SECTION 6

CONCLUSIONS

Wire rope systems for the seismic protection of equipment in buildings have been studied experimentally and analytically. Two installation methods were considered: one in which the equipment is supported by wire rope isolators and one in which the equipment is supported by locked casters and wire rope isolators are used for providing restoring force.

It has been found that wire rope isolators exhibit hysteretic damping which decreases with increasing amplitude of motion. Typical values of equivalent damping ratio are about 0.1 of critical for large deformations and about 0.2 to 0.3 of critical for small deformations. These values were measured in systems which reduced the acceleration response of the tested equipment in comparison to that of a fixed equipment.

Based on these results, it was concluded that stiff wire rope systems may provide a degree of protection to equipment in buildings while allowing very small displacements. In contrast, the classical isolation approach of increasing the period of the system to values beyond the predominant period of the input motion is impractical because a) floor seismic motions are rich in long period components, and b) displacements are unacceptably large for equipment.

Analytical models for describing the hysteretic behavior of wire rope isolators have been developed and

experimentally calibrated and verified. Analytical predictions of response of an equipment supported by wire rope isolators were in good agreement with experimental results. Furthermore, a simplified analysis method was developed and shown to be capable of providing reliable estimates of the peak response of equipment supported by wire rope isolators. The method makes use of floor response spectra which is the usual design specification for equipment.

The second installation method for equipment, consisting of locked casters to support the weight and wire rope isolators, was tested with an IBM computer equipment. The equipment was placed on top of a raised floor as it would have been in service. The response of the equipment in terms of peak accelerations and displacements of the locked casters was monitored in shake table tests and compared to the response of the equipment supported by other commonly used systems. It was found that the used stiff wire rope system reduced or maintained accelerations at the same level while reducing displacements by a factor of about 10. Based on these results, an installation method using wire rope isolators and an uplift control mechanism was proposed. This installation method is not permanent but, rather, it allows for easy removal for relocation of the equipment.

SECTION 7
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