28
Unloading Speed - bu/mn	1,000	800	800	800
Appx. Empty Weight - lbs. (kg)	32,700 (14,832)	25,200 (11,430)	18,975 (8607)	15,950 (7233)
Appx. Loaded Tongue Weight - lbs. (kg)	6,000 (2722)	5,500 (2495)	5,375 (2438)	5,200 (2395)
Overall Width (m)	13'11" (4.24)	13' (3.96)	12' (3.66)	12' (3.66
Overall Length (m)	37'10" (11.53)	34'2" (10.41)	30'10" (9.40)	30'10" (9.4
Transport Height (m)	12' (3.66)	12'9" (3.89)	12'8" (3.86)	12'2" (3.7
Height Loading Side (m)	11' (3.35)	11'5" (3.48)	11'4" (3.45)	10'10" (3.3
Auger Height - Adj. (m)	10'9" - 16'6" (3.28-5.03)	10'5"-15'11" (3.18-4.85)	10'5"-15'11" (3.18-4.85)	10'5"-15'1 (3.18-4.8
Vertical				

http://www.unverferth.com/brent/grainhandling/carts/avalanche.php?tab=specs 4/11/2011

- April 4, 2011
- Reports of 2-770 gal manure tanks crossing 22 ton bridge loaded
- April 7, 2011 reports of a semi crossing a 3 ton bridge

We Have NOT kept up with Modern Agriculture

Postings Do Not Work unless I am there.

The sign says 3 ton Gross

WE KNOW WHAT THE RESULTS WILL BE!

The world and our economy relies on Food

Pinned Trusses predated the Model T

It was posted at 9 tons

They did not care before

They always made it before

It was a loaded semi

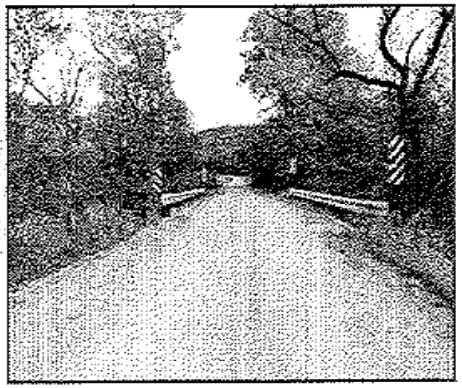
The Bridge does NOT Discriminate

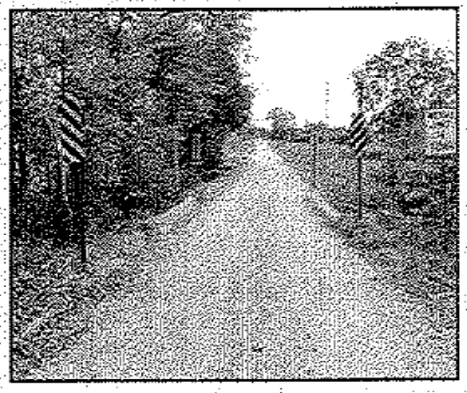
Access is essential for everyone

$260,000 of Motorgrader

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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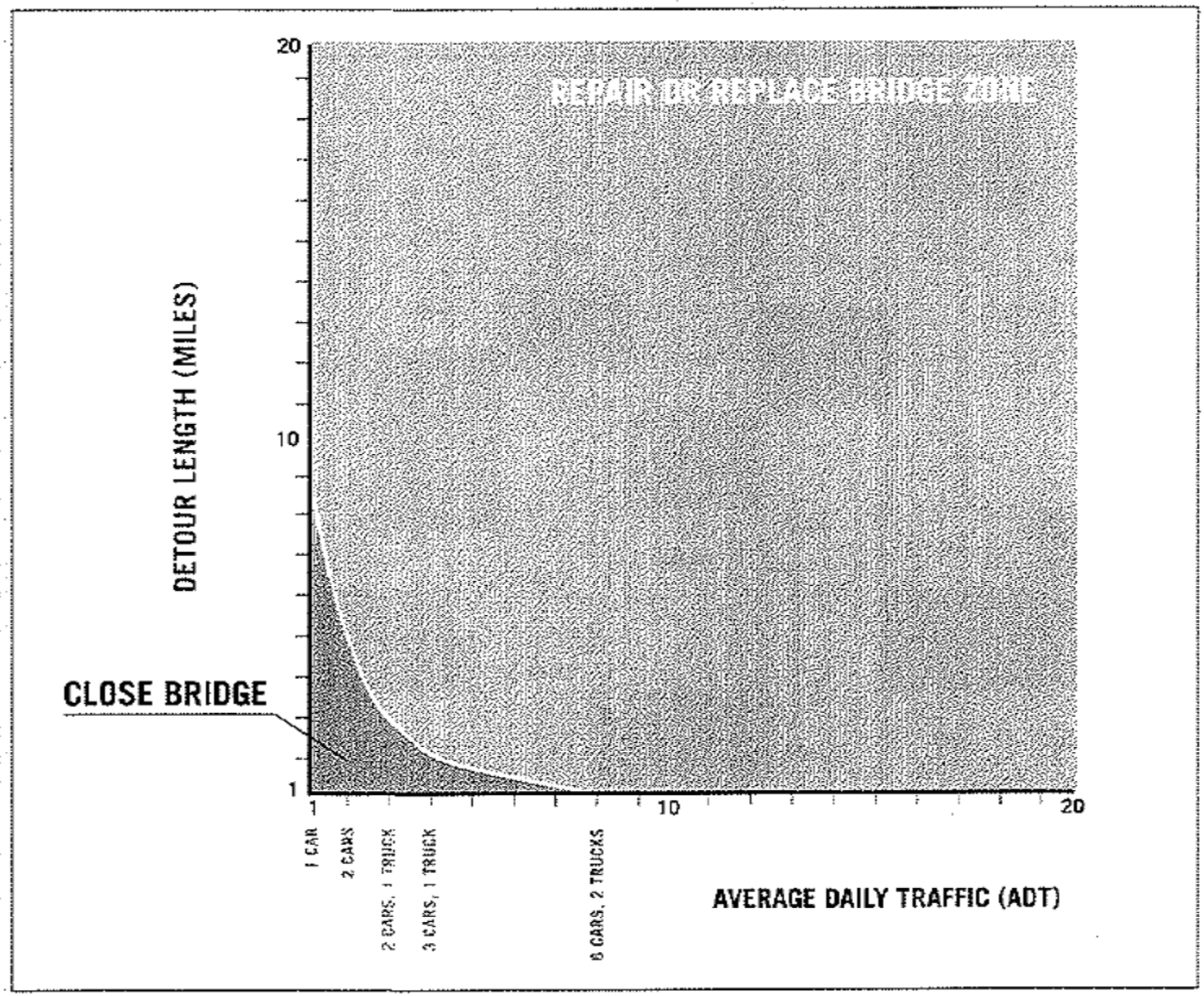


FIGURE 3. DETERMINING BRIDGE CLOSURE / REPAIR / REPLACE BASED ON ADT AND DETOUR LENGTH

Asphalt Over Concrete

Road Salts are Harmful

Simplified Deck Overlaying

We have spliced many H-piling in.

Simple and effective

Partial Timber encasement

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

Concrete Box Repair

Remove the Unsound Concrete and pour it back

Add a pier to eliminate postings

Sometimes there are no GOOD repairs

RECYCLING CAN BE AN OPTION

We have constructed 3 with open grated decks

Proposal

PH: (812) 797-0230
PH: (812) 275-7728

E & H
BRIDGE and GRATING, INC.
1 LAVENDER LANE • BEDFORD, INDIANA 47421

PH: (812) 797-8377
FAX: (812) 275-6389
SHOP: (812) 277-8343

PROPOSAL SUBMITTED TO		PHONE	DATE 7/21/14
STREET		JOB NAME	
CITY, STATE AND ZIP CODE		JOB LOCATION	
ARCHITECT	DATE OF PLANS		JOB PHONE

We hereby submit specifications and estimates for

All Steel Bridge
(0) Skew

Lenghh 50'
Width 27'
Steel Beams
Diaphrams
Lookouts
Bearing PLates
Assembly Hardware
Metal Grid Deck 4"
A-588 Steel
Guard Post Gal!
Guard @@ Rail Thrie
End Sections
Design IN.
Delivered

Total Cost----------$96,338.00

We Propose hereby to furnish material and labor - complete in accordance with above specifications, for the sum of:

Ninety Six Thousand Three Hundred Thirty Eight and n0/100 DOLLARS ($96,338.00)

Payment to be made as follows:

All material is guaranteed to be as specified. All work to be completed in a workmanlike manner according to standard practices. Any alteration or deviation from above specifications involving extra costs will be executed only upon written orders, and will become an extra charge over and above the estimate. All agreements contingent upon strikes, accidents or delays beyond our control. Owner to carry fire, tornado and necessary insurance. Our workers are fully covered by Workmen's Compensation Insurance.

Authorized Signature

NOTE: This proposal may be withdrawn by us if not accepted within _____ days.

We Propose The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payment will be made as outlined above.

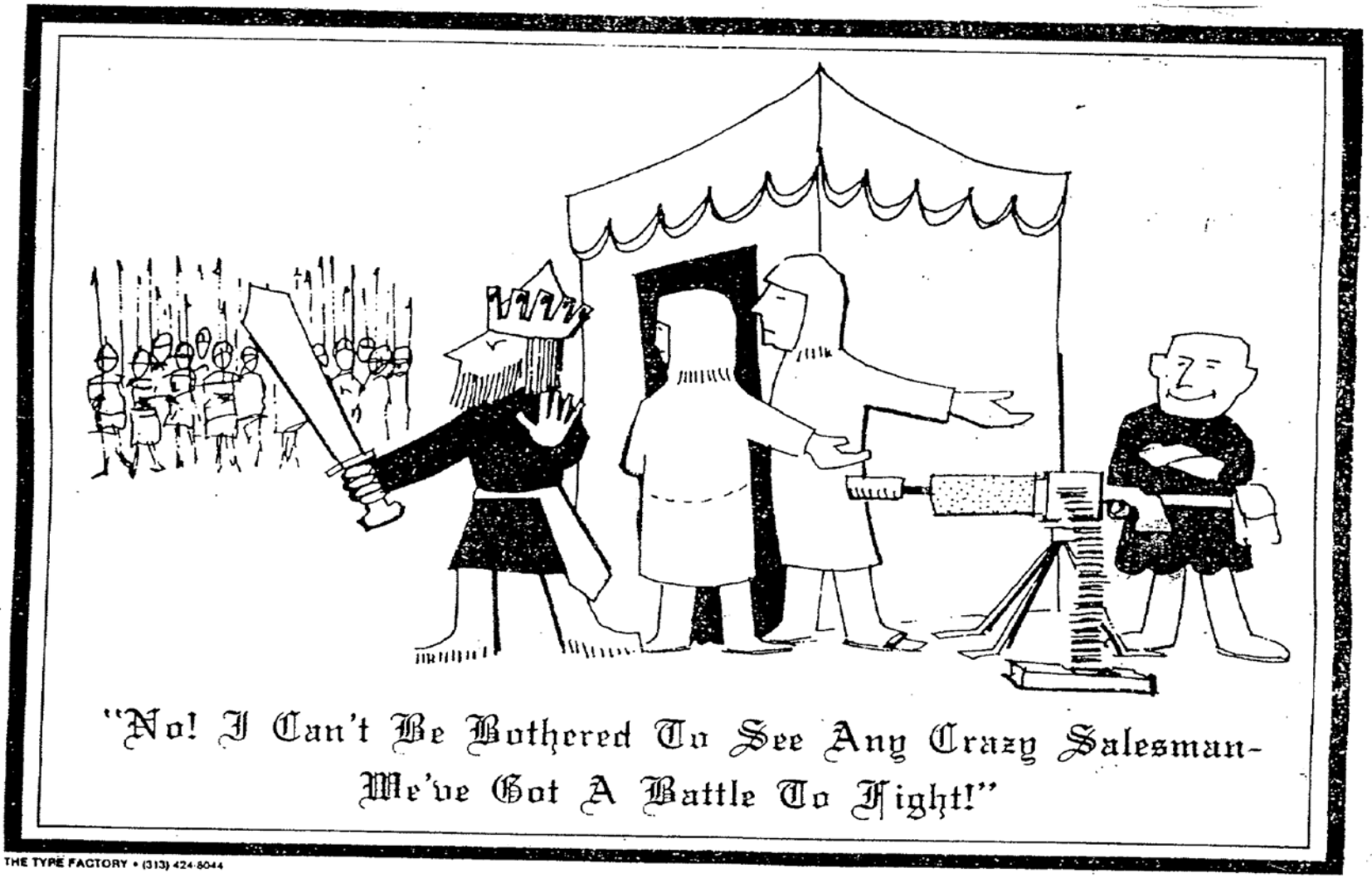
Date of Acceptence: _____

Signature _____

Signature _____

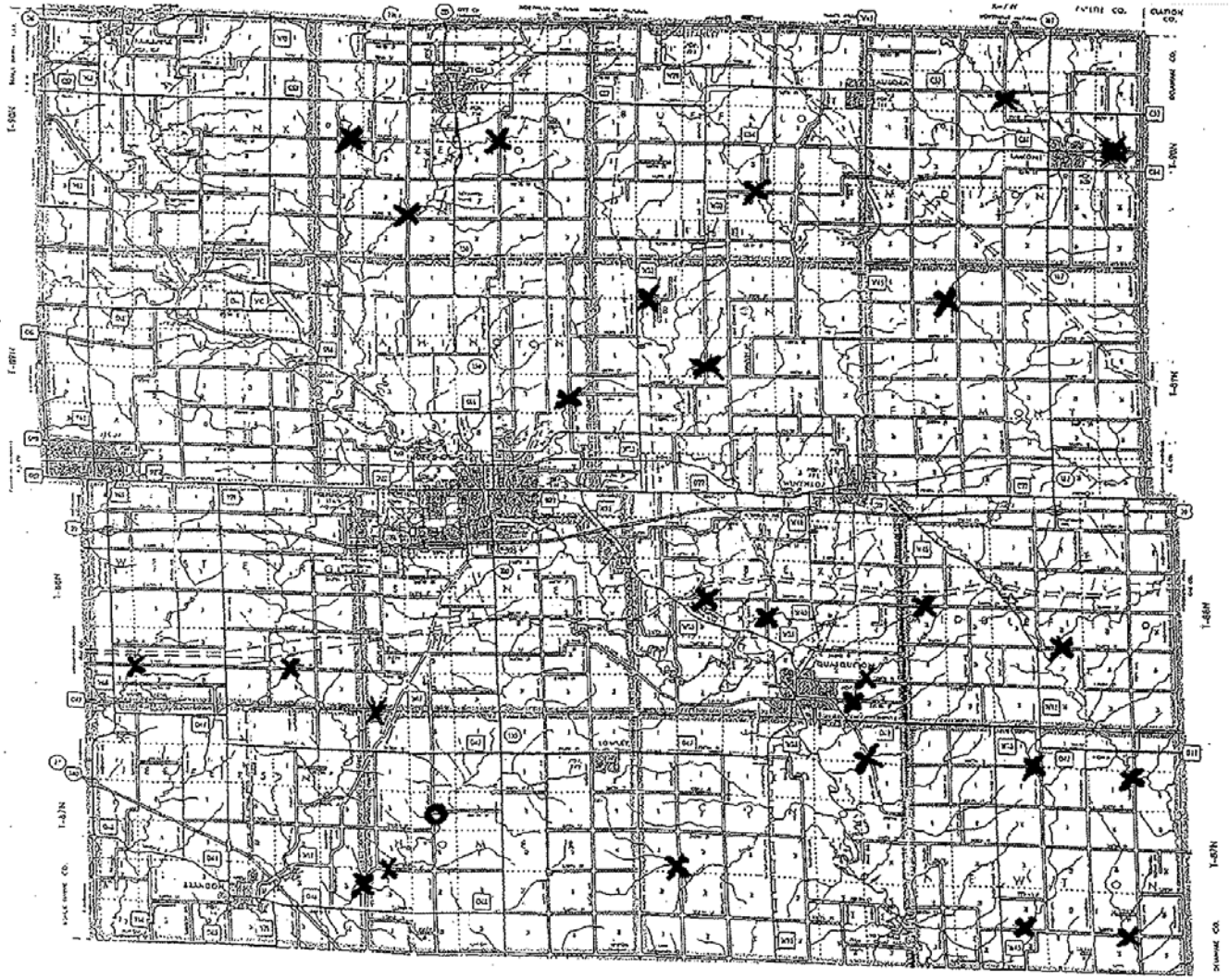
Signature _____

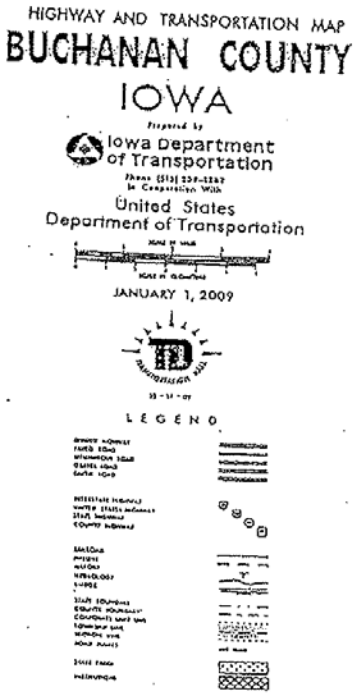
OVERCOME EXISTING PREJUDICES



Be Open To New Concepts

We have constructed 27 Bridges from Railroad Flatcars





0 - CARS ON GROUND AWAITING CONSTRUCTION

What Do They Look Like?

What They Look Like To Us

Types of Cars

- Pulp Cars
- Military
- 89’ Flatcars, Cost $19,750 (?) Delivered
- 89’ Flatcar cut to 68’, Cost $16,667 Delivered
- Total Costs range between $65,000 and $95,000

Flatcars Not Boxcars

Pulp Cars

Military

89 Ft. Flatcar

68 Ft Railcar

Load Capacity

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

- All our Bridges Carry LEGAL LOADS

Iowa State University has Load Tested all of our RRFC Bridge Designs

Figure 1. BCB5 RRFC Bridge Test Instrumentation (May 11, 2006)

TABLE 1. BCB4 Deflections

Location	Test						AASHTO Limit
	NL1	NL2	ML1	ML2	SL1	SL2	
East Midspan	-0.185	-0.177	-0.170	-0.168	-0.170	-0.174	0.596
West Midspan	-0.194	-0.188	-0.197	-0.196	-0.202	-0.194	0.604

TABLE 2. BCB4 Critical Stresses

Location	Test						AASHTO Limit
	NL1	NL2	ML1	ML2	SL1	SL2	
East Midspan North Girder	6.91	6.79	5.77	5.82	3.99	4.05	22.00
East Midspan South Girder	3.71	3.74	5.10	5.11	5.86	5.87	22.00
West Midspan North Girder	6.23	6.20	5.27	5.03	3.94	1.60	22.00
West Midspan South Girder	4.16	4.18	5.97	6.14	6.93	6.85	22.00

TABLE 4. BCB5 Critical Stresses

Location	Test						AASHTO Limit
	WL1	WL2	ML1	ML2	EL1	EL2	
North Midspan West Girder	8.22	8.35	6.59	6.57	4.94	4.76	22.00
North Midspan East Girder	3.99	3.98	5.24	5.21	6.26	6.24	22.00
South Midspan West Girder	10.69	10.77	8.27	8.23	6.02	5.93	22.00
South Midspan East Girder	7.23	7.15	10.94	10.90	13.97	13.98	22.00

Bowen Laboratory - Railroad Flatcar Bridge Fracture 2

Bowen Lab

.

Published on Oct 16, 2013

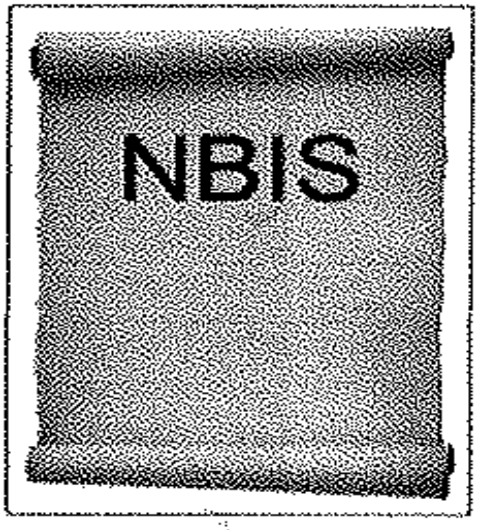
A full-scale railroad flatcar (RRFC) bridge was constructed in Bowen Laboratory. One objective of the research project was to determine if the system displayed adequate load redundancy after fracturing a primary member. The bottom flange and a portion of both webs of one of BOTH main girders at midspan 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



Various Types of Abutments

- 1) Existing Concrete Abutments
- 2) New Concrete Stub Abutments
- 3) Concrete Stub With Sheet piling
- 4) Typical Local Abutments
- 5) GRS Abutments
- 6) Cut Granite

Existing PCC

Stub Abutment With Sheet Piling

Galvanized sheetpiling

I will re use old abutments

Use What you have $68,019

Sheet Piling Placed With a Vibratory Plate

GRS Abutments

Expansion Joint

Tying The Cars Together

- 1) Bolted Directly
- 2) Bolted With Concrete and # 8 Bars
- 3) Welded

Concrete Beam and Bolts

Bolted Directly

Welded

Types of Decks

- Asphalt Millings
- Rock
- Asphalt Slurry

Asphalt Millings

Rock

Patch Holes in The Decks

- 1) Non-Woven Geotextile Fabric
- 2) Asphalt Treated Geotextile (petrotac)
- 3) Rubber Conveyor Belting

Tie Down Holes


ONE LANE
BRIDGE
OVERSIZE LOAD
ROAD CLOSED

Placement

Equipment Requirements depend on the site

Why Do They Retire the Railcars

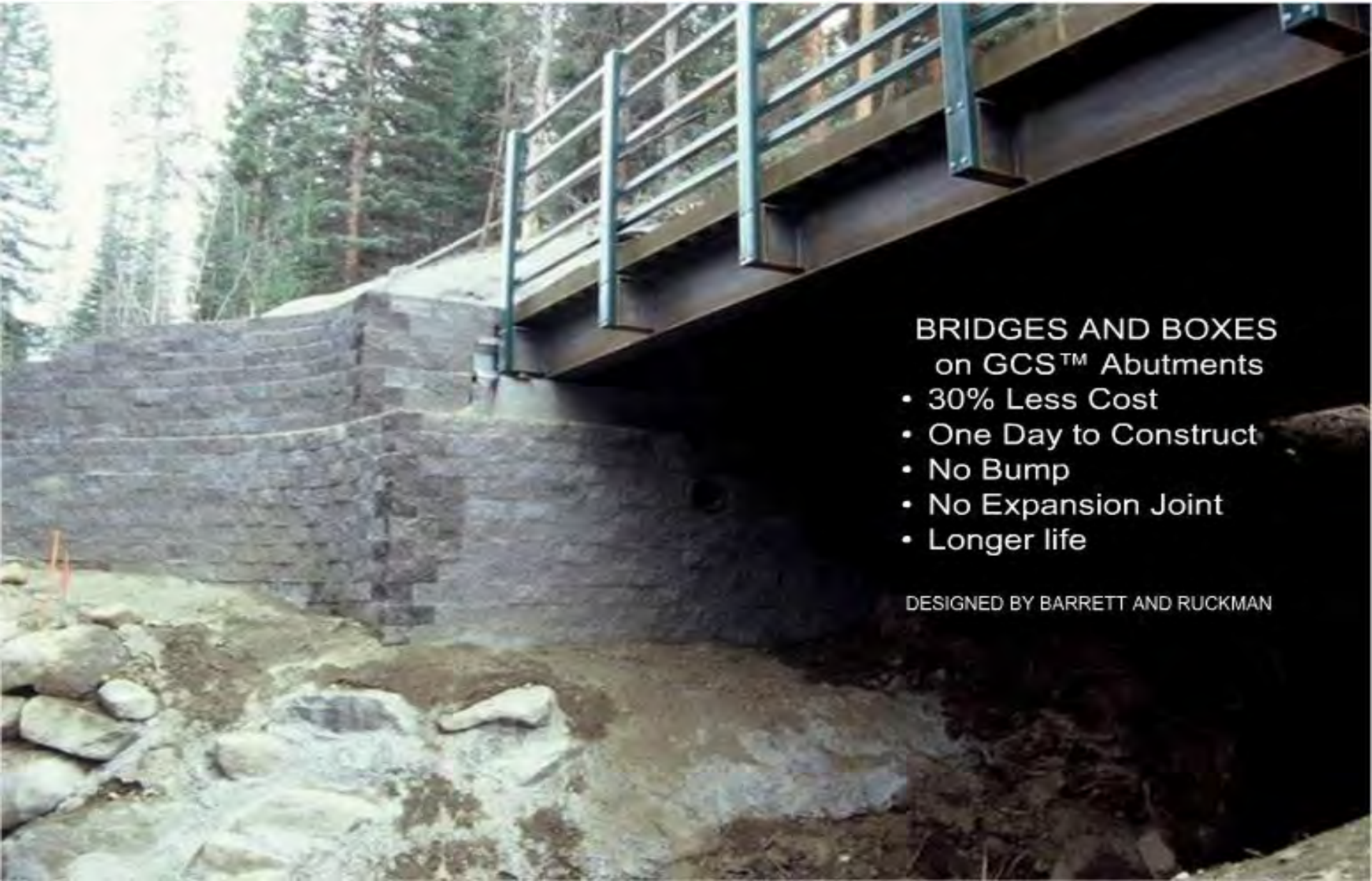
- Newer lighter More efficient Cars Exist
- Tax Purposes
- Derailments
- Age Limit-Not to Exceed **50** Years

INFORMATION-QUESTIONS

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

Geosynthetically Confined Soil Abutments (FABRIC)

UTILIZE NEW TECHNOLOGIES



COMPLETE ONE SIDE

RIPRAP

SET SUPERSTRUCTURE

COMPLETE SUPERSTRUCTURE

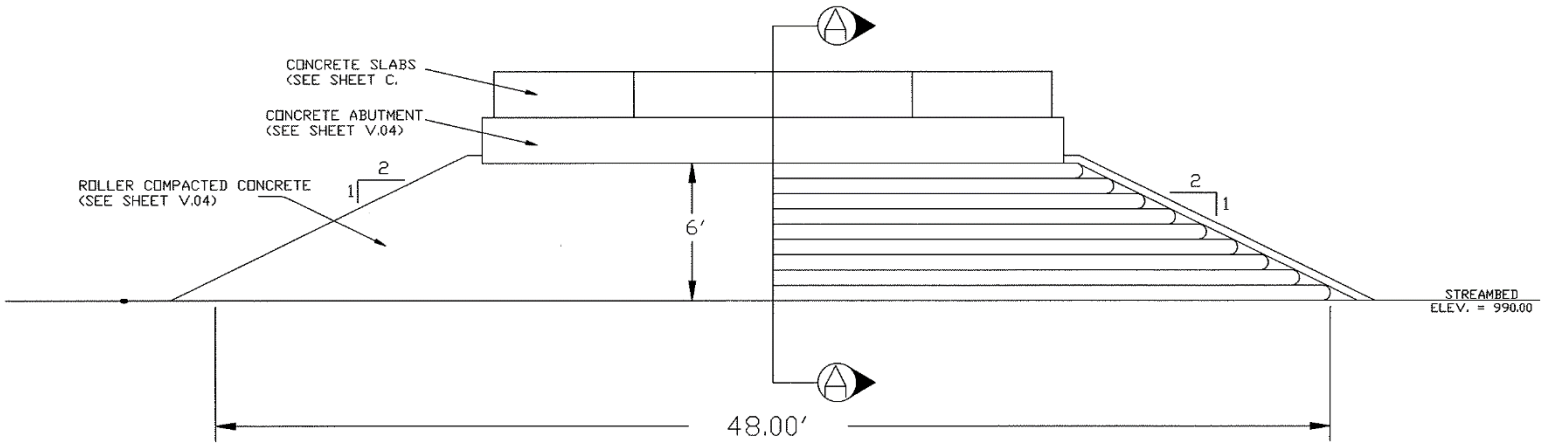
COMPLETE BRIDGE

ODEN”S Slab Wahoo Nebr.

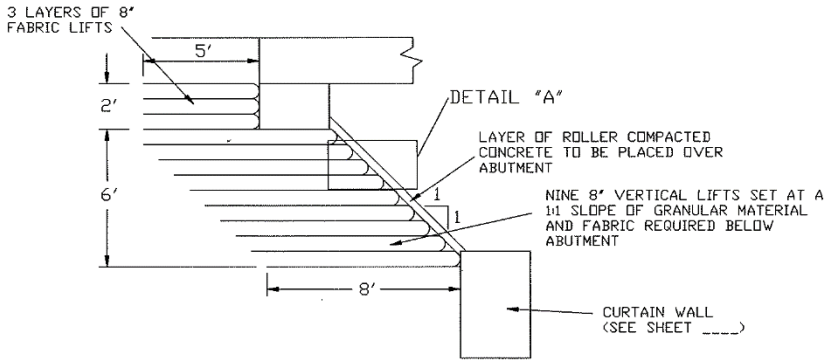
CAST ON SITE SLABS with INTERNAL CURING CONCRETE

Gerstenbergers Bridge

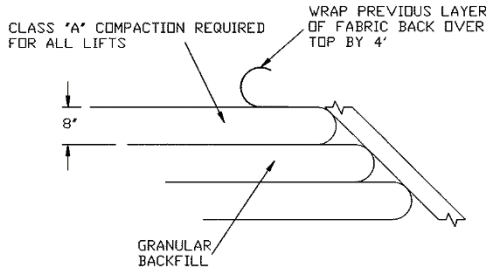
Constantly Improve The Methods



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

Design and Construction of Hawkeye UHPC Bridge

THE UNIVERSITY OF IOWA

BUCHANAN CO. SECONDARY ROADS

LACT

SUPER STRUCTURE 2020

KICT
KOREA INSTITUTE of CIVIL ENGINEERING and BUILDING TECHNOLOGY

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)

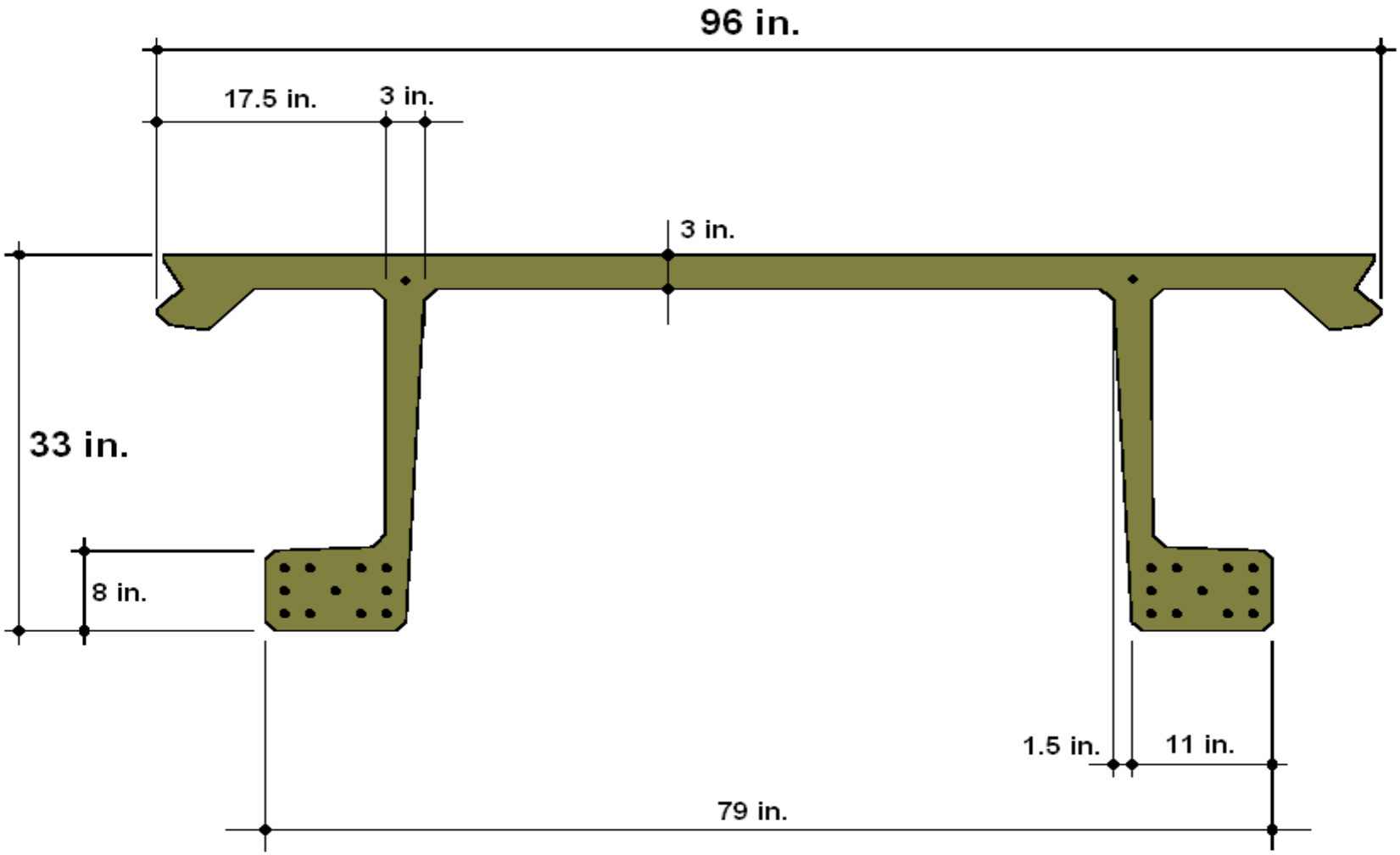
Dr. Joh, Mr. Keierleber, Dr. Kim ,Mr. Davis, Dr. Koh

No piling in the abutment

The Initial PI beam Design

- Design Guidelines - University of New South Wales, France, and Japan
- Development of PI section by Dr Ulm at MIT
- Testing of UHPC and PI section (Turner-Fairbanks)
- I-Beam Testing by Turner-Fairbanks & Iowa State University
- Experience Wapello Co. project
- Discussions with Dr. Graybeal (FHWA) and Vic Perry (LaFarge North America)

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

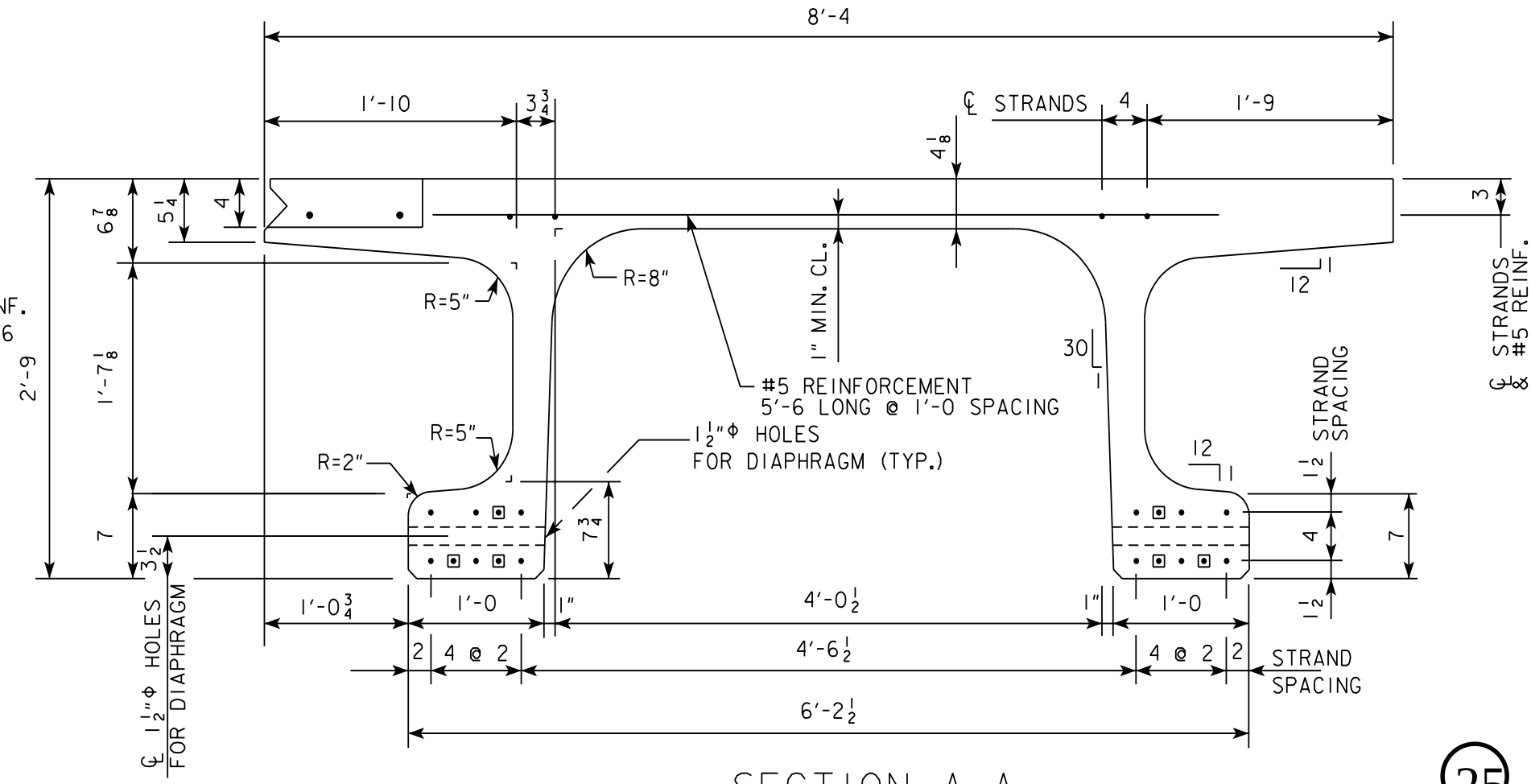
PI Girder

- Developed by MIT/FHWA
- Optimized section
- No Mild Steel NEEDED
- Integral Deck
- 4-71 ft sections tested by Turner-Fairbanks Laboratory, FHWA

Jakway Park Bridge 2008

Jakway prior to construction

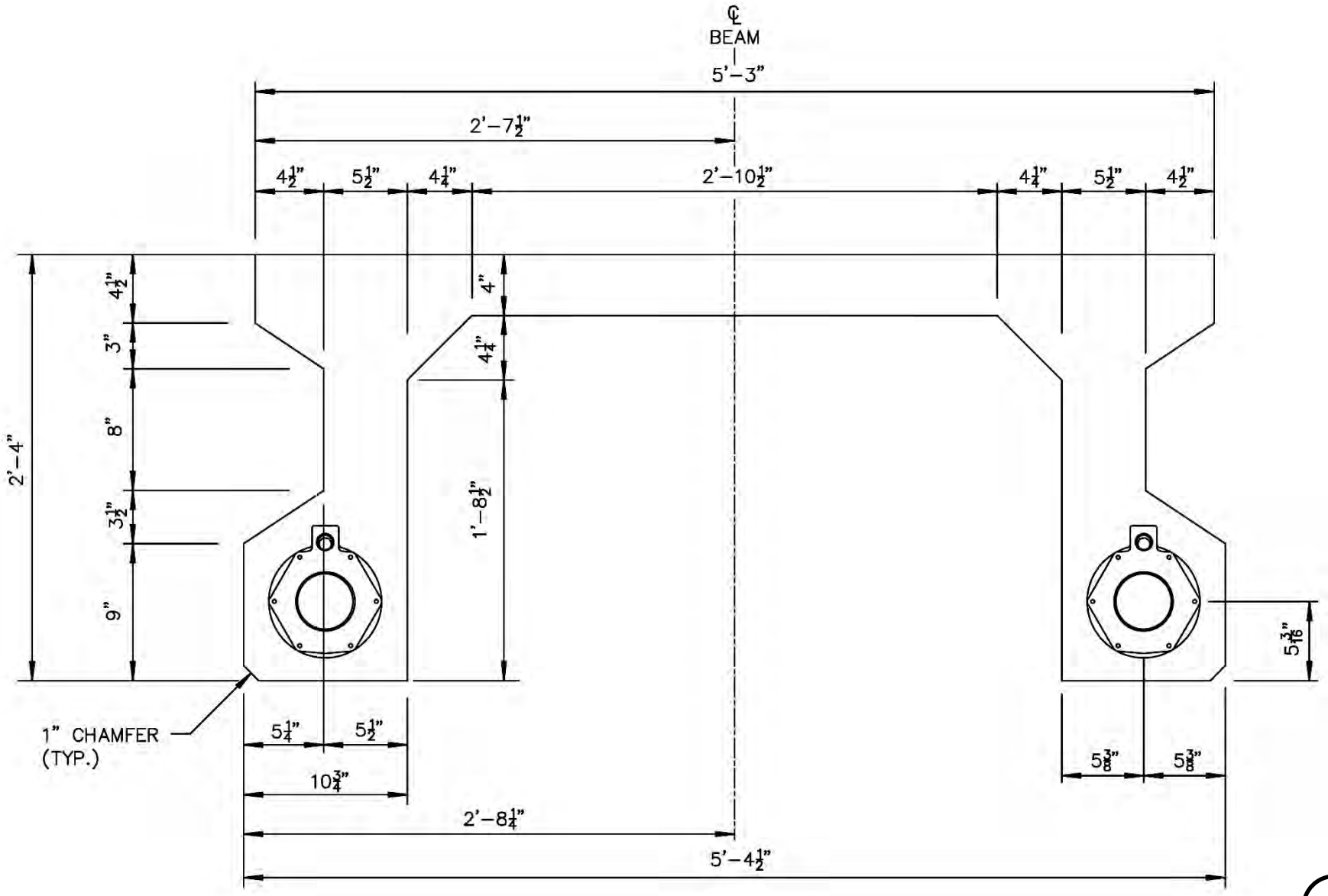
Final Section New detail



SECTION A-A

10 ROUGHENED CONCRETE

Korean UHPC Design



UHPC Material (Negative)

- Material is expensive(5% steel fibers = 200 Lbs. x@$2/lb. =$400/cy.
- Material Labor and equipment intensive
  - Mixing ~ ½ hr.
  - Initial Set ~ 40 hrs.
  - Curing ~ 48 hrs. at 195 deg
- Shrinkage high
- Concern fiber distribution
- Performance of cracked section
- Deck texture is an issue

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%

Mix Design Comparison of Different Types of UHPC

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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**

Alex Building the forms (Dr. Joh, Dr. Ryu, Haena)

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

K-UHP

JULY 16, 2

Pouring in Winnipeg

UHPC

Pouring the Beams

K-UHP

Curing in Winnipeg

The Steam Curing Machine.

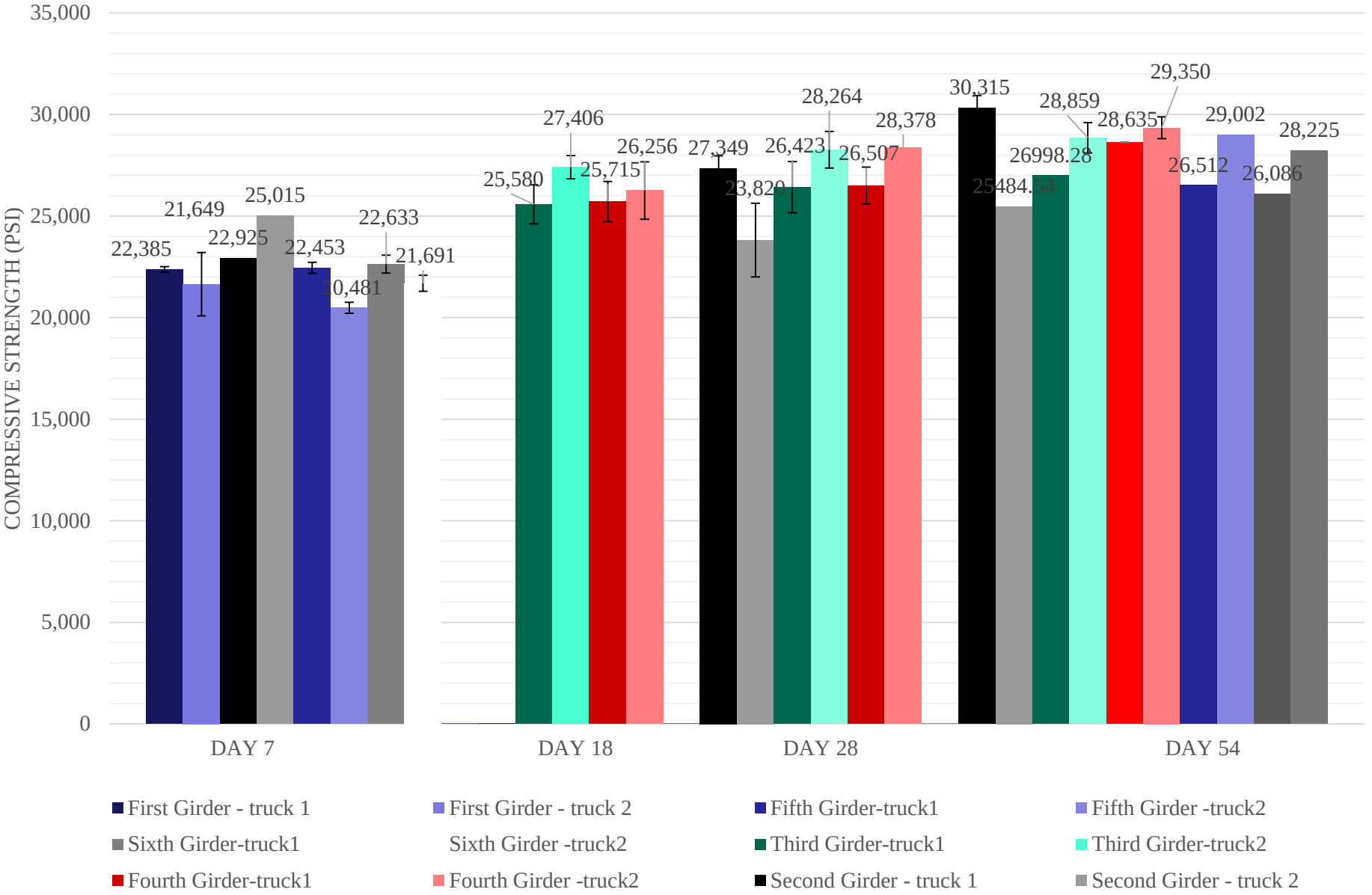
K-UHP

Steam Curing in our yard

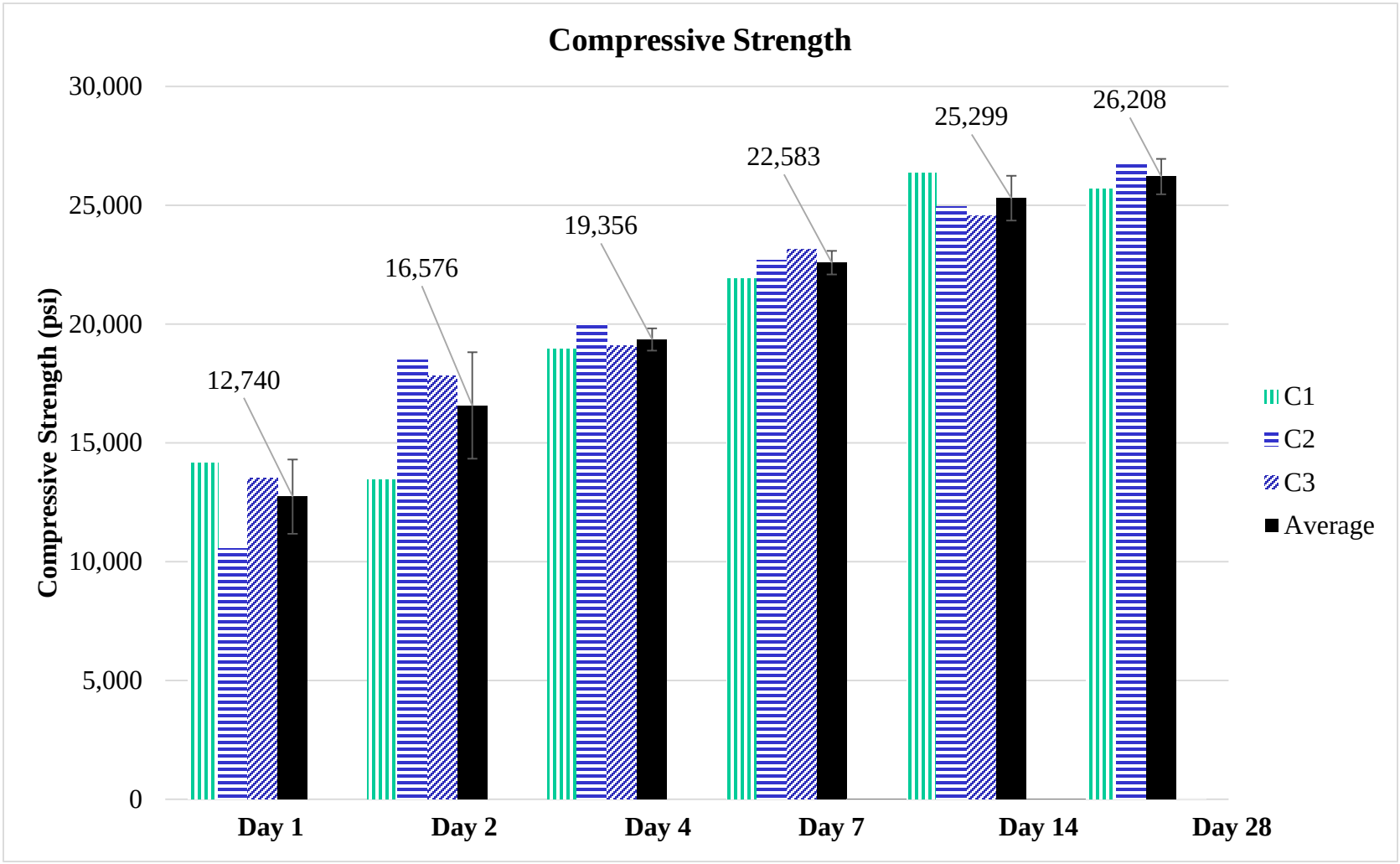
K-UHP

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

Loading the Beams

Transporting the beam.

Standard Abutments


August 25, 2
200LC
48

Standard Slab Construction

Not all the joints were perfect.

Highway Departments Have old Signs

Limited Finish Work

Curing the joints.

Reseeded with Hydromulcher

We have a small footprint

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

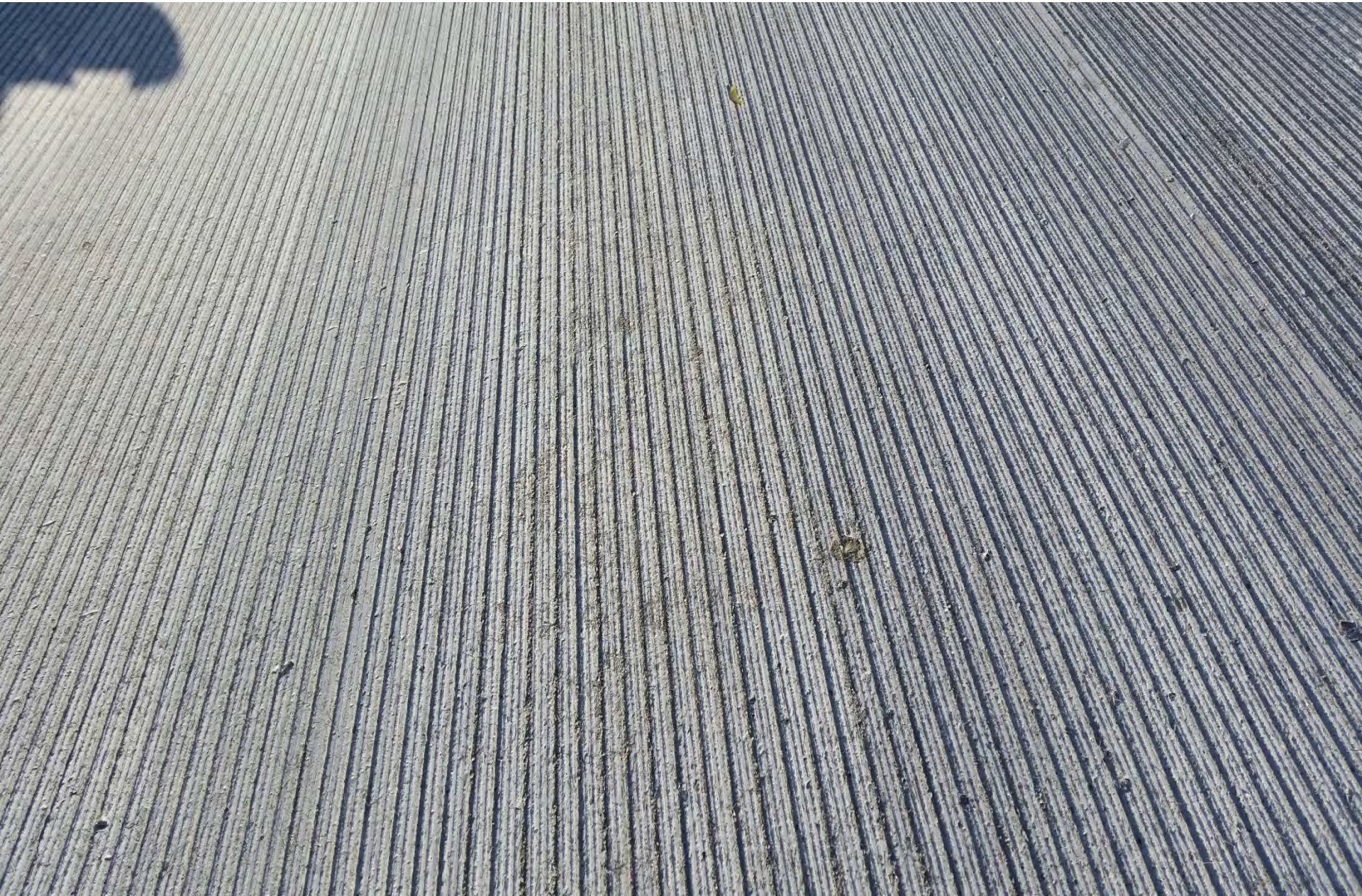
They Switched to placing perpendicular

Overlay prior to grinding

Grinding

Texture After Grinding

After Grooving



UHPC surface crack

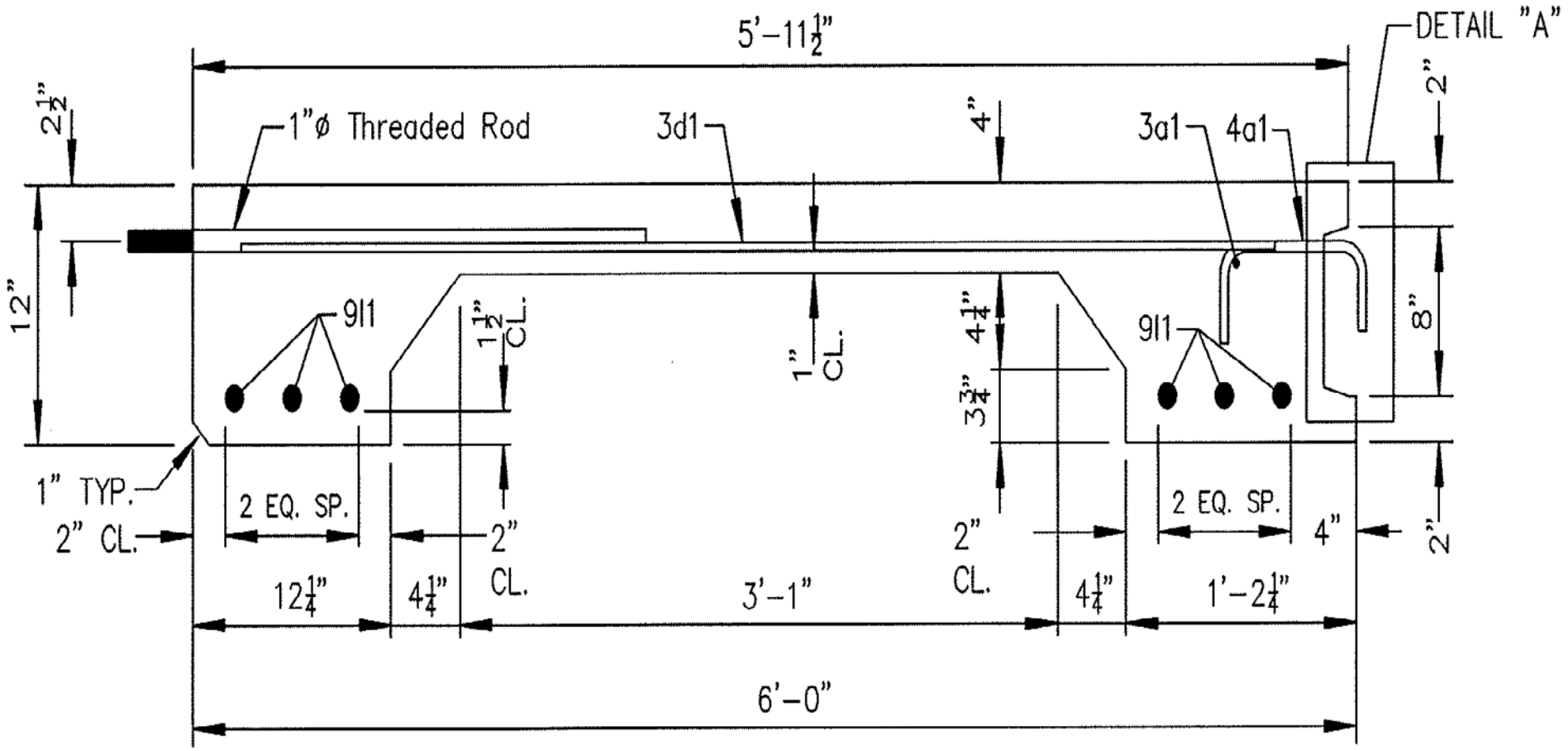
Finished Deck Overlay

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?

MURLEYS BRIDGE

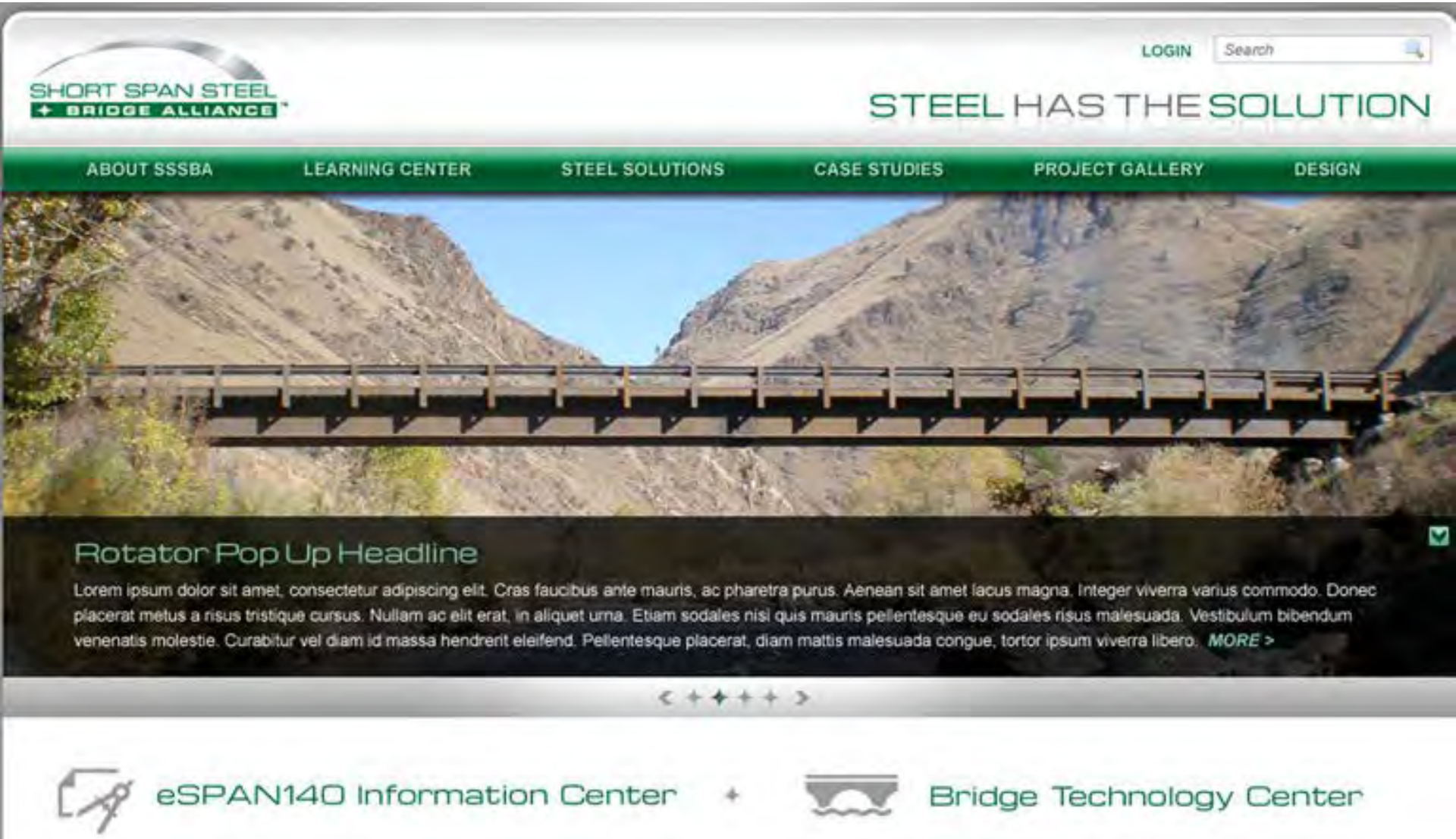


SECTION A-A

More Experience

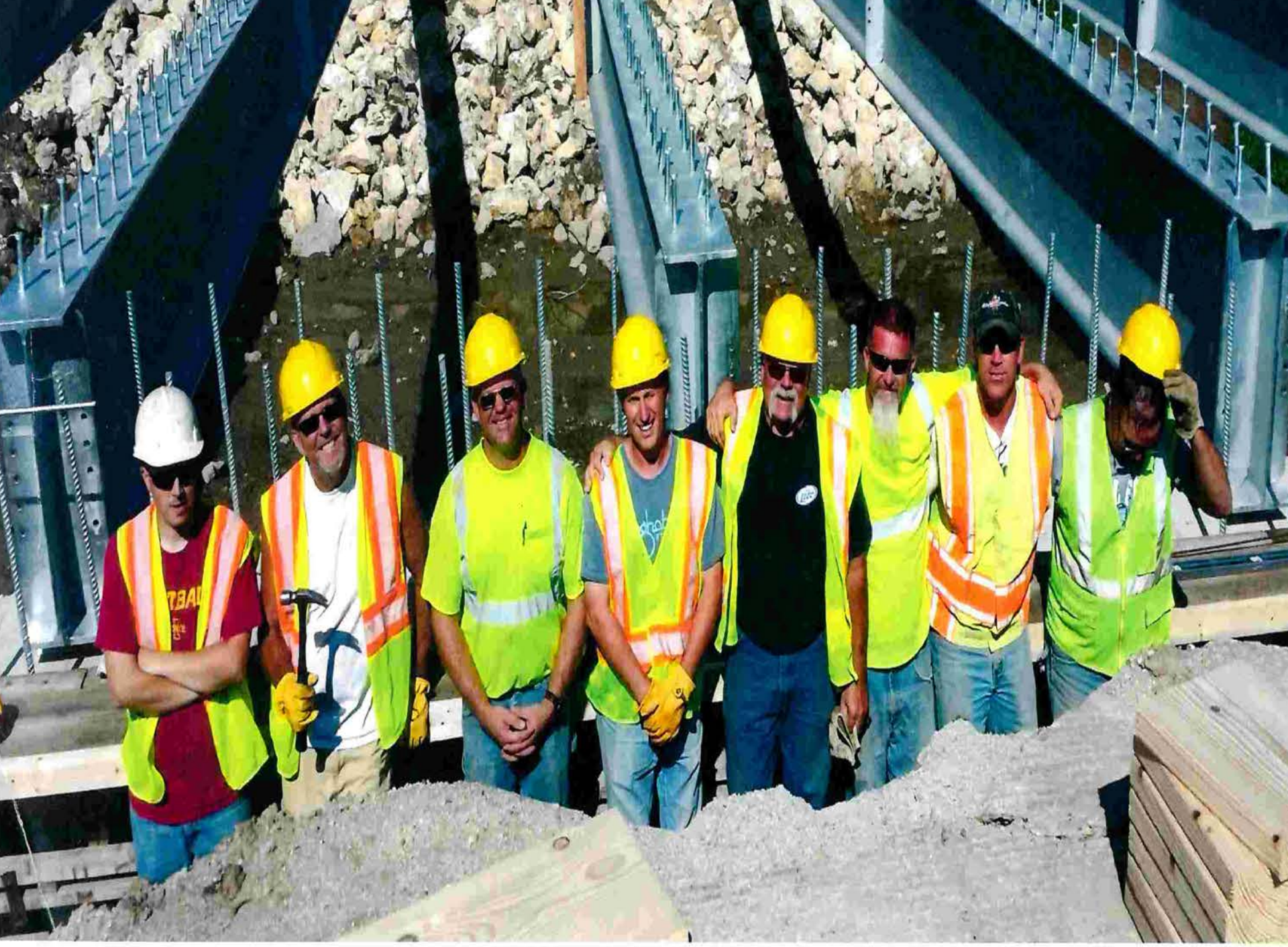
The learning continues

The New Design Processes Were Utilized



We have done this before

Setting Beams Proposed Sept 15th set October 2nd



Bolting Diaphragms

Pouring Deck

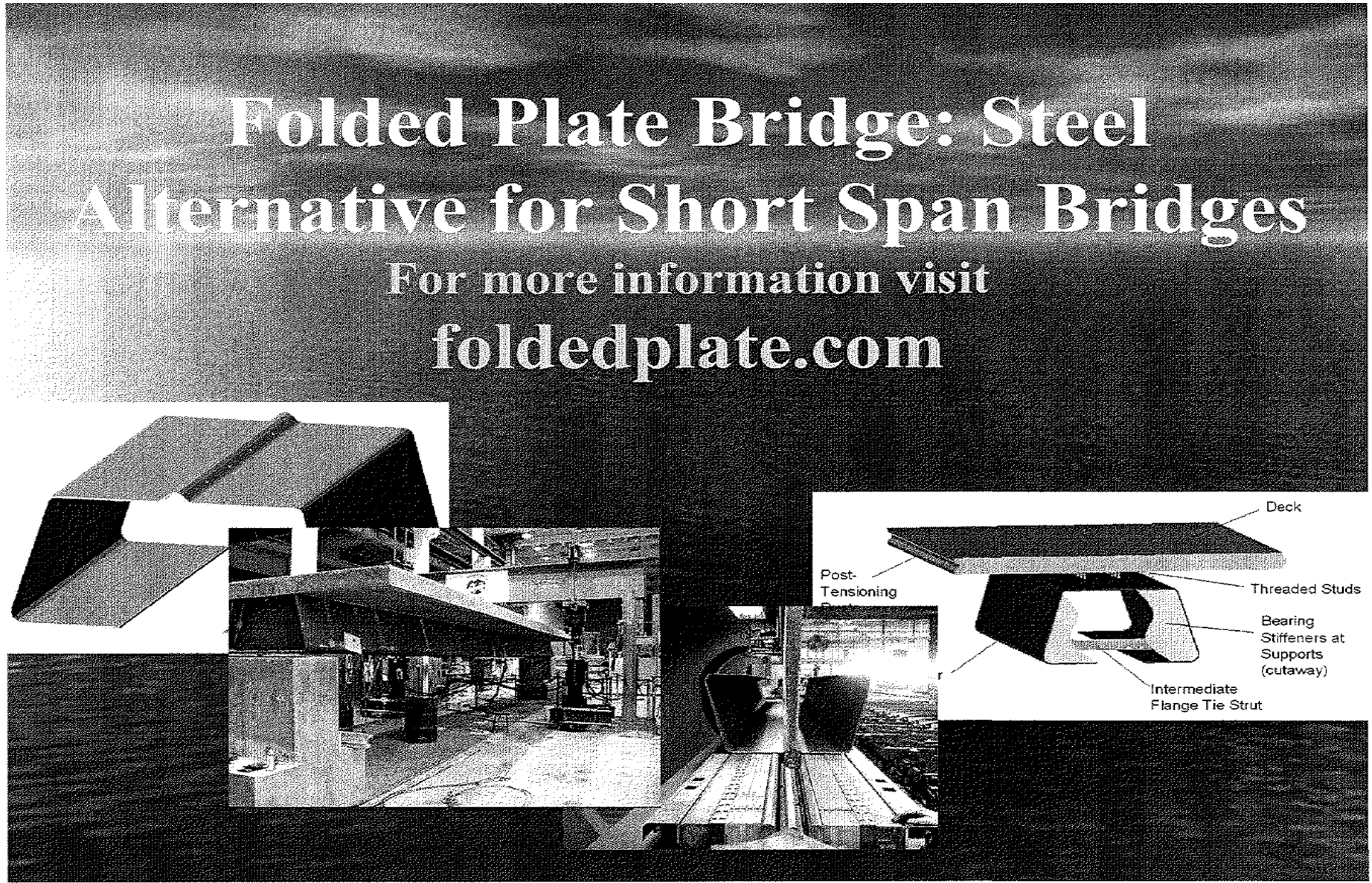
New Barrier Rail design was used

Crash Test Level 3

Incorporates many of the SHRP2 R-19 extended life concepts

Jesup South Bridge

Folded Plate Steel Bridge Concepts

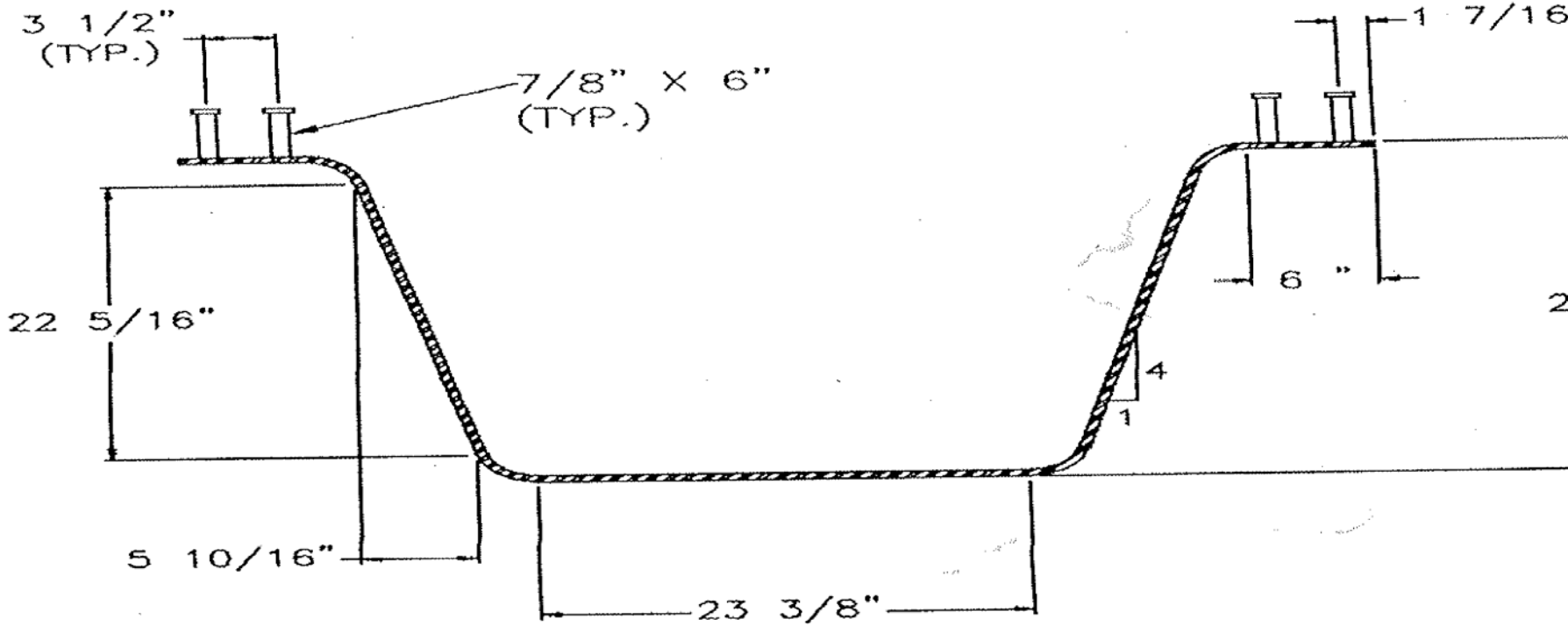


Dr.Karl Barth From

WestVirginiaUniversity

and Dr.Michael Barker From

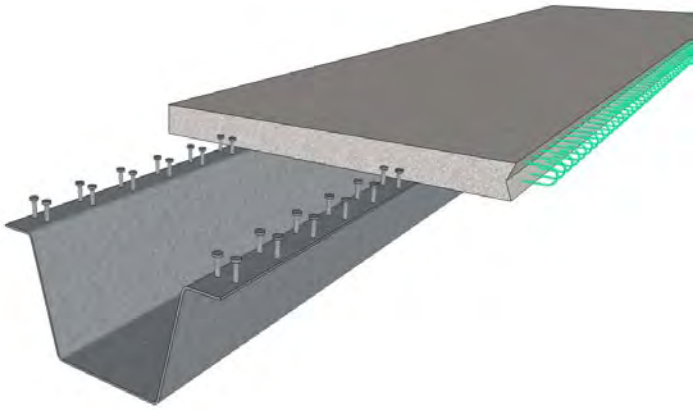
The University of Wyoming

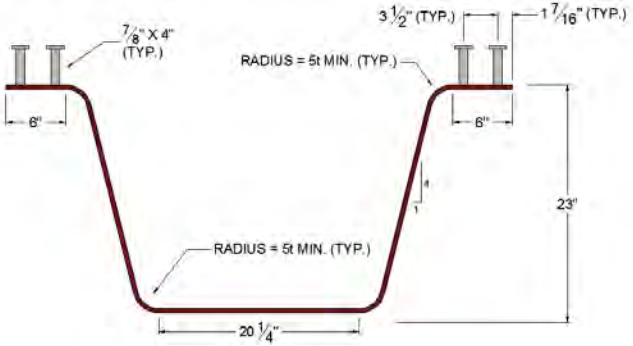


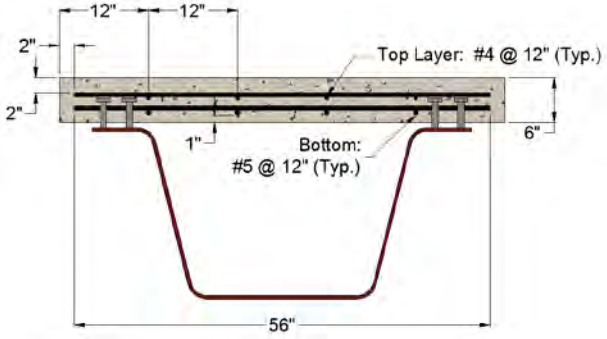
PRESS BRAKE TUB GIRDER

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

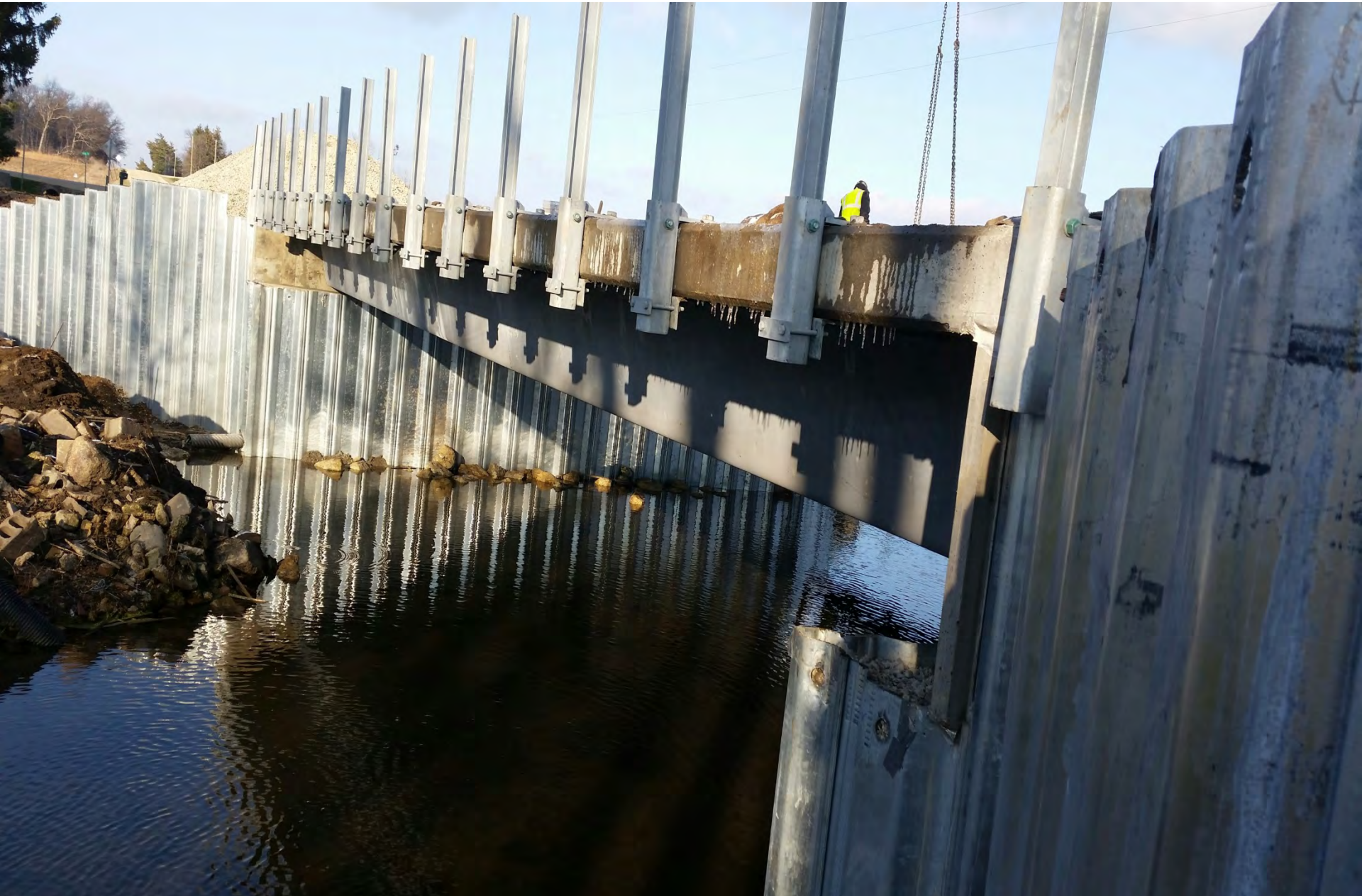
Stay in place decking and Galvanized rebar

Integral Abutments

Deck Pours in Late Fall

Standard process

MGS Guardrail



It will turn green in the spring

Press Brake Tub Girder Amish Sawmill

BURIED SOIL STRUCTURES

It looked something like this

Low profiles are possible

1,000 of these exist

Re-use the old piling

Be Patient, this is his first

Progress comes slow

Pre assembled sections

20 Degrees and Gusts to 30 MPH

Progress continues slowly

Small Crews and COLD Weather

This is an Overflow Structure

2 FT. of Cover

The Finished Product

Sometimes go the extra distance

Completed South Abutment

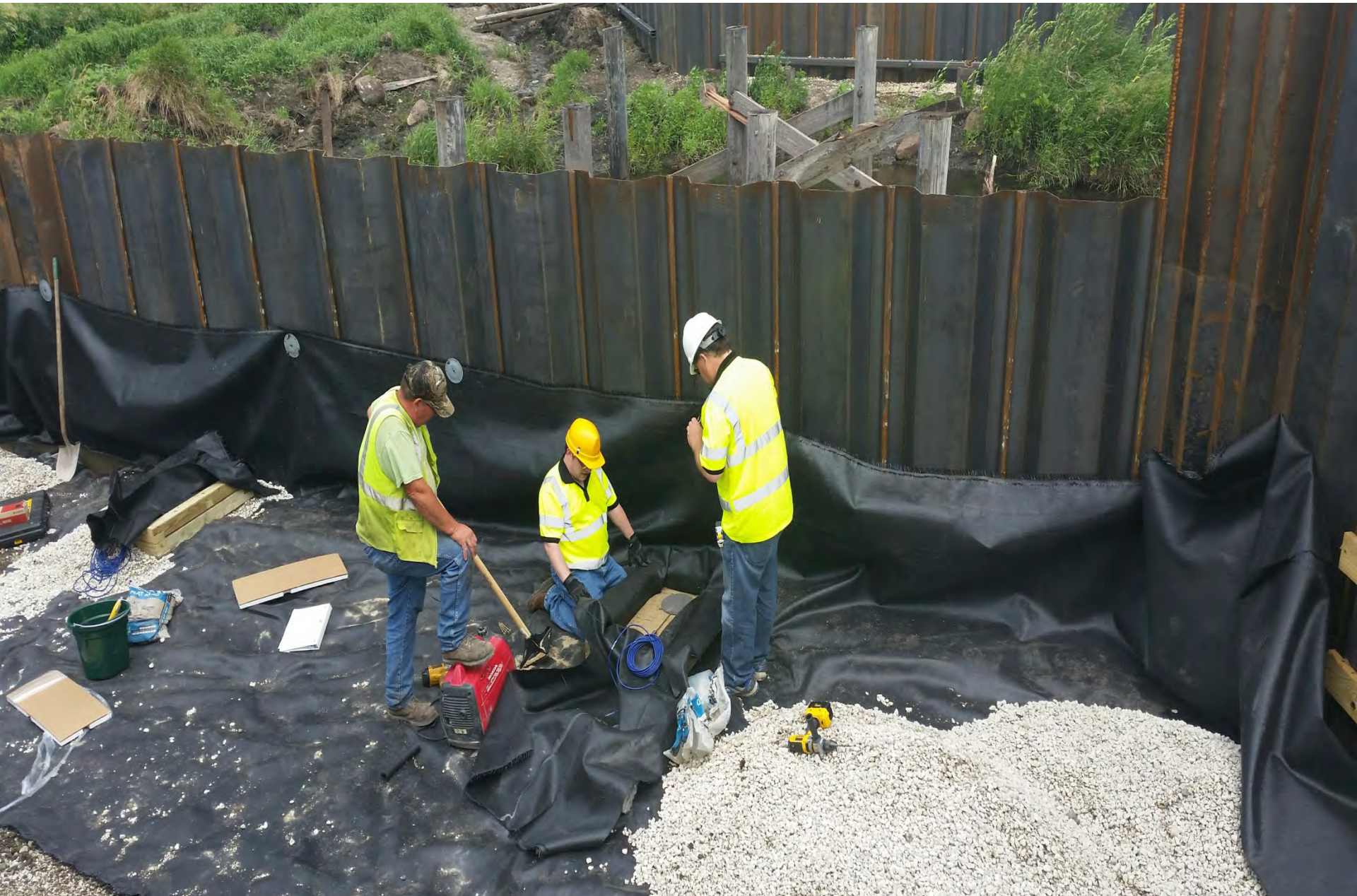
Placing the Beams

Widened for a path

GRUEN WALD Glue Laminated Bridge

Catt Bridge US Forest Products LAB

Timber on GRS



Load Testing the Beams

Abutment Caps

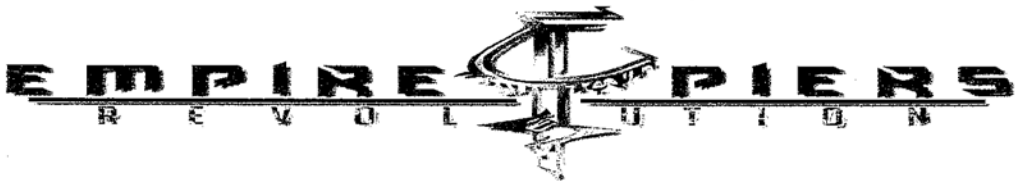
Setting The Beams

Placing the Deck

Placing The Backwall

US Forest Products Lab

We need simple substructure designs



HELICAL PIER/ ANCHOR FOUNDATION SYSTEM

Technical Manual

211 Steel Street

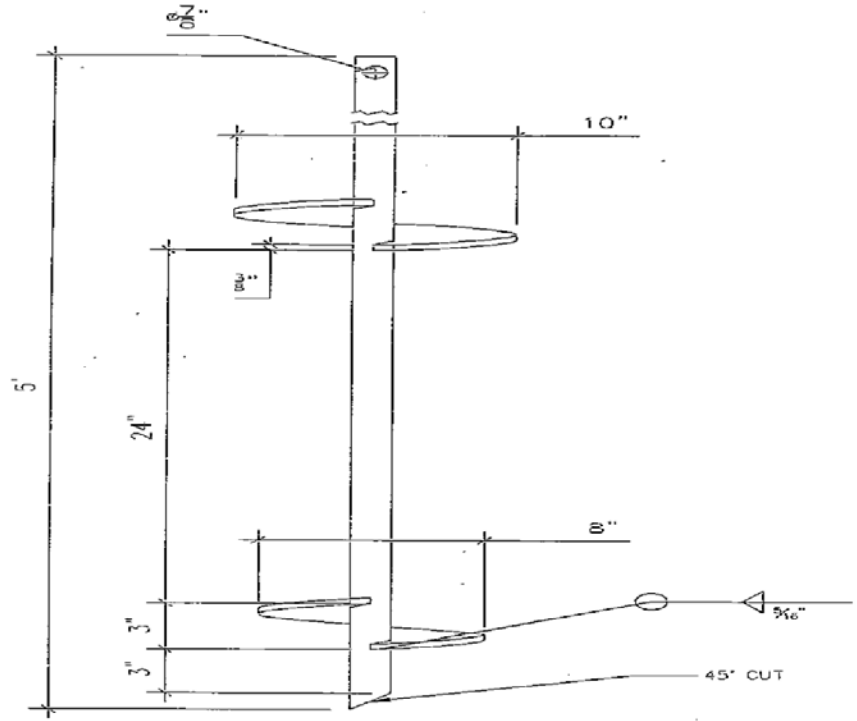
Cottleville, MO 63376

636-922-4747

www.empirepiers.com

Design Loads Range from 12.5 to 50 tons each

1½"x5'x8"x10" HELIX
PART # E1560810LG



NOTES:
- SHAFT MATERIAL – ROUND CORNERED SQUARE(RCS) STEEL BAR PER ASTM A29 GRADE 1045 WITH MILL CERT. AT 70 KSI
- FINISH HOT DIPPED GALV. PER ASTM A 123/153
- ALL WELDING TO PERFORM BY QUALIFIED WELDER TO AWS D1.1
- TORQUE STRENGTH RATING OF 5,500 FT-LBS
- ULTIMATE CAPACITY OF UNIT IS 55 KIPS (KT) =10
- ULTIMATE TENSION STRENGTH– 60 KIPS
- STEEL HELIX MATERIAL TO CONFORM TO A572 KSI 50 HELIX GEOMETRY IN ACORDANCE WITH ICC-ES AC358
- COUPLING BOLTS: ¾" DIAMETER x 3" LONG HEX HEAD PER ASTM A325
- ALL MATERIAL IS MANUFACTURED IN US.

EMPIRE PIERS

EMPIRE PIERS LLC,
211 STEEL ST.
COTTEVILLE, MO 63376

	NAME	DATE
DRAWN		
CHECKED		
ENG. APPR.		
MFG. APPR.		
PROJECT:		

MATERIAL		SIZE	DWG. NO.	REV.
		A4	E1560810LG	

Vibratory Piling Driver Clinton, Scott and Harrison Countys

Turn Lemons into Lemonade

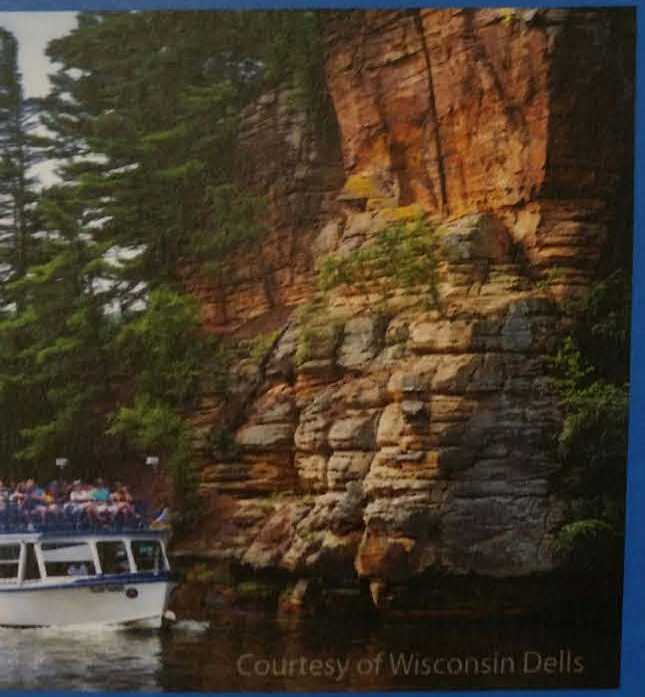
- **Buchanan Co. selling old bridges before building new ones**

Be Creative

Evaluate Technologies

PLAN NOW TO ATTEND!

THE LARGEST EVENT OF COUNTY INFRASTRUCTURE PROFESSIONALS



NACE 2018

THE DELLS, WISCONSIN

April 22-26 • Chula Vista Resort

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The Voice of County Road Officials

www.countyengineers.org

WISCONSIN COUNTY HIGHWAY ASSOCIATION

Any Questions????

THANK YOU