

# **Appendix A**

## **Figures & Tables**

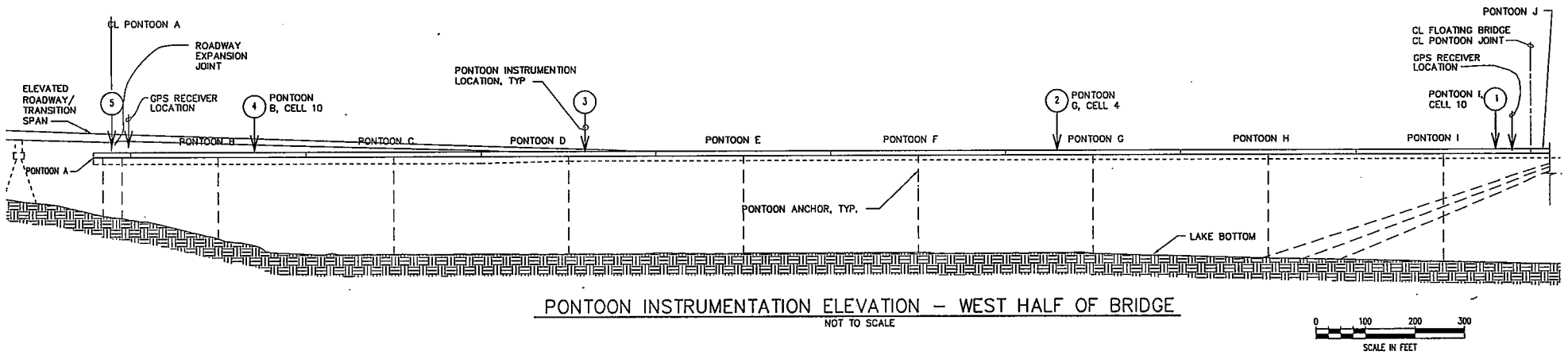
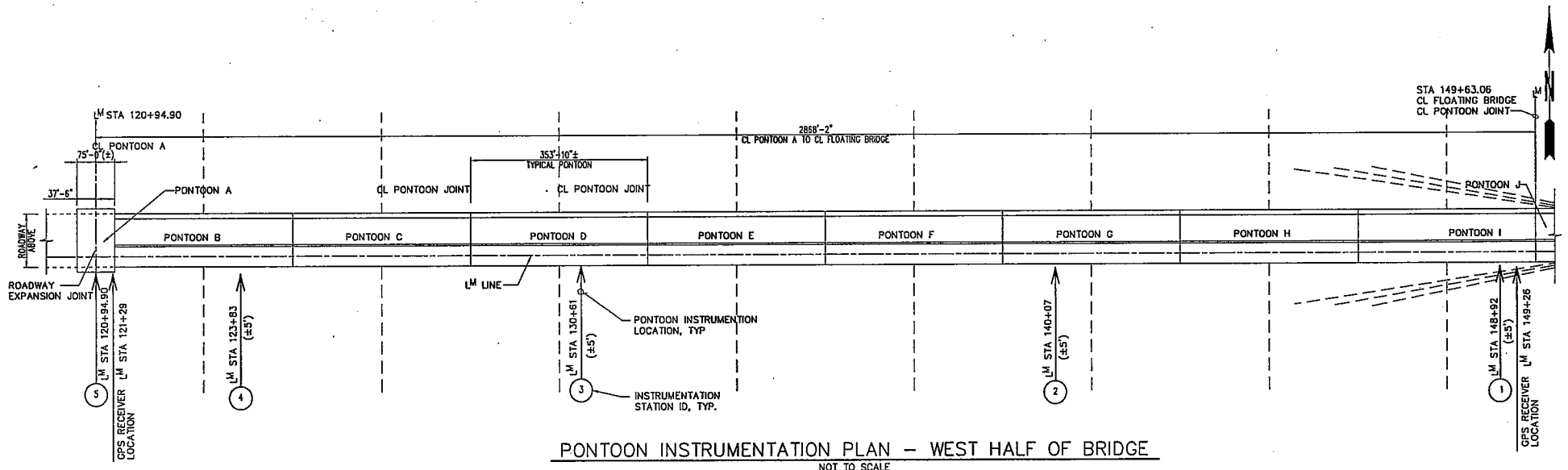


FIGURE 1 - INSTRUMENTATION LOCATIONS

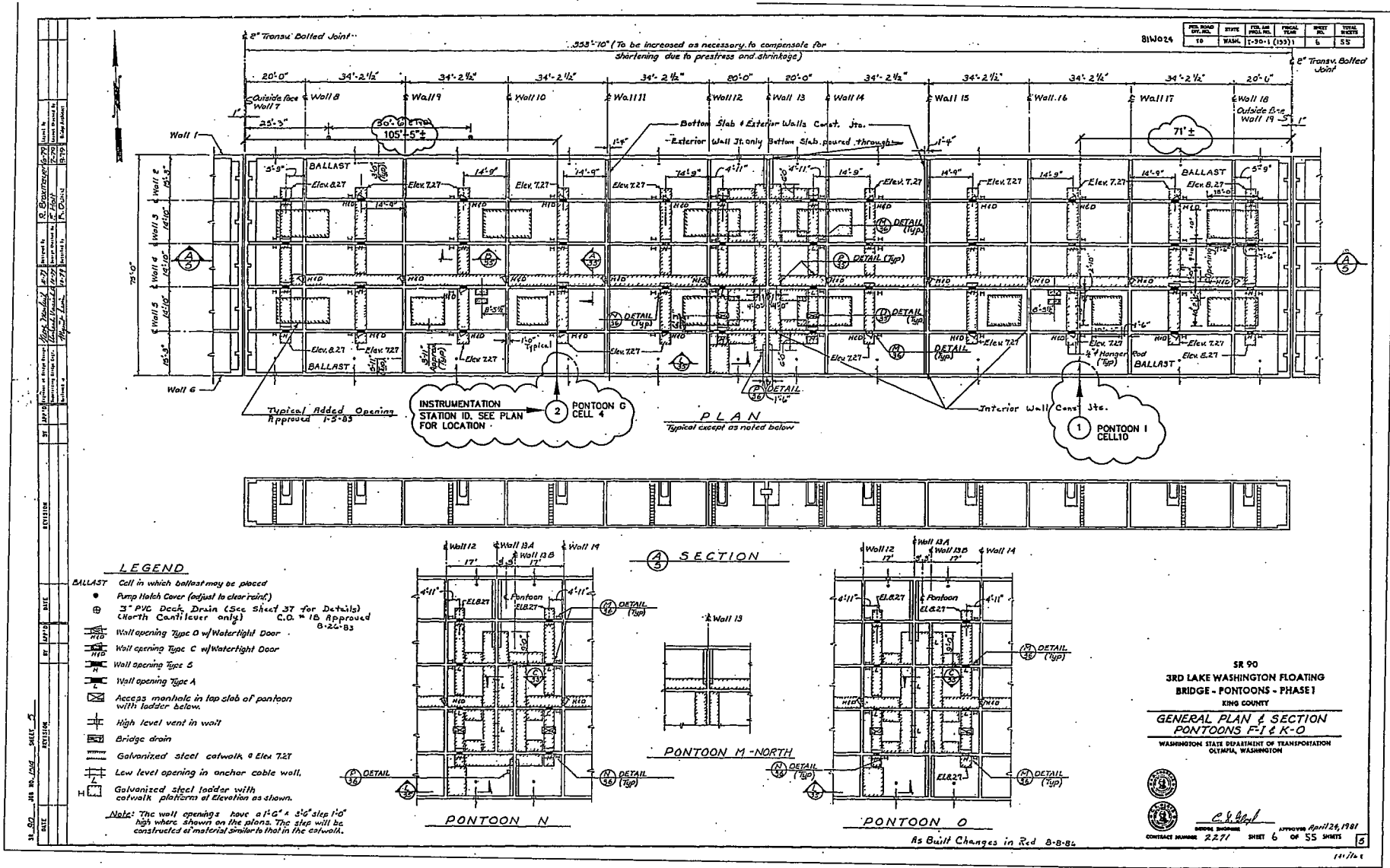
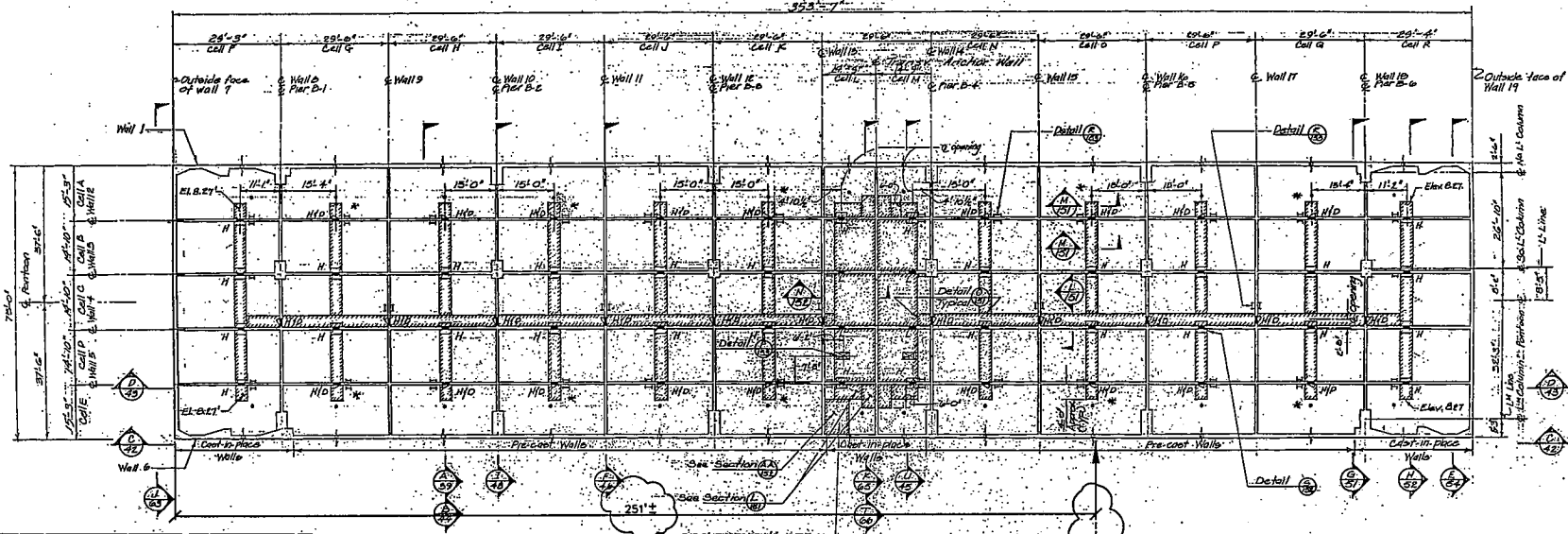


FIGURE 2 - INSTRUMENTATION AT PONTOONS G & I

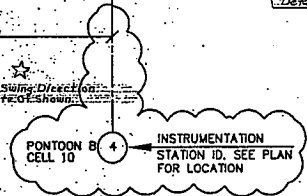


**LEGEND**

- Wall opening Type A
- Wall opening Type B
- Wall opening Type C w/ Watertight Door  
Access available in top slab of pontoon with ladder below to catwalk.  
Galvanized steel catwalk.
- Galvanized steel ladder at catwalk  
(One required per cell)
- Water inlet pipe for high of wall opening Type B w/ Catwalk elev. of 7.25
- High Level Vent in Wall
- Pump Hatch

**PLAN - PONTON B**

1. Fillets not shown.
2. Elevation of catwalk in all cells is 7.25. Except for noted alternate cells.
3. In corner catwalk, secure ladders, hatch above. Place 2" x 2" where bottom is 18" above catwalk. Walk and locate to clear ladders and catwalk.



Bridge Design Engineer: <i>[Signature]</i>	DATE: _____	REVISION: _____	BY: <i>[Signature]</i>	APP'D: _____
Checked by: <i>[Signature]</i>				
Designed by: <i>[Signature]</i>				
Contract No. <i>[Signature]</i>				
Contract No. <i>[Signature]</i>				
Contract No. <i>[Signature]</i>				

BRIDGES AND STRUCTURES

APPROVED: *[Signature]*

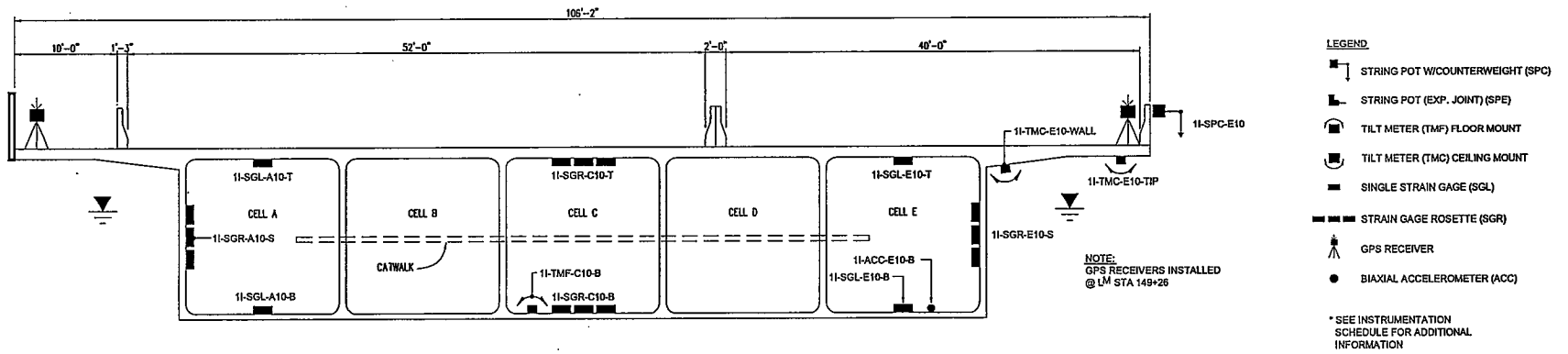
Washington State Department of Transportation

SR 90  
3RD LAKE WASHINGTON FLOATING BRIDGE - PONTOONS - PHASE II

PONTON B - GENERAL PLAN

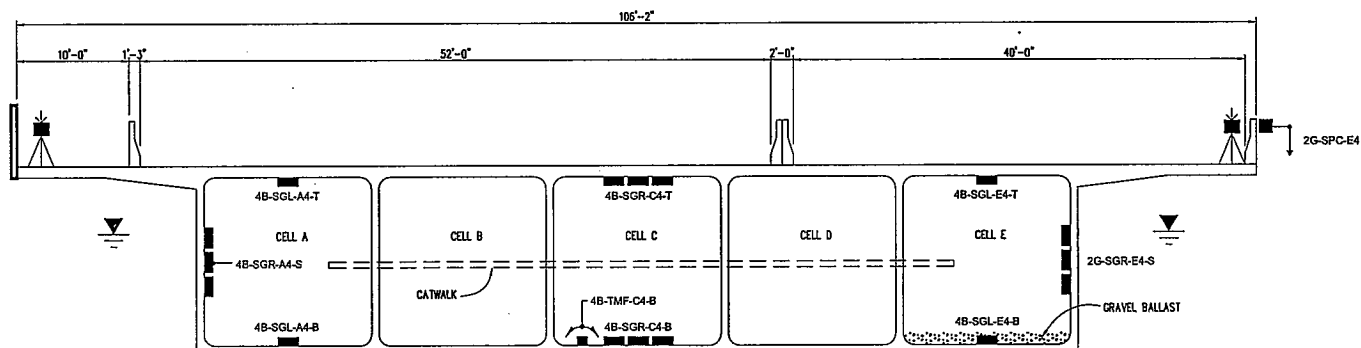
SHEET NO. 34 OF 213

FIGURE 3 - INSTRUMENTATION AT PONTON B



**A** PONTON INSTRUMENTATION @ STATION 1

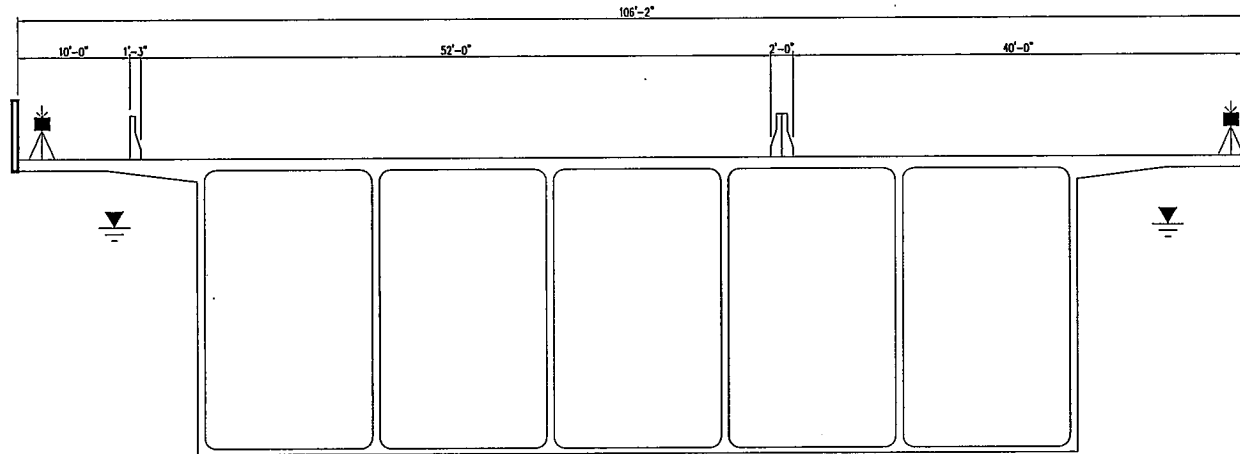
NTS  
PONTON I, CELL 10  
LM STA 148+92 (±)



**B** PONTON INSTRUMENTATION @ STATION 2

NTS  
PONTON C, CELL 4  
LM STA 140+07 (±)

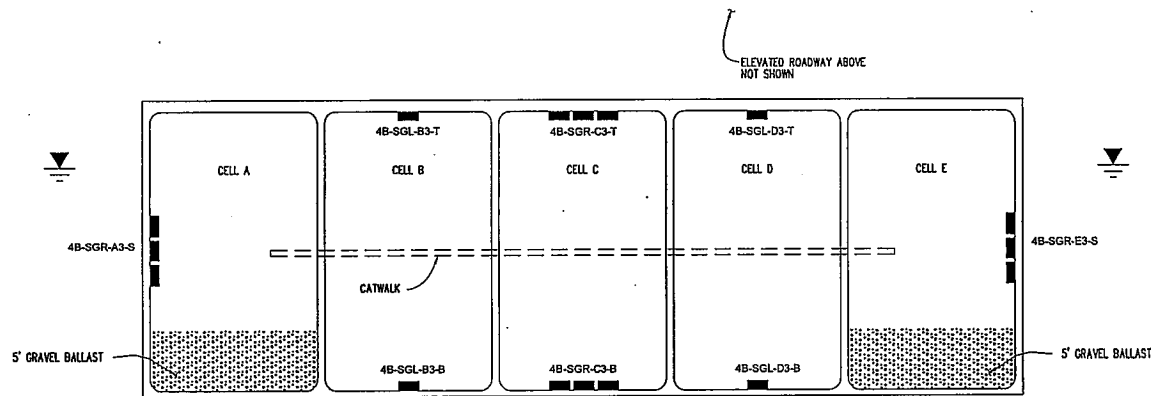
FIGURE 4 - INSTRUMENTATION SECTIONS



- LEGEND**
- ▣ STRING POT W/COUNTERWEIGHT (SPC)
  - ▣ STRING POT (EXP. JOINT) (SPE)
  - ⊙ TILT METER (TMF) FLOOR MOUNT
  - ⊙ TILT METER (TMC) CEILING MOUNT
  - ▬ SINGLE STRAIN GAGE (SGL)
  - ▬▬ STRAIN GAGE ROSETTE (SGR)
  - ⊙ GPS RECEIVER
  - BIAXIAL ACCELEROMETER (ACC)

\* SEE INSTRUMENTATION SCHEDULE FOR ADDITIONAL INFORMATION

**A** PONTON INSTRUMENTATION @ STATION 3  
NTS  
M STA 130+61 (±)



**B** PONTON INSTRUMENTATION @ STATION 4  
NTS  
PONTON B, CELL 10  
M STA 123+83 (±)

FIGURE 5 - INSTRUMENTATION SECTIONS

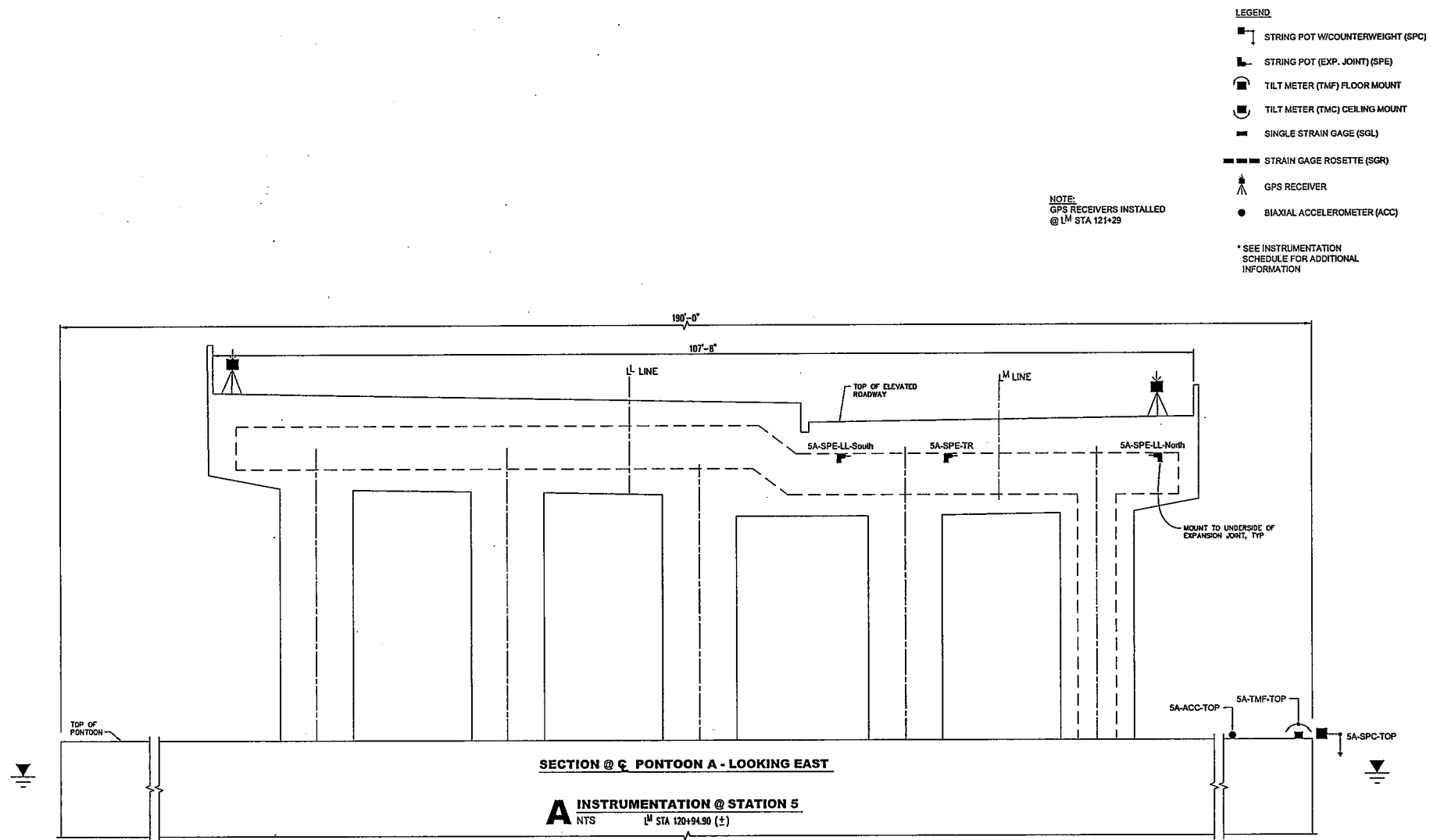








FIGURE 6 - INSTRUMENTATION SECTION

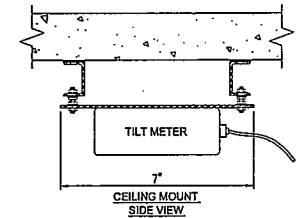
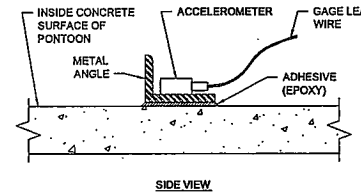
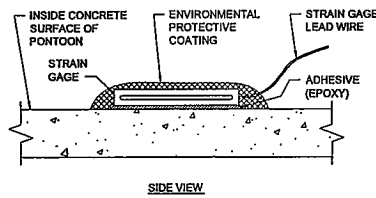
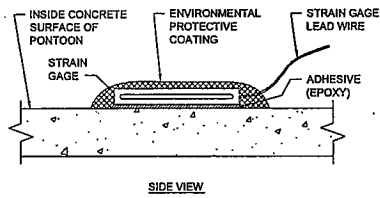
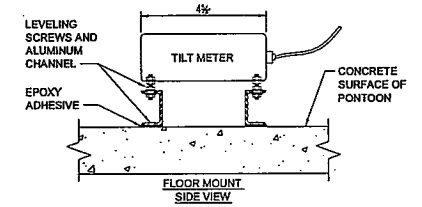
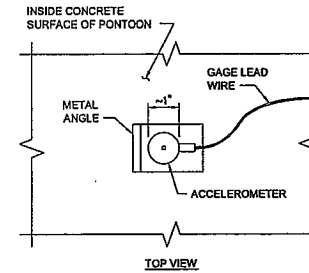
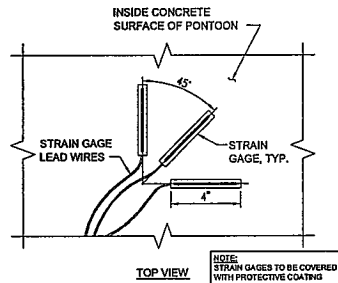
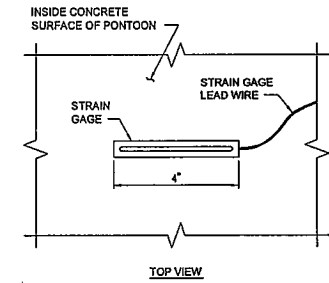
MARK/LEGEND	DESCRIPTION/ Make and Model #	MEASUREMENT	STATION #	QUANTITY			Range / RESOLUTIONS	DETAILS
				Each Station	Backup	Total Ordered		
	String Potentiometer/ Unimeasure JXP420 Series	Freeboard Measurement	1,2,5	1	1	4	Range 20in (free Board) and 6in (Exp. Joint), Resolution 0.001in, nonlinearity +/-0.5% full scale	F/B, G/B
		Bridge Expansion Joint* Deflection	5	3	1	4		E/B
	Tilt Meter / Applied Geomechanics Model 801-S	Bridge Roll	1,2,5	1	1	6	Range +/- 2 Deg., Resolution 0.001 Deg.	D/B
		Cantilever Tip Deflection	1	2				
	Strain Gages / Texas Measurements, Inc., P Series	Bridge Moment & Torsion	1,2,4	16	5	53	Resolution 1microstrain	A/B, B/B
	Biaxial Accelerometer	Vertical and horizontal Acceleration	1,5	1	1	3	-	C/B
	Data Collection System/ IOTech WBK 516E	Wireless Data Collection	1,2,3	1	0	3	A/D Resolution 16Bit A/D Speed 1MHz	
		HardWired Data Collection	5	1	0	1	Sampling Speed 1MHz	
	GPS System / Trimble 5700 GPS Receivers	Vertical/Horizontal Displacement and Test Vehicle Location	1,2,3,5	2	0	8	Static: +/-5 mm+1ppm Rms Real-time: Hori (+/-10mm +1ppm) (x baseline lengths)Rms Vert +/- (20mm +1ppm)Rms (See Note 2)	

\* Bridge Expansion Joint Measurement is only at the end pontoon location.

**Notes:**

1. Additional sensors as backup are added in the total ordered quantity.
2. Actual GPS accuracy for static and dynamic tests may vary due to signal noise and job site conditions. The close proximity of the trucks to the GPS antennas may introduce "multipath" errors that may cause displacement of true positions. It will also be necessary to eliminate cell phone and radio transmitting within 200 feet from each antenna, due to interference with satellite data streams.

FIGURE 7 - INSTRUMENTATION SCHEDULE

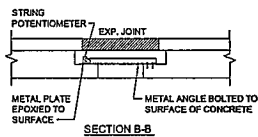
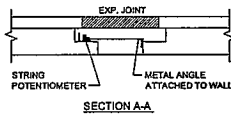
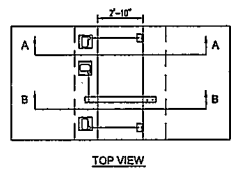


**A STRAIN GAGE INSTALLATION**  
NTS

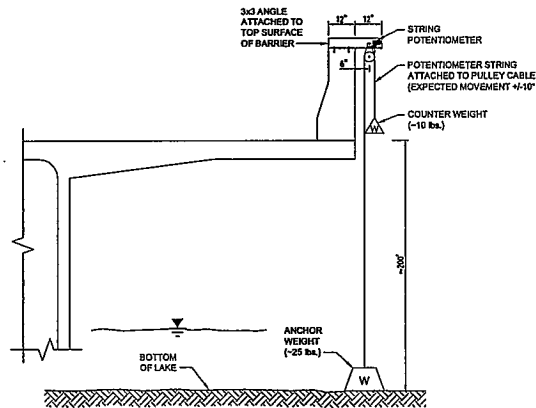
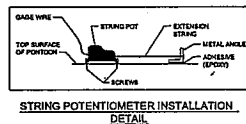
**B ELEMENT ROSETTE INSTALLATION**  
NTS

**C ACCELEROMETER INSTALLATION**  
NTS

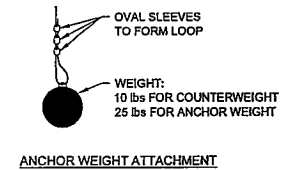
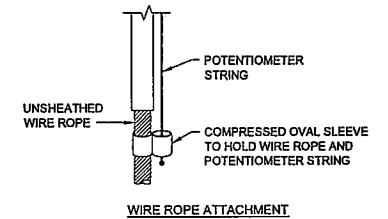
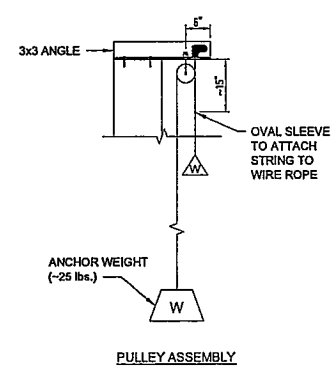
**D TILT METER INSTALLATION**  
NTS



**E STRING POTENTIOMETER INSTALLATION FOR EXPANSION JOINT DISPLACEMENT**  
NTS



**F FREEBOARD MEASUREMENT INSTALLATION**  
NTS



**G ATTACHMENT DETAILS**  
NTS

FIGURE 8 - INSTRUMENTATION DETAILS

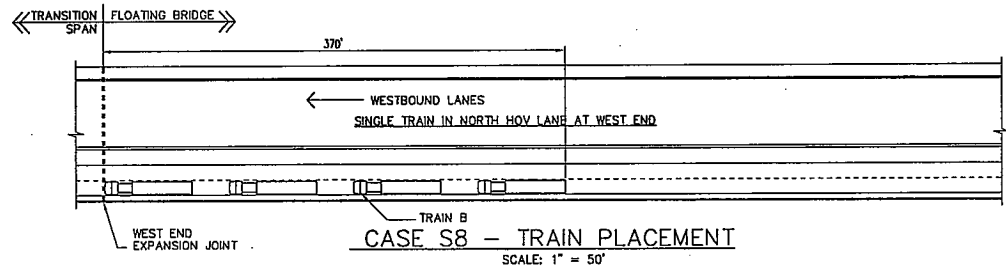
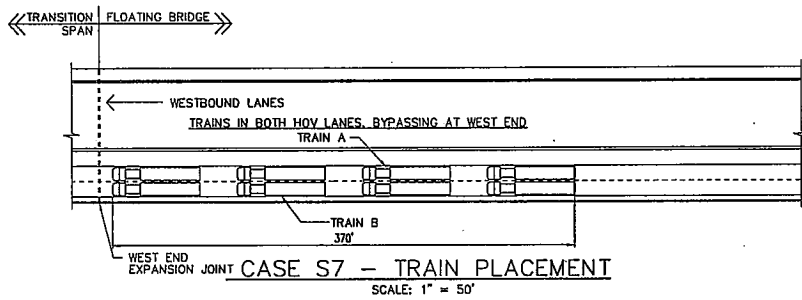
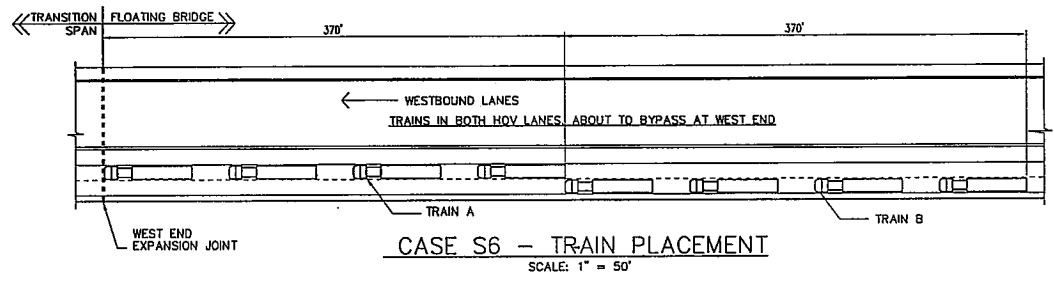
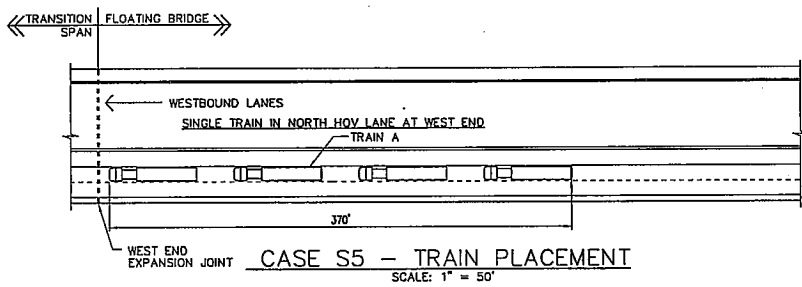
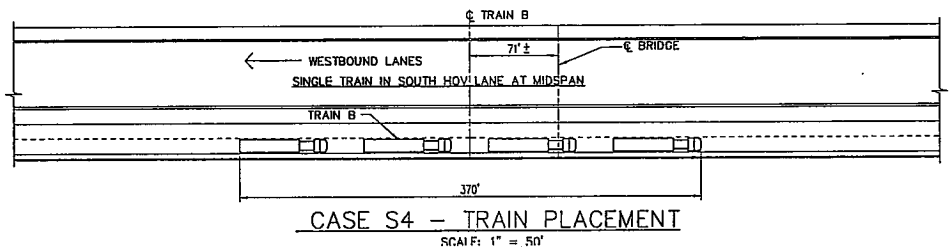
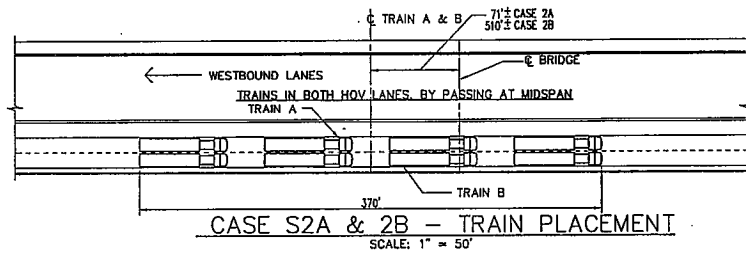
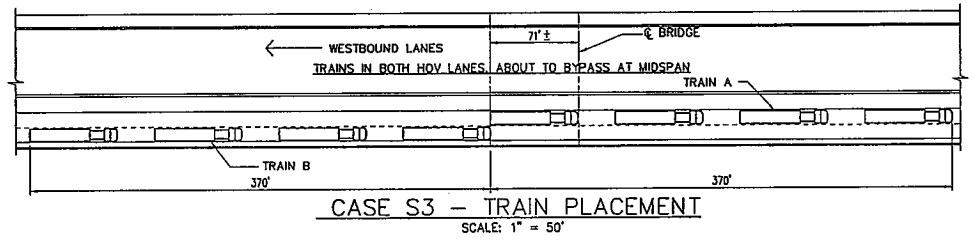
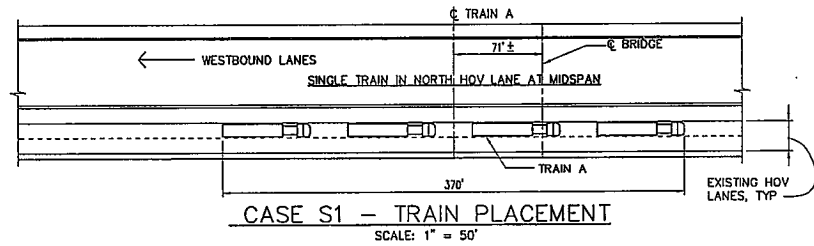


FIGURE 9 - STATIC LOAD TEST DIAGRAMS

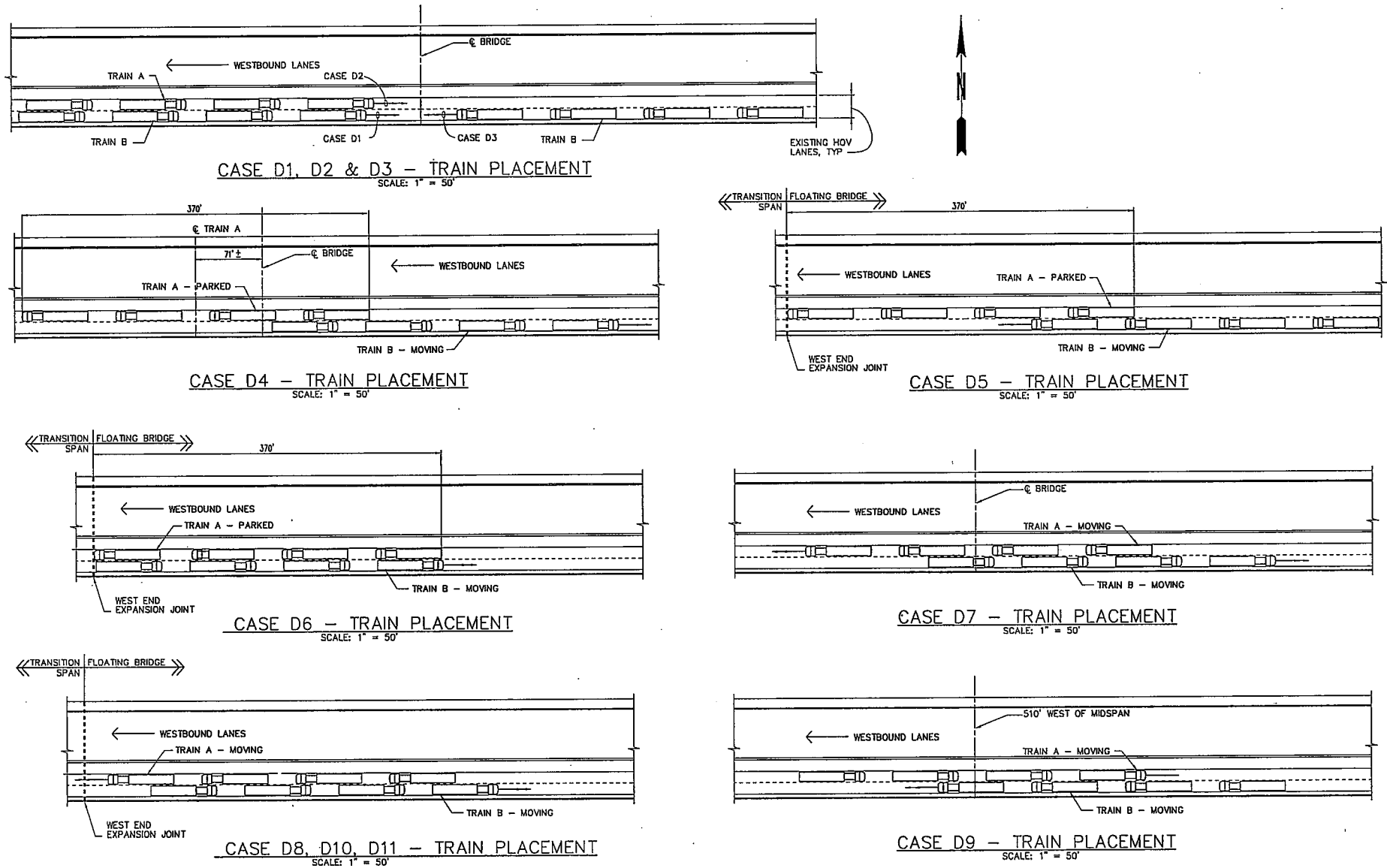
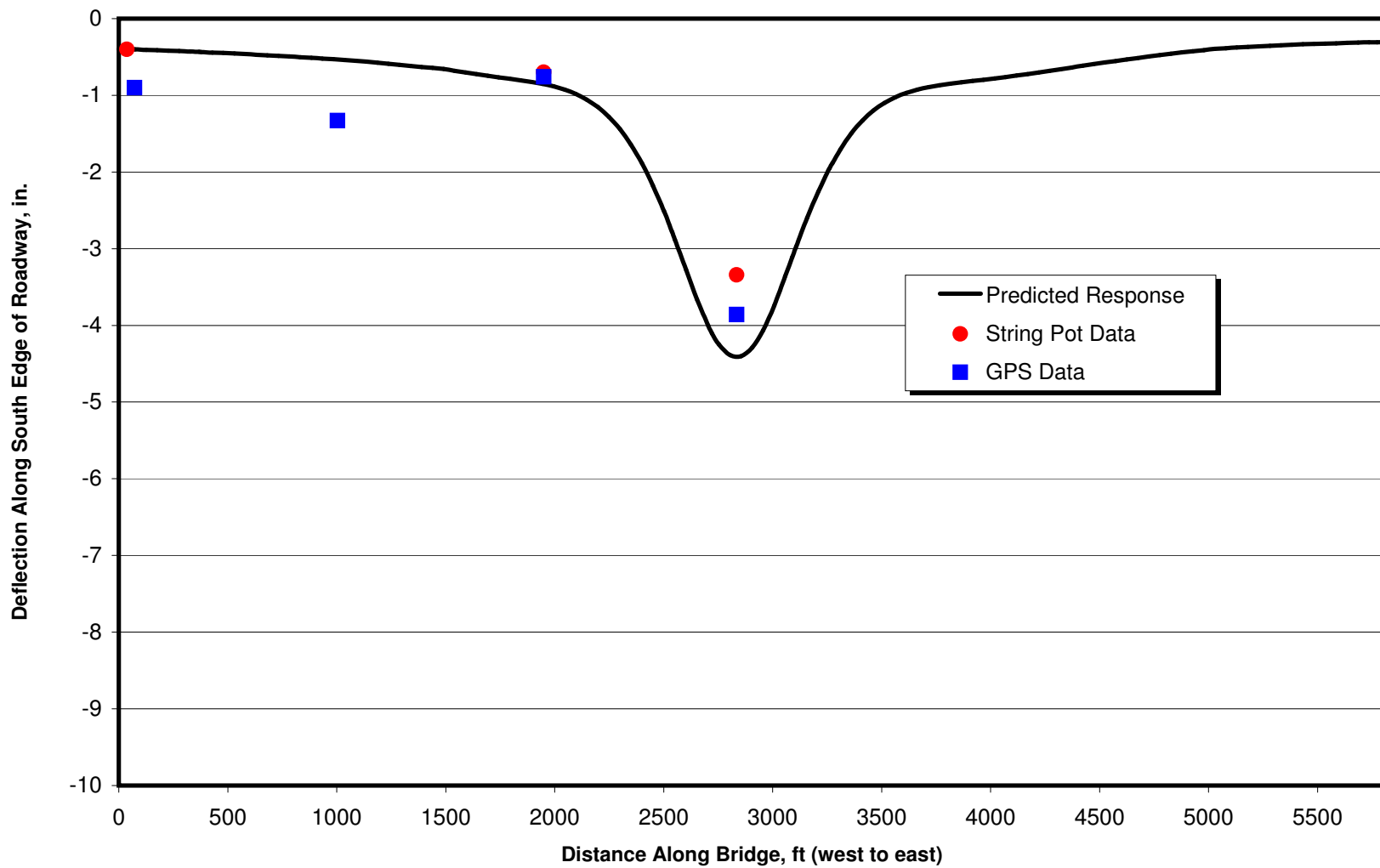


FIGURE 10 - DYNAMIC LOAD TEST DIAGRAMS

**STATIC TEST CASE S1 - SINGLE TRAIN ON NORTH TRACK AT MIDSPAN  
DEFLECTION ALONG SOUTH EDGE OF ROADWAY**



**FIGURE 11**

**SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)**

### TWO TRAINS BYPASSING AT MIDSPAN DEFLECTION ALONG SOUTH EDGE OF ROADWAY

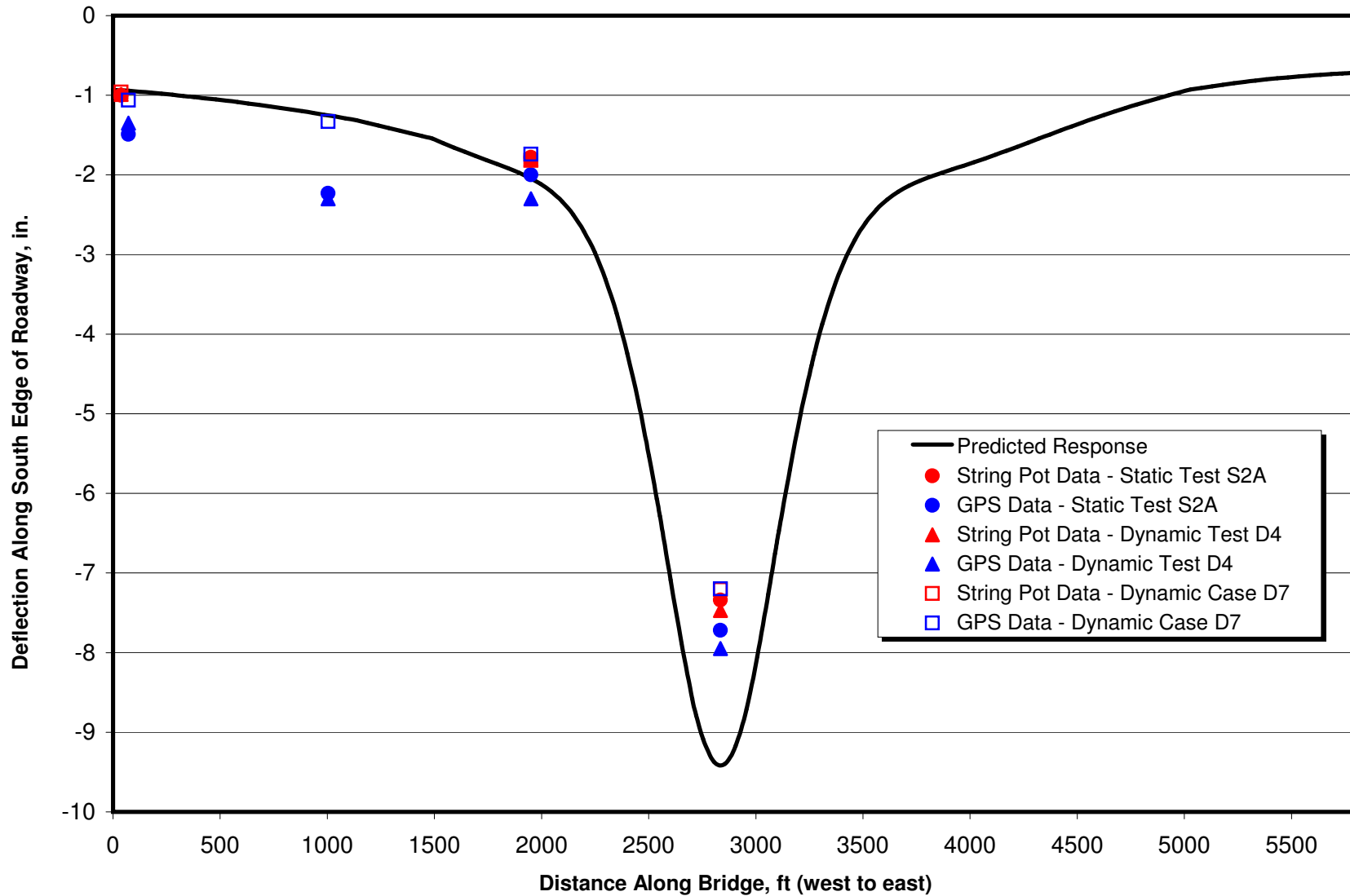
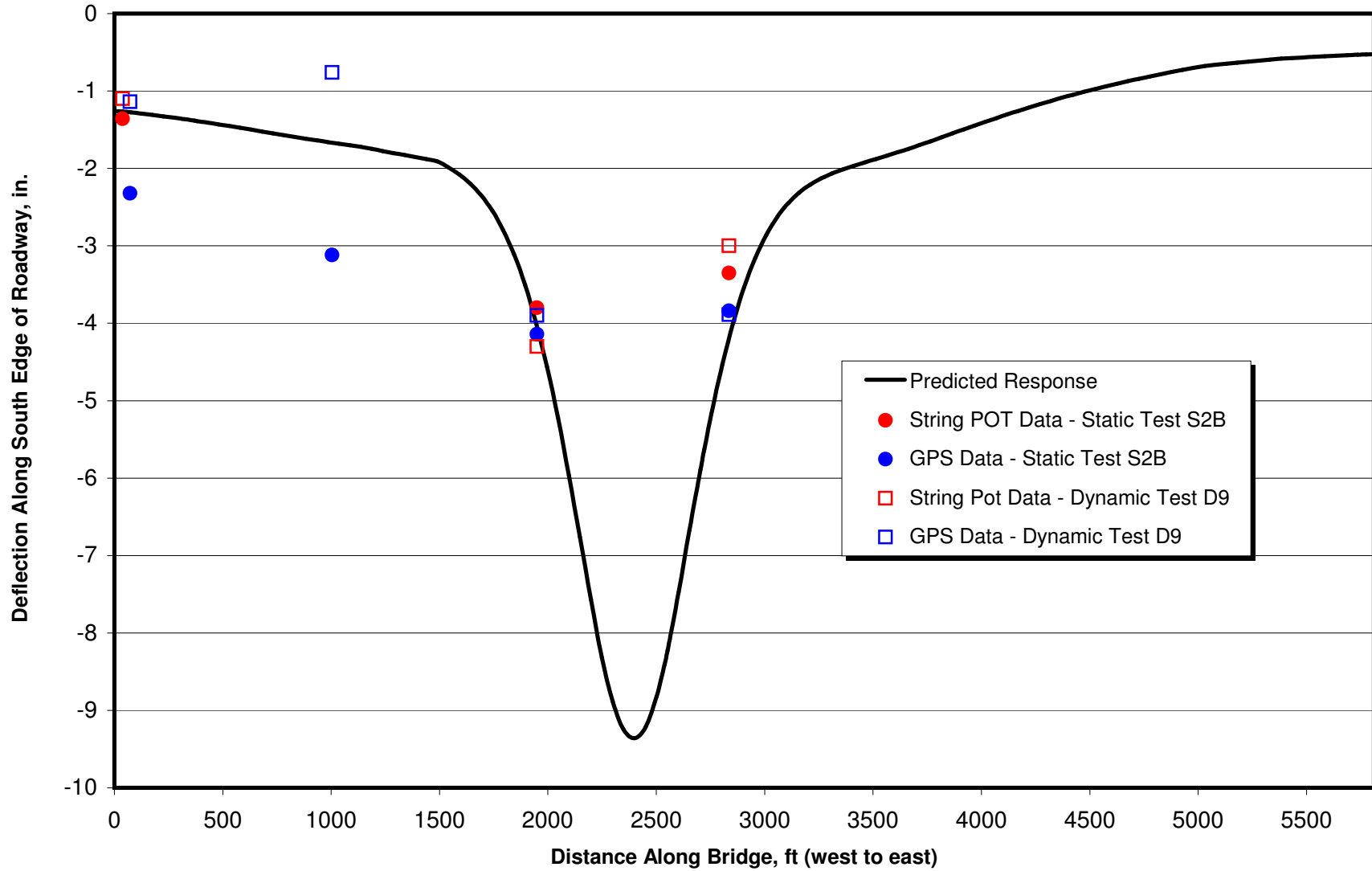


FIGURE 12

SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)

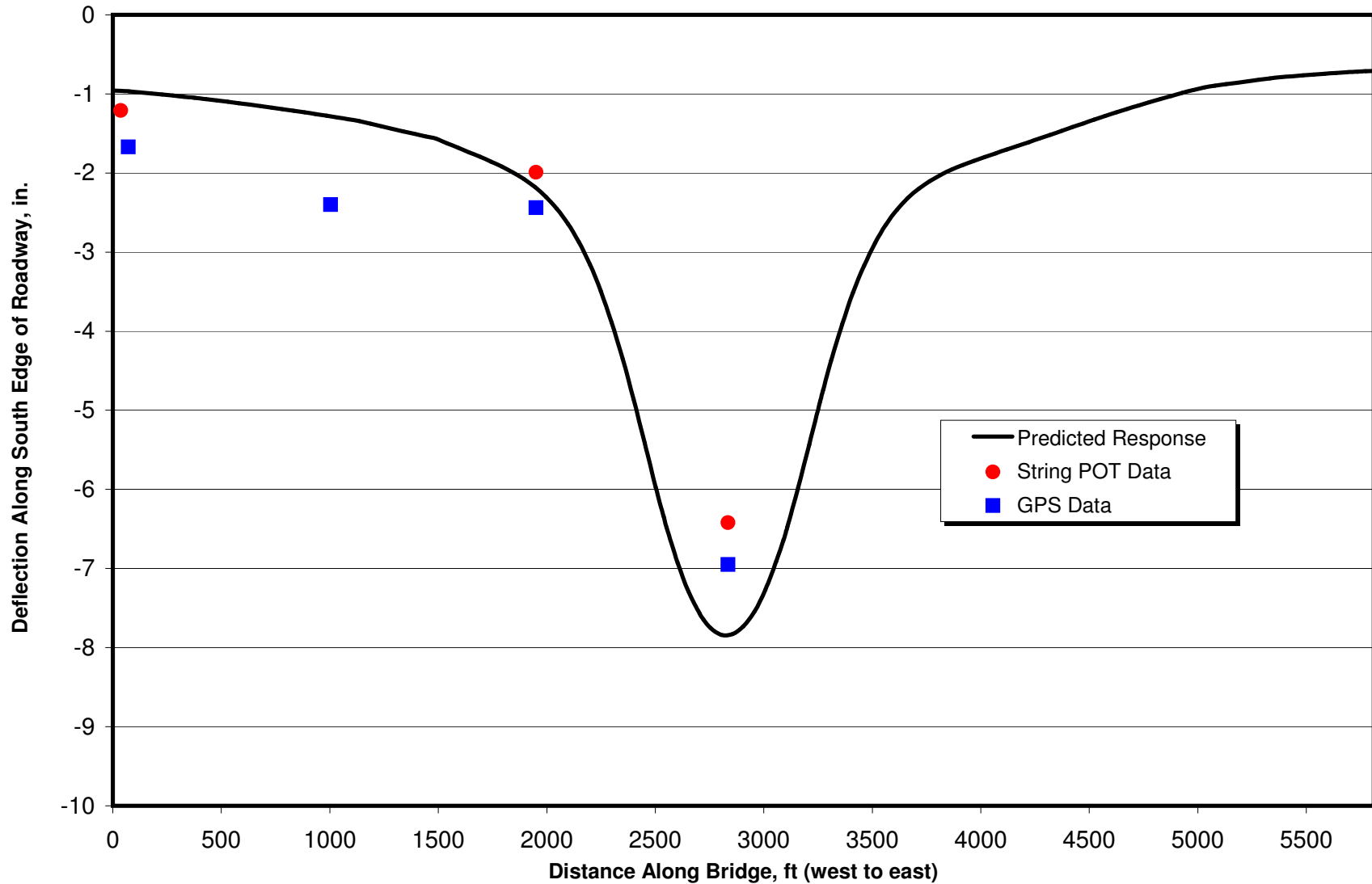
**TWO TRAINS BYPASSING 550 ft WEST OF MIDSPAN  
DEFLECTION ALONG SOUTH EDGE OF ROADWAY**



**FIGURE 13**

**SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)**

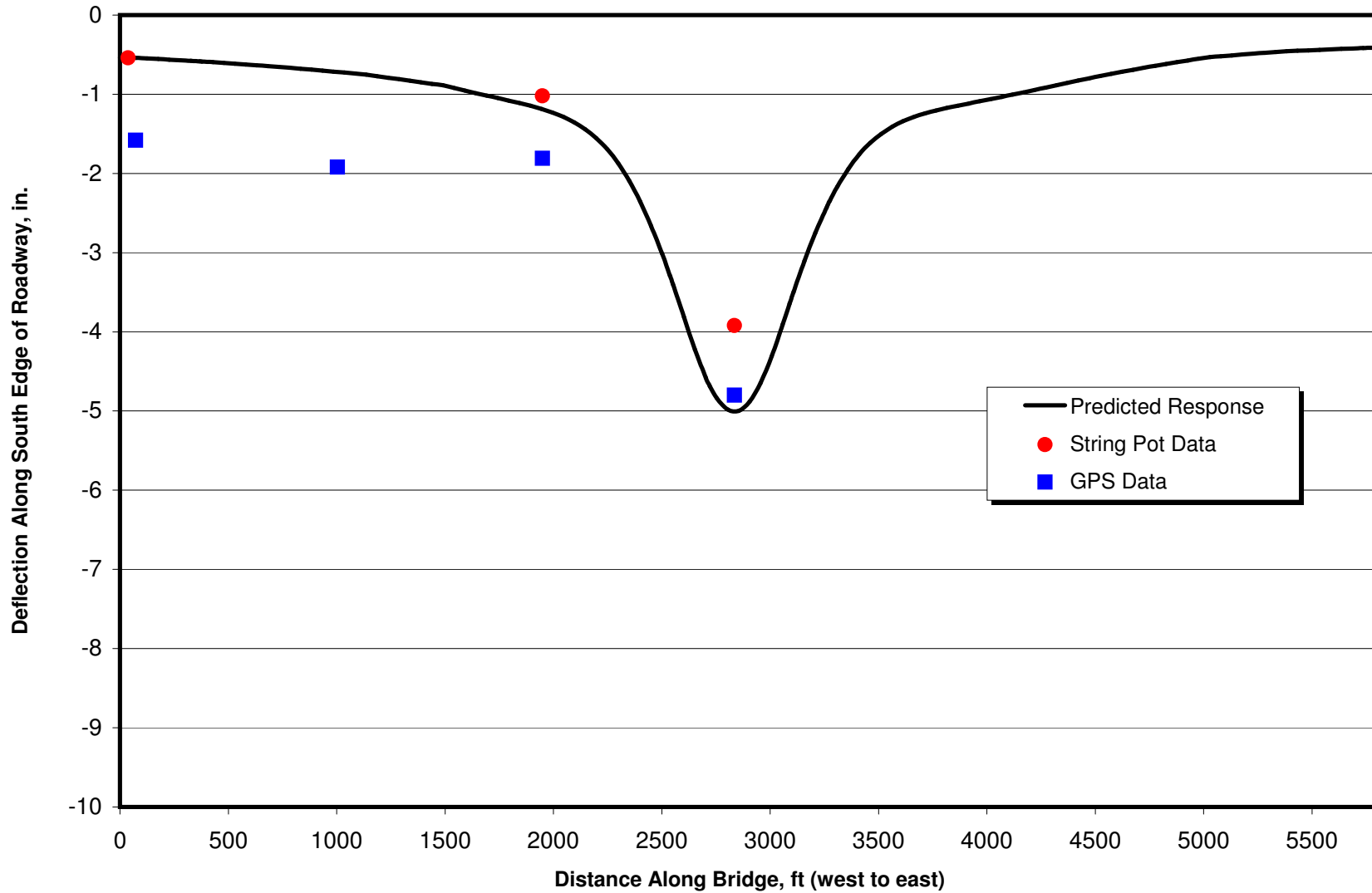
**STATIC TEST CASE S3 - TWO TRAINS ABOUT TO BYPASS AT MIDSPAN  
DEFLECTION ALONG SOUTH EDGE OF ROADWAY**



**FIGURE 14**

**SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)**

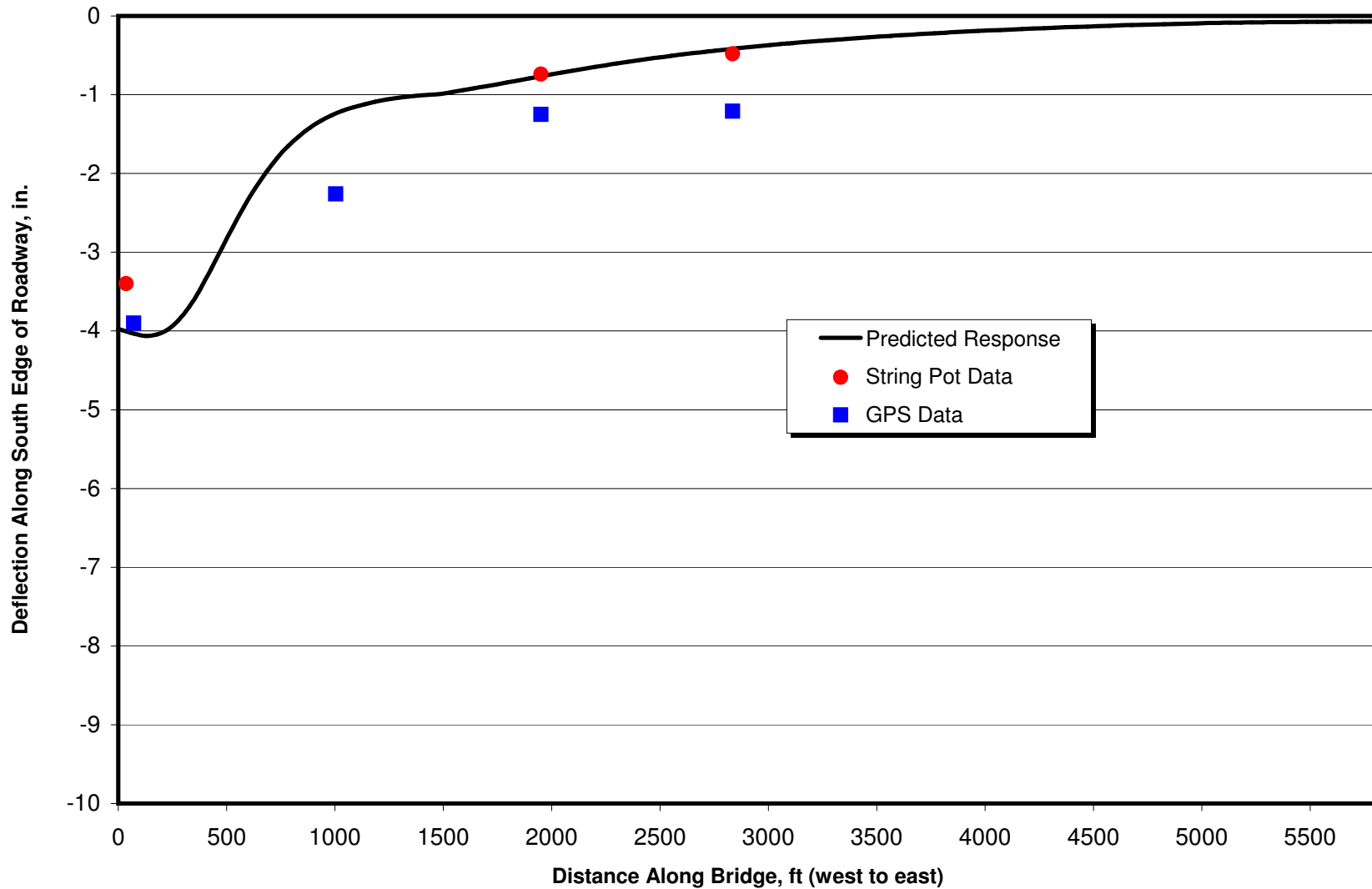
**STATIC TEST CASE S4 - SINGLE TRAIN ON SOUTH TRACK AT MIDSPAN  
DEFLECTION ALONG SOUTH EDGE OF ROADWAY**



**FIGURE 15**

**SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)**

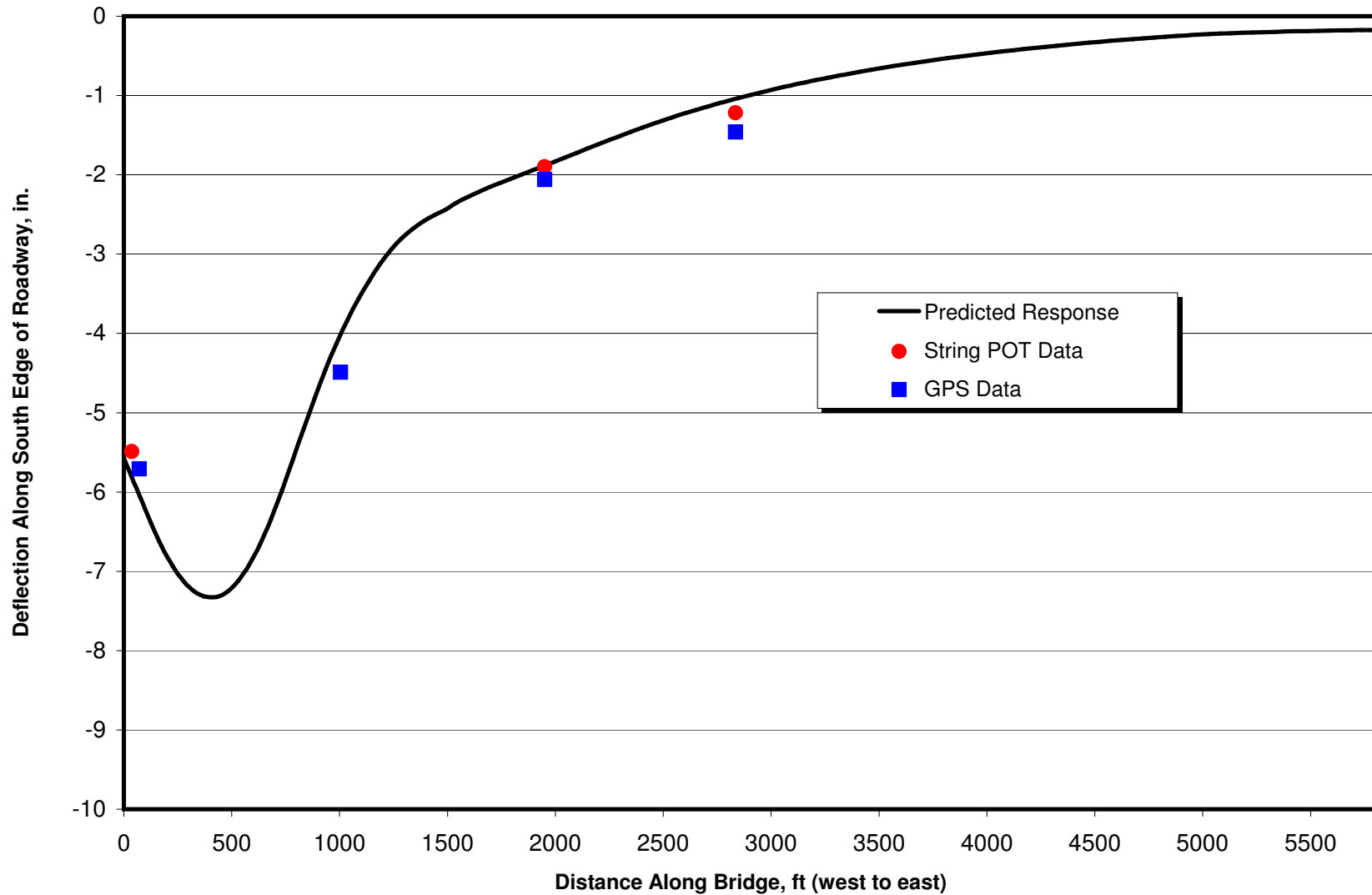
**STATIC TEST CASE S5 - SINGLE TRAIN ON NORTH TRACK AT WEST END  
DEFLECTION ALONG SOUTH EDGE OF ROADWAY**



**FIGURE 16**

**SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)**

**STATIC TEST CASE S6 - TWO TRAINS ABOUT TO BYPASS AT WEST END  
DEFLECTION ALONG SOUTH EDGE OF ROADWAY**



**FIGURE 17**

**SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)**

**TWO TRAINS BYPASSING AT WEST END  
DEFLECTION ALONG SOUTH EDGE OF ROADWAY**

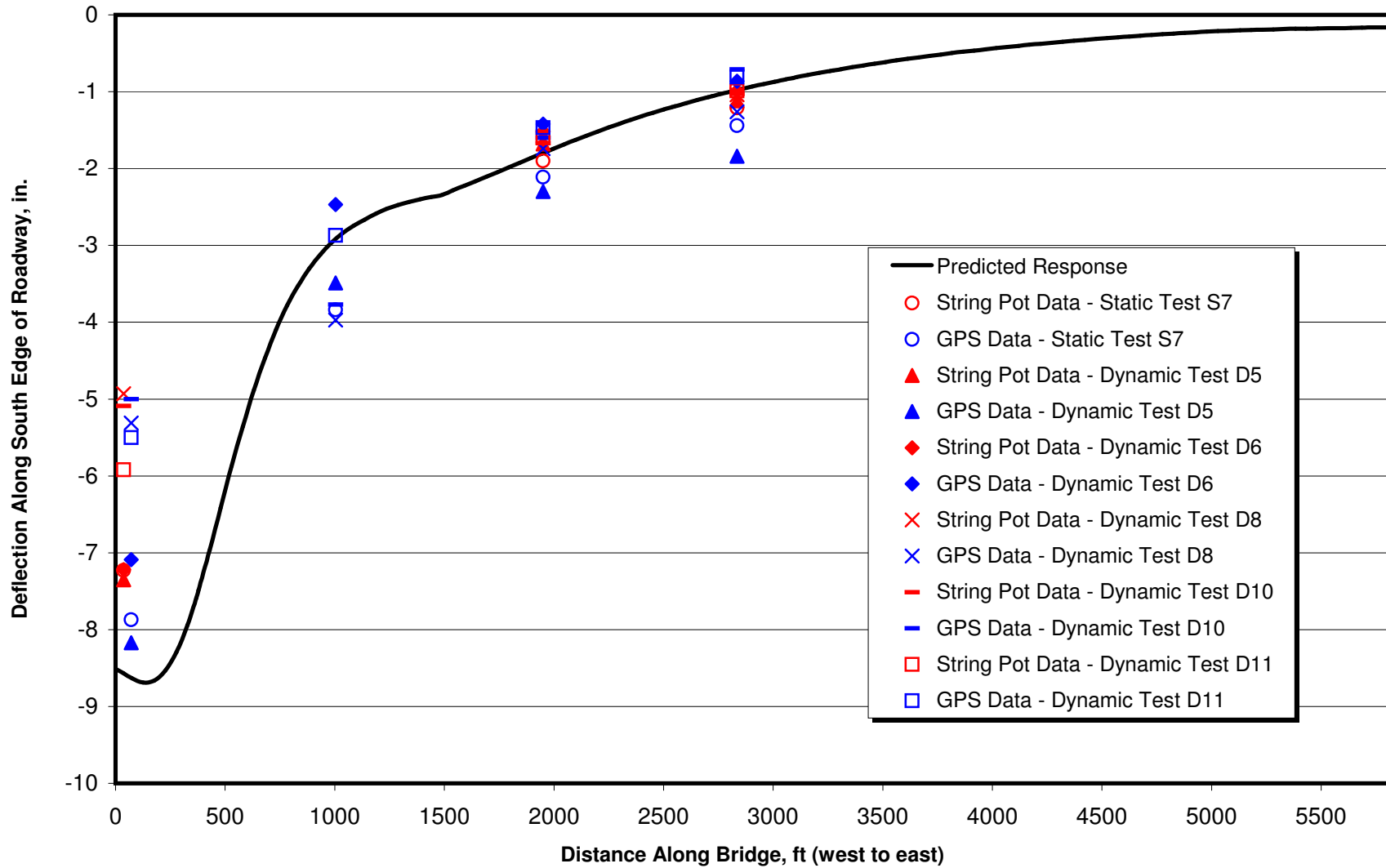
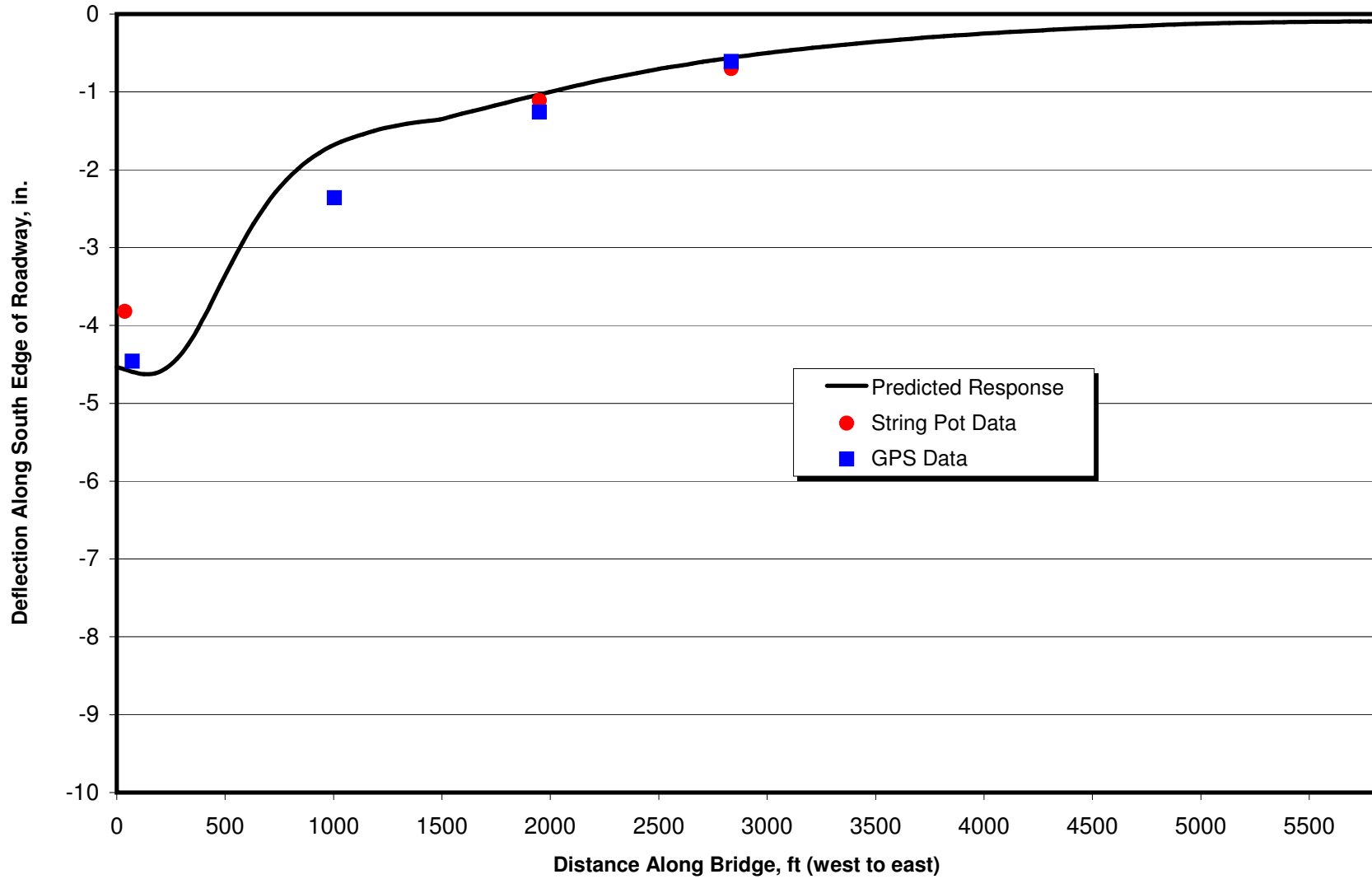


FIGURE 18

SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)

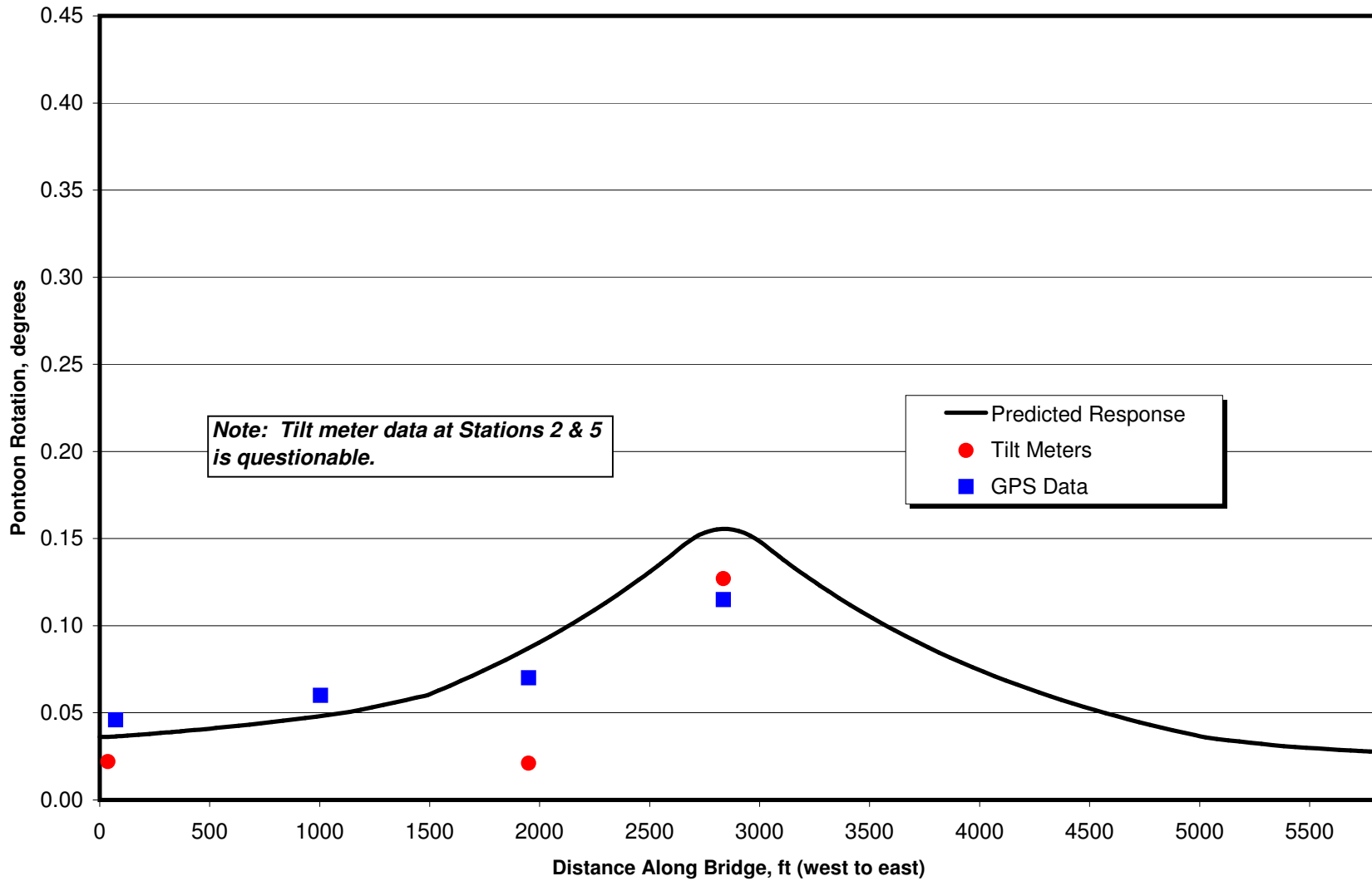
**STATIC TEST CASE S8 - SINGLE TRAIN ON SOUTH TRACK AT WEST END  
DEFLECTION ALONG SOUTH EDGE OF ROADWAY**



**FIGURE 19**

**SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)**

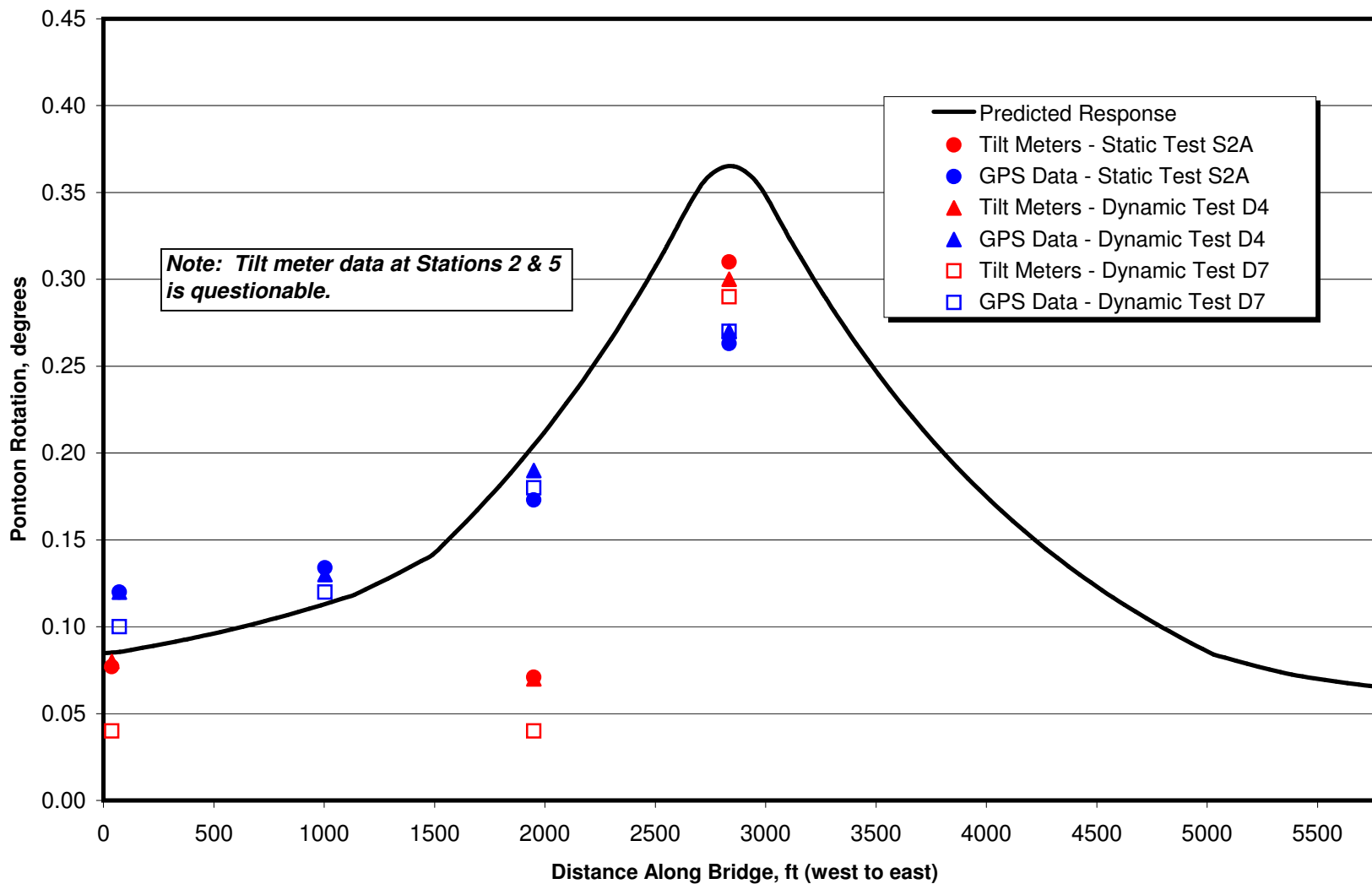
**STATIC TEST CASE S1 - SINGLE TRAIN ON NORTH TRACK AT MIDSPAN  
PONTOON ROTATION**



**FIGURE 20**

**SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)**

### TWO TRAINS BYPASSING AT MIDSPAN PONTOON ROTATION



*Note: Tilt meter data at Stations 2 & 5 is questionable.*

- Predicted Response
- Tilt Meters - Static Test S2A
- GPS Data - Static Test S2A
- ▲ Tilt Meters - Dynamic Test D4
- ▲ GPS Data - Dynamic Test D4
- Tilt Meters - Dynamic Test D7
- GPS Data - Dynamic Test D7

FIGURE 21

### TWO TRAINS BYPASSING AT 550 ft WEST OF MIDSPAN PONTOON ROTATION

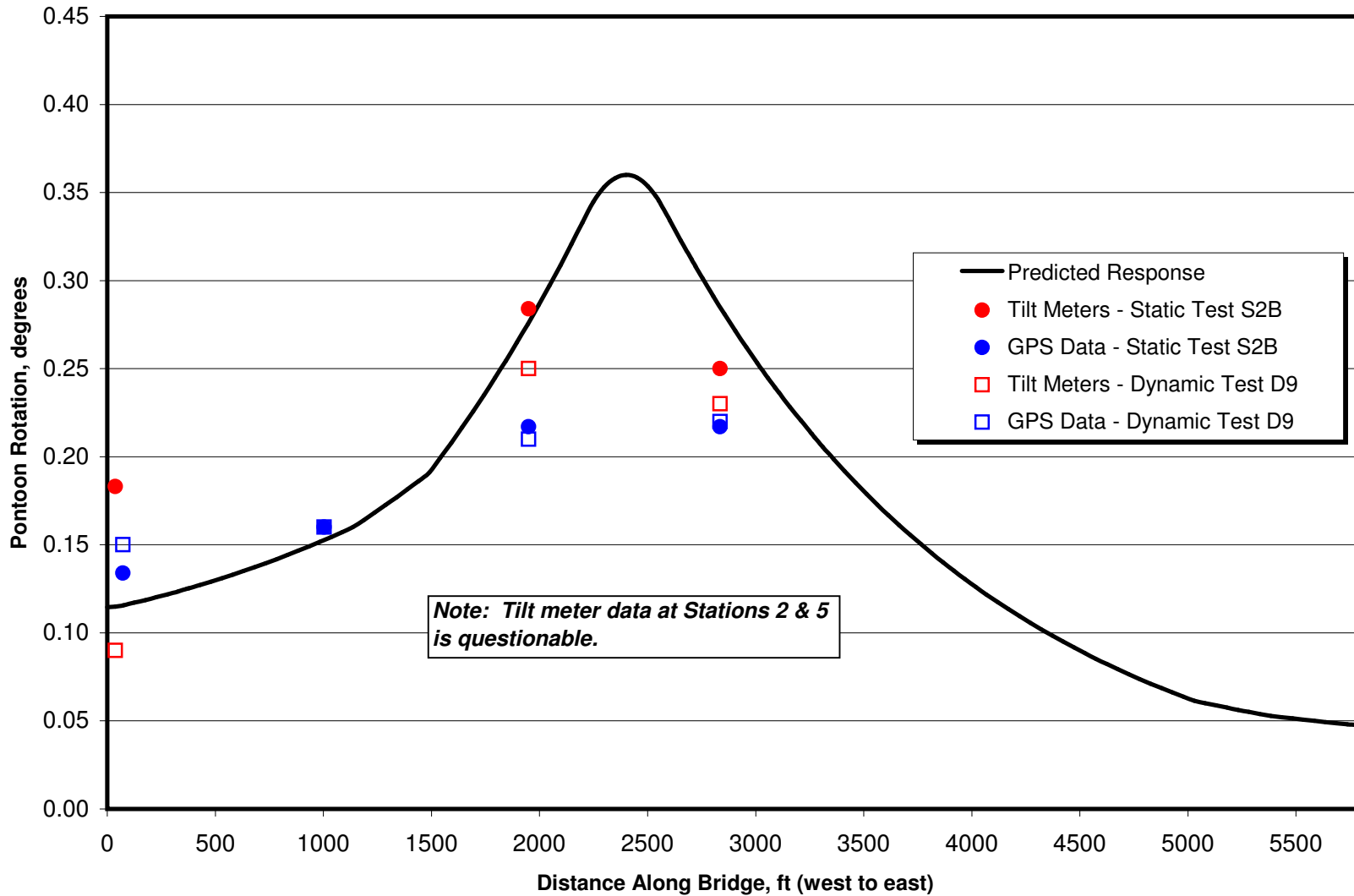
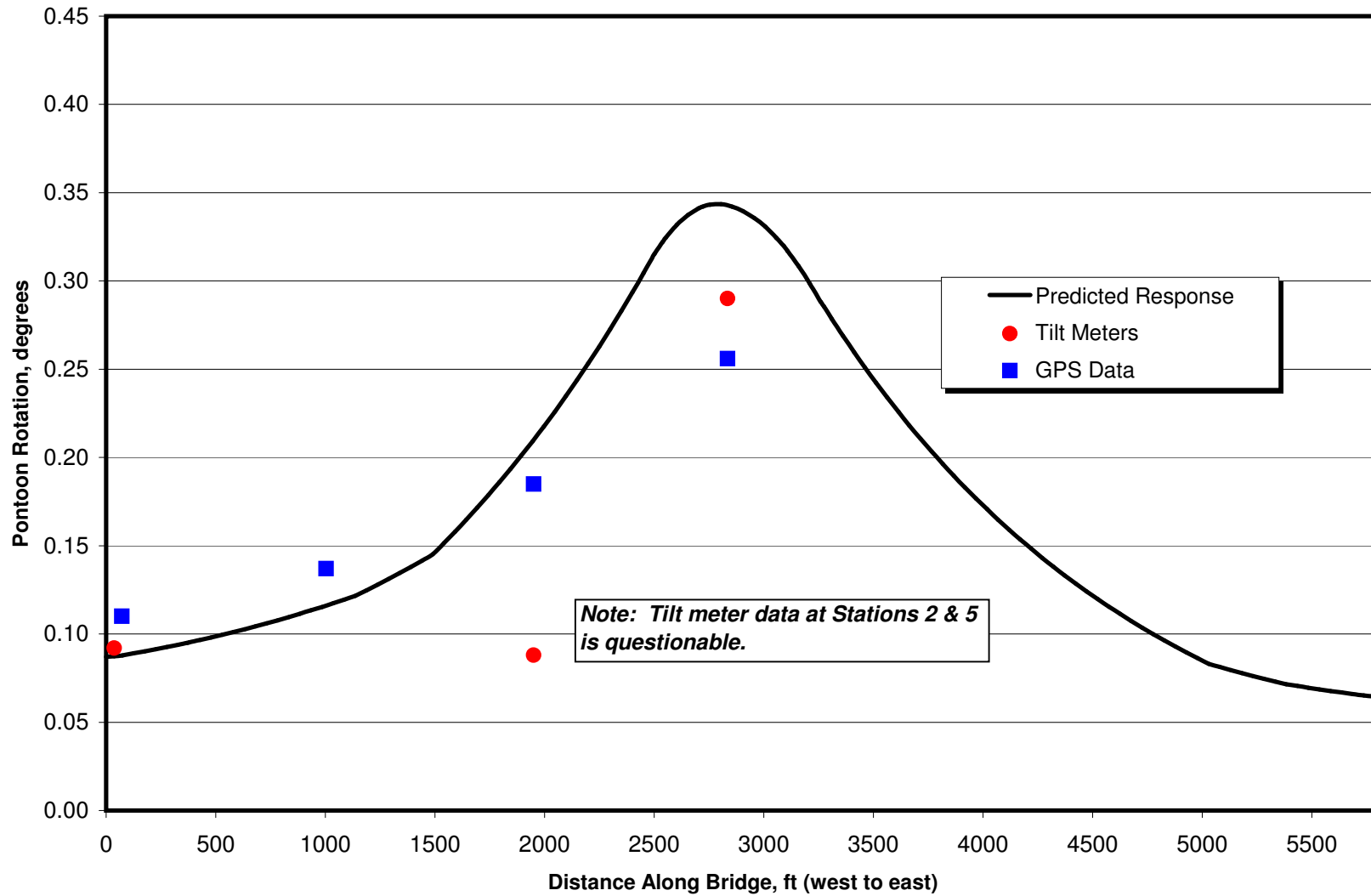


FIGURE 22

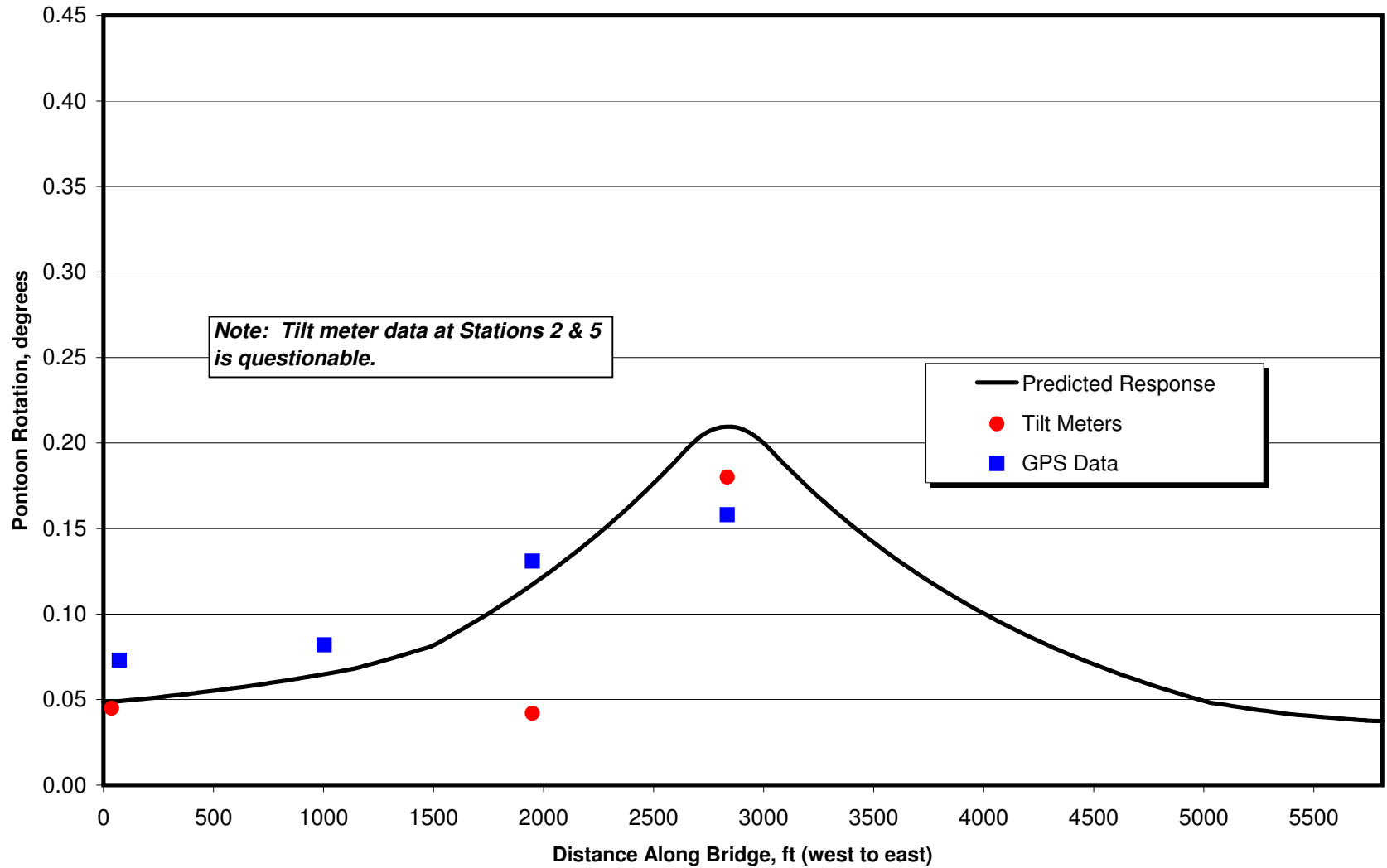
**STATIC TEST CASE S3 - TWO TRAINS ABOUT TO BYPASS AT MIDSPAN  
PONTOON ROTATION**



**FIGURE 23**

**SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)**

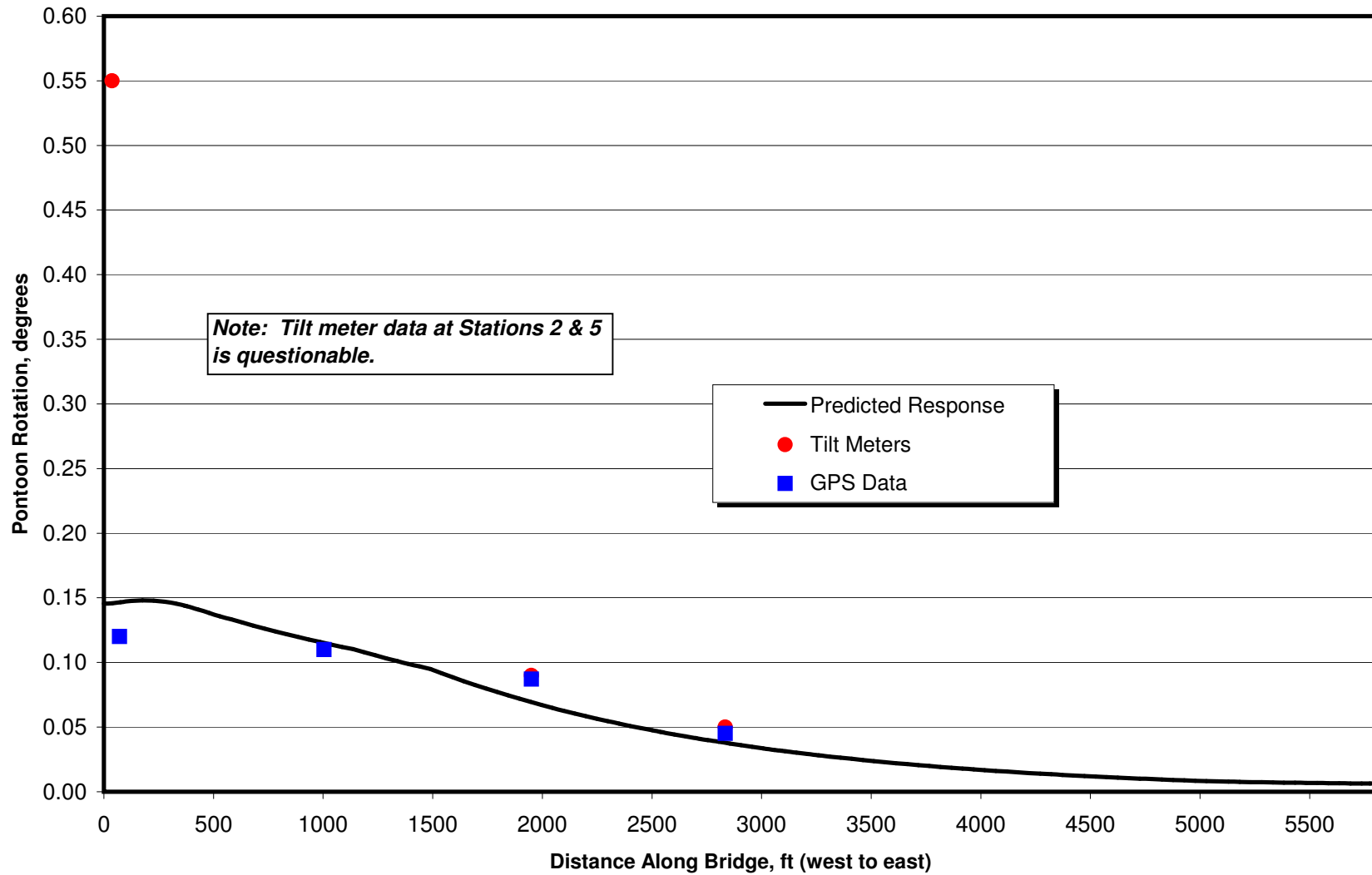
**STATIC TEST CASE S4 - SINGLE TRAIN ON SOUTH TRACK AT MIDSPAN  
PONTOON ROTATION**



**FIGURE 24**

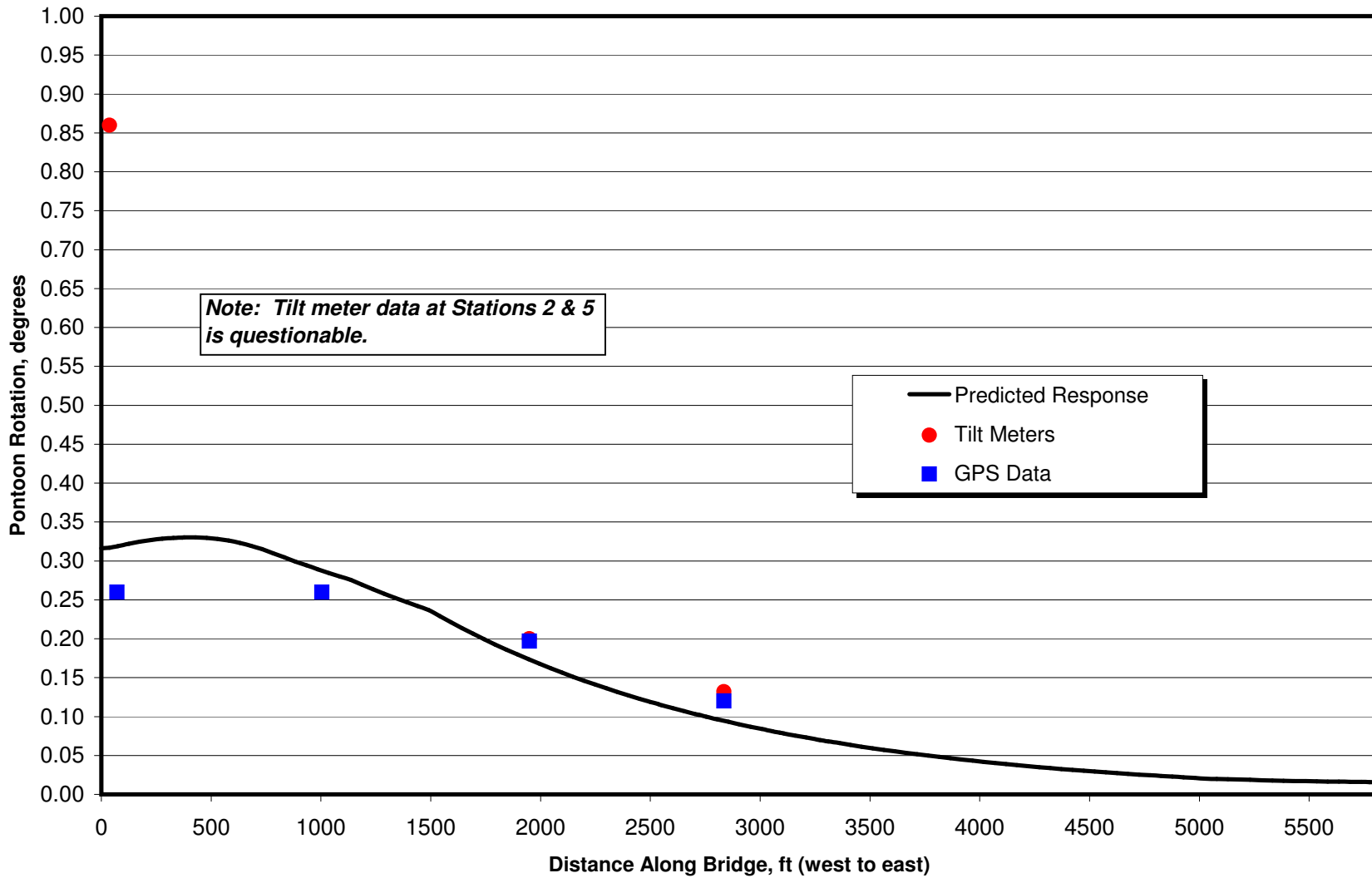
**SR90 HOMER HADLEY FLOATING BRIDGE TEST PROGRAM FOR LIGHT RAIL TRANSIT (LRT)**

**STATIC TEST CASE S5 - SINGLE TRAIN ON NORTH TRACK AT WEST END  
PONTOON ROTATION**



**FIGURE 25**

**STATIC TEST CASE S6 - TWO TRAINS ABOUT TO BYPASS AT WEST END  
PONTOON ROTATION**



**FIGURE 26**

## TWO TRAINS BYPASSING AT WEST END PONTOON ROTATION

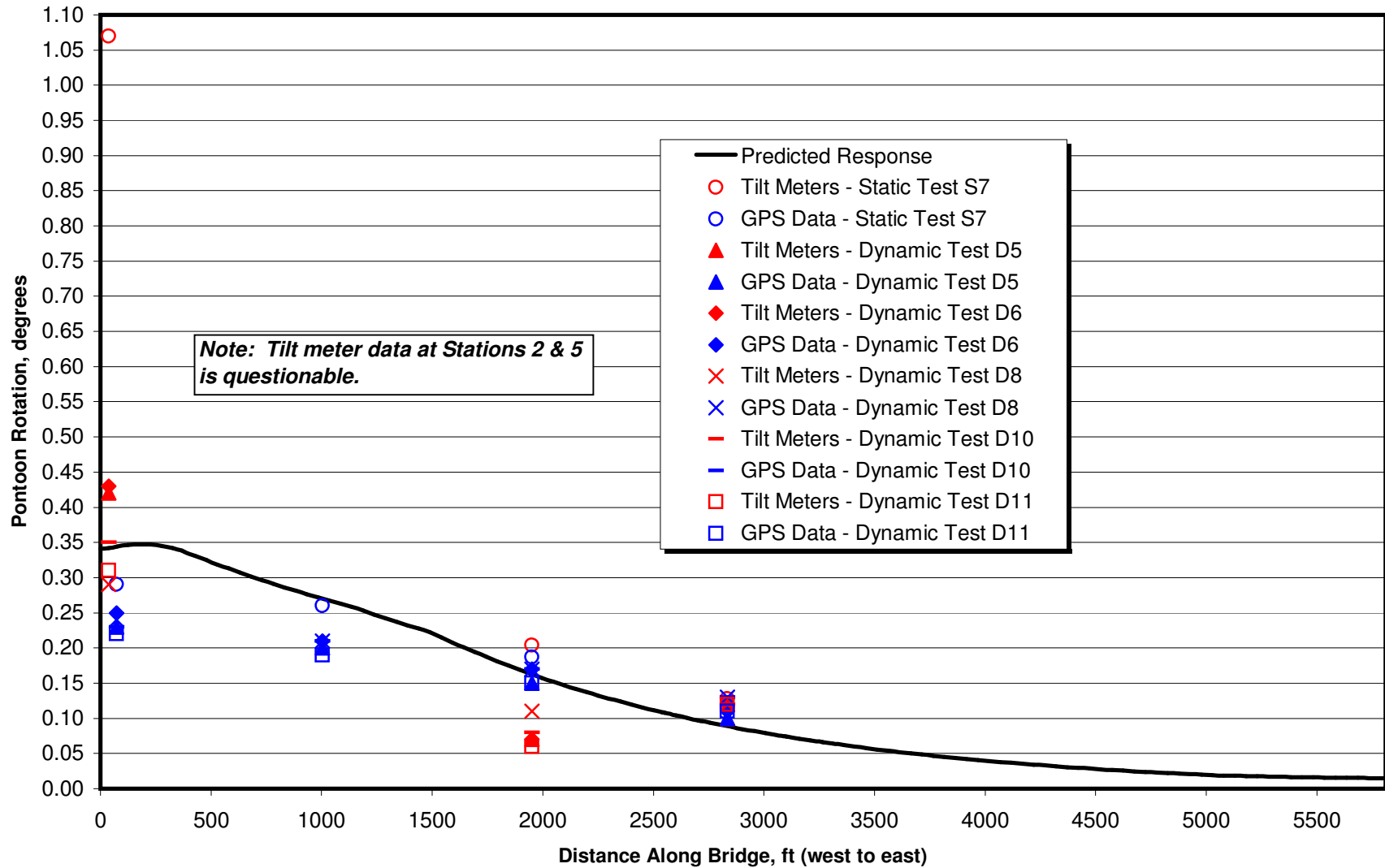
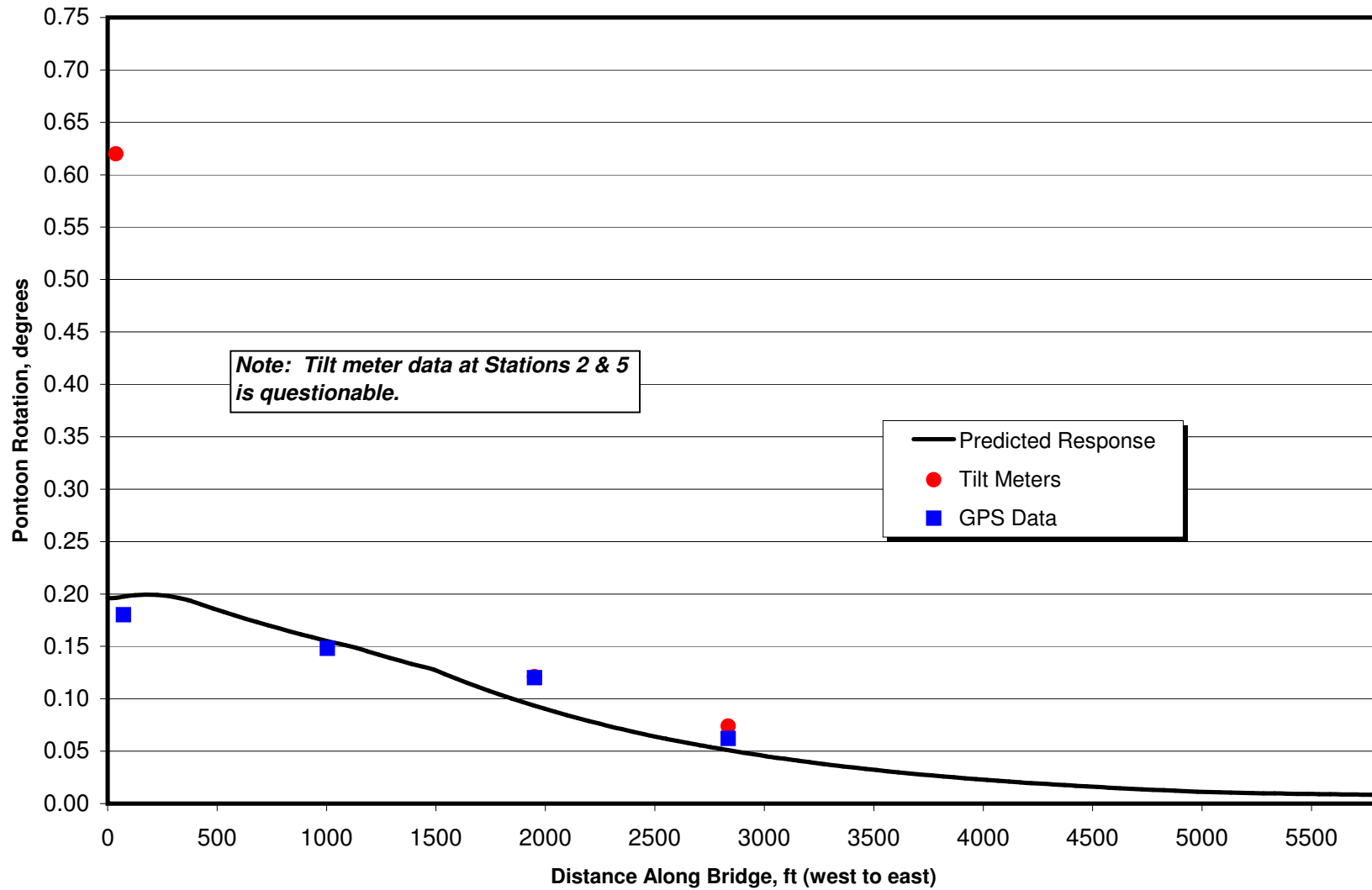
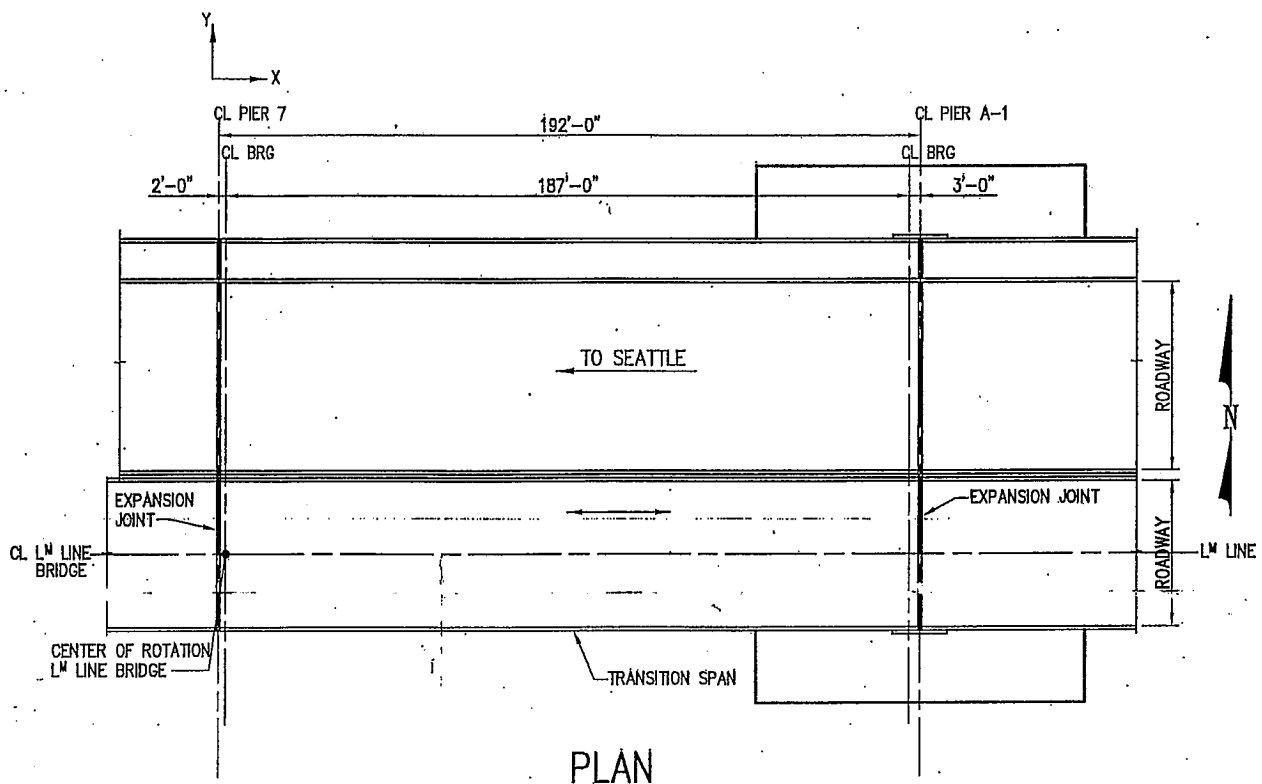


FIGURE 27

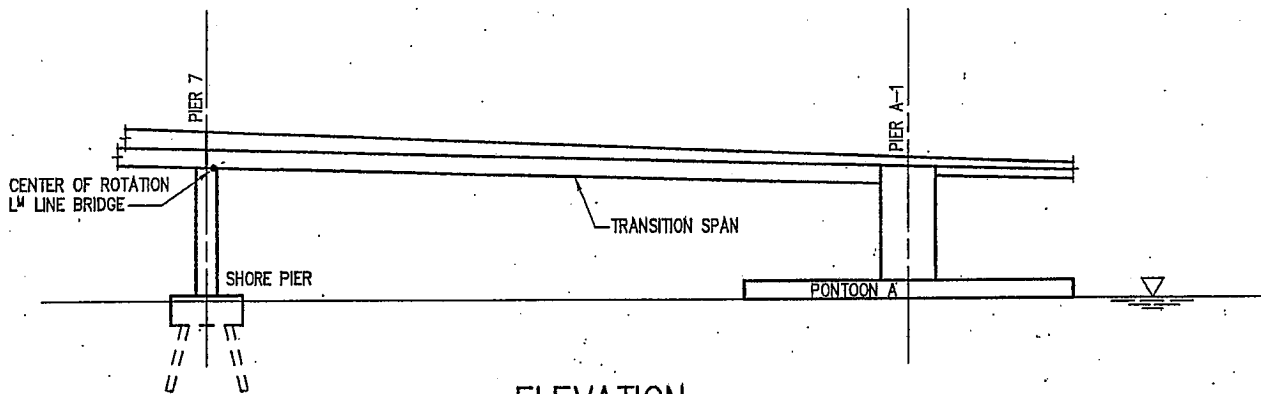
**STATIC TEST CASE S8 - SINGLE TRAIN ON SOUTH TRACK AT WEST END  
PONTOON ROTATION**



**FIGURE 28**

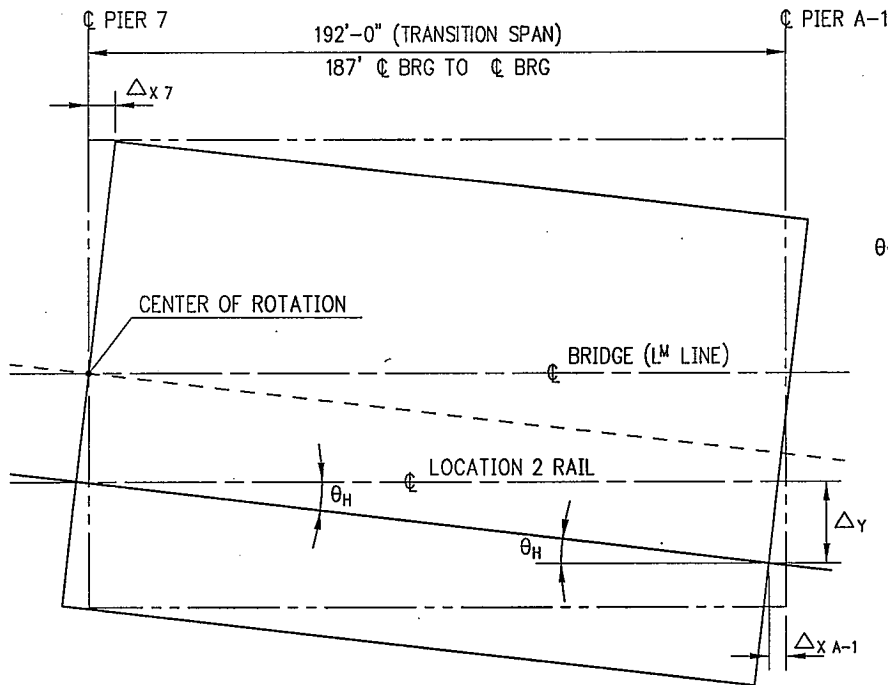


PLAN

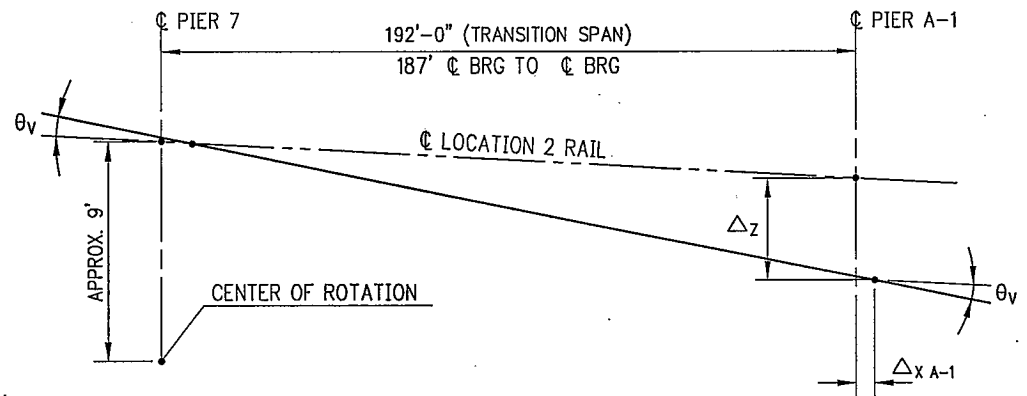


ELEVATION

**FIGURE 29**  
**TRANSITION SPAN**



PLAN  
HORIZONTAL RAIL MOVEMENT  
AT CENTERLINE PIER A-1



ELEVATION  
VERTICAL LRT RAIL MOVEMENT  
AT CENTERLINE PIER A-1

FIGURE 29.1  
TYPES OF MOTION OF THE RAIL  
AT THE TRANSITION SPAN EXPANSION JOINT