



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 E 119, the only available standardized test for fire resistant construction. However, the exposure specified in Test Methods E 119 does not adequately characterize large hydrocarbon pool fires. Test Methods E 119 is intended to be representative of building fires where the primary fuel is solid in nature, and where 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 E 119. 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 more closely approximates 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 may be useful for testing other items such as piping, electrical circuits in conduit, floors or decks, and cable trays. Because failure criteria and test specimen descriptions are not provided in these test methods, testing these types of items will require appropriate specimen details and end-point or failure criteria.

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

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

1.5.2 An evaluation of the degree to which the assembly contributes to the fire hazard through the generation of smoke, toxic gases, or other products of combustion.

1.5.3 Simulation of fire behavior of joints or connections between structural elements such as beam-to-column connections.

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 Construction Assemblies.

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