



# FLAME RETARDANT TESTS

## For Paper, Paperboard and Corrugated

### ASTM E-162

ASTM E-162 is called the Radiant Panel Flame Spread Test. The test is used as a requirement to meet the military specifications for corrugated paperboard packaging. To meet the mil-spec, the flame spread must be 20 or less. The ASTM E-162 flame spread requirement of 20 or less can be met with PyroCide II from PyroTech™ by Michelman (PTM™) at an application rate of 1.9 gal./MSF, or Ceramic EX1 at 2.5gal./MSF. The coatings are applied only to the outside of a corrugated box.

It's also possible to meet the ASTM E-162 specification with saturants such as PyroBreak™ EX13 and 18, and PyroNova™ from PTM™. However, both liners and the medium must be saturated with those flame retardants, which is usually impractical.

### ASTM E-662

ASTM E-662 is a test to measure the amount of smoke given off by a burning material. The smoke is measured optically. The smoke density is also a requirement of the mil-spec. To achieve a passing E-662 performance on paper, paperboard or corrugated, smoke generated by the sample cannot exceed an optical smoke density of 100. The test is performed by stacking sheets of the substrate to a prescribed thickness. An ignition source is applied to the sample and the smoke density is optically measured. Usually the flame retardant treated paper products that meet the radiant flame spread test of 20 or less will also achieve a smoke density rating of less than 100.

### MVSS - 302

Motor Vehicle Safety Standard 302 is a fire test requirement for materials installed in motor vehicles. Paperboard, such as that used in auto head liners, needs to pass this test. The MVSS-302 test is conducted by placing a sample of paperboard in the horizontal position in the test chamber. A small flame is started on one end for a prescribed amount of time. In order to pass the test, the flame must not progress beyond a certain length within a specific time frame. The test is classified on a pass/fail basis.

Most paper and corrugated applications that must meet the MVSS-302 test are flame retarded using a saturant (EX18, EX-13 or PyroNova™). When a saturant is used, the dry basis weight add-on rate for EX18 will be 12% to 15% or, for PyroNova™, 15% to 18% add-on.

### ASTM E-84

The E-84 test generally applies to products designed for use as building materials, including fabricated corrugated and paper used in such a way. The E-84 test measures the surface flame spread on the substrate to be tested. The test is conducted in a 24-ft. tunnel where air is blown through the tunnel at a prescribed velocity. The E-84 test then measures the rate of flame spread on a sample mounted horizontally on the roof of the test tunnel. The E-84 test also includes an optical density component during which the smoke density is measured as it blows by at the end of the tunnel. The results of the test are reported as Class A, B, or C.

Class A requires a smoke density of 400 or less, and a flame spread of 25 or less. ASTM E-84 can be met on corrugated or paper using either a saturant (EX18, EX-13 or PyroNova™) or a coating (PyroCide™ II, Ceramic EX1). When a saturant is used, the dry basis weight add-on rate for EX18 will be 12% to 15% or, for PyroNova™, 15% to 18% add-on. When corrugated is coated with PyroCide™ II to meet the E-84 test, the coating is usually applied to one surface (outer) at the rate of 2gal./MSF.

## **TAPPI - 461**

The Tappi 461 is a vertical burn test designed to measure flame spread up a vertically-mounted sample. Strips of the substrate to be tested (paper or paperboard) are laid out both in machine direction and cross-machine direction. Twelve seconds of flame are applied to the samples, the flame is removed and the “char length” on the sample is then measured. To pass the TAPPI 461, the sample must self-extinguish after the flame is removed, there should be no afterglow, and the char length should not exceed four inches.

TAPPI 461 can be met on paper saturated with EX18, EX13 or PyroNova™. The test is not appropriate for flame retardant coated paper or paperboard. Corrugated board is also not to be tested by the TAPPI - 461 method. When using saturants, the add-on rate for EX18 will be 12% to 15% or, for PyroNova™, 15% to 18% add-on by dry weight.

## **NFPA - 701**

NFPA-701 is another vertical burn test very similar to TAPPI 461.

## **NFPA-703**

NFPA-703 is similar to the E-84 test and also UL 723.



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