

## Lisbon: Downtown's reconstruction after the 1755 earthquake

G.D. Carlos, M.R. Correia, G. Sousa, A. Lima & F. Gomes  
*CI-ESG, Escola Superior Gallaecia, Vila Nova de Cerveira, Portugal*

V. Lopes dos Santos  
*Faculdade de Arquitetura da Universidade de Lisboa, Lisboa, Portugal*

**ABSTRACT:** The 1755 earthquake is the most striking example of the national scene, especially by the violence of its effects in the Portuguese capital city. The lower part of Lisbon has been reduced to rubble, due to the action of quakes and the fire spread accordingly. The process of reconstruction of Lisbon's downtown, according to the original model of the "House of risk", will be the main national reference of earthquake-resistant construction. The elected solution is not referred to only in what the need to improve the structural performance of buildings is concerned, as it also promoted the integration of several pro-active strategies to the post-disaster scenario. Its influence will be seen in the implementation of a specific urban plan, and the adoption of real architectural typologies. Technological innovation of building systems, applied in a systematised way, using standardization and prefabrication, is one of its most remarkable features. The piloting system of foundations, the regular application of vaulted ceilings on the ground floor and the implementation of structural walls with combined locking feature, determined a national unparalleled paradigm.

### 1 INTRODUCTION

#### 1.1 1755 Earthquake

The Lisbon and Tagus Valley regions are the surveyed ones of the country regarding the historical seismicity. Given the scale and impact it had in the capital, the occurrence of November 1, 1755 significantly dominates the research conducted in this area.

Lisbon was devastated by an earthquake of intensity X, followed by a tsunami and numerous fires that caused the destruction of much of the city, and caused tens of thousands of fatalities.

*Pombalino* downtown, located at a lower level, in the grounds of an ancient estuary, had increased seismic vulnerability, as evidenced by the reports of past events, such as those of 1356 and 1531 (Moreira, 1991). Its concentrated economic activity, its high occupational density, the general state of disrepair of buildings and the saturation of the soil, caused by poor sanitation, were relevant concerns even before the 1755's catastrophe.

#### 1.2 Downtown's reconstruction

The selected process is basically the strategy to overcome the drawbacks of the devastated urban fabric. The previous city was heavily conditioned by an organic matrix, a cluttered grew and it was founded on unstable alluvial ground. The issues identified as priorities bound up with the necessary increase in quality of movement, health, safety and structural reinforcement

of the buildings. The downtown rebuilding process was based on the application of a concept of Enlightenment city, fully replacing the existing urban fabric. The approach objectively valued the upward social class, the bourgeoisie, focusing on revenue building at the expense of the noble palace, the public or religious program equipment, seeking to expeditiously enhance the economy of the capital city. The process would not be conceivable without a set of duly regulated measures and additional procedures, as the prohibition of the construction outside the city limits, or control of the materials price to avoid their speculation. The operability of this process is naturally related to the authority and the reformer dynamism of the administration, supervised at that time by the inevitable Marquis of *Pombal*. The reconstruction proposal was coordinated by the Engineer-Major of the Kingdom: Manuel da Maia. This was derived from an exercise organised in progressive stages, involving a large team of technicians, who deliberated upon the more viable alternatives.

### 2 URBAN PLANNING

#### 2.1 The full redefinition of the existing fabric

The elected solution assumed the implementation of a completely new town planning, with a fully orthogonal layout, based on the urban proposal of Captain Eugenio of Santos e Carvalho's team. The layout is