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Carpet Flammability

The flammability characteristics of interior materials are essential because they can affect the behavior of fire. The less a fire spreads, the less threat to life and property and the easier it is to control and extinguish. Although carpet is one of the least likely interior materials to propagate fire, the carpet industry has long recognized and accepted the responsibility for providing a flammability safe product. Today, with the cooperation of the National Bureau of Standards and national fire fighting authorities, the carpet industry can boast that all carpet manufactured for sale in the United States must self extinguish in order to comply with stringent flammability regulations.

During the 1960's there was no widely accepted method to determine the fire response characteristics of carpet. Because of this, the carpet industry was forced to rely on the recommendations of the National Fire Protection Agency, which suggested that the Steiner Tunnel Test (ASTM-E84) be accepted as the standard. This test was originally developed to evaluate the fire hazards of wall and ceiling materials.

Using this test method, a carpet is affixed in a face down position from the ceiling of a tunnel. Two gas burners operating at 5,000 BTU's are ignited beneath the sample and allowed to burn for ten minutes. The time it takes and the distance that the flame travels on the inverted sample is then measured. The flame spread limit for carpet is set at a limit of 75, in a system that measures flame spread and fuel contribution on the premises that the higher the number the greater the flame spread potential. A Class A rating for carpet is 0-25, and a Class B rating is 26-75.

Inadequacies in the tunnel test were witnessed by the fact that two identical carpets often provided widely divergent test results. It was also determined that carpet mounted on walls and ceilings has a greater effect on flame spread than similar carpet installed on the floor. Because of these concerns the fire community agreed that the Tunnel Test did not yield data which could predict the performance of

carpet in an actual building fire, and that a more accurate and realistic flammability test was needed for carpet.

By 1971 the Department of Commerce (DOC) FF1-70 Flammability Fabrics Act was enacted into law. This act required that all carpet manufactured for sale in the United States pass the pill test, which provides carpet with a "first to ignite" scenario from a small incendiary source. This is established by placing a flammable, methenamine pill in the center of a 9" x 9" carpet specimen, which has been oven dried. The pill is ignited by a match, providing a standardized flame source for approximately two minutes. If the flame spread is more than three inches from the point of ignition the specimen fails. If more than one out of eight specimens fail that carpet cannot be legally manufactured for sale in the United States. This test vividly exhibits that all carpet sold in the United States will self extinguish, and that carpets that pass the pill test will not spread

flame during a Stage 1 fire (ignition and initial growth). Coupled with the use of items like smoke detectors and automatic sprinkler systems carpets that pass the pill test can obviate concerns for smoke generation and fire from the most common residential fire scenario which, according to the U.S. Fire Administration, is typically due to ignition of upholstery or mattresses by items like cigarettes. The importance of the pill test can't be overstated, since fire experts agree that to minimize fire threat, a fire must be detected and suppressed while it is still small.

As use of carpet increased, more and more attention was focused on a dependable, reproducible test method that would demonstrate what level of flame spread is necessary to prevent a Stage 3 fire (full involvement or flash over of the room or space of origin) from spreading to other parts of a building. In 1978 the Flooring Radiant Panel Test (ASTM E-648) was first used in the carpet industry for this purpose. By 1980 members of the National Fire Protection Association (N.F.P.A.) adopted the Flooring Radiant Panel flammability ratings as the new standard for carpet.

The Flooring Radiant Panel apparatus involves a horizontally mounted carpet specimen which receives radiant energy from a gas-air fueled radiant panel mounted above one end on the sample at a

30 degree angle. The sample and radiant panel are located within a test chamber. This test measures the lowest level of radiant energy necessary for a fire to continue to burn and spread. The distance the carpet specimen burns to extinguishment is measured and converted to watts per square centimeter from a calibration graph. This measurement is identified as critical radiant flux. The lower the critical radiant flux the greater the tendency of the material to spread flame. Flammability ratings are reported as either Class I (a minimum of 0.45 watts/sq centimeter), or Class II (a minimum of 0.22 watts/sq centimeter). Although the Flooring Radiant Panel Test has been adopted by virtually all federal agencies, this test is not required under federal law; testing of a specific style is left to the discretion of the manufacturer.

In most cases a Class I rating is only required for corridors, entrances, and exits of health care facilities and nursing homes. All other regulated areas are only required to have a Class II rating or to pass the Pill Test. However, if a local fire official determines a given area to be hazardous, a ruling requiring a Class I rating may be issued. Although the state Fire Marshall sets the state standard for flammability testing, the local Fire Marshall has the same level of legal authority and usually has the final say. Typically, you can determine which test

method a state or local fire official requires by asking them if they abide by the Life Safety Code (produced by the N.F.P.A.), which continues to recognize the Flooring Radiant Panel Test as the accepted standard.

A final word on carpet flammability should be directed toward smoke density. The ASTM E 662 Smoke Chamber Test method is used for the purpose of determining the specific optical density of smoke within a closed chamber on a carpet in a flaming and non-flaming mode. Three specimens are tested using a photometric system with a vertical light path to measure the reduction in light transmittants during the duration of the test to determine specific optical density. The photometric scale used to measure the smoke generated is similar to the optical density scale for human vision. The regulatory limit presently applied to carpet by a number of agencies is a maximum specific optical density of 450 based on tests conducted in the flaming mode.

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