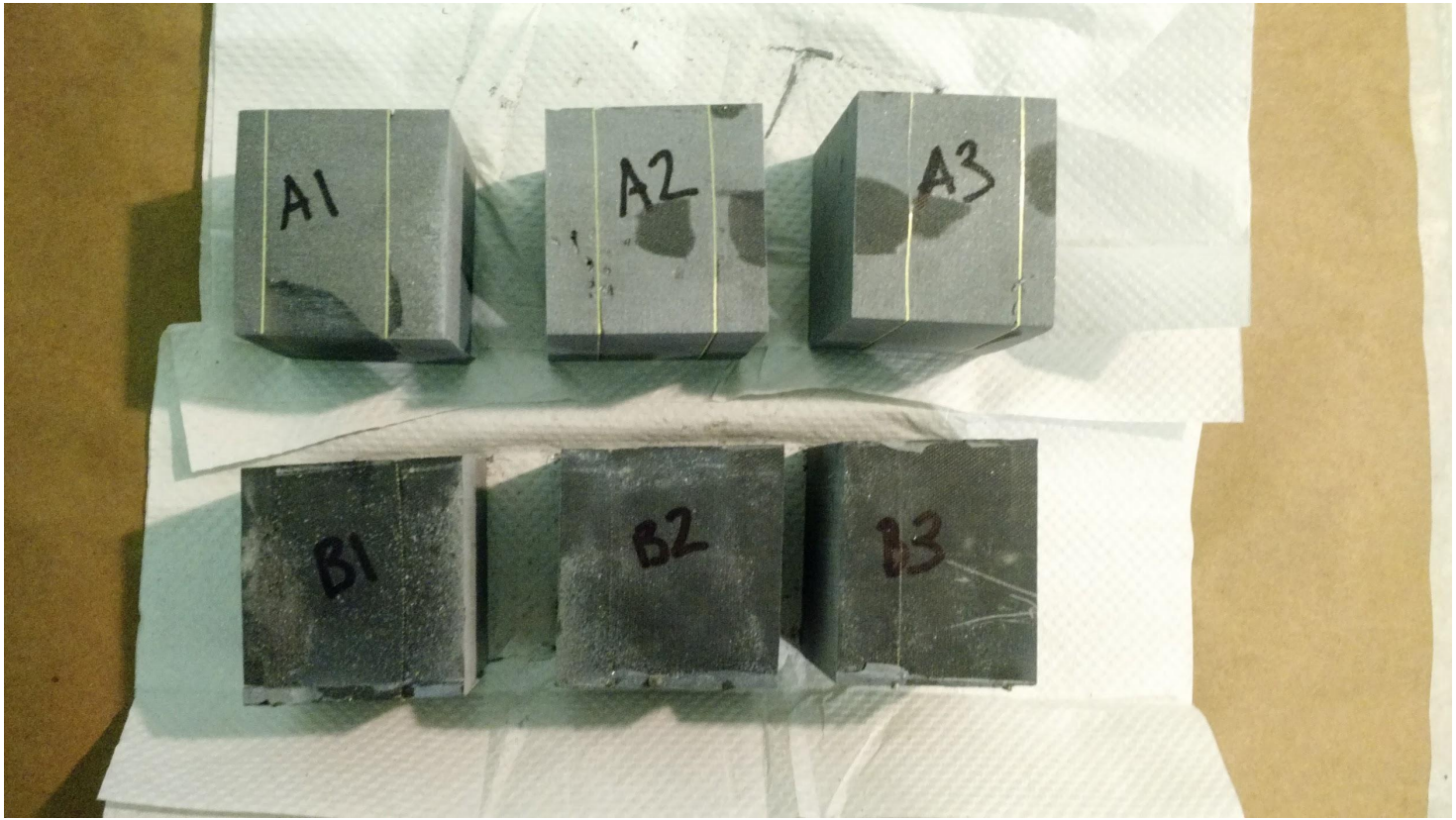
Internal Density Measurements of Vertical Fillings

October 2016

Module Into 3 Parts



- Part A.1 had the tungsten flow issue
- A had fibers, B did not have fibers
- B was made up of a mixture of many samples of tungsten (was used to address flow issues)

Modules Split Into 3 Parts

Block #	Mass (g)	Volume Displaced (mL)	Density(g/mL)	Length (inches : meters)	Mass of Fibers (g)	Adjusted Density (g/mL)
A.1	783.9±0.5	86.5±1.0	**9.10±0.10**	1.765 : 0.04483	12.60	**8.90±0.10**
A.2	1007.9±0.5	102.3±1.0	**9.85±0.096**	1.865 : 0.04737	13.31	**9.72±0.044**
A.3	1049.7±0.5	104.0±1.0	**10.09±0.097**	1.789 : 0.04544	12.76	**9.97±0.10**
B.1	1144.5±0.5	99.3±1.0	**11.50±0.12**	x	x	x
B.2	1260.0±0.5	110.0±1.0	**11.50±0.10**	x	x	x
B.3	1231.3±0.5	106.0±1.0	**11.6±0.11**	x	x	x

Fiber Specs:

67 170mm Fibers ≈ 1g
Length Density ≈ .0878 g/m
3200 fibers per filling ➡ 280.96 g/m of module

- "Adjusted Density" is the mass of the section minus the fibers all divided by original volume.
- More a representation of the tungsten density

Module Into 6 parts

Modules Split Into 6 Parts

Block #	Mass (g)	Volume Displaced (mL)	Density(g/mL)	Length (meters)	Mass of Fibers (g)	Adjusted Density (g/mL)
A.1.1	369.0±0.5	39.0±1.0	**9.5±0.24**	0.02254	6.33	**9.2±0.24**
A.1.2	388.2±0.5	40.5±1.0	**9.6±0.25**	0.02125	5.97	**9.4±0.23**
A.2.1	498.4±0.5	50.0±1.0	**10.0±0.20**	0.02389	6.71	**9.8±0.20**
A.2.2	482.1±0.5	49.2±1.0	**9.8±0.20**	0.02269	6.37	**9.7±0.20**
A.3.1	548.0±0.5	53.1±1.0	**10.3±0.19**	0.02322	6.52	**10.2±0.19**
A.3.2	497.0±0.5	51.0±1.0	**9.7±0.18**	0.02094	5.88	**9.6±0.19**
B.1.1	567.8±0.5	49.0±1.0	**11.6±0.24**	X	X	X
B.1.2	549.0±0.5	48.0±1.0	**11.4±0.24**	X	X	X
B.2.1	626.0±0.5	53.9±1.0	**11.6±0.22**	X	X	X
B.2.2	595.6±0.5	53.0±1.0	**11.2±0.21**	X	X	X
B.3.1	609.2±0.5	54.0±1.0	**11.3±0.21**	X	X	X
B.3.2	579.0±0.5	51.0±1.0	**11.4±0.22**	X	X	X

Statistics for 6-part data

Module A:

- Ignored A.1.1 and A.1.2 due to tungsten flow mistake
- Average: 9.95 g/mL
- St. Deviation: 0.26458

Module B:

- Average: 11.42 g/mL
- St. Deviation: 0.1602