

U.S. Fire Administration / National Fire Academy

Coffee Break Training

Topic: Fundamental Fire Physics: Lesson 2

Learning objective: The student shall be able to explain the terms piloted ignition, heat flux, and flame spread.

Last year's Coffee Break Training 2006-9 emphasized the importance that code enforcement personnel be familiar with fundamental fire physics. Today's Coffee Break Training offers another lesson.

1. Piloted Ignition — the ignition of a gas- or vapor-air mixture by the introduction of an outside source such as a flame, spark, or hot spot. Piloted ignition occurs at the lower flammable limit of vapor-air mixtures. Piloted ignition is employed when flammable and combustible liquids are tested for fire points by ASTM D92, *Test Method for Flash and Fire Points by Cleveland Open Cup*.

2. Heat Flux — the rate of heat transfer per unit of time in the cross-sectional area of a material. Heat flux is measure of the material's thermal conductivity. It often is measured in Btus/second/ft² (Watt/m²) and is represented in formulas by the symbol "Q". In the built environment, carpet and other floor coverings are tested for the heat flux needed to ignite them in accordance with NFPA 253, *Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source*.

3. Flame Spread — the continuous progress of piloted ignition along surfaces or through porous solids where the flames provide the heat source. The flame spread of building materials is measured in the Steiner Tunnel apparatus using ASTM E84, *Test Method for Surface Burning Characteristics of Building Materials*.

For additional information on ignition and combustion, refer to the SFPE *Handbook of Fire Protection Engineering*, the NFPA *Fire Protection Handbook*, or perform a keyword search for these terms on the World Wide Web.

