

**Purpose:**

Determine the effects of UV exposure on the physical properties of Concrete Cloth. CC8 samples were prepared for UV exposure. 13"x14" cut pieces were submerged in 70 degree Fahrenheit water bath for 6 minutes, and were then allowed to cure flat between steel plates for 28 days in a room conditioned at 70 Fahrenheit and 50% relative humidity. The samples were cut on a tile saw to target dimensions of 2"x6".

**Procedure:**

UV exposure was carried out using an Atlas Ci5000, Xenon Weather-Ometer, using a xenon arc and two borosilicate filters. The UV exposure was carried out according to ASTM D4355 which calls for a repeating 120 minute cycle of exposure consisting of:

- I. 90 minutes of light only at 65 +/- 3 degrees Celsius and 50 +/- 5% Relative Humidity
- II. 30 minutes of light plus water spray

The breaking tensile strength of the specimens was compared before exposure, after 150 hours, after 300 hours, and after 500 hours of exposure. The irradiance of the light source is calibrated to be 0.35 Watts/m<sup>2</sup>/nm at 340 nm. The samples placed in the Weather-Ometer are 2"x6", 28 day cured specimens placed with the fabric (hydration) face exposed to the light (PVC is away from light source).

Tensile tests were carried out by mounting the specimens into hydraulic rubber faced chucks on an MTS Sintech 10/G electro-mechanical tensile testing machine and applying a tensile load according to ASTM 5035. The distance between the top and bottom sample clamps is set at 3 inches. Elongations at incremental applications of a tensile load were recorded so that load elongation curves could be plotted.



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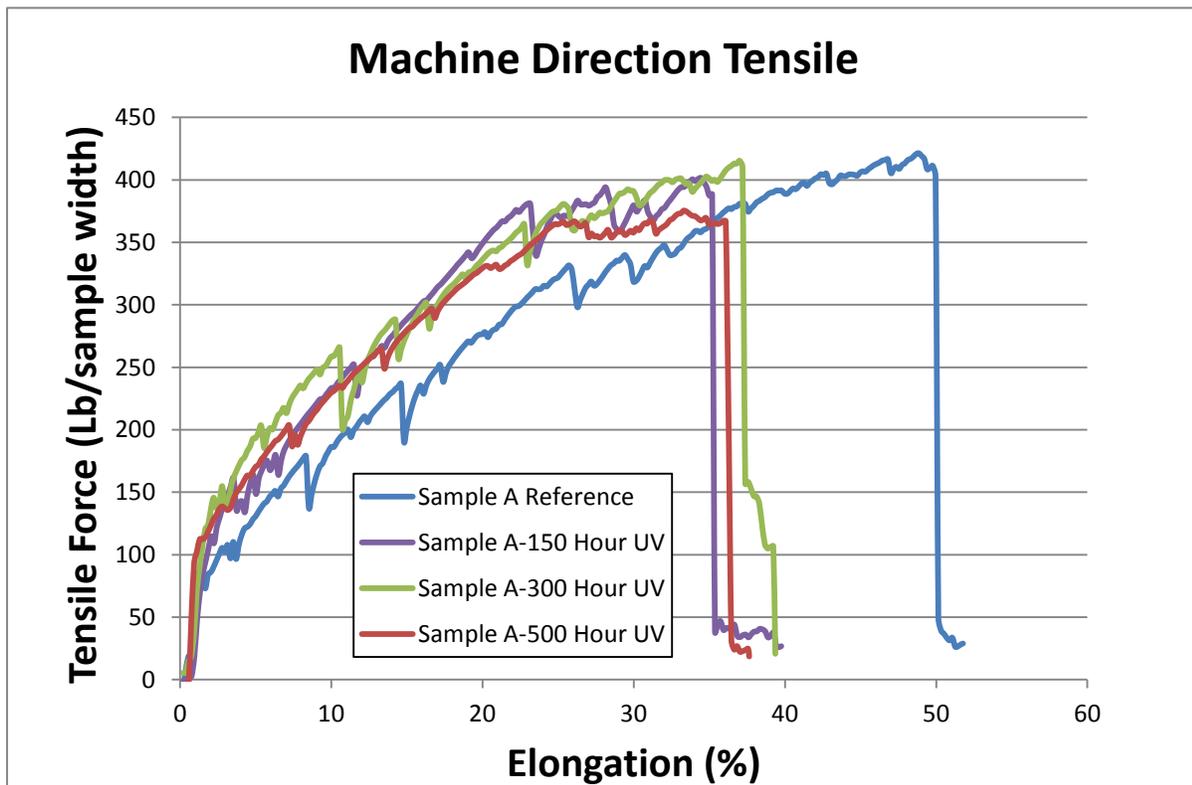
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**Observations:**

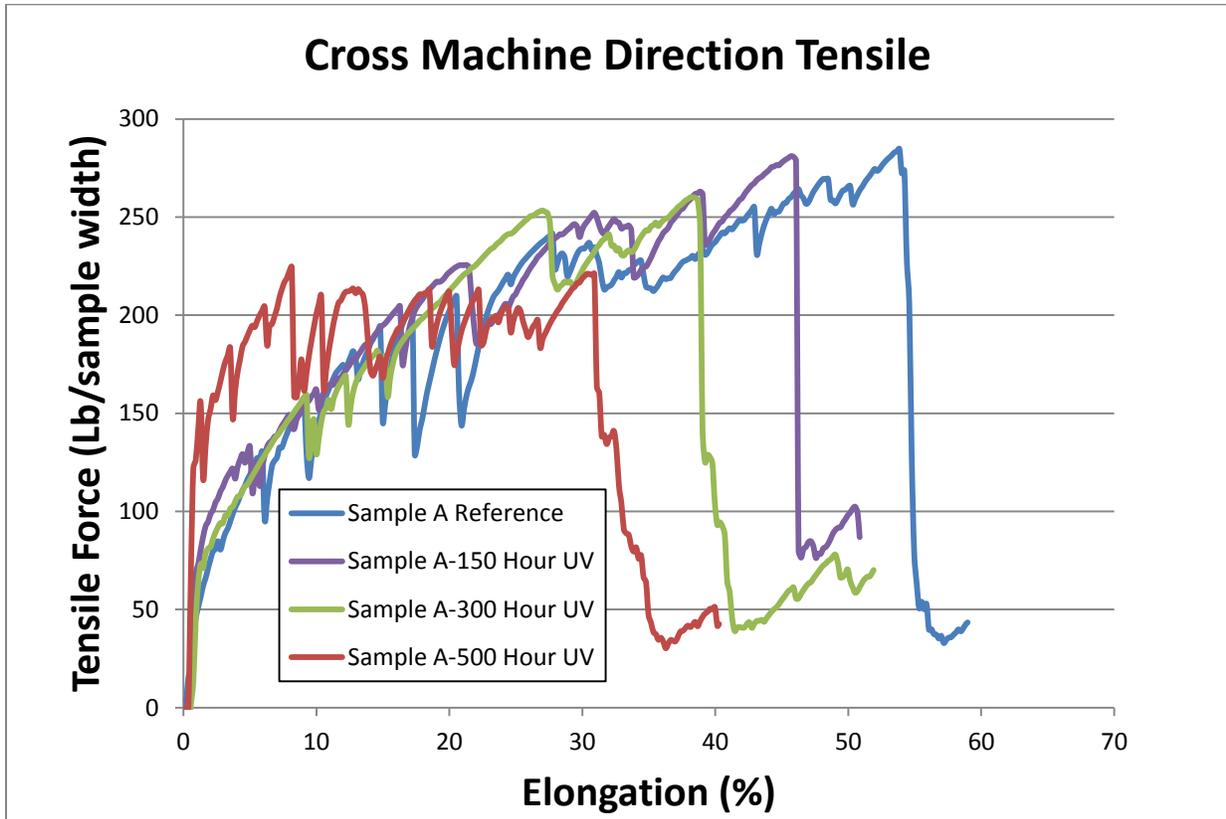
Five specimens were tested in tension in the machine direction and five specimens in the cross machine direction. Load versus elongation was recorded during each test. Below is a tabulation of the average results for the two specimen orientations (machine versus cross machine direction).

Specimen	Machine Direction			Cross Machine Direction		
	Strength (Lb/in)	Elongation at Peak (%)	Elongation @ Ultimate Failure (%)	Strength (Lb/in)	Elongation at Peak (%)	Elongation @ Ultimate Failure (%)
28 day Reference	216.2	48.8	50.0	123.6	51.1	54.3
150 hour	211.4	35.9	36.3	129.6	39.8	42.6
300 hour	208.8	41.8	44.0	125.9	34.6	38.2
500 hour	198.7	35.3	36.5	117.1	24.4	31.6

A plot of load versus percent elongation shows that as the tensile force is applied to the Concrete Cloth, there is a point early on the load versus elongation curve where the concrete cracks and the modulus changes. This is shown as a change in the slope on the load versus elongation curve. The data presented in the table for the ultimate tensile failure is where the fiber matrix fails. There appears to be a trend for the product to fail at a lower elongation when exposed to greater and greater amounts of UV. The maximum tensile



strength decreases a little when exposed to greater amounts of UV light retaining more than 90% strength at 500 hours. The cement in the sample may be experiencing additional curing during the UV exposure (it is being exposed to moisture and heat) which may explain some of the behavior, especially the increase of the tensile force at lower elongations.



**Conclusions:**

Concrete Cloth experiences a slight loss in tensile strength when exposed to UV retaining more than 90% of ultimate strength at 500 hours. The concrete continues to gain strength over time. This results in an increase in the initial tensile strength.

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