

Tensile Strength of Architectural Fabrics

The first and most important performance property that needs to be considered is the tensile strength of the architectural fabric. Like any building material, knowledge of the tensile strength is required to meet the design and engineering criteria of a building.

The Shelter-Rite material on a fabric structure, whether an air supported, tension membrane or custom structure, must withstand the forces that are applied. These stresses are related to the internal air pressure or pre-tension on a structure, or are related to forces such as wind load, snow load or other dead and live loads.

The strength requirements of a coated material for a given structure can be calculated using conventional engineering formulas and applying appropriate safety factors.

The tensile strength is directly related to the base fabric. In fact, the base fabric controls both tensile strength and stretch properties and the thickness of the coating compound have little or no effect on these properties. Seaman begins with high tenacity, continuous filament polyester yarns. The yarns are then formed into the base fabric by either weaving or knitting the threads into the base cloth. Typically, the yarns are placed in two directions, perpendicular to each other: the warp (machine) yarns and the weft (fill) yarns. The tensile strength is determined by the tenacity of the yarn multiplied by the denier of each yarn multiplied by the number of yarns per inch width. To increase the tensile strength of a given material, typically a higher tenacity yarn or increasing the number of yarns per inch can be used. It is important to note that on Seaman specifications, the strip tensile strength is based on 1 inch of yarn and reported as a minimum requirement at the time of manufacture. This is not to be confused with other specifications in which the 'typical' results are reported.

Testing the tensile strength of a material can be done by either the Cut Strip Test Method or the Grab Test Method as outlined in ASTM D 751. Samples of a material are tested in both the warp and fill directions. It is critical when comparing tensile and stretch of multiple fabrics, to use the same test method/criteria.

Because the tensile strength of the architectural fabric depends on the base fabric and the polyester yarns, the useful life of a fabric structure is then dependent on keeping the yarns from deteriorating. If the yarns start to break down, then the structural integrity of the entire building system is in question. Protecting the yarns from damage is one of the main functions of the exterior coating compounds.