Accelerated Bridge Construction in Illinois

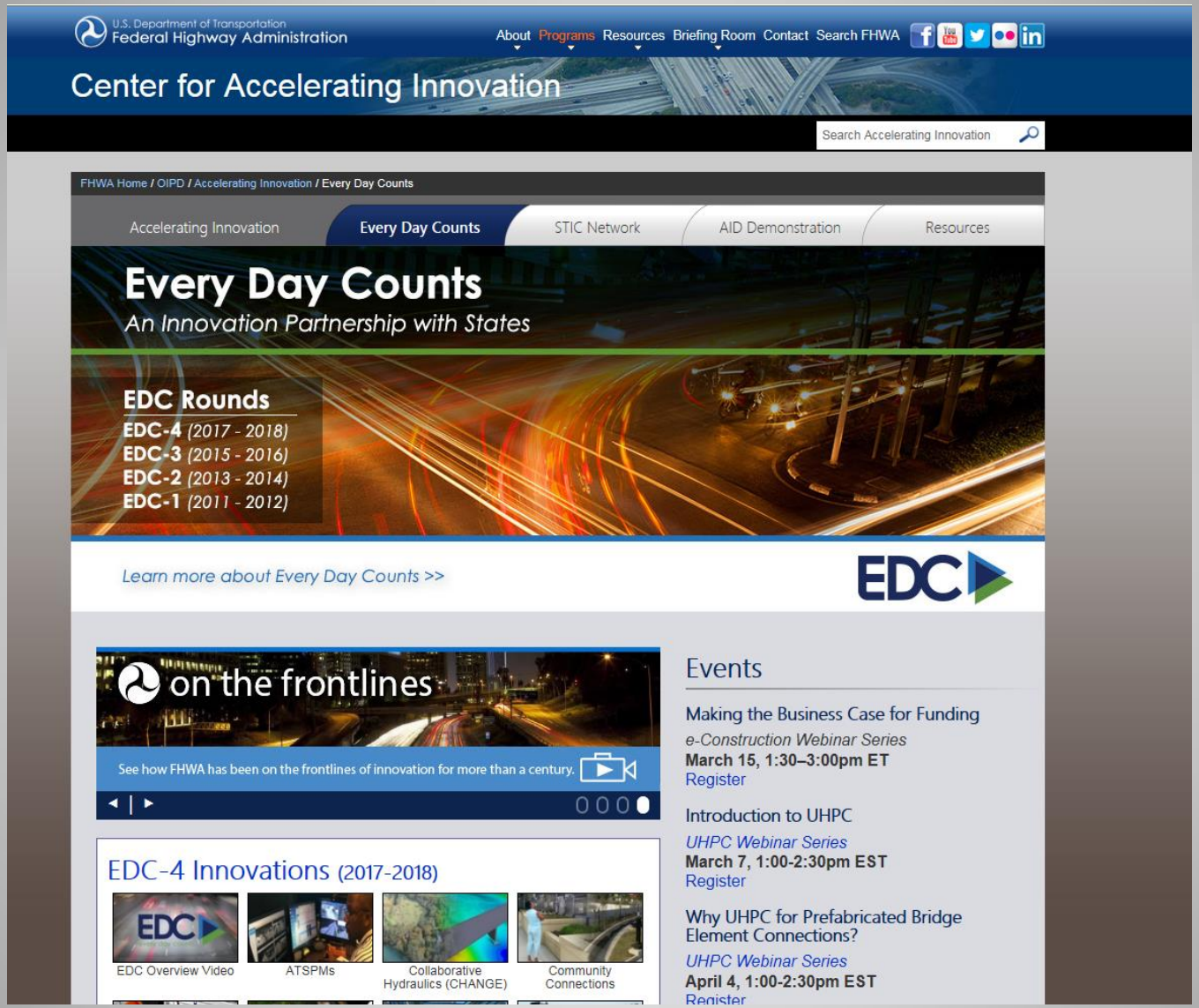
Illinois Tollway – ABC Workshop

Dan Brydl, FHWA

March 6, 2017

Presentation Outline

- Float-in Truss
- Adjacent Box Beam Structures
- Partial Depth Deck Panels
- Full Depth Deck Panels
- Prefabricated Concrete Pier Caps
- SPMT Bridge Moves
  - Wells St., Torrence Ave., Bloomingdale Trail, One Other One???
- Bridge Slide-Ins
  - District 8 – near St. Louis
  - District 3 – near Kankakee


U.S. Department of Transportation
Federal Highway Administration
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Accelerating Innovation
Every Day Counts
STIC Network
AID Demonstration
Resources
Every Day Counts
An Innovation Partnership with States
EDC Rounds
EDC-4 (2017 - 2018)
EDC-3 (2015 - 2016)
EDC-2 (2013 - 2014)
EDC-1 (2011 - 2012)
Learn more about Every Day Counts >>
EDC
on the frontlines
See how FHWA has been on the frontlines of innovation for more than a century.
EDC-4 Innovations (2017-2018)
EDC Overview Video
ATSPMs
Collaborative Hydraulics (CHANGE)
Community Connections
Events
Making the Business Case for Funding
e-Construction Webinar Series
March 15, 1:30–3:00pm ET
Register
Introduction to UHPC
UHPC Webinar Series
March 7, 1:00-2:30pm EST
Register
Why UHPC for Prefabricated Bridge Element Connections?
UHPC Webinar Series
April 4, 1:00-2:30pm EST
Register

EDC-2 Innovations *(2013-2014)*

3D Engineered Models for Construction

Using 3D engineered models allows for faster, more accurate and more efficient planning and construction of transportation projects. EDC-2 encouraged a transition from traditional two-dimensional design to 3D modeling as a strategy for shortening project delivery and improving quality and safety on the construction site.

Accelerated Bridge Construction (ABC)

Accelerated bridge construction enables highway agencies to replace bridges in hours and reduce planning and construction efforts by years, reducing traffic delays and potentially lowering project costs. EDC-2 promoted three ABC technologies:

- Geosynthetic Reinforced Soil-Integrated Bridge System (GRS-IBS)
- Prefabricated Bridge Elements and Systems (PBES)
- Slide-In Bridge Construction (SIBC)

Alternative Technical Concepts (ATC)

The use of alternative technical concepts gives contractors the opportunity to propose innovative, cost-effective solutions that are equal to or better than the contracting agency's

Contact

Nichole Causey
Marketing Specialist
(202) 366-0627
Nichole.Causey@dot.gc

EDC Rounds

EDC-1 *(2011-2012)*

EDC-3 *(2015-2016)*

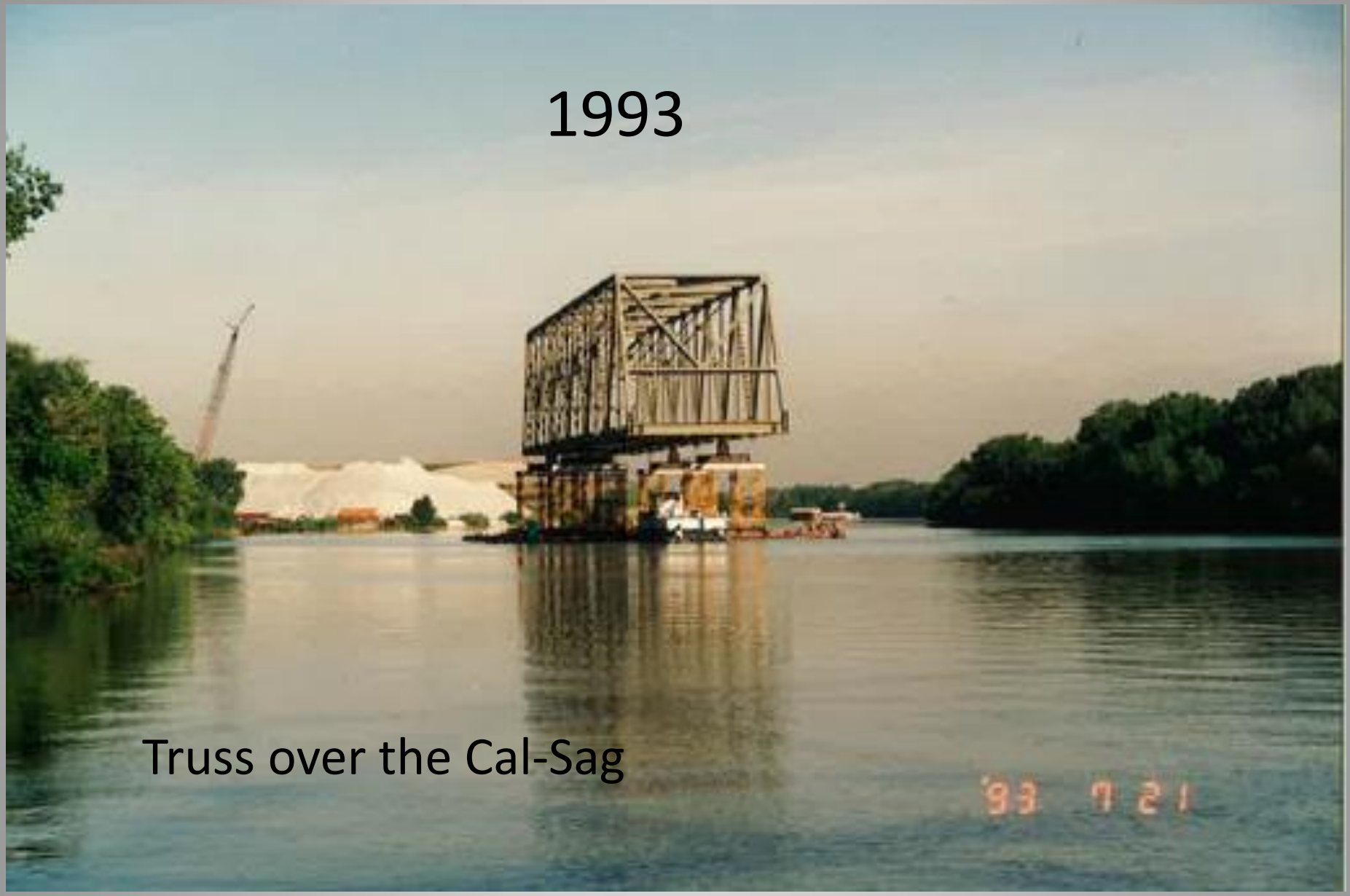
EDC-4 *(2017-2018)*

Publications

Final Report for EDC-2

1993 – Every Day Didn’t Count

But Illinois was already busy !!!


1993
Truss over the Cal-Sag
'93 7 21


1993

1993

Adjacent Box Beams

Can be considered ABC

Adjacent Box Beam Structures

Locals can build entire structure in 5 weeks

PPC DECK BEAM BRIDGES

HISTORY

MID 1960's - BEGAN USING ON STATE ROUTES

PPC DECK BEAM BRIDGES
HISTORY

LATE 1970's – CURTAILED USE ON STATE ROUTES

Heavy usage on the local system –"bread and butter" bridge of Illinois

PPC DECK BEAM BRIDGES
HISTORY

1988 – NOTED WATER INFILTRATING BEAMS

Liquid Bridge Killer

PPC DECK BEAM BRIDGES

DETERIORATION


ERSIZE LOAD

Partial Depth Deck Panels

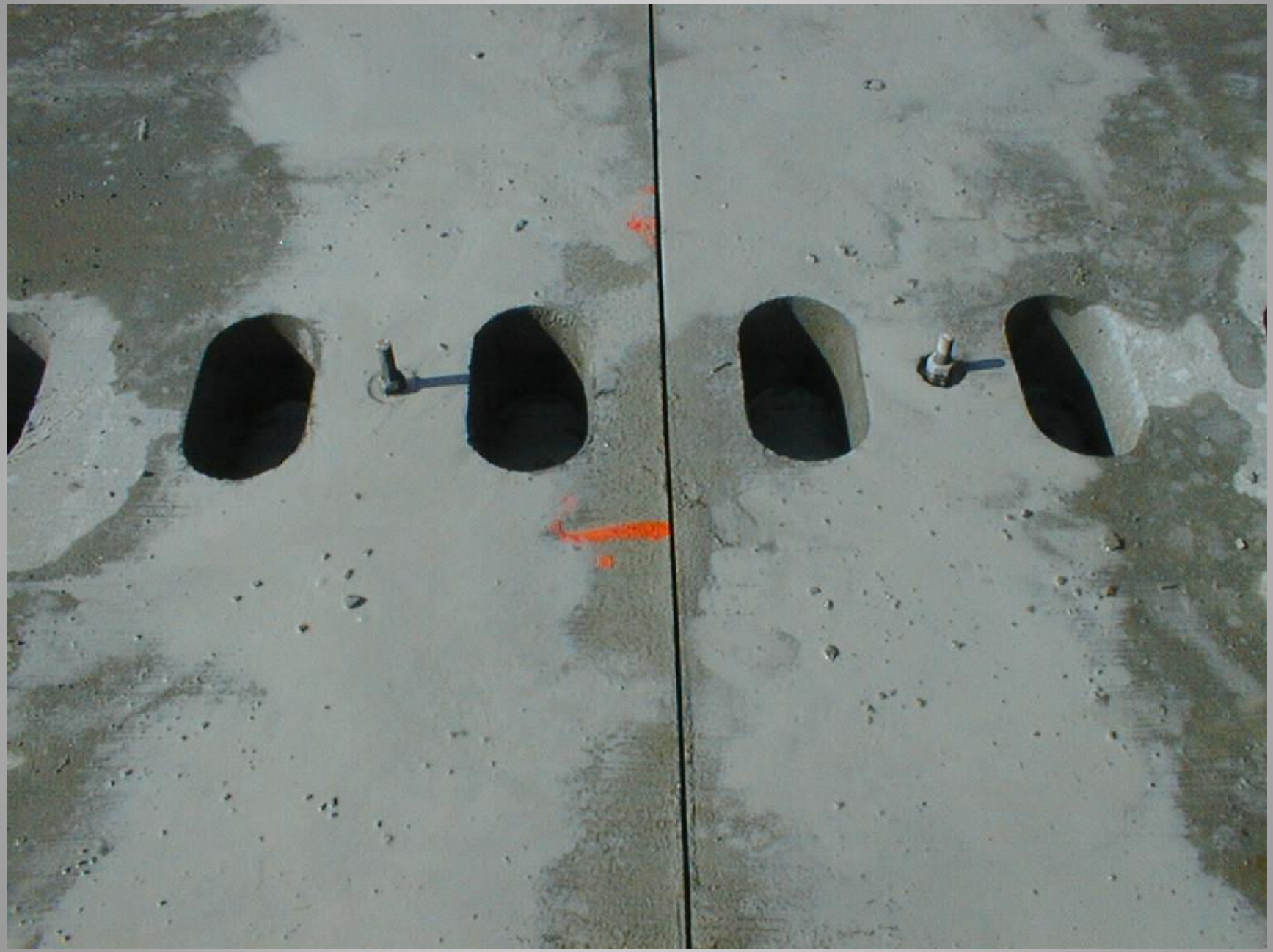
Full Depth Deck Panels

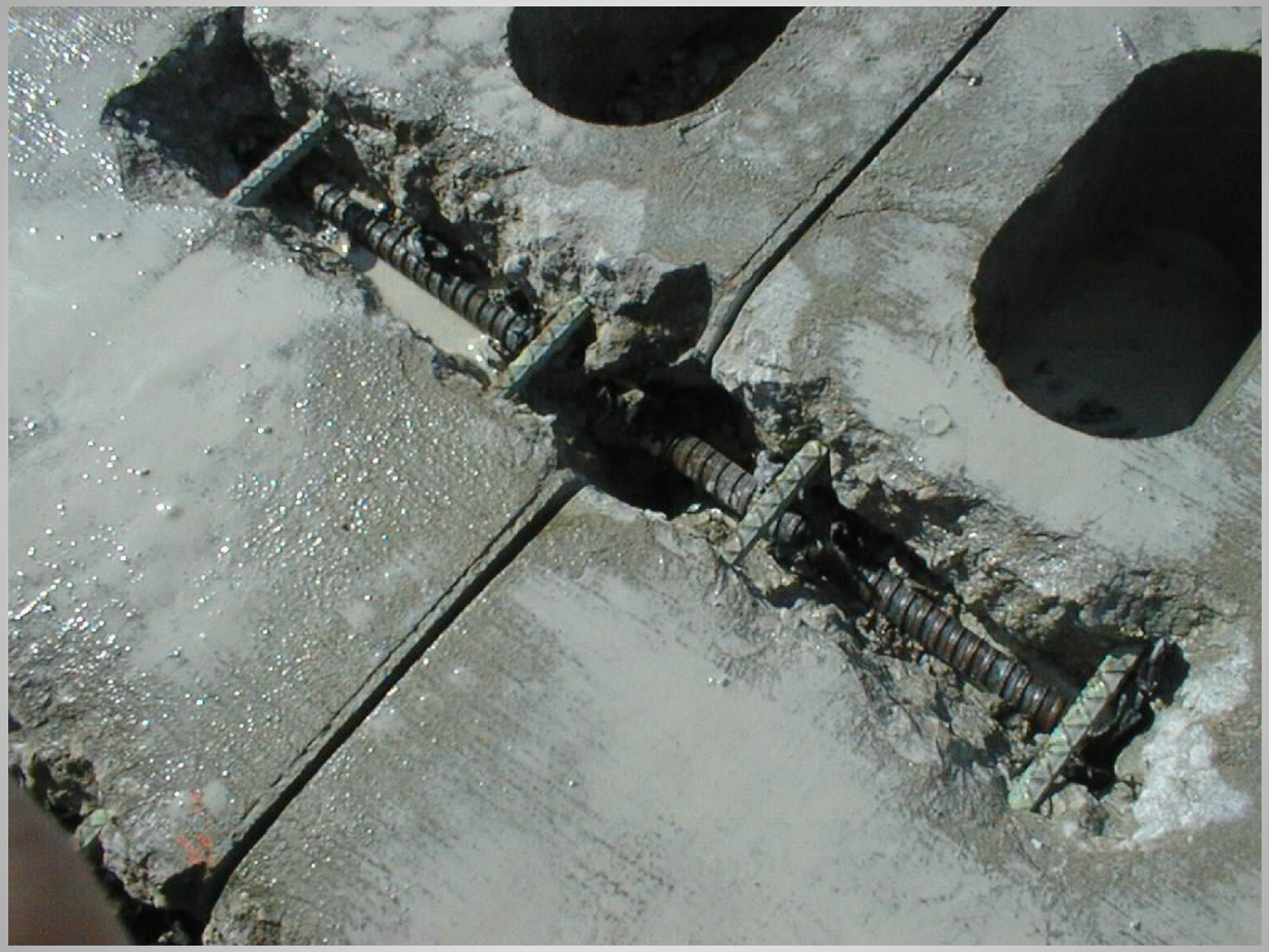
Full Depth Deck Panels

- Illinois has 4 in the inventory (that we know of)
  - Excluding cable stayed bridge
  - Two on IL Route 29 – D6
  - One in Greene County – D8
  - One in Chicago area – Peoria St.
  - Three built in 2000 – 17 yrs old
    - Peoria St – 2 years old

Route 29 Full Depth Deck Panels

Year Built: 2000



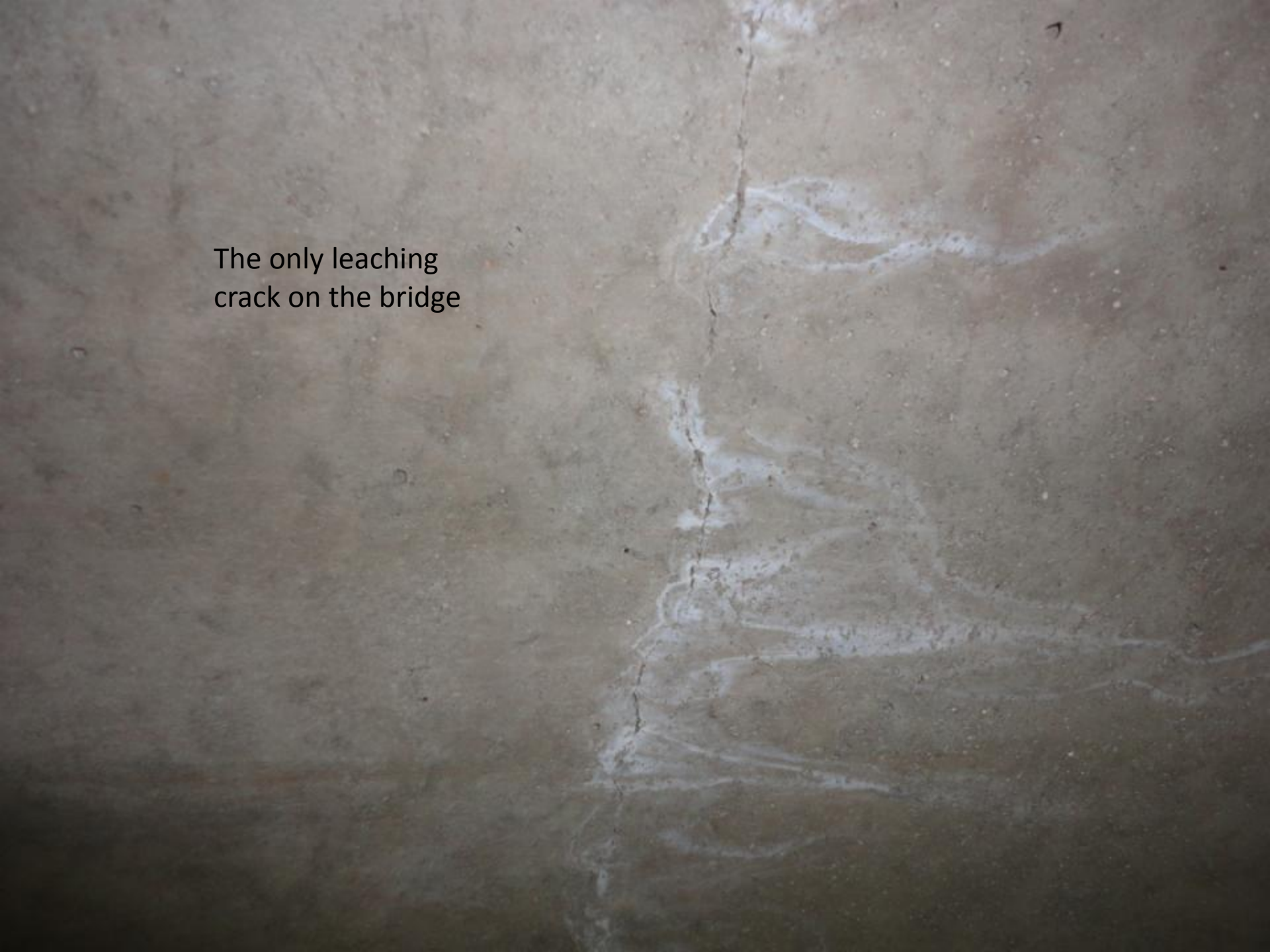


General Observations

- Looks very good for 12 year old deck
- No evidence of leakage anywhere
- Overlay performing well
- Precast parapets somewhat misaligned from construction, but performing fine
- A few panels had tight, hairline cracks running longitudinally along the length of the bridge (the few that had cracks there were two to four cracks) – doesn't appear detrimental


Very Typical View

The only joint leakage we could find – maybe from original construction?


The only leaching
crack on the bridge

Greene County Structure


Greene County – Full Depth Deck Panels

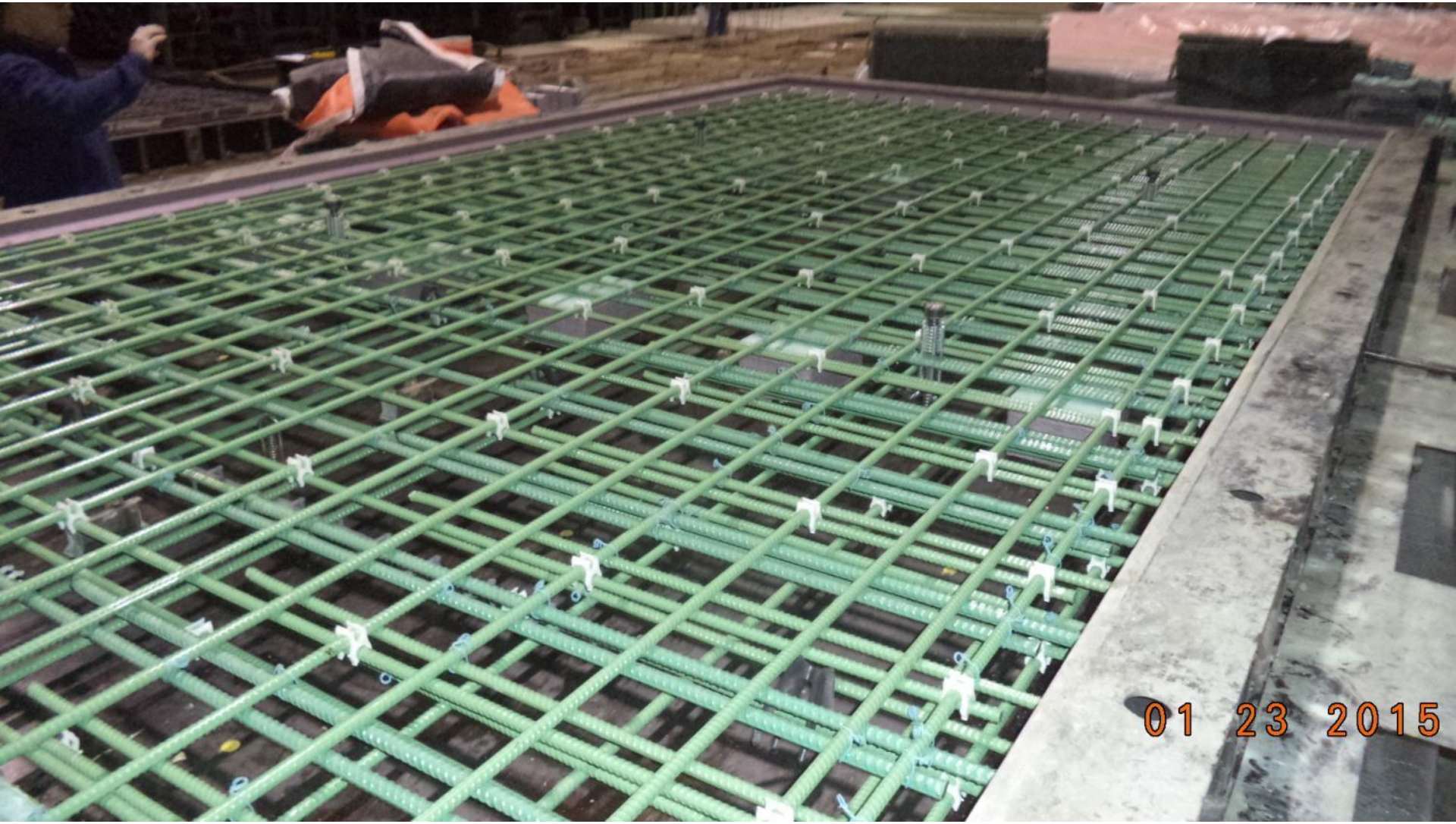

Closure Pour for Microsilica Overlay?
Not sure why?

Peoria Street – Circle Interchange

- Full depth deck panels
- UPHC connections
- Pedestrian Bridge
- Latex Overlay
- Construction Season - 2015

- Goal: Try full depth panels and UHPC as a guinea pig project for Illinois

- NOTE: Not for purposes of ABC this time


01 23 2015


01 23 2015


01 23 2015


01 23 2015


allen


Kiewit
Ductal
0.5-13-07
0.5-13-07
0.5-13-08
Ductal


SAFETY
BEGINS WITH ME

BEKAERT

Dramix®

Steel wire fibres for concrete reinforcement

20 kg.

CAUTION: Puncture Hazard

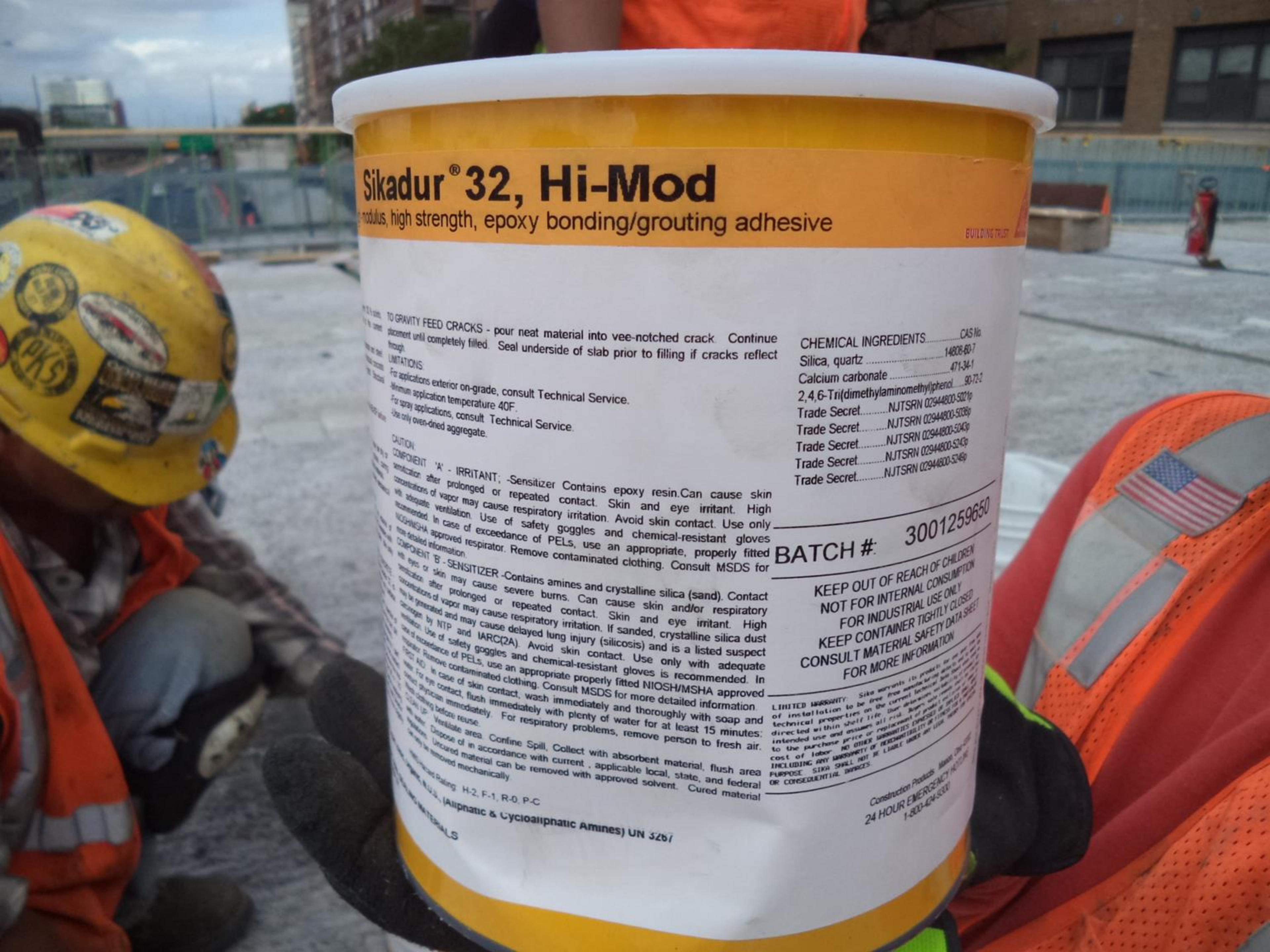
KEEP DRY

0015892

DRAMIX


Klewit
20
Kg
LAFARGE

CANTEX SCHEDULE 40 RIGID PVC NONMETALLIC



Sikadur® 32, Hi-Mod
modulus, high strength, epoxy bonding/grouting adhesive
BUILDING TRUST
TO GRAVITY FEED CRACKS - pour neat material into vee-notched crack. Continue placement until completely filled. Seal underside of slab prior to filling if cracks reflect through.
LIMITATIONS
For applications exterior on-grade, consult Technical Service.
Minimum application temperature 40F.
For spray applications, consult Technical Service.
Use only oven-dried aggregate.
CAUTION
COMPONENT 'A' - IRRITANT; -Sensitizer Contains epoxy resin.Can cause skin sensitization after prolonged or repeated contact. Skin and eye irritant. High concentrations of vapor may cause respiratory irritation. Avoid skin contact. Use only with adequate ventilation. Use of safety goggles and chemical-resistant gloves recommended. In case of exceedance of PELs, use an appropriate, properly fitted NIOSH/MSHA approved respirator. Remove contaminated clothing. Consult MSDS for more detailed information.
COMPONENT 'B' - SENSITIZER -Contains amines and crystalline silica (sand). Contact with eyes or skin may cause severe burns. Can cause skin and/or respiratory sensitization after prolonged or repeated contact. Skin and eye irritant. High concentrations of vapor may cause respiratory irritation. If sanded, crystalline silica dust may be generated and may cause delayed lung injury (silicosis) and is a listed suspect carcinogen by NTP and IARC(2A). Avoid skin contact. Use only with adequate ventilation. Use of safety goggles and chemical-resistant gloves is recommended. In case of exceedance of PELs, use an appropriate properly fitted NIOSH/MSHA approved respirator. Remove contaminated clothing. Consult MSDS for more detailed information.
FIRST AID: In case of skin contact, wash immediately and thoroughly with soap and water. For eye contact, flush immediately with plenty of water for at least 15 minutes; contact physician immediately. For respiratory problems, remove person to fresh air. Wash clothing before reuse.
CLEAN UP: Ventilate area. Confine Spill, Collect with absorbent material, flush area with water. Dispose of in accordance with current, applicable local, state, and federal regulations. Uncured material can be removed with approved solvent. Cured material can only be removed mechanically.
Hazard Rating: H-2, F-1, R-0, P-C
(Aliphatic & Cycloaliphatic Amines) UN 3267
CHEMICAL INGREDIENTS.............CAS No.
Silica, quartz 14808-60-7
Calcium carbonate 471-34-1
2,4,6-Tri(dimethylaminomethyl)phenol 90-72-2
Trade Secret.........NJTSRN 02944800-5021p
Trade Secret.........NJTSRN 02944800-5038p
Trade Secret.........NJTSRN 02944800-5043p
Trade Secret.........NJTSRN 02944800-5243p
Trade Secret.........NJTSRN 02944800-5249p
BATCH #: 3001259650
KEEP OUT OF REACH OF CHILDREN
NOT FOR INTERNAL CONSUMPTION
FOR INDUSTRIAL USE ONLY
KEEP CONTAINER TIGHTLY CLOSED
CONSULT MATERIAL SAFETY DATA SHEET
FOR MORE INFORMATION
LIMITED WARRANTY:
Construction Products
24 HOUR EMERGENCY

ABOVEGROUND AND UNDERGROUND SUNLIGHT RESISTANT MAX 30 C WIRE PER TC-2

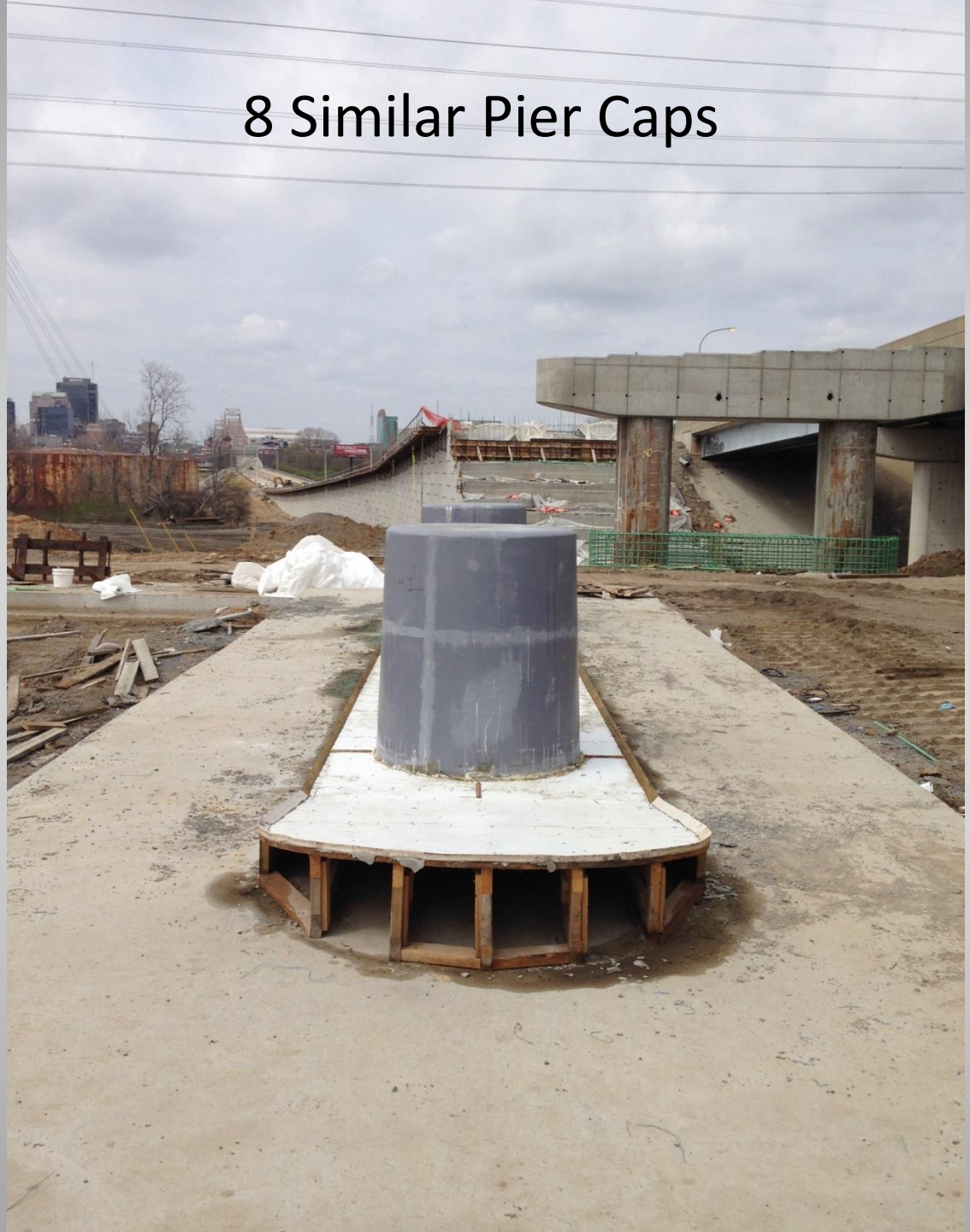
SCHEDULE 40 RIGID PVC NONMETALLIC CONDUIT


NOV 07
A 1/4
LP SolidStart LVL
NOV 07
A 1/4
LP SolidStart LVL
90
94
WEST
Kennedy

Prefabricated Concrete Pier Caps


MLK Connector – IDOT District 8
2016

8 Similar Pier Caps




MLK Connector – IDOT District 8
MANTIS
20010


HOLTHAUS

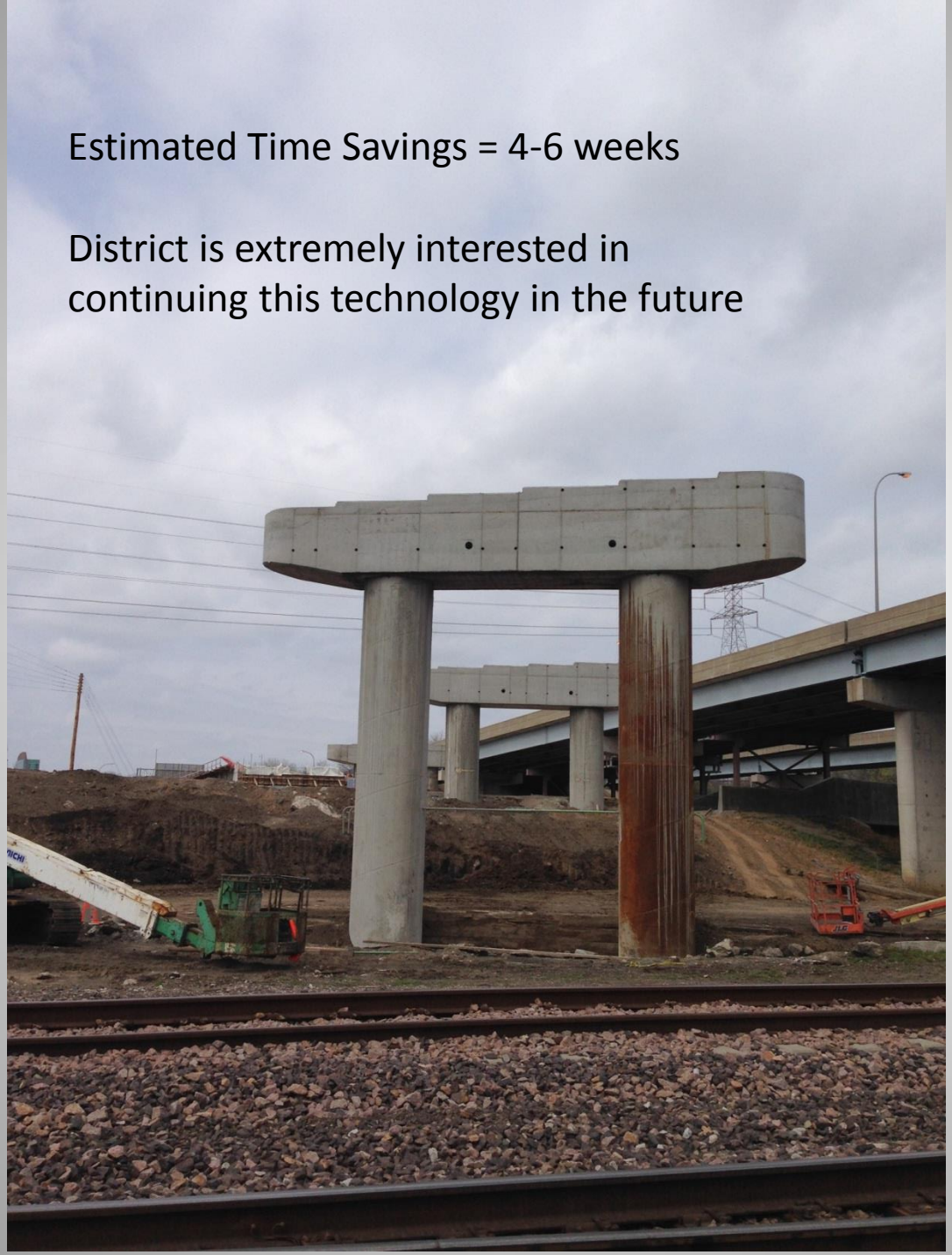

HC210
WORKHORSE
Keeley & Sons


HC210
WORKHORSE
426
Kelley & Sons


HC210

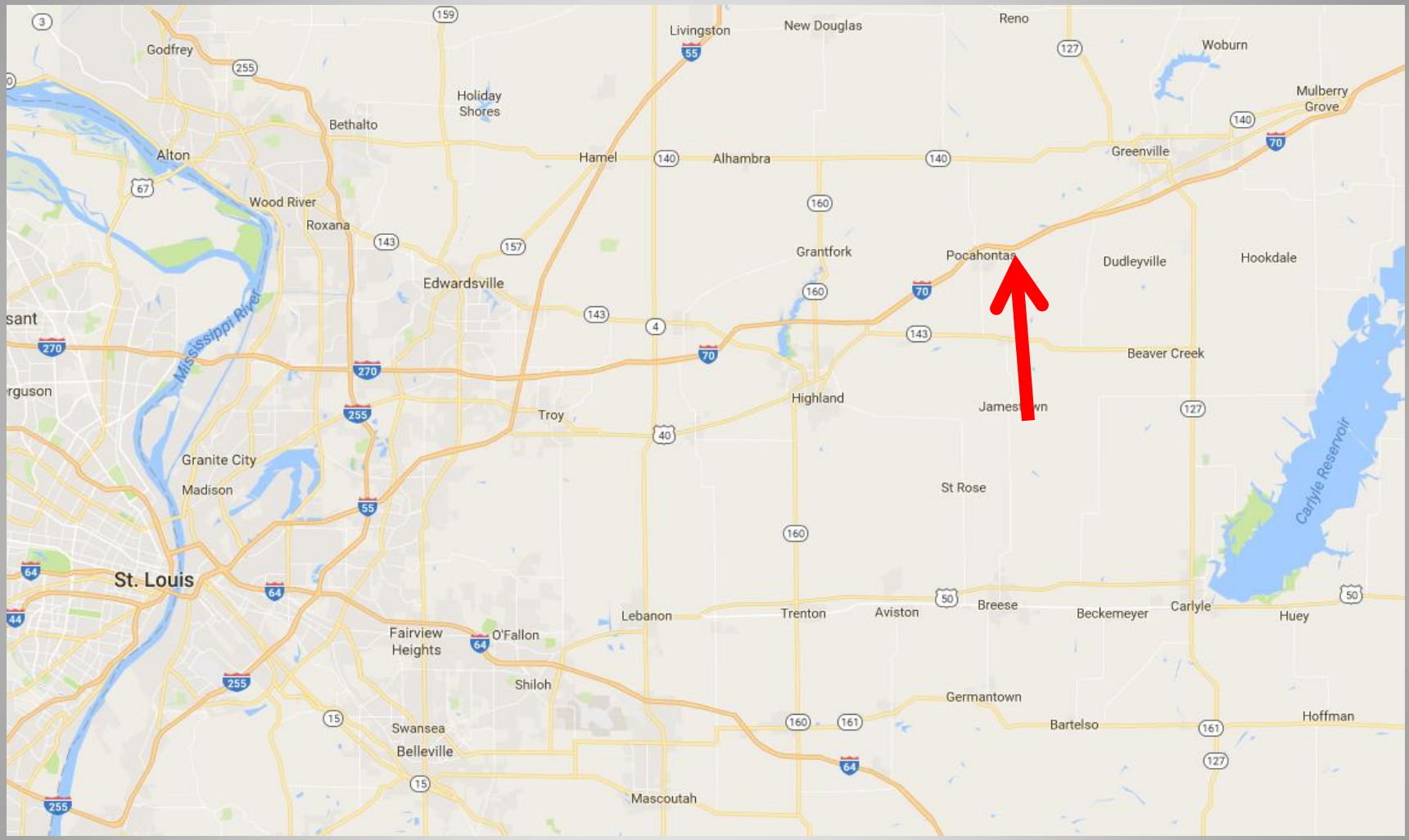
Estimated Time Savings = 4-6 weeks

District is extremely interested in continuing this technology in the future



Bridge Slide-ins

Illinois' First Attempt – US 40 over Shoal Creek



11/04/16 Letting


E City Rte 40
E City Rte 40
E City Rte 40
40
40
40
70
70
70
70


E City Rte 40
©2016 Google
©2016 Google
Hide imagery

-2016 LETTING ITEM 070

F.A.S RTE.	SECTION	COUNTY	TOTAL SHEETS
779	35-1-BR	BOND	57
	ILLINOIS		

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

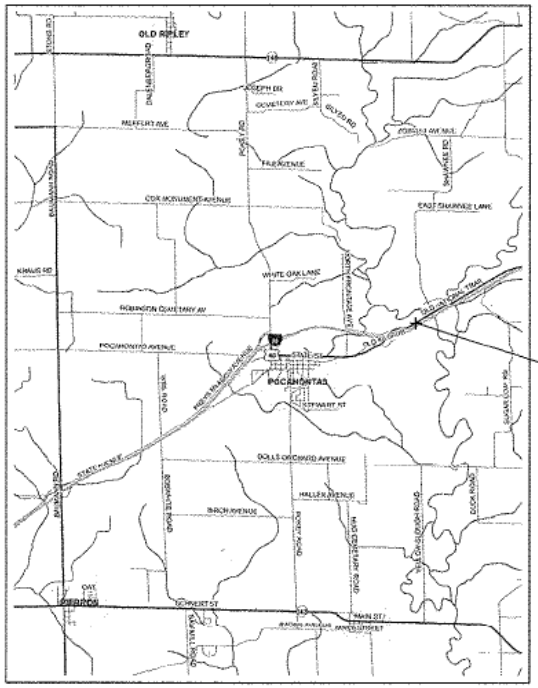
PROPOSED HIGHWAY PLANS

FAS ROUTE 779 (US 40)
SECTION 35-1-BR
BRIDGE REPLACEMENT
BOND COUNTY

X OF SHEETS, SEE SHEET NO. 2

D-98-068-10

C-98-087-10
HSW



PROPOSED SINGLE SPAN 45" WEB R GIRDER
BRIDGE OVER WEST FORK SHOAL CREEK
108'-0" BACK TO BACK ABUTS, 0° SKEW
STA. 1574+34.5
S.N. 003-0020 (E), SN 003-0063 (P)
BEGIN STA. 1571+45
END STA. 1579+80
LAT: 38.8352
LONG: -89.5087

MAP NOT TO SCALE

GROSS / NET LENGTH = 0.158 MILE

TRAFFIC DATA

2013 ADT = 1200 (ACTUAL)
2018 ADT = 1250 (ESTIMATED)
2038 ADT = 1550 (ESTIMATED)
SU = 4.2% MU = 1.0%

N

200' 300' — 1"= 100'
20' 30' — 1"= 10'
100' — 1"= 50'
100' — 1"= 40'
50' 100' — 1"= 30'
50' 100' — 1"= 20'

NS HAVE BEEN PREPARED USING STANDARD
SCALES. REDUCED SIZED PLANS WILL NOT
STANDARD SCALES. IN MAKING MEASUREMENTS
PLANS, THE ABOVE SCALES MAY BE USED.

LOCATION INFORMATION FOR EXCAVATION
3

DESIGN DESIGNATION
N/A

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

SUBMITTED Aug. 5 20 16
REGIONAL ENGINEER
Sept 30 2016
ENGINEER OF DESIGN AND ENVIRONMENT
Sept 30 2016
DIRECTOR OF PROGRAM DEVELOPMENT

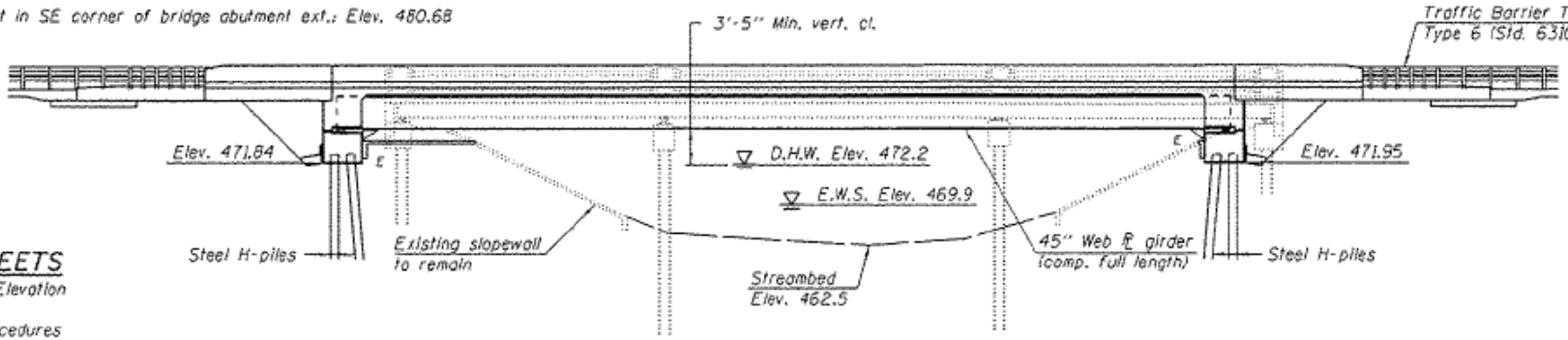
PRINTED BY THE AUTHORITY
OF THE STATE OF ILLINOIS

ENGINEER: HERVE GELIN (618) 346-3179
MANAGER: BILLIE OWEN (618) 346-3209

CT NO. 76E04

...moves into final location using lateral slide in bridge construction (SIBC) techniques with ...ted Bridge Construction (ABC) contract to reduce traffic detour days.

...' set in SE corner of bridge abutment ext.; Elev. 480.68



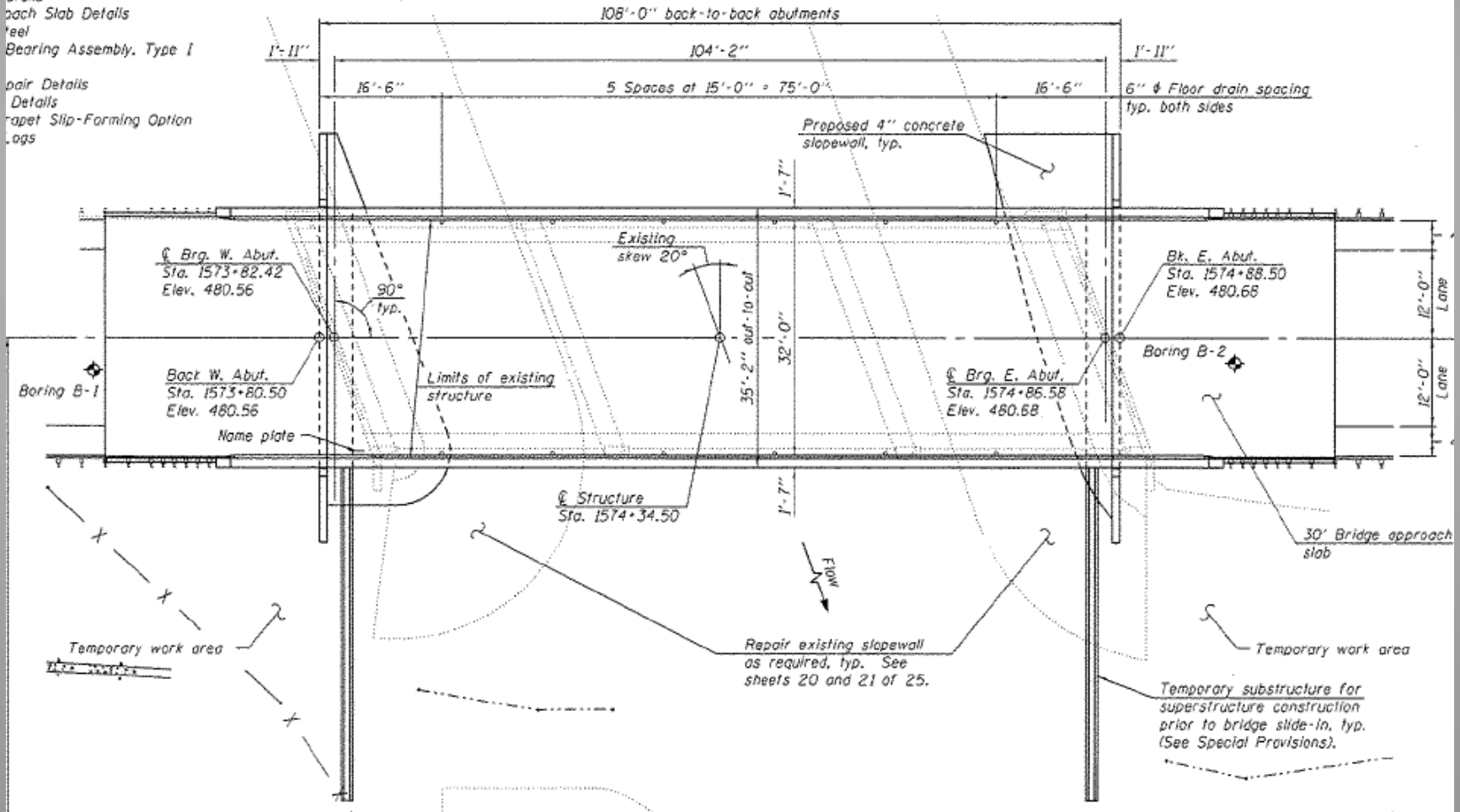
SHEETS

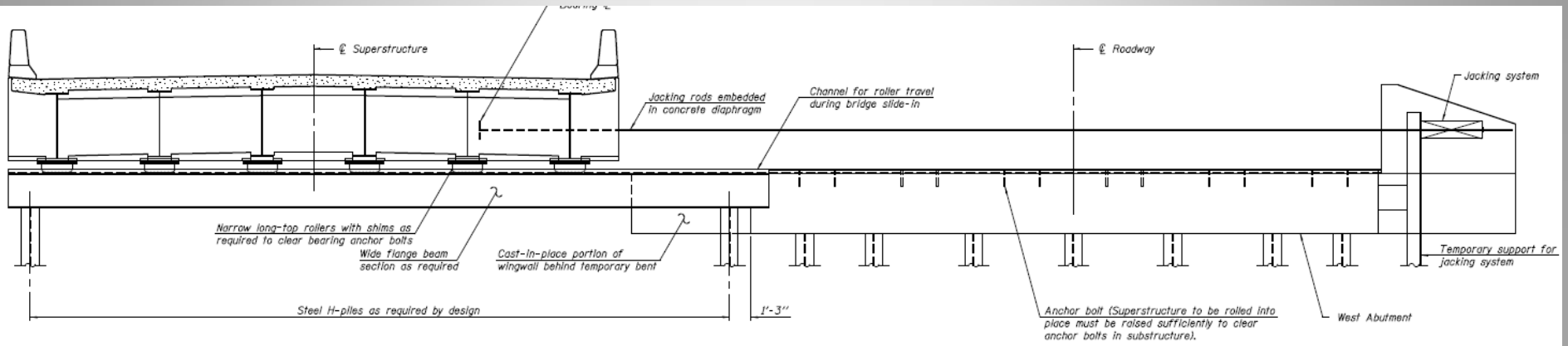
...& Elevation

...Procedures
...Elevations
...oach Slab Elevations
...re
...etails
...oach Slab Details
...eel
...Bearing Assembly, Type I

...pair Details
...Details
...rapet Slip-Forming Option
...ogs

ELEVATION





SECTION THRU BRIDGE PRIOR TO SLIDE-IN

(Looking West at West abutment. East abutment mirror image)

Lateral Slide Br Superstructure

QUANTITY	UNIT OF MEASURE		UNIT PRICE
1.000	L	SUM	
		275,000.0000	
		267,890.0000	
		197,515.0000	
		300,000.0000	
		225,000.0000	

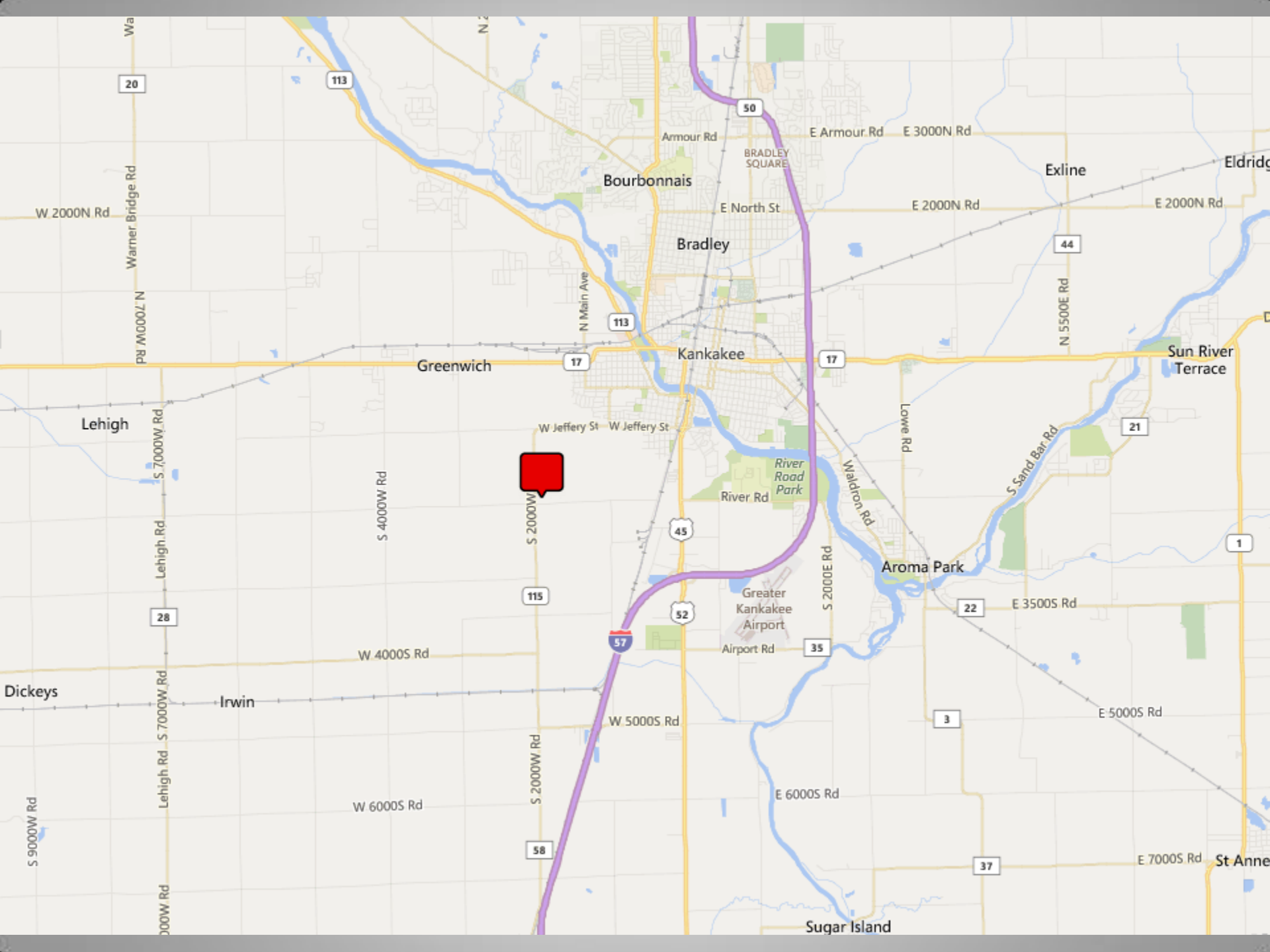
Bid Item is 15.2% of total contract

Work to Date

- 21 Day Closure Allowed
- Nothing Yet
- You're probably invited if you want to see the slide-in later in the year

Illinois' Second Attempt at SIBC

- Illinois 115 over Gar Creek
- Kankakee County
- March 2017 Letting – Last Friday


Armour Rd
E Armour Rd
E 3000N Rd
BRADLEY SQUARE
Bourbonnais
Exline
Eldridg
W 2000N Rd
E North St
E 2000N Rd
E 2000N Rd
Bradley
Warner Bridge Rd
N 7000W Rd
N Main Ave
N 5500E Rd
Kankakee
Greenwich
Sun River Terrace
Lehigh
W Jeffery St
W Jeffery St
River Road Park
River Rd
Lowe Rd
S Sand Bar Rd
Waldron Rd
S 7000W Rd
S 4000W Rd
S 2000W
Lehigh Rd
Aroma Park
S 2000E Rd
Greater Kankakee Airport
Airport Rd
E 3500S Rd
W 4000S Rd
Dickeys
Irwin
S 7000W Rd
W 5000S Rd
E 5000S Rd
S 2000W Rd
E 6000S Rd
W 6000S Rd
S 9000W Rd
E 7000S Rd
St Anne
Sugar Island
20
113
50
44
17
21
45
1
28
115
52
22
57
35
3
58
37

115
S 2000W Rd
Gar Creek
Gar Creek
115
Gar Creek
Gar
S 2000W Rd
115
S


S 2000W Rd

3-2017 LETTING ITEM 006

NOTES

S

DETAILS

UCTURE NO. 046-0152)
CAUSEWAY/WORK PAD PLAN
CTURE NO. 046-0107)

NDARDS, SEE SHEET NO. 2

AND REPLACE THE SUPERSTRUCTURE
RIDGE WITH A SINGLE SPAN STEEL
RAIL WILL BE REPLACED IN ALL FOUR
RDS FOR 3R PROJECTS. THE ROADWAY
ADJUSTED TO ACCOMMODATE THE
S WORK ALSO INCLUDES ROADSIDE
MENT OF DITCHES. TRAFFIC WILL BE
OF THE BRIDGE. ACCELERATED BRIDGE
TO LIMIT THE ROAD CLOSURE PERIOD.

100'
50'
0'
0'
= 20'
100' — 1" = 20'

USING STANDARD
LANS WILL NOT
AKING MEASUREMENTS
MAY BE USED.

FOR EXCAVATION

ALEXANDER, PE

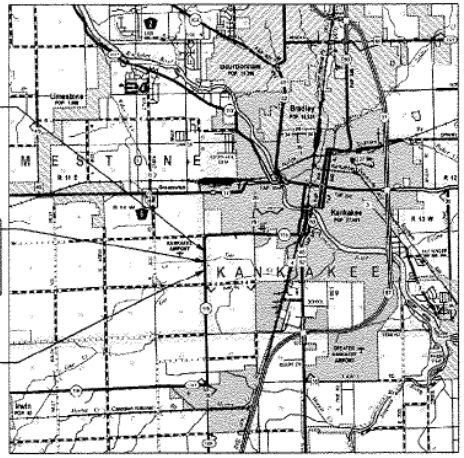
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

PROPOSED HIGHWAY PLANS

FAU 6188 (IL 115)
SECTION (39C) 1-BR
PROJECT ACM-6188(003)
BRIDGE REPLACEMENT
OVER GAR CREEK
KANKAKEE COUNTY

C-93-003-16

S11 T30N R14W



RANGE 14W-2nd P.M.

LUKE BOLZENIUS
062-066356
LICENSED
PROFESSIONAL
ENGINEER
OF
STATE OF ILLINOIS

SIGNATURE 12/7/2016 DATE

11/30/2017 EXPIRES

N

LOCATION MAP
NOT TO SCALE

F.A.U. RTE.	SECTION
6188	(39C) 1-BR

D-93-008-16

LOCATION OF SECTION INDICATED THUS: –

TRAFFIC DATA

ROUTE: FAU 6188 (IL RTE. 115)
FUNCTIONAL CLASS: MINOR ARTERIAL (URBA
EXISTING ADT: 2850 (2011)
CONSTRUCTION ADT: 3000 (2017)
DESIGN ADT: 4000 (2037)
PV: 76% SU: 10% MU: 14%

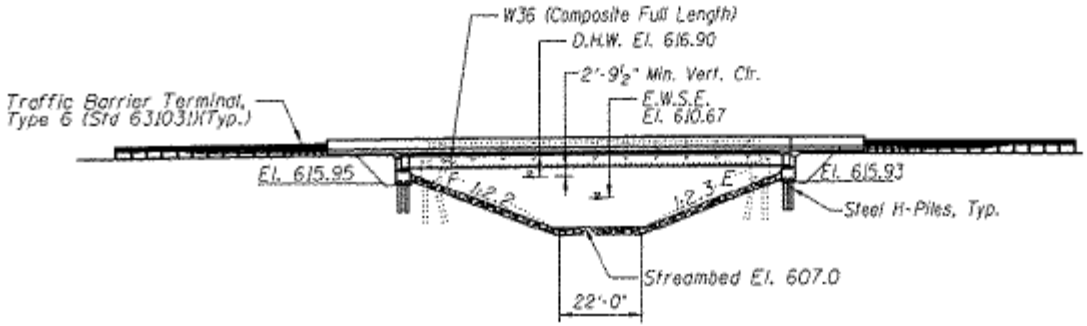
DESIGN SPEED: 55 MPH
POSTED SPEED: 55 MPH

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTAT

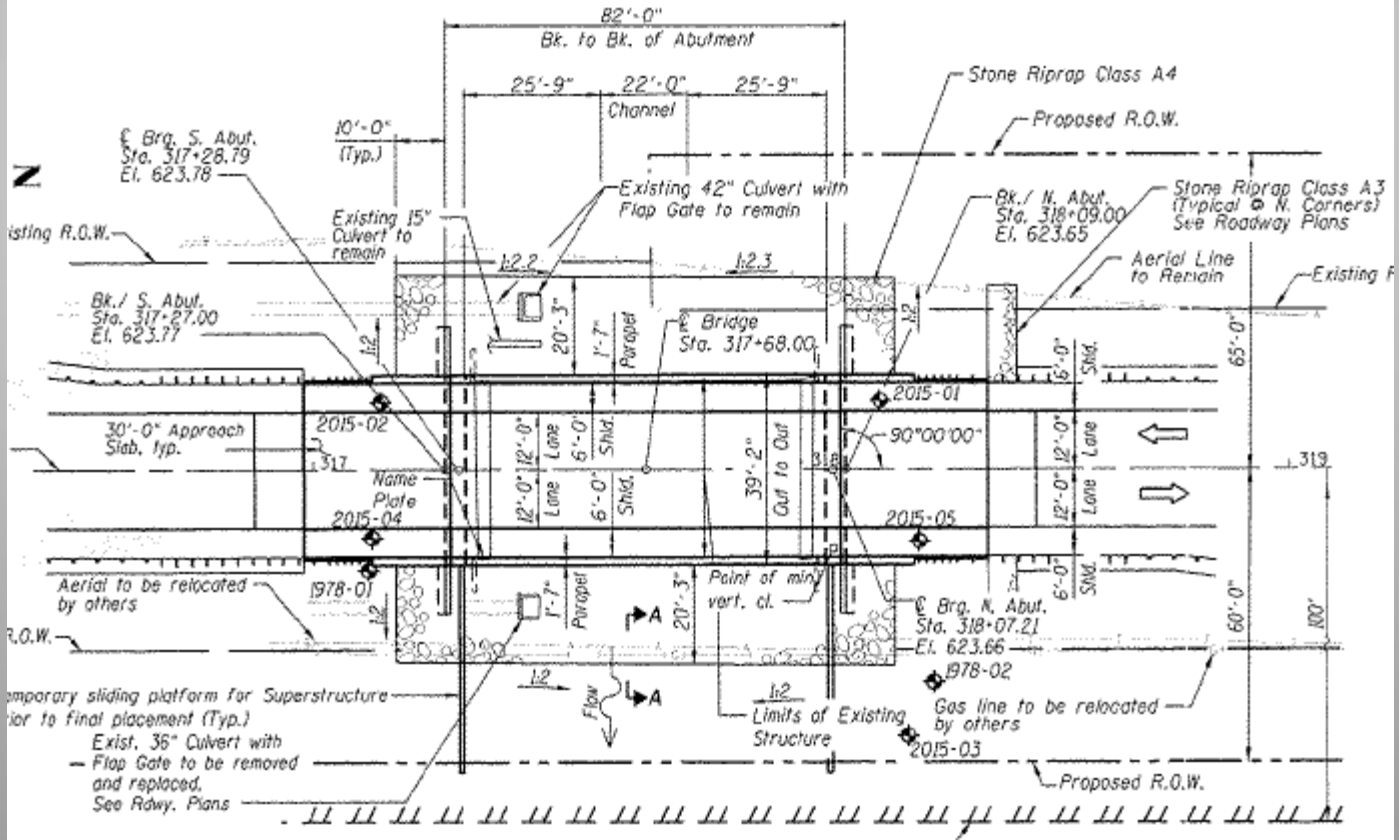
SUBMITTED December 9 20 14
Kevin Marche
Jan 27 20 17
ENGINEER OF DESIGN
Jan 27 20 17
DIRECTOR OF PRO

construction shall be utilized to limit time of road closure.

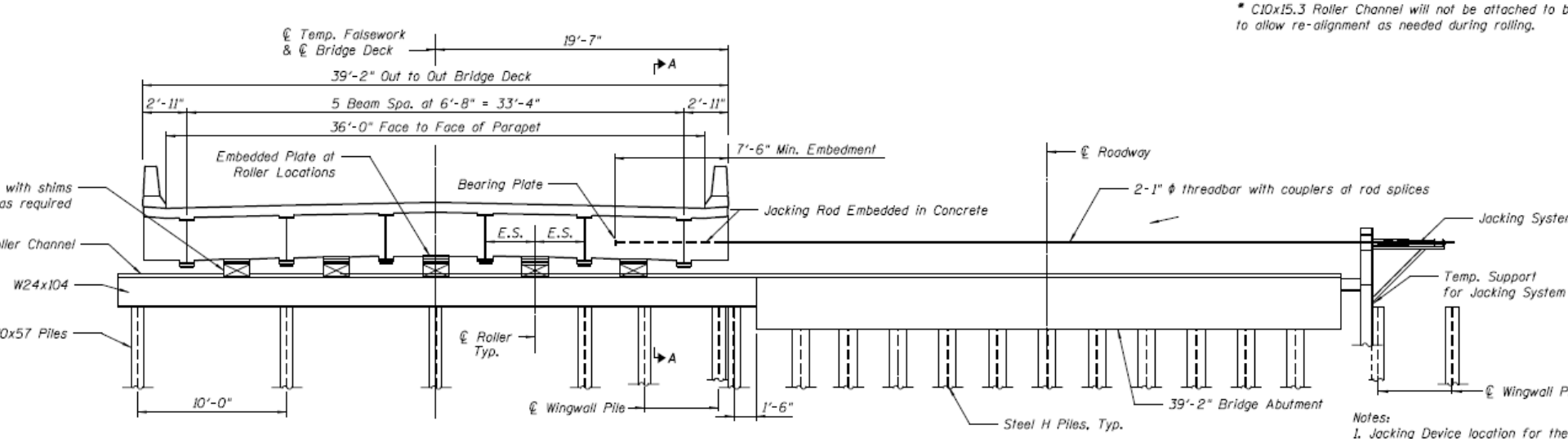
No Salvage



ELEVATION



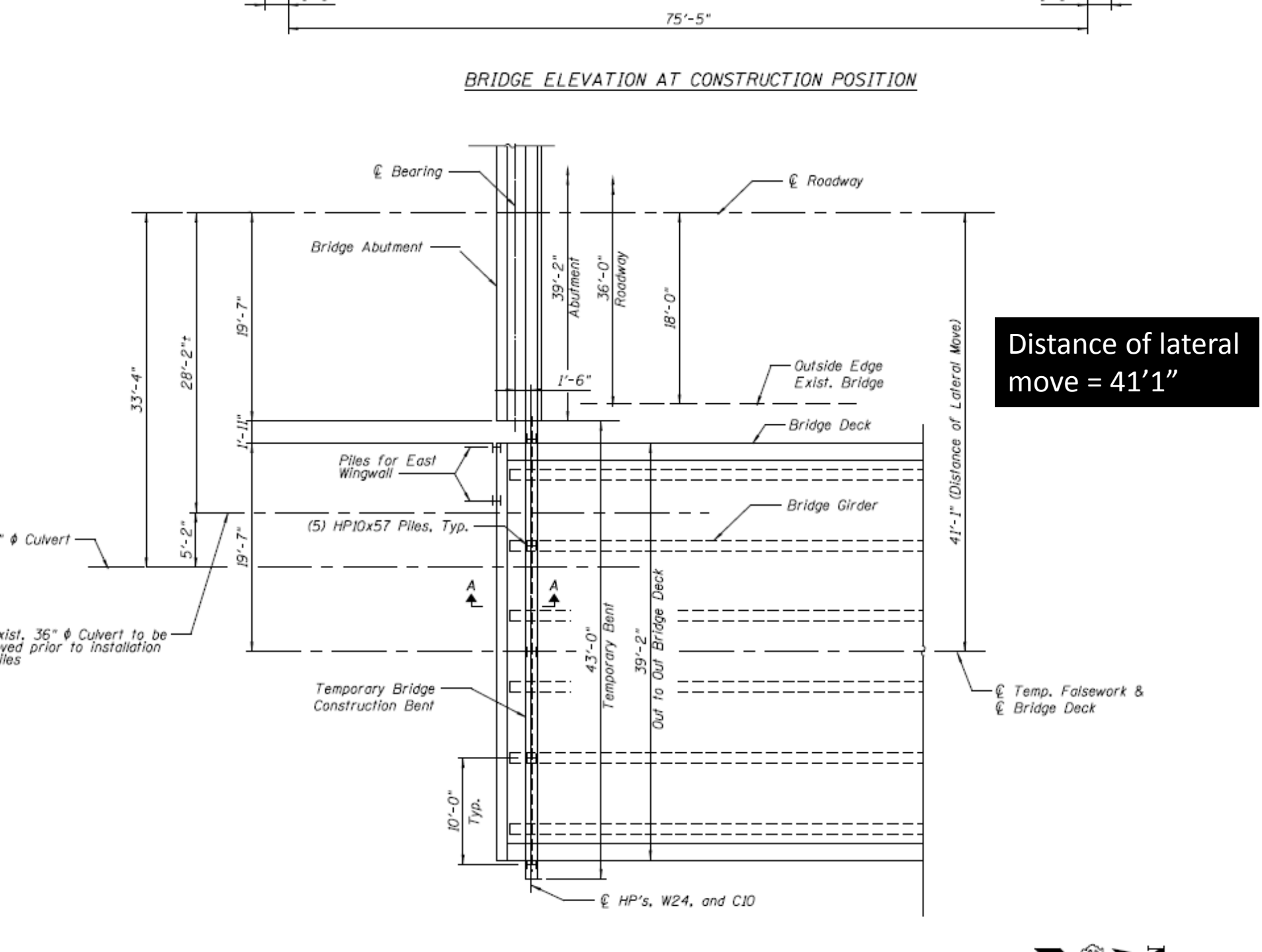
BRIDGE PLAN VIEW AT CONSTRUCTION POSITION



BRIDGE SECTION AT CONSTRUCTION POSITION

* C10x15.3 Roller Channel will not be attached to b
to allow re-alignment as needed during rolling.

Notes:
1. Jacking Device location for the
will be at each concrete diaphrag
2. Section A-A & B-B see sheet



Distance of lateral move = 41’1”

Spec Requirements

- 72 Hour - Road Closure
  - Can occur anytime between 6/15/17 and 10/31/17
  - Penalty : $2,000 per hour past 72 hours
- Prefabricated Elements
  - Abutment Pile Caps
  - Abutment Wing Walls
  - Full Depth Bridge Approach Slabs

SPMT Bridge Moves

In Illinois

- Wells Street Bridge
- Torrence Ave Bridge
- Bloomingdale Trail Bridge

Wells Street Bridge, Chicago - 2002

111-ft long, 25-ft high, 425-ton truss span installed over a weekend

Torrence Avenue Bridge Move

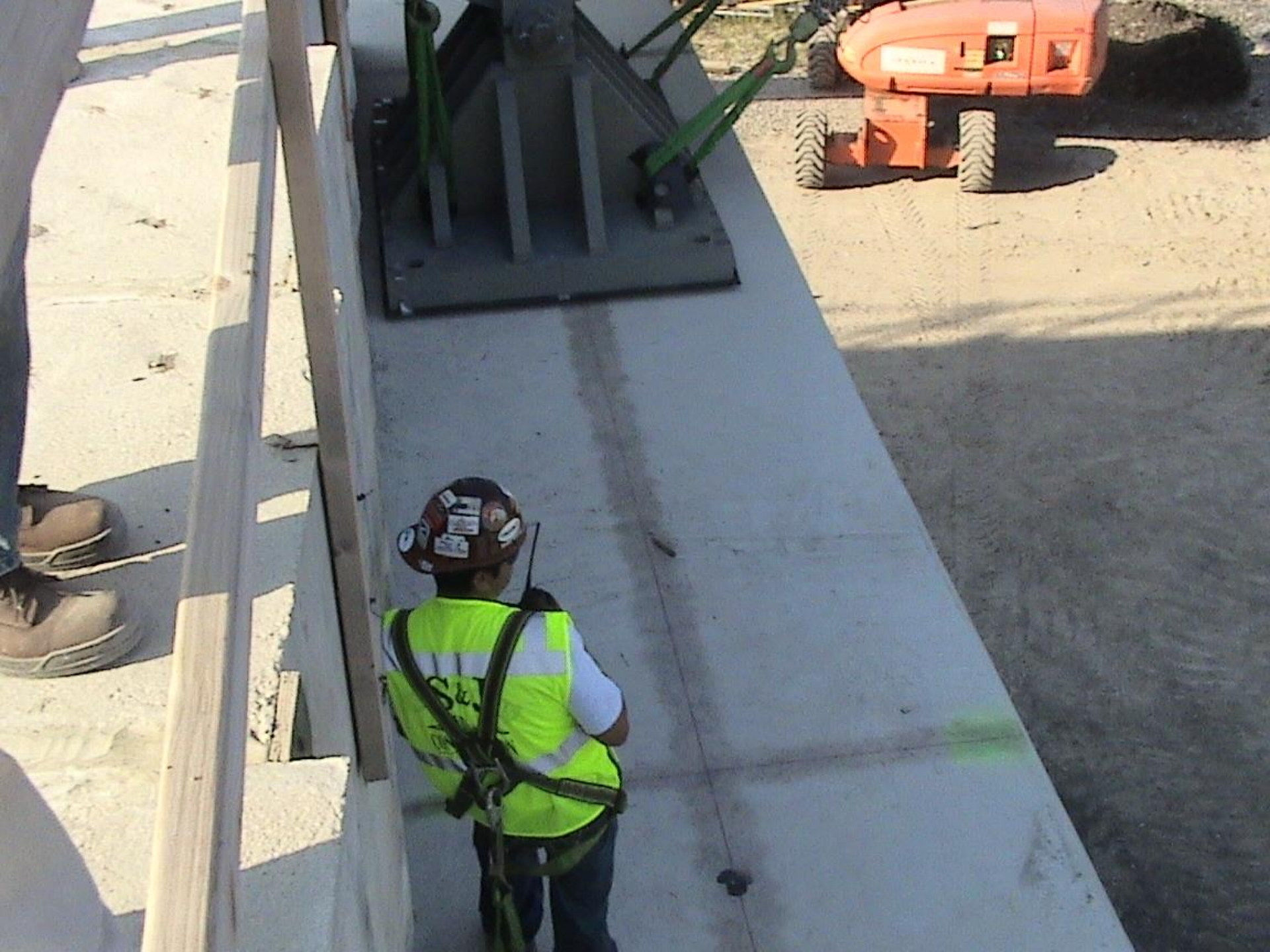
- August 25, 2012 – Saturday
- About 6-7 hours to move into place

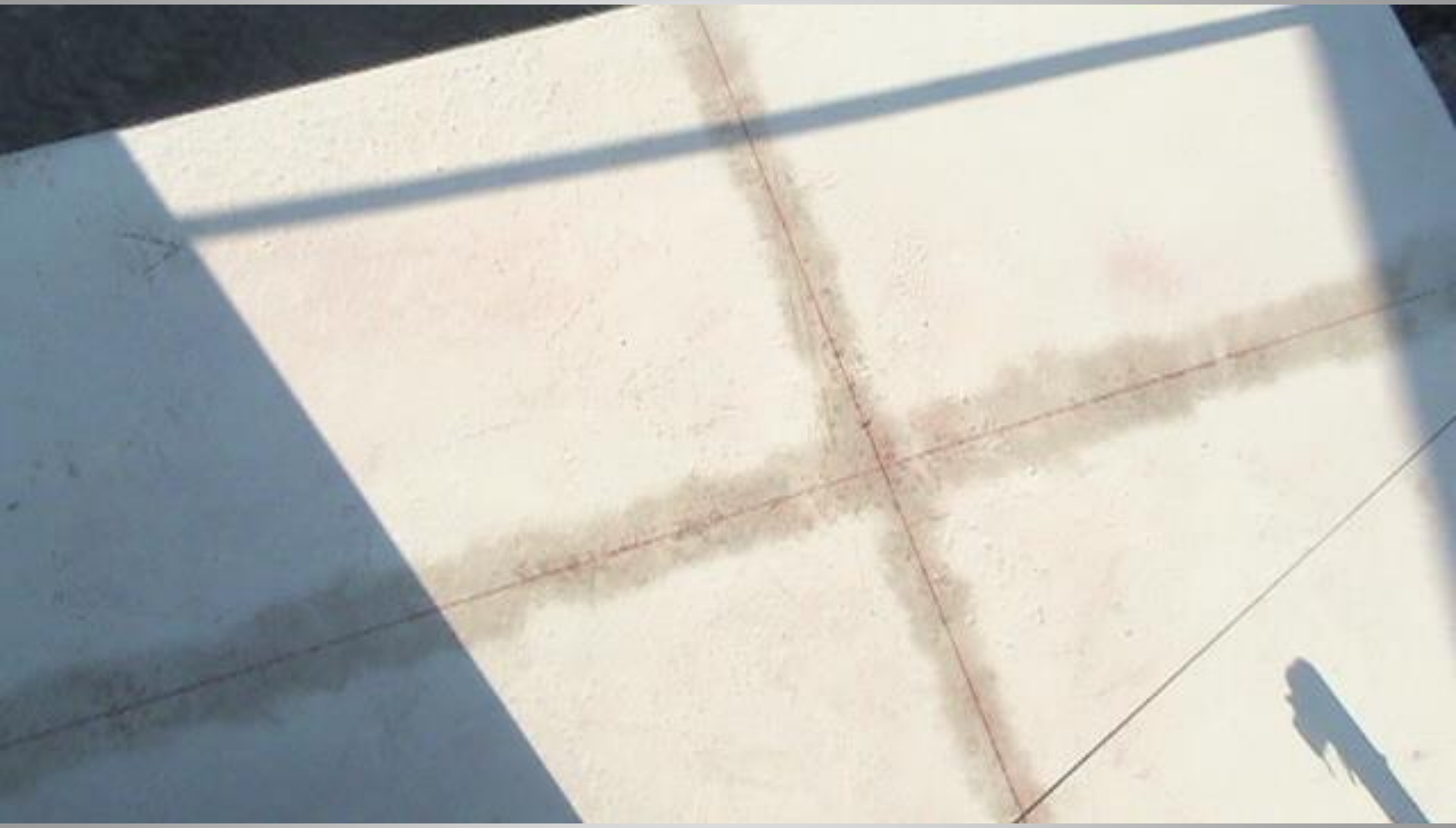

sarens


benesch


1046
www.sarens.com
www.sarens.com


www.sarens.com






KAMAZ


GM SERVICIO, VENTAS, PIEZAS
Midwest
KAMAZ

left stick
right stick


WALSH
S&J
ROAD CLOSED
ROAD CLOSED

Boomingdale Trail

- Took Unused RR bridge from Ashland Ave.
- Moved it to yard to rehab/paint
- Moved it to Western Ave. for Relocation

- 200,000 lbs – bridge weight
- 70 feet long
- Old RR Thru girder bridge

March 29, 2014

March 29, 2014


For more info
visit
the606.org
MAMMOET

22 Days Later

1.5 Mile Bridge Walk


BUILDING A NEW CHICAGO
MAMMOET


BUILDING A NEW CHICAGO
MAM MOET
MAM MOET

Questions???