Eurocode structural fire design of Brazilian masonry buildings

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Abstract

This paper presents a structural fire design of a loadbearing external wall from a Brazilian 3-storey structural masonry building based on Eurocode EN 1996-1-2, through an adaptation of tabular data and simplified calculation methods for buildings designed according to Brazilian standards for the ultimate and serviceability states. The building fire safety regulation of the State of São Paulo instructs the use of Eurocodes in the absence of a specific national standard for structural fire design. EN 1996-1-2 procedures are applied to provide information to Brazilian standardization, comparing results for concrete and clay units. The observed limitations in these adaptations of design methods may not be uncommon to other EU countries. Finally, for a 60-minute TRRF (Brazilian requirement), the building required a minimum thickness (Eurocode requirement) of 100/140mm for concrete units and 90/100mm for clay units.

Keywords: fire design; structural masonry; Brazilian masonry.

1 Introduction

Structural concrete and clay block masonry construction is in constant growth in Brazil since this constructive method has several advantages. However, there is no specific Brazilian standard for structural fire design of masonry structures. The building fire safety regulation of the State of São Paulo instructs the use of Eurocodes in the absence of a specific national standard for structural fire design [1]. The Brazilian study committee ABNT/CE-002:123.010 is drafting the base text for a new standard to cover this gap regarding the fire behaviour of structural masonry.

The fire resistance rating system established by the State of São Paulo prescribes the basis of the considerations for region's fire design, adopts prescriptive methods with limitations and the test program results do not match the actual fire conditions [2]. Compartmentalization of areas should be considered as a fire safety feature. Masonry walls can promote it between environments and hinder the spread of fire and smoke between areas of the structure, assuming the role of restricting the area and containing the action of the flame for safe evacuation [3].

To design structural elements in fire situation, the procedure must follow the criteria for load-bearing capacity (R), integrity (E) and thermal insulation (I). Given these considerations, the structure must not have breaks, cracks or openings that could allow the passage of gases or flames [4].

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