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LABORATORY TEST REPORT NO 185.W.04.B

Subject: The effects of application of RENOLIT decorative foil to spacer frame between glazing layers on performance of molecular sieve.

Commissioned by: eco instruments Sp. z o.o  
(name and address): Powsińska 18, 02-920 Warszawa  
(order dated: 11 October 2004)

Samples received date: 8 October 2004  
Test commencement date: 25 October 2004  
Test completion date: 20 December 2004

Tests performed by: Barbara Mazur, M.Sc. Eng.

Distribution list:  
Eco instruments Sp. z o.o. (orderer) – 2 copies  
Research laboratory – 2 copies

Plenipotentiary of the Research Branch's Director  
Research Laboratory Manager  
[signature illegible]

.....  
Teresa Siekierska, M.Sc. Eng.

Kraków, 20 January 2005

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<p>1. Identification and description of the test subject</p> <p>The subject of this test was single chamber double glazed window assembly delivered by eco instruments Sp z o.o. Assemblies were manufactured by Starglass sp z o.o. in Ostrołęka. Two sample assemblies, dimensions 500x700mm were submitted for testing by eco instruments Sp z o.o. on 8 October 2004. The samples were labelled by the manufacturer with stickers. For the purpose of testing, samples were designated 185.W.04.B/1 and 185.W.04.B/2.</p> <p>For simplicity, the part of sample identification being the report's number, is omitted further on in the report.</p> <p>As per the orderer's statement (letter of 11 October 2004), the samples 700x500 mm and of 4/16/4 design were made from the following materials:</p> <ul style="list-style-type: none"> <li>- colourless float glass manufactured by Saint Gobain</li> <li>- glass with soft and low emitting coat manufactured by Guardian</li> <li>- 16mm spacer frames coated with PVC film (eco instruments) manufactured by Vetrim (Poland)</li> <li>- Ecomol molecular sieve by eco instruments</li> <li>- butyl Bostik 3524 by Le Joint Francais,</li> <li>- polyurethane sealant Bostik 3189/2 by Le Joint Francais</li> </ul>		
<p>Note:</p> <ol style="list-style-type: none"> <li>1. Test results refer strictly to objects being tested.</li> <li>2. This report may be copied in part only with express written permission of the Research Laboratory.</li> <li>3. Any claims concerning this report will be accepted for investigation within one month of the report's date of issue.</li> </ol>		

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<p>2. Test procedure</p> <p>2.1 Scope of testing</p> <p>The scope of performed tests was:</p> <ul style="list-style-type: none"> <li>- to determine whether application of RENOLIT decorative foil to spacer frame has any effect on the performance of the frame's molecular sieve.</li> </ul> <p>2.2 Test methodology</p> <p>The two supplied double glazing assemblies were tested for dewpoint temperature. Using a device (as per fig. 2 PN-B-13079) manufactured by Building Research Institute (Instytut Techniki Budowlanej) in Warsaw, formation of vapour condensation was verified against test duration and dewpoint temperature curves for various glass thicknesses. According to these curves, test duration for dewpoint temperature of <math>-35^{\circ}\text{C}</math>, for glass with thickness of 4mm, is 58 seconds. Extended uncertainty of vapour condensation testing stated at a confidence level of 95% using a k factor of 2 is 2.6%.</p> <p>Samples were then subjected to freezing/heating cycles at <math>-18^{\circ}\text{C}</math> (6h) and <math>+53^{\circ}\text{C}</math> respectively and relative humidity <math>\geq 95\%</math> (18h) for seven days. Subsequently, samples were placed in an air conditioning chamber for further 7 days at <math>+53^{\circ}\text{C}</math> and relative humidity <math>\geq 95\%</math> and for the last 14 days of testing at <math>+70^{\circ}\text{C}</math> and relative humidity <math>\geq 95\%</math>.</p> <p>After each freezing/heating cycle as well as during the successive stages of the testing procedure, the samples were visually inspected for any changes in their appearance.</p> <p>Testing methodology complied with the following standards <i>EN 1279-2:2002 Glass in building. Insulating glass units. Part 2: Long term test method and requirements for moisture penetration</i> (for temperature range <math>-18^{\circ}\text{C}</math> to <math>+53^{\circ}\text{C}</math> and relative humidity <math>\geq 95\%</math>) and according to <i>PN-B 13079 Glass in building. Insulating glass units</i> (temperature of <math>+70^{\circ}\text{C}</math>).</p> <p>Finally, dewpoint temperature for both samples was determined immediately after testing and after 30 days when glass assemblies were stored at room temperature.</p>		
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<p>3. Test results</p> <p>3.1 Performance of molecular sieve in spacer frame covered with RENOLIT foil.</p> <p>Dewpoint temperature tests performed on samples number 185.W.04.B/1 and 185.W.04.B/2 delivered to the Institute were positive. After 28 days of subjecting samples to varying temperature and humidity, no visible changes in the samples' appearance were observed. The result of dewpoint temperature test performed on the second day succeeding the freezing/heating cycle was negative – vapour condensation formed between glass layers. Another dewpoint temperature test performed on samples after 30 days of storing at room temperature was positive, i.e. no vapour condensation formation between glass layers was observed.</p> <p>3.2 Summary</p> <p>In the course of the performed tests and visual inspection of the samples, the following has been determined:</p> <ul style="list-style-type: none"><li>- visual inspection of samples subject to freezing/heating cycle in varying humidity revealed no changes in their appearance such as presence of water vapour condensation between glass layers, misalignment of glass panes, 'running' sealants or changes to the appearance of RENOLIT foil.</li><li>- presence of moisture between glass layers detected during dewpoint temperature test immediately after the freezing/heating cycle indicates penetration by water in quantities larger than those that could have been absorbed by the molecular sieve.</li><li>- positive result of dewpoint test performed after 30 days of storing samples at room temperature indicates that molecular sieve in spacer frame covered with RENOLIT was able to absorb the moisture, which penetrated the space between glazing layers during high temperature and humidity test.</li></ul> <p>[signature illegible]</p> <p>..... Signature of the person developing the report</p> <p>Plenipotentiary of the Research Branch's Director Research Laboratory Manager [signature illegible]</p> <p>..... Teresa Siekierska, M.Sc. Eng.</p>		
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