

I-10 Twin Span Bridge Instrumentation

Geocomp Corp.
&
LA DOTD & LTRC

TRB 01/12/2009

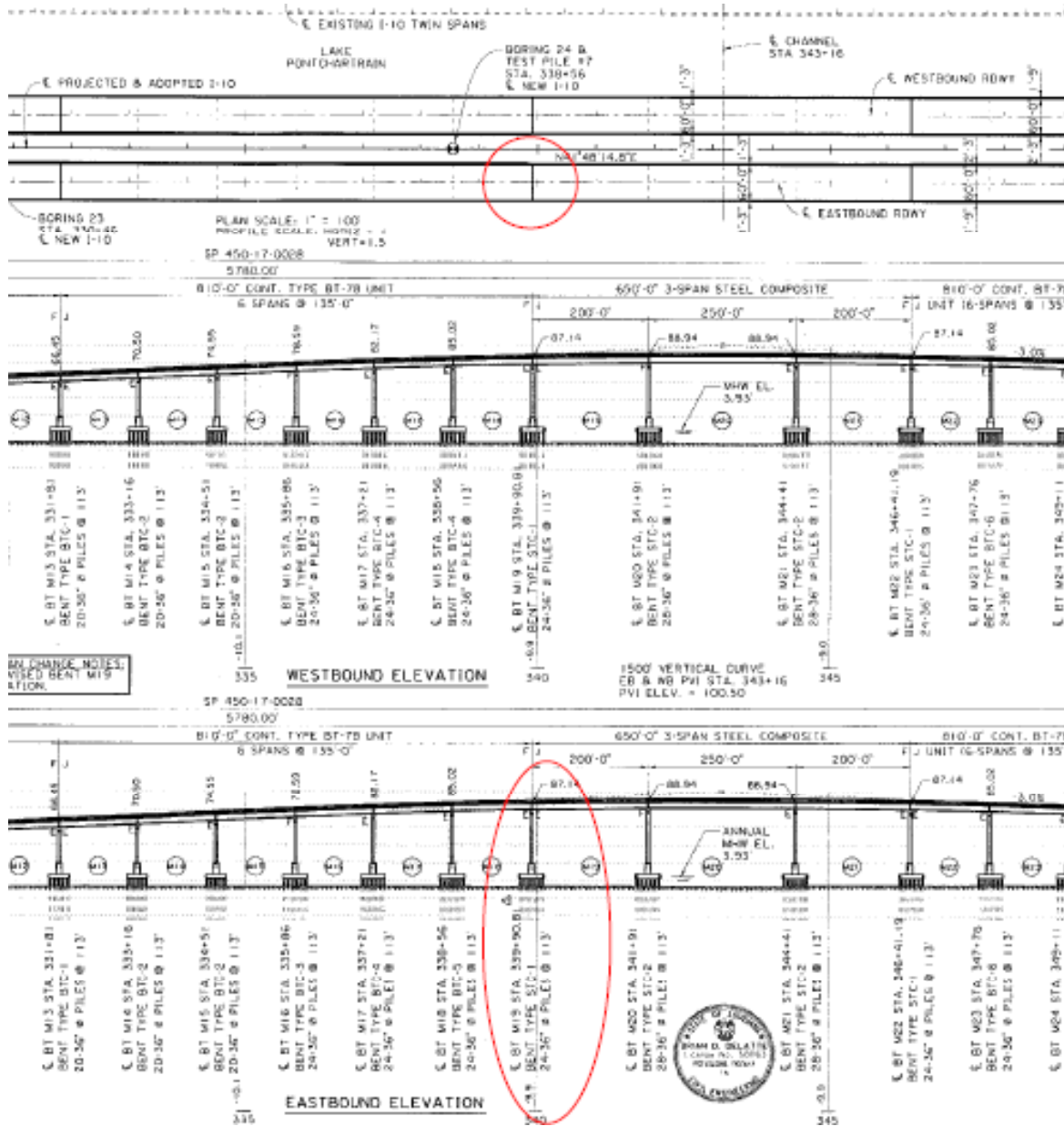
Objectives

- Short term monitoring for lateral load test of Eastbound pier M19 pile foundation.
- Pile performance during superstructure construction.
- Long-term health monitoring of foundation performance including short-term rapid loads from rogue wave, wind and impact.
- Long-term health monitoring of superstructure for strain and corrosion, including Weigh-In-Motion.

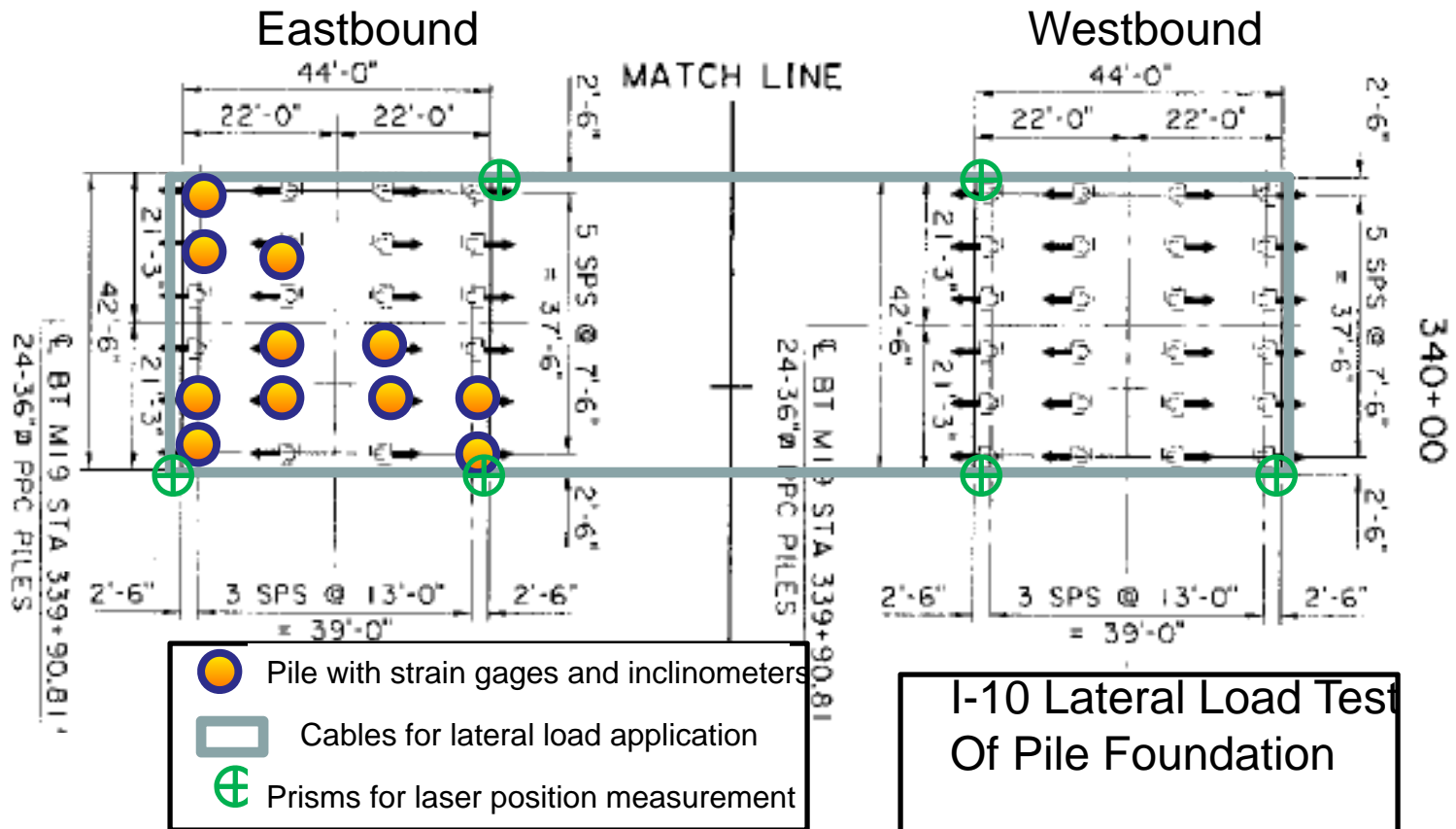
Challenges

- Sensors need to be installed during different construction phases. Sensors and cables need to fit into complex structure (reinforced concrete) systems and last for a long-time.
- Pulling together data from different sensors, such as sister bar strain gages, in-place inclinometer (IPI), tiltmeter, water pressure sensors, corrosion meters, triaxial accelerometers, weight-in-motion (WIM) system at high rates of sampling over years of monitoring.

M-19 Eastbound



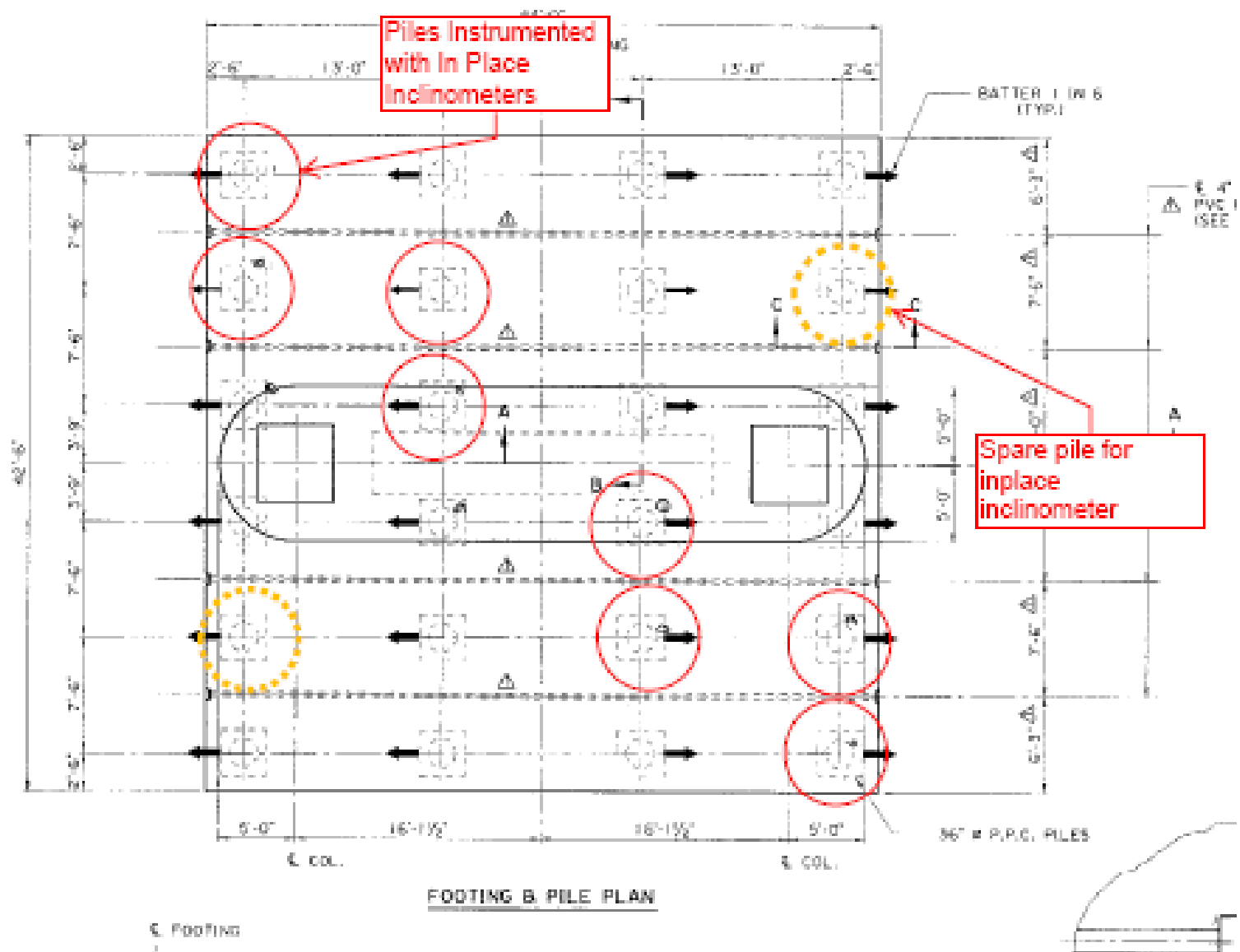
Water depth - ft
 Pile length – 150 ft
 Pile OD = 36 inches
 Batter: 1 to 6



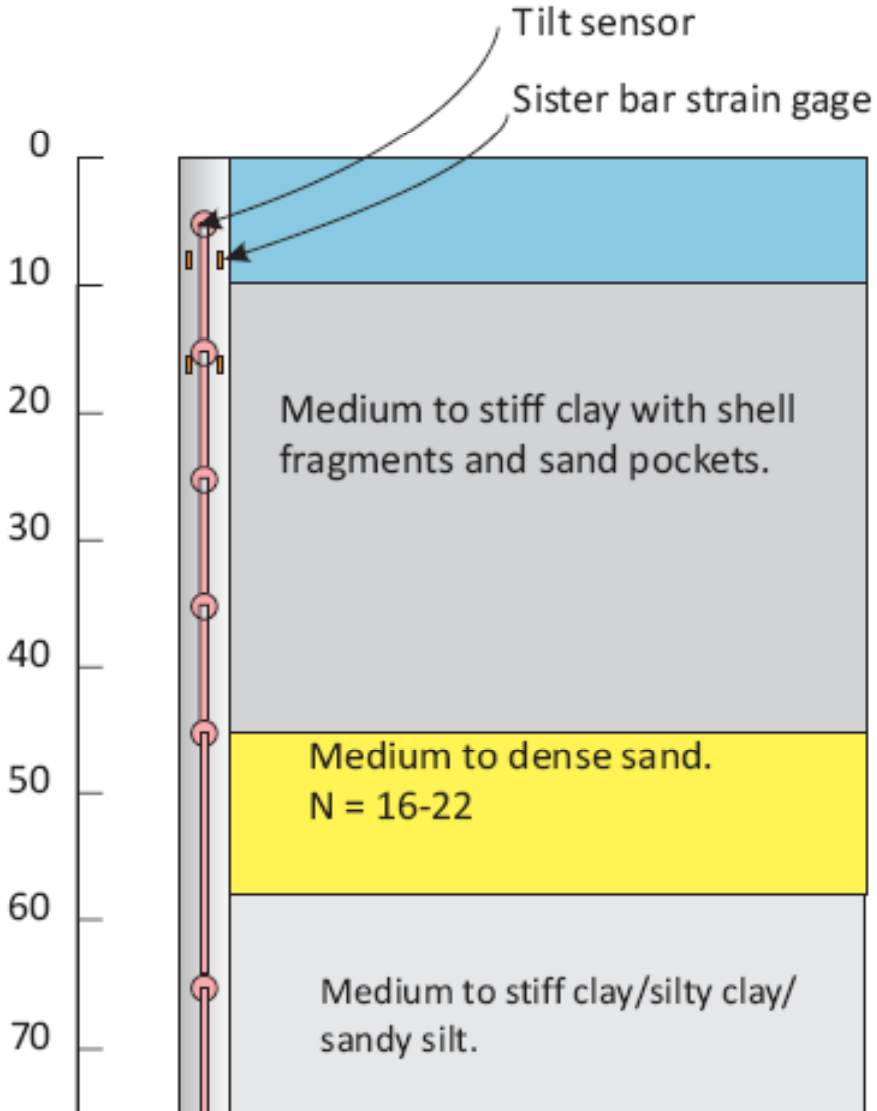
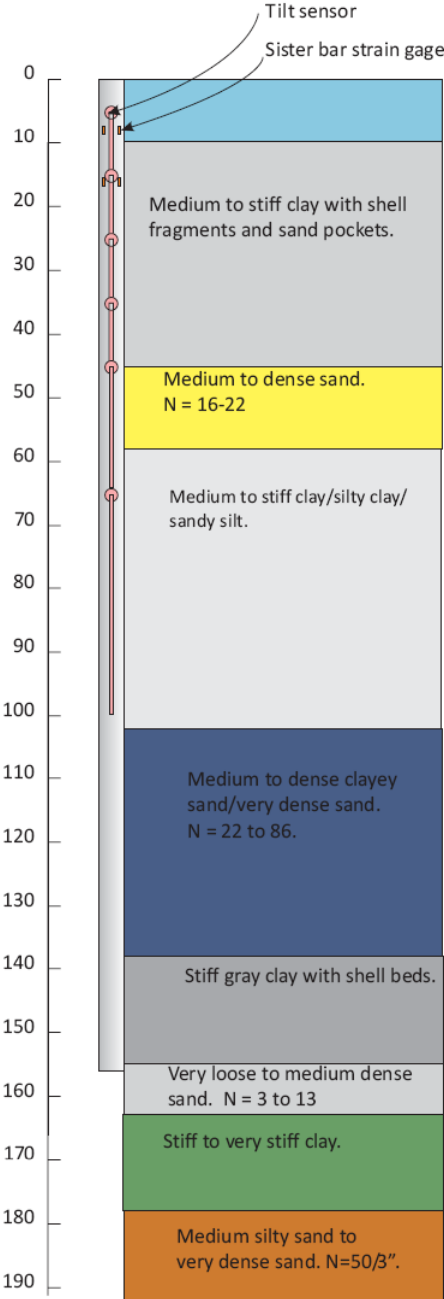
I-10 Lateral Load Test
Of Pile Foundation

Piles with In-place inclinometers

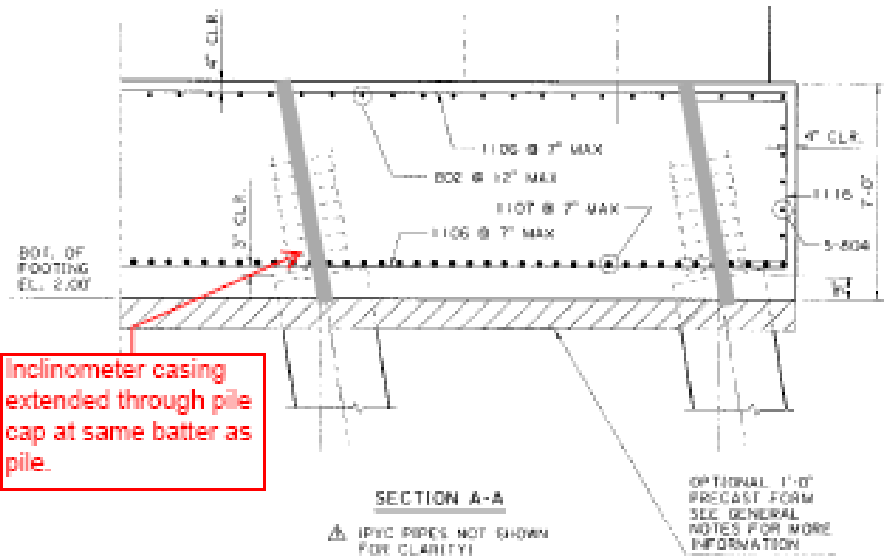
(depths of 5, 15, 25, 35, 45 and 65 ft)



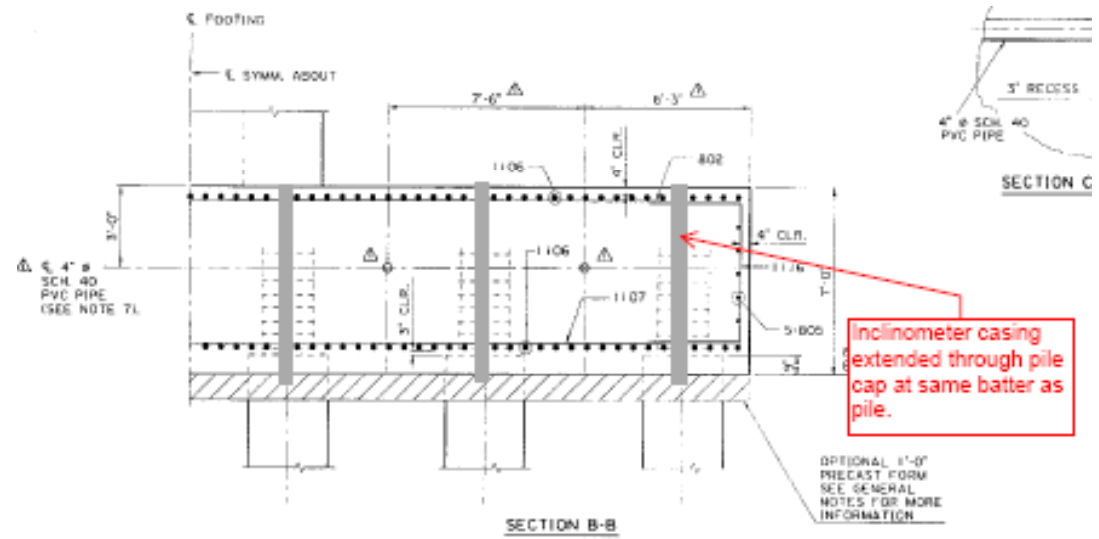
Typical Instrumented Pile



Inclinometer Casing Extended through Pilecap



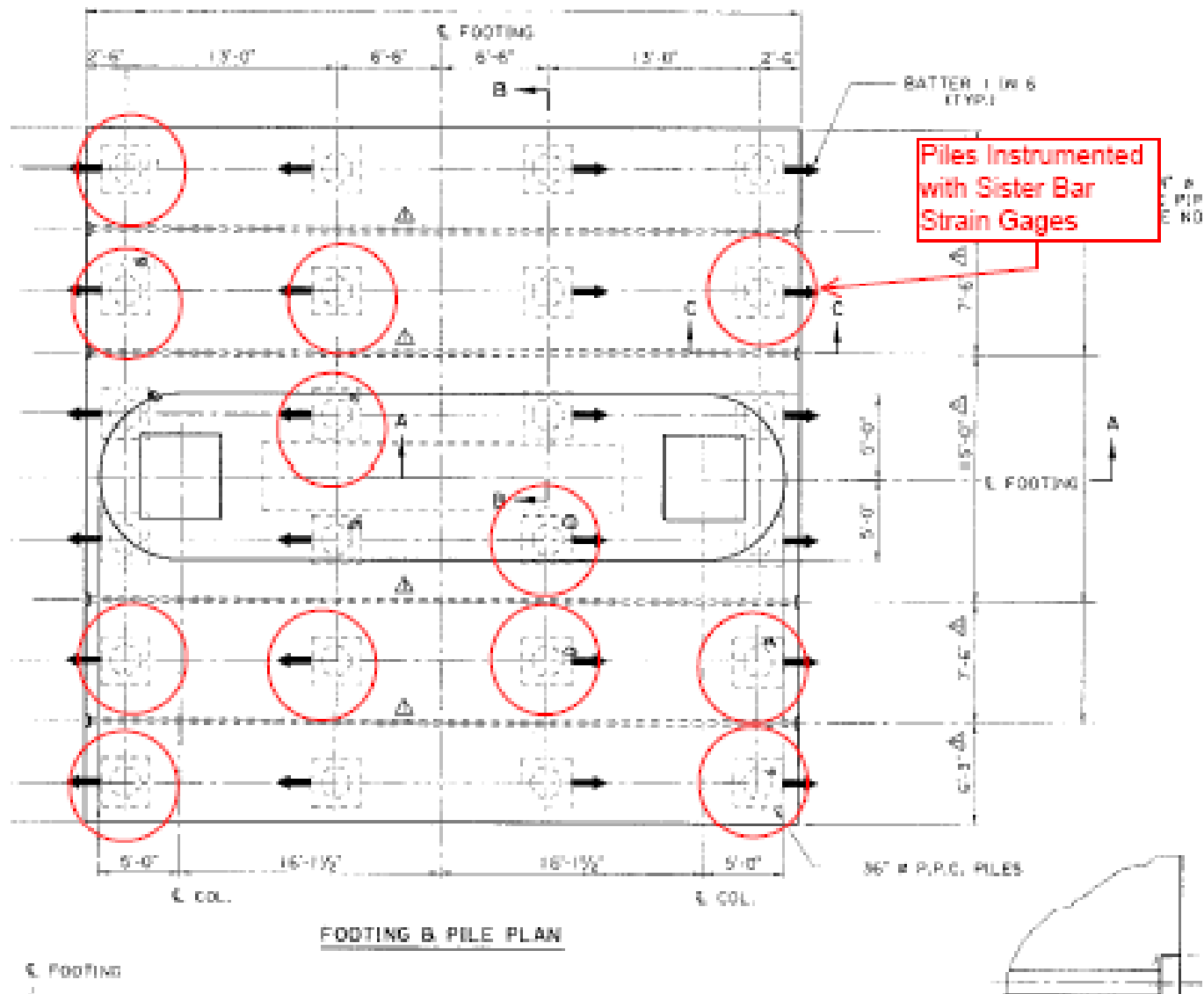
Inclinometer casing extended through pile cap at same batter as pile.



Inclinometer casing extended through pile cap at same batter as pile.



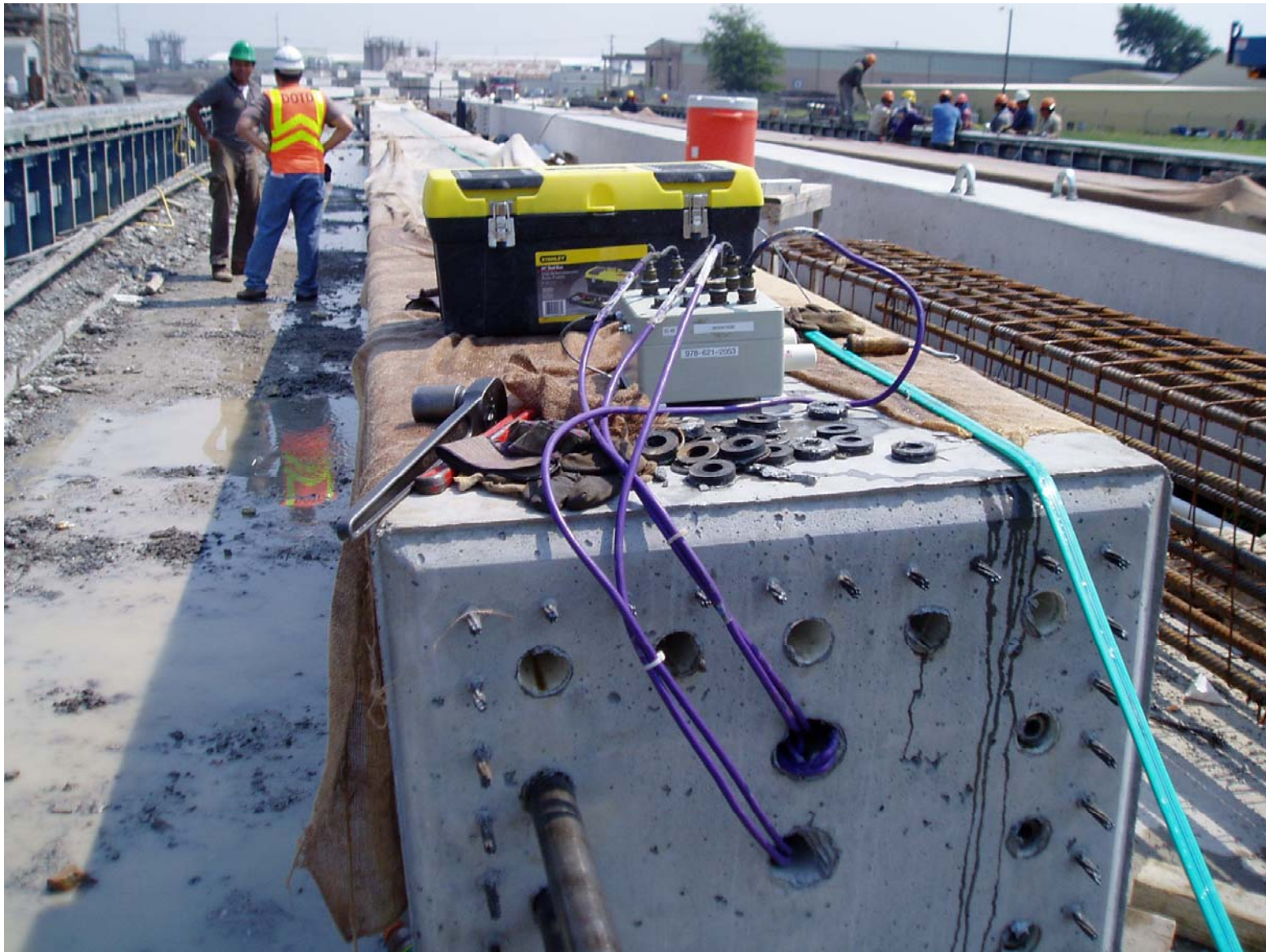
Piles with sister bar pairs at 16 and 21 ft



Pile Casting

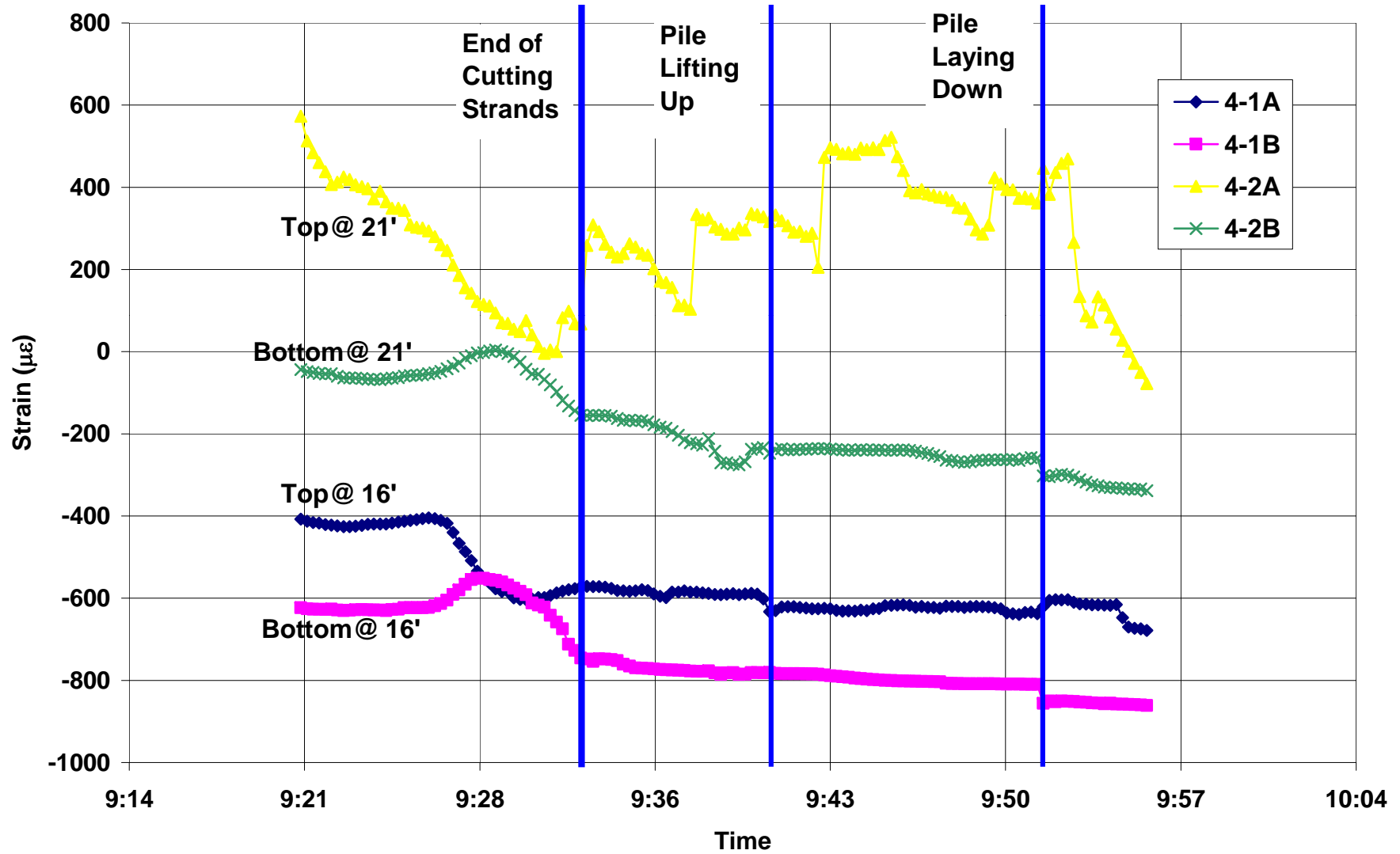
- Sister bar strain gage
- IPI casing
- Monitoring pile strain change during strand cutting
- Monitoring pile strain change during casting, storage and delivery



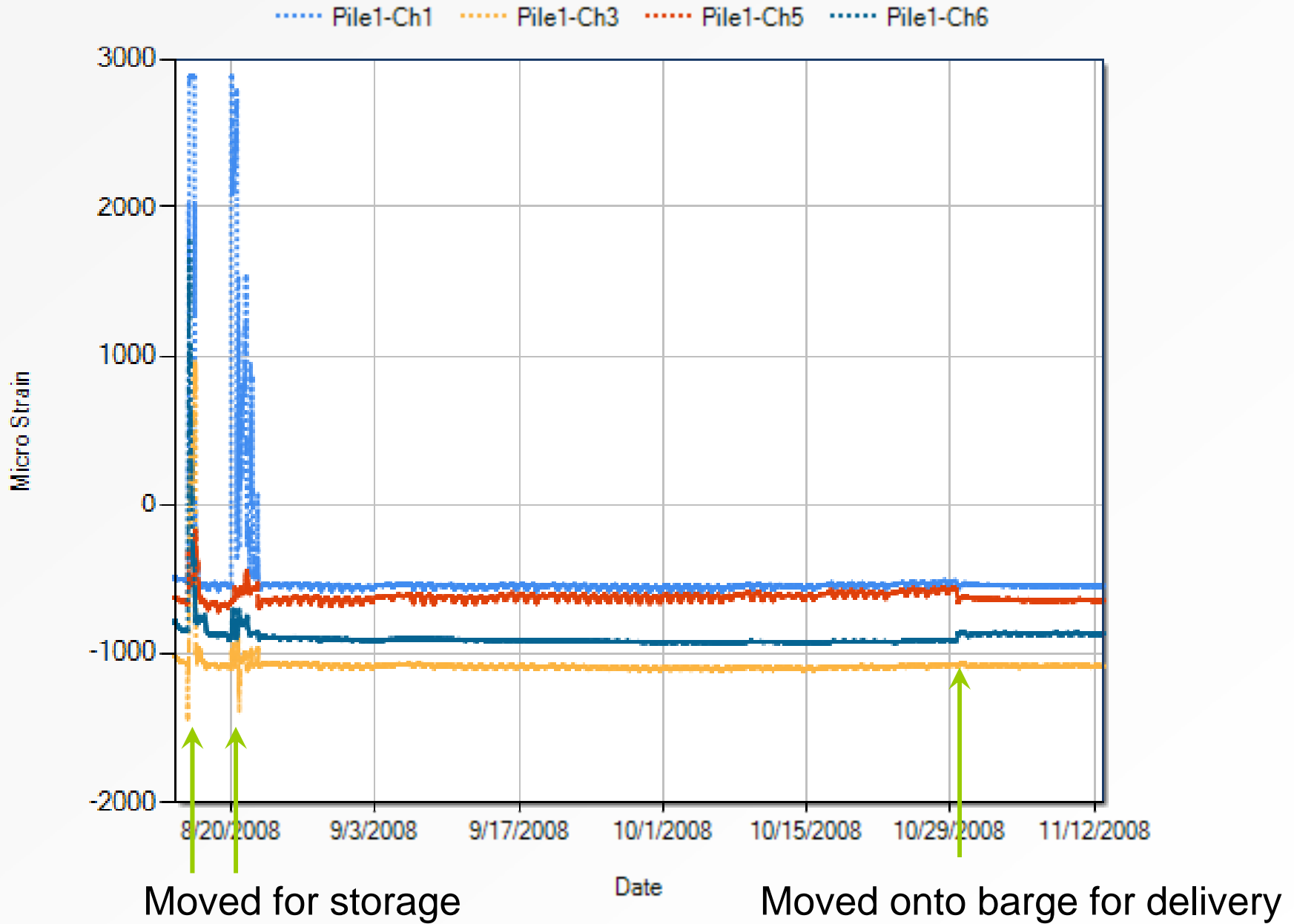


- Instrumented pile with data logger and battery

Strain Change During Strands Cutting and Pile Relocation



Strain Change During Storage and Delivery



Pile Driving



Cutting pile with saw



- Cutting depth = 8.5 inch

Hammering in Wedges



- Put wedges in the pile and hammer in

- Then crane snaps the pile to break it.

Pile lifting



- Lift pile about 10 inches

Pipe cutting



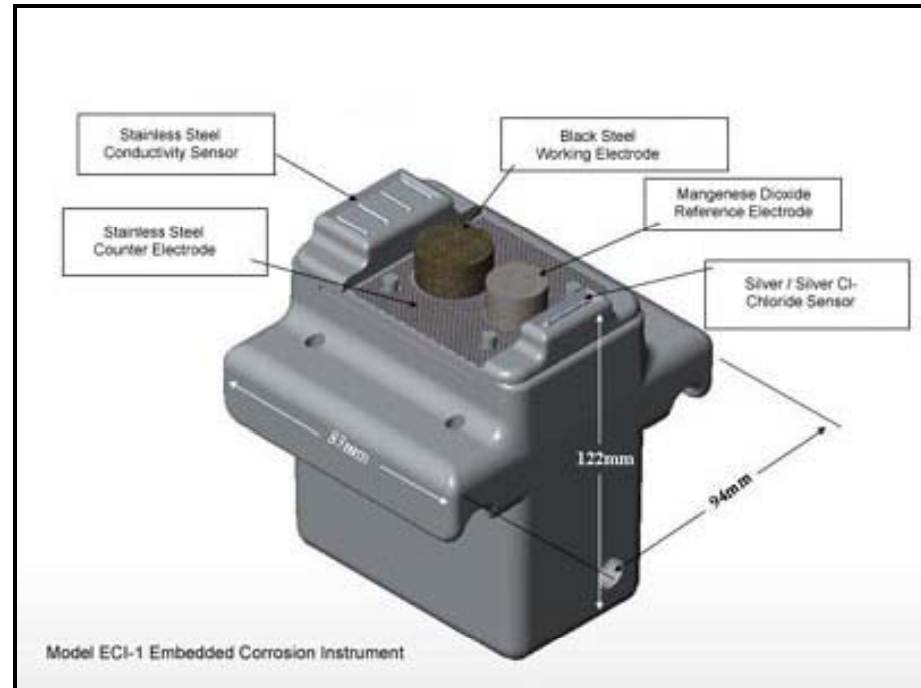
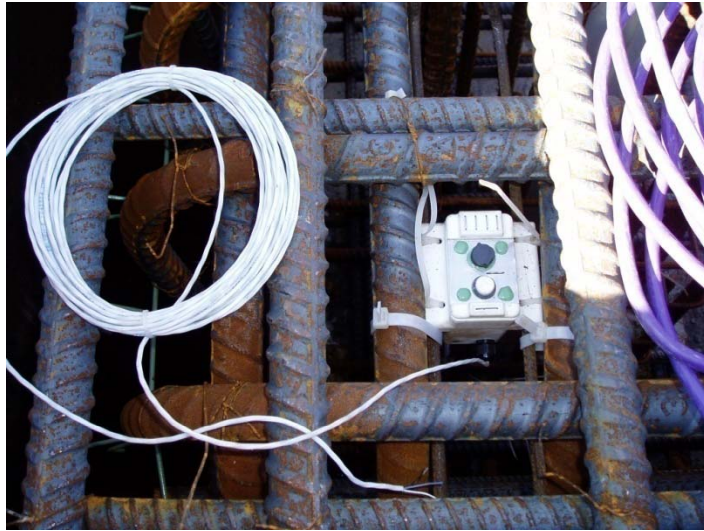
- Cut pvc pipe and IPI casing.

Rebar Mesh



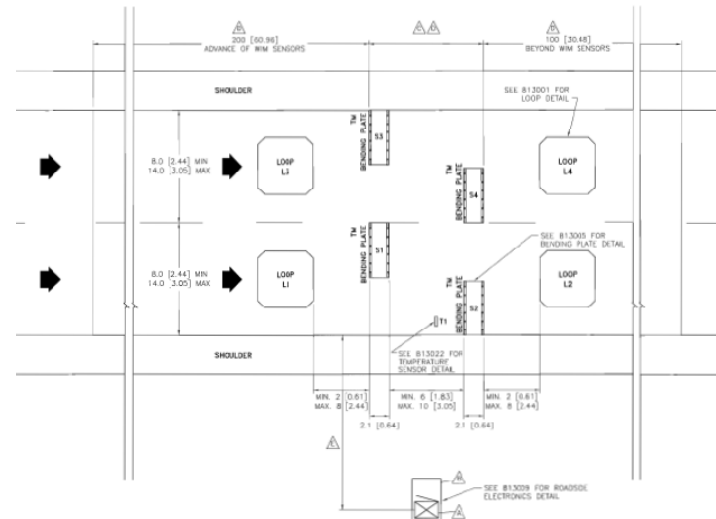
- Rebar Mesh completed with no damage to instrument cable.

Corrosion Sensors in Bents and Deck



Example Application:
Seohae Grand Bridge,
Korea

Weigh-In-Motion (WIM) System



Status

- Piles all installed with 46 of 48 strain gages working. (These were lost during casting when shoving cables into casings multiple times.)
- Inclinator casings are in the cast piles.
- Pile cap is being poured this week.
- In-place inclinometers into piles, water pressure transducers and accelerometers on pile cap next.
- Corrosion sensors in bents and bridge deck
- Strain gages on key girders
- Weight in motion equipment into deck.
- Data loggers and computer.

Conclusions

- Work proceeding without interference to contractor.
- Success rate on installed sensors is very good.
- When completed this may be the first bridge in US with substructure and superstructure instrumented to monitor long-term performance and capture effects of short-term loads.

Temperature Change During Storage and Delivery

