

Vacuum lifting

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The principle of vacuum lifting is fairly straightforward. A suction pad is positioned on the item surface and by using a vacuum pump the air inside the pad is removed this creates a pressure difference to the outside atmospheric pressure. With the suction pad and pressure difference the item is then gripped firmly and the can then be lifted. This means that the stress is then transferred to the pad and it is the pad in contact with the surface that carries the load. Once air is then pumped back into the space between pad and item surface the item can be released as there is no longer a pressure difference.

As opposed to using chains, hooks or straps, for lifting Vacuum lifting does not damage the items surface. The equipment can be attached to cranes, forklifts or excavating machines for use on site and are typically used to raise and install glass panels.

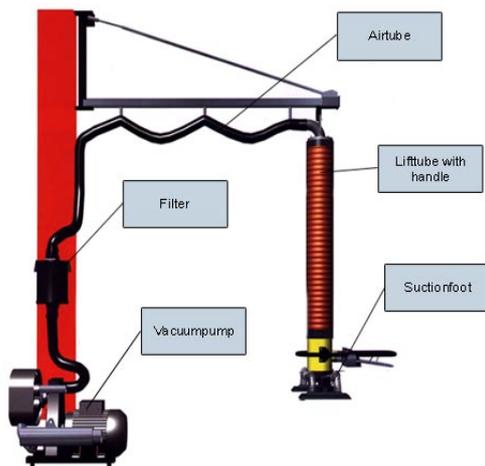


fig 1: typical schematic of vacuum lifting equipment
<http://www.ezisystems.co.za/images/vacubig.jpg>



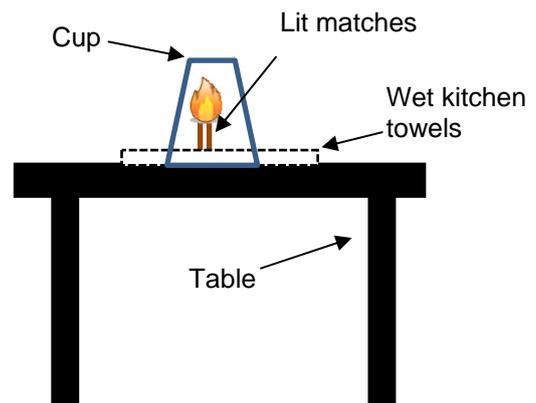
fig 2: Vacuum lifter, lifting a panel
http://www.glassparts.ie/images/prod/7211_DS4.jpg

To demonstrate vacuum lifting an appropriate model demonstration was conducted whereby a table was lifted, without actual physical contact with the table, using a glass cup and a formed seal and vacuum.

The equipment used for this demonstration was:

- A small table
- A glass cup
- Kitchen towels (wet)
- Matches

The arrangement of the equipment is shown

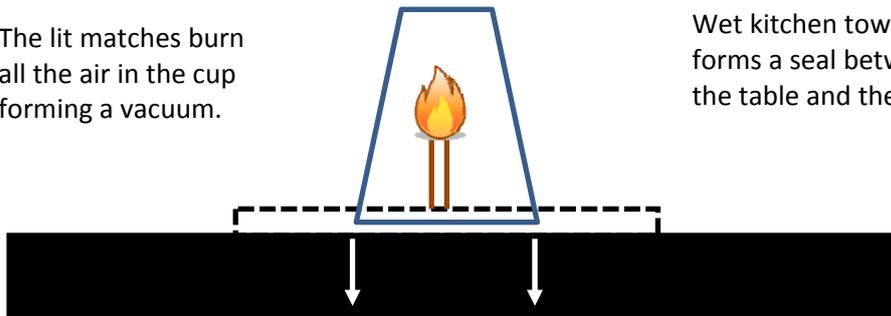


Method

- The wet kitchen towels were flattened and placed on the centre of the table.
- A small bundle of matches were placed in the centre of the wet kitchen towels and then set alight.
- The cup is placed over the matches and the fire burns the air in the cup creating a vacuum.
- The table is then lifted with a firm grip around the cup.

Below shows the detailed area and stress transfer

The lit matches burn all the air in the cup forming a vacuum.



Wet kitchen towel forms a seal between the table and the cup

With the vacuum and seal, when lifted with the cup the load is carried by the seal and contact area of the cup.



Once the matches are lit over the seal the cup is quickly placed over it and pressed down firmly until the fire burns out, indicating that the air has been burned and the vacuum formed.

The table can then be lifted just by lifting the cup, not requiring any physical contact with the actual table itself. The seal eventually peels allowing air to enter the cup, and so in professional vacuum lifting equipment an actual vacuum is used with a strong seal.

