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Weather Or Knot: The Effects Of Environment And Exposure On High Strength Safety Textiles, Phase 2

This project was designed to improve upon accelerated exposure techniques used in laboratories by creating a more detailed and realistic experiment to evaluate the performance and durability of high strength safety textiles (e.g., climbing and rescue equipment, seat belts, and trucking tie-downs) after exposure to natural weathering. Seventy-two samples of looped polyethylene along with 72 samples of both colors of looped nylon webbing (216 total) were attached to a holding assembly in an open field allowing every sample equal exposure to all forms of weathering. Every two weeks, samples were removed from the assembly and stored for future testing. The samples were pulled to failure using a Universal Testing Machine to determine tensile strength and elongation before failure; then evaluated for breakage location, color, and handling characteristics. After 10 weeks of exposure the samples on average lost 15.8% of their initial strength. After 30 weeks there was only an additional 1.1% loss and after 38 weeks another 2.3%. In the end, the three sample sets lost an average of 1025 pounds (19.2%) of their tensile capacity. Throughout the test a home-built computerized device continuously recorded light exposure; the consistent accumulative exposure correlated poorly with the observed erratic strength loss profile. The data strongly supports that weathering and exposure are major contributors to the decreased performance of high-strength safety textiles. The data also suggests the possibility of other chemical reactions caused by exposure to light, heat, and moisture contributing to strength degradation of the webbing.