

Standard Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies¹

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INTRODUCTION

The performance of structural members and assemblies exposed to fire conditions resulting from large, free-burning (that is, outdoors), fluid-hydrocarbon-fueled pool fires is of concern in the design of hydrocarbon processing industry (HPI) facilities and other facilities subject to these types of fires. In recognition of this unique fire protection problem, it is generally required that critical structural members and assemblies be of fire-resistant construction.

Historically, such requirements have been based upon tests conducted in accordance with Test Methods E119, the only available standardized test for fire resistant construction. However, the exposure specified in Test Methods E119 does not adequately characterize large hydrocarbon pool fires. Test Methods E119 is used for representation of building fires where the primary fuel is solid in nature, and in which there are significant constraints on the movement of air to the fire, and the combustion products away from the fire (that is, through doors, windows). In contrast, neither condition is typical of large hydrocarbon pool fires (see Appendix X1 on Commentary).

One of the most distinguishing features of the pool fire is the rapid development of high temperatures and heat fluxes that can subject exposed structural members and assemblies to a thermal shock much greater than that associated with Test Methods E119. As a result, it is important that fire resistance requirements for HPI assemblies of all types of materials be evaluated and specified in accordance with a standardized test that is more representative of the anticipated fire conditions. Such a standard is found in the test methods herein.

1. Scope*

1.1 The test methods described in this fire-test-response standard are used for determining the fire-test response of columns, girders, beams or similar structural members, and fire-containment walls, of either homogeneous or composite construction, that are employed in HPI or other facilities subject to large hydrocarbon pool fires.

1.2 It is the intent that tests conducted in accordance with these test methods will indicate whether structural members of assemblies, or fire-containment wall assemblies, will continue to perform their intended function during the period of fire exposure. These tests shall not be construed as having determined suitability for use after fire exposure.

1.3 These test methods prescribe a standard fire exposure for comparing the relative performance of different structural

and fire-containment wall assemblies under controlled laboratory conditions. The application of these test results to predict the performance of actual assemblies when exposed to large pool fires requires a careful engineering evaluation.

1.4 These test methods provide for quantitative heat flux measurements during both the control calibration and the actual test. These heat flux measurements are being made to support the development of design fires and the use of fire safety engineering models to predict thermal exposure and material performance in a wide range of fire scenarios.

1.5 These test methods are useful for testing other items such as piping, electrical circuits in conduit, floors or decks, and cable trays. Testing of these types of items requires development of appropriate specimen details and end-point or failure criteria. Such failure criteria and test specimen descriptions are not provided in these test methods.

1.6 *Limitations*—These test methods do not provide the following:

1.6.1 Full information on the performance of assemblies constructed with components or of dimensions other than those tested.

¹ These test methods are under the jurisdiction of ASTM Committee E05 on Fire Standards and are the direct responsibility of Subcommittee E05.11 on Fire Resistance.

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