

Pre-Acting Impact Isolation Systems

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The pre-action control concept is considered as applied to impact isolation systems. Pre-acting systems start responding to an impact before this impact has occurred. The limiting performance analysis of the pre-acting isolator is performed for a SDOF system subject to an instantaneous impact. The isolation performance index is defined as the peak displacement of the object to be isolated relative to the base, provided that the magnitude of the control force does not exceed a prescribed value. A substantial advantage of pre-acting isolators over isolators without pre-action is established. A pre-acting isolator based on a passive elastic element (a spring) is suggested. To provide the pre-action operation mode, one should cock the spring and release it at an appropriate instant before the impact. The optimal stiffness of the spring and the optimal time of release are identified. The application of pre-acting impact isolation systems for injury prevention is discussed.

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