Uniaxial and Biaxial Elongation

As a load is applied to the coated polyester fabric, the material will stretch and ultimately break at its breaking strength. This property is similar to conventional building materials such as steel or glass. However, the length of elongation will be significantly greater for synthetic resin coated materials. Typical elongation at break values for Seaman's coated materials will range from 20% to 50%.

From a design and engineering viewpoint the ultimate elongation at break is not as important as the elongation at the design working loads on the structure. Again, the PVC coated polyester fabric exhibits much higher elongation at the working loads as compared to other building materials. It is very important that the engineer understand what the elongation values are for a given material at a given load and that the elongation values are consistent from roll to roll.

The elongation properties are related to the polyester base fabric; more accurately these properties are dependent on polyester yarn selection, weave/knit pattern, and coating methods. Different types of polyester yarns can be used to produce the base fabric; some yarns have relatively low elongation under stress, and some yarns have high elongation under stress. It is not unusual to use one type of yarn in the warp direction and a different type of yarn in the weft direction, but different types should not be used in the same direction.

The second factor affecting the elongation properties is the weave pattern that is used to make the base fabric. If the warp and fill yarns are combined in a conventional plain woven construction, the yarns are crimped as they are placed in the material. When this fabric is stressed the yarns begin to straighten, reducing the crimp. This typically results in a material that has relatively high elongation at low loads.

If the warp and fill yarns are combined using a warp-knit weft-inserted machine, the warp and fill yarns are laid into the material in a straight and flat position, and held in place with a stitching yarn. As a load is applied to this type of material, the load goes directly on the polyester fibers. A warp-knit weft-inserted material typically will have a lower elongation at a given load than a woven fabric of a similar strength. Shelter-Rite's performance has been based on this type of design.

The third factor affecting the elongation properties is related to the coating method used to apply the synthetic resin coating compound. In most coating procedures, the base fabric is run through coating ovens and can be stretched under heat. These processes can cause the material to be drawn or can cause the material to shrink; in either case the elongation properties will be affected. The fabric may be processed with a predetermined tension in the weft direction in some cases which will then reduce the elongation under applied loads.

Testing the uniaxial elongation properties of a material can be done per ASTM D-751 Cut Strip Test Method, or testing under a static load can be done by ASTM D-4851. Biaxial testing is done by various test methods as developed by the material manufacturers or structure fabricators.

1000 VENTURE BLVD. WOOSTER, OHIO 44691 USA, www.architecturalfabrics.com
Phone 330.262.1111, Fax 330.263.6950 U.S. *Toll-Free:* Phone 800.927.8578, Fax 800.649.2737