

Development of a shear-wave generator for shallow seismic investigation

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Shear wave velocity is a fundamental parameter in determining geological structures and soil characteristics for geotechnical and earthquake engineering studies. Shear wave velocity can be obtained from the conventional surface seismic method such that the shear wave is generated by the seismic source and the refracted and reflected energies are recorded by the array of geophones. We report here on the design and development of an effective shear wave seismic source that will be alternatively used for shallow seismic survey. Structure of the developed source consists of 4 main parts, including base plate, activated mass, lifting and shooting system, body and transportation system. It is operated based on a simple mechanical system by lifting an activated mass with an attached sling and puller. When the mass reach the armed position and spring is under compression, the potential energy is stored. After the mass is released and horizontally hit the base plate, shear wave is generated by the momentum and energy transfer into the ground. To evaluate the source performance, a comparison test of the conventional shear wave sources and the developed source was performed at a test site. Data were analyzed in both qualitative and quantitative manner by examining the physical properties and visualizing the raw data, comparison of energy, frequency content, signal penetration and repeatability. It was found that the developed source produces the higher energy and repeatability than the conventional source and allows for a reducing the man power requirement. Overall, our apparatus has potential application and is suitable for teaching, research and academic service purposes.

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