RESEARCH PROJECT
ON THE NOISE ISOLATION PROVIDED
BY WINDOWS IN RESIDENTIAL PROJECTS

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ABSTRACT

The external Research Program of CANADA MORTGAGE AND HOUSING CORPORATION accepted the proposal by MJM ACOUSTICAL CONSULTANTS INC. to conduct a study on the noise isolation provided by windows of residential projects. A total of eighteen tests were conducted: nine on stand-alone double glazing thermopanes, and nine on different types of operational windows. The report is addressed to acousticians, builders and construction professionals; it discusses the sound isolation properties of three types of operable windows most commonly used in residential construction, and compares the performance of the windows to that of the stand-alone thermopanes tested.

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RESEARCH PROJECT ON THE NOISE ISOLATION PROVIDED BY WINDOWS IN RESIDENTIAL PROJECTS

EXECUTIVE SUMMARY

The external Research Program of CANADA MORTGAGE AND HOUSING CORPORATION accepted the proposal by MJM ACOUSTICAL CONSULTANTS INC. to conduct a study on the noise isolation provided by windows of residential projects.

The acoustical data presently available on windows is presented as if the glazing composition was the only factor influencing the sound isolation which they provide; sound transmission loss data on fully operable windows is not easily available. One of the objectives of this research project was to fill this void by investigating the sound attenuation properties of the most popular types of standard operable windows currently installed in low and medium cost residential projects: casement windows (2 sashes, one fixed, one operable), horizontal sliding windows (4 operable sashes), and vertical sliding windows (2 operable sashes). Another goal of this study was to investigate ways to improve the acoustical performance of casement windows by modifying the composition of the thermopanes while maintaining the standard sash thickness of this type of windows.

A total of eighteen tests were conducted: nine on stand-alone double glazing thermopanes, and nine on different types of double glazing operational windows. **Table 1** below contains a summary of the results obtained, expressed in terms of Sound Transmission Class (STC); it also contains useful information about the windows tested such as their type, their weight, their price, etc.

The conclusions of the present study are as follows:

- The Sound Transmission Class (STC) of the nine stand-alone thermopanes tested in this study varied from STC 25 to STC 34. The STC measured on casement windows, horizontal sliding windows, and double hung sash windows varied from STC 27 to STC 41.

- Sealed thermopanes with a deeper airspace provide a higher STC rating and a higher sound Transmission Loss (TL) for frequencies above the Mass-Air-Mass resonance.

- Doubling the thickness of one of the glass panes composing the double-glazing thermopanes increased the STC by approximately 6 points. Also, for thermopanes constructed with an unbalanced construction (one 3 mm and one 6 mm glass), the coincidence dip in the TL curve is much less pronounced, resulting in better sound isolation at high frequencies. To reduce significantly the coincidence dip however, the mass of one pane must be at least twice the mass of the other pane.

- A study conducted from 1978 to 1981 on the transmission loss of windows by the NRCC[1] indicated that factory sealed thermopanes incorporating an aluminum spacer between the panes provided inferior sound transmission loss when compared to glazing of similar composition with no spacer. In the present study three factory sealed thermopanes constructed with spacers made of different materials (aluminum, PVC, and aluminum/neoprene) were tested and were found to provide equivalent STC and TL.

1 J.D. Quirt: Measurement of Sound Transmission Loss of Windows, Building Research note no 172, National Research Council of Canada, Ottawa, April 1981.

- The STC rating of 1200 mm x 1600 mm casement windows was approximately 3 points higher than the STC rating measured on 1200 mm x 1600 mm stand-alone thermopanes with same glazing composition, sealed in the test opening. In the case of the double hung sash window, the increase in performance compared to the stand-alone thermopane is 1 point of STC. The reason for those increases have yet to be determined with further research.

- Casement windows built with aluminum, wood, and PVC constructed with identical glazing provided similar sound isolation performance with STC ratings varying by 2 points. The maximum sound transmission class measured on casement windows was achieved by an aluminum window (STC 35), equipped with a double glazed thermopane composed of one 3 mm glass and one 6 mm glass with a 16 mm airspace, followed by the wood (STC 34) and PVC (STC 33) thermopane windows with panes of equal thickness separated by a 13 mm airspace instead of 16 mm. The deeper airspace in the thermopane of the aluminum window is probably responsible for the superior STC rating and partly responsible for the higher 1/3 octave TL values provided by this window. However, comparing the sound transmission loss curves of the aluminum, PVC and wood windows suggests that the seals and the sash composition of the aluminum window could also be responsible for the better sound isolation performance of this window at mid and high frequencies.

- The casement window which offers the best ratio cost/sound-isolation is the wood window followed by the PVC window and, in last position, the aluminum window.
- Combining the maximum STC rating obtained on a stand-alone thermopane measured in the present study (thermopane n^{o} 6) with the maximum STC rating

measured on casement windows (aluminum window n^{o} 11), it appears that STC 37 would be the maximum rating which could be obtained from an operable casement window equipped with a 25 mm (1") thick thermopane.

- The aluminum sliding window provides very superior sound isolation when compared to a PVC sliding window (STC 41 vs STC 32). Based on the previously mentioned NRCC study on windows, the STC rating of these two windows should have been in the same range (STC 40). Further research is required to explain the poor performance of the PVC horizontal sliding window.

  The aluminum horizontal sliding window ranked first in terms of acoustical performance, and seventh in terms of price. This window appears particularly well adapted for low cost residential projects located in noisy environments.

- Acousticians and construction professionals must be careful when selecting windows destined for buildings located in noisy environments. They should not rely solely on glazing composition to determine the sound isolation performance of operable windows. They must be aware that factory sealed thermopanes can have a significantly lower sound transmission loss than that published for glazing samples of apparently identical composition but whose perimeter is not factory sealed using a standard aluminum spacer. In addition, the sound isolation efficiency of the gaskets at the perimeter of operable window sashes seems to vary substantially with the type of window considered. For casement windows and aluminum sliding windows, the present study indicates that a degradation of approximately 3 points of STC could exist between the acoustical performance of an operable casement window and the data published by the NRCC for a sealed window having the same glazing composition (This is consistent with the predictions of David Quirt the author of the NRCC study). In the case of PVC

sliding windows and in the case of sash windows however, the results of this study indicate that this degradation could be more substantial and reach 8 points of STC.

- This research was a preliminary attempt to determine the effect of glazing size, gaskets, frame and sash composition of operable windows on their sound isolation performance. Further research is required to confirm some of its findings.

Measurement / Manufacturer	Window description	Type of frame/sash	Thermal glazing composition	Notes	Weight of sample / Glazing thickness	STC rating
1 Thermalite	Thermopane installed directly in test opening and sealed at perimeter	No frame No sash	Glass 3 mm Airspace 19 mm Glass 3 mm	Standard thermopane used in Aluminum casement windows (window no 8)	62 lbs 24,5 mm	27
2 Thermalite	Thermopane installed directly in test opening and sealed at perimeter	No frame No sash	Glass 3 mm Airspace 16 mm Glass 3 mm	Standard thermopane used in wood and PVC casement windows (windows no 9 and 10)	62 lbs 21,5 mm	26
3, 3A, 3B Thermalite	Thermopane installed directly in test opening and sealed at perimeter	No frame No sash	Glass 3 mm Airspace 13 mm Glass 3 mm	Standard thermopane used in pine sash windows (window no 16)	62 lbs 19 mm	3 = 26 3A = 25 3B = 25
4 Thermalite	Thermopane installed directly in test opening and sealed at perimeter	No frame No sash	Glass 3 mm Airspace 16 mm Glass 6 mm	Thermopane designed to enhance the acoustical performance of aluminum windows (window no 11)	91 lbs 24,5 mm	33
5 Thermalite	Thermopane installed directly in test opening and sealed at perimeter	No frame No sash	Glass 3 mm Airspace 13 mm Glass 6 mm	Thermopane designed to enhance the acoustical performance of wood or PVC windows (windows no 12 and 13)	91 lbs 22 mm	31
6 Thermalite	Thermopane installed directly in test opening and sealed at perimeter	No frame No sash	Glass 6 mm Airspace 9 mm Glass 8 mm	Thermopane designed to maximize the acoustical performance of aluminum, wood and PVC windows while maintaining a thin airspace between the glass lights	146 lbs 23 mm	34
7 Thermalite	Thermopane installed directly in test opening and sealed at perimeter	No frame No sash	Glass 5 mm Airspace 38 mm Glass 5 mm	Glazing composition destined to a sealed window or to the most economical sliding window (window no 15)	104 lbs 48 mm	32

Measurement / Manufacturer	Window description	Type of frame/sash	Thermal glazing composition	Notes	Weight of sample / Glazing thickness	STC rating	Net Price
8 Wilton	Casement window; 2 sashes (1 fixed, 1 operable)	Aluminum sash and frame	Glass 3 mm Airspace 19 mm Glass 3 mm	Standard aluminum casement window	103 lbs 25 mm	30	456$
9 Melco	Casement window; 2 sashes (1 fixed, 1 operable)	PVC sash; wood frame covered with PVC	Glass 3 mm Airspace 16 mm Glass 3 mm	Standard PVC casement window	98 lbs 22 mm	28	334$
10 Polar	Casement window; 2 sashes (1fixed, 1 operable)	Wood sash and frame	Glass 3 mm Airspace 16 mm Glass 3 mm	Standard wood casement window	92 lbs 22 mm	29	295$
11 Wilton	Casement window; 2 sashes (1 fixed, 1 operable)	Aluminum sash and frame	Glass 3 mm Airspace 16 mm Glass 6 mm	Superior sound isolating glazing in standard aluminum sash	124 lbs 25 mm	35	514$
12 Melco	Casement window; 2 sashes (1 fixed, 1 operable)	PVC sash; wood frame covered with PVC	Glass 3 mm Airspace 13 mm Glass 6 mm	Superior sound isolating glazing in standard PVC sash	118 lbs 22 mm	33	355$
13 Polar	Casement window; 2 sashes (1 fixed, 1 operable)	Wood sash and frame	Glass 3 mm Airspace 13 mm Glass 6 mm	Superior sound isolating glazing wood sash	112 lbs 22 mm	34	320$

Measurement Manufacturer	Window description	Type of frame/sash	Thermal glazing composition	Notes	Weight of sample Glazing thickness	STC rating	Net Price
14 Wilton	Sliding window; 4 sashes sliding horizontally	Aluminum sash and frame	Glass 3 mm Airspace 108 mm Glass 3 mm	Standard aluminum sliding window	95 lbs 114 mm	41	268$
15 Robert	Sliding window; 4 sashes sliding horizontally	Sash and frame made out of vinyl covered pine	Glass 5 mm Airspace 34 mm Glass 5 mm	The most economical 4 sash sliding windows	120 lbs 44 mm	32	177$
16 Robert	Sash window; 2 sashes sliding vertically	Sash and frame made out of vinyl covered pine	Glass 3 mm Airspace 13 mm Glass 3 mm	The most economical window	90 lbs 19 mm	27	149$

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1.0 INTRODUCTION

The external Research Program of CANADA MORTGAGE AND HOUSING CORPORATION accepted the proposal by MJM ACOUSTICAL CONSULTANTS INC. to conduct a study on the noise isolation provided by windows of residential projects. This report, which is addressed to acousticians, builders and construction professionals, presents and discusses the results of the Sound Transmission Loss tests performed on stand-alone double glazing factory sealed thermopanes and on double glazing operable windows which are destined for new and renovated residential constructions. All the tests were conducted in the acoustical laboratory of the DOMTAR RESEARCH CENTER located in Senneville Quebec; Mr. Jean-Marie Guérin, M.Sc.A., consultant at the employment of MJM ACOUSTICAL CONSULTANTS INC. carried out all the measurements under the supervision and the direction of the undersigned.

2.0 OBJECTIVES OF THE STUDY

The acoustical data presently available on windows is presented as if the glazing composition was the only factor influencing the sound isolation which they provide; sound transmission loss data on fully operable windows is not easily available. One of the objectives of this research project was to fill this void by investigating the sound attenuation properties of the most popular types of standard operable windows currently installed in low and medium cost residential projects. Another goal of this study was to investigate ways to improve the acoustical performance of casement windows by modifying the composition of the thermopanes while maintaining the standard sash thickness of this type of windows. The following factors were taken into consideration during the selection of the window assemblies to be tested:

- availability
- cost
- thermal performance
- thickness of the thermal glazing and of the sashes
- weight
- durability
- aesthetics

The window and thermopane samples which have been tested in this study are listed on **table 1** of the executive summary. The aspects considered during the selection of the thermopanes and windows tested are described in more details in **paragraphs 4.1 to 4.4** below.

3.0 STRUCTURE OF THE REPORT

This report is organized into an executive summary, a main report, and three annexes. Consumers, builders, and construction professionals should find most of the information of interest to them in the **executive summary**, in **sections 4.0, 5.0 and 6.0** of the main report respectively entitled SAMPLE SELECTION, ANALYSIS OF RESULTS, and CONCLUSIONS, and in **Annex I** which contains the graphs pertaining to **section 5.0**.

Annexes II and III should be of interest to acousticians. **Annex II** presents, in the form of graphs and tables, the complete results of the sound transmission loss tests conducted on each window and the physical dimensions of the stand-alone thermopanes and windows tested. **Annex III** contains a description of the test facility and of the experimental procedure followed during the measurements; it also contains the brochures of the operable windows tested.

4.0 SAMPLE SELECTION

4.1 TYPES OF WINDOWS MOST COMMONLY USED IN RESIDENTIAL CONSTRUCTION

Due to the limited funds available for this study, the author decided to base his selection on the three main types of standard double glazing windows which are currently used in the construction and renovation of low to medium cost residential buildings: casement windows, horizontal sliding windows, and double hung sash windows.

Most of the **casement windows** sold currently consist of one fixed and one operable sash, and are made of aluminum, PVC, or wood. Since one of the goals of this study was to determine if and how the materials and techniques used in the fabrication of casement windows influence their sound isolating properties, all three types of casement windows have been tested. It is worth noting that the thermopanes inserted in the sashes of the casement windows tested had the same composition for the wood and PVC windows, but had a slightly deeper airspace in the case of the aluminum windows (this is apparently due to a thicker sash).

Horizontal **sliding windows** generally consist of four sashes which slide horizontally with an airspace between the two exterior and the two interior sashes varying from 34 to 115 millimeters (1 3/8" to 4 5/8"). The sashes most often encountered consist in a perimeter frame constructed of aluminum or PVC, in which a single pane of variable thickness is inserted. Both aluminum and PVC sliding windows were tested in the present study.

Many types of double hung **sash windows** (windows sliding vertically) are available on the market; for the purpose of this project the most economical model was tested. The frame and sashes of the sample tested were constructed with vinyl covered pine; double glazed thermopanes were mounted in the sashes.

All the windows were tested while fully operational to take into account the efficiency of the gaskets between the sashes and the frame. Due to limited funds, the windows were not tested with the sashes sealed to the frame.

4.2 SIZE OF THE WINDOW SAMPLES

All the window samples tested in this study measured 1200 mm x 1600 mm (47 1/4" x 63"), with a total area corresponding to approximately 2 square meters. According to VIMAT, the supplier of the samples tested, this window size is standard and popular in new residential construction. Please refer to the **graphs A2-1 to A2-16** of **Annex II** for the complete physical measurements on the windows and stand-alone thermopanes tested.

4.3 INSTALLATION OF WINDOW SAMPLES INSIDE THE TEST OPENING (See Annex III for more details about the test set-up and method, and for the brochures which illustrate the windows tested.)

The windows were installed in the test opening to simulate a standard installation in an exterior wall constructed with wood studs and brick cladding, the exterior side of this virtual exterior wall being located on the source room side.

The wood casement window n^{o} 13 was installed and tested twice to see if the installation method had a significant effect on the noise isolation provided by the window. As can be seen on **graph A3-2** of **Annex III** the STC rating was the same in both cases, and only minor differences were noted between the 1/3 octave TL results of these two measurements.

The effect of the location of the stand-alone thermopanes inside the test opening was also determined prior to proceeding with tests n^{o} 1, 2, 3, 3A, 3B and 4 to 7. To that effect, tests were conducted with n^{o} 6 thermopane mounted in two different positions inside the

test opening, corresponding approximately to mid-depth and to a distance of 2" inside the test opening, when measured from the edge closest to the source room. **Graph A3-3** illustrates the installation of the thermopane in the test opening and the measurement results. Again the STC rating was the same in both cases, and only minor differences were noted between the 1/3 octave transmission loss curves.

4.4 COMPOSITION OF THE GLAZING

The airspace between the lights of glass composing the double glazed samples tested in this study varied from 9 mm to 108 mm. Most of the glazing samples tested consisted of thermopanes having an airspace varying from 13 to 19 mm, which is close to the 12 to 15 mm airspace recommended for optimal thermal performance. In addition to the thermal considerations, the thickness of the thermopanes was limited to fit the sash depth of standard casement windows which, based on the samples tested in the present study, varies from 46 mm (1 7/8") to 64 mm (2 1/2").

To evaluate the acoustical performance of different types of windows, the manufacturers were asked to supply their standard windows equipped with standard thermopanes. The manufacturers of casement windows were also asked to submit a window sample equipped with a thermopane composed of one 3 mm glass and one 6 mm glass, with the airspace varying between 13 and 16 mm depending of the overall width of the window sash.

The first nine samples tested (including three samples of thermopane n^{o} 3) which appear in **Table 1** are factory sealed thermopanes which measured 1200 mm x 1600 mm and were tested individually without being inserted in sashes or frames; most of these thermopanes had the same glazing composition as that of the thermopanes of the operable windows tested (tests n^{o} 8 to 16). The tests conducted on the stand-alone thermopanes were intended to determine the influence of the frame, the sash and the gaskets on the

acoustical performance of the operable windows. With the exception of test 3A and 3B, all the stand-alone thermopanes tested were constructed with a glued aluminum spacer which sealed the perimeter of the thermopane. Test 3A was conducted on a thermopane constructed with a hybrid neoprene/aluminum spacer, and test 3B on a thermopane built with a PVC spacer.

5.0 ANALYSIS OF RESULTS

A total of eighteen tests were conducted: nine on stand-alone double glazing thermopanes, and nine on different types of operable double glazed windows. The sound transmission class ratings of the stand-alone thermopanes tested varied from STC 25 to STC 34; those of the fully operable windows varied from STC 27 to STC 41.

As mentioned earlier, **Table 1** in the executive summary provides a summary of the results obtained, expressed in terms of Sound Transmission Class (STC); it also contains other useful information relative to the sealed thermopanes and operable windows tested such as the composition and the overall thickness of the glazing, and the cost and weight of the windows tested. The complete 1/3 octave Sound Transmission Loss (TL) data for each assembly tested appear in **Annex II** in the form of graphs and tables; each graph of **Annex II** also provides a sketch describing the dimensions and glazing composition of the window/ thermopane assembly tested.

5.1 STANDARD THERMOPANES

The thermopanes most often encountered in the construction industry are composed of two lights of 3 mm (1/8") glass separated by an airspace varying from 13 to 19 mm (1/2" to 3/4"). A spacer generally made of aluminum is installed at the perimeter and holds the lights of glass together while sealing the thermopane to prevent air and moisture infiltration.

.1 Depth of the airspace

Varying the air spacer of thermopanes from 13 to 19 mm resulted in an increase of 1 or 2 points of STC.

Graph 1 of **Annex I** illustrates the acoustical performance of thermopanes fabricated with two lights of 3 mm thick glass separated by 13 mm, 16 mm, and 19 mm airspaces. The calculated Mass-Air-Mass resonance (MAM) associated with each of these airspace depths are 272 Hz, 245 Hz and 225 Hz* respectively. It is this MAM resonance which is responsible for the sharp degradation of the transmission loss around 250 Hz which can be observed on **graph 1**. Above this frequency the sound transmission loss of the thermopanes increases with the depth of the airspace; below the MAM frequency one can observe the opposite trend where the thermopanes with the smaller airspace provides better sound isolation. This is mainly due to the order of occurrence of the Mass-Air-Mass resonance whose frequency is higher for a thinner airspace resulting in a shift of the transmission loss curve towards the high frequencies, which in turn results in higher transmission loss at frequencies ranging from 125 to 250 Hz. At 4000 Hz one observes a second sharp dip in the transmission loss curves due to the coincidence effect** (the critical frequency calculated for 3 mm glass is approximately 4247 Hz).

* Refer to **Table A-1** of **Annex I** for the Mass-Air-Mass (MAM) resonance calculated for all the glazing assemblies tested. The Mass-Air-Mass resonance is created by air trapped between two panels such as in a double glazed window. The frequency of this resonance is linked to the depth of the airspace and the mass of the panel or panes composing the assembly: the deeper airspace and the more massive the panels, the lower the MAM resonance frequency.

** The coincidence frequency is the frequency at which the wave length of bending waves in a glass pane matches that of the incident sound waves in the air. At this frequency, a noticeable drop in the transmission loss of the glass pane occurs. In a diffuse field the coincidence dip corresponds to the critical frequency which is governed essentially by the surface mass and internal damping of the pane. The critical frequencies calculated for the glazing of the thermopanes and windows tested in this study appear in **Tables A-1** of **Annex I**.

With the exception of the coincidence dip, the remarks of the above paragraph also apply to **graph 2** on which are plotted the sound transmission loss curves of the thermopanes made with one 3 mm and one 6 mm glass pane separated by airspaces of 13 mm and 16 mm. It is believed that the much less pronounced coincidence dip observed in curves plotted on **graph 2**, compared to that on **graph 1** is caused by the critical frequencies of the glass lights composing the thermopanes being at least one octave apart (4247 Hz for the 3 mm glass and 2123 Hz for the 6 mm glass).

.2 Thickness of the glass

The TL of thermopanes built with two lights of 3 mm glass and those of thermopanes built with one light of 3 mm and one light of 6 mm are compared on **graphs 3 and 4**. It can be seen clearly on both graphs that doubling the thickness of one light of glass increases the transmission loss of the thermopanes from 250 Hz to 1600 Hz resulting in a 5 to 7 points increase in the STC rating. These graphs also show that a thermopane made with panes of substantially different thicknesses provides better sound isolation at high frequency.

.3 Effect of the spacer used in factory sealed thermopanes

In a study conducted by David Quirt[1] around 1980 in the acoustical laboratory of the National Research Council of Canada, the influence of the aluminum spacer between the panes of factory sealed thermopanes was evaluated. **Graph 5** illustrates the data obtained by the NRCC for a glass assembly composed of two lights of 3 mm glass separated with a 6 mm airspace both with and without the

1 J.D. Quirt: Measurement of Sound Transmission Loss of Windows, Building Research note no 172, National Research Council of Canada, Ottawa, April 1981

presence of an aluminum spacer in the airspace at the perimeter of the sample tested. The transmission loss of the factory sealed glazing incorporating a spacer is inferior (by approximately 3 dB) for frequencies above the Mass-Air-Mass resonance, and its STC rating is also lower by 3 points.

To further determine the influence of spacers on the sound isolation provided by factory-sealed glass assemblies, thermopanes built with spacers made of different materials were tested in the present study. **Graph 6** illustrates the sound isolating performance of three thermopanes having identical composition except for the spacers which were reported by the manufacturer to be made of aluminum in the case of thermopane n^{o} 3, aluminum/ neoprene in the case of the thermopane 3A, and PVC in the case of thermopane 3B. As can be seen on **graph 6** the overall acoustical performance of the thermopanes did not change significantly as a function of the spacers used (STC 25 to 26) except for frequencies between 1600 Hz to 4000 Hz where the PVC spacer (3B) appeared to be slightly superior to the two others.

.4 Optimizing the sound isolating performance of the thermopanes destined to casement windows

Plotted on **graph 7** are the transmission loss curves of thermopanes having the following construction:

- Glass 3 mm - airspace 19 mm - glass 3 mm (thermopane n^{o} 1): STC 27
- Glass 3 mm - airspace 16 mm - glass 6 mm (thermopane n^{o} 4): STC 33
- Glass 6 mm - airspace 9 mm - glass 8 mm (thermopane n^{o} 6): STC 34

These three thermopanes have a thickness varying between 23 mm and 24.5 mm

and are therefore thin enough to be easily inserted in the sashes of aluminum, wood or PVC casement windows. The highest STC rating was achieved by thermopane n^{o} 6 which is the most massive thermopane (146 lbs) and that with the thinnest airspace 9 mm (3/8"). However, at high frequency, the sound isolation provided by thermopane n^{o} 6 is inferior to the thermopane n^{o} 4 presumably because the critical frequencies of the panes of glass composing thermopane n^{o} 6 are not spaced one octave apart.

5.2 SEALED THERMOPANES VS OPERABLE WINDOWS

Most of the transmission loss data available for windows is presented as if the glazing composition was the only factor influencing the sound isolation they provide. One of the objectives of this study was to compare the acoustical performance of the glazing alone with that of operable windows complete with frames, sashes and gaskets. To achieve this, the sound isolation provided by stand-alone thermopanes samples measuring 1200 mm x 1600 mm sealed in place was compared with the sound isolation of operable windows also measuring 1200 mm x 1600 mm constructed with thermopanes having the same composition as the stand-alone thermopanes. In the case of casement and double hung sash windows, the operable windows were constructed with two thermopanes, whose area corresponded to approximately one half of the test opening and which were mounted in one fixed and one operable sash; horizontal sliding windows were constructed with four operable sashes. Refer to **graphs A2-1 to A2-16** of **Annex II** for sketches of the thermopanes and windows tested.

.1 <u>Casement windows</u>

For the casement windows studied, the overall sound isolation of the windows is 2 to 3 points of STC greater than the stand-alone thermopanes. In the case of the aluminum windows (**graphs 8 and 9**) their transmission loss is superior to the stand-alone thermopanes for all but the 160 and 200 Hz frequencies. In the case

of the wood and PVC windows (**graphs 10 and 11**), the performance of the windows is superior to that of the thermopanes from 250 Hz to 1000 Hz, the frequency range beyond which the TL of the thermopane alone begins to be superior to that of the window. The lesser sound isolation provided by the window above 1000 Hz compared to a stand-alone thermopane could be due to a possible infiltration through the gaskets at the perimeter of the operable sash, or to a sash construction which provides less sound isolation than the thermopane itself at these frequencies. The reason for which the overall sound isolation of the windows expressed in terms of STC was better than that of the stand-alone thermopane has yet to be determined by more research.

.2 **Double hung sash windows**

For identical glazing composition sash window n^{o} 16 provided a sound isolation superior by 1 point of STC compared with thermopane n^{o} 3, which is less than the increase observed with casement windows. **Graph 12** compares the TL of stand-alone thermopane n^{o} 3 to sash window n^{o} 16. The sash window provides a higher TL for frequencies ranging from 315 Hz to 1250 Hz; below this range, the TL of the window is virtually identical to that of the thermopane; above this range the performance of the thermopane is superior, presumably due to leaks through the gaskets between the sliding sash and the frame of the window or to a sash construction which provides less sound isolation than the thermopane itself at these frequencies.

.3 **Horizontal sliding windows**

The STC rating of the PVC sliding window is identical to that of the thermopane n^{o} 7 having similar glazing composition (STC 32). In the case of the PVC sliding window n^{o} 15, **graph 13** shows that the 1/3 octave band TL of the thermopane is generally superior to that of the sliding window with the exception of the

coincidence frequency for which the dip in the TL curve of the thermopane is very pronounced. This suggests sound infiltration through the joints at the junction of the sashes themselves and between the sashes and the perimeter frame.

5.3 COMPARISON BETWEEN WINDOWS MADE OF DIFFERENT MATERIALS

It is a popular but erroneous belief amongst construction professionals, that the sound isolation properties of PVC and wood windows are superior than that of aluminum windows (because it is assumed that wood and PVC "carry less sound than metal"). The sound isolation properties of similar types of windows made of different materials are compared in the following paragraphs. The comparisons made in this section are intended to demonstrate that it is a combination of factors such as glazing composition, sash composition, gasket efficiency, etc. which influences the acoustical performance of a window rather than just the material of the window frame and sash.

.1 Casement windows

The acoustical performances of aluminum, PVC and wood windows are plotted on attached **graph 14** for windows built with a standard thermopane made of two lights of 3 mm glass, and on **graph 15** for windows built with a thermopane made of 3 mm and 6 mm glass. The STC ratings obtained varied by two points of STC depending of the material used in the construction of the sashes: the aluminum window provided the highest sound isolation with ratings of STC = 30 and STC = 35, followed by the wood window (STC = 29 and STC = 34) and by the PVC window which ranked last (STC = 28 and STC = 33). The better sound isolation performance of aluminum windows is quite noticeable on **graphs 14 and 15** for all frequencies above 200 Hz. The thicker airspace inside the thermopane of the aluminum window is probably responsible for the superior STC rating of this window and partly responsible for the higher 1/3 octave band TL it provides. Comparing the sound transmission loss curves of the windows suggests that the

seals and/or sash composition of the aluminum window could be responsible for its better sound isolation performance especially at mid and high frequencies; this however should be confirmed by further research.

.2 Horizontal sliding windows

Graph 16 compares the acoustical performance of aluminum sliding window n° 14 (glass: 3 mm, airspace: 108 mm, glass: 3 mm) and PVC sliding window n° 15 (glass: 5 mm, airspace: 34 mm, glass: 5 mm). The transmission loss curves on **graph 16** show that the aluminum window n° 14 provides an average sound transmission loss performance 7 to 10 dB superior to that of the PVC window n° 15 for most frequencies and a STC rating superior by 9 points (STC 41 vs 32). The STC obtained for the aluminum window is consistent with that measured by the NRCC on a similar glass composition during the previously mentioned window study. Also, based on the same study, the more massive the panes of glass of the PVC window should have counteracted the smaller space between its panes compared to the aluminum window, and should have resulted in an STC rating close to 40 instead of 32. The lower than expected performance of the PVC window n° 15 can not be explained without further research.

5.4 COMPARISON BETWEEN DIFFERENT TYPES OF WINDOWS MADE OF SAME MATERIAL

1. Aluminum windows

The performance of sliding (window n° 14) and casement (window n° 11) aluminum windows are compared on **graph 17**. The sliding window composed of 3 mm glass separated by a 108 mm air spacer provides a sound isolating performance (STC 41) clearly superior to that of the casement window whose glazing is composed of one 3 mm pane and a 6 mm pane of glass separated with a 16 mm airspace (STC 35). In addition to being more economical, the aluminum

sliding window provides better noise isolation and is the better choice for buildings located in noisy urban environments.

.2 **PVC windows**

As can be seen on **graph 18** the acoustical performance of the PVC sliding window STC 32 (GL 5 mm - AS 34 mm - GL 5 mm) is virtually identical to the PVC casement window STC 33 (GL 3 mm - AS 13 mm - GL 6 mm).

5.5 COST VS SOUND ISOLATION

.1 Based on the net costs provided by VIMAT, the supplier of the windows tested, improving the acoustical performance of casement windows by a substantial 6 STC points represents an increased cost of approximately 13% for the aluminum windows, 6.3% for the PVC windows, and 8.5% for the wood window.

.2 Based on the net costs provided by VIMAT, it also appears that the casement window which offers the best cost vs acoustical performance ratio is the wood window, followed by the PVC window and the aluminum window.

.3 For horizontal sliding windows the cost of aluminum window is approximately 50% higher than the PVC sliding window. However, the aluminum window offers a very superior sound isolation and should be preferred to the PVC window in noisy environments.

.4 The aluminum sliding window is 17% to 48% cheaper than the casement windows equipped with glazing composed of one 3 mm and one 6 mm pane, but provides a STC rating 6 to 8 points superior.

5.6 COMPARING THE RESULTS OF THIS STUDY WITH THOSE FROM THE NRCC[1] STUDY

On attached **graphs 19 to 31**, the results obtained in the present study are compared to those obtained in the previously mentioned study on the sound isolation provided by glazing conducted by the NRCC in the late 70's / early 80's. In the NRCC study, the glazing tested was mounted and sealed to three 40 mm thick wood frames which in turn were mounted in the test opening and sealed to it. In most instances, the sound transmission loss of the windows and the thermopanes tested in the current study are lower than those measured by the NRCC for equivalent glass compositions. For identical or comparable glazing composition, the STC ratings measured by the NRCC are:

- 5 to 8 points higher than the STC ratings measured on the factory sealed stand-alone thermopanes (measurements n^{o} 1 to 7);

- 1 to 4 points higher than the casement windows (measurements n^{o} 8 to 13) and between 0 to 8 points higher than the STC measured on sliding and double hung sash windows.

The casement and sliding aluminum windows were those whose performance was closest to the sealed windows tested at NRCC (see **graphs 23, 26 and 29**).

In the case of PVC sliding window n^{o} 15 (**graph 30**) or wooden sash window n^{o} 16 (**graph 31**), the difference between the data obtained in this study and that measured by the NRCC is quite noticeable especially at high frequencies

1 J.D. Quirt: Measurement of Sound Transmission Loss of Windows, Building Research note no 172, National Research Council of Canada, Ottawa, April 1981**.**

The differences noted between the sound transmission loss data published by the NRCC and that reported in these pages can be partly explained by the fact that the measurements of the present study were conducted on fully operable windows constructed with factory sealed thermopanes incorporating an aluminum spacer while in the case of the NRCC measurements, the double glazing samples were mounted in wood frames sealed to the perimeter of the test opening, and there were no spacer between the glass panes.

6.0 CONCLUSIONS

6.1 The Sound Transmission Class (STC) of the nine stand-alone thermopanes tested in this study varied from STC 25 to STC 34. The STC measured on casement windows, horizontal sliding windows, and double hung sash windows varied from STC 27 to STC 41.

6.2 Sealed thermopanes with a deeper airspace provide a higher STC rating and a higher sound Transmission Loss (TL) for frequencies above the Mass-Air-Mass resonance.

6.3 Doubling the thickness of one of the glass panes composing the double-glazing thermopanes increased the STC by approximately 6 points. Also, for thermopanes constructed with an unbalanced construction (one 3 mm and one 6 mm glass), the coincidence dip in the TL curve is much less pronounced, resulting in better sound isolation at high frequencies. To reduce significantly the coincidence dip however, the mass of one pane must be at least twice the mass of the other pane.

6.4 A study conducted from 1978 to 1981 on the transmission loss of windows by the NRCC indicated that factory sealed thermopanes incorporating an aluminum spacer between the panes provided inferior sound transmission loss when compared to glazing of similar

composition with no spacer. In the present study three factory sealed thermopanes constructed with spacers made of different materials (aluminum, PVC, and aluminum/neoprene) were tested and were found to provide equivalent STC and TL.

6.5 The STC rating of 1200 mm x 1600 mm casement windows was approximately 3 points higher than the STC rating measured on 1200 mm x 1600 mm stand-alone thermopanes with same glazing composition, sealed in the test opening. In the case of the double hung sash window, the increase in performance compared to the stand-alone thermopane is 1 point of STC. The reason for these increases have yet to be determined with further research.

6.6 Casement windows built with aluminum, wood, and PVC constructed with identical glazing provided similar sound isolation performance with STC ratings varying by 2 points. The maximum sound transmission class measured on casement windows was achieved by an aluminum window (STC 35), equipped with a double glazed thermopane composed of one 3 mm glass and one 6 mm glass with a 16 mm airspace, followed by the wood (STC 34) and PVC (STC 33) thermopane windows with panes of equal thickness separated by a 13 mm airspace instead of 16 mm. The deeper airspace in the thermopane of the aluminum window is probably responsible for the superior STC rating and partly responsible for the higher 1/3 octave TL values provided by this window. However, comparing the sound transmission loss curves of the aluminum, PVC and wood windows suggests that the seals and the sash composition of the aluminum window could also be responsible for the better sound isolation performance of this window at mid and high frequencies.

6.7 The casement window which offers the best ratio cost/sound-isolation is the wood window followed by the PVC window and, in last position, the aluminum window.

6.8 Combining the maximum STC rating obtained on a stand-alone thermopane measured in the present study (thermopane n^{o} 6) with the maximum STC rating measured on casement windows (aluminum window n^{o} 11), it appears that STC 37 would be the maximum rating which could be obtained from an operable casement window equipped with a 25 mm (1") thick thermopane.

6.9 The aluminum sliding window provides very superior sound isolation when compared to a PVC sliding window (STC 41 vs STC 32). Based on the previously mentioned NRCC study on windows, the STC rating of these two windows should have been in the same range (STC 40). Further research is required to explain the poor performance of the PVC horizontal sliding window.

The aluminum horizontal sliding window ranked first in terms of acoustical performance, and seventh in terms of price. This window appears particularly well adapted for low cost residential projects located in noisy environments.

6.10 Acousticians and construction professionals must be careful when selecting windows destined for buildings located in noisy environments. They should not rely solely on glazing composition to determine the sound isolation performance of operable windows. They must be aware that factory sealed thermopanes can have a significantly lower sound transmission loss than that published for glazing samples of apparently identical composition but whose perimeter is not factory sealed using a standard aluminum spacer. In addition, the sound isolation efficiency of the gaskets at the perimeter of operable window sashes seems to vary substantially with the type of window considered. For casement windows and aluminum sliding windows, the present study indicates that a degradation of approximately 3 points of STC could exist between the acoustical performance of an operable casement window and the data published by the NRCC for a sealed window having the same glazing composition (This is consistent with the

predictions of David Quirt the author of the NRCC study). In the case of PVC sliding windows and in the case of sash windows however, the results of this study indicate that this degradation could be more substantial and reach 8 points of STC.

6.11 This research was a preliminary attempt to determine the effect of glazing size, gaskets, frame and sash composition of operable windows on their sound isolation performance. Further research is required to confirm some of its findings.

Respectfully submitted March 4, 1997
and revised March 21st, 1997
MJM ACOUSTICAL CONSULTANTS INC., by

Michel Morin, OAQ, ASA
President and principal consultant

ANNEX I

CRITICAL FREQUENCY AND M-A-M RESONANCE OF THERMOPANES AND WINDOWS

Description	Thickness of glass No 1 (mm)	Air space (mm)	Thickness of glass No 2 (mm)	Critical frequency of glass No 1 (Hz)	Critical frequency of glass No 2 (Hz)	M-A-M Frequency (Hz)
Thermopane No 1	3	19	3	4247	4247	225
Thermopane No 2	3	16	3	4247	4247	245
Thermopane No 3	3	13	3	4247	4247	272
Thermopane No 4	3	16	6	4247	2123	212
Thermopane No 5	3	13	6	4247	2123	235
Thermopane No 6	6	9	8	2123	1593	216
Thermopane No 7	5	38	5	2548	2548	123
Window No 8	3	19	3	4247	4247	225
Window No 9	3	16	3	4247	4247	245
Window No 10	3	16	3	4247	4247	245
Window No 11	3	16	6	4247	2123	212
Window No 12	3	13	6	4247	2123	235
Window No 13	3	13	6	4247	2123	235
Window No 14	3	108	3	4247	4247	94
Window No 15	5	34	5	2548	2548	130
Window No 16	3	13	3	4247	4247	272

Critical frequency: $Fc=c^2/[1.8*cl*t]$

c: speed of sound in the air: 340 m/s

t: thickness of material (m)

cl: speed of sound in material; for glass: $cl=\sqrt{E/\rho(1-\nu^2)}=5160 m/s$

E: Young modulus: 6.1 10^{10} N/m^2

ρ: density of material: 2500 kg/m^3

ν: Poisson ratio: 0.3

M-A-M frequency: $F_{MAM}=60\sqrt{(t_1+t_2)/d\rho t_1 t_2}$

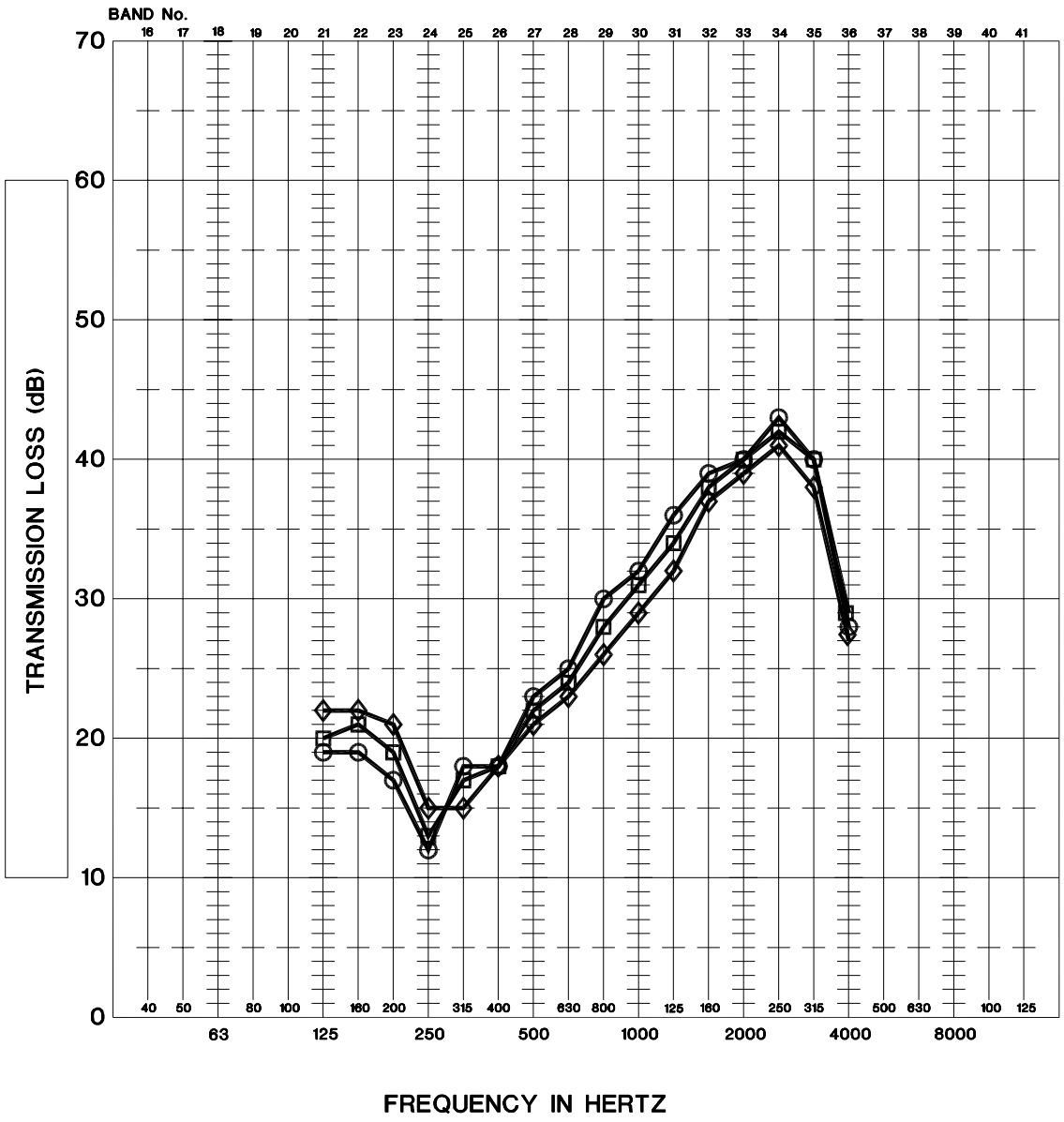
t_1, t_2: thickness of glass No1 and No2 (m)

d: air space (m)

ρ: density of material (kg/m^3)

TABLE A1

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

THERMOPANES ARE COMPOSED OF TWO 3 mm THICK GLASSES:

STC 27
THERMOPANE No 1
AIR SPACE: 19 mm

STC 26
THERMOPANE No 2
AIR SPACE: 16 mm

STC 26
THERMOPANE No 3
AIR SPACE: 13 mm

PROJECT DESCRIPTION

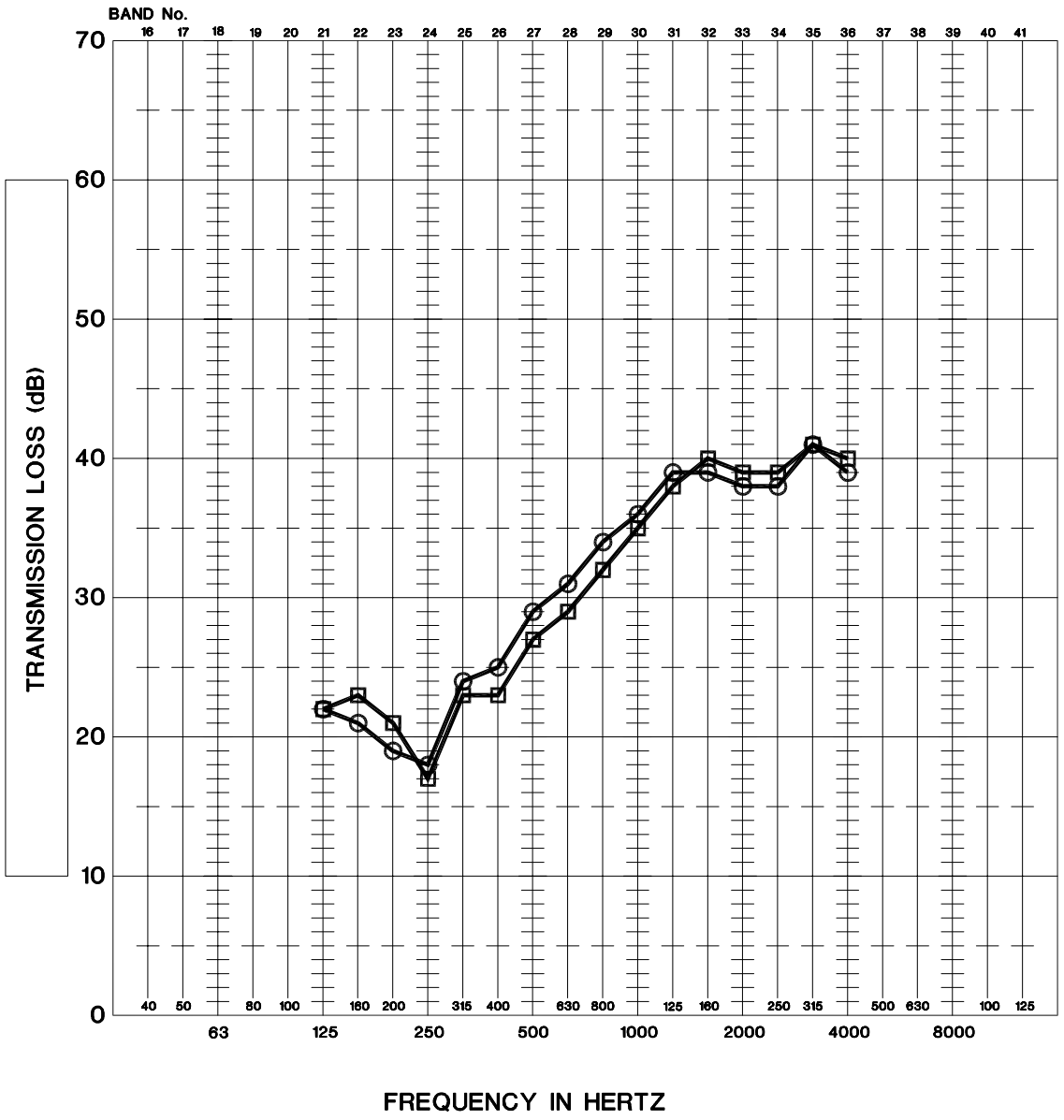
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF THE DEPTH OF THE AIR SPACE ON THE TRANSMISSION LOSS OF THERMOPANES

GRAPH NUMBER 1	**FILE NAME:** 177COMP1
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

THE THERMOPANES ARE COMPOSED OF ONE 3 mm AND ONE 6 mm THICK GLASS:

STC 33
THERMOPANE No 4
AIR SPACE: 16 mm

STC 31
THERMOPANE No 5
AIR SPACE: 13 mm

PROJECT DESCRIPTION

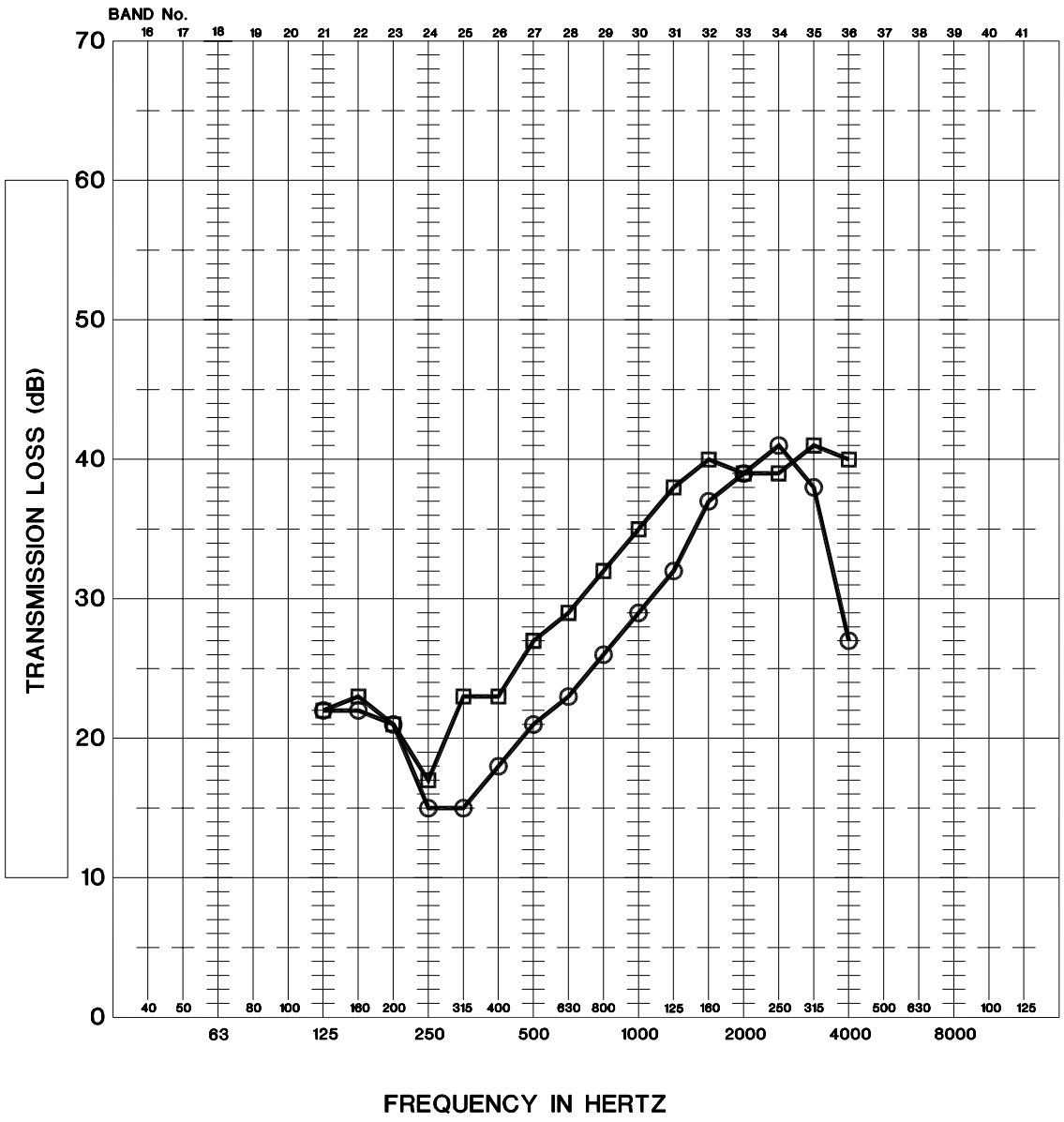
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF THE DEPTH OF THE AIR SPACE ON THE TRANSMISSION LOSS OF THERMOPANES

GRAPH NUMBER 2	**FILE NAME:** 177COMP7
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

GLASSES OF THERMOPANES ARE SEPARATED BY AN AIR SPACE OF 13 mm:

STC 31
THERMOPANE No 5
GL: 3mm; AS: 13mm; GL: 6mm

STC 26
THERMOPANE No 3
GL: 3mm; AS: 13mm; GL: 3mm

PROJECT DESCRIPTION

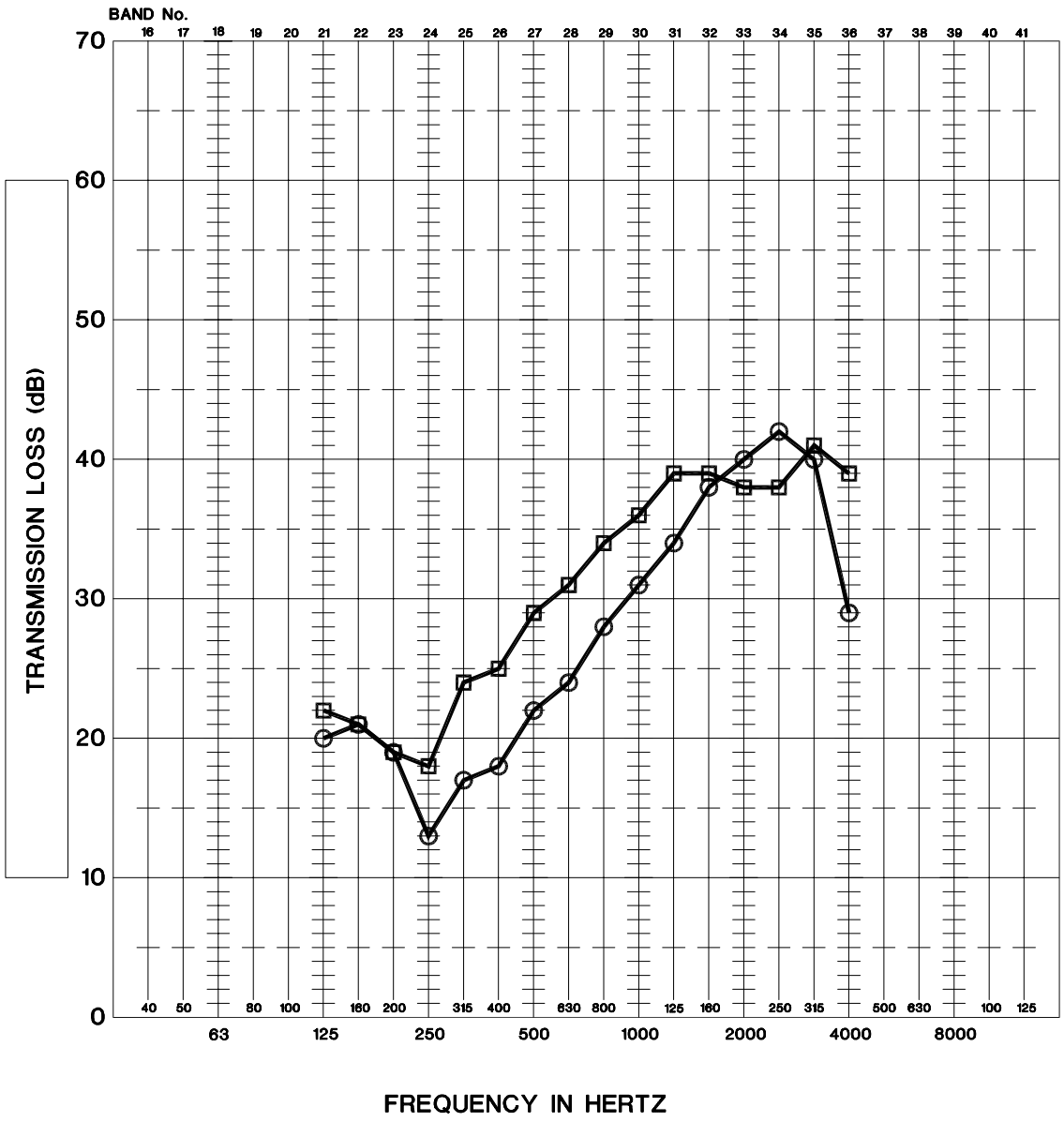
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF GLASS THICKNESS ON THE TRANSMISSION LOSS OF THERMOPANES

GRAPH NUMBER 3	**FILE NAME:** 177COMP6
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

GLASSES OF THERMOPANES ARE SEPARATED BY AN AIR SPACE OF 16 mm:

STC 33
THERMOPANE No 4
GL: 3mm; AS: 16mm; GL: 6mm

STC 26
THERMOPANE No 2
GL: 3mm; AS: 16mm; GL: 3mm

PROJECT DESCRIPTION

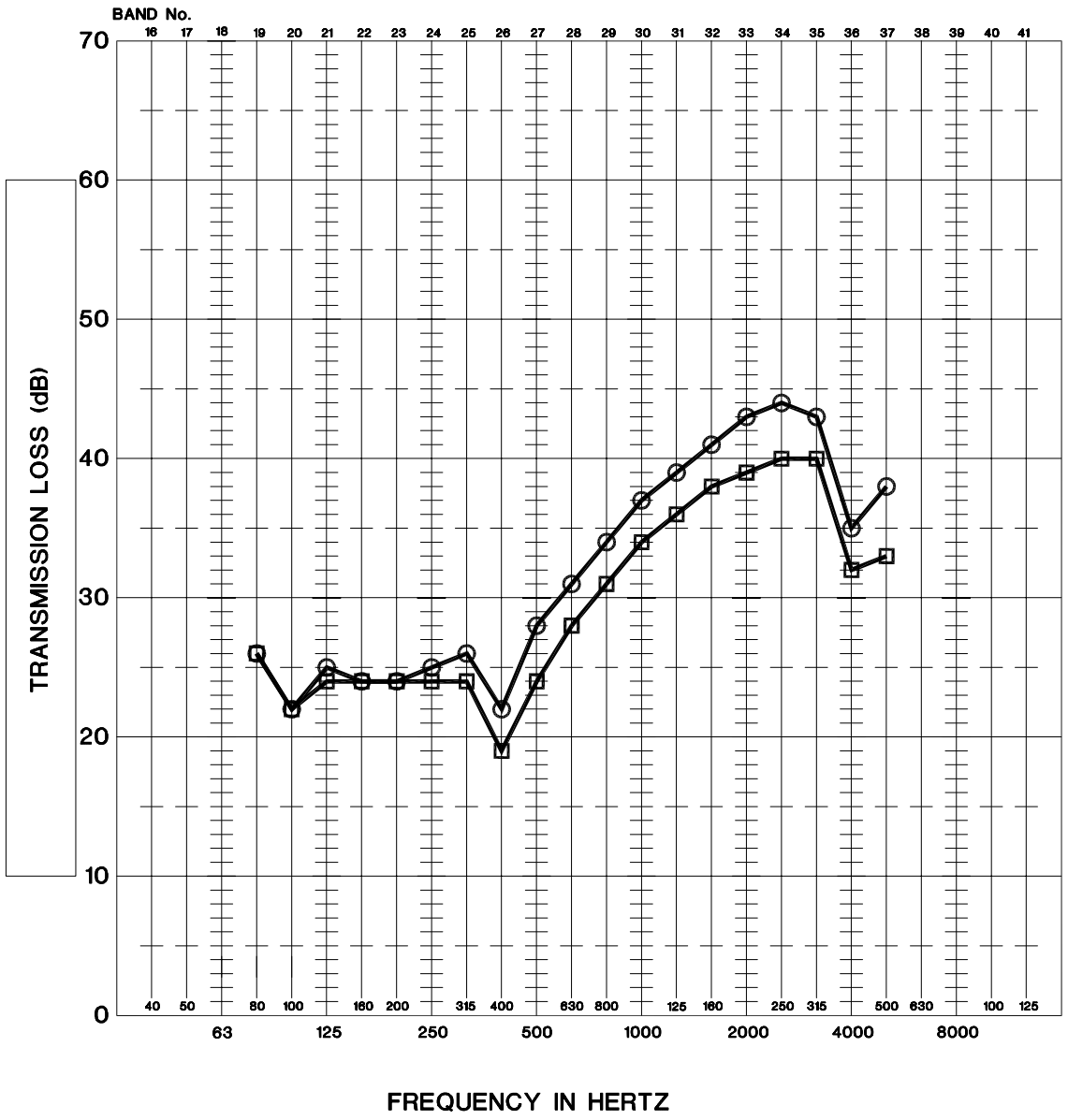
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF GLASS THICKNESS ON THE TRANSMISSION LOSS OF THERMOPANES

GRAPH NUMBER 4	**FILE NAME:** 177COMP5
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

NOTE: THE WINDOWS TESTED @ CNRC WERE MOUNTED IN A 40 mm THICK WOOD FRAME

STC 31
CNRC: GL3_AIR6_GL3

STC 28
CNRC: GL3_AIR6_GL3, SPACER ALUMINIUM

PROJECT DESCRIPTION

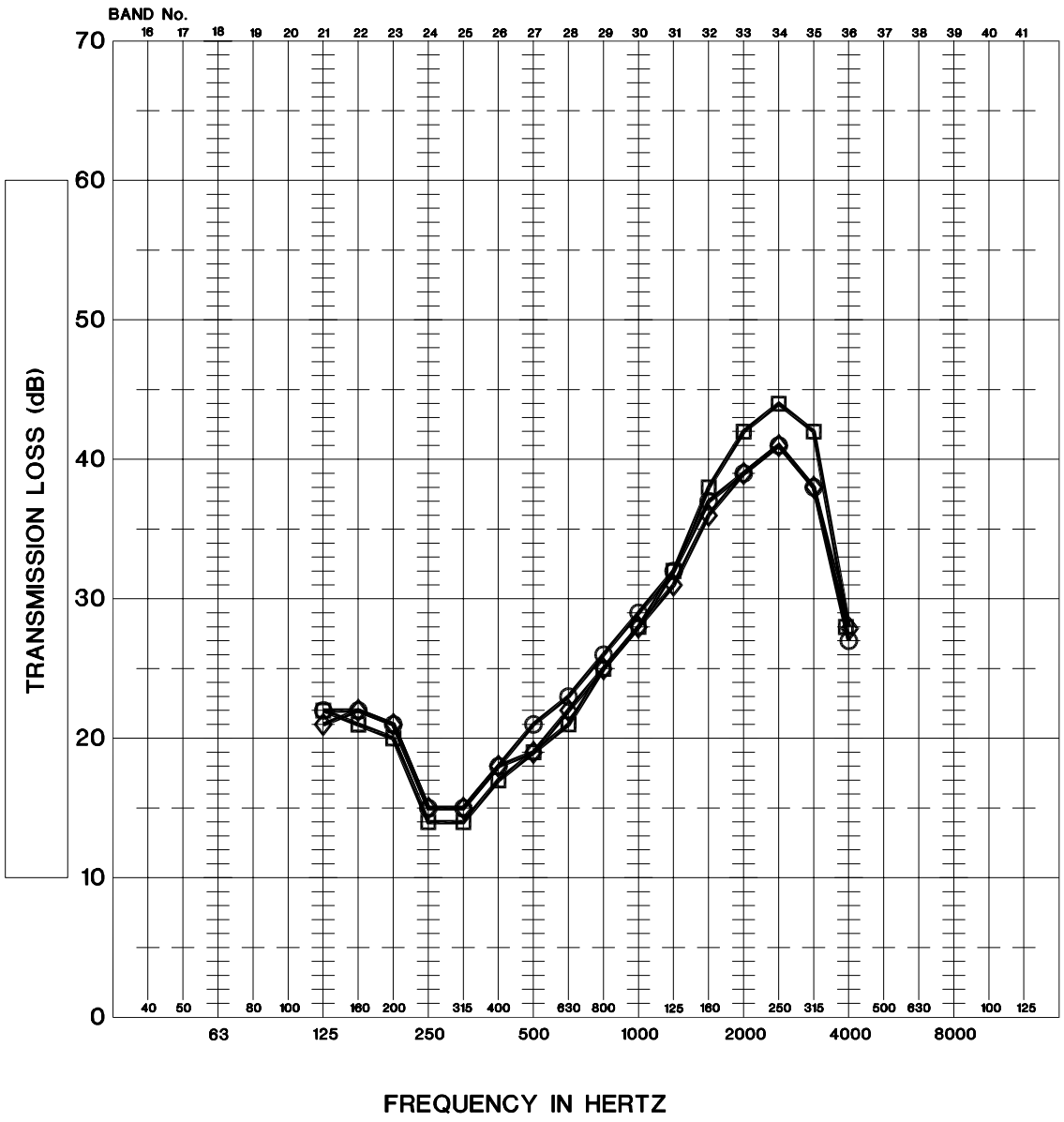
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

EFFECT OF ADDING AN ALUMINIUM SPACER BETWEEN TWO LIGHTS OF GLASS

GRAPH NUMBER 5	**FILE NAME:** 177CP-17
PROJECT NUMBER 177931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

THERMOPANES ARE COMPOSED OF TWO 3 mm WIDTH GLASSES WITH AN AIR SPACE OF 13 mm

STC 26
THERMOPANE No 3
ALUMINIUM SPACER

STC 25
THERMOPANE No 3A
ALUMINIUM SPACER WITH NEOPRENE STRIPS

STC 25
THERMOPANE No 3B
PVC SPACER

PROJECT DESCRIPTION

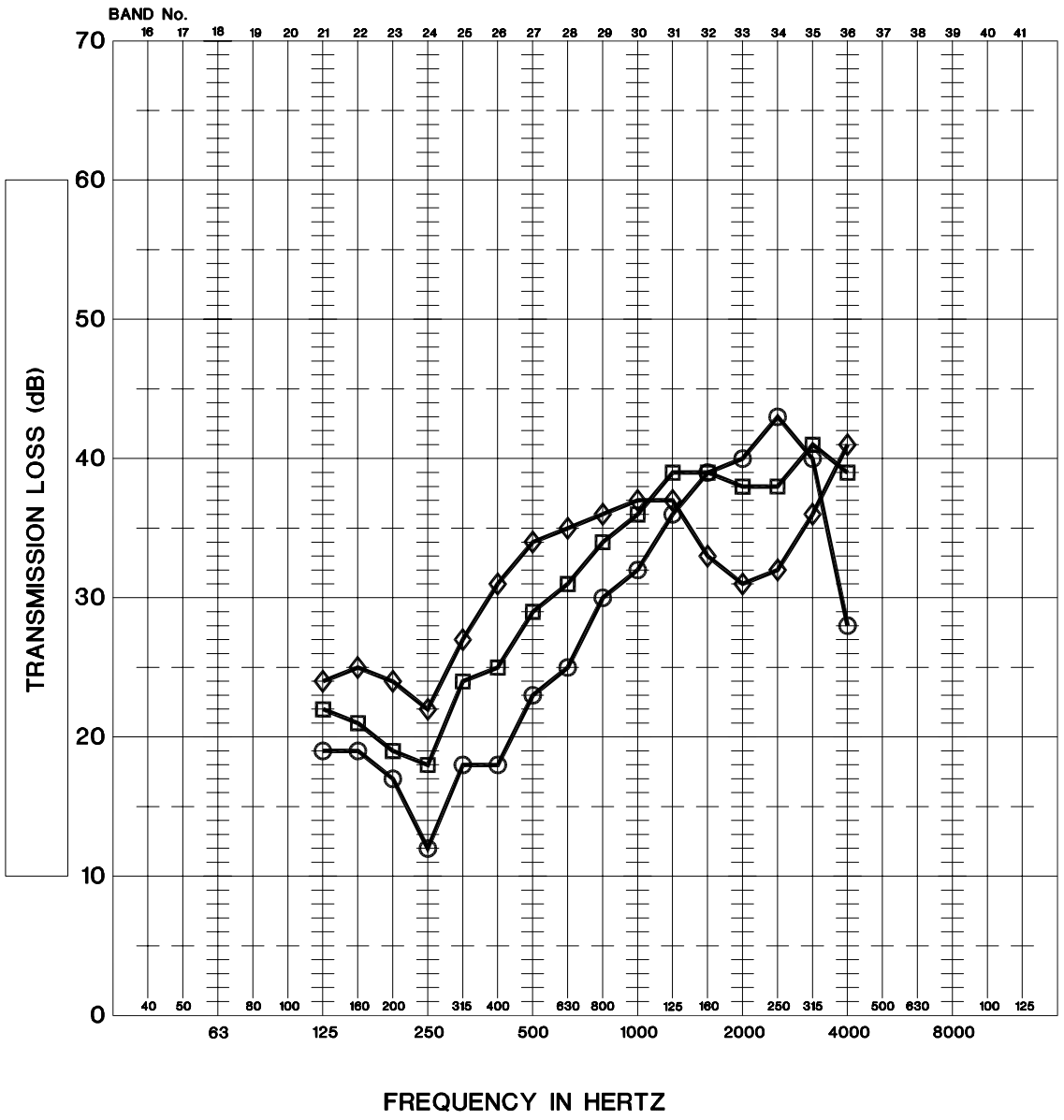
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

EFFECT OF THREE TYPES OF SPACER ON THE TRANSMISSION LOSS OF THERMOPANES

GRAPH NUMBER 6	**FILE NAME:** 177CMP13
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 34
THERMOPANE No 6
GL: 6mm; AS: 9mm; GL 8mm

STC 33
THERMOPANE No 4
GL: 3mm; AS: 16mm; GL: 6mm

STC 27
THERMOPANE No 1
GL: 3mm; AS: 19mm; GL: 3mm

PROJECT DESCRIPTION

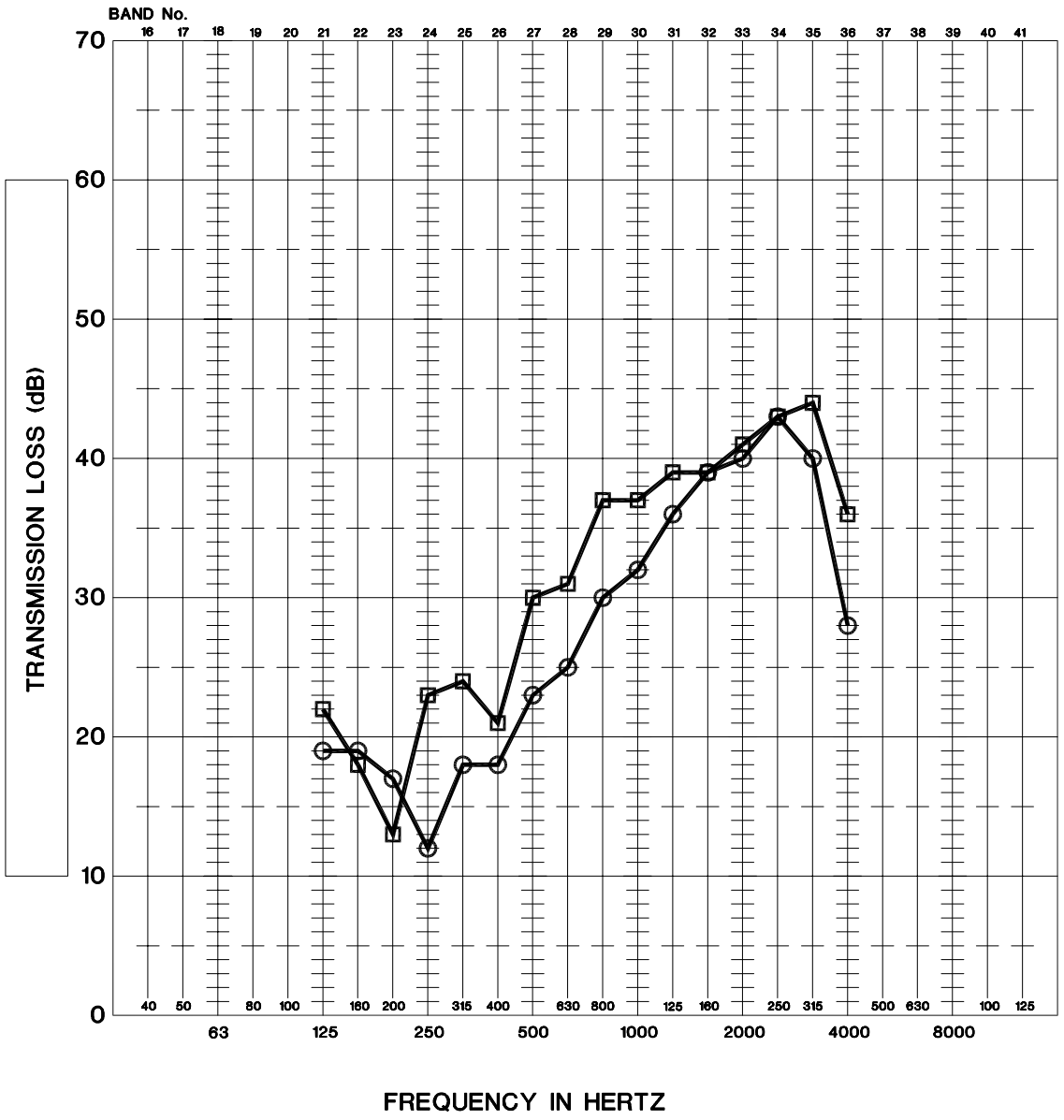
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

EFFECT OF THE MASS OF THERMOPANES OF EQUIVALENT THICKNESS ON THEIR TRANSMISSION LOSS

GRAPH NUMBER 7	**FILE NAME:** 177CMP14
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

– THERMOPANE No 1 VERSUS ALUMINIUM WINDOW No 8

STC 30
THERMOPANE No 1 AS PART OF ALUMINIUM CASEMENT WINDOW No 8

STC 27
THERMOPANE No 1 SEALED IN THE TEST OPENING
GL: 3mm; AS: 19mm; GL: 3mm

PROJECT DESCRIPTION

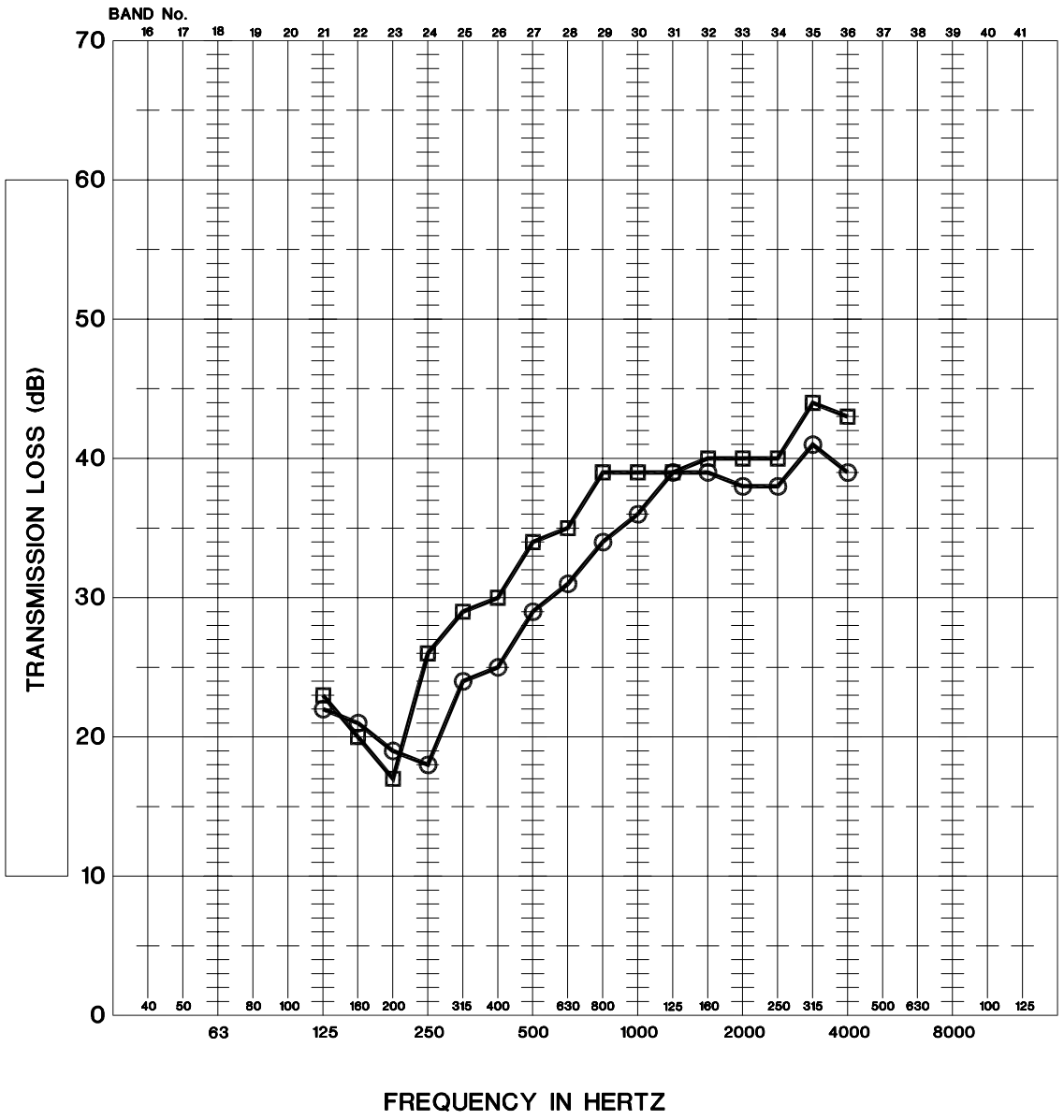
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF WINDOW FRAME ON THE ACOUSTICAL PERFORMANCE OF THERMOPANES

GRAPH NUMBER 8	**FILE NAME:** 177COMP2
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

– THERMOPANE No 4 VERSUS ALUMINIUM CASEMENT WINDOW No 11

STC 35
THERMOPANE No 4 AS PART OF ALUMINIUM CASEMENT WINDOW No 11

STC 33
THERMOPANE No 4 SEALED IN THE TEST OPENING
GL: 3mm; AS: 16mm; GL: 6mm

PROJECT DESCRIPTION

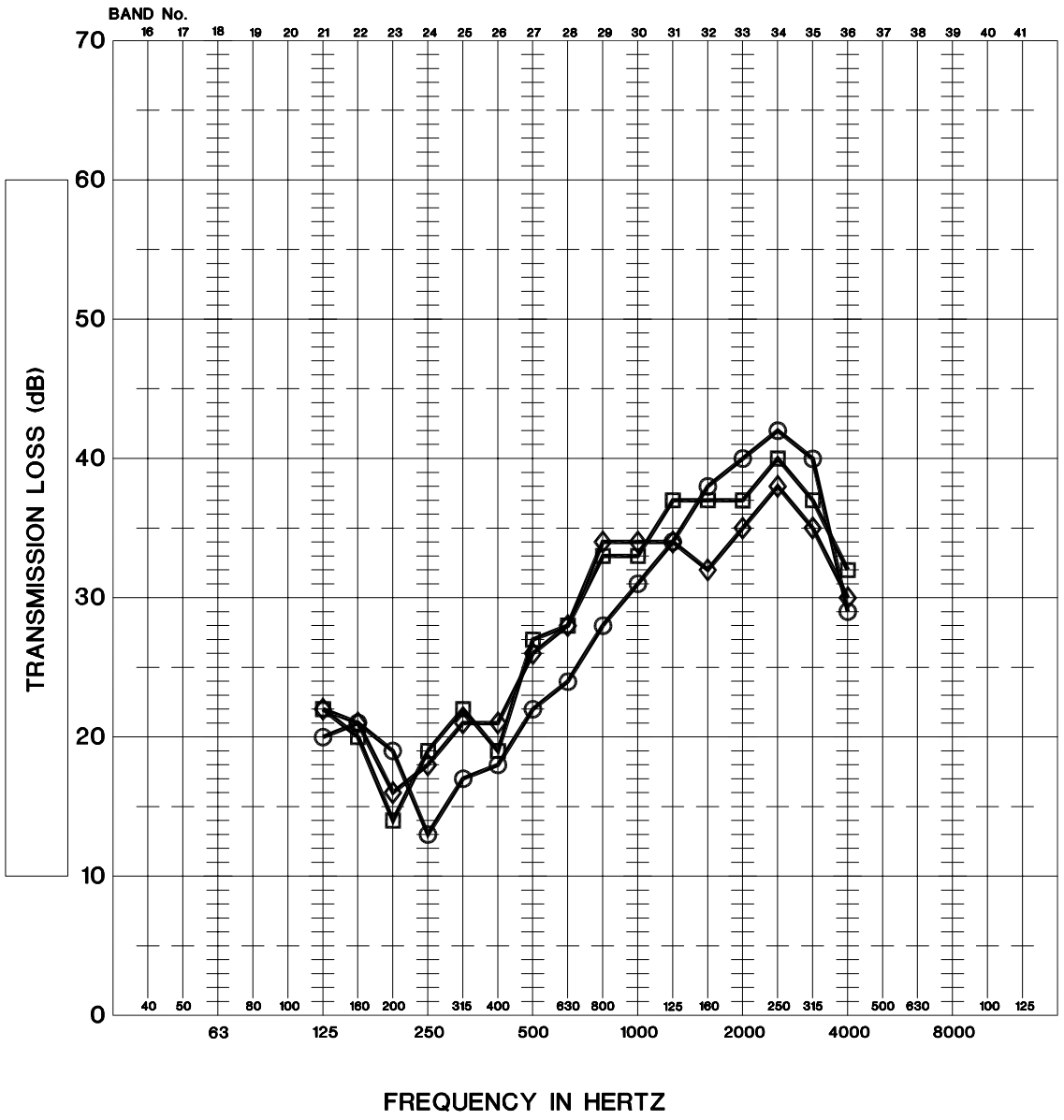
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF WINDOW FRAME ON THE ACOUSTICAL PERFORMANCE OF THERMOPANES

GRAPH NUMBER 9	**FILE NAME:** 177CMP12
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

— THERMOPANE No 2 VERSUS WOOD AND PVC WINDOWS No 9 AND 10

STC 29
THERMOPANE No 2 AS PART OF WOOD CASEMENT WINDOW No 10

STC 28
THERMOPANE No 2 AS PART OF PVC CASEMENT WINDOW No 9

STC 26
THERMOPANE No 2 SEALED IN THE TEST OPENING
GL: 3mm; AS: 16mm; GL: 3mm

PROJECT DESCRIPTION

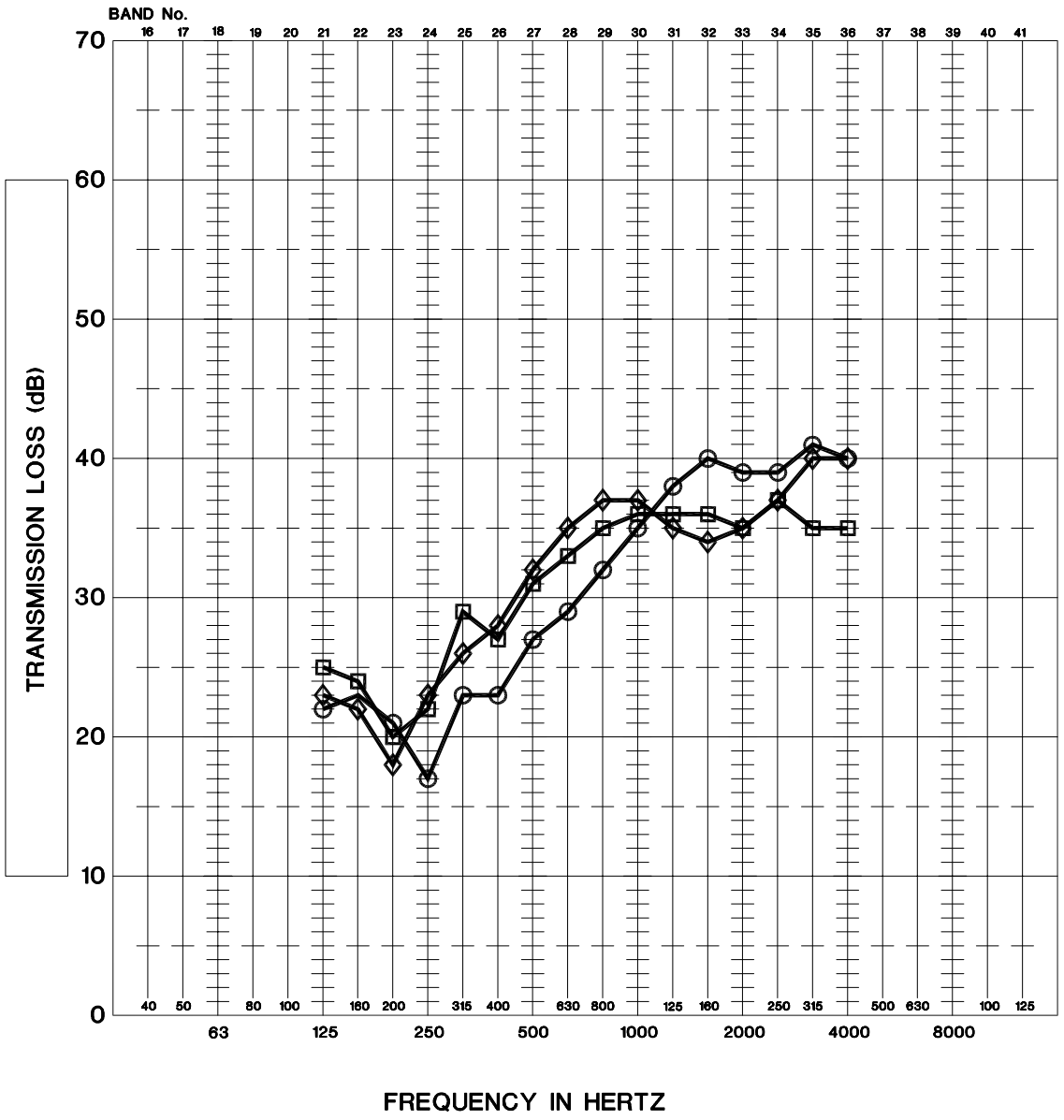
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF WINDOW FRAME ON THE ACOUSTICAL PERFORMANCE OF THERMOPANES

GRAPH NUMBER 10	**FILE NAME:** 177CMP11
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

– THERMOPANE No 5 VERSUS WOOD AND PVC CASEMENT WINDOWS No 12 AND 13

STC 34
THERMOPANE No 5 AS PART OF WOOD CASEMENT WINDOW No 13

STC 33
THERMOPANE No 5 AS PART OF PVC CASEMENT WINDOW No 12

STC 31
THERMOPANE No 5 SEALED IN THE TEST OPENING
GL: 3mm; AS: 13mm; GL: 6mm

PROJECT DESCRIPTION

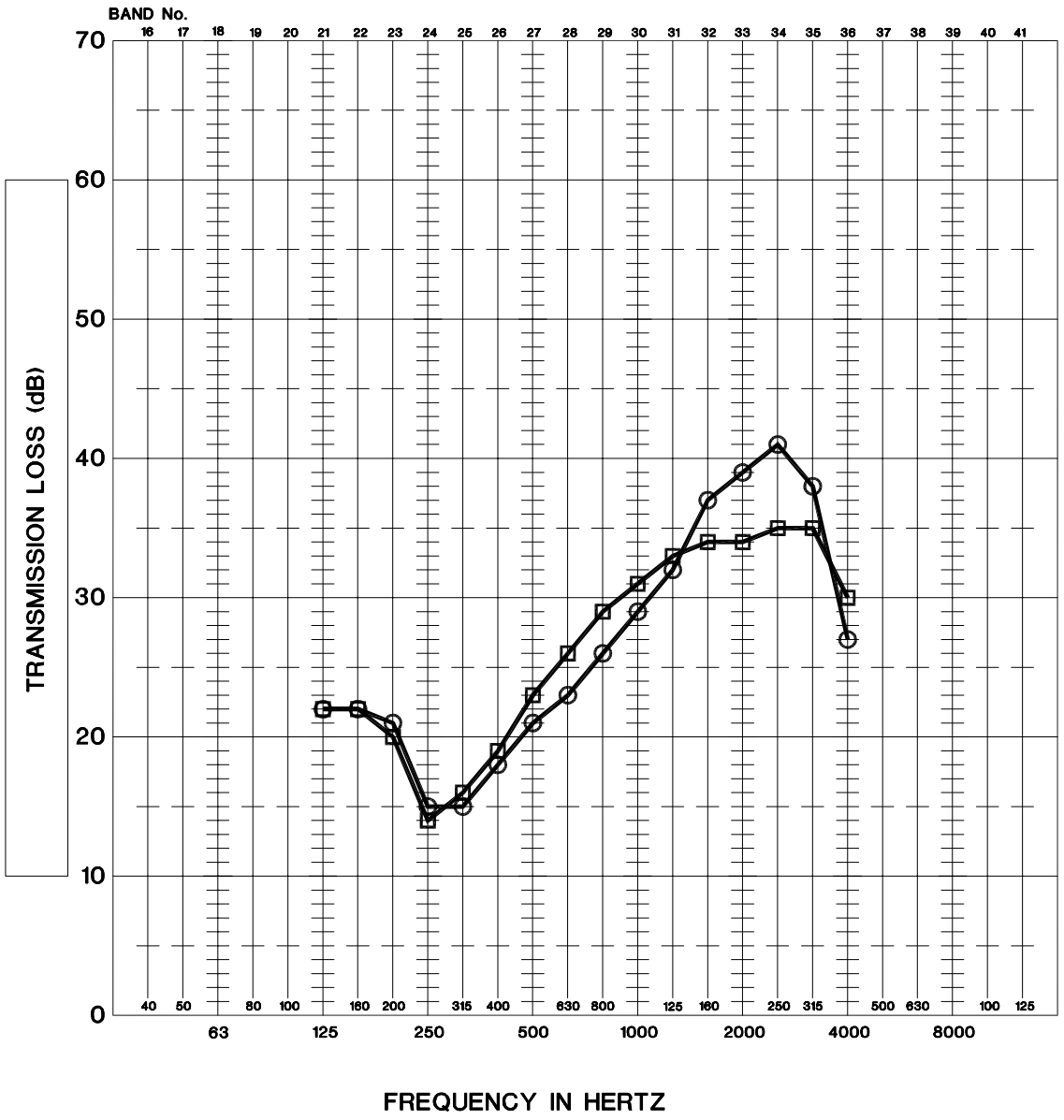
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF WINDOW FRAME ON THE ACOUSTICAL PERFORMANCE OF THERMOPANES

GRAPH NUMBER 11	**FILE NAME:** 177CMP10
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

— THERMOPANE No 3 VERSUS SASH WINDOW No 16

STC 27
WOOD SLIDING WINDOW No 16 WITH AN IDENTICAL COMPOSITION AS THERMOPANE No 3

STC 26
THERMOPANE No 3 SEALED IN THE TEST OPENING
GL: 3mm; AS: 13mm; GL: 3mm

PROJECT DESCRIPTION

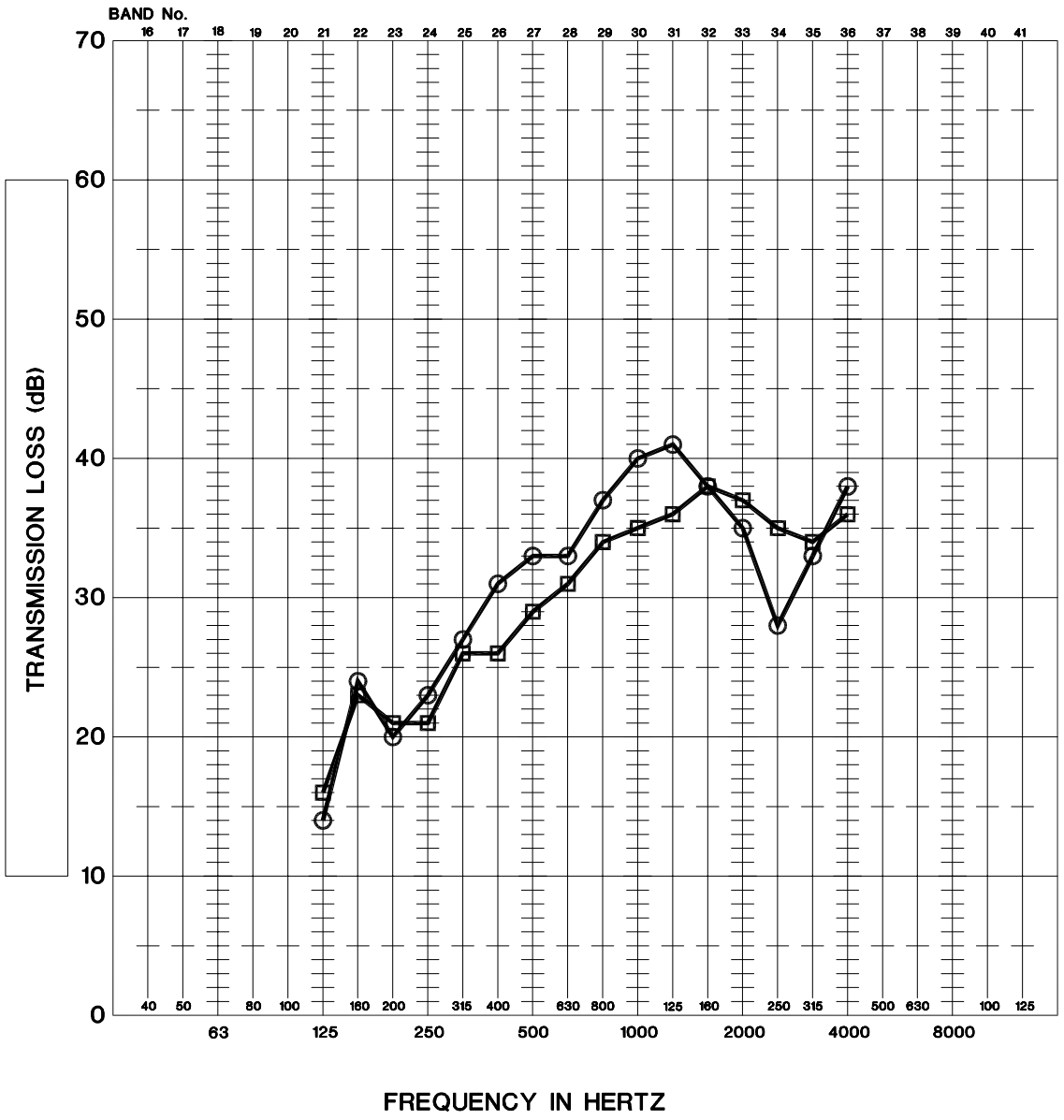
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF WINDOW FRAME ON THE ACOUSTICAL PERFORMANCE OF THERMOPANES

GRAPH NUMBER 12	**FILE NAME:** 177COMP9
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

– THERMOPANE No 7 VERSUS PVC SLIDING WINDOW No 15

STC 32
THERMOPANE No 7 SEALED IN THE TEST OPENING
GL: 5mm; AS: 38mm; GL: 5mm

STC 32
WOOD SLIDING WINDOW No 15 WITH AN IDENTICAL COMPOSITION AS THERMOPANE No 7

PROJECT DESCRIPTION

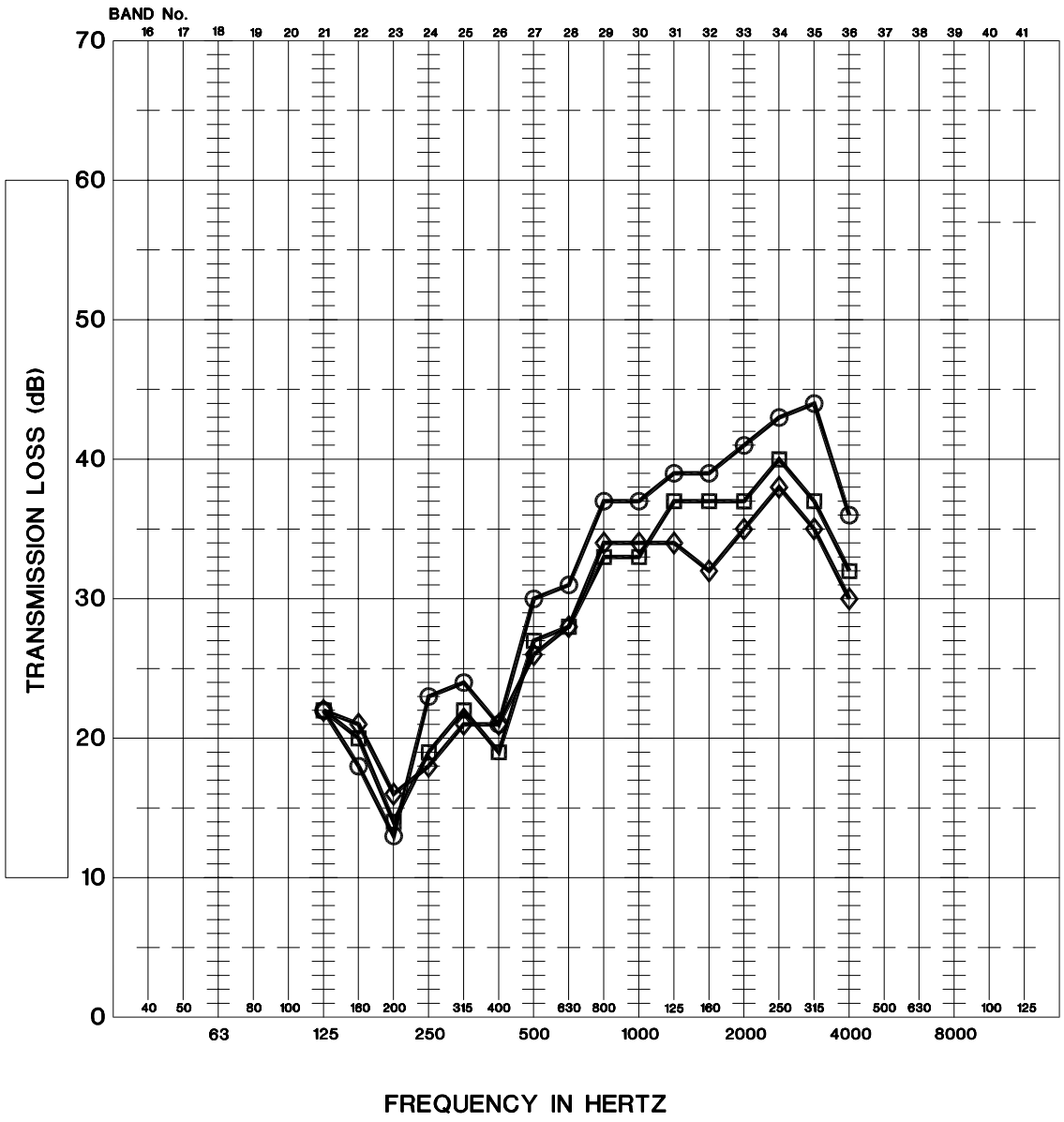
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF WINDOW FRAME ON THE ACOUSTICAL PERFORMANCE OF THERMOPANES

GRAPH NUMBER 13	**FILE NAME:** 177COMP8
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

COMPARISON BETWEEN CASEMENT WINDOWS WITH STANDARD THERMOPANE

STC 30
ALUMINUM CASEMENT WINDOW No 8
WITH THERMOPANE No 1
GL: 3mm; AS: 19mm; GL: 3mm

STC 29
WOOD CASEMENT WINDOW No 10
WITH THERMOPANE No 2
GL: 3mm; AS: 16mm; GL: 3mm

STC 28
PVC CASEMENT WINDOW No 9
WITH THERMOPANE No 2
GL: 3mm; AS: 16mm; GL: 3mm

PROJECT DESCRIPTION

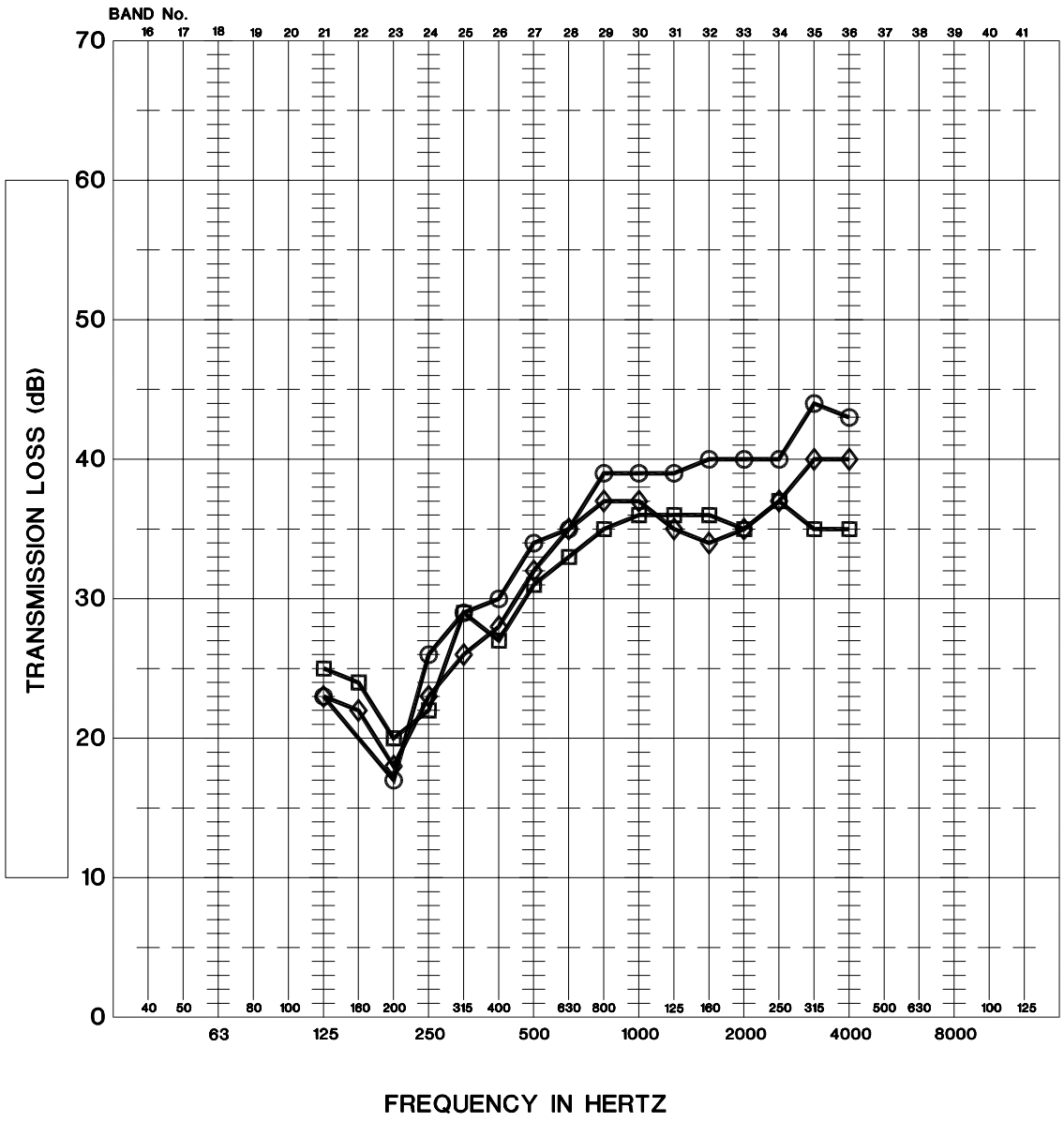
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARING THE TL OF DIFFERENT TYPES OF CASEMENT WINDOW (ALUMINUM, PVC, WOOD) WITH STANDARD THERMOPANE

GRAPH NUMBER 14	**FILE NAME:** 177COMP4
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

COMPARISON BETWEEN CASEMENT WINDOWS WITH A THERMOPANE OFFERING A SUPERIOR SOUND ISOLATION

STC 35
ALUMINUM CASEMENT WINDOW No 11
WITH THERMOPANE No 4
GL: 3mm; AS: 16mm; GL: 6mm

STC 34
WOOD CASEMENT WINDOW No 13
WITH THERMOPANE No 5
GL: 3mm; AS: 13mm; GL: 6mm

STC 33
PVC CASEMENT WINDOW No 12
WITH THERMOPANE No 5
GL: 3mm; AS: 13mm; GL: 6mm

PROJECT DESCRIPTION

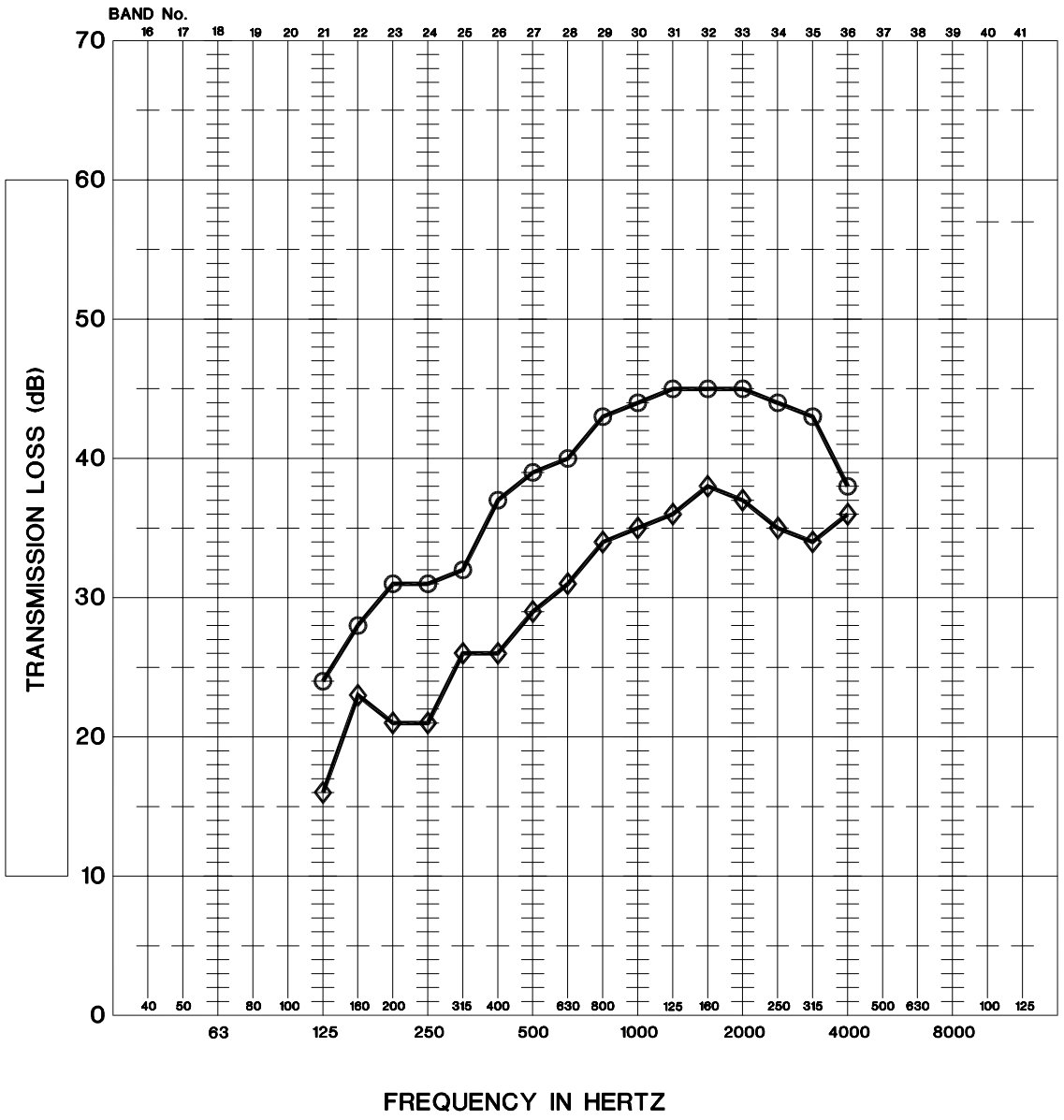
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARING THE TL OF DIFFERENT TYPES OF CASEMENT WINDOW (ALUMINUM, PVC, WOOD) WITH THERMOPANE HAVING SUPERIOR TL

GRAPH NUMBER 15	**FILE NAME:** 177COMP3
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

COMPARISON BETWEEN SLIDING WINDOWS

STC 41
ALUMINUM SLIDING WINDOW No 14
GL: 3mm; AS: 108mm; GL: 3mm

STC 32
SLIDING WINDOW No 15, PINE COVERED WITH PVC
GL: 5mm; AS: 34mm; GL: 5mm

PROJECT DESCRIPTION

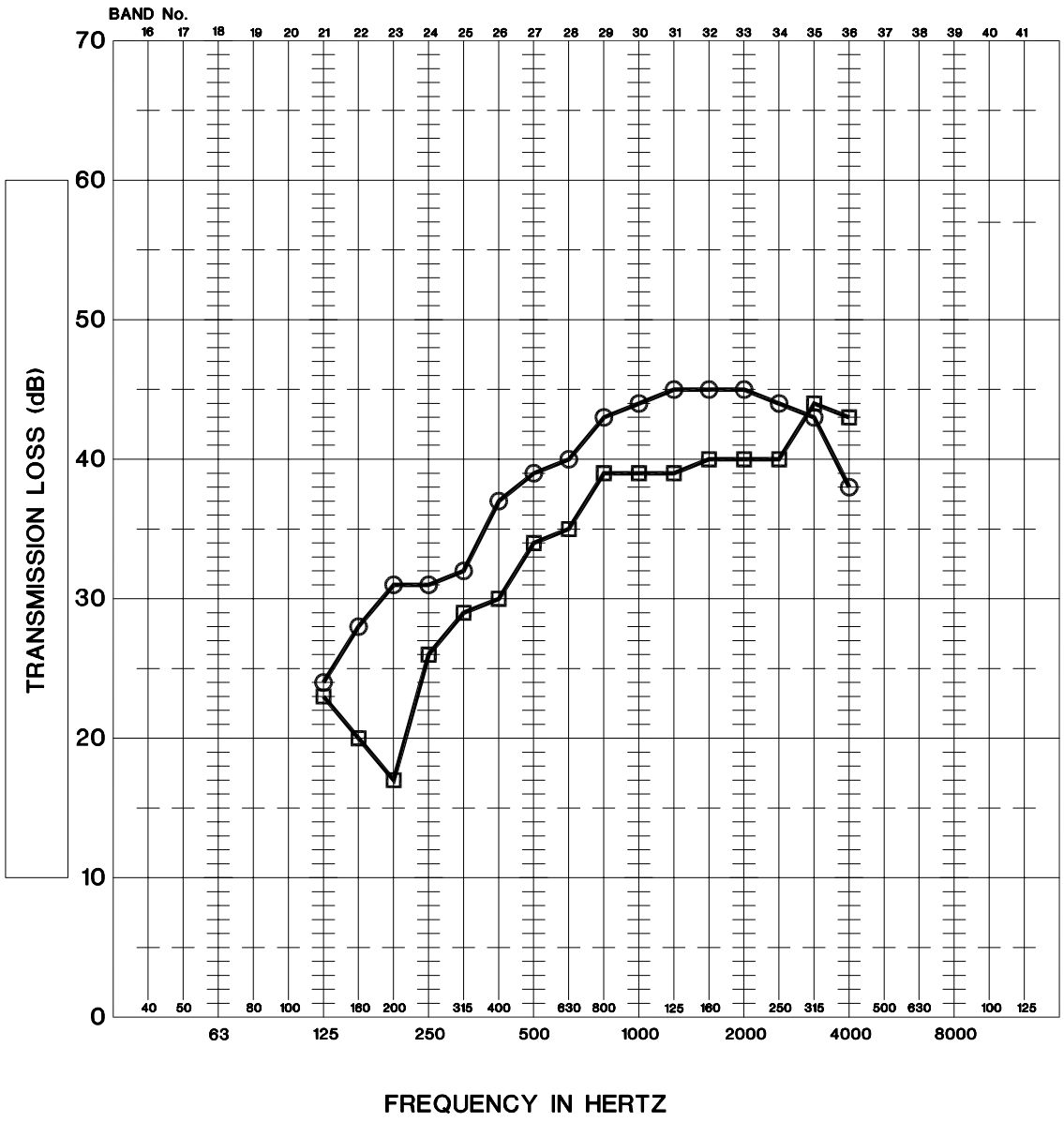
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARING THE TL OF DIFFERENT TYPES OF SLIDING WINDOW (ALUMINUM AND PVC)

GRAPH NUMBER 16	**FILE NAME:** 177CMP15
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

COMPARISON BETWEEN ALUMINUM SLIDING AND CASEMENT WINDOWS:

STC 41
ALUMINUM SLIDING WINDOW No 14
GL: 3mm; AS: 108mm; GL: 3mm

STC 35
ALUMINUM CASEMENT WINDOW No 11
WITH THERMOPANE No 4
GL: 3mm; AS: 16mm; GL: 6mm

PROJECT DESCRIPTION

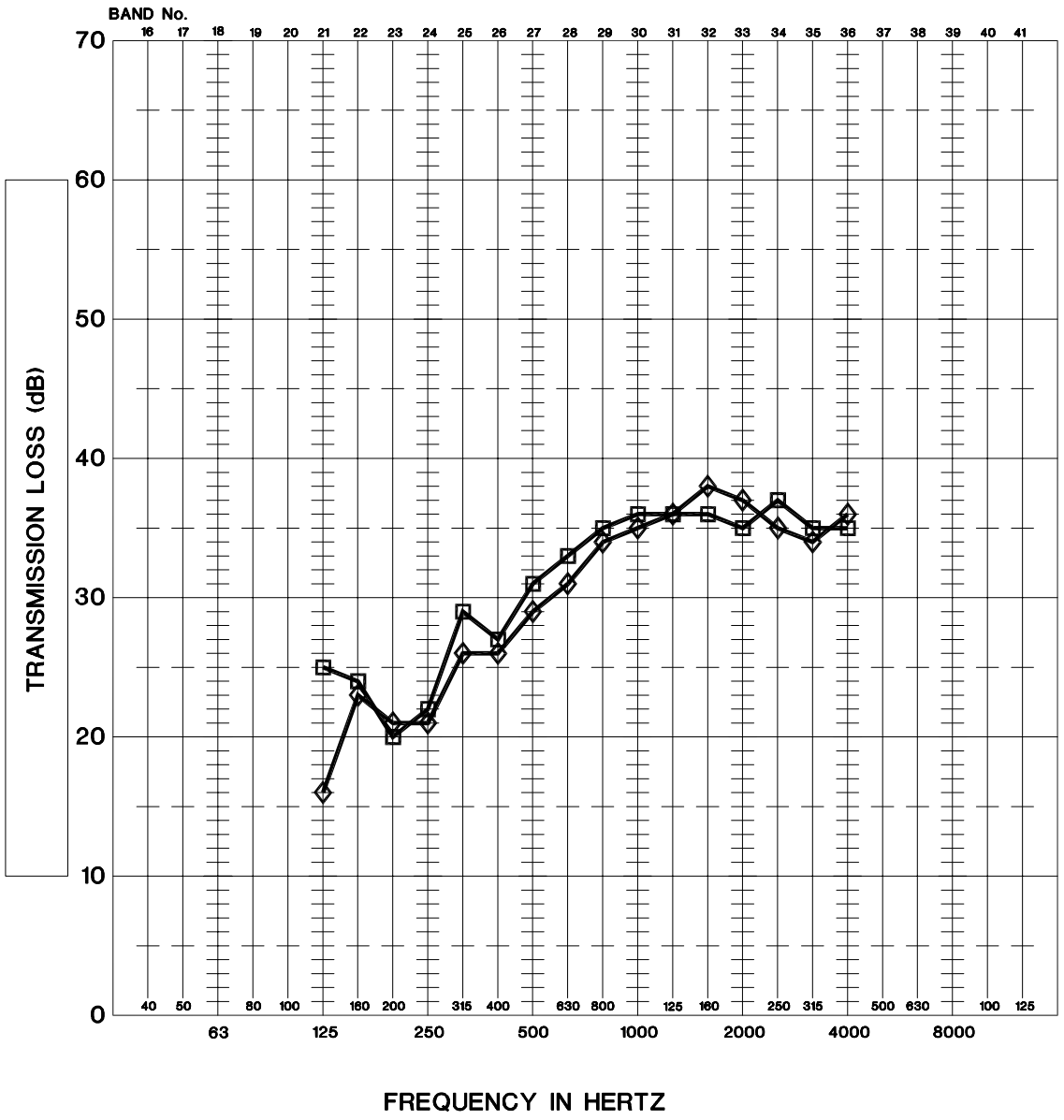
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARING THE TL OF AN ALUMINUM CASEMENT WINDOW TO THAT OF AN ALUMINUM SLIDING WINDOW

GRAPH NUMBER 17	**FILE NAME:** 177CMP16
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

COMPARISON BETWEEN A PVC SLIDING WINDOW AND A PVC CASEMENT WINDOW

STC 33
PVC CASEMENT WINDOW No 12
WITH THERMOPANE No 5
GL: 3mm; AS: 13mm; GL: 6mm

STC 32
SLIDING WINDOW No 15, PINE
COVERED WITH PVC
GL: 5mm; AS: 34mm; GL: 5mm

PROJECT DESCRIPTION

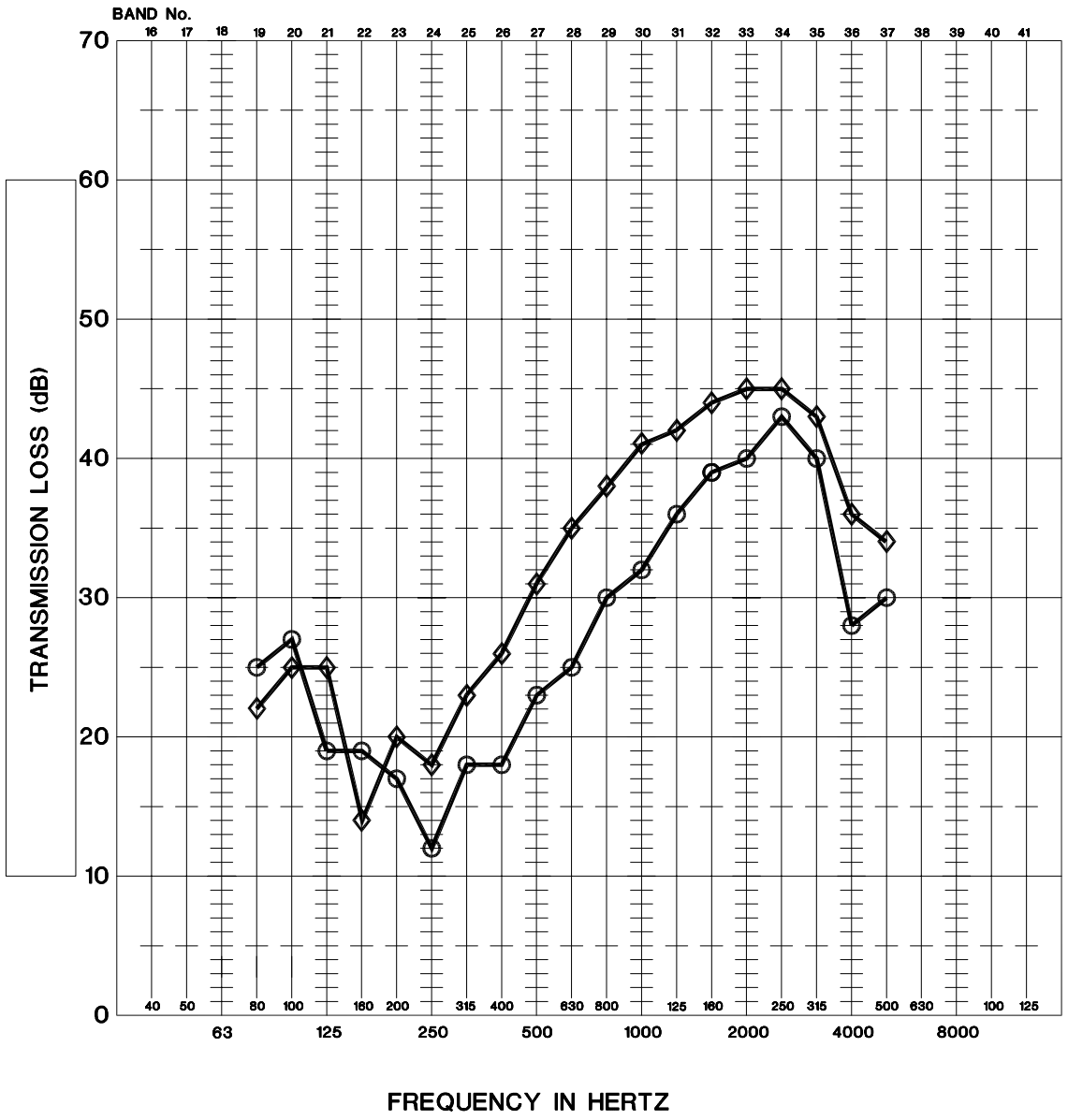
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARING THE TL OF A PVC CASEMENT WINDOW WITH THAT OF A PVC SLIDING WINDOW

GRAPH NUMBER 18	**FILE NAME:** 177CMP17
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 33
CNRC: GL3_AIR_19_GL3
TEST No: 78.8

STC 27
MJM: GL3_AIR19_GL3

PROJECT DESCRIPTION

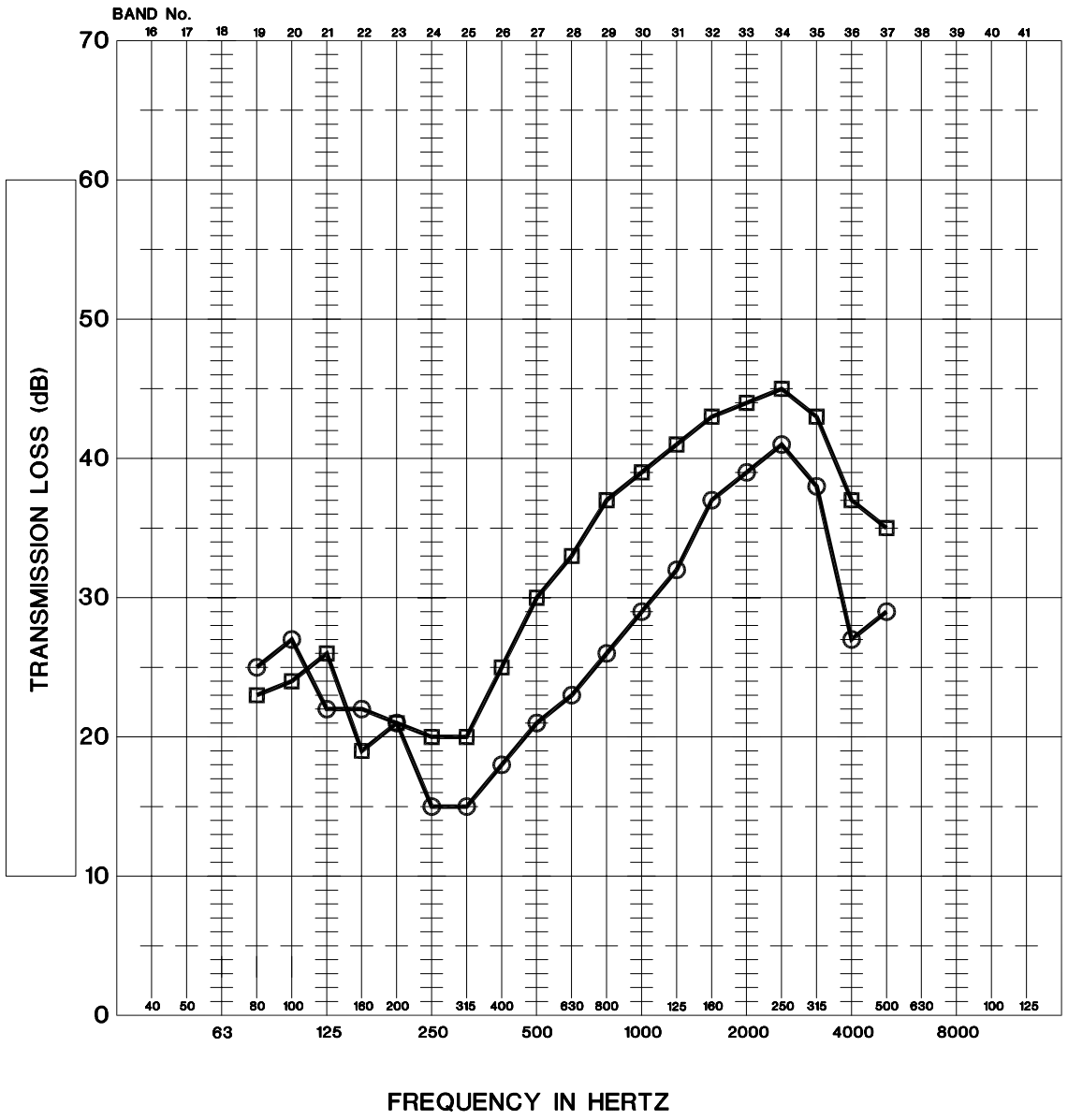
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: THERMOPANE No 1

GRAPH NUMBER 19	**FILE NAME:** 177CP-04
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 32
CNRC: GL3_AIR13_GL3
TEST No: 78.6

STC 26
MJM: GL3_AIR13_GL3

PROJECT DESCRIPTION

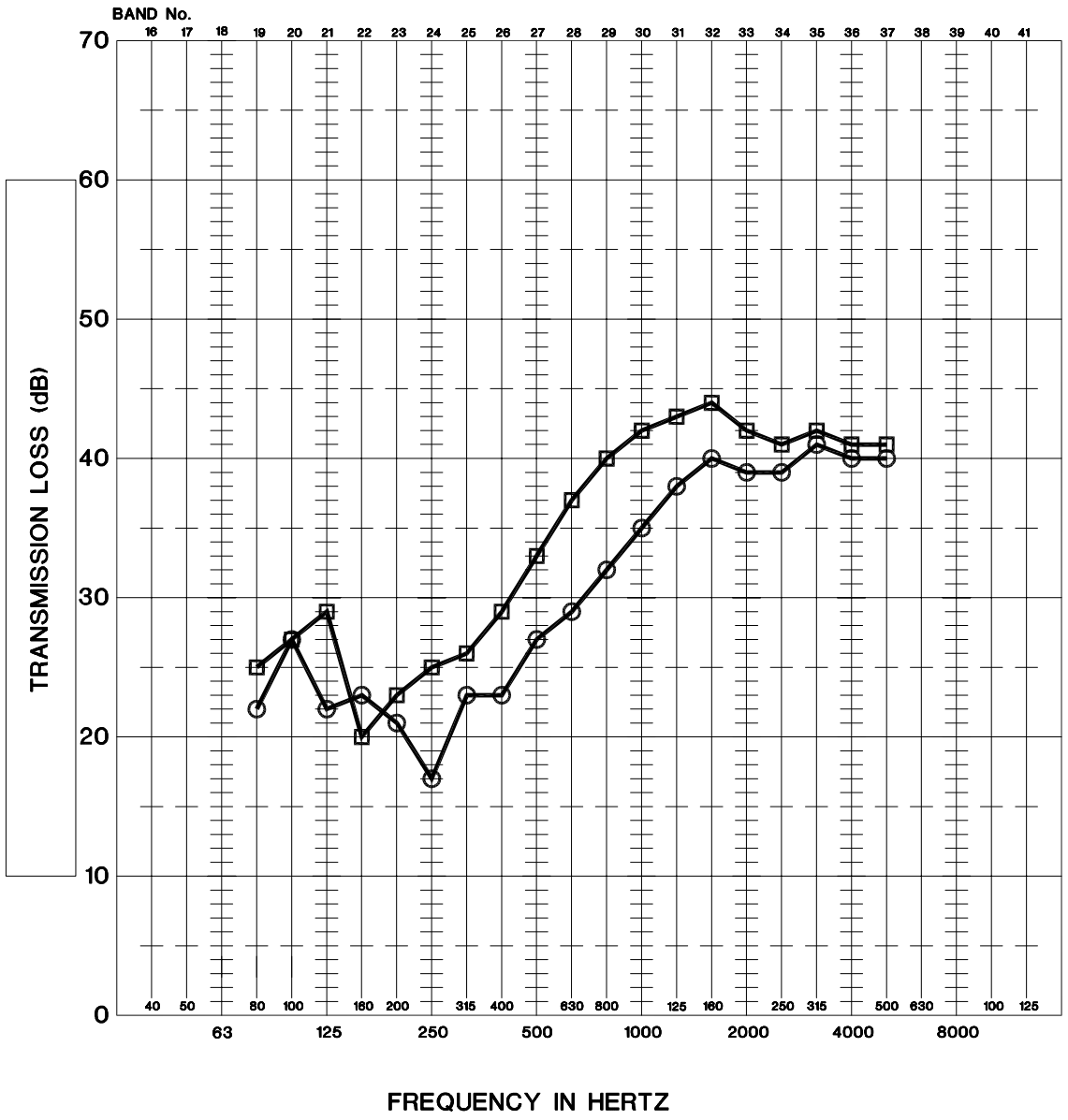
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: THERMOPANE No 3

GRAPH NUMBER 20	**FILE NAME:** 177CP-03
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 37
CNRC: GL3_AIR13_GL6
TEST No: 78.14

STC 31
MJM: GL3_AIR13_GL6

PROJECT DESCRIPTION

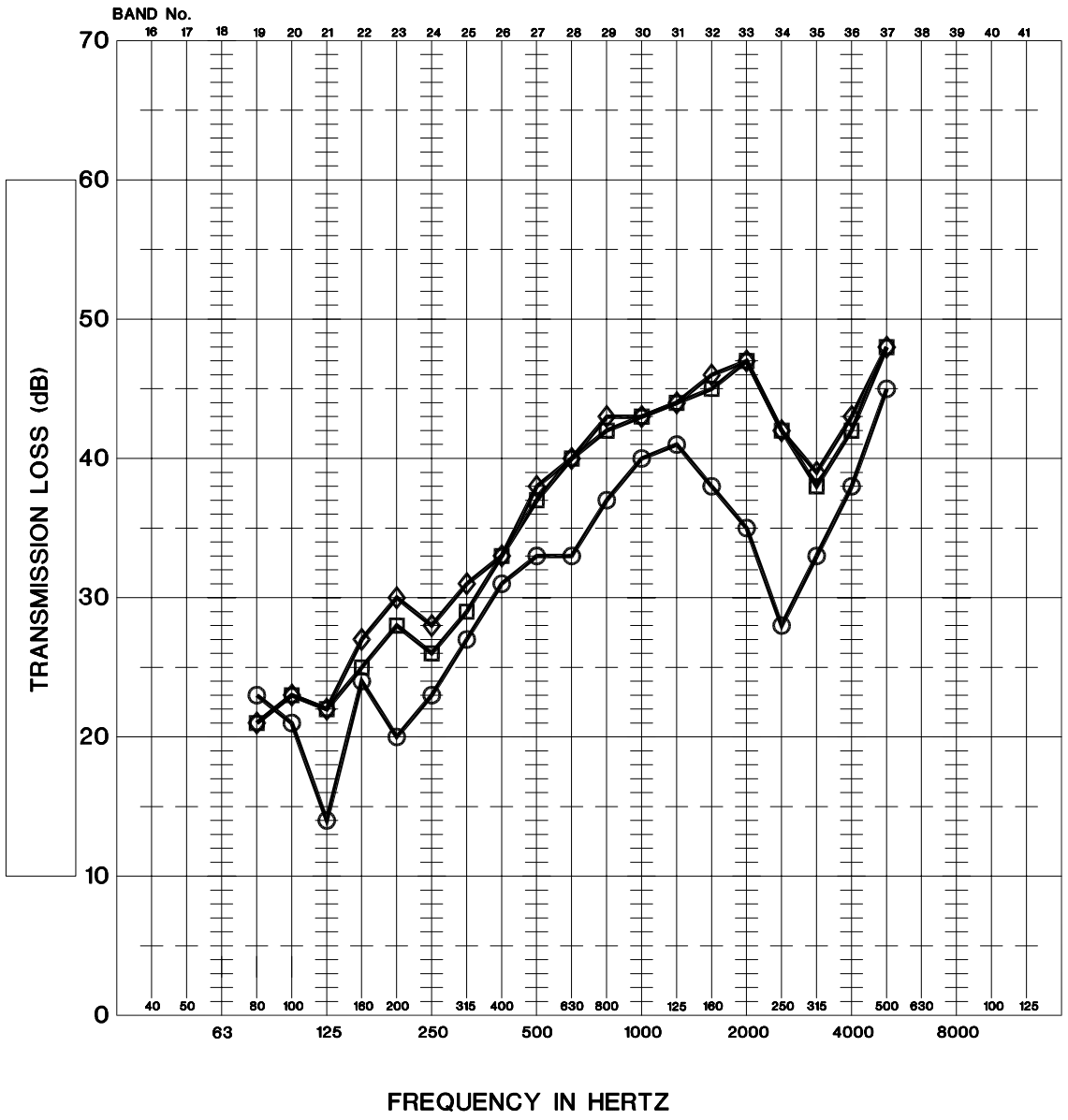
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: THERMOPANE No 5

GRAPH NUMBER 21	**FILE NAME:** 177CP-05
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 40
CNRC: GL4_AIR41_GL4
TEST No: 78.34

STC 39
CNRC: GL4_AIR35_GL4
TEST No: 78.33

STC 32
MJM: GL5_AIR38_GL5

PROJECT DESCRIPTION

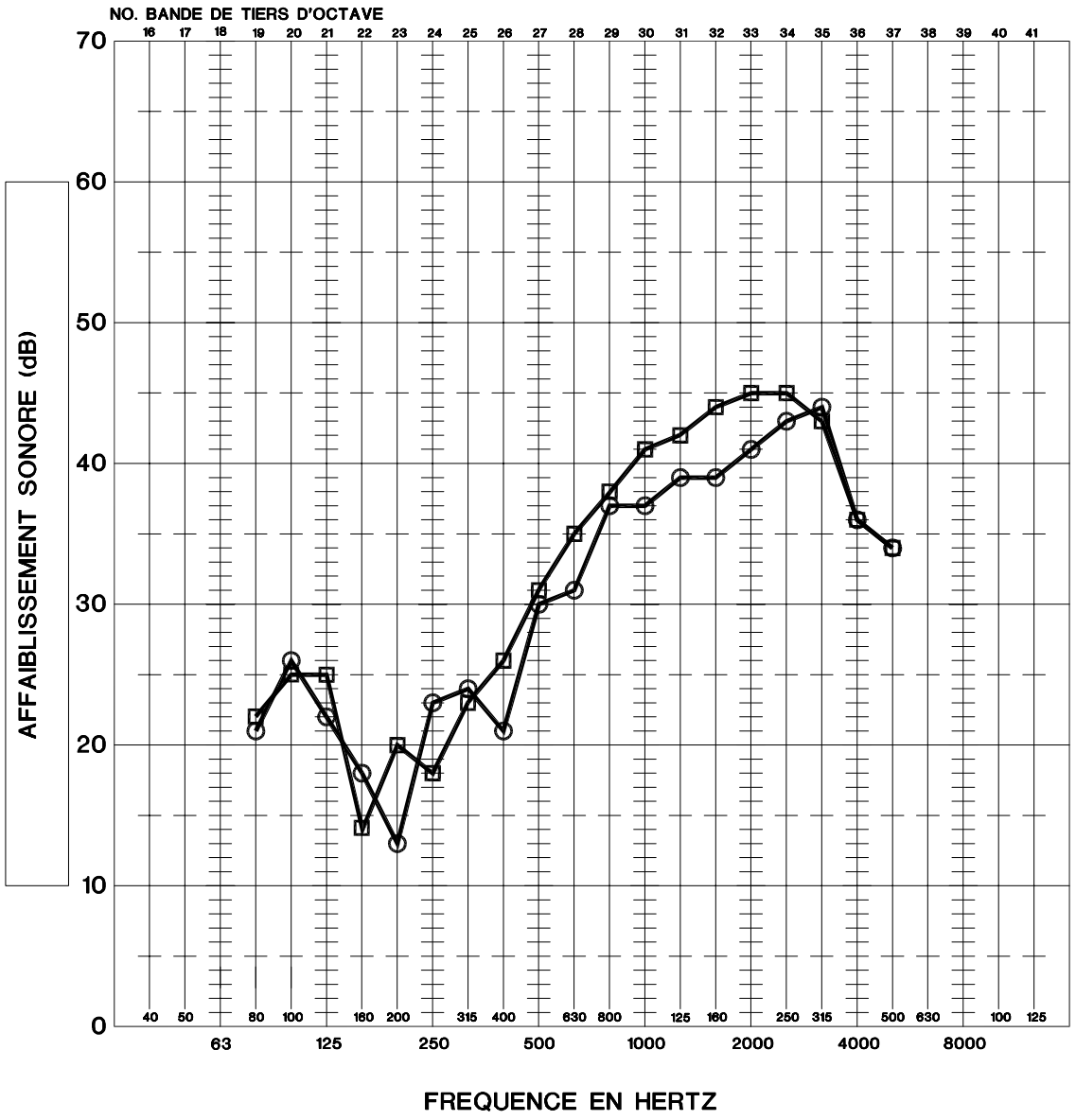
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: THERMOPANE No 7

GRAPH NUMBER 22	**FILE NAME:** 177CP-07
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: CE GRAPHE SEUL NE CONSTITUE PAS UN RAPPORT COMPLET



LEGENDE

STC 35
FENÊTRE À BATTANT EN ALUMINIUM No 11 AVEC VITRAGE SCELLÉ No 4

VITRAGE	3mm
ESPACE D'AIR	16mm
VITRAGE	6mm

STC 34
FENÊTRE À BATTANT EN BOIS No 13 AVEC VITRAGE SCELLÉ No 5

VITRAGE	3mm
ESPACE D'AIR	13mm
VITRAGE	6mm

STC 33
FENÊTRE À BATTANT EN PVC No 12 AVEC VITRAGE SCELLÉ No 5

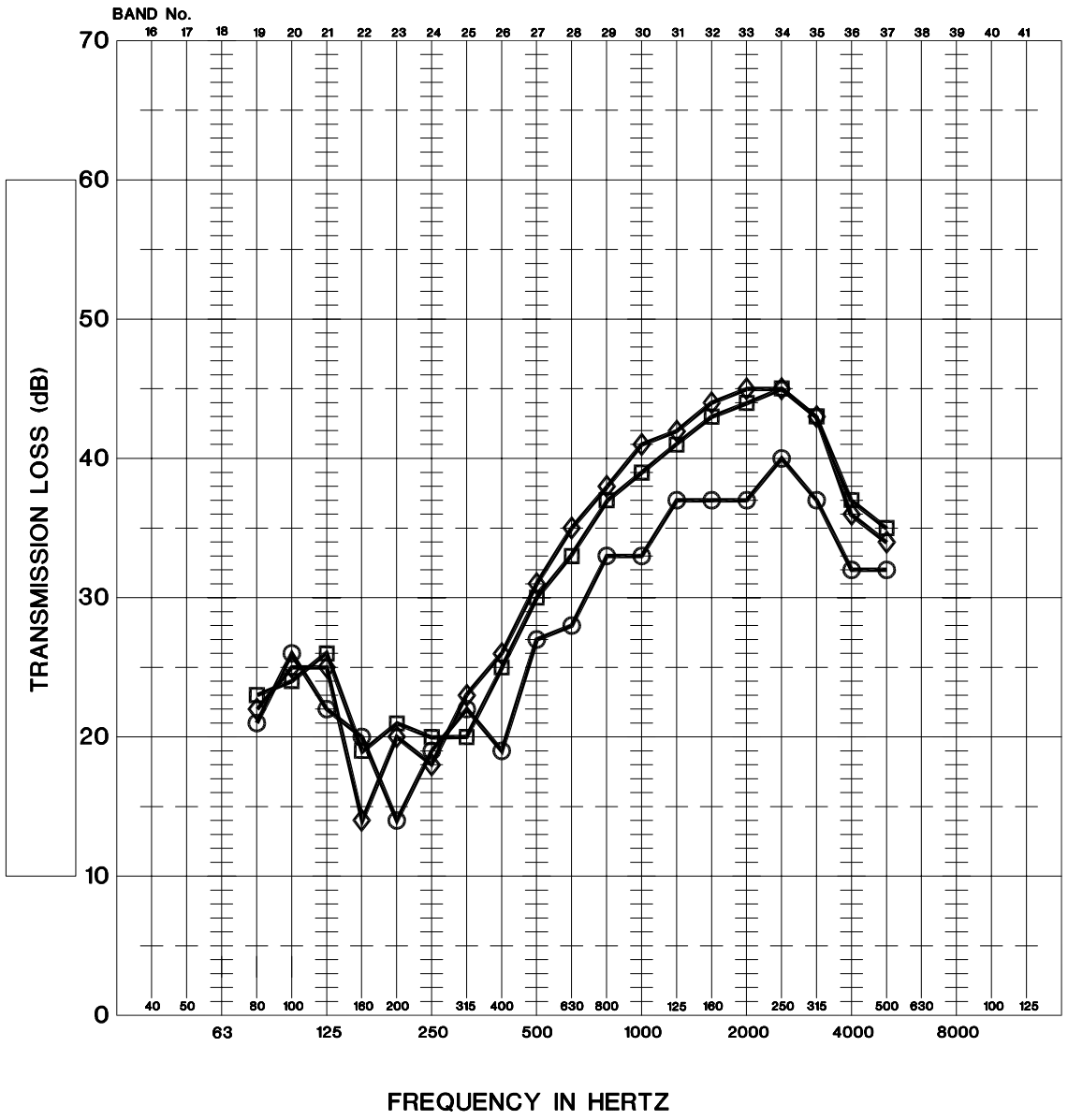
VITRAGE	3mm
ESPACE D'AIR	13mm
VITRAGE	6mm

PROJET
ISOLATION ACOUSTIQUE PROCURÉE PAR LES FENÊTRES DE PROJETS RESIDENTIELS

TITRE DU GRAPHE
COMPARAISON DES TL POUR TROIS TYPES DE CHASSIS DIFFÉRENTS

GRAPHE NO. 22	**FICHIER:** 177CP-08
NO. DE PROJET 177.961fr	**DATE** 98 08

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 33
CNRC: GL3_AIR19_GL3
TEST No: 78.8

STC 32
CNRC: GL3_AIR13_GL3
TEST No: 78.6

STC 28
MJM: GL3_AIR16_GL3

PROJECT DESCRIPTION

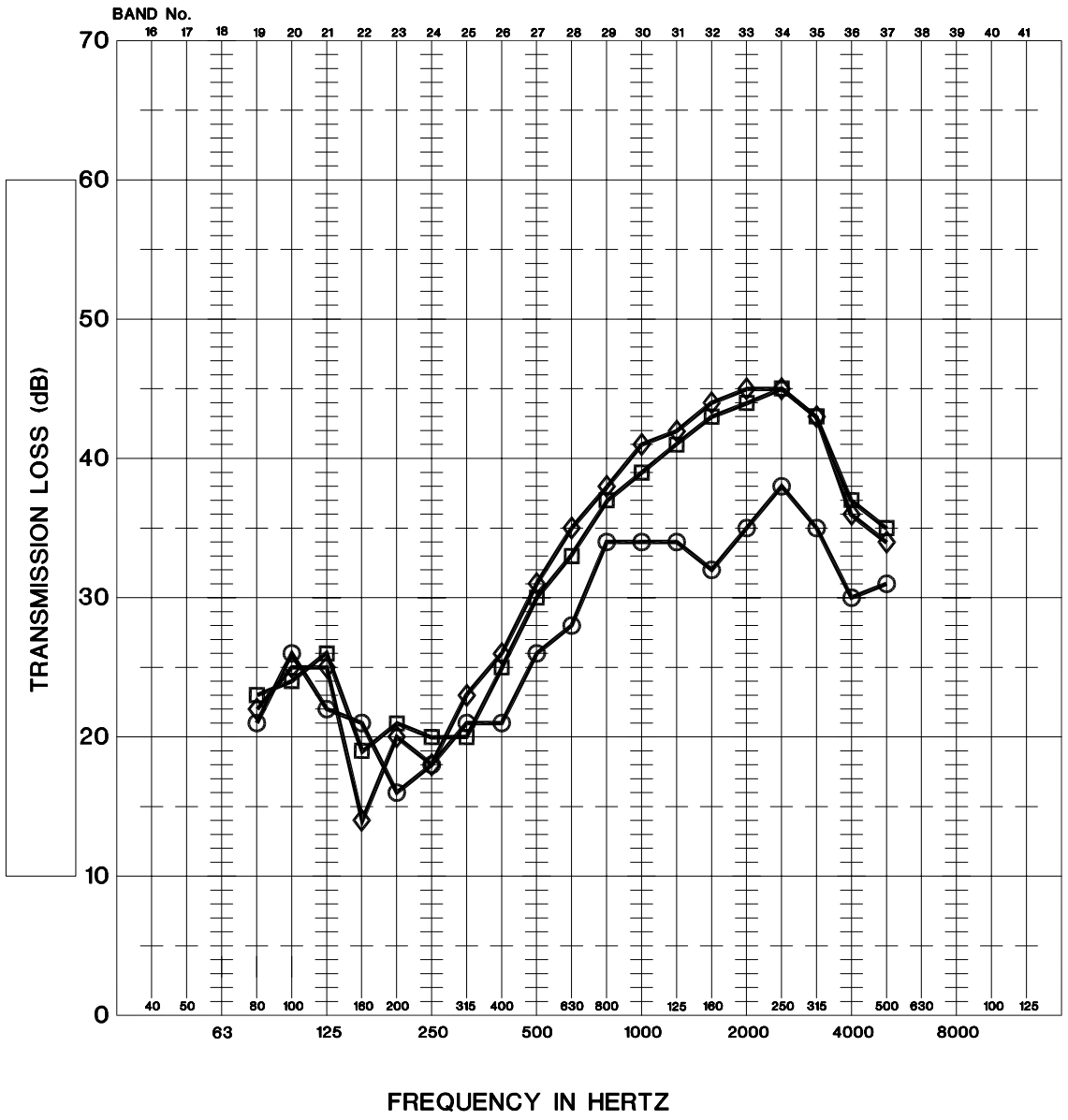
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: PVC CASEMENT WINDOW No 9

GRAPH NUMBER 24	**FILE NAME:** 177CP-09
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 33
CNRC: GL3_AIR19_GL3
TEST No: 78.8

STC 32
CNRC: GL3_AIR13_GL3
TEST No: 78.6

STC 29
MJM: GL3_AIR16_GL3

PROJECT DESCRIPTION

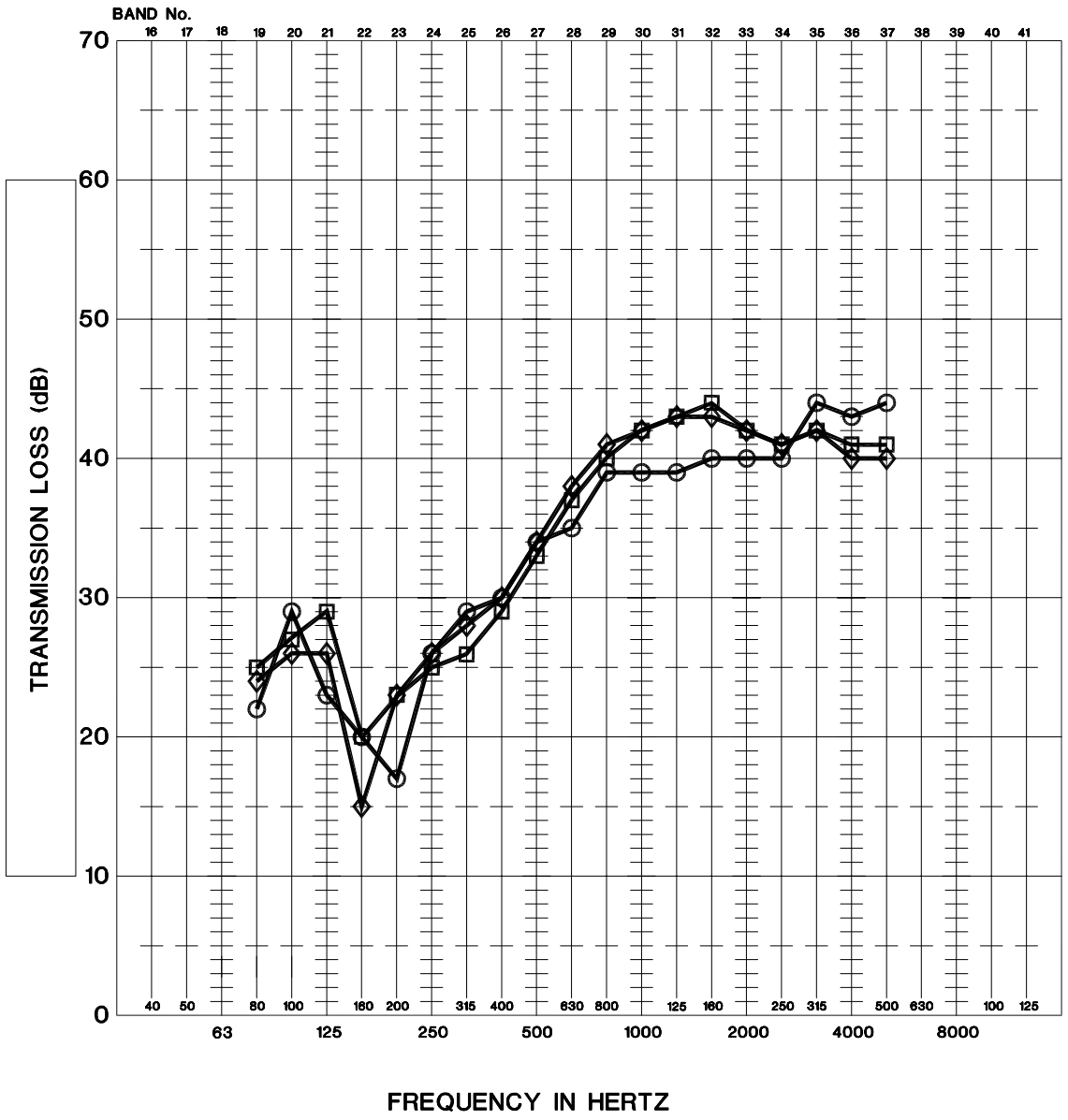
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: WOOD CASEMENT WINDOW No 10

GRAPH NUMBER 25	**FILE NAME:** 177CP-10
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 36
CNRC: GL3_AIR19_GL6
TEST No: 78.16

STC 37
CNRC: GL3_AIR13_GL6
TEST No: 78.14

STC 35
MJM: GL3_AIR16_GL6

PROJECT DESCRIPTION

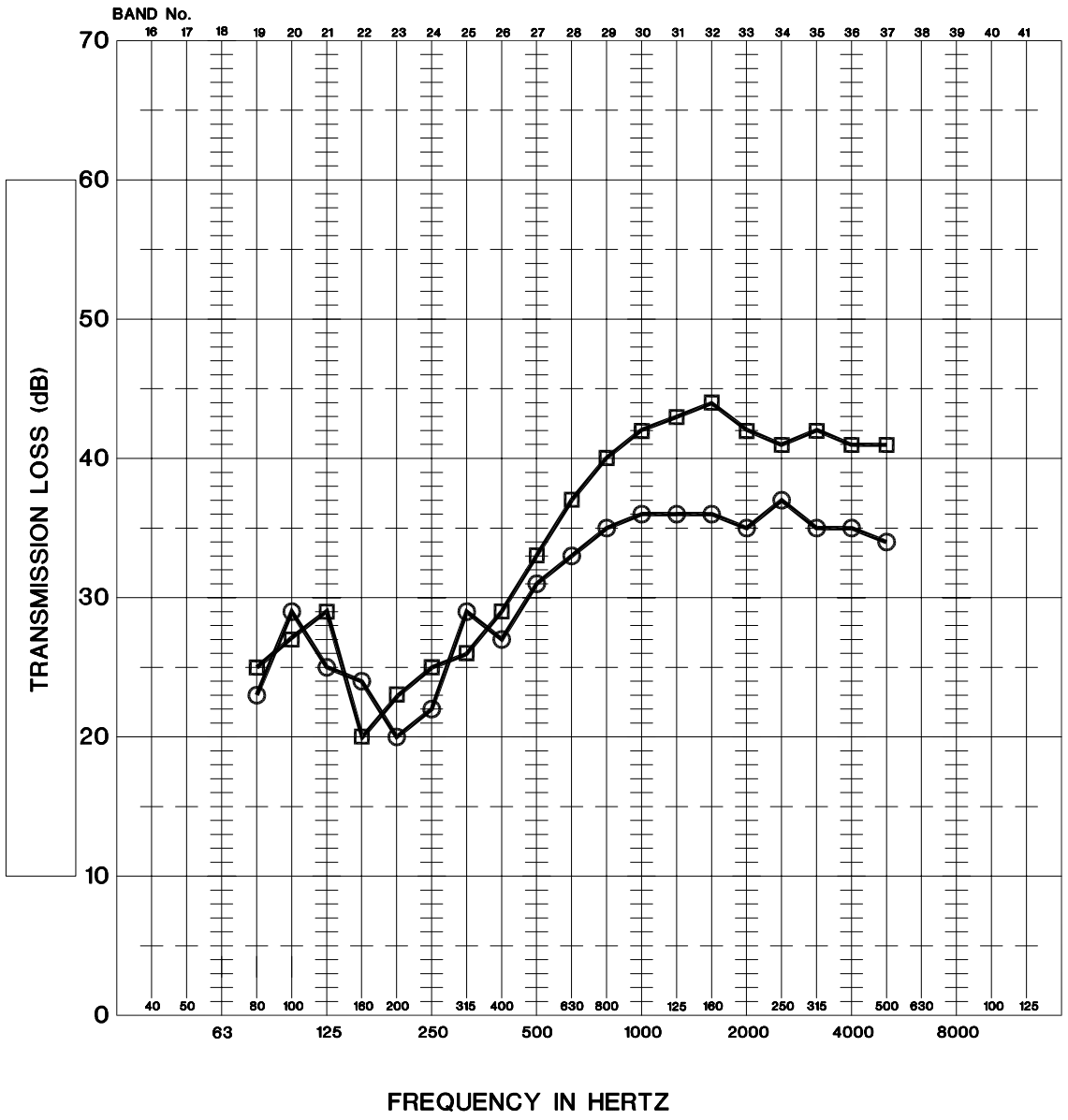
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: ALUMINIUM CASEMENT WINDOW No 11

GRAPH NUMBER 26	**FILE NAME:** 177CP-11
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 37
CNRC: GL3_AIR13_GL6
TEST No: 78.14

STC 33
MJM: GL3_AIR13_GL6

PROJECT DESCRIPTION

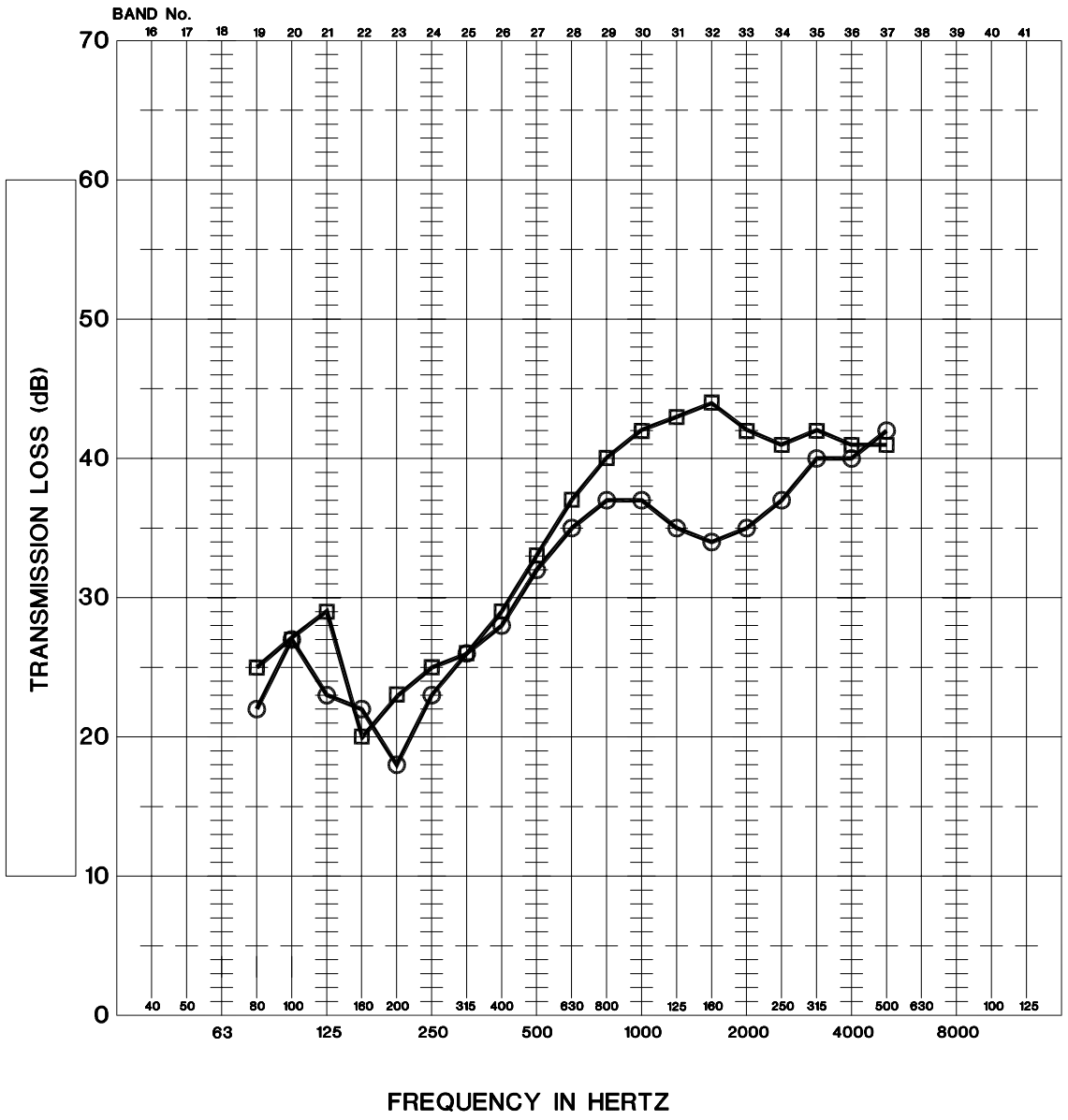
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: PVC CASEMENT WINDOW No 12

GRAPH NUMBER 27	**FILE NAME:** 177CP-12
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 37
CNRC: GL3_AIR13_GL6
TEST No: 78.14

STC 34
MJM: GL3_AIR13_GL6

PROJECT DESCRIPTION

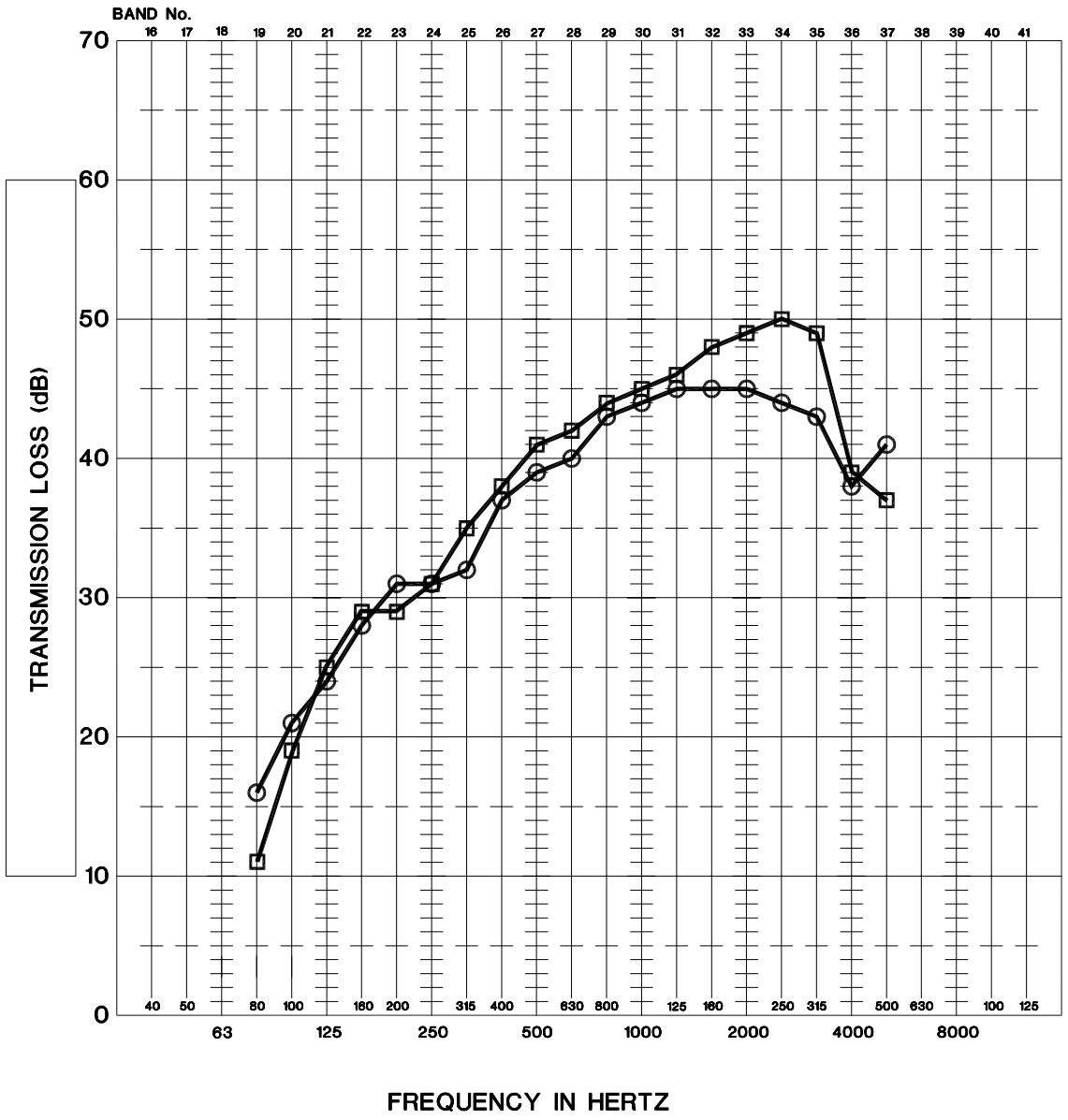
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: WOOD CASEMENT WINDOW No 13

GRAPH NUMBER 28	**FILE NAME:** 177CP-13
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 42
CNRC: GL3_AIR100_GL3
TEST No: 78.28

STC 41
MJM: GL3_AIR108_GL3

PROJECT DESCRIPTION

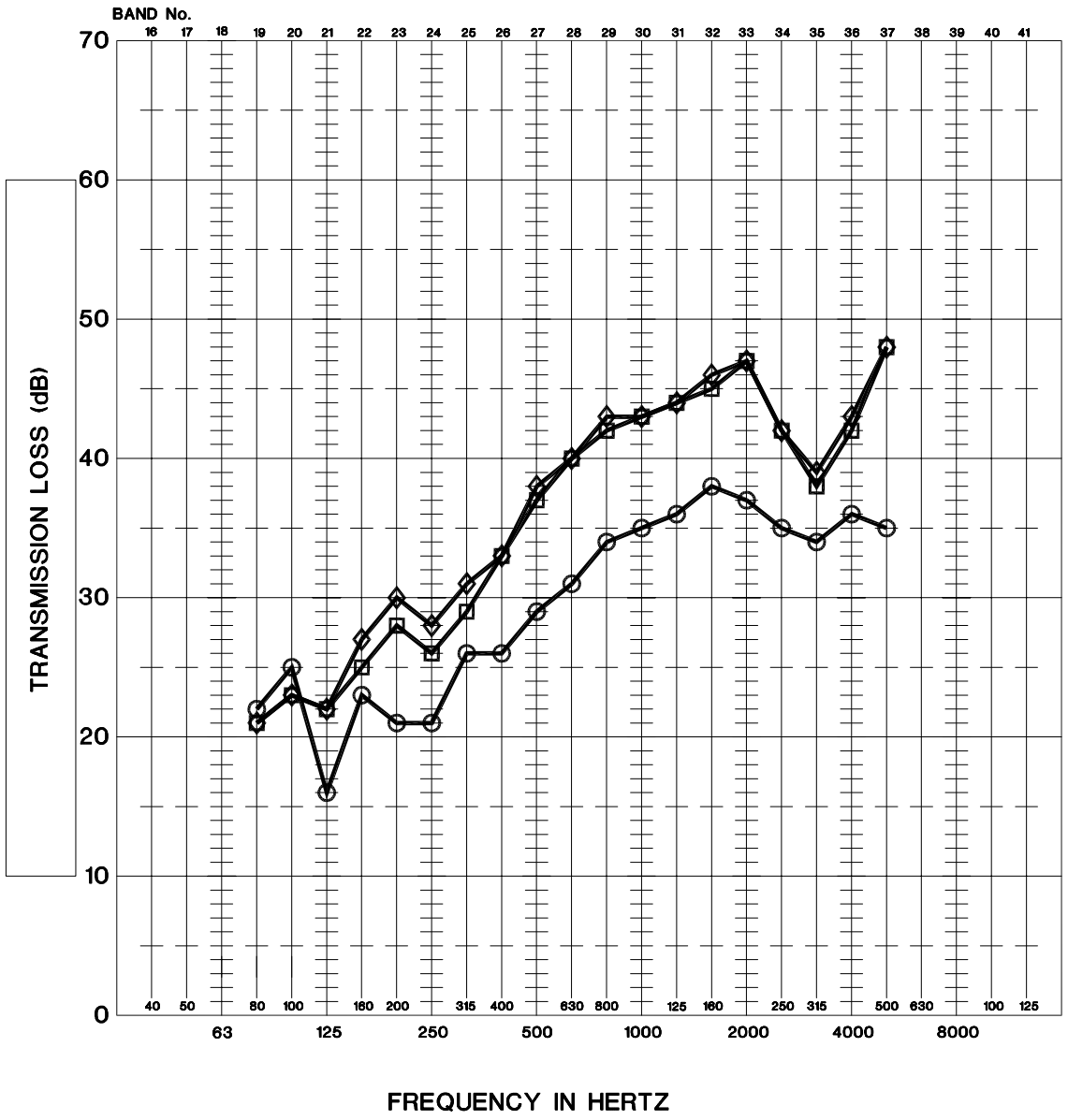
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: ALUMINIUM SLIDING WINDOW No 14

GRAPH NUMBER 29	**FILE NAME:** 177CP-14
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 40
CNRC: GL4_AIR41_GL4
TEST No: 78.34

STC 39
CNRC: GL4_AIR35_GL4
TEST No: 78.33

STC 32
MJM: GL5_AIR34_GL5

PROJECT DESCRIPTION

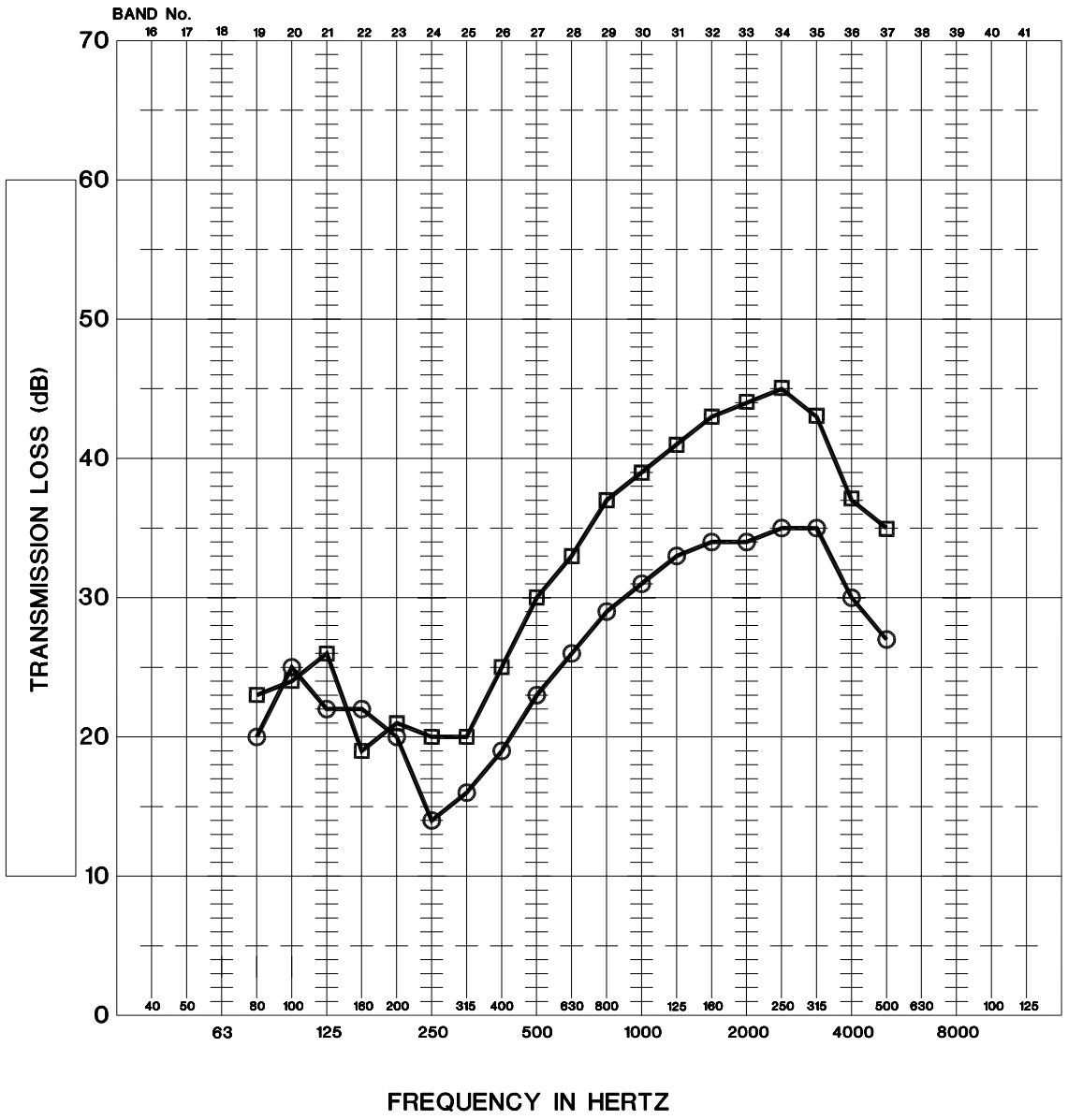
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: SLIDING WINDOW No 15

GRAPH NUMBER 30	**FILE NAME:** 177CP-15
PROJECT NUMBER 177.931	**DATE** 1996 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

STC 32
CNRC: GL3_AIR13_GL3
TEST No: 78.6

STC 27
MJM: GL3_AIR13_GL3

PROJECT DESCRIPTION

NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

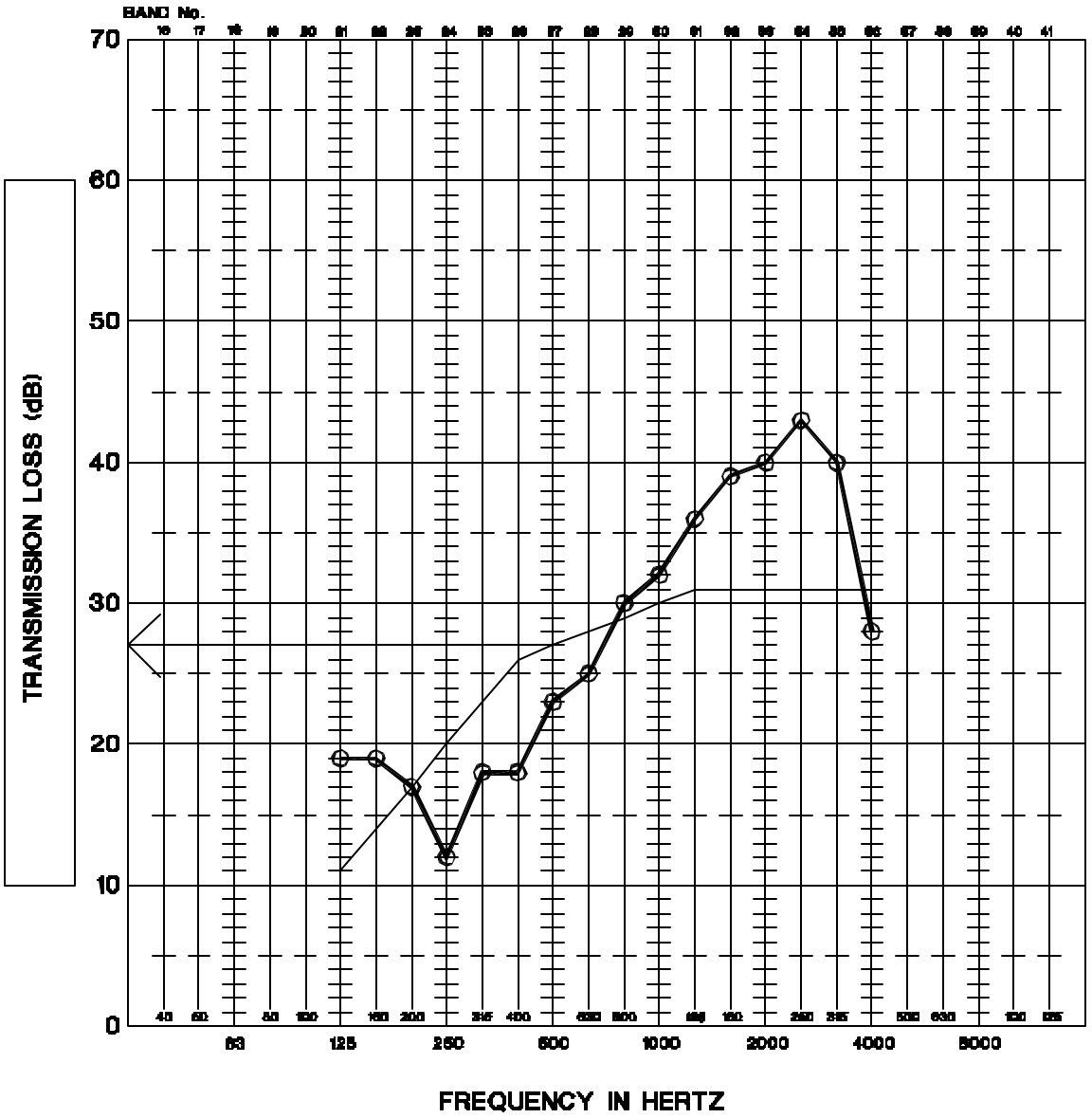
GRAPH TITLE

COMPARISON BETWEEN MJM AND CNRC MEASUREMENTS: SLIDING WINDOW No 16

GRAPH NUMBER 31	**FILE NAME:** 177CP-16
PROJECT NUMBER 177.931	**DATE** 1996 10

ANNEX II

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

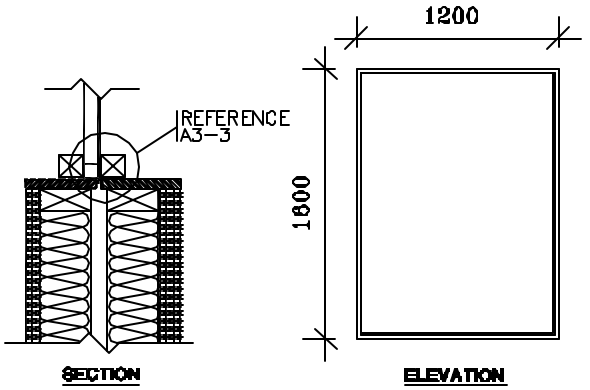
Transmission Loss (TL)

STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 27

WINDOW No 1: THERMOPANE

COMPOSITION	DIMENSIONS (in millimetres)	
GL 3 mm	A: NA	D: NA
AS 19 mm	B: NA	E: NA
GL 3 mm	C: NA	F: NA



PROJECT DESCRIPTION

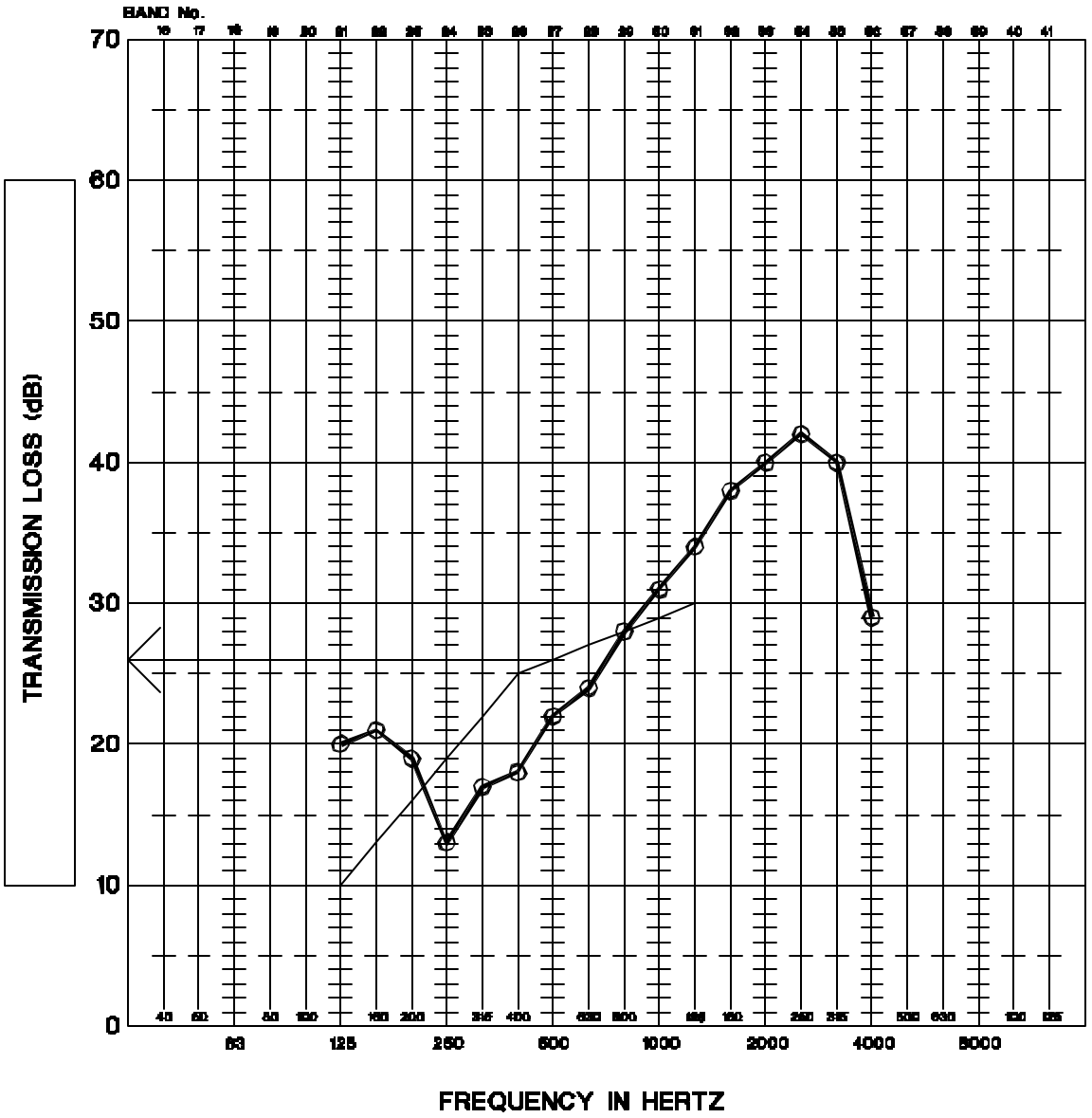
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 1: THERMOPANE

GRAPH NUMBER A2–1	FILE NAME: 177WIN01
PROJECT NUMBER 177.961	DATE 96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

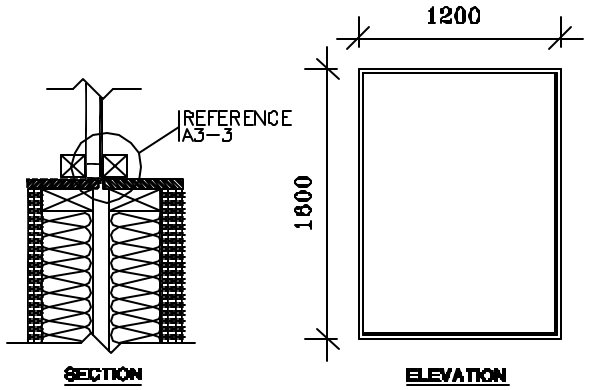
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 26

WINDOW No 2: THERMOPANE

COMPOSITION
GL 3 mm
AS 16 mm
GL 3 mm

DIMENSIONS (in millimeters)	
A: NA	D: NA
B: NA	E: NA
C: NA	F: NA



PROJECT DESCRIPTION

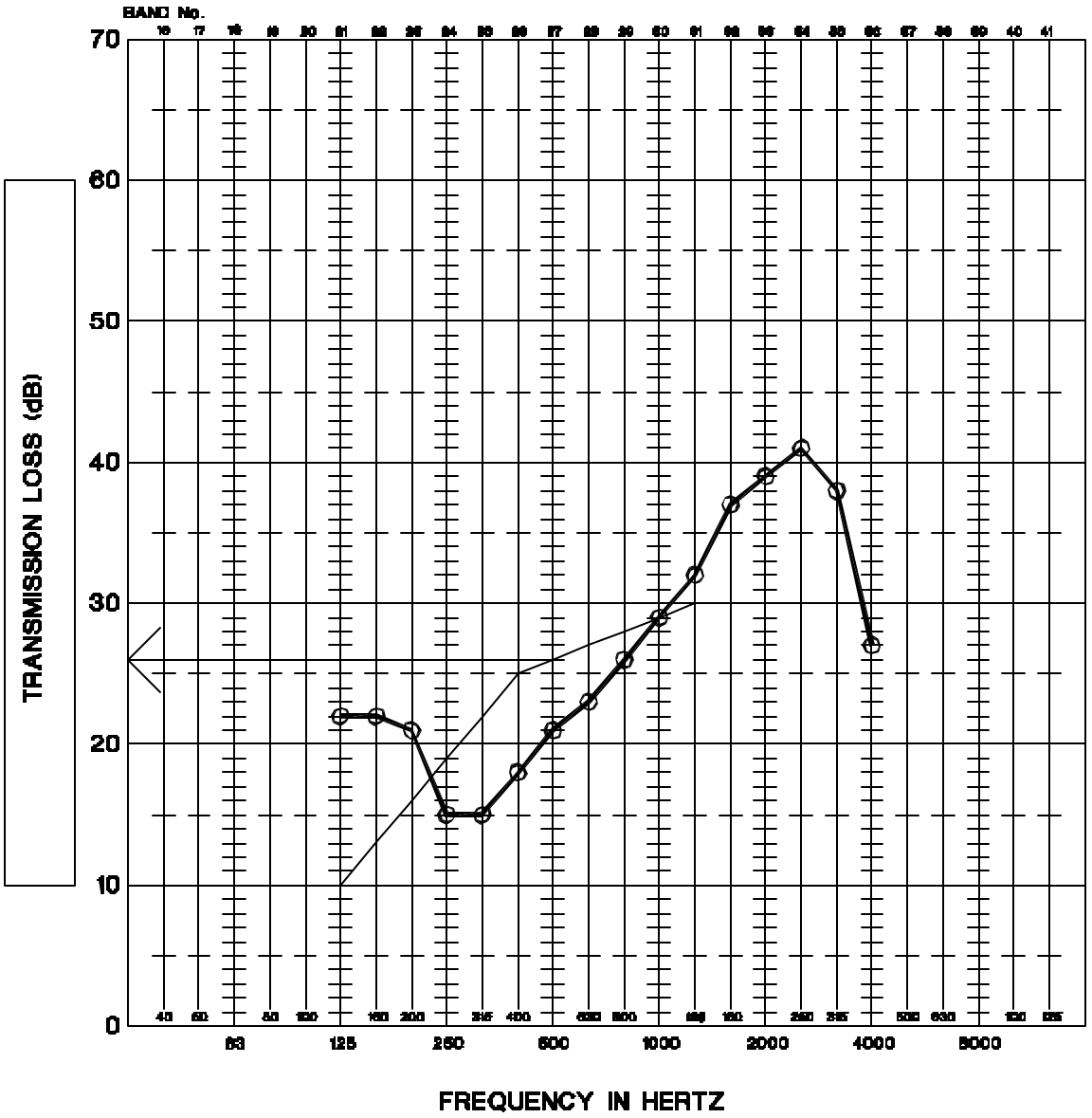
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 2: THERMOPANE

GRAPH NUMBER A2–2	**FILE NAME:** 177WIN02
PROJECT NUMBER 177.961	**DATE** 96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

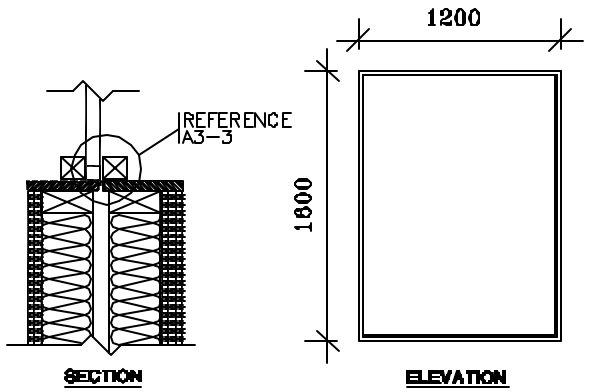
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 26

WINDOW No 3: THERMOPANE

COMPOSITION
GL 3 mm
AS 13 mm
GL 3 mm

DIMENSIONS (in millimeters)	
A: NA	D: NA
B: NA	E: NA
C: NA	F: NA



PROJECT DESCRIPTION

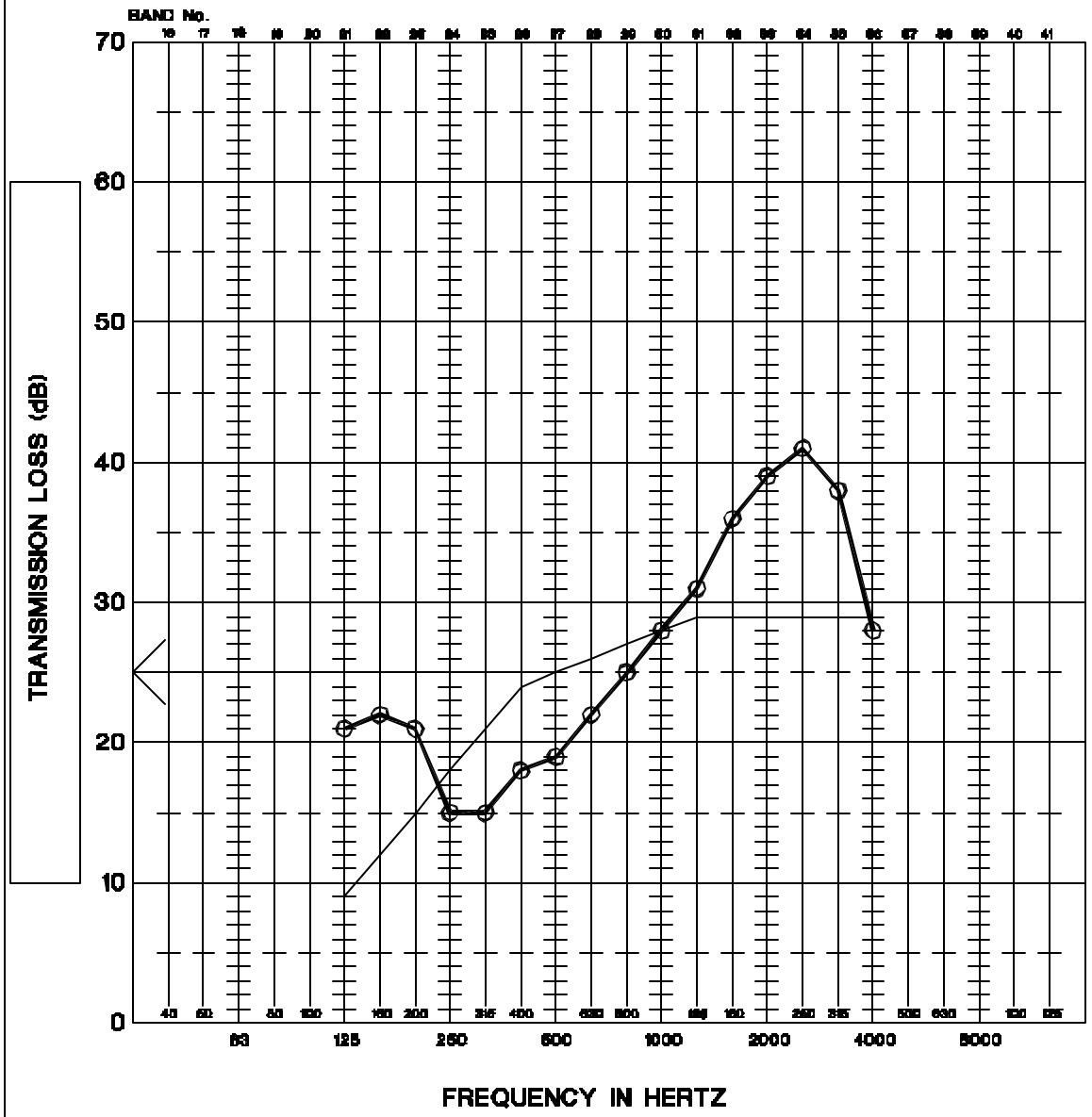
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 3: THERMOPANE

GRAPH NUMBER A2–3	FILE NAME: 177WIN03
PROJECT NUMBER 177.961	DATE 96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

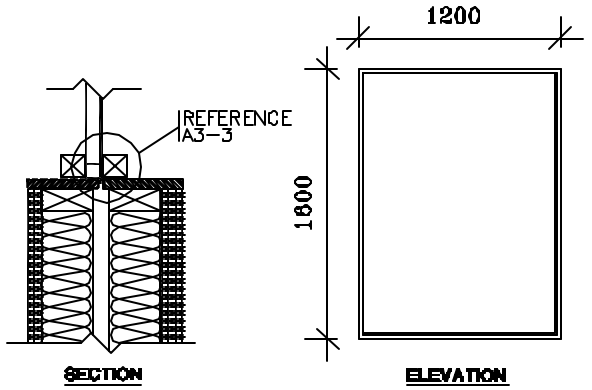
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 25

WINDOW No 3A: THERMOPANE

COMPOSITION
GL 3 mm
AS 13 mm
GL 3 mm

DIMENSIONS (in millimetres)	
A: NA	D: NA
B: NA	E: NA
C: NA	F: NA



PROJECT DESCRIPTION

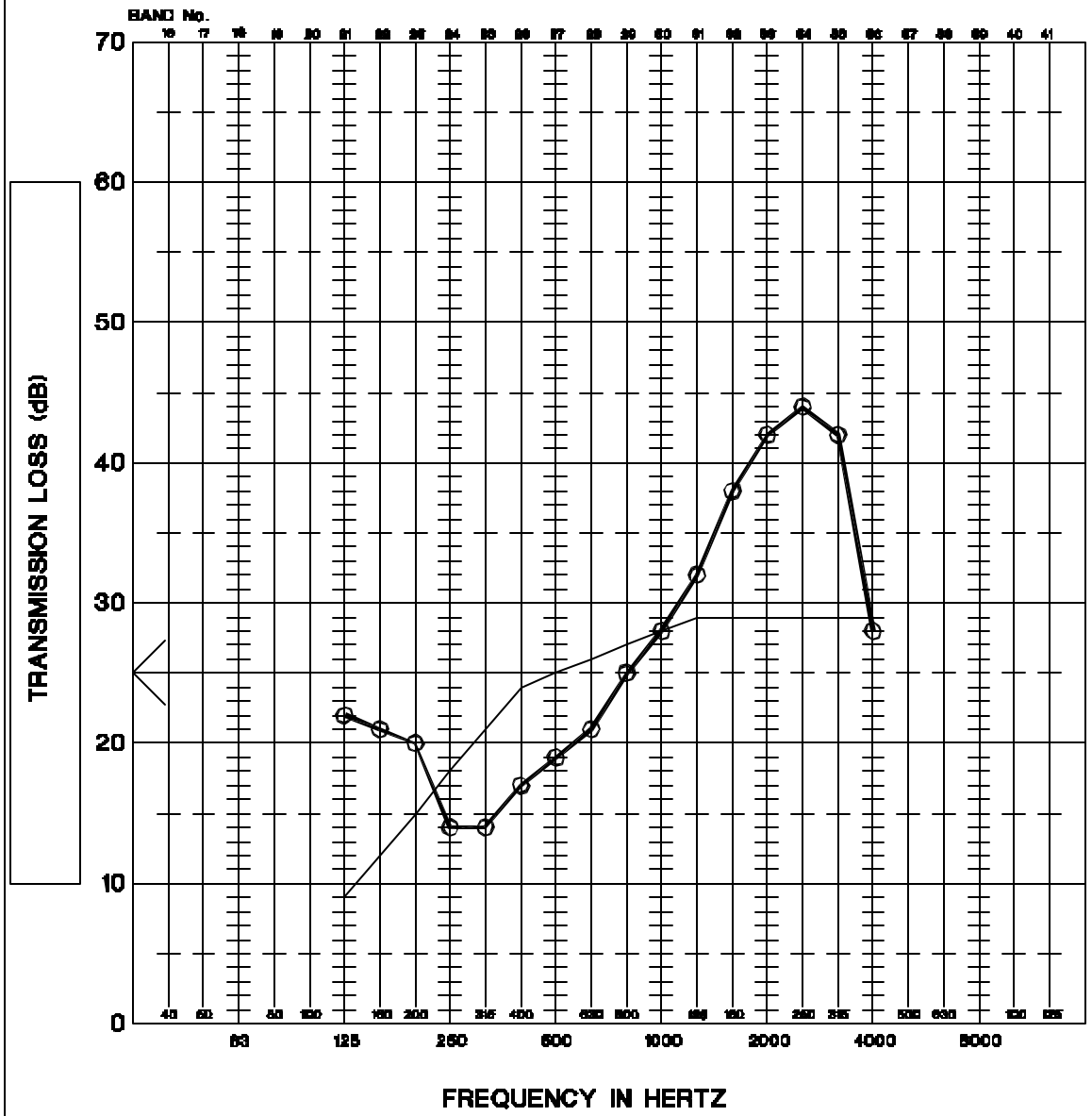
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 3A: THERMOPANE

GRAPH NUMBER	FILE NAME:
A2–3A	177WIN3A
PROJECT NUMBER	**DATE**
177.961	96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

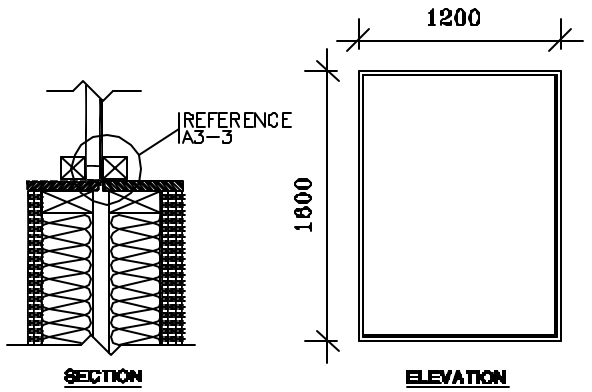
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 25

WINDOW No 3B: THERMOPANE

COMPOSITION
GL 3 mm
AS 13 mm
GL 3 mm

DIMENSIONS (in millimetres)	
A: NA	D: NA
B: NA	E: NA
C: NA	F: NA



PROJECT DESCRIPTION

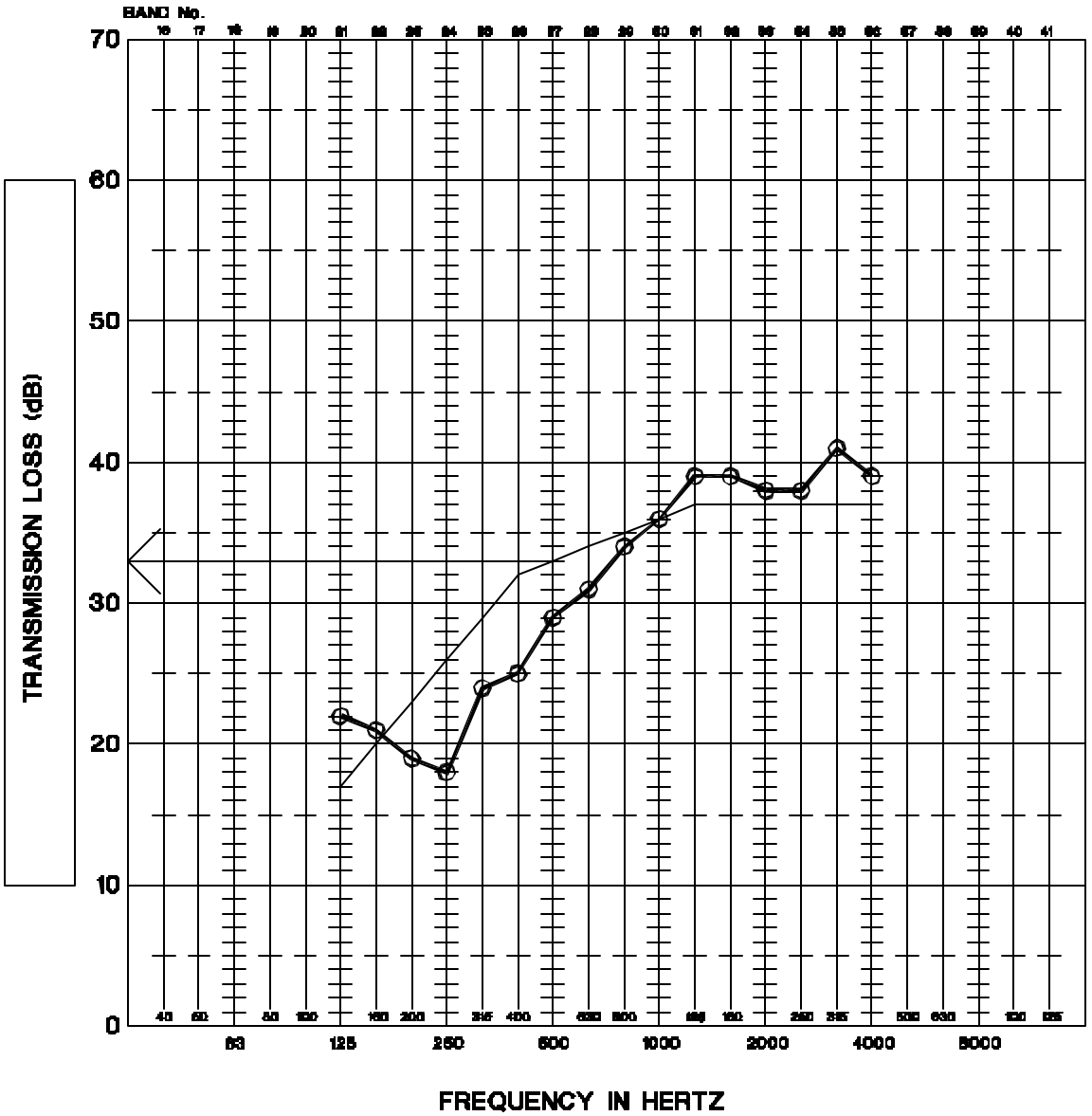
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS MEASUREMENT No 3B: THERMOPANE

GRAPH NUMBER	FILE NAME:
A2–3B	177WIN3B
PROJECT NUMBER	**DATE**
177.961	96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

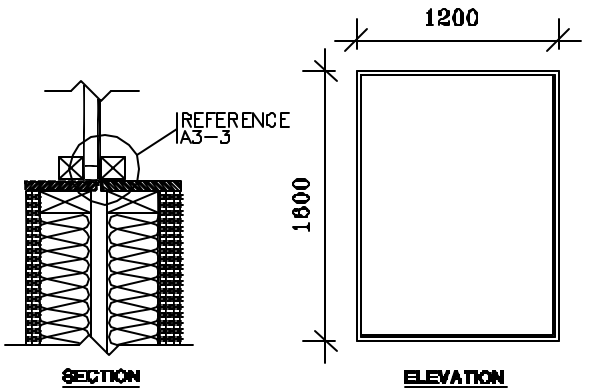
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 33

WINDOW No 4: THERMOPANE

COMPOSITION
GL 3 mm
AS 16 mm
GL 6 mm

DIMENSIONS (in millimetres)	
A: NA	D: NA
B: NA	E: NA
C: NA	F: NA



PROJECT DESCRIPTION

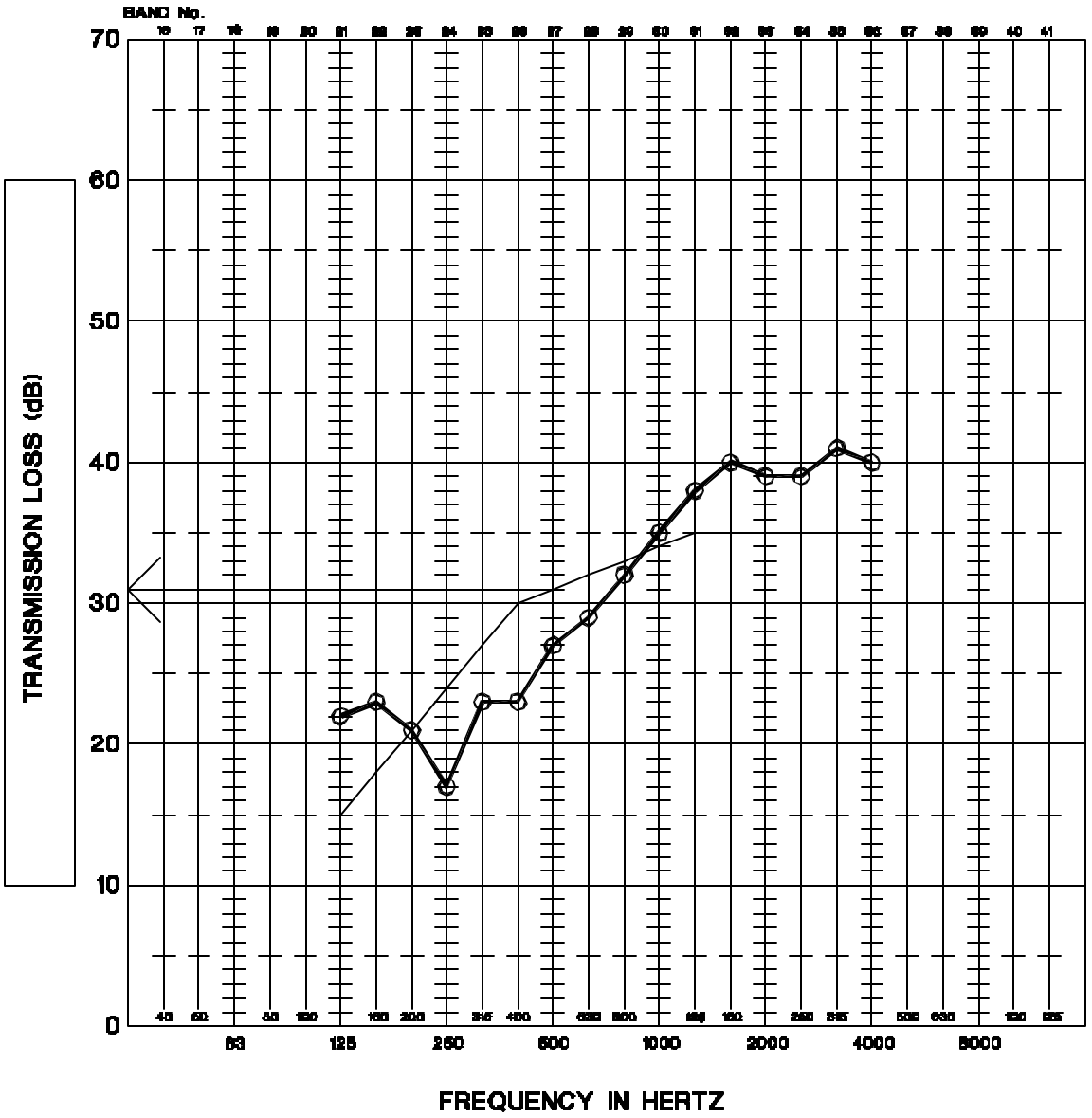
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 4: THERMOPANE

GRAPH NUMBER A2–4	FILE NAME: 177WN04B
PROJECT NUMBER 177.961	DATE 96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

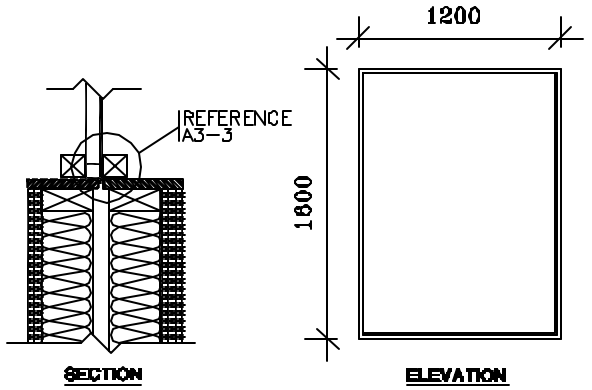
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 31

WINDOW No 5: THERMOPANE

COMPOSITION
GL 3 mm
AS 13 mm
GL 6 mm

DIMENSIONS (in millimeters)	
A: NA	D: NA
B: NA	E: NA
C: NA	F: NA



PROJECT DESCRIPTION

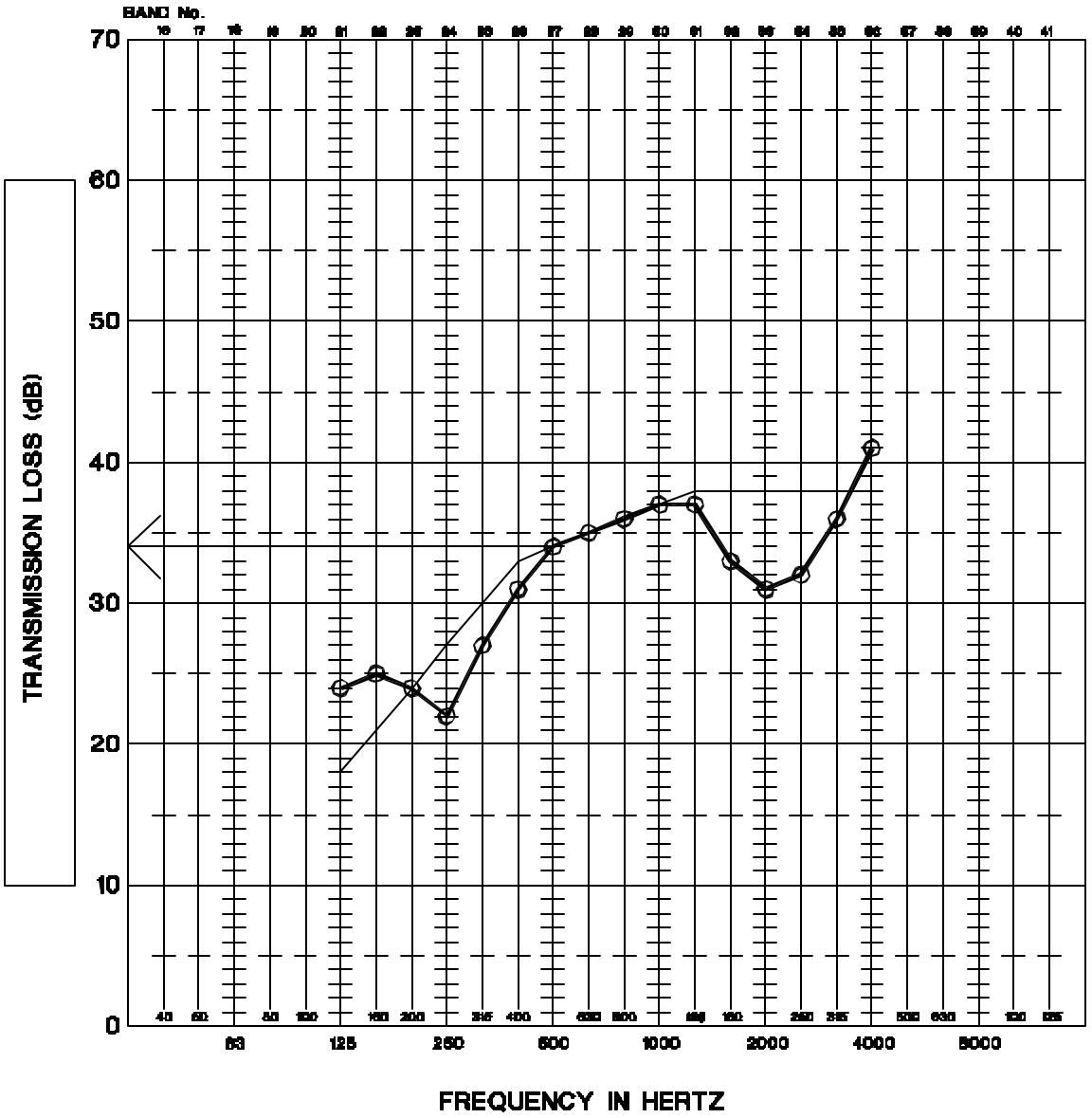
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 5: THERMOPANE

GRAPH NUMBER A2–5	**FILE NAME:** 177WN05B
PROJECT NUMBER 177.961	**DATE** 96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

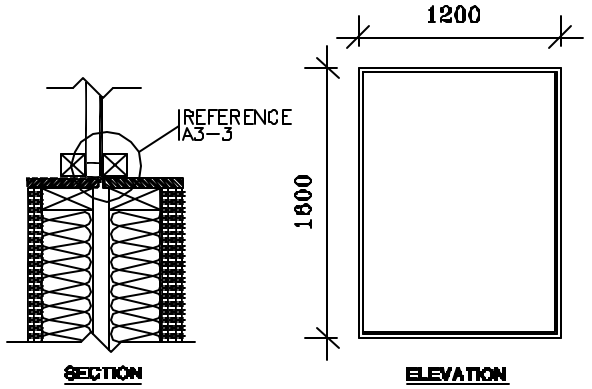
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 34

WINDOW No 6: THERMOPANE

COMPOSITION
GL 6 mm
AS 9 mm
GL 8 mm

DIMENSIONS (in millimetres)	
A: NA	D: NA
B: NA	E: NA
C: NA	F: NA



PROJECT DESCRIPTION

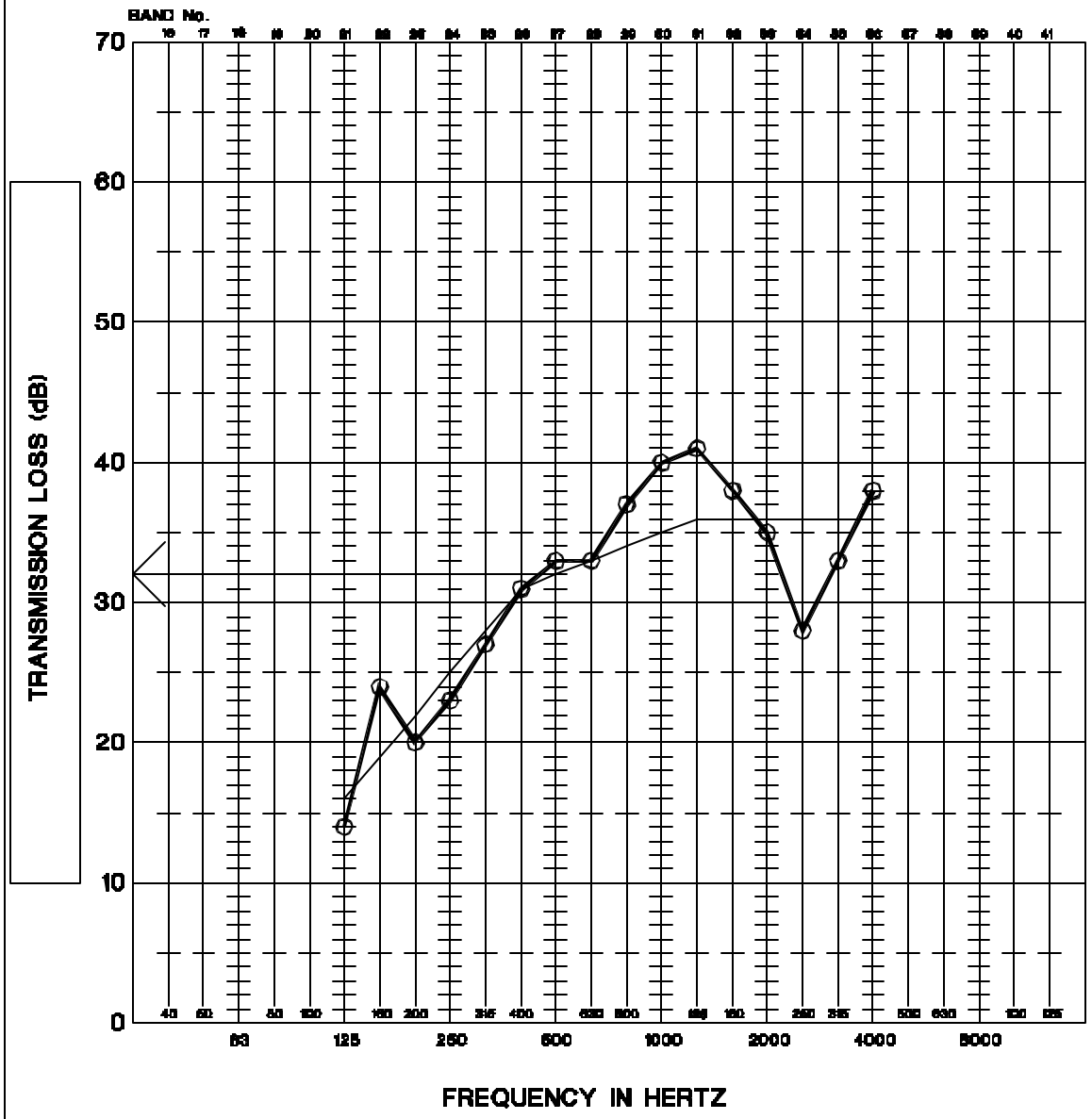
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 6: THERMOPANE

GRAPH NUMBER A2–6	**FILE NAME:** 177WIN06
PROJECT NUMBER 177.961	**DATE** 96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

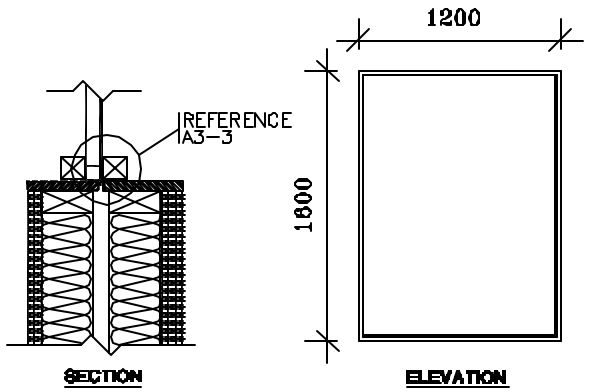
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 32

WINDOW No 7: THERMOPANE

COMPOSITION
GL 5 mm
AS 38 mm
GL 5 mm

DIMENSIONS (in millimetres)	
A: NA	D: NA
B: NA	E: NA
C: NA	F: NA



PROJECT DESCRIPTION

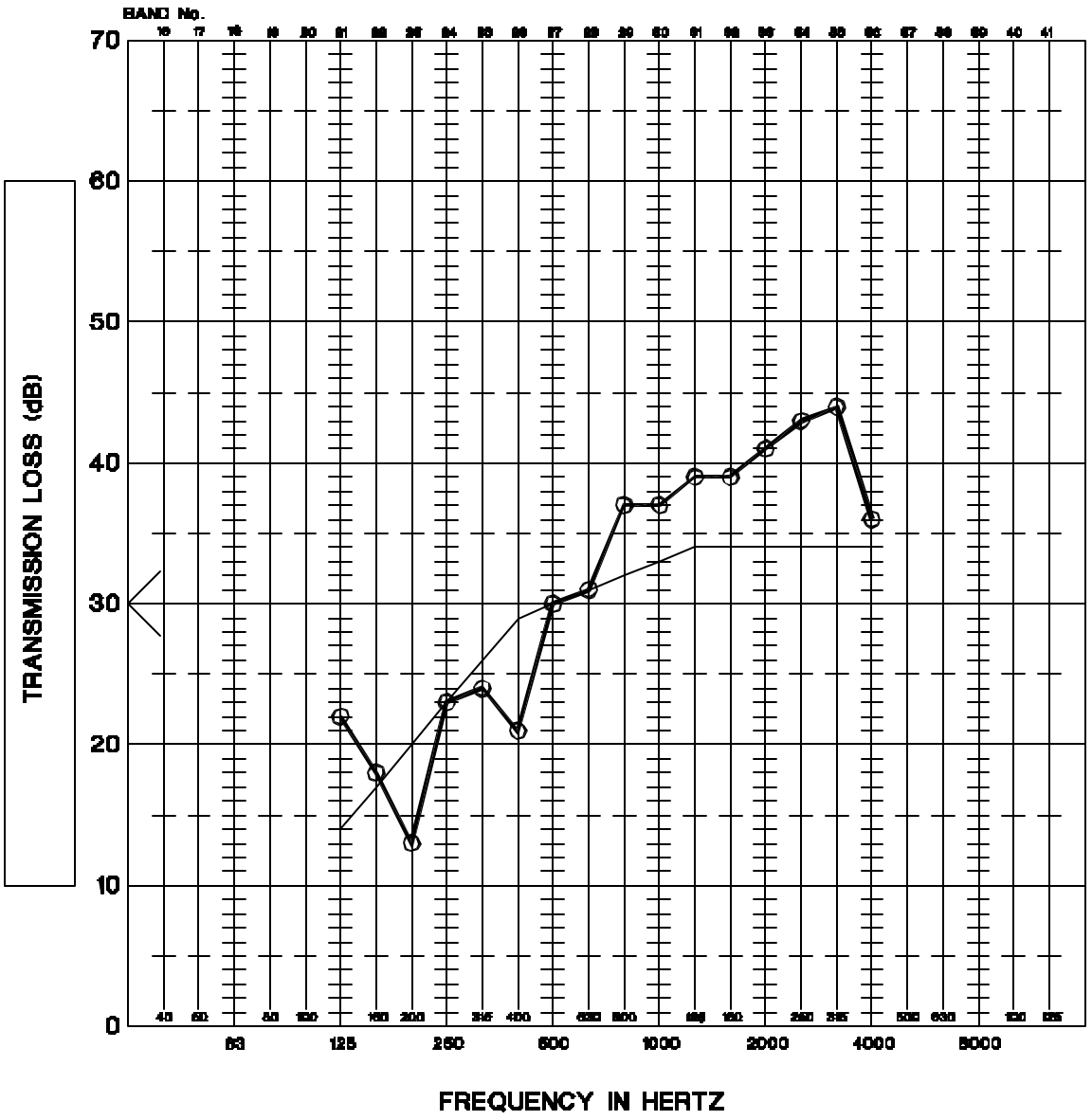
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 7: THERMOPANE

GRAPH NUMBER A2–7	**FILE NAME:** 177WIN07
PROJECT NUMBER 177.961	**DATE** 96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

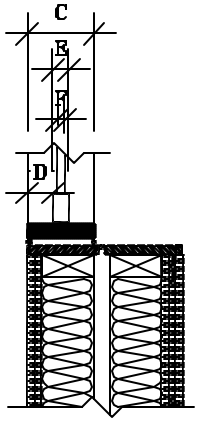
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 30

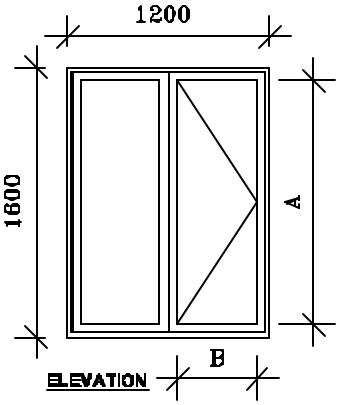
WINDOW No 8: ALUM. CASEMENT WINDOW

COMPOSITION
GL 3 mm
AS 19 mm
GL 3 mm

DIMENSIONS (in millimeters)	
A: 1425	D: 20
B: 440	E: 64
C: 100	F: 25



SECTION



ELEVATION

PROJECT DESCRIPTION

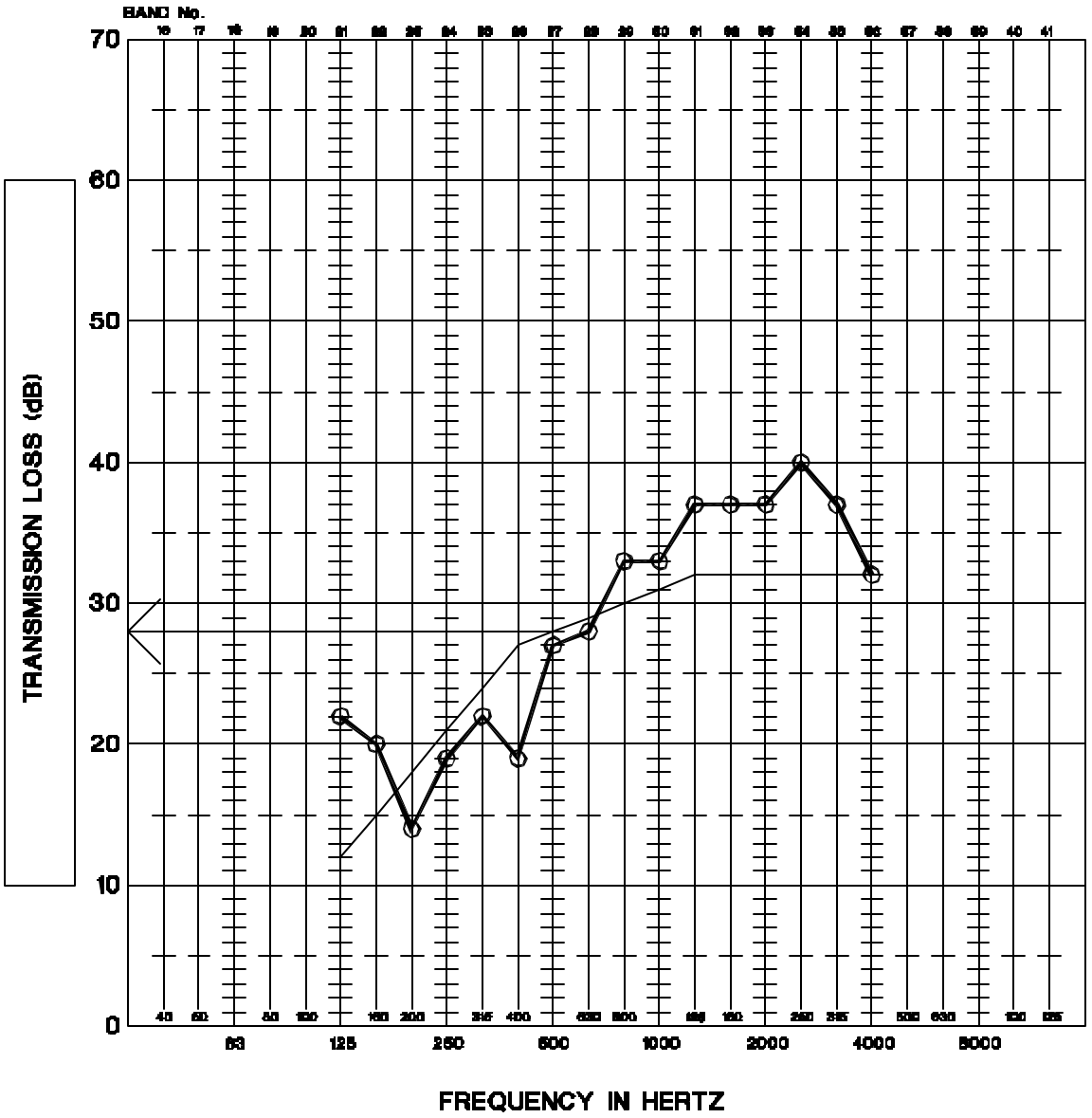
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS MEASUREMENT No 8: ALUMINIUM CASEMENT WINDOW

GRAPH NUMBER A2–8	FILE NAME: 177WIN08
PROJECT NUMBER 177.961	DATE 96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

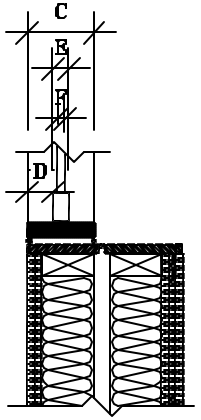
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 28

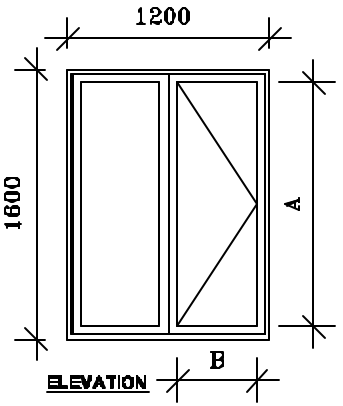
WINDOW No 9: PVC CASEMENT WINDOW

COMPOSITION
GL 3 mm
AS 16 mm
GL 3 mm

DIMENSIONS (in millimetres)	
A: 1440	D: 40
B: 435	E: 56
C: 185	F: 22



SECTION



ELEVATION

PROJECT DESCRIPTION

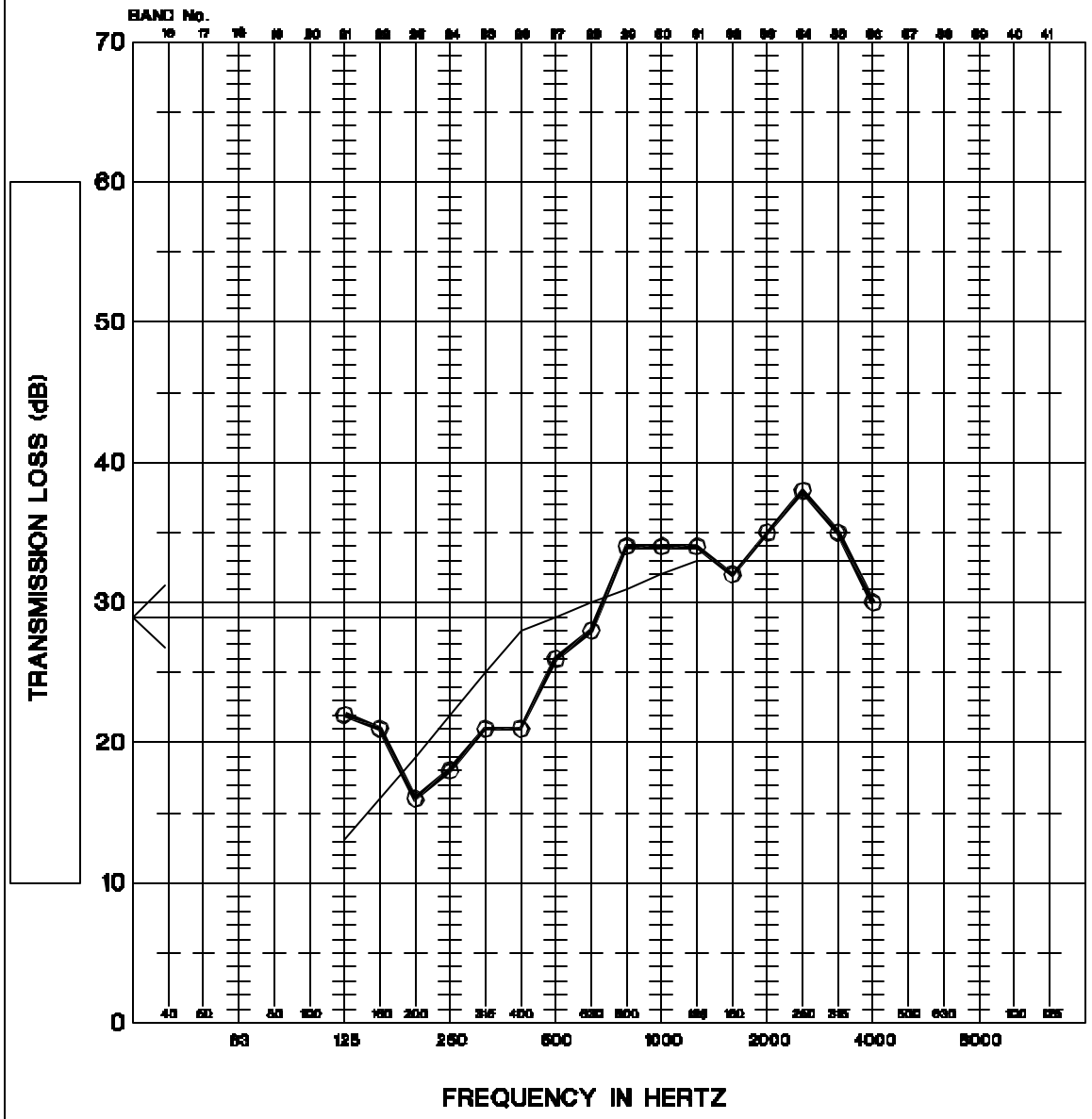
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 9: PVC CASEMENT WINDOW

GRAPH NUMBER A2–9	**FILE NAME:** 177WIN09
PROJECT NUMBER 177.961	**DATE** 96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

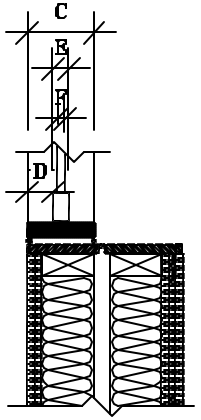
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 29

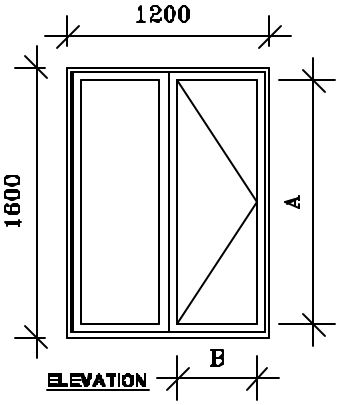
WINDOW No 10: WOOD CASEMENT WINDOW

COMPOSITION
GL 3 mm
AS 16 mm
GL 3 mm

DIMENSIONS (in millimeters)	
A: 1410	D: 25
B: 450	E: 46
C: 115	F: 22



SECTION



ELEVATION

PROJECT DESCRIPTION

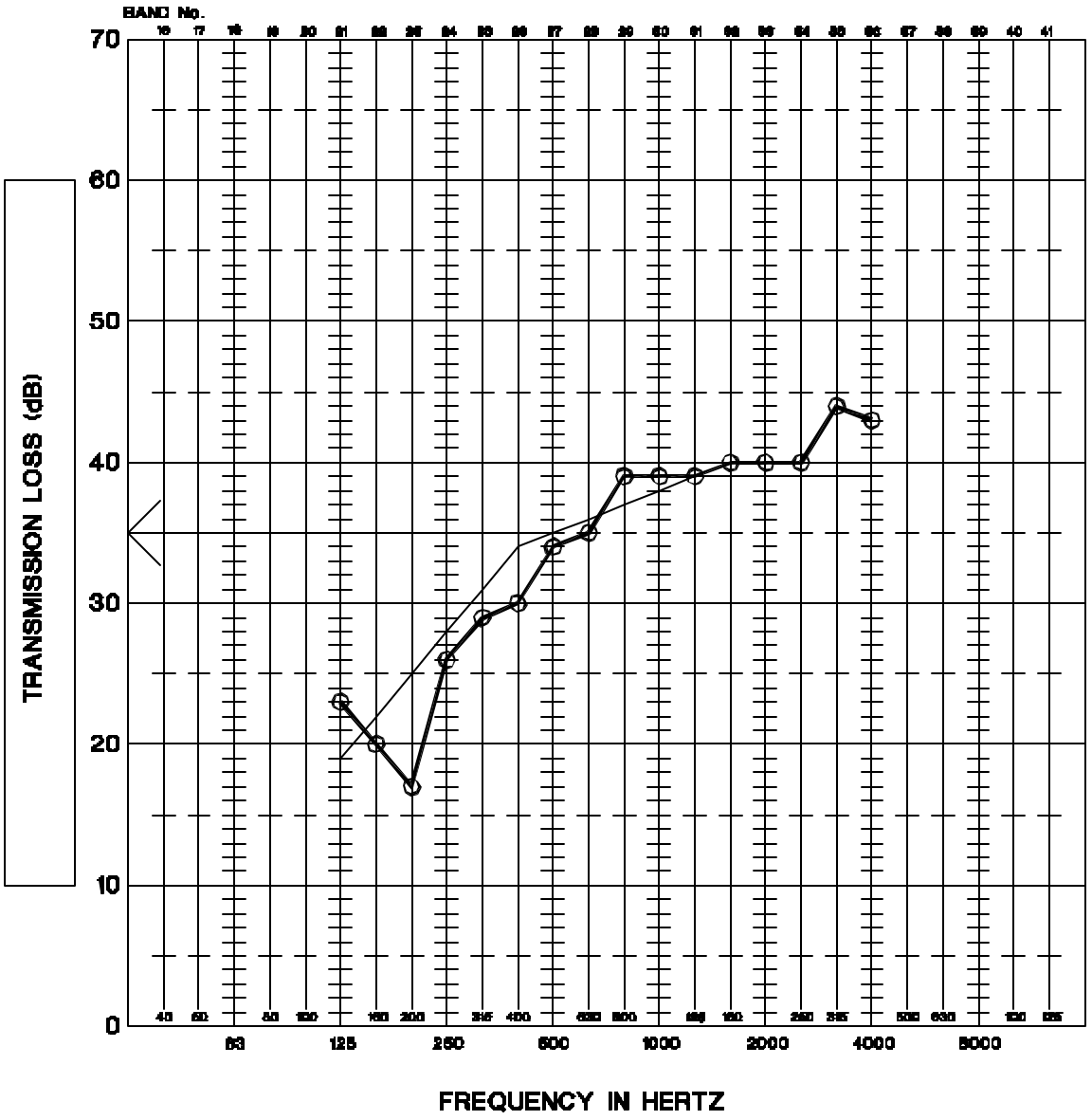
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS MEASUREMENT No 10: WOOD CASEMENT WINDOW

GRAPH NUMBER	FILE NAME:
A2–10	177WIN10
PROJECT NUMBER	**DATE**
177.961	96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

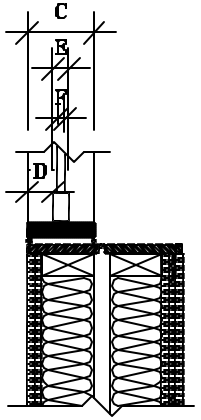
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 35

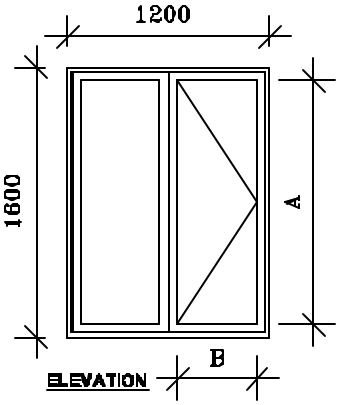
WINDOW No 11: ALUM. CASEMENT WINDOW

COMPOSITION
GL 3 mm
AS 16 mm
GL 6 mm

DIMENSIONS (in millimetres)	
A: 1425	D: 20
B: 440	E: 64
C: 100	F: 25



SECTION



ELEVATION

PROJECT DESCRIPTION

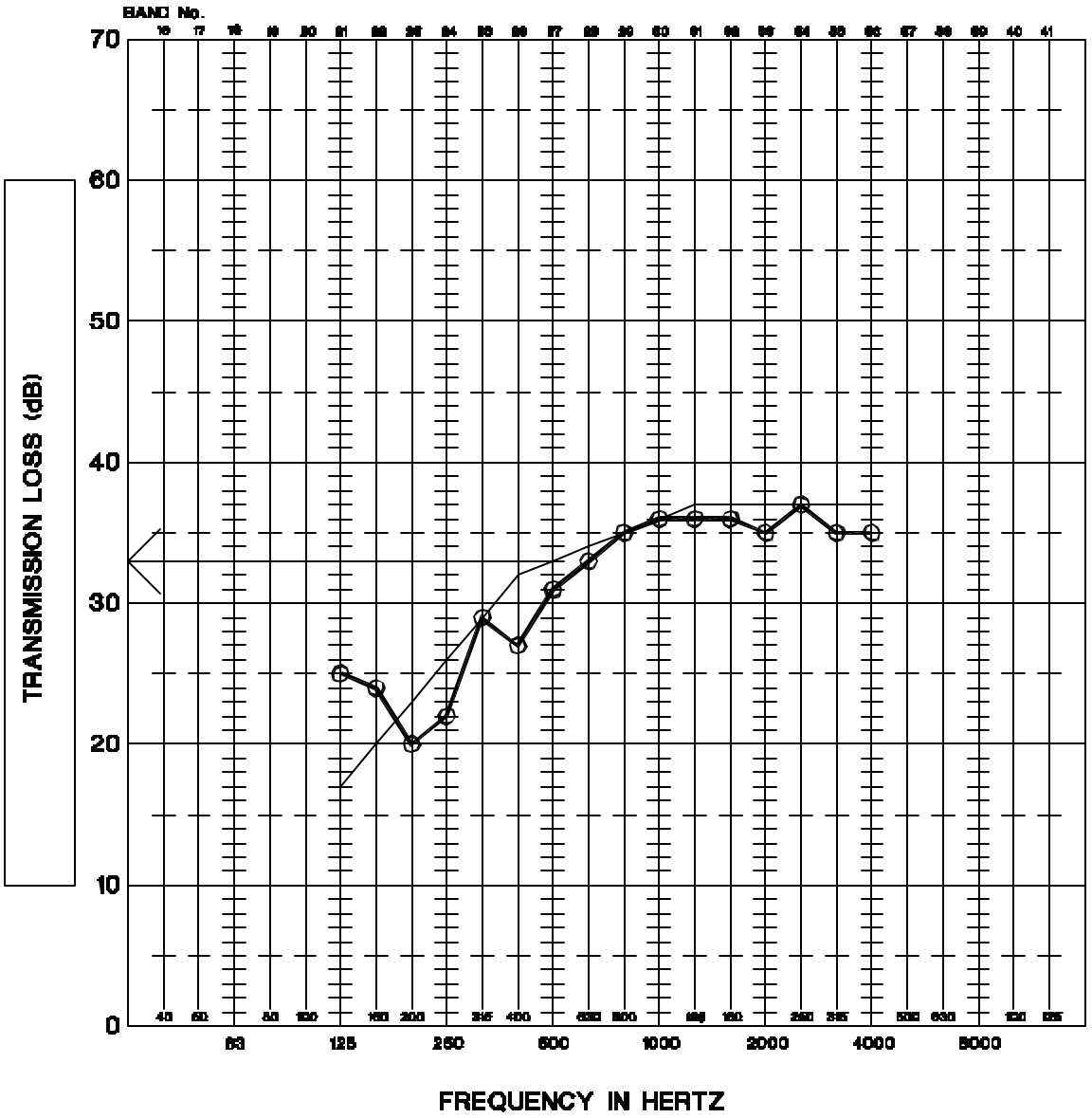
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS MEASUREMENT No 11: ALUMINIUM CASEMENT WINDOW

GRAPH NUMBER	FILE NAME:
A2–11	177WIN11
PROJECT NUMBER	**DATE**
177.961	96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

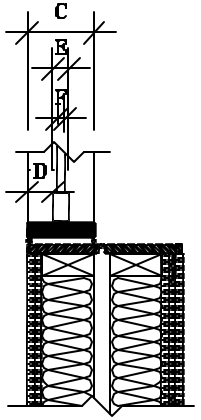
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 33

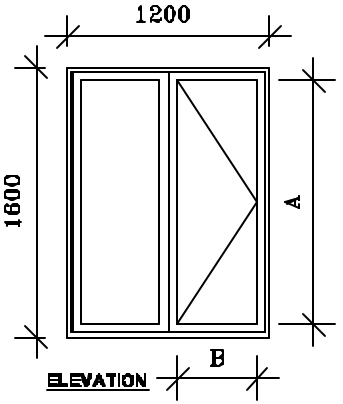
WINDOW No 12: PVC CASEMENT WINDOW

COMPOSITION
GL 3 mm
AS 13 mm
GL 6 mm

DIMENSIONS (in millimetres)	
A: 1440	D: 40
B: 435	E: 56
C: 185	F: 22



SECTION



ELEVATION

PROJECT DESCRIPTION

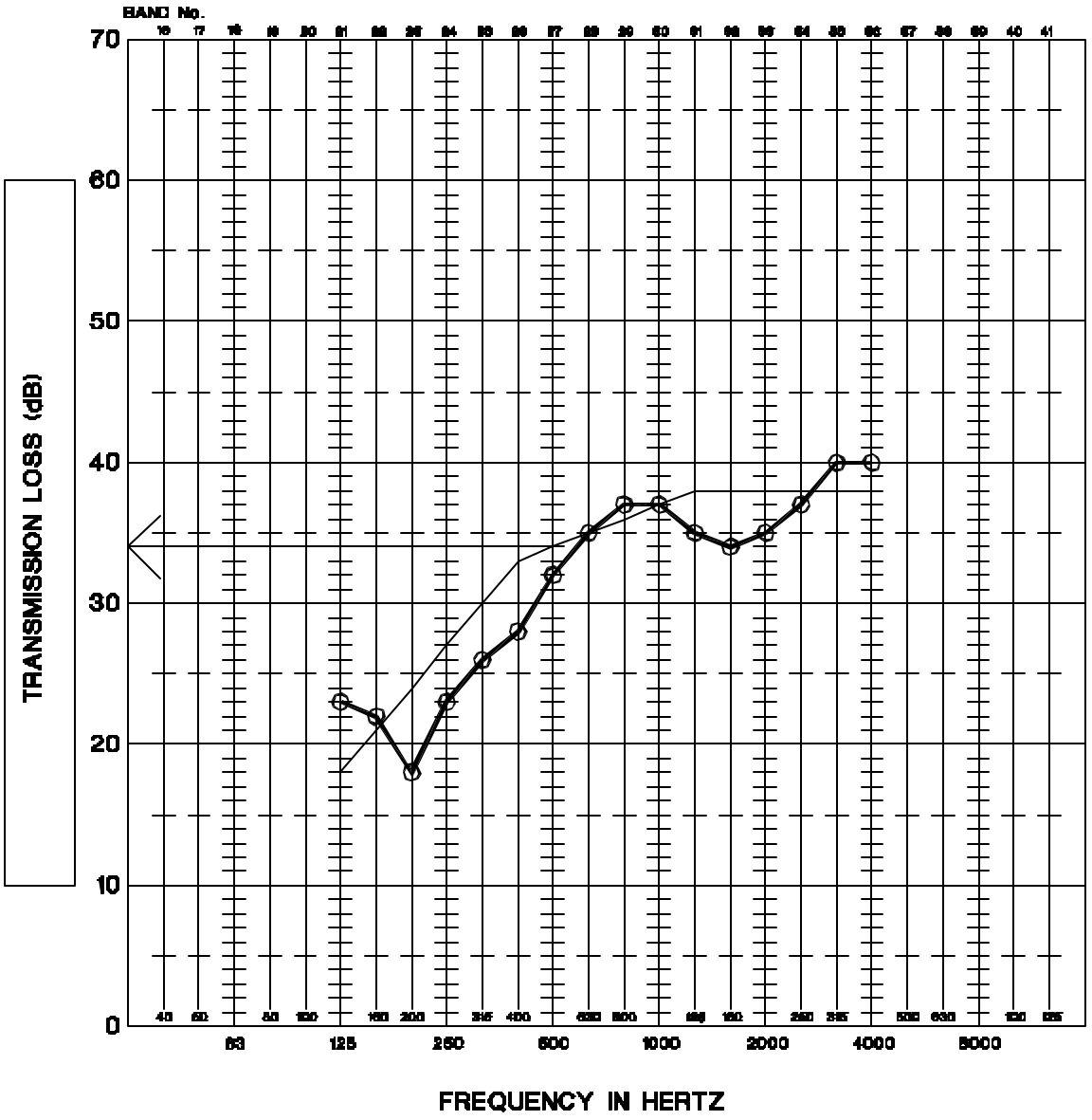
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 12: PVC CASEMENT WINDOW

GRAPH NUMBER	FILE NAME:
A2–12	177WIN12
PROJECT NUMBER	**DATE**
177.961	96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

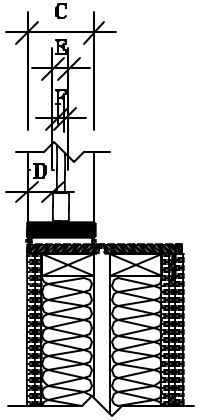
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 34

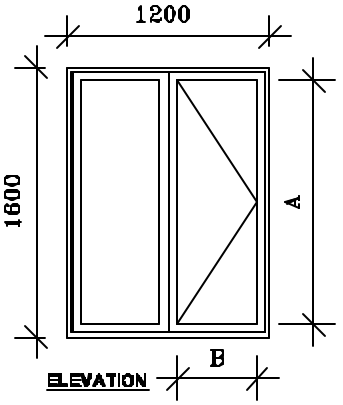
WINDOW No 13: WOOD CASEMENT WINDOW

COMPOSITION
GL 3 mm
AS 13 mm
GL 6 mm

DIMENSIONS (in millimeters)	
A: 1410	D: 25
B: 450	E: 46
C: 115	F: 22



SECTION



ELEVATION

PROJECT DESCRIPTION

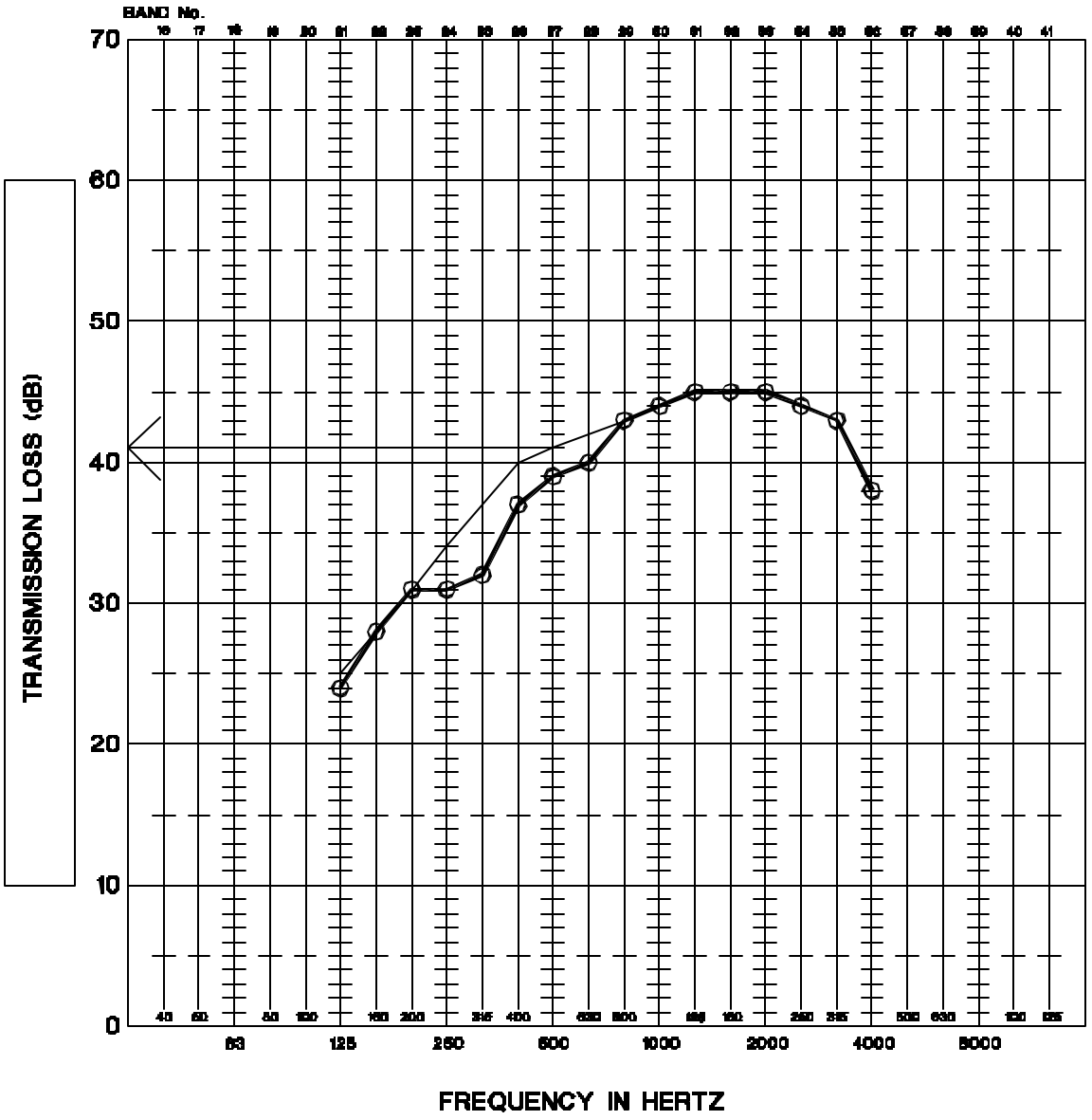
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS MEASUREMENT No 13: WOOD CASEMENT WINDOW

GRAPH NUMBER	FILE NAME:
A2–13	177WIN13
PROJECT NUMBER	**DATE**
177.961	96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

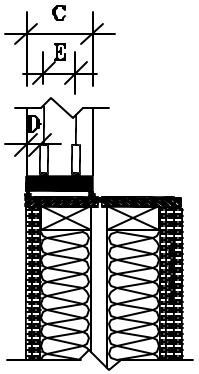
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 41

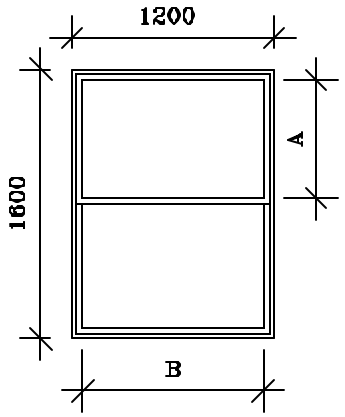
WINDOW No 14: ALUM. SLIDING WINDOW

COMPOSITION
GL 3 mm
AS 108 mm
GL 3 mm

DIMENSIONS (in millimeters)	
A: 720	D: 20
B: 1060	E: 115
C: 175	F: NA



SECTION



ELEVATION

PROJECT DESCRIPTION

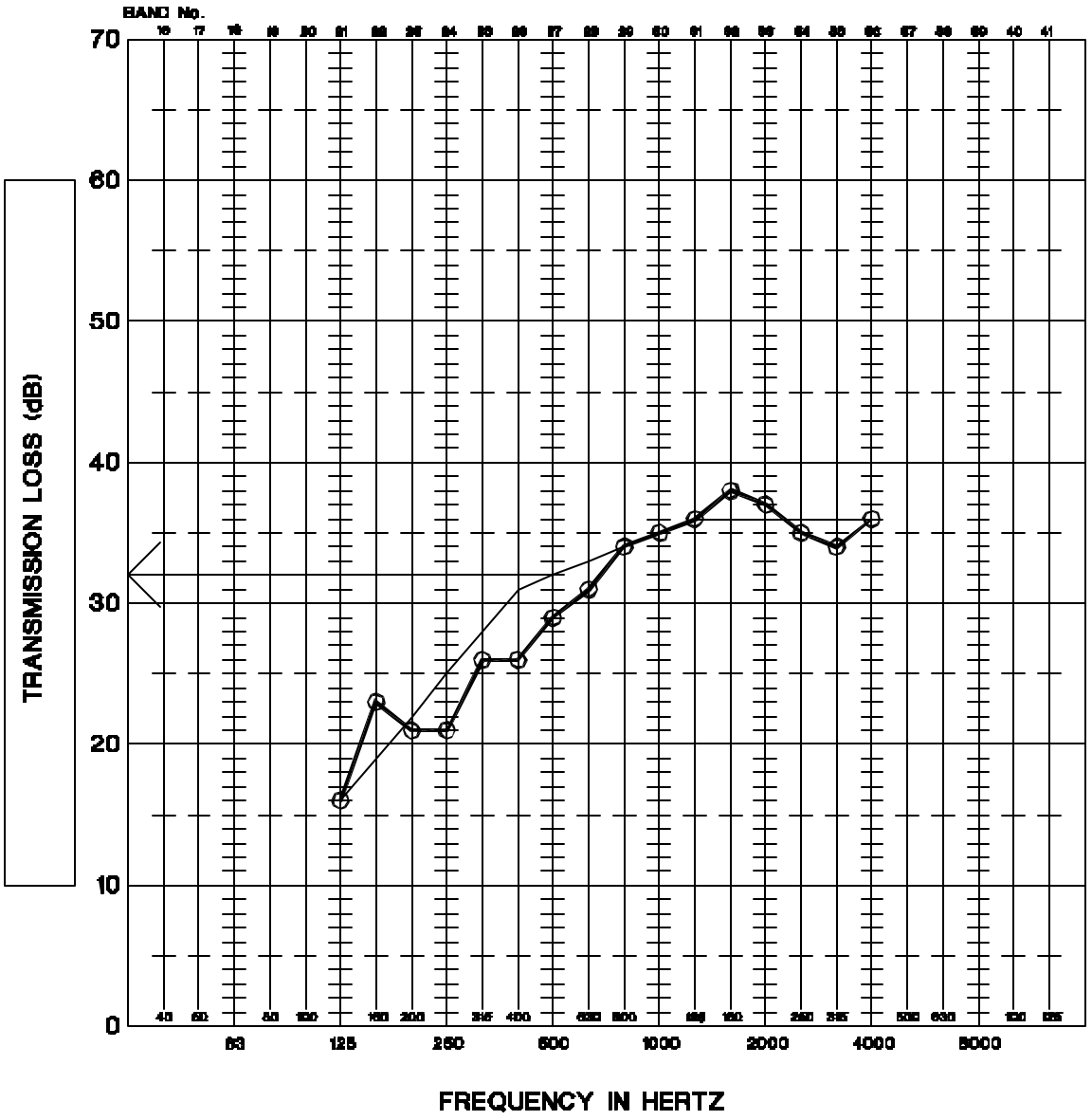
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS MEASUREMENT No 14: ALUMINIUM SLIDING WINDOW

GRAPH NUMBER	FILE NAME:
A2–14	177WIN14
PROJECT NUMBER	**DATE**
177.961	96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

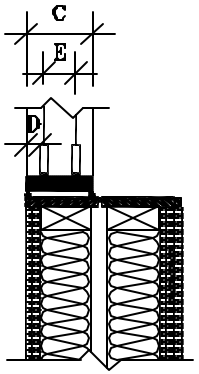
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 32

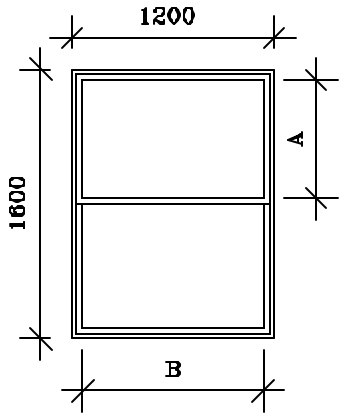
WINDOW No 15: WOOD SLIDING WINDOW

COMPOSITION
GL 5 mm
AS 34 mm
GL 5 mm

DIMENSIONS (in millimeters)	
A: 730	D: 40
B: 1085	E: 44
C: 185	F: NA



SECTION



ELEVATION

PROJECT DESCRIPTION

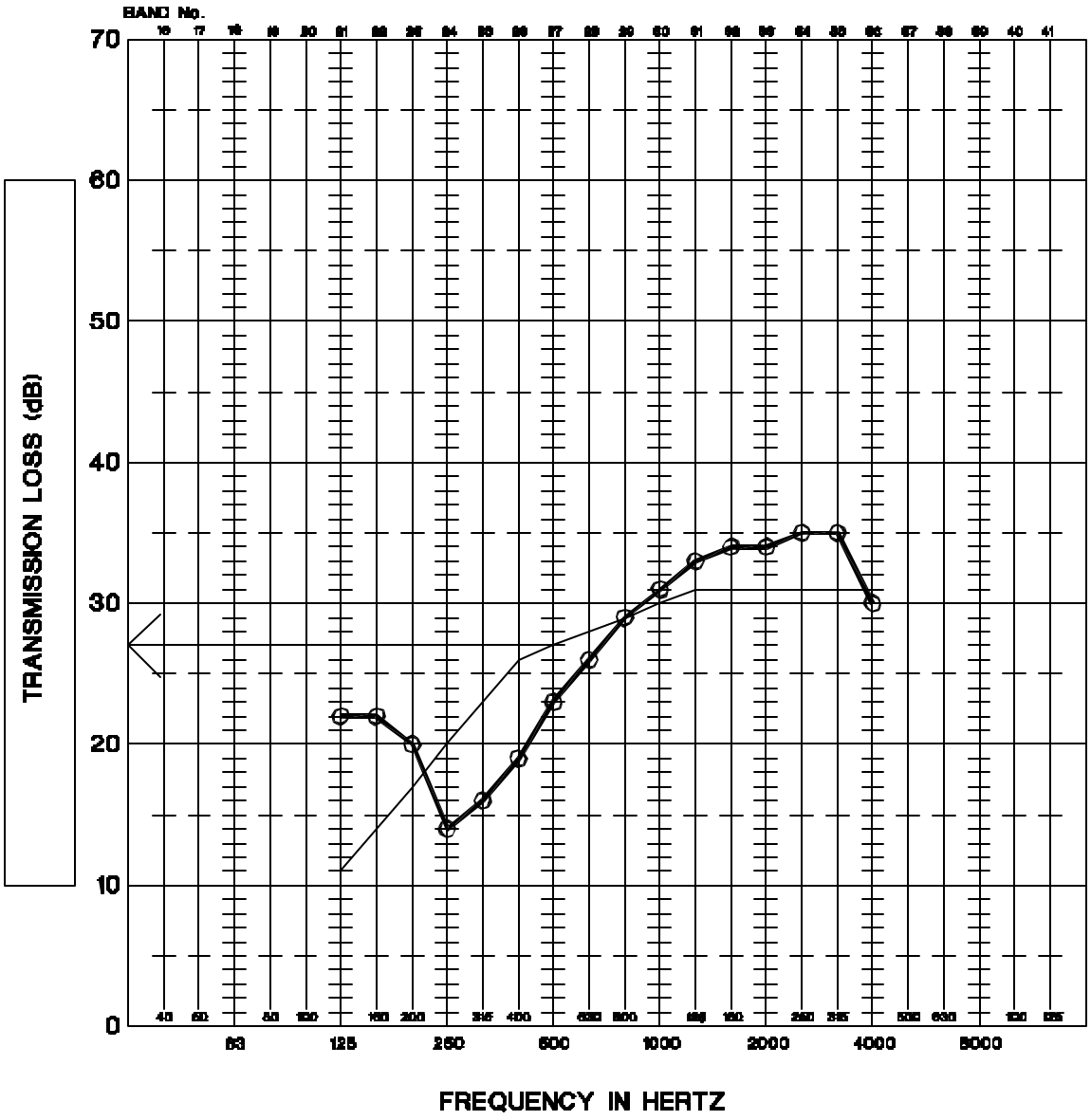
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 15: SLIDING WINDOW, PINE COVERED WITH PVC

GRAPH NUMBER	FILE NAME:
A2–15	177WIN15
PROJECT NUMBER	**DATE**
177.961	96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

Transmission Loss (TL)

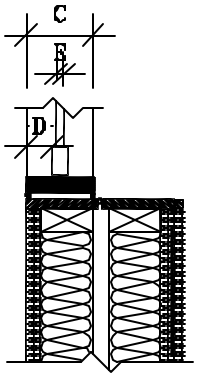
STC contour (ASTM E 413–87)

Sound Transmission Class
STC = 27

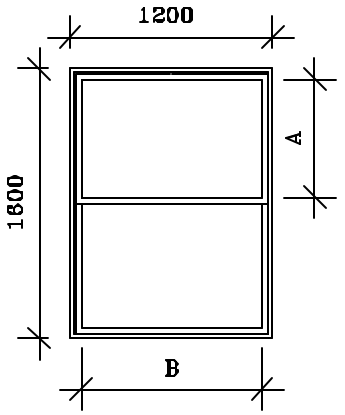
WINDOW No 16: WOOD SLIDING WINDOW

COMPOSITION
GL 3 mm
AS 13 mm
GL 3 mm

DIMENSIONS (in millimeters)	
A: 730	D: 40
B: 1030	E: 19
C: 185	F: NA



SECTION



ELEVATION

PROJECT DESCRIPTION

NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS
MEASUREMENT No 16: SLIDING WINDOW, PINE COVERED WITH VINYLE

GRAPH NUMBER	FILE NAME:
A2–16	177WIN16
PROJECT NUMBER	**DATE**
177.961	96 11

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	19	± 1.9	0
160	19	± 1.5	0
200	17	± 1.0	0
250	12	± 0.9	8
315	18	± 0.6	5
400	18	± 0.7	8
500	23	± 0.5	4
630	25	± 0.4	3
800	30	± 0.6	0
1000	32	± 0.5	0
1250	36	± 0.3	0
1600	39	± 0.5	0
2000	40	± 0.5	0
2500	43	± 0.5	0
3150	40	± 0.4	0
4000	28	± 0.4	3

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 27	STC 26	STC 28	31

SOUND TRANSMISSION LOSS MEASUREMENT No 1
THERMOPANE

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	20	± 2.2	0
160	21	± 1.4	0
200	19	± 1.0	0
250	13	± 0.9	6
315	17	± 0.7	5
400	18	± 0.6	7
500	22	± 0.4	4
630	24	± 0.4	3
800	28	± 0.5	0
1000	31	± 0.5	0
1250	34	± 0.3	0
1600	38	± 0.4	0
2000	40	± 0.5	0
2500	42	± 0.4	0
3150	40	± 0.4	0
4000	29	± 0.4	1

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 26	STC 26	STC 27	26

SOUND TRANSMISSION LOSS MEASUREMENT No 2
THERMOPANE

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	22	± 1.8	0
160	22	± 1.4	0
200	21	± 0.9	0
250	15	± 0.8	4
315	15	± 0.7	7
400	18	± 0.5	7
500	21	± 0.4	5
630	23	± 0.4	4
800	26	± 0.4	2
1000	29	± 0.4	0
1250	32	± 0.2	0
1600	37	± 0.3	0
2000	39	± 0.3	0
2500	41	± 0.3	0
3150	38	± 0.3	0
4000	27	± 0.3	3

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 26	STC 25	STC 26	32

SOUND TRANSMISSION LOSS MEASUREMENT No 3
THERMOPANE

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	21	± 1.8	0
160	22	± 1.5	0
200	21	± 1.0	0
250	15	± 1.0	3
315	15	± 0.7	6
400	18	± 0.4	6
500	19	± 0.4	6
630	22	± 0.5	4
800	25	± 0.4	2
1000	28	± 0.4	0
1250	31	± 0.2	0
1600	36	± 0.3	0
2000	39	± 0.3	0
2500	41	± 0.3	0
3150	38	± 0.4	0
4000	28	± 0.3	1

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 25	STC 25	STC 26	28

SOUND TRANSMISSION LOSS MEASUREMENT No 3A
THERMOPANE

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	22	± 1.8	0
160	21	± 1.6	0
200	20	± 0.9	0
250	14	± 0.8	4
315	14	± 0.6	7
400	17	± 0.4	7
500	19	± 0.4	6
630	21	± 0.4	5
800	25	± 0.4	2
1000	28	± 0.3	0
1250	32	± 0.2	0
1600	38	± 0.3	0
2000	42	± 0.3	0
2500	44	± 0.3	0
3150	42	± 0.3	0
4000	28	± 0.3	1

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 25	STC 24	STC 25	32

SOUND TRANSMISSION LOSS MEASUREMENT No 3B
THERMOPANE

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	22	± 1.8	0
160	21	± 1.4	0
200	19	± 1.0	4
250	18	± 0.7	8
315	24	± 0.6	5
400	25	± 0.6	7
500	29	± 0.4	4
630	31	± 0.4	3
800	34	± 0.4	1
1000	36	± 0.4	0
1250	39	± 0.2	0
1600	39	± 0.3	0
2000	38	± 0.3	0
2500	38	± 0.3	0
3150	41	± 0.3	0
4000	39	± 0.3	0

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 33	STC 32	STC 33	32

SOUND TRANSMISSION LOSS MEASUREMENT No 4
THERMOPANE

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	22	± 1.9	0
160	23	± 1.3	0
200	21	± 0.9	0
250	17	± 0.7	7
315	23	± 0.6	4
400	23	± 0.6	7
500	27	± 0.4	4
630	29	± 0.4	3
800	32	± 0.4	1
1000	35	± 0.4	0
1250	38	± 0.2	0
1600	40	± 0.3	0
2000	39	± 0.3	0
2500	39	± 0.3	0
3150	41	± 0.3	0
4000	40	± 0.3	0

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 31	STC 31	STC 32	26

SOUND TRANSMISSION LOSS MEASUREMENT No 5
THERMOPANE

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	24	± 1.8	0
160	25	± 1.4	0
200	24	± 1.1	0
250	22	± 0.7	5
315	27	± 0.6	3
400	31	± 0.4	2
500	34	± 0.3	0
630	35	± 0.4	0
800	36	± 0.4	0
1000	37	± 0.4	0
1250	37	± 0.2	1
1600	33	± 0.3	5
2000	31	± 0.3	7
2500	32	± 0.3	6
3150	36	± 0.5	2
4000	41	± 0.3	0

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 34	STC 33	STC 34	31

SOUND TRANSMISSION LOSS MEASUREMENT No 6
THERMOPANE

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	14	± 1.6	2
160	24	± 1.5	0
200	20	± 1.1	2
250	23	± 0.6	2
315	27	± 0.7	1
400	31	± 0.6	0
500	33	± 0.5	0
630	33	± 0.5	0
800	37	± 0.4	0
1000	40	± 0.3	0
1250	41	± 0.2	0
1600	38	± 0.3	0
2000	35	± 0.3	1
2500	28	± 0.3	8
3150	33	± 0.3	3
4000	38	± 0.3	0

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 32	STC 32	STC 33	19

SOUND TRANSMISSION LOSS MEASUREMENT No 7
THERMOPANE

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	22	± 1.6	0
160	18	± 2.0	0
200	13	± 1.2	7
250	23	± 0.8	0
315	24	± 0.8	2
400	21	± 0.5	8
500	30	± 0.4	0
630	31	± 0.4	0
800	37	± 0.4	0
1000	37	± 0.3	0
1250	39	± 0.3	0
1600	39	± 0.4	0
2000	41	± 0.3	0
2500	43	± 0.2	0
3150	44	± 0.3	0
4000	36	± 0.4	0

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 30	STC 30	STC 31	17

SOUND TRANSMISSION LOSS MEASUREMENT No 8
ALUMINIUM CASEMENT WINDOW

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	22	± 1.7	0
160	20	± 1.7	0
200	14	± 1.1	4
250	19	± 0.9	2
315	22	± 0.9	2
400	19	± 0.6	8
500	27	± 0.4	1
630	28	± 0.4	1
800	33	± 0.4	0
1000	33	± 0.3	0
1250	37	± 0.3	0
1600	37	± 0.4	0
2000	37	± 0.4	0
2500	40	± 0.3	0
3150	37	± 0.6	0
4000	32	± 0.4	0

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 28	STC 28	STC 29	18

SOUND TRANSMISSION LOSS MEASUREMENT No 9
PVC CASEMENT WINDOW

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	22	± 1.6	0
160	21	± 1.8	0
200	16	± 1.1	3
250	18	± 0.9	4
315	21	± 0.8	4
400	21	± 0.4	7
500	26	± 0.5	3
630	28	± 0.4	2
800	34	± 0.5	0
1000	34	± 0.4	0
1250	34	± 0.4	0
1600	32	± 0.4	1
2000	35	± 0.3	0
2500	38	± 0.3	0
3150	35	± 0.4	0
4000	30	± 0.3	3

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 29	STC 29	STC 30	27

SOUND TRANSMISSION LOSS MEASUREMENT No 10
WOOD CASEMENT WINDOW

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	23	± 1.5	0
160	20	± 2.0	2
200	17	± 1.5	8
250	26	± 0.8	2
315	29	± 0.8	2
400	30	± 0.4	4
500	34	± 0.4	1
630	35	± 0.3	1
800	39	± 0.3	0
1000	39	± 0.3	0
1250	39	± 0.3	0
1600	40	± 0.3	0
2000	40	± 0.3	0
2500	40	± 0.2	0
3150	44	± 0.4	0
4000	43	± 0.4	0

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 35	STC 33	STC 36	20

SOUND TRANSMISSION LOSS MEASUREMENT No 11
ALUMINIMUM CASEMENT WINDOW

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	25	± 1.7	0
160	24	± 1.8	0
200	20	± 1.3	3
250	22	± 0.9	4
315	29	± 0.7	0
400	27	± 0.4	5
500	31	± 0.4	2
630	33	± 0.3	1
800	35	± 0.3	0
1000	36	± 0.3	0
1250	36	± 0.3	1
1600	36	± 0.4	1
2000	35	± 0.3	2
2500	37	± 0.3	0
3150	35	± 0.4	2
4000	35	± 0.3	2

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 33	STC 33	STC 34	23

SOUND TRANSMISSION LOSS MEASUREMENT No 12
PVC CASEMENT WINDOW

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	23	± 1.6	0
160	22	± 1.9	0
200	18	± 1.4	6
250	23	± 0.8	4
315	26	± 0.8	4
400	28	± 0.4	5
500	32	± 0.4	2
630	35	± 0.3	0
800	37	± 0.4	0
1000	37	± 0.4	0
1250	35	± 0.3	3
1600	34	± 0.3	4
2000	35	± 0.3	3
2500	37	± 0.3	1
3150	40	± 0.5	0
4000	40	± 0.5	0

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 34	STC 33	STC 34	32

SOUND TRANSMISSION LOSS MEASUREMENT No 13
WOOD CASEMENT WINDOW

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	24	± 1.6	1
160	28	± 1.4	0
200	31	± 1.0	0
250	31	± 0.7	3
315	32	± 0.8	5
400	37	± 0.4	3
500	39	± 0.4	2
630	40	± 0.3	2
800	43	± 0.4	0
1000	44	± 0.3	0
1250	45	± 0.2	0
1600	45	± 0.3	0
2000	45	± 0.3	0
2500	44	± 0.2	1
3150	43	± 0.4	2
4000	38	± 0.3	7

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 41	STC 40	STC 41	26

SOUND TRANSMISSION LOSS MEASUREMENT No 14
ALUMINIUM SLIDING WINDOW

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	16	± 1.7	0
160	23	± 1.7	0
200	21	± 1.1	1
250	21	± 0.7	4
315	26	± 0.8	2
400	26	± 0.6	5
500	29	± 0.3	3
630	31	± 0.3	2
800	34	± 0.3	0
1000	35	± 0.3	0
1250	36	± 0.2	0
1600	38	± 0.3	0
2000	37	± 0.3	0
2500	35	± 0.2	1
3150	34	± 0.4	2
4000	36	± 0.2	0

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 32	STC 32	STC 33	20

SOUND TRANSMISSION LOSS MEASUREMENT No 15
SLIDING WINDOW, PINE COVERED WITH PVC

Frequency (Hz)	Sound Transmission Loss (TL)	95% confidence limits	Deficiencies under classification curve
125	22	± 1.8	0
160	22	± 1.8	0
200	20	± 1.3	0
250	14	± 0.8	6
315	16	± 0.8	7
400	19	± 0.4	7
500	23	± 0.4	4
630	26	± 0.3	2
800	29	± 0.4	0
1000	31	± 0.4	0
1250	33	± 0.3	0
1600	34	± 0.4	0
2000	34	± 0.4	0
2500	35	± 0.3	0
3150	35	± 0.4	0
4000	30	± 0.3	1

STC rating	95% confidence limits		Sum of the deficiencies below the curve
	MIN	MAX	
STC 27	STC 27	STC 28	27

SOUND TRANSMISSION LOSS MEASUREMENT No 16
SLIDING WINDOW, PINE COVERED WITH VINYLE

ANNEX III

ANNEX III

SOUND TRANSMISSION LOSS TESTS
AT THE DOMTAR RESEARCH CENTER ACOUSTICAL LABORATORY

1.0 INTRODUCTION

All the tests presented in the present research project have been conducted in the acoustical laboratory of the Domtar research center in Senneville, Quebec, by the firm MJM ACOUSTICAL CONSULTANTS INC. whose offices are located in Montreal, Quebec. The test facility, the standards used to perform the tests and the methods used to install the samples are presented in the paragraphs below.

2.0 APPLICABLE STANDARDS

All the sound transmission loss measurements described in this report have been conducted in accordance to the ASTM E 90-90 standard entitled "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions"; the Sound Transmission loss values of the windows tested were classified to obtain the Sound Transmission Class rating using ASTM E 413-87 standard entitled "Classification for Rating Sound Insulation".

3.0 MEASUREMENT METHOD

The method described in the ASTM E90 Standard to measure the sound transmission loss of a building element consists in installing this element between two reverberant rooms which are structurally independent from each other, in a frame which is itself structurally independent from the reverberant rooms. A broadband steady state noise is generated in the source room and its level is measured; the portion of the sound which has been transmitted through the element tested inside the receiving room is also measured. By subtracting the sound pressure level measured in the receiving room from that measured

in the source room, one can calculate the Noise Reduction (NR) values for each 1/3 octave band from 125 Hz to 4000 Hz. The sound transmission loss (TL) values are obtained by normalizing the NR values in function of the surface of the building element tested and of the absorption in the receiving room, this latter quantity being determined by measuring the reverberation time in the receiving room. The TL values are then classified as per ASTM E 413-87 to obtain the Sound Transmission Class (STC), which is a single number rating allowing to quickly compare the sound isolation provided by buildings elements.

4.0 DESCRIPTION OF THE ACOUSTICAL LABORATORY OF THE DOMTAR RESEARCH CENTER

The test facility is composed of three reverberant rooms built of poured in place concrete. The volume of each room is 60, 80 and 250 m^3; the rooms are structurally independent from one another. The test opening where the samples were installed measures 2700 mm (9 ft) by 3000 mm (10 ft), and is located between the 80 m^3 room (the source room) and the 250 m^3 room (the receiving room). Each room is equipped with fixed and rotating diffusing panels to provide an experimental environment as close as possible to a diffuse sound field. The sound field is sampled and analysed at 10 microphone positions along a diagonal in the source and in the receiving room, using Bruel and Kjaer microphones model 4145 and associated preamplifiers and power supply, connected to a LARSON DAVIS model 2800 real time analyser. All the measurements (10 sound pressure measurements in the source room, 10 sound pressure measurements in the receiving room, and 10 reverberation time measurements in the receiving room) are made for 1/3 octave bands which center frequencies range from 50 Hz to 5000 Hz.

5.0 SAMPLE INSTALLATION

5.1 Filler panel composition

All the windows and thermopanes tested measured 1200 x 1600 mm. The samples tested were installed in an opening made in the middle of a 3060 mm x 2745 mm double stud partition constructed as indicated below into the test frame of the laboratory:

- 2 layers of 13 mm drywall;
- 38 mm x 92 mm wood studs;
- 89 mm glass fibre batt insulation between the studs;
- 25 mm air space;
- wood studs 38 mm x 92 mm;
- 89 mm glass fibre batt insulation between the studs;
- 3 layers of 13 mm drywall;

The above partition was tested prior to making the test opening where the samples were to be installed. The results of the test performed appears on **graph A3-1** of this annex: a STC rating of 62 was achieved.

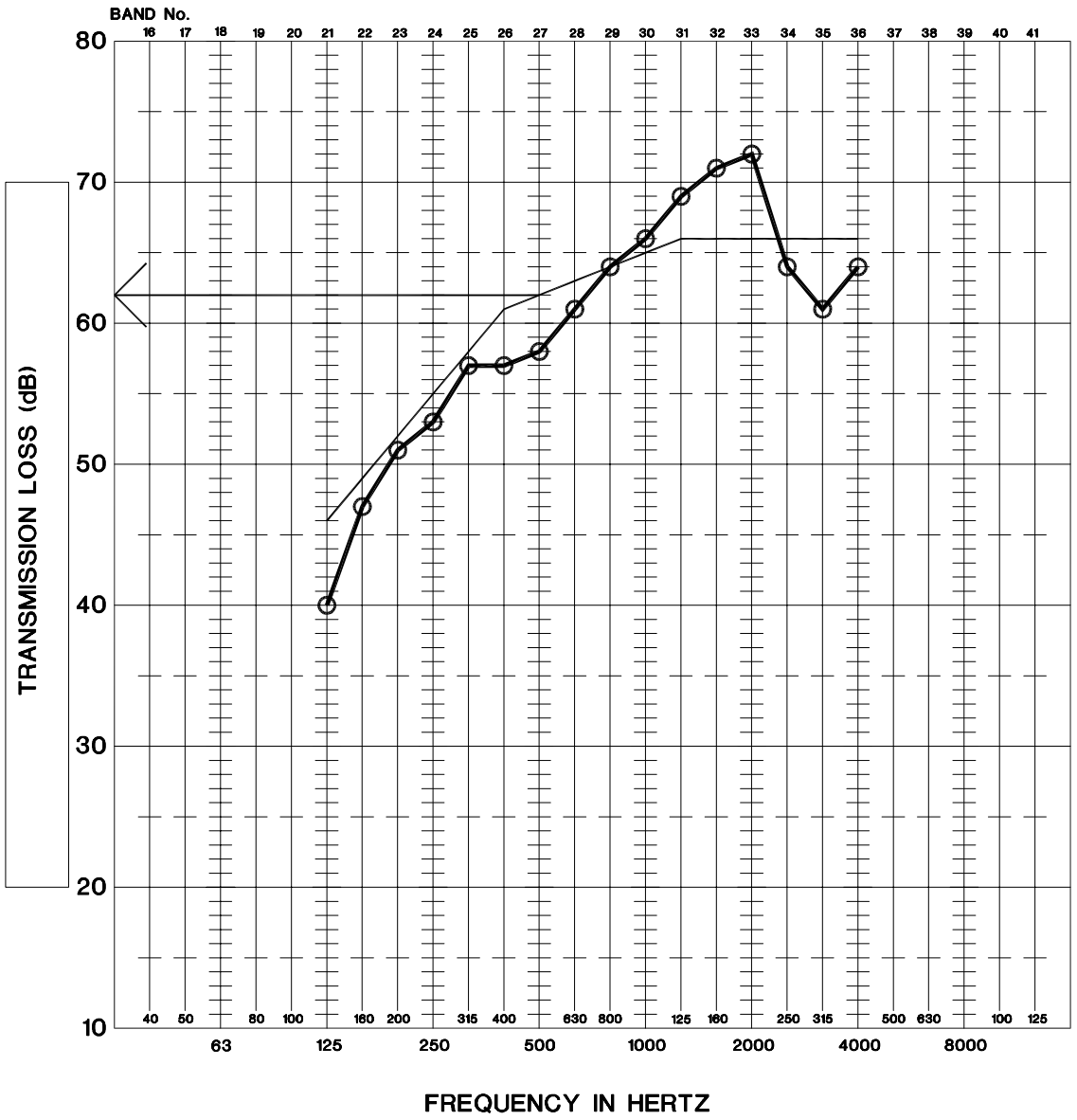
5.2 Installation of window samples inside the test opening

All the windows tested were installed in the test opening to simulate a standard installation inside an exterior wall constructed with wood studs and brick cladding, the exterior side of the virtual exterior wall being located in the source room of the laboratory. The 6 to 12 mm gap between the stand-alone thermopane or the window frame and the opening in the partition was packed with batt insulation and caulked on both sides using a non-hardening, non-shrinking latex caulking.

The wood casement window was installed and tested twice to see if the installation method had a significant effect on the noise isolation provided by the window. As can be seen on **graph A3-2** of this annex the STC rating was the same in both cases, and small differences were noted between the 1/3 octave TL results of these two measurements.

The effect of the placement of the stand-alone thermopanes inside the test opening was also determined prior to proceeding with the series of tests on samples 1 through 7. To that effect, tests were conducted with n^{o} 6 thermopane mounted in two different positions inside the test opening, corresponding to mid-depth and to 2" inside the test opening, when measured from the edge closest to the source room (the latter position correspond to the position of the glazing of the operable windows). **Graph A3-3** illustrates how the thermopanes were installed in the test opening and the results of the measurements. Again the STC rating was the same in both cases, and minor differences were noted between the 1/3 octave transmission loss curves. In order to minimize the potential for flanking through the plywood strip at the perimeter of the test opening, the thermopanes were installed and tested in the center position.

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



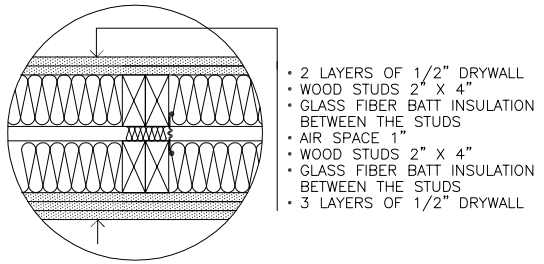
LEGEND

Transmission Loss (TL)

STC contour
(ASTM E 413–87)

Sound Transmission Class
STC = 62

SECTION



PROJECT DESCRIPTION

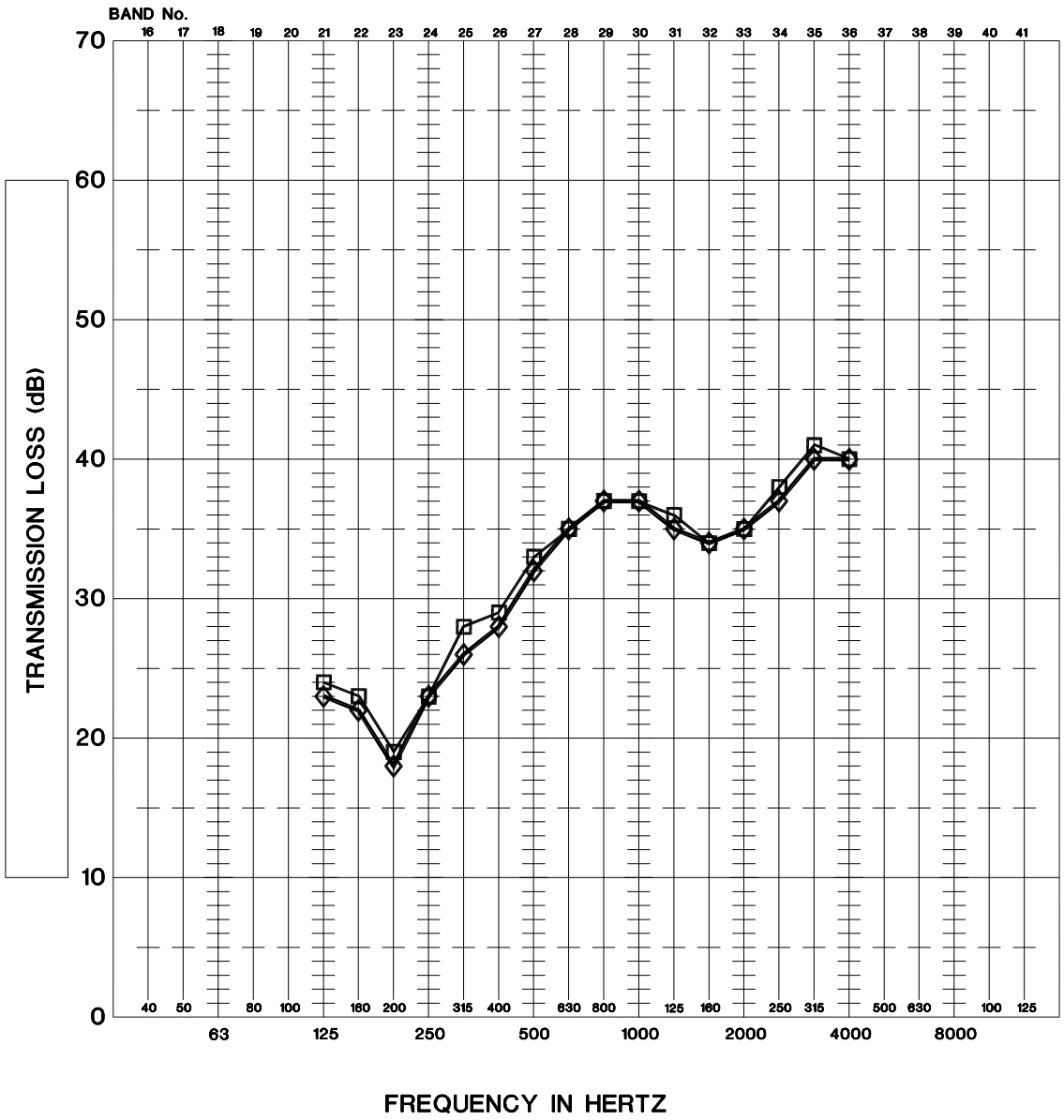
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

SOUND TRANSMISSION LOSS MEASUREMENT: DOUBLE STUD PARTITION

GRAPH NUMBER A3–1	**FILE NAME:** 177CLOIS
PROJECT NUMBER 177.961	**DATE** 96 11

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT



LEGEND

TESTS OF REPETABILITY ON WOOD CASEMENT WINDOW No 13

STC 34
WOOD CASEMENT WINDOW No 13
TEST No 1: FIRST INSTALLATION OF THE WINDOW
GL: 3mm; AS: 13mm; GL: 6mm

STC 34
WOOD CASEMENT WINDOW No 13
TEST No 2: THE WINDOW HAS BEEN REMOVED FROM THE TEST OPENING AND INSTALLED AGAIN
GL: 3mm; AS: 13mm; GL: 6mm

PROJECT DESCRIPTION

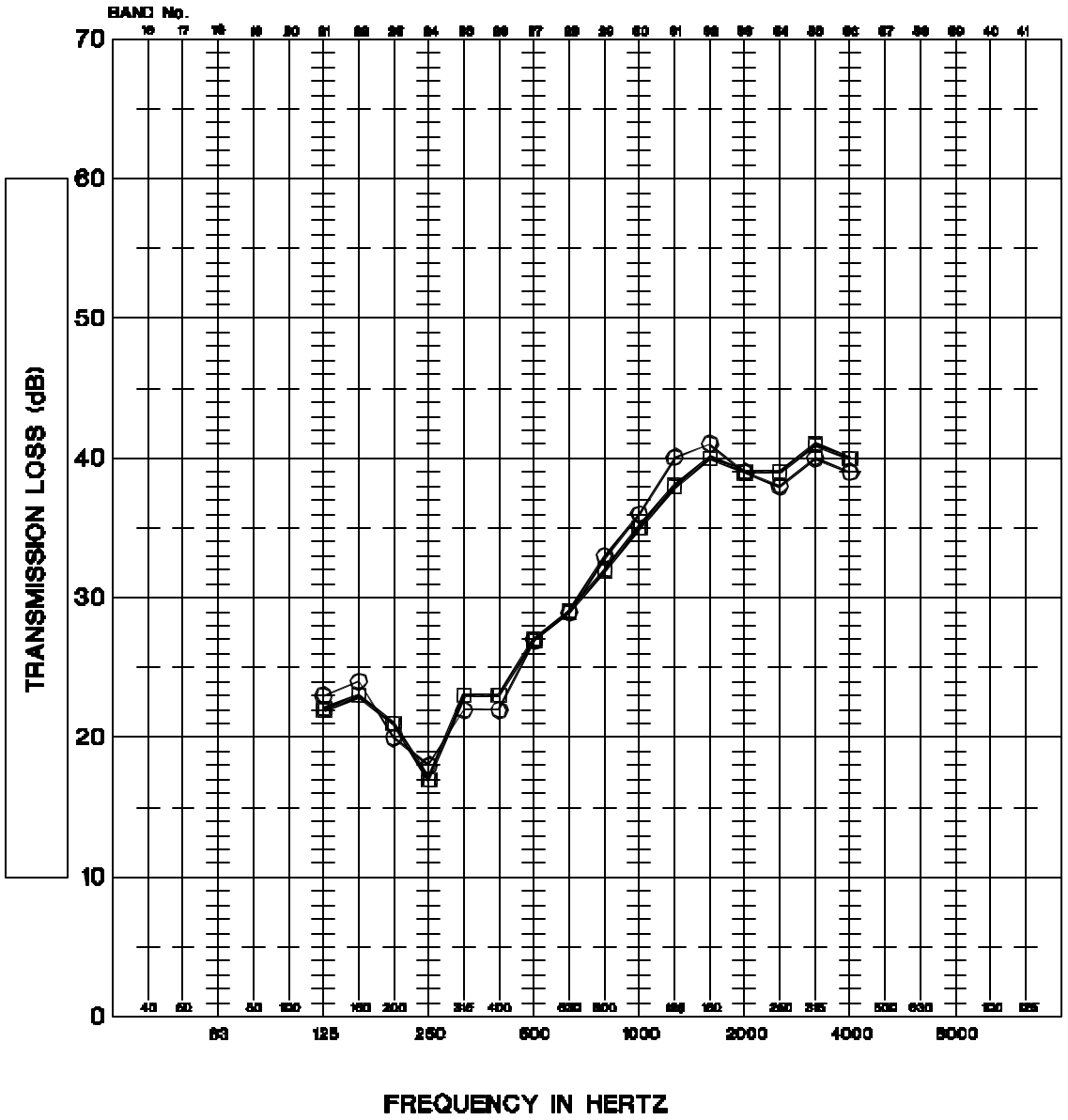
NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

REPETABILITY TESTS ON WOOD CASEMENT WINDOW No 13

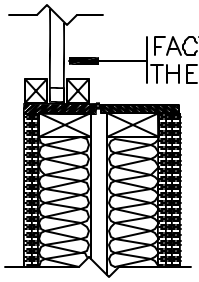
GRAPH NUMBER A3-2	**FILE NAME:** 177CMP19
PROJECT NUMBER 177.961	**DATE** 96 10

NOTE: THIS GRAPH ALONE DOES NOT REPRESENT A COMPLETE REPORT

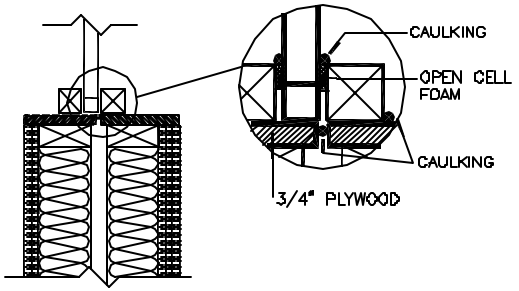


LEGEND

STC 31
THERMOPANE No 5 INSTALLED IN THE TEST OPENING AT 2 in FROM THE EDGE OF THE PARTITION



STC 31
THERMOPANE No 5 INSTALLED IN THE MIDDLE OF THE TEST OPENING



PROJECT DESCRIPTION

NOISE ISOLATION PROVIDED BY WINDOWS OF RESIDENTIAL PROJECTS

GRAPH TITLE

INFLUENCE OF THE POSITION OF THE THERMOPANE No 5 IN THE TEST OPENING

GRAPH NUMBER A3–3	**FILE NAME:** 177CMP18
PROJECT NUMBER 177.961	**DATE** 96 10

PRODUCT INFORMATION

Seules les fenêtres à battants

WILTON

vous offrent ces avantages exclusifs :

Des cadres pour tous les besoins

Wilton vous offre des fenêtres à cadre de bois ainsi que des fenêtres à cadre d'aluminium. De plus, Wilton offre une vaste gamme de moulures structurelles et de moulures de finition qui permettent d'adapter les fenêtres à toutes les épaisseurs de murs.

Approbation

Les fenêtres Wilton ont subi des tests rigoureux en matière d'isolation thermique, de résistance aux infiltrations d'eau et d'air ainsi que de résistance aux chocs, aux vents violents et aux déformations. Après ces tests, elles ont reçu l'approbation CAN-CSA-A 440 M-90.

Meilleure garantie

Wilton vous offre une garantie exclusive sur les pièces et la main-d'oeuvre.

FABRIQUÉ AU QUÉBEC

Exigez les autres produits de qualité

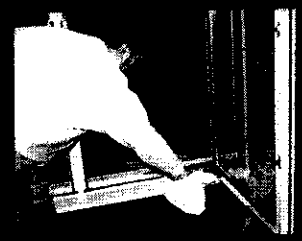
WILTON

- **Fenêtres coulissantes • Portes-fenêtres**
- **Fenêtres à battants «Nouvelle génération»**
- **Fenêtres à guillotine • Contre-fenêtres**
- **Contre-portes**

Depuis 25 ans,

Wilton conçoit et produit des portes et des fenêtres de qualité supérieure. Seuls des éléments de toute première qualité entrent dans leur fabrication. De plus, des contrôles de qualité rigoureux permettent à Wilton d'offrir aux consommateurs des produits au fonctionnement et à la finition impeccables.

Chez Wilton, quand on dit qualité, on veut dire qualité!

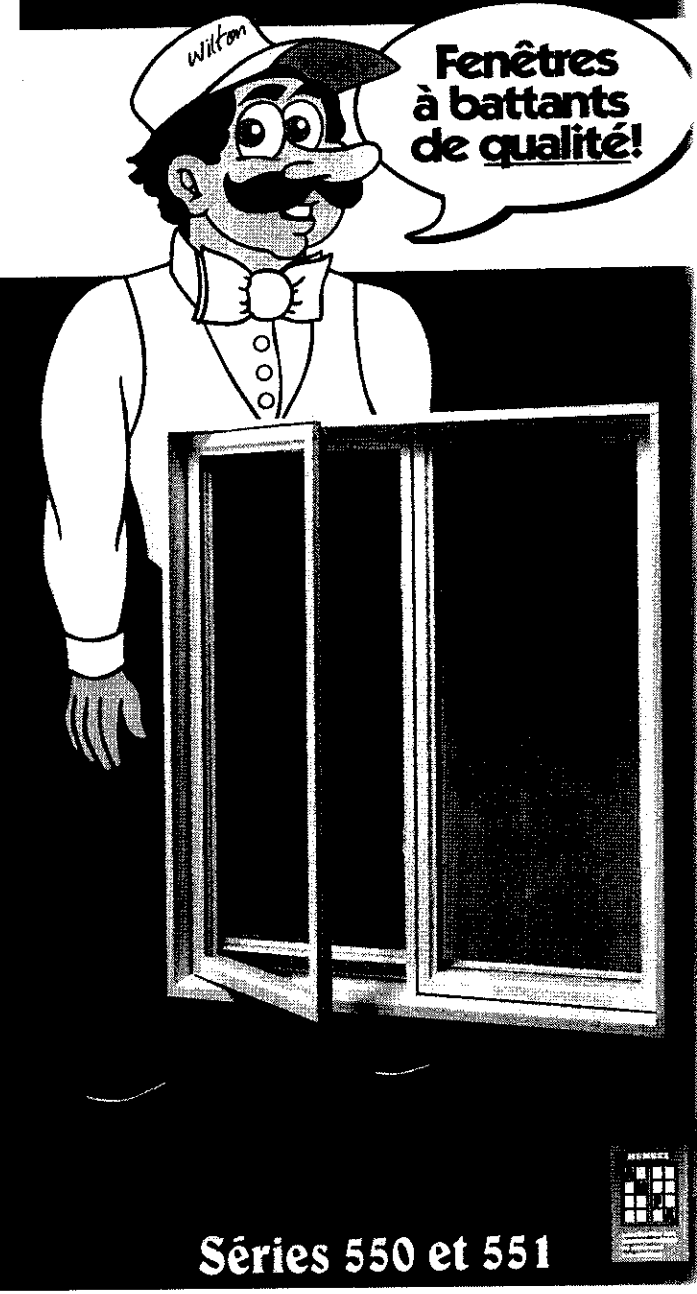


Chaque produit est minutieusement vérifié avant de recevoir le sceau de qualité Wilton.

DÉTAILLANT

WILTON

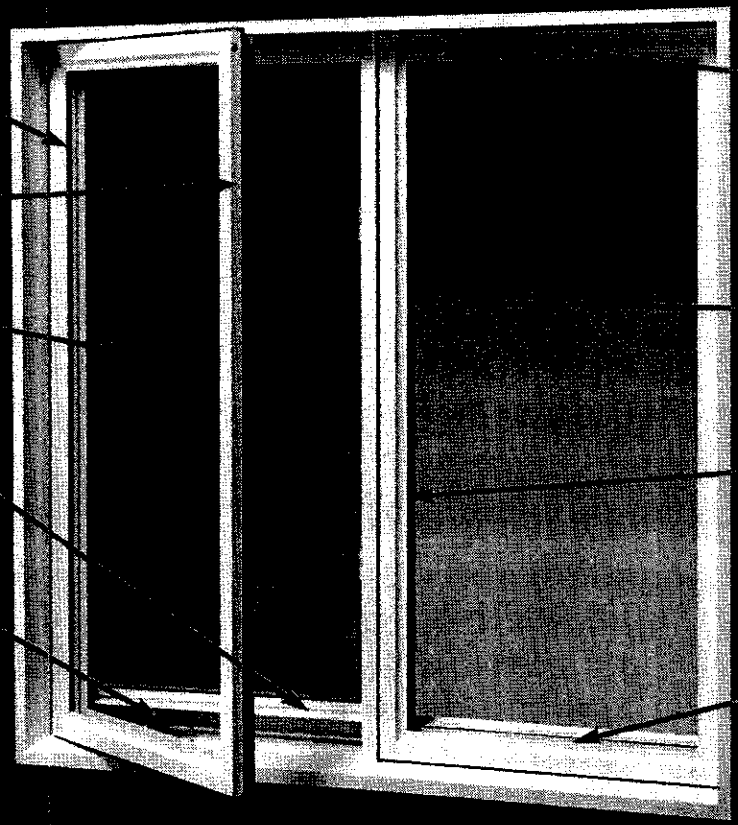
FENÊTRES À BATTANTS



Séries 550 et 551

WILTON

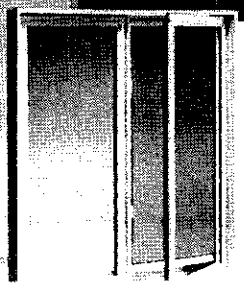
- Intercalaire non-conducteur.
- Gros coupe-froid avec lamelle de vinyle, plus efficaces
- Volets ouvrant à 90°
- Bris thermique en PVC scellé à l'usine. Aucune infiltration d'air ou d'eau
- Mécanisme d'ouverture à double action, robuste et durable



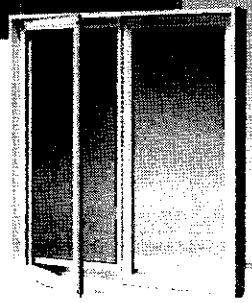
- Volets isolés à l'uréthane injecté sous pression
- Vaste choix de vitrages énergétiques : unité scellée de 1", Heat Mirror, Superglass, Low E, argon, etc.
- Unique : caoutchouc de retenue offert en trois teintes : blanc, gris ou noir
- Cache-mécanisme et cache-vis esthétiques

Modèle 550

- **Cadre en aluminium de 1/8" d'épaisseur**
- **Cadre de bois en option**
- **Largeur des cadres : 4 5/8" ou 6 1/2"**
- **Rebord de 1 1/2" en option**
- **Moulures de finition en option**



- **Vaste choix de fenêtres en oriel ou en saillie**
- **Formes irrégulières disponibles**
- **Volet «Auvent» offert en option**
- **Carrelage offert en option**
- **Vaste choix de teintes**



Modèle 551

- **Cadre en aluminium de 1" d'épaisseur**
- **Largeur des cadres : 6 1/2", 7 5/4" ou 9 1/4"**
- **Volets et barrière thermique à l'intérieur, offrant un meilleur rendement énergétique**

Seules les fenêtres coulissantes

WILTON

vous offrent ces avantages exclusifs :

Des cadres pour tous les besoins

Wilton vous offre des fenêtres à cadre de bois ainsi que des fenêtres à cadre d'aluminium. De plus, Wilton offre une vaste gamme de moulures structurelles et de moulures de finition qui permettent d'adapter les fenêtres à toutes les épaisseurs de murs.

Approbation

Les fenêtres Wilton ont subi des tests rigoureux en matière d'isolation thermique, de résistance aux infiltrations d'eau et d'air ainsi que de résistance aux chocs, aux vents violents et aux déformations. Après ces tests, elles ont reçu l'approbation CAN-CSA-A 440 M-90.

Meilleure garantie

Wilton vous offre une garantie exclusive sur les pièces et la main-d'oeuvre.

FABRIQUÉ AU QUÉBEC

Exigez les autres produits de qualité

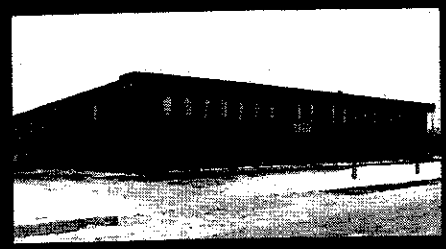
WILTON

- **Fenêtres à battants • Portes-fenêtres**
- **Fenêtres à battants «Nouvelle génération»**
- **Fenêtres à guillotine • Contre-fenêtres**
- **Contre-portes**

Depuis 25 ans,

Wilton conçoit et produit des portes et des fenêtres de qualité supérieure. Seuls des éléments de toute première qualité entrent dans leur fabrication. De plus, des contrôles de qualité rigoureux permettent à Wilton d'offrir aux consommateurs des produits au fonctionnement et à la finition impeccables.

Chez Wilton, quand on dit qualité, on veut dire qualité!

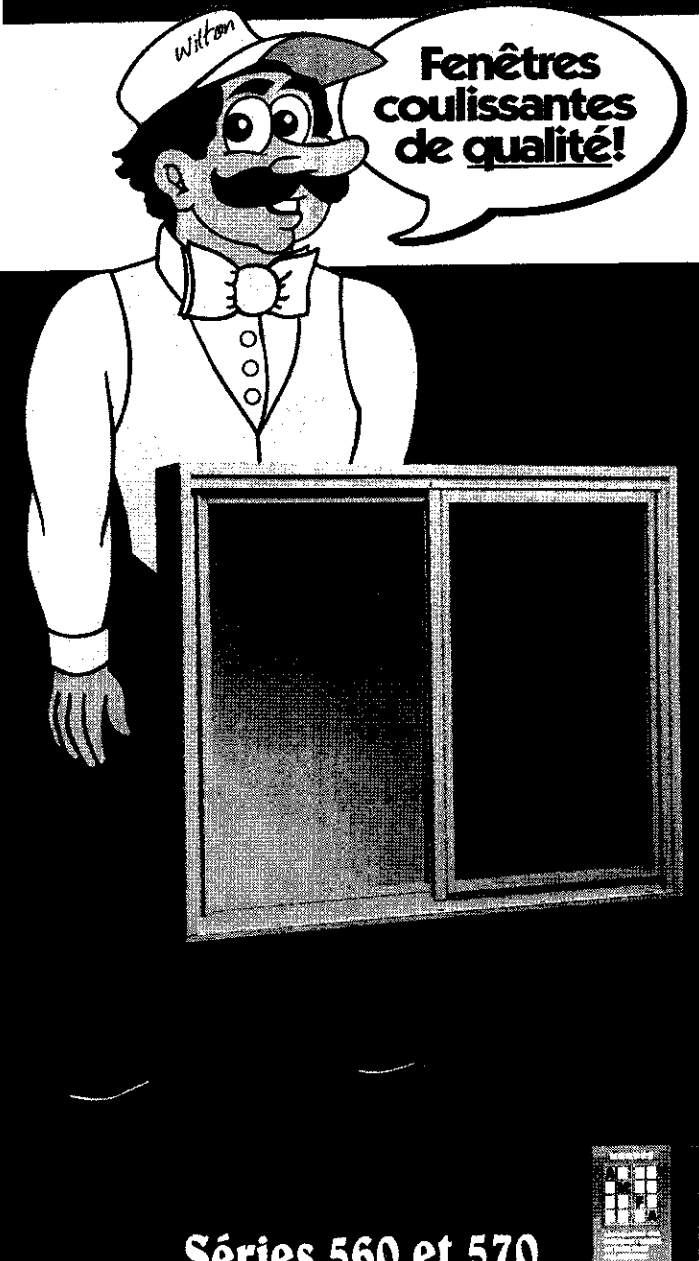


Les produits Wilton sont fabriqués dans une usine ultra-moderne dotée d'équipements dernier cri.

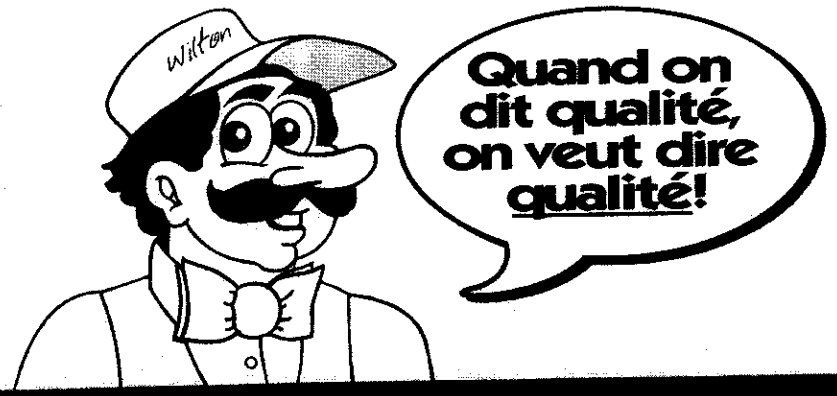
DÉTAILLANT

WILTON

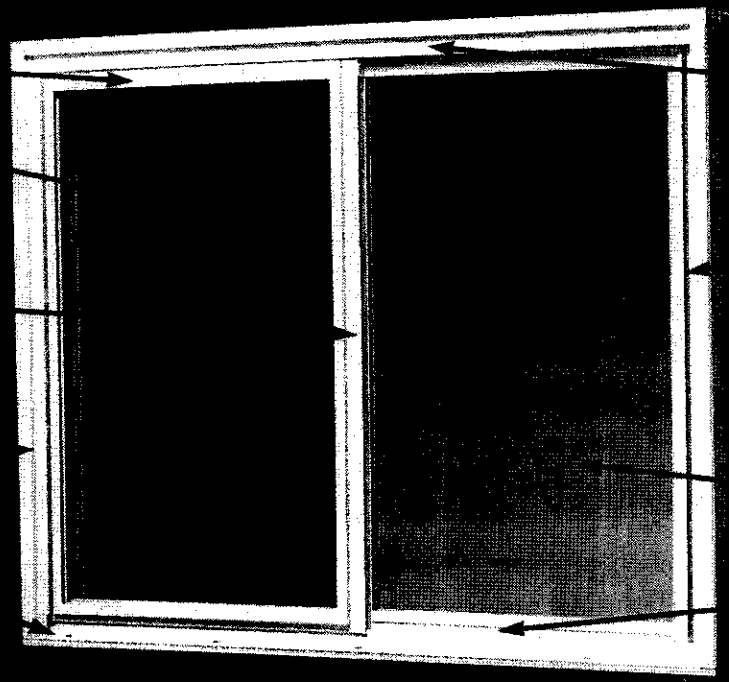
FENÊTRES COULISSANTES



Séries 560 et 570



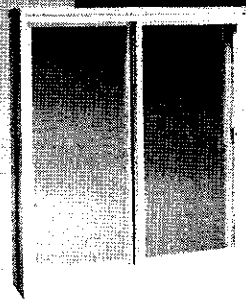
- Volets en profilés épais, les plus robustes de toute l'industrie
- Moustiquaire intérieure mobile, en aluminium
- Volets s'emboîtant parfaitement, éliminant toute infiltration d'air ou d'eau
- Cadres en profilés surdimensionnés offrant une rigidité supérieure
- Évents d'évacuation d'eau dissimulés, esthétiques et fonctionnels



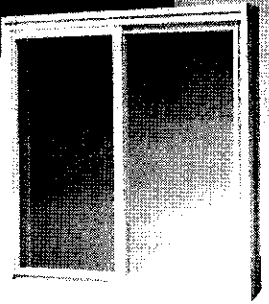
- Linteaux sous pression individuels : étanchéité et manoeuvrabilité supérieures, facilité à enlever les volets
- Coupe-froid à haut rendement éliminant tout passage d'air
- Poignées plus robustes et plus durables
- Offert en double vitrage ou en triple vitrage, au choix
- Fonctionnement ultra-doux, sur patins de nylon

Modèle 560

- Vitrage double constitué de 4 volets simples
- Cadre de bois en option
- Moustiquaire centrale, entre le vitrage
- Vaste choix de moulures structurelles et de finition

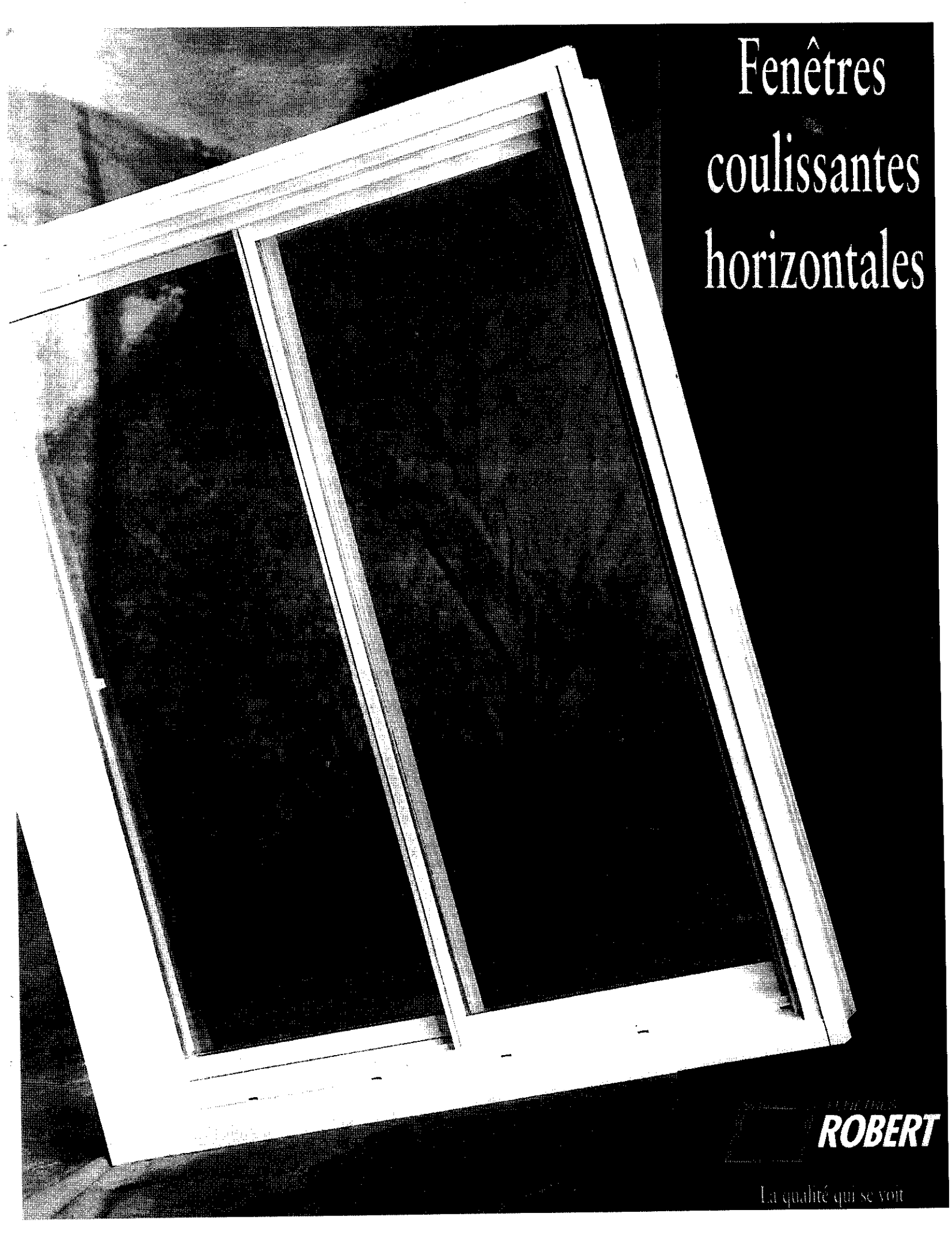


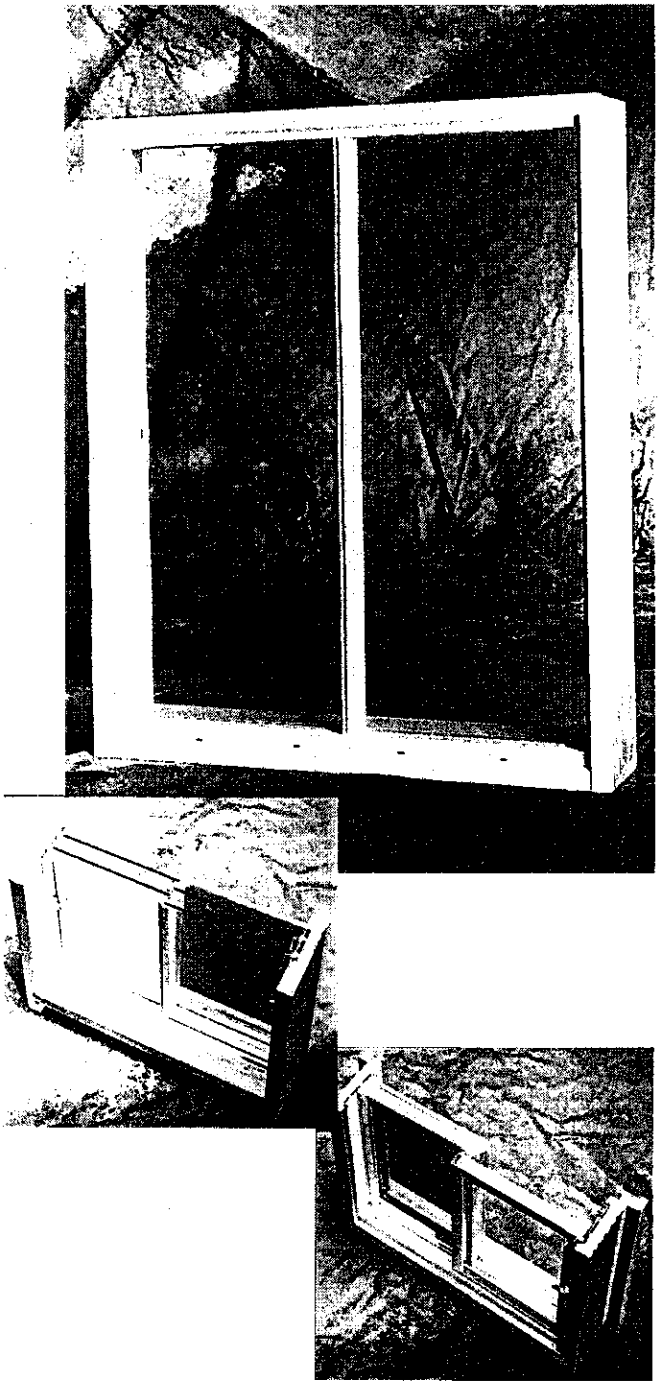
- Vaste choix de fenêtres en oriel ou en saillie
- Formes irrégulières disponibles
- Carrelage offert en option
- Vaste choix de teintes



Modèle 570

- Vitrage triple (1 unité scellée et 1 vitrage simple)
- Cadre de bois en option
- Moustiquaire centrale, entre le vitrage
- Vaste choix de moulures structurelles et de finition


Fenêtres
coulissantes
horizontales
ROBERT
La qualité qui se voit



FENÊTRE COULISSANTE À DOUBLE VITRAGE SIMPLE

- Cadre : 5 1/8" (130 mm) avec ou sans moulure extérieure
  7 1/4" (184 mm) sans moulure extérieure
- Cadre en pin traité
- Recouvrement extérieur de PVC blanc ou ivoire
- Vitres de 3/16" (5 mm)
- Coulisse de PVC (blanche)
- Moustiquaire en fibre de verre avec cadre d'aluminium émaillé blanc

OPTIONS

- Recouvrement intérieur de PVC blanc
- Soufflure de cadre intérieur en pin (de plusieurs dimensions)
- Soufflure de cadre intérieur recouvert de PVC blanc

PERFORMANCE

Normes CCMC	A-440
Infiltration d'air	A-2
Infiltration d'eau	B-3
Résistance au vent	C-3

FENÊTRE COULISSANTE VERRE THERMOS

- Cadre : 5 1/8" (130 mm) avec ou sans moulure extérieure
  7 1/4" (184 mm) sans moulure extérieure
- Cadre en pin traité
- Recouvrement extérieur de PVC blanc ou ivoire
- Volet de PVC et verre scellé avec un espace d'air de 1/2 " (12,5 mm)
- Coulisse de PVC (blanche)
- Moustiquaire en fibre de verre avec cadre d'aluminium émaillé blanc

OPTIONS

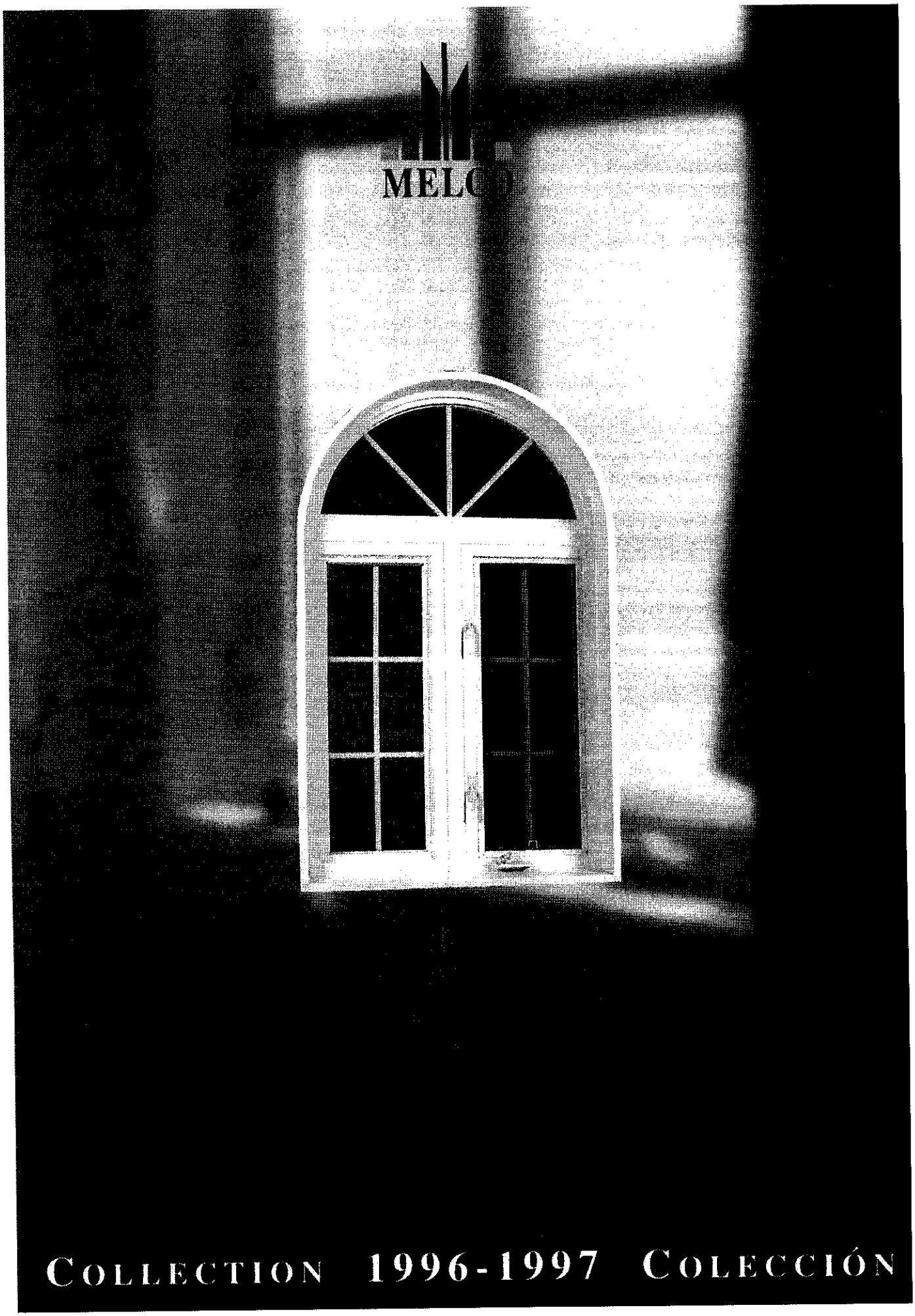
- Verre thermos énergie Argon
- Intercalaires à haute performance
- Recouvrement intérieur de PVC blanc
- Soufflure de cadre intérieur en pin (de plusieurs dimensions)
- Soufflure de cadre intérieur recouvert de PVC blanc

PERFORMANCE

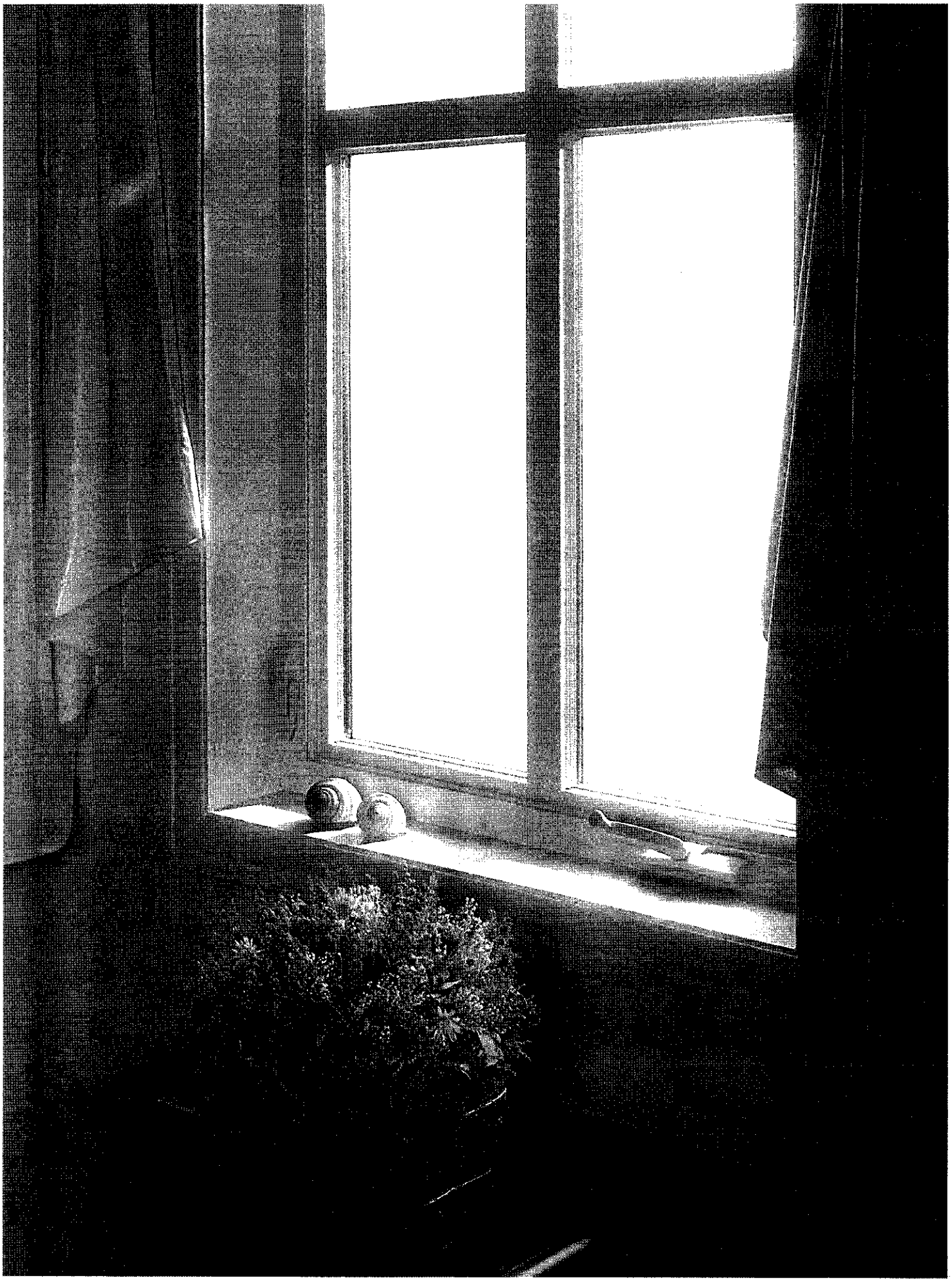
Normes CCMC	A-440
Infiltration d'air	A-2
Infiltration d'eau	B-3
Résistance au vent	C-1

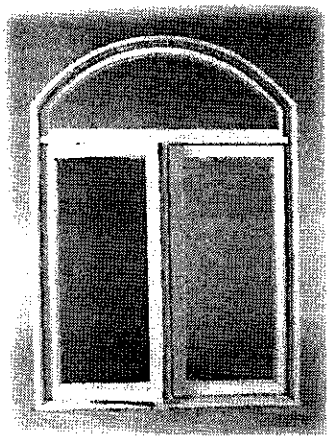
FENÊTRES ROBERT

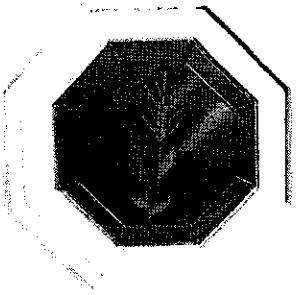
59, Chemin Labrie, St-François-Xavier de Brompton (Québec) J0B 2V0
Téléphone : (819) 845-2731 Télécopieur : (819) 845-3270



COLLECTION 1996-1997 COLECCIÓN







Depuis 1986, Melco construit les meilleures fenêtres qui soient : en résine de synthèse. Par rapport au bois ou à l'aluminium, la résine présente deux avantages importants : elle ne nécessite aucun entretien et offre un niveau d'isolation thermique et sonore supérieur.

Des profilés de haute qualité

Les nombreuses sections internes de nos profilés donnent de la rigidité aux montants et augmentent l'efficacité thermique en créant une multitude de petites chambres d'isolation.

De même, des recherches approfondies nous ont permis de créer une résine extrêmement stable, qui résiste à la décoloration et à l'écaillement causés par les rayons ultraviolets ou les pluies acides, par exemple. En fait, nous avons une telle confiance en notre résine que nous la garantissons pendant 20 ans contre la décoloration.

Since 1996 Melco manufactures the best windows available: with synthetic resin. Compared to wood or aluminum, resin has two important advantages: it requires no upkeep and offers superior thermo-acoustic insulation.

High quality extrusions

Resin windows are made of extrusions which consist of multiple cells that provide rigidity to the uprights and improve thermal efficiency. Melco high density synthetic resin is immune to colour variations and chipping caused by ultra-violet rays or acid rain. We are so confident in the quality of our resin that we offer a 20-year guarantee against fading.

Desde 1986, Melco construye lo mejor en ventanas: las de resina sintética. Ésta última tiene dos ventajas importantes respecto a la madera y al aluminio: no necesita mantenimiento y el grado de aislamiento térmico y acústico es superior.

Perfiles de gran calidad

Las secciones internas de los perfiles dan rigidez a los largueros y aumentan el rendimiento térmico creando numerosas cámaras aislantes.

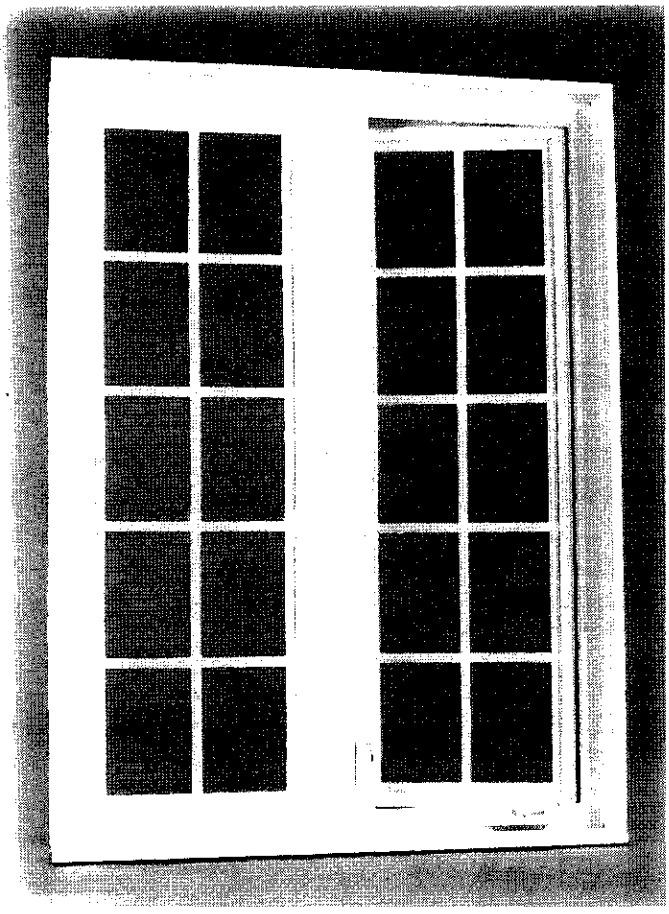
Por otra parte, con investigación exhaustiva se ha logrado crear una resina extremadamente estable resistente al descoloramiento y la desconchadura resultantes de los rayos ultravioleta y la lluvia ácida, por ejemplo. Tal es la confianza que tenemos en nuestra resina que la garantizamos por veinte años contra el descoloramiento.

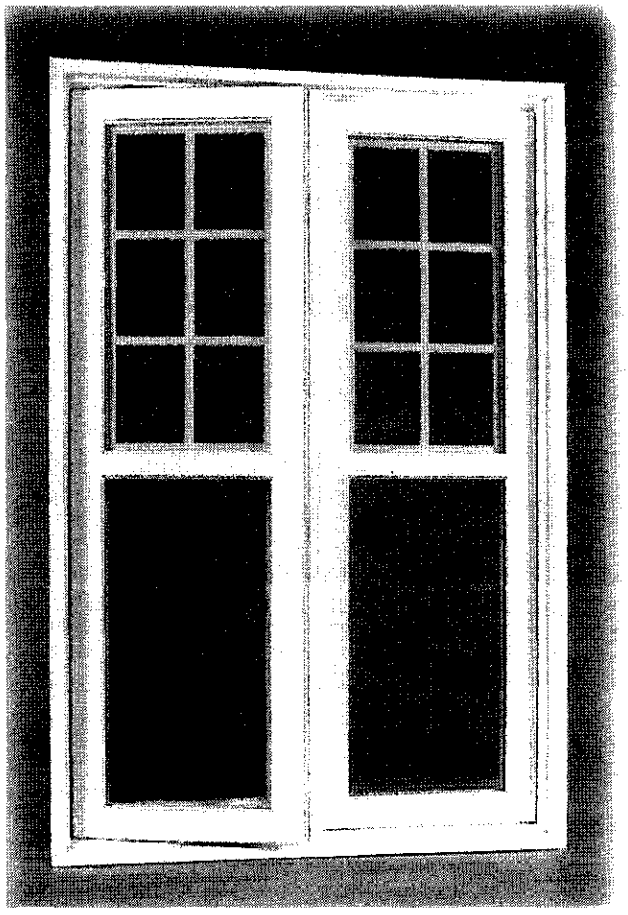
Les fenêtres et portes-patio Melco obtiennent les meilleurs résultats d'étanchéité selon la norme canadienne CAN/CSA A440-M90 :

Melco windows and patio doors show the best thermal insulation ratings from canadian CAN/CSA A440-M90:

Las ventanas y puertas vidrieras de Melco dan los mejores resultados de hermeticidad según la norma canadiense CAN/CSA A440-M90, como se puede apreciar en el siguiente cuadro:

	Infiltration d'air Air infiltration Infiltración de aire	Infiltration d'eau Water infiltration Infiltración de agua	Résistance à la charge due au vent Wind resistance Resistencia a la carga eólica
Fenêtre à battant Casement window Ventana de bisagra	A3	B7	C5
Fenêtre à guillotine Vertical slider Ventana de guillotina	A3	B3	C3
Fenêtre coulissante Sliding window Ventana de corredera	A3	B3	C3
Porte patio Patio door Puerta vidriera	A3	B7	C3





Côtés pratique, fiabilité, étanchéité, aucun modèle ne surpasse le **battant**. Il s'ouvre et se referme aisément, il est facile d'entretien et surtout, son rendement est nettement supérieur.

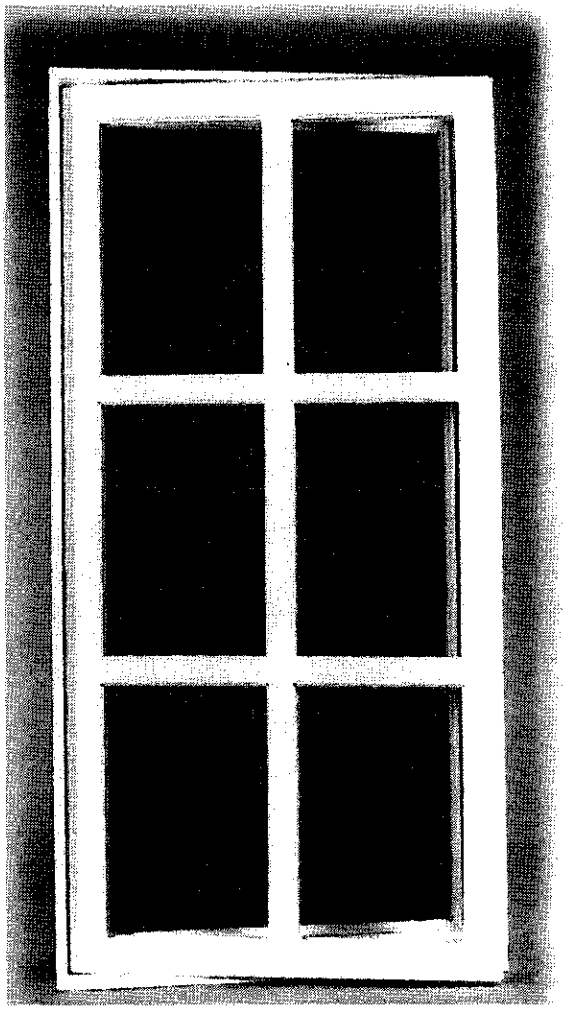
The **casement window** has always been tops in its class: practical, reliable, and watertight. It opens and closes smoothly, requires minimum upkeep and provides superior performance.

Prácticas, fiables y herméticas. Ningún modelo supera las **ventanas de bisagras**. Se abren y cierran con facilidad, mantenerlas es simple y tienen un rendimiento netamente superior.

Nul besoin de faire de compromis sur le rendement ou sur le style, le **battant guillotine** Melco réunit tous les avantages d'une fenêtre à battant et le look d'une fenêtre à guillotine.

The Melco **sash-casement window** is in a class by itself for style and performance: it has all the advantages of a casement window and the looks of a vertical slider.

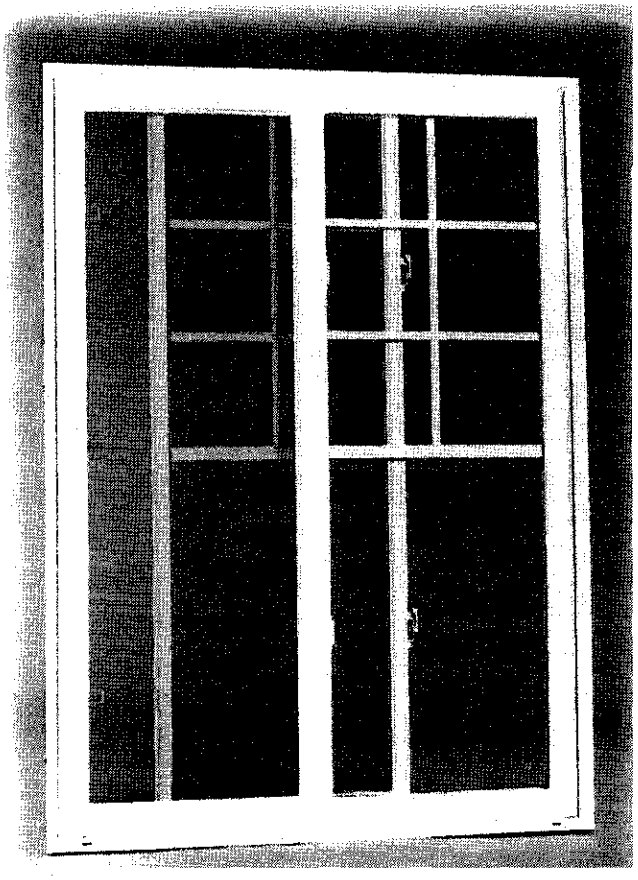
La unión perfecta de rendimiento y estilo: las **guillotinas falsas**. En ellas Melco reunió todas las ventajas de las ventanas de bisagras y el carácter de las ventanas de guillotina.



Le **barrotin** c'est pareil, à quatre ou six carreaux, on le choisit pour le style. Du reste, le niveau d'isolation thermique et sonore est toujours celui d'une fenêtre à battant, sans compromis.

For distinctive style, the Melco four or six grille **"barrotin" window** should be your choice. Its thermal and sound insulation properties are the same as those of a casement window.

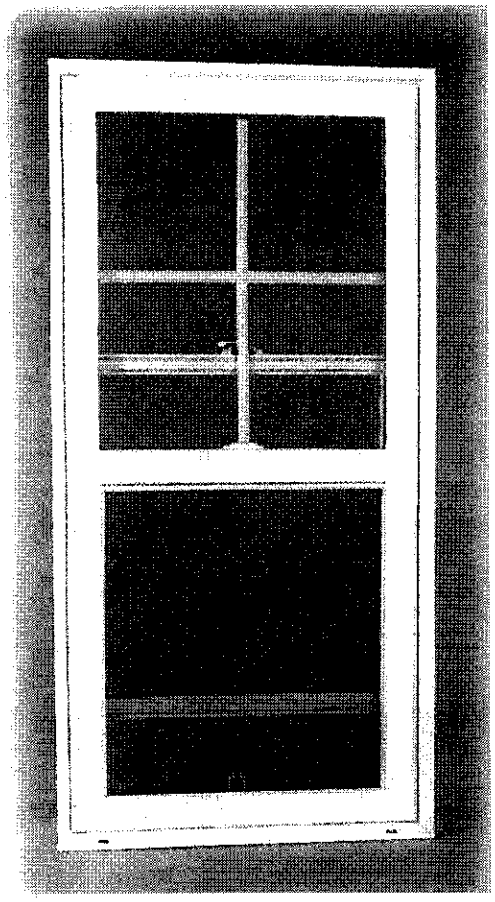
Las **ventanas de cristales herrados** se escogen por su estilo. Ya tengan cuatro o seis cristales, el rendimiento térmico y acústico sigue siendo el de las ventanas de bisagras: incomparable.



Le **coulissant**, plus économique, s'harmonise parfaitement aux autres modèles de fenêtre. Monté sur roulettes, son fonctionnement reste doux et durable. Carrelage offert en option.

The **sliding window** is more economical and in perfect harmony with other window models. Mounted on rollers, it provides smooth and durable gliding. A grille is offered in option.

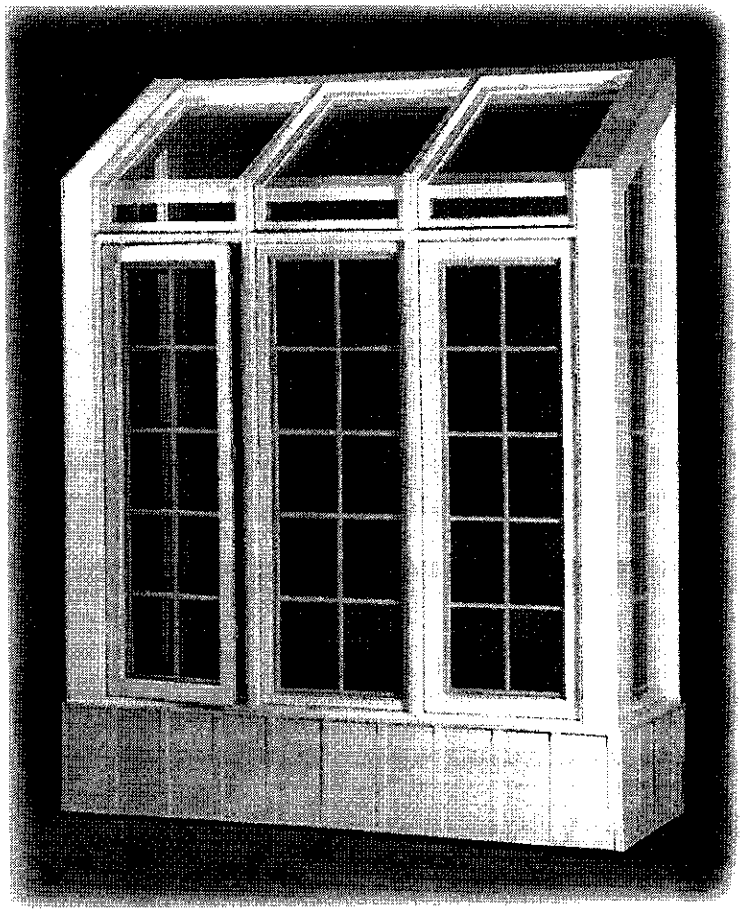
Las **ventanas de corredera** son más económicas y van a la perfección con los demás modelos de ventanas. Con sistema de deslizado sobre ruedas suave y duradero, se pueden escoger con o sin cuadrícula.



Toujours populaire, la **guillotine** Melco s'ouvre et se referme facilement, année après année. Elle peut être à simple (bas vers le haut) ou double glissant.

Always popular, the Melco **vertical slider** opens and closes easily, from year to year. Available as single (bottom to top) or double sliding.

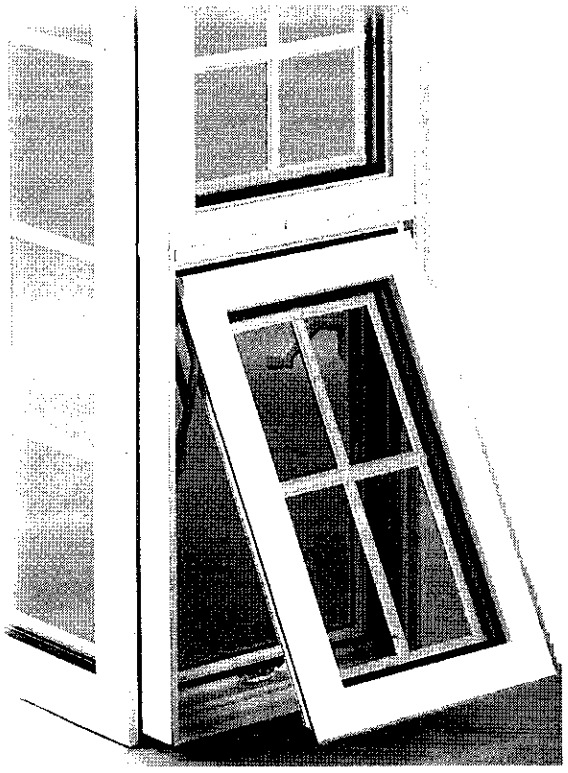
Siempre favoritas, las **ventanas de guillotina** de Melco se abren y cierran con facilidad año tras año. Pueden tener una corredera (que se abre hacia arriba) o dos.



Laissez pénétrer la lumière dans votre univers intérieur et relaxez. La **fenêtre serre** est le choix du coeur, le choix de vivre en harmonie avec la nature... dans le confort du foyer.

Let light penetrate your world and relax: the **greenhouse window** is a heartfelt choice of harmonious living with nature, in the comfort of your home.

No hay como relajarse en un interior lleno de luz. Las **ventanas de solana** se escogen con el alma al querer vivir en armonía con la naturaleza sin dejar el agrado del hogar.



L'ouverture de bas en haut de l'**auvent** en fait une fenêtre de spécialité qui se prête bien aux endroits où l'on recherche une ventilation permanente... même lorsqu'il pleut légèrement.

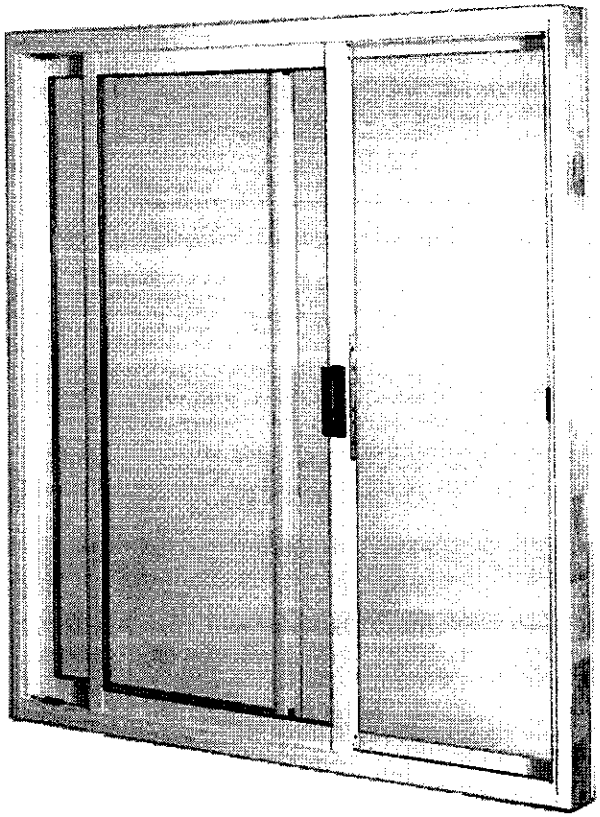
The bottom to top opening of the **awning window** makes it an ideal specialty when permanent ventilation is required, even with a little rain.

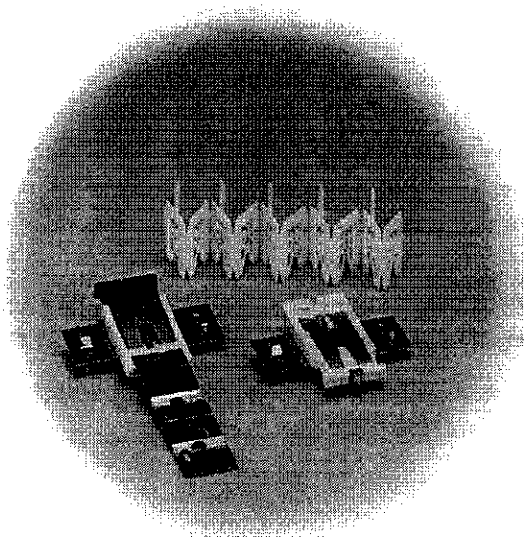
Las **claraboyas** que abren hacia afuera son ideales para los lugares en que se requiere ventilación aunque haya llovizna.

La **porte-patio** Melco est fabriquée avec des matériaux de première qualité. Son cadre de bois traité recouvert de résine de synthèse extrudée, son vitrage standard ou à basse émissivité et ses coupe-froid triples en font l'une des portes-patio les plus durables et les plus performantes.

The Melco **patio door** is manufactured with top quality materials. Its heat treated wood frame is clad with extruded synthetic resin. Standard or low-E glass and triple weatherstrip guarantee its superior performance and durability.

Las **puertas vidrieras** de Melco están hechas con materiales de primera calidad. Con marcos de madera impregnada recubierta de resina sintética extruida, vidrios estándar o de baja emisión calórica y burletes triples, son de las más durables y de mejor rendimiento.

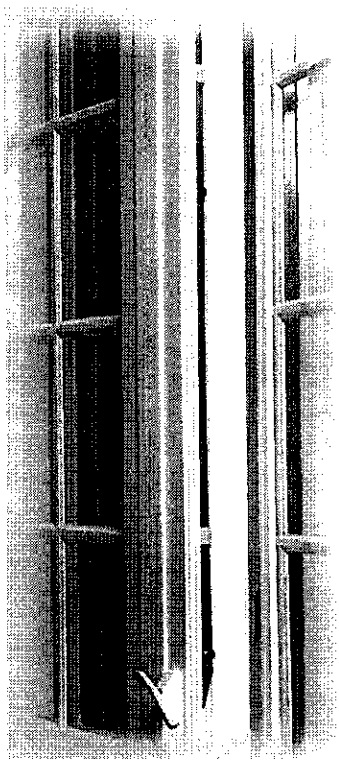




Le système de cales **Shimex**, exclusif à Melco, rend l'installation d'une fenêtre simple, rapide et durable.

Setting up a new door system is simple, quick and durable with the new **Shimex** mechanical shim control. exclusive to Melco.

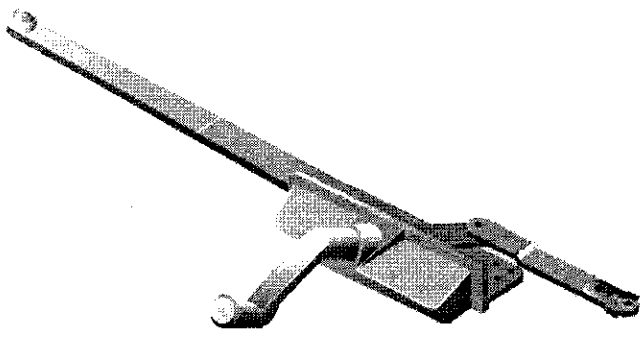
Con el sistema de juntas **Shimex** exclusivo de Melco, la instalación es simple, rápida y duradera.



Pour une sécurité accrue, vous pouvez choisir la **serrure multipoints** offerte en option sur le battant, le battant guillotine ou le barrotin.

For added security, ask the **multipoint lock**, optional on casement, sash-casement or "barrotin" windows.

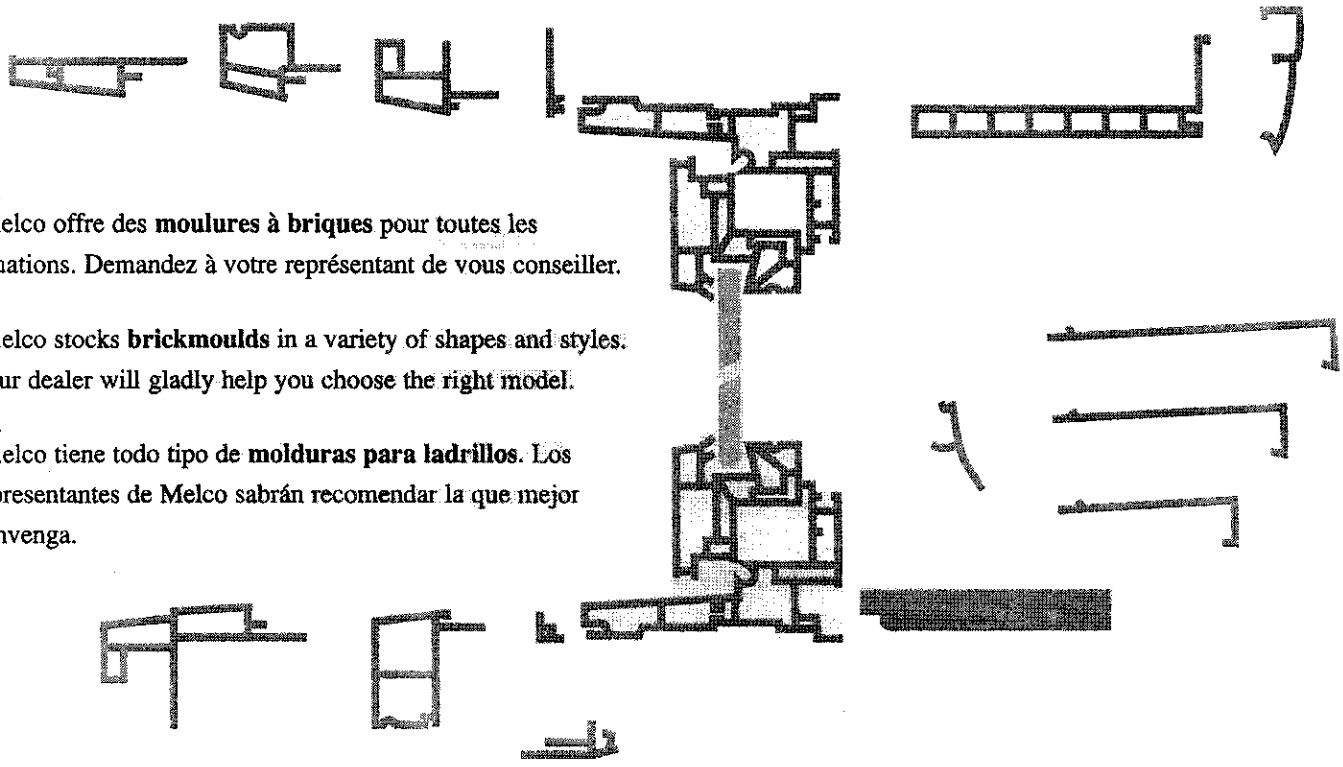
Para mayor seguridad, se puede optar por la **cerradura múltiple** con los modelos de bisagra, guillotina falsa y cristales herrados.



Le **bras double-action** qui équipe tous les battants Melco de 23 5/8 po (600 mm) de large et plus permet une ouverture de la fenêtre à 90°, décalée du coin, ce qui facilite grandement le nettoyage. Et surtout, plus besoin de forcer pour ouvrir et refermer la fenêtre.

The **double action arm** is standard on all Melco casement windows (starting from 23-5/8" or 600 mm). It allows a corner free opening of 90°. Eliminates tugging to open or close the window. Cleaning is much easier.

Las **bisagras de doble efecto** que vienen con todas las ventanas de bisagra de Melco de más de 600 mm (23 5/8") de ancho permiten abrir la ventana en un ángulo de 90° abierto en la esquina, lo que facilita enormemente la limpieza. Lo mejor es que nunca hace falta forzar para abrir o cerrar una ventana.



Melco offre des **moulures à briques** pour toutes les situations. Demandez à votre représentant de vous conseiller.

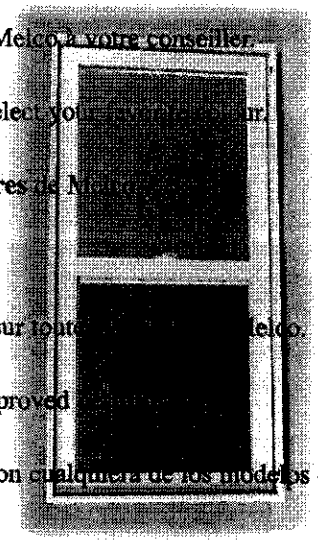
Melco stocks **brickmoulds** in a variety of shapes and styles. Your dealer will gladly help you choose the right model.

Melco tiene todo tipo de **molduras para ladrillos.** Los representantes de Melco sabrán recomendar la que mejor convenga.

Les fenêtres et portes-patio peuvent être peintes en usine. Demandez la **charte des couleurs** Melco à votre conseiller.

Windows and patio doors can be factory-painted. The Melco **colour chart** should help you select your [illegible].

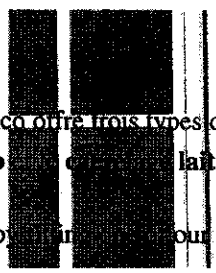
Las ventanas y puertas vidrieras pueden pedirse pintadas de fábrica. Véase el **cuadro de colores** de Melco.



Pour un rendement supérieur, exigez le **verre énergétique Low-E + argon** offerts en option sur [illegible] Melco.

Optional on all Melco windows, the **Low-E + argon energy glass** is a wise investment in improved [illegible].

Para un rendimiento superior, se puede exigir **vidrios de alto rendimiento Low-E + argón** con cualquiera de los modelos de ventanas de Melco.



Vous aimez la fantaisie, Melco offre trois types de carrelage pour vos fenêtres : le **carrelage PVC amovible**, le **carrelage PVC intégré dans le thermo** [illegible] **laiton.**

Add class to your windows by [illegible] our three types of grilles: the **removable PVC grille**, the **thermo-sealed PVC grille**, and the **brass grille.**

Para un toque de originalidad, Melco ofrece tres tipos de cuadrícula: **amovible de PVC, termointegrada de PVC y de latón.**

Dimensions courantes de fenêtres / Standard window frame sizes / Dimensiones de ventanas corrientes

FENÊTRE À BATTANT
CASEMENT WINDOW
VENTANA CON BISAGRAS

Code / Código	Width / Ancho	Height / Alto
T1V-0406	17 3/4"	23 5/8"
T1V-0408	17 3/4"	31 1/2"
T1V-0410	17 3/4"	39 3/8"
T1V-0412	17 3/4"	47 1/4"
T1V-0414	17 3/4"	55 1/8"
T1V-0416	17 3/4"	63"
T1V-0418	17 3/4"	70 7/8"
T1V-0506	19 11/16"	23 5/8"
T1V-0508	19 11/16"	31 1/2"
T1V-0510	19 11/16"	39 3/8"
T1V-0512	19 11/16"	47 1/4"
T1V-0514	19 11/16"	55 1/8"
T1V-0516	19 11/16"	63"
T1V-0518	19 11/16"	70 7/8"
T1V-0606	23 5/8"	23 5/8"
T1V-0608	23 5/8"	31 1/2"
T1V-0610	23 5/8"	39 3/8"
T1V-0612	23 5/8"	47 1/4"
T1V-0614	23 5/8"	55 1/8"
T1V-0616	23 5/8"	63"
T1V-0618	23 5/8"	70 7/8"
T1V-0706	27 9/16"	23 5/8"
T1V-0708	27 9/16"	31 1/2"
T1V-0710	27 9/16"	39 3/8"
T1V-0712	27 9/16"	47 1/4"
T1V-0714	27 9/16"	55 1/8"
T1V-0716	27 9/16"	63"
T1V-0718	27 9/16"	70 7/8"
T1V-0808	31 1/2"	23 5/8"
T1V-0808	31 1/2"	31 1/2"
T1V-0810	31 1/2"	39 3/8"
T1V-0812	31 1/2"	47 1/4"
T1V-0814	31 1/2"	55 1/8"
T1V-0816	31 1/2"	63"
T1V-0818	31 1/2"	70 7/8"

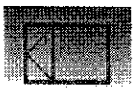
Code / Código	Width / Ancho	Height / Alto
T2V-0906	35 7/16"	23 5/8"
T2V-0908	35 7/16"	31 1/2"
T2V-0910	35 7/16"	39 3/8"
T2V-0912	35 7/16"	47 1/4"
T2V-0914	35 7/16"	55 1/8"
T2V-0916	35 7/16"	63"
T2V-0918	35 7/16"	70 7/8"
T2V-1006	39 3/8"	23 5/8"
T2V-1008	39 3/8"	31 1/2"
T2V-1010	39 3/8"	39 3/8"
T2V-1012	39 3/8"	47 1/4"
T2V-1014	39 3/8"	55 1/8"
T2V-1016	39 3/8"	63"
T2V-1018	39 3/8"	70 7/8"
T2V-1206	47 1/4"	23 5/8"
T2V-1208	47 1/4"	31 1/2"
T2V-1210	47 1/4"	39 3/8"
T2V-1212	47 1/4"	47 1/4"
T2V-1214	47 1/4"	55 1/8"
T2V-1216	47 1/4"	63"
T2V-1218	47 1/4"	70 7/8"
T2V-1406	55 1/8"	23 5/8"
T2V-1408	55 1/8"	31 1/2"
T2V-1410	55 1/8"	39 3/8"
T2V-1412	55 1/8"	47 1/4"
T2V-1414	55 1/8"	55 1/8"
T2V-1416	55 1/8"	63"
T2V-1418	55 1/8"	70 7/8"
T2V-1806	63"	23 5/8"
T2V-1808	63"	31 1/2"
T2V-1810	63"	39 3/8"
T2V-1812	63"	47 1/4"
T2V-1814	63"	55 1/8"
T2V-1816	63"	63"
T2V-1818	63"	70 7/8"

Code / Código	Width / Ancho	Height / Alto
T3V-1506	59 1/16"	23 5/8"
T3V-1508	59 1/16"	31 1/2"
T3V-1510	59 1/16"	39 3/8"
T3V-1512	59 1/16"	47 1/4"
T3V-1514	59 1/16"	55 1/8"
T3V-1516	59 1/16"	63"
T3V-1518	59 1/16"	70 7/8"
T3V-1806	70 7/8"	23 5/8"
T3V-1808	70 7/8"	31 1/2"
T3V-1810	70 7/8"	39 3/8"
T3V-1812	70 7/8"	47 1/4"
T3V-1814	70 7/8"	55 1/8"
T3V-1816	70 7/8"	63"
T3V-1818	70 7/8"	70 7/8"
T3V-2106	82 11/16"	23 5/8"
T3V-2108	82 11/16"	31 1/2"
T3V-2110	82 11/16"	39 3/8"
T3V-2112	82 11/16"	47 1/4"
T3V-2114	82 11/16"	55 1/8"
T3V-2116	82 11/16"	63"
T3V-2118	82 11/16"	70 7/8"

FENÊTRE À BATTANT
CASEMENT WINDOW
VENTANA CON BISAGRAS

Code / Código	Width / Ancho	Height / Alto	Modular width / Ancho de los módulos
T4V-2006	78 3/4"	23 5/8"	
T4V-2008	78 3/4"	31 1/2"	
T4V-2010	78 3/4"	39 3/8"	
T4V-2012	78 3/4"	47 1/4"	
T4V-2014	78 3/4"	55 1/8"	
T4V-2016	78 3/4"	63"	
T4V-2018	78 3/4"	70 7/8"	
T4V-2406	94 1/2"	23 5/8"	
T4V-2408	94 1/2"	31 1/2"	
T4V-2410	94 1/2"	39 3/8"	
T4V-2412	94 1/2"	47 1/4"	
T4V-2414	94 1/2"	55 1/8"	
T4V-2416	94 1/2"	63"	
T4V-2418	94 1/2"	70 7/8"	
T4V-2806	110 1/4"	23 5/8"	
T4V-2808	110 1/4"	31 1/2"	
T4V-2810	110 1/4"	39 3/8"	
T4V-2812	110 1/4"	47 1/4"	
T4V-2814	110 1/4"	55 1/8"	
T4V-2816	110 1/4"	63"	
T4V-2818	110 1/4"	70 7/8"	

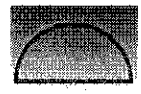
Code / Código	Width / Ancho	Height / Alto
T5V-3008	118 1/8"	23 5/8"
T5V-3008	118 1/8"	31 1/2"
T5V-3010	118 1/8"	39 3/8"
T5V-3012	118 1/8"	47 1/4"
T5V-3014	118 1/8"	55 1/8"
T5V-3016	118 1/8"	63"
T5V-3018	118 1/8"	70 7/8"



Code / Código	Width / Ancho	Height / Alto	Modular width / Ancho de los módulos
T2LV-1506	59 1/16"	23 5/8"	5-10
T2LV-1508	59 1/16"	31 1/2"	5-10
T2LV-1510	59 1/16"	39 3/8"	5-10
T2LV-1512	59 1/16"	47 1/4"	5-10
T2LV-1514	59 1/16"	55 1/8"	5-10
T2LV-1516	59 1/16"	63"	5-10
T2LV-1518	59 1/16"	70 7/8"	5-10
T2LV-1806	70 7/8"	23 5/8"	6-12
T2LV-1808	70 7/8"	31 1/2"	6-12
T2LV-1810	70 7/8"	39 3/8"	6-12
T2LV-1812	70 7/8"	47 1/4"	6-12
T2LV-1814	70 7/8"	55 1/8"	6-12
T2LV-1816	70 7/8"	63"	6-12
T2LV-1818	70 7/8"	70 7/8"	6-12
T2LV-2006	78 3/4"	23 5/8"	6-14
T2LV-2008	78 3/4"	31 1/2"	6-14
T2LV-2010	78 3/4"	39 3/8"	6-14
T2LV-2012	78 3/4"	47 1/4"	6-14
T2LV-2014	78 3/4"	55 1/8"	6-14
T2LV-2016	78 3/4"	63"	6-14
T2LV-2018	78 3/4"	70 7/8"	6-14

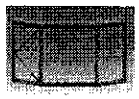
Code / Código	Width / Ancho	Height / Alto	Modular width / Ancho de los módulos
T3LV-2006	78 3/4"	23 5/8"	5-10-5
T3LV-2008	78 3/4"	31 1/2"	5-10-5
T3LV-2010	78 3/4"	39 3/8"	5-10-5
T3LV-2012	78 3/4"	47 1/4"	5-10-5
T3LV-2014	78 3/4"	55 1/8"	5-10-5
T3LV-2016	78 3/4"	63"	5-10-5
T3LV-2018	78 3/4"	70 7/8"	5-10-5
T3LV-2206	86 5/8"	23 5/8"	5-12-5
T3LV-2208	86 5/8"	31 1/2"	5-12-5
T3LV-2210	86 5/8"	39 3/8"	5-12-5
T3LV-2212	86 5/8"	47 1/4"	5-12-5
T3LV-2214	86 5/8"	55 1/8"	5-12-5
T3LV-2216	86 5/8"	63"	5-12-5
T3LV-2218	86 5/8"	70 7/8"	5-12-5
T3LV-2406	94 1/2"	23 5/8"	6-12-6
T3LV-2408	94 1/2"	31 1/2"	6-12-6
T3LV-2410	94 1/2"	39 3/8"	6-12-6
T3LV-2412	94 1/2"	47 1/4"	6-12-6
T3LV-2414	94 1/2"	55 1/8"	6-12-6
T3LV-2416	94 1/2"	63"	6-12-6
T3LV-2418	94 1/2"	70 7/8"	6-12-6

FENÊTRE CINTRÉE
ARCH WINDOW
VENTANA CURVA



25 3/8"	11 13/16"
35 7/16"	17 3/4"
39 3/8"	19 11/16"
47 1/4"	23 5/8"
55 1/8"	27 9/16"
59 1/16"	29 9/16"
70 7/8"	35 7/16"
82 11/16"	41 11/32"
94 1/2"	47 1/4"

FENÊTRE EN BAIE
BAY WINDOW
VENTANA SALIENTE



Code / Código	Width / Ancho	Height / Alto	Modular width / Ancho de los módulos	Approximate projection / Proyección aproximada
TBV	70 3/4"	55 1/8"	4-10-4	12 1/2"
TBV	70 3/4"	63"	4-10-4	12 1/2"
TBV	70 3/4"	70 7/8"	4-10-4	12 1/2"
TBV	73 5/8"	55 1/8"	5-10-5	13 7/8"
TBV	73 5/8"	63"	5-10-5	13 7/8"
TBV	73 5/8"	70 7/8"	5-10-5	13 7/8"
TBV	79 1/8"	55 1/8"	6-10-6	16 11/16"
TBV	79 1/8"	63"	6-10-6	16 11/16"
TBV	79 1/8"	70 7/8"	6-10-6	16 11/16"
TBV	84 3/4"	55 1/8"	7-10-7	19 1/2"
TBV	84 3/4"	63"	7-10-7	19 1/2"
TBV	84 3/4"	70 7/8"	7-10-7	19 1/2"
TBV	78 5/8"	55 1/8"	4-12-4	12 1/2"
TBV	78 5/8"	63"	4-12-4	12 1/2"
TBV	78 5/8"	70 7/8"	4-12-4	12 1/2"
TBV	81 1/2"	55 1/8"	5-12-5	13 7/8"
TBV	81 1/2"	63"	5-12-5	13 7/8"
TBV	81 1/2"	70 7/8"	5-12-5	13 7/8"
TBV	87"	55 1/8"	6-12-6	16 11/16"
TBV	87"	63"	6-12-6	16 11/16"
TBV	87"	70 7/8"	6-12-6	16 11/16"
TBV	92 5/8"	55 1/8"	7-12-7	19 1/2"
TBV	92 5/8"	63"	7-12-7	19 1/2"
TBV	92 5/8"	70 7/8"	7-12-7	19 1/2"
TBV	86 1/2"	55 1/8"	4-14-4	12 1/2"
TBV	86 1/2"	63"	4-14-4	12 1/2"
TBV	86 1/2"	70 7/8"	4-14-4	12 1/2"
TBV	89 3/8"	55 1/8"	5-14-5	13 7/8"
TBV	89 3/8"	63"	5-14-5	13 7/8"
TBV	89 3/8"	70 7/8"	5-14-5	13 7/8"
TBV	94 7/8"	55 1/8"	6-14-6	16 11/16"
TBV	94 7/8"	63"	6-14-6	16 11/16"
TBV	94 7/8"	70 7/8"	6-14-6	16 11/16"
TBV	106"	55 1/8"	8-14-8	22 1/4"
TBV	106"	63"	8-14-8	22 1/4"
TBV	106"	70 7/8"	8-14-8	22 1/4"

FENÊTRE ARQUÉE
BOW WINDOW
VENTANA EN ARCO

Code / Código	Width / Ancho	Height / Alto	Modular width / Ancho de los módulos	Approximate projection / Proyección aproximada
T4VT-450	71 13/16"	55 1/8"	04	6 3/4"
T4VT-450	71 13/16"	63"	04	6 3/4"
T4VT-450	71 13/16"	70 7/8"	04	6 3/4"
T4VT-500	79 1/2"	55 1/8"	05	7 1/2"
T4VT-500	79 1/2"	63"	05	7 1/2"
T4VT-500	79 1/2"	70 7/8"	05	7 1/2"
T4VT-600	94 7/8"	55 1/8"	06	9"
T4VT-600	94 7/8"	63"	06	9"
T4VT-600	94 7/8"	70 7/8"	06	9"
T4VT-700	110 1/4"	55 1/8"	07	10 1/2"
T4VT-700	110 1/4"	63"	07	10 1/2"
T4VT-700	110 1/4"	70 7/8"	07	10 1/2"

Code / Código	Width / Ancho	Height / Alto	Modular width / Ancho de los módulos	Approximate projection / Proyección aproximada
T5VT-450	88 3/4"	55 1/8"	04	10"
T5VT-450	88 3/4"	63"	04	10"
T5VT-450	88 3/4"	70 7/8"	04	10"
T5VT-500	98 3/16"	55 1/8"	05	11 1/8"
T5VT-500	98 3/16"	63"	05	11 1/8"
T5VT-500	98 3/16"	70 7/8"	05	11 1/8"
T5VT-600	117 3/16"	55 1/8"	06	13 3/8"
T5VT-600	117 3/16"	63"	06	13 3/8"
T5VT-600	117 3/16"	70 7/8"	06	13 3/8"
T5VT-700	136 1/8"	55 1/8"	07	15 8/8"
T5VT-700	136 1/8"	63"	07	15 8/8"
T5VT-700	136 1/8"	70 7/8"	07	15 8/8"

Code / Código	Width / Ancho	Height / Alto

FENÊTRE GUILLOTINE VERTICAL SLIDER VENTANA DE GUILLOTINA

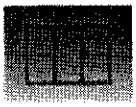
T1GS-0608	23 5/8"	31 1/2"
T1GS-0610	23 5/8"	39 3/8"
T1GS-0612	23 5/8"	47 1/4"
T1GS-0614	23 5/8"	55 1/8"
T1GS-0616	23 5/8"	63"
T1GS-0618	23 5/8"	70 7/8"
T1GS-0708	27 9/16"	31 1/2"
T1GS-0710	27 9/16"	39 3/8"
T1GS-0712	27 9/16"	47 1/4"
T1GS-0714	27 9/16"	55 1/8"
T1GS-0716	27 9/16"	63"
T1GS-0718	27 9/16"	70 7/8"
T1GS-0808	31 1/2"	31 1/2"
T1GS-0810	31 1/2"	39 3/8"
T1GS-0812	31 1/2"	47 1/4"
T1GS-0814	31 1/2"	55 1/8"
T1GS-0816	31 1/2"	63"
T1GS-0818	31 1/2"	70 7/8"
T1GS-0908	35 7/16"	31 1/2"
T1GS-0910	35 7/16"	39 3/8"
T1GS-0912	35 7/16"	47 1/4"
T1GS-0914	35 7/16"	55 1/8"
T1GS-0916	35 7/16"	63"
T1GS-0918	35 7/16"	70 7/8"
T1GS-1008	39 3/8"	31 1/2"
T1GS-1010	39 3/8"	39 3/8"
T1GS-1012	39 3/8"	47 1/4"
T1GS-1014	39 3/8"	55 1/8"
T1GS-1016	39 3/8"	63"
T1GS-1018	39 3/8"	70 7/8"
T1GS-1208	47 1/4"	31 1/2"
T1GS-1210	47 1/4"	39 3/8"
T1GS-1212	47 1/4"	47 1/4"
T1GS-1214	47 1/4"	55 1/8"
T1GS-1216	47 1/4"	63"
T1GS-1218	47 1/4"	70 7/8"

T2GS-1208	47 1/4"	31 1/2"
T2GS-1210	47 1/4"	39 3/8"
T2GS-1212	47 1/4"	47 1/4"
T2GS-1214	47 1/4"	55 1/8"
T2GS-1216	47 1/4"	63"
T2GS-1218	47 1/4"	70 7/8"
T2GS-1408	55 1/8"	31 1/2"
T2GS-1410	55 1/8"	39 3/8"
T2GS-1412	55 1/8"	47 1/4"
T2GS-1414	55 1/8"	55 1/8"
T2GS-1416	55 1/8"	63"
T2GS-1418	55 1/8"	70 7/8"
T2GS-1608	63"	31 1/2"
T2GS-1610	63"	39 3/8"
T2GS-1612	63"	47 1/4"
T2GS-1614	63"	55 1/8"
T2GS-1616	63"	63"
T2GS-1618	63"	70 7/8"
T2GS-1808	70 7/8"	31 1/2"
T2GS-1810	70 7/8"	39 3/8"
T2GS-1812	70 7/8"	47 1/4"
T2GS-1814	70 7/8"	55 1/8"
T2GS-1816	70 7/8"	63"
T2GS-1818	70 7/8"	70 7/8"
T2GS-2008	78 3/4"	31 1/2"
T2GS-2010	78 3/4"	39 3/8"
T2GS-2012	78 3/4"	47 1/4"
T2GS-2014	78 3/4"	55 1/8"
T2GS-2016	78 3/4"	63"
T2GS-2018	78 3/4"	70 7/8"
T2GS-2408	94 1/2"	31 1/2"
T2GS-2410	94 1/2"	39 3/8"
T2GS-2412	94 1/2"	47 1/4"
T2GS-2414	94 1/2"	55 1/8"
T2GS-2416	94 1/2"	63"
T2GS-2418	94 1/2"	70 7/8"

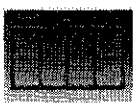
T3GS-1808	70 7/8"	31 1/2"
T3GS-1810	70 7/8"	39 3/8"
T3GS-1812	70 7/8"	47 1/4"
T3GS-1814	70 7/8"	55 1/8"
T3GS-1816	70 7/8"	63"
T3GS-1818	70 7/8"	70 7/8"
T3GS-2108	82 11/16"	31 1/2"
T3GS-2110	82 11/16"	39 3/8"
T3GS-2112	82 11/16"	47 1/4"
T3GS-2114	82 11/16"	55 1/8"
T3GS-2116	82 11/16"	63"
T3GS-2118	82 11/16"	70 7/8"
T3GS-2408	94 1/2"	31 1/2"
T3GS-2410	94 1/2"	39 3/8"
T3GS-2412	94 1/2"	47 1/4"
T3GS-2414	94 1/2"	55 1/8"
T3GS-2416	94 1/2"	63"
T3GS-2418	94 1/2"	70 7/8"

FENÊTRE COULISSANTE SLIDING WINDOW VENTANA DE CORREDERA

T2C-0606	31 1/2"	23 5/8"
T2C-0608	31 1/2"	31 1/2"
T2C-0610	31 1/2"	39 3/8"
T2C-0612	31 1/2"	47 1/4"
T2C-0614	31 1/2"	55 1/8"
T2C-0616	31 1/2"	63"
T2C-0906	35 7/16"	23 5/8"
T2C-0908	35 7/16"	31 1/2"
T2C-0910	35 7/16"	39 3/8"
T2C-0912	35 7/16"	47 1/4"
T2C-0914	35 7/16"	55 1/8"
T2C-0916	35 7/16"	63"
T2C-1006	39 3/8"	23 5/8"
T2C-1008	39 3/8"	31 1/2"
T2C-1010	39 3/8"	39 3/8"
T2C-1012	39 3/8"	47 1/4"
T2C-1014	39 3/8"	55 1/8"
T2C-1016	39 3/8"	63"
T2C-1206	47 1/4"	23 5/8"
T2C-1208	47 1/4"	31 1/2"
T2C-1210	47 1/4"	39 3/8"
T2C-1212	47 1/4"	47 1/4"
T2C-1214	47 1/4"	55 1/8"
T2C-1216	47 1/4"	63"
T2C-1406	55 1/8"	23 5/8"
T2C-1408	55 1/8"	31 1/2"
T2C-1410	55 1/8"	39 3/8"
T2C-1412	55 1/8"	47 1/4"
T2C-1414	55 1/8"	55 1/8"
T2C-1416	55 1/8"	63"
T2C-1606	63"	23 5/8"
T2C-1608	63"	31 1/2"
T2C-1610	63"	39 3/8"
T2C-1612	63"	47 1/4"
T2C-1614	63"	55 1/8"
T2C-1616	63"	63"



T3C-1506	59 1/16"	23 5/8"
T3C-1508	59 1/16"	31 1/2"
T3C-1510	59 1/16"	39 3/8"
T3C-1512	59 1/16"	47 1/4"
T3C-1514	59 1/16"	55 1/8"
T3C-1516	59 1/16"	63"
T3C-1806	70 7/8"	23 5/8"
T3C-1808	70 7/8"	31 1/2"
T3C-1810	70 7/8"	39 3/8"
T3C-1812	70 7/8"	47 1/4"
T3C-1814	70 7/8"	55 1/8"
T3C-1816	70 7/8"	63"
T3C-2106	82 11/16"	23 5/8"
T3C-2108	82 11/16"	31 1/2"
T3C-2110	82 11/16"	39 3/8"
T3C-2112	82 11/16"	47 1/4"
T3C-2114	82 11/16"	55 1/8"
T3C-2116	82 11/16"	63"
T3C-2406	94 1/2"	23 5/8"
T3C-2408	94 1/2"	31 1/2"
T3C-2410	94 1/2"	39 3/8"
T3C-2412	94 1/2"	47 1/4"
T3C-2414	94 1/2"	55 1/8"
T3C-2416	94 1/2"	63"



T4C-1606	63"	23 5/8"
T4C-1608	63"	31 1/2"
T4C-1610	63"	39 3/8"
T4C-1612	63"	47 1/4"
T4C-1614	63"	55 1/8"
T4C-1616	63"	63"
T4C-2006	78 3/4"	23 5/8"
T4C-2008	78 3/4"	31 1/2"
T4C-2010	78 3/4"	39 3/8"
T4C-2012	78 3/4"	47 1/4"
T4C-2014	78 3/4"	55 1/8"
T4C-2016	78 3/4"	63"
T4C-2406	94 1/2"	23 5/8"
T4C-2408	94 1/2"	31 1/2"
T4C-2410	94 1/2"	39 3/8"
T4C-2412	94 1/2"	47 1/4"
T4C-2414	94 1/2"	55 1/8"
T4C-2416	94 1/2"	63"
T4C-2606	110 1/4"	23 5/8"
T4C-2608	110 1/4"	31 1/2"
T4C-2610	110 1/4"	39 3/8"
T4C-2612	110 1/4"	47 1/4"
T4C-2614	110 1/4"	55 1/8"
T4C-2616	110 1/4"	63"

FENÊTRE COULISSANTE SLIDING WINDOW VENTANA DE CORREDERA

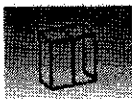
T2CF-0606-14	31 1/2"	55 1/8"
T2CF-0606-16	31 1/2"	63"
T2CF-0606-18	31 1/2"	70 7/8"
T2CF-0606-14	35 7/16"	55 1/8"
T2CF-0606-16	35 7/16"	63"
T2CF-0606-18	35 7/16"	70 7/8"
T2CF-1006-14	39 3/8"	55 1/8"
T2CF-1006-16	39 3/8"	63"
T2CF-1006-18	39 3/8"	70 7/8"
T2CF-1206-14	47 1/4"	55 1/8"
T2CF-1206-16	47 1/4"	63"
T2CF-1206-18	47 1/4"	70 7/8"
T2CF-1406-14	55 1/8"	55 1/8"
T2CF-1406-16	55 1/8"	63"
T2CF-1406-18	55 1/8"	70 7/8"
T2CF-1606-14	63"	55 1/8"
T2CF-1606-16	63"	63"
T2CF-1606-18	63"	70 7/8"

T3CF-1506-14	59 1/16"	55 1/8"
T3CF-1506-16	59 1/16"	63"
T3CF-1506-18	59 1/16"	70 7/8"
T3CF-1806-14	70 7/8"	55 1/8"
T3CF-1806-16	70 7/8"	63"
T3CF-1806-18	70 7/8"	70 7/8"
T3CF-2106-14	82 11/16"	55 1/8"
T3CF-2106-16	82 11/16"	63"
T3CF-2106-18	82 11/16"	70 7/8"
T3CF-2406-14	94 1/2"	55 1/8"
T3CF-2406-16	94 1/2"	63"
T3CF-2406-18	94 1/2"	70 7/8"

T4CF-1606-14	63"	55 1/8"
T4CF-1606-16	63"	63"
T4CF-1606-18	63"	70 7/8"
T4CF-2006-14	78 3/4"	55 1/8"
T4CF-2006-16	78 3/4"	63"
T4CF-2006-18	78 3/4"	70 7/8"
T4CF-2406-14	94 1/2"	55 1/8"
T4CF-2406-16	94 1/2"	63"
T4CF-2406-18	94 1/2"	70 7/8"
T4CF-2606-14	110 1/4"	55 1/8"
T4CF-2606-16	110 1/4"	63"
T4CF-2606-18	110 1/4"	70 7/8"

FENÊTRE SERRE CASEMENT WINDOW VENTANA DE SOLANA

Profondeur
Depth 29 1/8"
Profundidad
Projection intérieure
Interior projection 23 5/8"
Interior proyección



ST2S-1210	47 1/4"	39 3/8"
ST2S-1212	47 1/4"	47 1/4"
ST2S-1214	47 1/4"	55 1/8"
ST2S-1216	47 1/4"	63"
ST2S-1218	47 1/4"	70 7/8"
ST2S-1410	55 1/8"	39 3/8"
ST2S-1412	55 1/8"	47 1/4"
ST2S-1414	55 1/8"	55 1/8"
ST2S-1416	55 1/8"	63"
ST2S-1418	55 1/8"	70 7/8"
ST2S-1610	63"	39 3/8"
ST2S-1612	63"	47 1/4"
ST2S-1614	63"	55 1/8"
ST2S-1616	63"	63"
ST2S-1618	63"	70 7/8"

ST3S-1810	70 7/8"	39 3/8"
ST3S-1812	70 7/8"	47 1/4"
ST3S-1814	70 7/8"	55 1/8"
ST3S-1816	70 7/8"	63"
ST3S-1818	70 7/8"	70 7/8"
ST3S-1821	70 7/8"	84"
ST3S-2110	82 11/16"	39 3/8"
ST3S-2112	82 11/16"	47 1/4"
ST3S-2114	82 11/16"	55 1/8"
ST3S-2116	82 11/16"	63"
ST3S-2118	82 11/16"	70 7/8"
ST3S-2121	82 11/16"	84"
ST3S-2410	94 1/2"	39 3/8"
ST3S-2412	94 1/2"	47 1/4"
ST3S-2414	94 1/2"	55 1/8"
ST3S-2416	94 1/2"	63"
ST3S-2418	94 1/2"	70 7/8"
ST3S-2421	94 1/2"	84"

ST4S-2810	110 1/4"	39 3/8"
ST4S-2812	110 1/4"	47 1/4"
ST4S-2814	110 1/4"	55 1/8"
ST4S-2816	110 1/4"	63"
ST4S-2818	110 1/4"	70 7/8"
ST4S-2821	110 1/4"	84"
ST4S-3210	126"	39 3/8"
ST4S-3212	126"	47 1/4"
ST4S-3214	126"	55 1/8"
ST4S-3216	126"	63"
ST4S-3218	126"	70 7/8"
ST4R-3221	126"	84"

PORTE-PATIO PATIO DOOR PUERTA VENTANA

N2P-1520	59"	81 7/8"
N2P-1820	70 7/8"	81 7/8"
N2P-2420	94 1/2"	81 7/8"
N3P-2720	106 1/4"	81 7/8"
N4P-3620	139 1/8"	81 7/8"

Comment commander votre fenêtre Melco

Suivre chacune des étapes attentivement :

1- En fonction de l'épaisseur du mur sur lequel sera installée la fenêtre, déterminer l'épaisseur que doit avoir le cadre de la fenêtre :
- 4 1/2" : cadre de fenêtre sans soufflage
- 7 1/4", 8 1/4" ou 9 1/4" : cadre avec soufflage en pin installé en usine
- aussi disponible avec soufflage en PVC 5 1/4" non posé en usine à ajuster par l'installateur

2- Choisir parmi les types de soufflage disponibles :
- Code de produit débutant par la lettre «T» : sans soufflage
- Code de produit débutant par la lettre «N» : soufflage en pin naturel non recouvert
- Code de produit débutant par la lettre «R» : soufflage en pin naturel recouvert de vinyle blanc

3- Déterminer la dimension extérieur du cadre de la fenêtre
(largeur et hauteur)

Exemples de commandes :

1- • Cadre de fenêtre sans soufflage : 4 1/2"
• Fenêtre : 47 1/4" x 47 1/4"
T2V-1212

2- • Cadre avec soufflage en pin naturel non recouvert : 7 1/4", 8 1/4" ou 9 1/4"
• Fenêtre : 47 1/4" x 47 1/4"
N2V-1212

3- • Cadre avec soufflage en pin naturel recouvert de vinyle blanc : 7 1/4", 8 1/4" ou 9 1/4"
• Fenêtre : 47 1/4" x 47 1/4"
R2V-1212

How to order a Melco window

Each stage should be followed closely:

1- According to the thickness of wall in which the window will be installed, determine the thickness of window frame:
- 4-1/2": window frame without thickening
- 7-1/4", 8-1/4" or 9-1/4": white pine thickening factory installed
- also available with 5 1/4" PVC thickening not factory installed

2- Choose type of thickening available:
- Product code starting with letter "T": without thickening
- Product code starting with letter "N": thickening with unclad jointed pine
- Product code starting with letter "R": jointed pine thickening, with white vinyl cladding

3- Determine exterior dimension of window frame
(width and height)

Various types of ordering:

1- • Window frame without thickening: 4-1/2"
• Window: 47-1/4" x 47-1/4"
T2V-1212

2- • Frame with jointed pine thickening, unclad: 7-1/4", 8-1/4" or 9-1/4"
• Window: 47-1/4" x 47-1/4"
N2V-1212

3- • Frame with jointed pine thickening, white vinyl clad: 7-1/4", 8-1/4" or 9-1/4"
• Window: 47-1/4" x 47-1/4"
R2V-1212

Pedido de ventanas de Melco

Se recomienda seguir detenidamente los siguientes pasos:

1. Determinar el espesor que debe tener el marco en función del grosor del muro en que se instalará la ventana:
- 4 1/2": marco de ventana sin embono
- 7 1/4, 8 1/4 ó 9 1/4": marco con embono de pino instalado en la fábrica
- marco de PVC de 5 1/4" no instalado en la fábrica para ajustar en el momento de instalarlo

2. Escoger un tipo de embono:
- Código de producto que comienza con "T": sin embono
- Código de producto que comienza con "N": embono de pino natural sin recubrimiento
- Código de producto que comienza con "R": embono de pino natural recubierto de plástico vinilo blanco

3. Determinar las dimensiones externas del marco de la ventana (ancho y alto).

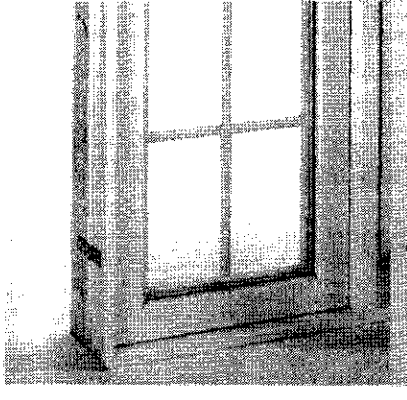
Ejemplos de pedido:

1- • Marco de ventana sin embono de 4 1/2"
• Ventana cuadrada de 47 1/4"
T2V-1212

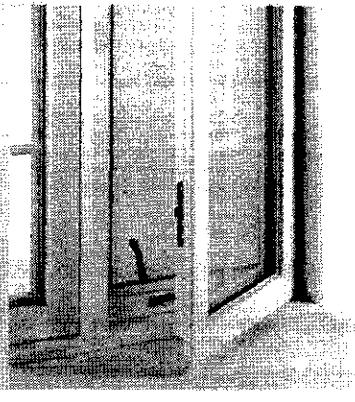
2- • Marco con embono de pino natural sin recubrimiento de 7 1/4, 8 1/4 ó 9 1/4"
• Ventana cuadrada de 47 1/4"
N2V-1212

3- • Marco con embono de pino natural recubierto de plástico vinilo blanco de 7 1/4, 8 1/4 ó 9 1/4"
• Ventana cuadrada de 47 1/4"
R2V-1212

Soufflage en pin recouvert de vinyle blanc.
White vinyl clad pine thickening.
Embono de pino natural recubierto de plástico vinilo blanco.

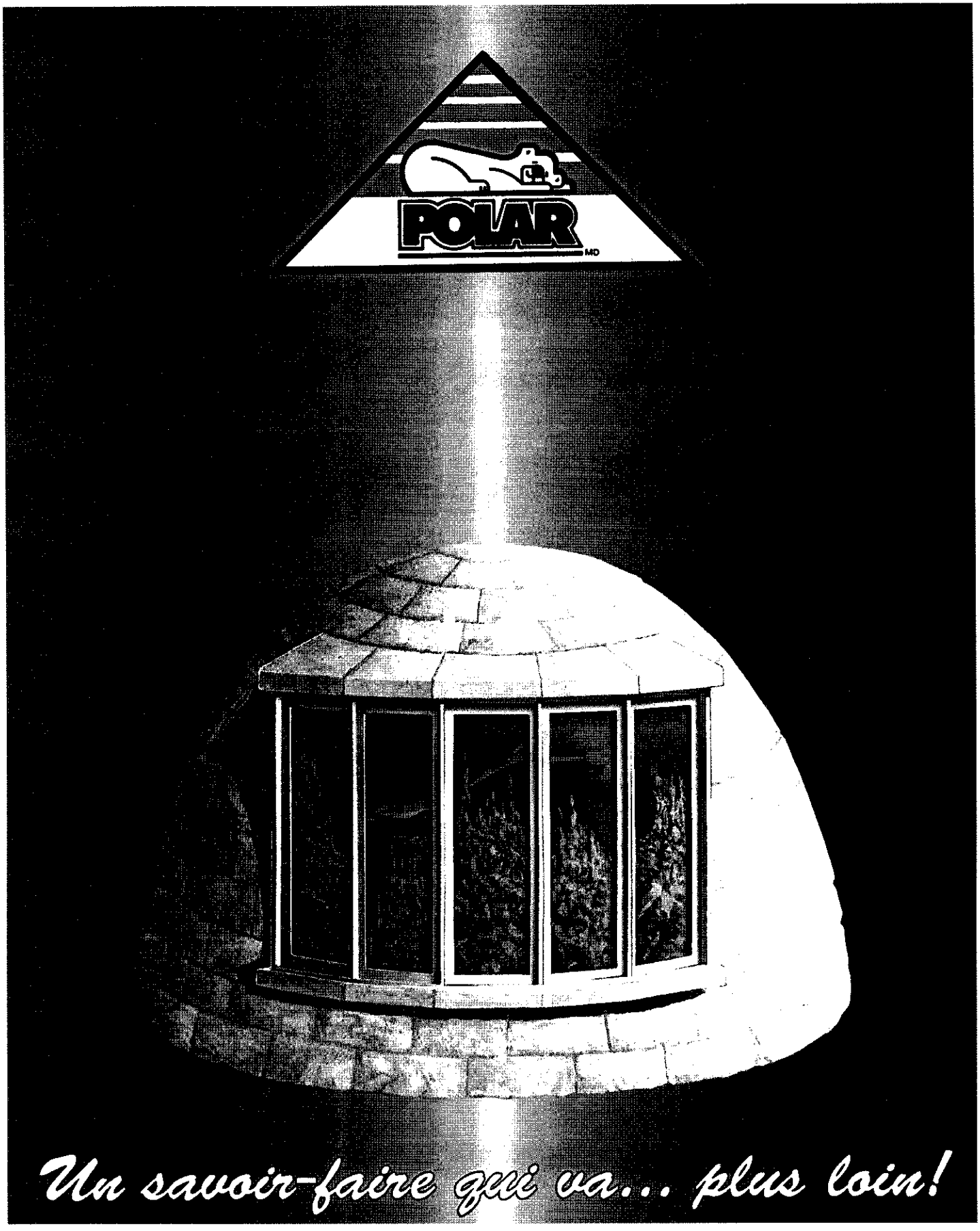


Toutes le fenêtres à battants Melco incluent un ouvrant à l'origine.
All Melco casement windows are initially supplied with one opening.
Todas las ventanas de bisagra de Melco tienen inicialmente una hoja móvil.



MELCO

Les industries Melco Canada ltée
Terrebonne (Québec) Canada J6W 5Y8
Tél. : (514) 492-0404 / 1 800 363-8240 Fax : (514) 492-2973


POLAR
MD
Un savoir-faire qui va... plus loin!

GARANTIE À VIE

FENÊTRES ET PORTES

Fenêtres Montmagny Inc. manufacturier des produits POLAR, consent à l'égard de l'acheteur original, la garantie suivante sur tous les produits que la compagnie fabrique ou assemble depuis son usine de St-François, Montmagny:

À vie: Quincaillerie Truth et verres trempés servant à la fabrication des portes-patio Silensia contre le bris naturel.

20 ans: Extrusions de PVC (Panda, Flex, Micro-Flex et porte-patio Silensia)

10 ans: Panneaux de verre scellé (thermos)

5 ans: Recouvrement de vinyle et panneau de porte d'acier.

1 an: Contre tout défaut de fabrication

Pour certains produits , les garanties ci-haut décrites sont données par les fournisseurs de Fenêtres Montmagny Inc., auquel cas Fenêtres Montmagny Inc. n'est pas responsable de telles garanties, seuls les fournisseurs concernés le sont. En outre, la présente publicité a pour objet de résumer le certificat de garantie. Par conséquent, les garanties données sont celles spécifiquement décrites au certificat de garantie et aucune autre. En cas de contradiction entre la présente publicité et le certificat de garantie, les dispositions du certificat prévaudront.

Pour toute demande de service sur garantie, veuillez vous référer à votre distributeur.

Distributeur autorisé

Votre choix... notre engagement!

FENÊTRES MONTMAGNY INC. C.P. 160, SAINT-FRANÇOIS (MONTMAGNY) (QUÉBEC) G0R 3A0

UN QUART DE SIÈCLE À VOTRE SERVICE

Depuis ses débuts, Fenêtres Montmagny Inc. fabrique des portes et fenêtres de haute performance sous la marque déposée de POLAR.

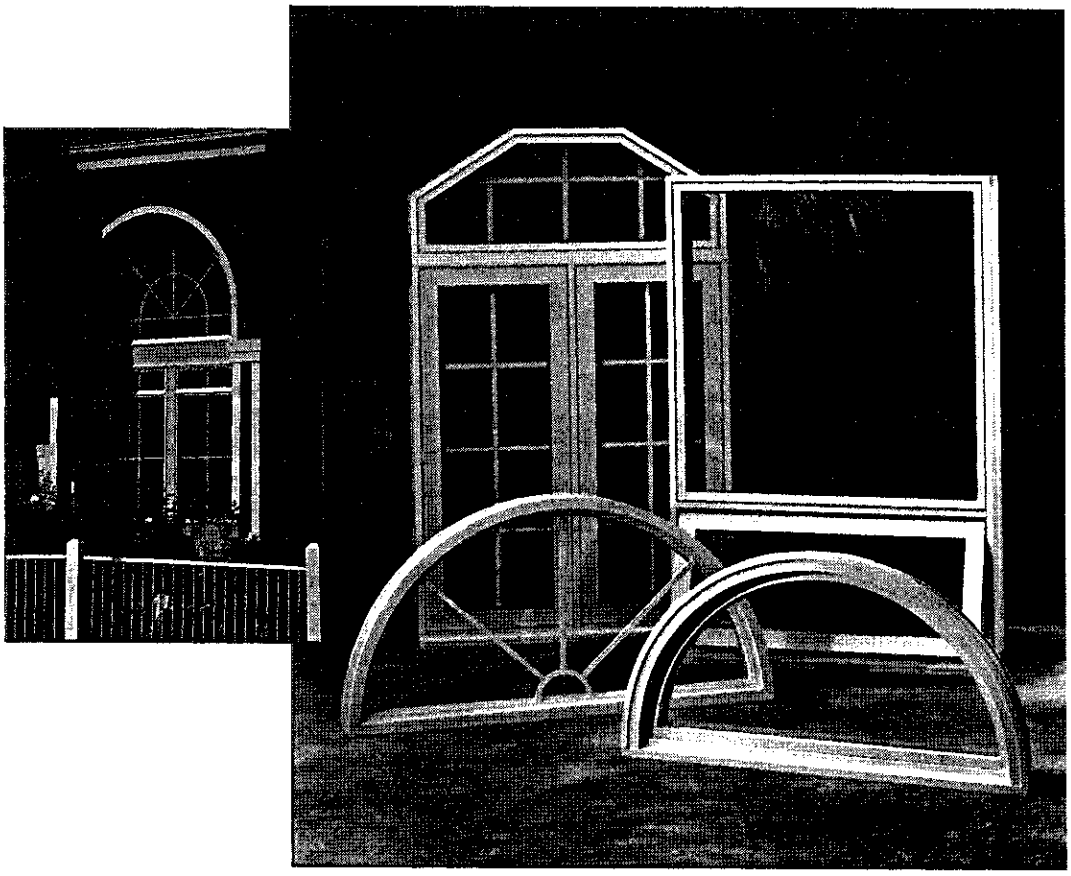
Cette expérience, nous la retrouvons parmi des foyers établis au Québec, en Ontario, dans les diverses provinces des Maritimes et de l'Atlantique, de même qu'aux États-Unis. Des millions d'utilisateurs s'accordent pour dire qu'ils sont satisfaits.

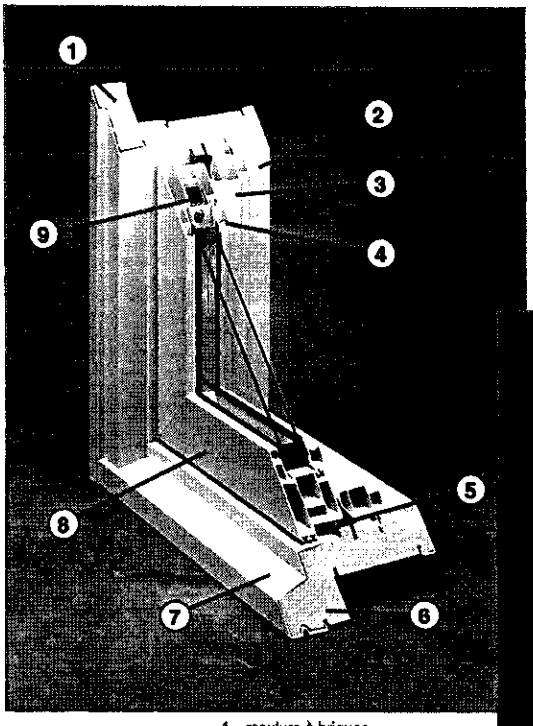
Une fenêtre est aussi synonyme d'ouverture. Ouverture vers la lumière, les nouveaux horizons, le monde extérieur, la recherche et le développement de nos produits. Cette démarche nous a toujours servi de ligne de conduite et ce, afin de s'assurer que votre degré de satisfaction, aussi élevé soit-il, puisse être comblé.

Conscients du vecteur économique dans un processus de décision, nous l'avons aussi incorporé à notre recette de fabrication au même titre que la longévité, la qualité, l'étanchéité, la résistance, l'élégance et l'harmonisation architecturale.

Polar, c'est la réponse à votre question: comment obtenir une barrière efficace et durable envers les éléments climatiques et aux autres contraintes tout en conservant une ouverture agréable sur ce monde extérieur qui vous entoure.

Notre but ultime est de vous offrir un savoir faire qui va... plus loin!





Le plaisir de jongler avec le revêtement de vos fenêtres. Flex, c'est la versatilité des produits habilités à vous satisfaire.

1. moulure à briques
2. recouvrement de vinyle intérieur
3. arrêt-volet
4. pareclose
5. coupe-froid double action
6. tablette
7. recouvrement de vinyle extérieur
8. volet en PVC extrudé
9. renfort rectangulaire en acier

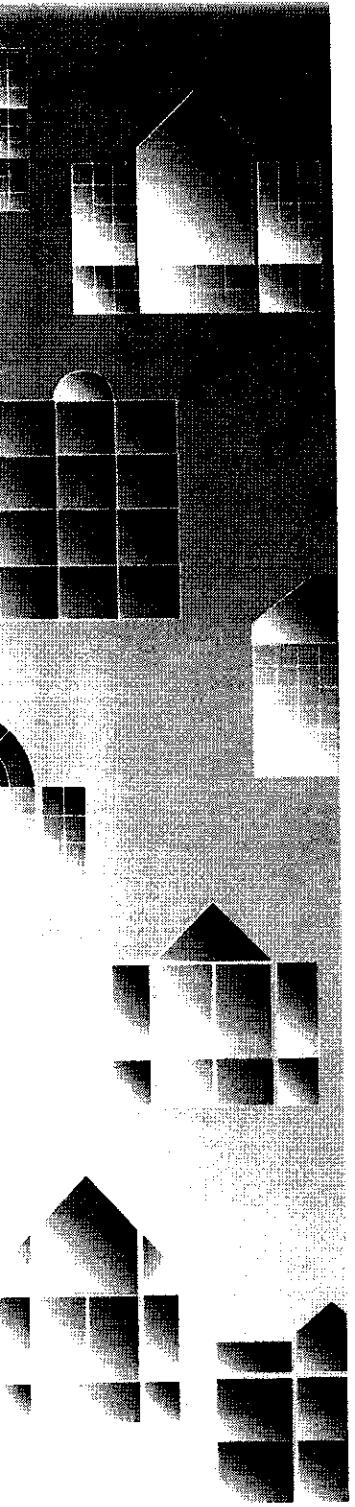
FLEX

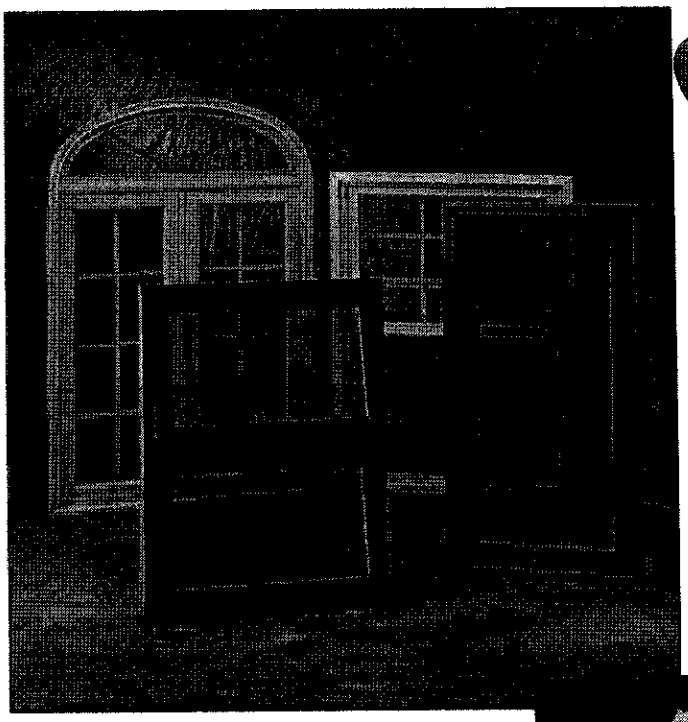
LE MARIAGE POSSIBLE ENTRE LE BOIS ET LE PVC

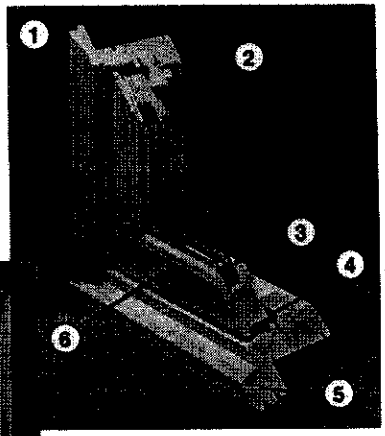
À l'origine , un cadre de bois couplé d'un volet tout PVC. Mais, voilà qu'il vous est possible de jongler comme bon vous semble avec les parements tant extérieurs qu'intérieurs.

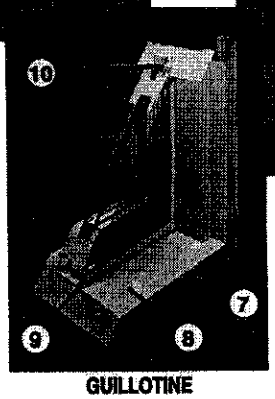
À votre guise, l'extérieur peut être recouvert de PVC blanc ou d'aluminium disponible dans une gamme de couleurs. L'intérieur, tout à fait génial, vous pourrez conserver son aspect naturel, le bois, ou bien recouvrir en totalité ou en partie ses composantes (le volet est toujours en PVC).

Vous recherchez de la flexibilité dans votre décoration? La réponse faite sur mesure: **FLEX**.







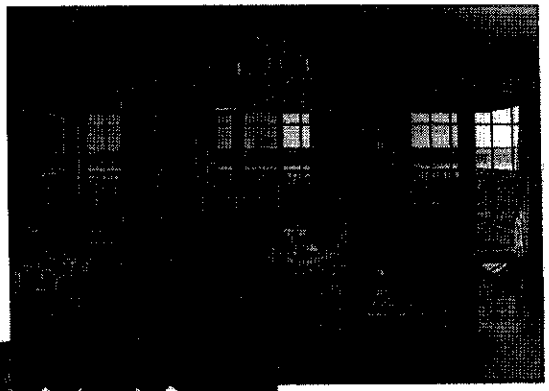


GUILLOTINE

1. moulure à briques
2. arrêt-volet
3. pareclose
4. coupe-froid à double action
5. tablette
6. volet

GUILLOTINE

7. moulure à briques aluminium extrudé
8. recouvrement aluminium extérieur
9. moustiquaire
10. système de balance



Le plaisir d'un bon café tout comme la chaleur traditionnelle du bois, au même titre que la tranquillité d'esprit, le tout à votre goût et selon votre choix.

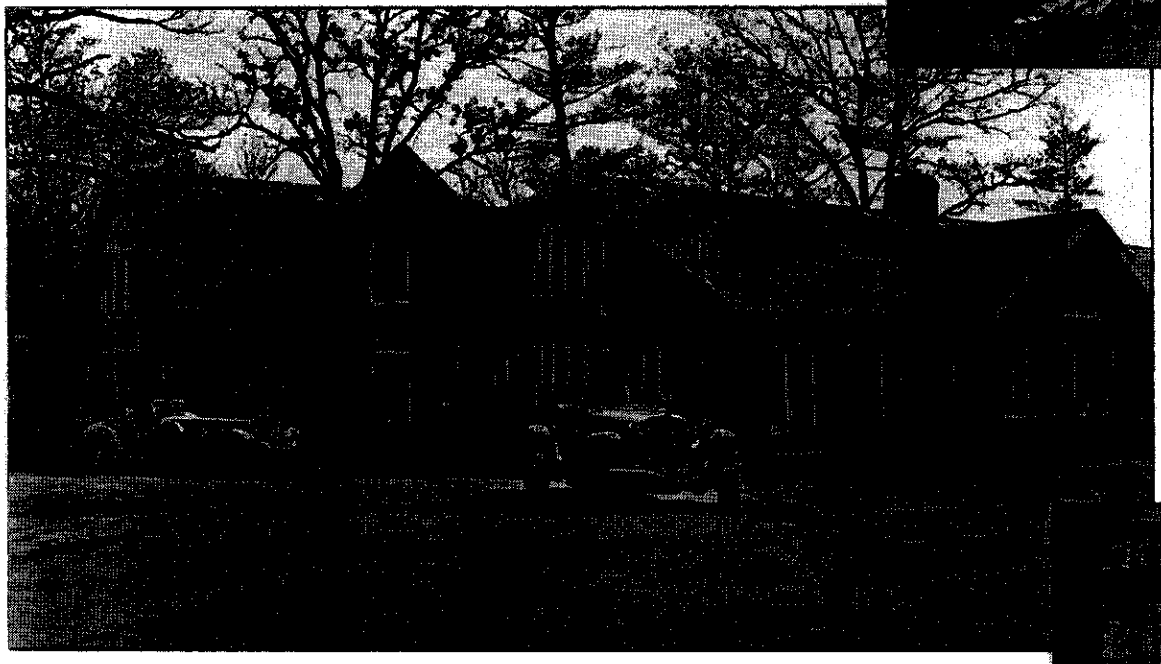
RIZZY

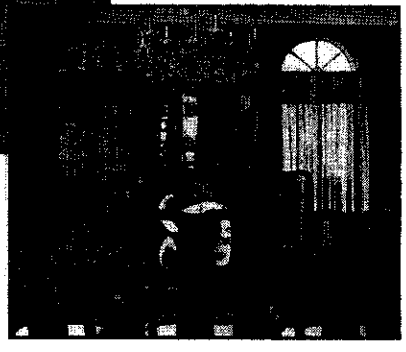
LA FENÊTRE DE BOIS AVEC OU SANS OPTION DE RECOUVREMENT EXTÉRIEUR EN ALUMINIUM

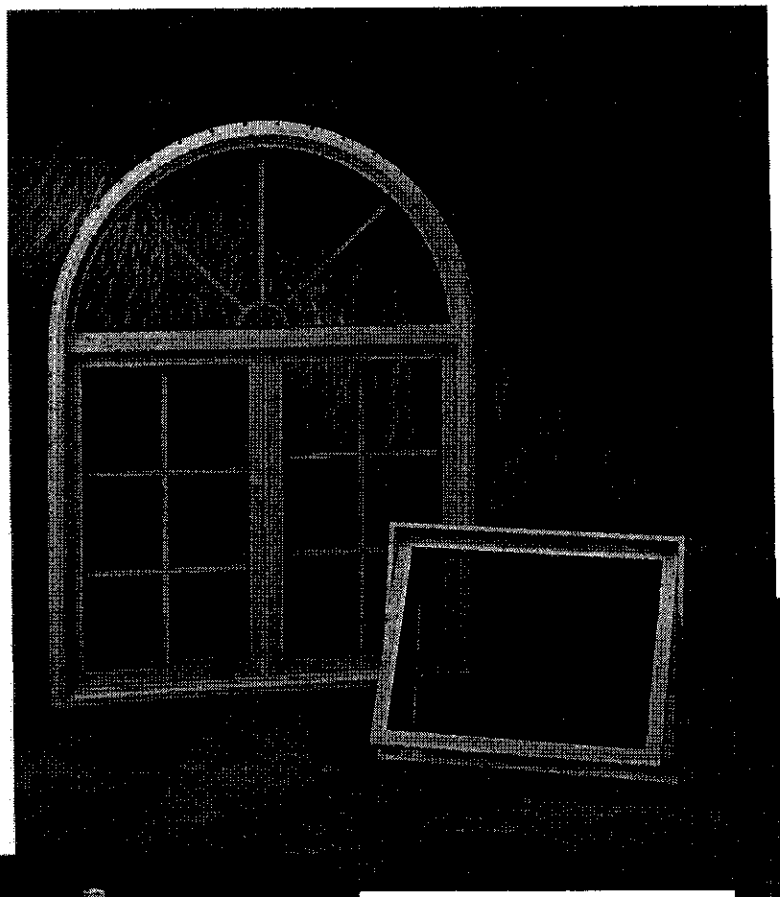
Dans l'âme, vous êtes attaché à la chaleur traditionnelle du bois et sa beauté légendaire?
Nous avons ce qu'il vous faut!

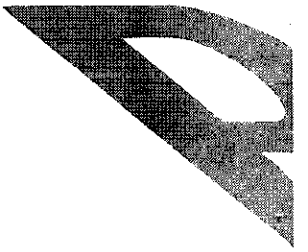
Une option pour le revêtement extérieur en aluminium sans entretien?
Nous avons encore ce qu'il vous faut!

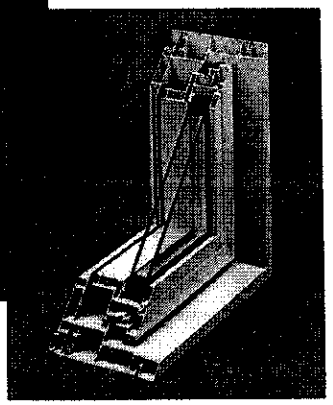
En pin ou en cèdre de l'Ouest, tous deux de première qualité, chaque pièce est séchée au four et traitée par immersion dans un préservatif pour accroître sa durabilité.



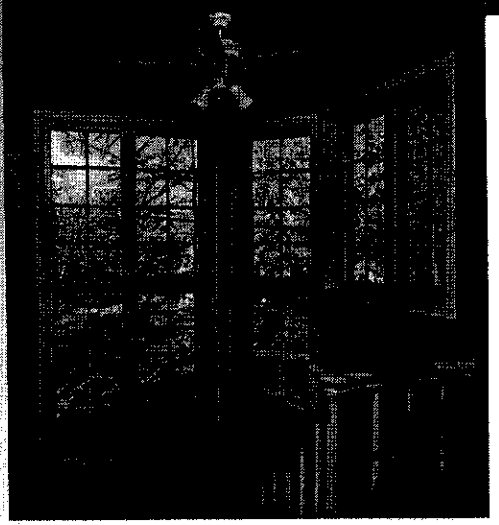


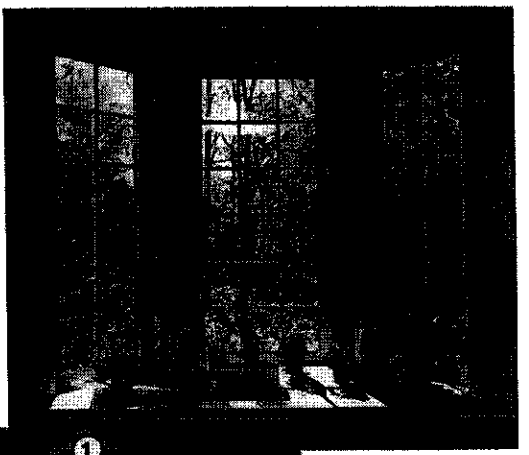


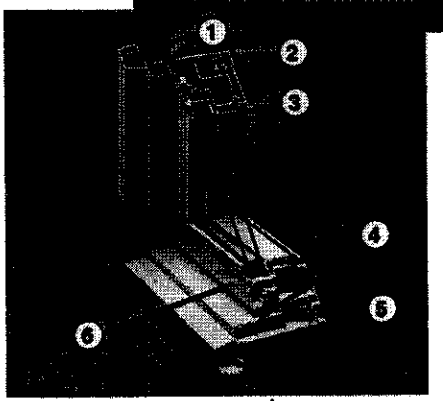




CADRE FLUSH

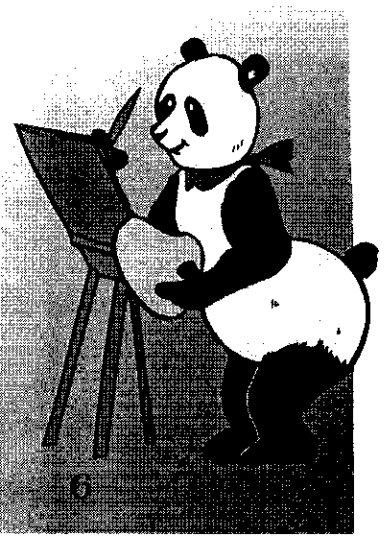






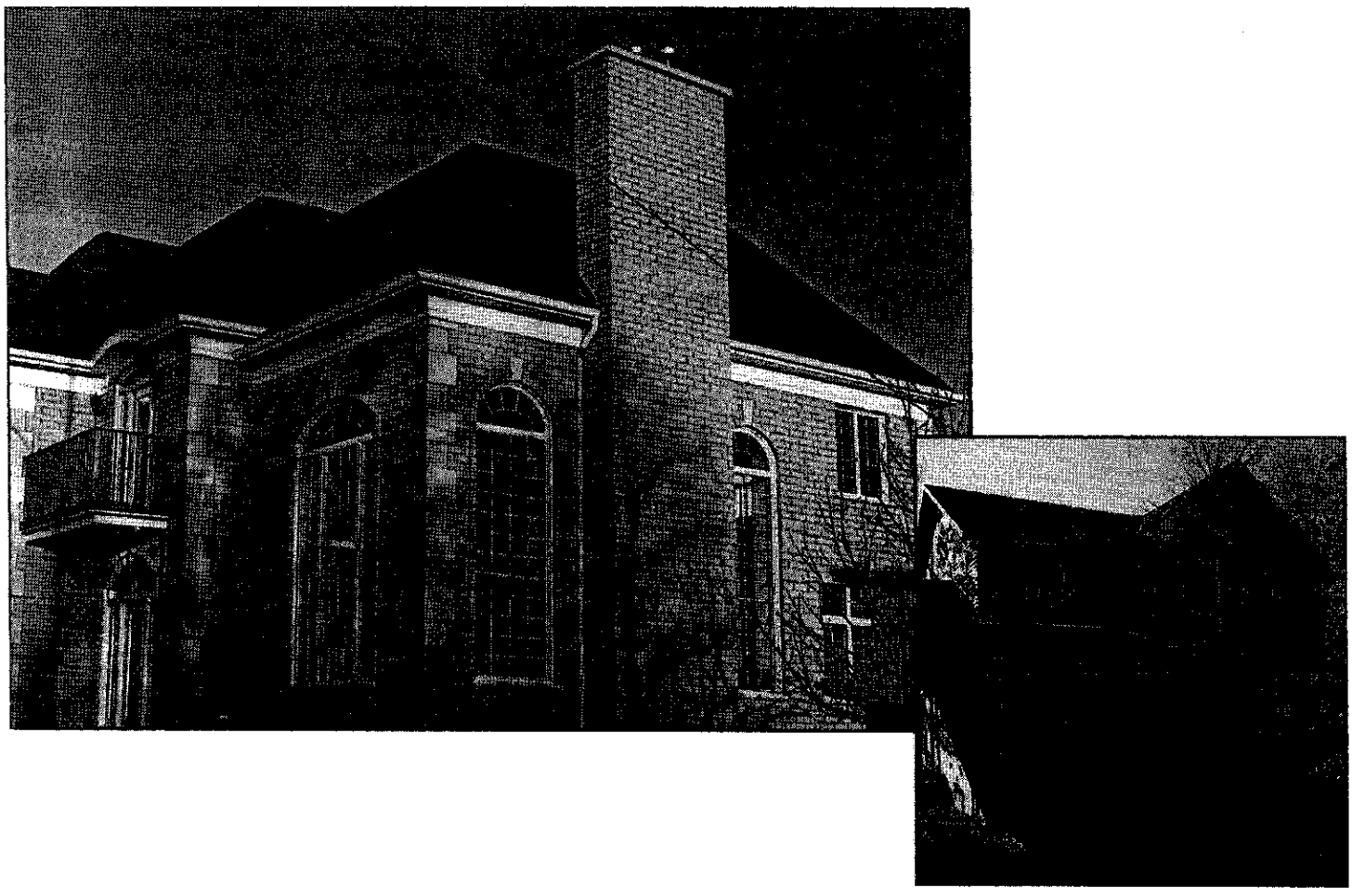
CADRE BOISÉ

1. cadre monopièce
2. cache-rainure J 1/2
3. cache-rainure de moustiquaire
4. coupe-froid
5. J 1/2
6. volet



Réveillez l'artiste qui sommeille en vous, profitez de tous les avantages du "sans entretien" et devenez artiste-peintre... sur toile.

PANDA

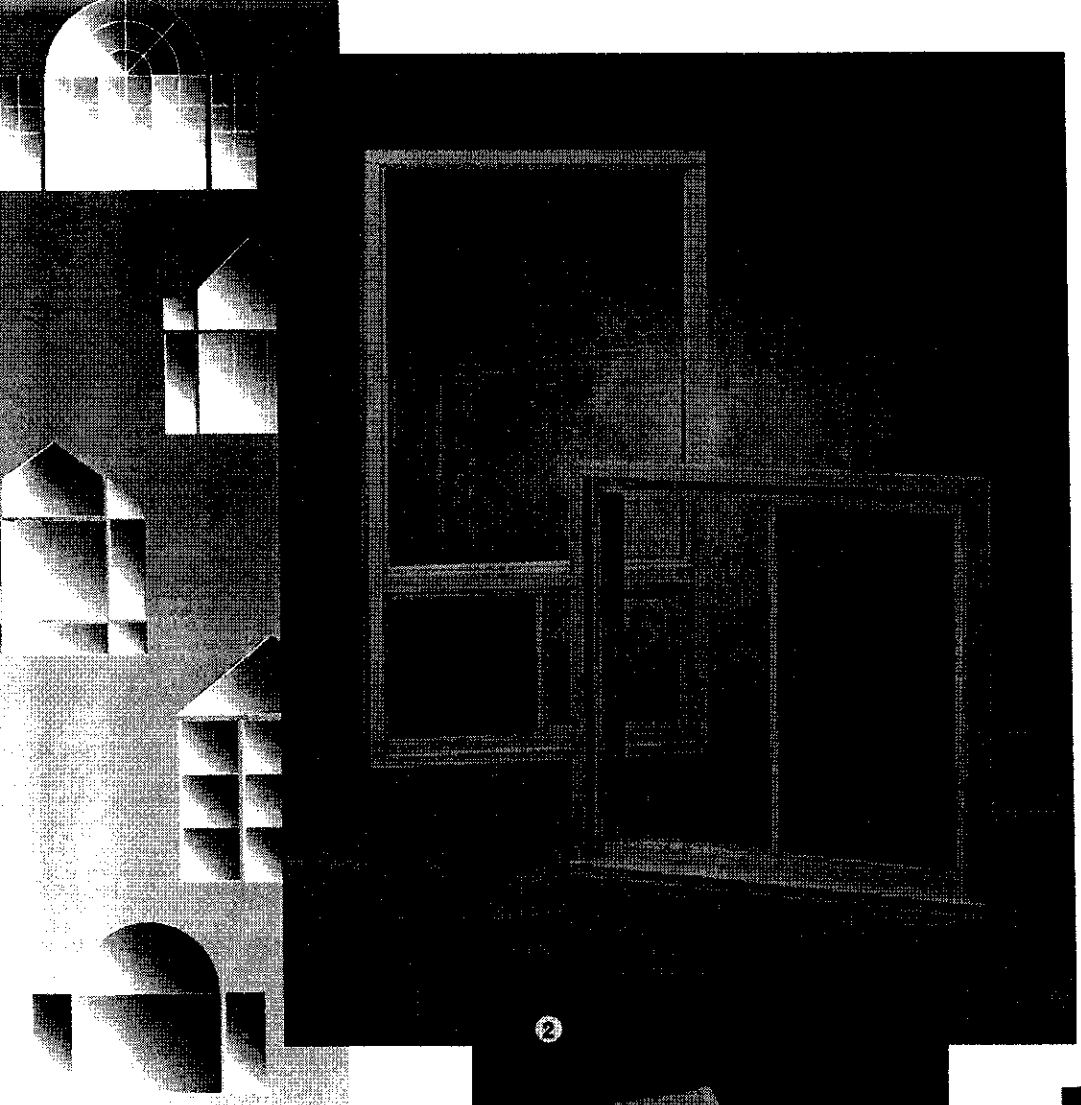


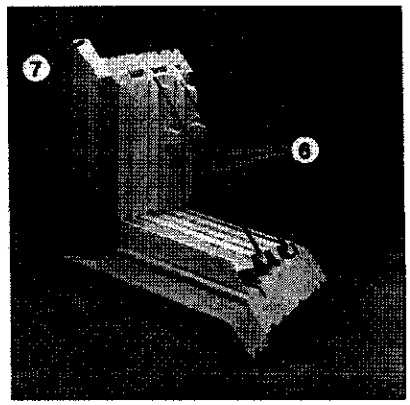
LA FENÊTRE TOUT PVC

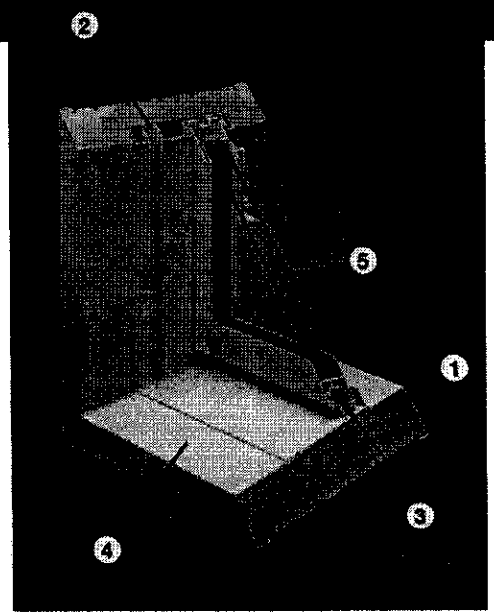
Pureté de ligne et design moderne, cette fenêtre s'adapte à tous les types architecturaux.

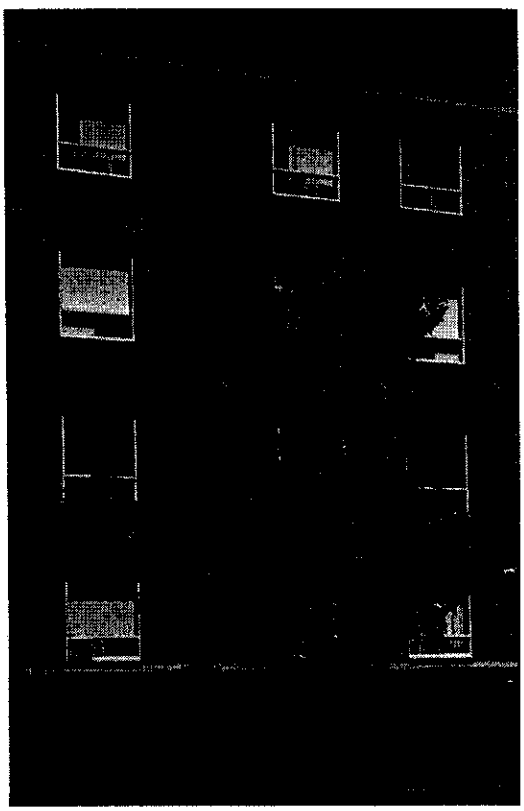
Tout en étant composée d'un matériau robuste, résistant et léger, elle vous offre toute la souplesse nécessaire à votre imagination pour créer des formes spectaculaires.

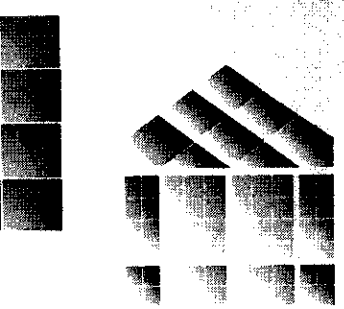
Très isolante et ne nécessitant aucun entretien, cette fenêtre vous accorde plus de temps pour vos occupations personnelles.











MAKWA
"Petit ours noir" en algonquin.

Ça roule en grand et je consacre tous mes temps libres à ce que j'apprécie le plus. Lorsqu'il faut faire le bon choix, je suis vite sur mes patins.

1. recouvrement extérieur
2. rencontre du moustiquaire
3. glissière
4. recouvrement intérieur
5. unité thermos scellée
6. système 4 vitres
7. moulure à briques

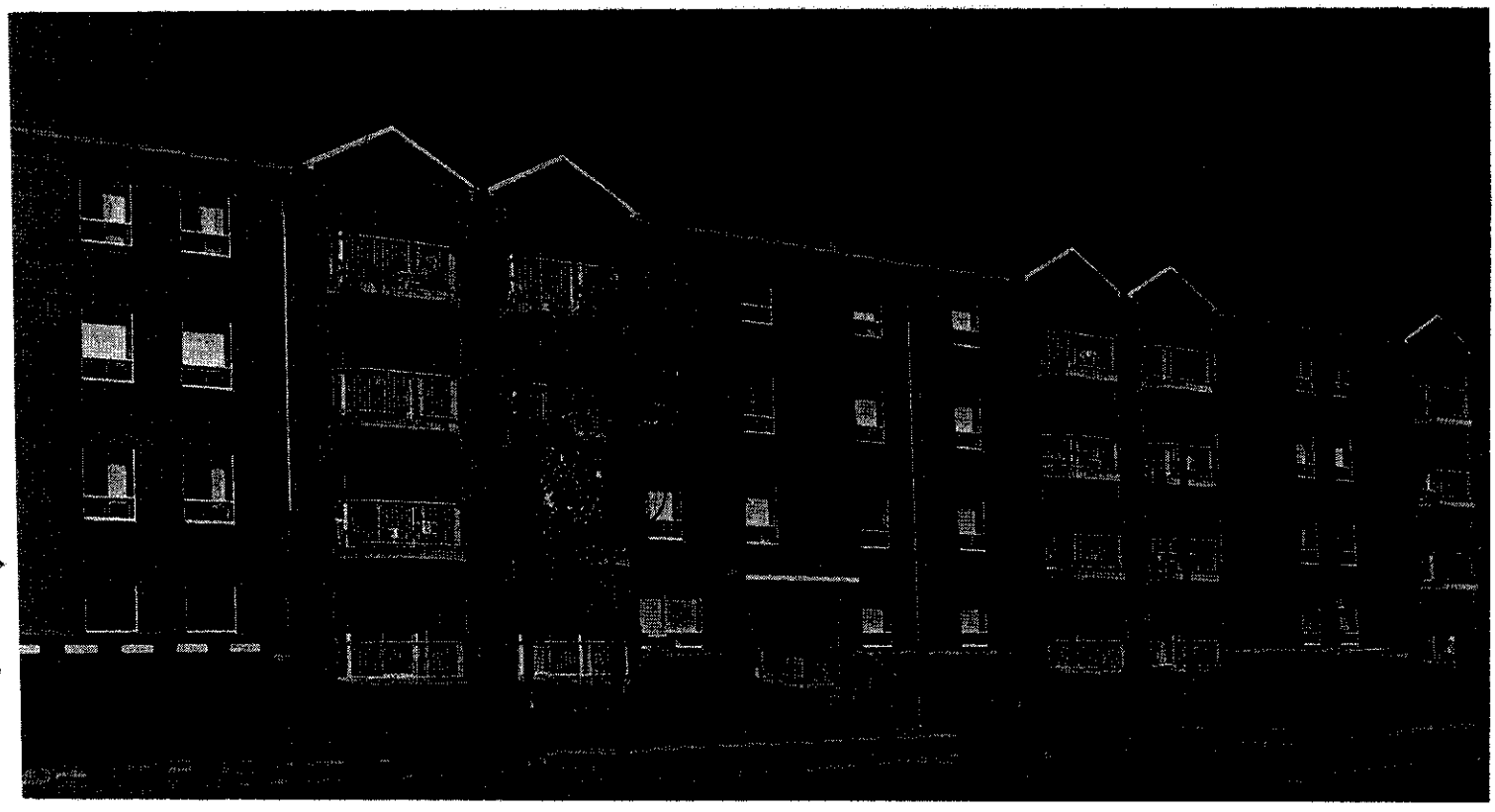
LA FENÊTRE COULISSANTE

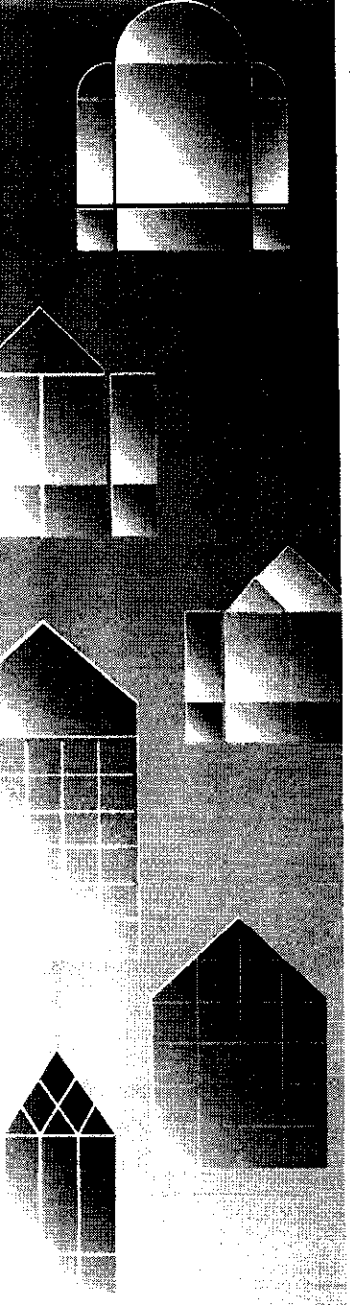
Glisse à gauche, glisse à droite, pour ces endroits où l'ouverture d'un battant à l'extérieur pourrait gêner, voici le compromis idéal.

En version thermos scellé ou 4 vitres, elles sont aisées à l'entretien tout en vous procurant l'étanchéité que vous souhaitez.

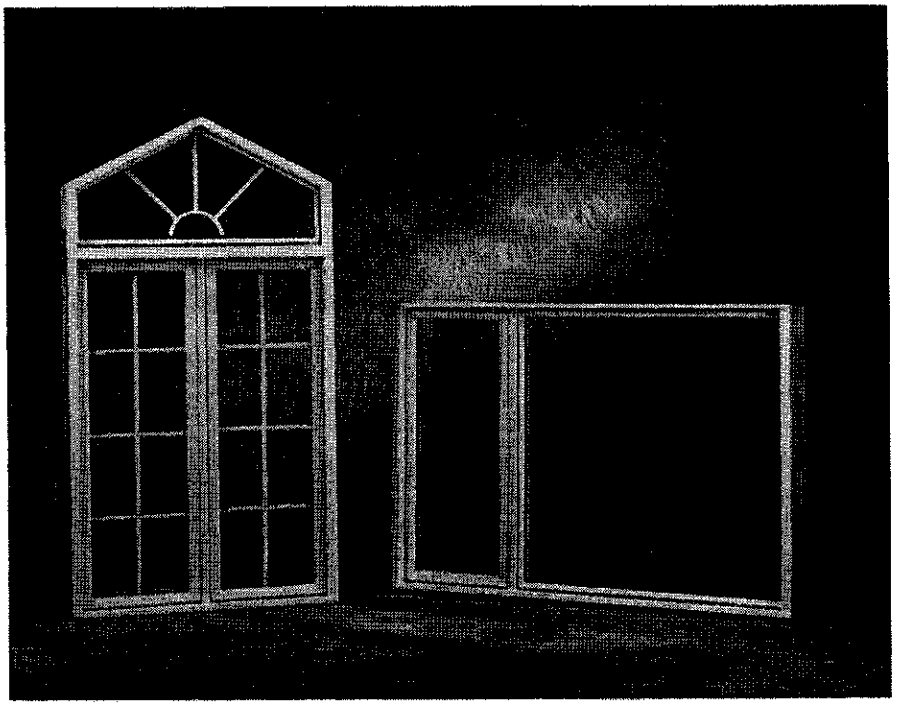
À votre gré, ses multiples variantes de recouvrements tant extérieurs qu'intérieurs facilitent son intégration avec nos autres modèles.

(N.B.: En version thermos scellé c'est l'unité de gauche, vue extérieure qui coulisse).

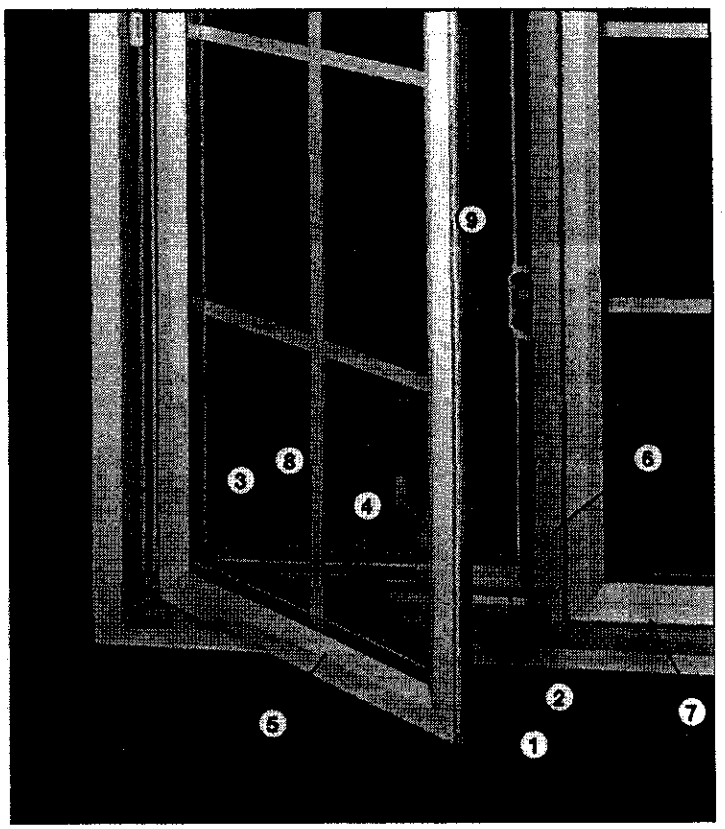


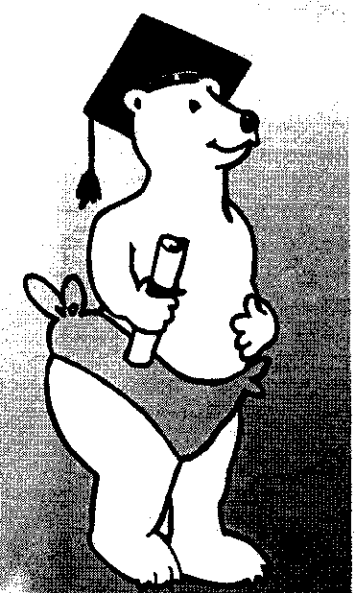


NIC



1. coupe-froid contour
2. coupe-froid tubulaire
3. coupe-froid co-extrudé
4. bras articulé 90°
5. volet aminci tout PVC
6. poteau central à coin arrondis
7. positionnement du volet vers l'intérieur
8. arrêt-volet tout PVC
9. coupe-froid mousse de barrure





Qualité et efficacité reconnues

Mises à l'épreuve et diplôme en poche, son avenir est déjà si bien maîtrisé.

Parfois l'expérience n'attend pas le nombre des années.

RO-FLEX

LA P'TITE "NOUVELLE": TOUTE CONTEMPORAINE

Fruit de nos dernières recherches, cette version plus économique de la FLEX, vous comblera avec son volet plus aminci et son cadre encore plus profilé: en définitive plus de lumière.

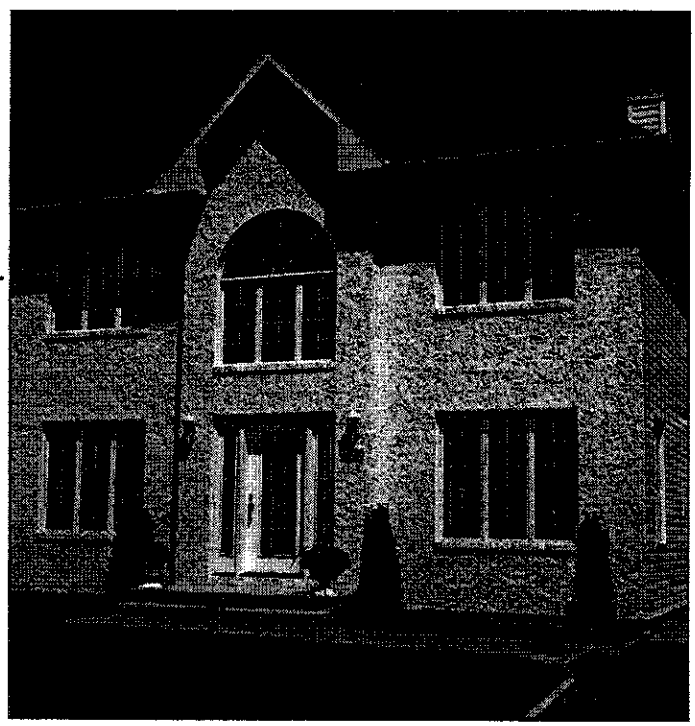
Tout comme sa grande soeur, elle se présente avec un cadre de bois et un volet tout PVC. L'extérieur est toujours recouvert d'un vinyle blanc sans entretien. Sa quincaillerie standard, le bras articulé à ouverture à 90°, vous permet le nettoyage de la surface vitrée extérieure par l'intérieur.

Son volet, pour les cadres de 184mm (7 1/4") et plus est installé vers l'intérieur du cadre, vous assurant un positionnement de la surface vitrée dans la partie chaude du mur.

Et que dire de l'esthétique. Un poteau central aux coins arrondis et toujours recouvert de vinyle tant à l'extérieur qu'à l'intérieur en assouplit la forme, une harmonisation sans compromis. L'arrêt volet en tout PVC de part sa conception, élimine aussi l'entretien.

Finalement le cadre intérieur peut être en pin clair ou recouvert de vinyle blanc selon votre besoin en décoration.

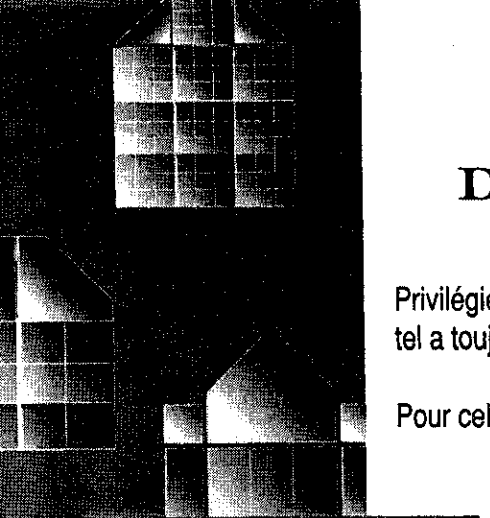
Une p'tite “Nouvelle” déjà fort avancée pour son âge!



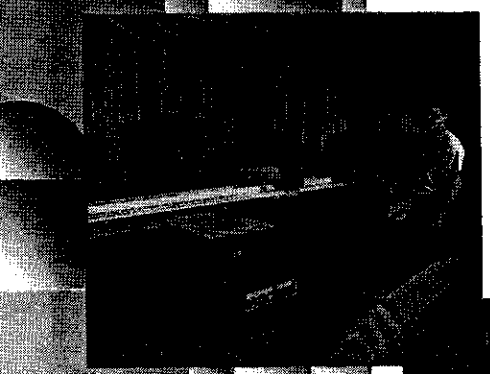
BIENVENUE
DANS NOTRE MONDE STRUCTURAL!

Privilégier un type d'assemblage qui nous permette de maximiser l'étanchéité de nos fenêtres, tel a toujours été notre préoccupation.

Pour cela et pour votre confort, nous avons développé le système structural.



Nos fenêtres ont une tête et un seuil continus. En conséquence, vous obtenez un produit beaucoup plus résistant aux flexions et aux torsions. De la rigidité, quoi!



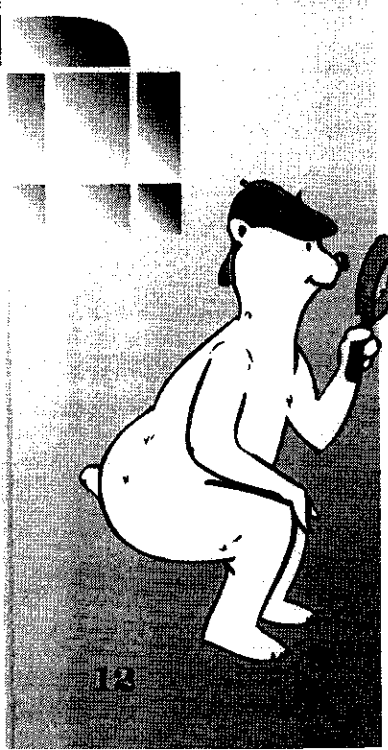
Un seul poteau suffit pour tracer la division entre deux volets. Sans joints, l'eau et l'air ne peuvent y pénétrer et vous y gagnerez la tranquilité d'esprit.

Et que dire du «LOOK». Le poteau central étant grosso modo de la même épaisseur que le cadre, vous améliorez la similitude, le design, bref l'harmonie. De plus, de cette façon vous augmentez la quantité de lumière pénétrant dans votre intérieur.

Vous ne voudriez pas que votre résidence soit raboutée de bouts en pièces. Nous non plus! Nos fenêtres ne sont pas une collection de cache-joints.

ATTENTION...
CE N'EST PAS DROIT!

Une fenêtre tout comme une porte doivent être installées avec attention. Il ne suffit pas de la placer dans son ouverture sans aucune précaution.



En effet, il faut vérifier avec un niveau les quatre faces du produit de même que le «trait-carré». Il est fortement recommandé que tout produit de fenestrage soit fixé par vis à travers le jambage (côté de la fenêtre). Si le produit n'est pas installé selon les règles de l'art, il en résultera obligatoirement des difficultés d'opération qui n'auront aucune relation avec la qualité de fabrication du produit.

Une fois cette étape réalisée, il vous suffit d'insérer avec modération la laine isolante ou la mousse isolante. Prenez garde à une application trop généreuse, spécialement en ce qui a trait à la mousse: ceci aura pour effet d'en faire arquer les jambages et la tête.

"Garder l'oeil ouvert", telle est notre devise. C'est dans les petits détails que l'on reconnaît la qualité de nos produits et c'est en les installant selon les règles de l'art, qu'ils la conservent.

UN PETIT COUP DE PINCEAU OU UN PETIT COUP DE CHIFFON

Naturellement, le bois doit être traité avec égard. Après son installation, toutes les surfaces apparentes en bois doivent recevoir une couche d'apprêt, de teinture ou de peinture que nous recommandons à base d'huile. Insoluble dans l'eau, l'huile aura pour conséquence d'en accroître son imperméabilité. Il faut cependant prendre garde de ne pas appliquer ces produits sur les coupe-froid.

Un petit truc, durant la période de séchage, laissez le volet entrouvert afin d'éviter que ce dernier ne colle sur son cadre.

Tous les parements extérieurs en aluminium de même que toutes les surfaces de PVC tant extérieurs qu'intérieurs ne nécessitent qu'une eau légèrement savonneuse et surtout sans abrasif.

LE VRAI COUPABLE?

De la buée? De la condensation? Lorsqu'elle a été bien installée selon les normes, une fenêtre de qualité n'en est jamais la cause.

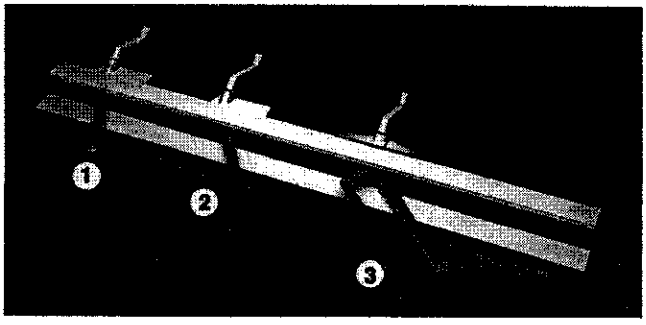
La condensation est souvent le fruit d'une isolation excessive. Une mauvaise circulation d'air, un excès d'humidité, un chauffage inadéquat sont souvent les responsables de ces embêtements. À cet effet la SCHL a publié un petit guide pratique sur l'air et l'humidité, ses problèmes et ses solutions. N'hésitez pas à vous le procurer.

FROID DEHORS, CHAUD EN DEDANS!

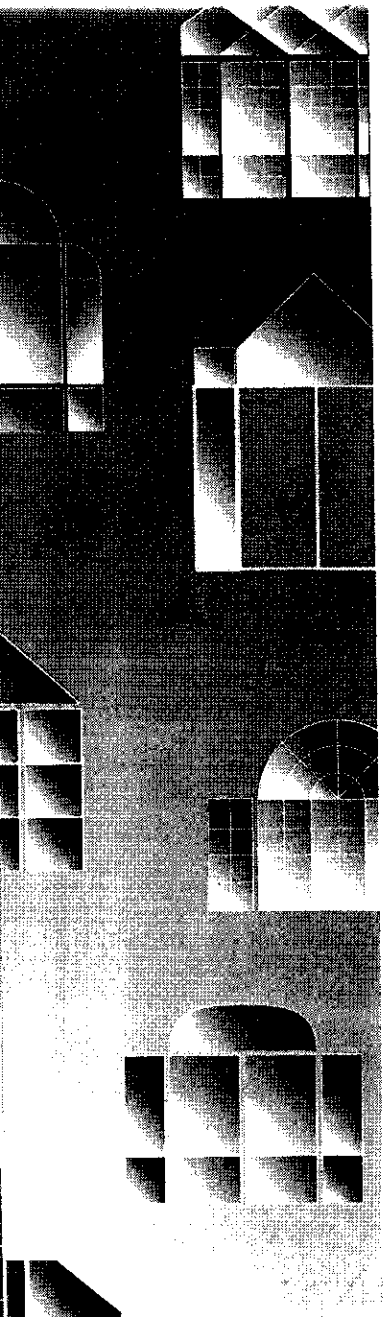
Pendant les saisons froides, vous augmentez bien sûr, le niveau de chauffage à l'intérieur de vos résidences. Afin d'accroître la durabilité de l'unité scellée (thermos) et d'éviter qu'il s'y dépose de la condensation, il est préférable de favoriser une circulation d'air. De temps à autre donnez-lui une petite chance, laissez-la respirer en ouvrant les rideaux.

SANS SE FAIRE TORDRE UN BRAS

En équipement standard, le bras à simple action offrant une ouverture à 70°. Pour la chambre à coucher, où il est nécessaire d'offrir le maximum de surface d'évacuation, l'option consiste en un système à pentures qui permet l'ouverture à 90° dans le coin extrême du cadre. Finalement pour faciliter le nettoyage extérieur avec une ouverture à 90° décalée du coin , vous avez le choix entre le bras articulé et pour plus de souplesse, le bras à double action... de quoi se tordre de rire.



1) Bras à simple action 2) Bras articulé 3) Bras à double action



POUR Y VOIR CLAIR!

Selon certains critères d'évaluation, l'industrie du fenestrage se doit de respecter la norme canadienne (CAN / CSA A440 - M90) dans trois champs d'application bien spécifiques.

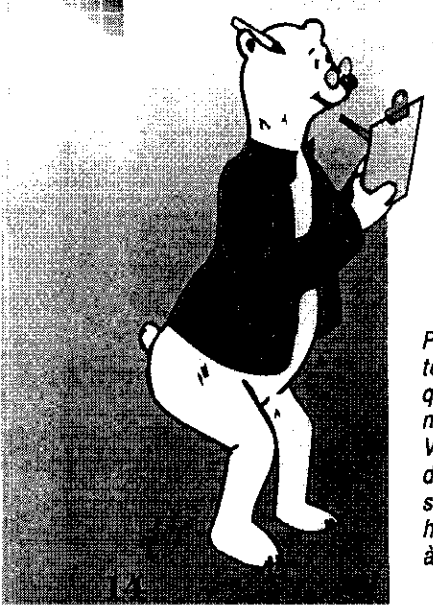
- La cote A donne le niveau de résistance à l'infiltration d'air
- La cote B donne le niveau de résistance à l'infiltration d'eau
- La cote C donne le niveau de résistance à la pression du vent

Plus le chiffre suivant la cote est élevé, meilleur en sera le rendement.

La norme canadienne étant A1, B1, C1, voici la performance des produits Polar.

PRODUITS	A NORME A1 0.5 pi³ / min.-pi	B NORME B1 150 PASCAL	C NORME C1 1500 PASCAL en résistance
Fenêtre à battant GRIZZLY	A3 0.005 pi³	B5 500 Pascal	C5 5000 Pascal
Fenêtre à battant GRIZZLY*	A3 0.005 pi³	B7 700 Pascal	C5 5000 Pascal
Cadre à thermos fixe GRIZZLY	A3 0.001 pi³	B7 700 Pascal	C3 3000 Pascal
Fenêtre à guillotine simple GRIZZLY	A3 0.095 pi³	B3 250 Pascal	C5 5000 Pascal
Fenêtre à battant rec. PVC FLEX	A3 0.060 pi³	B5 500 Pascal	C4 4000 Pascal
Fenêtre à battant rec. PVC FLEX*	A3 0.060 pi³	B7 700 Pascal	C4 4000 Pascal
Cadre à thermos fixe rec. PVC FLEX	A3 0.030 pi³	B7 700 Pascal	C2 2000 Pascal
Fenêtre à battant en PVC PANDA	A3 0.018 pi³	B20 2000 Pascal	C3 3000 Pascal
Fenêtre coulissante 4 vitres MAKWA	A2 0.285 pi³	B2 200 Pascal	C3 3000 Pascal
Fenêtre coulissante Thermos MAKWA	A3 0.065 pi³	B3 300 Pascal	C3 3000 Pascal
Fenêtre à battant Micro-Flex	A3 0.055pi³	B5 500 Pascal	C3 3000 Pascal

* Double coupe-froid



Pour tous les amateurs de statistiques, tests, données techniques: Vous serez bien au dessus des normes standards. De la haute performance à tout point de vue.

LAISSEZ-MOI RÉFLÉCHIR!

La principale fonction de l'unité scellée est de nous isoler au niveau calorifique.

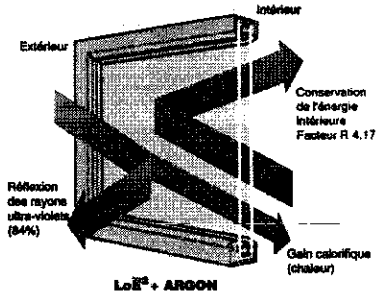
Malgré toute sa bonne volonté, l'unité scellée régulière laisse s'échapper quelque peu de la chaleur radiante des personnes et du mobilier dans la pièce. Cette déperdition est reliée au fait que la vitre intérieure absorbe de la chaleur ambiante qui se transmet par effet de convection de l'air entre les 2 vitres de l'unité, à la vitre extérieure.

Afin d'accroître l'efficacité énergétique de votre unité scellée, deux possibilités s'offrent à vous;

L'OPTION "LoÉ² (Low-E square) + ARGON"

Ces enduits "intelligents" garantissent des économies optimales d'énergie pendant toute l'année en filtrant l'énergie du soleil de façon sélective durant l'été et en réduisant la perte thermique durant l'hiver. En été, les produits de verre LoÉ² laissent pénétrer la lumière visible du soleil tout en bloquant les rayons infrarouges et ultraviolets qui sont responsables de l'augmentation des coûts de climatisation et qui causent des dommages aux revêtements de fenêtres, aux rideaux, au tapis et aux meubles. En hiver, les produits de verre LoÉ² de Polar permettent d'obtenir un confort accru, car ils réduisent les coûts de chauffage en réfléchissant la chaleur à ondes longues émise par le mobilier vers l'intérieur de la pièce.

Les unités scellées LoÉ², remplies du gaz argon pur inerte, limitent la perte par rayonnement ou par conduction, à travers la fenêtre, de l'energie thermique à ondes longues provenant de la chaleur créée dans la pièce.



L'OPTION R-TECH

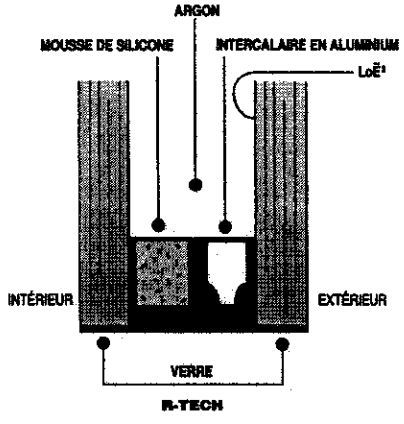
À la base, cette option inclue celle du "LoÉ² + ARGON".

La chaleur comme vous le savez se transmet aussi par conduction. La seule partie de l'unité scellée dont le vitrage extérieur fait contact avec la surface intérieure, c'est sur son pourtour.

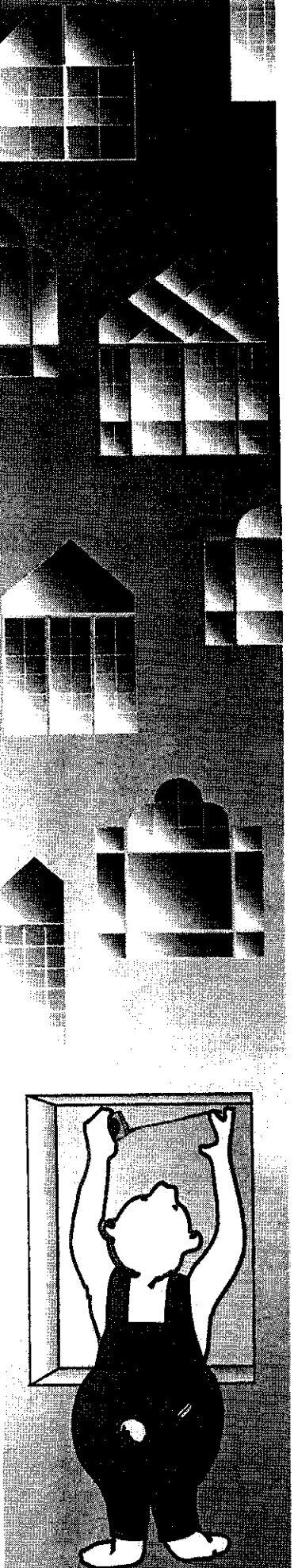
En effet, les deux vitres sont reliées ensemble par une baguette que l'on appelle l'intercolaire et c'est par celle-ci que peu se transmettre de la chaleur intérieure vers l'extérieur par conduction.

La solution consiste simplement par l'ajout d'une barrière thermique à même cet intercalaire et c'est exactement ce en quoi se distingue l'option "R-tech".

Ainsi l'intercalaire régulier d'aluminium est remplacé par un dit hybride soit moitié aluminium, moitié barrière thermique de mousse de silicone.



NOS OPTIONS,
"LAISSEZ-MOI RÉFLÉCHIR!",
UNE SOLUTION SPÉCIALEMENT CONÇUE POUR VOTRE CONFORT.



FLEX ET GRIZZLY

(BATTANT)

HAUTEUR	23 ⅝" 590 mm	31 ⅛" 790 mm	39" 990 mm	46 ⅞" 1190 mm	54 ⅞" 1390 mm	62 ⅜" 1590 mm	70 ½" 1790 mm

B1V LARGEUR	
16"	406 mm
18"	456 mm
19 ⅞"	506 mm
23 ⅞"	606 mm
27 ⅝"	706 mm
31 ¾"	806 mm

B2V LARGEUR	
31 ⅜"	796 mm
35 ¼"	896 mm
39 ¼"	996 mm
47 ⅛"	1196 mm
55"	1396 mm
62 ⅞"	1596 mm

B3V LARGEUR	
52 ⅝"	1336 mm
58 ½"	1486 mm
70 ⅜"	1786 mm
82 ⅛"	2086 mm
93 ⅞"	2386 mm

B4V LARGEUR	
69 ⅞"	1776 mm
77 ¾"	1976 mm
93 ½"	2376 mm
109 ¼"	2776 mm

B5V LARGEUR	
87 ¼"	2216 mm
97 ⅛"	2466 mm
116 ¾"	2966 mm
136 ½"	3466 mm

BBR LARGEUR (1) 920 mm	
54 ⅛"	1376 mm
56 ⅛"	1426 mm
58 ⅛"	1476 mm
62"	1576 mm
66"	1676 mm
69 ⅞"	1776 mm

BBR LARGEUR (1) 1120 mm	
62"	1576 mm
64"	1626 mm
66"	1676 mm
69 ⅞"	1776 mm
73 ⅞"	1876 mm
77 ¾"	1976 mm

BBR LARGEUR (1) 1220 mm	
66"	1676 mm
68"	1726 mm
69 ⅞"	1776 mm
73 ⅞"	1876 mm
77 ¾"	1976 mm
81 ¾"	2076 mm

BBR LARGEUR (1) 1320 mm	
69 ⅞"	1776 mm
71 ⅞"	1826 mm
73 ⅞"	1876 mm
77 ¾"	1976 mm
81 ¾"	2076 mm
85 ⅝"	2176 mm

BGV LARGEUR (1) 920 mm	
69 ½"	1766 mm
73 ½"	1866 mm
77 ⅜"	1966 mm
85 ¼"	2166 mm
93 ⅛"	2366 mm
101"	2566 mm

BGV LARGEUR (1) 1120 mm	
77 ⅜"	1966 mm
81 ⅜"	2066 mm
85 ¼"	2166 mm
93 ⅛"	2366 mm
101"	2566 mm
108 ⅞"	2766 mm

BGV LARGEUR (1) 1220 mm	
81 ⅜"	2066 mm
85 ¼"	2166 mm
89 ¼"	2266 mm
97 ⅛"	2466 mm
105"	2666 mm
112 ⅞"	2866 mm

BGV LARGEUR (1) 1320 mm	
85 ¼"	2166 mm
89 ¼"	2266 mm
93 ⅛"	2366 mm
101"	2566 mm
108 ⅞"	2766 mm
116 ¾"	2966 mm

BGB LARGEUR (1) 920 mm	
68"	1726 mm
70 ¾"	1797 mm
73 ½"	1868 mm
79 ⅛"	2009 mm
84 ¾"	2151 mm
90 ¼"	2293 mm

BGB LARGEUR (1) 1120 mm	
75 ⅞"	1926 mm
78 ⅝"	1997 mm
81 ⅜"	2068 mm
87"	2209 mm
92 ⅝"	2351 mm
98 ⅛"	2493 mm

BGB LARGEUR (1) 1220 mm	
79 ¾"	2026 mm
82 ⅝"	2097 mm
85 ⅜"	2168 mm
90 ⅞"	2309 mm
96 ½"	2451 mm
102 ⅛"	2593 mm

BGB LARGEUR (1) 1320 mm	
83 ¾"	2126 mm
86 ½"	2197 mm
89 ¼"	2268 mm
94 ⅞"	2409 mm
100 ⅛"	2551 mm
106"	2693 mm

B4A LARGEUR	
64 ¼"	1632 mm
71 ⅝"	1820 mm
79 ⅛"	2008 mm
93 ⅞"	2384 mm
108 ⅝"	2759 mm

B5A LARGEUR	
80 ¼	2038 mm
89 ⅝	2277 mm
99"	2516 mm
117 ⅞"	2994 mm
136 ¾"	3473 mm

Vous avez toujours des idées différentes? Vous avez un faible pour le sur-mesure, le non-standard? Nous sommes en mesure d'y répondre sans aucune difficulté. Nous aimons les défis.

FLEX ET GRIZZLY (AUVENT)

HAUTEUR	18" 480 mm	20" 530 mm	24" 630 mm	28" 730 mm	32" 830 mm	36" 930 mm	40 1/8" 1015 mm	48" 1215 mm	55" 1415 mm	63" 1615 mm	57" 1450 mm	65" 1650 mm	70" 1800 mm

A1V LARGEUR	↔
22 1/8"	566 mm
30 1/8"	766 mm
38" *	966 mm
45 7/8"	1166 mm

* Hauteur supplémentaire de 40 1/2" (1030 mm) est disponible, pour cette largeur

A2V LARGEUR	↔
44"	1116 mm
59 3/4"	1516 mm
75 1/2"	1916 mm
91 1/4"	2316 mm

A1S LARGEUR	↔
22 1/8"	566 mm
30 1/8"	766 mm
38"	966 mm
45 7/8"	1166 mm

A2S LARGEUR	↔
44"	1116 mm
59 3/4"	1516 mm
75 1/2"	1916 mm
91 1/4"	2316 mm

A1T LARGEUR	↔
22 1/8"	566 mm
30 1/8"	766 mm
38"	966 mm
45 7/8"	1166 mm

A2T LARGEUR	↔
44"	1116 mm
59 3/4"	1516 mm
75 1/2"	1916 mm
91 1/4"	2316 mm

GRIZZLY (GUILLOTINE)

HAUTEUR	31 1/2" 800 mm	35 7/16" 900 mm	39 3/8" 1000 mm	43 5/16" 1100 mm	47 1/4" 1200 mm	51 3/16" 1300 mm	55 1/16" 1400 mm	59 1/16" 1500 mm	63" 1600 mm

G1V LARGEUR	↔
19 11/16"	500 mm
23 5/8"	600 mm
27 9/16"	700 mm
31 1/2"	800 mm
35 7/16"	900 mm
39 3/8"	1000 mm
43 5/16"	1100 mm

G2V LARGEUR	↔
39 3/8"	1000 mm
47 1/8"	1200 mm
55 1/8"	1400 mm
63"	1600 mm
70 7/8"	1800 mm
78 3/4"	2000 mm
86 5/8"	2200 mm

GBR LARGEUR	↔
59"	1500 mm
63"	1600 mm
70 7/8"	1800 mm
78 3/4"	2000 mm

GGV LARGEUR	↔
78 3/4"	2000 mm
86 5/8"	2200 mm
94 1/2"	2400 mm
102 3/8"	2600 mm

GGB LARGEUR	↔
70 7/8"	1800 mm
78 3/4"	2000 mm
86 5/8"	2200 mm
94 1/2"	2400 mm

MAKWA

CADRE 4 5/8"

(COULISSANT)
4 VITRES OU THERMOS
CADRE 7 1/4"

HAUTEUR	15" 380 mm	19" 480 mm	23" 580 mm	31" 780 mm	34" 880 mm	38" 980 mm	46" 1180 mm	54" 1380 mm

FC1 LARGEUR	↔
23 1/8"	586 mm
31 "	786 mm

ATTENTION: Pour ces largeurs la hauteur 54 3/8" (1386mm) n'est pas disponible.

FC1 LARGEUR	↔
34 7/8"	886 mm
38 3/4"	986 mm
46 3/4"	1186 mm
54 5/8"	1386 mm
62 1/2"	1586 mm
70 3/8"	1786 mm

FC2 LARGEUR	↔
78 1/4"	1986 mm
94 "	2386 mm

HAUTEUR	15" 380 mm	19" 480 mm	23" 580 mm	31" 780 mm	35" 880 mm	39" 980 mm	47" 1180 mm	54" 1380 mm

FC1 LARGEUR	↔
23 1/8"	586 mm
31 "	786 mm

ATTENTION: Pour ces largeurs la hauteur 54 7/8" (1394mm) n'est pas disponible.

FC1 LARGEUR	↔
34 7/8"	886 mm
38 3/4"	986 mm
46 3/4"	1186 mm
54 5/8"	1386 mm
62 1/2"	1586 mm
70 3/8"	1786 mm

FC2 LARGEUR	↔
78 1/4"	1986 mm
94 "	2386 mm

FC4T LARGEUR	↔
23 1/8"	586 mm
31 "	786 mm
34 7/8"	886 mm

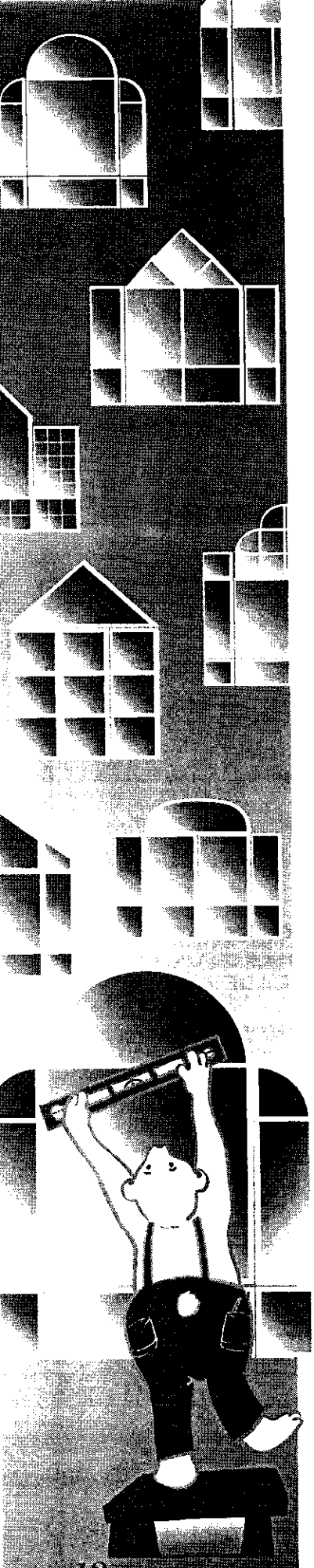
HAUTEUR	47" 1180 mm	55" 1380 mm	63" 1580 mm	70 7/8" 1780 mm

38 3/4"	986 mm
46 3/4"	1186 mm
54 5/8"	1386 mm

CADRE 4 5/8"
&
CADRE 7 1/4"

92 5/8"	2353 mm

FC5T LARGEUR	↔
62 1/8"	1553 mm
69 "	1753 mm
76 7/8"	1953 mm



PANDA

(BATTANT)

HAUTEUR ↕	23 ½"	31 ⅜"	39 ¼"	47 ⅛"	55"	62 ⅞"	70 ¾"
	596 mm	796 mm	996 mm	1196 mm	1396 mm	1596 mm	1796 mm

B1V LARGEUR ↔	
16 ⅜"	416 mm
18 ⅜"	466 mm
20 ⅜"	516 mm
24 ¼"	616 mm
28 ¼"	716 mm
32 ⅛"	816 mm

B2V LARGEUR ↔	
31 ⅞"	810 mm
35 ⅞"	910 mm
39 ¾"	1010 mm
47 ⅝"	1210 mm
55 ½"	1410 mm
63 ⅜"	1610 mm

B3V LARGEUR ↔	
53 ¼"	1354 mm
59 ¼"	1504 mm
71"	1804 mm
82 ¾"	2104 mm
94 ⅝"	2404 mm

B4V LARGEUR ↔	
70 ¾"	1798 mm
78 ⅝"	1998 mm
94 ⅜"	2398 mm
110 ⅛"	2798 mm

B5V LARGEUR ↔	
88 ¼"	2242 mm
98 ⅛"	2492 mm
117 ¾"	2992 mm
137 ½"	3492 mm

BBR LARGEUR (1) 920 mm ↔	
55 ½"	1410 mm
57 ½"	1460 mm
59 ½"	1510 mm
63 ⅜"	1610 mm
67 ⅜"	1710 mm
71 ¼"	1810 mm

BBR LARGEUR (1) 1120 mm ↔	
63 ⅜"	1610 mm
65 ⅜"	1660 mm
67 ⅜"	1710 mm
71 ¼"	1810 mm
75 ¼"	1910 mm
79 ⅛"	2010 mm

BBR LARGEUR (1) 1220 mm ↔	
67 ⅜"	1710 mm
69 ¼"	1760 mm
71 ¼"	1810 mm
75 ¼"	1910 mm
79 ⅛"	2010 mm
83 ⅛"	2110 mm

BBR LARGEUR (1) 1320 mm ↔	
71 ¼"	1810 mm
73 ¼"	1860 mm
75 ¼"	1910 mm
79 ⅛"	2010 mm
83 ⅛"	2110 mm
87"	2210 mm

BGV LARGEUR (1) 920 mm ↔	
71"	1804 mm
75"	1904 mm
78 ⅞"	2004 mm
86 ¾"	2204 mm
94 ⅝"	2404 mm
102 ½"	2604 mm

BGV LARGEUR (1) 1120 mm ↔	
78 ⅞"	2004 mm
82 ¾"	2104 mm
86 ¾"	2204 mm
94 ⅝"	2404 mm
102 ½"	2604 mm
110 ⅜"	2804 mm

BGV LARGEUR (1) 1220 mm ↔	
82 ¾"	2104 mm
86 ¾"	2204 mm
90 ¾"	2304 mm
98 ⅝"	2504 mm
106 ½"	2704 mm
114 ⅜"	2904 mm

BGV LARGEUR (1) 1320 mm ↔	
86 ¾"	2204 mm
90 ¾"	2304 mm
94 ⅝"	2404 mm
102 ½"	2604 mm
110 ⅜"	2804 mm
118 ¼"	3004 mm

BGB LARGEUR (1) 920 mm 45° ↔	
69 ⅞"	1776 mm
72 ¾"	1847 mm
75 ½"	1918 mm
81 ⅛"	2059 mm
86 ⅝"	2201 mm
92 ¼"	2342 mm

BGB LARGEUR (1) 1120 mm 45° ↔	
77 ¾"	1976 mm
80 ⅝"	2047 mm
83 ⅜"	2118 mm
88 ⅞"	2259 mm
94 ½"	2401 mm
100 ⅛"	2542 mm

BGB LARGEUR (1) 1220 mm 45° ↔	
81 ¾"	2076 mm
84 ½"	2147 mm
87 ⅜"	2218 mm
92 ⅞"	2359 mm
98 ½"	2501 mm
104"	2642 mm

BGB LARGEUR (1) 1320 mm 45° ↔	
85 ⅝"	2176 mm
88 ½"	2247 mm
91 ¼"	2318 mm
96 ¾"	2459 mm
102 ⅜"	2601 mm
108"	2742 mm

B4A LARGEUR 18° ↔	
66"	1675 mm
73 ⅜"	1863 mm
80 ¾"	2051 mm
95 ½"	2425 mm
110 ⅜"	2802 mm

B5A LARGEUR 18° ↔	
82 ⅜"	2092 mm
91 ¾"	2331 mm
101 ⅛"	2570 mm
120"	3048 mm
138 ⅞"	3527 mm

Un "Look" unique... Hum! ça vous plairait? Nous pouvons réaliser des projets de toute envergure et selon vos goûts. Soyez audacieux!

PANDA
(AUVENT)

HAUTEUR ↕ 18" 20" 24" 28" 32"

A1V LARGEUR ↔	
23 ½"	596 mm
31 ⅜"	796 mm
39 ¼"*	996 mm
47 ⅛"	1196 mm

* Hauteur supplémentaire de 40" (1016 mm) est disponible pour cette largeur.

A2V LARGEUR ↔	
46 ⅛"	1170 mm
61 ⅞"	1570 mm
77 ⅝"	1970 mm
93 ⅜"	2370 mm

HAUTEUR ↕ 35" 39" 47" 55" 63"

A1S LARGEUR ↔	
23 ½"	596 mm
31 ⅜"	796 mm
39 ¼"	996 mm
47 ⅛"	1196 mm

A2S LARGEUR ↔	
46 ⅛"	1170 mm
61 ⅞"	604 mm
77 ⅝"	1970 mm
93 ⅜"	2370 mm

HAUTEUR ↕ 57" 65" 71"

A1T LARGEUR ↔	
23 ½"	596 mm
31 ⅜"	796 mm
39 ¼"	996 mm
47 ⅛"	1196 mm

A2T LARGEUR ↔	
46 ⅛"	1170 mm
61 ⅞"	1570 mm
77 ⅝"	1970 mm
93 ⅜"	2370 mm

MICRO-FLEX

HAUTEUR ↕ 23" 31" 39" 47" 54" 62" 70"

B1V LARGEUR ↔	
16 "	406 mm
18 "	456 mm
19 ⅞"	506 mm
23 ⅞"	606 mm
27 ¾"	706 mm
31 ¾"	806 mm

B2V LARGEUR ↔	
30 ⅞"	785 mm
34 ⅞"	885 mm
38 ¾"	985 mm
46 ⅝"	1185 mm
54 ⅛"	1385 mm
62 ⅜"	1585 mm

B3V LARGEUR ↔	
51 ¾"	1314 mm
57 ⅝"	1464 mm
69 ½"	1764 mm
81 ¼"	2064 mm
93 ⅛"	2364 mm

B4V LARGEUR ↔	
68 ⅝"	1743 mm
76 ½"	1943 mm
92 ¼"	2343 mm
108"	2743 mm

B5V LARGEUR ↔	
85 ½"	2172 mm
95 ⅜"	2422 mm
115"	2922 mm
134 ¾"	3422 mm

BBR LARGEUR (t) 920 mm (36 ¼") ↔	
53 ¾"	1365 mm
55 ¾"	1415 mm
57 ⅝"	1465 mm
61 ⅝"	1565 mm
65 ½"	1665 mm
69 ½"	1765 mm

BBR LARGEUR (t) 1120 mm (44 ⅛") ↔	
61 ⅝"	1565 mm
63 ⅝"	1615 mm
65 ½"	1665 mm
69 ½"	1765 mm
73 ½"	1865 mm
77 ⅝"	1965 mm

BBR LARGEUR (t) 1220 mm (48") ↔	
65 ½"	1665 mm
67 ½"	1715 mm
69 ½"	1765 mm
73 ½"	1865 mm
77 ⅜"	1965 mm
81 ¼"	2065 mm

BBR LARGEUR (t) 1320mm (51 ⅞") ↔	
69 ½"	1765 mm
71 ½"	1815 mm
73 ½"	1865 mm
77 ⅜"	1965 mm
81 ¼"	2065 mm
85 ¼"	2165 mm

BGV LARGEUR (t) 920mm (36 ¼") ↔	
68 ⅝"	1744 mm
72 ⅝"	1844 mm
76 ½"	1944 mm
84 ⅜"	2144 mm
92 ¼"	2344 mm
100 ⅛"	2544 mm

BGV LARGEUR (t) 1120mm (44 ⅛") ↔	
76 ½"	1944 mm
80 ½"	2044 mm
84 ⅜"	2144 mm
92 ¼"	2344 mm
100 ⅛"	2544 mm
108"	2744 mm

BGV LARGEUR (t) 1220mm (48") ↔	
80 ½"	2044 mm
84 ⅜"	2144 mm
88 ⅜"	2244 mm
96 ¼"	2444 mm
104 ⅛"	2644 mm
112"	2844 mm

BGV LARGEUR (t) 1320mm (51 ⅞") ↔	
84 ⅜"	2144 mm
88 ⅜"	2244 mm
92 ¼"	2344 mm
100 ⅛"	2544 mm
108"	2744 mm
115 ⅞"	2944 mm

BGB LARGEUR (t) 920mm (36 ¼") ↔	
68"	1726 mm
70 ¾"	1797 mm
73 ½"	1868 mm
79 ⅛"	2009 mm
84 ¾"	2151 mm
90 ¼"	2293 mm

BGB LARGEUR (t) 1120mm (44 ⅛") ↔	
75 ⅞"	1926 mm
78 ⅝"	1997 mm
81 ⅜"	2068 mm
87"	2209 mm
92 ⅝"	2351 mm
98 ⅛"	2493 mm

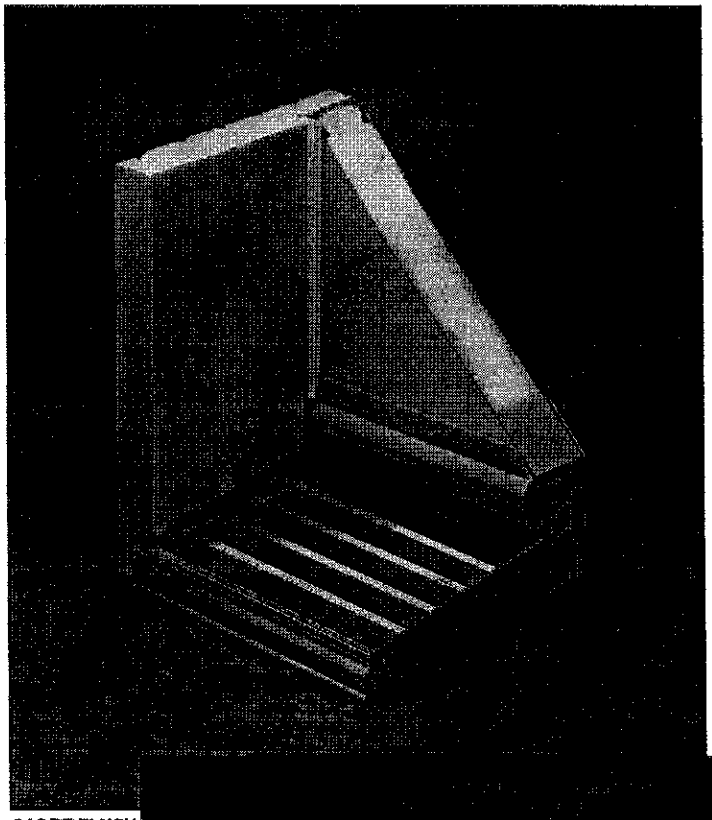
BGB LARGEUR (t) 1220mm (48") ↔	
79 ¾"	2026 mm
82 ⅝"	2097 mm
85 ⅜"	2166 mm
90 ⅞"	2309 mm
96 ½"	2451 mm
102 ⅛"	2593 mm

BGB LARGEUR (t) 1320mm (51 ⅞") ↔	
83 ⅜"	2126 mm
86 ½"	2197 mm
89 ¼"	2268 mm
94 ⅞"	2409 mm
100 ½"	2551 mm
106"	2693 mm

B4A LARGEUR ↔	
64 ¼"	1632 mm
71 ⅝"	1820 mm
79 ⅛"	2008 mm
93 ⅞"	2384 mm
108 ⅝"	2759 mm

B5A LARGEUR ↔	
80 ¼"	2038 mm
89 ⅝"	2277 mm
99"	2516 mm
117 ⅞"	2994 mm
136 ¾"	3473 mm

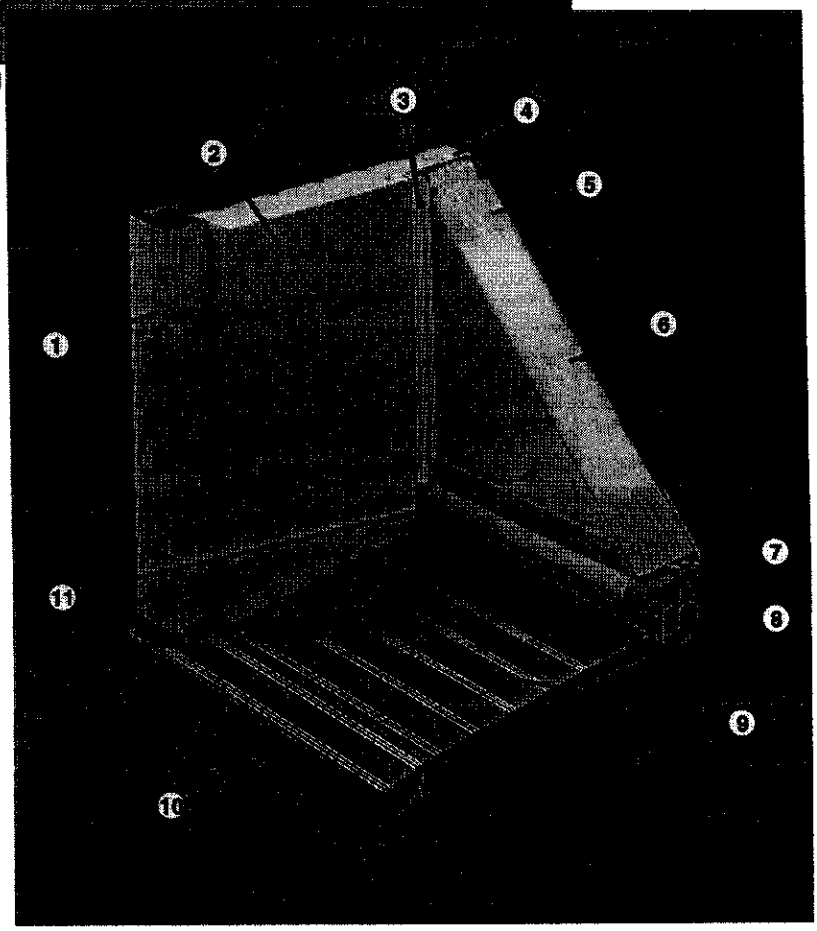
LA QUALITÉ À VOTRE PORTE



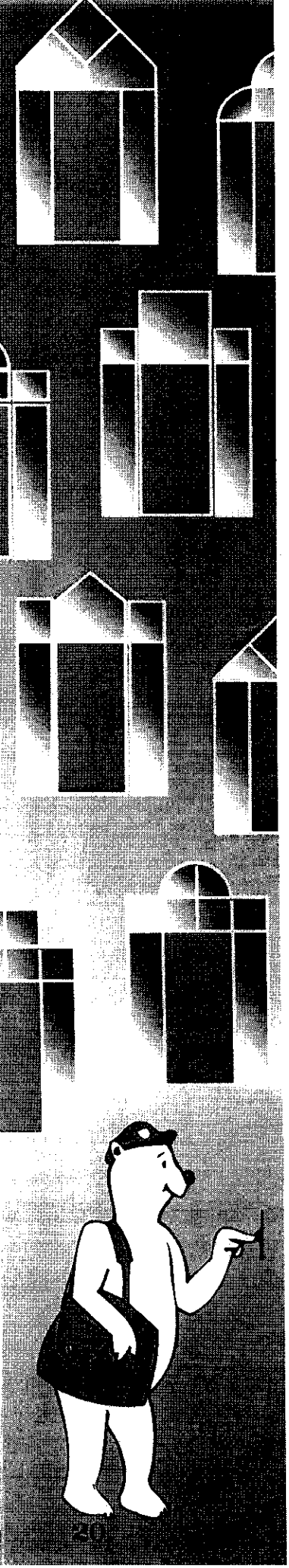
CADRE FLUSH

La porte d'acier, de plus en plus répandue sur le marché, est l'élément vedette de l'accueil que vous réservez à vos invités. Synonyme d'élégance par excellence, elle est robuste et sans entretien et a une isolation de polyuréthane qui lui procure un taux d'isolation supérieur.

Le cadre de pin, de différentes épaisseurs en option, est un élément important, donnant la résistance à l'ensemble de la structure. Les coupe-froid se doivent d'être installés judicieusement autour de la porte, qu'ils soient magnétiques ou de compression. Le seuil se doit d'être efficace afin d'éviter l'accumulation d'eau et de glace, grâce à une inclinaison et un balai appropriés.



1. moulure à briques aluminium extrudé
2. recouvrement extérieur
3. coupe-froid magnétique
4. recouvrement intérieur
5. panneau de porte
6. Isolation de polyuréthane
7. Balai de bas de porte
8. Coupe-froid de seuil
9. Seuil incliné aluminium extrudé
10. Extension de seuil
11. Joint d'étanchéité inférieur

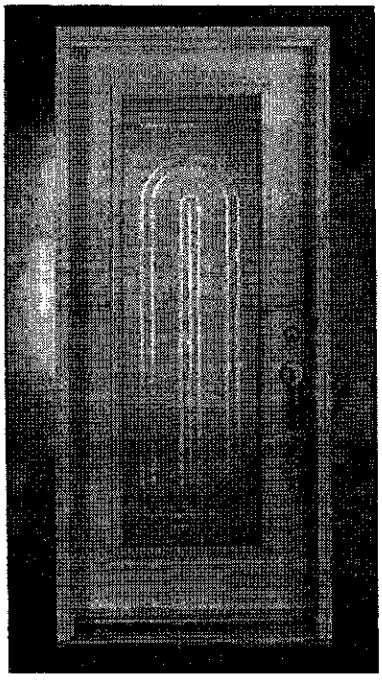


Tout porte à croire que les bonnes nouvelles sont toujours pour ceux qui ont fait le bon choix.

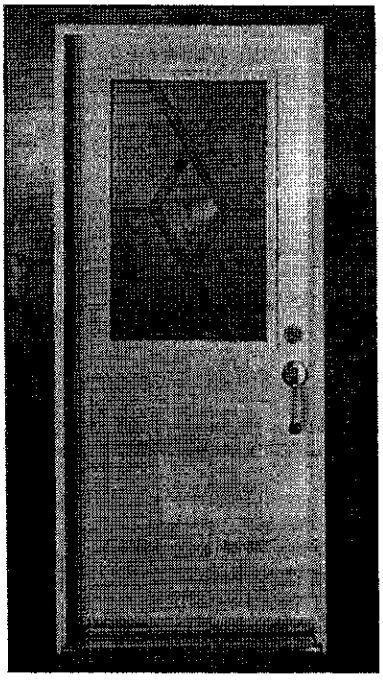
NOTRE COLLECTION PRIVÉE

D'un coup d'oeil raffiné et distinctif, ces quatre motifs donneront fière allure à votre résidence.

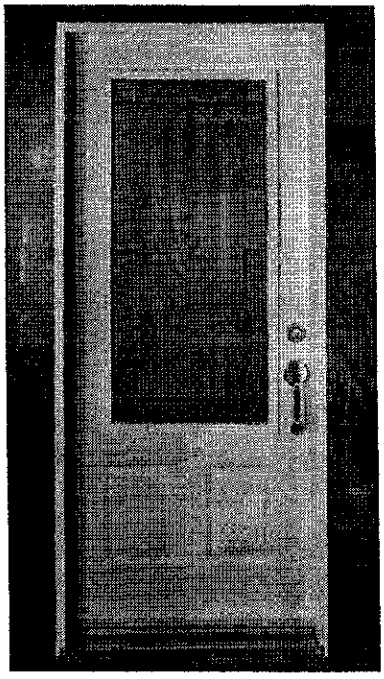
Modèle LYS
200-LYS 2337



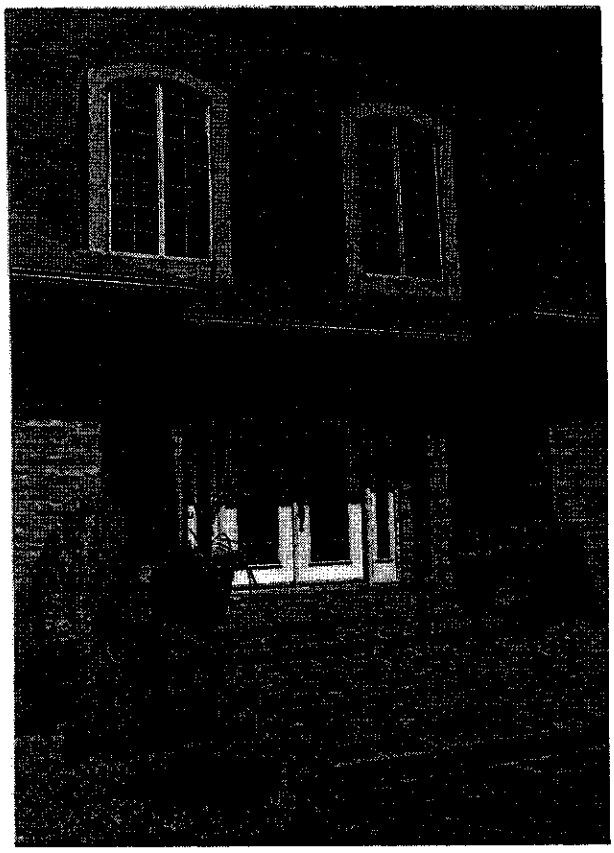
Modèle JULIE
100-JULIE 2165



Modèle ARISTO
200 - ARISTO 2337L



Modèle SILICA
400 - SILICA 2348L



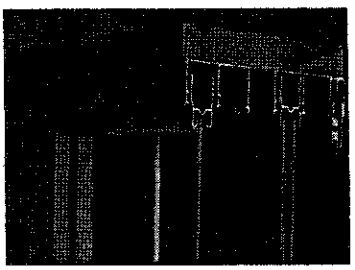
COLLECTION RÉGULIÈRE

Pour une gamme de vitraux plus étendue, consultez les catalogues de Baylite, Novatech, Verre Select, Vitre Art, nous serons en mesure d'insérer dans nos modèles de porte, le verre décoratif que vous aurez sélectionné.

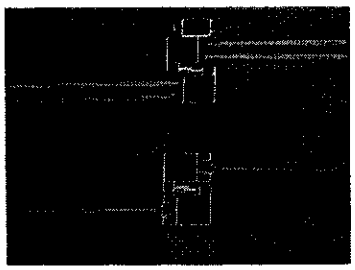
PORTE PATIO BARIBAL

La porte patio est devenue un élément essentiel de la plupart des résidences. Elle est une source de lumière abondante et un oeil ouvert sur votre aménagement extérieur.

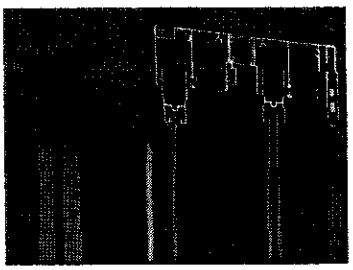
Le modèle R-700 +, à cadre de bois et mécanisme en aluminium et le modèle R-775 + à cadre tout en aluminium sont pratiques et sécuritaires. Poignée de luxe, barrure sécuritaire, résistante et esthétique sont parmi les qualités de ces modèles.



TÊTE
Thermos double extérieur.
Verre simple intérieur.
Chambre thermique de 3".
(Tête-cadre en bois)



CENTRE
Les doubles coupe-froid
donnent une barrière quadruple
contre l'infiltration d'air.
(Joint central des volets)

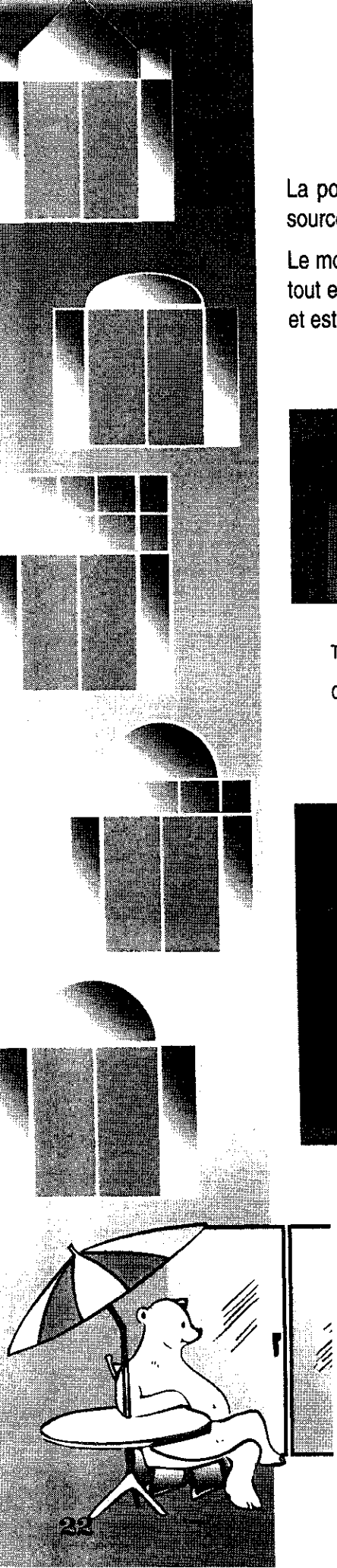


TÊTE
Thermos double extérieur.
Verre simple intérieur.
Chambre thermique de 3".
Barrière thermique de 1".
(Tête-cadre en aluminium)

TESTS TECHNIQUES

A3	(Résistance à l'air) Maximum
B4	(Résistance à l'eau) Maximum
C1 à C3	(Charge uniforme) Maximum
E3	(Facilité de fonctionnement) Maximum

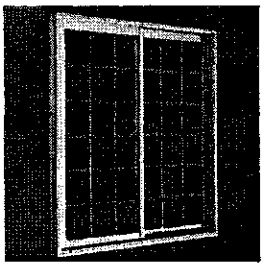
TYPE DE VERRE	FACTEUR «R»
Verre simple extérieur (1 + 1) Verre simple intérieur	R-3
Verre thermos extérieur (2 + 1) Verre simple intérieur	R-4.5
Verre thermos extérieur (2 + 2) Verre thermos intérieur	R-5.5.
Verre thermos extérieur LOW-E + ARGON (2 + 1E) Verre simple intérieur	R-6.33



Offrez-vous une vue panoramique sur la nature qui vous entoure. La porte-patio et la porte-terrasse vous en metteront plein la vue: beaucoup de luminosité et une vision directe sur votre univers extérieur.

SILENSIA: LE MUR DU SILENCE

Cette porte-patio surpassant les normes standards assurera votre tranquillité d'esprit à tous les points de vue. En plus d'une isolation et d'une étanchéité supérieures, elle possède une stabilité parfaite. Un monde de paix intérieure. Ses performances sont reconnues internationalement.



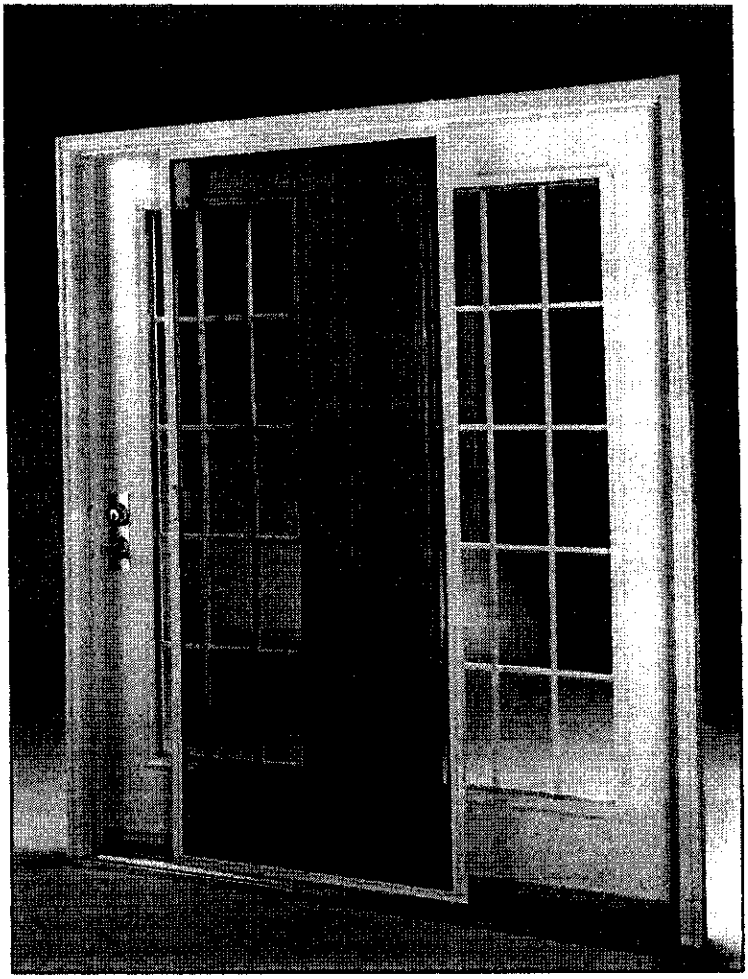
LUMINOSITÉ SUPÉRIEURE
Profilés élancés offrant une plus grande surface vitrée, donc une plus grande clarté.

STABILITÉ PARFAITE
Rigidité des vantaux assurée par un renfort en acier galvanisé garantissant une parfaite stabilité mécanique.

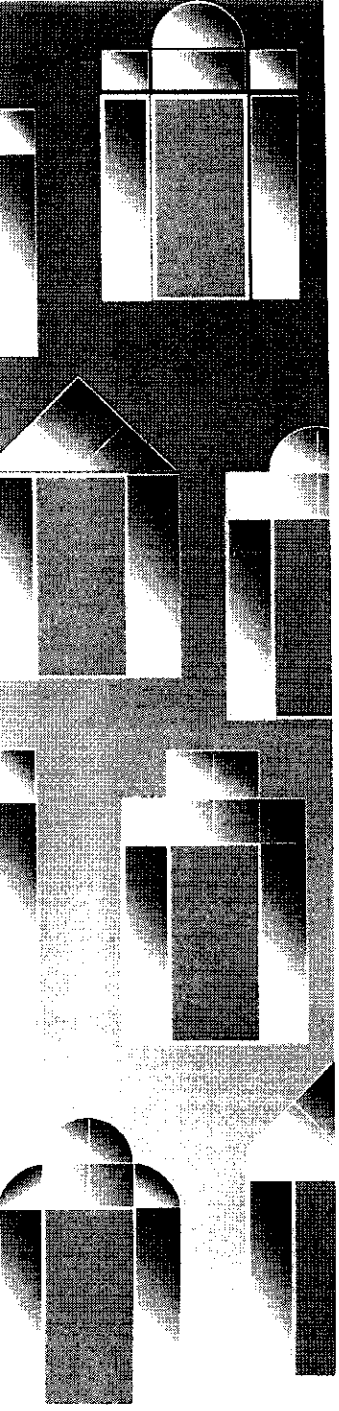
OPTIONS PRATIQUES
- Tout type de vitrages spéciaux.
- Petits carreaux décoratifs.
- Serrure à clef.

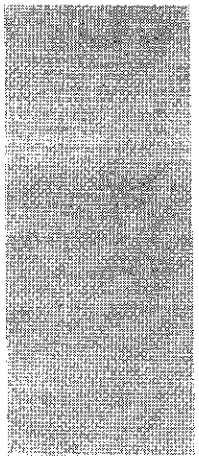
PORTE TERRASSE

La porte terrasse est un heureux mélange de la porte-patio et de la porte française. Cette porte nouvelle vague donnera une allure esthétique et pratique à votre résidence, une dimension nouvelle à la salle à manger ou à une pièce de séjour et créera un décor des plus harmonieux.



COLLECTION COMMODITÉ





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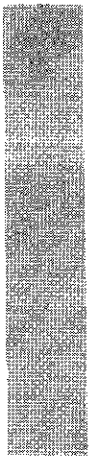

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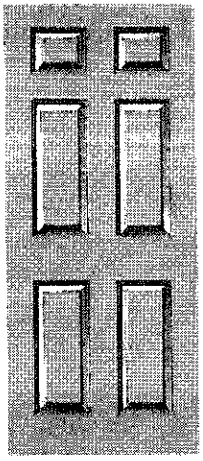

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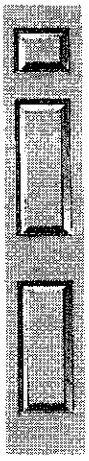

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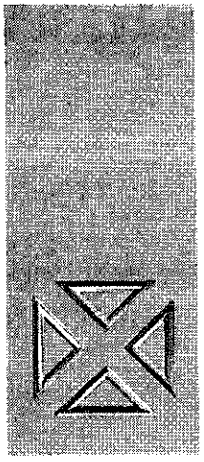

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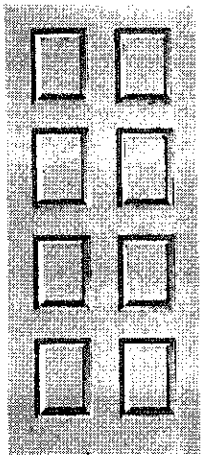

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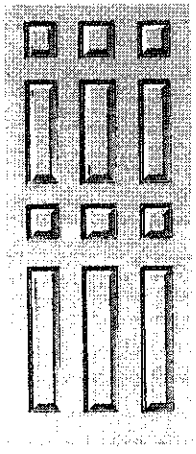
L400



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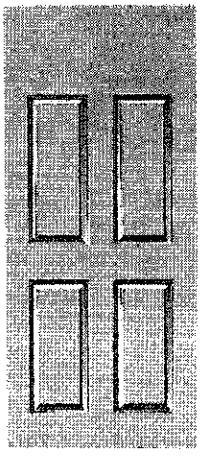
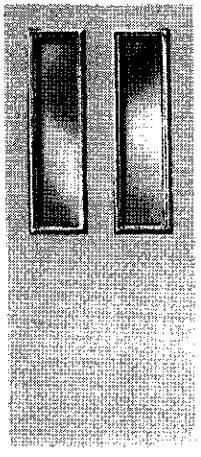


700

A: Carrelage amovible
I: Carrelage intégré
M: Moulé au cadre

C: Clair
D: Diamant
E: Énergétique

L: Modèle 23 x 48
.5: Un unité de verre dans le panneau



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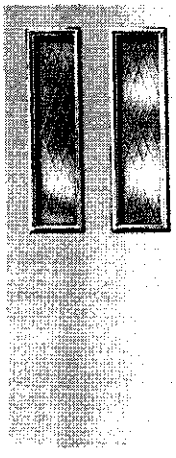
L1101C



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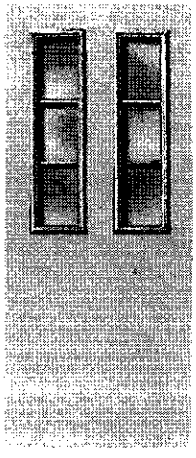

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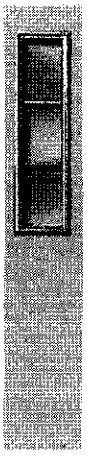

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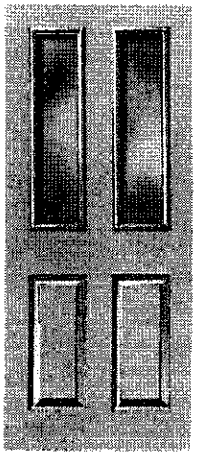

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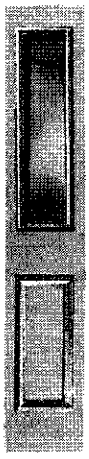

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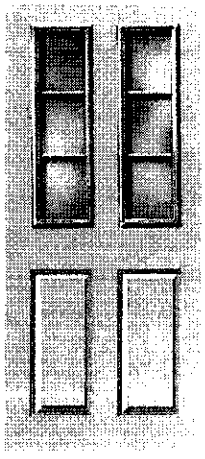

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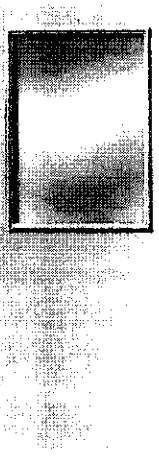
L2101M



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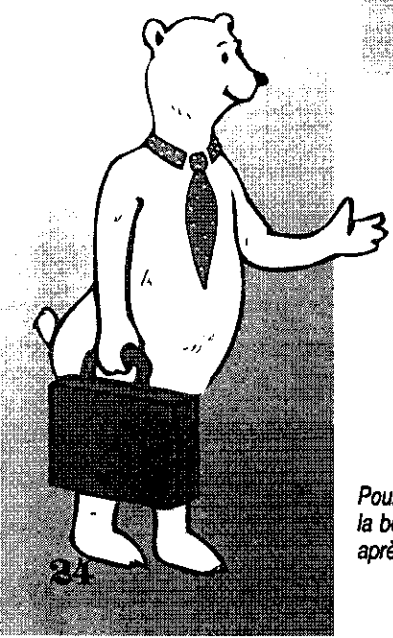
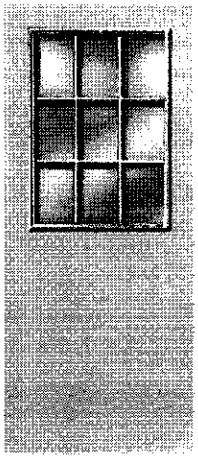


Pour apprécier le plaisir de toujours frapper à la bonne porte, donnez leur satisfaction année après année.



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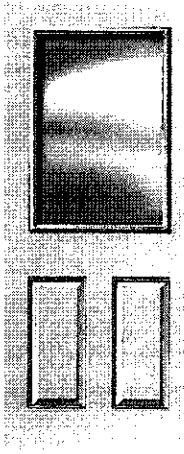

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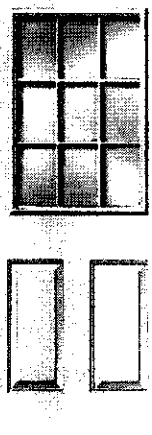

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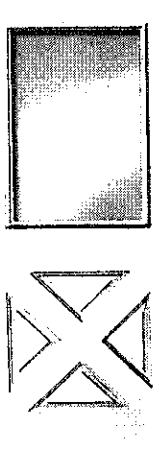

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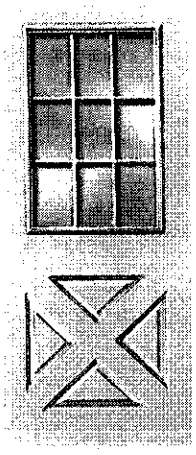

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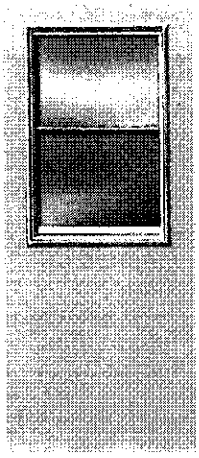

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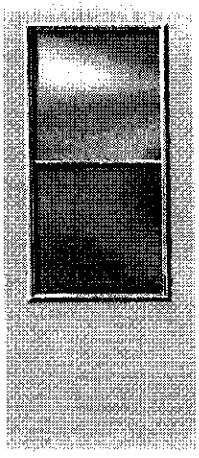

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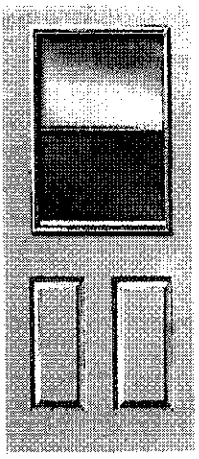

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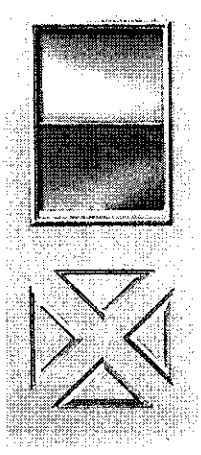

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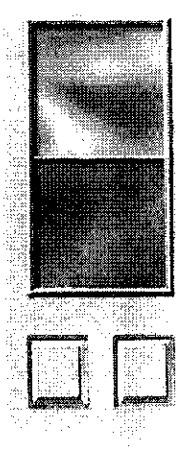

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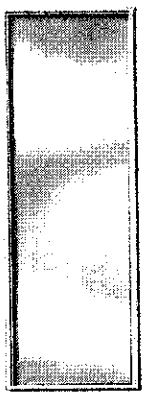

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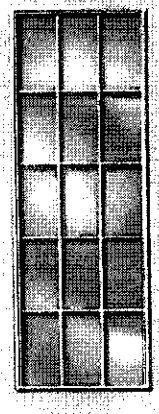
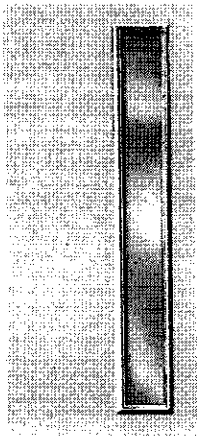


1104M

1105C

L1105C



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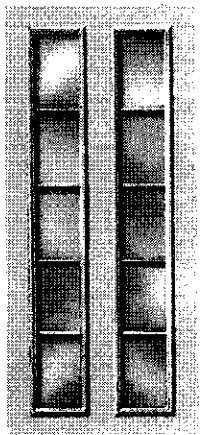

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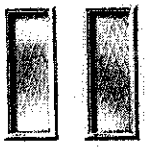
L1105M

1105M.5



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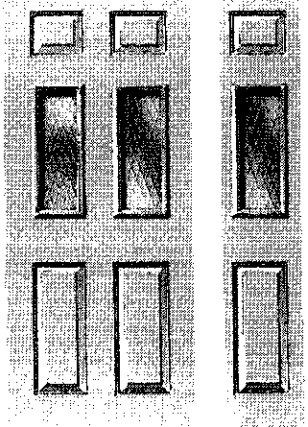

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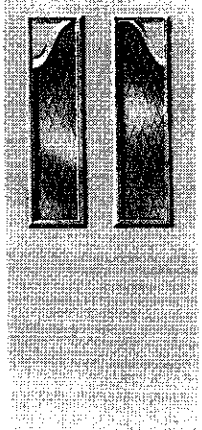
L2106

L1109DG



1109D

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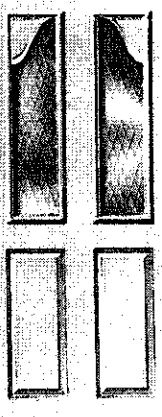

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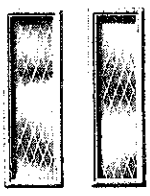

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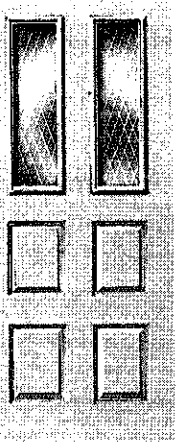
L1110D



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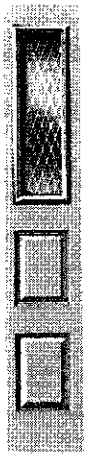

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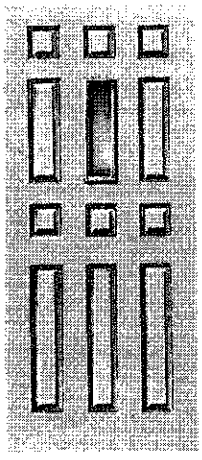

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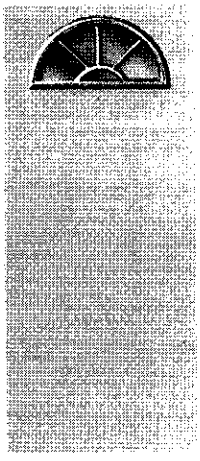

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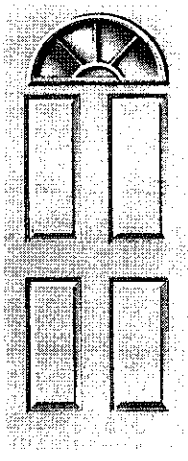

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