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Hail impact resistance (HIR) summary of classification

according to test report number: 132_1005_002 and 132_1005_003, date:07.02.2012

reportnumber : 132_1005_005
date: 02.06.2014
executors of testings: Hans Starl, MSc / MarR
Ext.: 874
pages: 6

CLIENT	**FunderMax GmbH** IZ-NÖ-Süd Straße 3 A-2355 Wiener Neudorf
TEST OBJECT	„Max Exterior F8 mm and F10 mm“ duromer high-pressure laminates with extremely effective weather protection based on acrylic polyurethane resins
TEST BASES	*number 00a general part A (2009)* *number 00b general part B (2009)* *APBIC specification number 11 plastic plates, 1.02*

TEST RESULTS AND EVALUATION FOR HAIL IMPACT RESISTANCE (HIR)	**material requirements**	**classification**
	water tightness	HIR 5
	appearance	HIR 5
	minimal	HIR 5

VALID UNTILL 07.02.2017

Ing. Mag. Robert BRENNER
official in charge

Hans STARL, MSc
authorized to sign

austrolab

Summary

On 07th of February 2012, a series of tests according to Swiss Association of Public Building Insurance Companies (APBIC), Bern, specification number 11 - edition 2011, have been done by using the hail test equipment of the IBS (Institut für Brandschutztechnik und Sicherheitsforschung GmbH – accredited test laboratory by APBIC Bern and the Austrian government). In these tests, ice balls of 40-70 millimetres diameter have been propelled against the test elements, following the required velocity.
Shingles for roofing application are mounted to face an impact angle of 90° and shingles used at facades to face an angle of 45°. A specific characteristic for this test series was that all ice balls were shot at an element configuration, which remained unchanged during the entire test series. Due to that fact, it has to be mentioned, that the applied test load is even higher than the APBIC requirements are. In terms of "FM-Approvals", the results of this test series shows a much higher load resistance as "class 4" in terms of FM 4473-Approvals would require.

Test set-up

The size of the test samples was 510 mm x 510 mm (width and length). Always 4 plates were friction locked on the test frame with clamping rails to avoid any motion, which would not occur in practise. In total the tested area was approximately 1 m^2. The plates have been tested with rounded and sharp finished edges, at an ambient air temperature between 16°C - 25°C.

Target Points:
Impact locations included, but were not limited to, edges, corners, unsupported areas, overlaps and joints.

Ice balls

Ice balls are made in the laboratory. The ice balls requirements are: being transparent, free of cracks and without any air inclusions (free of air bubbles). The temperature of the ice balls has to be minus 20 ±2 degrees Celsius. The weight of the ice balls is monitored through a high precision electronic balance with an accuracy of 10^{-3} grams. Distance between speed meter and target was 400-500 mm.

All this requirements have to be verified every two years with round robin tests, observed by the Austrian government and the Swiss APBIC.
Sizes of laboratory ice balls in the APIBC standard correspond to the class shown below:

Nominal ice ball

hail impact resistance (HIR=HW)	diameter (mm)	mass (g)	speed (m/s)	class limit (J)
HW1	10	0,5	13,8	0,04
HW2	20	3,6	19,5	0,7
HW 3	30	12,3	23,9	3,5
HW 4	40	29,2	27,5	11,1
HW 5	50	56,9	30,8	27,0

Overall result

During the entire test series no breakage, no discoloration and no tearing has been observed on the test object. The final HIR classification was proofed by the technical body of the Association of Public Building Insurance Companies APBIC, Bern Switzerland and is listed at: www.hagelregister.info
(Note: by searching at the webpage use: Hersteller=producer=Fundermax)

This document is an excerpt of test reports in German:
132_1005_002
132_1005_003.

Illustrations of test arrangements:

Illustration 1: test procedure

Illustration 2: loading of the equipment, with a laboratory made, transparent, ice ball (70 mm diameter)

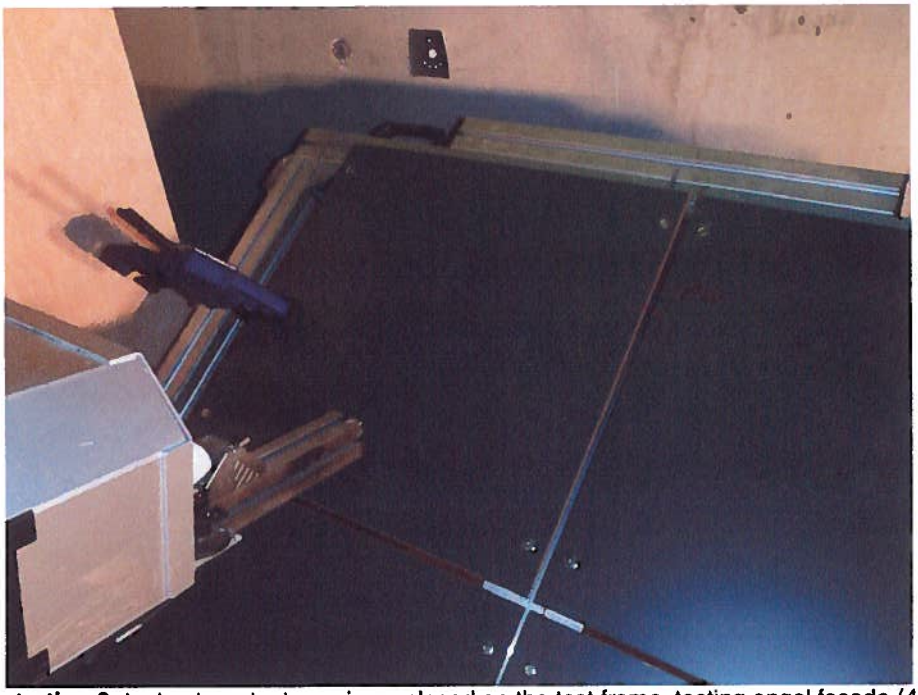

Illustration 3: test set-up, test specimen placed on the test frame, testing angel facade (45°)

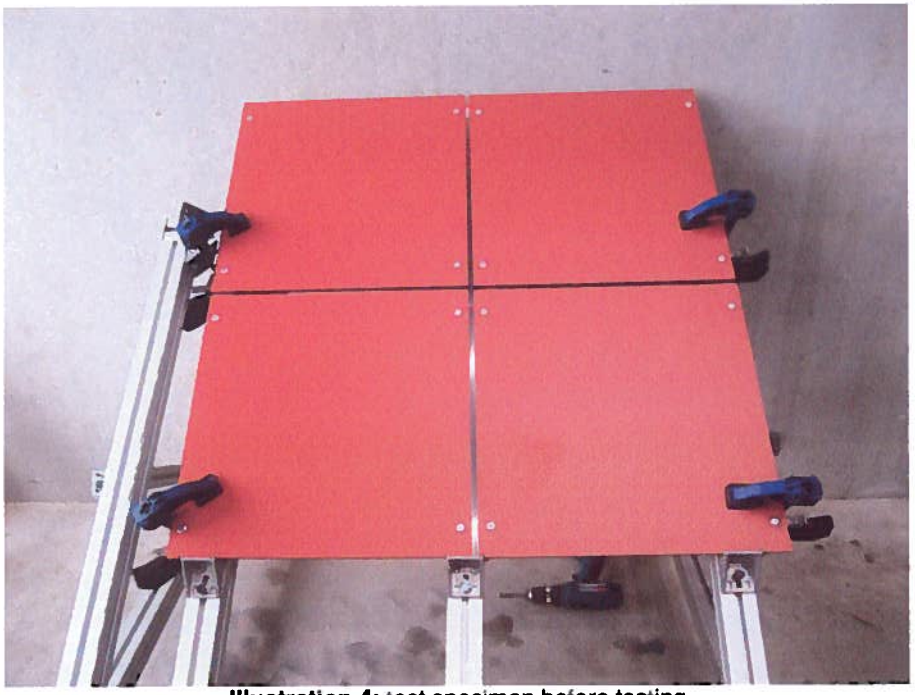

Illustration 4: test specimen before testing

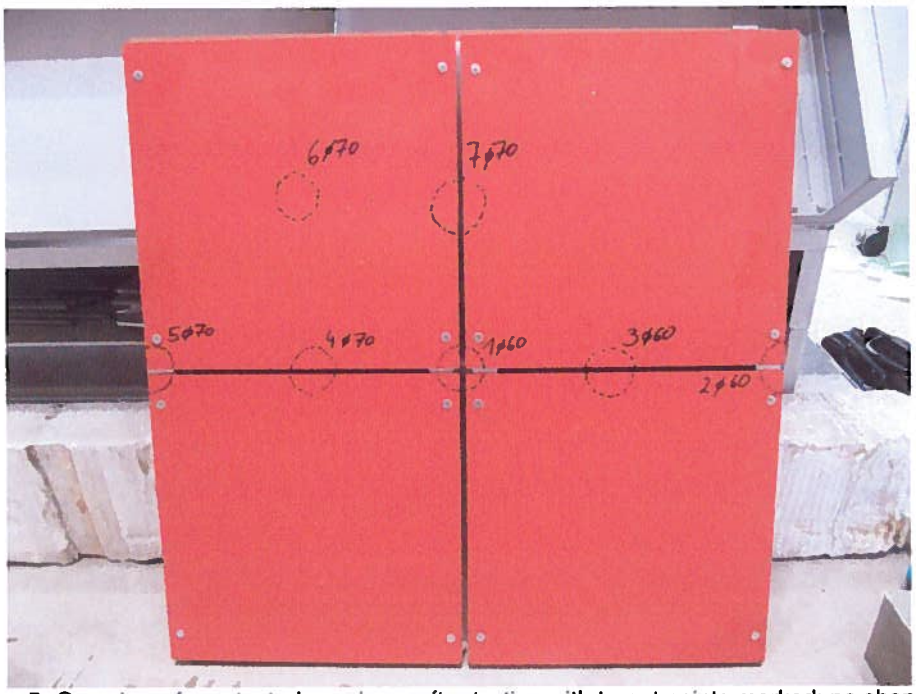

Illustration 5: Overview of one tested specimen after testing with target points marked; no changes at the specimen visible