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BACKGROUND

GLASSPROTECH™ is a network of professional film applicators, providing a cost effective solution against glass damage & breakage. We have been established in New Zealand since 2005 and Australia since 2009. Our products comply with internationally recognised Standards and GLASSPROTECH™ is an approved member of the Window Film Association of Australia & New Zealand.

GLASSPROTECH™ is a National Company with dedicated and experienced fitting teams. This allows the application of the protective window film at any location with minimal disruption to your working day. GLASSPROTECH™'s business model allows us to create new teams quickly and efficiently to meet with growing demands and new markets.

Most films are warranted for between 5 and 12 years (materials and labour). However typical product life expectancy ranges between 12-20+ years. Products are low maintenance with normal window cleaning methods and solutions.

THE BENEFITS OF WINDOW FILM

GLASSPROTECH™'s range of window films is available either clear or tinted. The application of GLASSPROTECH™'s window film makes it particularly cost effective for institutional, commercial and residential structures in need of solutions to one or more of the following problems:

COST REDUCTIONS

- Apply film at a fraction of the cost of glass replacement
- Reducing the cost of damage caused by vandals
- Energy Savings – Reduction in Air Conditioning unit size, operation & cost
- Block out heat & glare
- Block out 99% of UV rays – reducing fading of interiors & furniture
- Reduce the risk of breakage - It laminates & strengthens glass
- Longer Lasting - Its tough, scratch resistant coating makes the film more robust & last longer than other films
- Glass replacement & clean up is quick & easy
- Hide Existing Damage - It can reduce the appearance of existing scratches & acid rain & protect from further damage
- It can be removed and replaced as technology advances and product performance improves. Such periodic updating of window glass is too costly
SAFETY & SECURITY

- Increases the Break Strength of Glass, reducing the risk of breakage
- Strengthens glass to protect from damage, intrusion and vandalism
- Anti shatter protection from broken glass and shards
- Cost effective alternative to more expensive toughened glass options
- Optically clear film available for invisible protection from vandals
- Upgrades Glass - To Conform with International Health & Safety Standards

ANTI GRAFFITI & VANDALISM

- Acts as a sacrificial layer that protects glass from etching and graffiti
- Optically clear protective film that adds strength to glass
- Adds an anti shatter proof protection in the event of breakage
- Can be replaced as and when required
- Ideal for buildings, buses, trains and public infrastructure

SOLAR, INSULAR & UV PROTECTION

- Reduces heat loss and/or gain by as much as 30%
- Reduces up to 90% glare, 95% infrared heat, 79% total solar energy
- Reduces 99% of damaging UV rays
- Reduces sun damage to interior fittings, carpet and furniture
- Solar Overheating
- Reduction in discomfort to building occupants and visitors due to high temperatures
- Increasing productivity of building occupants through maximising natural light
- Utilisation of floor space adjacent to windows and fixed glass
- Some increase in insulation against heat loss in winter
- Increasing a buildings efficiency without compromising its historic and aesthetic qualities

POLYCARBONATE PROTECTION

- To reduce damage caused by flying objects and projectiles
- Reduces scratching, therefore reduces the need for replacement
- Improved vision on already scratched polycarbonates by up to 80%
- Repels water to increase visibility
- The film can be replaced at a cost far lower that replacing the window
- Extends the life of the polycarbonate
SAFETY & SECURITY TESTING STANDARDS

SUMMARY

GLASSPROTECH™ Safety films increase the break strength of glass, reducing the risk of breakage & provide effective defence from glass fragments and splinters in the event of glass breaking. Shattered glass caused by natural disasters, terrorism, burglary or accidental breakage is a threat to us all, at work, at home, in public places. GLASSPROTECH™ Safety films offer reduced risk of breakage, protection from glass shards, shield from UV radiation, solar heat control (combined films), combat graffiti and answer the requirements of insurance companies for commercial buildings & shop front protection.

4, 7, 8, and 12 mil (100, 175, 200 and 300micron) clear safety & security films feature superb optical transparency and a scratch resistant coating. Safety Films are also available for external (outdoor) use with a robust scratch resistant coating. The thicker the film the greater resistance to breakage:

The main difference between film and laminated glass is that the film can be applied to the glass or glazing after manufacture or installation, i.e., it is a retrofit product. These films are used widely all over the world; they can be found on trains, buses, cars, and buildings.

Safety and security films can have components added, such as for solar control and decorative effects.

TESTS AND ACCREDITATION

Safety and security window films are designed to perform under adverse conditions. As such, standards and standard tests have been devised to ensure that these films will perform in such a situation. There are four best-known organizations that produce standards and guidelines for how a film performs under impact (see table below).

<table>
<thead>
<tr>
<th>Organization</th>
<th>Relevant Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Standards Institution</td>
<td>BS 6206 (Class A, B &amp; C)</td>
<td>British standard impact testing for annealed glass with applied safety film</td>
</tr>
<tr>
<td>American National Standards Institute</td>
<td>ANSI Z97.1</td>
<td>American Impact testing for annealed glass with applied safety film</td>
</tr>
<tr>
<td>European Committee for Standardization</td>
<td>EN12600</td>
<td>List of EN standards European standard Classification of Resistance of Glazing to Impact.</td>
</tr>
<tr>
<td>General Services Administration (GSA)</td>
<td>GSA-TS01-2003</td>
<td>Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings</td>
</tr>
</tbody>
</table>
ANCHORING SYSTEM

Whilst the GLASSPROTECH™ Security Films grip the glass fragments, an Anchoring system secures the film to the window frame, maximizing the effectiveness of the film, and helping to prevent collapse of the window. The anchoring system is recommended for use in shop-front protection, high security institutions or public areas vulnerable to unrest or attack.

TESTING PROTOCOLS FOR FILM PERFORMANCE

The following tables detail the internationally recognised testing’s completed for the range of clear Safety & Security films. Detailed information on any other products can be made available on request.

IMPACT

<table>
<thead>
<tr>
<th>TESTING PROTOCOL</th>
<th>TEST RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 MIL</td>
<td>5 MIL</td>
</tr>
<tr>
<td>ANSI Z-97.1 (12” pendulum fall)</td>
<td>PASS</td>
</tr>
<tr>
<td>ANSI Z-97.1 (18” pendulum fall)</td>
<td>PASS</td>
</tr>
<tr>
<td>ANSI Z-97.1 Cat 2 (48” pendulum fall)</td>
<td></td>
</tr>
<tr>
<td>CPSC 1201 Cat 1 (18” pendulum fall)</td>
<td>PASS</td>
</tr>
<tr>
<td>CPSC 1201 Title 16 (48” pendulum fall)</td>
<td>PASS</td>
</tr>
<tr>
<td>BS 6206 class B</td>
<td>PASS</td>
</tr>
<tr>
<td>EN12600 class 2B2</td>
<td>PASS</td>
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<tr>
<td>EN12600 class 1B1</td>
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</tr>
<tr>
<td>EN356 P2A</td>
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<td>DIN 52290, part 4, A1</td>
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ANTI-GRAFFITI

<table>
<thead>
<tr>
<th>TESTING PROTOCOL</th>
<th>TEST RESULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 MIL</td>
<td>5 MIL</td>
</tr>
<tr>
<td>Paris Metro Anti-Graffiti</td>
<td>PASS</td>
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</tbody>
</table>

FIRE

<table>
<thead>
<tr>
<th>TESTING PROTOCOL</th>
<th>TEST RESULT</th>
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</thead>
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<td>4 MIL</td>
<td>5 MIL</td>
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<tr>
<td>BS 476 Fire Propagation</td>
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<tr>
<td>ASTM D-1929 Ignition</td>
<td>PASS</td>
</tr>
<tr>
<td>ASTM E84-98 Surface Burn</td>
<td>PASS</td>
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</table>
### Wind Debris

<table>
<thead>
<tr>
<th>Testing Protocol</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM E330-97el (Wind Load) Comparative Data Hurricane</td>
<td></td>
</tr>
<tr>
<td>AS 201, TAS 202, TAS 203 – Florida Building Code (Dade County Small Missile Test) Hurricane</td>
<td></td>
</tr>
</tbody>
</table>

### Burglary

<table>
<thead>
<tr>
<th>Testing Protocol</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL 972 Burglary Resisting Glazing Material</td>
<td></td>
</tr>
</tbody>
</table>

### Bomb Blast

<table>
<thead>
<tr>
<th>Testing Protocol</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siach Gefen – IDF Testing</td>
<td></td>
</tr>
<tr>
<td>GSA Level C (4psi, 30psi/msec)</td>
<td>3B PASS</td>
</tr>
<tr>
<td>GSA Level D (10.2psi, 90.6psi/msec)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3A PASS(2)</td>
</tr>
</tbody>
</table>
APPENDIX 1 ABRASION TESTING

TABER ABRASION - COMPARATIVE WEATHERING

Comparative Testing of Silver 20 Exterior Films

Introduction
To confirm our position as market leader in the field of Exterior films, Hanita has been running an on-going series of comparative tests between Hanita's second generation Silver 20 Xtra, and three well-known competitors' extended-wear Silver 20 Exterior films, launched in 2008.

The analysis covered the following criteria:
- General structure of the products (construction, raw materials)
- Optical factors (spectral appearance/performance – haze, UV protection, VLT)
- Mechanical performance (Taber abrasion of SR coatings by 100, 300, 500 cycles)
- Resistance to accelerated weathering
  - QUV testing – UV radiation + temperature + condensation
  - Xenon Weatherometer chamber – UV radiation + temperature + rain
  - Proprietary - extreme UV radiation + temperature

Evaluation of the samples during accelerated weathering testing was done by optical performance measurements and visible observation of appearance.

The photographs illustrate typical defects and failures, as recorded during the testing process to complement the verbal description.

Selected Testing Results

<table>
<thead>
<tr>
<th>Product</th>
<th>Construction</th>
<th>Warranty (as publicly available)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanita Silver 20 Xtra</td>
<td>2 mil, 3 ply, metallized PET, UV stable film, SR</td>
<td>5 year vertical, 3.5 years horizontal/slope</td>
</tr>
<tr>
<td>Competitor 1 new extended product</td>
<td>3 mil, 2 ply, 50µ +23µ, metallized PET, non UV stable film, SR</td>
<td>5 year vertical, 2 years horizontal/slope</td>
</tr>
<tr>
<td>Competitor 2 new extended product</td>
<td>2 mil, 2 ply, UV stable film + metallized PET, SR</td>
<td>5 year vertical, 3 years horizontal/slope</td>
</tr>
<tr>
<td>Competitor 3 new extended product</td>
<td>3 mil, 2 ply, 2 layers of SR, UV stable film + metallized PET</td>
<td>5 year vertical, 2 years horizontal/slope</td>
</tr>
</tbody>
</table>
2. Mechanical Performance

Taber Abrasion Resistance (ASTM D1044/D1004)

<table>
<thead>
<tr>
<th>Product</th>
<th>100</th>
<th>300</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hanita Silver 20 Xtra</td>
<td>1.8</td>
<td>2.4</td>
<td>3.9</td>
</tr>
<tr>
<td>Competitor 1 new extended product</td>
<td>3.0</td>
<td>4.1</td>
<td>5.8</td>
</tr>
<tr>
<td>Competitor 2 new extended product</td>
<td>3.7</td>
<td>5.5</td>
<td>9.2</td>
</tr>
<tr>
<td>Competitor 3 new extended product</td>
<td>2.6</td>
<td>3.5</td>
<td>6.1</td>
</tr>
</tbody>
</table>

Delta Haze = difference between haze after and before abrasion.

The lower the delta haze, the better the resistance to surface scratching.

3. Weathering Performance

1.

Hanita film after 950 hours accelerated weathering. No change

Competitor 1 film after 700 hours accelerated weathering – film failure with cracking, flakes and cloudiness. First cracks appeared after 240 hours
3. Weathering performance (continued)

2. Hanita Silver 20 Xtra
Hanita film after 930 hours of accelerated weathering. No visible change under magnification.

3. Competitor 2
Competitor 2 film after 930 hours of accelerated weathering. Magnification shows bubbles, craters, adhesion loss.

4. Hanita Silver 20 Xtra
Hanita film after 930 hours of accelerated weathering. No visible change under magnification.

5. Competitor 3
Competitor 3 film after 757 hours of accelerated weathering. Cracks, flakes, cloudiness and haze under magnification.
External Window films

The 4 window film samples tested as part of the programme all resisted deposition of material quite effectively when exposed on the Ravensbourne manufacturing stack for one month. For each of these samples the surface gloss and the light transmission were relatively un-affected (reductions of 3 gloss units and 2% light transmission were the most observed). These results indicate that these films could offer markedly better resistance to particle deposition.

Some localized delaminations were observed for the stack-exposed films and this mirrored findings from the accelerated weathering testing.

Scrub Resistance Test Method

Scrub resistance was tested as described in AS 1580.450.1, with the exception of a sponge pad replacing the hog bristle brush. Testing was carried out in the parallel (long) direction. Two samples of each exterior film type were tested for up to 9000 cycles at a variety of cycle counts. The surface of each sample was examined before and after testing. Specular gloss at 85°, with the meter placed along the longest length of the samples, was measured before and after testing to detect any changes in the substrate due to scrubbing. The scrubbing solution used for each panel was a commercial available cleaner, Werner & Mertz Tana Green Care No. 6.

Accelerated Weathering Test Methods

A Q-Sun 3300 xenon arc weatherometer was used to weather external film samples for up to 2100 light hours. The equipment was set for an irradiance of 0.55 W/m² at 340 nm. During the 9 hours light cycle the cabinet temperature was maintained at 50°C, while during the following 3 hours dark and spray cycle a temperature of 50°C was maintained.

A Q-Panel QUV chamber with UV-A fluorescent tubes was used to weather external film samples for 1000 light hours. The equipment was set for an irradiance of 0.68 W/m² at 340 nm. During the 8 hours light cycle the cabinet temperature was maintained at 60°C, while during the following 4 hours dark and condensation cycle a temperature of 50°C was maintained.

Colour Measurements

The CIELab colour space is an internationally accepted model used as a standard to define colour within industry. CIE stands for "Commission Internationale de l’Eclairage", an international group of colour scientists whose standards make it possible to accurately communicate colour information.

Yellowness index, YI, is a measure of how yellow a clear sample appears. Samples are measured over a standard white colour plaque and YI is derived from the CIE chromaticity coordinates Yxy.
Scrub Resistance Results

The results for each exterior film tested are shown in Table 1. Intermediate cycles were omitted for the last pair of exterior film samples as little change in surface gloss was expected.

<table>
<thead>
<tr>
<th>Cycle no.</th>
<th>0</th>
<th>1500</th>
<th>3000</th>
<th>6000</th>
<th>9000</th>
<th>85°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td></td>
<td></td>
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<td></td>
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<td>Code</td>
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<tr>
<td>External Film 1</td>
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<td></td>
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</tr>
<tr>
<td>3M</td>
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<td>106.0</td>
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<td>108.8</td>
<td>107.5</td>
<td>104.9</td>
<td>103.3</td>
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<tr>
<td></td>
<td>109.4</td>
<td>107.7</td>
<td>108.0</td>
<td>104.9</td>
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<td>Hanita 4 Mil</td>
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<td>110.5</td>
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<td>110.9</td>
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<td>110.8</td>
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<tr>
<td>Average</td>
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<td>-</td>
<td>110.3</td>
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</tr>
</tbody>
</table>

Table 1: Film Scrub Resistance Results

The results indicate that External Film 1 may be susceptible, to some extent, to surface damage by scrubbing as the surface gloss has fallen under the test conditions used. All other samples appear unaffected by the scrubbing conditions used.
Weathering Testing Results

The results for each exterior film tested are shown in Table 2.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Colour Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Y</td>
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<td><strong>External Film 1</strong></td>
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<tr>
<td>Control</td>
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<tr>
<td>1000 h QUV-A</td>
<td>75.5</td>
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<tr>
<td>1000 h Xenon Arc</td>
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<tr>
<td>1000 h Xenon Arc</td>
<td>75.7</td>
</tr>
<tr>
<td>1500 h Xenon Arc</td>
<td>75.6</td>
</tr>
<tr>
<td>2100 h Xenon Arc</td>
<td>74.9</td>
</tr>
<tr>
<td><strong>External Film 3</strong></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>75.7</td>
</tr>
<tr>
<td>1000 h QUV-A</td>
<td>75.4</td>
</tr>
<tr>
<td>1000 h Xenon Arc</td>
<td>75.3</td>
</tr>
<tr>
<td>1500 h Xenon Arc</td>
<td>75.4</td>
</tr>
<tr>
<td>2100 h Xenon Arc</td>
<td>73.3</td>
</tr>
<tr>
<td><strong>External Film 4</strong></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>75.7</td>
</tr>
<tr>
<td>1000 h QUV-A</td>
<td>75.4</td>
</tr>
<tr>
<td>1000 h Xenon Arc</td>
<td>75.0</td>
</tr>
<tr>
<td>1500 h Xenon Arc</td>
<td>76.0</td>
</tr>
<tr>
<td>2100 h Xenon Arc</td>
<td>74.6</td>
</tr>
</tbody>
</table>

Table 2: Film Weathering Results

The external films all showed some localised delaminations from the glass at the end of the accelerated weathering exposures. The external films also exhibited an increase in YI after weathering exposure.
Certificate of Compliance

In respect to Product R12106X – 4 Mil Exterior Clear

This is to certify that all testing done for monitoring the performance results with regard to solar and safety properties of the above mentioned products have been measured, calculated and reported in strict accordance with ASTM, ASHRAE and AIMCAL standards.

The testing includes:

- Visible Light Transmitted
- Visible Light Reflected
- U. V. Block
- Total Solar Energy Reflected
- Total Solar Energy Transmitted
- Total Solar Energy Absorbed
- Emittance
- U-Value
- Shading Coefficient
- Total Solar Energy Rejected

Performance results are subject to variations in process conditions within industry standards.

Hanita Coatings is an ISO 9001-2000 certified company.

Issued by:

Israel Rozenfarb
Quality Manager
APPENDIX 3 – IMPACT TESTING CERTIFICATION

ANSI Z97.1

IMPACT TESTING ON SAFETY WINDOW FILM MATERIAL

Rendered to:
HANITA COATINGS
TEST DATES: 10/25/05 through 10/27/05

Report No: 60575.04-801-37
Report Date: 11/18/05

2865 Market Loop, Suite B
Southlake, Texas 76092
phone: 817-410-7202
fax: 817-424-8463
www.archtest.com
IMPACT TESTING ON SAFETY WINDOW FILM MATERIAL

Rendered to:

HANITA COATINGS
Kibbutz Hanita
Hanita, Galilee Maravi, Israel

Report No: 60575.04-801-37
Test Dates: 10/25/05
Through: 10/27/05
Report Date: 11/18/05

Project Summary: Architectural Testing, Inc. was contracted by HanitaTek Window Films to perform tests on three sample sets of organic safety window film material. This report is a reissue of the original Report No. 60575.02-801-37. Test specimen descriptions and results are reported herein.

Test Methods: The test specimens were evaluated in accordance with the following:


Impact Test Procedure: Each of the test specimens were impacted on the glass side with a 100 lb (45.4 kg) impactor dropped from the specified height above the vertical centerline of the test specimen according to the referenced standards. All test specimens were destroyed by testing and have been disposed of as trash.

Test Conditions:

Lab Temperature: 68-70°F
Duration of Pre-Conditioning: Minimum of 8 Hours
Test Size: 34" (865mm) wide by 76" (1930mm) high
Glass Type: 1/4" annealed glass
Test Results:

Sample Set #1: 1/4" Annealed Transparent Glass with 4 mil Safety Film

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Overall Thickness</th>
<th>Impact Drop Height</th>
<th>Test Results</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.222&quot;</td>
<td>18&quot;</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
<tr>
<td>2</td>
<td>0.224&quot;</td>
<td>18&quot;</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
<tr>
<td>3</td>
<td>0.224&quot;</td>
<td>18&quot;</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
<tr>
<td>4</td>
<td>0.223&quot;</td>
<td>48&quot;</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
</tbody>
</table>

\(^1\)Acceptance Criteria: No shear or opening through which a 3" sphere can freely pass.

Conclusion: Meets the impact requirements of the referenced standard.

Sample Set #2: 1/4" Annealed Transparent Glass with 7 mil Safety Film

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Overall Thickness</th>
<th>Impact Drop Height</th>
<th>Test Results</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.229&quot;</td>
<td>48&quot;</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
<tr>
<td>2</td>
<td>0.227&quot;</td>
<td>48&quot;</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
<tr>
<td>3</td>
<td>0.226&quot;</td>
<td>48&quot;</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
<tr>
<td>4</td>
<td>0.225&quot;</td>
<td>48&quot;</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
</tbody>
</table>

\(^1\)Acceptance Criteria: No shear or opening through which a 3" sphere can freely pass.

Conclusion: Meets the impact requirements of the referenced standard.
Sample Set #3:  
1/4" Annealed Transparent Glass with 8 mil Safety Film

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Overall Thickness</th>
<th>Impact Drop Height</th>
<th>Test Results 1</th>
<th>Observations</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.227&quot;</td>
<td>48&quot;</td>
<td>Pass</td>
<td>Cracked, no openings</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.226&quot;</td>
<td>48&quot;</td>
<td>Pass</td>
<td>Cracked, no openings</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.229&quot;</td>
<td>48&quot;</td>
<td>Pass</td>
<td>Cracked, no openings</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.276&quot;</td>
<td>48&quot;</td>
<td>Pass</td>
<td>Cracked, no openings</td>
<td></td>
</tr>
</tbody>
</table>

1 Acceptance Criteria: No shear or opening through which a 3" sphere can freely pass.

Conclusion: Meets the impact requirements of the referenced standard.

A copy of this report and all supporting data will be retained by ATI for a period of four years from the original test date. This report is a reissued in the name of Hanita Coatings through written authorization of HanitaTek Window Films to whom the original report was rendered. The original Report No. is 60575.02-801-37. This report is the exclusive property of the client so named herein and is applicable only to the sample tested. Results obtained are tested values and do not constitute an opinion or endorsement by this laboratory. This report may not be reproduced, except in full, without the written approval of Architectural Testing.

For ARCHITECTURAL TESTING, INC.:

Fernell McGaunn
Technician
JHW:cr

John H. Waskow
Director of Regional Operations
<table>
<thead>
<tr>
<th>Rev. #</th>
<th>Date</th>
<th>Page(s)</th>
<th>Revision(s)</th>
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<tbody>
<tr>
<td>0</td>
<td>11/18/05</td>
<td>N/A</td>
<td>Original report issue</td>
</tr>
</tbody>
</table>
IMPACT TESTING ON SAFETY WINDOW FILM MATERIAL

Rendered to:

HANITA COATINGS

TEST DATES: 10/25/05 through 10/27/05

Report No: 60575.05-801-37
Report Date: 11/18/05
IMPACT TESTING ON SAFETY WINDOW FILM MATERIAL

Report No: 60575.05-801-37
Test Dates: 10/25/05
Through: 10/27/05
Report Date: 11/18/05

Project Summary: Architectural Testing, Inc. was contracted by HanitaTek Window Films to perform tests on three sample sets of organic safety window film material. This report is a reissue of the original Report No. 60575.03-801-37. Test specimen descriptions and results are reported herein.

Test Methods: The test specimens were evaluated in accordance with the following:


Impact Test Procedure: Each of the test specimens were impacted on the glass side with a 100 lb (45.4 kg) impactor dropped from the specified height above the vertical centerline of the test specimen according to the referenced standards. All test specimens were destroyed by testing and have been disposed of as trash.

Test Conditions:

Lab Temperature: 68-70°F
Duration of Pre-Conditioning: Minimum of 8 Hours
Test Size: 34" (865mm) wide by 76" (1930mm) high
Glass Type: 1/4" annealed glass
Test Results:

Sample Set #1: 1/4” Annealed Transparent Glass with 4 mil Safety Film

<table>
<thead>
<tr>
<th>Impact Test:</th>
<th>Overall Thickness</th>
<th>Impact Drop Height</th>
<th>Test Results¹</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample No. 1</td>
<td>0.223”</td>
<td>48”</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
</tbody>
</table>

¹Acceptance Criteria: No shear or opening through which a 3” sphere can freely pass with 4 lbs force.

Conclusion: Meets the impact requirements of the referenced standard.

Sample Set #2: 1/4” Annealed Transparent Glass with 7 mil Safety Film

<table>
<thead>
<tr>
<th>Impact Test:</th>
<th>Overall Thickness</th>
<th>Impact Drop Height</th>
<th>Test Results¹</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample No. 1</td>
<td>0.229”</td>
<td>48”</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
</tbody>
</table>

¹Acceptance Criteria: No shear or opening through which a 3” sphere can freely pass with 4 lbs force.

Conclusion: Meets the impact requirements of the referenced standard.
Sample Set #3:

### 1/4" Annealed Transparent Glass with 8 mil Safety Film

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Overall Thickness</th>
<th>Impact Drop Height</th>
<th>Test Results</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.227&quot;</td>
<td>48&quot;</td>
<td>Cracked, no openings</td>
<td>Pass</td>
</tr>
</tbody>
</table>

*Acceptance Criteria: No shear or opening through which a 1" sphere can freely pass with 4 lbs force.

**Conclusion:** Meets the impact requirements of the referenced standard.

A copy of this report and all supporting data will be retained by ATI for a period of four years from the original test date. This report is reissued in the name of Hanita Coatings through written authorization of HanitaTek Window Films to whom the original report was rendered. The original Report No. is 60575.03-801-37. This report is the exclusive property of the client so named herein and is applicable only to the sample tested. Results obtained are tested values and do not constitute an opinion or endorsement by this laboratory. This report may not be reproduced, except in full, without the written approval of Architectural Testing.

For ARCHITECTURAL TESTING, INC.:

Fernell McGrann  
Technician

John H. Waskow  
Director of Regional Operations

Digitally Signed for: Fernell McGrann by John H. Waskow

Digitally Signed by: John H. Waskow

JHW:wr
<table>
<thead>
<tr>
<th>Rev. #</th>
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</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>11/18/05</td>
<td>N/A</td>
<td>Original report issue</td>
</tr>
</tbody>
</table>
Glass and Glazing Federation

Certifies that

Hanita Coatings.

Certificate No: **TC 0305**

100 microns External Clear Safety Film (R12106X)
Has passed Class 2B2
of BS EN 12600 ‘Glass in Building – Pendulum Test – Impact Test Method and Classification For Flat Glass’ on 4mm Float Glass

Tested at Wintech Engineering Ltd, UKAS accredited Test Laboratory, No.2223

Issued: **17 March 2006**

Chief Executive:

[Signature]

Director of Glazing:

[Signature]
BUILDING INVESTIGATION & TESTING SERVICES

TESTING OF FILM COATED GLASS TO BS 6206:1981
REPORT NO. BP 2286/21C/97

Prepared for: Hanita Coatings
Kikhtez Hanita
22885
Israel

For the attention of:- Ms Alison Navon

Date 26 June 1997

BUILDING INVESTIGATION AND TESTING SERVICES (REDHILL) LTD
TROWERS WAY, HOLMETHORPE INDUSTRIAL ESTATE, REDHILL, SURREY, RH1 2LH
TEL. 01737 765432/765070/779350 FAX. 01737 765431 Registered in England 2974410
TESTING OF FILM COATED GLASS TO BS 6206: 1981

SUMMARY

Samples of 4mm annealed glass coated on one side with a 100 micron plastic film, have been impacted and satisfied the requirements of a Class B drop height to BS 6206.

INTRODUCTION

Building Investigation and Testing Services (Redhill) Ltd were requested by Mr Alison Navon of Hanita Coatings to carry out impact tests on samples of film coated glass to Class B of BS 6206: 'Specification for Impact performance requirements for flat safety glass and safety plastics for use in buildings': 1981.

This work was carried out on 25 June 1997 to the latest amended version of the standard and was authorised by your letter dated 28 May 1997. Our confirmation form dated 30 May 1997 refers.

SAMPLE RECEIVED

A sample of 16 test pieces of film coated glass, each 1930mm x 865mm x 4mm, were received on 17 June 1997.

For all samples the film stopped short of the glass edge, providing a 10mm margin of uncoated glass, which is allowed in the standard.

The following information and sample identification references were received.

<table>
<thead>
<tr>
<th>Film Code</th>
<th>Film thickness (microns)</th>
<th>Description</th>
<th>Glass</th>
</tr>
</thead>
<tbody>
<tr>
<td>R12306T</td>
<td>100</td>
<td>Clear polyester film with scratch resistance coating, pressure-sensitive adhesive and 23 micron release liner</td>
<td>4mm float glass</td>
</tr>
</tbody>
</table>

The specimens were conditioned at 20 ± 5°C prior to testing, with free air circulation around all faces.
## 4. Results

<table>
<thead>
<tr>
<th>Impact side</th>
<th>BS 6206 Glass</th>
<th>BS 6206 requirement</th>
<th>Result</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Film</td>
<td>Film</td>
<td>Plastic film coated glass shall be deemed to break safely if numerous cracks or fissures appear in test piece, but no shear, or opening, develops within the body of the test piece through which a 75mm sphere can be passed freely. Additionally, if particles are detached from the test piece up to 3 mins after impact, they shall in total weigh no more than the mass equivalent to 10000 mm² of the original test piece. The largest single piece shall weigh less than the mass equivalent to 4400 mm² of the original test piece.</td>
<td>Slight split 210mm x 10mm</td>
<td>PASS</td>
</tr>
<tr>
<td>Glass</td>
<td>Glass</td>
<td>No splits or tears</td>
<td>PASS</td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>Glass</td>
<td>No splits</td>
<td>PASS</td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>Glass</td>
<td>No splits</td>
<td>PASS</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**

For all tests carried out very little glass was detached from the specimen.

---

**REPORTED AND AUTHORISED**

I COLLINS  
Building Consultant

**CHECKED AND APPROVED BY**

R FRYER  
Building Consultant
SECURITY FILM TESTING

Client: SOLABLOC Solar Control Films
122 Rozelle Ave
MELROSE PARK SA 5039
Attn: Travis Seeley

Product Code: AS/NZS 2208-1996
Test Specification: AS/NZS 2208-1996 Appendix D
Sample Identification: Hanita R12306T

Issue Date: 11/12/2006
Test Date: November 2006
Report No: 06MAAD11615 Part 1A
Client Ref: Req. T.Seeley

The samples listed above conform to the testing requirements of AS/NZS 2208-1996 Appendix D, Impact test. Please see report 06MAAD11615 SOLABLOC PTY LTD Consolidated report 1 for the full test results.

Testing Officer: Nick Maloney
Status: Materials Testing Officer

Monty Luke
Group Leader
Materials Services
### SECURITY FILM TESTING

**Client:** SOLABLOC Solar Control Films  
122 Rozelle Ave  
MELROSE PARK SA 5039  
**Attn:** Travis Seeley  

**Issue Date:** 08/12/2006  
**Test Date:** November 2006  
**Report No:** 06MAAD11615 Part A  
**Client Ref:** Req. T. Seeley

**Product Code:** AS/NZS 2208-1996  
**Test Specification:** AS/NZS 2208-1996 Appendix D  
**Sample Identification:** Hanita R12306T

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Film Orientation</th>
<th>Result</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3mm, 400μm 1/8</td>
<td>N/A</td>
<td>No sample provided</td>
<td>-</td>
</tr>
<tr>
<td>3mm, 400μm 2/8</td>
<td>Facing away from impactor</td>
<td>300mm drop height, NAD, 450mm drop height, sample came out of frame.</td>
<td>PASS</td>
</tr>
<tr>
<td>3mm, 400μm 3/8</td>
<td>Facing away from impactor</td>
<td>300mm drop height, NAD, 450mm drop height, sample came out of frame.</td>
<td>PASS</td>
</tr>
<tr>
<td>3mm, 400μm 4/8</td>
<td>Facing away from impactor</td>
<td>300mm drop height, NAD, 450mm drop height, sample came out of frame.</td>
<td>PASS</td>
</tr>
<tr>
<td>3mm, 400μm 5/8</td>
<td>N/A</td>
<td>No sample provided</td>
<td>-</td>
</tr>
<tr>
<td>3mm, 400μm 6/8</td>
<td>Facing impactor</td>
<td>300mm drop height, multiple cracks noted sample still in frame. 450mm drop height, sample came out of frame.</td>
<td>PASS</td>
</tr>
<tr>
<td>3mm, 400μm 7/8</td>
<td>Facing away from impactor</td>
<td>300mm drop height, multiple cracks noted sample still in frame. 450mm drop height, sample came out of frame.</td>
<td>PASS</td>
</tr>
<tr>
<td>3mm, 400μm 8/8</td>
<td>N/A</td>
<td>No sample provided</td>
<td>-</td>
</tr>
</tbody>
</table>

**Remarks:** NAD = No Apparent Defects  
The samples were destroyed during testing.

**Testing Officer:** Nick Maloney  
**Status:** Materials Testing Officer

---

Amade Limited shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Amade Limited be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the item tested. Samples will be stored for thirty days. Ref: Zevent reports 2006/06asad11618 solabloc06asad111618 solabloc py fl consolidated report 1.doc
APPENDIX 4 - FIRE TESTING

ASTM D1919

FIRE TESTING LABORATORY REPORT

March 4, 1999

Client: Hanita Coatings
Kibbutz Hanita 22885
Israel

Project: Ignition Properties of 4 Mil Window Film

Introduction

This report presents the results of a fire test conducted on material submitted to our laboratory on February 2, 1999. Testing was completed on February 12, 1999.

Specimen Preparation

A clear, 4 mil sheet of window film was supplied by the client and identified as 4 mil Window film. Twelve (12) 3.0 grain samples were fabricated from the material by removing the release film from the back and cutting the sheet into 1 inch squares. The squares were stacked and placed into the specimen cups. The samples were conditioned in a controlled laboratory at 75°F and 50% relative humidity a minimum of 48 hours prior to testing.

ASTM D1929 Test Method:

The following results were determined in accordance with the test method below.


The plastic materials self-ignition and flash ignition temperatures were determined using a "Seitchkin" hotair ignition furnace. This standard should be used if measure will describe flint properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

This report is for the information of the client. It may be used in its entirety for the purpose of securing product acceptance from duly constituted approval authorities; however, this report or the name of Celotex Corporation shall not be used in publicity or advertising.
Summary of ASTM D1929 Test Results

<table>
<thead>
<tr>
<th>Specimen I.D.</th>
<th>Flash-Ignition Temperature</th>
<th>Self-Ignition Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mil. Window Film</td>
<td>360°C 680°F</td>
<td>400°C 752°F</td>
</tr>
</tbody>
</table>

Observations:

Constant air velocities of 5 ft/min were maintained in the furnace test chamber as specified by Section 9.1.1 of the Standard Test Method. The 4 mil Window Film material was flaming upon ignition and smoked during the flash and self ignition tests. Tabulated and graphical data are located in the Appendix.

Tested by: William M. Gwynn
Research Technologist

Approved by: Mark I. Hennis
Research Chemist
Global Installation References

Brazil
Royal Netherlands Embassy, Sao Paulo

Belgium
King Alfred National Library, Brussels
Council of the European Union, Brussels

Chile
German Embassy, Quito

Czech Republic
Veletržní Palace, Prague
Prague Castle, Prague
Czech National Bank
National Gallery, Prague
Kinský Palace, Prague
Nuclear Power Plant, Temelín
City Hall, Hradec
Czech Power Company HQ, Prague
Kimberly-Clark, U.K., HQ & factory, Jaroměř
University Center, Prague
Trade Fair Ground, Brno

Ethiopia
U.N. Building, Addis Ababa
Hilton Hotel, Addis Ababa

Finland
Czech Embassy, Helsinki

France
EU Parliament, Strasbourg
Paris Metro Underground Railway
Memorial to the Unknown Jewish Martyrs, Paris
Meteo France, Toulouse
La Samaritaine, Paris

Germany
Foreign Affairs Office, Berlin
Microsoft HQ, Munich
Shell, Wesseling
TUI, Neuss
IKEA, Hofheim
E-Plus, Düsseldorf
Deutsche Post, Essen
Nestlé, Nürnberg
SIG Sauer, Kiel
Siemens, Bruchsal
Coca-Cola, Dorsten
Total Raffinerie, Spergau
Ing.-DIBA AG, multiple locations
LTU-Arena, Düsseldorf

Greece
Acropolis Museum, Athens
Greek Parliament, Athens
Chinese Embassy, Athens
Metro Underground Railway, Athens
Hellenic National Meteorological Service, Athens
Coca-Cola Company, Athens
HSBC Bank, Athens

Guatemala
Westin Camino Real Hotel, Guatemala City

Holland
ABN-AMRO Bank, multiple locations
Netherlands Police HQ, Groningen
Schiphol Airport, Amsterdam
Ministry of Defense, multiple locations
ING Dibank, multiple locations
## Global Installation References

<table>
<thead>
<tr>
<th>Location</th>
<th>Companies/Buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>KPN</td>
<td>KPN telecommunication HQ, The Haag</td>
</tr>
<tr>
<td></td>
<td>Phillips HQ, Eindhoven</td>
</tr>
<tr>
<td>DSM</td>
<td>DSM Research, Maastricht</td>
</tr>
<tr>
<td>Ernst &amp;</td>
<td>Ernst &amp; Young, Amsterdam</td>
</tr>
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<td>Young</td>
<td></td>
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<tr>
<td>Toyota</td>
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<tr>
<td>Mizuho Bank</td>
<td>Mizuho Bank, Tokyo</td>
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<td>Risona</td>
<td>Risona Bank, Osaka and Tokyo</td>
</tr>
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<td>Japan Coast</td>
<td>Japan Coast Guard, Tokyo</td>
</tr>
<tr>
<td>Lithuania</td>
<td>Czech Embassy, Vilnius</td>
</tr>
<tr>
<td></td>
<td>Pilsner Urquell Czech Brewery, Kaunas</td>
</tr>
<tr>
<td>Israel</td>
<td>Diamond Exchange, Tel Aviv</td>
</tr>
<tr>
<td>Knesset</td>
<td>Knesset (Parliament), Jerusalem</td>
</tr>
<tr>
<td>Prime</td>
<td>Prime Minister’s Residence, Jerusalem</td>
</tr>
<tr>
<td>Ben Gurion</td>
<td>Ben Gurion Airport, Tel Aviv</td>
</tr>
<tr>
<td>Swiss</td>
<td>Swiss Embassy, Tel Aviv</td>
</tr>
<tr>
<td>Israeli</td>
<td>Israeli Museum, Jerusalem</td>
</tr>
<tr>
<td>National</td>
<td>National Congress Building, Jerusalem</td>
</tr>
<tr>
<td>Bank</td>
<td>Bank Leumi, multiple locations</td>
</tr>
<tr>
<td>Discount</td>
<td>Discount Bank, multiple locations</td>
</tr>
<tr>
<td>Crown</td>
<td>Crown Plaza Hotel, Ein Bokok, Dead Sea</td>
</tr>
<tr>
<td>Supreme</td>
<td>Supreme Court of Justice, Jerusalem</td>
</tr>
<tr>
<td>Amdocs</td>
<td>Amdocs HQ, Ra’anana</td>
</tr>
<tr>
<td>Port</td>
<td>Port Terminal, Haifa</td>
</tr>
<tr>
<td>Intel</td>
<td>Intel Israel, Haifa</td>
</tr>
<tr>
<td>Romania</td>
<td>City Hall, Brasov</td>
</tr>
<tr>
<td>City</td>
<td>City Hospital, Gheorgheni City</td>
</tr>
<tr>
<td>Hospital</td>
<td>City Hospital, M. Cluc City</td>
</tr>
<tr>
<td>Hochland</td>
<td>Hochland Factories, various sights</td>
</tr>
<tr>
<td>Factories</td>
<td>McDonalds, multiple locations</td>
</tr>
<tr>
<td>various</td>
<td>Sports Arena, Tg. Secuiesc City</td>
</tr>
<tr>
<td>City</td>
<td>Sugas Central Store, Sf. Gheorghe</td>
</tr>
<tr>
<td>Japan</td>
<td>State Parliament (Duma), Moscow</td>
</tr>
<tr>
<td></td>
<td>Moscow Residence of President</td>
</tr>
<tr>
<td>Russia</td>
<td>Kremlin Residence of President</td>
</tr>
</tbody>
</table>

**Notes:**

- SOLAR Zone: Heat and UV Control Window Film
- SAFETY ZONE: Safety and Security Window Film
Global Installation References

South Korea
President's Administration Building, Moscow
Russian Federation Savings Bank, multiple locations
Moscow Metro Underground pedestrian subways, multiple locations
Czech Embassy, Moscow
Groznyi Administrative Building Complex, Chechnya
Pushkin Museum, Moscow
Gorky Museum, Moscow
State Museum of the Orient, Moscow
State Customs Committee, Moscow
Bank of Moscow, multiple locations
International Moscow Bank, multiple locations
Moscow Capital Bank, multiple locations
Slovak Embassy, Moscow

Slovak Republic
Japanese Embassy, Bratislava
Slovak State Bank, all locations
Slovac Parliament, Bratislava
Eurotel AS, 80 locations
Police HQ, Bratislava
Government Hotel, Bratislava
Holocaust Museum and Jewish Center, Nitra

Senegal
Royal Netherlands Embassy, Dakar

Serbia
Faculty of Dentistry, Beograd
Public Roads Department, multiple locations
Military Academy of Serbia, Beograd
Coca Cola Company, Beograd
Faculty of Economy, Beograd

South Korea
Presidential Blue House, Seoul
Samsung Group Head Office, Seoul
Japanese Embassy, Seoul
Samsung Electronic Co, Gee Heung
Hyundai Mobile Head Office, Seoul
Pohang Iron & Steel Company Ltd (POSCO), Seoul

Spain
Juan Miro Museum, Barcelona
Antena 3 TV Station, Madrid
Camp Nou Football Stadium, Barcelona
Metro, Barcelona and Madrid

Switzerland
Le Corbusier Museum, Zurich
B. Braun Medical, Escholzammatt
Siemens, Wallisellen
IWC International Watch Co. Ltd, Schaffhausen
Curlinghall Dolder, Zurich
AFG Arena, St. Gallen Stadium
SBB, Swiss Rail, multiple locations
JOWA Migros, multiple locations
Cartier, La Chaux-de-Fonds
Zurich Zoo
City Hospital, Zurich
Chocolat Frey, Buchs

Thailand
Ministry of Public Health, Nonthaburi
ExxonMobil Refinery, Sriracha
American Embassy, Bangkok
Government Saving Bank, Pattani Province
Dept. of Mineral Resources, Komain Building, Bangkok
Global Installation References

Tesco Lotus, multiple locations
Thai Toshiba Electric Industries, Nonthaburi
Rajabhat Ratchanakarin University, Chachoengsao Province

Turkey
Korean Embassy, Istanbul
Topkapi Palace, Istanbul
JP Morgan Bank, (all branches)
Anitkabir Museum, Ankara
Akmerkez Residence, Istanbul
Demirbank, (all branches)
HSBC bank, (all branches)
Interbank, (all branches)
Yapi & Kredi Bank, (all branches)
Yurt bank, (all branches)
Botas Petroleum Pipeline Corporation
Or-Ahayim Hospital, Balat
Turkcell Telecommunications, various branches

UK
Southampton University, Hampshire
Coca Cola, Peterborough
BAE Systems, Hampshire
Nuneaton Comprehensive School, Nuneaton
Saga, Cheriton House, Folkestone

USA
Governors Mansion, Austin, TX
555 Montgomery, San Francisco, CA
Belo Broadcasting Ch. 8, Dallas, TX
Belo Broadcasting Ch. 11, Houston, TX
US Army Ammunition Depot, McAllister, OK
USAA Building, San Antonio, TX
Financial Center, Los Gatos, CA
Holiday Inn Select, Dallas, TX
Hallmark Cards Manufacturing Plant, Kansas City, KS
Copely Symphony Towers, San Diego, CA
Diablo Canyon Nuclear Plant, CA
Dublin Corporate Center, Dublin, CA
State of California Offices, San Francisco, CA
US Federal Office Building, Sacramento, CA
Stanford University, Palo Alto, CA
West Valley Mall, Tracy, CA
Pan Pacific Building, Burlingame, CA
University of CA Medical Center, San Francisco, CA
Placerville, CA Town Hall, Placerville, CA
Klemm Properties HQ, Tracy, CA
Modesto Irrigation District HQ, Modesto, CA
Doctor's Hospital, Modesto, CA
Seagate Properties@44 Montgomery, San Francisco, CA
Cushman and Wakefield as agents for eBay HQ, San Jose, CA
Safeway Supermarkets Fuel Stations, various cities, CA
County of Santa Clara Child Protective Services Building, Milpitas, CA
Harley Davidson Financial Services HQ, Carson City, NV
San Jose, CA Academy High School, San Jose, CA
Sony Metreon Entertainment Complex, San Francisco, CA
EDS Building, Sacramento, CA and Charlotte, NC
Tiffany and Company Jewelers, Walnut Creek, CA
Rail Logistics, Overland Park, KS
Bank Midwest, Lee's Summit, MO
Academy of Aesthetic Arts, Shawnee, KS
First National Bank, Overland Park, KS
500 Capitol Mall, Sacramento, CA
The Use of Dow Corning® 995 Silicone Structural Adhesive in Retrofit Protective Glazing Installations

It's hard to imagine an office building without windows. No one doubts the aesthetic value of glass from both interior and exterior perspectives, but glass can create certain hazards that only now are being recognized and resolved. One solution transforms window glass from a hazard in the event of severe weather, terrorist attack, or simple breakage into a component of a building's defenses. These systems help maintain the integrity of the glass in the frame, not only reducing the risk to occupants and passersby, but also reducing the amount of building damage that can occur during severe weather and seismic events.

Converting windows from a hazard to a defensive asset requires that (1) the glass is held together even when broken and (2) the window lite remains attached to the frame. Window systems developed to meet these requirements are comprised of a tough, transparent polyester film adhered to the window glass and Dow Corning® 995 Silicone Structural Adhesive, used as a glazing sealant to anchor the edges of the film and to hold the lite in the supporting frame. These systems have proven effective when evaluated for blast or impact resistance.

Each of the hazards noted above has slightly different needs and requirements. Any system proposed must be evaluated for specific requirements and must be used only as tested. For example, a system that can withstand a 4-psf bomb blast may not be acceptable for a hurricane application or one with a 10-psf blast requirement. Performance depends upon the flexibility and strength of the entire system, including the film, sealant and frame. Therefore, the glazing sealant joint must be designed with a thorough understanding of the flexibility and strength of the whole window film system. A joint that performs well with one type of window film may not perform as well with a different type of film.

The sealant attachment systems that are economically viable in retrofit applications are built around a triangular joint connecting the film to the supporting framing member. To achieve acceptable performance, a very high-performance sealant must be used. The following information documents some of the key parameters that have proven critical for proper sealant application in high-performance protective glazing systems and provides examples of application issues that could affect system performance.

**Figure 1.** Application utilizing a triangular bead of Dow Corning® 995 Silicone Structural Adhesive.