

# Wire Plane Design & Testing

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*Sean McGrath*

*6/10/2014*

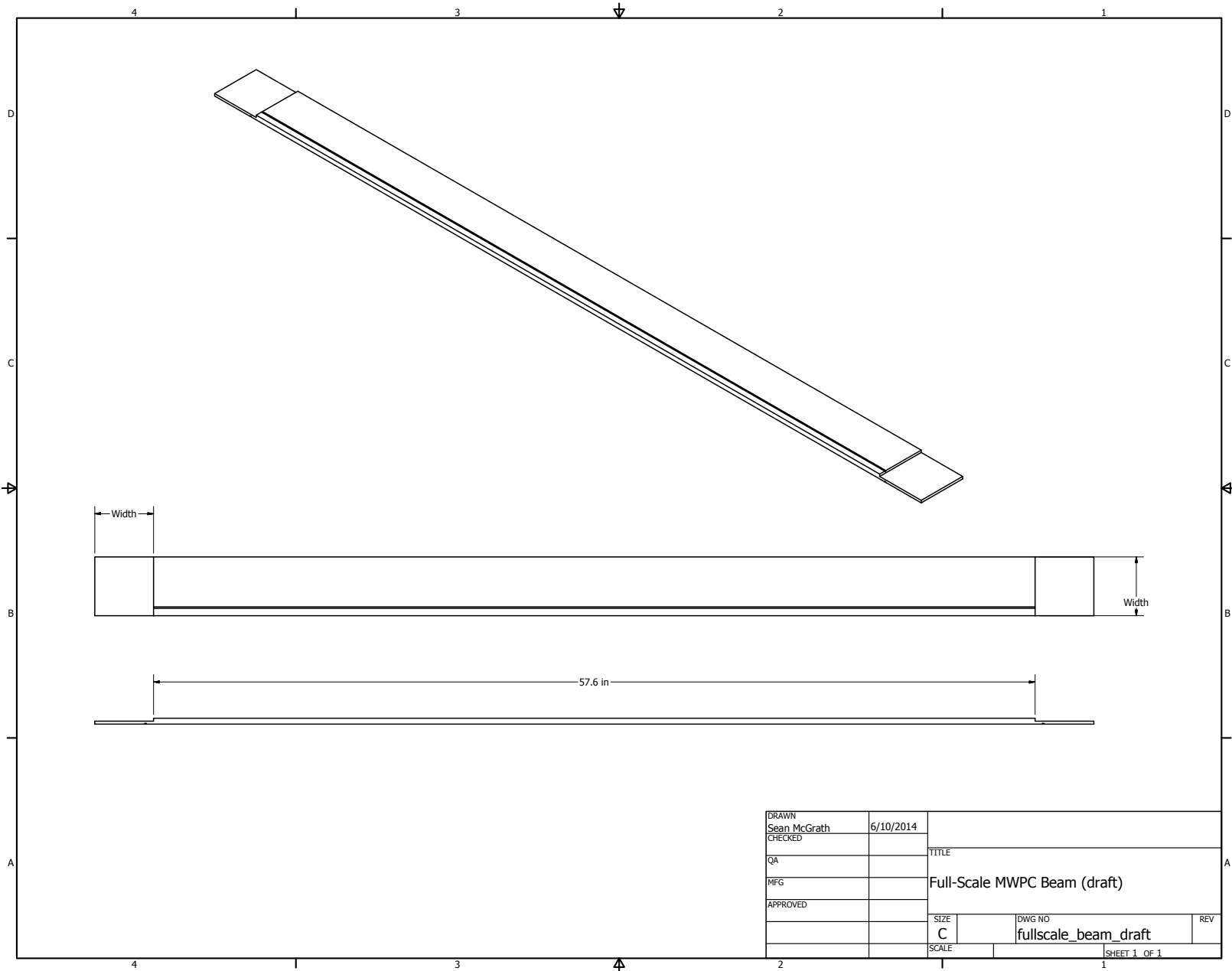
# Goals

- ◆ Define dimensions of beam window
- ◆ Choose appropriate beam width
- ◆ Finalize MWPC design

# Beam Window

- ◆ Approximately  $1.5\text{m} \times 1.5\text{m}$
- ◆ 24-Channel connectors, .4 in/channel
- ◆ Implies  $57.6\text{ in} \times 57.6\text{ in}$ , 144 channels
- ◆ 2 ADCs per MWPC

What does that look like? →



DRAWN	Sean McGrath	6/10/2014		
CHECKED				
QA			TITLE	
MFG			Full-Scale MWPC Beam (draft)	
APPROVED			SIZE	DWG NO
			C	fullscale_beam_draft
			SCALE	REV
				1

SHEET 1 OF 1

# Determining Width

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Want to minimize deflection of beam to due to wire tension, as well as material cost.

# Stress Analysis

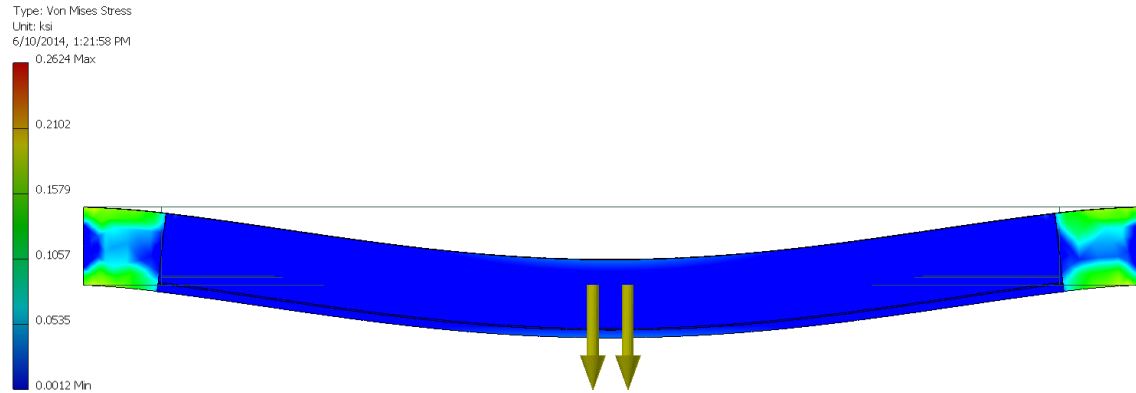
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$$\frac{288 \text{ total wires} \times 50\text{g tension per wire}}{57.6 \text{ in length} \times 0.4 \text{ in depth}} \approx 1.38 \text{ PSI}$$

How does G-10 respond? →

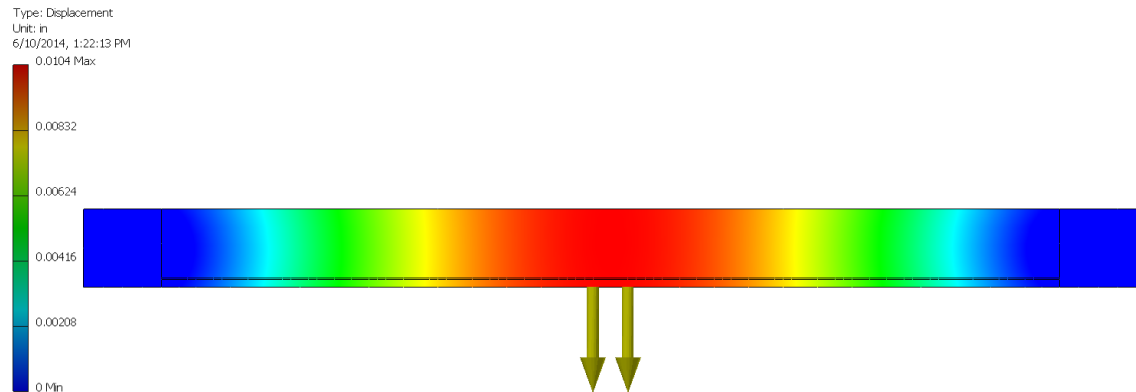
# Beam Stress:

Exaggerated  
Deformation



# Displacement:

Actual  
Deformation



# Results

Wire Window (in)	Full Length (in)	Beam Width (in)	Wire Pressure (psi)	Max deflection (in)	Max Deflection (mm)
57.6	63.6	3	1.38	0.033	0.84
57.6	65.6	4	1.38	0.01737	0.4412
57.6	67.6	5	1.38	0.0104	0.264
57.6	69.6	6	1.38	0.0057	0.14



# In Sum

- ◆ 57.6 in × 57.6 in window
- ◆ 5 or 6 inch thick beams
- ◆ 67.6 or 69.6 inch final design