

Analysis of Seismic Waves Generated by Blasting Operations and their Response on Buildings

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Abstract : The paper analyzes the response of buildings and industrially structures on seismic waves (low frequency mechanical vibration) generated by blasting operations. The principles of seismic analysis can be applied for different kinds of excitation such as: earthquakes, wind, explosions, random excitation from local transportation, periodic excitation from large rotating and/or machines with reciprocating motion, metal forming processes such as forging, shearing and stamping, chemical reactions, construction and earth moving work, and other strong deterministic and random energy sources caused by human activities. The article deals with the response of seismic, low frequency, mechanical vibrations generated by nearby blasting operations on a residential home. The goal was to determine the fundamental natural frequencies of the measured structure; therefore it is important to determine the resonant frequencies to design a suitable modal damping. The article also analyzes the package of seismic waves generated by blasting (Primary waves – P-waves and Secondary waves S-waves) and investigated the transfer regions. For the detection of seismic waves resulting from an explosion, the Fast Fourier Transform (FFT) and modal analysis, in the frequency domain, is used and the signal was acquired and analyzed also in the time domain. In the conclusions the measured results of seismic waves caused by blasting in a nearby quarry and its effect on a nearby structure (house) is analyzed. The response on the house, including the fundamental natural frequency and possible fatigue damage is also assessed.

Keywords : building structure, seismic waves, spectral analysis, structural response

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