Vacuum Insulation Panels (VIP)

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What are VIPs?

- Insulating Structures
- Resistant to Thermal Conduction
- Relatively Thin with high R-value
- Useful Application: Window Panels

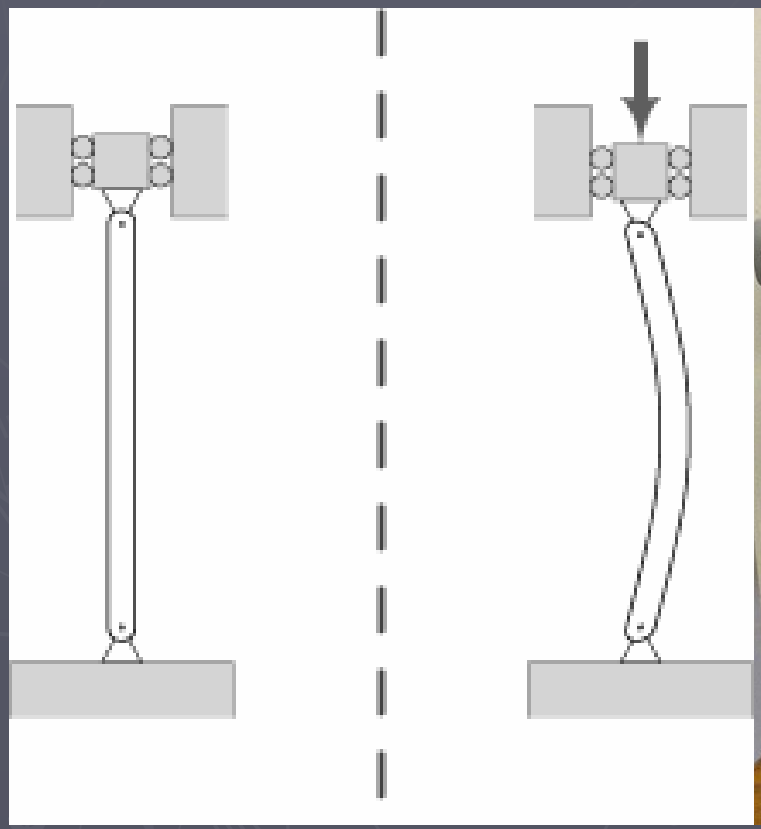
Heat Transfer

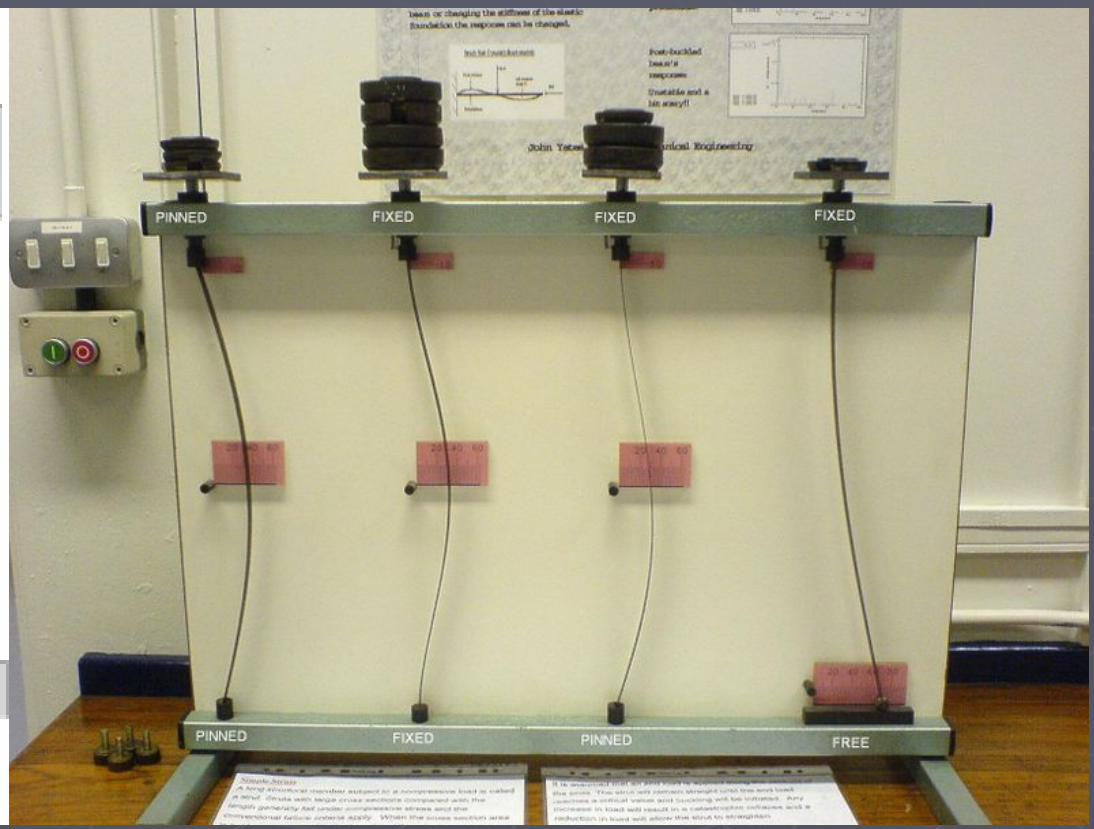
- The main goal is to prevent heat transfer through the panel
- Temperature and Heat Flow
- Related to Kinetic Energy
- 3 main categories: Conduction, Convection and Radiation

Current Technology

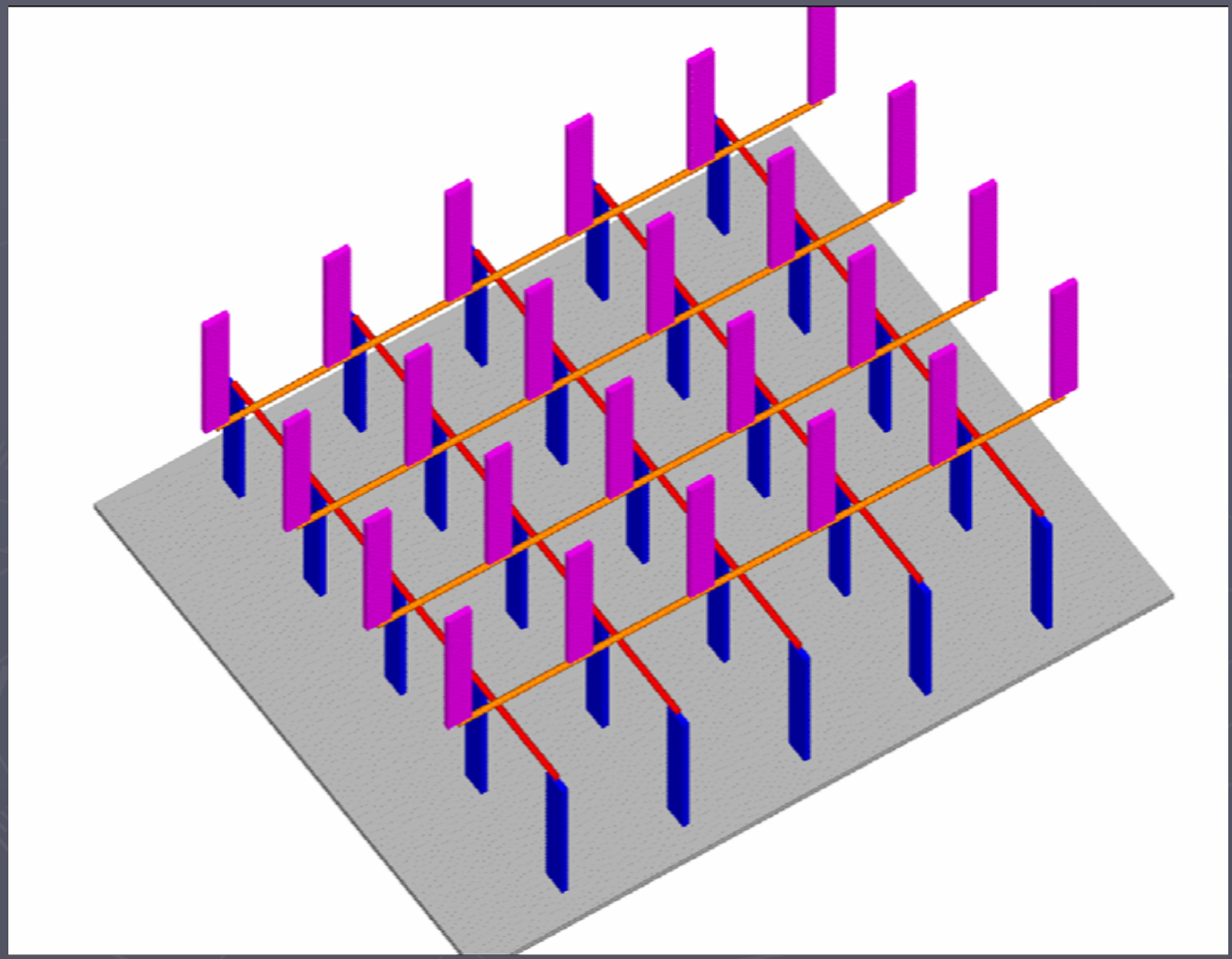
- Evacuated Glazing
- Layers of glass with vertical support
- Evacuate space and fill it with Argon
- Use stainless steel to seal the panel

Compression causes Buckling





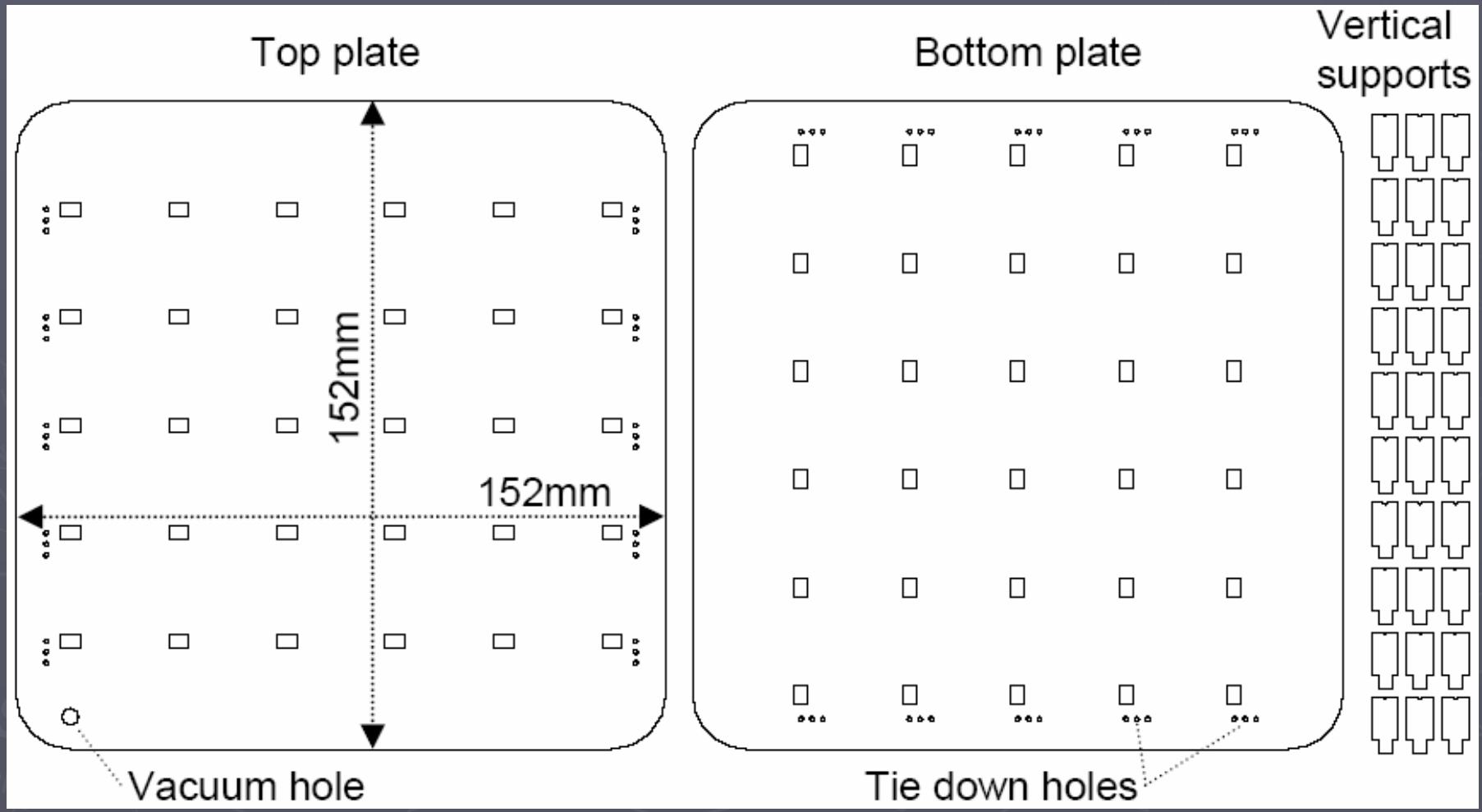
New Plan



Thermal Conductivity

- k_{kev} = 0.04 W/m*K
- k_{ss} = 16 W/m*K
- k_{air} = 0.024 W/m*k
- k_{Ar} = 0.017 W/m*K

Design


Top plate
Bottom plate
Vertical supports
152mm
152mm
Vacuum hole
Tie down holes

Cutting

- CO_2 Laser
- Acrylic
- Computer Operated

Finished Model

Testing

- Model was placed in a zip-lock bag
- The bag was sealed using double wire heat press
- Vacuum Pump was attached
- After observation, changes were made accordingly

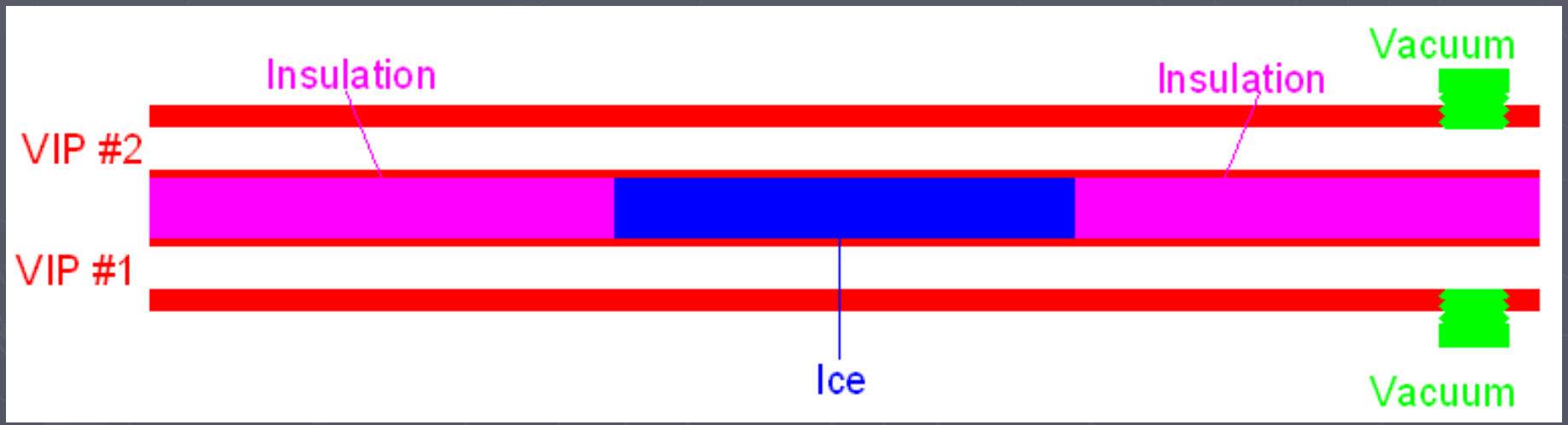
Results

- Kevlar thread does not break and is able to keep the two panels apart
- The pillars never touch the surface
- The zip-lock bag keeps getting sucked in the space between the two panels

Build a Wall

- The bag ripped causing the wall and pillars to break
- A second model with pillar support and thicker wall also failed the testing
- The third model is currently being built

Future Work



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