



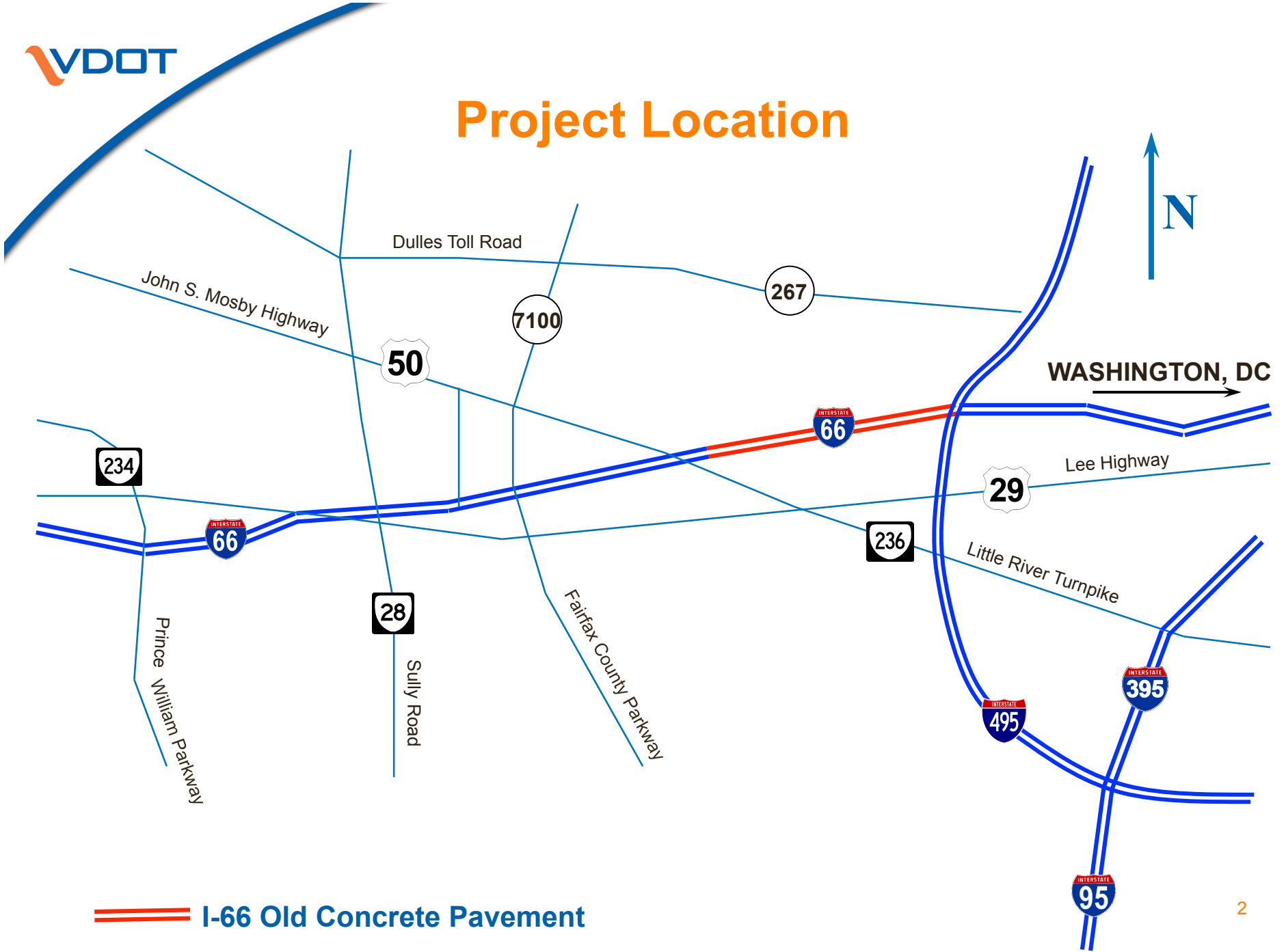
I-66 Highways for LIFE

PCI PAVEMENT COMMITTEE

Karen L. Consiglio, P.E.

September 10, 2009

Project Location



 I-66 Old Concrete Pavement

I-66 Highways for LIFE

Existing Pavement Structure

- 9" JRCP built in early 1960s
- 6" of plain aggregate sub-base
- 6" cement stabilized sub-grade
- Lot of joint problems and mid-slab spalling



I-66 Highways for LIFE

Site Selection for Precast Pre-stressed Concrete Pavement

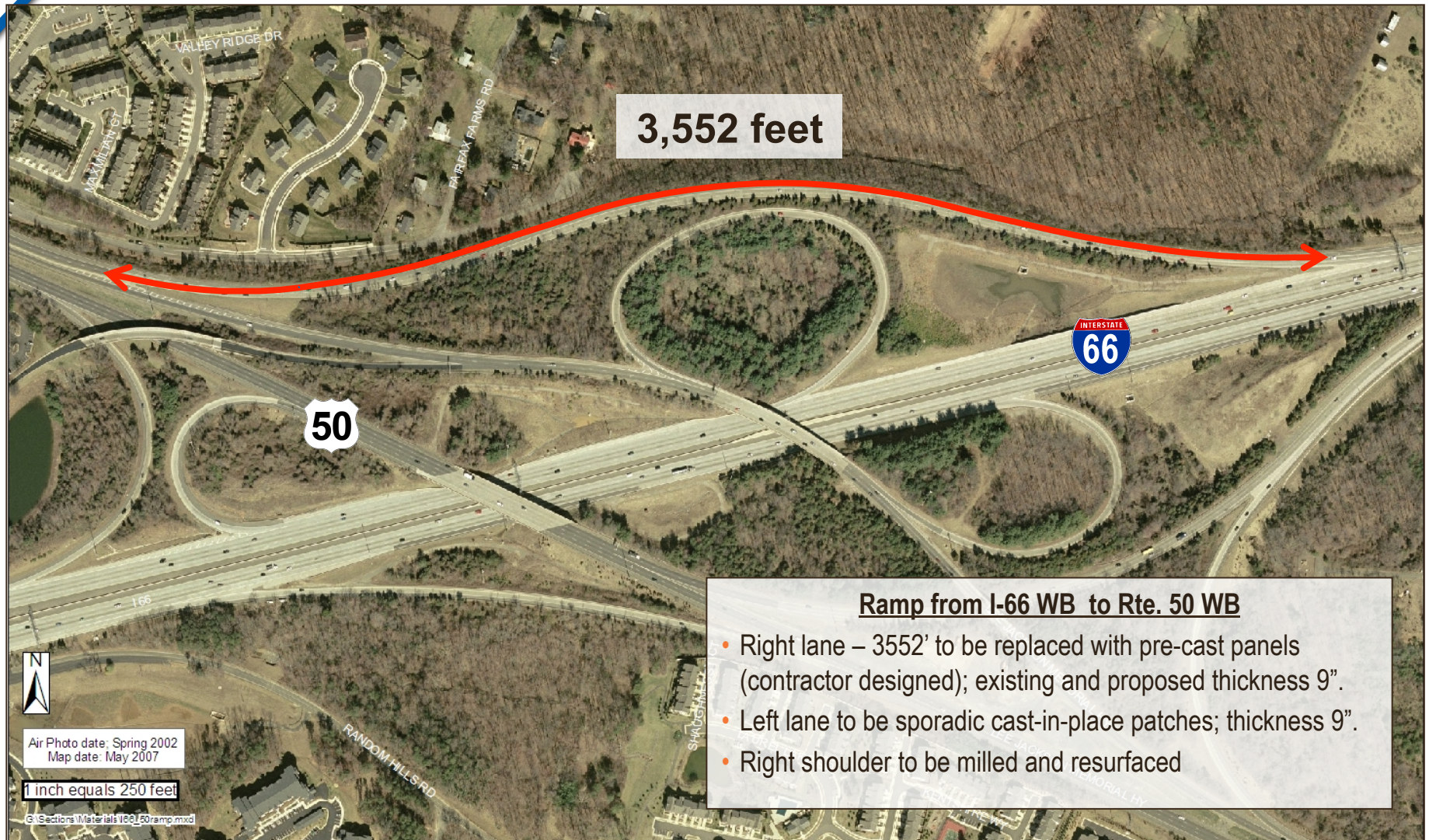
- Based upon condition of pavement
- Available working space (barriers, drainage inlets, etc.)
- Overhead clearances
- Utilities (loop detectors, etc.)
- Curved sections



I-66 Highways for LIFE



Highways for LIFE: Area A



Ramp: Right Lane to be Replaced with Pre-cast Concrete Panels



Highways for LIFE: Area B



I-66 Mainline: Pre-cast, Pre-stressed Concrete Panels (PPCP)



I-66 Mainline: Pre-cast, Pre-stressed Concrete Panels (PPCP)



Maintenance of Traffic

Extremely High Traffic Volumes

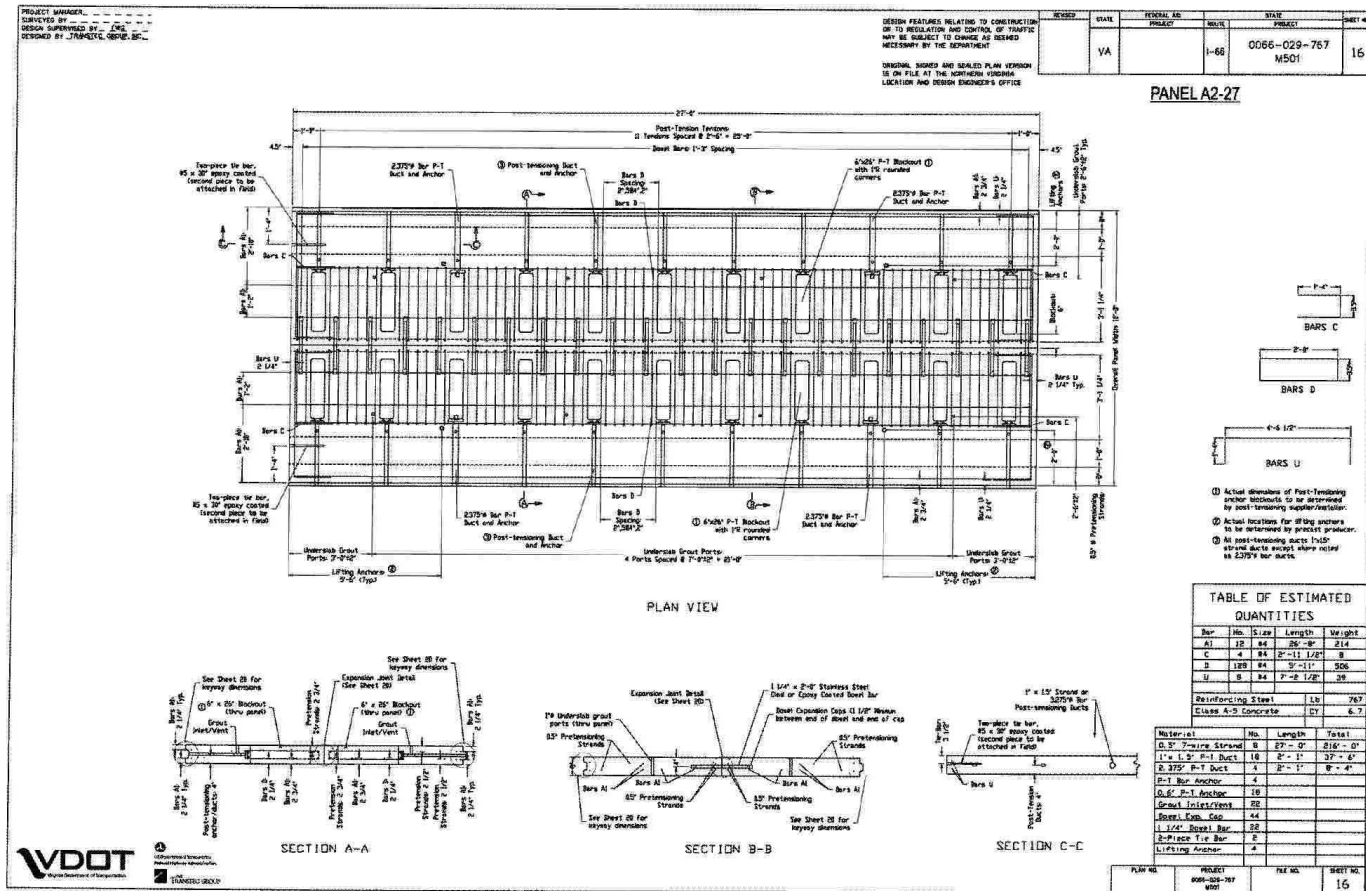
- $ADT_{2008} = 184,000$ vpd (5% trucks)
- Shoulder use 5:30 am to 11 am EB; 2 pm to 8 pm WB

Lane Closure Restrictions

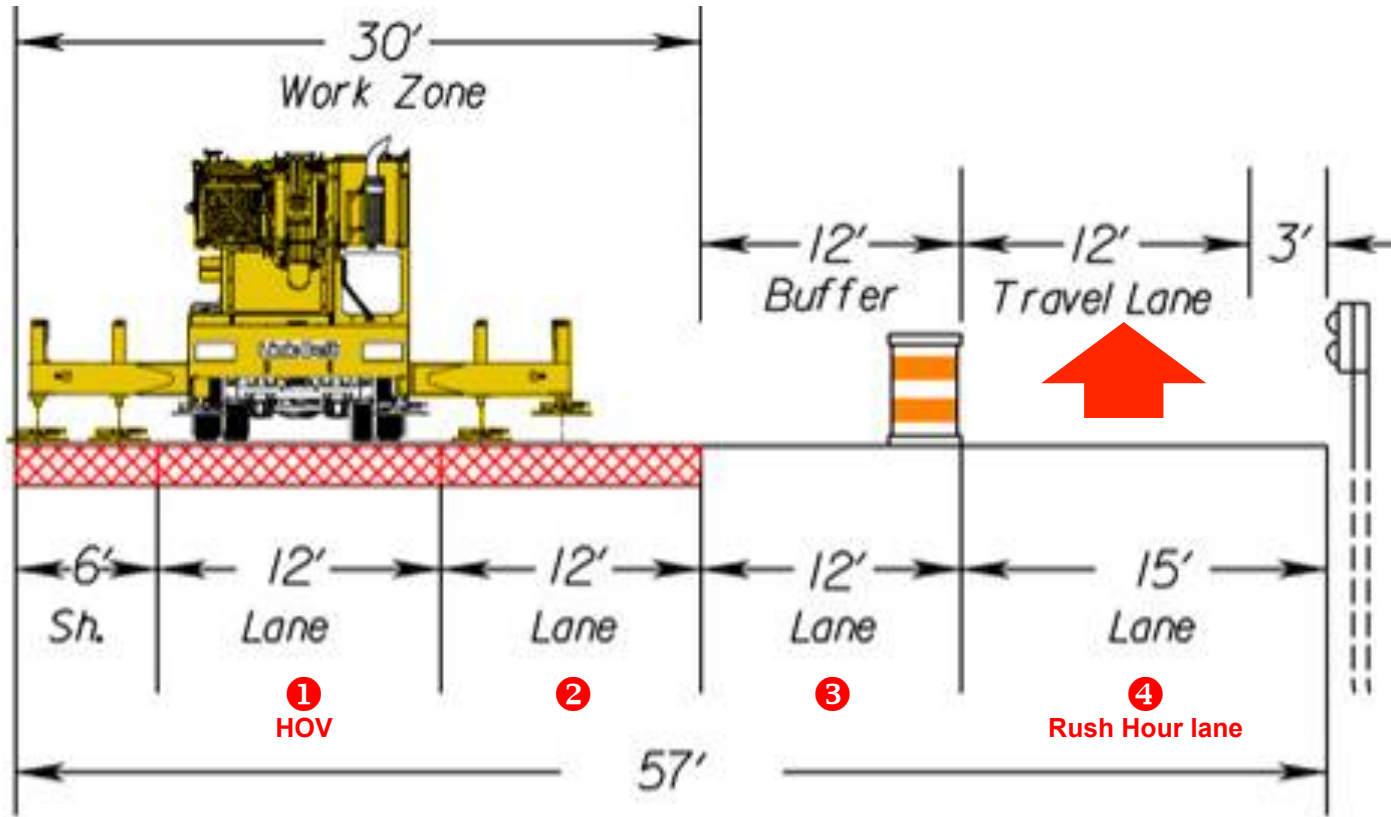
- Close two lanes at 9 pm; close third lane at 10 pm; open by 5 am



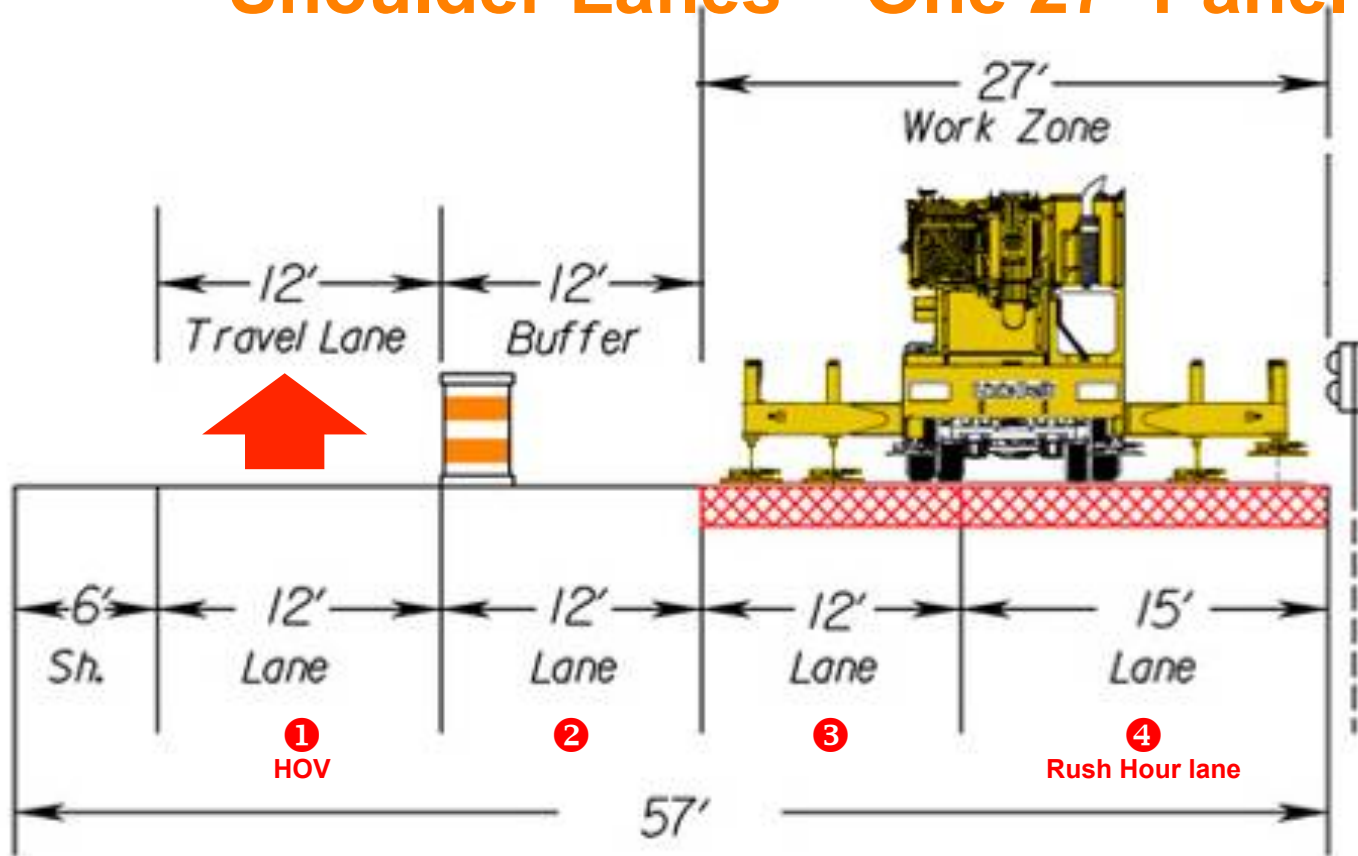
I-66 Mainline: Pre-cast, Pre-stressed Concrete Panels (PPCP)



Prestressed Panels on I-66 Inside Lanes – Two 12' Panels



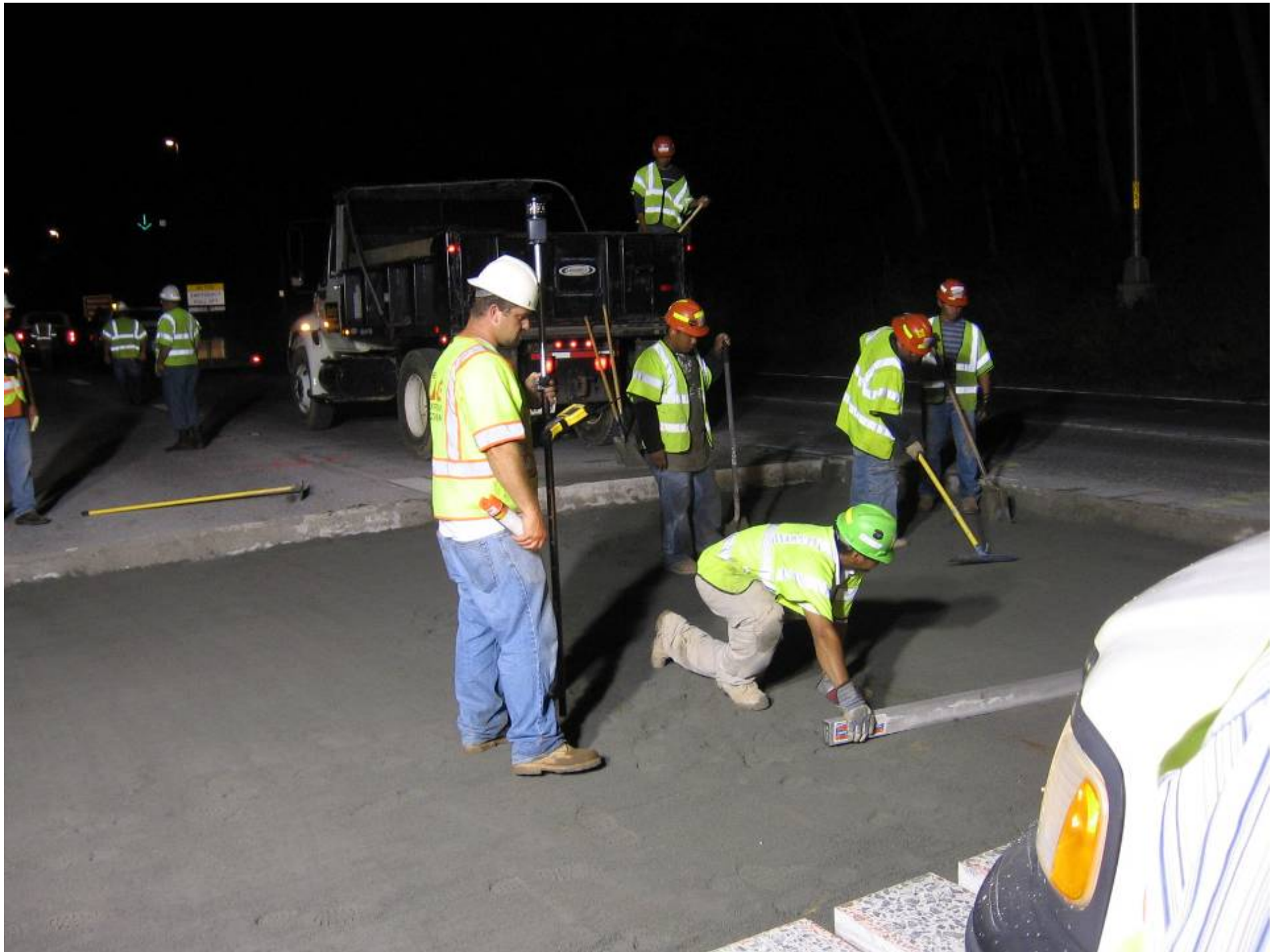
Prestressed Panels on I-66 Outside & Shoulder Lanes – One 27' Panel



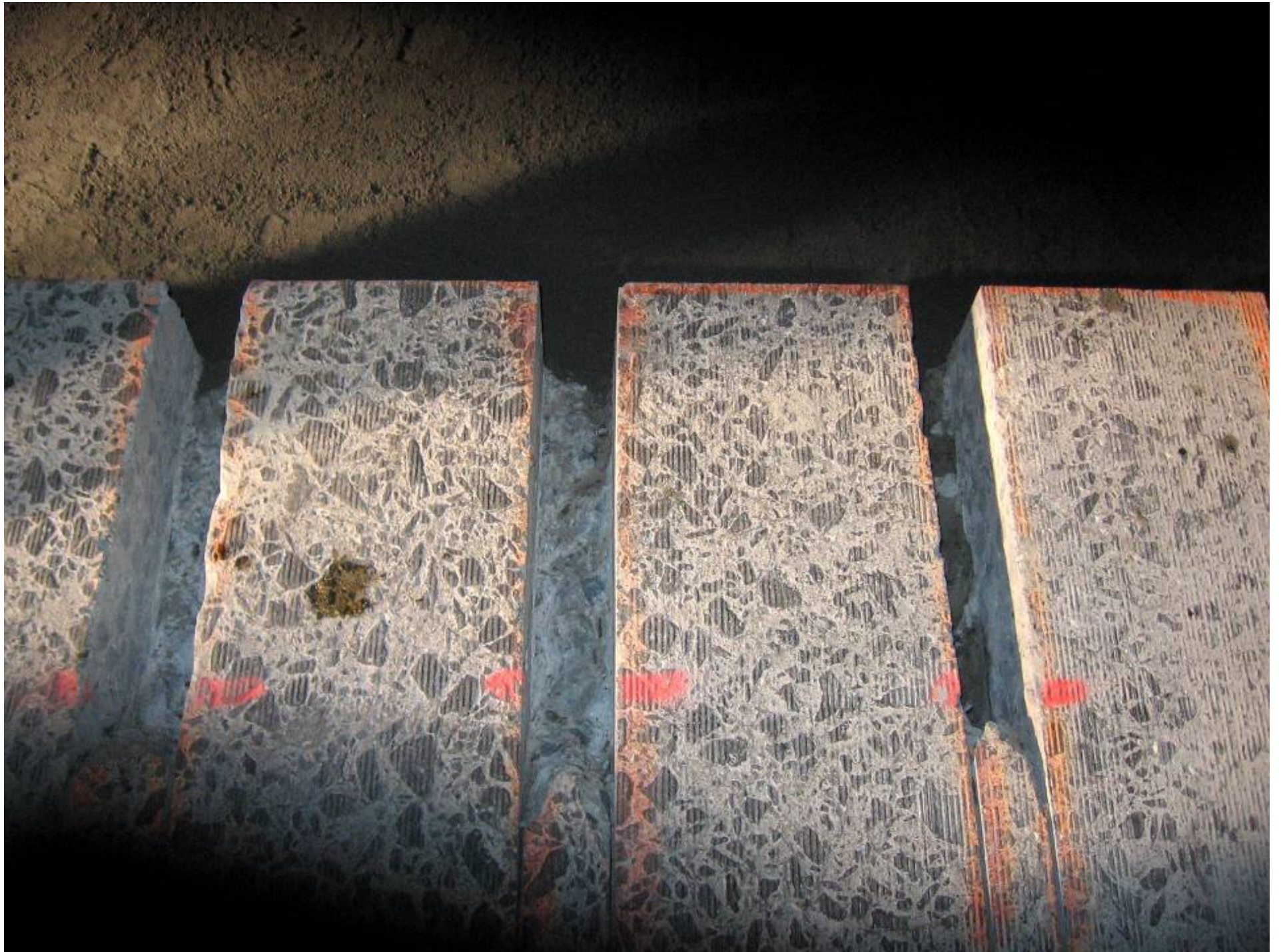


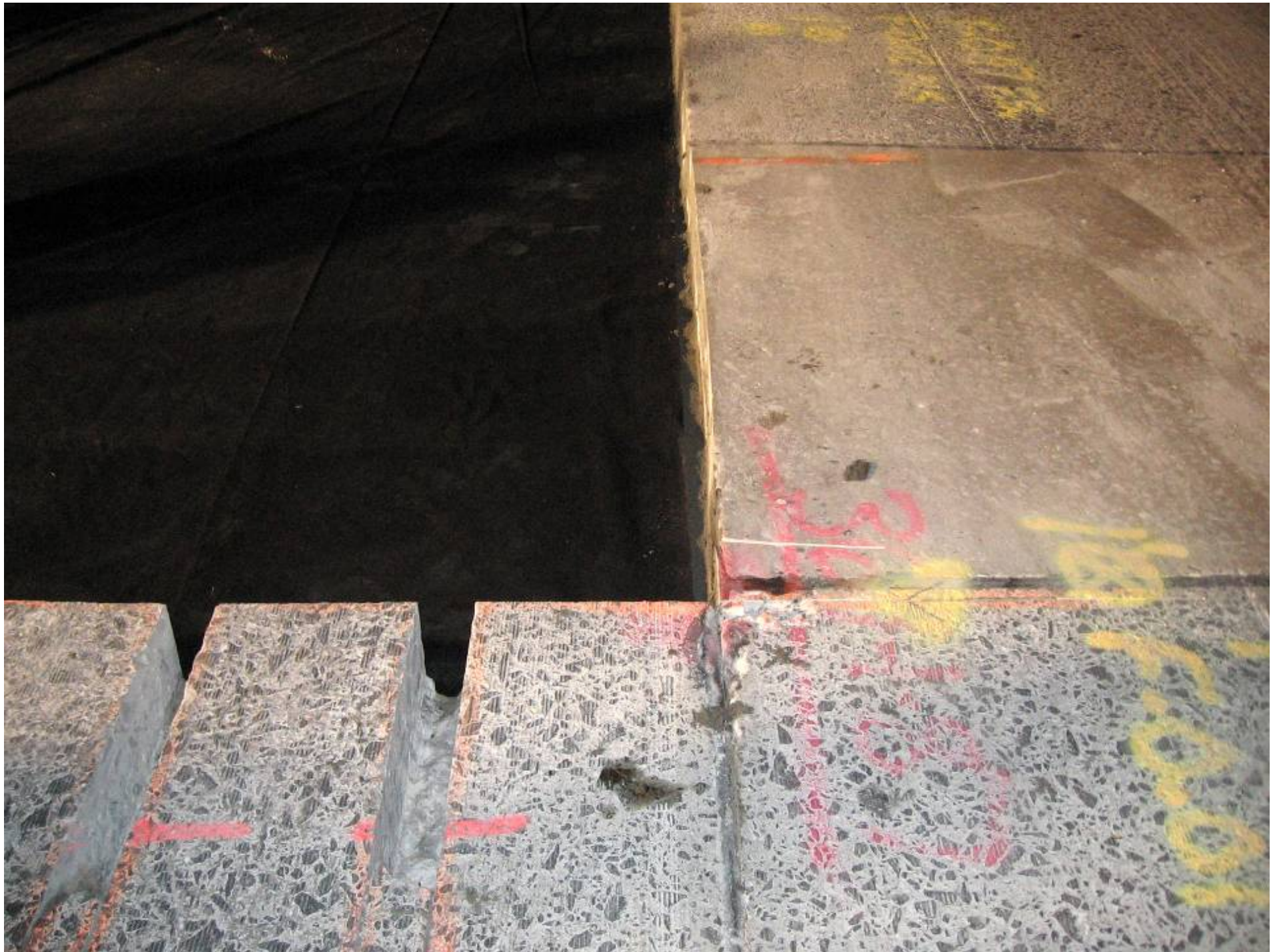












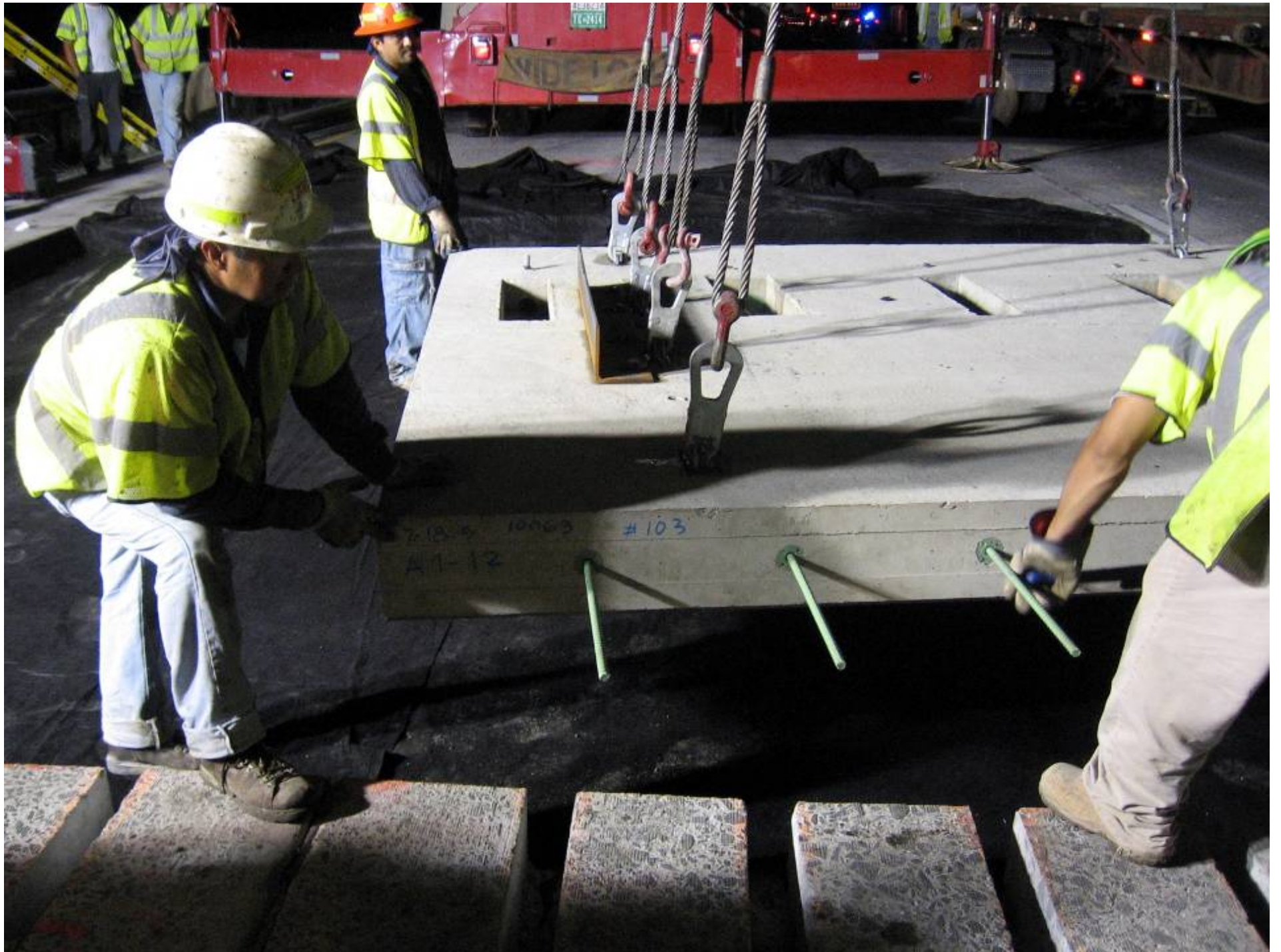




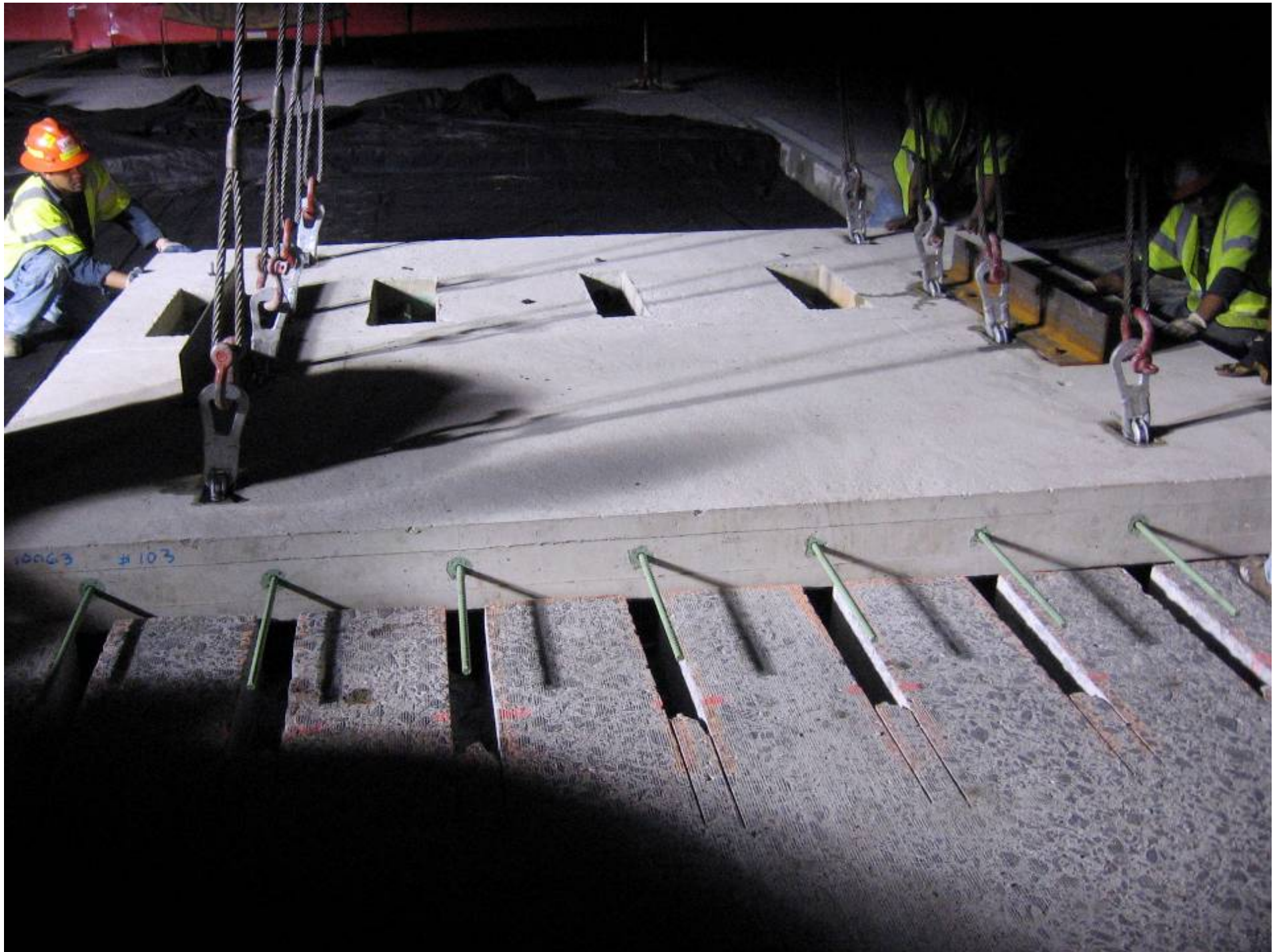




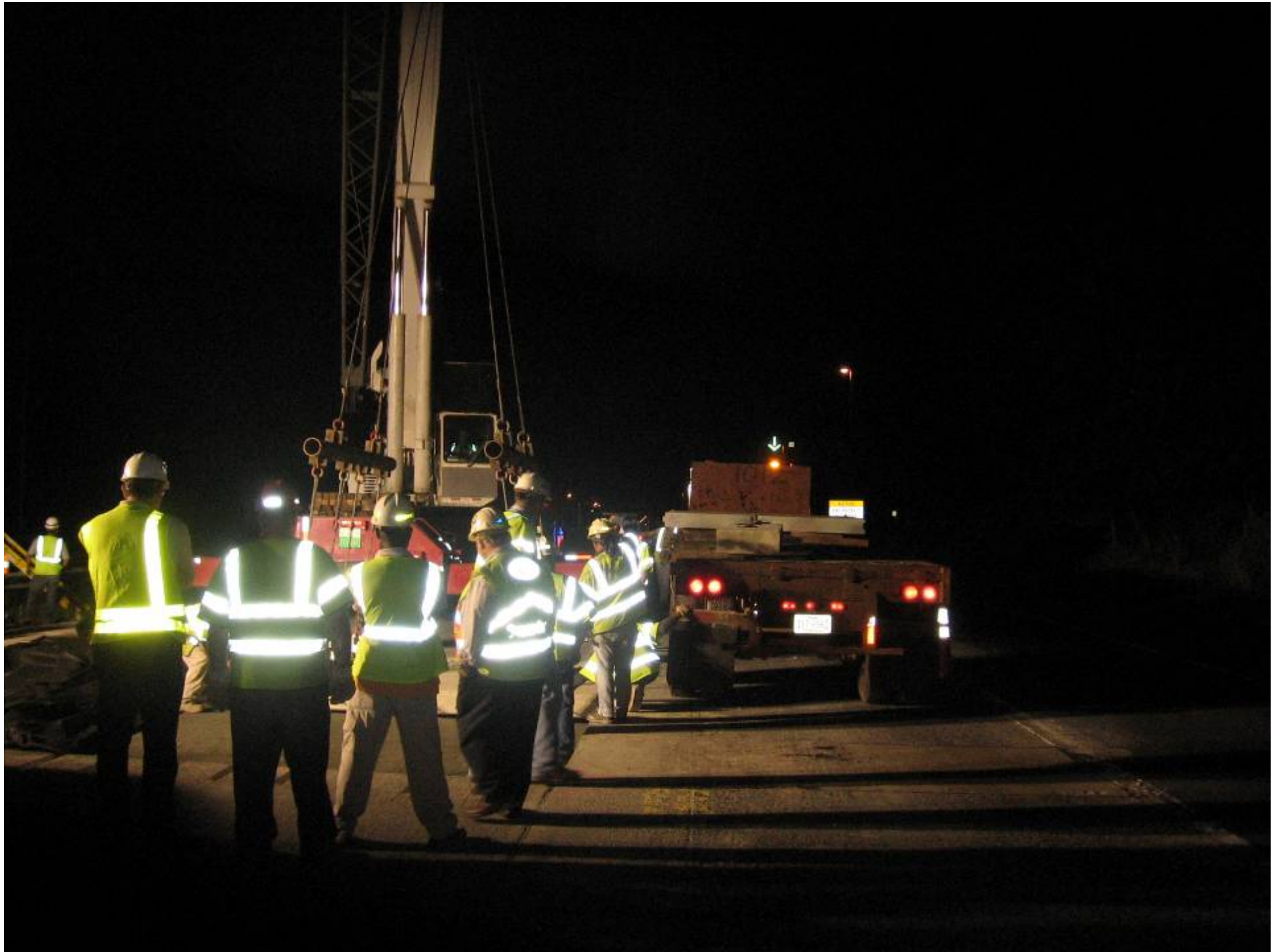






















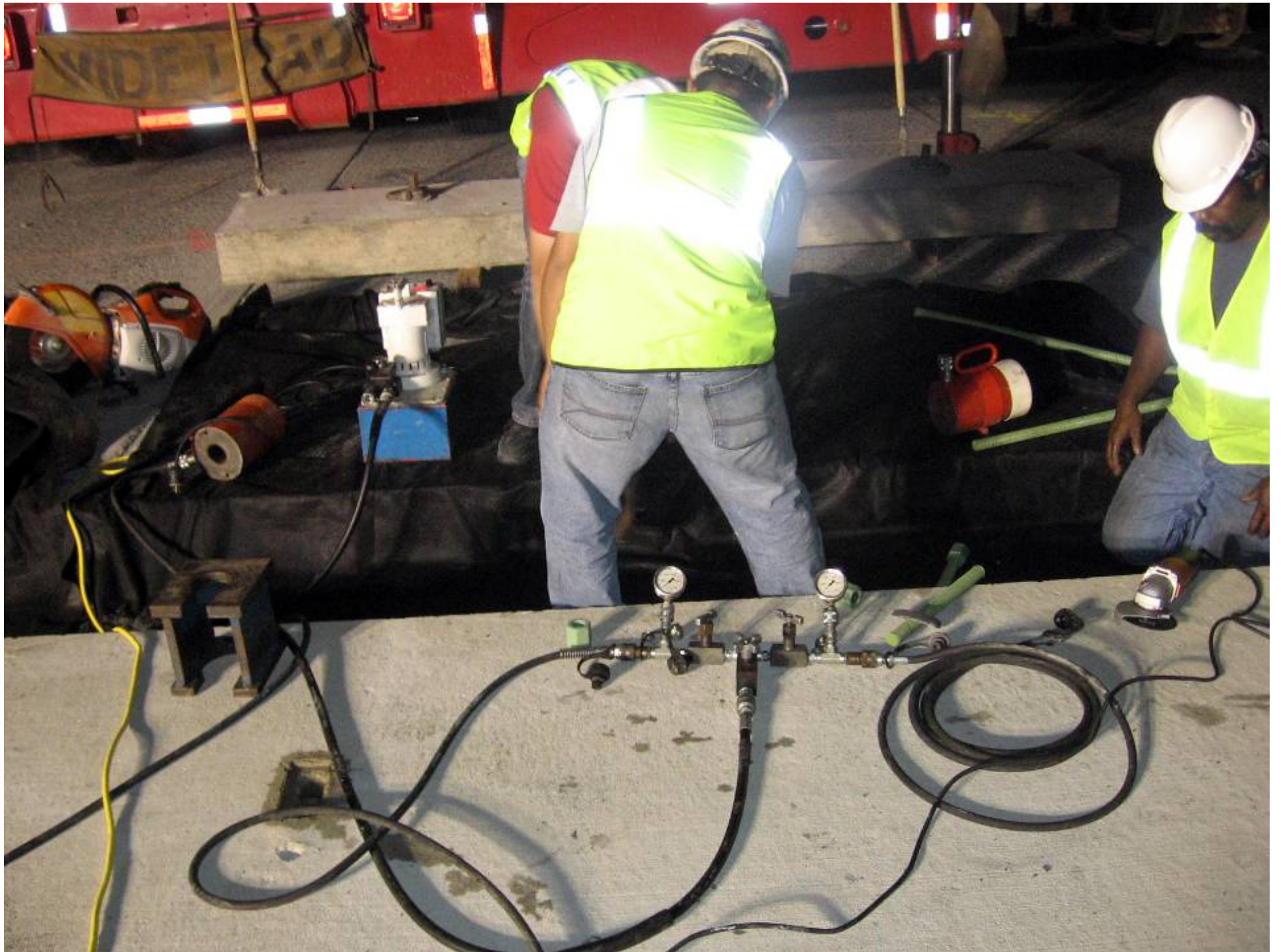




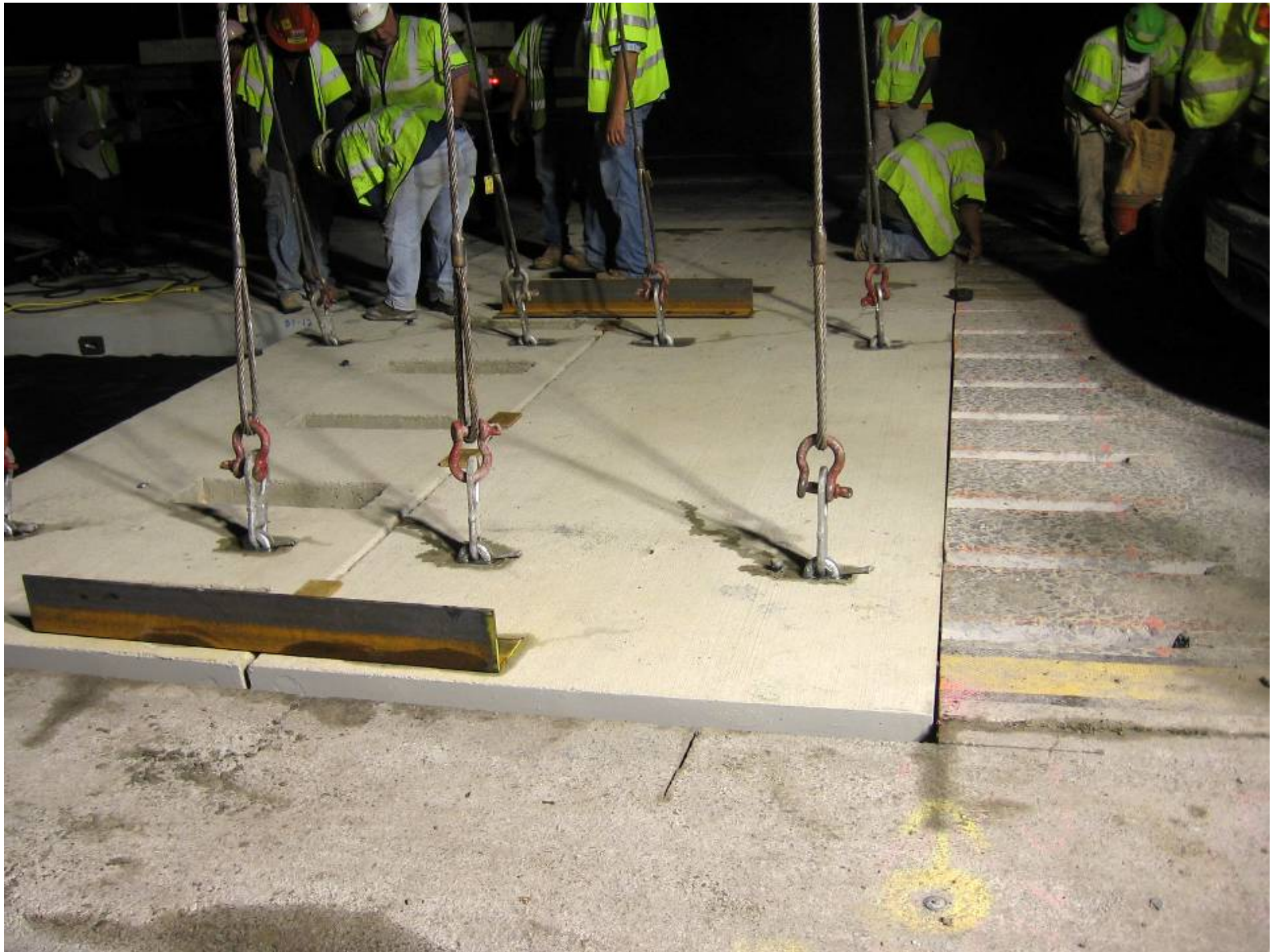
B1-12

A1-12

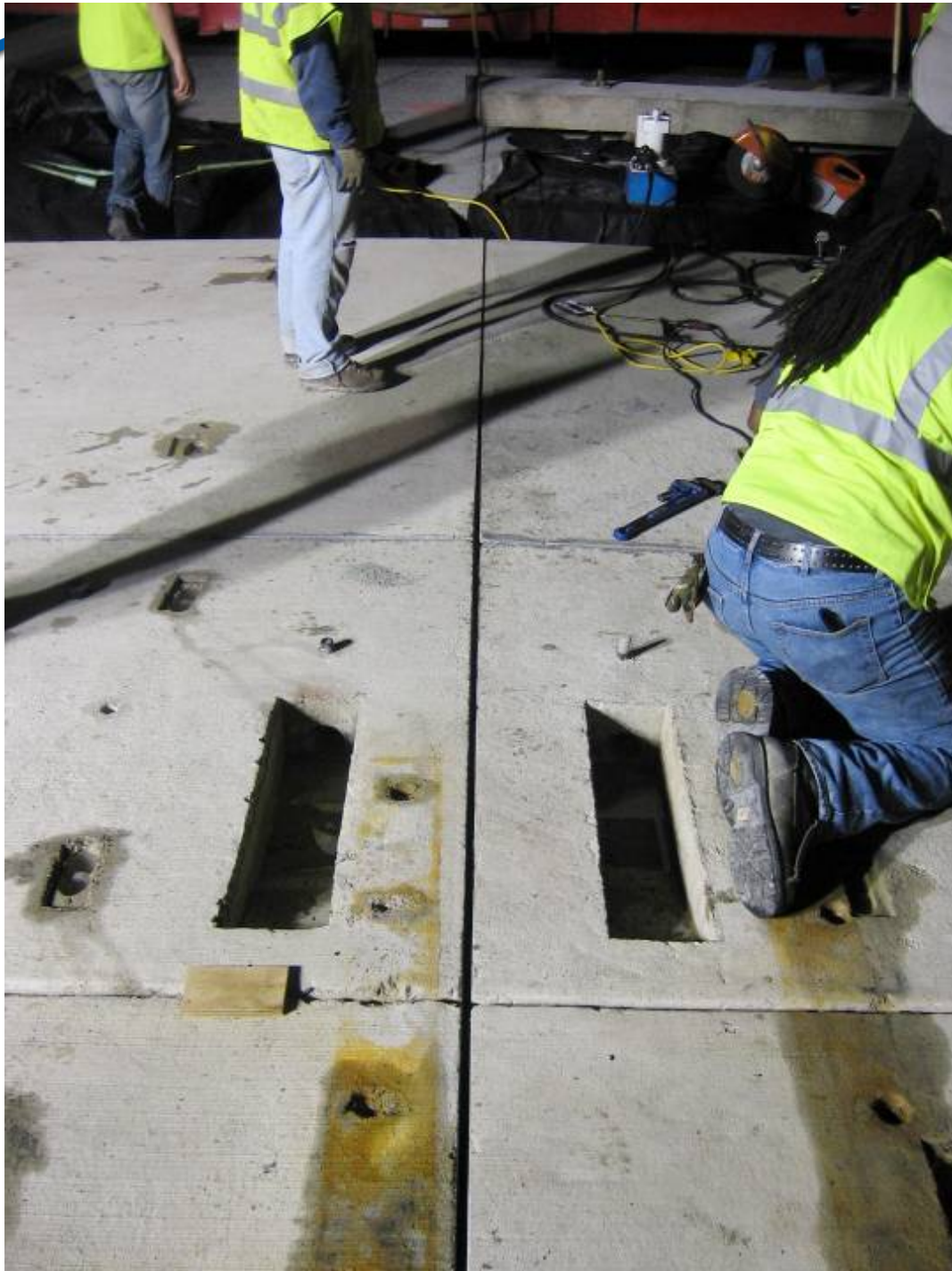
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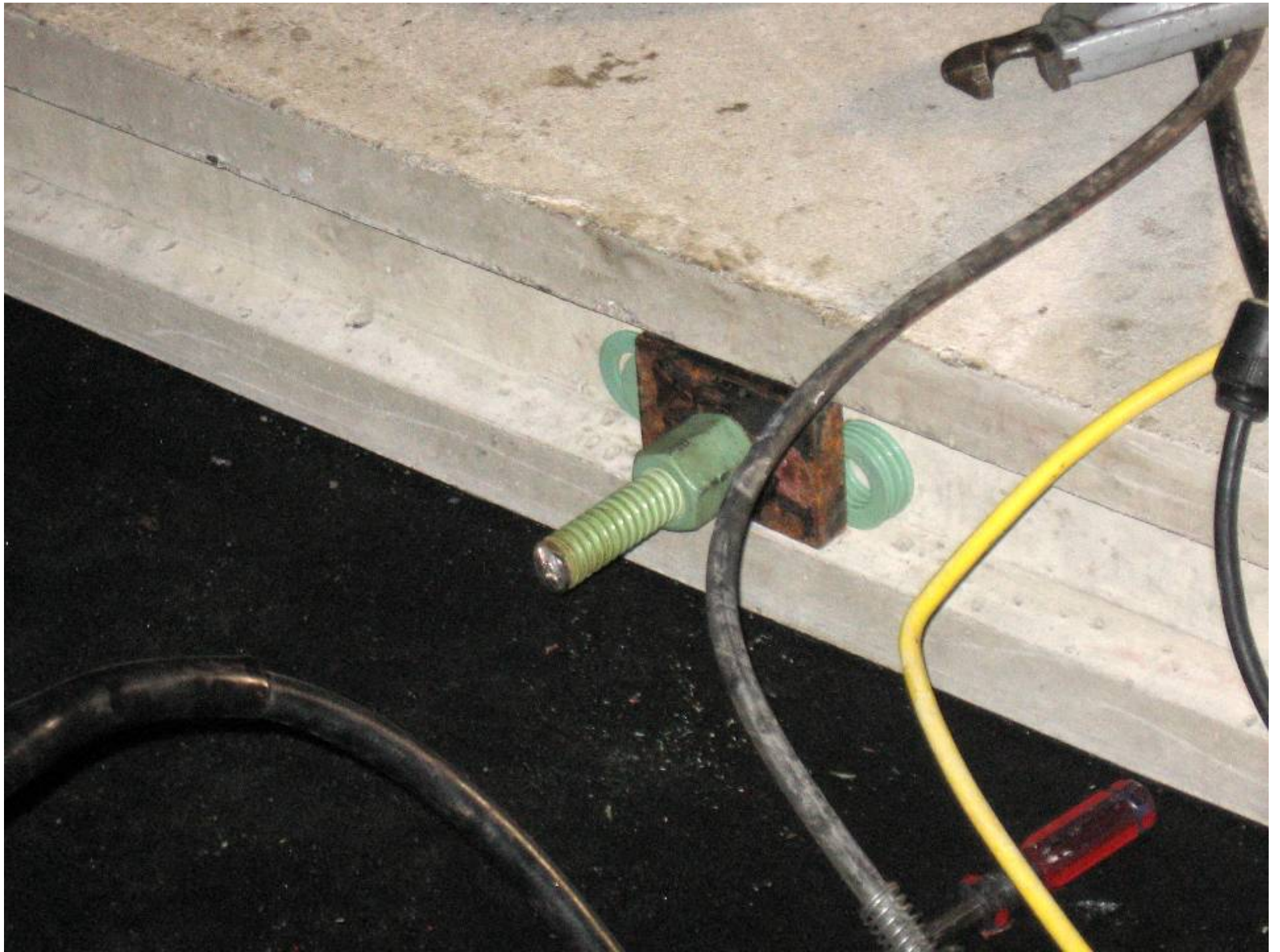






















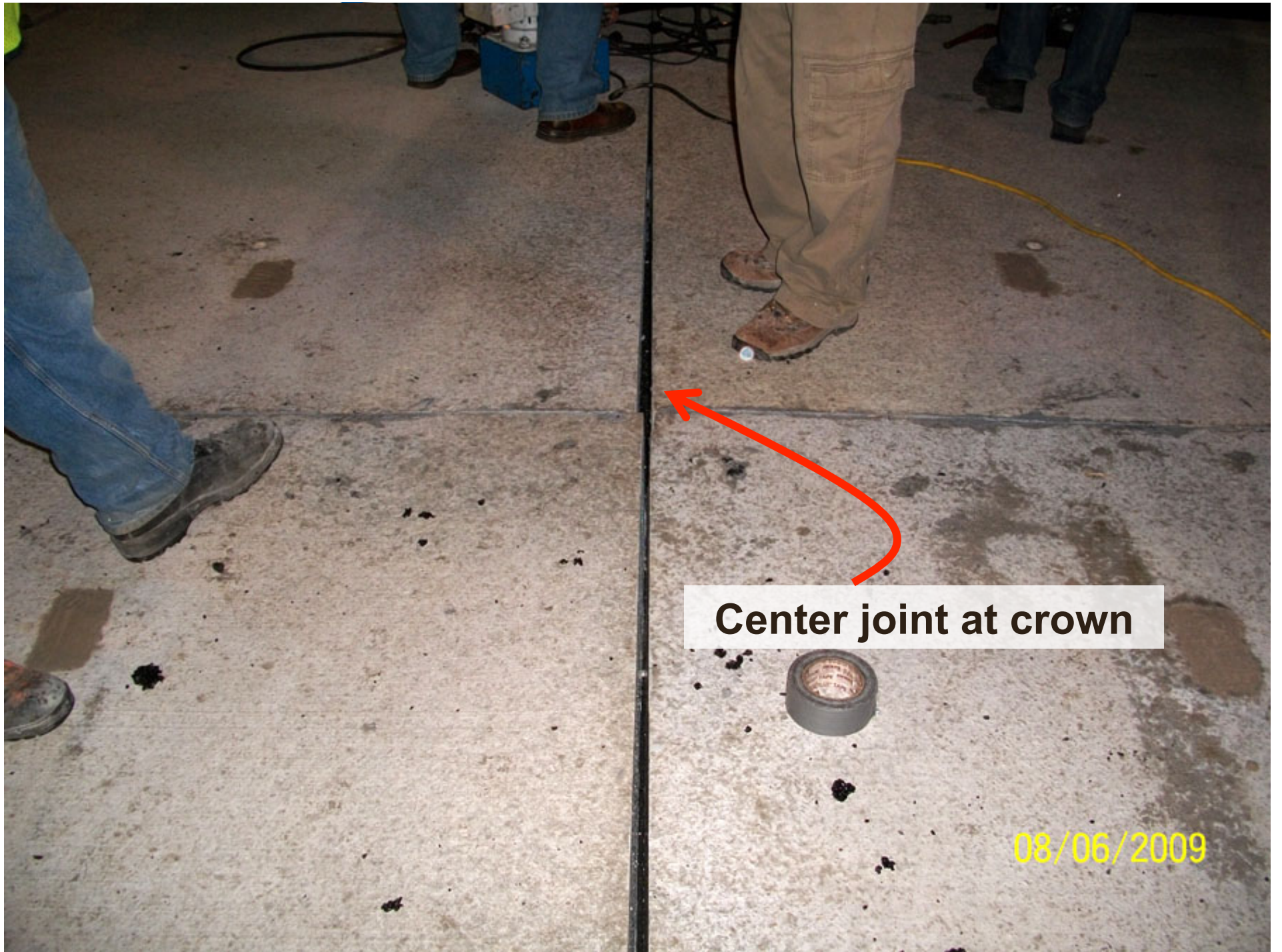






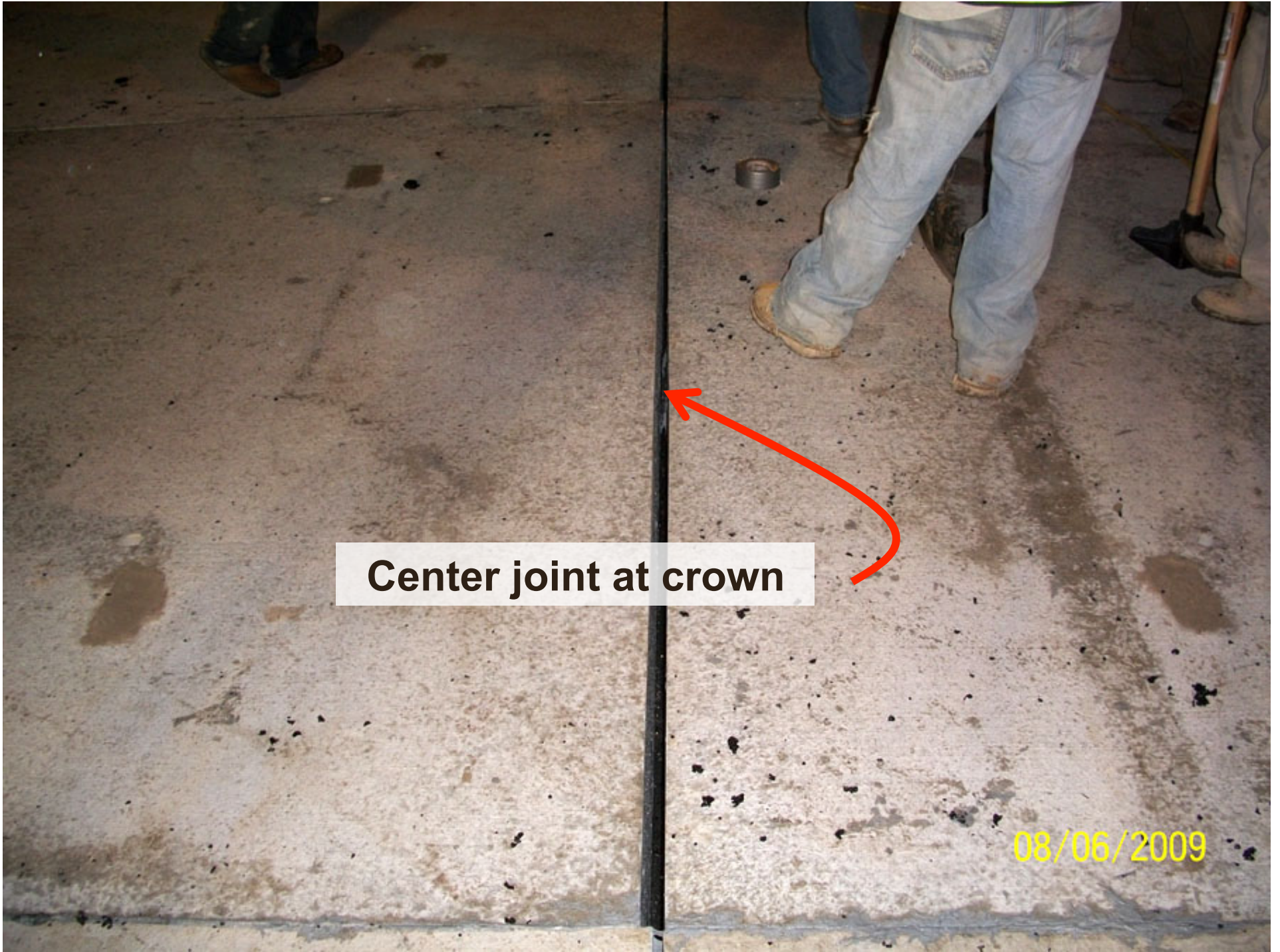


Panel Alignment



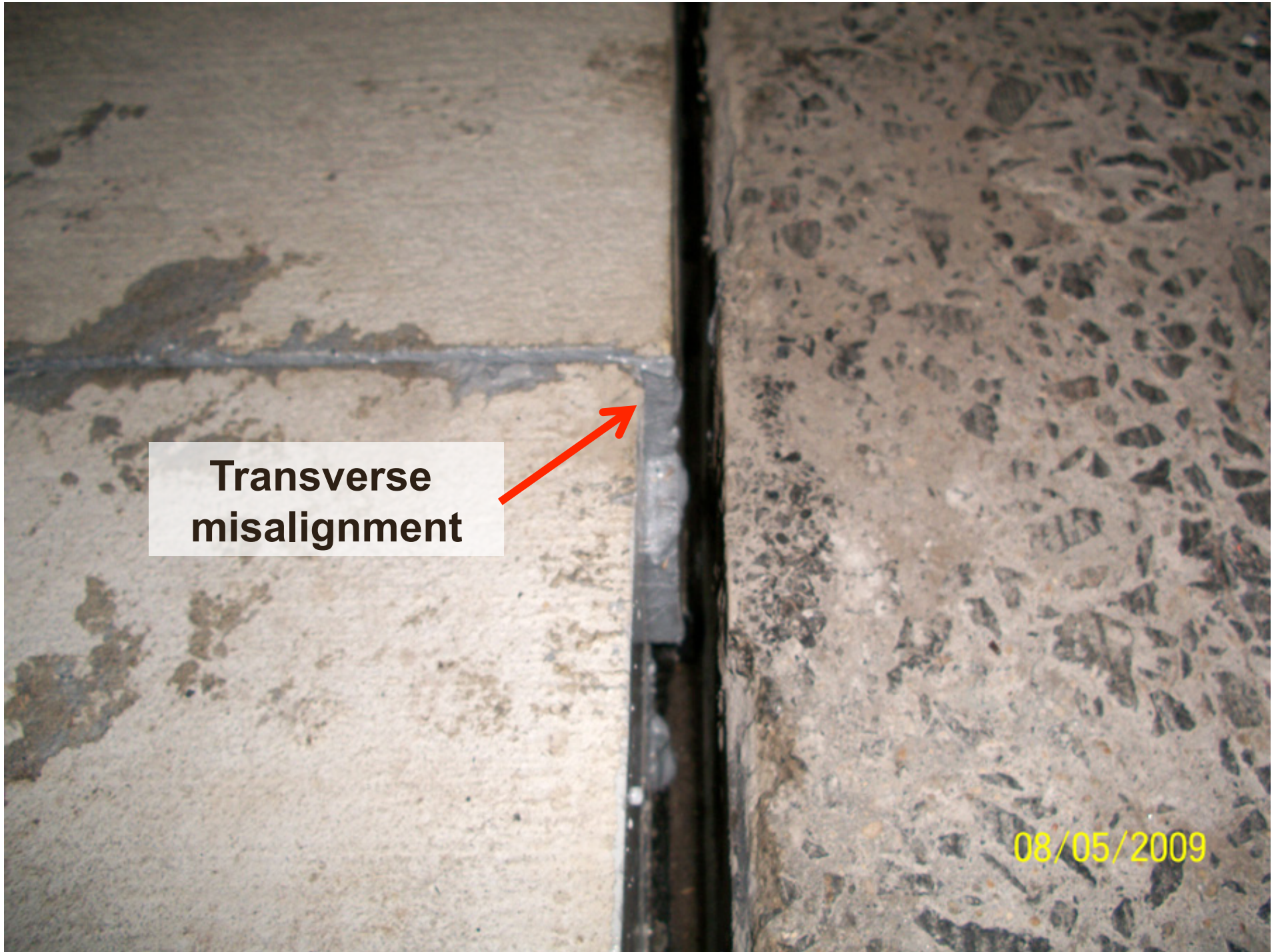
Center joint at crown

08/06/2009



Center joint at crown

08/06/2009



**Transverse
misalignment**

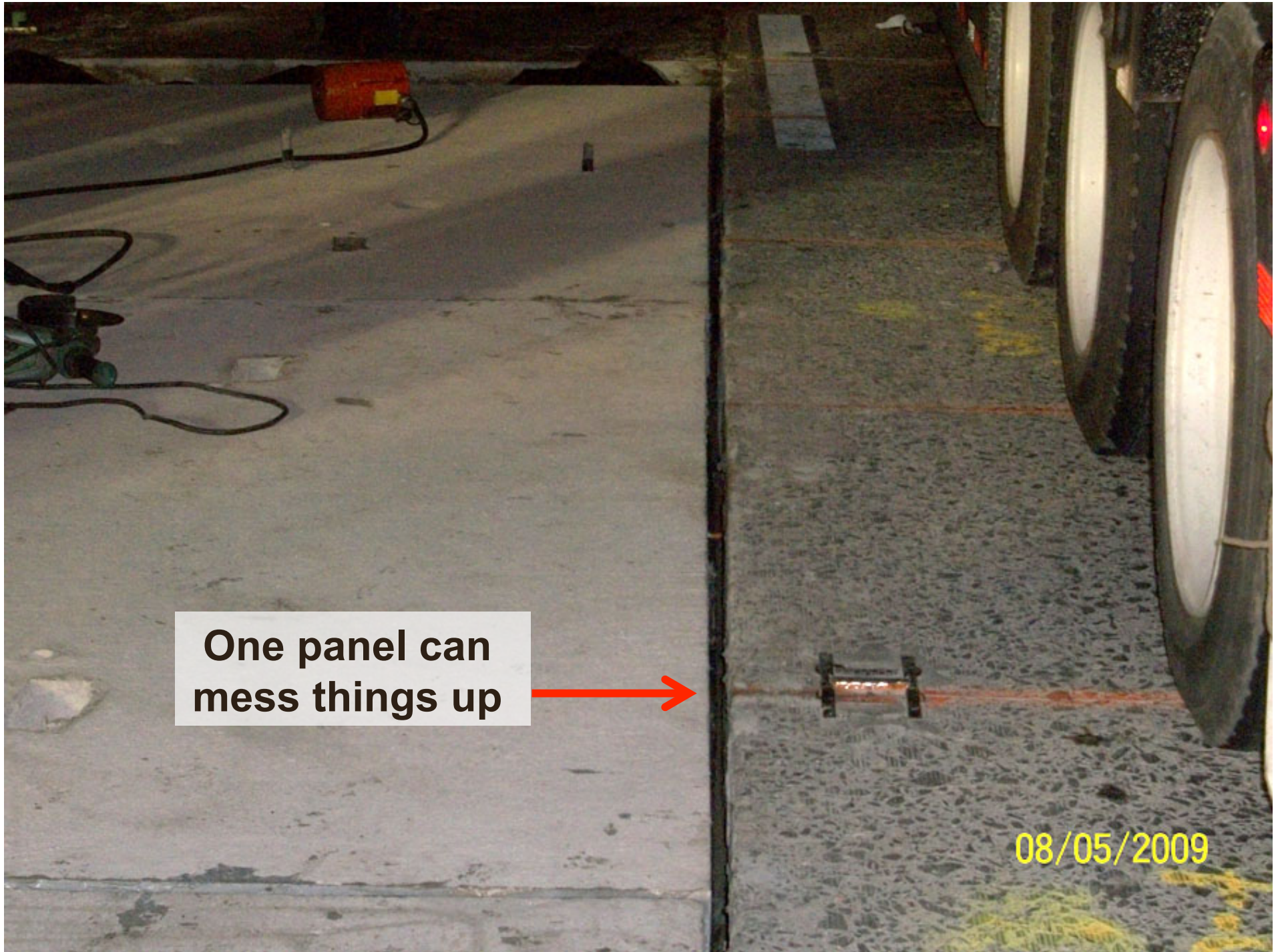
08/05/2009



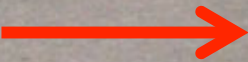
Keyway fit



08/05/2009



**One panel can
mess things up**



08/05/2009



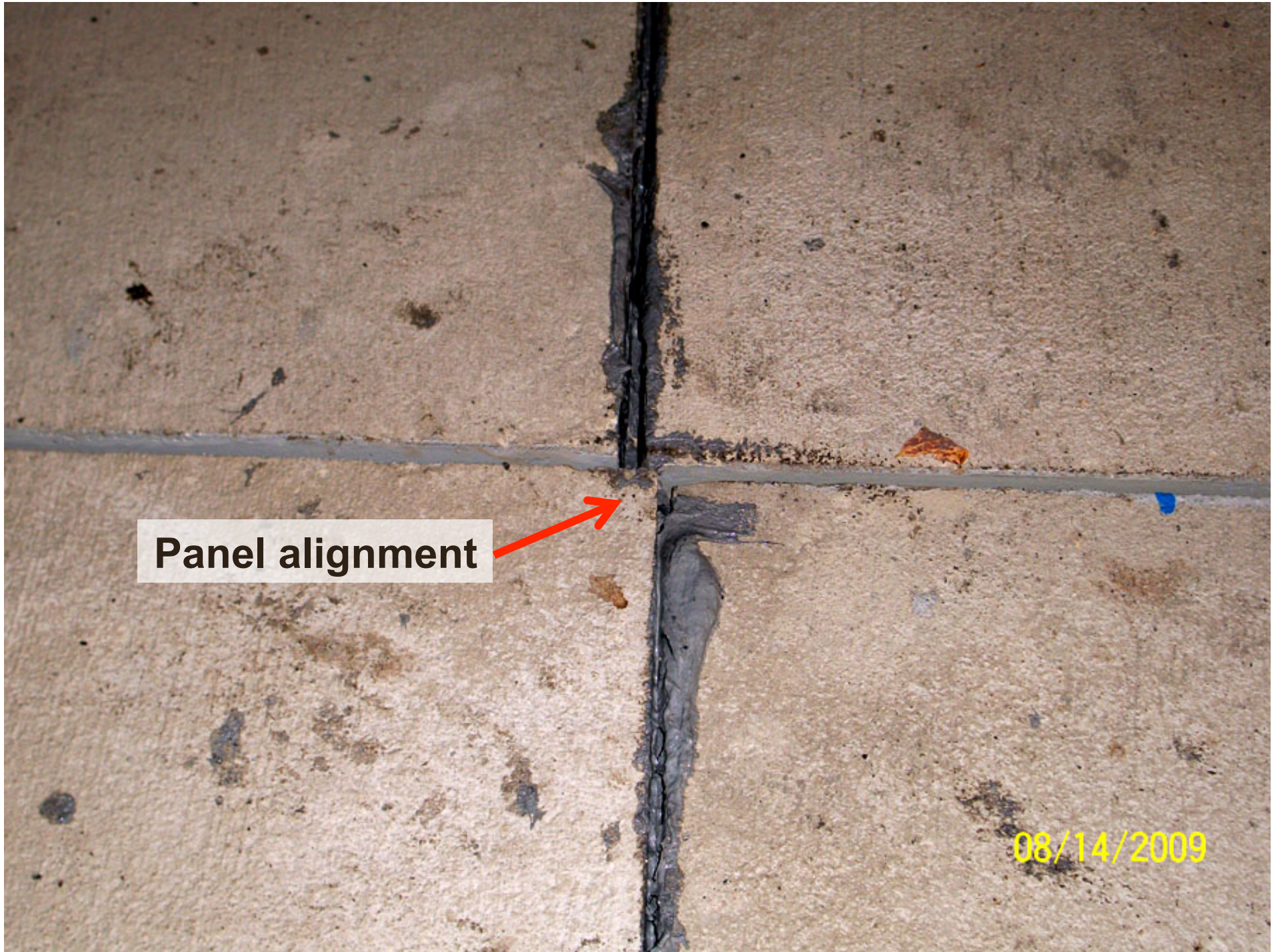
**One panel can
mess it up –
other
direction**

08/09/2009



Joint with existing pavement

08/09/2009



Panel alignment

08/14/2009



Keyway crack



B 1-12

109

7.22.9



Other Installation Issues

Grout leaking at tendons

- Tendon grout being done first per specification
- Foam gaskets being used at duct openings

Transverse connection

- 1x3 transverse duct along bottom of panels
- .5" strand to be placed across lanes and grouted (strand not tensioned)

Grout popping out at lifting holes

Proprietary PCP Systems: Super Slab[®] System

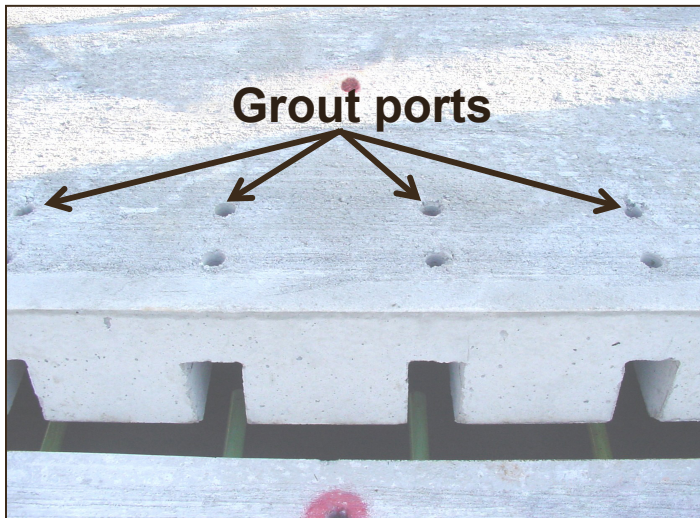
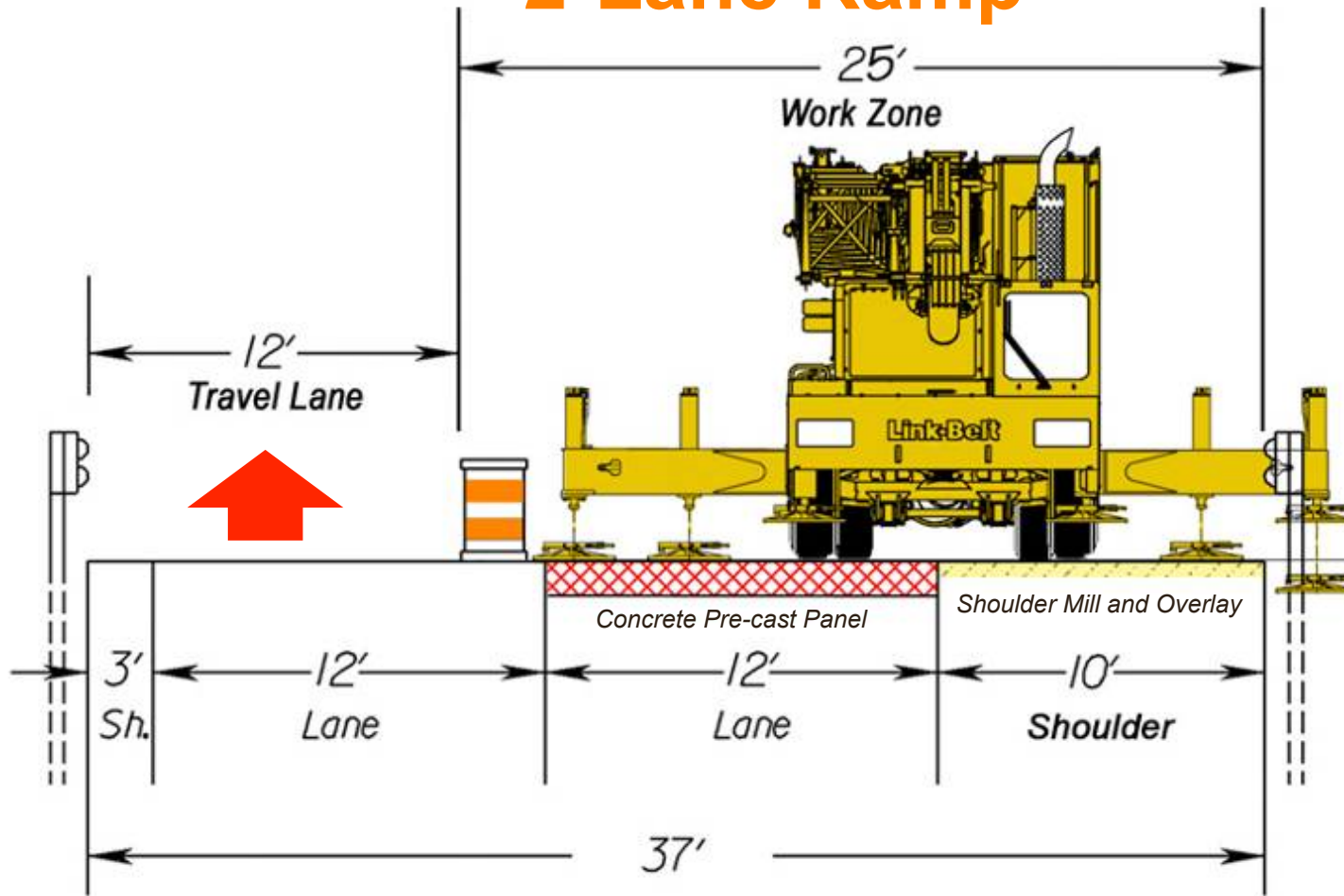


Photo source: The Fort Miller Company

Precast Panels on Right Lane of 2-Lane Ramp



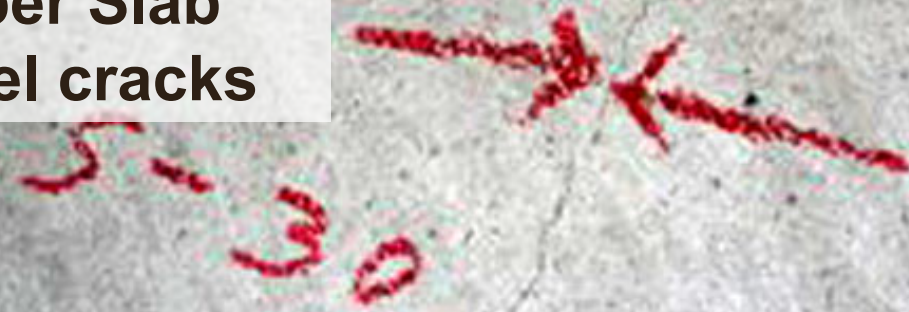


**Longitudinal
joint on ramp**



08/25/2009

**Super Slab
Panel cracks**



09/02/2009



**Super Slab
Panel crack
down side of
panel**

09/02/2009

Project Goals

Comparison of Technologies (CIP, PCP, PPCP)

- **Costs**
- **Construction issues**
- **Availability of systems/qualified contractors**
- **Proprietary issues**
- **Time (design, shop drawings, casting, construction)**
- **MOT requirements**
- **Inspection requirements**
- **Long term performance**

Lessons Learned

Lead Time for Shop Drawings/Submittals/Trial Installations

- Specify *off-site* prior to construction

Staging Area

- Critical for deliveries, etc.

Trial Installations

- Specify *off-site* prior to construction
- Trial batches for grouts (hardware and underslab)
- Falling weight deflectometer testing; cores

Closure Pour

- Necessary for PPCP

Existing Conditions are Variable!

- Variability of existing pavements (cast-in-place)
- Tolerances for precasting
- Difficult to predict; especially at tie-ins

Concerns/Industry Issues for PPCP

Openness of system and resultant grout leaks

- Need better seal for tendon ducts.

Transverse tie-bars

- Need efficient means of connecting panels in transverse direction or proof that not needed.

Weak points in pavement surface

- Potential future maintenance issues in areas of anchor pockets, tie-in slots, lifting anchor holes, or spalls during construction.

Casting accuracy required

- Casting is key! Can tolerances be improved without significantly increasing cost?

Quality of contractor needed to achieve good product

Facts & Figures

Prestressed Panels

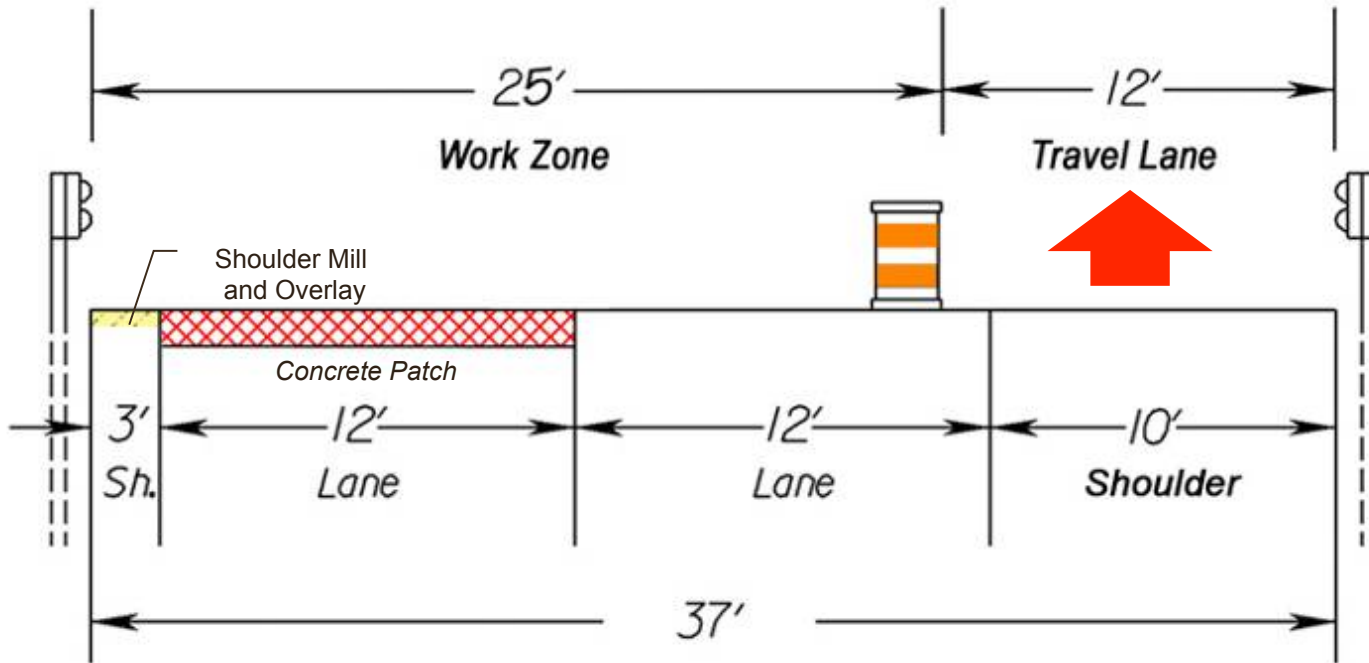
- **Overall work window of 8hrs on I-66**
 - 2hrs for traffic (1hr on either end)
 - Total of a 6hr work window
- **Actual Peak Production in a 6hr window**
 - 12ea 10' x 12' Panels
 - Equals 120 Lane Feet or 160 SY of surface area

Facts & Figures (cont.)

Precast Panels

- **Overall work window of 7hrs on Off Ramp**
 - 1hr for traffic (1/2hr on either end)
 - Total of a 6hr work window
- **Actual Peak Production in a 6hr window**
 - 12ea 16' x 12' Panels
 - Equals 192 Lane Feet or 256 SY of surface area

Cast-in-Place on Left Lane of 2-Lane Ramp



Facts & Figures (cont.)

Cast In Place

- **Overall work window of 8hrs on Off Ramp**
 - 2hr for traffic (1hr on either end)
 - Total of a 6hr work window
- **Actual Peak Production in a 6hr window**
 - Allow 3-4 hrs for Cure Time
 - 40 Lane Feet or 53 SY of surface area

Cost Per System

Type	Bid Price
CIP (9")	\$225/sy
PCP (9")	\$350/sy
PPCP (8")	\$410/sy



Questions ?