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Shape Memory Alloy Based Dampers for Earthquake Response Mitigation

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Abstract

This paper describes the development process and initial tests performed with a new energy dissipation damper based on Shape Memory Alloy (SMA) wires. The aim of this study was to develop a new iteration of this type of devices, and eventually develop a methodology to properly design them for any type of application. The underlying concept of our device is the use of a double counteracting system of pre-strained SMA wire sections as the dissipating component. By using pre-strained wires, this design focuses on maximizing energy dissipation, partially relinquishing the re-centering capabilities of the device.
The experimental part was performed on a downscaled prototype based on this design methodology. The goal of this study was to validate the basic mechanical concepts. The device was subjected to a considerable number of load cycling tests, in order to better characterize the SMA wire behavior when used in this arrangement and to improve our understanding of their influence on the device's capabilities.

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Keywords: Vibration Damper; Shape Memory Alloy; Earthquake Response.

1. Introduction

Passive control techniques have shown to be an effective strategy when aimed at structural preservation for seismic events. These systems are designed to eliminate or at least to reduce structural damage on buildings and infrastructures

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