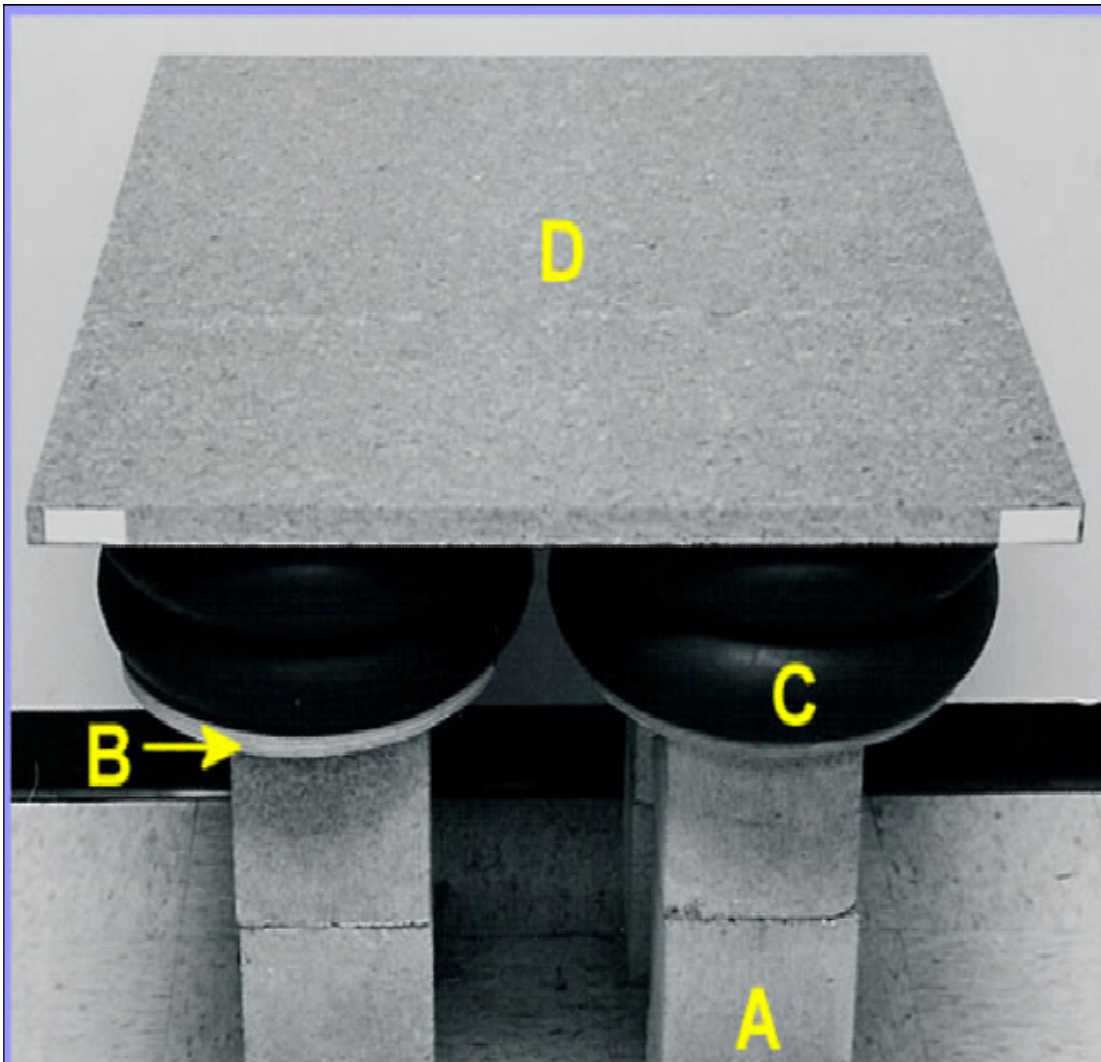


What You Should Know About Optical Tables



James Fisher
Senior Director – Vibration Control Group
Newport Corp

Optical Table Systems

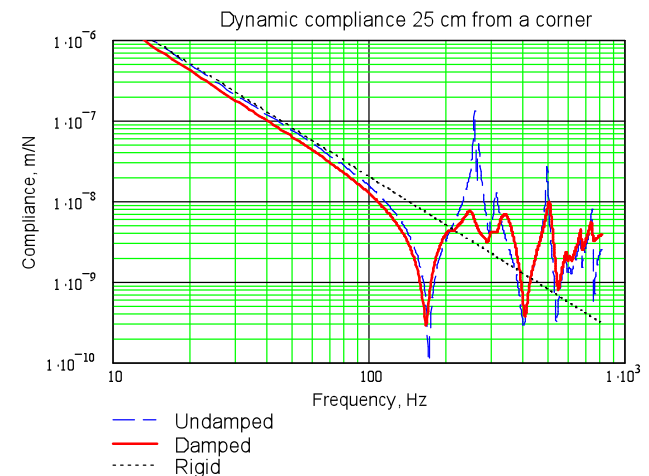
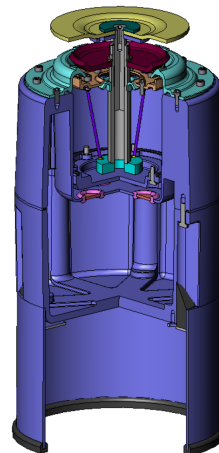


- Early optical table systems consisted of granite slabs supported by rigid blocks or air bladders
- Granite was used because of its stiffness and flatness
- However, granite is heavy, costly to machine and has multiple resonances

- Early Steel optical tables, circa 1968, featured 2" hole spacing and wooden side panels as acoustic dampers
- At the same time more customized supports were developed using truck air suspension components

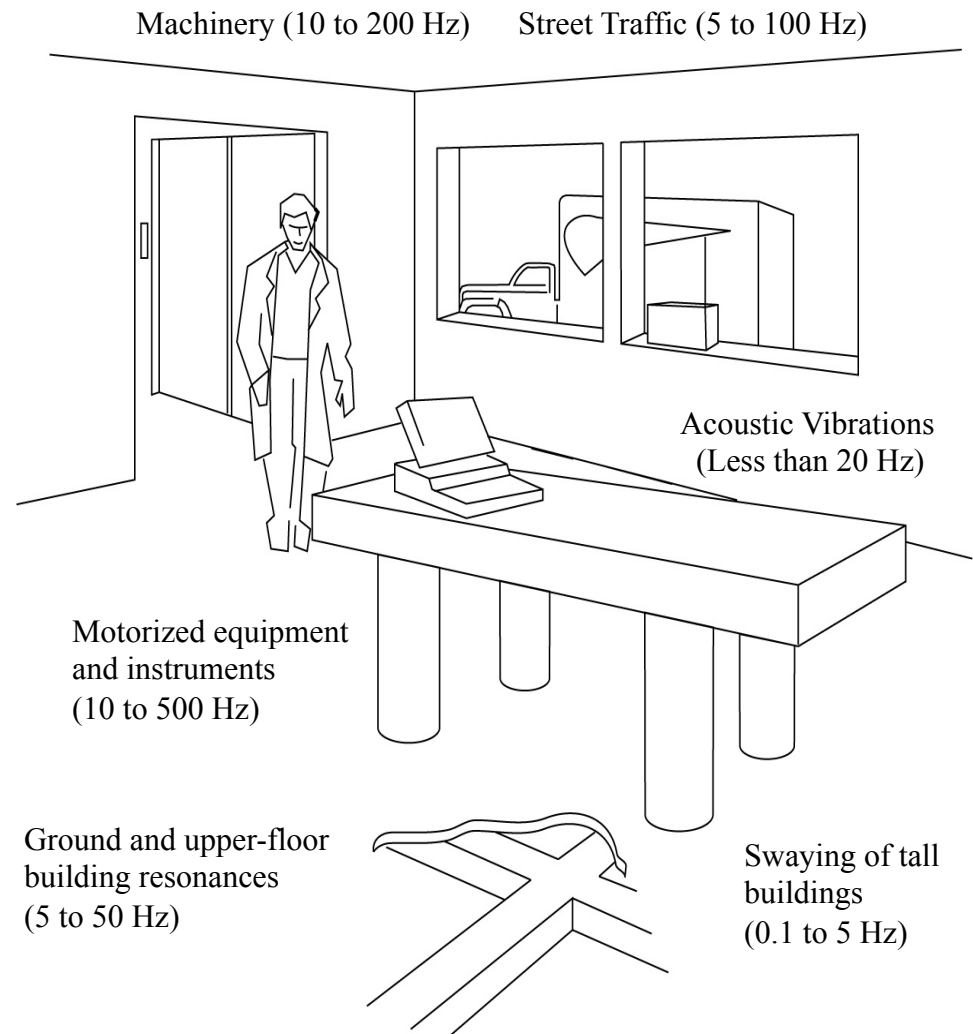


- Today, optical tables utilize more advanced structural damping techniques and are supported by specially designed isolation supports
- The purpose of the **optical table** is to minimize platform motion (bending) due to transmitted floor, airborne or surface vibrations
- The purpose of the **isolation system** is to minimize floor vibrations from reaching and exciting the table surface



Sources of Laboratory Noise

- Sources of vibration
 - Ground Vibration
 - Earthquakes
 - Ocean Waves
 - Auto/Rail Traffic
 - Floor Vibrations
 - Rotating machinery
 - Elevators
 - Foot Traffic
 - Building Sway
 - Building Resonances
 - “Other” Disturbances
 - Loading Docks
 - Door Slams
 - Sliding Chairs!



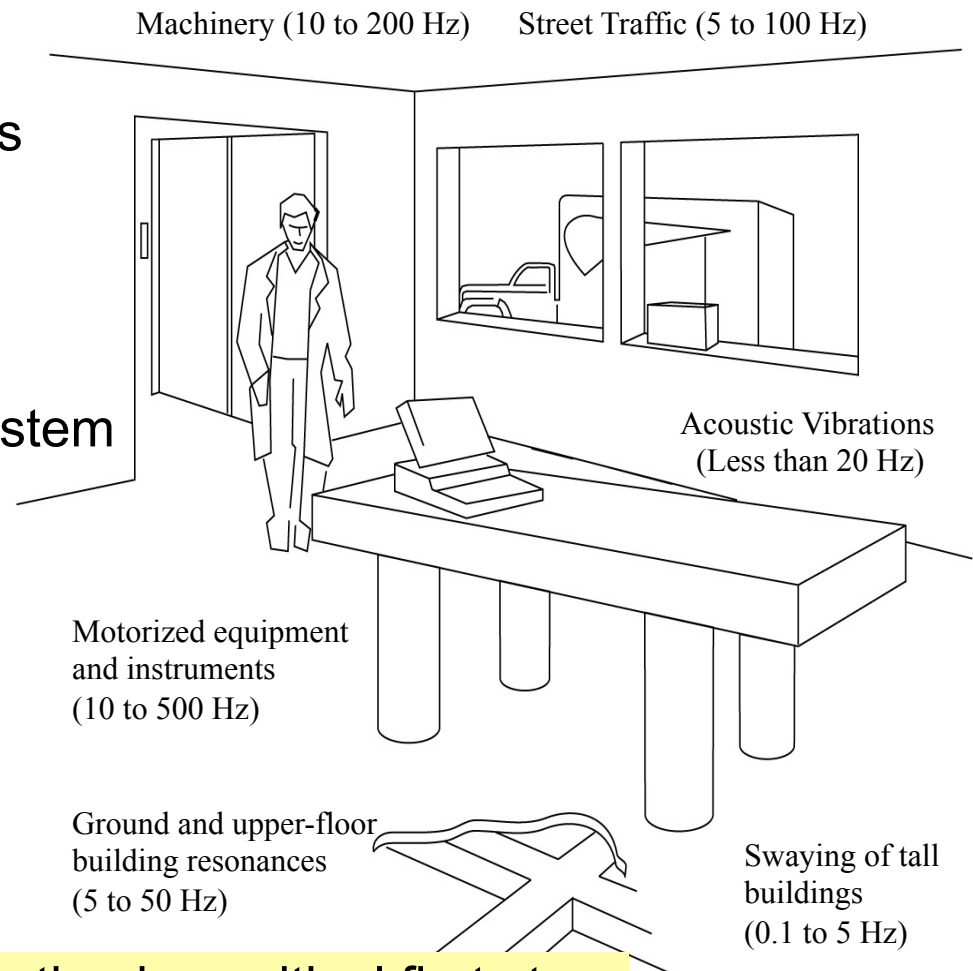
- Sources of vibration

- Acoustic (airborne) vibrations

- HVAC Ducts
- Open Doors
- Machinery

- Equipment on/around the system

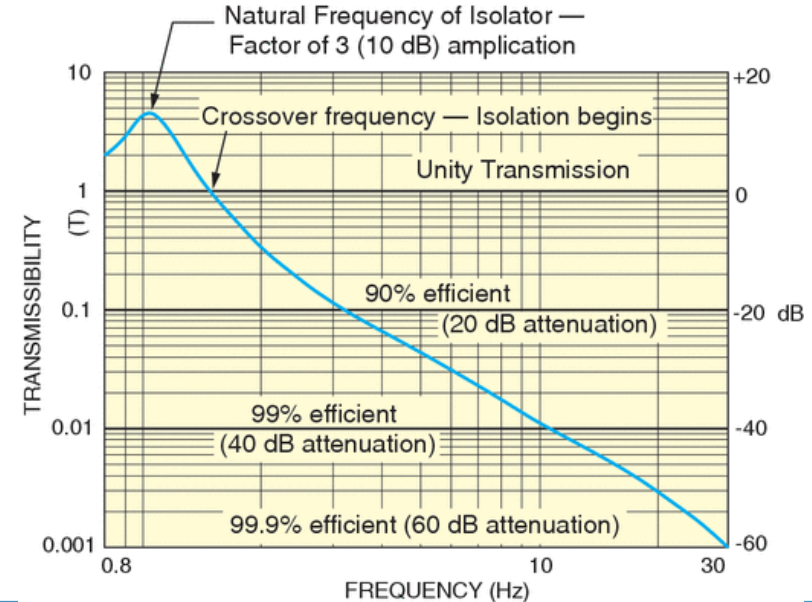
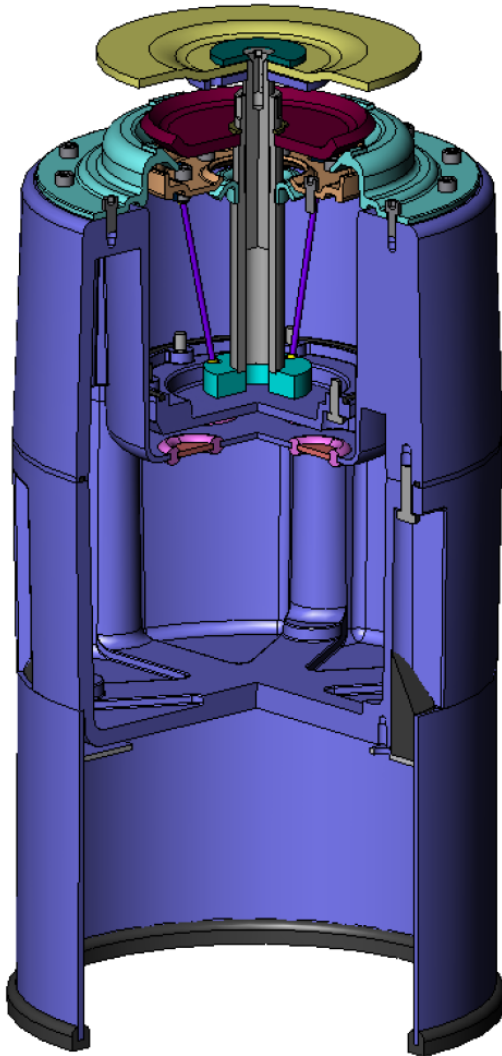
- Laser Chillers
- Cooling Fans
- Motorized Positioners
- Choppers/Spinning Disks
- Unsecured components
- Non-Rigid Structures



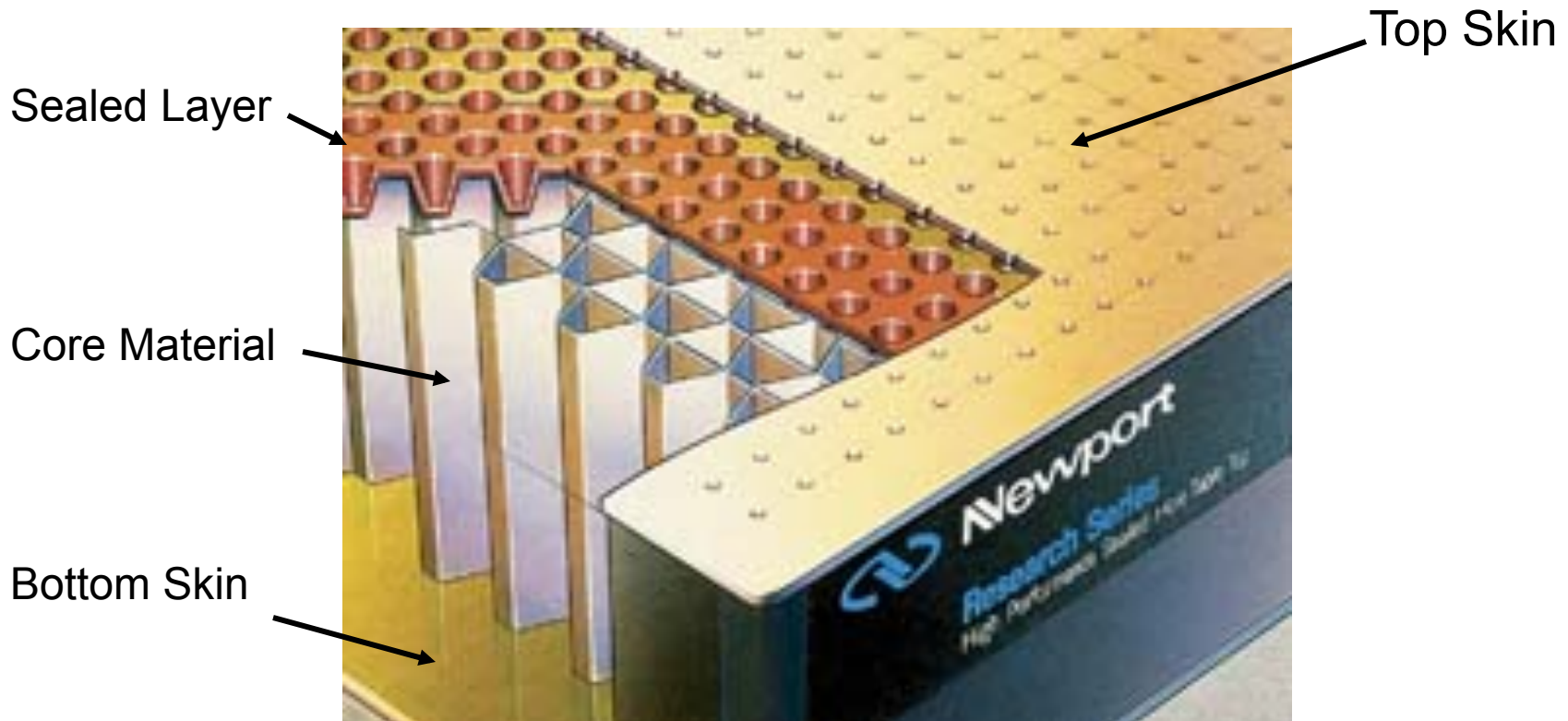
Understanding the sources of vibration is a critical first step toward building any high precision system

- Isolation Systems

- Isolation systems are used to prevent floor disturbances from reaching the system platform
- They typically start isolating at 1.5 to 2.5Hz with a amplified resonance around 1-2Hz.
- After 10Hz they provide a 99% reduction in floor transmitted vibrations
- For the **majority** of laser applications, high quality pneumatic isolators provide sufficient reduction of floor disturbances



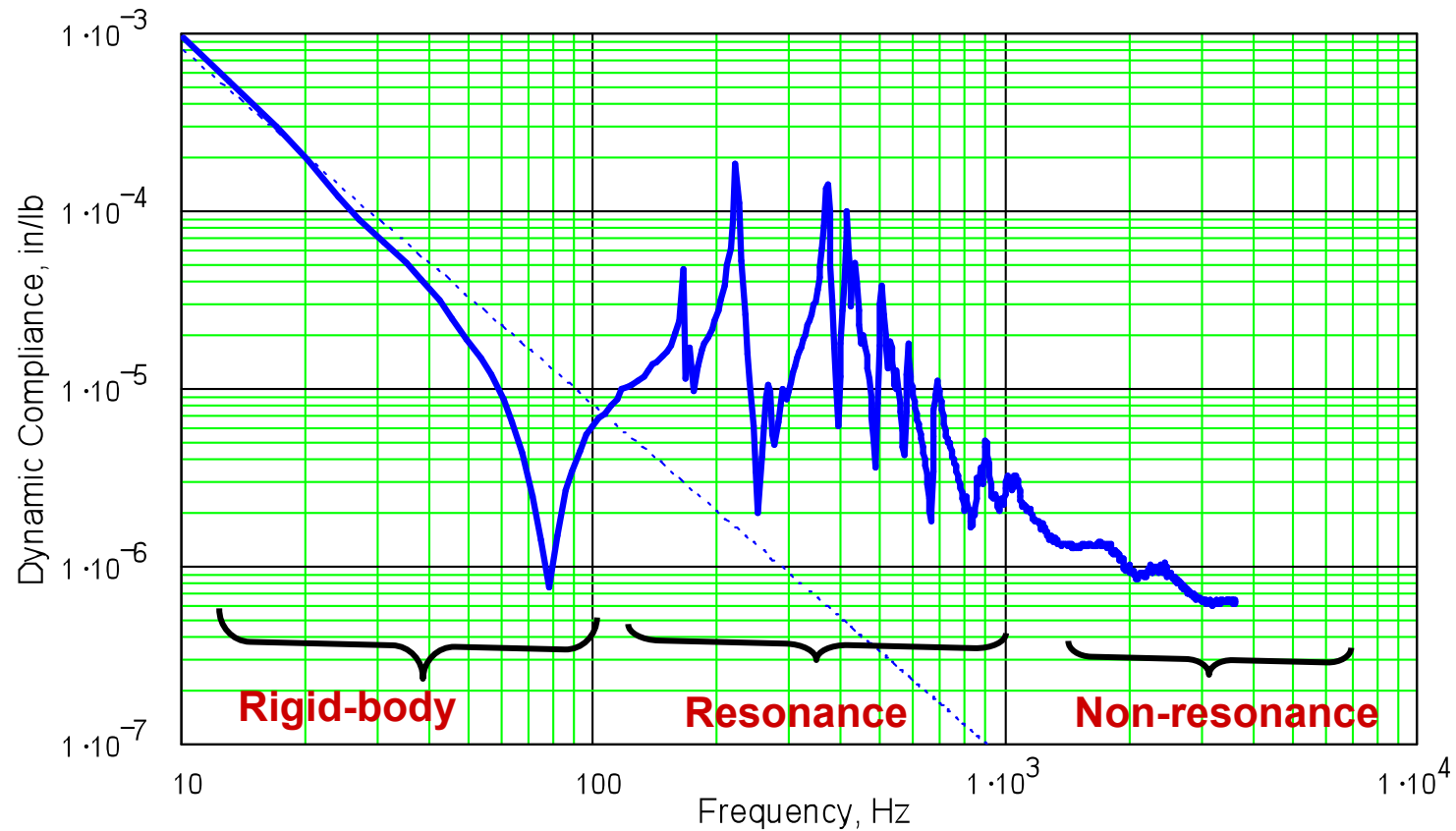
Most Optical Tables consist of four main components



Each component and their assembly contributes to the quality and performance of the table, especially its ability to reduce and dissipate vibrations.

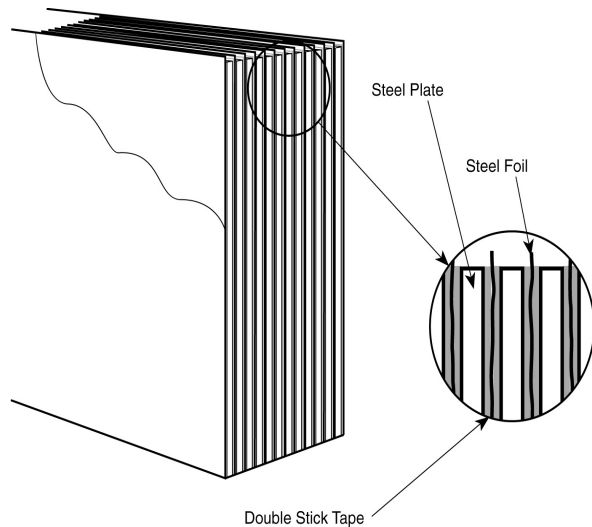
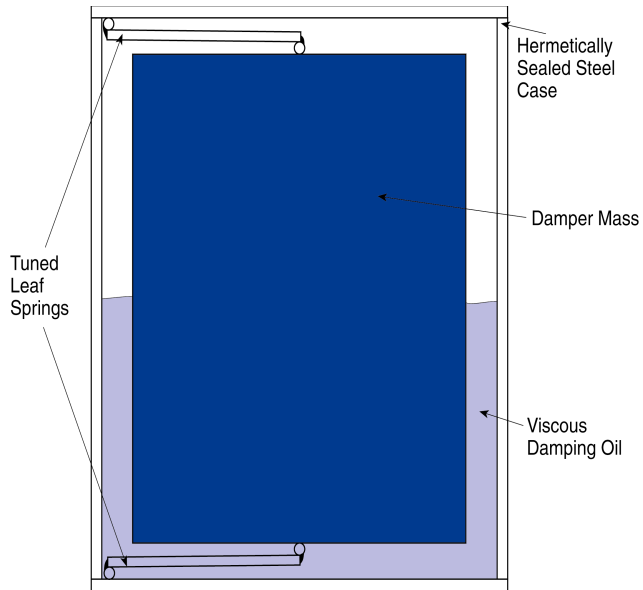
Dynamic Properties of an Optical Table

Dynamic compliance of a non-damped table

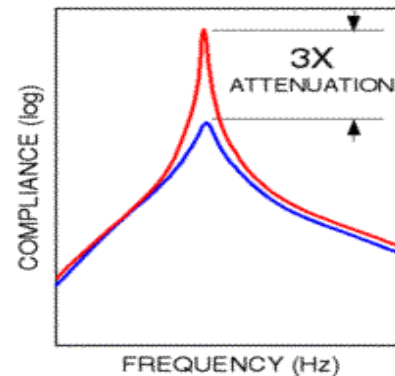
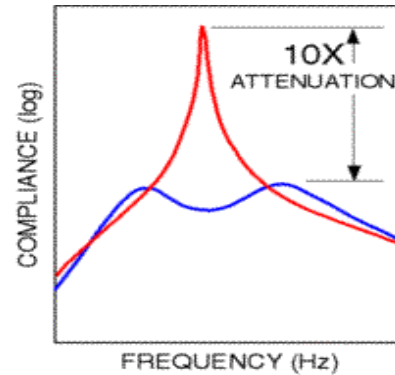


Deviations from rigid-body behavior occur at the table's natural frequencies. Structural damping methods are required to reduce the magnitude of the resonances

Structural Damping Methods



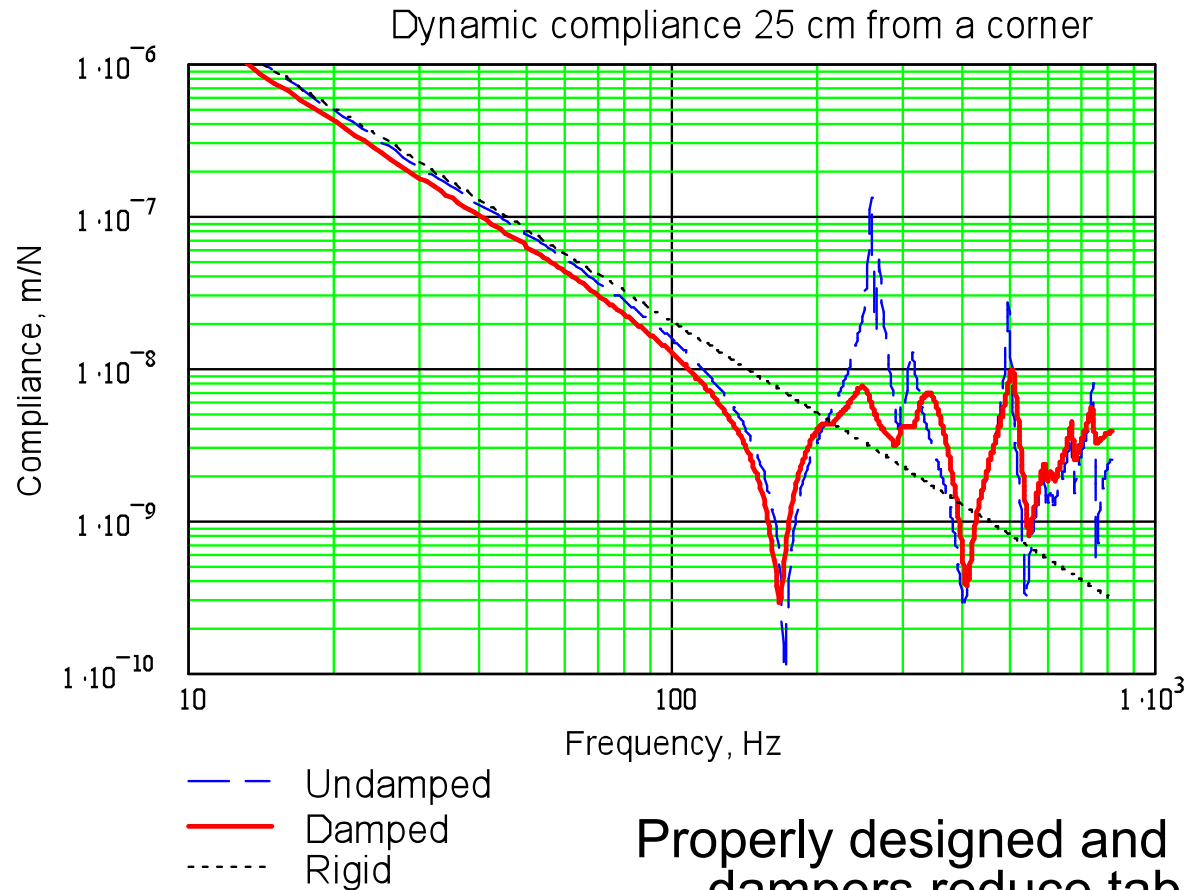
- **Tuned Mass Damper**



- Tuned Mass Dampers provide the most efficient and effective method for reducing table top motions

- **Broadband Damper**

The Benefit of Proper Structural Damping



Properly designed and constructed tuned mass dampers reduce table resonances by 10x

Effective damping improves beam stability, data accuracy and safety

- The most effective method to reduce system vibrations is selecting the most stable location!
 - Location, Location, Location!
 - Optimal locations
 - Basements, away from **any** machinery or high traffic areas
 - First floor near load bearing walls away from machines or traffic
 - Worst Locations
 - Upper floors, near elevators or equipment rooms, adjacent to hallways
 - Lower floors next to streets, loading docks, machinery
- It is also critical that lab accessibility, future changes and facility capabilities also be considered when selecting the proper location....and most of all...**be safe!!**

Optical Table Systems - Safety

- The table on the left weighs 1500 lbs.
- Please use trained facilities or machine riggers to install or relocate optical table systems
- Visit Newport's YouTube page to view demonstrations of how to properly handle optical tables – search “optical table”

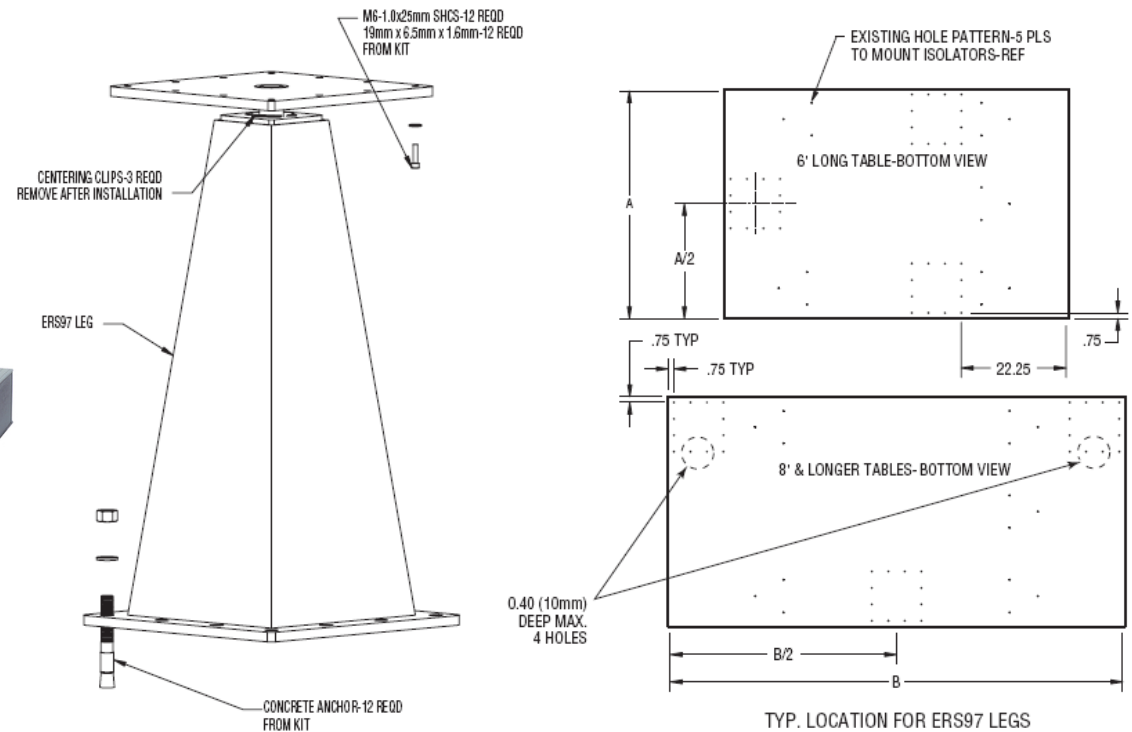


Rigging photos Courtesy of
Musser and Associates

- Seismic Restraints
- Newport's ERS97 Series are UBC, Section 2312 compliant.
- Each restraint can withstand 1 G at 2000 lbs.
- Restraint base bolts to floor while upper post bolts to underside of table
- Notify table manufacturer if restraints will be fastened to table



* Table and legs sold separately



- **SmartTable OTS Optical Table System**

- Upgradeable damping and isolation performance
- Unique design optimizes laboratory space utilization, organization and safety
- New Laser Safety Curtain option

- **Vision IsoStation**

- Provides industry leading performance and more user friendly features and accessories than any other isolation workstation
- Designed specifically to improve installation and set-up, safety and maximize lab space utilization.



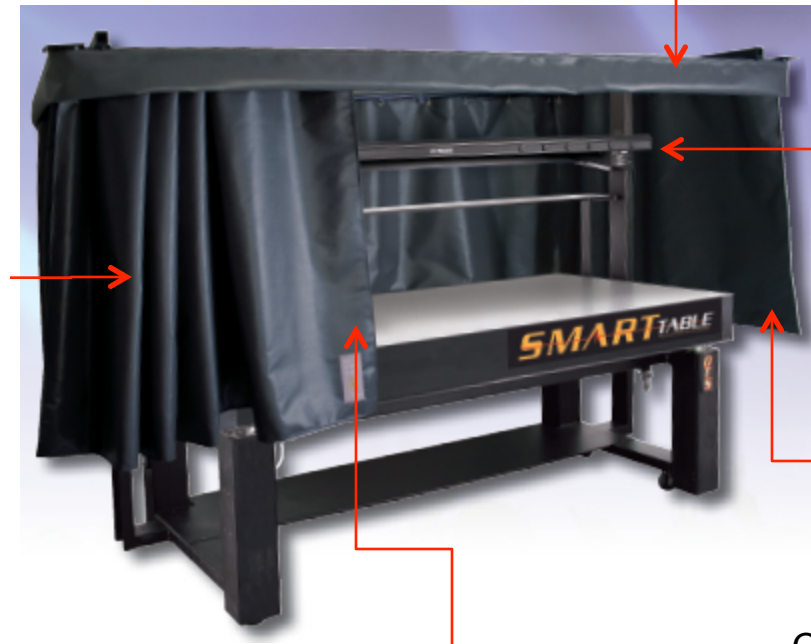
OTS Laser Safety Curtain

Curtains are compatible with stand-alone, standard ATS shelves as well as OTS system

Curtain is made from 4 pieces – one for each side of the table. The joints are secured by hook and loop material (Velcro)

Several sizes available

Model Number	Price
OTS-LSC-46	\$ 5,054
OTS-LSC-48	\$ 5,544
OTS-LSC-410	\$ 6,106
OTS-LSC-510	\$ 6,235
OTS-LSC-512	\$ 6,894



Curtain support rails are covered by a valance

Curtain attaches to OTS or ATS support shelf – height is adjustable

Curtain material has a Maximum Irradiance level of 200W/cm² with a Maximum Exposure time of 100 Seconds

Curtain overhangs table with 12" clearance around the table perimeter

See the new “OTS Overview” video on YouTube!!



VISION IsoSTATION™

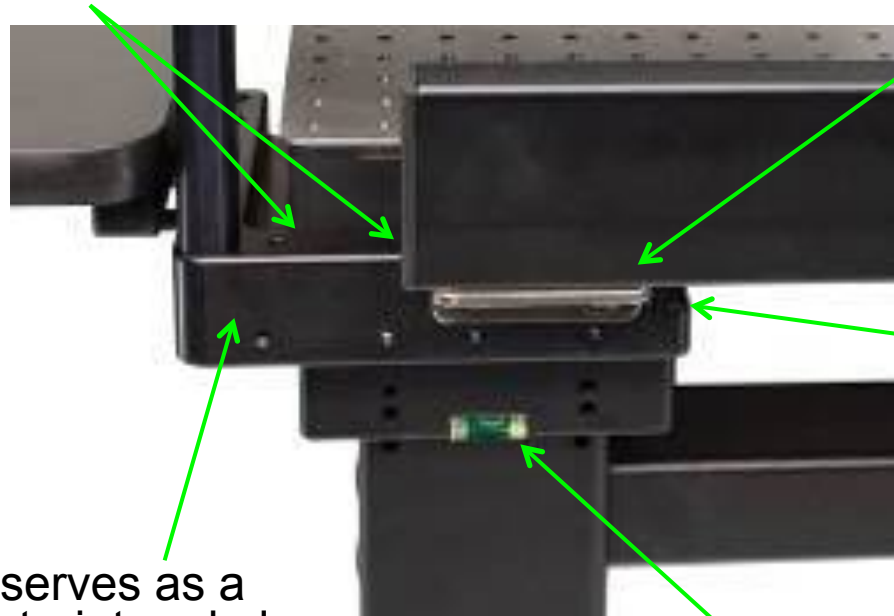
Industry leading performance

More user friendly features and accessories than any other system

Superior ease-of-installation, safety and lab space utilization

Vision IsoStation™ – Unique Platform Interface

Multiple attachment points around interface allow users to mount their “homemade” accessories also



Standard accessories like this front guard/armrest shown attach easily to interface

Breadboard float height indicators to verify proper set-up and operation

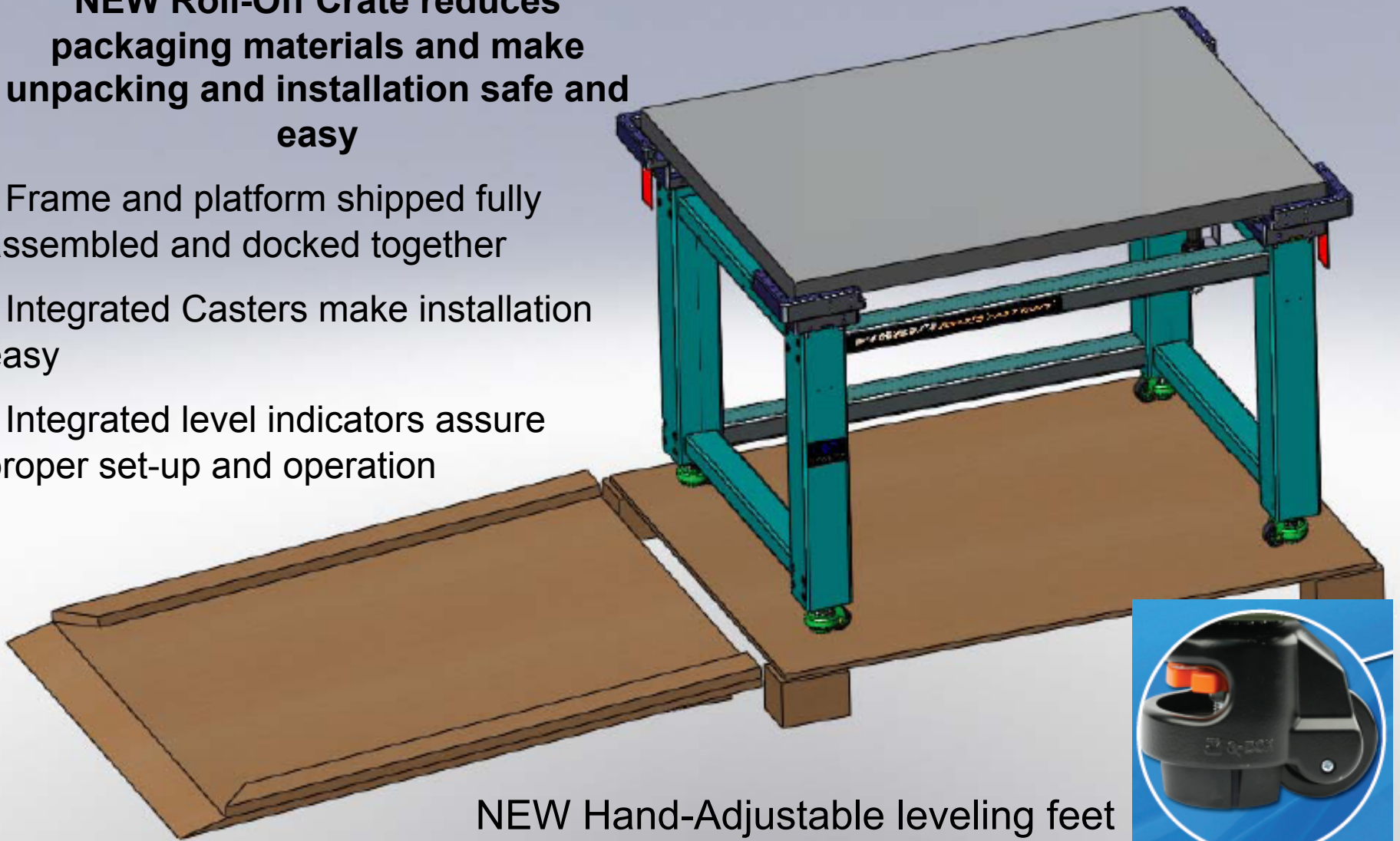
New interface serves as a breadboard restraint and also a docking surface when isolators are inactive, a desired feature for in-vivo preparation and imaging applications

Frame bubble levels in each corner to make set-up and installation simple and easy. Also great for remote troubleshooting!

Vision IsoStation™ - New Roll-Off Standard Crate

NEW Roll-Off Crate reduces packaging materials and make unpacking and installation safe and easy

- Frame and platform shipped fully assembled and docked together
- Integrated Casters make installation easy
- Integrated level indicators assure proper set-up and operation



NEW Hand-Adjustable leveling feet

- **Faraday Cages**
 - Protect electrically sensitive experiments from Electro-magnetic interference (EMI)
 - Neuroscience investigations - electrophysiology, patch-clamp
 - Typically copper mesh and aluminum frame, can be purchased or home-built
- **Optical Enclosures**
 - To protect experiments from ambient light or acoustics (not necessarily laser safe)
 - Bio-Imaging investigations – Multi-Photon Microscopy, TIRF (total internal reflection fluorescence)
 - Users must specify if enclosures are intended to be light-tight or laser-safe
 - Floor mounted enclosures help reduce table-top disturbances
 - The Model CAB-1 Blower/Filter produces slight positive pressure inside the table enclosure and filters 95% of particles over 5 microns in diameter.



- Understanding sources of noise and select the best location based upon noise level, accessibility and space requirements
- Selecting supports first, then table (be sure table can be moved into area!!)
- Selecting the proper table based upon needs, budget and future requirements
- Upgradeable systems offer low acquisition costs and a performance upgrade path
- Safety, ease of use and installation costs should all be considered when selecting new equipment

