

Methods and principles of seismic protection

Duration depends upon the university/department choice
The following themes to be studied

1. Introduction

- a. Earth structure and the principle faults as the main sources of earthquakes
- b. The greatest earthquakes and their consequences
- c. The main types of the surface acoustic waves(SAW) transmitting seismic energy
- d. Frequency, speed, and the wavelength of the seismic and anthropogenic SAW

2. A survey on the theories of SAW propagation

- a. A brief introduction to the theory of anisotropic elasticity
- b. Theory of
 - i. Rayleigh waves
 - ii. Lamb waves
 - iii. Stoneley waves
 - iv. Rayleigh-Lamb waves
 - v. Love waves
 - vi. SH waves
- c. A problem of “forbidden” directions and “forbidden” materials for SAW

3. Principles of seismic and vibration protection

- a. Vibration protection devices (extinguishers)
 - i. Extinguishers based on the linear Kelvin viscoelastic element
 - Single mass extinguishers
 - Den Hartog’s auxiliary mass dynamic extinguishers
 - Principles of optimal tuning
 - ii. Extinguishers utilizing nonlinear Kelvin elements
 - Nonlinearity in springs
 - Nonlinearity in dashpots
 - System with Coulomb friction
 - iii. Extinguishers based on the Zener (standard linear) element
- b. Barriers for seismic waves
 - i. Barriers transversal to the wave front
 - ii. Barriers utilizing concept of the modified surface layer

4. Conclusion and directions for further studies

Recommended literature:

1. Ting T.C.T. Anisotropic Elasticity: Theory and Applications. Oxford Univ. Press, N.Y., 1996
2. Brekhovskikh L.M, Godin O.M. Acoustics of Layered Media I: Plane and Quasi-Plane Waves (2nd edition). Springer-Verlag, Berlin, 1998.
3. Den Hartog J.P. Mechanical Vibrations (4th edition). McGraw-Hill, N.Y.
4. Harris C.M., Piersol A.G. Harris’ Shock and Vibration Handbook (5th edition), McGraw-Hill, N.Y.