

Full- and Partial-Depth Repair of Continuously Reinforced Concrete Pavement

TxDOT Implementation Project 5-9045-5-P1

Moon Won
Texas Tech University

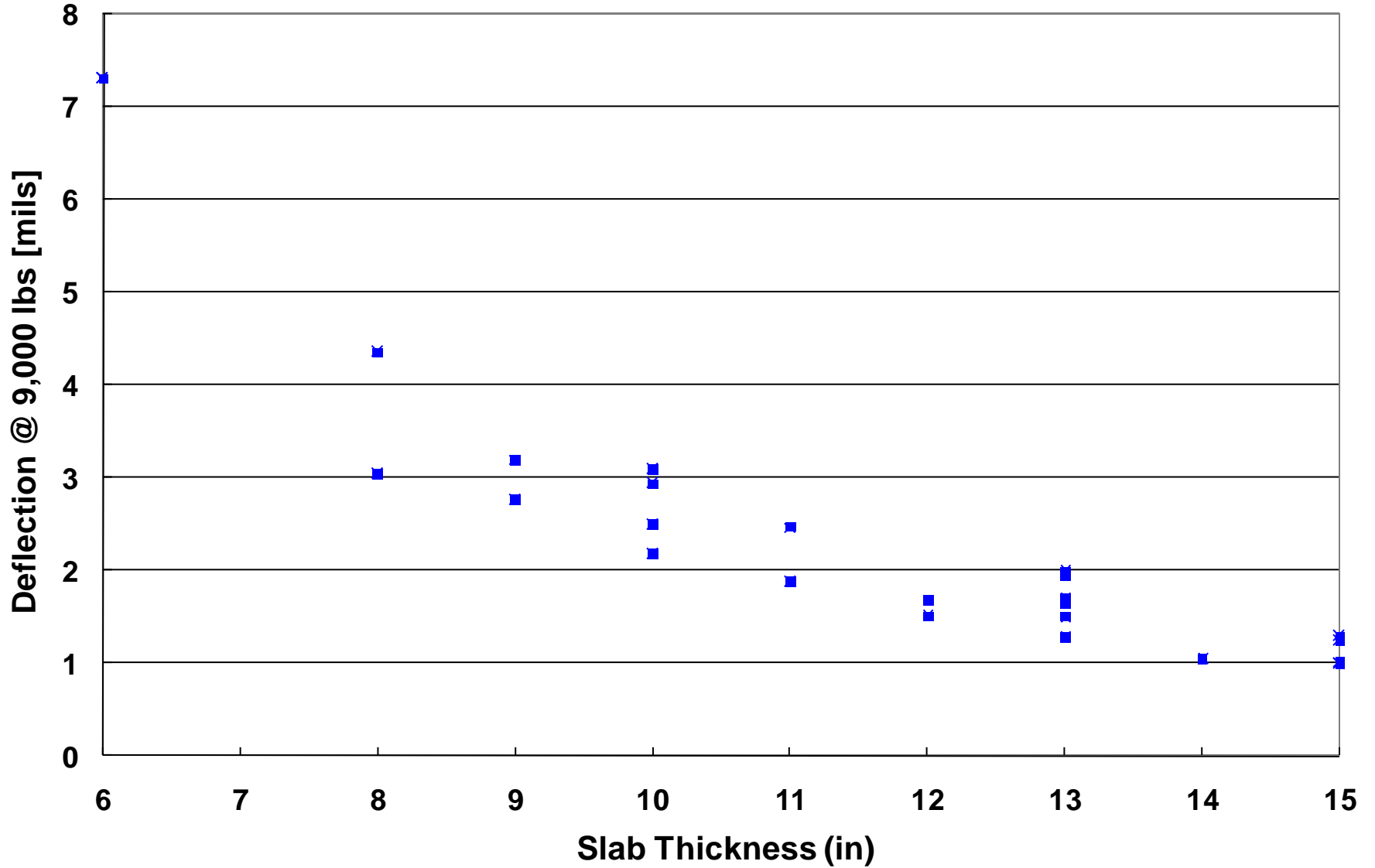
Outline

- CRCP Behavior and Performance
- Full-Depth Repair (FDR)
- Partial-Depth Repair (PDR)

CRCP Behavior and Performance

- Deflections and, to a lesser degree, load transfer efficiency (LTE) at transverse cracks are the key to CRCP performance.

Slab Thickness vs Deflections



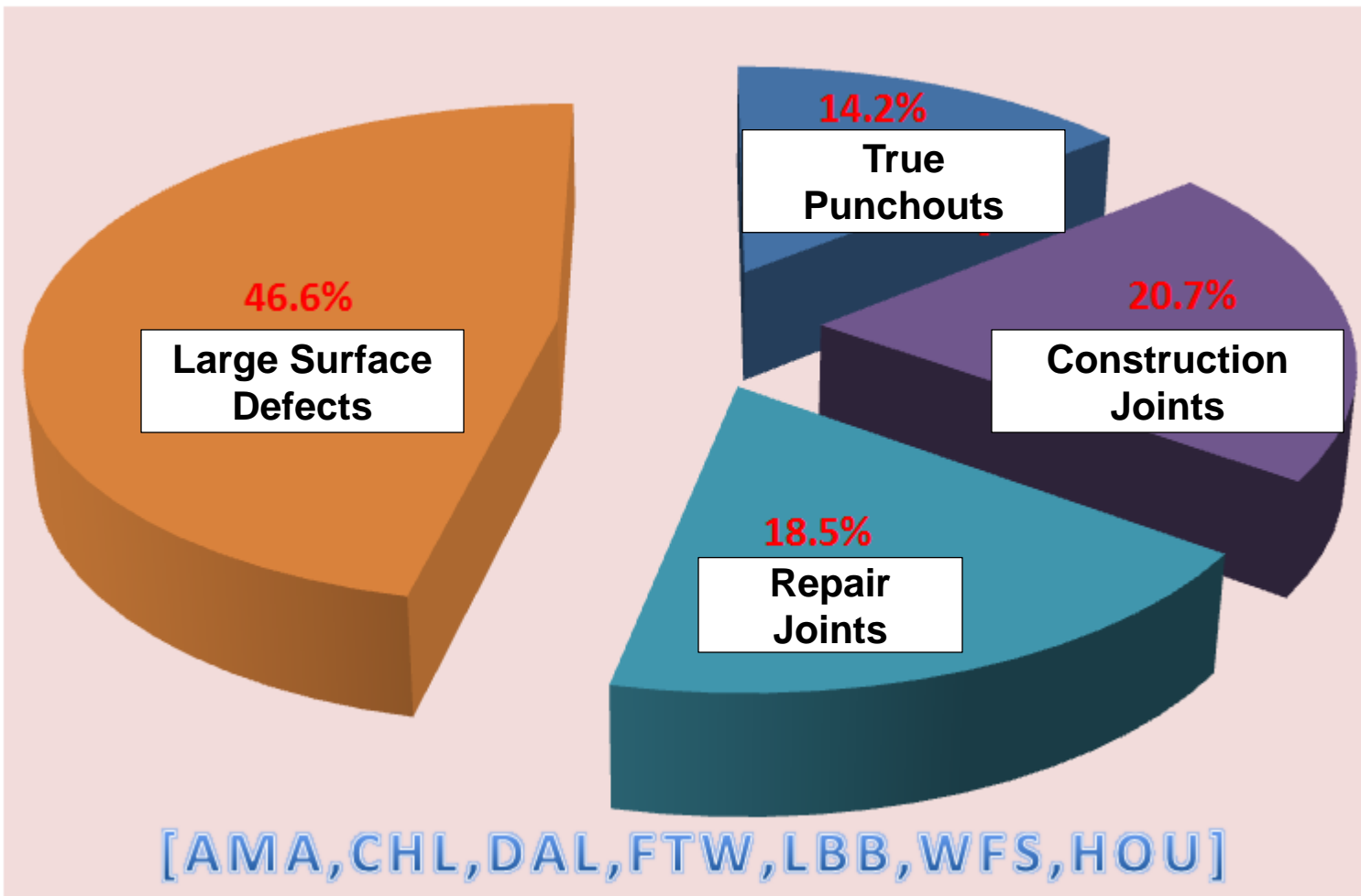
CRCP Behavior and Performance

- Deflections and, to a lesser degree, load transfer efficiency (LTE) at transverse cracks are the key to CRCP performance.
- Control of deflections by steel reinforcement, adequate slab support and slab thickness

Overall Performance of CRCP in Texas

- Punchout: 1 per 8.8 lane miles
- Concrete Patch: 1 per 4.6 lane miles
- Asphalt Patch: 1 per 88 lane miles





FULL-DEPTH REPAIR OF CRCP



02.11.2012 08:35

Full-Depth Repair of CRCP

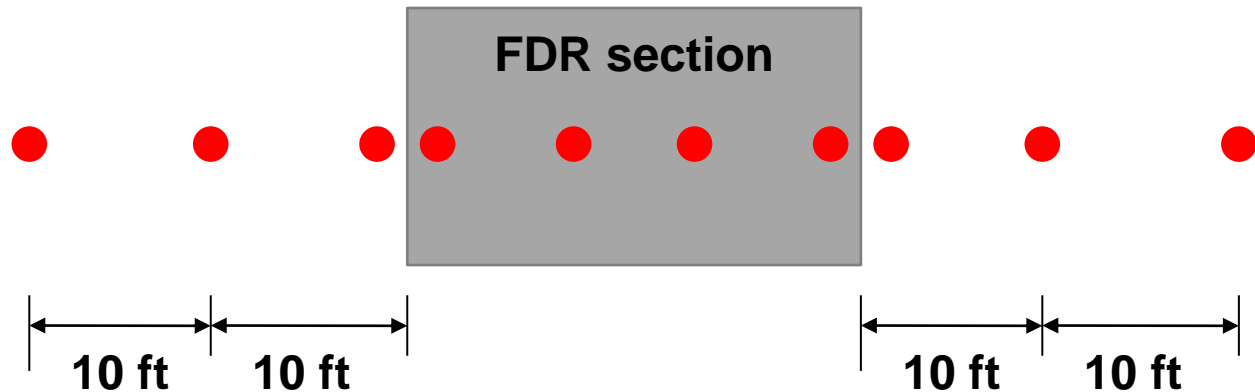
- Conduct only when needed. (i.e., when CRCP distress extends through the slab depth)
- If distresses are limited to the top half of the slab, use partial-depth repair.

Key to Successful Full-Depth CRCP Repairs

- Lower deflections at transverse repair joints
- Sound base support along the perimeter of repair areas

Evaluation of the Performance of FDRs

Deflection Testing using FWD





DEC 8 2001

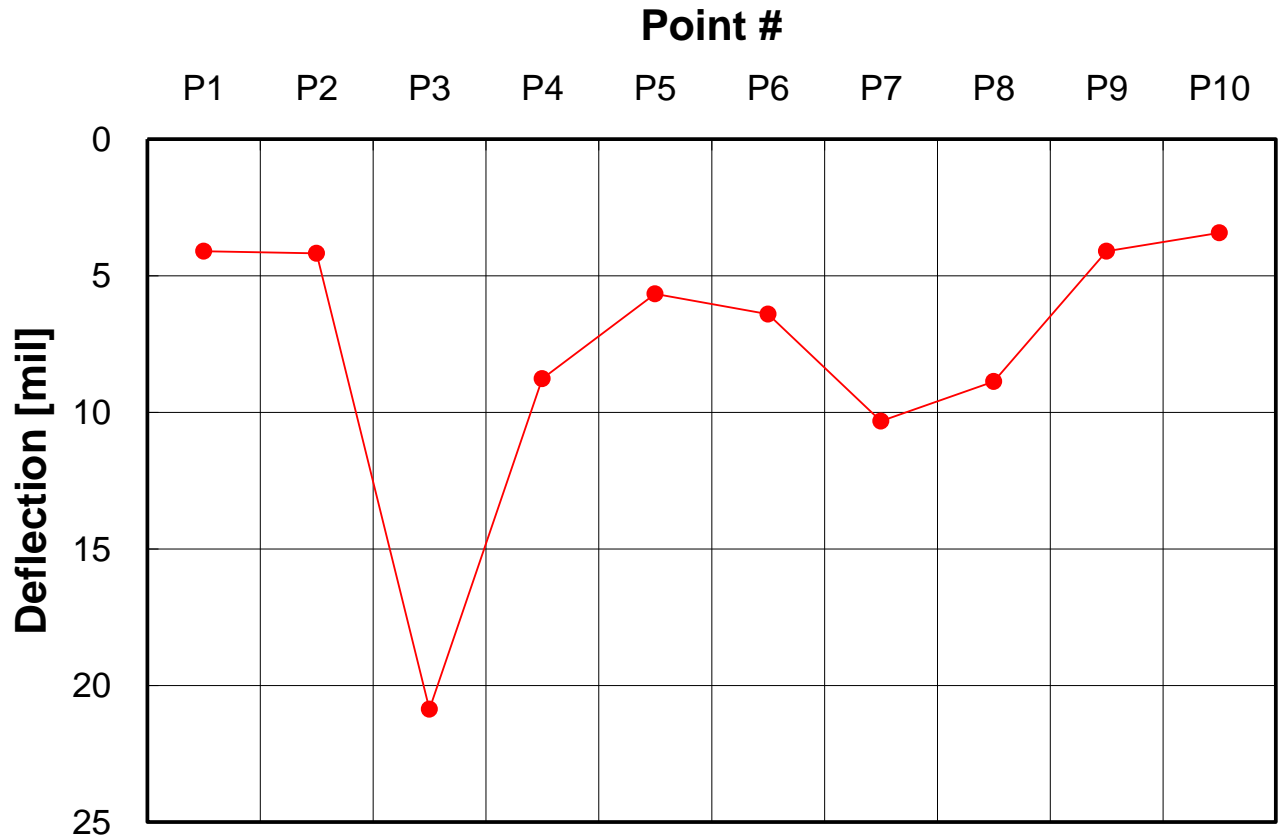
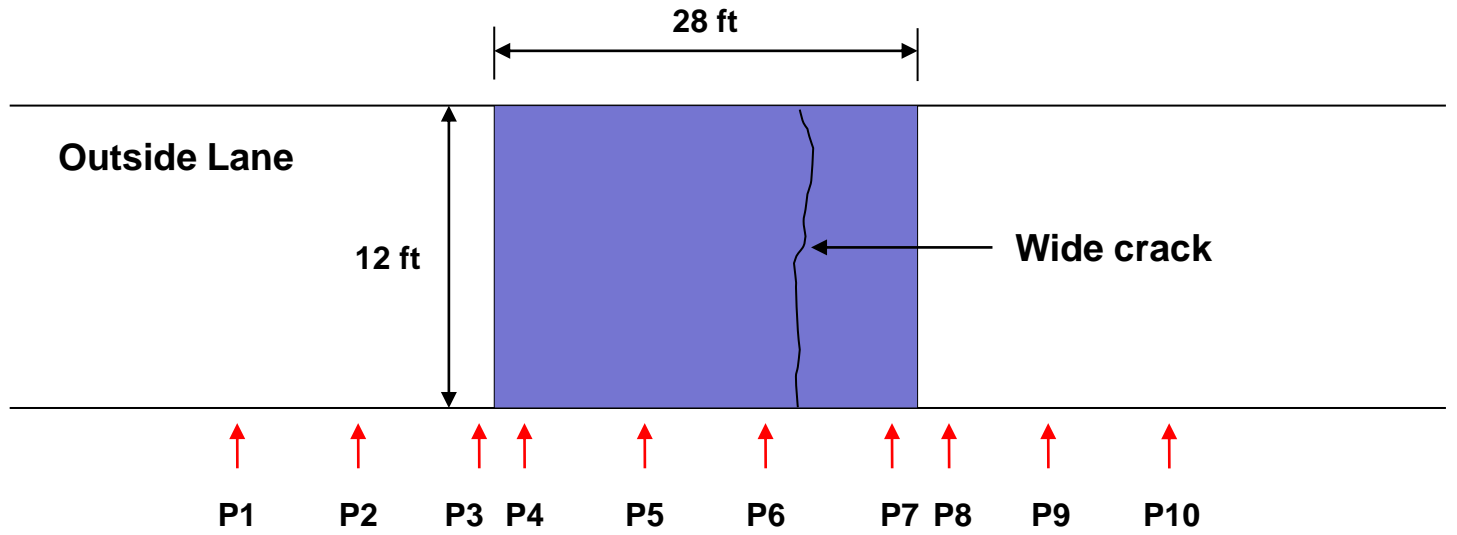


DEC 8 2001

FDR-N-4



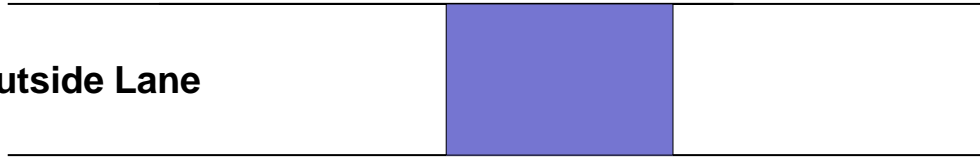
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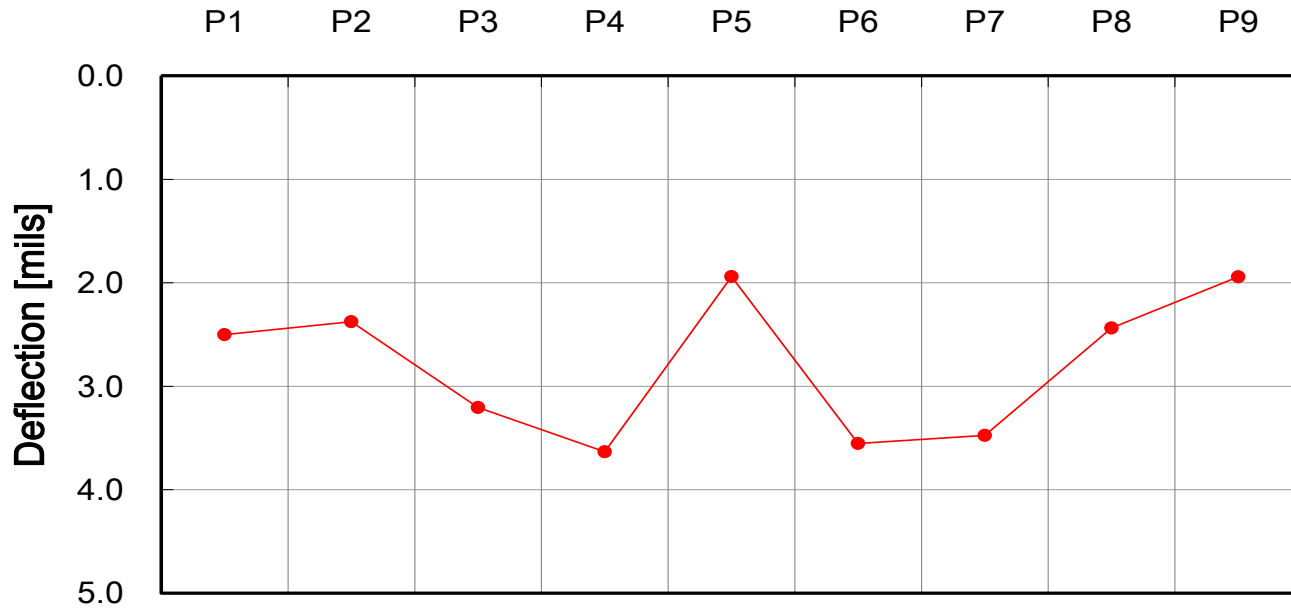
Inside Lane

Outside Lane



P1 P2 P3 P4 P5 P6 P7 P8 P9

Ponit #



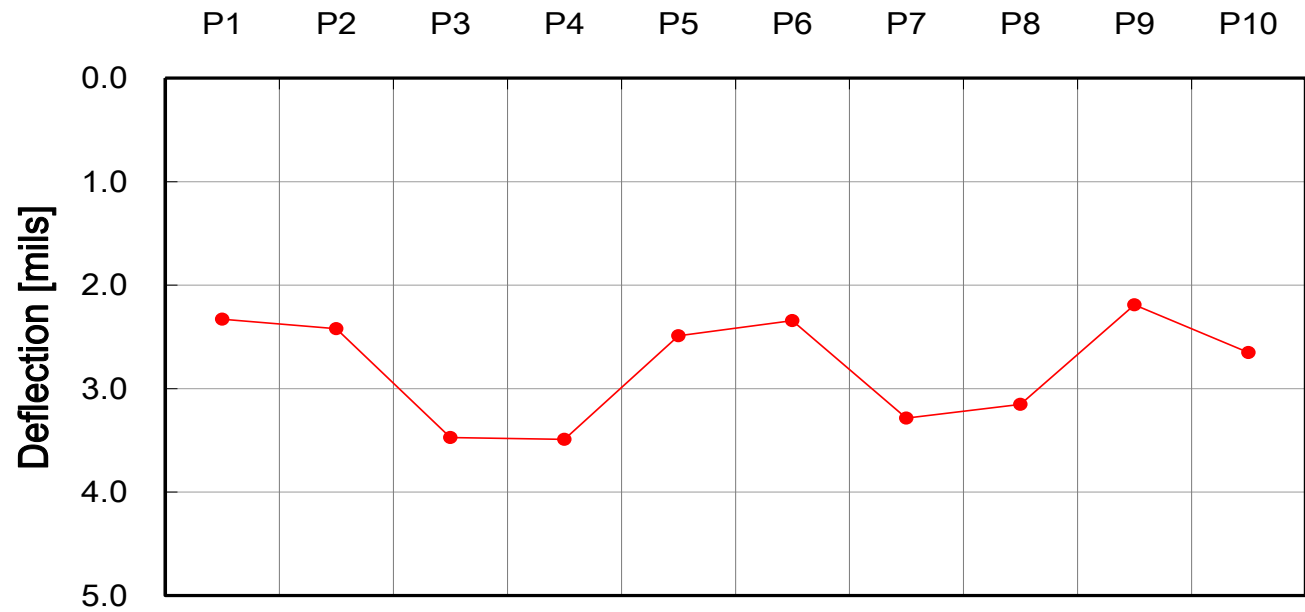


Inside Lane

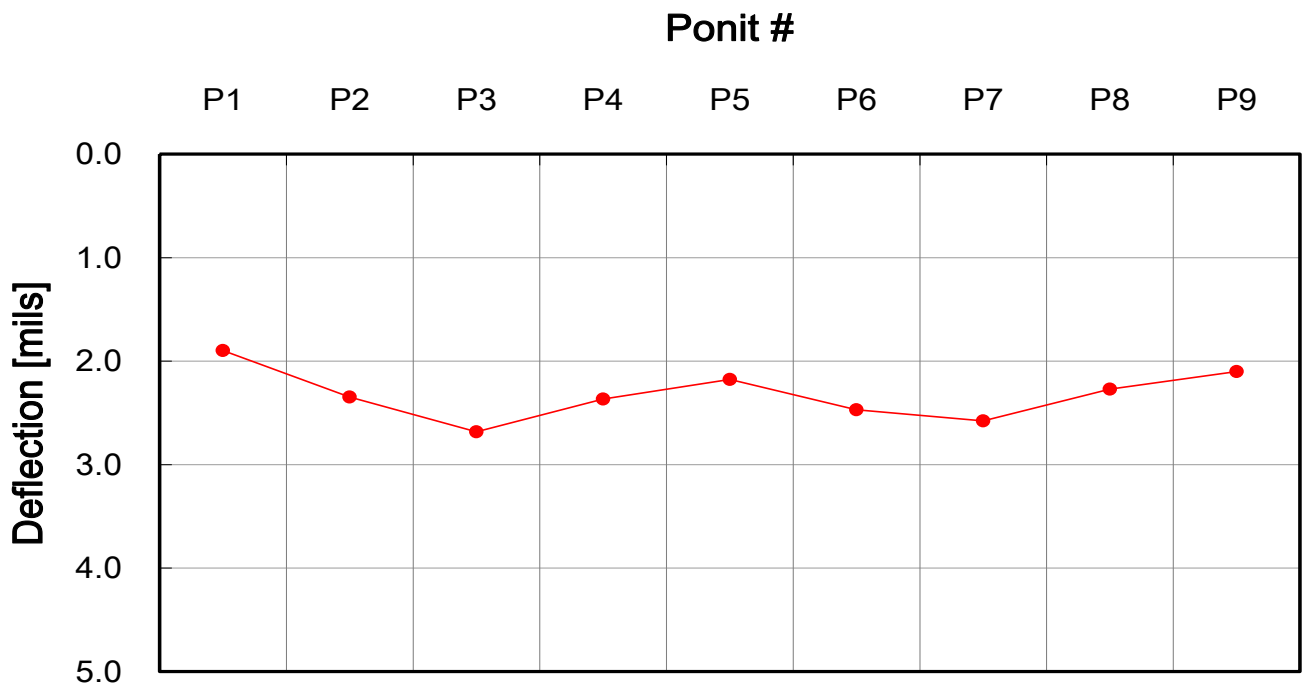
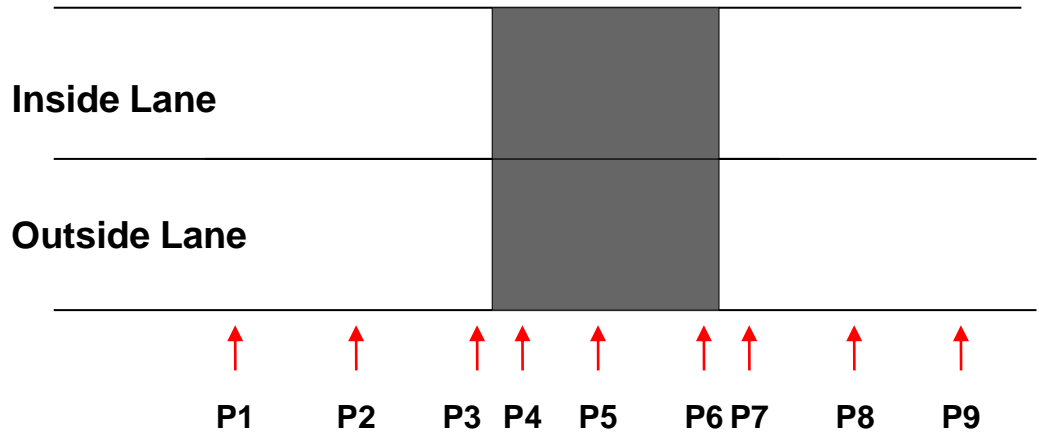
Outside Lane



Ponit #







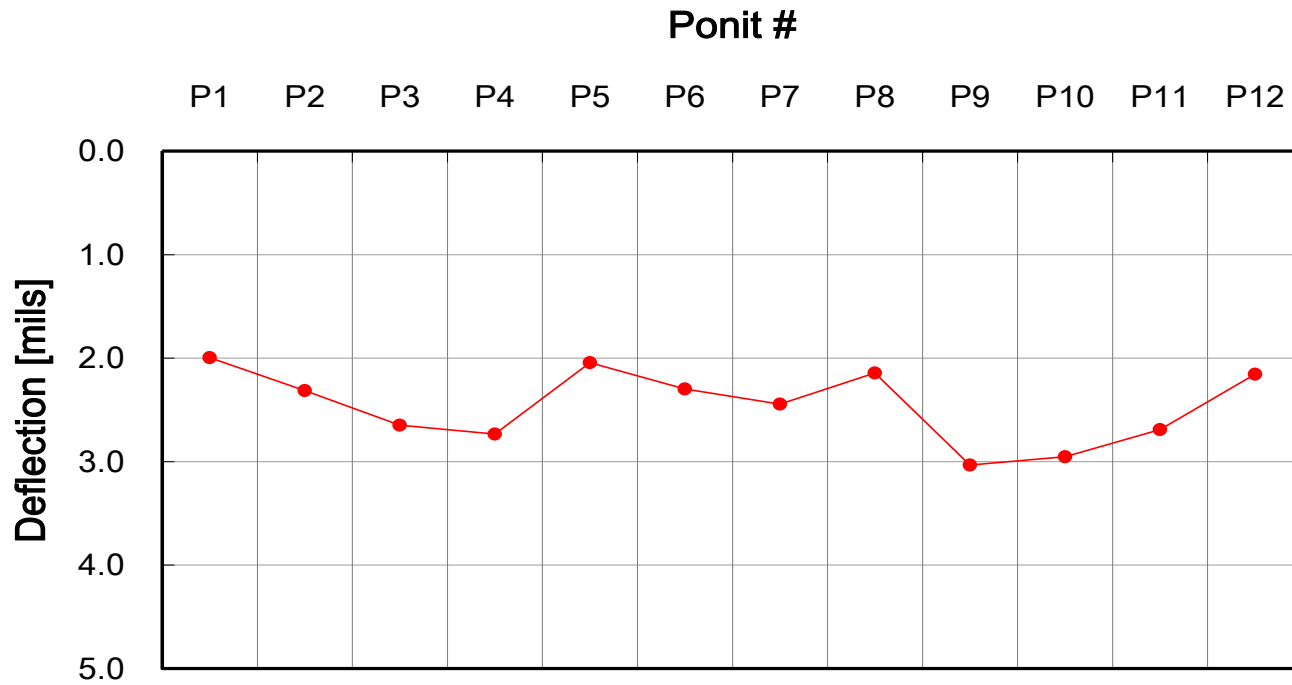


Welded

Epoxy

Inside Lane

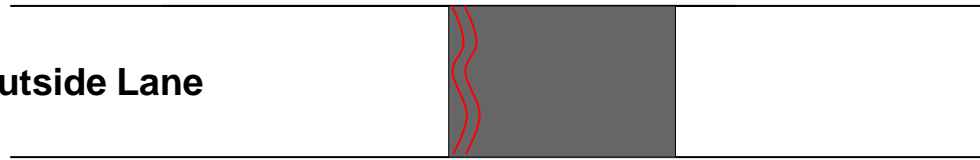
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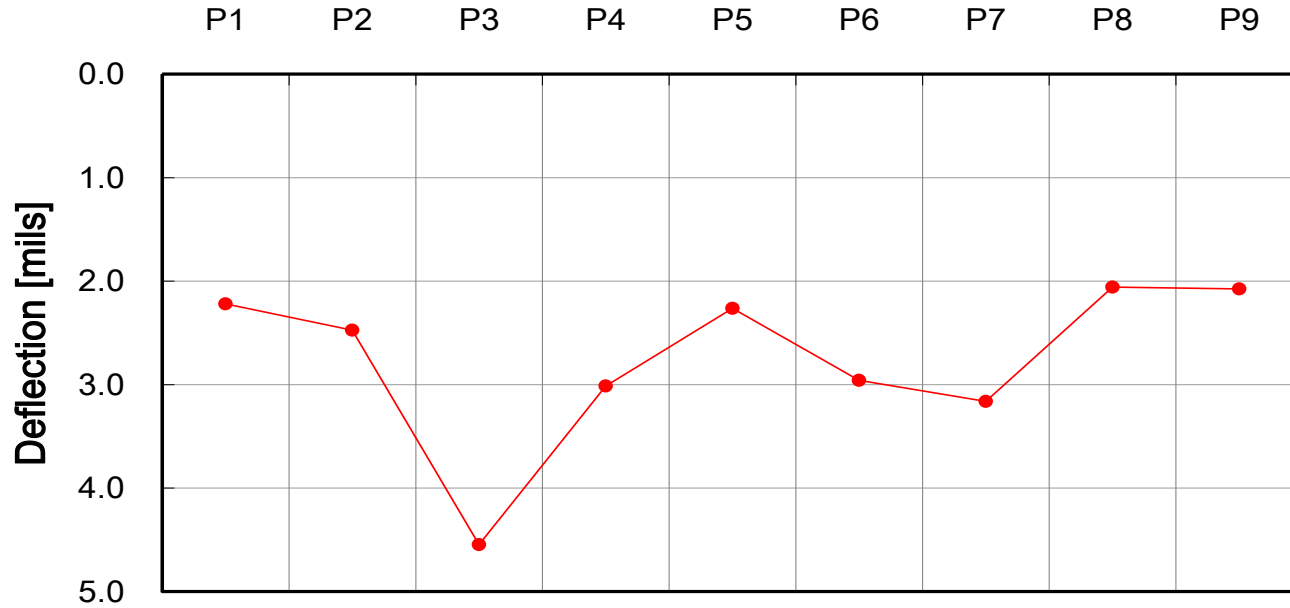
Inside Lane

Outside Lane

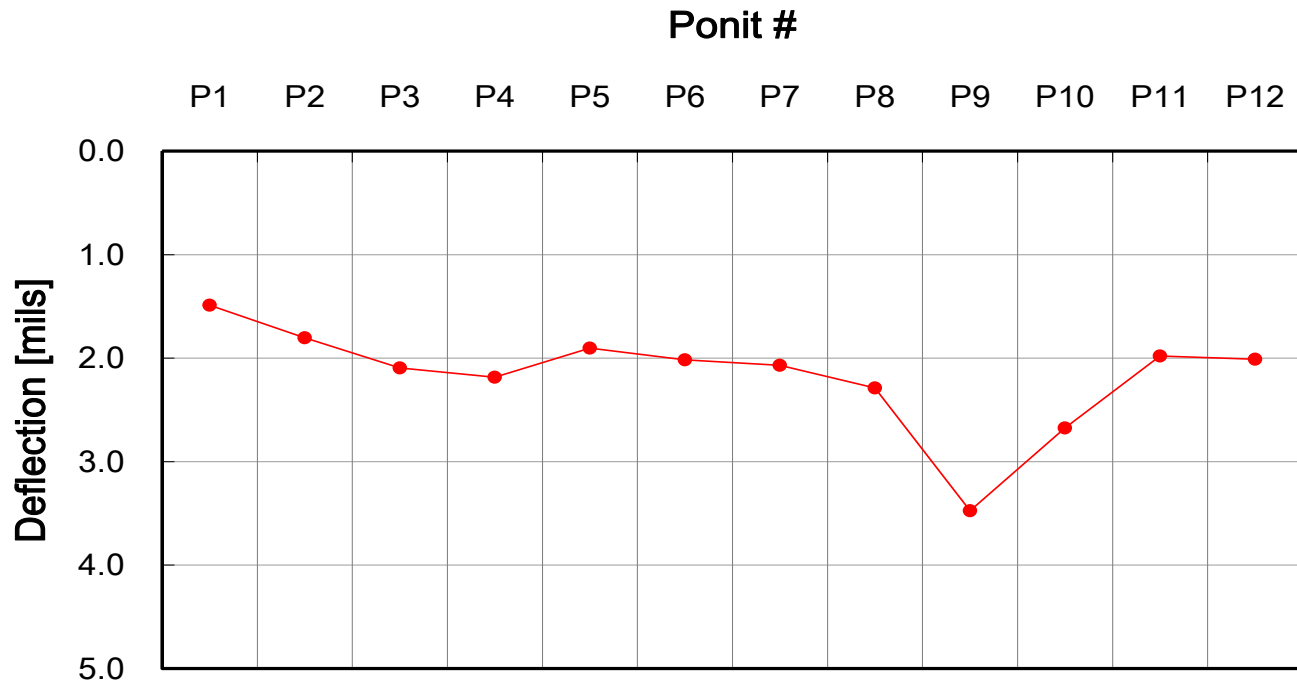
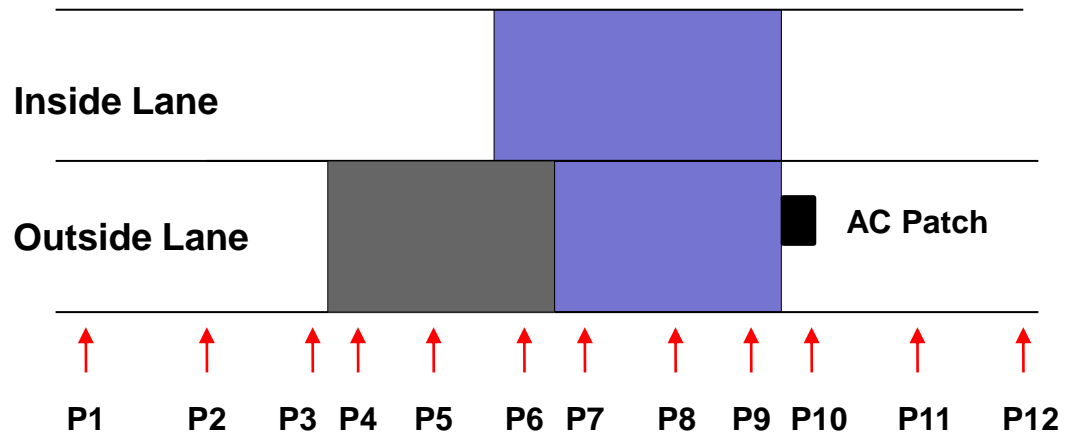


P1 P2 P3 P4 P5 P6 P7 P8 P9

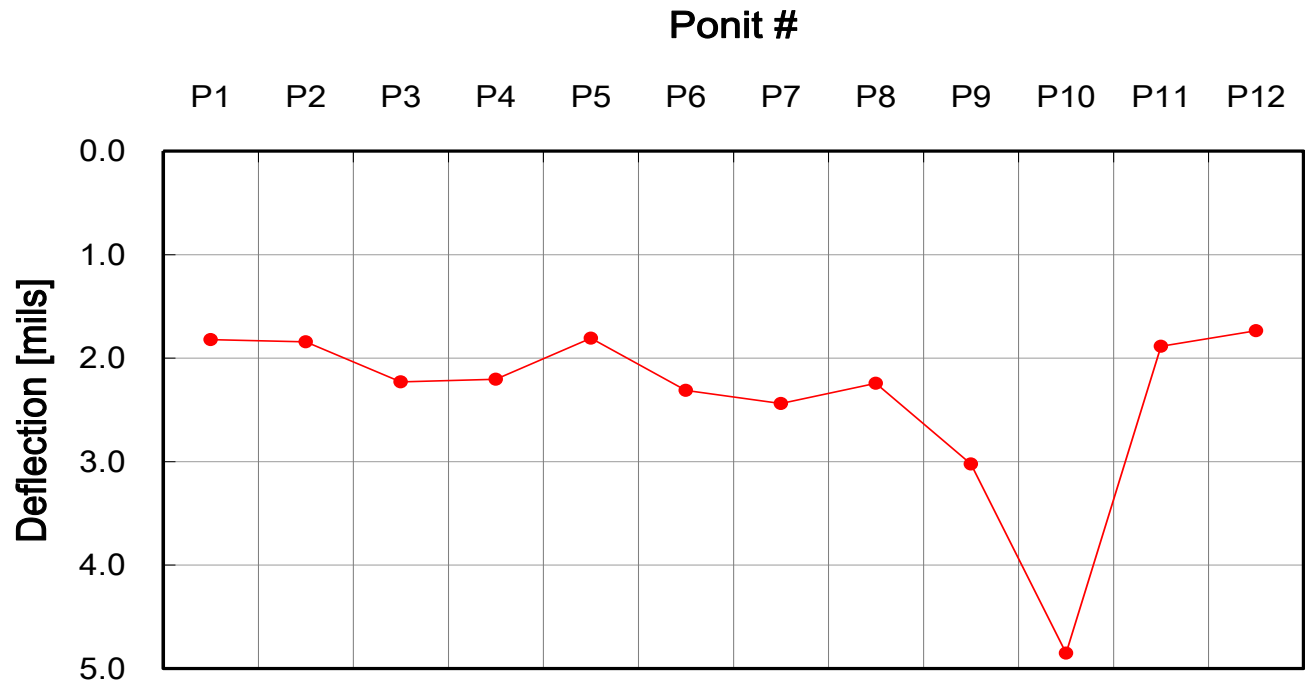
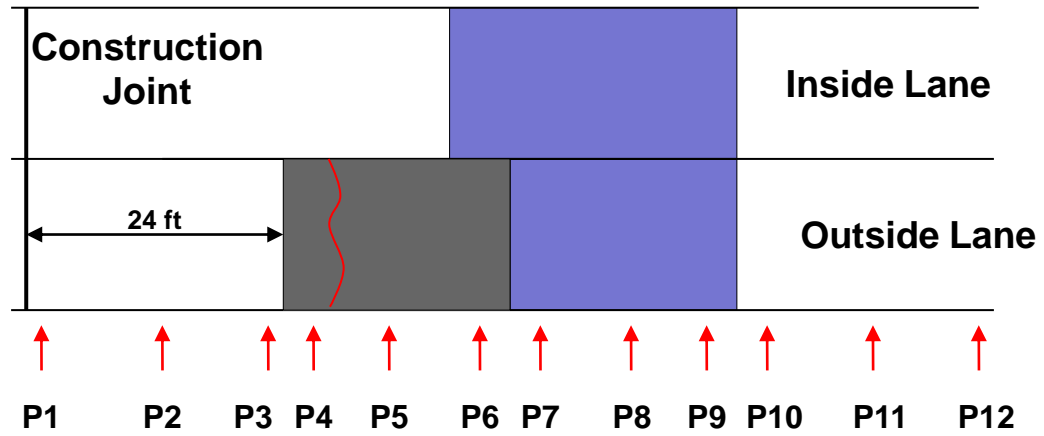
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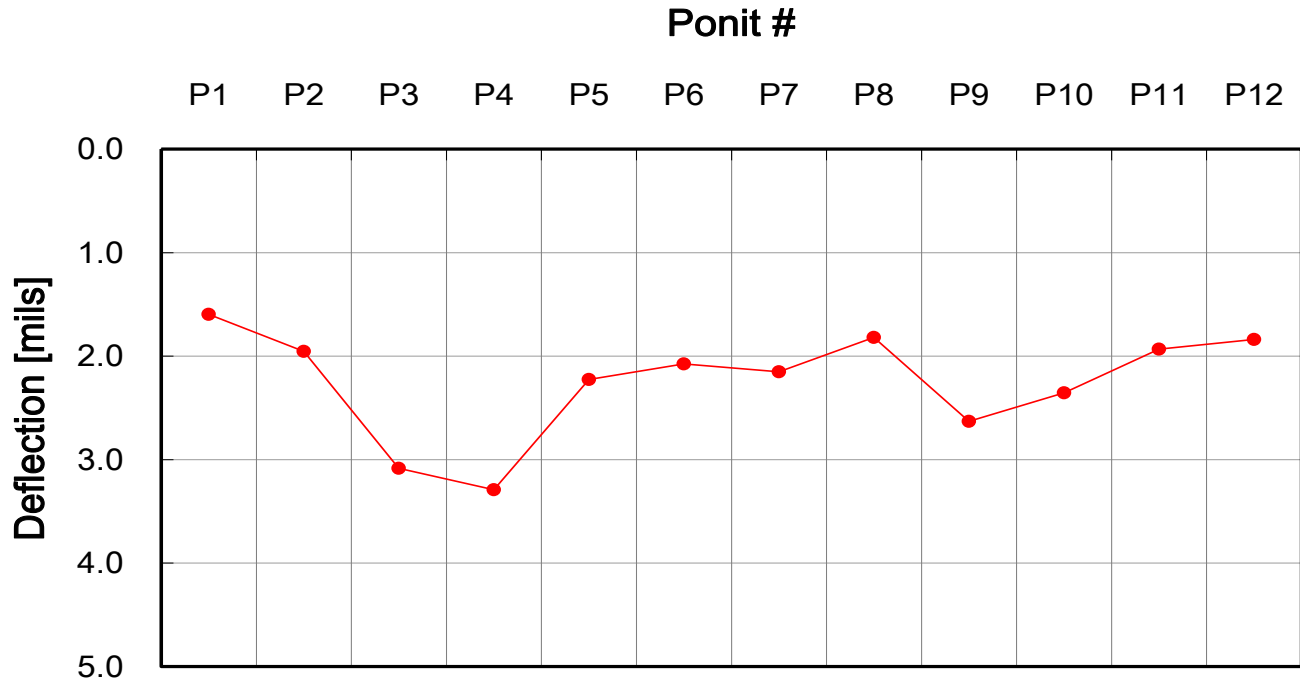
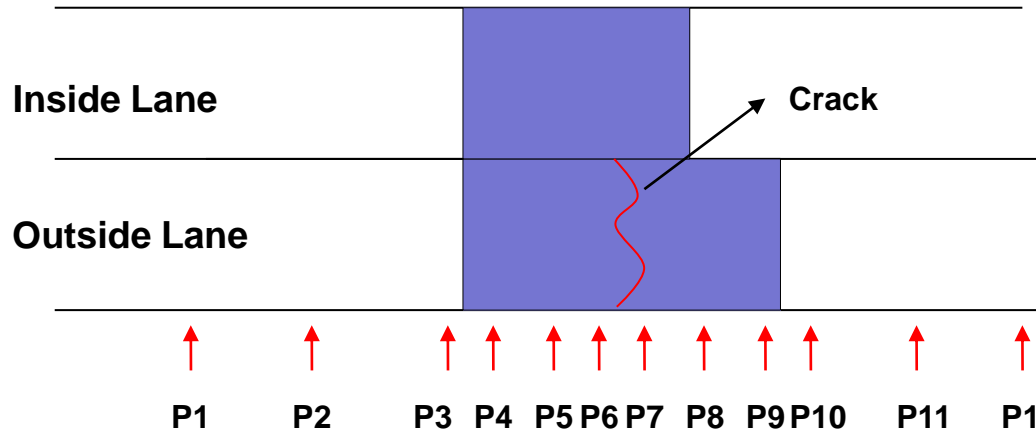






Welded

Epoxy





01/12/2012 10:22



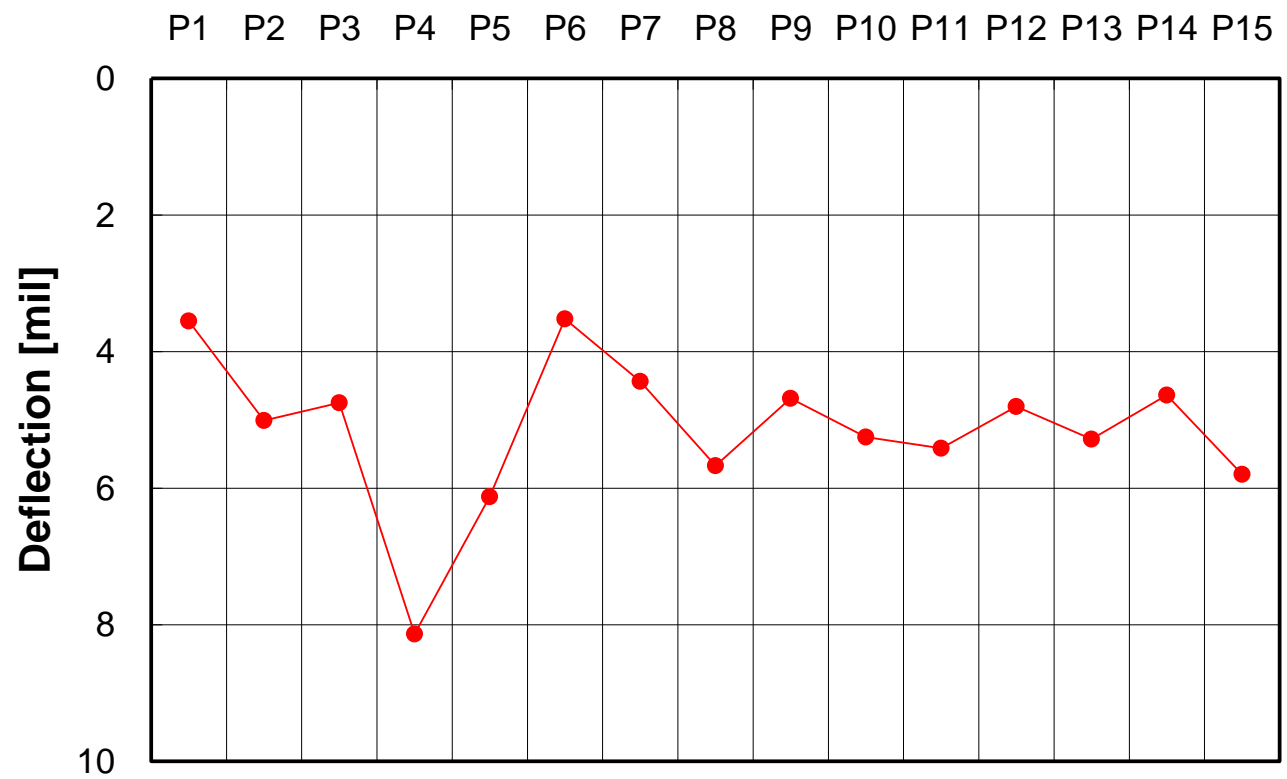
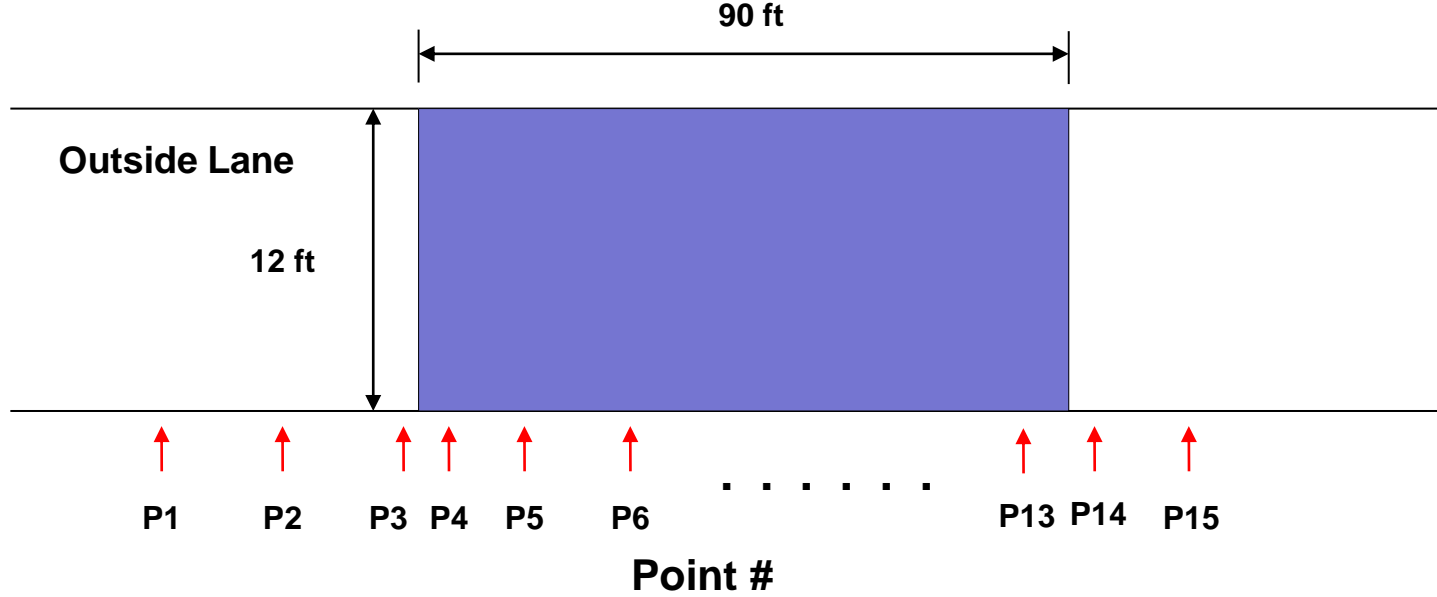
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01/12/2012 10:31

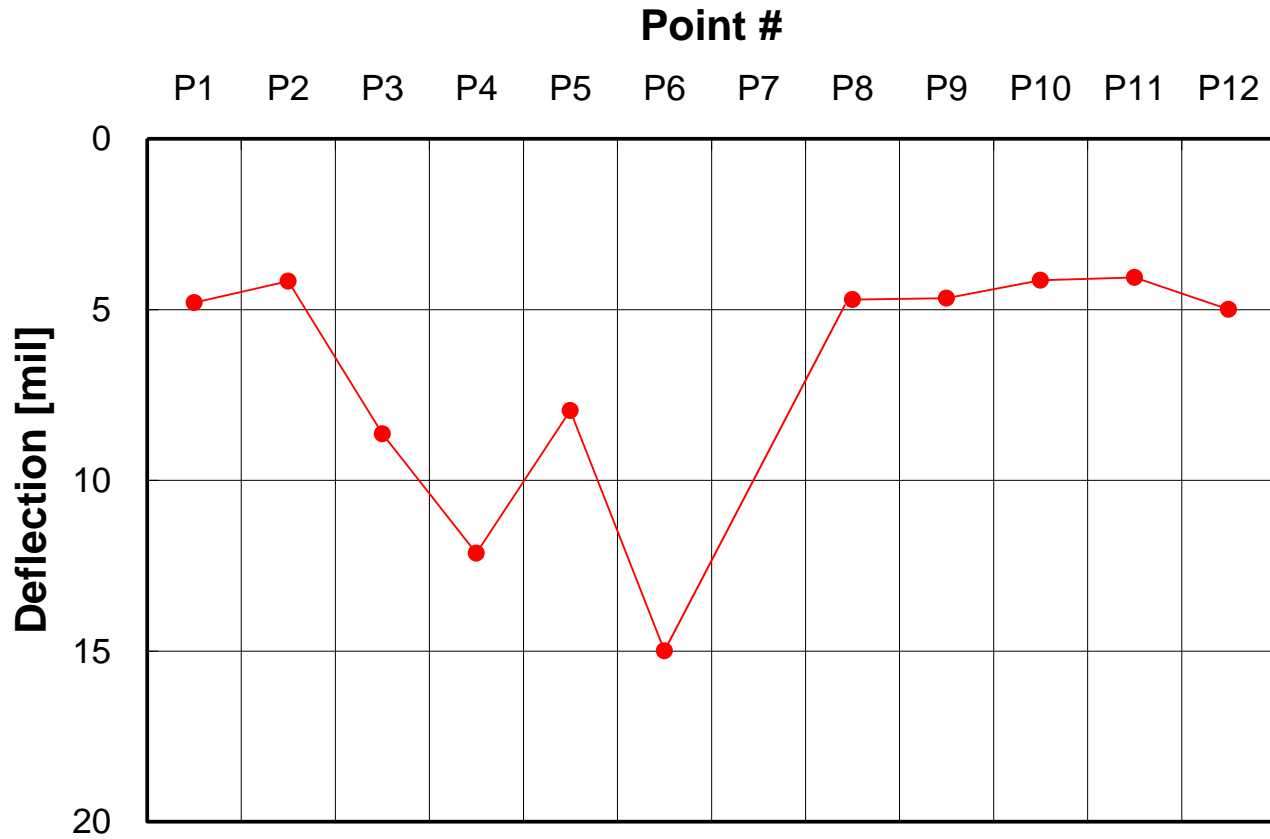
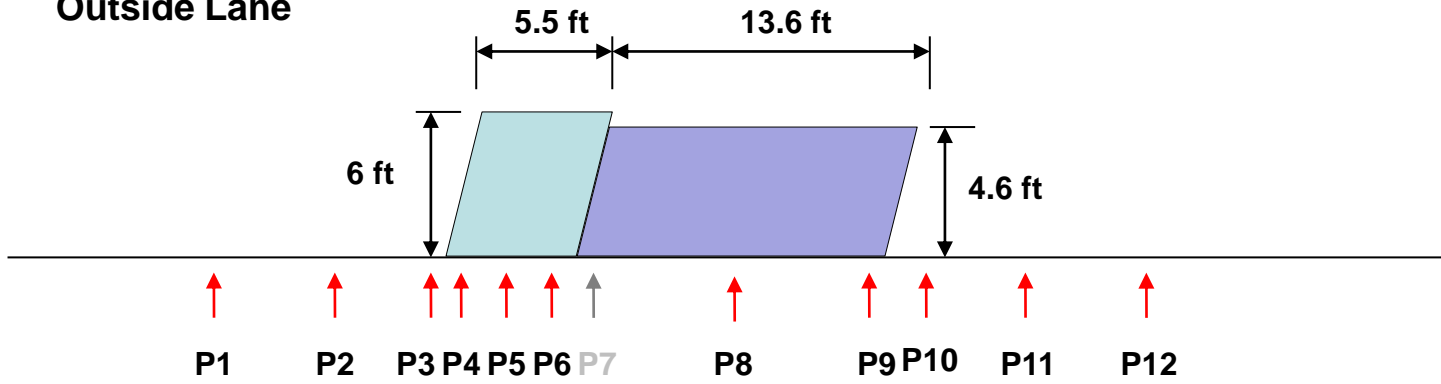


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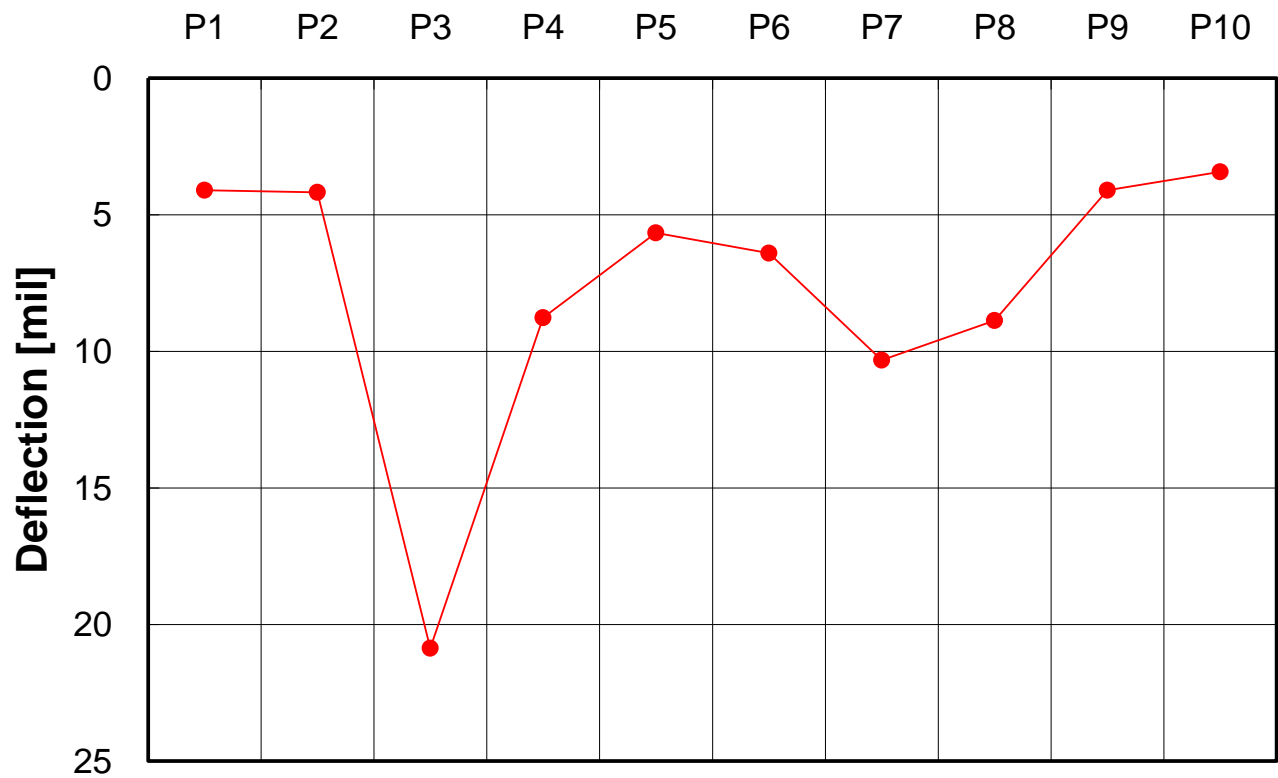
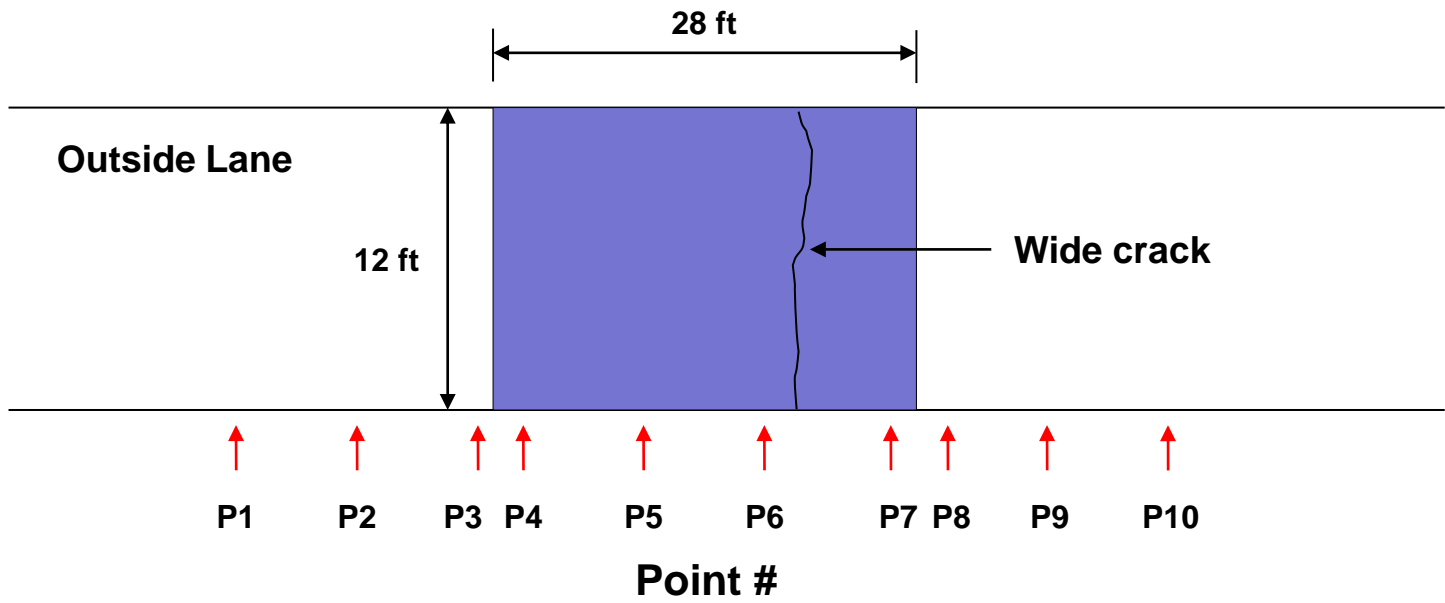




Outside Lane





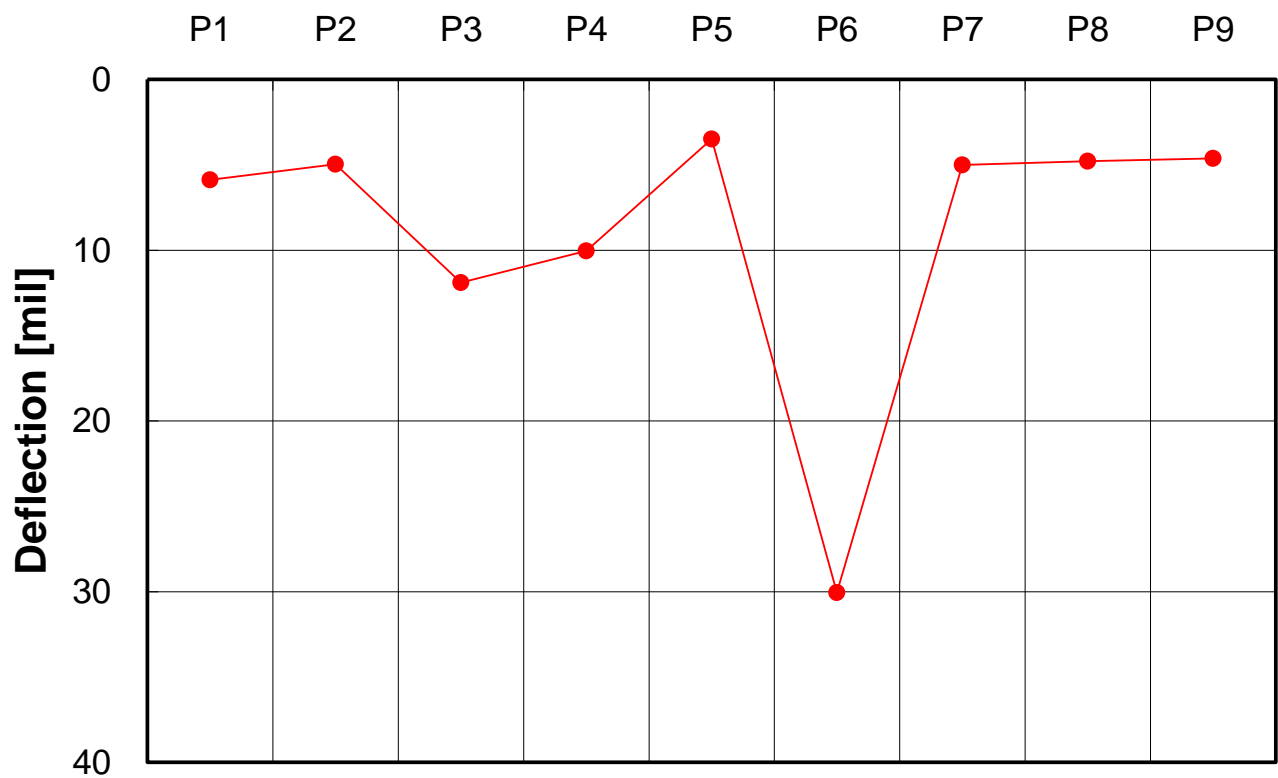
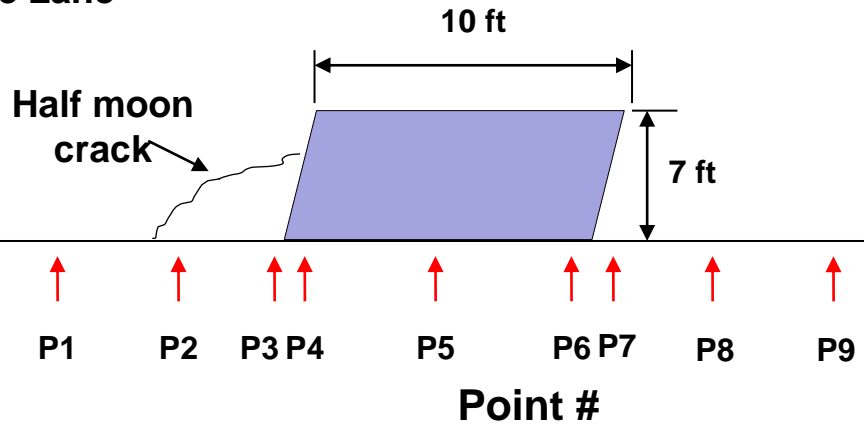




FDR-S-1

01/12/2012 12:45

Outside Lane

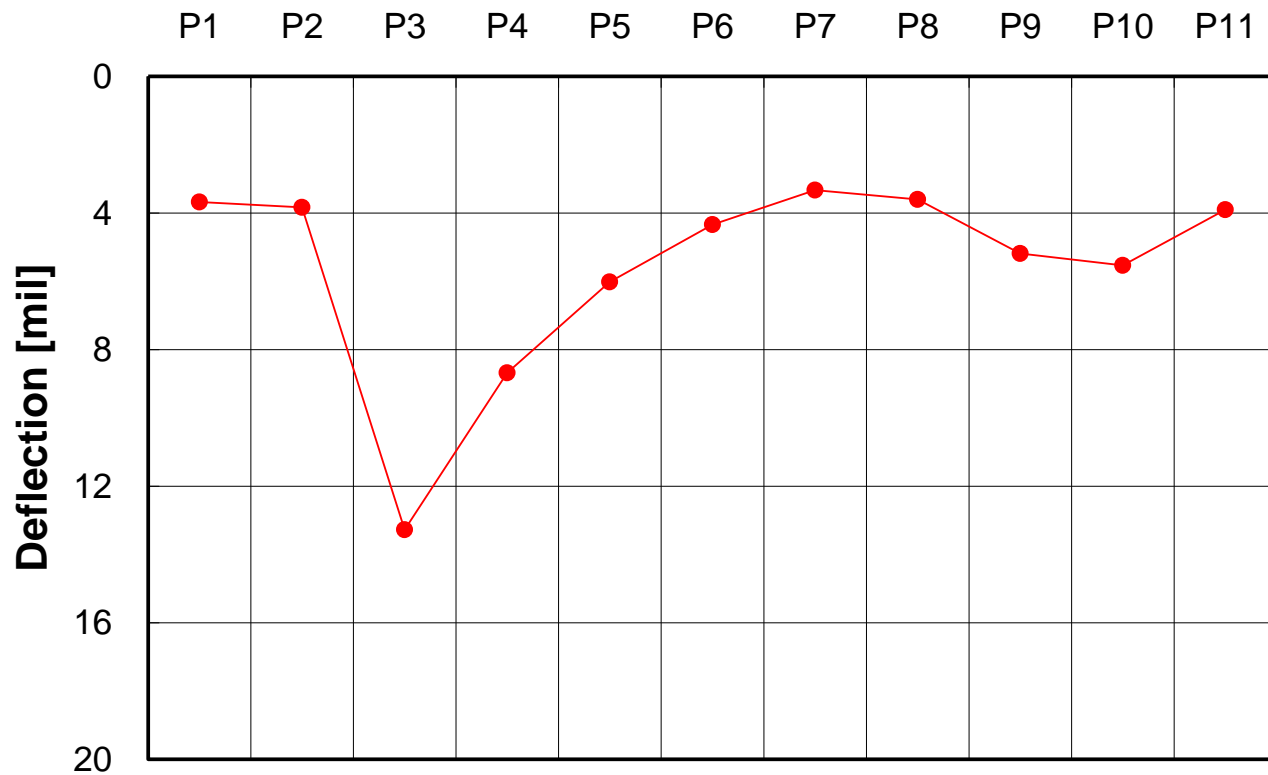
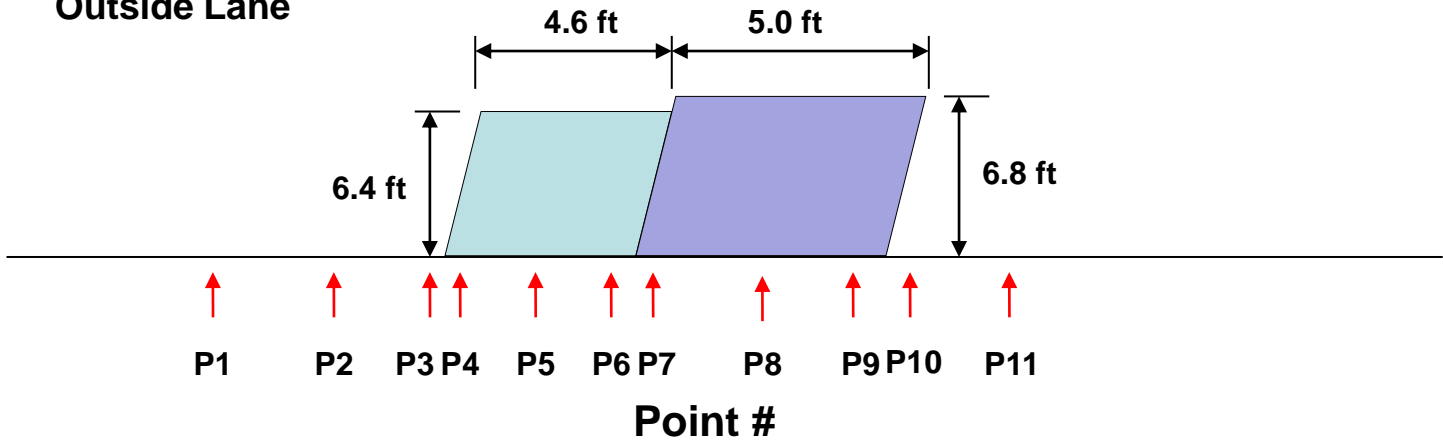




FDR-S-2

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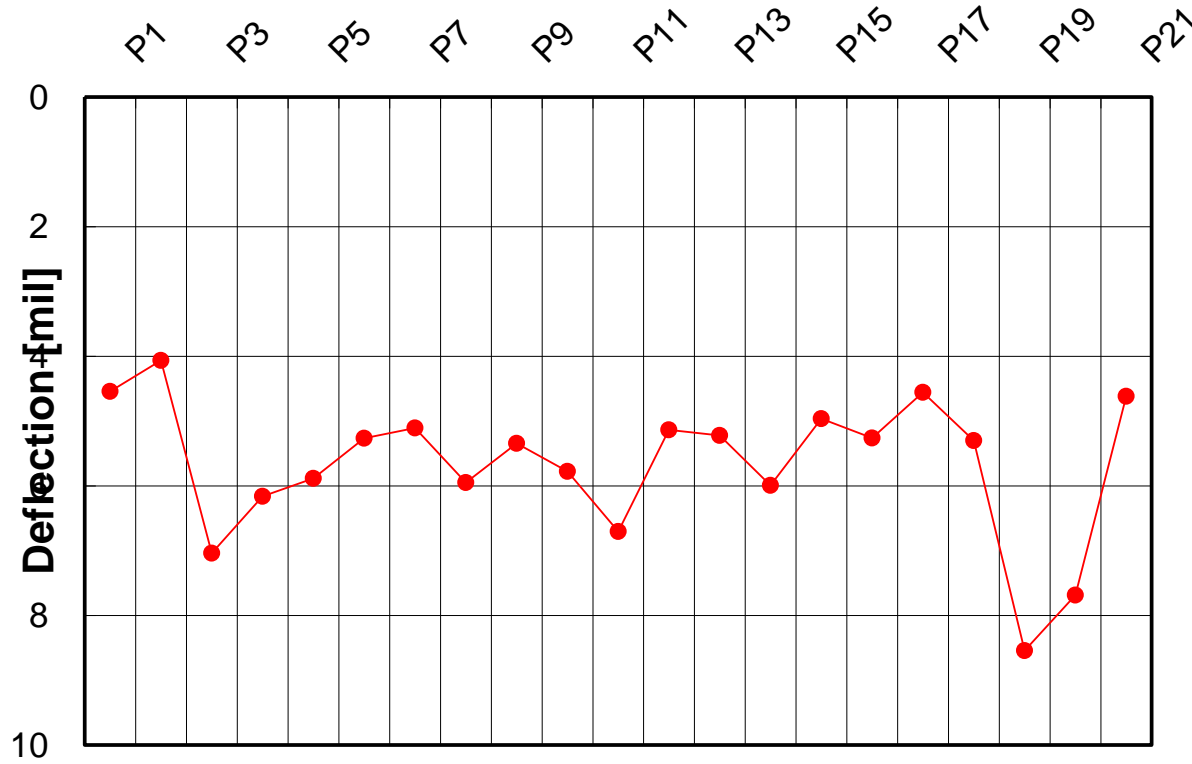
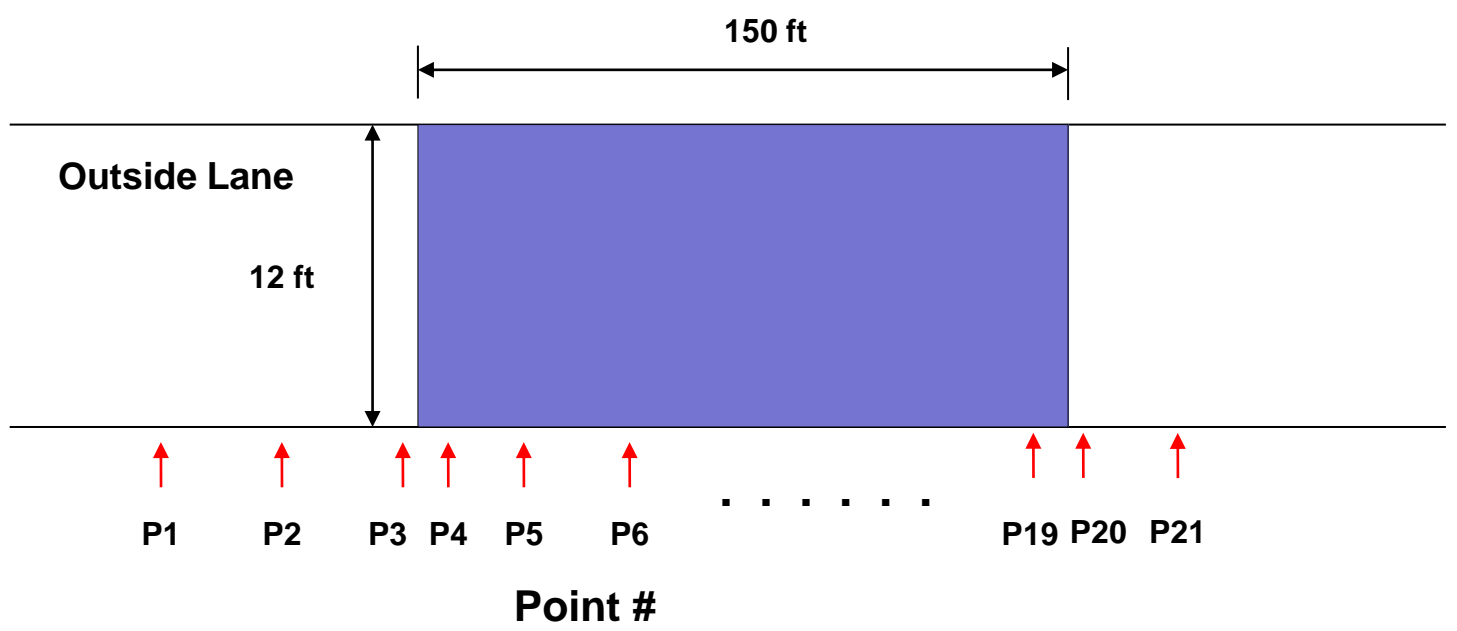
Outside Lane



FDR-S-5



<Location>
N : 33°29.277'
W : 97°48.551'





SPX

EXIT

03.17.2010 10:24



03.17.2010 10:37



03.17.2010 11:39



03.17.2010 11:38

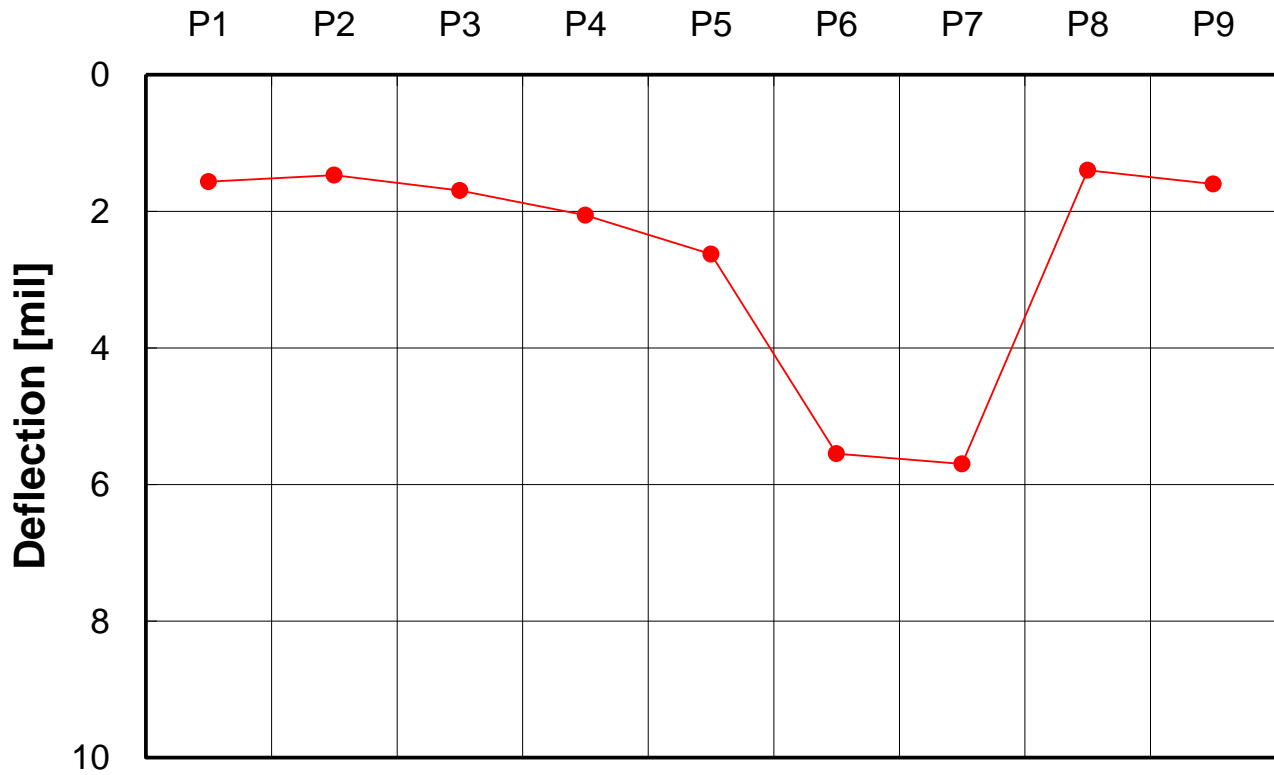
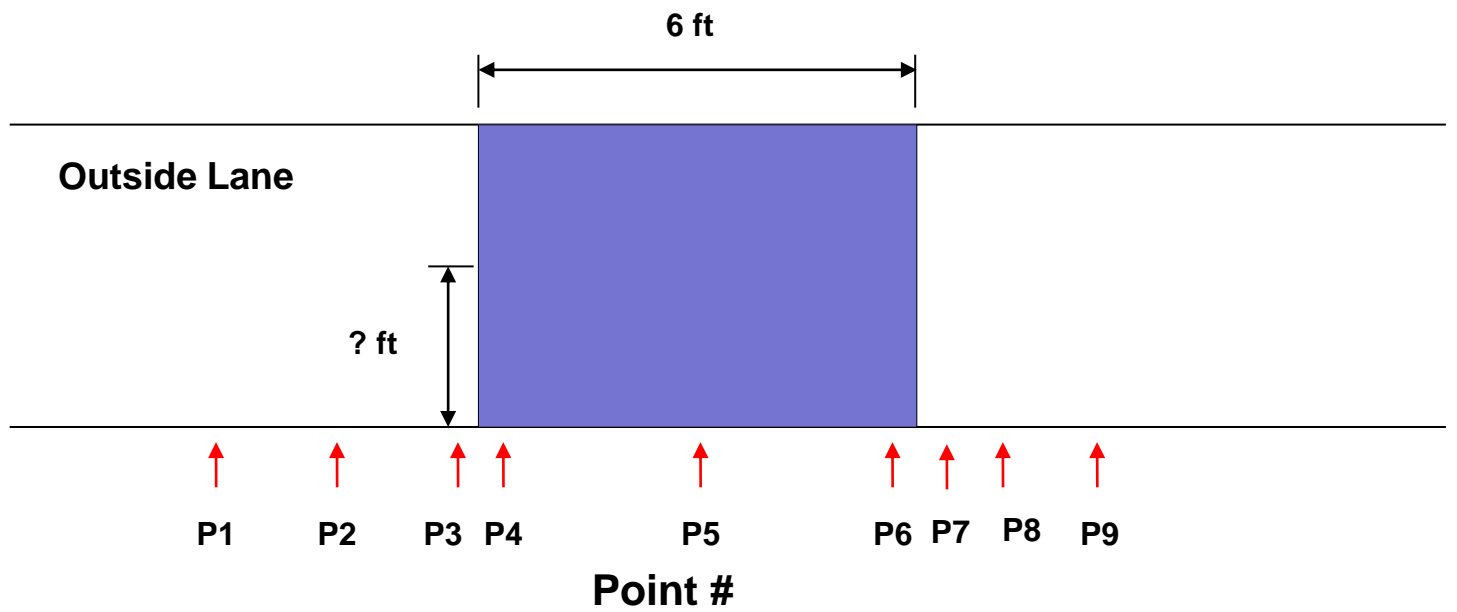


03.17.2010 11:37

Project Level

*0000 +00.0

| | | | | | | | | | | | | | | | | | |
|---|---------|--|-----|-----|-----|--------|--------|---------|---------|--------------|-------------|------|------|------|------|------|------|
| S | 0.000R1 | | | | 20 | I31017 | 68 | Heights | | | | | | | | | |
| | | 647 | 46 | 41 | 36 | 43 | 25 | 21 | 18 | <u>10273</u> | <u>1.79</u> | 1.61 | 1.41 | 1.69 | 0.98 | 0.84 | 0.70 |
| | | 837 | 61 | 55 | 47 | 57 | 33 | 28 | 23 | <u>13292</u> | <u>2.40</u> | 2.15 | 1.86 | 2.26 | 1.29 | 1.09 | 0.90 |
| | | '13-in side | | | | | | | | | | | | | | | |
| S | 0.004R1 | | | | | 20 | I31020 | 67 | Heights | | | | | | | | |
| | | 621 | 41 | 42 | 39 | 41 | 30 | 28 | 25 | <u>9860</u> | <u>1.61</u> | 1.65 | 1.52 | 1.63 | 1.18 | 1.09 | 0.97 |
| | | 808 | 59 | 54 | 50 | 54 | 38 | 34 | 29 | <u>12839</u> | <u>2.33</u> | 2.14 | 1.95 | 2.13 | 1.51 | 1.33 | 1.15 |
| | | '13-in side | | | | | | | | | | | | | | | |
| S | 0.008R1 | | | | | 20 | I31023 | 68 | Heights | | | | | | | | |
| | | 638 | 49 | 47 | 40 | 38 | 28 | 24 | 20 | <u>10138</u> | <u>1.91</u> | 1.83 | 1.58 | 1.50 | 1.11 | 0.95 | 0.80 |
| | | 824 | 67 | 64 | 55 | 52 | 39 | 33 | 28 | <u>13097</u> | <u>2.83</u> | 2.51 | 2.16 | 2.05 | 1.52 | 1.31 | 1.09 |
| | | 'Upstream Pic 3-17 10:24 am | | | | | | | | | | | | | | | |
| S | 0.009R1 | | | | | 20 | I31026 | 68 | Heights | | | | | | | | |
| | | 631 | 58 | 53 | 49 | 46 | 38 | 35 | 21 | <u>10019</u> | <u>2.29</u> | 2.09 | 1.94 | 1.80 | 1.50 | 1.39 | 0.82 |
| | | 820 | 79 | 73 | 66 | 62 | 52 | 48 | 25 | <u>13034</u> | <u>3.12</u> | 2.86 | 2.60 | 2.46 | 2.06 | 1.89 | 0.98 |
| | | 'Downstream Pic 3-17 10:27 am | | | | | | | | | | | | | | | |
| S | 0.009R1 | | | | | 21 | I31028 | 69 | Heights | | | | | | | | |
| | | 634 | 75 | 81 | 82 | 63 | 36 | 31 | 25 | <u>10070</u> | <u>2.94</u> | 3.17 | 3.21 | 2.48 | 1.43 | 1.22 | 0.98 |
| | | 822 | 103 | 109 | 111 | 86 | 49 | 42 | 34 | <u>13062</u> | <u>4.06</u> | 4.30 | 4.36 | 3.37 | 1.93 | 1.65 | 1.33 |
| | | 'Middle of the slab 71-in long | | | | | | | | | | | | | | | |
| S | 0.009R1 | | | | | 21 | I31033 | 69 | Heights | | | | | | | | |
| | | 631 | 157 | 68 | 58 | 122 | 36 | 28 | 21 | <u>10023</u> | <u>6.18</u> | 2.67 | 2.26 | 4.80 | 1.41 | 1.12 | 0.84 |
| | | 815 | 214 | 91 | 76 | 169 | 47 | 38 | 28 | <u>12954</u> | <u>8.44</u> | 3.57 | 2.99 | 6.64 | 1.87 | 1.49 | 1.11 |
| | | 'Upstream of wide joint (almost 1-in wide transverse construction joint) | | | | | | | | | | | | | | | |
| S | 0.009R1 | | | | | 21 | I31036 | 69 | Heights | | | | | | | | |
| | | 625 | 160 | 132 | 102 | 66 | 56 | 40 | 27 | <u>9935</u> | <u>6.29</u> | 5.19 | 4.02 | 2.58 | 2.20 | 1.59 | 1.07 |
| | | 811 | 219 | 180 | 140 | 85 | 77 | 56 | 38 | <u>12891</u> | <u>8.60</u> | 7.09 | 5.50 | 3.35 | 3.04 | 2.20 | 1.50 |
| | | 'Downstream wide joint (almost 1-in wide transverse construction joint) | | | | | | | | | | | | | | | |
| S | 0.012R1 | | | | | 21 | I31038 | 70 | Heights | | | | | | | | |
| | | 632 | 40 | 40 | 37 | 33 | 27 | 23 | 18 | <u>10043</u> | <u>1.56</u> | 1.57 | 1.45 | 1.30 | 1.07 | 0.90 | 0.71 |
| | | 815 | 55 | 55 | 52 | 47 | 39 | 33 | 27 | <u>12950</u> | <u>2.15</u> | 2.18 | 2.03 | 1.83 | 1.53 | 1.31 | 1.07 |
| | | '12-ft into allegedly 10-in CRCP | | | | | | | | | | | | | | | |
| S | 0.016R1 | | | | | 21 | I31040 | 69 | Heights | | | | | | | | |
| | | 629 | 45 | 39 | 33 | 42 | 25 | 23 | 20 | <u>9999</u> | <u>1.78</u> | 1.53 | 1.30 | 1.66 | 0.98 | 0.89 | 0.78 |
| | | 817 | 61 | 52 | 44 | 57 | 33 | 30 | 27 | <u>12986</u> | <u>2.41</u> | 2.06 | 1.73 | 2.24 | 1.30 | 1.19 | 1.06 |
| | | '24-ft into allegedly 10-in CRCP | | | | | | | | | | | | | | | |



Important Findings

- Deflections at transverse repair joints are **higher** than those at other areas, which explains poor performance of FDRs.
- Efforts should be made to strengthen transverse repair joints.

Amarillo IH 40

- 9-in CRCP + 600 #/SY ASB
- Completed in 1979

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT CARSON AND GRAY COUNTIES INTERSTATE HIGHWAY 40

FROM: 2.0 MI. WEST OF GROOM
TO : 2.0 MI. EAST OF GROOM

FEDERAL AID PROJECT 140-1(99)110

GRADING, STRUCTURES, FLEXIBLE BASE, ASPHALT
STABILIZED BASE, ASPH. CONC. PAV. & CONCRETE PAVEMENT
(UNIT II CONSTRUCTION)

TOTAL NET LENGTH OF PROJECT * 29,331.33 FT. * 5.555 MI.
NET LENGTH OF CONTROL 275-4-78 * 22,657.96 FT. * 4.297 MI.
NET LENGTH OF CONTROL 275-5-79 * 6,643.37 FT. * 1.258 MI.

(1)
(2)
(3)
(4)
(5)
(6)
(7)

STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

CORRECT 2-27-78

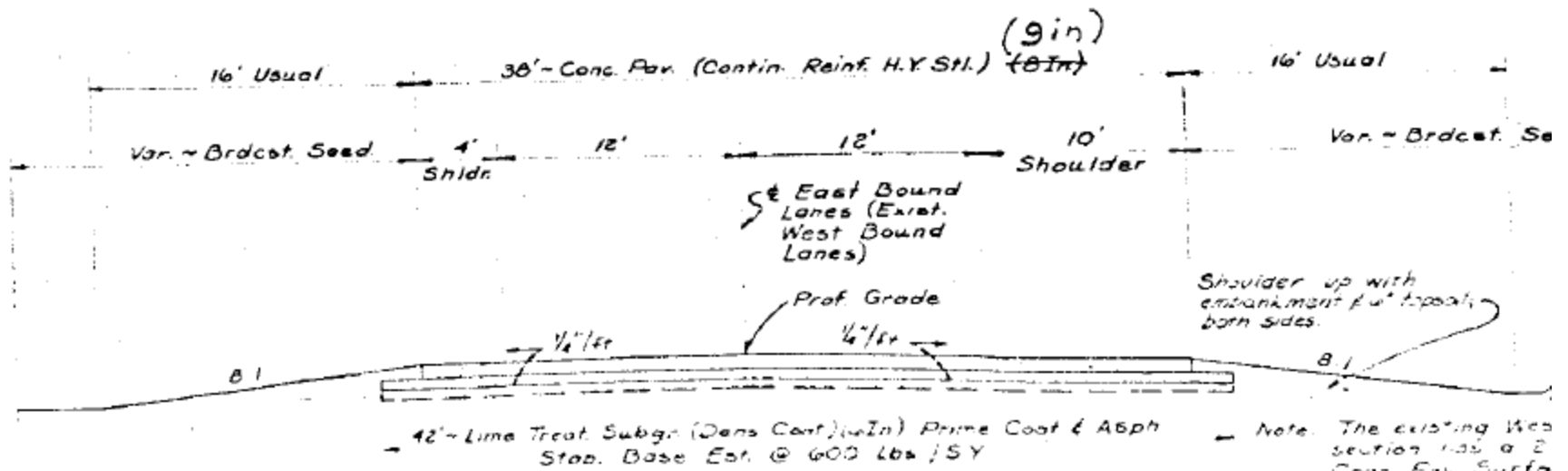
Jack V. Light
DISTRICT DESIGN ENGINEER

F. Cannon
SUPERVISORY RESIDENT ENGINEER

RECOMMENDED FOR APPROVAL 2/27-78

O. L. McKee
DISTRICT ENGINEER

| | |
|---|--|
| APPROVED FOR APPROVAL APPROVED: APPROVED FOR APPROVAL | <div style="border: 1px solid black; height: 20px; width: 100%;"></div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> 3/1/78 </div> <div style="border: 1px solid black; padding: 5px; margin-top: 5px;"> 3-14-78 </div> |
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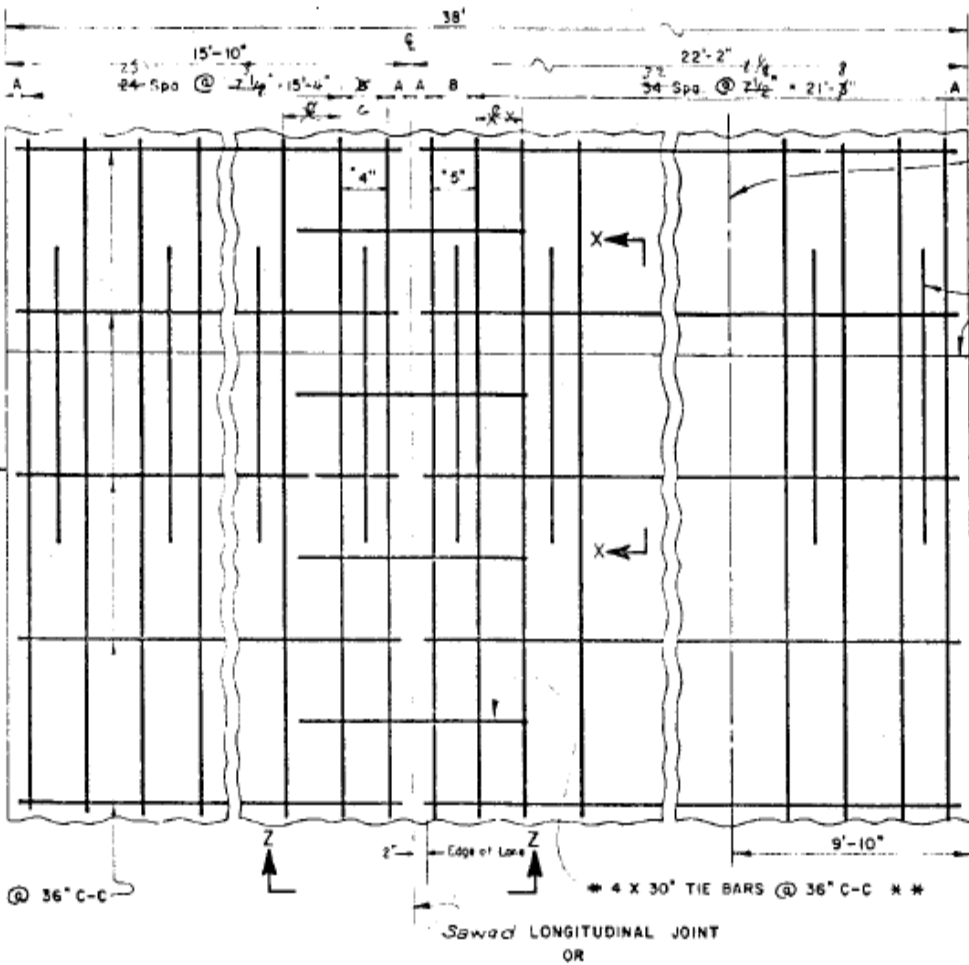


TYPICAL SECTION NO. 2 ~ EAST BOUND LANES

To be used between the following Stations: 1438+00 to 1452+00
1709+00 to 1729+90.65

2 * 140 pcf
= 7 pcf
= 147 pcf

| CONCRETE THICKNESS "T" in. | PAV'T THICKNESS "T" in. | BAR SIZE | 38 FT. PLACEMENT WIDTH | | | 15'-10" PLACEMENT WIDTH | | | 22'-2" PLACEMENT WIDTH | | | ADDITIONAL STEEL AT TRANS. CONST. JOINT | | | | | | | | | | | | | | | |
|----------------------------------|-------------------------------|-------------|------------------------|------------|------------|-------------------------|-----------------------|-------------|------------------------|----------|----------------|---|-------------|----------|----------|----------------|-----------------------|-----------------------|------------------------------------|--|---------------------------------------|---|--|------|------|------|------|
| | | | SPACING C-C | | | NO. OF BARS | STEEL lbs/SY. ① | SPACING C-C | | | NO. OF BARS | STEEL lbs/SY. ① | SPACING C-C | | | NO. OF BARS | STEEL lbs/SY. ① | SIZE AND LENGTH | ② NO. PER 38' PLACE WIDTH | ② NO. PER 15'-10" PLACE WIDTH | ② NO. PER 22'-2" PLACE WIDTH | WEIGHT lbs./FT. BASED ON 38' PLACEMENT | WEIGHT lbs./FT. BASED ON 22'-2" PLACEMENT | | | | |
| | | | (A) in. | (B) in. | (C) in. | | | A in. | B in. | C in. | | | A in. | B in. | C in. | | | | | | | | | | | | |
| 0.6 | 8-9 | No. 5 | 3 | 4 | 5 | 7.5 | 62 | 1738 | 3 | 4 | 5 | 7.5 | 26 | 1745 | 3 | 5 | 7.5 | 36 | 1731 | No. 5x36 | 31 | 13 | 18 | 2.55 | 3.47 | 2.55 | 3.47 |
| | | | | | | 8 1/2 | 57 | 22.29 | | 8 | 24 | 27.44 | | 8 1/2 | 33 | 22.12 | No. 6x36 | | | | | | | | | | |

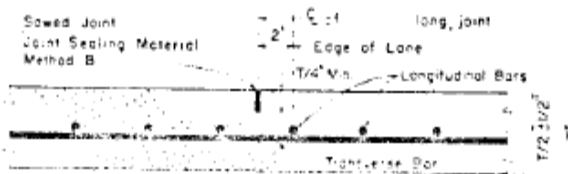


Sawed LONGITUDINAL JOINT

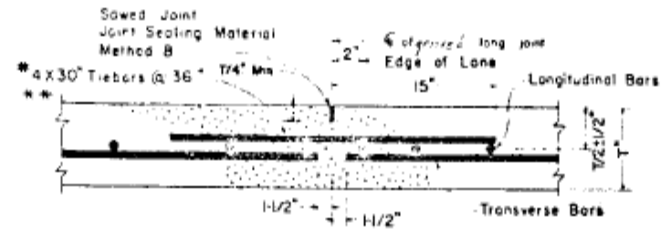
OUTSIDE PAV'T. EDGE

ADD'L STEEL BARS

TRANSVERSE CONST. JT.



Sawed LONGITUDINAL JOINT
Section Z-Z



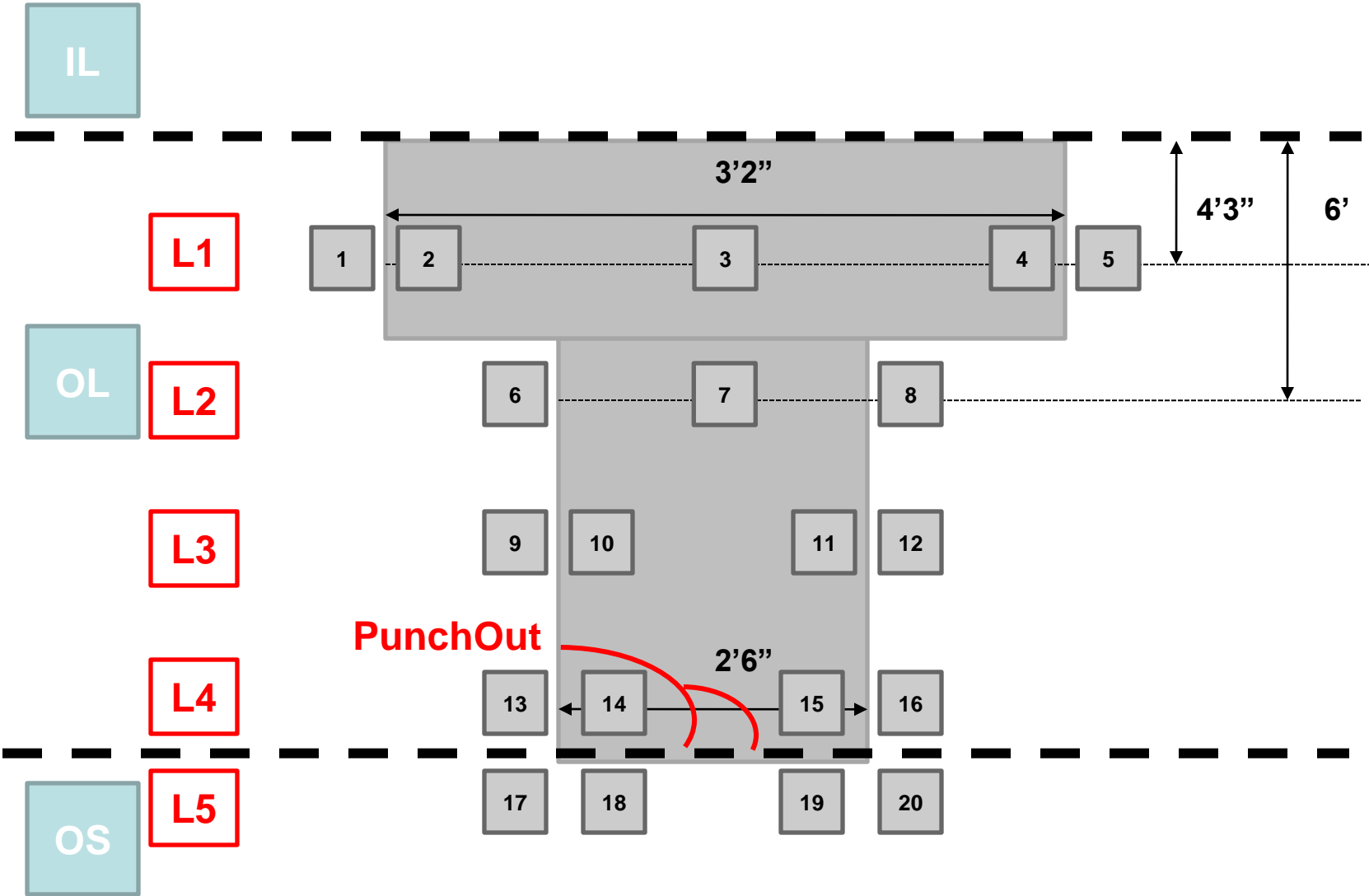
- NO EXPANSION JOINTS WILL BE USED IN THE PLANS.
- FOR FURTHER INFORMATION REGARDING GOVERNING SPECIFICATIONS FOR CONCRETE, SEE THE SPECIFICATIONS FOR CONCRETE.
- DETAILS AS TO PAVEMENT WIDTH, HAVE BEEN SHOWN ELSEWHERE IN THE PLANS.
- WITHIN ANY AREA BOUNDED BY TWELVE FEET OF PAVEMENT WIDTH MEASUREMENT, THERE SHALL BE ONE REGULAR LONGITUDINAL JOINT.
- LONGITUDINAL AND TRANSVERSE BARS SHALL BE AS NOTED IN THE SPECIFICATIONS.
- SPLICES SHALL BE A MINIMUM OF 30 INCHES.
- BARS OF WITH DESIGNATIONS, SHALL BE USED TO REINFORCE THE JOINTS, THEY SHALL BE SPACED AT 24 INCHES.
- AT TRANSVERSE CONSTRUCTION JOINTS, THE MAX. SPLICES FOR THE REGULAR LONGITUDINAL JOINTS, SHALL BE LIMITED TO ONE PER JOINT. THE JOINTS SHALL BE REINFORCED WITH REGULAR LONGITUDINAL BARS.
- WITH THE APPROVAL OF THE ENGINEER, A DEVICE, MAY BE USED TO FACILITATE THE JOINTS, THE MINIMUM HEIGHT SHALL BE LESS THAN OR EQUAL TO THE SLAB THICKNESS.
- THE TIE BARS USED TO SUPPORT THE JOINTS, SHALL BE WITHIN THE JOINT AREA.
- IN THE NORMAL JOINT PLACEMENT, THE JOINTS SHALL BE TRANSVERSE TO THE PLANS, IN ALTERNATE LANE ARE, JOINTS SHALL BE LONGITUDINAL.
- JOINT WIDTHS AND SEAL DETAILS SHALL BE AS NOTED IN THE SPECIFICATIONS.
- LONGITUDINAL AND TRANSVERSE BARS SHALL BE AS NOTED IN THE SPECIFICATIONS.
- WITHIN ANY AREA BOUNDED BY TWELVE FEET OF PAVEMENT WIDTH MEASUREMENT, THERE SHALL BE ONE REGULAR LONGITUDINAL JOINT.



04.14.2010 14:25



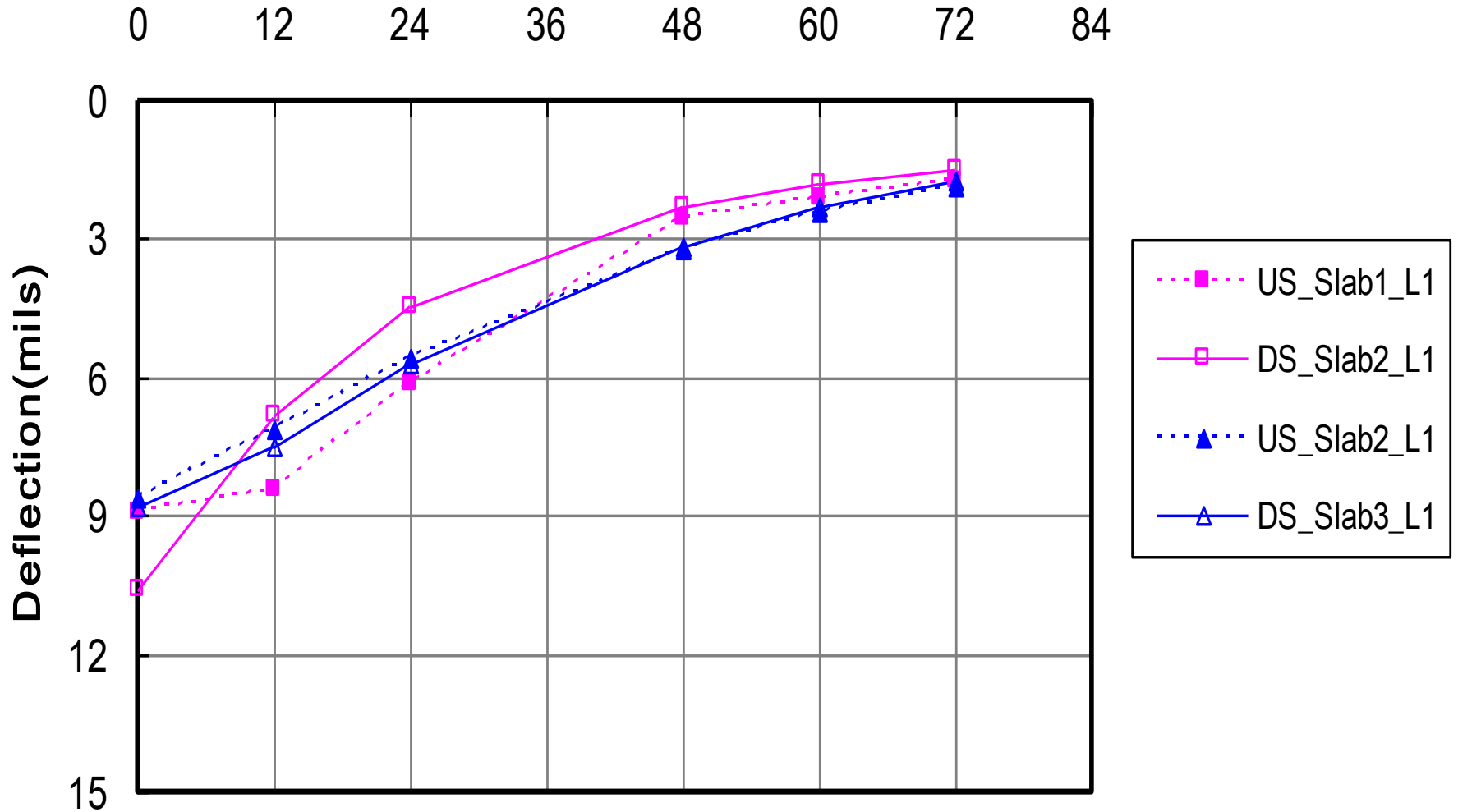
FWD Test Setup



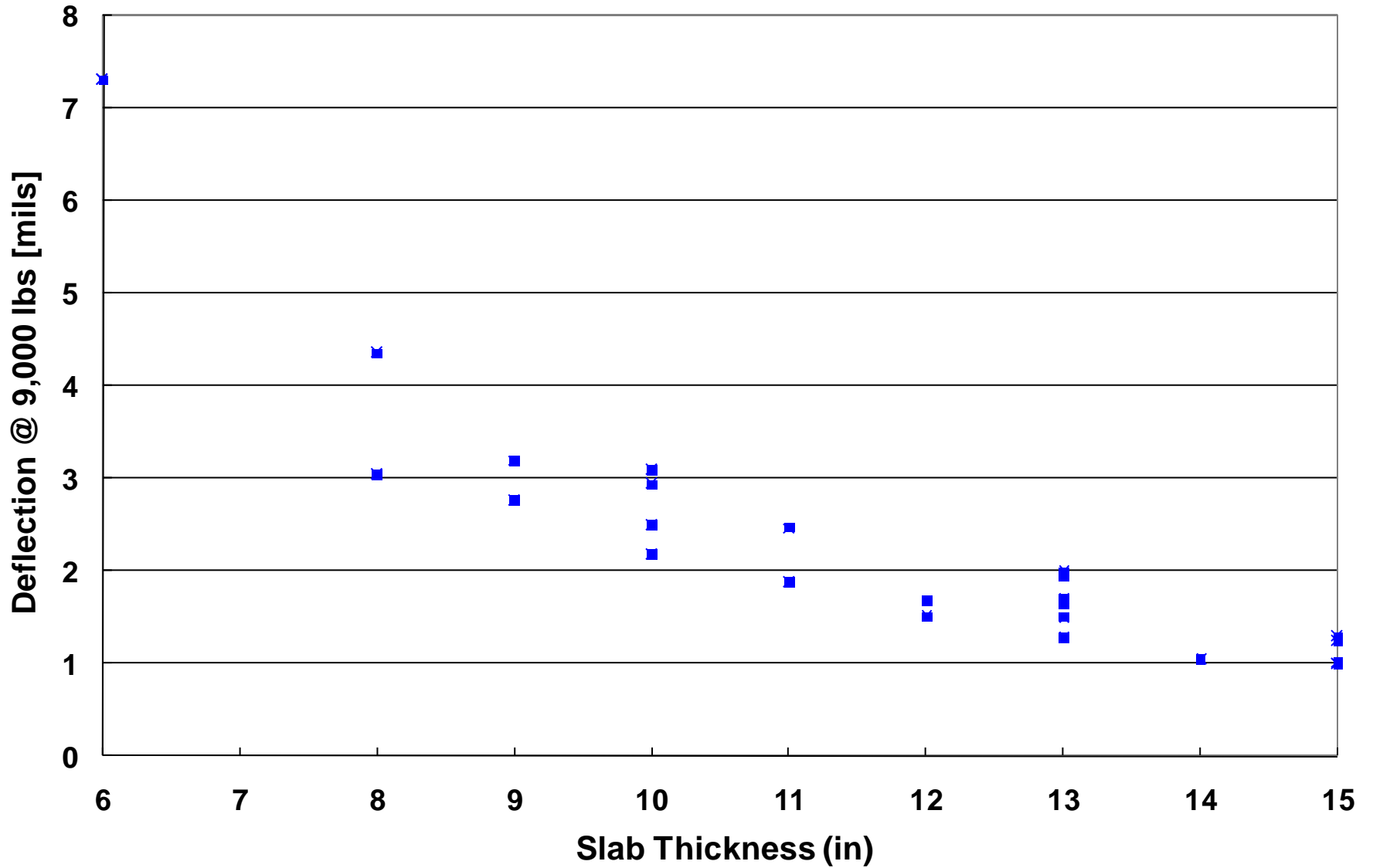


L1

Geophone Location(inch)

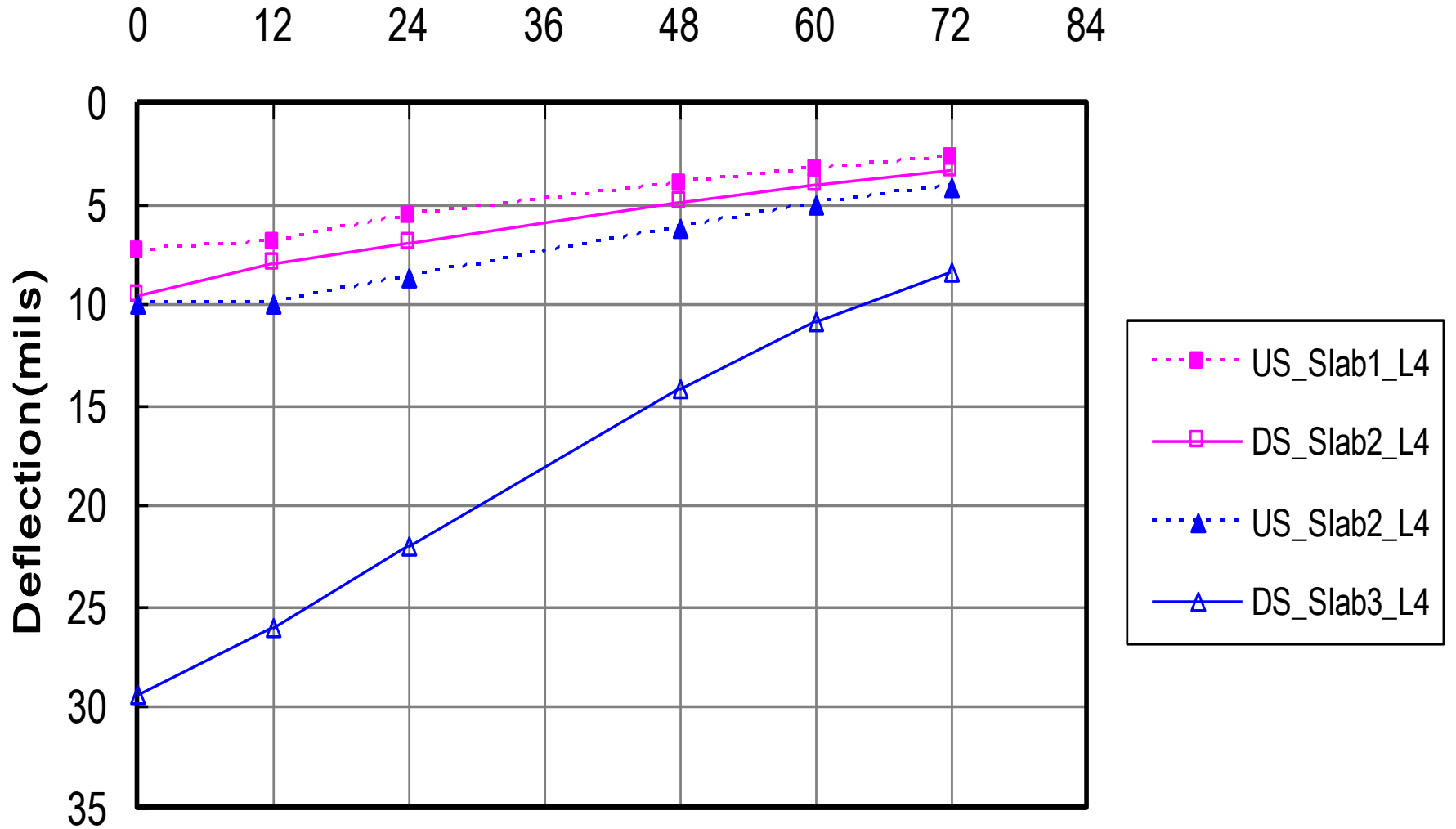


Slab Thickness vs Deflections



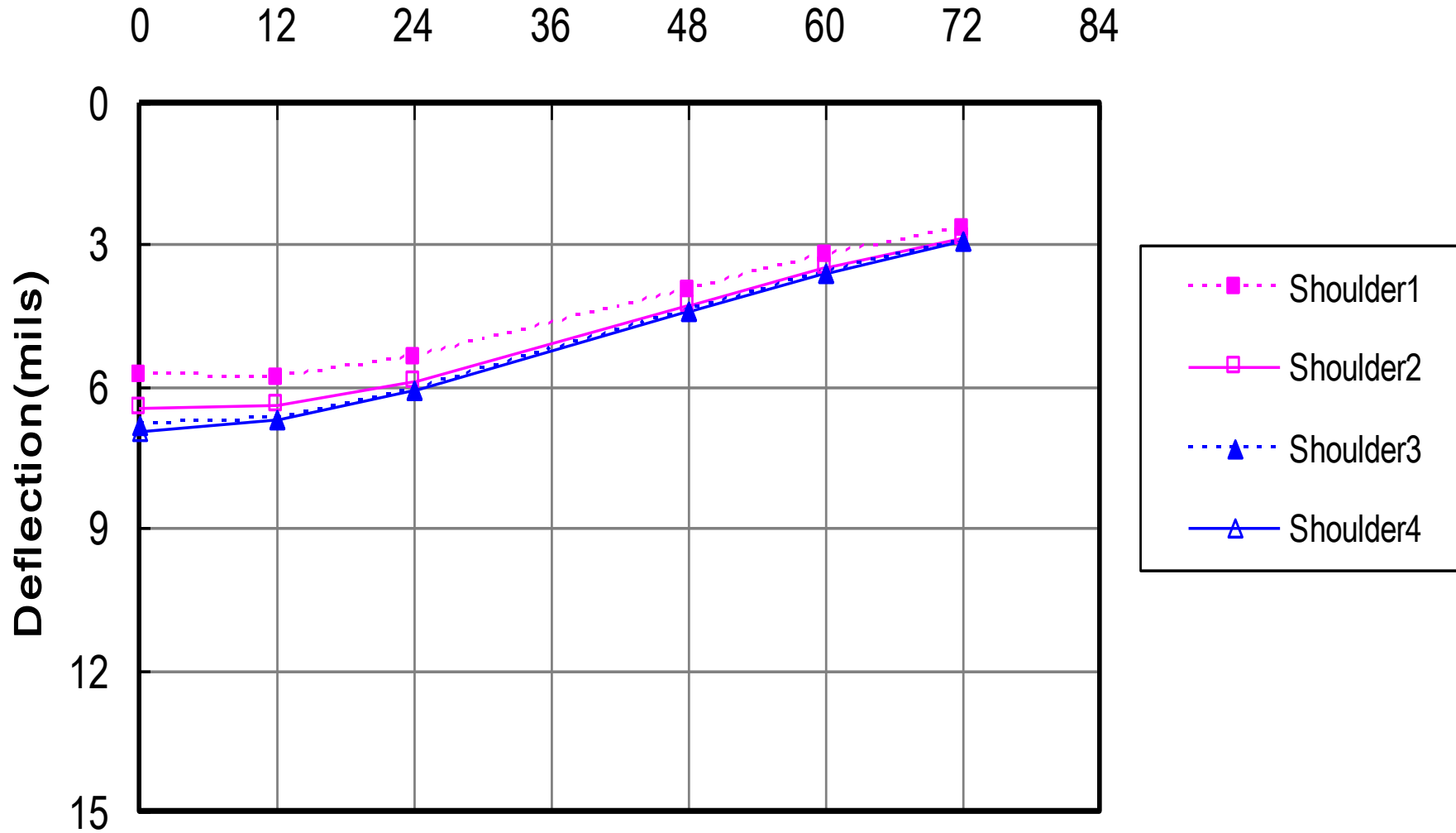
L4

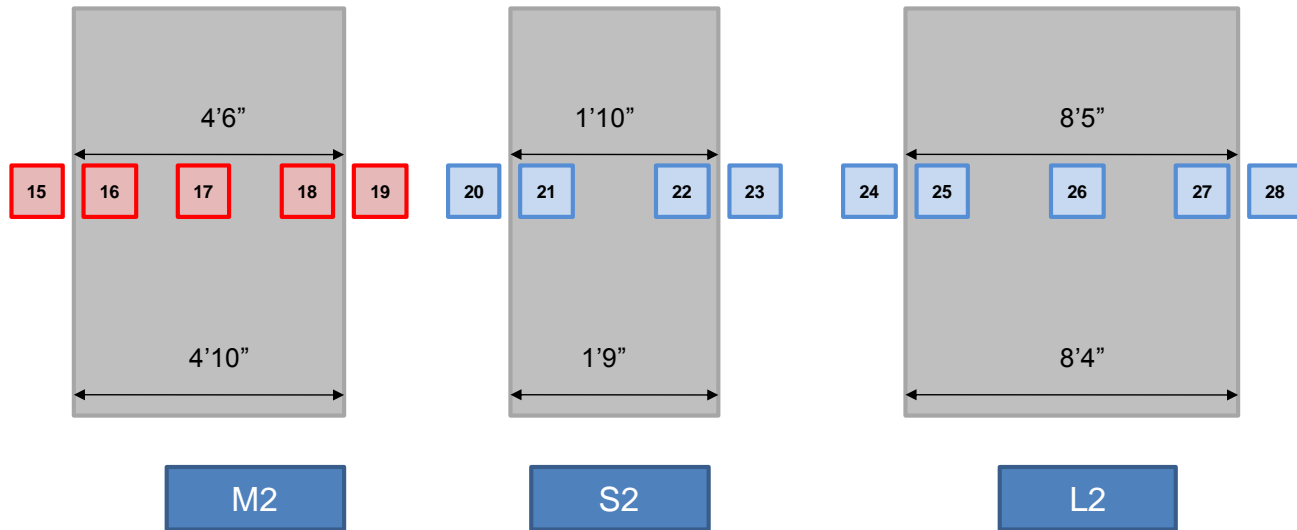
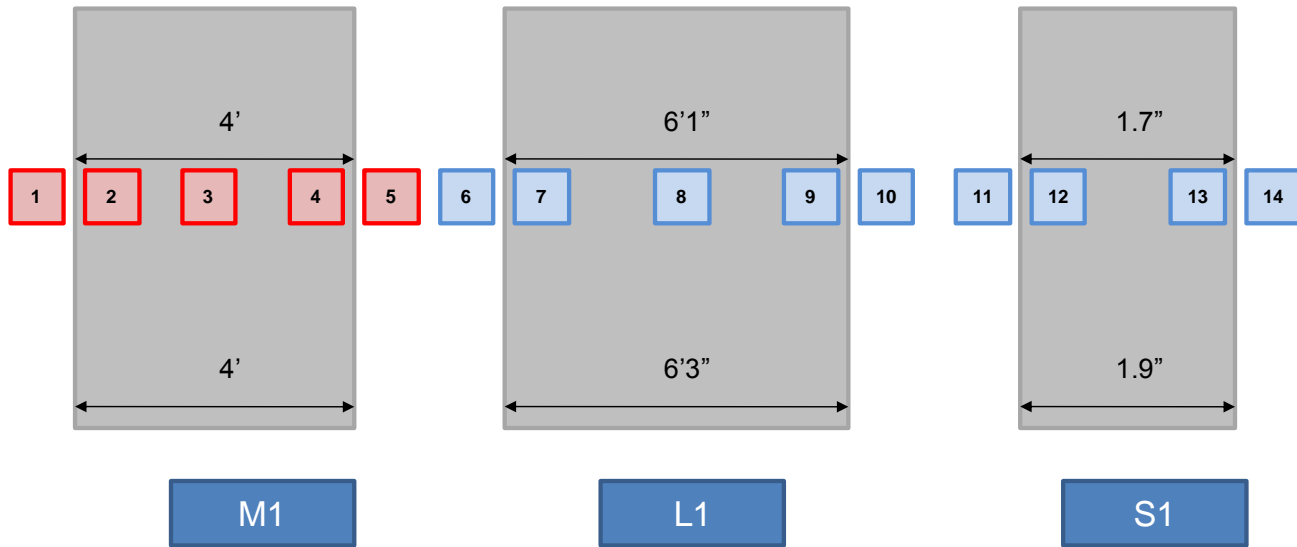
Geophone Location(inch)



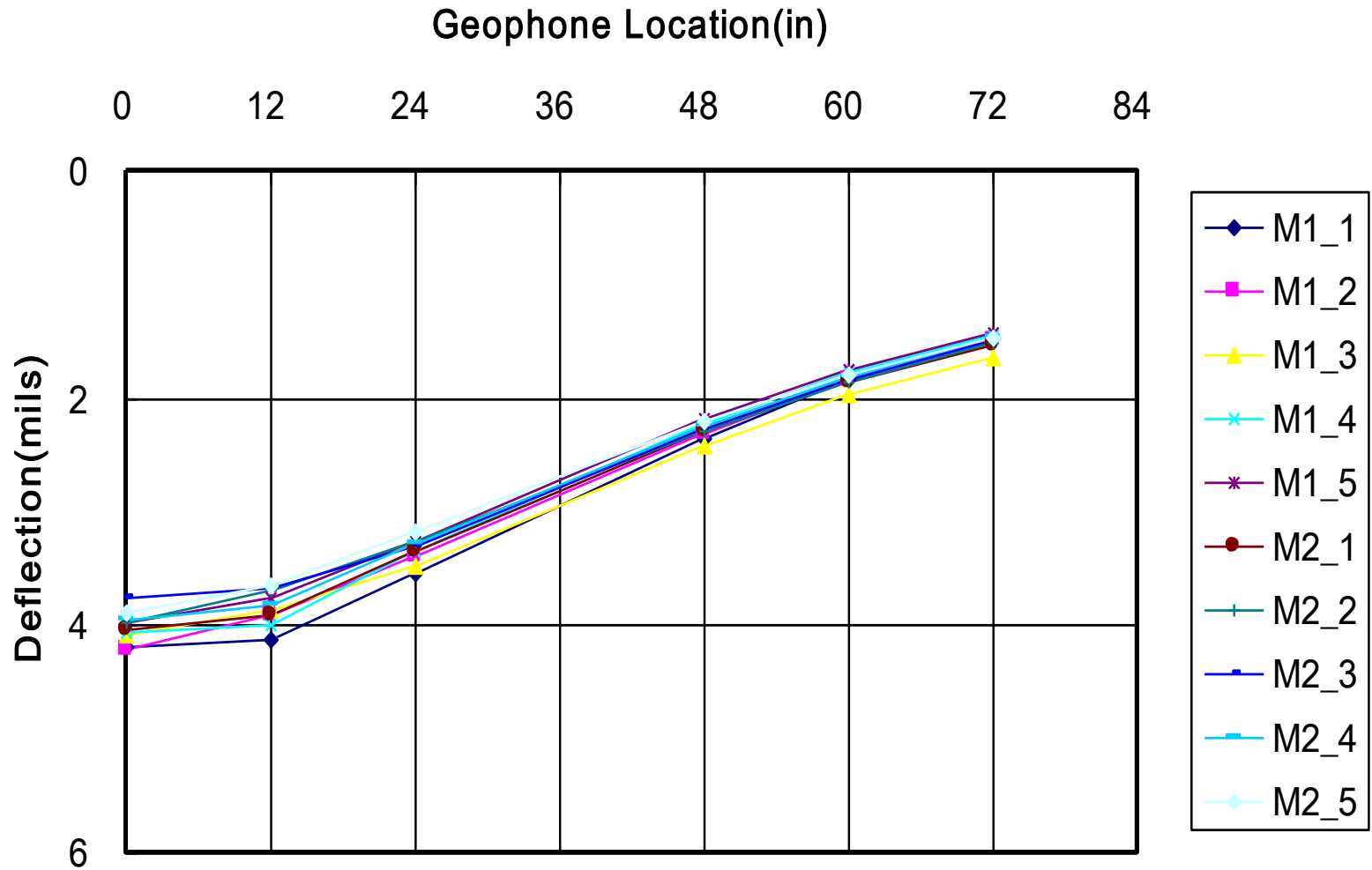
L5

Geophone Location(inch)





Medium Crack Spacing



Review of Specifications Item 361

361.3. Construction.

Epoxy-grout all tiebars for at least a 12-in. embedment into existing concrete. Completely fill the tiebar hole with Type III, Class A or Class C epoxy before inserting the tiebar into the hole.





03.21.2010 22:26



02/09/2012 12:48



02/09/2012 12:48



02/09/2012 12:48



01.18.2012 17:45





STOP

STOP

SOUTH
NORTH

W. PARKWAY
PARKWAY
CLARK

01.19.2012 10:51

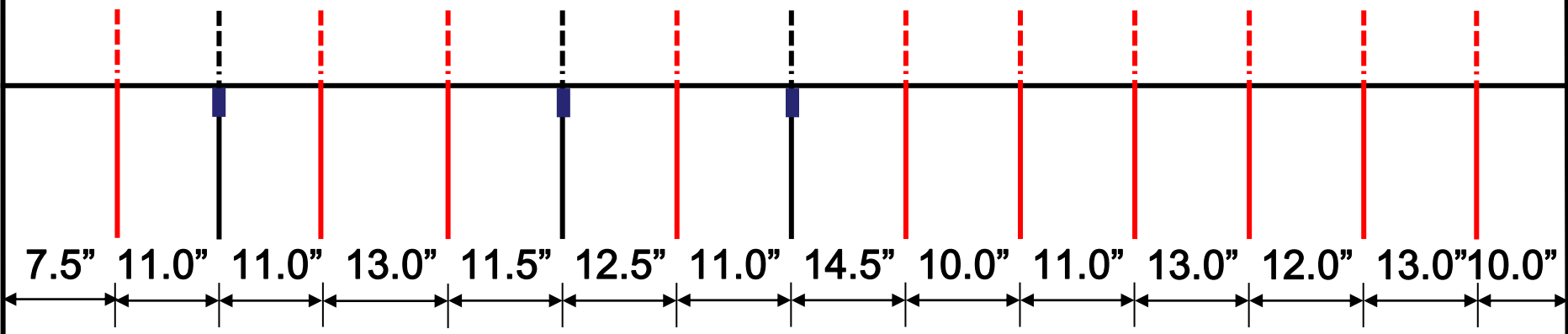
■: SSG

Existing Pavement

Left

Mid-left

Mid-right



7.5" 11.0" 11.0" 13.0" 11.5" 12.5" 11.0" 14.5" 10.0" 11.0" 13.0" 12.0" 13.0" 10.0"

13' - 5"

Full depth
repair section

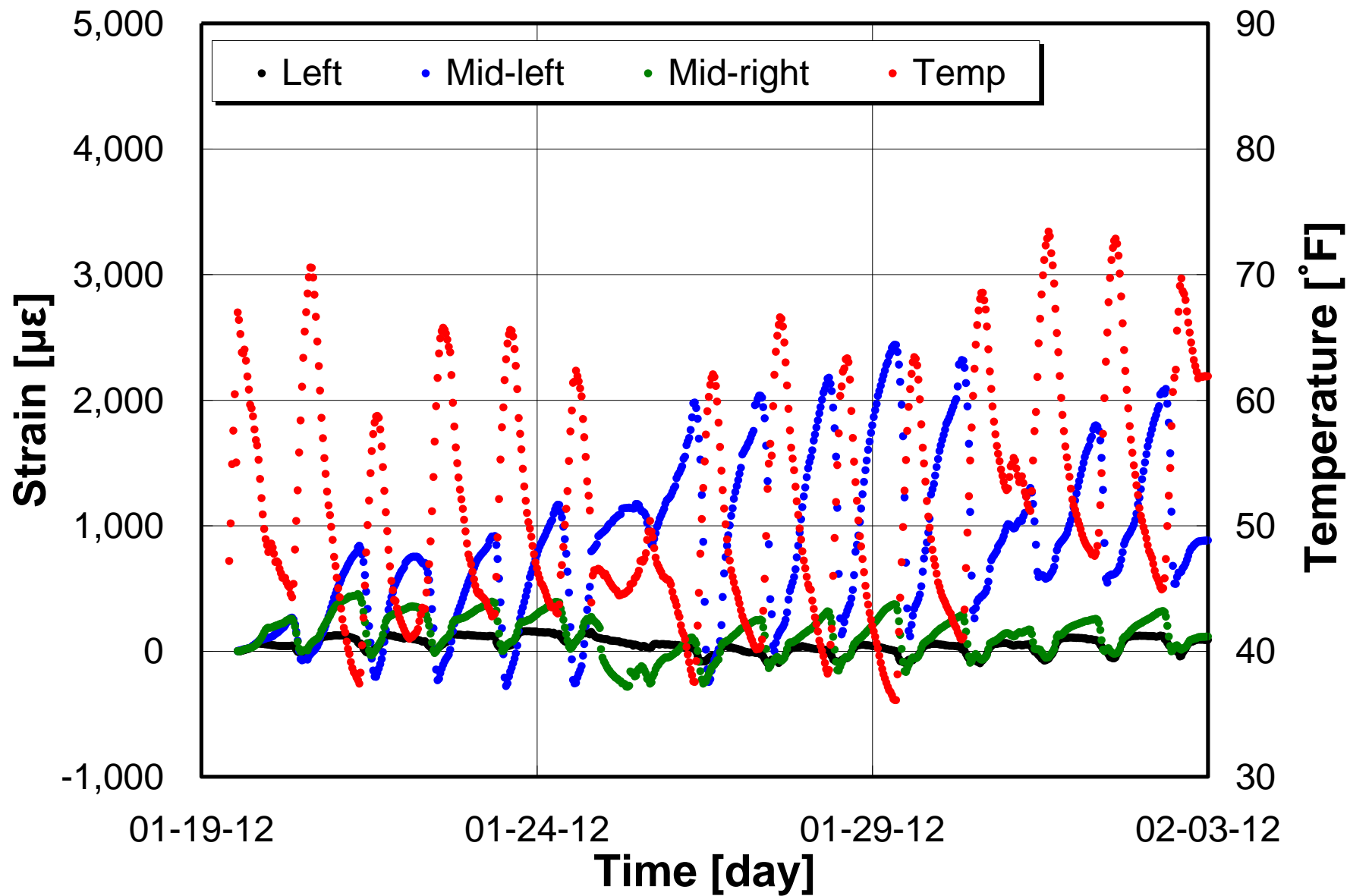
THE STEEL SPACING FOR CONTINUOUSLY REINFORCED CONCRETE PAVEMENT (CRCP) AND JOINTED REINFORCED CONCRETE PAVEMENT (JRCP) SHALL BE REINFORCED AS SHOWN IN TABLE NO.1.

TABLE NO. 1 STEEL BARS SIZE AND SPACING

| TYPE OF REINFORCEMENTS | TYPE PAVEMENT | PAVEMENT THICKNESS (INCHES) | TIEBARS | | REGULAR REBARS | |
|------------------------|---------------|-----------------------------|--------------------|----------------------|--------------------|------------------|
| | | | SIZE BAR (BAR NO.) | BAR SPACING (INCHES) | SIZE BAR (BAR NO.) | SPACING (INCHES) |
| TRANSVERSE BARS | CRCP JRCP | ALL | #6 | 24 | #6 | 24 |
| | JCP (CPCD) | ALL | #6 | 24 | NONE | NONE |
| LONGITUDINAL BARS | CRCP | 8 | #6 | 9 | #6 | 9 |
| | | 9 | #6 | 8 | #6 | 8 |
| | | 10 | #6 | 7 | #6 | 7 |
| | | 11 | #6 | 6.5 | #6 | 6.5 |
| | | ≥ 12 | #6 | 6 | #6 | 6 |



01.19.2012 10:55





01.11.2012 15:40



02/10/2012 14:35



02/10/2012 14:39



DEC 7 2001



8-in CRCP

8-in CRCP



3-in AC Overlay

8-in CRCP

8-in CRCP



3-in AC Overlay

8-in CRCP



3-in AC Overlay

8-in CRCP

8-in CRCP



3-in AC Overlay

8-in CRCP



3-in AC Overlay

8-in CRCP

8-in CRCP



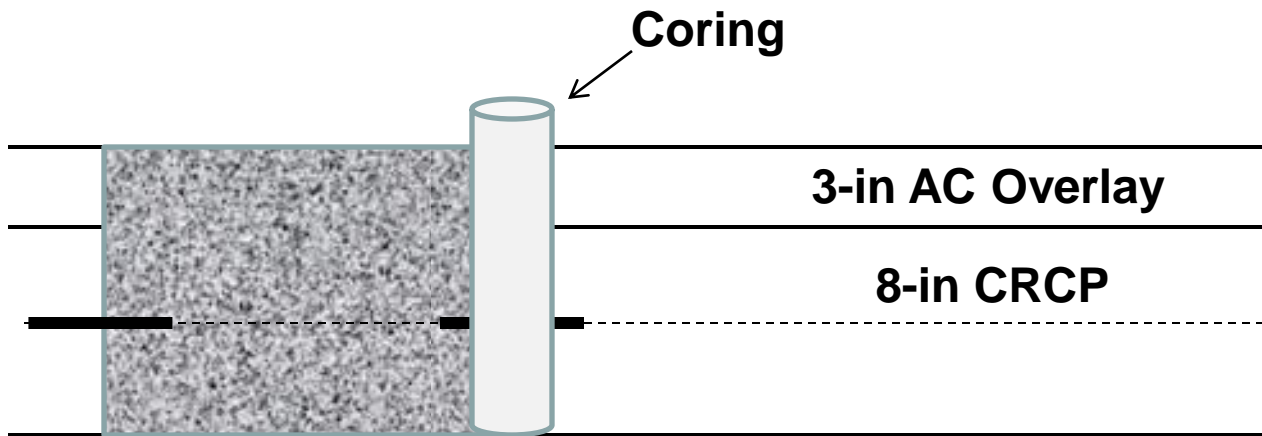
3-in AC Overlay

8-in CRCP



3-in AC Overlay

8-in CRCP











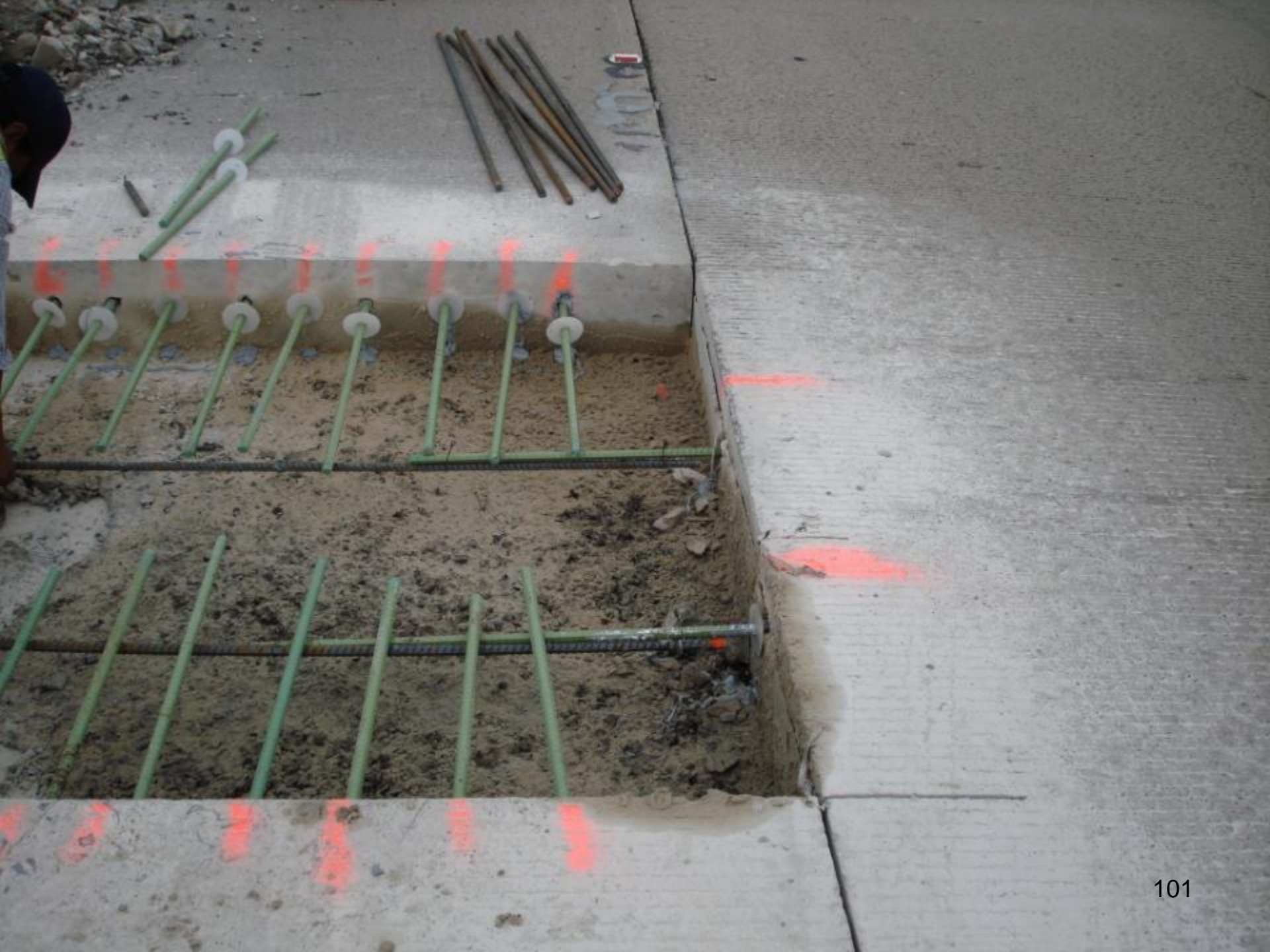


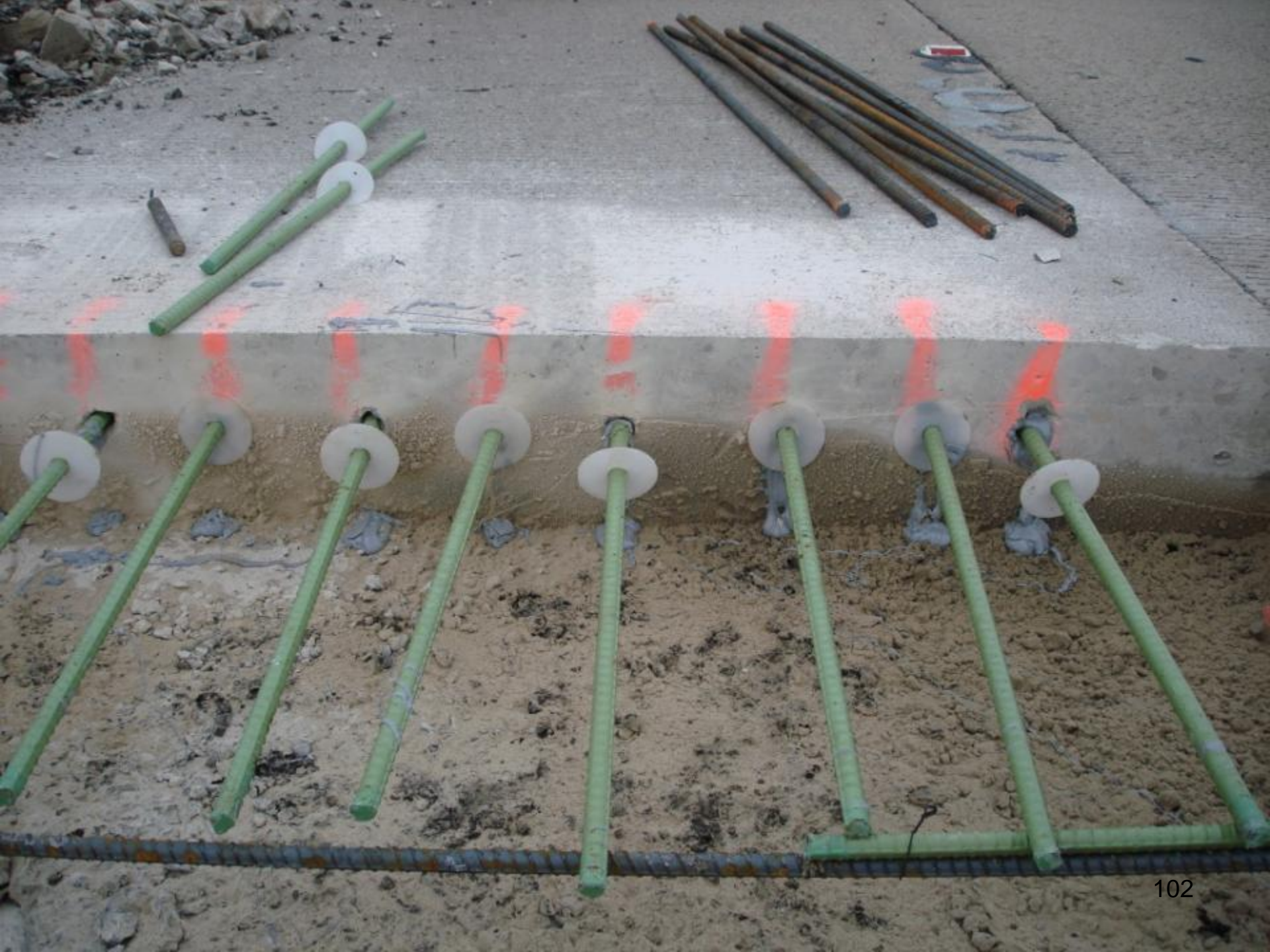


361.3. Construction.

Provide grout retention disks for all tiebar holes.







Remove or repair loose or damaged base material, and replace or repair it with approved base material to the original top of base grade. Place a polyethylene sheet at least 4 mils thick as a bond breaker at the interface of the base and new pavement. Allow concrete used as base material to attain sufficient strength to prevent displacement when placing pavement concrete.



01.19.2012 12:21

Remove or repair loose or damaged base material, and replace or repair it with approved base material to the original top of base grade. Place a polyethylene sheet at least 4 mils thick as a bond breaker at the interface of the base and new pavement. Allow concrete used as base material to attain sufficient strength to prevent displacement when placing pavement concrete.



12.04.2008 09:59

Remove or repair loose or damaged base material, and replace or repair it with approved base material to the original top of base grade. Place a polyethylene sheet at least 4 mils thick as a bond breaker at the interface of the base and new pavement. Allow concrete used as base material to attain sufficient strength to prevent displacement when placing pavement concrete.











361.3. Construction.

dowel bars in place. Demonstrate, through simulated job conditions, that the bond strength of the epoxy-grouted tiebars meets a pullout strength of at least 3/4 of the yield strength of the tiebar when tested in accordance with ASTM E 488 within 18 hr. after grouting. Increase embedment depth and retest when necessary to meet testing requirements. Perform tiebar testing before starting repair work.

Drill-Epoxy Evaluations

- Test procedures
- Preliminary test
- Main test



Drill a hole



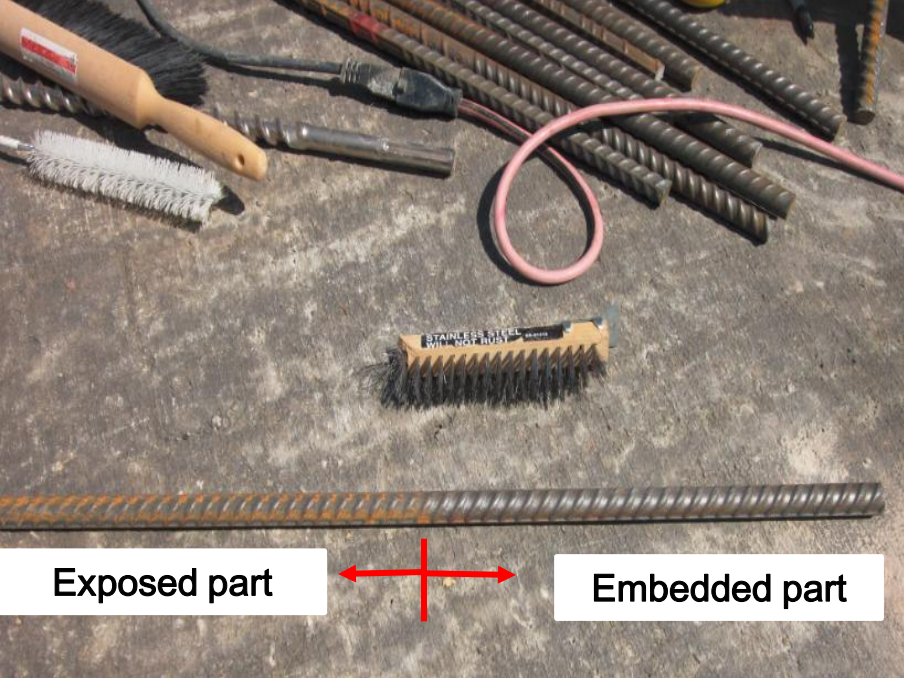
Clean a hole



Clean a hole



Remove stain on a rebar





Grout a rebar with epoxy



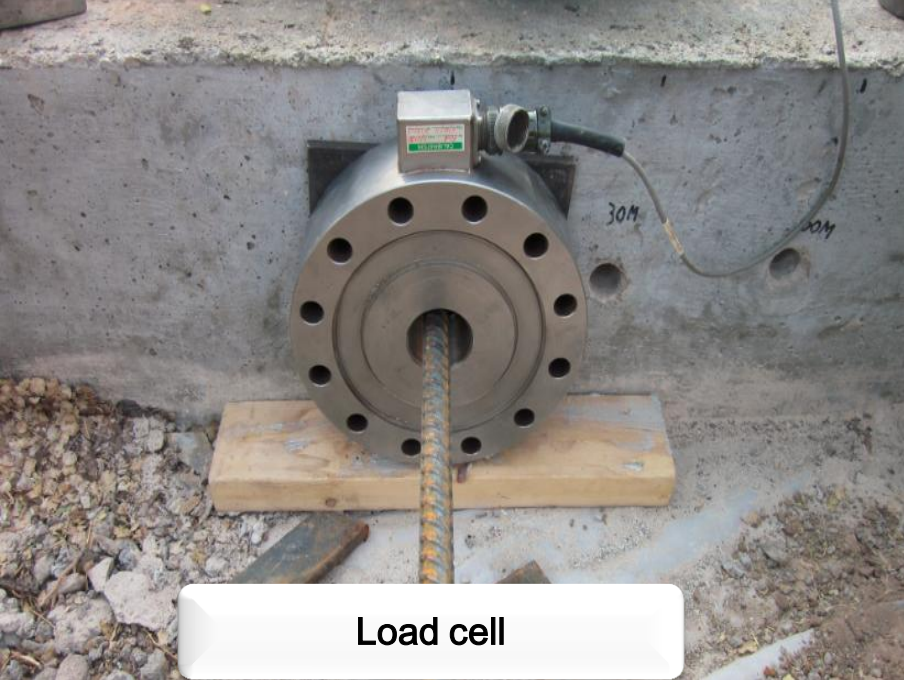
Insert a rebar in the hole



Prevent the epoxy leak



Steel plate



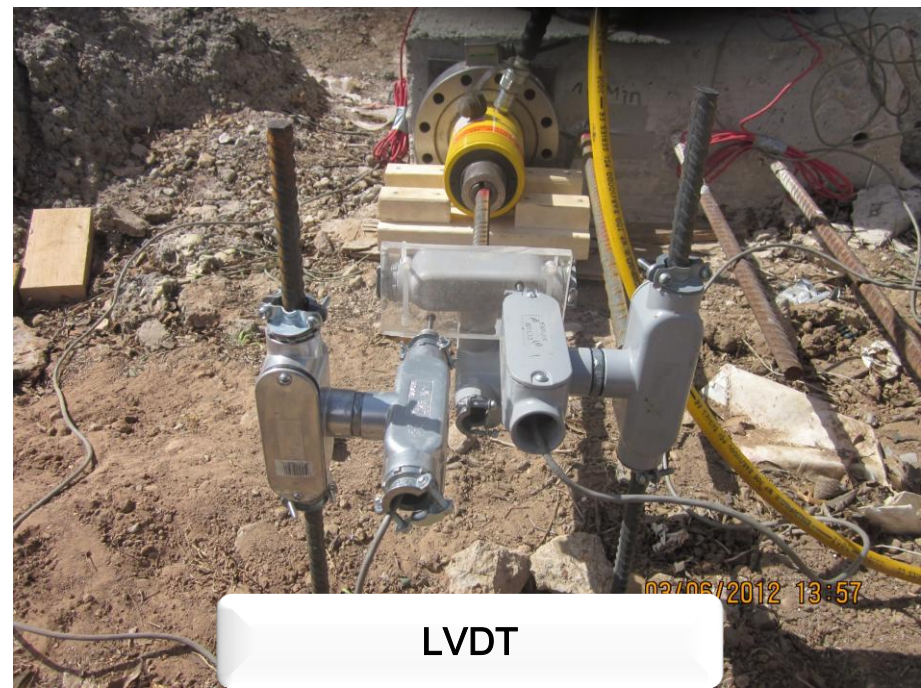
Load cell



Hydraulic jack



Gripper and reference point



LVDT



Preliminary test

Experimental factors

- Used # 6 rebar for all test
- Compressive strength of concrete at testing day : 8,485 and 8,274 psi
- Quantity of epoxy
- Curing time of epoxy
- Hole condition

Test 1

- 1 Hour curing
- Enough epoxy



Test 2

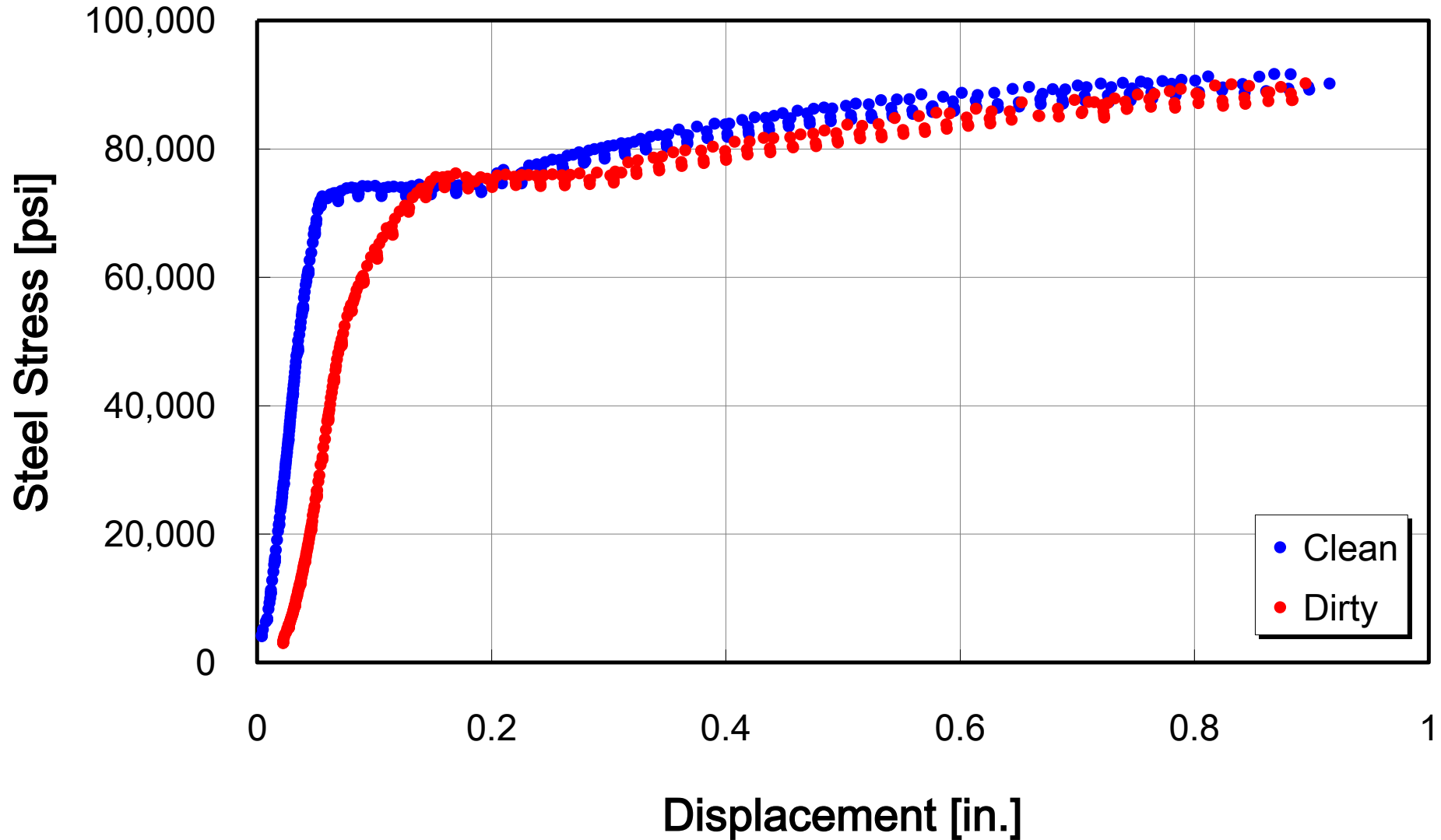
- 1 Hour curing
- Not enough epoxy



Hole condition

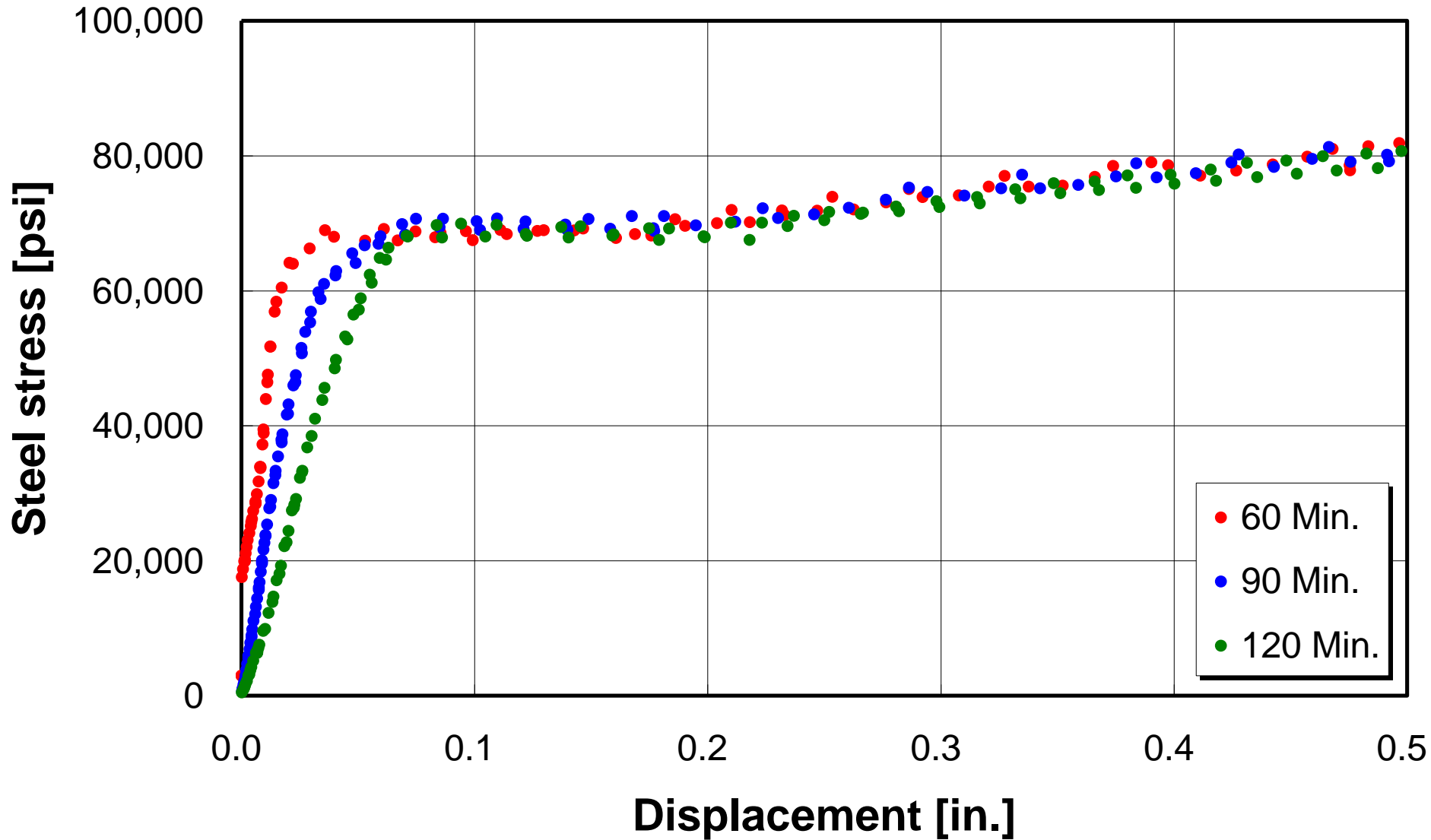


Hole condition

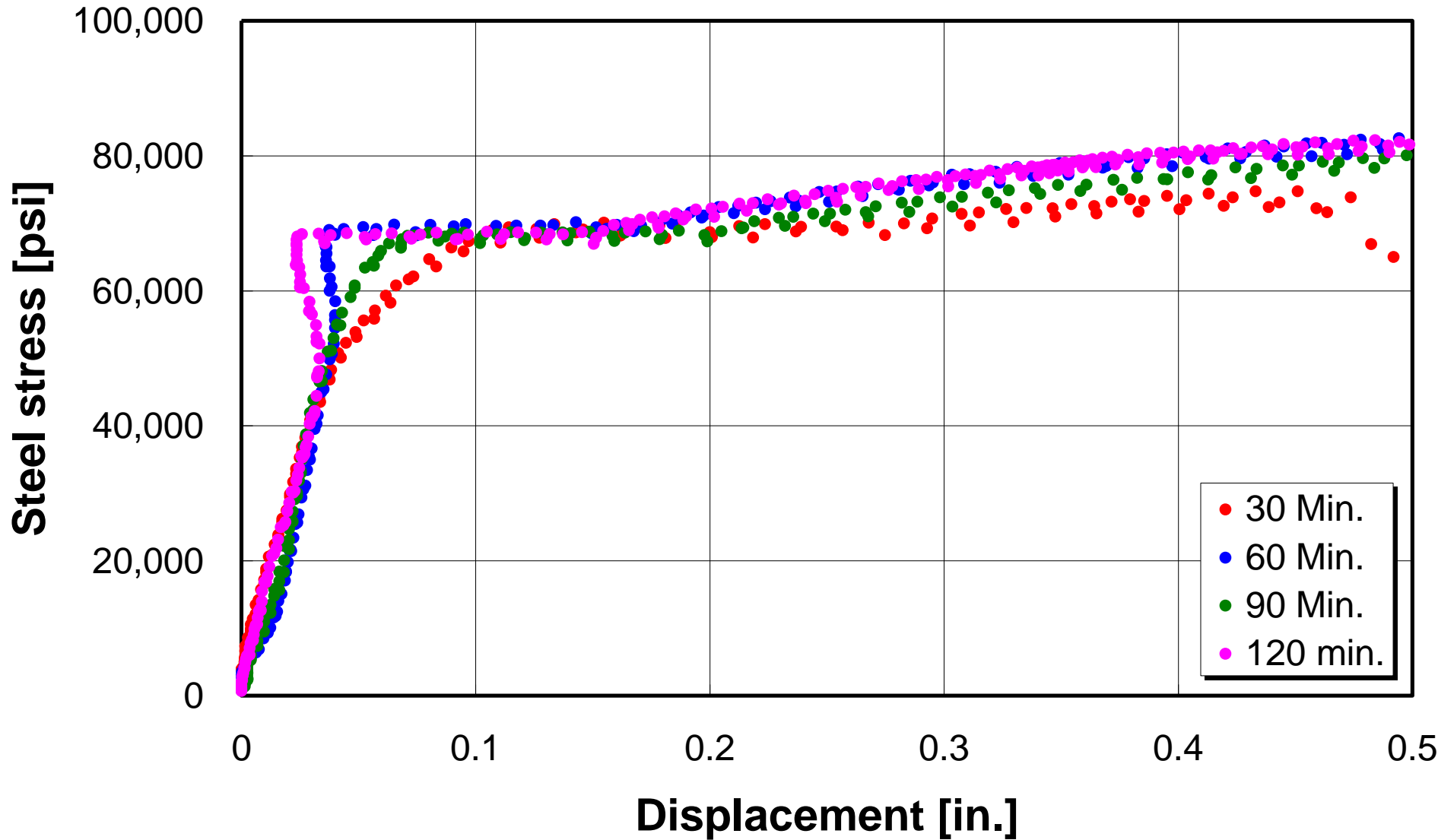


Main test

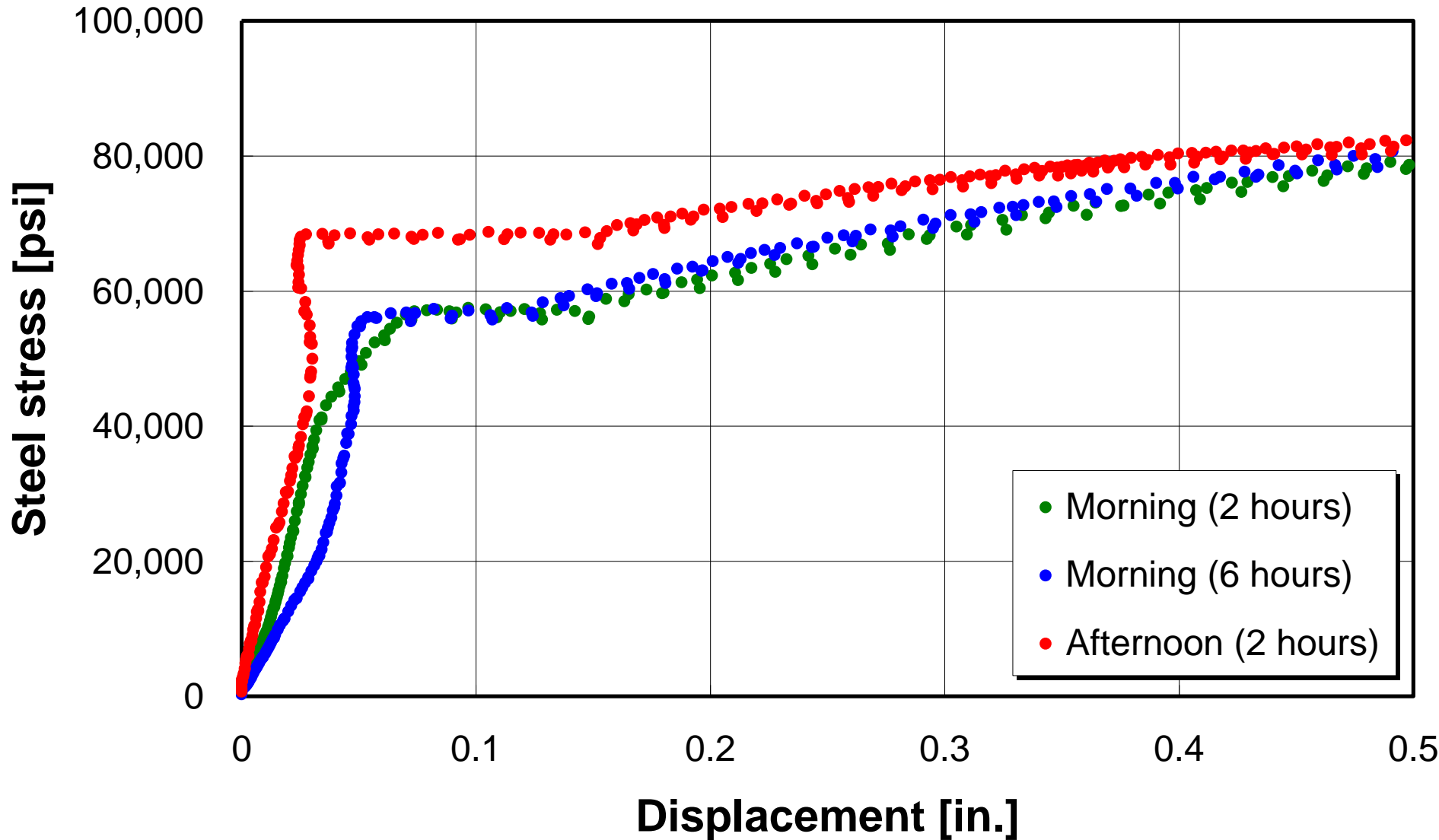
Curing time -1



Curing time - 2

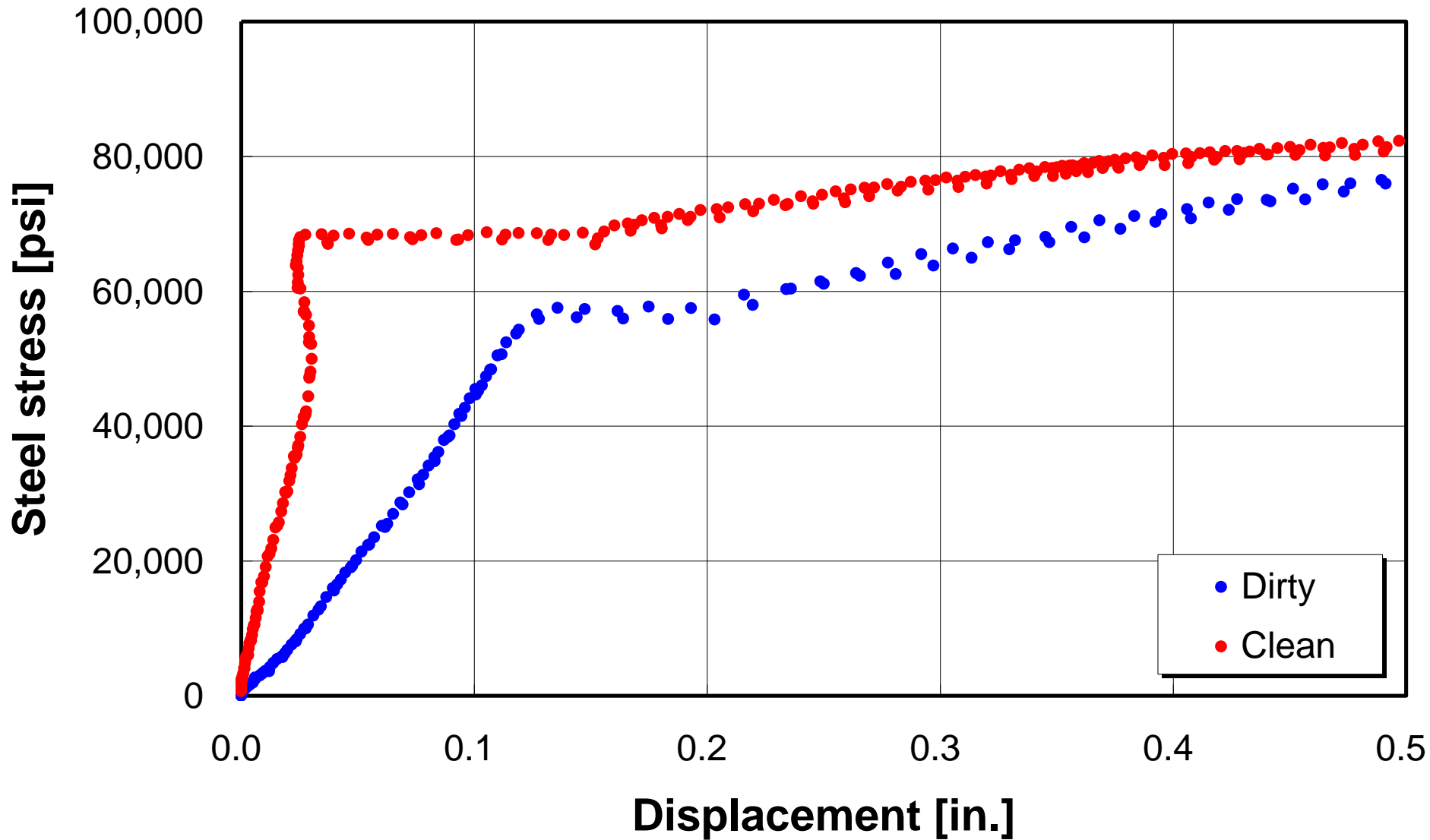


Epoxy injecting time





Dirty and clean hole



Specification method



Non-compliance

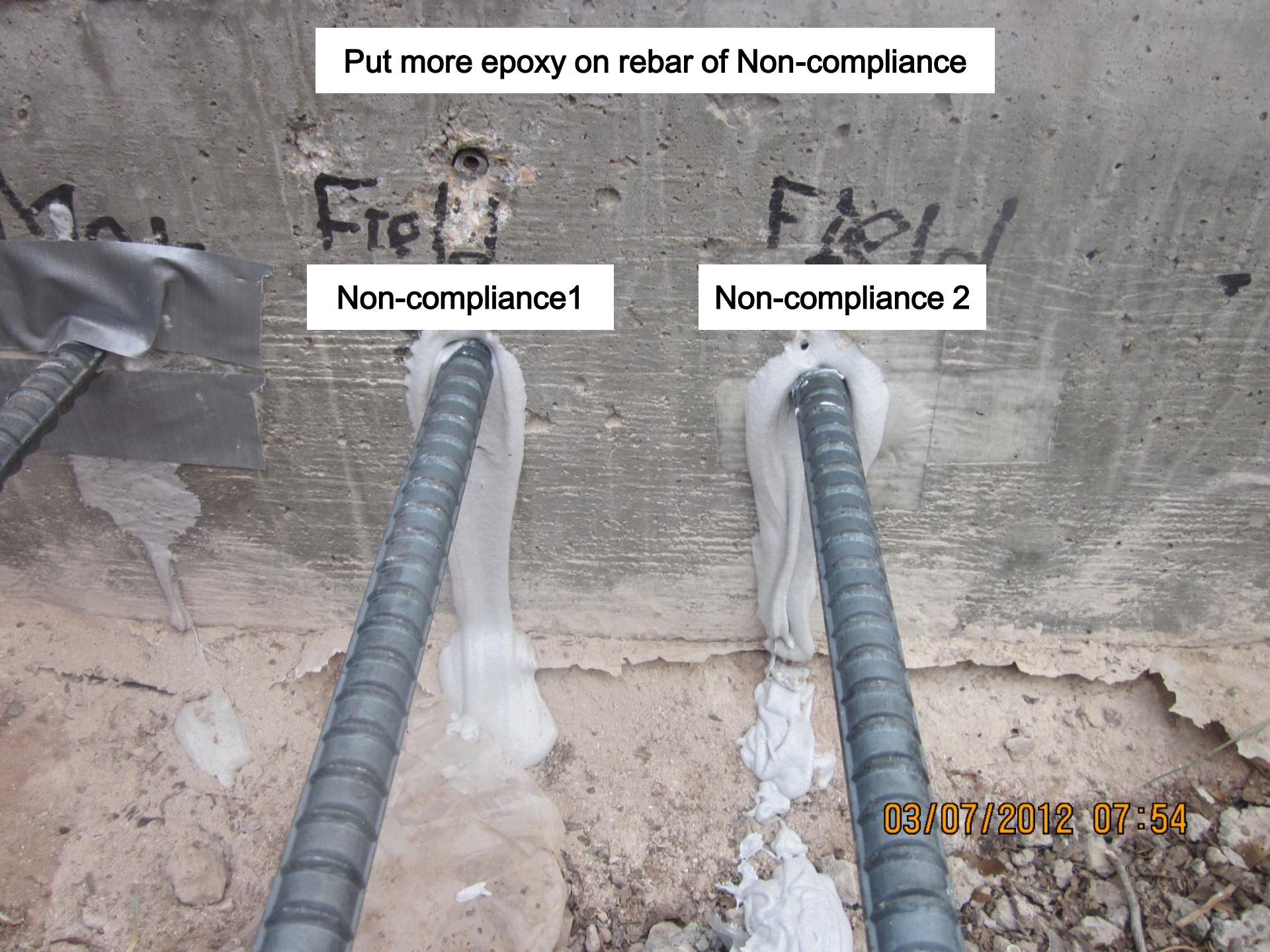


Put more epoxy on rebar of Non-compliance

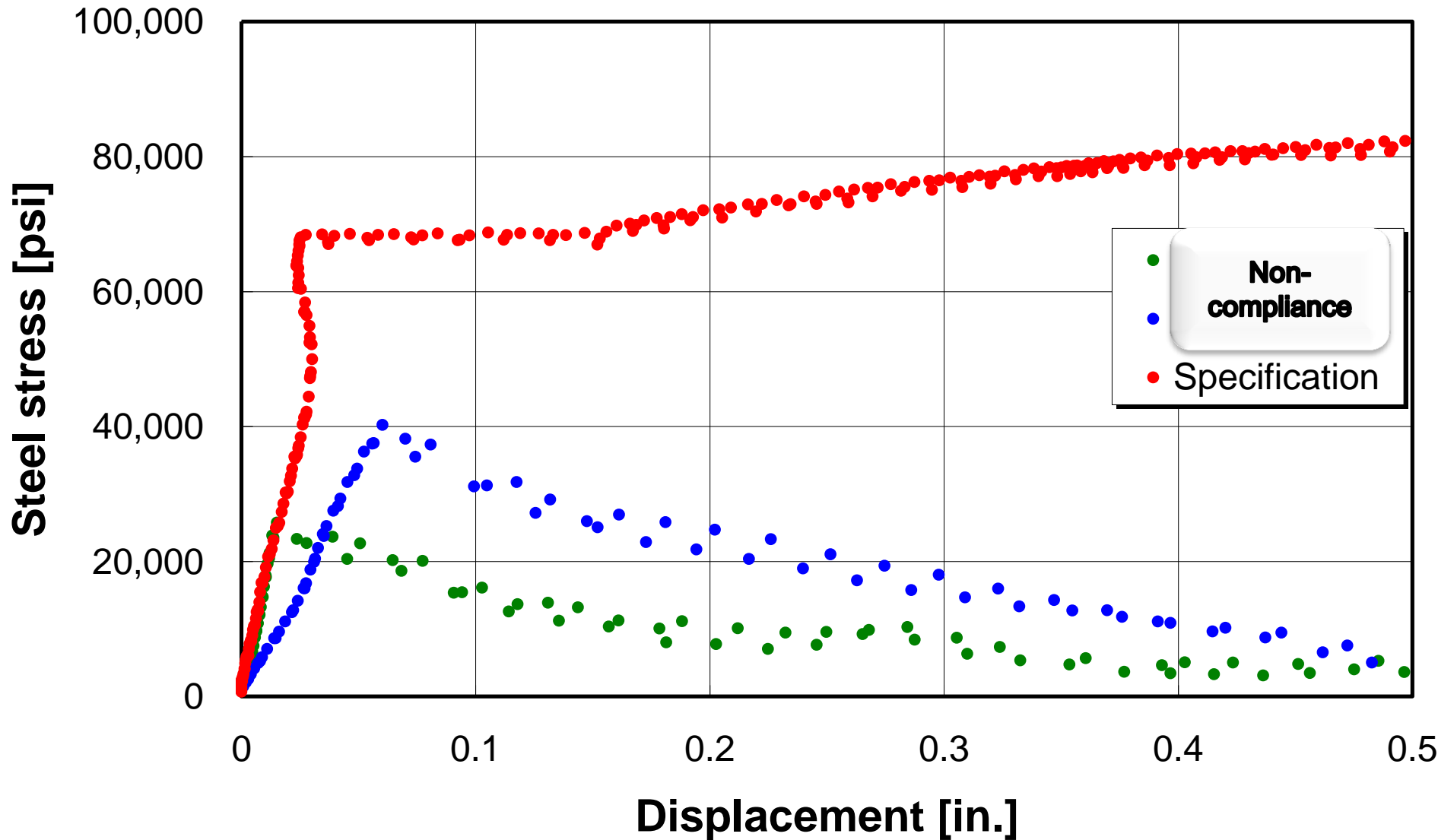
Non-compliance 1

Non-compliance 2

03/07/2012 07:54



Epoxy injecting method





EPC

EPC6

2 in

3 in

6 in

6 in

9 in

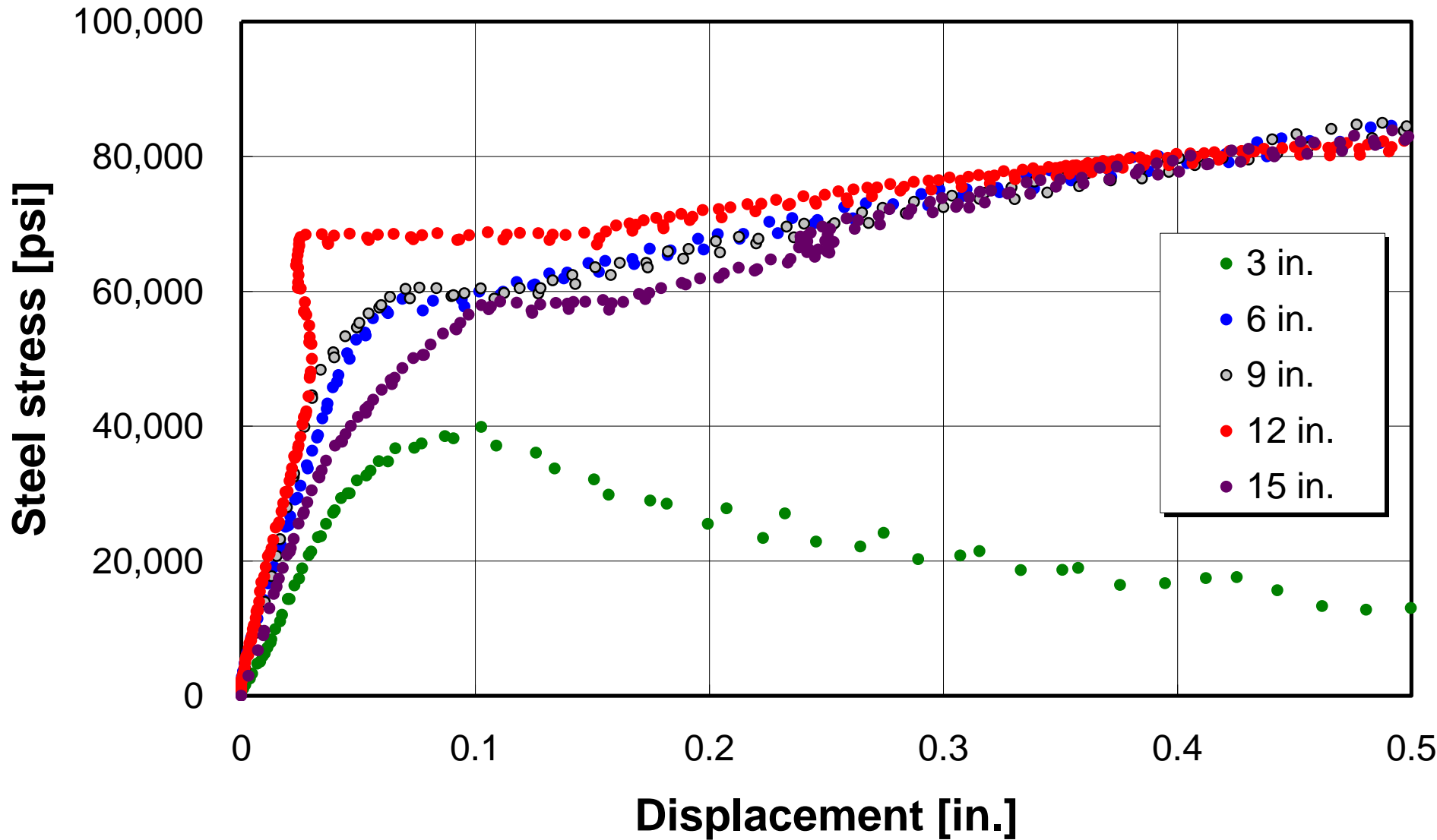
9 in

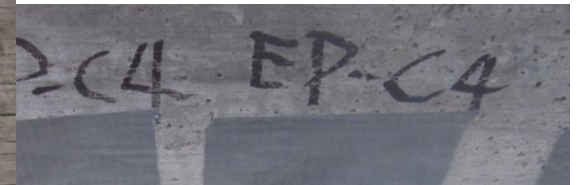
15 in

15 in

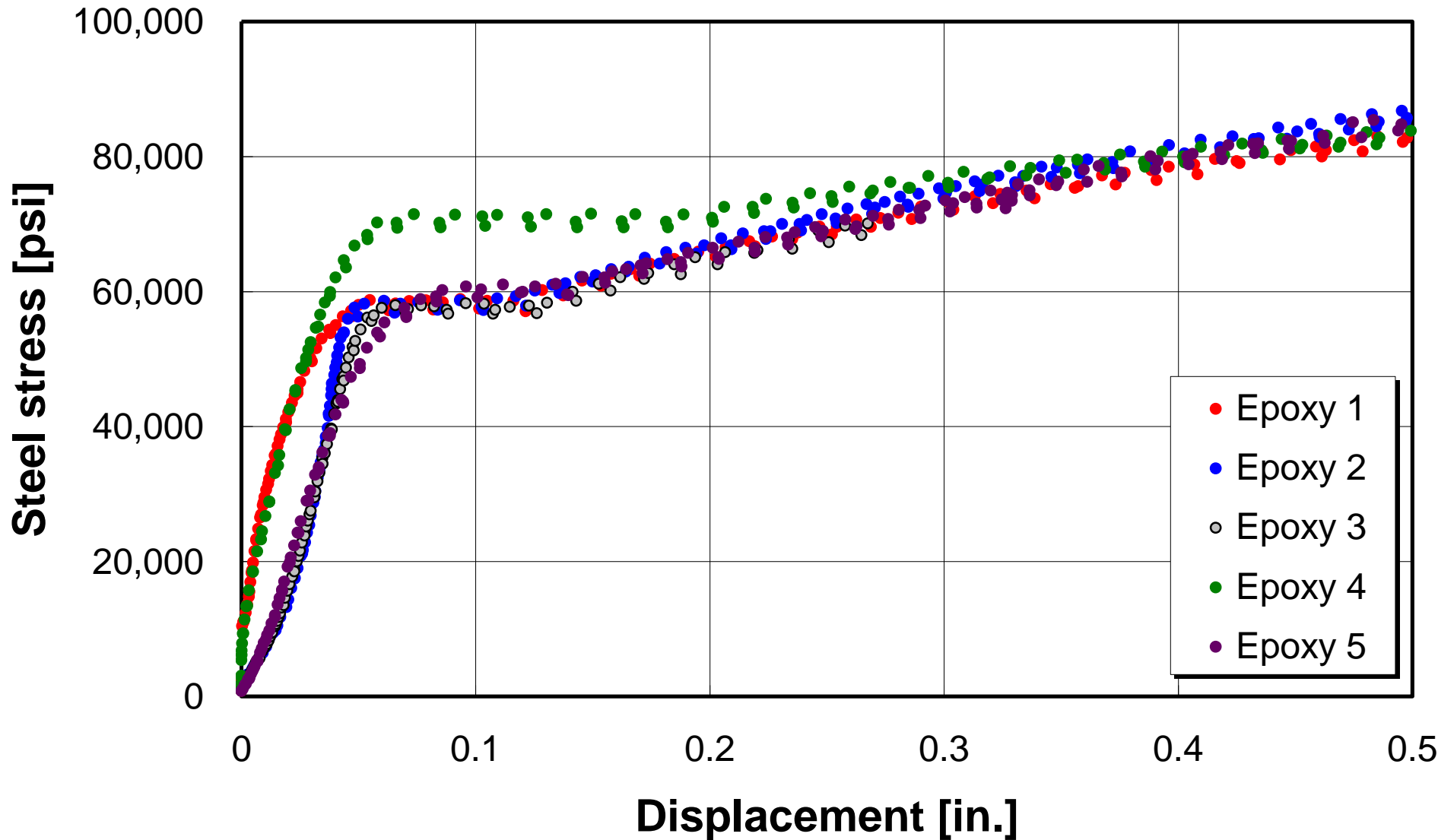
03/07/2012 13:18

Embedded depth





Different epoxy





01.18.2012 17:45



01/19/2012 08:54



01/19/2012 09:50



01/19/2012 09:49



01/19/2012 10:25



01/19/2012 10:25



STOP
ALL WAY

STOP
ALL WAY

SOUTH
369
NORTH
369

PAVING
FURNACE
SCHAFFER
CLARK

01.19.2012 10:51



SSG

01.19.2012 10:55



Thermocouple

01/19/2012 10:56



01.19.2012 12:23



Regular 309¢
Special 379¢
Fuel

01.19.2012 12:47



01.19.2012 12:47



01.19.2012 12:46



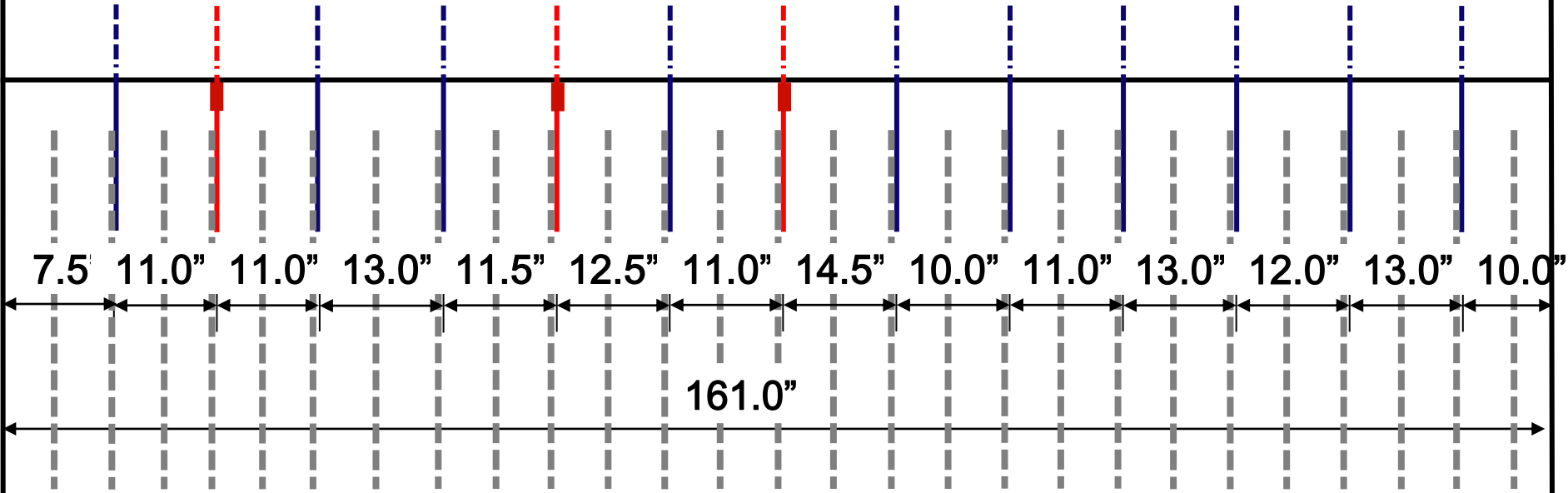
01.19.2012 12:50

Gage analysis

Layout of gage installation

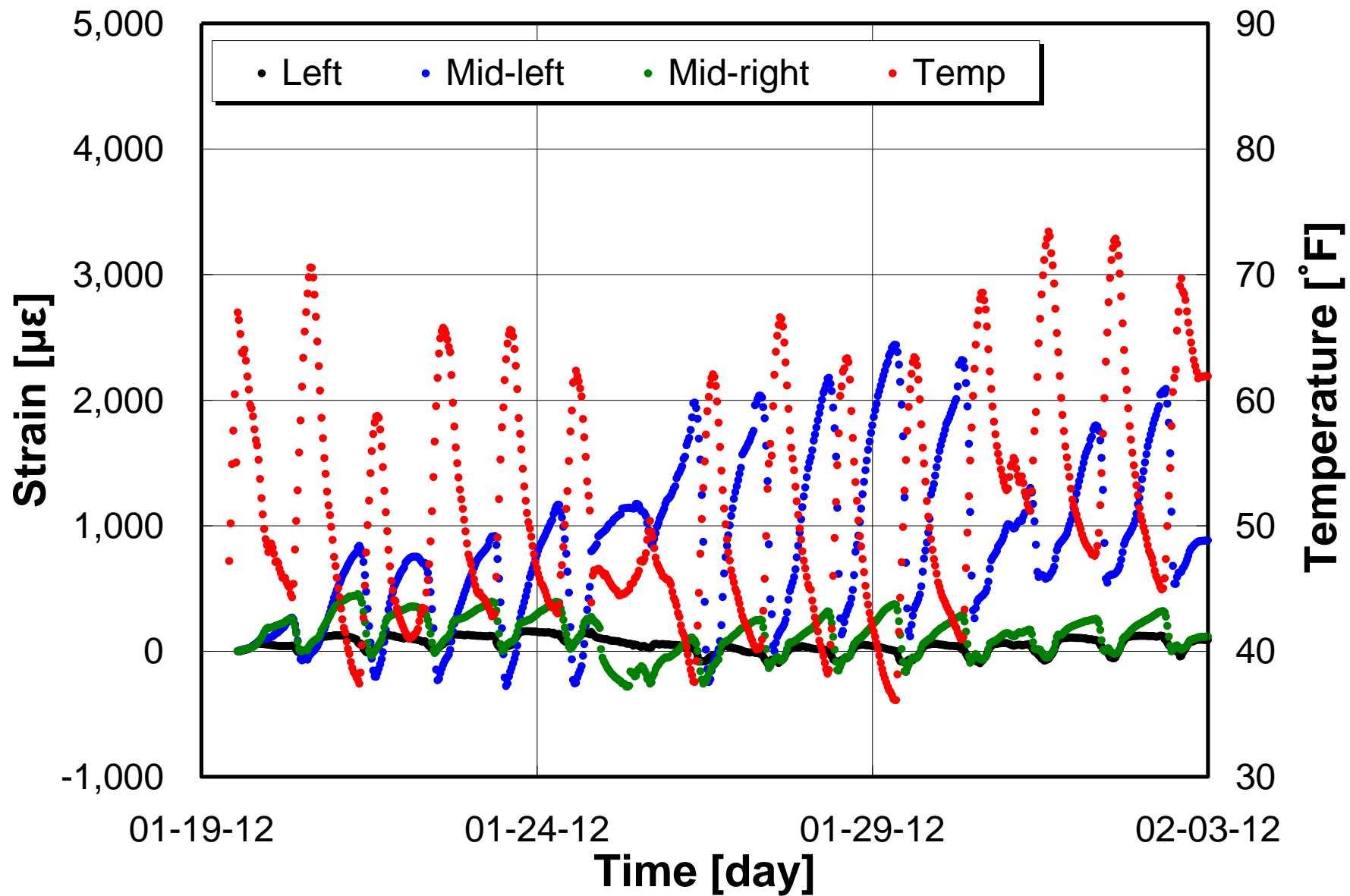
Existing Pavement

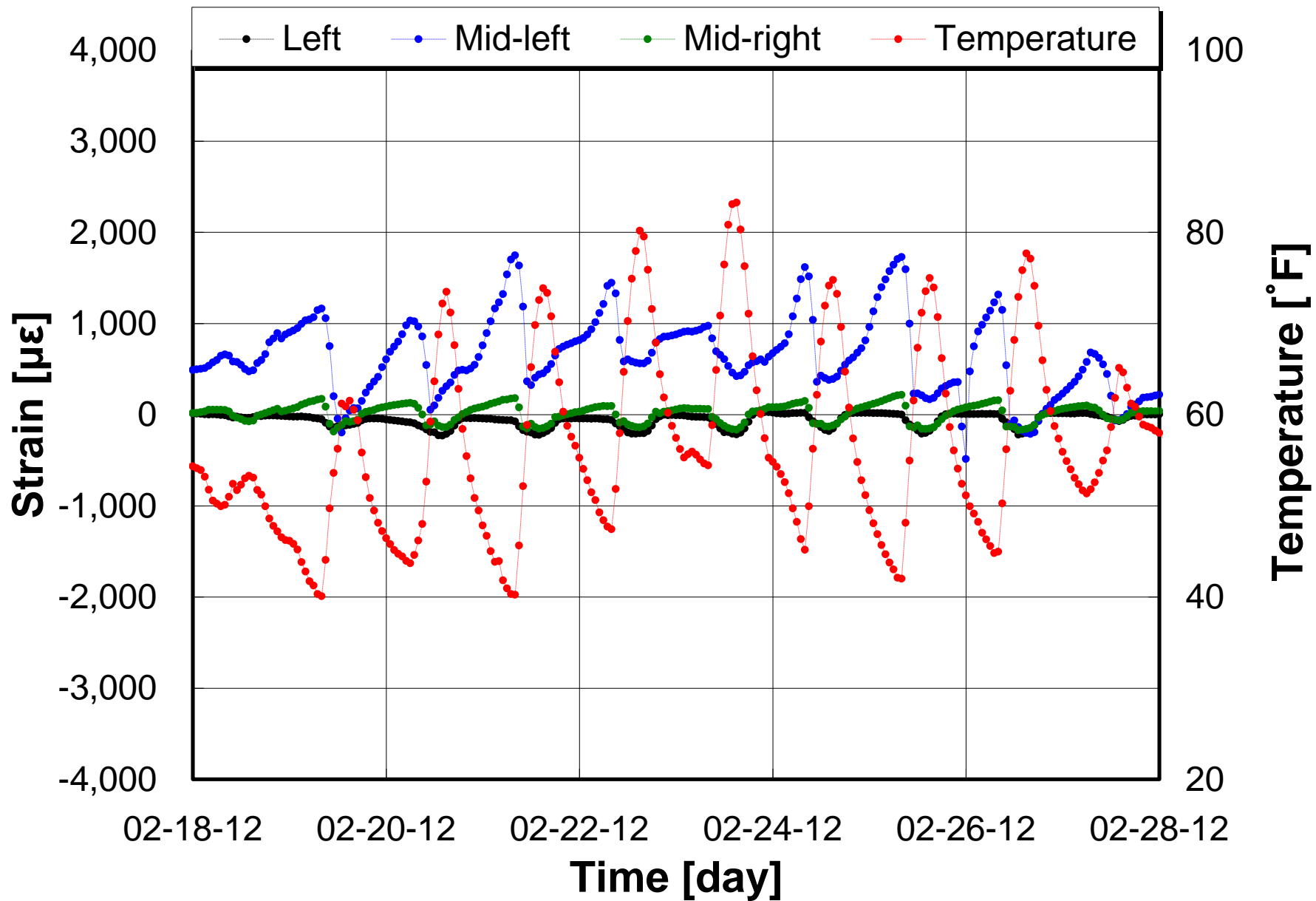
Left Mid-left Mid-right



Full depth
repair section

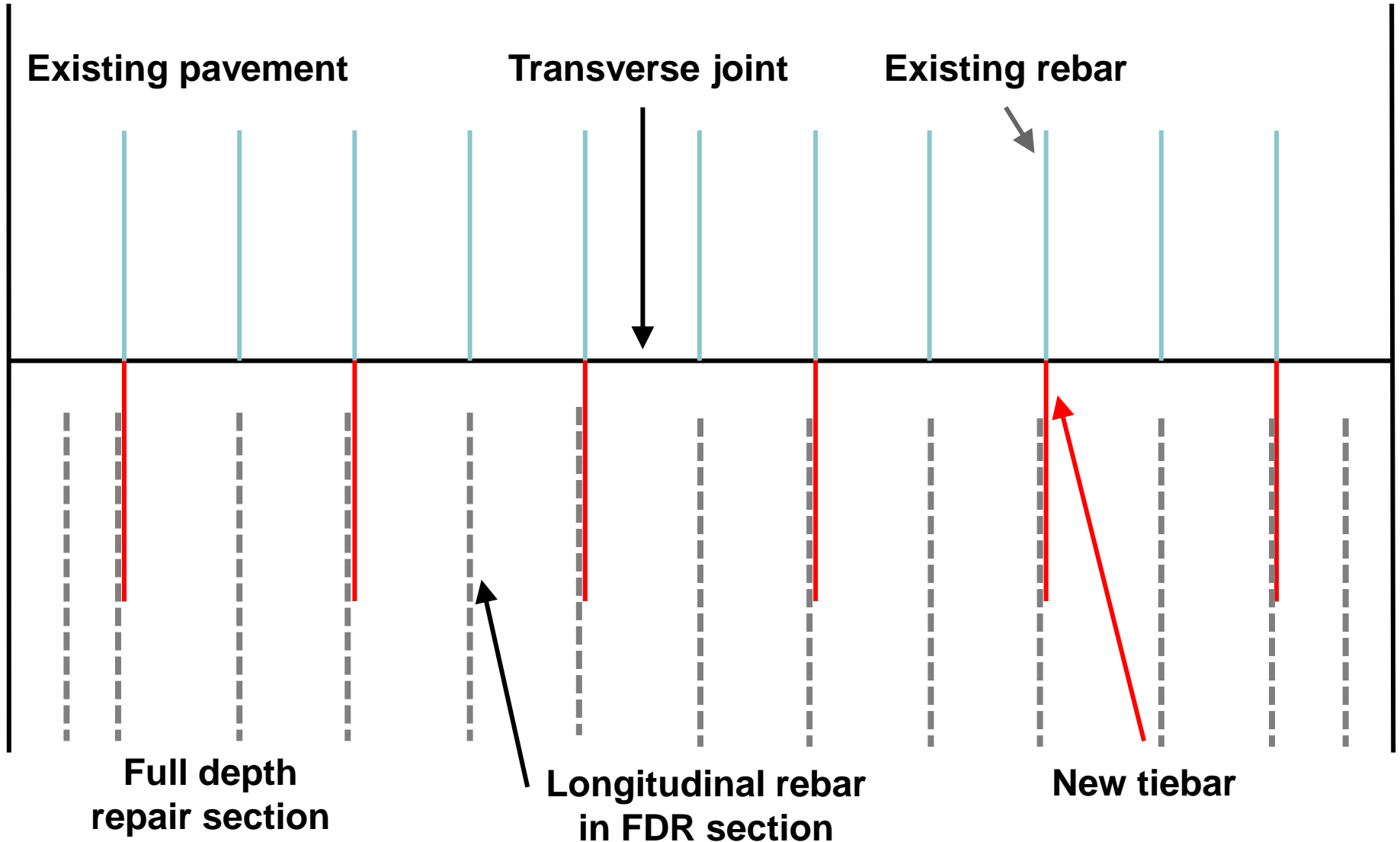
- : SSG
- · - : Tiebar with SSG
- · - : Tiebar without SSG
- · - : Longitudinal rebar in FDR section





Other Issues with FDRs

Non-Compliance with Specifications





01.11.2012 16:04



01.19.2012 10:49



01.11.2012 16:04

TABLE NO. 1 STEEL BARS SIZE AND SPACING

| TYPE OF REINFORCEMENTS | TYPE PAVEMENT | PAVEMENT THICKNESS (INCHES) | TIEBARS | | REGULAR REBARS | | ALL BARS FIRST & LAST SPACING AT END OR SIDE (INCHES) |
|------------------------|---------------|-----------------------------|--------------------|----------------------|--------------------|------------------|--|
| | | | SIZE BAR (BAR NO.) | BAR SPACING (INCHES) | SIZE BAR (BAR NO.) | SPACING (INCHES) | |
| TRANSVERSE BARS | CRCP JRCP | ALL | #6 | 24 | #6 | 24 | 12 |
| | JCP (CPCD) | ALL | #6 | 24 | NONE | NONE | 12 |
| LONGITUDINAL BARS | CRCP | 8 | #6 | 9 | #6 | 9 | 12 |
| | | 9 | #6 | 8 | #6 | 8 | 12 |
| | | 10 | #6 | 7 | #6 | 7 | 12 |
| | | 11 | #6 | 6.5 | #6 | 6.5 | 12 |
| | | ≥ 12 | #6 | 6 | #6 | 6 | 12 |
| | JRCP | ALL | #6 | 12 | #6 | 24 | 12 |
| | JCP (CPCD) | ALL | #6 | 12 | NONE | NONE | 12 |



Texas Department of Transportation
Construction Division (Pavements)

FULL DEPTH REPAIR
FOR
CONCRETE PAVEMENT

FDR (CP) -05

| | | | | |
|------------------------|-----------|---------------------|--------|-------------|
| FILE: fdrp05.dgn | DN: TxDOT | CK: | DW: HC | CK: LL |
| © TxDOT September 1994 | DISTRICT | FEDERAL AID PROJECT | | SHEET |
| REVISIONS | | | | |
| COUNTY | | CONTROL | SECT | JOB HIGHWAY |
| | | | | |

No compaction on loose base



Insufficient epoxy



01.11.2012 15:40

Different depths



01.11.2012 15:59

No transverse tiebars



01.11.2012 16:03

Use only drilling operations that do not damage the surrounding operations. Place new deformed reinforcing steel bars of the same size and spacing as the bars removed or as shown on the plans.



02/09/2012 13:10



02/10/2012 15:40

012
30

HAMMER
DRILL
NO.
1-1

HAMMER
DRILL
NO.
1-2

HAMMER
DRILL
NO
1-3

surface

02/10/2012 16:40



02/10/2012 15:49

PARTIAL-DEPTH REPAIR OF CRCP

Partial-Depth Repair of CRCP

- Ideal for distresses that are limited to the top half of the slab in CRCP
- Ensuring good bond between existing CRCP and repair materials is a key to good performance.



02.10.2012 09:57



02/09/2012 11:01



03.17.2010 15:48



02.11.2012 07:53



02.11.2012 08:05



02.11.2012 08:34



03.18.2010 07:33

180



03.18.2010 07:59



02.11.2012 07:52



03.18.2010 07:59



03.18.2010 07:59

183



03.18.2010 08:00



03.18.2010 08:28

185



03.18.2010 09:24



03.18.2010 10:06

187



03.18.2010 11:15



03.18.2010 11:23



03.18.2010 11:31



03.18.2010 12:11



03.18.2010 12:14

192



03.18.2010 12:22



03.18.2010 12:57



03.18.2010 17:07

195



03.18.2010 17:22

196



03.18.2010 07:33



197
03.18.2010 17:22



01.10.2012 15:51

198

SPECIAL SPECIFICATION

XXXX

Partial Depth Repair of Concrete Pavement

1. **Description.** Repair concrete pavement to partial depth in accordance with the details shown on the plans and the requirements of this Item.
2. **Materials.** Provide materials that meet the pertinent requirements of the following:
 - Item 360, “Concrete Pavement”
 - Item 421, “Hydraulic Cement Concrete”
 - Item 440, “Reinforcing Steel”
 - DMS 6100, “Epoxies and Adhesives.”

If material in Item 421 does not meet the strength requirement, provide material that meets the requirements in DMS-4655, “Rapid-Hardening Cementing Materials for Concrete Repair”

3. **Equipment.** Provide tools and equipment necessary for proper execution of the work that meet the pertinent requirements of the following:
 - Item 360, “Concrete Pavement”
 - Item 429, “Concrete Structure Repair”

Summary

- Full-Depth Repairs -

- Establishing solid bond in tie bars
 - Spec requirements: fill holes with epoxy, minimize drain downs using grout retention disks
- Drilling holes
 - Hammer drill, rotary drill, core drill
 - At mid-depth or below the mid-depth if needed, but not above
- Tie bar or longitudinal bar spacing
 - Should be the same as in the existing CRCP.

Summary

- Full-Depth Repairs -

- Establishing solid base
 - Spec requirements: remove loose materials & replace with concrete

Summary

- Partial-Depth Repairs -

- Good candidate for distresses for US 75 and IH 30
 - Still under evaluations
- Establishing good bond bet'n old and new concrete
 - Hook bars
- Other good concreting practices