Double Glazing Retrofit: It's a Snip!

"Snip some plastic strips, widely available in hardware stores, and you have the perfect spacer for adding a second window pane to every window in your house. My brother-in-law is a window glazier, and he still can't believe that they don't fog-up with trapped moisture." - Michael Gunter

Window terminology: Windows can be fixed, casement, sash or louvre. The stuff surrounding a sheet of glass in a window might be called a rail, stile, frame or sash. For the purposes of this exercise, I shall fudge the terminology, and call them all the "frame" because they frame the sheet of glass, just as a picture frame frames a picture. I have not tried double glazing a louvre window, and would not recommend that any sane person make the attempt. This method can usually be applied to all other sorts of upright (glass always vertical) windows, with varying aesthetic results.

Mythology of double glazing: Some people say there is a vacuum between the two panes of glass - this is never true. Even a slight negative pressure causes the panes of glass to bend quite alarmingly. The trapped air must be very dry to prevent condensation, and in commercial units, may be an inert gas such as argon to fractionally reduce the flow of heat.

Cost. The cost of commercial sealed custom made double glazed replacement units is around AUD$85 per square metre, not including installation. Minimum specification for such units is probably 4 mm float glass on each pane with a 6mm air gap.

Benefits of double glazing:

- improved thermal performance: typically R 0.9 single glazing will be improved to R 2.0, thus halving the heat loss for each retrofitted window. This will usually be noticed on cold winter evenings by less chilly down draughts of air when sitting near the window.

- reduced noise transmission: expect about 5 dB for a perceived halving of transmitted noise. However, a rattling window with large air gaps around it will still let in the noise - and the draughts! The best solution for noise reduction is actually *secondary glazing*, with a larger air-gap. Secondary glazing is not dealt with in this article.

- Increased security from forced entry.

Cheap DIY alternative. An "average" sized window pane can be double glazed using this method for about AUD$30.

Tools and materials: Glass cleaning kit. Heavy duty scissors, hack saw, butyl mastic cartridge, gun and nozzle. Leather gloves, cotton gloves, 3mm float glass, cut to size. Lengths of 4.5 mm capping (a PVC plastic extrusion designed to provide neat edging to 4.5mm cement sheet or fibreboard panels).

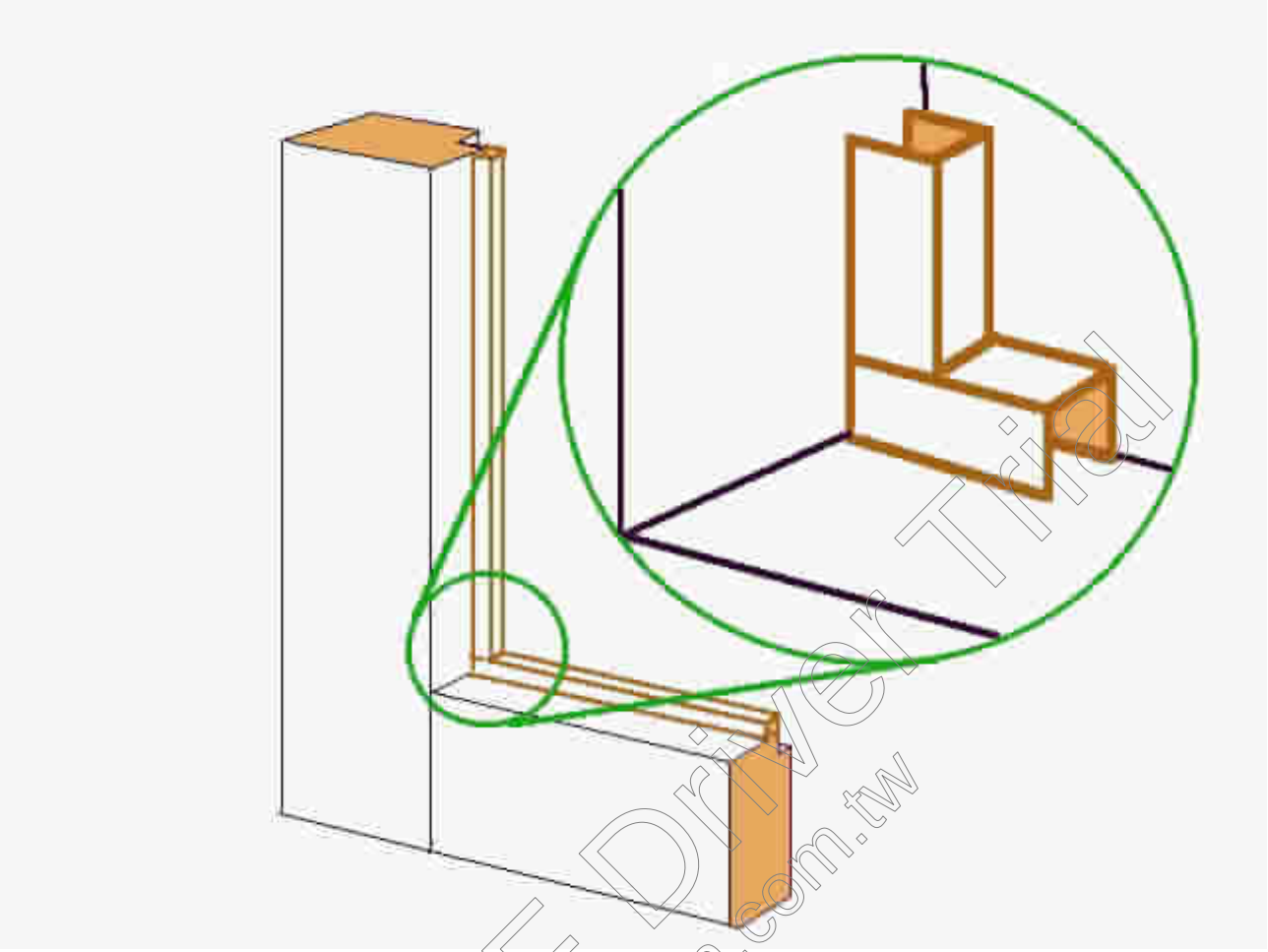
Colour matching: White painted timber or aluminium frames would match best with white PVC capping and white butyl mastic. If your timber window frames are varnshed timber or painted brown, then brown/tan capping can be sourced with difficulty, and brown butyl mastic is widely available.

Make sure that your glass merchant will supply glass with the exact measurement that you specify, as they sometimes subtract two or three millimetres to allow a roomy fit into the specified aperture.

One technique that works.

After checking that the glass is a snug fit in the chosen window, clean both sides of the new glass sheet, and of the existing window pane. Float glass cut to size is usually supplied unwashed, and the "fog" often seen on one side is presumably a tin residue from the manufacturing process, in which molten glass is floated on a bath of pure molten tin. To clean it, lay two big beach towels flat on a rug or carpeted floor, and carefully lay the window pane flat on them. Scrub it with a soapy nylon brush or with a very old green scourer (a new scourer will scratch the glass). Remove all soap by repeated wiping with a wet cloth, rinsed repeatedly. Dry it with a soft dry cotton cloth, until you satisfy yourself that the glass is scrupulously clean. Once the window is assembled, any residual dirt, lint or smudges will be a permanent feature of your view. Commercial glass cleaning agents may also be suitable, if they don't leave a residue that interferes with adhesion of butyl mastic.

Apply a 3mm bead of butyl mastic to the perimeter of the existing window pane, 3mm from the frame. Trim the 4.5mm capping with rugged scissors to make it a perfect U-shaped channel in cross section. With a hack saw, cut two lengths of capping to the exact width of the window aperture, i.e. the exact distance between the inner edges of



the window frame. Press them into the adhesive bead, with open side of the U-channel abutting the window frame. (see diagram).

Then measure and fit the two vertical U-channels. In each corner, a bead of butyl mastic must be carefully applied to the butt join, in order for an airtight seal to be made. When all four U-channels are glued in place, another 3mm bead of butyl mastic is applied to the inner face, making sure to form a small “blob” in each corner to provide a continuous glue seal at the butt joints.

Note that the U-channel is not glued to the window frame at all. It relies on the existing sheet of glass to be already firmly attached to its window frame, and it merely acts as a spacer. It follows, especially given the plastic (“semi-liquid”) properties of butyl mastic, that the weight of our second pane of glass will be resting on the bottom rail of the window frame. Now the moment of truth: using clean dry cotton gloves, carefully align the inner pane, resting it on the bottom rail of the window frame. Press it into place with a hand placed in the middle of the sheet of glass. If all goes according to plan, a continuous contact between mastic and glass will form around the perimeter, sealing off the trapped air between the two sheets.

If the window is not vertical at all times, it will be essential to retain the glass with additional strips of wooden beading, attached with small screws or panel pins

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Alternative adhesives: I chose to use butyl mastic, because it forms a skin very slowly, and apparently does not allow moisture to diffuse through it. If you are very quick at running a bead of silicone adhesive, then it could be used as an alternative. Any delay and it will develop a skin: then the second pane of glass will not properly adhere to it when pressed into place Silicone's advantage is that it cures with a much greater adhesive strength than butyl mastic, but it may allow water vapour to penetrate, potentially leading to the window developing condensation in the double glazed cavity.

Security issues. It may be necessary to remove latches, locks or other hardware on sash windows in order to fit the second pane of glass. If you are lucky these can be re-positioned and pressed back into service, otherwise a lockable window bolt can be attached to provide probably better security than the traditional sash window latches.

Breakage and replacement: I have not yet had to deal with this situation, but it would probably be wise to treat the situation of a broken pane as if it was a single glazed window: remove the rubber strip or putty from outside the house, and remove both panes outwards.

Size, weight and safety. Handling large sheets of glass can be extremely hazardous. Ladders must be strong, the operator must not be fatigued, and must have sufficient strength in the hands to confidently and securely grasp the glass. Ideally the method of installation should be carefully planned so that in the event the glass is dropped at any stage, no injury or death results. I have done a solo installation of some moderately sized highlight ("clerestory") secondary window panes. They were only 2.5 metres off the ground, with dimensions of 1365 x 565mm (W x H). Climbing a step ladder with such a pane in my grasp seemed close to the limit of my strength and confidence. Larger panes where you are not standing on the ground would probably necessitate a strong trestle platform and a trusted assistant.

Photo Gallery:

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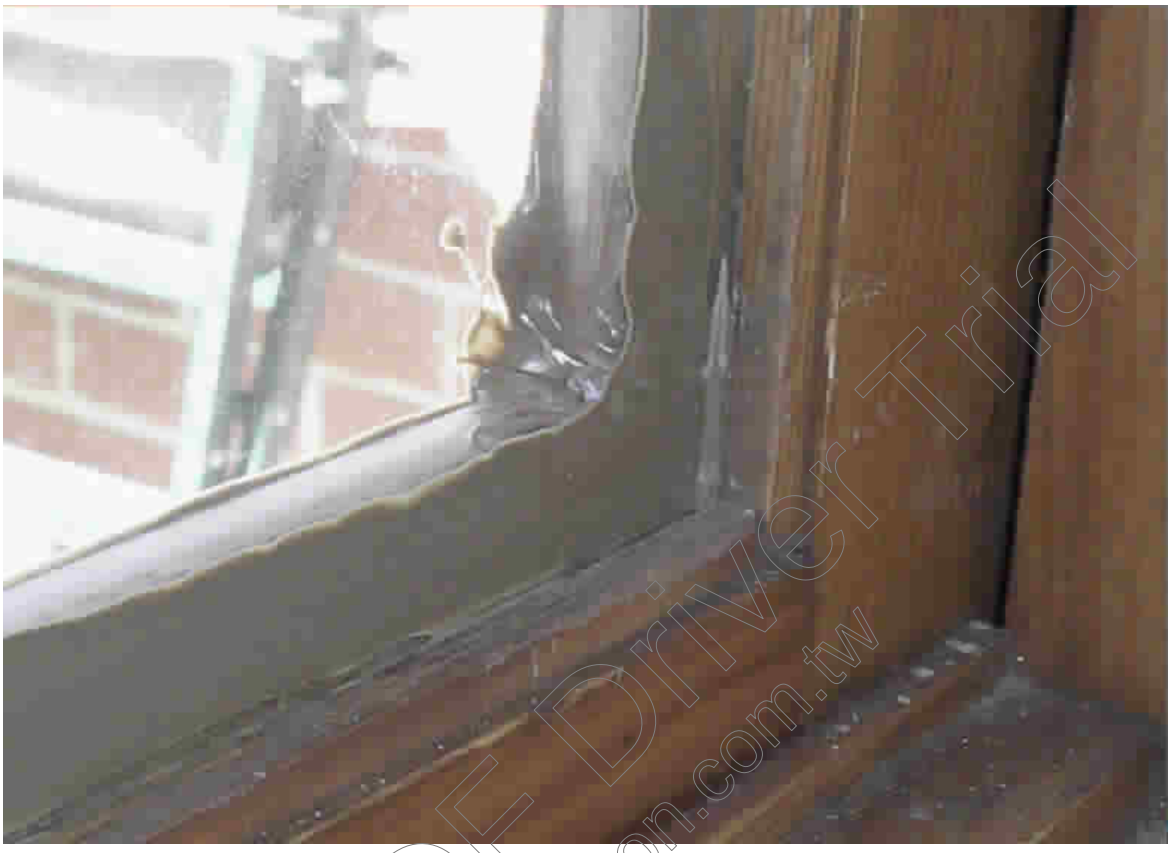
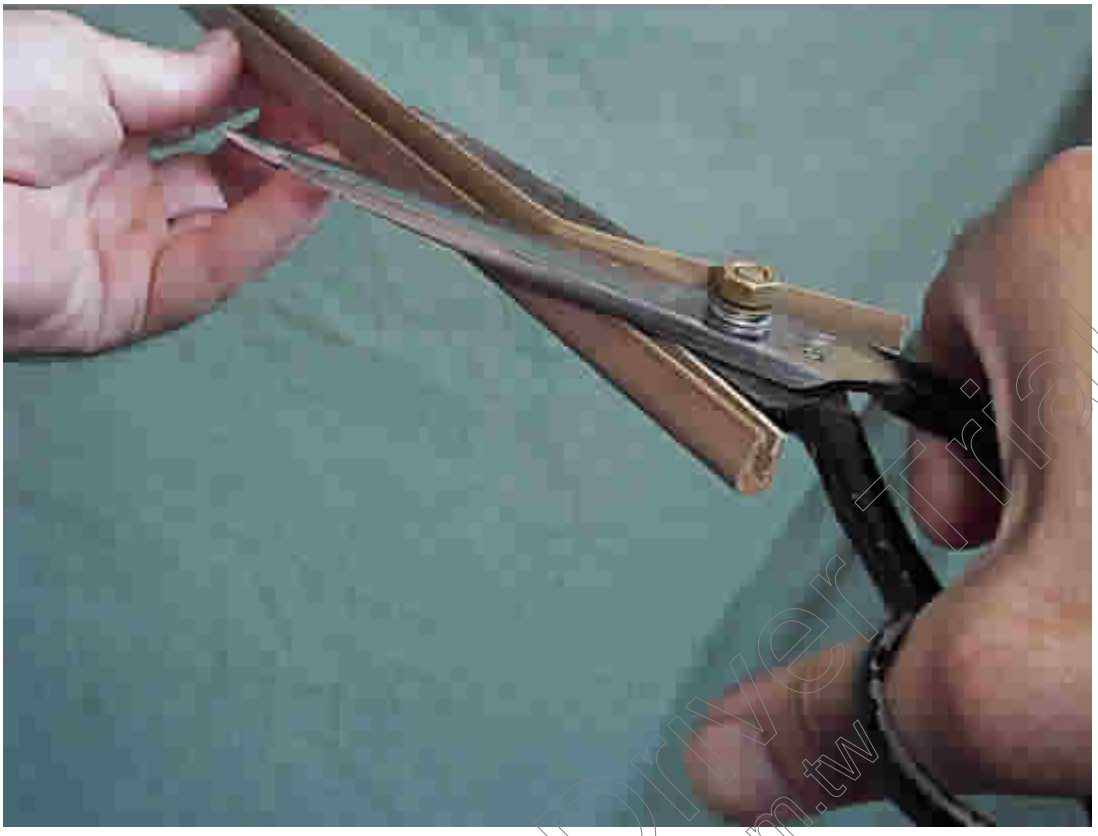


No, it’s not Lindor chocolate, this is excess brown butyl mastic making sure of a good seal at the butt joint. Despite the brown colour scheme, appearances would be improved by the use of wooden beading or mouldings to hide the glue, and ensure that the glass cannot become unstuck.

Removal of a window latch necessitated the use of a lockable window bolt (not shown) to restore home security.

If the plastic extrusion in not perfectly straight, then it can slowly lever the sheets of glass apart, and break the airtight seal. Surprisingly this window has had a failed seal for over tewlve months, and still no condensation has appeared in the air-space.



This could be you! Get snipping now to make your home cozy for those chilly winter nights.