

ASSESSING THE FIRE PERFORMANCE OF EXISTING REINFORCED CONCRETE FLOORING SYSTEMS

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During the course of their lifetimes, buildings are refurbished or renovated many times, often in order to provide functions not envisaged during the design of the building. As a result, the existing structure may no longer be capable of achieving the required fire resistance. The presence of defects or material degradation may mean that the existing structure can no longer achieve the levels of performance assumed when first built. A number of large residential and commercial buildings built in the post-war period of reconstruction incorporate reinforced concrete flooring systems.

This Information Paper provides information on assessing the fire performance of existing reinforced concrete flooring systems using tabulated values from national standards and the fire part of the Eurocode for the design of concrete structures, as well as experience from assessment of existing buildings and historical research from the Fire Research Station (now part of BRE Group). It will assist clients, contractors and building control authorities to estimate levels of performance provided by specific forms of construction, many of which are incorporated within existing buildings but are no longer in widespread use.

INTRODUCTION

Fire performance for elements of structure is traditionally assessed in relation to performance in a standard fire test^[1, 2], where structural elements are placed in a standard furnace under prescribed boundary and loading conditions and subjected to a thermal exposure corresponding to the standard time–temperature fire curve. Performance is assessed in relation to the ability of the structure to



Figure 1: Large-scale fire test on a precast concrete floor system

maintain loadbearing capacity, prevent the passage of flames or hot gases and restrict the temperature rise on the unexposed face of the specimen for a specified duration of time. The fire performance of structural elements of reinforced concrete is generally assessed by reference to tabulated values as set out in national codes^[3] and design guides^[4]. This generally involves checking that minimum dimensions and minimum cover from the exposed face of the concrete to the reinforcement are provided to achieve the specified period of fire resistance. In many cases the requirements for durability and strength under normal conditions will mean that such a check is unnecessary. With the advent of the structural Eurocodes, national standards have been withdrawn. In the first instance for new buildings, recourse should now be made to the fire part of the Eurocode for concrete design^[5] to see if the structural element has the fire resistance required. For floors, the Eurocode presents tabulated data to cover simply supported and continuous solid and ribbed slabs. Such information should be used to determine the fire resistance of new forms of construction or to assess the

