Flame Resistance of PVC Coated Fabric

There is probably no more important performance property of Shelter-Rite fabric than the flame resistant characteristics of the material. Like any building material, the flame resistant properties need to be fully understood so that the material can be used safely in a structure.

Synthetic resin coated polyester fabrics react differently than conventional building materials in the presence of a fire. This difference is not commonly understood by building officials or properly addressed by the building codes.

The best way to describe the flame resistant characteristics of Shelter-Rite fabric is to refer to it as a "limited combustible" material. The material will burn when in the presence of a flame source, but will be self-extinguishing once the flame is removed. This property can actually be an advantage when considering what happens with a fire inside an architectural fabric building.

This situation was tested in a 1994 Factory Mutual full-scale fire test performed on a steel framed PVC coated polyester fabric clad building. In this test, a six-foot high pile of wood skids was ignited in the corner of the building and allowed to burn. The building was 20 feet high at the corner and was equipped with smoke detectors and a sprinkler system but with no water supplied. The following observations were made by the Factory Mutual fire experts:

As the fire started, the smoke detectors sounded, providing early detection of the fire.
The heat detectors on the sprinkler heads were activated and the sprinklers would have functioned if water had been available.
As the woodpile burned, the material melted and burned in the area of the fire. As the material burned away from the fire source, the material self-extinguished. Only the fabric in the immediate area of the fire source became involved in the fire.
The material did not propagate a flame or sustain combustion when exposed to a severe fire.
As the material burned, the structure became self-venting, allowing smoke, harmful gases and heat to escape from the building.
At no time during the fire did the temperature of the steel frame reach a point that would cause structural damage to the metal.
Due to the nature of the fire inside this building, fire fighters could battle this fire without entering the building. They would not need to place personnel on the roof of the building to vent the smoke and heat.
The observations made in the Factory Mutual fire test have been confirmed in a recent real life fire. On November 14, 1999, a steel-framed architectural fabric structure containing recycled paper caught fire in Portland, Maine. The fire started on a bale of paper and spread to other bales inside the building. The warehouse did not contain a sprinkler system so the flames quickly spread to the fabric membrane roof.

As the flames reached the roof, the architectural fabric melted and burned away, allowing the smoke and heat to escape the building. According to the Portland fire chief, this allowed the fire to be fought from the outside of the building without having to place any personnel on the roof of the building to vent the smoke and heat.

While all of the paper was destroyed along with most of the fabric skin, the steel frame was not damaged. In fact, a new skin was fabricated and installed within a week and the warehouse was back in service.

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Flame Resistance of PVC Coated Fabric (continued)

The fire resistance properties of Shelter-Rite fabric are typically related to the exterior-coating compound. The compound is formulated with the proper types and amounts of flame retardant additives to impart the self-extinguishing properties that are required for a safe building material. Since these additives are incorporated into the coating and are not extractable, the material will remain flame retardant for the life of the coated fabric.

There are a variety of flame resistant testing procedures that are used for building materials, but many of these do not apply to a synthetic resin coated polyester fabric. The primary test that is used for coated fabric is the NFPA 701 Vertical Flame Test. In this test, a sample of the architectural fabric is held in a vertical position and a flame is exposed to the bottom of the material for 12 seconds, and then removed. The material must self-extinguish within 2 seconds after the flame is removed, and cannot have an excessive char length. Shelter-Rite fabrics have an excellent performance record in the field for providing a high-quality flame retardant product.

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