TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Date: ____May 9 2012_____

Lead Agency (FHWA or State DOT): _____Indiana DOT_____

INSTRUCTIONS:
Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

Transportation Pooled Fund Program Project # *(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)* ***TPF 5-253***	**Transportation Pooled Fund Program - Report Period:** X Quarter 1 (January 1 – March 31) ☐ Quarter 2 (April 1 – June 30) ☐ Quarter 3 (July 1 – September 30) ☐ Quarter 4 (October 1 – December 31)

Project Title: **Evaluation of Member Level Redundancy in Built-up Steel Members**		
Name of Project Manager(s): Robert J. Connor	**Phone Number:** 765-496-8272	**E-Mail** rconnor@purdue.edu
Lead Agency Project ID:	**Other Project ID (i.e., contract #):**	**Project Start Date:** 9/1/2011
Original Project End Date: 8/31/2014	**Current Project End Date:** 8/31/2014	**Number of Extensions:** None

Project schedule status:

X On schedule ☐ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
$600,000	**$22,784**	**14%**

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
$5,384 (0.9%)	**3.8%**	**16.6%**

Project description:

The objective of this research project is to quantify the redundancy possessed by built-up members. For example, a riveted built-up member will not typically "fail" if one of the components fractures. However, there is very little experimental data which is available to quantify the remaining fatigue life or strength of a member in which one of the components has failed. Furthermore, if built-up members are located in bridges classified as fracture critical, when significant member redundancy can be shown the bridge may not need to be classified as FC. However, doing so would release these members from the more rigorous arms-length inspection currently required. As a result, should a component fail, it may go undetected for an extended interval. Thus, a portion of the project is devoted to setting rational inspection intervals for these members. Lastly, the advantages of using built-up members fabricated with HPS components fastened using HS bolts in new construction will also be explored.

Progress this quarter (includes meetings, work plan status, contract status, significant progress, etc.):

- The literature review continues.
- The large-scale experimental program is being refined. The cooling chamber has been designed and has undergone multiple tests. At this time, a full-scale plate girder that is larger than what will be tested, has been successfully cooled to temperature below -60F (Zone III LAST). All minor refinements have made and the cooling chamber is ready for use.
- Test setup is being refined. Specimen dimensions (including load frame, and actuator placement) have been investigated.
- The synchronization of two hydraulic actuators has begun. The actuators are being connected to the control system to test the ability of using two actuators simultaneously. Such a setup will be used during the fracture test and possibly during cyclic loading.
- The Research Team has been in discussions with various owners to secure riveted built-up members from existing bridges to be used in the large-scale testing program.
- Attendance at the Iron and Steel Preservation Conference in Lansing Michigan to collaborate with others interested in built-up riveted bridges. Valuable information about riveting and rivet performances was obtained. This will prove useful should riveted specimens (large or small scale) be required.
- Final design of built-up members fabricated using HS bolts for new construction is about 95% complete and quotes are being obtained. The specimen drawings are attached to this report.
- Fixtures for loading have been obtained and are in fabrication.
- Initial Finite Element (FE) models are being developed and calibrated to previous research data. These FE models will then be used to develop parametric studies to extrapolate experimental test results to different specifications.

Anticipated work next quarter:

- Finalize the testing plan.
- Finalize the program for simultaneous actuator loading.
- Take Delivery of the large-scale testing fixtures.
- Finalize the design of the first specimens to be fabricated using HS bolts and rivets.
- Obtain first set of bolted member specimens for testing. Testing will begin this summer.
- Continue to work with DOT's to obtain specific existing riveted built-up members.
- Continue and improve FE models to estimate fracture toughness demands on girders and plates with cracks.

Significant results:

During the past quarter, the major steps forward included:

1. Finalization of large cooling chamber to ensure large girders can be tested at temperatures of -60F or less.
2. Initial FE work has commenced
3. Programming of the hydraulic actuator control program for the fracture test has initiated.
4. 95% completion of design of built-up test specimens.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).

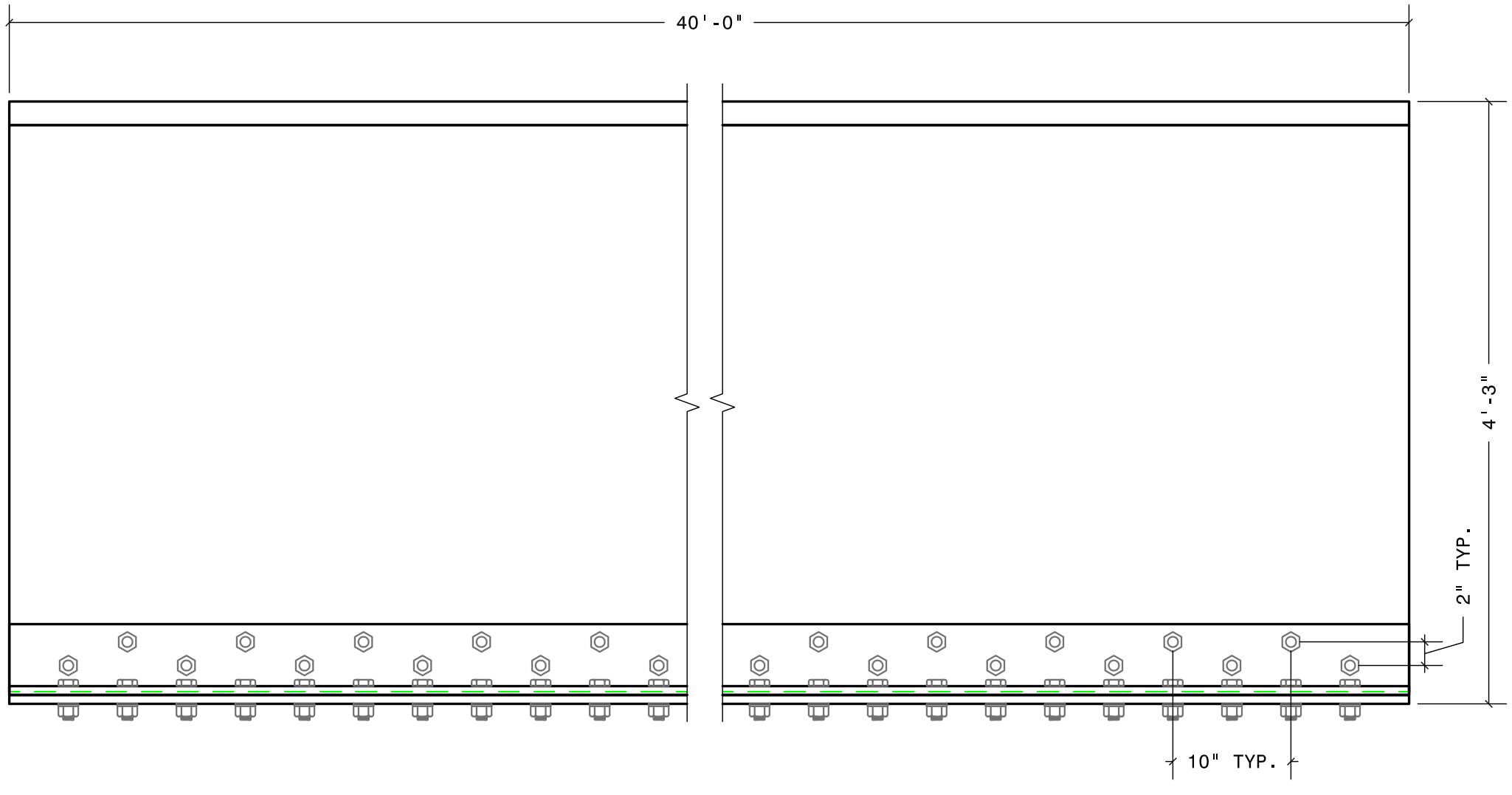
None this quarter

Potential Implementation:

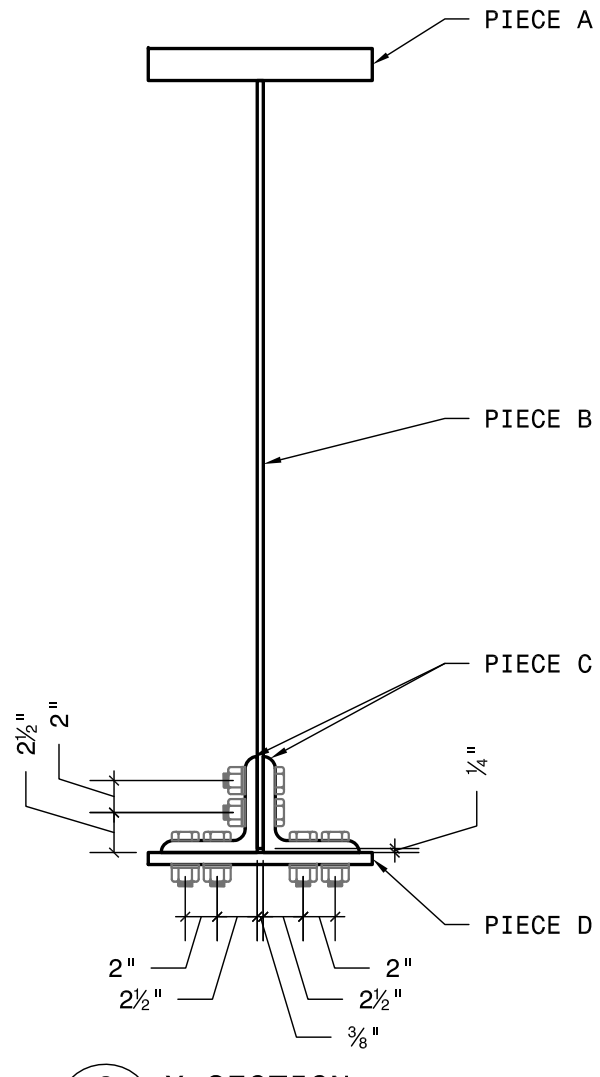
None at this time. Too early in the research.

PARTS SCHEDULE						
PIECE	LABEL	MATERIAL	COUNT (PER SPECIMEN)	GAGE	PITCH	TOTAL NUMBER OF HOLES
A	TOP FLANGE PLATE	PL14X2"	1	-	-	-
B	WEB PLATE	PL48X⅜"	1	2	10	96
C	BOTTOM FLANGE ANGLE	L6X6X¾"	2	2	10	384
D	BOTTOM COVER PLATE	PL14X¾"	1	2	10	192
					SPECIMEN TOTAL	672

NOTE: PITCH OF COVER PLATE BOLTS MAY BE UP TO 11". THEY ARE SPECIFIED HERE AS 10" TO MATCH DIMENSIONS OF THE WEB PLATE



1/1 ELEVATION
SCALE: 1" = 1'-0"



2/1 X-SECTION
SCALE: 1" = 1'-0"

BOWEN LABORATORY
PURDUE UNIVERSITY

1040 SOUTH RIVER ROAD
WEST LAFAYETTE, IN 47906
P: 765-494-2227 F: 765-494-9886

PROJECT:
POOLED FUND TPF-5(253)

SHEET NOTES:

1. ALL STEEL SHALL BE MIN. FY=50KSI
2. ALL BOLTS SHALL BE ⅞"Ø A325
3. ALL FASTENER HOLES SHALL BE 15/16"Ø DRILLED

REVISIONS:

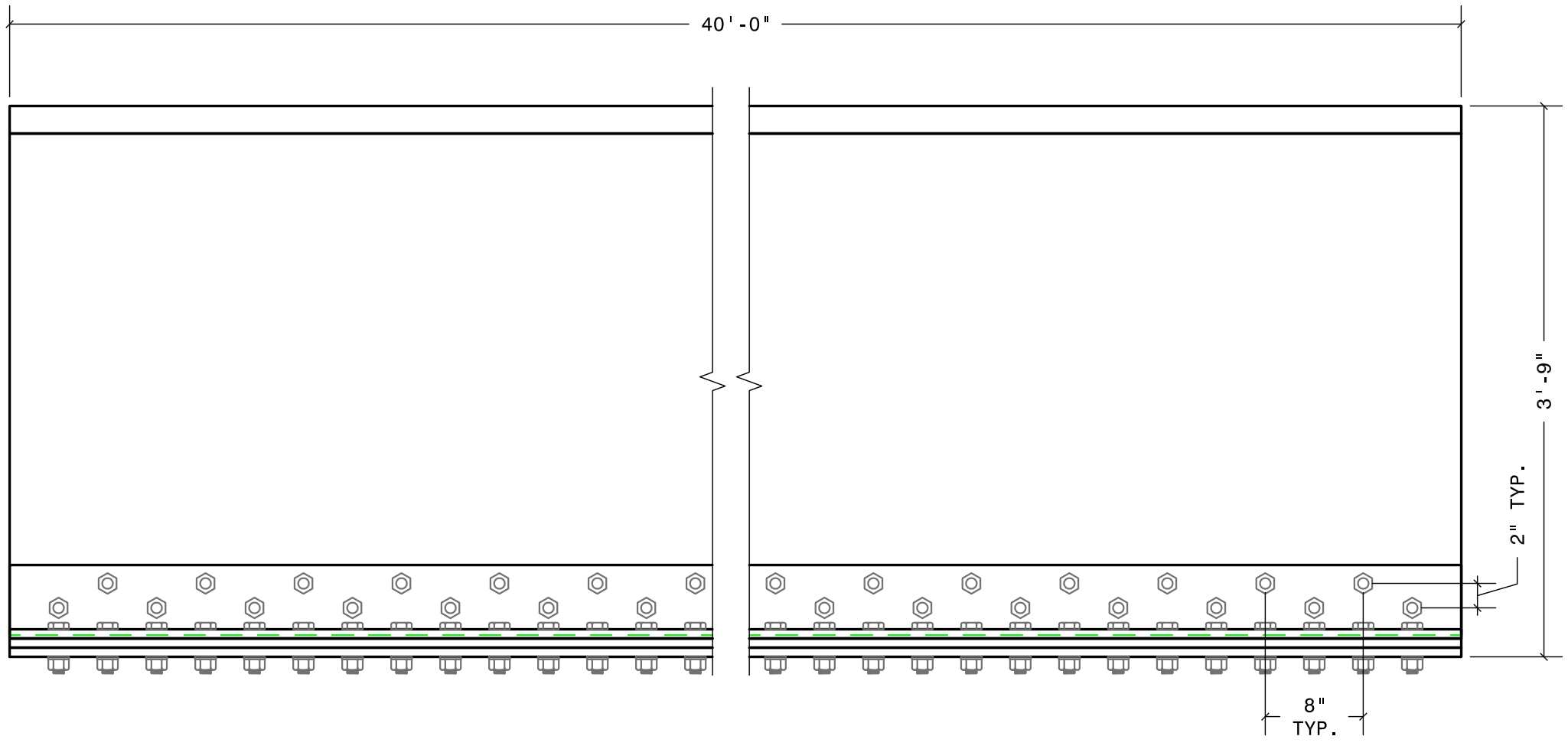
NO.	DATE	BY

DESIGNED BY:	MHH
DRAWN BY:	MHH
CHECKED BY:	RJC
DATE:	04-16-2012
PROJECT NO.:	TPF-5(253)

SHEET TITLE:
SPECIMEN 1:
53" PLATE GIRDER

PARTS SCHEDULE						
PIECE	LABEL	MATERIAL	COUNT (PER SPECIMEN)	GAGE	PITCH	TOTAL NUMBER OF HOLES
A	TOP FLANGE PLATE	PL14X2¼"	1	-	-	-
B	WEB PLATE	PL41X⅜"	1	2	8	120
C	BOTTOM FLANGE ANGLE	L6X6X¾"	2	2	8	480
D	BOTTOM COVER PLATE	PL14X¾"	2	2	8	480
					SPECIMEN TOTAL	1080

NOTE: PITCH OF COVER PLATE BOLTS MAY BE UP TO 11". THEY ARE SPECIFIED HERE AS 8" TO MATCH DIMENSIONS OF THE WEB PLATE



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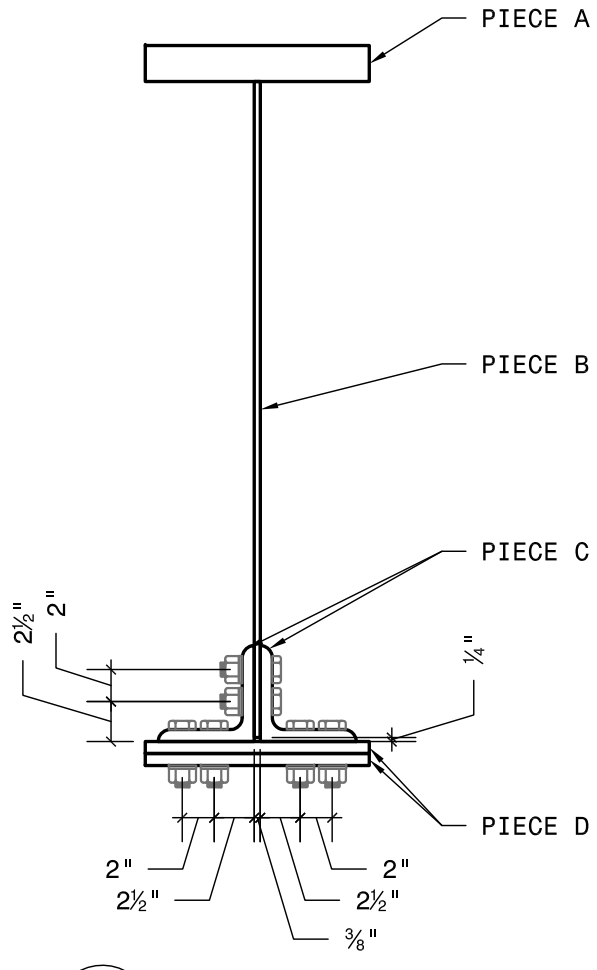
SCALE: 1" = 1'-0"



2/2 X-SECTION
SCALE: 1" = 1'-0"

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PROJECT:
POOLED FUND TPF-5(253)

SHEET NOTES:

1. ALL STEEL SHALL BE MIN. FY=50KSI
2. ALL BOLTS SHALL BE ⅞"Ø A325
3. ALL FASTENER HOLES SHALL BE 15/16"Ø DRILLED

REVISIONS:

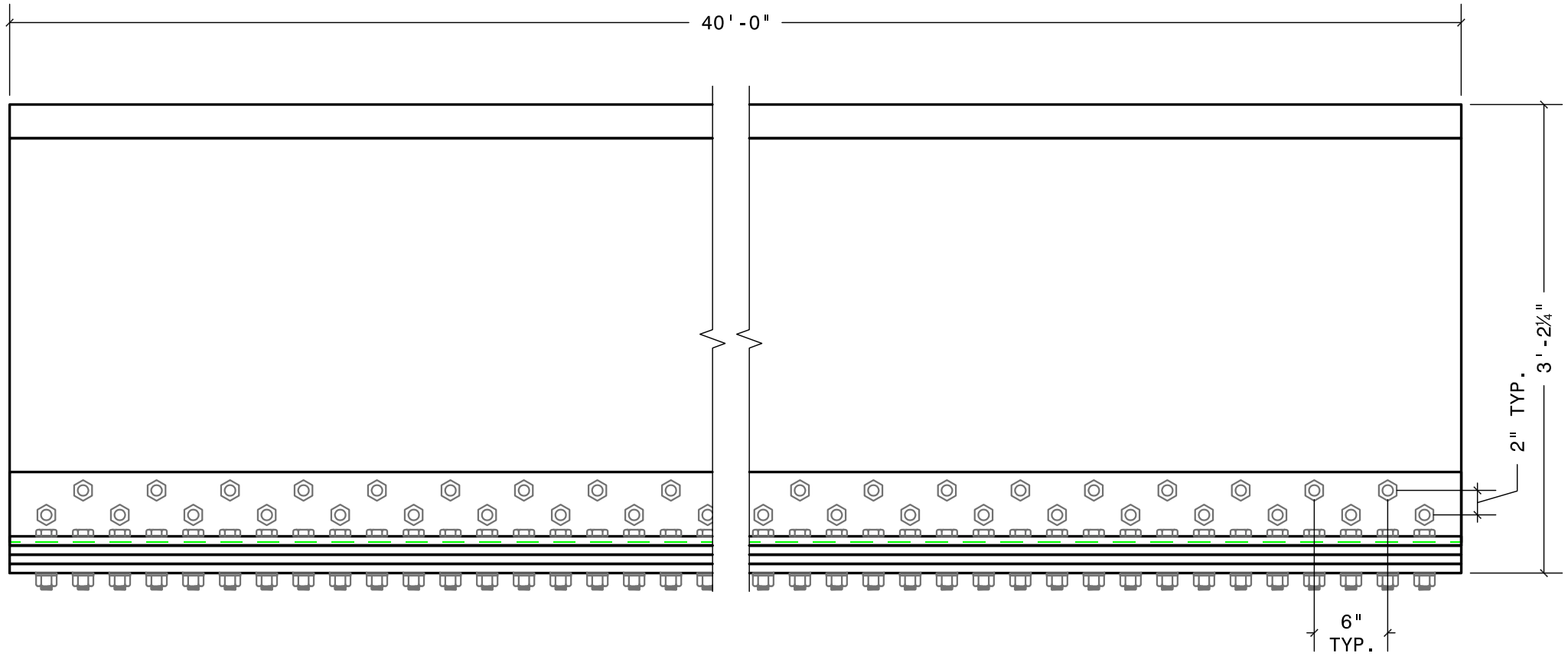
NO.	DATE	BY

DESIGNED BY:	MHH
DRAWN BY:	MHH
CHECKED BY:	RJC
DATE:	04-16-2012
PROJECT NO.:	TPF-5(253)

SHEET TITLE:
SPECIMEN 2:
45" PLATE GIRDER

PARTS SCHEDULE						
PIECE	LABEL	MATERIAL	COUNT (PER SPECIMEN)	GAGE	PITCH	TOTAL NUMBER OF HOLES
A	TOP FLANGE PLATE	PL14X2¾"	1	-	-	-
B	WEB PLATE	PL33X⅜"	1	2	6	160
C	BOTTOM FLANGE ANGLE	L6X6X¾"	2	2	6	640
D	BOTTOM COVER PLATE	PL14X¾"	3	2	6	960
					SPECIMEN TOTAL	1760

NOTE: PITCH OF COVER PLATE BOLTS MAY BE UP TO 11". THEY ARE SPECIFIED HERE AS 6" TO MATCH DIMENSIONS OF THE WEB PLATE



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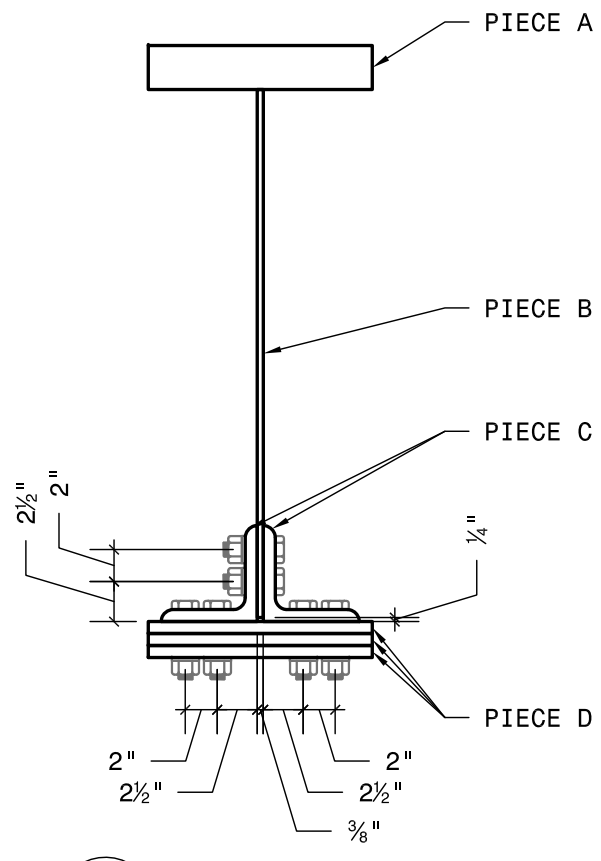

2/3 X-SECTION
SCALE: 1" = 1'-0"

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PROJECT:
POOLED FUND
TPF-5(253)

SHEET NOTES:

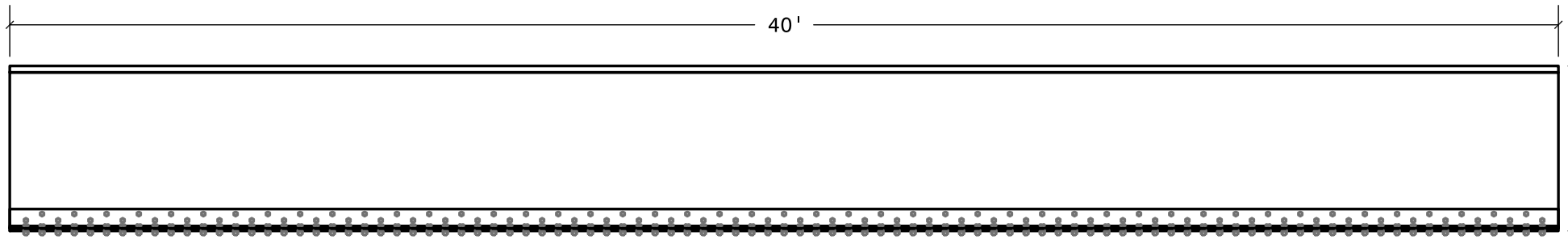
1. ALL STEEL SHALL BE MIN. FY=50KSI
2. ALL BOLTS SHALL BE ⅞"Ø A325
3. ALL FASTENER HOLES SHALL BE 15/16"Ø DRILLED

REVISIONS:

NO.	DATE	BY

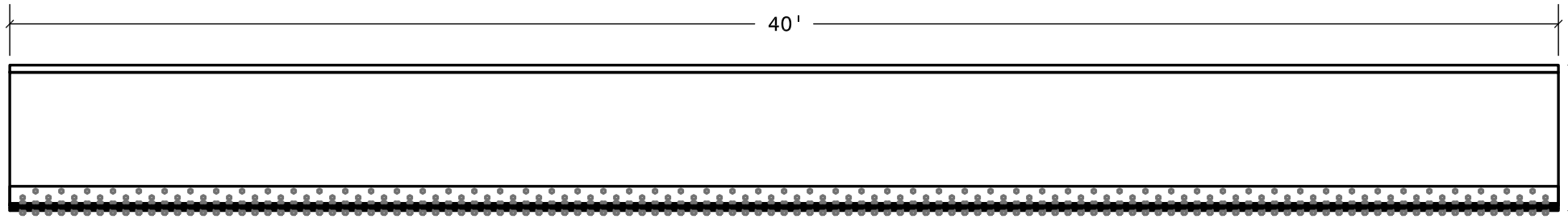
DESIGNED BY:	MHH
DRAWN BY:	MHH
CHECKED BY:	RJC
DATE:	04-16-2012
PROJECT NO.:	TPF-5(253)

SHEET TITLE:
SPECIMEN 3:
38¼" PLATE GIRDER



1/4 SPEC. 1 ELEVATION
SCALE: 1/4" = 1'-0"

2/4 SPEC. 1 X-SECTION
SCALE: 1/4" = 1'-0"



3/4 SPEC. 2 ELEVATION
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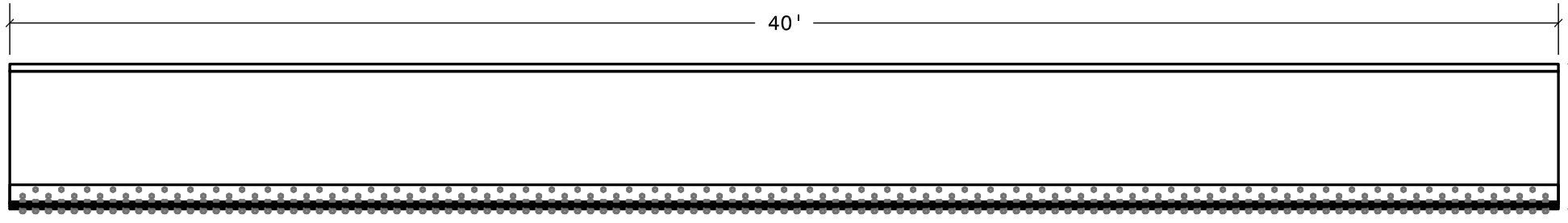
4/4 SPEC. 2 X-SECTION
SCALE: 1/4" = 1'-0"



5/4 SPEC. 3 ELEVATION
SCALE: 1/4" = 1'-0"

6/4 SPEC. 3 X-SECTION
SCALE: 1/4" = 1'-0"

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PROJECT:

POOLED FUND TPF-5(253)

SHEET NOTES:

1. ALL STEEL SHALL BE MIN. FY=50KSI

2. ALL BOLTS SHALL BE 7/8"Ø A325

3. ALL FASTENER HOLES SHALL BE 15/16"Ø DRILLED

REVISIONS:

NO.	DATE	BY

DESIGNED BY:	MHH
DRAWN BY:	MHH
CHECKED BY:	RJC
DATE:	04-16-2012
PROJECT NO.:	TPF-5(253)

SHEET TITLE:

SPECIMEN VIEWS