Floor Isolation

The New Solution In Seismic Technology

Earthquake Protection For The Contents Of Your Building.

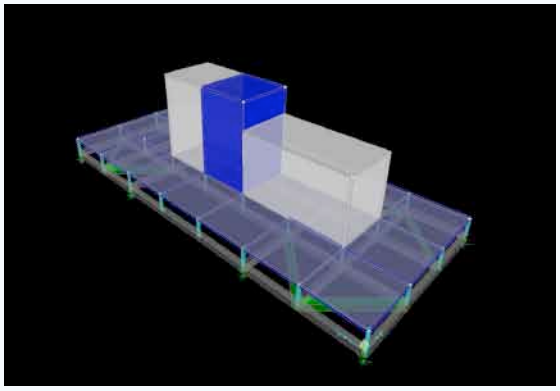
DYNAMIC ISOLATION SYSTEMS

Floor Isolation Should Be Your Design Solution Because It Provides:

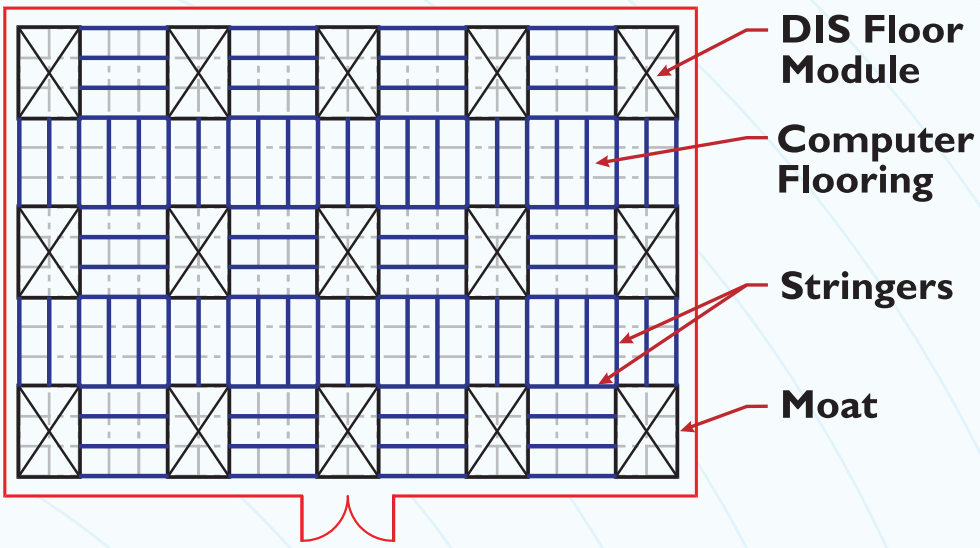
- Superior Performance
- Continuous Operation
- Content Protection
- Cost Savings

DIS Floor Isolation System

Dynamic Isolation Systems is the leader in seismic isolation with over 250 building and bridge projects completed worldwide. The superior protection that isolation provides can now be achieved within a conventional building with the DIS Floor Isolation System.



Seismic isolation features isolators under columns that are an integral part of the structure. The DIS Floor Isolation System is installed inside a building and is not a primary part of the structure. The system is an attractive alternative for protecting valuable contents in cases where it is not practical to isolate the entire structure.



Floor Plan

What are the components of the DIS Floor Isolation System?

- The system consists of special multi-directional spring units and a combination of roller and slider bearings. A complete floor is assembled from modules connected by stringers. Standard computer floor tiles make up the top surface of the isolated floor.
- The floor system is available in heights of 13 inches to 24 inches. The 24-inch height is a direct substitute for conventional raised computer flooring.
- Services and wiring run in the space beneath the stringers. Custom stringers are available to accommodate services, columns and geometric constraints.

When should floor isolation be considered?

Floor isolation is an ideal solution whenever seismic isolation of the entire building is not practical or economical. Many valuable objects and essential equipment require a higher level of seismic protection than a conventionally-designed structure can provide. These include data centers, servers, medical equipment, high-tech manufacturing process equipment, artwork and high-value products such as vaccines and medicines.

Performance Verification

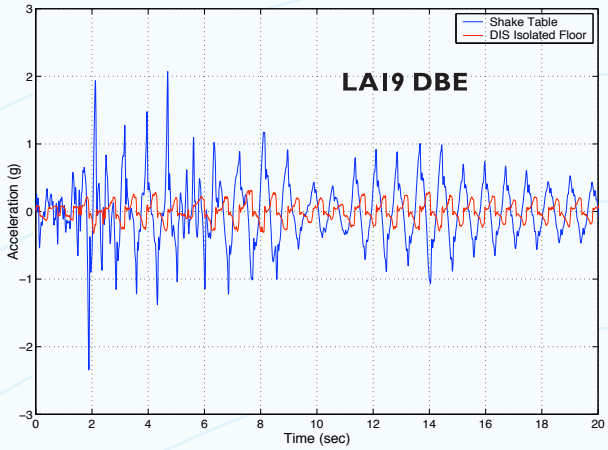
The DIS Floor Isolation System has been extensively tested using major earthquake motions.

Full-Scale Shake Table Testing

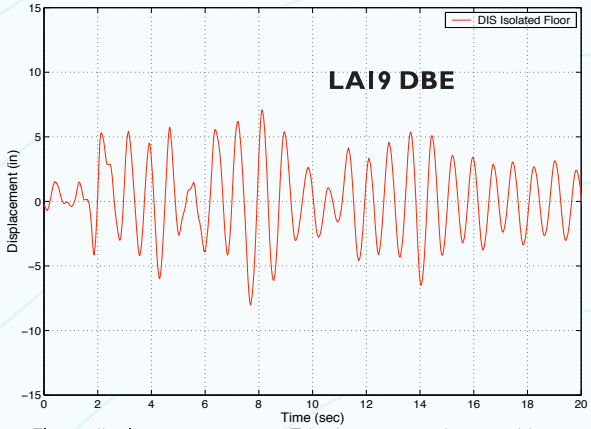
A full-scale portion of a DIS Floor Isolation System, comprising two modules connected by stringers, was shake table tested at the University of Nevada, Reno.

More than 100 earthquake tests, including 75 DBE (Design Basis Earthquake) and MCE (Maximum Credible Earthquake) motions were performed.

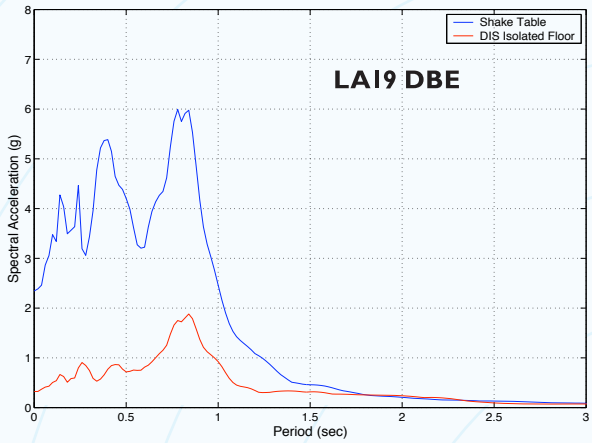
This suite of tests was extreme with maximum accelerations of 6g and floor displacements relative to the shake table of 18 inches. The results showed good agreement with the performance predicted by nonlinear computer models. Peak accelerations and spectral accelerations were reduced by up to a factor of seven.



Accelerations for the LA19 DBE motion were reduced by up to a factor of 5.



Floor displacements up to 7 inches were observed in this DBE test.



Spectral accelerations for the LA19 DBE motion are reduced by factors ranging from 3 to 5.

Design Procedures

- **Selection of earthquake ground motions for the building analysis.**
- **Development of floor acceleration spectral demands at the location in the building at which the Isolated Floor System will be installed.**
- **Design and detailing of the floor system to meet the required performance objectives.**
- **Detailed design for manufacture and installation.**

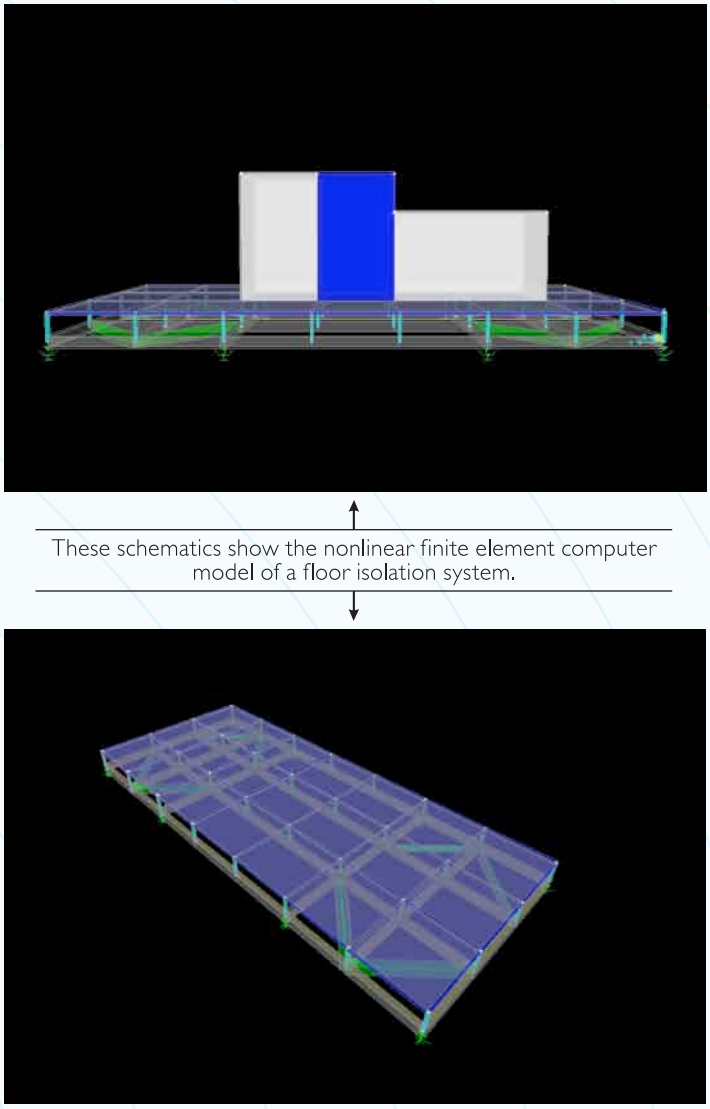
What design parameters should be considered?
Buildings are typically designed for the code-defined Design Base Earthquake (DBE). The same hazard level is appropriate for design of the Floor Isolation System.

In cases of very high-value contents or equipment to be protected - or when continuous post-earthquake operation is necessary - larger design earthquakes and maximum acceptable acceleration limits should also be considered. Design earthquakes will be in the range of 6.0 to 8.0 on the Richter scale.

What is involved with structural modeling?
The response of a particular building and its contents to an earthquake is unique because the structure modifies and filters the earthquake input.

Factors that influence floor accelerations in a building include the structural type, the location within the building, the soil type and the proximity to faults. Due to the uniqueness of these variables, specific design of a floor system is required. We will work with your engineer or can provide this service through our consultants.

A nonlinear time history analysis is used to model the floor system's performance. Our Floor Isolation System can be readily tailored to meet the design requirements.



These schematics show the nonlinear finite element computer model of a floor isolation system.

Why is engineering required?
Demands on each floor in the building can be accurately determined only by proper analysis and engineering. For example, the accelerations in even a three-story building may vary by a factor of three from the ground to third level.

Should earthquakes smaller than a DBE be considered?
Small earthquakes can be resisted simply by anchoring contents to the floors and walls. In addition, equipment such as computers are designed to accommodate accelerations caused by smaller earthquakes.

Should a Floor Isolation System be installed in a base isolated building?
No. A base isolated structure already provides superior content protection. Isolation of floors and buildings involves lengthening their natural shaking period. As both systems have similar frequencies, resonance between the two systems will generally give poorer performance than either system on its own.

Installation Considerations
The DIS Isolated Floor System will typically displace from 8 to 24 inches horizontally depending on the severity of shaking. The floor system can be configured to be continuous to the walls of the room in which it is installed, in which case a closure assembly is provided around the perimeter of the floor. Alternately, the floor system can be detailed as a stand-alone unit with an edge closure. Adequate space is available beneath the floor to accommodate utilities and ductwork.

What was our first floor isolation project?
Dynamic Isolation Systems' first floor isolation project was the King County Emergency Center in Seattle. The floor system protects communications equipment and comprises a post-tensioned concrete floor isolated with lead rubber isolators and roller bearings. The new DIS Floor Isolation System is a lightweight solution that allows its application on any floor of a building.

What is unique about the DIS Floor Isolation System?
The DIS Isolated Floor System features a special multi-directional spring unit with very low stiffness. This allows building contents which are relatively lightweight to be effectively isolated. The unique combination of sliders and roller supports, along with the multi-directional spring units, allows the system stiffness and damping properties to be tuned for each application.

Other Applications
Our special multi-directional spring unit allows us to directly isolate a wide range of lightweight objects and equipment. DIS offers a complete range of seismic isolation devices suitable for protecting the lightest equipment to the heaviest and largest structures.

$$m\ddot{x}(t) + c\dot{x}(t) + kx(t) = P(t)$$

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