All Sciences Proceedings
http://as-proceeding.com/

AS-ABSTRACTS
https://as-proceeding.com/index.php/as-abstracts
ISSN: 2980-1834

All Sciences Abstracts, *Volume 1, pp 4, 5, 2023*
Copyright © 2023
AS-ABSTRACTS

Re-entrant honey comb meta-materials configuration and its application in buckling restrained braces: A numerical study

Hamza Basri[1, *], Abdelouahab Ras [1] and Karim Hamdaoui [1]

[1]*Civil Engineering Department/ Faculty of Technology, University of Tlemcen, Algeria*

[*] *hamza.basri@univ-tlemcen.dz*

Abstract – Evens came up with the term "auxetics" in the 1990s. It is used to describe materials and structures with a negative Poisson's ratio (NPR) that shrink or grow in an unusual way when put under uniaxial compression and tension. These materials have different mechanical properties, such as a high shear bearing capacity, resistance to breaking, ability to absorb energy, and resistance to falling apart. But because auxetics often have holes in them, they are often much less stiff than solid structures. Although these shapes should function well under both static and dynamic loading conditions as energy-absorbing components, the behavior of auxetic metamaterials has been rarely investigated in the field of seismic protection. In this paper, a parametric study was conducted using a metallic damper, such as a buckling restrained brace (BRB) equipped with an auxetic steel core and re-entrant honeycomb cells, with the aim of exploring the performance dissipative of these types of metamaterials. The proposed model of BRB with an auxetic core was modeled and analyzed under cyclic loading using a finite element method. The repetitive re-entrant honeycomb cells are controlled by four parameters: hole ratio (porosity), section weakening rate, concave angle, and angle chamfering radius. Hysteresis behavior and vos mises distribution under large deformation were extracted and discussed. As seen in the results, it was found that the local buckling of the steel core could be improved by the auxetic behavior. The values of 75° angle and 0.5 corner chamfer radius were selected to have the largest effect on the hysteresis curves of BRB model specimens when the axial strain exceeds 1.2%. The dissipative performance of these metamaterials under cyclic tests provides a good basis for further investigations about applying auxetic structures in the field of protective structures.

Keywords – Buckling Restrained Brace, Auxetic Steel Core, Cyclic Test, Hysteresis Behavior, Energy Absorption