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Large-Scale Fire Testing of Cartoned Plastics

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ABSTRACT

In order to simplify the effort of testing the storage of different materials, generic classifications of commodities were developed. The classifications include Class I, II, III, IV, Cartoned Unexpanded Plastic (CUP), Cartoned Expanded Plastic (CEP), Uncartoned Unexpanded Plastic (UUP), and Uncartoned Expanded Plastic (UEP); provided in order of accepted fire severity. Materials found throughout industry are categorized into one of these groups and the required protection is determined based on that for the generic commodity.

To categorize a material into one of the classification groups, fire tests are conducted with small arrays of the commodity (2x2x2 or 2x4x3 storage arrangement). These tests are conducted beneath a calorimeter, and water is supplied uniformly to the array surface from an applicator positioned directly above the commodity. A series of tests are conducted and the critical water application rate needed to control the heat release rate of the fire is determined. The critical water application rate is then used to rank the relative hazard associated with the commodity.

Recently, work was conducted to evaluate the commodity classification protocol used by FM Global. Results from that research indicate that there may be overlap between the fire hazards associated with some of the eight commodities, concluding that they could be further simplified. Specifically, that the protection required for the two cartoned plastics (CUP and CEP) is the same and that they can be grouped together.

However, historical full-scale sprinklered fire tests with high storage (7-tiers) of the cartoned plastics indicated that the protection required for the CEP is greater than that required for the CUP. Sufficient test data did not exist at lower storage heights (3-tier) to fully assess the applicability of the commodity classification results.

A two-phase full-scale fire test program was proposed to establish the difference in protection required for the CUP versus the CEP. The first phase of the test program was conducted at a low storage height (3-tier) to align with the test setup used for the commodity classification testing. The second phase of the program was conducted at the high storage height (7-tier) to assess the scalability of the classification results. Results and conclusions from the large-scale fire tests will be presented.