

TEST REPORT REACTION TO FIRE TEST

Test Sponsor:

Golden Sheet Factory
7156 Tarib-Industrial Area, Unit 15
Duruma 19869-3972, Riyadh
T: +966 53 6303094
Website: www.mc-bond.com

Test Material / Assembly:

4mm thick Aluminum Composite Panel (ACP)

Test Standard:

ASTM E84 – 21a: Standard Test Method for Surface Burning Characteristics of Building Materials



**THOMAS BELL-WRIGHT
INTERNATIONAL CONSULTANTS**

Test Date: 21-Apr-22
Issue Date: 19-May-22
Test Reference No: WA110-1

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DUBAI

ABU DHABI

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Accreditation

Testing

ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories with:

United Kingdom Accreditation Service (UKAS) - Testing Laboratory: **4439**
www.ukas.com



GCC Accreditation Center (GAC) – Testing Laboratory: **ATL-0017**
www.GCC-accreditation.org



Memberships

Members of European Group of Organization for Fire Testing, Inspection and Certification

www.egolf.org.uk

Member of Association for Specialist Fire Protection

www.asfp.org.uk

Member of Centre for Window and Cladding Technology

www.cwct.co.uk



The work which is the subject of this report falls under the accreditations of **ISO 17025 UKAS** and **ISO 17025 GAC**.



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1. INTRODUCTION

Determination of the flame spread index and the smoke developed index of 4mm thick Aluminum Composite Panel (ACP) as per ASTM E84 – 21a; Standard Test Method for Surface Burning Characteristics of Building Materials.

2. SPONSOR

Name: Golden Sheet Factory
Address: 7156 Tarib-Industrial Area, Unit 15
Duruma 19869-3972, Riyadh
T: +966 53 6303094
Website: www.mc-bond.com

3. TESTING LABORATORY

Name: Thomas Bell-Wright International Consultants (TBWIC)
Address: Corner of 46th and 47th streets, Jebel Ali Industrial Area 1
P.O. Box 26385, Dubai, U.A.E.
T: +971 (0) 4 821 5777
www.bell-wright.com

4. DATE OF TEST

Sample received date: 14-Apr-22
Test date: 21-Apr-22

The test was not witnessed by the sponsor.



5. SPECIMEN DESCRIPTION

Note: The testing laboratory does not hold any responsibility for the information that has been provided by the test sponsor which could not be verified by the testing laboratory, as this could affect the validity of the test result. All information that could not be verified will be indicated by an asterisk () mark.*

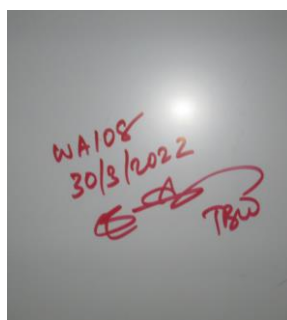
Product Tested		4mm thick Aluminum Composite Panel (ACP)*	
Product Name		MC-BOND*	
Manufacturer		Golden Sheet Factory – Dorma Industrial Area – Riyadh - Saudi Arabia *	
Product Description	Top Skin Coating	Reference Name	Becker PVDF/HDPE*
		Manufacturer	Becker*
		Thickness	28-28 μ * (stated)
		No. of Layers	2 layers* (stated)
		Area Weight	0.0425 kg/m ² * (stated)
	Primer	Reference Name	Becker Primer*
		Manufacturer	Becker*
		Thickness	5-7 μ * (stated)
		No. of Layers	1 layer* (stated)
		Area Weight	0.00852 kg/m ² * (stated)
	Aluminum Top Skin	Reference Name	Aluminum*
		Manufacturer	Alucopanel*
		Thickness	0.45mm* (stated)
		Area Weight	1.28 kg/m ² * (stated)
	Adhesive	Reference Name	Adhesive*
		Manufacturer	Napco national*
		Thickness	0.01mm* (stated)
		Area Weight	0.05 kg/m ² * (stated)
	Core	Reference Name	FR-Core*
		Manufacturer	MetalPlast industries F.Z. E*
		Thickness	3.22mm* (stated)
		Area Weight	4.7 kg/m ² * (stated)
	Adhesive	Reference Name	Adhesive*
		Manufacturer	Napco national*
Thickness		0.01mm* (stated)	
Area Weight		0.05 g/cm ² * (stated)	
Aluminum Back Skin	Reference Name	Aluminum*	
	Manufacturer	Aluco-panel ME*	
	Thickness	0.45mm* (stated)	
	Area Weight	1.28 kg/m ² * (stated)	
PE Coating	Reference Name	Becker Primer*	
	Manufacturer	Becker*	
	Thickness	5-7 μ * (stated)	
	No. of Layers	1 layer* (stated)	



	Area Weight	0.00852 kg/m ² * (stated)
Dimensions per panel	1225 x 600 x 4mm (l x w x t) (Measured by TBWIC)	
Quantity of panels	6 Nos.	
Total dimension	7350 x 600 x 4mm (l x w x t) (Measured by TBWIC)	
Area Weight	6.8 kg/m ² * (stated) 6.5 kg/m ² (Calculated by TBWIC)	
Density	1700 kg/m ³ * (stated) 1624.15 kg/m ³ (Calculated by TBWIC)	
Specimen placement	The 6 panels of 4mm thick Aluminum Composite Panel (ACP) were butt jointed end-to-end. The test specimen was placed directly to the tunnel ledges with the top surface towards the flame source.	

6. SPECIMEN VERIFICATION

TBWIC testing laboratory has not been involved in the selection or design of the specimen. However, the materials were selected, marked, and signed by TBWIC representative from TBWIC Certification Division (Certification Body) on 30-Mar-22 as shown below. The results apply to the samples as received.



Note: There are contexts where information has been provided by the sponsor and verification of information has been done through either technical datasheet or other document submission, or as indicated directly by the sponsor. For this reason, materials have been tested in an as-received condition and TBWIC bears no liability for the legitimacy of the submitted information.

7. METHOD OF TEST

7.1. Placing of test specimen

The test specimen consisted of 6 panels of 4mm thick Aluminum Composite Panel (ACP). The dimension per panel was 1225 x 600 x 4mm (l x w x t) and was butt jointed end-to-end. The total dimension of the specimen was 7350 x 600 x 4mm (l x w x t).

Several sections of cement board butt jointed end-to-end with overall dimensions of 7350 x 600mm (l x w), were placed at the back of the sample to protect the furnace lid assembly.

7.2. Test Method

The specimen was placed in the ceiling position, supported horizontally on the ledges of the Steiner Tunnel. The top surface was exposed face down to the ignition source during the 10-minute test duration.



Flame Spread and Smoke Density were measured, and the results were compared against standard calibration materials (fiber-cement board, heptane and red oak flooring).

7.3. Conditioning

After delivery on 14-Apr-22, the specimen was placed in a conditioned space where temperature and humidity were maintained between $23 \pm 2.8^{\circ}\text{C}$ and $50 \pm 5\%$ respectively, until constant weight was attained.

Note: There were deviations observed in the temperature and relative humidity in 4 separate probes of thermo-hygrometer in our conditioning room, however the average values were within the limit.

8. OBSERVATION

Test Data and Observation

Observations	Result
Ignition Time (min:sec)	1:30
Time to maximum flame front advance (min:sec)	9:16
Maximum flame spread (ft)	19.5
Time to end of tunnel reached (min:sec)	9:16
Maximum temp recorded at the exposed thermocouple located near the end of the tunnel ($^{\circ}\text{F} / ^{\circ}\text{C}$)	821/438
Dripping (min:sec)	None
Flaming on the floor (min:sec)	None
After flame on the top (min:sec)	None
After flame on the floor (min:sec)	None
Delamination (min:sec)	None
Sagging (min:sec)	None
Shrinkage (min:sec)	None
Fallout (min:sec)	None
FS*Time Area (ft*min)	72.76
Smoke Area (%A*min)	175.73
Heptane Smoke Area (%A*min)	85.7

9. SUMMARY OF RESULTS

The test specimen has been evaluated in accordance with ASTM E84 – 21a; Standard Test Method for Surface Burning Characteristics of Building Materials.

The test results are:

FLAME SPREAD INDEX (FSI)	35
SMOKE DEVELOPED INDEX (SDI)	200

Results are valid for the tested configuration only.



10. CLASSIFICATIONS

The following information is designed to help put these test results into context. Flame Spread Index and Smoke Developed Index results from an ASTM E84 test are often used by regulatory agencies to approve materials for various applications. For example, the International Building Code 2021, Section 803.1.2 requires that:

Interior wall and ceiling finish materials shall be classified in accordance with ASTM E84 or UL 723-11th Ed. 2021. Such interior finish materials shall be grouped in the following classes in accordance with their flame spread and smoke-developed indices.

Class A: Flame spread index 0 - 25; smoke-developed index 0 - 450.

Class B: Flame spread index 26 - 75; smoke-developed index 0 - 450.

Class C: Flame spread index 76 - 200; smoke-developed index 0 - 450.

Note that the above example is the IBC requirement for interior wall and ceiling finishes only; the application of the tested specimen may differ.



11. LIMITATIONS

Testing of materials that melt, drip, or delaminate to such a degree that the continuity of the flame front is destroyed, results in low flame spread indices that do not relate directly to indices obtained by the testing materials that remain in place.

Thomas Bell-Wright International Consultants recommend that the relevance of test reports should be considered after a period of five years.

This test report is respectfully submitted by: Thomas Bell-Wright International Consultants

Prepared/Tested By:

Sarah Shaheir
Junior Fire Testing Engineer

Reviewed By:

Fredilyn Paragoso
Fire Testing Support Engineer

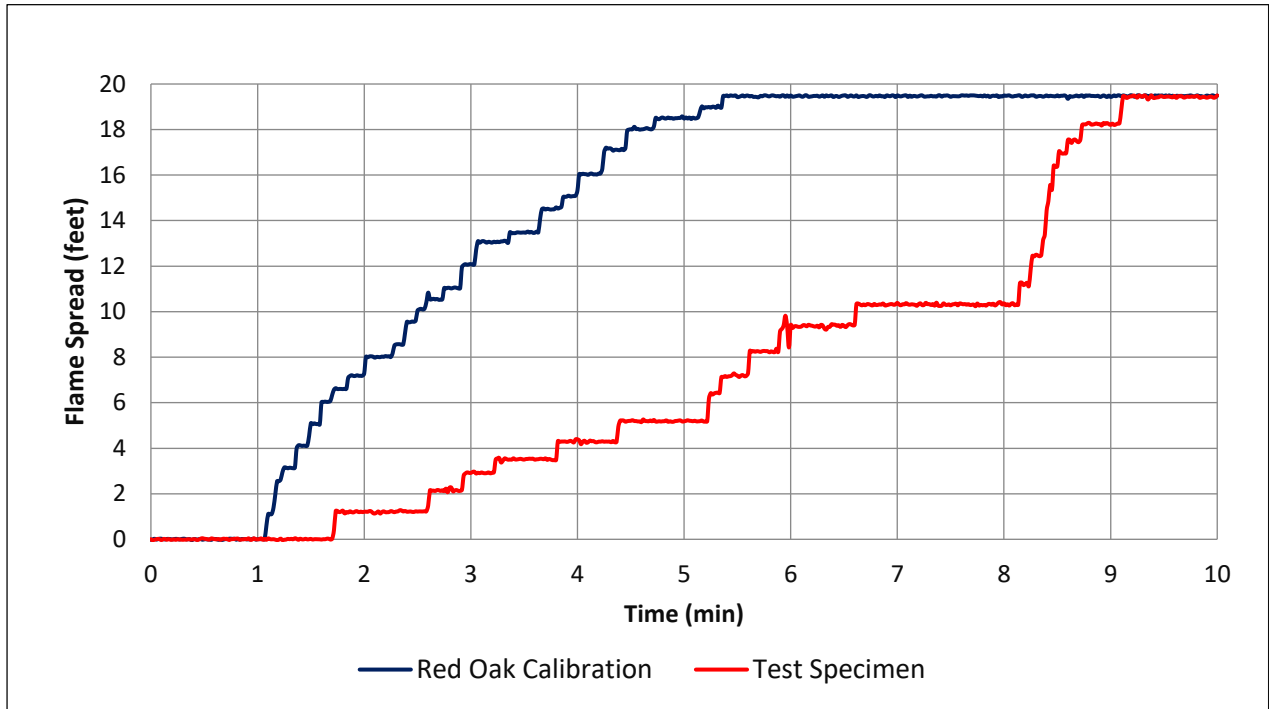
Approved By:

Suketa Tyagi
Reaction to Fire - Manager

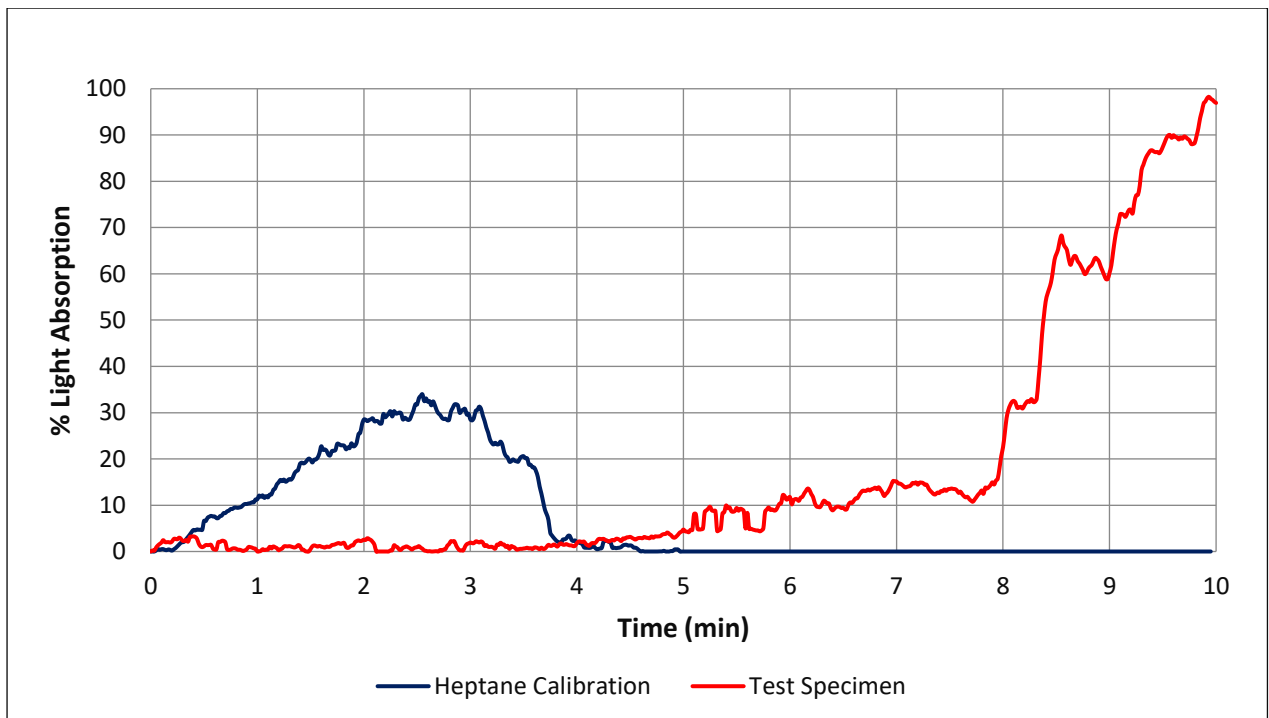




12. APPENDIX 1 – GRAPHS



Graph 1: Flame Spread Index (FSI)



Graph 2: Smoke Developed Index (SDI)



13. APPENDIX 2 – PICTURES



Photo 1: Specimen before the test.
(Non-Fire Side)



Photo 2: Specimen before the test.
(Fire Side)



Photo 3: Specimen after the test.
(As seen from the fire-end)



Photo 4: Specimen after the test.
(As seen from the exhaust end)

----- End of Test Report -----



ميديل ايسست لخدمات الفحص ذ.م.م.
Middle East Testing Services L.L.C.

TEST REPORT

Report No.: METS-R I 857/2019

Client / Establishment : M/s. Motabaqah Inspection & Certification Services L.L.C
P.O. Box: 25639, Sheikh Zayed Road, Dubai
United Arab Emirates

Sample ID : METS-S-I 857
Sample Receiving Date : 27/11/2019
Reporting Date : 08/12/2019
Date of Analysis : 27/11/2019-08/12/2019
Tested by : AJ/SC
Issue No : 01 (Re-Issue Date: NA)

Sample Information:

Sample Description : Aluminum Composite Panel (MC bond)
Sample reference : CR 1110000457

Brief Evaluation of the Results

	Test	Compliance*
METS-S-I 857	Physico-Chemical Analysis	Pass

#The product complies with SASO 2752:2018 specification limit

The corresponding test results are furnished in following page

Verified by

Rasmi

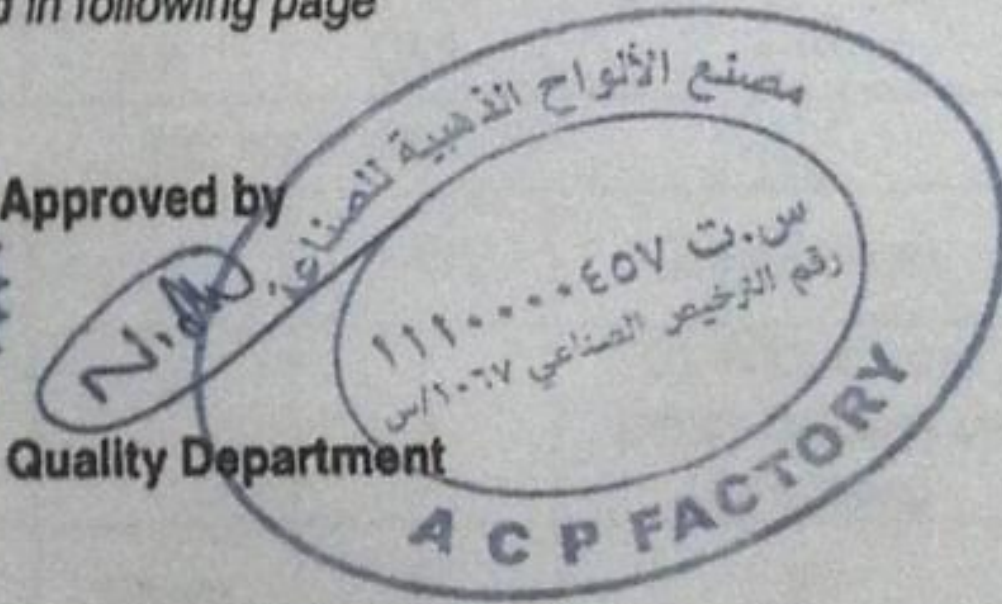
Dr. Rasmi Krishnakumar, Ph. D
Chemist



Approved by

N. Al...

Quality Department



The above test results are only applicable to the sample (s) referred above. This report shall not be reproduced except in full, without the written approval of METS laboratory.

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Issue No: 2

Form MRF 27



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Middle East Testing Services L.L.C.

Report No.: METS-R I 857/2019
Date of analysis: 27/11/2019-08/12/2019

Test Results:

Parameter		Test Method	Unit	Result	Specification Limit: SASO 2752:2018
Dimension ¹	Length	SASO 2752:2018	cm	30	-
	Width	SASO 2752:2018	cm	30	-
	Thickness	SASO 2752:2018	mm	4.24	-
Appearance	Visual	-	Pass	Shall free from scratch, stains, concaves and convexes.	
Core mechanical properties requirements					
Tensile Strength		ASTM D 638-14	MPa	34.29	30 Min
Flexural Bending Strength		ASTM D 790-17	MPa	76	70 Min
Flexural Elastic Modulus		ASTM D 790-17	MPa	6785	1200 Min
Shear strength by punch		ASTM D 732:2017	MPa	36.20	30 Min
180° Peel strength		SASO ISO 8510-2:2008	N/mm	14.1	9.0 Min
Thermal properties (core thermal properties)					
Heat Deflection Temperature		ASTM D 638-14	°C	118	85 Min
Linear Thermal Expansion Coefficient		ASTM D 638-14	µm/m°C	170	200 Max
Thermal Resistance (R Value)		SASO ASTM C 518-17	k.m ² /w	0.25	0.2 Min
Coefficient of Thermal Conductivity (µ Value)		SASO ASTM C 518-17	w/m ² .k	0.09	4.5 Max
Self-ignition temperature		SASO ASTM D 1929:2015	°C	361	343 Min
Panel coating requirements					
Coating thickness, µm (External Wall)		SASO 2752:2018	µm	33.3	≥25
Gloss deviation		Not applicable			
Pencil hardness		SASO GSO ISO 15184:2015	-	F-4H	2H minimum
Coating Flexibility (External Wall)		ISO 17132:2007	-	3	≥2 Without any cracks damage on the coating
Adhesion Grade		SASO ISO 2409:2013	Grade	0 ²	≥1
Impact resistance(kg.cm)		SASO ISO 6272-2:2014	-	No peel off and cracks observed	Shall not be any peel off and cracks

Form MRF 27 Issue No: 2





ميديل ايست لخدمات الفحص ذ.م.م.
Middle East Testing Services L.L.C.

Report No.: METS-R I 857/2019

Date on analysis: 27/11/2019-08/12/2019

Test Results:

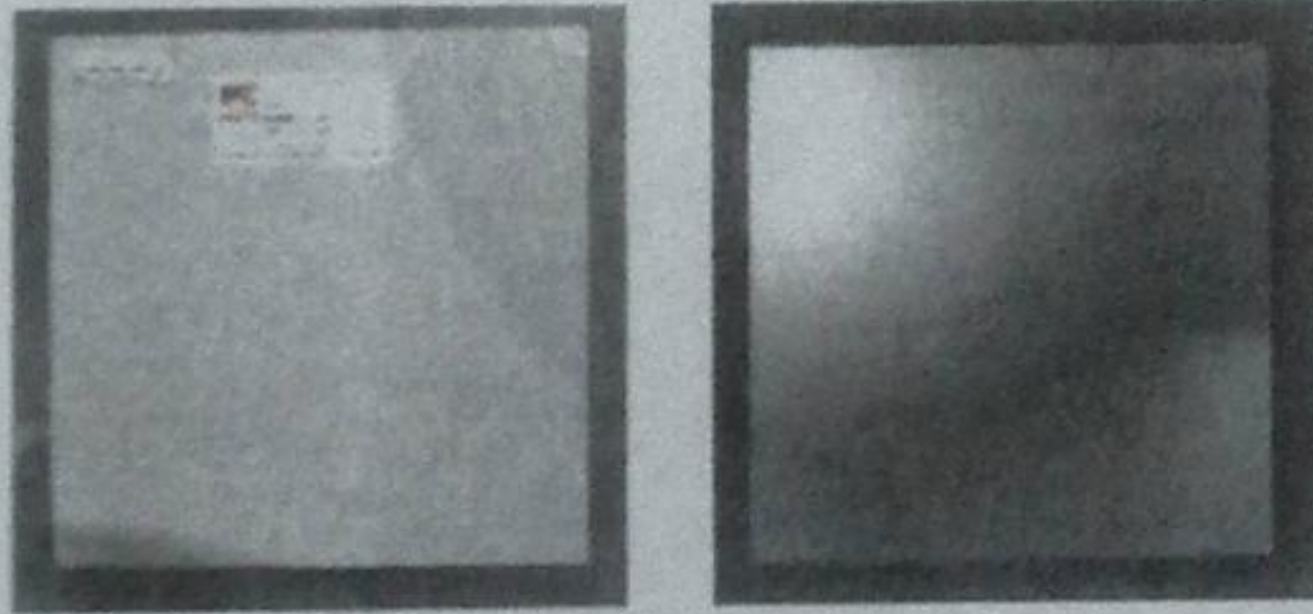
Parameter	Test Method	Unit	Result	Specification Limit: SASO 2752:2018
Abrasion resistance	SASO 2752/2018	L μ m	>2	≥ 2
Hot water resistance	SASO ISO 2812-2:2014	-	Resistant	Shall be resistant
Stain resistance	SASO ISO 11997-1:2007	%	10	15 max
Accelerated weathering (100 hrs)	SASO 2752/2018	-	No specific change or discoloration	No change
Gloss deviation	SASO 2752/2018	Degree	0	-
Brush resistance	SASO ISO 11998:2007	-	Resistant	Shall be resistant
Chemical Resistance				
Acid resistance	ASTM D 1308-02 (2013)	-	Resistant	Shall be resistant
Alkali resistance	ASTM D 1308-02 (2013)	-	Resistant	Shall be resistant
Oil resistance	ASTM D 1308-02 (2013)	-	Resistant	Shall be resistant
Solvent resistance	ASTM D 2248-01a (2018)	-	Resistant	Shall be resistant

Note

*1 Other sizes tolerance is depending on mutual agreement between customer, design engineer, and the manufacturer.

*2 The edges of the cuts are completely smooth, none of the squares of the lattice is detached.

Image of tested Specimen



Issue No: 2

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