

ConcealFab Acetal straps – Environmental Testing

BACKGROUND

ConcealFab's Cable Support Straps are qualified to Telcordia specification TR-TSY-000789, a general requirements specification developed in the 1980's for longer life, more reliable lashed cable supports. These cables have been used for more than 30 years in the communications industry to support aerial cables and recently have been adopted by wireless operators to reduce Passive Intermodulation (PIM) at cell sites. Products that meet the Telcordia specification are expected to provide a service life of greater than 20 years in the field. In order to be qualified, straps must survive a barrage of tests including tensile strength (measured at room temperature), elongation, insertion force, bending, oven aging, UV/condensation exposure, chemical resistance, and corrosion resistance.

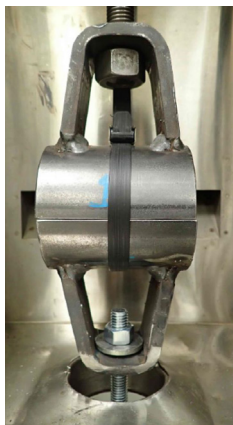


ConcealFab has independently verified the UV/condensation performance as well as the tensile strength performance of its 900443 series Acetal straps. In addition to room temperature testing, ConcealFab performed tensile strength measurements at -40°C (-40°F) and +70°C (+158°F), to verify extreme cold and extreme hot performance.

While other Acetal straps are available that are qualified to the TR-TSY-000789 specification, not all straps perform equally. ConcealFab's straps utilize a unique manufacturing process that aligns polymer chains during fabrication to increase tensile strength and reduce stretch under load. Comparison data is included for another manufacturer's Acetal strap to demonstrate the ConcealFab advantage.

TENSILE STRENGTH TESTING:

Straps were assembled over a 3.5-inch diameter split mandrel and pulled to failure using a Satec Systems Model Apex 22EMF tensile tester. Force vs. distance data was recorded and plotted for each test sample. Tests were repeated inside a thermal chamber able to hold the temperature at the desired temperature extreme. The sample plus test mandrel soaked at the test temperature for 1 hour before beginning the pull test.

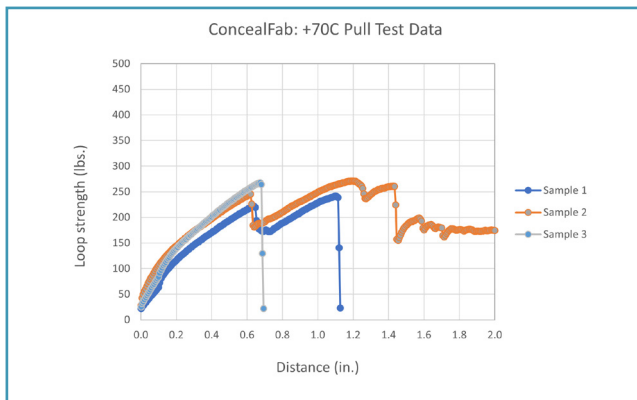
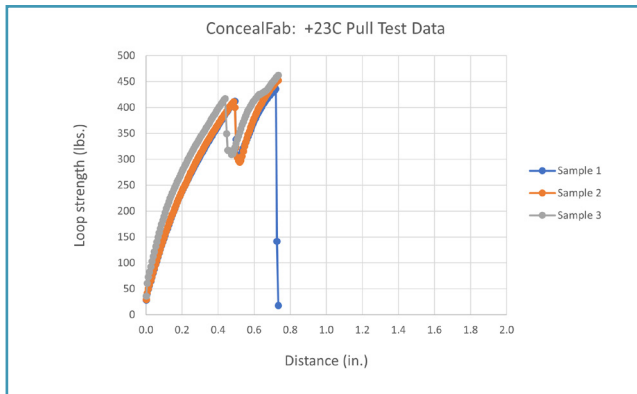
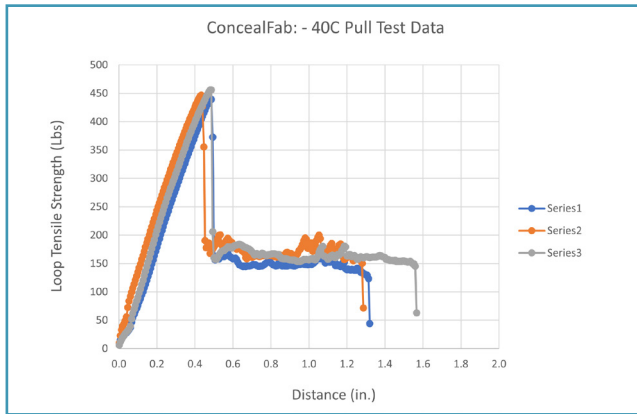


Strap installed on 3.5-inch split mandrel



Thermal chamber used for temperature tests

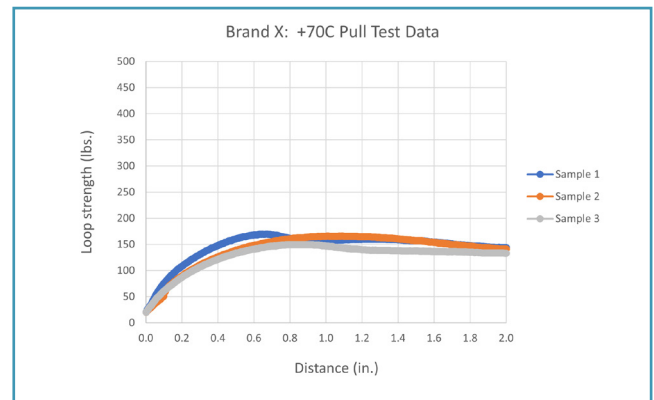
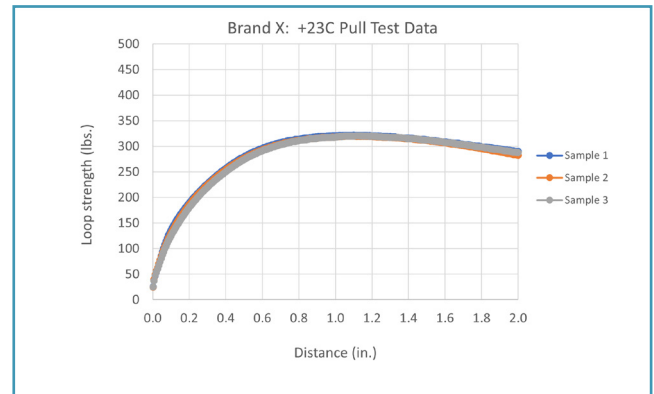
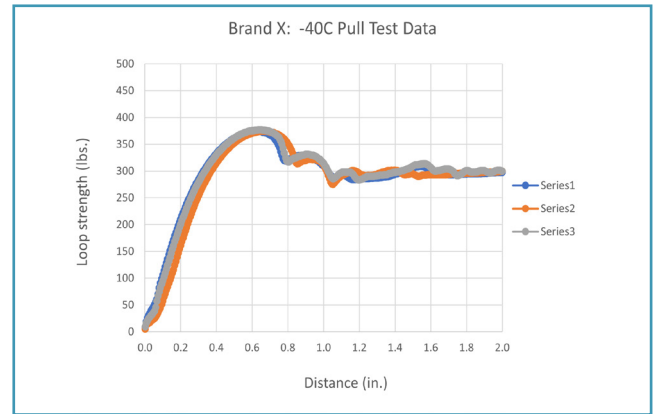
CONCEALFAB ACETAL STRAP DATA



CONCEALFAB DATA SUMMARY

	-40C(-40F)	+23C(+73F)	+70C (158F)
Sample 1	439	412	221
Sample 2	447	411	246
Sample 3	456	417	267
Max.	456	417	267
Min.	439	411	221
Average	447	414	245

COMPETITOR'S ACETAL STRAP DATA



COMPETITOR'S DATA SUMMARY

	-40C(-40F)	+23C(+73F)	+70C (158F)
Sample 1	374	322	170
Sample 2	374	320	166
Sample 3	377	320	150
Max.	377	322	170
Min.	374	320	150
Average	375	320	162

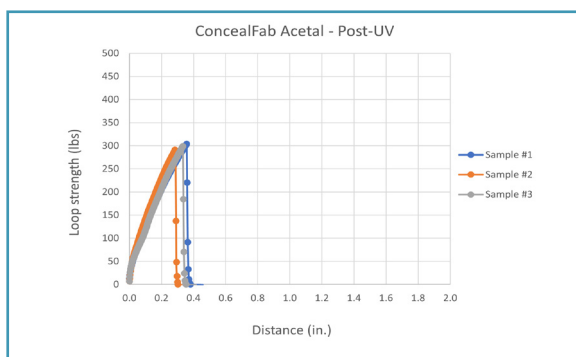
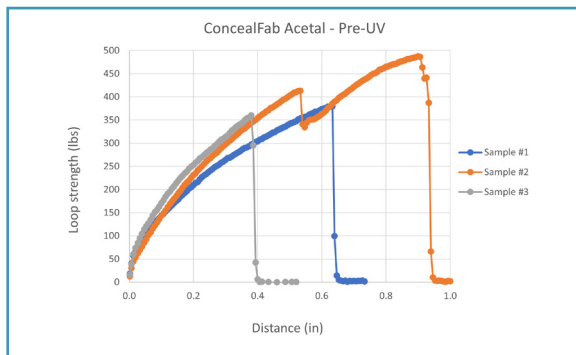
Not only is ConcealFab's strap significantly stronger than the competition, ConcealFab's straps do not stretch as much under applied load. For example, looking at the +23°C test data, ConcealFab's straps supported an average of 414 lbs. load while stretching a maximum of 0.49-inch. The competitor's straps supported an average of 320 lbs. load (94 lbs. less) and stretched as much as 1.13-inch! This is more than double the stretch of the ConcealFab straps!

UV/CONDENSATION TESTING:

Acetal straps

Six straps from each manufacturer were selected for UV/condensation testing. Tensile strength was measured on three samples with no UV exposure. The remaining three straps were subjected to UV/condensation exposure in accordance with ASTM G154, Cycle 1 using a UVA-340 lamp for a total of 4000 hrs. The samples were exposed to repeated cycles of 8 hrs. UV exposure at 60°C followed by 4 hrs. condensation exposure at 50°C. Total UV exposure in this test was 2666 hrs. vs. 2000 hrs. required by the Telcordia specification. After exposure, tensile strength was measured to evaluate changes due to prolonged UV/condensation exposure.

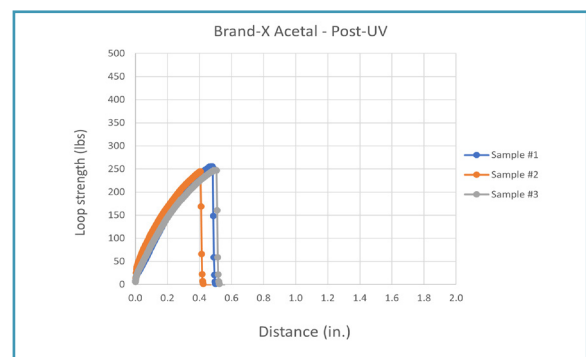
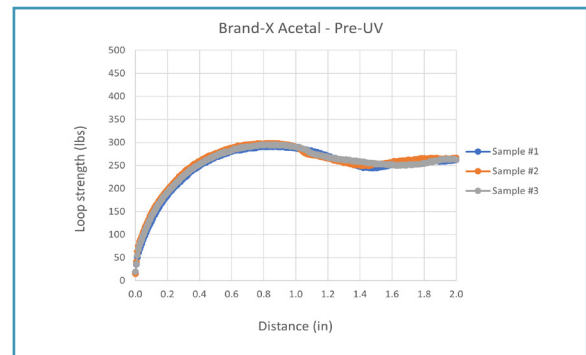
CONCEALFAB ACETAL STRAP DATA



CONCEALFAB DATA SUMMARY

	Pre-UV	Post-UV
Sample 1	380	304
Sample 2	413	291
Sample 3	360	299
Max.	413	304
Min.	360	291
Average	384	298

COMPETITOR'S ACETAL STRAP DATA



COMPETITOR'S DATA SUMMARY

	Pre-UV	Post-UV
Sample 1	260	255
Sample 2	276	245
Sample 3	270	248
Max.	276	255
Min.	260	245
Average	269	249

Both Acetal straps performed well after UV/condensation exposure. The ConcealFab straps showed an average of almost 50 lbs. higher strength after prolonged UV/condensation exposure compared to the competitor's straps. The Telcordia specification requires that after UV/condensation exposure a strap must maintain a loop tensile strength of at least 250 lbs. The competitor's product does not meet this requirement but given that this test included 33% longer UV exposure than the 2000 hrs. required by the Telcordia specification, the competitor's product would certainly have passed the Telcordia requirement.

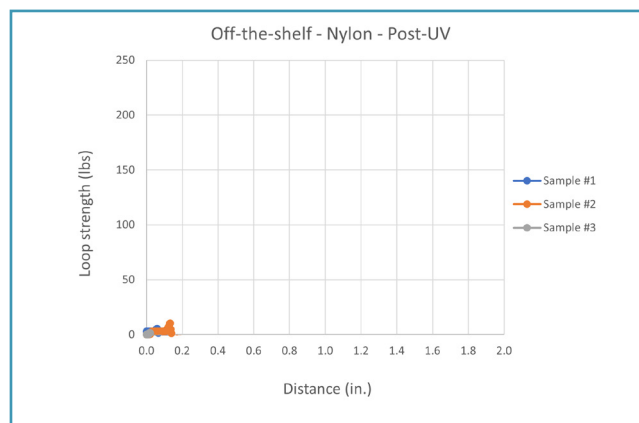
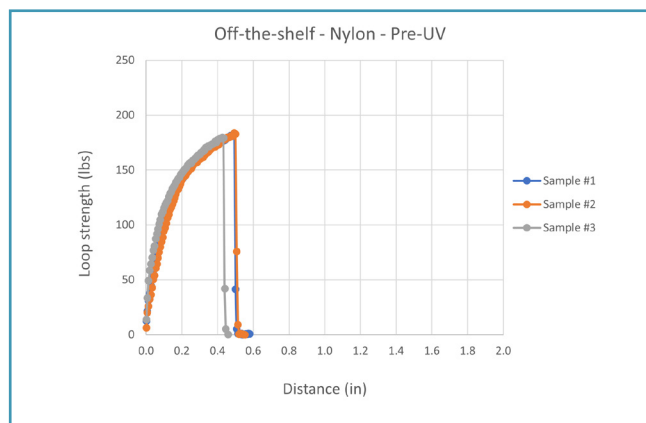
OFF-THE-SHELF NYLON STRAPS

Most of us have experienced plastic zip-ties that fall apart in your hands after a few years in the sun. As part of our UV/condensation testing, we included a variety of Nylon zip ties for comparison to ConcealFab's Acetal strap.

The Nylon straps tested were 0.25-inch wide, which is half the width of the Acetal straps tested. The scale on the tensile test plots has been adjusted from 500 lbs. to 250 lbs. given the lower strength of the narrower straps.



OFF-THE-SHELF NYLON STRAP DATA



OFF-THE-SHELF NYLON STRAP DATA

	Pre-UV	Post-UV
Sample 1	182	5
Sample 2	184	10
Sample 3	180	2
Max.	184	10
Min.	180	2
Average	182	6

No strength after UV exposure!

CONCLUSION:

The testing conducted by ConcealFab on its 900443 series Acetal straps confirm compliance with Telcordia specification TR-TSY-000789. The Telcordia specification requires a minimum of 250 lbs. loop tensile strength at room temperature and after 4000 hrs. UV/condensation exposure (2000 hrs. UV / 2000 hrs. condensation). The ConcealFab straps exceed this requirement with an average for 414 lbs. strength at room temperature and 298 lbs. strength after a more stringent UV/condensation exposure.

Compared to competitive product, ConcealFab's Acetal straps are an average of 83 lbs. stronger over the temperature range of -40°C and +70°C. In addition, the ConcealFab straps are twice as resistant to stretching due to their unique manufacturing process.

Most of the Nylon straps that ConcealFab tested performed well after UV/condensation exposure. Some samples, however, lost almost 100% of their strength. Because such variation is possible, operators should only approve straps with known environmental performance for securing critical site infrastructure.