

MWPC Design & Testing

Sean McGrath

6/23/2014

Goals

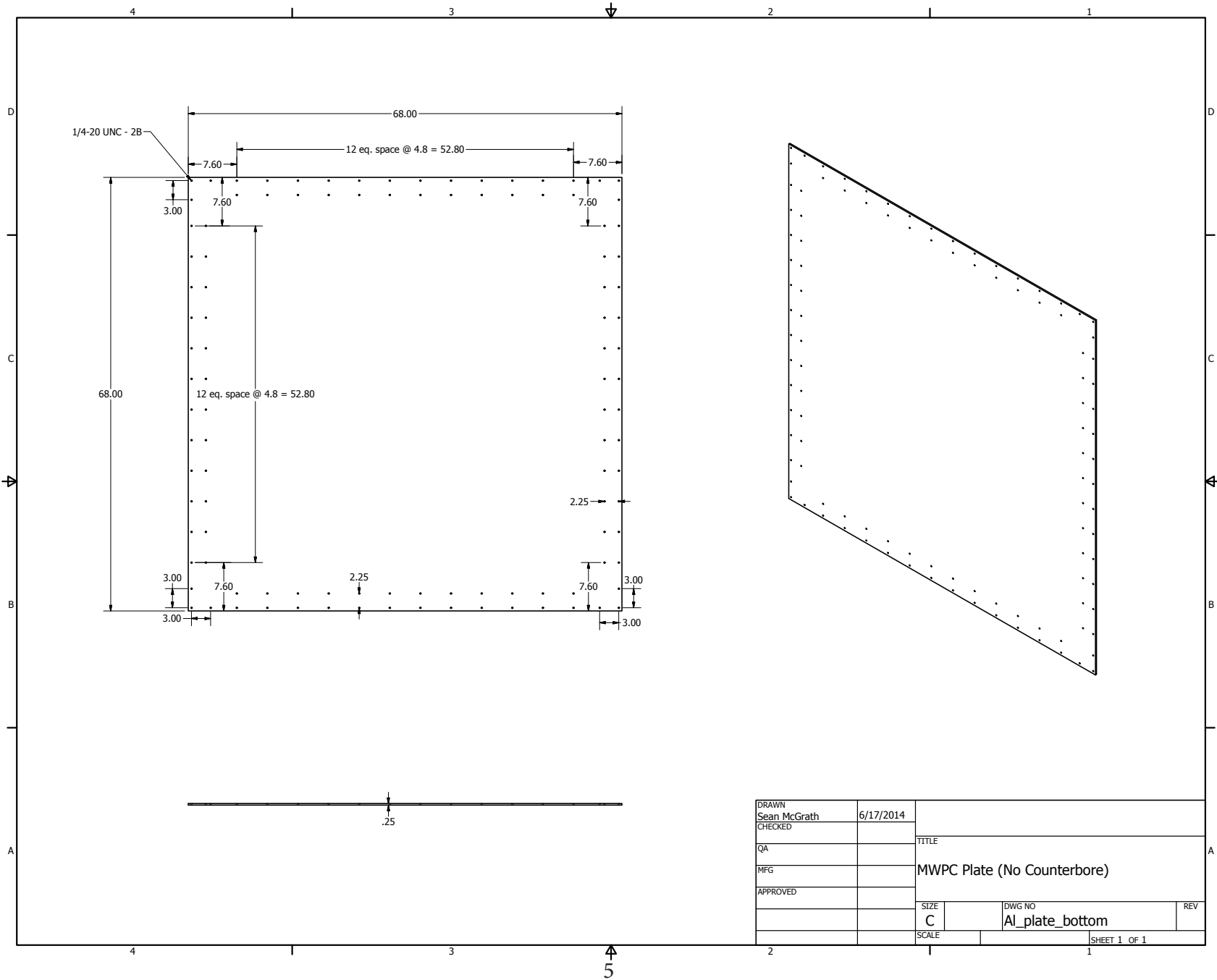
- ◆ Create full digital model of detector
- ◆ Test strength of chamber material
- ◆ Finalize MWPC dimensions

Materials & Parts

G-10 (Glass-epoxy laminate. High mechanical strength, excellent insulator.)	{	Spacer Beam	—	6
		Wire Beam	—	2
Aluminum 6061 (Common precipitation-hardened aluminum alloy.)	{	Top Plate	—	1
		Bottom Plate	—	1
FR-4 (Same as G-10, with flame-retardant properties.)	{	Readout PCB	—	12
Nylon (Highly resilient thermoplastic.)	{	UNC 1/4-20 Bolt	—	112

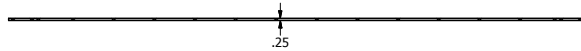
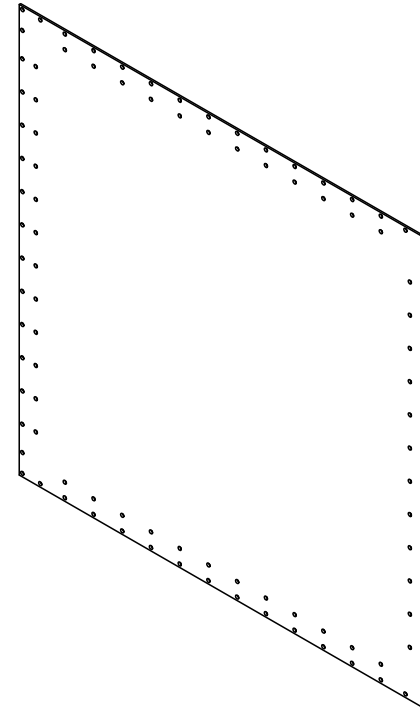
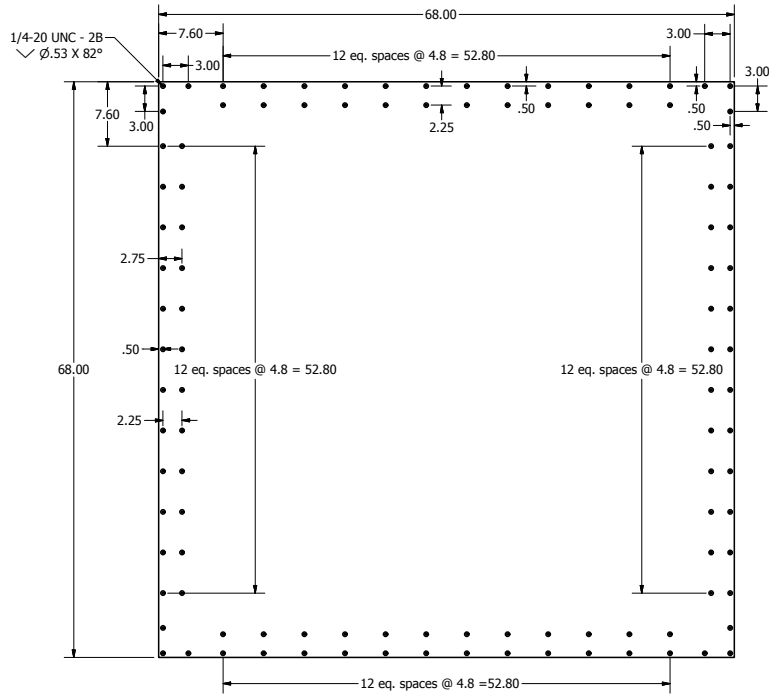
Preliminary Dimensions

Feature	Dimension
Full Detector size	68" × 68"
Beam Window	60" × 60"
Charge Plate Thickness	¼"
Spacer Beam Thickness	0.4"
Spacer Beam Width	4"
Wire Beam Thickness	0.4" - ⅛"
Wire Beam Width	4"
PCB Thickness	⅛"
PCB Size	9.6" × 6"
Wire Tension	25g
Wire Count	288
Bolt Spacing (long side)	4.8"
Bolts per Corner	3
Bolt Count	112

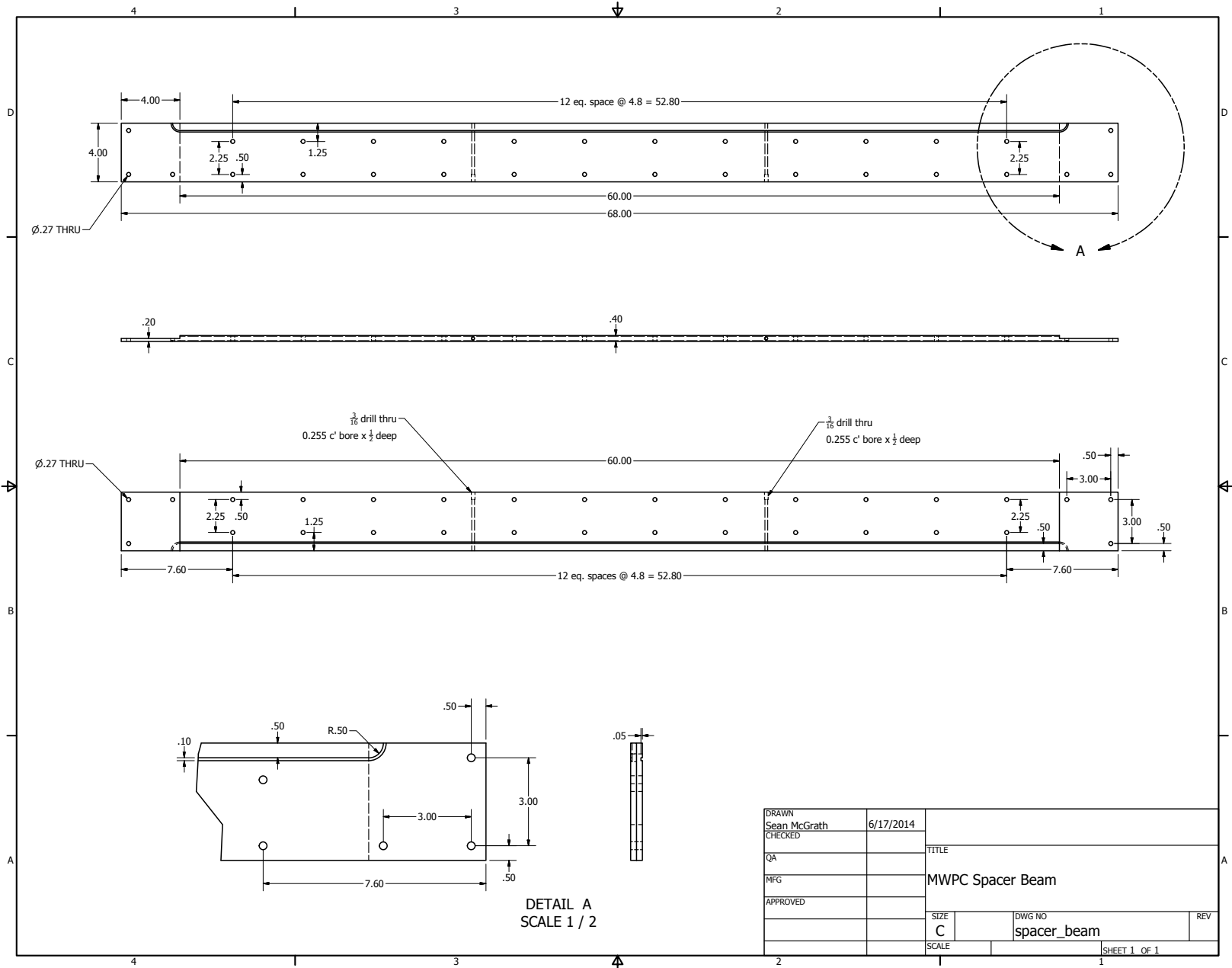


DRAWN		6/17/2014	
Sean McGrath			
CHECKED			
QA		TITLE	
MFG		MWPC Plate (No Counterbore)	
APPROVED			
SIZE	DWG NO	REV	
C	Al_plate_bottom		
SCALE	SHEET 1 OF 1		

Plate has mirror symmetry in x and y dimensions.

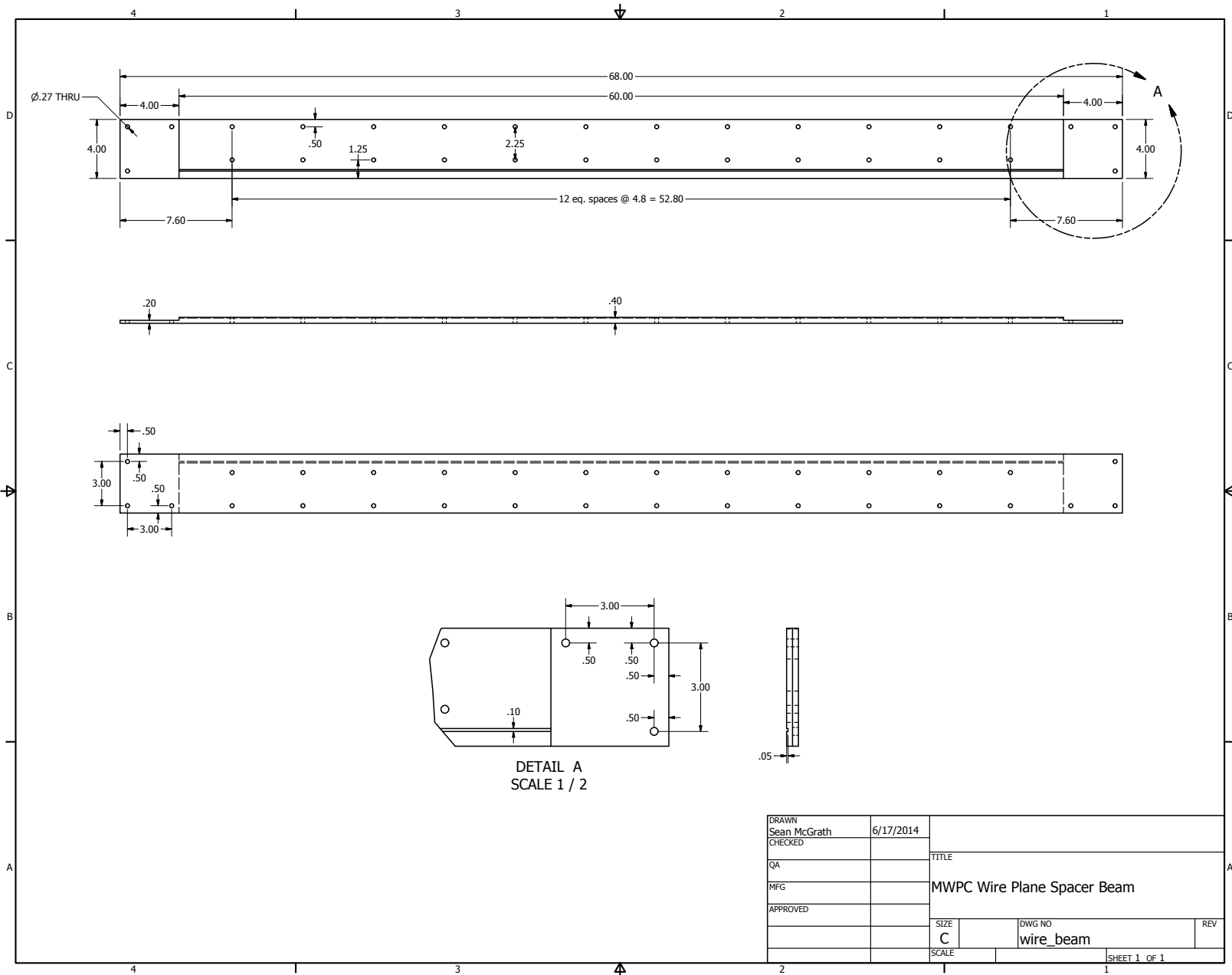


DRAWN Sean McGrath		6/17/2014		TITLE	
CHECKED				MWPC Plate (Counter-Bored)	
QA				REV	
MFG				DWG NO	
APPROVED				Al_plate_top	
		SCALE		SHEET 1 OF 1	



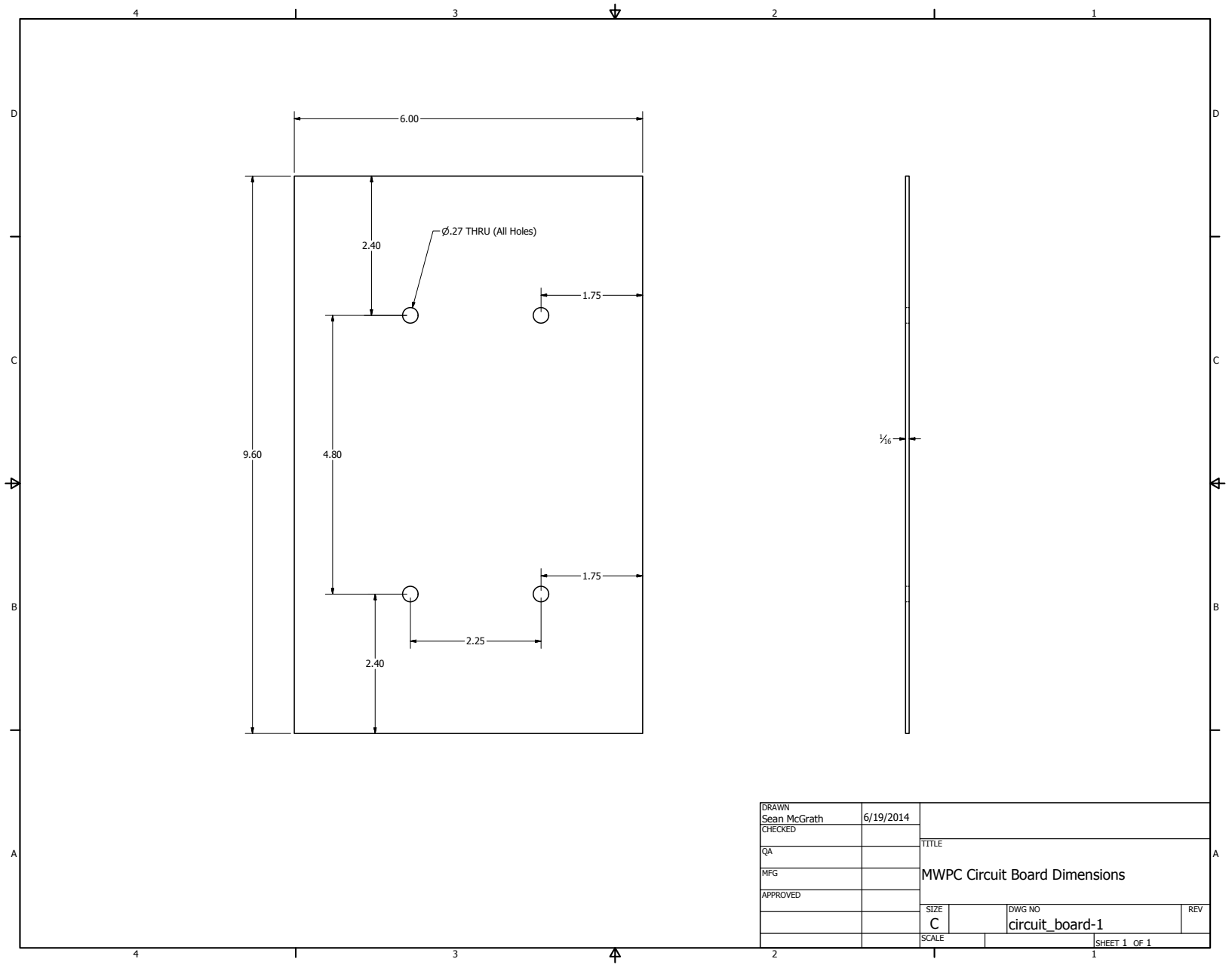
DETAIL A
SCALE 1 / 2

DRAWN Sean McGrath	6/17/2014	TITLE	
CHECKED		MWPC Spacer Beam	
QA		SIZE	REV
MFG		C	spacer_beam
APPROVED		SCALE	SHEET 1 OF 1



DETAIL A
SCALE 1 / 2

DRAWN Sean McGrath	6/17/2014	TITLE	
CHECKED		MWPC Wire Plane Spacer Beam	
QA		SIZE	REV
MFG		C	wire_beam
APPROVED		SCALE	SHEET 1 OF 1

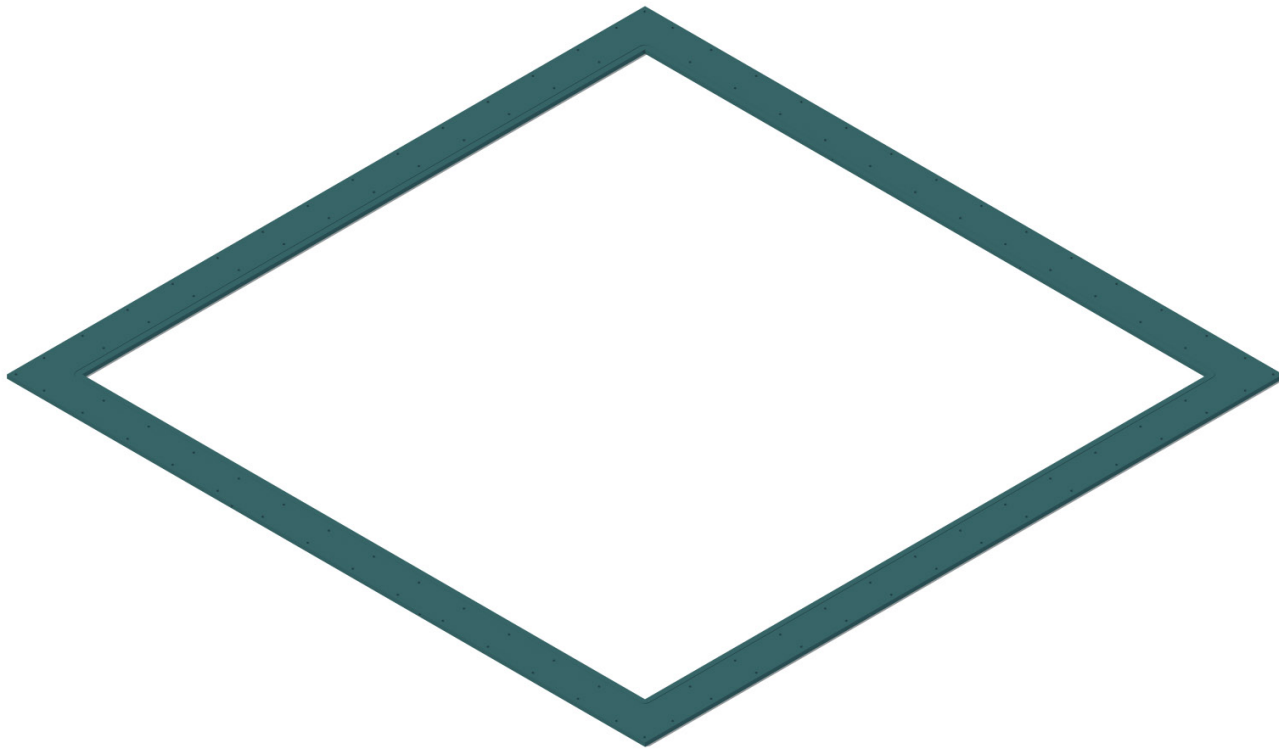
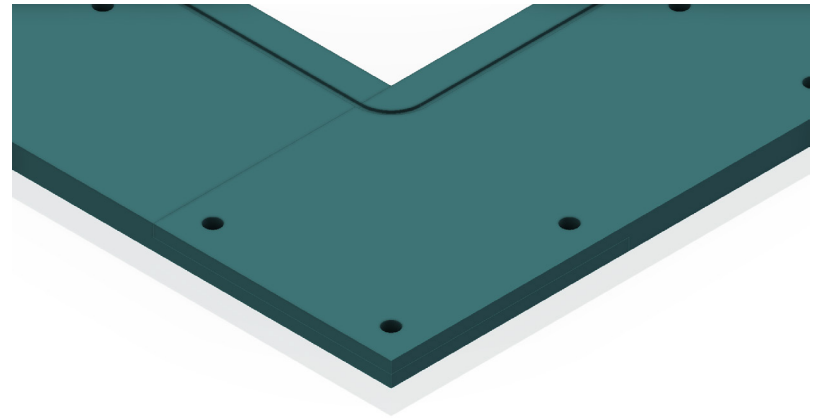


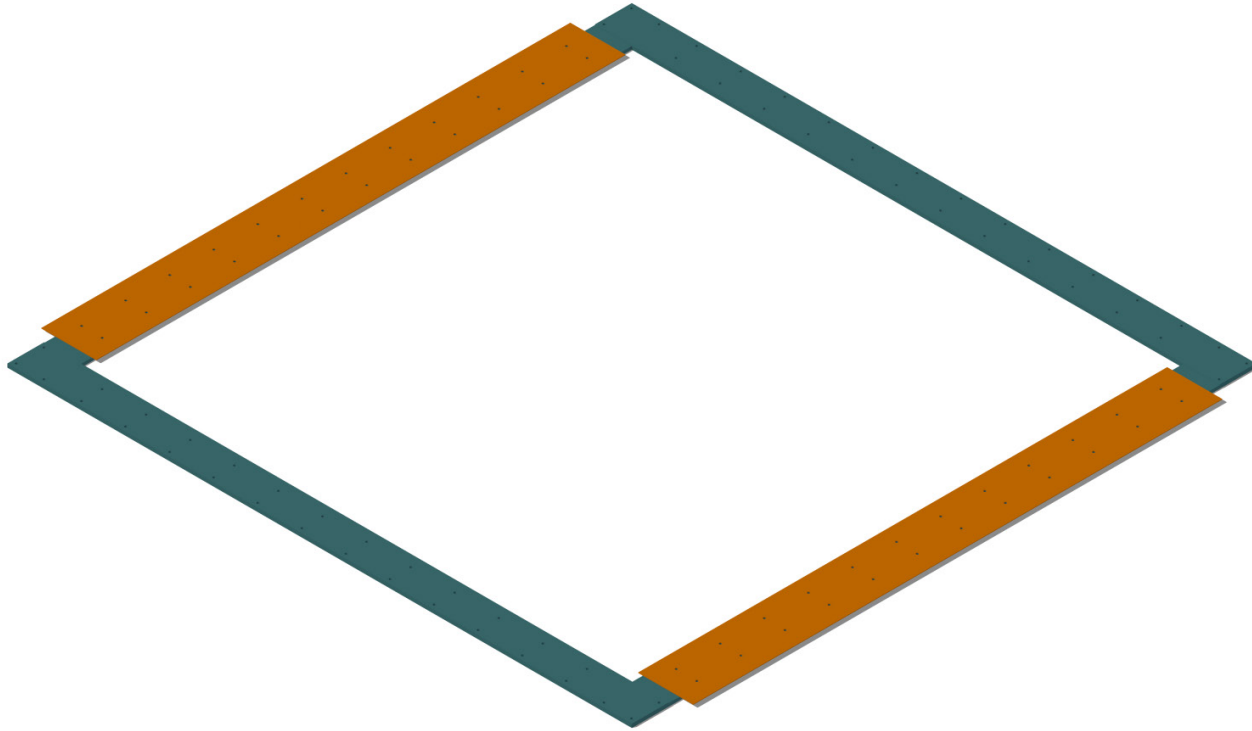
DRAWN	Sean McGrath	6/19/2014		
CHECKED			TITLE	
QA			MWPC Circuit Board Dimensions	
MFG			SIZE	DWG NO
APPROVED			C	circuit_board-1
			SCALE	REV
				1
			SHEET 1 OF 1	

Modeling Process

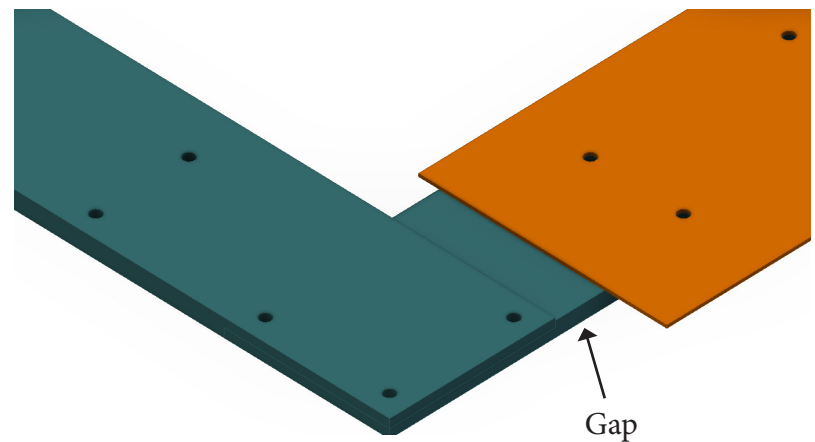
- ◆ Create 3D version of each part
- ◆ Assemble beams into planes
- ◆ Assemble full detector

Spacer beams are designed to “tile” into a spacer plane, seen below. The milled-down area on an inverted beam can be mated with the mill-down on another beam to produce a perfect right angle lap joint, seen at right. The resulting plane has correctly aligned boltholes and continuous o-ring grooves on both sides.

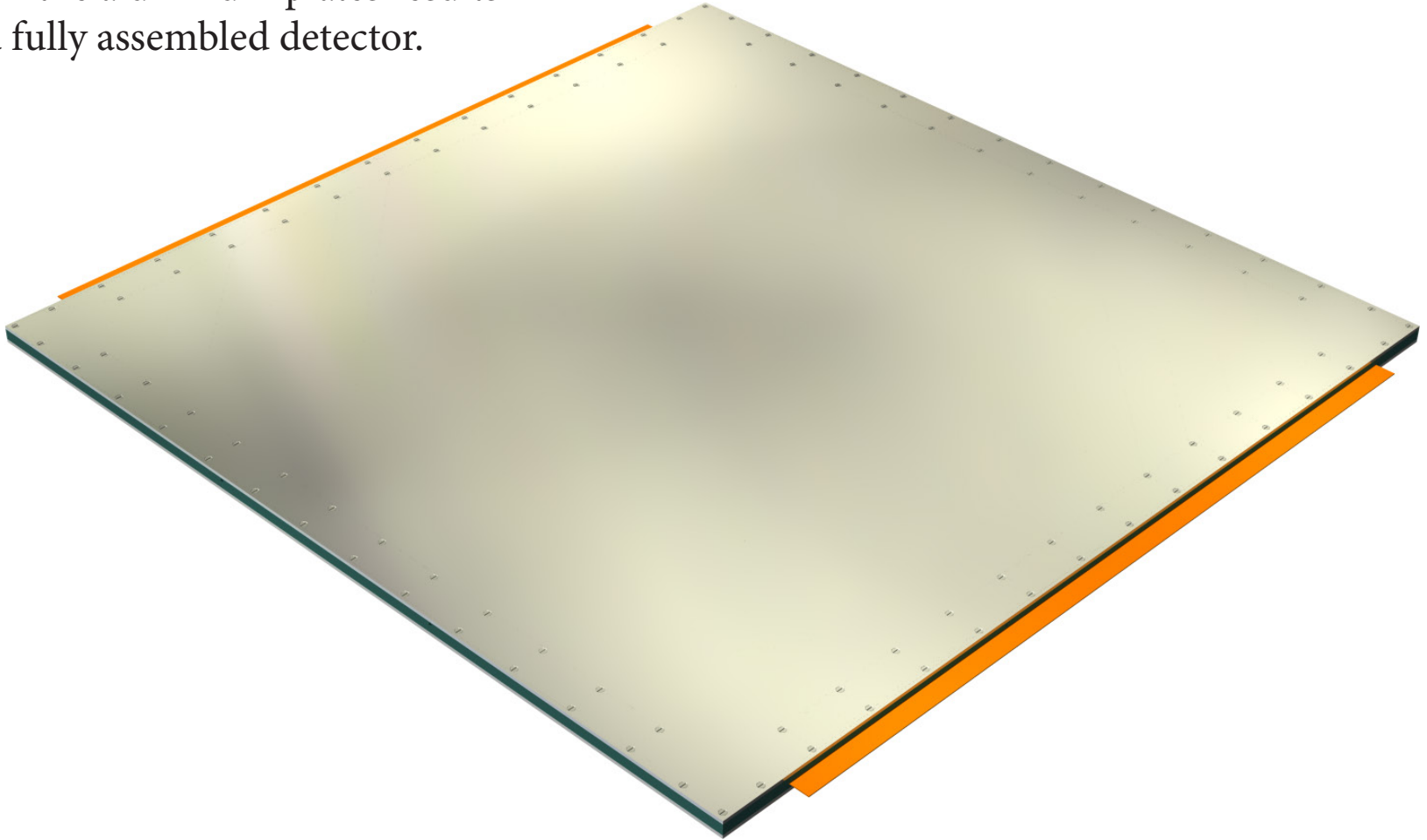




The wire beams are $\frac{1}{16}$ " thinner than the spacer beams, which allows room for the circuit boards to be attached. The wire plane is completed with two spacer beams that are only grooved on their unmilled sides, giving the plane its full 0.4" thickness. Presently there is a 1.2" gap on each side of the circuit board arrays, which may be used for a high-voltage connection.



Stacking the planes and bolting on the aluminum plates results in a fully assembled detector.



Type: Displacement
Unit: in
6/13/2014, 4:16:31 PM

