

**Embargo Tuesday 29 October 2002**  
**Spy vs Spy: the science of surveillance and security**  
**Session 5: 1.45pm Sensing the changes**



The Science Forums

Presentation: Seismic sashays  
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- *key words/terms:* dampers, earthquakes
- *applications:* architecture, engineering

### **You push me I'll push back**

What happens when tall buildings are subjected to a force such as an earthquake, wind or impact?

They start to move.

The amount of movement depends on many factors including the size of the force, the material that the building is made of and the height of the building.

In countries where earthquakes are common, most tall steel buildings have dampers built in to their structures. Dampers slow down the movement of the building by absorbing the energy of the force.

### **Smart Buildings**

Imagine a building that is able to sense an earthquake and then move in the equal and opposite direction to the earthquake. Such dampers are known as active dampers. Dampers that react automatically without sensors, or active systems, are known as passive dampers.

Sydney has two buildings with dampers built into their structures: Centrepoin Tower and Chifley Tower. Both are passive dampers. The damper in Chifley Tower is the largest damper of its type in the world; 400 tonnes of layered steel.

### **Is bigger better**

Without the invention of reliable and fast elevators tall buildings would not grace the skylines of the world.

Tall buildings are not necessarily a result of going up because you can't go out. It is only in densely populated areas such as Hong Kong that tall buildings are a result of space considerations. In fact, you could fit the whole population of the world in South Australia if you built at the intensity of Hong Kong.

Most tall buildings exist because in western culture, 'bigger is better'.

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### **How high can we go**

The design of buildings is a complex mix of factors including strength, safety, cost, and comfort.

Comfort considerations include an assessment of how much a building moves on a windy day.

Steel buildings are light but flexible. Concrete buildings are heavier and not very flexible.

### **Are tall buildings safe?**

In earthquakes tall buildings are often the safest places to be because tall buildings move more slowly than shorter buildings.

The attacks on the World Trade Center Towers in New York City and the Pentagon outside Washington DC, on September 11 2001, marked the beginning of a new age of awareness of safety in the built environment.

### **Can we build impact-proof buildings?**

The development of damper technology to minimise the effects of earthquakes on buildings along with sophisticated computer modelling has gone hand-in-hand with our understanding of earthquakes.

Earthquakes and wind are easy to model because they are relatively predictable whereas terrorist attack is unpredictable.

Until humans can evolve bullet-proof heads, we will not be able to build terrorist-proof buildings.

### **Profile**

Professor Bijan Samali is head of the Infrastructure and Environment group in the Faculty of Engineering at UTS. He has spent the past 20 years researching methods of providing buildings with control systems to mitigate vibrations from earthquakes and wind. The International Association of Structural Control recognizes two models developed by his research group as benchmark models for testing buildings.

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