



An innovative seismic protection system for existing buildings: External Dissipative Towers

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Abstract

This paper deals with an innovative system for seismic protection of existing buildings, especially strategic ones, patented as “Dissipative Towers”. This protection system is based on the structural coupling of the building with new steel truss towers constructed externally and then rigidly connected to the building floors by means of steel elements; the towers are erected over a rigid r.c. thick base plate that is restrained to the foundation cap with a spherical hinge located in central position. The towers are equipped with dissipative devices located between the two plates, at the angles; the effectiveness of the dampers is enhanced by the use of articulated quadrangles which amplify the vertical displacements of the devices. The effectiveness of the system can be very high and it is usually designed to satisfy the Immediate Occupancy Limit State even for high intensity earthquakes. In this paper this innovative system is described referring to the retrofit of two existing school buildings in Italy, both characterized by a reinforced concrete frame structure. The seismic rehabilitation is obtained by suitably positioning external dissipative towers and eliminating expansion joints. The towers allow a high level of seismic protection at the Save Life Limit State, with a significant reduction of horizontal displacements and accelerations. The seismic protection is achieved with a moderate economic impact due to the elimination of indirect costs related to the arrangement of internal spaces, interruption and/or relocation of activities.

Keywords: External Steel Truss Tower, Seismic Retrofitting, Steel Dissipative Towers, Strategic Buildings, Viscous Dampers

1 Introduction

The seismic protection of both new and existing buildings, especially strategic ones, is a current issue that involves not only structural but also

economical and functionality aspects. Among the others, passive control systems have proven to be very efficient solutions for the seismic retrofitting of existing structures [1, 2].