




FIGG M-071  
Via E-mail

MEMORANDUM

TO: Mr. Rodrigo Isaza

FROM: Manuel Feliciano, P.E. 

REFERENCE: UniversityCity Prosperity Project  
Project ID BT-904  
Submittal #000400-6.A, SPMT Bridge Movement Monitoring Plan (Revised)  
FIGG Project No. 2262.06

DATE: February 13, 2018

FIGG received Submittal #000400-6.A (5 drawings) for the referenced project on February 2, 2018. The shop drawings are being returned as “Accepted” (A) and “Accepted As Noted” (AN). See the table below for the review status of each drawing. For comments, see reviewed drawings.

Drawing No.	Drawing Title	Review Status
LLT-01	Overall Legend	A
LLT-02	Truss Elevation & Gantry Plan	A
LLT-03	Instrumentation Cross Sections (Set 1)	A
LLT-04	Instrumentation Cross Sections (Set 2)	A
LLT-05	Sensor Installation	AN

Please let us know if you have any questions.

xc: Mr. Ernie Hernandez  
Mr. W. Denney Pate, P.E.  
Mr. Dwight D. Dempsey, P.E., S.E.



# Submittal #000400-6.A 000400 - DIVISION 2 - CONCRETE STRUCTURES

6201 SW 70th Street 2nd Floor  
Miami, Florida 33143  
Phone: (305) 541-0000  
Fax: (305) 541-9771

Project: 2015-711 - FIU - UCPP - DB Pedestrian Bridge  
SW 109 Avenue & SW 8th Street  
Miami, Florida 33174  
Phone: 305-541-0000

## SPMT Bridge Movement Monitoring Plan

<b>SPEC SECTION:</b>	000400 - DIVISION 2 - CONCRETE STRUCTURES	<b>CREATED BY:</b>	
<b>STATUS:</b>	Open	<b>DATE CREATED:</b>	02/02/2018
<b>ISSUE DATE:</b>	02/02/2018	<b>REVISION:</b>	A
<b>RESPONSIBLE CONTRACTOR:</b>	Barnhart Crane & Rigging	<b>RECEIVED FROM:</b>	
<b>RECEIVED DATE:</b>	02/02/2018	<b>OWNER JOB NO.:</b>	BT-904
<b>FINAL DUE DATE:</b>	02/09/2018	<b>DAYS ELAPSED:</b>	
<b>TYPE:</b>		<b>MCM JOB NO.:</b>	2015-711
<b>PRIORITY:</b>			
<b>APPROVERS:</b>	Erika Hango (FIGG Bridge Engineers)		
<b>BALL IN COURT:</b>	Erika Hango (FIGG Bridge Engineers)		
<b>DISTRIBUTION:</b>	Alan Ruiz (MCM) , Rodrigo Isaza (MCM) , Ernie Hernandez (MCM) , Manuel Feliciano (FIGG Bridge Engineers) , Dwight Dempsey (FIGG Bridge Engineers) , Pedro Cortes (MCM)		
<b>DESCRIPTION:</b>	SPMT Bridge Movement Monitoring Plan		
<b>ATTACHMENTS:</b>			

### SUBMITTAL WORKFLOW

#	NAME	SUBMITTER/ APPROVER	SENT DATE	DUE DATE	RETURNED DATE	RESPONSE	COMMENTS
1	Erika Hango	Approver		2/9/2018		Pending	

**ENGINEERS & GENERAL CONTRACTORS**

Review is for general conformance with the Contract Documents. Comments shall not be construed as relieving the supplier/subcontractor from strict compliance with such documents. The supplier/subcontractor remain responsible for details and accuracy, for complying with standards of the industry regarding fabrication, assembly, erection and installation procedures.

REVIEWED
  REVISE & RESUBMIT  
 REVIEWED AS NOTED
  REJECTED

By: Alan Ruiz Date: 2-2-2018

BY \_\_\_\_\_ DATE \_\_\_\_\_ COPIES TO \_\_\_\_\_



RAW DATA. REFINED RESULTS.

740 S PIERCE AVE, SUITE 15  
LOUISVILLE, CO 80027  
303.494.3230  
WWW.BDITEST.COM

ISSUE

CLIENT

BARNHART C&R  
2163 AIRWAYS BLVD,  
MEMPHIS, TN 38114

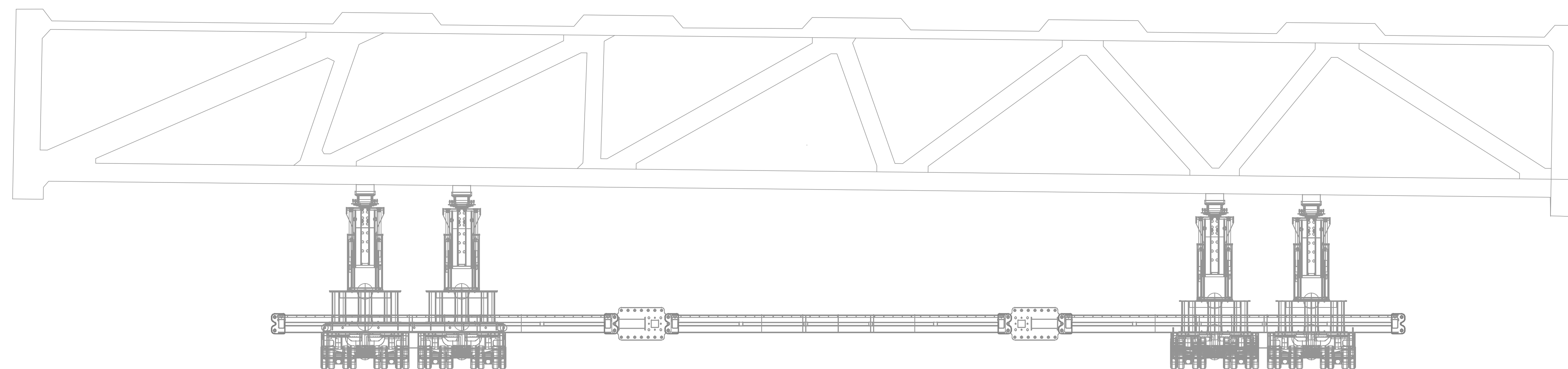
PROJECT NAME



RAW DATA. REFINED RESULTS.

# BARNHART CRANE & RIGGING FIU PEDESTRIAN BRIDGE MOVE STRUCTURAL MONITORING SYSTEM

BARNHART CRANE & RIGGING  
FIU PEDESTRIAN BRIDGE MOVE  
STRUCTURAL MONITORING SYSTEM



Drawn By: RLW  
Checked By: BCC  
Date: 12/22/17  
Client No.: 2262.06  
BDI No.: 160903-NY  
SCALE: NTS

COVER PAGE

LLT-00

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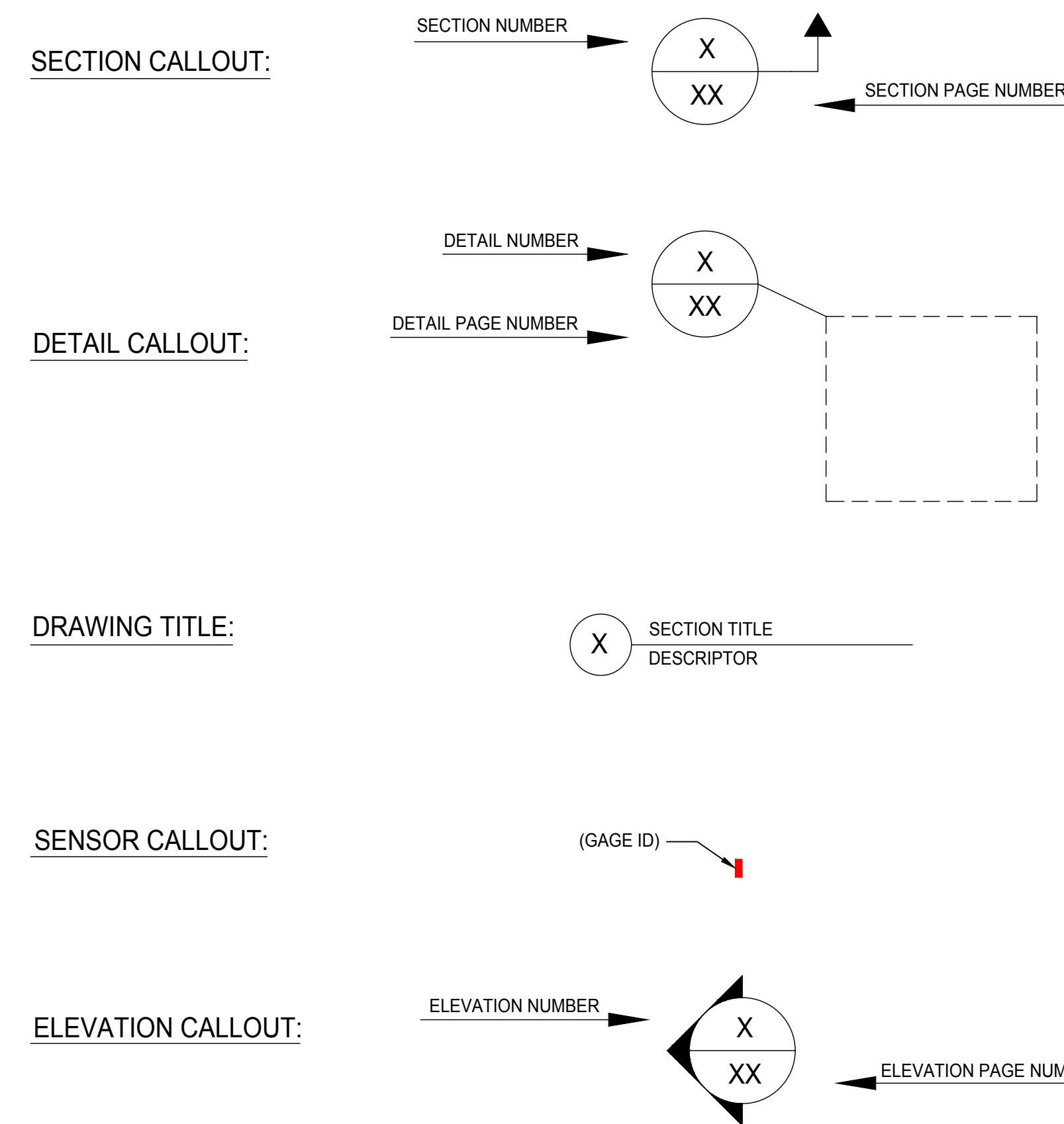
GAGE LEGEND & SPECIFICATION

SYMBOL	TYPE	BRAND	MODEL	NOTES
-	STRAIN TRANSDUCER	BDI	ST350	
⊗	ROTATION SENSOR	BDI	T500-030	
▲	DISPLACEMENT SENSOR	BDI	STRING POT	

INDEX OF SHEETS

SHEET NUMBER	SHEET TITLE
LLT - 00	COVER PAGE
LLT - 01	OVERALL LEGEND
LLT - 02	TRUSS PLAN & GANTRY ELEVATION
LLT - 03	INSTRUMENTATION CROSS SECTIONS (SET 1)
LLT - 04	INSTRUMENTATION CROSS SECTIONS (SET 2)
LLT - 05	SENSOR INSTALLATION

ANNOTATION KEY



TOTAL SENSOR COUNT

-	STRAIN TRANSDUCER	(24)
⊗	ROTATION SENSORS	(9)
▲	DISPLACEMENT SENSOR	(5)
TOTAL		(38)

INDEX OF REVISIONS

NO.	DATE	REVISION DESCRIPTION
-	12/22/2017	INITIAL PLANS - PRE-INSTALL
BDI REFERENCE NUMBER: 170804-FL		
CLIENT PROJECT NUMBER: 2262.06		

TESTING NOTES

- MEASUREMENTS FROM ALL SENSORS WILL BE RECORDED USING STS4 STRUCTURAL MONITORING SYSTEM WITH A 1 HZ. SAMPLE RATE DURING THE BRIDGE SPAN MOVE.
- SPAN DISPLACEMENT MEASUREMENTS WILL BE OBTAINED RELATIVE TO THE GROUND AT TWO INSTANCES ONLY:
  - WHILE THE SPAN IS LIFTED FROM THE INITIAL TEMPORARY BEAM SEATS.
  - WHILE THE SPAN IS SET ON ABUTMENT BEARINGS.
- ROTATION AND STRAIN MEASUREMENTS WILL BE RECORDED FOR THE ENTIRE DURATION OF THE SPAN MOVE.
- MEASUREMENTS WILL BE VIEWED IN REAL TIME.
- VIRTUAL (COMPUTED) SENSOR VALUES WILL BE MONITORED NEAR REAL TIME TO EXAMINE:
  - STRUCTURE TILT (AVERAGE OF SEVERAL ROTATION SENSORS)
  - STRUCTURE TWIST (DIFFERENCE BETWEEN ROTATION SENSORS AT LIFT POINTS)
- BEAM DEFLECTION VALUES DURING LIFTING AND SETTING WILL BE POST PROCESSED AND PROVIDED IN TEST REPORT. RIGID BODY MOTION WILL BE ELIMINATED FROM DISPLACEMENT MEASUREMENTS TO PROVIDE STRUCTURE DEFLECTION.

**SHOP DRAWING REVIEW**

\_\_\_\_\_ FOR INFORMATION ONLY  ACCEPTED \_\_\_\_\_ ACCEPTED AS NOTED  
 \_\_\_\_\_ ACCEPTED AS NOTED & RESUBMIT \_\_\_\_\_ NOT ACCEPTED

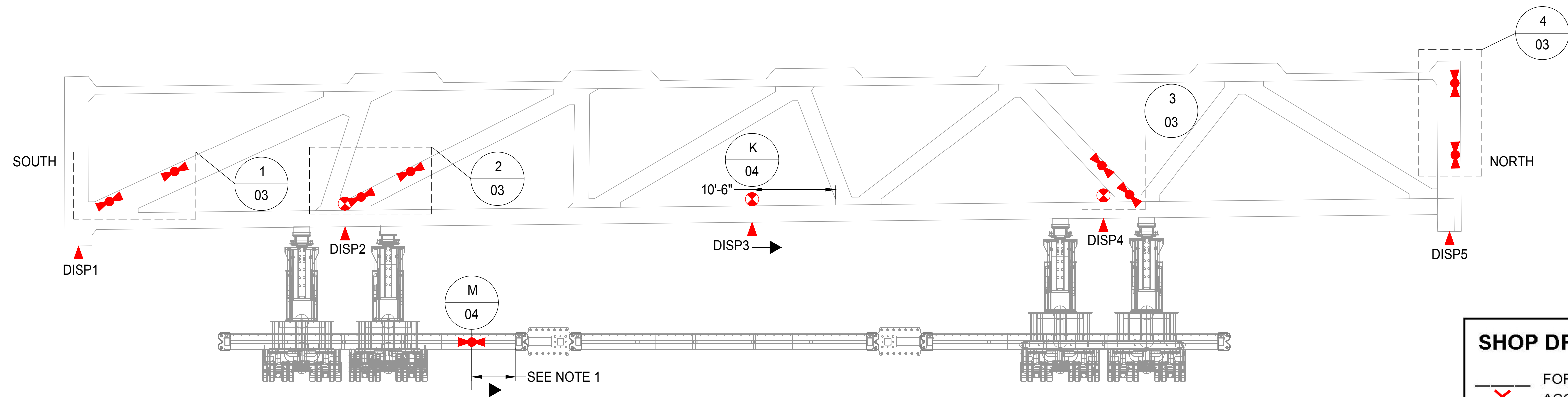
This review is only for general conformance with design intent of the project and general compliance with the information given in the contract documents. Review, corrections or comments made concerning the shop drawings during this review do not relieve the contractor from compliance with requirements of the drawings and specifications, nor relieve the contractor of contractual responsibility for any error or deviation from contract requirements. The contractor is responsible for confirming and correlating all quantities, dimensions and structural capabilities - Selecting fabrication processes and techniques of construction - Coordinating his work with that of all other trades - and performing his work in a safe and satisfactory manner.

**FIGG BRIDGE ENGINEERS, INC.** By: EDL Date: 02/13/18

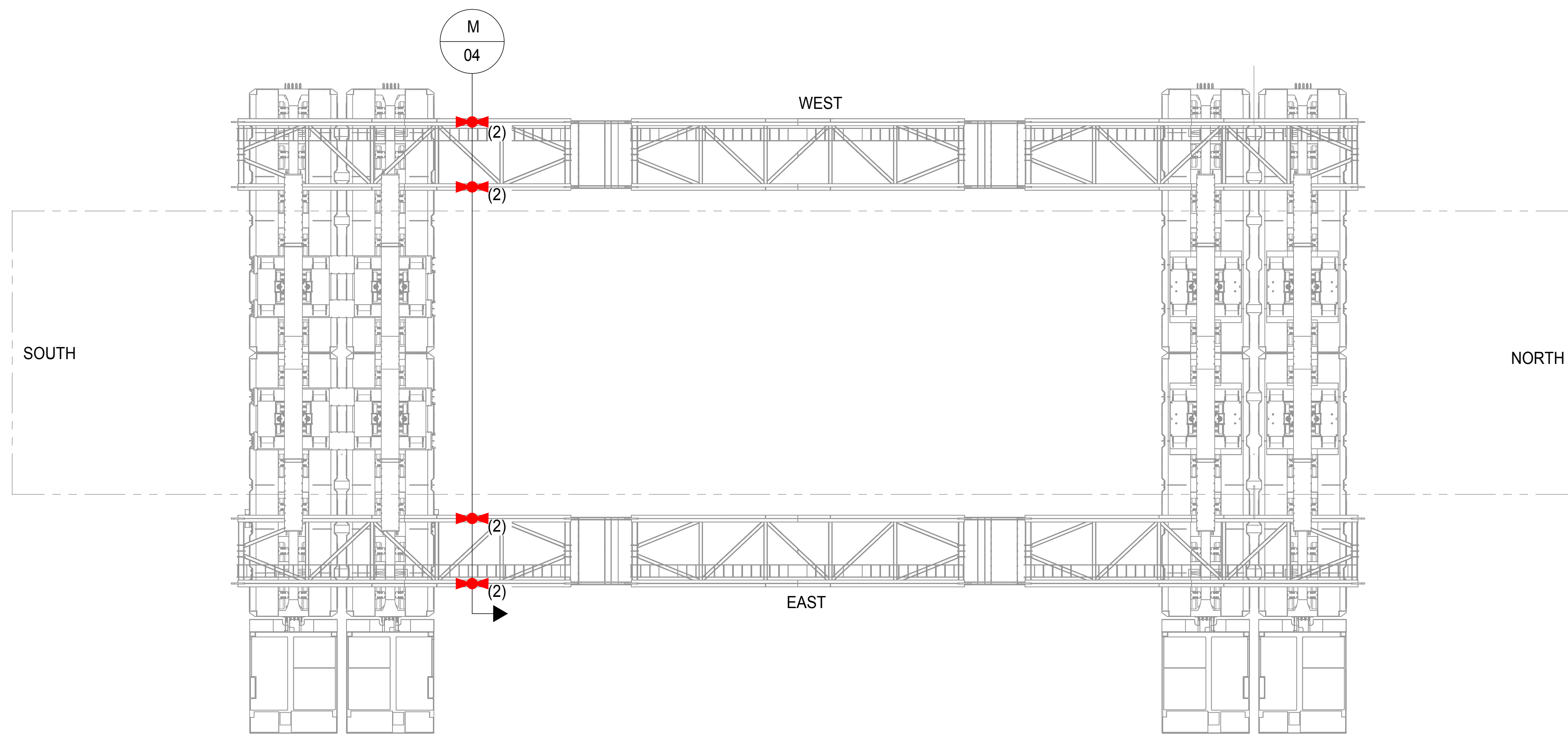
Drawn By: RLW  
 Checked By: BCC  
 Date: 12/22/17  
 Client No.: 2262.06  
 BDI No.: 160903-NY  
 SCALE: NTS

OVERALL LEGEND

LLT-01



1 PEDESTRIAN BRIDGE MOVE ELEVATION  
LOOKING WEST



2 GANTRY PLAN VIEW

### SHOP DRAWING REVIEW

- FOR INFORMATION ONLY
- ✗ ACCEPTED
- ACCEPTED AS NOTED
- ACCEPTED AS NOTED & RESUBMIT
- NOT ACCEPTED

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FIGG Subconsultant:

Firm:

By: \_\_\_\_\_ Date: \_\_\_\_\_

FIGG BRIDGE ENGINEERS, Inc.

By: **EDL** Date: **02/13/18**

**NOTES:**

1. GANTRY INSTRUMENTATION SHALL BE INSTALLED ON THE HSS TUBES. CROSS SECTION LOCATION SHALL BE DETERMINED ON SITE.
2. ALL DISPLACEMENT SENSORS SHALL MEASURE VERTICAL DISPLACEMENT AT THE MIDDLE OF THE UNDERSIDE OF THE DECK OF RELATIVE TO THE GROUND.
3. DISP1 SHALL BE CENTERED UNDER THE SOUTH DIAPHRAGM.
4. DISP2 SHALL BE ALIGNED WITH THE TILTMETER AT INSTRUMENTATION LOCATION 2 (SECTION J).
5. DISP3 SHALL BE ALIGNED WITH THE TILTMETER AT SECTION K.
6. DISP4 SHALL BE ALIGNED WITH THE TILTMETER AT INSTRUMENTATION LOCATION 3 (SECTION L).
7. DISP5 SHALL BE CENTERED UNDER THE NORTH DIAPHRAGM.

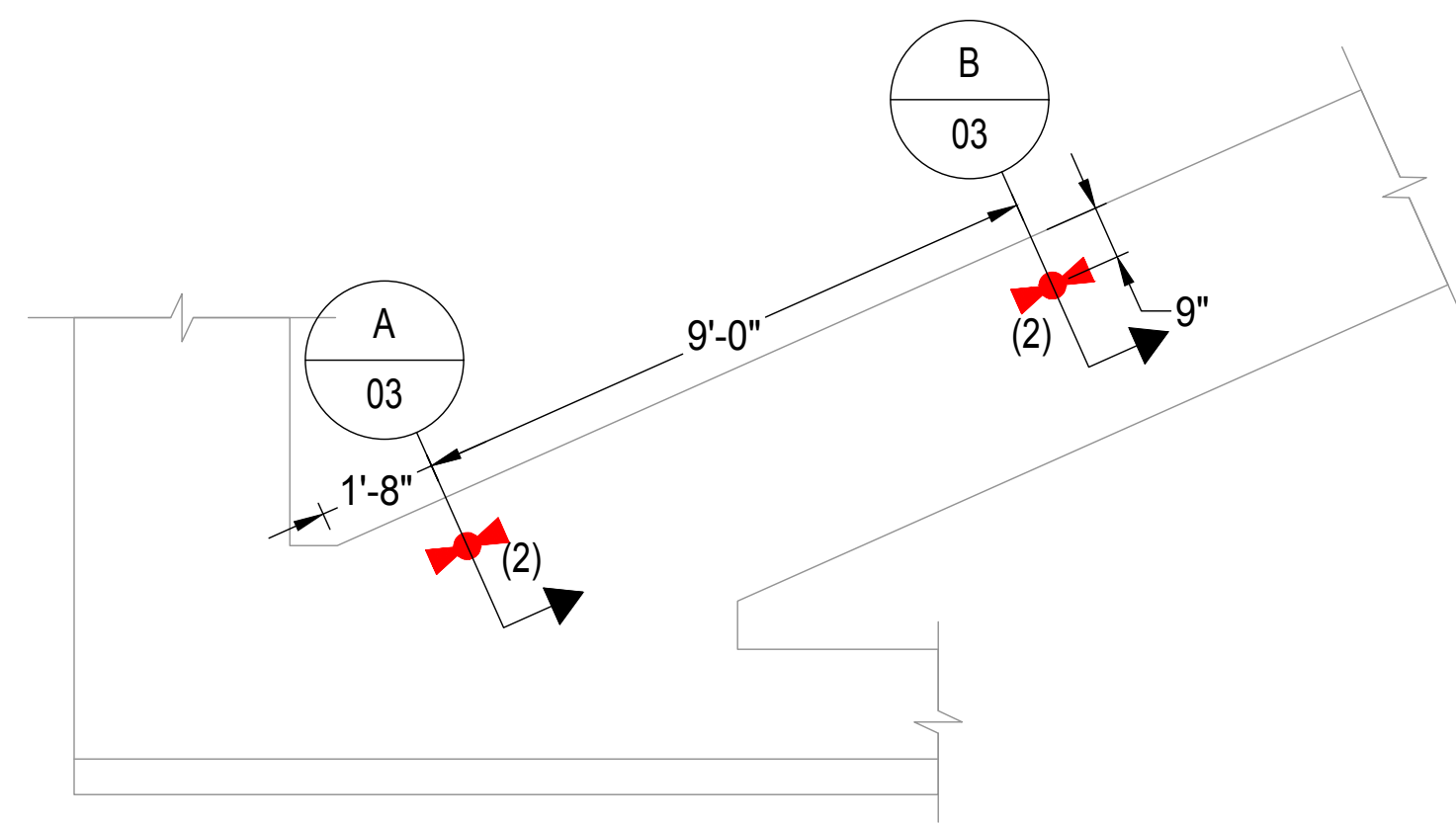
SENSOR LEGEND

- ✗ STRAIN TRANSDUCER
- ⊗ TILTMETER
- ▲ DISPLACEMENT SENSOR (STRING POT)

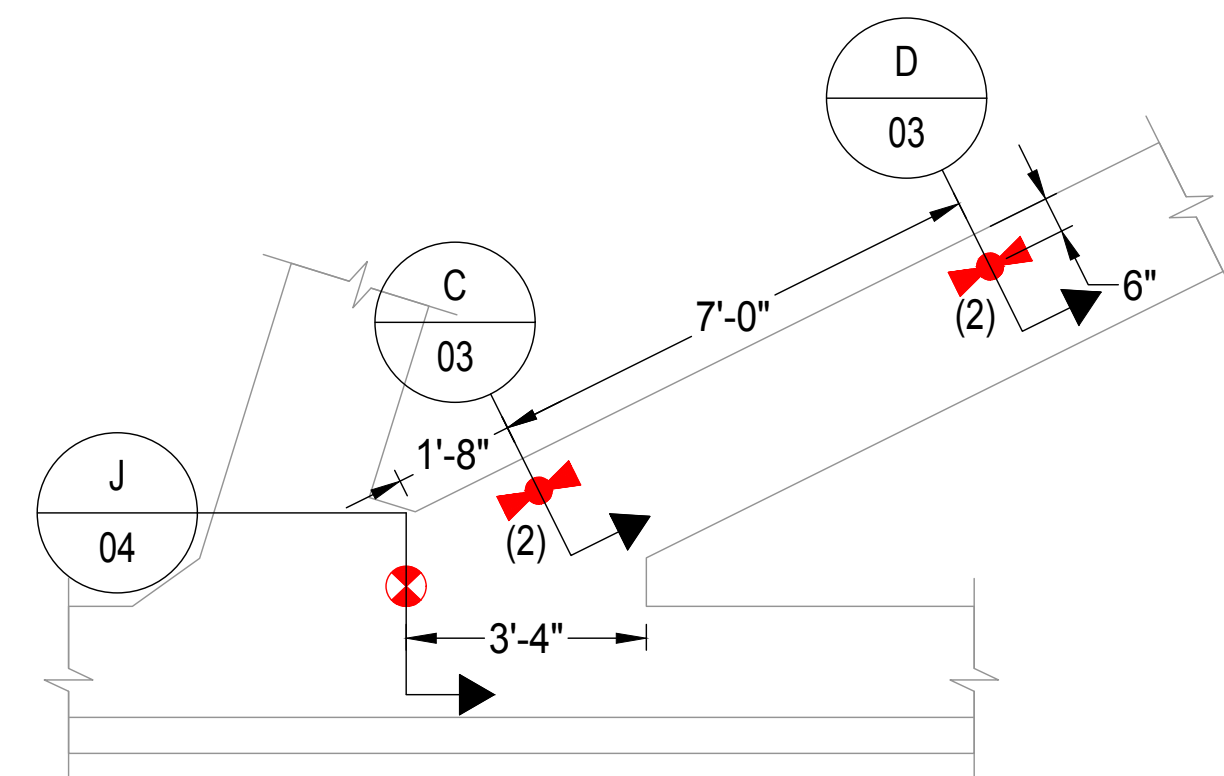
Drawn By: RLW  
Checked By: BCC  
Date: 12/22/17  
Client No.: 2262.06  
BDI No.: 160903-NY  
SCALE: NTS

TRUSS ELEVATION &  
GANTRY PLAN  
**LTT-02**

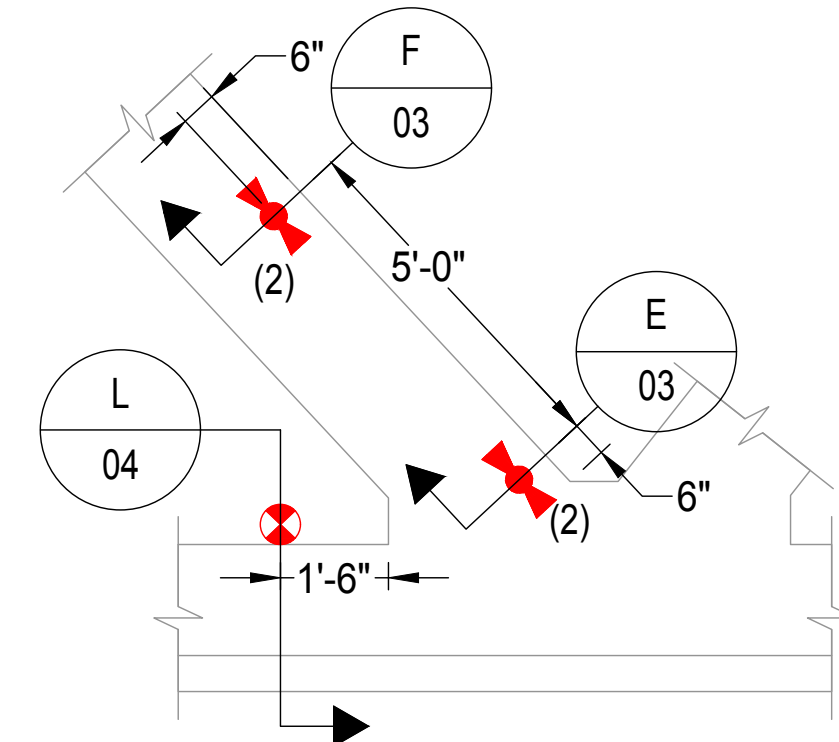
© 2015 BRIDGE DIAGNOSTICS, INC.



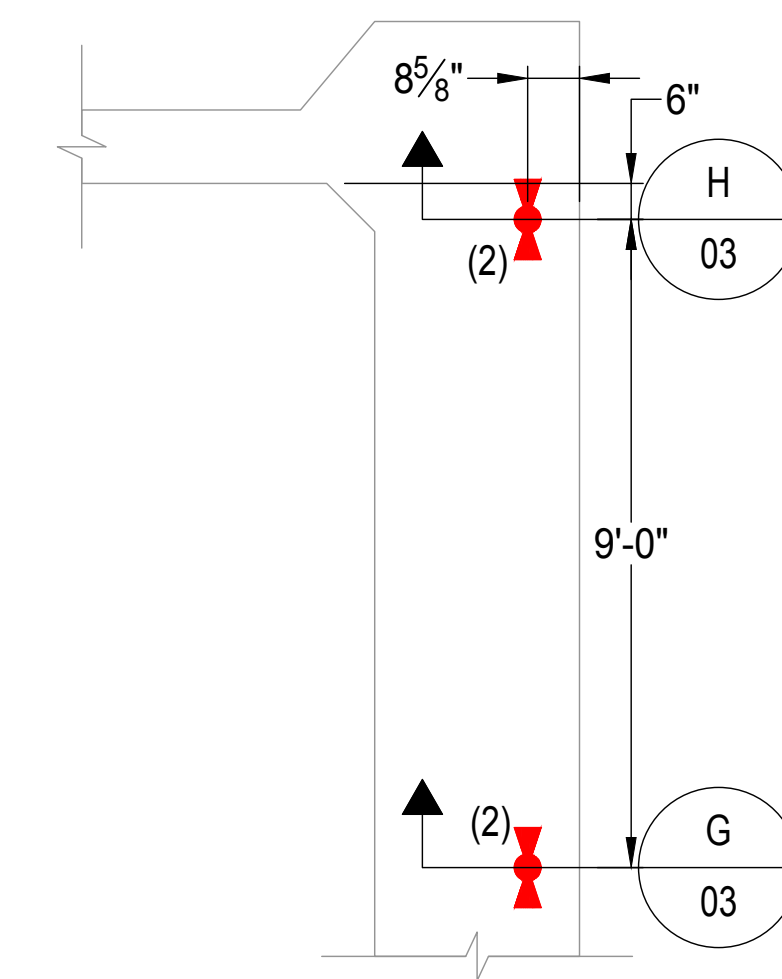
1 INSTRUMENTATION LOCATION 1



2 INSTRUMENTATION LOCATION 2



3 INSTRUMENTATION LOCATION 3



4 INSTRUMENTATION LOCATION 4

### SHOP DRAWING REVIEW

- FOR INFORMATION ONLY
- ACCEPTED
- ACCEPTED AS NOTED
- ACCEPTED AS NOTED & RESUBMIT
- NOT ACCEPTED

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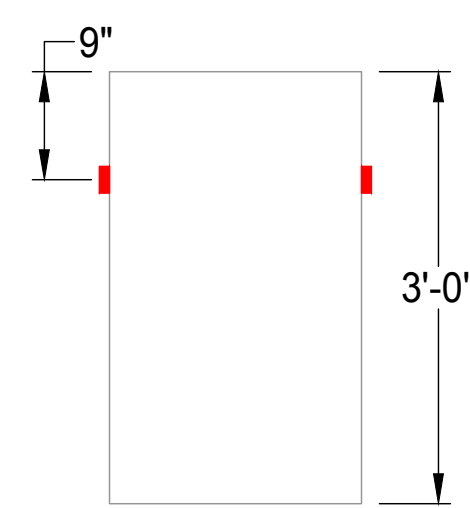
FIGG Subconsultant:

Firm:

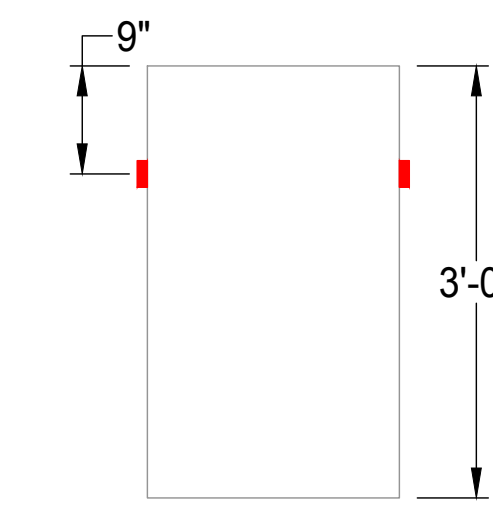
By: \_\_\_\_\_ Date: \_\_\_\_\_

FIGG BRIDGE ENGINEERS, Inc.

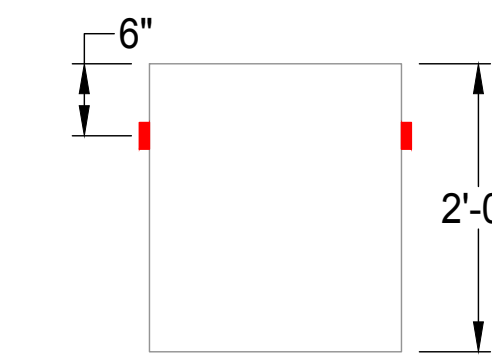
By: EDL Date: 02/13/18



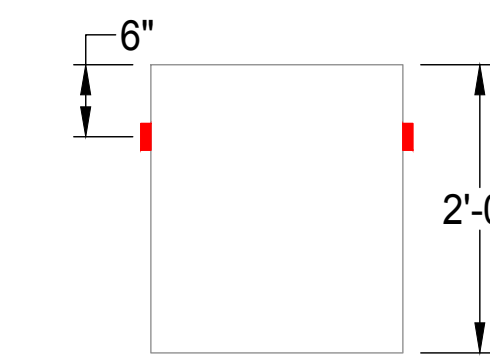
A SECTION A  
LOOKING NORTH



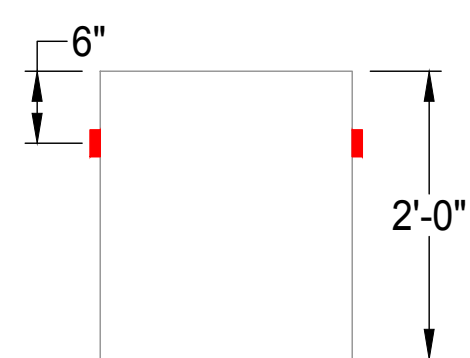
B SECTION B  
LOOKING NORTH



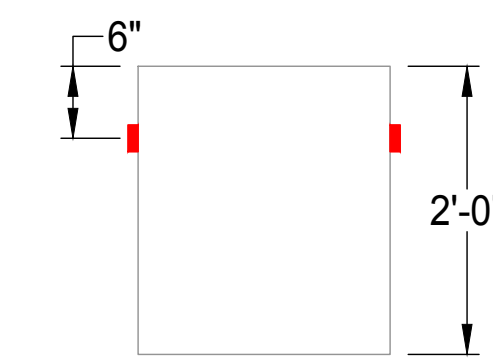
C SECTION C  
LOOKING NORTH



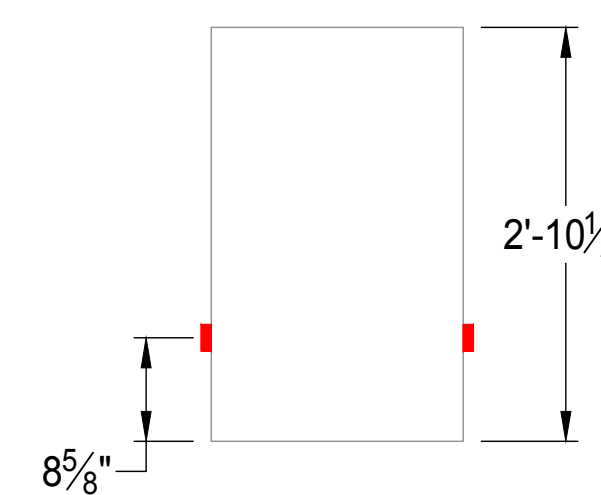
D SECTION D  
LOOKING NORTH



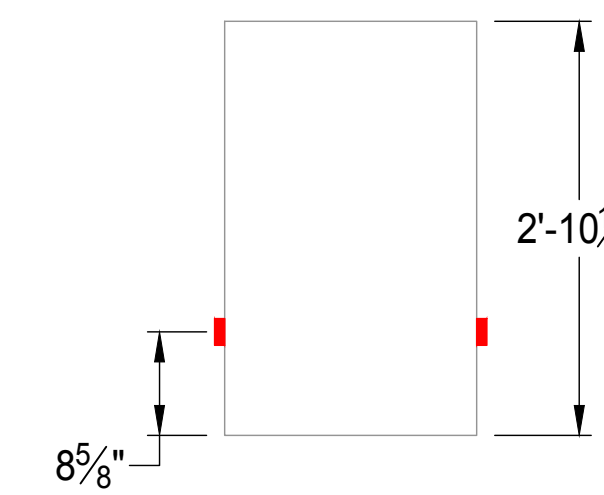
E SECTION E  
LOOKING SOUTH



F SECTION F  
LOOKING SOUTH



G SECTION G  
LOOKING UP



H SECTION H  
LOOKING UP

NOTES:

1. ALL ROTATION SENSORS SHALL BE ORIENTED TO MEASURE TRANSVERSE ROTATION
2. EXTERIOR ROTATION SENSORS SHALL BE CENTERED ON CURB.
3. ALL STRAIN SENSORS SHALL BE ORIENTED TO MEASURE LONITIDINAL AXIAL STRAIN IN EACH TRUSS MEMBER.
4. GANTRY HSS STRAIN GAGES SHALL BE INSTALLED 180° FROM EACH OTHER

SENSOR LEGEND

- STRAIN TRANSDUCER
- TILTMETER
- DISPLACEMENT SENSOR (STRING POT)

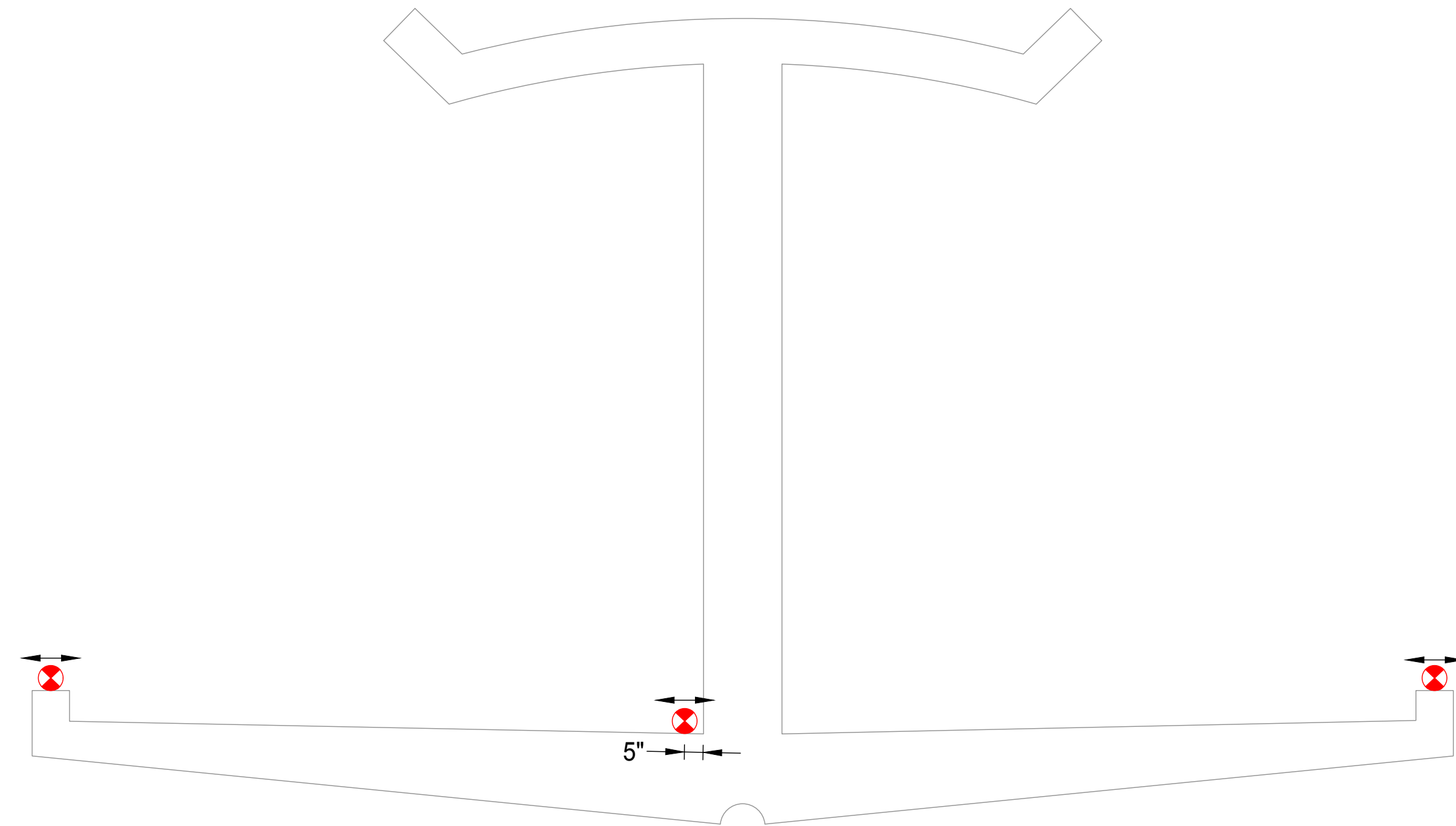
ISSUE

CLIENT

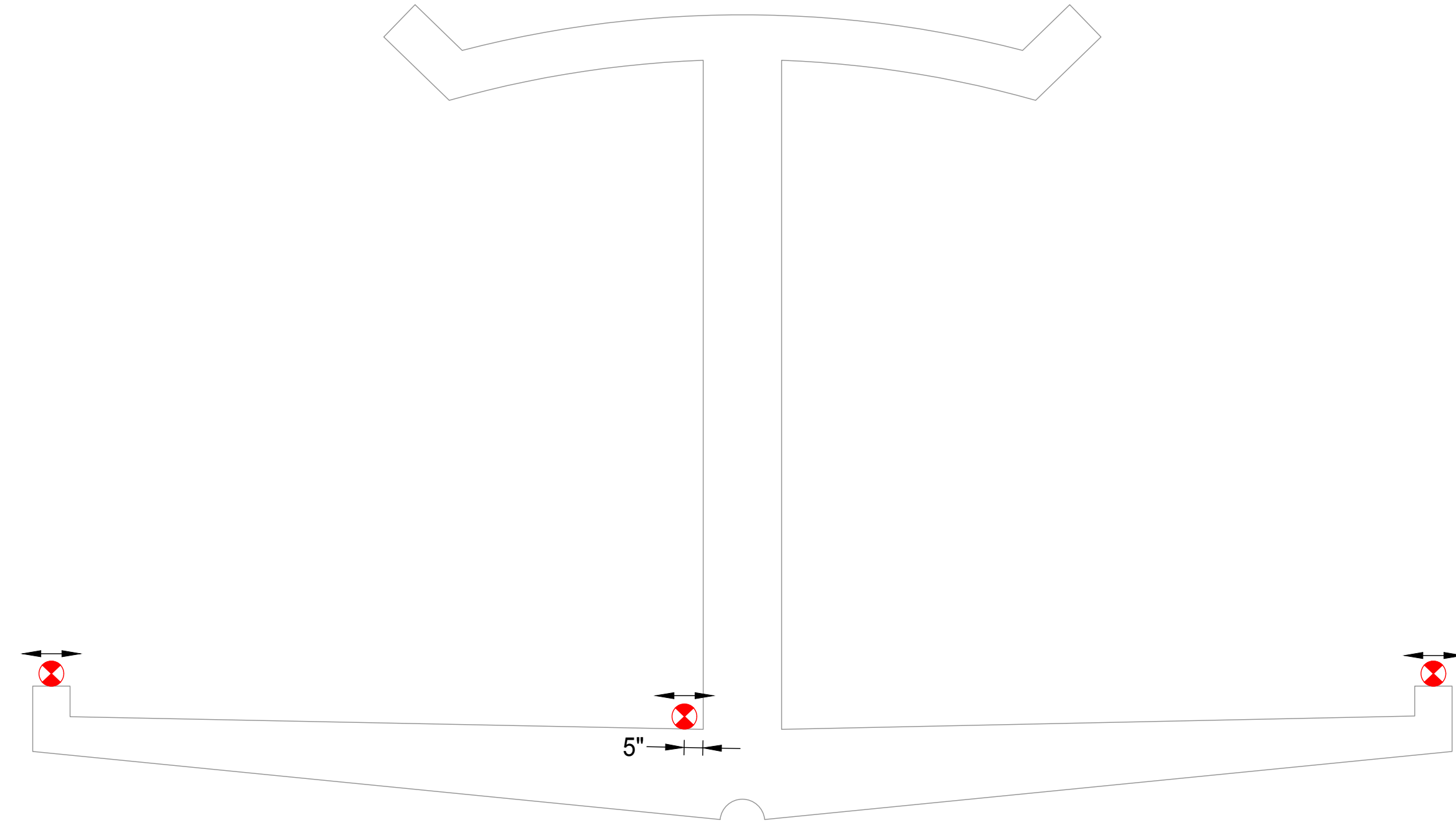
BARNHART C&R  
 2163 AIRWAYS BLVD,  
 MEMPHIS, TN 38114

PROJECT NAME

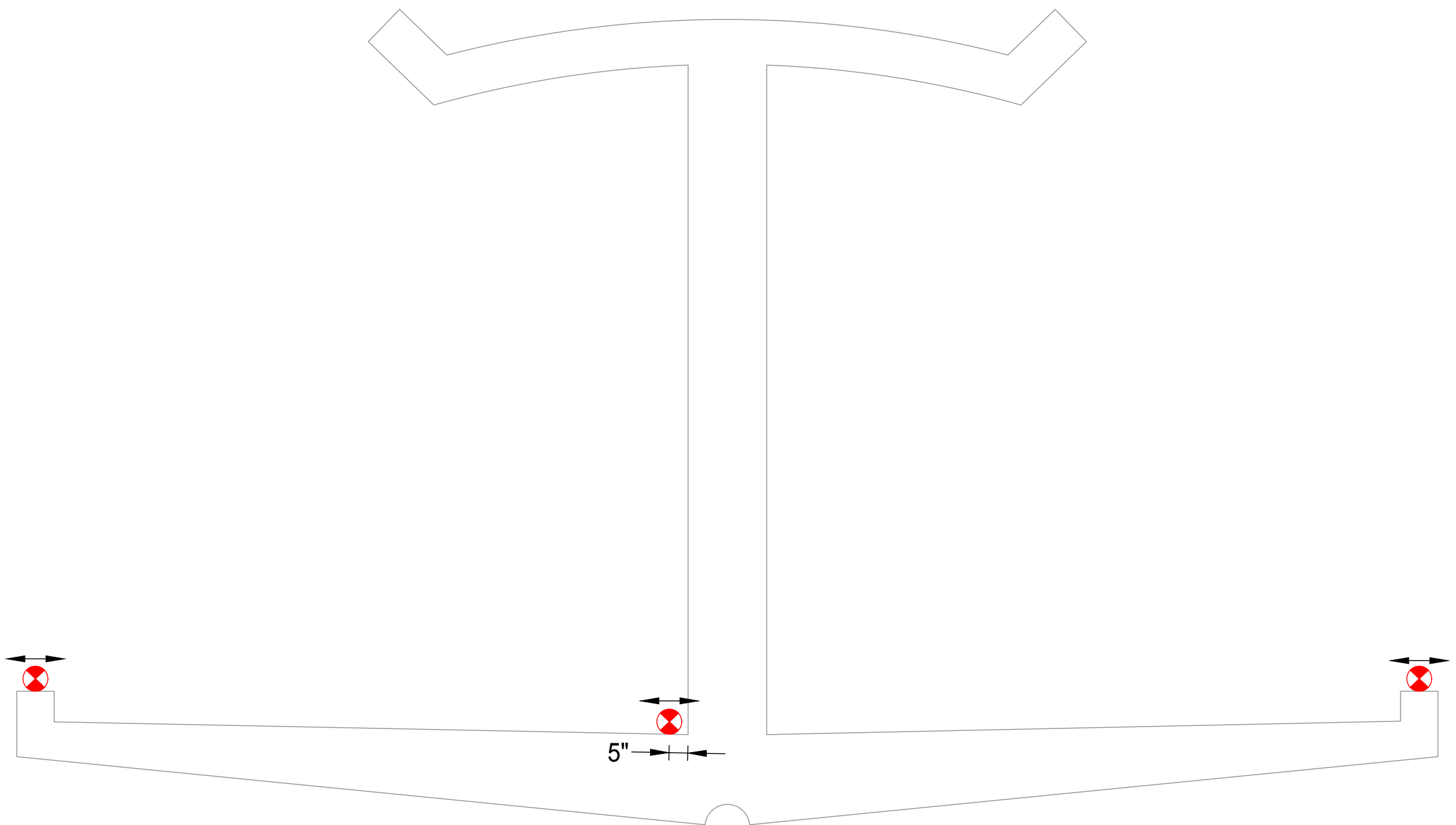
BARNHART CRANE & RIGGING  
 FUI PEDESTRIAN BRIDGE MOVE  
 STRUCTURAL MONITORING SYSTEM



J SECTION J  
 LOOKING NORTH



K SECTION K  
 LOOKING NORTH



L SECTION L  
 LOOKING NORTH

**SHOP DRAWING REVIEW**

FOR INFORMATION ONLY     ACCEPTED     ACCEPTED AS NOTED  
 ACCEPTED AS NOTED & RESUBMIT     NOT ACCEPTED

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**FIGG BRIDGE ENGINEERS, INC.**    By: EDL    Date: 02/13/18



M SECTION M  
 LOOKING NORTH

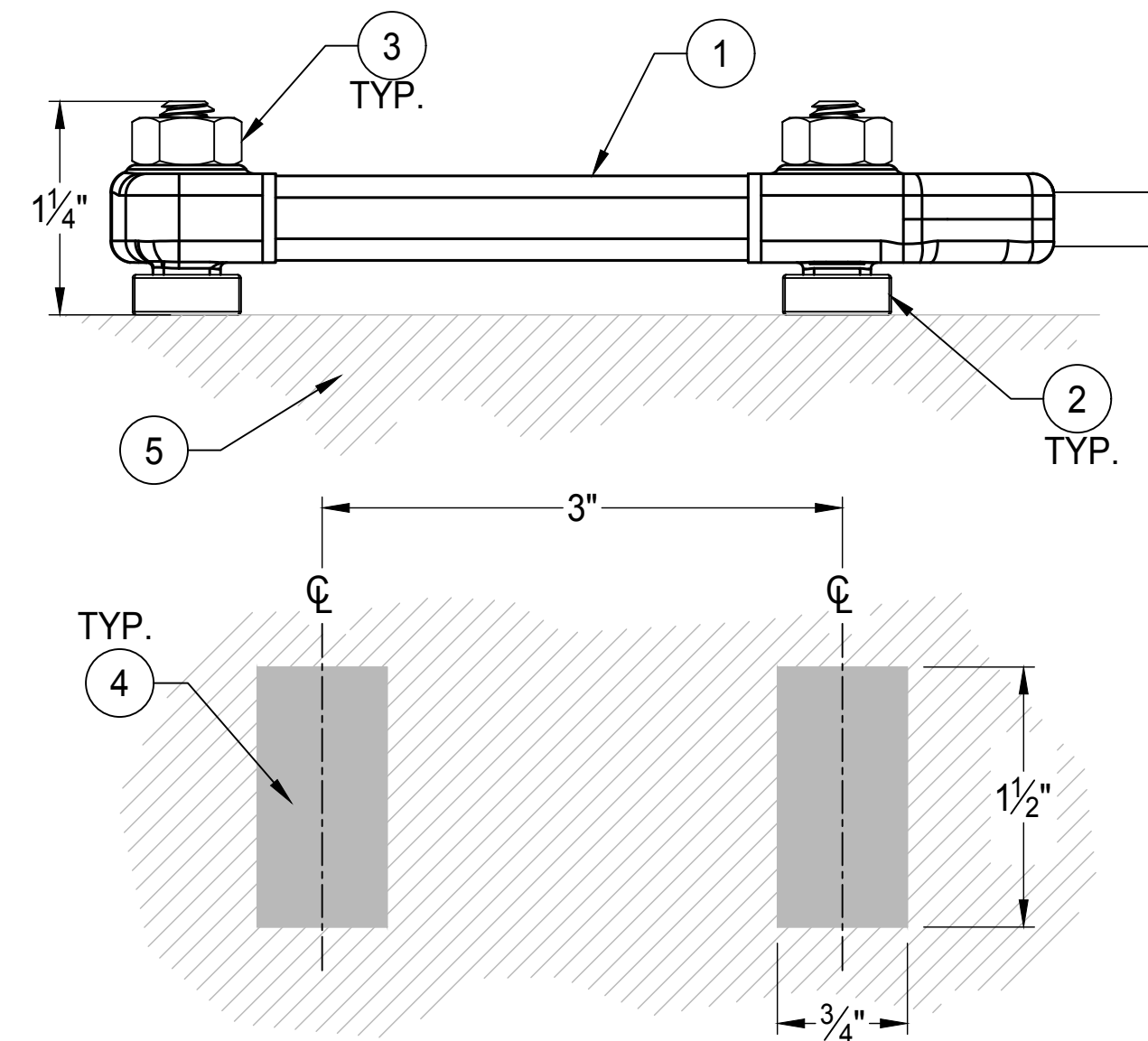
- NOTES:**
- ALL ROTATION SENSORS SHALL BE ORIENTED TO MEASURE TRANSVERSE ROTATION
  - EXTERIOR ROTATION SENSORS SHALL BE CENTERED ON CURB.
  - ALL STRAIN SENSORS SHALL BE ORIENTED TO MEASURE LONITDINAL AXIAL STRAIN IN EACH TRUSS MEMBER.
  - GANTRY HSS STRAIN GAGES SHALL BE INSTALLED 180° FROM EACH OTHER

- SENSOR LEGEND**
- STRAIN TRANSDUCER
  - TILTMETER
  - DISPLACEMENT SENSOR (STRING POT)

Drawn By: RLW  
 Checked By: BCC  
 Date: 12/22/17  
 Client No.: 2262.06  
 BDI No.: 160903-NY  
 SCALE: NTS

INSTRUMENTATION CROSS  
 SECTION (SET 2)  
**LLT-04**

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MOUNTING - INSTANT ADHESIVE

MATERIAL DESCRIPTION

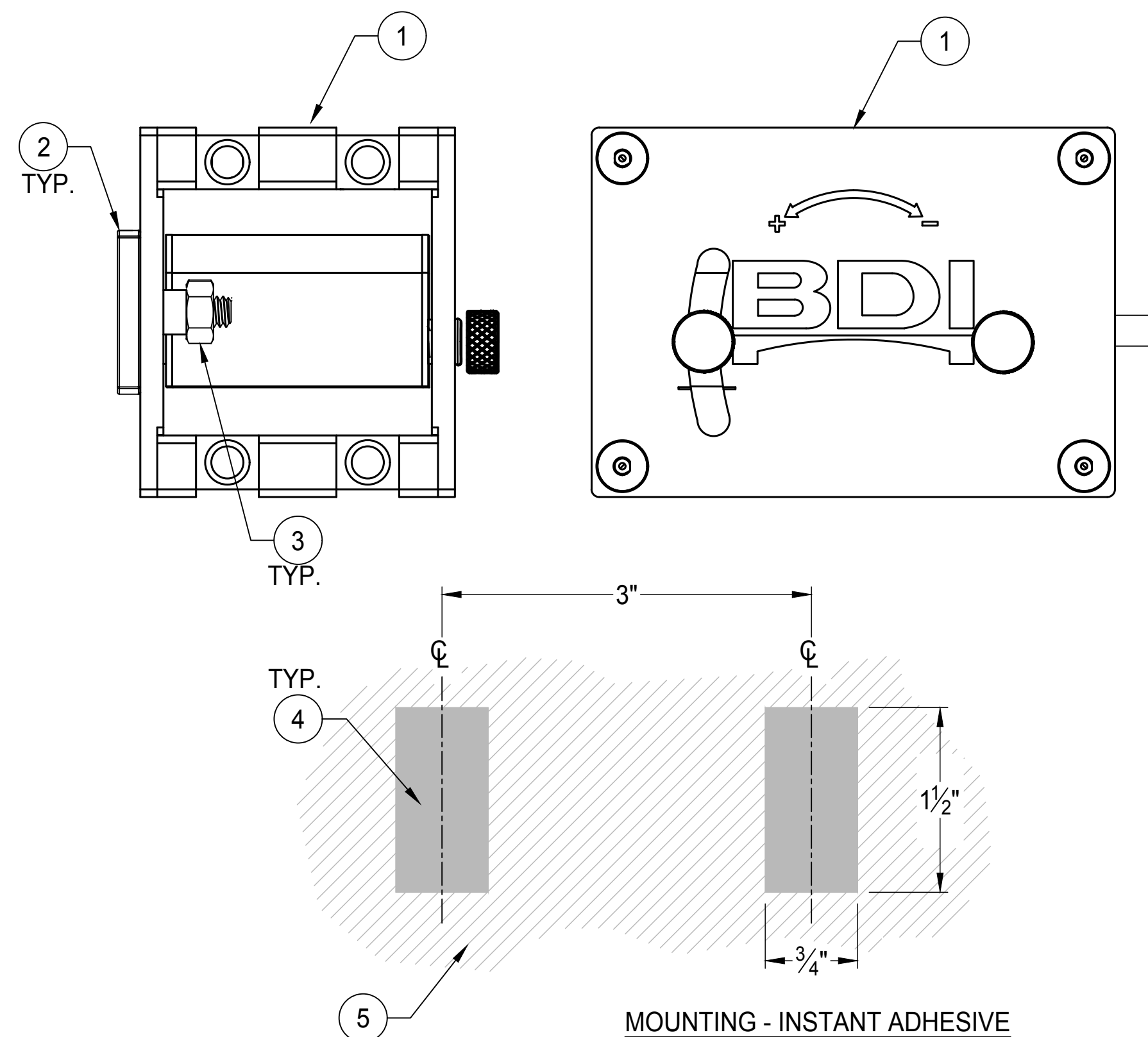
- 3" STRAIN GAGE
- 1/4"-20 THREADED MOUNTING TAB
- 1/4"-20 STAINLESS STEEL NUT
- TYPICAL SURFACE PREP REQUIRED TO MOUNT STRAIN GAGES
- TYPICAL MOUNTING SURFACE

FOOTNOTES - INSTANT ADHESIVE

- STRAIN GAGES SHALL BE MOUNTED WITH LOCTITE 410 INSTANT ADHESIVE AND LOCTITE 7452 ACCELERANT.
- DURING SURFACE PREP ALL PAINT AND SURFACE DEFORMATIONS MUST BE REMOVED WITH A SANDING WHEEL.
- SURFACE PREP IS REQUIRED JUST PRIOR TO GAGE INSTALLATION AS TO NOT ALLOW SURFACE CONTAMINANTS TO ACCUMULATE.
- THREADED MOUNTING TAB TO BE REMOVED USING TAB REMOVAL HAND TOOL.
- AFTER REMOVAL OF THE TAB, LEFTOVER ADHESIVE TO BE REMOVED USING A SANDING WHEEL, LEAVING A BARE CONCRETE FINISH.

ENSURING A UNIFORM APPEARANCE WITH REST OF STRUCTURE.

1 TYPICAL BDI STRAIN GAGE INSTALLATION



MOUNTING - INSTANT ADHESIVE

MATERIAL DESCRIPTION

- BDI TILTMETER
- 1/4"-20 THREADED MOUNTING TAB
- 1/4"-20 STAINLESS STEEL NUT
- TYPICAL SURFACE AREA REQUIRED TO MOUNT TABS
- TYPICAL MOUNTING SURFACE

FOOTNOTES - INSTANT ADHESIVE

- TILTMETERS SHALL BE MOUNTED WITH LOCTITE 410 INSTANT ADHESIVE AND LOCTITE 7452 ACCELERANT
- TABS SHALL BE INSTALLED ON PAINT SINCE FORCE TRANSFER IS NOT A CONCERN.
- MOUNTING SURFACE SHALL BE WIPED CLEAN OF ANY SURFACE DEBRIS AND THEN DEGREASED PRIOR TO TILTMETER INSTALLATION.
- THREADED MOUNTING TAB TO BE REMOVED USING TAB REMOVAL HAND TOOL.
- AFTER REMOVAL OF THE TAB, LEFTOVER ADHESIVE TO BE REMOVED USING A SANDING WHEEL, LEAVING A BARE CONCRETE FINISH.

ENSURING A UNIFORM APPEARANCE WITH REST OF STRUCTURE.

2 TYPICAL BDI TILTMETER INSTALLATION

SHOP DRAWING REVIEW

- \_\_\_\_\_ FOR INFORMATION ONLY
- \_\_\_\_\_ ACCEPTED
- ACCEPTED AS NOTED
- \_\_\_\_\_ ACCEPTED AS NOTED & RESUBMIT
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FIGG Subconsultant:

Firm: \_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_

FIGG BRIDGE ENGINEERS, Inc.

By: EDL Date: 02/13/18

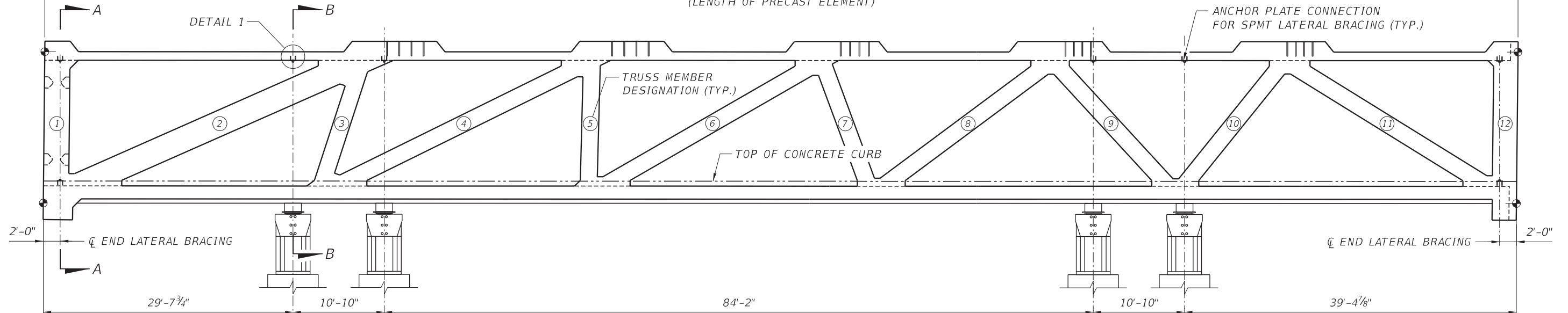
Drawn By: RLV  
Checked By: BCC  
Date: 12/22/17  
Client No.: 2262.06  
BDI No.: 160903-NY  
SCALE: NTS



DIRECTION OF STATIONING

174'-10<sup>5</sup>/<sub>8</sub>"

(LENGTH OF PRECAST ELEMENT)



SOUTH END

"SPMT" SUPPORT LOCATIONS (TYP.)

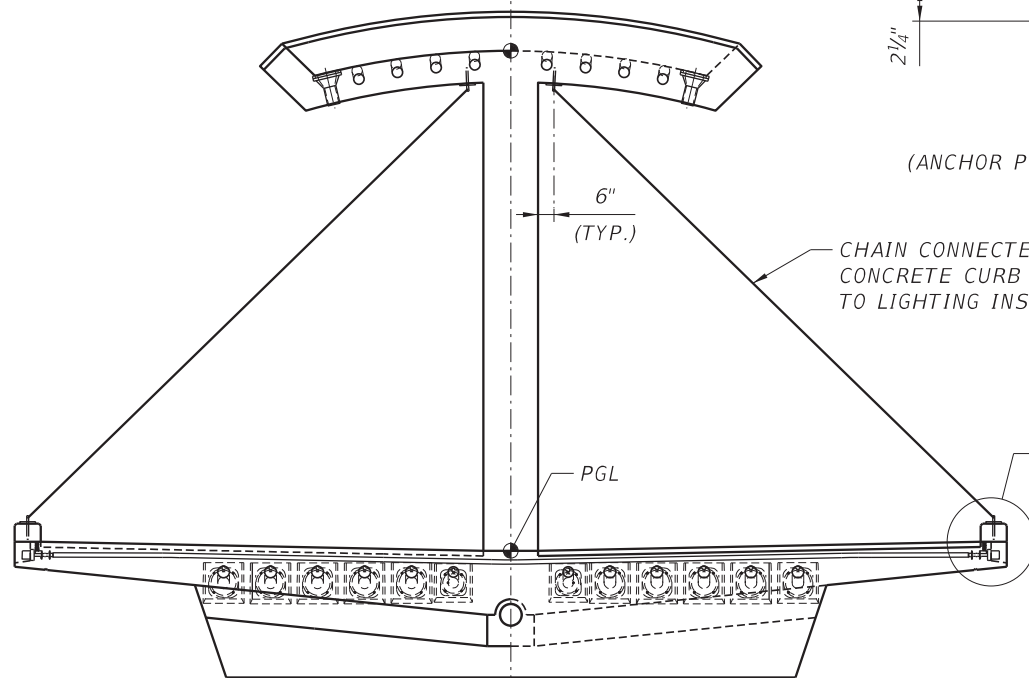
ELEVATION (MAIN SPAN)

PYLON END

NOTES:

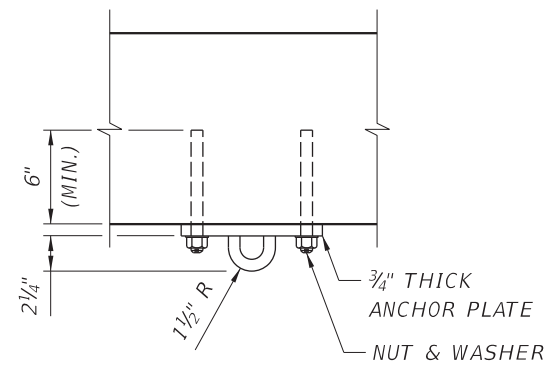
1. ANCHOR BOLTS FOR SPMT LATERAL BRACING SUPPORT SHALL BE ASTM F1554 GRADE 105 WITH ASTM A563 HEAVY-HEX NUTS AND ASTM F436 PLATE WASHER. ANCHOR BOLTS SHALL BE STAINLESS STEEL.
2. AFTER TRUSS ERECTION, ANCHOR BOLTS SHALL BE CUT FLUSH WITH CONCRETE SURFACE.
3. LENGTH OF BOLT IS EQUAL TO 9".
4. ANCHOR STEEL PLATE SHALL BE GRADE 36.
5. THE CHAINS SHALL BE STRESSED TO A NOMINAL FORCE EQUAL TO 1 KIP. BOTH CHAINS SHALL BE STRESSED SIMULTANEOUSLY.

SYMM. ABOUT CL STRUCTURE (UNLESS NOTED OTHERWISE)



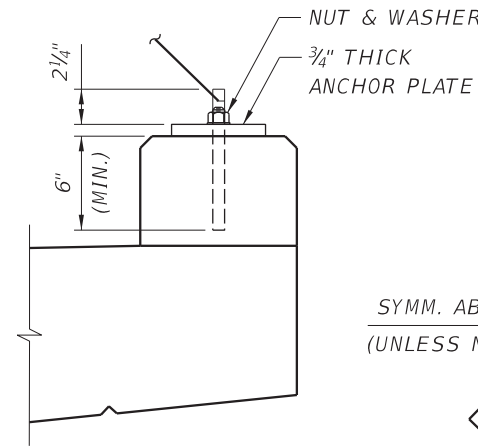
SECTION A-A

(SOUTH END SHOWN, ALSO APPLIES AT PYLON END)



DETAIL 1

(ANCHOR PLATE CONNECTION - CANOPY)

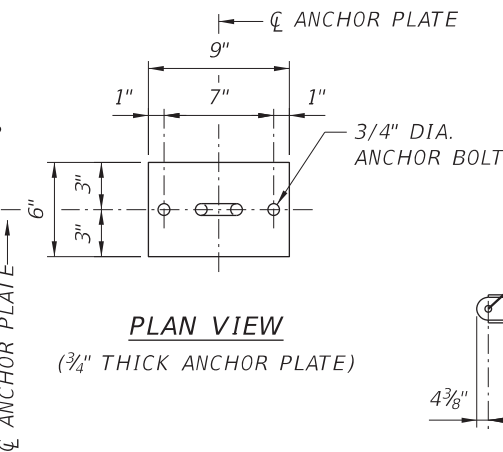


DETAIL 2

(ANCHOR PLATE CONNECTION - CURB)

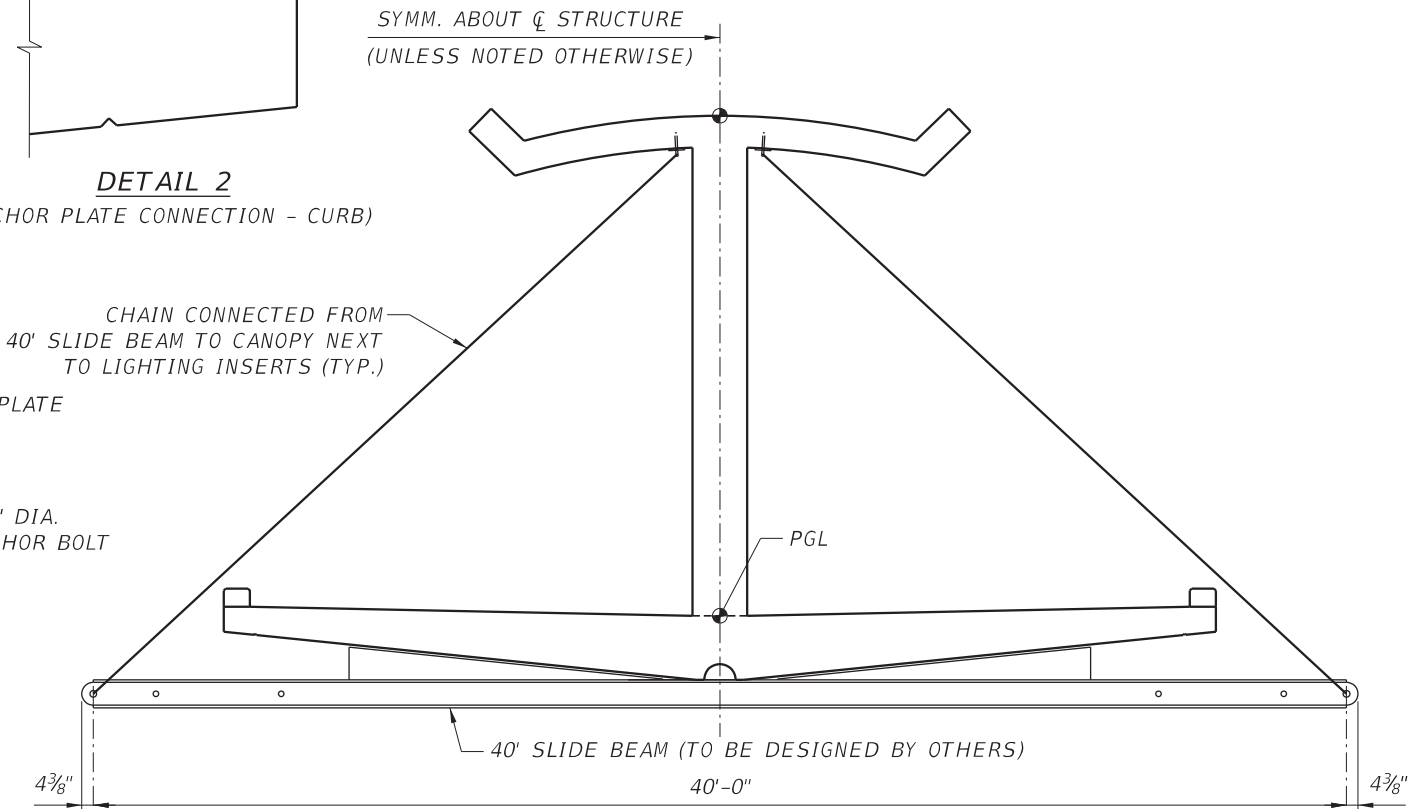
SYMM. ABOUT CL STRUCTURE (UNLESS NOTED OTHERWISE)

CHAIN CONNECTED FROM 40' SLIDE BEAM TO CANOPY NEXT TO LIGHTING INSERTS (TYP.)



PLAN VIEW

(3/4" THICK ANCHOR PLATE)



SECTION B-B

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

ENGINEER OF RECORD:

**FIGG**  
424 North Calhoun Street  
Tallahassee, Florida 32301

DRAWN BY: DCB  
CHECKED BY: EDL  
DESIGNED BY: EDL  
CHECKED BY: MF


**FIU** FLORIDA INTERNATIONAL UNIVERSITY

ROAD NO.	COUNTY	PROJECT ID
	MIAMI - DADE	434688-1-58-01

SHEET TITLE: LATERAL BRACING DETAILS - MOVEMENT PLAN

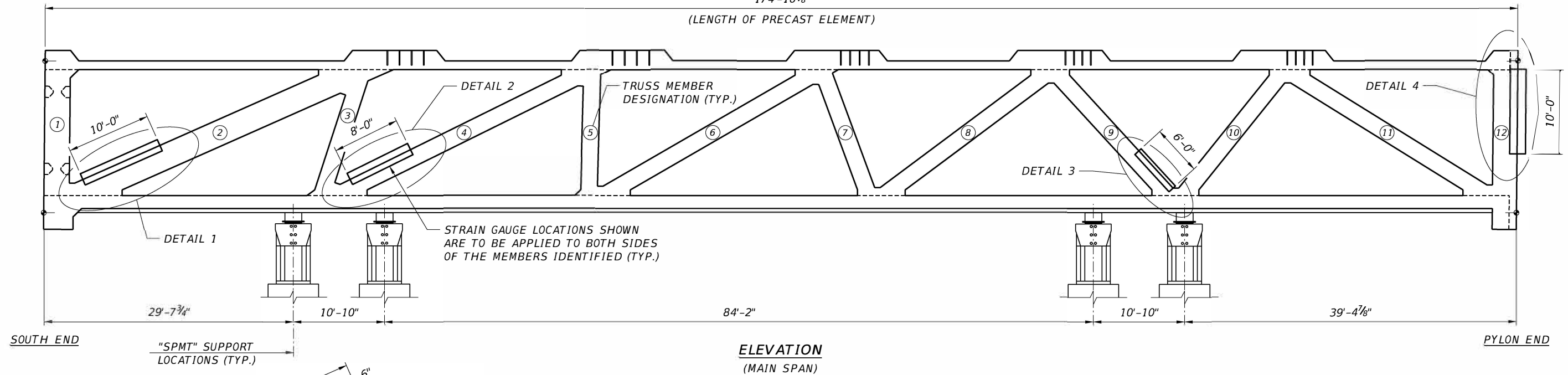
PROJECT NAME: UNIVERSITYCITY PROSPERITY PROJECT

SHEET NO. 2

DIRECTION OF STATIONING 

174'-10<sup>5</sup>/<sub>8</sub>"

(LENGTH OF PRECAST ELEMENT)

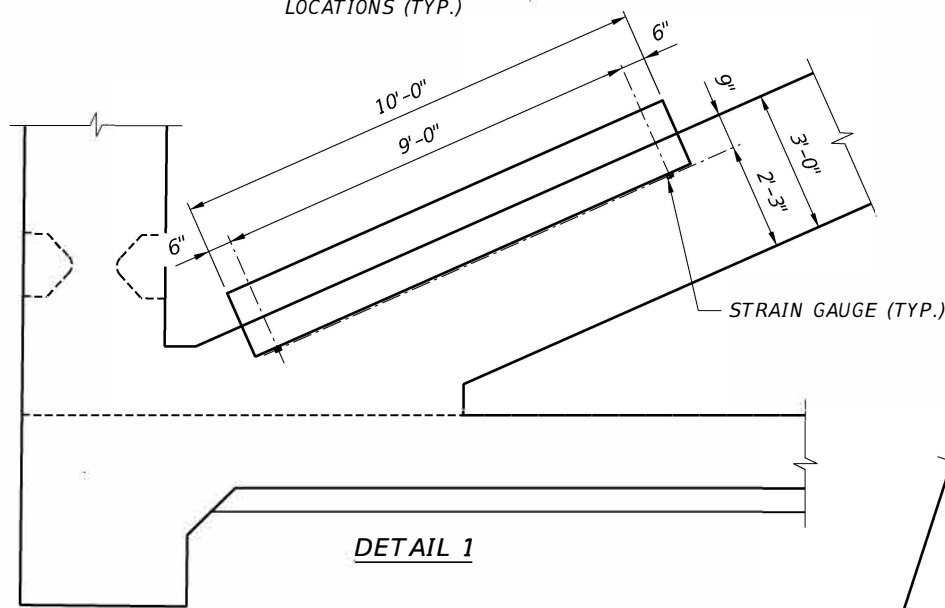


SOUTH END

"SPMT" SUPPORT LOCATIONS (TYP.)

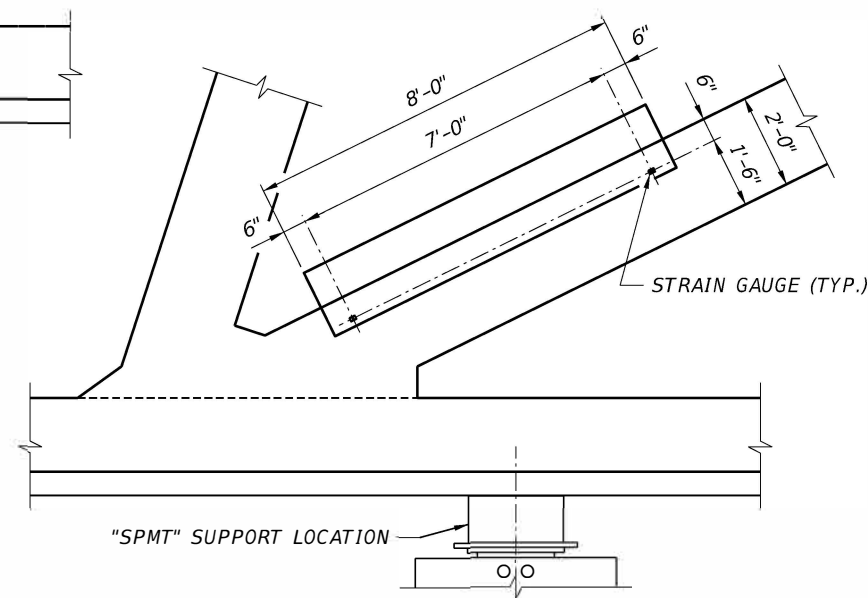
ELEVATION  
(MAIN SPAN)

PYLON END



DETAIL 1

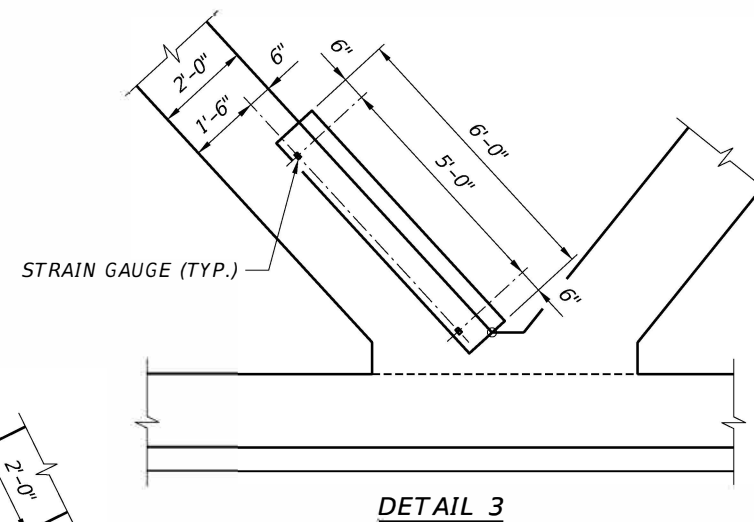
STRAIN GAUGE (TYP.)



DETAIL 2

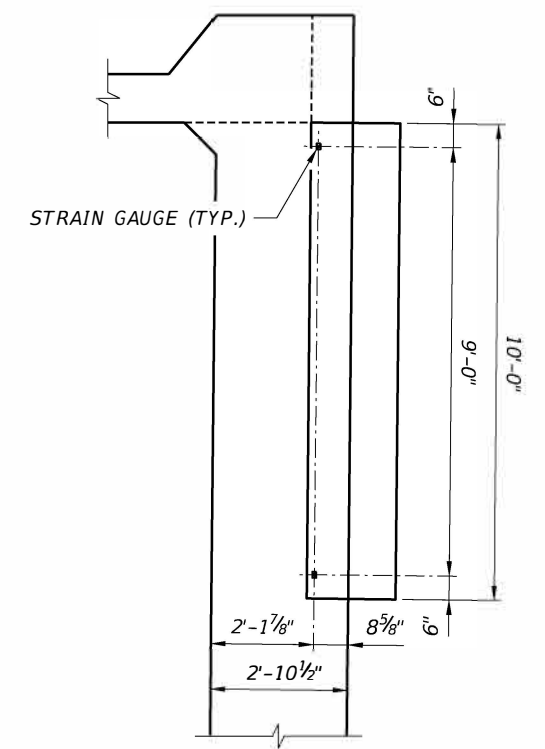
"SPMT" SUPPORT LOCATION

STRAIN GAUGE (TYP.)



DETAIL 3


STRAIN GAUGE (TYP.)



DETAIL 4

STRAIN GAUGE (TYP.)

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

ENGINEER OF RECORD:  
  
 424 North Calhoun Street  
 Tallahassee, Florida 32301

DRAWN BY: DCB  
 CHECKED BY: ADH  
 DESIGNED BY: ADH  
 CHECKED BY: MF

**FIU** FLORIDA INTERNATIONAL UNIVERSITY

ROAD NO. COUNTY PROJECT ID  
 MIAMI-DADE 434688-1-58-01

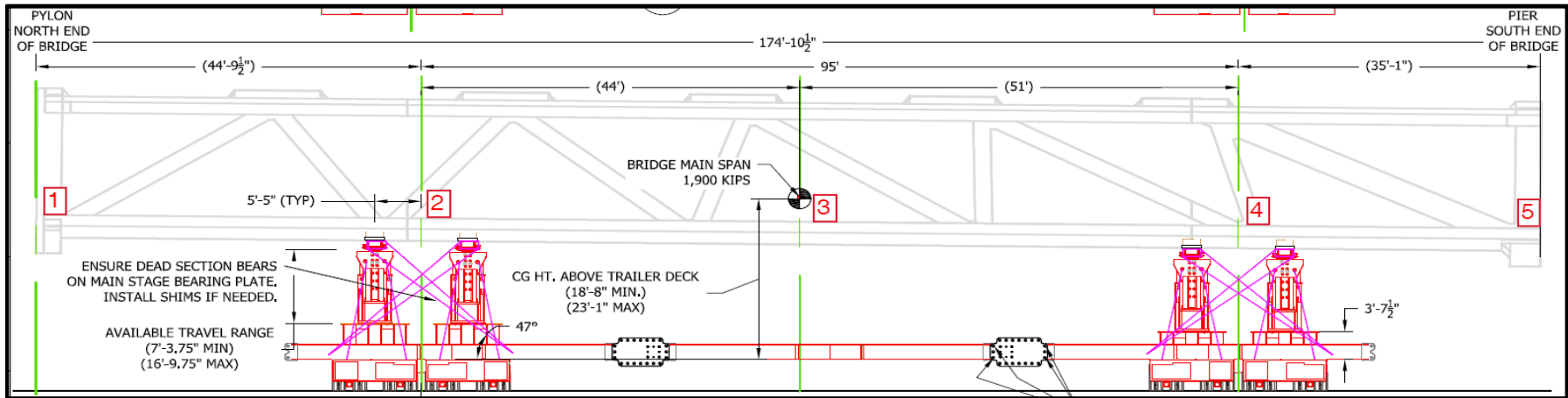
SHEET TITLE: RECOMMENDED STRAIN GAUGE LOCATIONS - MOVEMENT PLAN

PROJECT NAME: UNIVERSITYCITY PROSPERITY PROJECT

SHEET NO. 1

FIGG Project No. 2262.06

Movement Plan - Vertical Deflection and Rotation Tolerances

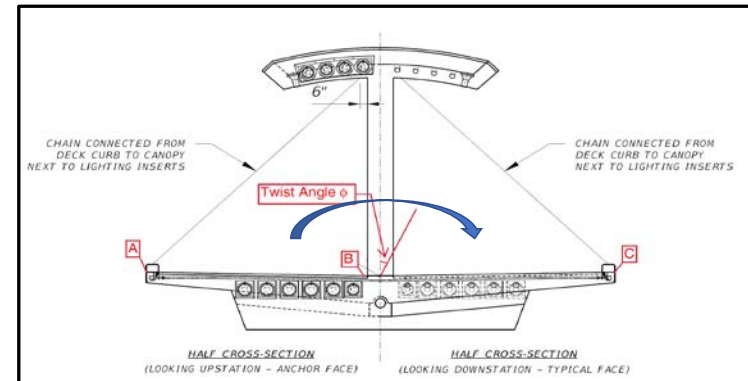


Anticipated Vertical Displacement (Normalized Relative to Support Locations)

Location	Displacement (in.)
1B	-0.50"
SPMT Support Adjacent to Node 2	0.00"
3B	-0.08"
SPMT Support Adjacent to Node 4	0.00"
5B	-0.50"

Notes:

1) Contractor needs to record vertical elevations of the deck prior to removing the falsework system AND after the span is supported by the SPMT support stands.



Net Allowable Torque of Span 1 (Difference in Rotation Between Supports at Nodes 2 and 4)

Maximum limit for twist/torque that is achievable by Barnhart's current equipment and methods where there likely would be temporary cracks observed on selected areas of certain struts (localized) for the temporary conditions during the bridge movements. Once the span is in the final position and the torque/twist is removed, any cracks that may have occurred during the movement would likely close and would be very small in width, if measurable at all. There may be select non-structural cracks in select areas, if any, that may need to be sealed (per FDOT Standard Specifications for Roadway and Bridge Construction, 2015 – Section 400 Concrete Structures) once the span is in the final position. As part of the Bridge Movement Monitoring Plan, the "Recommended Strain Gauge Locations - Movement Plan" sheet shows the recommended strain gauge locations that are in the localized areas where temporary cracks may be observed during the bridge movement.

Location	Difference in Rotation Angle $\phi$
Net Rotation (Node 2 to Node 4)	0.5 deg