Marvin Architectural

Your Guide To
Sound Resistant Windows
Why Has Soundproofing Become Such a Hot Topic?

- Recent health research
- Protection of property values
Overview

• Need and Desire for Sound Resistant Windows and Doors
• Definition of Sound
• Testing Protocol Created to Measure Sound Transmission
• Window Ratings and Correct Usage
• Achieving Higher STC Ratings
• Importance of Correct Installation
Krakatoa, a volcanic island made of lava in Indonesia, exploded in 1883, killing approximately 40,000 people. The explosion is considered to be the loudest sound ever heard in modern history, with reports of it being heard nearly 3,000 miles (4,800 km) from its point of origin.
Good Sounds vs. Bad Sound

127 dB per vuvuzela
The perfect volume: 50 dB
<table>
<thead>
<tr>
<th>Noise Source</th>
<th>Decibels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic</td>
<td>67–83 dB</td>
</tr>
<tr>
<td>Barking Dog</td>
<td>100 dB</td>
</tr>
<tr>
<td>Vuvuzela</td>
<td>127 dB</td>
</tr>
<tr>
<td>Jet</td>
<td>150 dB</td>
</tr>
</tbody>
</table>
Welcome to the Science of Sound

Lower pitch

Higher pitch
# The Decibel

<table>
<thead>
<tr>
<th>dB levels</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>140</td>
<td>Painful Acoustic Trauma</td>
</tr>
<tr>
<td>130</td>
<td>Shotgun blast</td>
</tr>
<tr>
<td>120</td>
<td>Jet engine 100 feet away</td>
</tr>
<tr>
<td>110</td>
<td>Rock concert</td>
</tr>
<tr>
<td>100</td>
<td>Car horn, snowblower</td>
</tr>
<tr>
<td>90</td>
<td>Motorcycle, lawn mower, convertible ride on highway</td>
</tr>
<tr>
<td>80</td>
<td>Blow dryer, subway, helicopter, chainsaw</td>
</tr>
<tr>
<td>70</td>
<td>Factory, noisy restaurant, vacuum, screaming child</td>
</tr>
<tr>
<td>60</td>
<td>Car, alarm clock, city traffic</td>
</tr>
<tr>
<td>50</td>
<td>Conversation, dishwasher</td>
</tr>
<tr>
<td>40</td>
<td>Moderate rainfall</td>
</tr>
<tr>
<td>30</td>
<td>Refrigerator</td>
</tr>
<tr>
<td>20</td>
<td>Whisper, library</td>
</tr>
<tr>
<td></td>
<td>Watch ticking</td>
</tr>
</tbody>
</table>
Combined Sounds
Mass Law

The more mass (weight), the greater the reduction of noise energy.
Limp/Mass Law

The stiffer a material is, the more easily sound waves can transmit through the barrier.
Limp/Mass Law and Windows

Higher Density +
More Flexibility

= Higher Sound Transmission Reduction
Absorption vs. Transmission

Sound absorption: The reduction of reflected sound within a room

Sound transmission: The passing of sound from room to room or between interior and exterior of a building
TL: Transmission Loss

A measurement of a material’s ability to block sound at a given frequency.
STC: Sound Transmission Class

• An STC rating measures a material or partition's transmission loss. The higher the number, the better the noise isolation.

• STC can be increased by:
  - Adding mass
  - Increasing or adding air space
  - Absorptive material inside partition

• Rule of thumb: A 10-point change in an STC rating means that sound transmission is either twice (or half) as loud
STC: Sound Transmission Class

Used to compare insulating properties for partitions.

Wall at STC rating of 30 = audible loud speech
Wall at STC rating of 50 (standard) = loud speech awareness but not comprehensible
Wall at STC rating of 60 = loud speech completely blocked
OITC: Outdoor/Indoor Transmission Class

Used to measure transmission of transportation-related sounds.

- Provides a single-number rating for facades and fenestration
- The higher the number, the better the noise buffering
STC vs. OITC

**STC: Sound Transmission Class**
Indoor: Used to compare insulating properties for partitions.

**OITC: Outdoor/Indoor Transmission Class**
Outdoor to indoor: Used to measure transmission of transportation-related sounds.
NC: Noise Criteria Level

Recommended NC levels for various spaces:

Home: 20–30 (approx 30–38 dB)
Church: 30–35 (approx. 40–45 dB)
Private Office: 30–35 (approx. 40–45 dB)
Restaurant: 40–45 (approx. 50–55)
Factory: 40–65 (approx. 50–75 dB)
Sports Arena: 45–55 (approx. 55–65 dB)
## Comparison: Sound Intensity and Sound Pressure Level

<table>
<thead>
<tr>
<th>Sound</th>
<th>dB Level</th>
<th>Sound Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold of hearing</td>
<td>0 dB</td>
<td>1</td>
</tr>
<tr>
<td>Traffic</td>
<td>67-83 dB</td>
<td>10,000,000</td>
</tr>
<tr>
<td>Barking Dog</td>
<td>100 dB</td>
<td>10,000,000,000</td>
</tr>
<tr>
<td>Vuvuzela</td>
<td>127 dB</td>
<td>1,000,000,000,000</td>
</tr>
<tr>
<td>Jets</td>
<td>150 dB</td>
<td>1,000,000,000,000,000+</td>
</tr>
</tbody>
</table>
# Acoustical Properties: Glass

<table>
<thead>
<tr>
<th>Glass Type</th>
<th>Dimensions</th>
<th>STC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single pane</td>
<td>3mm</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>12mm</td>
<td>36</td>
</tr>
<tr>
<td>Insulated glass</td>
<td>3mm / 6mm AS / 3mm</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>3mm / 12mm AS / 3mm</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>6mm / 12mm AS / 6mm</td>
<td>35</td>
</tr>
<tr>
<td>Insulated glass w/storm panel</td>
<td></td>
<td>35+</td>
</tr>
<tr>
<td>Single laminated</td>
<td>3mm / .030 PVB / 5mm</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>5mm / .090 PVB / 6mm</td>
<td>41</td>
</tr>
<tr>
<td>Laminated IG</td>
<td>3mm / 11mm AS/ 3mm 0.90/3mm</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>3mm / 12mm AS / 3mm 030/3mm</td>
<td>35</td>
</tr>
</tbody>
</table>
One of the Biggest Annoyances: Airports

Heathrow 55dBALden Contour
Government-Led Noise Mitigation Projects

• One approach to appease residents: Noise mitigation programs.

• In 2006 the European Union issued a new law that required all large airports to produce a Noise Action Plan
• BAA believes their Action Plan will result in an improved noise climate around Heathrow, in particular it will mean:
  - A more equitable distribution of noise
  - The phase-out of the nosiest aircraft at Heathrow
  - Improved noise mitigation schemes
  - More transparent and improved communication about noise
What Have Window and Door Manufacturers Done?

Air Space
Glass Thickness
Varying Glass Thickness
Laminating Glass
Weatherstripping
Frame
Storm Panel
Air Space

- As air space increases, STC increases
- Higher energy-efficiency/STC rating relationship
# Glass Thickness

## Scale of 1-10

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Sound Stoppage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2mm thick – Single Strength</td>
<td>Very poor; seldom found on larger windows</td>
</tr>
<tr>
<td>3mm thick – Double Strength</td>
<td>Okay; very typical</td>
</tr>
<tr>
<td>3mm thick – Double Strength</td>
<td>Good; recommended</td>
</tr>
<tr>
<td>5mm thick</td>
<td>Very Good; recommended</td>
</tr>
<tr>
<td>3mm thick – Double Strength</td>
<td></td>
</tr>
</tbody>
</table>
Varying Glass Thickness

3mm thick – Double Strength

5mm thick

3mm thick – Double Strength

6mm thick
# Laminating Glass

<table>
<thead>
<tr>
<th>Glass Type</th>
<th>STC Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>4mm clear</td>
<td>29</td>
</tr>
<tr>
<td>5mm clear</td>
<td>30</td>
</tr>
<tr>
<td>6.38mm laminate</td>
<td>30</td>
</tr>
<tr>
<td>7.52mm laminate</td>
<td>35</td>
</tr>
<tr>
<td>10.38mm laminate</td>
<td>36</td>
</tr>
<tr>
<td>IGU 3mm clear/8mm air/4m clear</td>
<td>28</td>
</tr>
<tr>
<td>Secondary window 6mm clear/100mm space/4mm clear</td>
<td>46</td>
</tr>
</tbody>
</table>
Don’t forget to consider:

- Weatherstripping
- Frame
- Mullions
- Storm Panel
How to achieve the best STC rating

• Heavier Second Layers
• Laminated glass
• Storm Panel
• Provide a generous airspace
Installation
Why Soundproof?

Building owners and consumers are becoming more aware of the benefits of acoustically improved windows—and of the long-term dangers of noise.
Marvin Architectural

• Marvin Windows and Doors. Established over 100yrs

• Marvin Architectural – UK and Ireland distributors for Marvin products – 20yrs+

• Projects range from domestic replacements to newbuild and commercial
Marvin Architectural Services

- Full architectural support service
- Fully trained and experienced installation teams
- Customization and prototyping solutions
- Project management
- Consistent 10-12 week delivery schedule
- Product range exceeds all current building regulations
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Thanks To...

- Cardinal Glass
- The Construction Specifier (October 2004 Issue) - Specifying the Appropriate Glazing System: By Terry Zeimetz, CSI, CCPR, AIA
- Canadian Building Digest:  http://irc.nrc-cnrc.gc.ca/pubs/cbd/cbd236_e.html
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