**TENSILE BEHAVIOR OF RUBBER ISOLATORS AND SOLUTIONS TO**

**OVERCOME TENSION PROBLEM**

**DOI 10.37153/2686-7974-2019-16-659-659**

Bahadır Şadan**[[1]](#footnote-1)**, Mustafa Erdik**[[2]](#footnote-2)**, Cüneyt Tüzün**[[3]](#footnote-3)**, Mehmet Emre Özcanlı**[[4]](#footnote-4)**

**ABSTRACT**

Rubber isolators are widely used at seismic isolation projects worldwide for the earthquake protection. Commonly used types of rubber isolators are high damping rubber bearings (HDRB) and lead rubber bearings (LRB). Rubber isolators’ behavior under combined compression and shear loading is well known and predicted. However, the tensile behavior is not assessed properly, and commonly neglected.

Cavitation in rubber develops under tensile stress level of around 1-1.5MPa depending on the shear modulus of rubber compound. However, in the code approach the tensile forces on the rubber isolators are not generally permitted.

In this paper, analytical studies and test data in the literature for tensile behavior of rubber isolators are summarized in the first place. Modifications to the structural system to reduce tensile forces on isolators are described in a recently constructed base isolated hospital in Turkey. The effectiveness of these modifications has been confirmed by nonlinear time history analysis.

Finally, a simple, yet effective and low-cost solution, employing the Belleville washers, also known as disc springs, used in the connection details of isolator base plates are presented. The dynamic behavior of the isolators with this solution under combined shear and tension is discussed in the light of analytical results.

1. Dr., OBS Engineering Consultancy Ltd. [↑](#footnote-ref-1)
2. Prof., Bogazici University; Kandilli Observatory and Earthquake Research Institute [↑](#footnote-ref-2)
3. Dr., Turkish Association for Seismic Isolation, President; CT Consulting Engineers [↑](#footnote-ref-3)
4. EMKE Construction Ltd. [↑](#footnote-ref-4)