STOCHASTIC SIMULATION OF SHELTER EQUIPMENT VIBRATIONS DUE TO NUCLEAR EXPLOSIONS

KESSLER,E.

In today's practice, shock testing of nuclear shelter equipment is mainly based on response spectra criteria. Yet this gives room for rather arbitrary tests which do not guarantee the survivability of the tested equipment in real events.

In this paper a probabilistic shock testing concept is presented, proposed as an alternative to or an improvement of the purely spectrum based qualification tests. A fundamental part of this concept is to have a large statistical ensemble of realistic time functions representing virtual support motions for shelter equipment.

A FORTRAN program has been established to stochastically generate such time functions for Swiss Civil Defense 3-bar-shelters. Much research work was concentrated on the underlying numerical models to ensure that they produce time functions which are physically and statistically representative of real shelter shock motions due to air slap and earthquake-similar seismic waves.

The mathematical shelter model used considers the rigid body motion of the structure as well as elasto-plastic vibrations of walls, ceilings and floors and their interaction with the surrounding soil.

The proposed shock testing with stochastic time functions can be combined with response spectrum criteria in several ways. A strict but conservative one is to inflate the stochastic time functions by amplitude scaling so as to envelope the prescribed spectrum.