

Studying the Rehabilitation of Existing Structures Using Compound System of Cables and Shape Memory Alloys

S.M. Zahrai and M.J. Hamidia+,*

** Associate Proff. School of Civil Engineering, University of Tehran, Tehran, Iran.*

+ M.S. Student School of Civil Engineering, University of Tehran, Tehran, Iran.

Abstract

Cables are not suitable options for rehabilitation of structures due to their low ductility capacity. But in many cases, with respect to the existing limitations they are good alternatives for enhancement of lateral load resisting system by reducing the disadvantages.

On the other hand, the concept of passive control of vibration has recently drawn the attention of many researchers. The main idea underlying this controlling system is absorption and dissipation of part of the input energy in a specific way. Thus, the energy absorption demand reduces in other sections of the structure decreasing the damage on the structural and nonstructural elements.

Shape Memory Alloys (SMA) with super elasticity properties are appropriate materials to decrease the negative effects of using cables for retrofitting structures due to their ability of dissipating energy without any unrecoverable plastic deformation.

The authors intend to present a plan for a new compound system of cable and SMA which resists against lateral load with tension performance free from the present disadvantages of the merely cable systems. The behavior of this compound system is described in this Article and compared with the other related systems. Afterwards, an analytic case study will be conducted on the structure equipped with this brace. Some of the most important advantages of this compound system are listed below:

- Effective reduction in the roof displacement of the structure
- Noticeable decrease in the story drifts
- Improvement of the structure's level of service
- Drop off in base shear
- Stable hysteresis loops
- Applicable in the historical buildings which there is no permission to have changes inside the structure

Keywords: Cable, Shape Memory Alloy, Passive Control, Case Study

⁺ Corresponding Author: School of Civil Engineering, University of Tehran, P.O. Box: 11365-4563, Tehran, Iran.

E-mail addresses: mjhamidia@yahoo.com

Phone No: +98-9125168160