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Surveys of Insulated Glazing Use in New Zealand Housing, as an Energy Efficiency Micro-Indicator 1994 –1998

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Surveys of Insulated Glazing Use in New Zealand Housing, as an Energy Efficiency Micro-Indicator 1994-1998

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Abstract: The penetration of insulated glazing units into the NZ domestic market has risen rapidly in the last decade. Hermetically sealed insulated glazing units (IGUs) have been on the market worldwide for half a century and have been available in New Zealand for over 30 years. Their use in this country, however, is only recently becoming more common. The surveys that this paper reports were performed from 1993 to 1998, and show that 28% of the South Island domestic glazing market is now in insulated glazing units, whereas the North Island market size has risen to 4%.

Note: The surveys this paper describes were commissioned by the Insulated Glazing Unit Manufacturers Association of New Zealand (IGUMA), a subgroup of the Window Association of NZ (WANZ), and funded by the Energy Efficiency and Conservation Authority (EECA) and the Building Research Levy.

Introduction

Hermetically sealed insulated glazing units (IGUs) have been on the market worldwide for half a century and have been available in New Zealand for over 30 years. Their use in this country, however, is only recently becoming more common.

As most housing in New Zealand is detached single-storey with a large proportion of glazing, the temperature and humidity inside houses is strongly influenced by the outdoor conditions [1], so that the insulation of glazing areas in an otherwise well insulated dwelling has a large effect on the inside temperature of a house, and therefore the thermal comfort and expenditure on indoor heating or cooling.

Because of the potential for energy efficiency gains and its use as an energy efficiency micro-indicator, the Window Association of NZ (WANZ), and the Energy Efficiency and Conservation Authority (EECA) have commissioned this, the latest in a continuing series of annual surveys on the extent of IGU use in New Zealand domestic situations. The first survey was completed following the end of the 1993-1994 financial year, the second at the end of the 1995 -1996 financial year, the third after the 1996-1997 year and the most recent at the conclusion of the 1997-1998 financial year. These survey results are reported below, along with some additional general information.

Surveys

First in March 1994, then in March 1996, 1997, and 1998 New Zealand IGU manufacturers were asked to confidentially provide to BRANZ the amount, in square metres, of insulating glass that they had produced for the New Zealand domestic market in the previous year. In the 1993-94 year, the size of the New Zealand domestic IGU market was gauged, while in the 1995-96, 1996-97 and 1997-98 years, the North and South Island domestic markets were recorded separately. The surveys were performed by telephoning and/or faxing queries to all identified manufacturers of IGUs in New Zealand, and following up these queries until a 100% response rate was achieved. As with any survey, the results are dependent upon the accuracy of the data provided, yet the totals reported below match well the amount independently assessed by a large New Zealand manufacturer [1], and that expected by WANZ.

Survey Result 1993-94

The total quantity of IGU produced for domestic glazing purposes in the 1993-94 year by New Zealand manufacturers, was 60 000 m², with an uncertainty of ± 5000 m².

Survey Result 1995-96

The total domestic IGU production by New Zealand manufacturers in the 1995-96 year for the North Island market was 17 500 \pm 2500 m², and in the South Island was 57 000 \pm 3000m², forming a total New Zealand domestic IGU production by New Zealand manufacturers of 74 500 \pm 5000 m² in the 1995-96 year.

Survey Result 1996-97

The total domestic IGU production by New Zealand manufacturers in the 1996-97 year for the North Island market was 26 000 \pm 3000 m², and in the South Island was 56 000 \pm 5000m², forming a total New Zealand domestic IGU production by New Zealand manufacturers of 82 000 \pm 6000 m² in the 1996-97 year.

Survey Result 1997-98

The total domestic IGU production by New Zealand manufacturers in the 1997-98 year for the North Island market was 32 000 \pm 3000 m², and in the South Island was 67 000 \pm 5000m², forming a total New Zealand domestic IGU production by New Zealand manufacturers of 99 000 \pm 7000 m² in the 1997-98 year.

Survey Analysis

Table 1 below, displays the information from these surveys, together with the fraction of IGU produced for both the North and South Island markets in 1995-96, 1996-97 and 1997-98 separately with the New Zealand market size also split between the two main Islands.

These figures show that a 25% increase has occurred in the total New Zealand domestic IGU production in the two years between the 1994 survey, and the 1996 survey. A 10% further increase in the New Zealand-production of IGU for domestic purposes occurred between the 1996 survey and the 1997 survey, with another 20% increase shown in the 1998 survey. Most of the growth from 1993-1996 was due to the establishment of new IGU manufacturing facilities in the South Island, together with the consolidation of manufacturing following the establishment of the IGUMA in 1993 and the impact of continued manufacturing quality control.

Note i: There is no significant importation of IGU from offshore into New Zealand for domestic use, except for that incorporated in skylights imported by Velux, so the total domestic IGU production reported here by New Zealand manufacturers for any year to date will be the total available for vertical glazing use in New Zealand produced for domestic use in that year. There is however, an unknown quantity of IGU imported for commercial use in NZ construction which may be 20% (estimated) of the NZ commercial glazing market.

Note ii: This survey does not separate after-market upgrades to the glazing thermal performance from secondary glazing with glass, or with rigid or flexible heat-shrink films, but solely reports the market size for new and retrofit sealed double glazing units.

Discussion

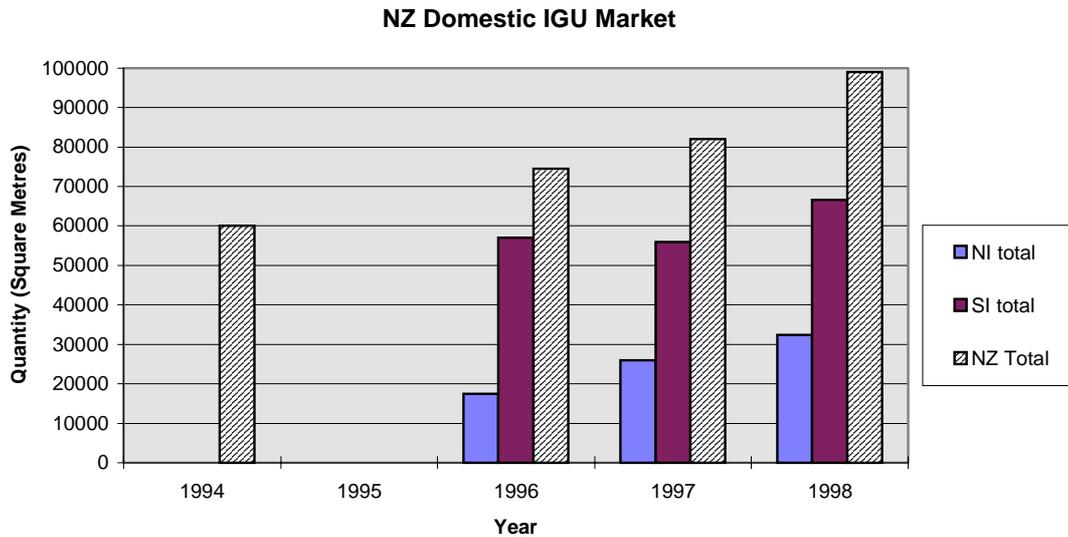
The penetration of IGUs into the New Zealand domestic glazing and insulation markets can be seen by these surveys to be increasing. The total new housing starts in the 1995-96 year was 21 100, with 15 190 in the North Island and 5910 in the South Island [3]. The total new housing starts in the 1996-97 year was 22 800, with 17 600 in the North Island and 5200 in the South Island [3]. The total new housing starts in the 1997-98 year was 25 565, with 20 280 in the North Island and 5285 in the South Island [3]. The domestic aluminium window market size, including IGU, was at $1.04 \times 10^6 \text{ m}^2$ in 1995 [2], and had grown to $1.14 \times 10^6 \text{ m}^2$ by 1997 (estimated from [3]). The IGU market share of the domestic vertical glazing market in NZ can be seen to have grown from 6% in 1993-94, to 7.5% in 1995-96, to 8% in 1996-97, to 9% in 1997-98.

Table 1 tabulates this information, with Graph 1 portraying the split between the North and South Island markets. An important corollary to this is that the South Island dwelling activity has been 11% lower in the last two years than it has been in 1996 with only 5200 consents issued in 1997, and 5285 dwelling consents in 1998.

Item	NZ totals	North Island	South Island
IGU produced 1993-4	60 000 m ²		
IGU/Single ratio 93-4	6%		
IGU produced 1995-6	74 500 m ²	17 500 m ²	57 000 m ²
IGU/Single ratio 95-6	7.5%	2 %	20 %
IGU produced 1996-7	82 000 m ²	26 000 m ²	56 000 m ²
IGU/Single ratio 96-7	8%	3 %	22 %
IGU produced 1997-8	99 000 m ²	32 000 m ²	67 000 m ²
IGU/Single ratio 97-8	9%	4 %	28 %

Note: These figures in m² have an uncertainty of $\pm 10\%$

Table 1: Domestic IGU production survey for 1993-94, 1995-96, 1996-97 and 1997-98.



Graph 1. Domestic IGU market volume split by islands

New Zealand Statistics

The average house window area in New Zealand has been increasing in line with the trend to larger floor areas, with the average window area of new New Zealand housing having reached 40m² [2] in 1996, compared with the average window area of 17.5 m² found in a survey in the Pacific North West of the USA in 1994 [4]. There is also the likelihood of a trend towards domestic summer cooling in certain climatic regions of New Zealand, which will result in an increasing demand for IGUs for air conditioned dwellings, since most IGUs in NZ domestic construction are being used to reduce winter heating needs, and for condensation control.

As can be seen in Table 1 above, 28% of house glazing in the South Island was performed with IGUs in the 1997-98 year. This figure could be expected to be lower in the temperate areas of Nelson and Marlborough, and higher in the rapidly developing prestige home/tourist areas around Queenstown and other similar areas in the South Island, yet no nationwide survey dissected on a regional basis has been performed to reveal this data.

Window Industry Analysis

Aluminium held 93% [1] of the New Zealand domestic-new and domestic-renovation window and door market in 1996, and is estimated to hold 94% of the market today, with wood framing estimated to hold another 4%, and other materials, such as uPVC (vinyl), steel, and combination frames together holding 2% of the market. While the use of uPVC in window and door framing is a relatively recent event in New Zealand, its use and market acceptance is increasing, particularly when used in combination with IGUs. uPVC holds 80% of the domestic external joinery retrofit market in the former West Germany, which increased rapidly from nothing over a fifteen year period.

Aluminium frames are now available in thermally-broken or combination form (timber inside, aluminium outside) from some of New Zealand fabricators, and these, along with thermally improved spacers such as Tremco's 'Swiggle Strip'TM, and Edgetech's 'Superspacer'TM are increasingly being used with double glazing units in New Zealand to improve their thermal performance. Energy efficient low-e glazing, and IGUs with gas fills, while available in New Zealand, are not yet manufactured here, although recent advances are making this technology accessible. Changes to the proposed energy efficiency clause H1 of the New Zealand Building Code and international political pressures are also changing demands upon the use of IGUs in New Zealand, as the new market for home air conditioning for summer cooling begins to impact in the warm-temperate, and high cost housing markets.

Window Energy Rating

A Window Energy Rating Scheme (WERS) has been launched by the Australasian Window Council in one state of Australia to date, with the other Australian states to follow. Development work has commenced at BRANZ in New Zealand to allow the technical implementation of WERS for New Zealand climatic regions to be performed. The full WERS scheme able to rate the performance of windows on the basis of the window's performance in a heating season, a cooling season, for fading prevention and for condensation resistance, is intended to be completed by March 2000.

Economic Justification

While the net cost of double glazing within a well insulated house in at least Christchurch and Invercargill in the South Island is beneficial [5] the relatively low cost of electricity, temperate climate, limited market size, (around 1×10^6 dwellings), and restrictions in available glazing rebate widths commonly available in the low-volume domestic IGU market in the North Island, together with the rapid domestic property turnover rate (of 7 years on average) means that it is difficult to offset the difference in purchase cost between single glazing and IGUs purely against the cost of heating a dwelling in New Zealand. However, issues such as increased thermal comfort, noise reduction, the reduction of internal window condensation - and the subsequent reduction in damage to interior finishings, the ability to use a larger proportion of interior heated space, summer cooling requirements, the ability to leave view windows un-curtained at night, and other aesthetic requirements, means that IGUs can be specified in all of New Zealand's climate zones to achieve real advantages.

Conclusions

This survey shows that there is significant uptake of IGUs into the domestic New Zealand market with 9% of all domestic glazing (99 000 m²) in New Zealand being performed with IGUs. This proportion of the total domestic glazing market has increased from 6% in 1994 to 9% in 1998, as has the absolute quantity of IGUs produced for the New Zealand domestic market from 60 000m² in 1994 to 99 000m² in 1997.

Significantly a lot of the IGU use is in the South Island, with 28% of all domestic glazing here being performed with IGUs, with significant regional variations.

The market is likely to continue to rise as initiatives such as the Window Energy Rating Scheme (WERS) are introduced into New Zealand, as public acceptance of IGUs increases, as

demand for house air conditioning increases, and as revisions to the New Zealand Building Code require higher levels of thermal insulation in domestic construction.

References

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