

## NOVELL HEADQUARTERS, UTAH

Retrofit solution reduced noise and met seismic restraint requirements



Vibro-Acoustics helped overcome existing limitations and create a customized and code-compliant seismic restraint and vibration isolation solution which greatly minimized the installation work required.

Above: Novell Headquarters, Utah  
(Photo courtesy of Novell)

### Project Achievements

**Value Stream** (out of 5 stars)

- Ability to customize solution ★★★★★
- Reliable noise reduction ★★★★★
- Project risk minimization ★★★★★
- Job-site coordination ★★★★★

**Highlights**

- » No need to disconnect piping to install the product
- » Noise reduced to acceptable level
- » Code compliant design
- » On-site assistance by local representative

### SITUATION

Novell is a provider of information technology infrastructure software with its worldwide headquarters located in Provo, Utah. The primary building on their Provo campus is an eight-story office building built in the late 1990s.

The building is served by two water-cooled variable speed centrifugal chillers located in the penthouse above various office and meeting room spaces. As originally installed, the chillers were mounted on single-layer neoprene vibration isolation pads under each foot. Since the area is subject to significant seismic forces, the chillers were securely anchored into their respective 4” high housekeeping pad on top of 8” thick concrete on 3” decking. Piping was connected directly to the chiller, without the use of flexible connectors.

### PROBLEMS

In 2009, Novell attempted to address the ongoing complaints from building occupants related to noise created by the operation of the chillers. There was minimal reduction in vibration energy with the original installation. What little amount of vibration reduction could be provided by the thin neoprene isolation pads was made even less by the existence of concrete anchors through each chiller foot – rendering the pads ineffective. Also, without any flexible connectors between the piping and the machine, vibrations were traveling down the pipes, into the structure, and ultimately being heard as noise in occupied spaces below.

The building design left limited space around the machines for retrofit. The chillers could not be raised due to electrical conduit connections. The seismic design forces for the chillers were significant – three times higher at the penthouse level than on the ground floor. Code-required calculations showed that if the chillers were placed on springs, the seismic lateral design forces would exceed 1G of acceleration force.

## SOLUTION

Vibro-Acoustics reviewed information on the building structure, the chillers, room physical dimensions and layout, piping connections and code requirements for seismic restraint.



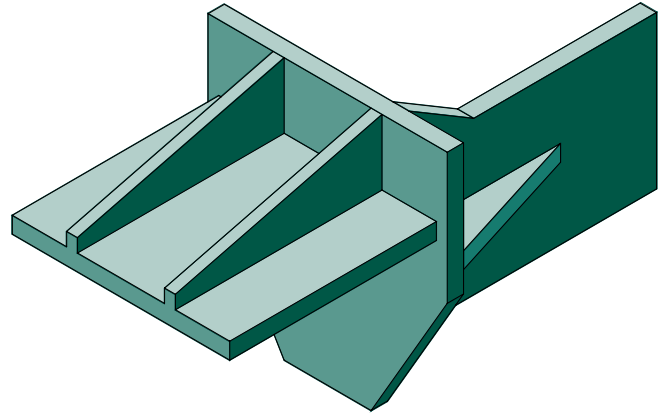
In accordance with ASHRAE vibration isolation guidelines for centrifugal chiller machines on upper floor installations with 20 to 30 foot spans, restrained spring isolators with spring deflections of 2" were selected.

Space was at a premium in the small mechanical room and an effort was made to try to locate the isolators under the equipment or in such a manner as to minimize the additional footprint required. Working with the contractor, it was decided to remove sections of the housekeeping pads to allow positioning the isolators as close as possible to the chiller legs.

Each chiller was "held" in place by chilled and condenser water piping connections and large electrical conduit - all of which would be very difficult and expensive to modify or relocate. The owner did not want to raise the chillers at all.

Due to the position of the isolators and the need to minimize any change in height, custom brackets were designed to transfer the weight of the chiller - and the seismic loads - to the isolator housings. These brackets were attached in a manner that neither changed the chillers' positions nor compromised the structural integrity of their support legs.

To address structural transmission of vibrations through the piping, Vibro-Acoustics selected twin-sphere neoprene



Custom brackets allowed the electrical conduit connections to remain intact by eliminating the need of raising the chillers.



flexible piping connectors which were installed in line with the existing piping.

Vibro-Acoustics provided seismic restraint analysis performed by one of our

professional engineers licensed in the state of Utah to ensure the solution was compliant with the building code.

The isolators were installed and the unit was gently raised a small amount to enable the old rubber pads to be removed and ensure the entire machine was floating on the springs - and thereby reducing structure-borne transmission of noise from the chillers.