



Gate 5, 2 Normanby Road, Clayton, Victoria 3168, Australia

Telephone: 61 3 9545 2777 Facsimile: 61 3 9544 1128 Web: <http://www.csiro.au>

ABN 41 687 119 230

TEST REPORT No. 8111B
[This report replaced CSIRO report 8111A]

02 October 2018

Our Ref: EN 13/2572

Customer: SSANGKOM PTY LTD
Yoolim Choi

Address: Unit 7&8, 225A Brisbane Rd,
Biggera Waters, QLD 4216

Manufacturer: SSANGKON (in Korea)
Product Description: SSANGKOM DRYFIX I

Sampling Details: By customer
Date: 14 June 2018
How (methods): N/A

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This test report consists of 14 pages.

These samples have been assessed to AS ISO 13007.2:2013.
Ceramic tiles – Grouts & adhesives.



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ADHESIVE DESCRIPTION: SSANGKOM DRYFIX I

SUMMARY OF RESULTS

AS ISO 13007:2013 Ceramic tiles – Grouts & adhesives
Part 1 Terms, definitions and specifications for adhesives
Part 2 Test methods for adhesives

Test Performed	Tensile Strength (N/mm ²) %20 Mean	Transverse deformation S (mm)	Slip (mm)	Classification
4.1 Determination of open time (20mins)	1.2			E
4.2 Determination of slip			0.28	T
4.4.4.2 Tensile adhesion strength	1.3			C2
4.4.4.3 Tensile adhesion strength after water immersion	0.3			Nil
4.4.4.4 Tensile adhesion strength after heat ageing	1.4			C2
4.4.4.5 Tensile adhesion strength after freeze-thaw cycle	0.2			Nil
4.5.3.4 Determination of transverse deformation		4.2		S1



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Test carried out in accordance with the method
AS ISO 13007.2:2013. Ceramic tiles – Grouts & adhesives.
Part 2 Test methods for adhesives

Section 4.1 – Determination of open time (20mins)

Test Date: 31 August 2018

Laboratory: CSIRO, Clayton
Substrate: Concrete
Test Conditions: 21.5°C and 51.5% RH
 In accordance with AS ISO 13007-2: 2013 - 4.1
Mix Ratios: 20kg cementitious tiles adhesive, 5.5liter of water

RESULTS:

Determination of open time (20mins)

Sample No.	Total Load Newton Force (kN)	Tensile Strength (N/mm ²)	Tensile Strength (N/mm ²) within 20% mean	Failure Mode
1	3.42	1.37	1.37	84% CF-A & 16% AF-T
2	2.85	1.14	1.14	98% CF-A & 2% CF-S
3	3.46	1.38	1.38	100% CF-A
4	3.09	1.24	1.24	100% CF-A
5	2.79	1.12	1.12	100% CF-A
6	3.34	1.34	1.34	96% CF-A & 4% CF-S
7	2.58	1.03	1.03	92% CF-A & 8% AF-T
8	3.22	1.29	1.29	98% CF-A & 2% CF-S
9	2.83	1.13	1.13	100% CF-A
10	2.69	1.08	1.08	100% CF-A
Mean		1.21	1.2	

Failure Code: Adhesive failure between adhesive and substrate (AF-S), Adhesive failure between tile and substrate (AF-T), Cohesive failure within the adhesive (CF-A), Cohesive failure within the substrate or within the tile (CF-S or CF-T), See Failure mode informative annex.

Requirements:

Classification

Normal cementitious adhesives (C1): ≥ 0.5 N/mm²

Improved cementitious adhesives (C2): ≥ 1.0 N/mm²

Determination of open time (20mins):

1.2 N/mm²

E



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Part 2 Test methods for adhesives

Section 4.2 – Determination of slip

Test Date: 23 July 2018

Laboratory: CSIRO, Clayton
Substrate: Concrete
Sample Size: 100mm x 100mm
Test Conditions: 21.5°C and 51.5% RH
 In accordance with AS ISO 13007-2: 2013 - 4.2
Mix Ratios: 20kg cementitious tiles adhesive, 5.5liter of water
RESULTS:

..... **Determination of slip**

Sample No.	Gap _{initial} (mm)	Gap _{final} (mm)	Maximum Slip (mm)
1	25.30	25.58	0.28
2	25.52	25.78	0.26
3	25.35	25.64	0.29
Mean			0.28

Requirement:

Classification

Special characteristics (T): ≤ 0.5 mm

Slip resistance :

0.28 mm

T



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Test carried out in accordance with the method
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Part 2 Test methods for adhesives

Section 4.4.4.2 – Tensile Adhesion Strength

Test Date: 31 August 2018

Laboratory: CSIRO, Clayton
Substrate: Concrete
Test Conditions: 21.5°C and 51.5% RH
 In accordance with AS ISO 13007-2: 2013 - 4.4.4.2
Mix Ratios: 20kg cementitious tiles adhesive, 5.5liter of water

RESULTS:

Tensile Adhesion Strength

Sample No.	Total Load Newton Force (kN)	Tensile Strength (N/mm ²)	Tensile Strength (N/mm ²) within 20% mean	Failure Mode
1	2.83	1.31	1.31	80% CF-A & 20% AF-T
2	3.11	1.44	1.44	95% CF-A & 5% AF-T
3	2.52	1.17	1.17	90% CF-A & 10% AF-T
4	2.61	1.21	1.21	94% CF-A & 6% AF-T
5	2.62	1.21	1.21	89% CF-A & 11% AF-T
6	3.12	1.44	1.44	95% CF-A & 5% AF-T
7	2.86	1.32	1.32	78% CF-A & 22% AF-T
8	2.72	1.26	1.26	80% CF-A & 20% AF-T
9	3.13	1.45	1.45	95% CF-A & 5% AF-T
10	2.49	1.15	1.15	50% CF-A & 50% AF-T
Mean		1.30	1.3	

Failure Code: Adhesive failure between adhesive and substrate (AF-S), Adhesive failure between tile and substrate (AF-T), Cohesive failure within the adhesive (CF-A), Cohesive failure within the substrate or within the tile (CF-S or CF-T), See Failure mode informative annex.

Requirements:

Classification

Normal cementitious adhesives (C1): $\geq 0.5 \text{ N/mm}^2$
 Improved cementitious adhesives (C2): $\geq 1.0 \text{ N/mm}^2$

Tensile adhesion strength :

1.3 N/mm²

C2



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Test carried out in accordance with the method
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Part 2 Test methods for adhesives

Section 4.4.4.3 – Tensile Adhesion Strength after water immersion

Test Date: 31 August 2018

Laboratory: CSIRO, Clayton
Substrate: Concrete
Test Conditions: 21.5°C and 51.5% RH, water immersion
 In accordance with AS ISO 13007-2: 2013 - 4.4.4.3
Mix Ratios: 20kg cementitious tiles adhesive, 5.5liter of water
RESULTS:

Tensile Adhesion Strength after water immersion

Sample No.	Total Load Newton Force (kN)	Tensile Strength (N/mm ²)	Tensile Strength (N/mm ²) within 20% mean	Failure Mode
1	0.71	0.33	0.33	13% CF-A & 87% AF-T
2	0.67	0.31	0.31	100% AF-T
3	0.70	0.32	0.32	18% CF-A & 82% AF-T
4	0.74	0.34		18% CF-A & 82% AF-T
5	0.55	0.25	0.25	100% AF-T
6	0.56	0.26	0.26	100% AF-T
7	0.51	0.24	0.24	100% AF-T
8	0.49	0.23	0.23	100% AF-T
9	0.54	0.25	0.25	100% AF-T
10	0.45	0.21		100% AF-T
Mean		0.27	0.3	

Failure Code: Adhesive failure between adhesive and substrate (AF-S), Adhesive failure between tile and substrate (AF-T), Cohesive failure within the adhesive (CF-A), Cohesive failure within the substrate or within the tile (CF-S or CF-T), See Failure mode informative annex.

Requirements:

Classification

Normal cementitious adhesives (C1): ≥ 0.5 N/mm²

Improved cementitious adhesives (C2): ≥ 1.0 N/mm²

Tensile adhesion strength after water immersion:

0.3 N/mm²

Nil



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Section 4.4.4.4 – Tensile adhesion strength after heat ageing

Test Date: 31 August 2018

Laboratory: CSIRO, Clayton
Substrate: Concrete
Test Conditions: 21.5°C, 51.5% RH and 70°C
 In accordance with AS ISO 13007-2: 2013 - 4.4.4.4
Mix Ratios: 20kg cementitious tiles adhesive, 5.5liter of water

RESULTS:

Tensile adhesion strength after heat ageing

Sample No.	Total Load Newton Force (kN)	Tensile Strength (N/mm ²)	Tensile Strength (N/mm ²) within 20% mean	Failure Mode
1	2.85	1.32	1.32	77% CF-A & 23% AF-T
2	3.02	1.40	1.40	82% CF-A & 18% AF-T
3	2.91	1.35	1.35	82% CF-A & 18% AF-T
4	3.26	1.51	1.51	87% CF-A & 13% AF-T
5	3.26	1.51	1.51	64% CF-A & 36% AF-T
6	2.40	1.11	1.11	27% CF-A & 73% AF-T
7	2.80	1.30	1.30	60% CF-A & 40% AF-T
8	2.98	1.38	1.38	45% CF-A & 55% AF-T
9	2.97	1.38	1.38	36% CF-A & 64% AF-T
10	3.00	1.39	1.39	60% CF-A & 40% AF-T
Mean		1.36	1.4	

Failure Code: Adhesive failure between adhesive and substrate (AF-S), Adhesive failure between tile and substrate (AF-T), Cohesive failure within the adhesive (CF-A), Cohesive failure within the substrate or within the tile (CF-S or CF-T), See Failure mode informative annex.

Requirements:

Classification

Normal cementitious adhesives (C1): ≥ 0.5 N/mm²
 Improved cementitious adhesives (C2): ≥ 1.0 N/mm²

Tensile adhesion strength after heat ageing:

1.4 N/mm²

C2



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Part 2 Test methods for adhesives

Section 4.4.4.5 – Tensile adhesion strength after freeze-thaw cycle

Test Date: 3 September 2018

Laboratory: CSIRO, Clayton
Substrate: Concrete
Test Conditions: 21.6°C, 50% RH and Freeze-thaw cycle
 In accordance with AS ISO 13007-2: 2013 - 4.4.4.5
Mix Ratios: 20kg cementitious tiles adhesive, 5.5liter of water

RESULTS:

Tensile adhesion strength after freeze-thaw cycle

Sample No.	Total Load Newton Force (kN)	Tensile Strength (N/mm ²)	Tensile Strength (N/mm ²) within 20% mean	Failure Mode
1	0.56	0.26	0.26	36% CF-A & 64% AF-T
2	0.38	0.18	0.18	10% CF-A & 90% AF-T
3	0.51	0.24	0.24	9% CF-A & 91% AF-T
4	0.40	0.19	0.19	14% CF-A & 86% AF-T
5	0.46	0.21	0.21	4.5% CF-A & 95.5% AF-T
6	0.51	0.24	0.24	23% CF-A & 77% AF-T
7	0.47	0.22	0.22	3% CF-A & 97% AF-T
8	0.41	0.19	0.19	100% AF-T
9	0.53	0.25	0.25	36% CF-A & 64% AF-T
10	0.49	0.23	0.23	18% CF-A & 82% AF-T
Mean		0.22	0.2	

Failure Code: Adhesive failure between adhesive and substrate (AF-S), Adhesive failure between tile and substrate (AF-T), Cohesive failure within the adhesive (CF-A), Cohesive failure within the substrate or within the tile (CF-S or CF-T), See Failure mode informative annex.

Requirements:

Classification

Normal cementitious adhesives (C1): ≥ 0.5 N/mm²

Improved cementitious adhesives (C2): ≥ 1.0 N/mm²

Tensile adhesion strength after freeze-thaw cycle:

0.2 N/mm²

Nil



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Part 2 Test methods for adhesives

Section 4.5 – Determination of transverse deformation

Test Date: 3 September 2018

Laboratory: CSIRO, Clayton
Sample size: 300mm x 45mm x 3mm
Test Conditions: 21.5°C
 In accordance with AS ISO 13007-2: 2013 - 4.5.3.4
Rate: 2mm/min.
Mix Ratios: 20kg cementitious tiles adhesive, 5.5liter of water

RESULTS:

Determination of transverse deformation

Sample No.	Thickness t ₁ (mm)	Thickness t ₂ (mm)	Thickness t ₃ (mm)	Average Thickness t _f (mm)	Transverse deformation S (mm)
1	2.95	3.01	3.05	3.0	4.02
2	2.98	2.95	3.06	3.0	4.58
3	2.97	3.07	3.09	3.0	3.99
Mean					4.2

Requirements:

Classification

Deformable adhesive (S1): ≥ 2.5 mm, < 5 mm

Highly deformable adhesives (S2): ≥ 5 mm

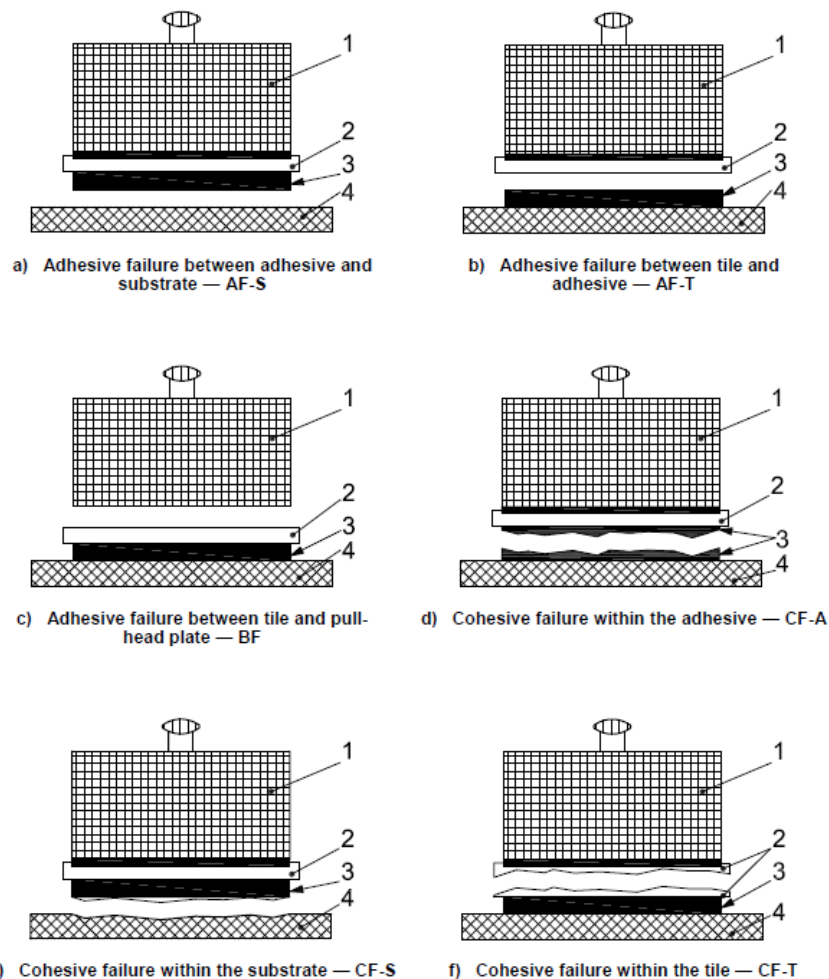
Determination of transverse deformation:

4.2mm

S1

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Informative annex from AS ISO 13007.2—2013:



- Key**
- 1 pull-head plate
 - 2 tile
 - 3 adhesive
 - 4 substrate (concrete slab)

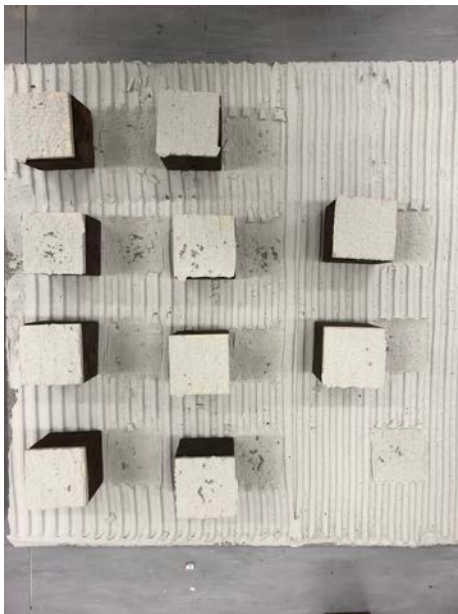
Figure 3 — Failure pattern

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Photos:

Tensile adhesion strength open time



Tensile adhesion strength

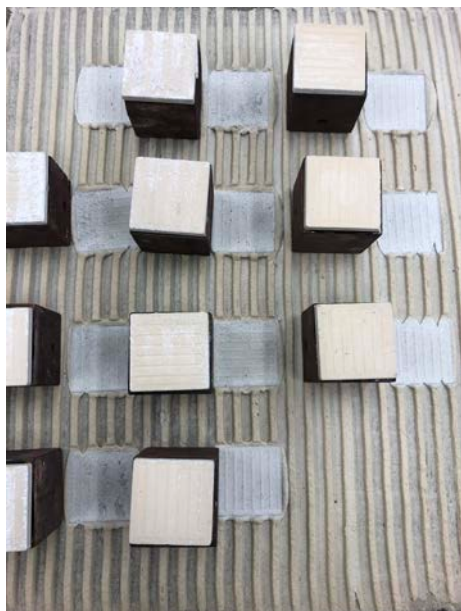


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Photos:

Tensile adhesion strength after water immersion



Tensile adhesion strength after heat ageing

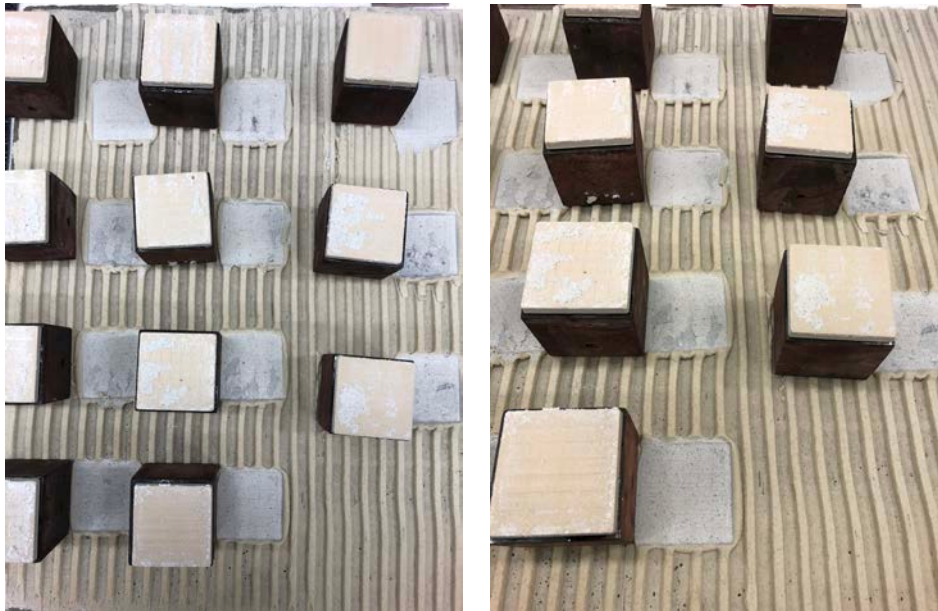


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Photos:

Tensile adhesion strength after freeze-thaw cycle





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Prepared on behalf of CSIRO by:

Name: Khanh Ho
Position: Research Project Officer
Date: 2 October 2018

Signature

A handwritten signature in black ink, appearing to read "Khanh Ho", is written over a large, faded, light grey circular watermark of the CSIRO logo.