TEST REPORT

No. : XMML110300837-2.1
Date : May 03, 2011

HANWHA L&C CORP.
HANWHA BLDG., 15F, #1, JANGGYO-DONG, JUNG-GU, SEOUL, 100-797, KOREA

The following sample(s) was/ were submitted and identified on behalf of the client as:

Sample Name	:	HANSTONE (LARGE GRAIN)
Place of origin	:	KOREA, REPUBLIC OF.
Manufacturer	:	HANWHA L&C
SGS Refer No.	:	AYAA10-05058
Test required	:	Selected test(s) as requested by applicant
Date of Receipt	:	Mar.07, 2011
Test Period	:	Mar.07, 2011 to Apr.02, 2011
Test result(s)	:	For further details, please refer to the following page(s)

******** To be continued********

Signed for and on behalf of
SGS-CSTC Ltd.

Civi Huang
Xiamen Materials Lab Technical Supervisor

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Summary of test results:

(Average value)

Test items	Test methods	Test results	Page
Water absorption	EN 14617-1:2005	0.02%	3
Open porosity	EN 14617-1:2005	0.04%	3
Apparent density	EN 14617-1:2005	2450 kg/m^3	3
Flexural strength	EN 14617-2:2008	32.4MPa	4
Slip resistance	EN 14231:2003	SRV "dry":50 SRV "wet":10	5
Abrasion resistance	EN 14617-4:2005	17.7mm	5
Thermal shock resistance	EN 14617-6:2005	Mass loss: 0.01% Flexural strength: 33.1MPa	6
Impact resistance	EN 14617-9:2005	3.09J Thickness:19.5mm	7
Linear thermal expansion coefficient	EN 14617-11:2005	17.23×10^{-6}/°C	8
Compressive strength	EN 14617-15:2005	218.1MPa	9
Reaction to fire test	EN 13501-1:2007 +A1:2009	See following pages	10

******** To be continued********

XMML 024208

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1. Apparent density and water absorption

Test Method:

EN 14617-1:2005 Agglomerated stone - Test methods - Part 1: Determination of apparent density and water absorption

Specimens: 50mm×50mm×20mm, 6pcs, one face polished

Test Result:

Specimens identification No.	1	2	3	4	5	6
Water absorption (%)	0.02	0.02	0.01	0.02	0.02	0.02
Arithmetic mean of the water absorption (%)	0.02					
Open porosity (%)	0.04	0.04	0.02	0.04	0.04	0.05
Arithmetic mean of the open porosity (%)	0.04					
Apparent density (kg/m^3)	2450	2440	2450	2440	2450	2450
Arithmetic mean of the apparent density (kg/m^3)	2450					

******** To be continued********

XMML 024207

2. Flexural Strength

Test Method:

EN 14617-2:2008 Agglomerated stone - Test methods - Part 2: Determination of flexural strength (bending)

Specimens: 200mm×50mm×19mm, 6pcs, one face polished

Test Result:

Loading rate: (0.25±0.05)MPa/s

Specimens identification No.	1	2	3	4	5	6
Flexural strength (MPa)	30.6	32.9	32.1	32.6	33.1	33.2
Mean value (MPa)	32.4					
Standard deviation (MPa)	1.0					
Lower expected value (MPa)	30.1					

******** To be continued********

XMML 024206

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3. Slip resistance

Test Method:

EN 14231:2003 Natural stone test methods - Determination of the slip resistance by means of the pendulum tester

Specimens: 200mm×150mm, 6pcs, one face polished

Testing surface: polished

Test Result:

Specimens identification No.	1	2	3	4	5	6
Mean pendulum value (Dry condition)	50	49	50	49	50	50
Slip resistance value (SRV "dry")	50					
Mean pendulum value (Wet condition)	10	10	10	10	10	10
Slip resistance value (SRV "wet")	10					

4. Abrasion resistance

Test Method:

The abrasion resistance have been determined according to EN 14617-4:2005 Agglomerated stone - Test methods - Part 4: Determination of abrasion resistance

Specimens: 150mm×100mm, 6pcs, one face polished

Testing surface: polished

Test Result:

Specimens identification No.	1	2	3	4	5	6
The length of the groove (mm)	17.0	18.0	17.0	18.0	18.0	18.0
Mean value (mm)	17.7					

******** To be continued********

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5. Thermal shock resistance

Test Method:

EN 14617-6:2005 Agglomerated stone - Test methods - Part 6: Determination of thermal shock resistance

Specimens: 200mm×50mm×19mm, 6pcs, one face polished

Test Result:

After 20 cycles of thermal shock, for each specimen, there is slight change of color, no obvious appearance of spots, no obvious swelling, no obvious cracking, no obvious scaling or exfoliation.

The change in mass:

Specimens identification No.	1	2	3	4	5	6
Mass loss (%)	0.00	0.00	0.00	0.00	0.00	0.00
Mean mass loss (%)	0.00					

Loading rate: (0.25±0.05)MPa/s

Specimens identification No.	1	2	3	4	5	6
Flexural strength (MPa)	29.3	33.8	35.6	33.1	33.1	33.5
Mean value (MPa)	33.1					
Standard deviation (MPa)	2.1					
Lower expected value (MPa)	28.4					

The change in flexural strength: -2.2%

******** To be continued********

XMML 024204

6. Impact resistance

Test Method:

EN 14617-9:2005 Agglomerated stone - Test methods - Part 9: Determination of impact resistance

Specimens: 200mm×200mm×19.5mm, 4pcs, one face polished

Test Result:

Specimens identification No.	1	2	3	4
Drop height, *h* (m)	0.30	0.30	0.30	0.30
Fracture work, *L* (J)	3.09	3.09	3.09	3.09
Average value (J)	3.09			

Note:

The fracture work L in joule is expressed by the formula

$L=M\times h\times g$

Where

M is the sphere mass, 1.050kg,

h is the drop height in meters of the sphere which causes the sample to break,

g is the gravity acceleration equal to 9.806m/s^2.

******** To be continued********

XMML 024203

7. Linear thermal expansion coefficient

Test Method:

EN 14617-11:2005 Agglomerated stone - Test methods - Part 11: Determination of linear thermal expansion coefficient

Specimens: 50mm×10mm×10mm, 3pcs

Test Result:

Temperature: from 30°C to 60°C.

Specimens identification No.	1	2	3
Linear thermal expansion coefficient (10^{-6}/°C)	16.51	18.53	16.65
Mean value(10^{-6}/°C)	17.23		

******** To be continued********

XMML 024202

8. Compressive Strength

Test Method:

EN 14617-15:2005 Agglomerated stone - Test methods - Part 15: Determination of compressive strength

Specimens: 50mm×50mm×20mm, 6pcs, one face polished

Test Result:

Loading rate: (1±0.5) MPa/s

Specimens identification No.	1	2	3	4	5	6
Compressive Strength (MPa)	239.9	246.2	232.3	242.5	232.9	224.3
Mean value (MPa)	236.4					
Standard deviation (MPa)	8.0					
Lower expected value (MPa)	218.1					

******** To be continued********

XMML 024201

9. Reaction to fire test

Test conducted:

This test is conducted as per EN 13501-1:2007+A1:2009 Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests. And the test methods as following:

1. EN 13823:2002 Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item.
2. EN ISO 11925-2:2002 Reaction to fire tests - Ignitability of building products subjected to direct impingement of flame - Part 2: Single-flame source test.

Details of classified product:

a) Nature and end use application

The product "Artificial stone" is defined as a decorative sheet. Its classification is valid for the following end use application: "decoration"

b) Description

The product" Artificial stone" is consists of stone power, resin, its thickness approximate 29.6mm, mass per unit area approximate 72.2kg/m^2

Color	Brown
Thickness	Approximate 29.6mm
Mass per unit area	72.2kg/m^2

Mounting and fixing:

Calcium silicate board, with its density approximate 900kg/m^3, thickness 9mm, is as the substrate, The test specimens are glued to a substrate with no cavity behind it, no joint in the long wing of specimen.

Test results:

Test method	Parameter	Number of tests	Results
EN 13823	FIGRA (W/s)	3	34.2
	LFS < edge of specimen		Yes
	THR_{600s} (MJ)		4.3
	SMOGRA (m^2/s^2)		11
	TSP_{600s} (m^2)		20.1
	Flaming particles or droplets		No

******** To be continued********

XMML 024200

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Test method	Parameter	Specimen number	Results
EN ISO 11925-2 Exposure = 30 s	*F*s ≤ 150 mm	6	Yes
	Ignition of the filter paper		No

Classification and direct field of application:

This classification has been carried out in accordance with **EN 13501-1:2007+A1:2009.**

a) Classification

The product, "Artificial stone", classification is as following,

Fire behaviour		Smoke production			Flaming droplets	
B	—	s	1	,	d	0

Reaction to fire classification: B—s1, d0

Remark: The classes with their corresponding fire performance are given in annex A.

b) Field of application

This classification for the submitted sample, is valid for the following end use condition:

---With all substrates classified A1 and A2

---With glued to a substrate

---No joint

This classification is valid for the following product parameters:

---Characteristics are described in § II b of this test report

Statement: The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

Warning:

This classification report does not represent type approval or certification of the product.

The test laboratory has, therefore, play no part in sampling the product for the test, although it holds appropriate references to the manufacturer's factory production control that is aimed to be relevant to the samples tested and that will provide for their traceability.

******** To be continued********

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Annex A

Classes of reaction to fire performance for construction products excluding floorings and linear pipe thermal insulation products

Class	Test method(s)		Classification criteria	Additional classification
A1	EN ISO 1182 [a] and		$\Delta T \leq 30$℃, and $\Delta m \leq 50\%$, and $t_f = 0$ (i.e. no sustained flaming)	-
	EN ISO 1716		$PCS \leq 2.0$MJ/kg [a] and $PCS \leq 2.0$MJ/kg [b c] and $PCS \leq 1.4$MJ/m^2 [d] and $PCS \leq 2.0$MJ/kg [e]	-
A2	EN ISO 1182 [a] or	and	$\Delta T \leq 50$℃, and $\Delta m \leq 50\%$, and $t_f \leq 20$ s	-
	EN ISO 1716		$PCS \leq 3.0$MJ/kg [a] and $PCS \leq 4.0$MJ/m^2 [b] and $PCS \leq 4.0$MJ/m^2 [d] and $PCS \leq 3.0$MJ/kg [e]	-
	EN 13823		$FIGRA \leq 120$W/s and $LFS <$ edge of specimen and $THR_{600s} \leq 7.5$MJ	Smoke production [f] and Flaming droplets/particles [g]
B	EN 13823 and		$FIGRA \leq 120$W/s and $LFS <$ edge of specimen and $THR_{600s} \leq 7.5$MJ	Smoke production [f] and Flaming droplets/particles [g]
	EN ISO 11925-2 [i] Exposure =30s		$Fs \leq 150$mm within 60s	
C	EN 13823 and		$FIGRA \leq 250$W/s and $LFS <$ edge of specimen and $THR_{600s} \leq 15$MJ	Smoke production [f] and Flaming droplets/particles [g]
	EN ISO 11925-2 [i] Exposure=30s		$Fs \leq 150$mm within 60 s	
D	EN 13823 and		$FIGRA \leq 750$W/s	Smoke production [f] and Flaming droplets/particles [g]
	EN ISO 11925-2 [i] Exposure=30s		$Fs \leq 150$mm within 60 s	
E	EN ISO 11925-2 [i] Exposure =15s		$Fs \leq 150$mm within 20 s	flaming droplets/particles [h]

******** To be continued********

XMML 024198

F	No performance determined

[a] For homogeneous products and substantial components of non-homogeneous products.
[b] For any external non-substantial component of non-homogeneous products.
[c] Alternatively, any external non-substantial component having a PCS ≤ 2,0 MJ/m^2 , provided that the product satisfies the following criteria of EN 13823: FIGRA ≤ 20 W/s, and LFS < edge of specimen, and THR_{600s} ≤ 4,0 MJ, and s1, and d0.
[d] For any internal non-substantial component of non-homogeneous products.
[e] For the product as a whole.
[f] In the last phase of the development of the test procedure, modifications of the smoke measurement system have been introduced, the effect of which needs further investigation. This may result in a modification of the limit values and/or parameters for the evaluation of the smoke production.

s1 = SMOGRA ≤ 30m^2/s^2 and TSP_{600s} ≤ 50m^2 ; s2 = SMOGRA ≤ 180m^2/s^2 and TSP_{600s} ≤ 200m^2; s3 = not s1 or s2
[g] d0 = No flaming droplets/ particles in EN 13823 within 600 s;
d1 = no flaming droplets/ particles persisting longer than 10 s in EN 13823 within 600 s;
d2 = not d0 or d1.
Ignition of the paper in EN ISO 11925-2 results in a d2 classification.
[h] Pass = no ignition of the paper (no classification);
Fail = ignition of the paper (d2 classification).
[i] Under conditions of surface flame attack and, if appropriate to the end-use application of the product, edge flame attack.

******** To be continued********

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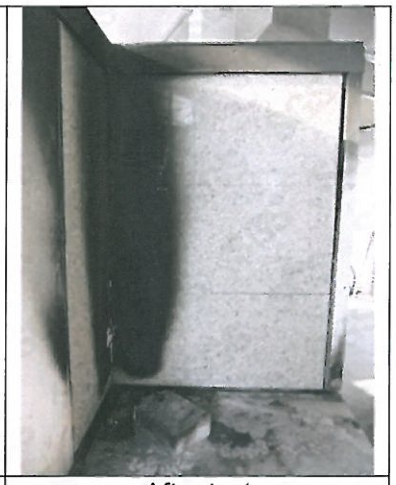
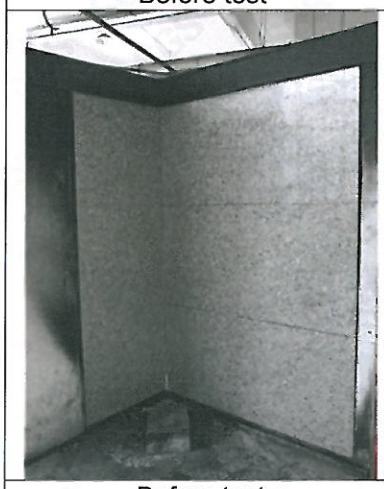
Photos for reaction to fire test:

Before test



After test



Before test

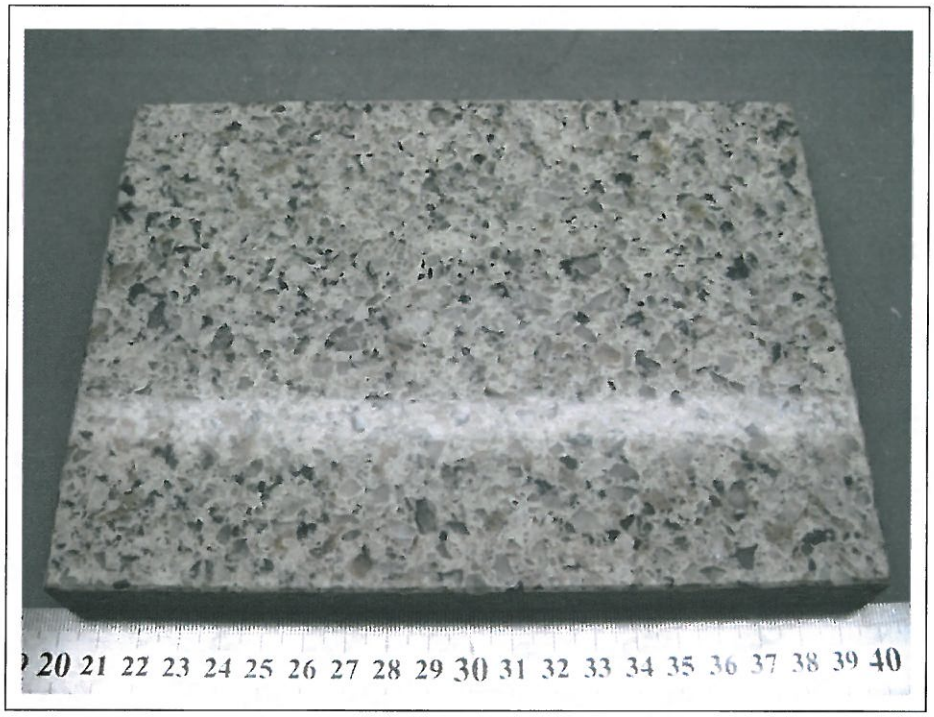
After test

******** To be continued********

XMML 024210

TEST REPORT

Specimen photograph:



SGS authenticate the photo on original report only

*******End of report*******

XMML 024211

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