



# Low Mass Isolation

Superior Earthquake Protection  
For Light Structures And Equipment



**DYNAMIC ISOLATION SYSTEMS**



# Introduction

**Dynamic Isolation Systems (DIS) is the leader in Seismic Isolation with over 300 building and bridge projects completed worldwide. DIS now has isolation technology that benefits lighter structures and equipment.**

The DIS Low Mass Isolation System was developed in order to isolate computer floors in data centers. The system uses DIS Multidirectional Spring Units and roller supports. The spring stiffnesses range 2 to 50 pounds/inch, which are much softer than typical building and bridge isolator stiffnesses that are in the range of 5000 to 30,000 lbs/in.



A self-contained data center being installed in Costa Rica.

The low spring stiffness allows isolation of lighter structures and equipment in the weight range of 1/2 ton to 50 tons.

Isolation reduces accelerations by more than a factor of 3, allowing equipment to remain operational during a major earthquake. The lower forces generated by isolation will result in reduced foundation costs.

## How Does Low Mass Isolation Work?

The structure or equipment is mounted on a custom platform designed and manufactured by Dynamic Isolation Systems.

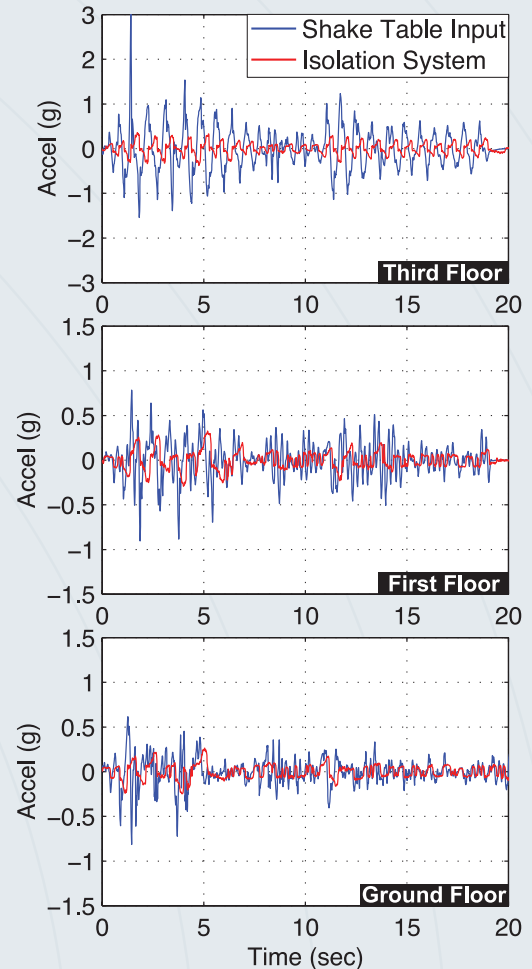
The system's spring units provide lateral stiffness and hysteretic damping. The rollers provide vertical support and very low lateral resistance.

Each application is engineered for the ground motion at the specific project location. For installations within buildings, the accelerations at the level of the equipment need to be considered. As seen in these graphs, the ground accelerations are amplified up the building and modified by the structure's response.

Only an engineered solution can cover the range of performance that will be required in practice.



The King County Emergency Center in Seattle.



LA SAC Motion 02 (10% in 50 yr.)

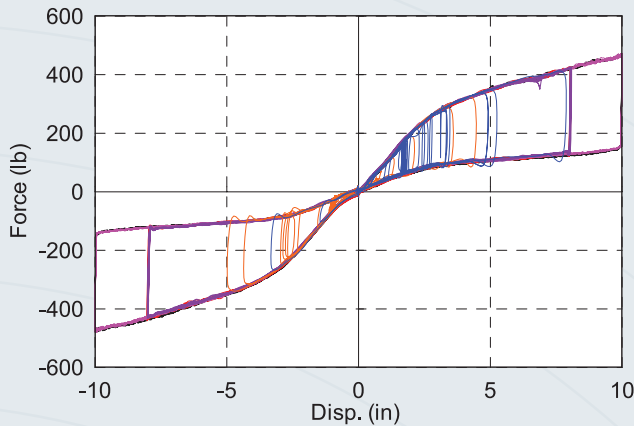


## Testing and Performance

Over 200 shake table tests at DBE (Design Basis Earthquake) and MCE (Maximum Considered Earthquake) levels were performed on the DIS Low Mass Isolation System at the University of Nevada, Reno (UNR) and at the State University of New York at Buffalo (UB). These tests conclusively demonstrated superior seismic protection by reducing the accelerations while controlling displacements.

The first phase at UNR consisted of shake table testing and verification of the low mass isolation concept for various SAC motions with up to 3g input accelerations.

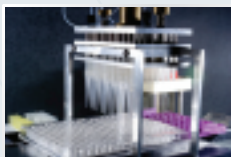
This was followed by rigorous testing and characterization of spring components along with shake table testing of the system at UB. The spring unit has the same properties in any horizontal direction, with a unique hysteresis loop, as shown in the graph below.



Hysteresis Loop for the multi-directional spring unit.

## Low Mass Isolation Candidates

- ◆ Self-Contained Data Centers
- ◆ Emergency Command Centers
- ◆ Data Center Floors
- ◆ Computer Servers
- ◆ Medical Equipment
- ◆ Manufacturing Equipment
- ◆ Artwork, Including Statues
- ◆ Prefabricated Buildings



Valuable statues and medical equipment are good candidates for low mass isolation.



UNR shake table test.

## Benefits

### Performance

- ◆ Only DIS offers a Low Mass Isolation System that provides true-engineered performance. For most applications, this means continued operation following an earthquake.
- ◆ Forces and accelerations are reduced by more than a factor of 3 with the DIS system.



A DIS Low Mass Isolation System can be used to isolate a whole floor or an individual server.

### Cost Savings

- ◆ Foundations are minimized for structures such as self-contained data centers. In most cases, a simple slab is all that is required as the forces are reduced significantly.
- ◆ High value equipment can be protected individually, which is more cost-effective than isolating the whole building.
- ◆ Avoids business interruption expense.



The Low Mass Isolation System results in reduced foundation costs.

### Risk Management

- ◆ Back up power systems and mirrored data storage are commonplace for data centers and essential equipment. The DIS Low Mass Isolation System fills the missing piece of the risk management puzzle.



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