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LIGHT STAR

GREENGUARD CERTIFICATION TEST REPORT

Customer Information	SHANDONG SUNFULL INDUSTRIAL CO., LTD. MS.SARAH ECONOMIC DEVELOPMENT ZONE PENGLAI SHANDONG CHINA	
Product Description	COMPACT (Phenolic), 2.0mm to 25mm Thickness	
Test Group	Surfacing Materials - 01 (Laminate) (Formerly Penglai Huasheng)	
Category	Surfacing Materials	
Test Type	Certification	Year 8
Test Method	UL 2821 "GREENGUARD Certification Program Method for Measuring and Evaluating Chemical Emissions From Building Materials, Finishes and Furnishings Using Dynamic Environmental Chambers"	

	Environment	TVOC	Formaldehyde	Total Aldehydes	CREL/TLV
GREENGUARD	Office	✓	✓	✓	✓
GREENGUARD Gold	Office	✓	✓	✓	✓
	Classroom	✓	✓	✓	✓

✓ - meets criteria; X - over criteria

Authorized by

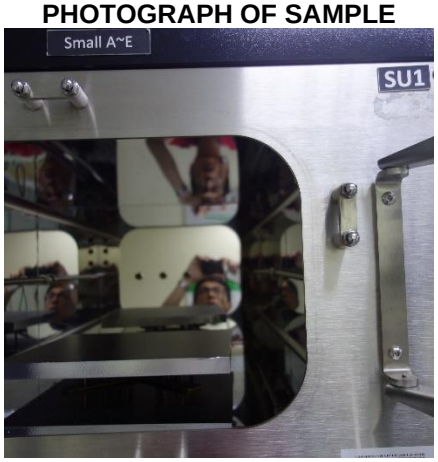
Ring Zhong
Laboratory Testing Supervisor

MODELING FOR PREDICTED AIR CONCENTRATION

Certification Program	Environment Basis	Modeling Basis	Surface Area (m^2)	Room Volume (m^3)	ACH (1/hr)
GREENGUARD and GREENGUARD Gold Office	CDPH/EHLB/Standard Method	Surfacing materials	6.4	30.6	0.68
GREENGUARD Gold Classroom	CDPH/EHLB/Standard Method	Surfacing materials	24.6	231	0.82

Note that certain environments and/or modeling scenarios may prevent assessment of low level CREL and TLV analytes due to the emissions being below the lower LOQ (0.04 µg). For example, benzene ½ CREL is 1.5 µg/m^3.

PHOTOGRAPH OF SAMPLE



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GREENGUARD RESULTS SUMMARY

Product Description	COMPACT (Phenolic), 2.0mm to 25mm Thickness		
GREENGUARD Acceptable IAQ Criteria		**168 Hour Product Measurement**	**Product Compliance for IAQ**
TVOC[a]	≤ 0.25 mg/m³	< 0.001 mg/m³	Yes
Formaldehyde	≤ 0.025 ppm	0.004 ppm	Yes
Total Aldehydes[b]	≤ 0.05 ppm	0.004 ppm	Yes
4-Phenylcyclohexene	≤ 0.0033 mg/m³	< 0.001 mg/m³	Yes
Individual VOCs	all ≤ 1/10 TLV	----------[c]	Yes

[a] "TVOC" is the sum of all VOCs measured via TD/GC/MS which elute between n-hexane (C_6) and n-hexadecane (C_{16}) quantified using calibration to a toluene surrogate.
[b] "Total Aldehydes" is the sum of all measured normal aldehydes from formaldehyde to nonanal, plus benzaldehyde. Heptanal through nonanal are analyzed using TD/GC/MS. The remaining aldehydes are analyzed using HPL/UV methodology. All aldehydes are quantified to authentic standards.
[c] All individual VOCs detected met the criteria of less than 1/10 the ACGIH established threshold limit values (TLVs).

PROJECT DESCRIPTION

This study was conducted using a UL Environment's GREENGUARD test method following the requirements of GREENGUARD Certification program. The product was monitored for emissions of total volatile organic compounds (TVOC), formaldehyde, target list aldehydes, and other individual volatile organic compounds (VOCs) over a 168 hour exposure period. These emissions were measured and the resultant air concentrations were determined for each of the potential pollutants. Determination of compliance is based on predicted air concentrations modeled using the GREENGUARD program room loading.

Report Outline:

Table 1	Environmental Chamber Study Parameters
Table 2	Emission Factors and Predicted Air Concentrations
Table 3	Chamber Concentrations of Identified VOCs
Table 4	Emission Factors of Identified VOCs
Table 5	Chamber Concentrations of Target List Aldehydes
Table 6	Emission Factor of Target List Aldehydes
Table 7	Supplemental Emissions Information
Chain of Custody	Chain of Custody
Appendix 1	GREENGUARD Gold Results Summary

Download more information regarding UL's technical references and resources, product evaluation methodologies information, quality control program, and environmental chamber evaluations from our website click here or https://www.ul.com/offerings/greenguard-certification

For RSD, Quality Assurance Report or other quality documents, Request here or contact ULE.

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TABLE 1

ENVIRONMENTAL CHAMBER STUDY PARAMETERS			
Product Description	COMPACT (Phenolic), 2.0mm to 25mm Thickness		
Product Manufacture Date	September 1, 2020		
Product Collection Date	September 10, 2020		
Product Shipping Date	September 13, 2020		
Date Received	November 16, 2020		
Test Description	The product was received by ULE Guangzhou Laboratory as packaged and shipped by the customer. The package was visually inspected and stored in a controlled environment immediately following sample check-in. Just prior to loading, the product was unpackaged and prepared for the required loading to expose the finished surfaces only. The sample was placed inside the environmental chamber, and tested according to the specified protocol.		
Test Period	November 18, 2020 - November 25, 2020**		
Area	two-sided area = 0.1800 m^2		
Environmental Chamber ID and Volume	SU1 - 0.0894 m^3		
Product Loading	2.01 m^2/m^3		
Test Conditions	1.00 ± 0.05 ACH 50% RH ± 5% RH 22.0ºC - 23.0ºC		
***Accredited Laboratory Locations**	**Testing Laboratory**	**Analytical Laboratory**	**Technical Reporting Location**
	ULE - Guangzhou	ULE - Guangzhou	ULE - Guangzhou

**The manufacturing date was not within 10 days of receipt and testing of product.
The temperature range specification is 23°C ± 1°. The actual temperature range listed above may vary slightly. If the range is outside this specification, data was reviewed to ensure a negative impact did not occur.

*Accredited Laboratory Locations	
Location	**Address**
ULE - Marietta	UL Environment 2211 Newmarket Parkway, Marietta, GA 30067-9399 USA
ULE - Guangzhou	UL Verification Services (Guangzhou) 1-3F & Room 501, Building 2 (R&D Center A1), No. 25, South Huanshi Avenue, Nansha District, Guangzhou 511458, China
ULE - Cabiate	UL International Italia S.r.l ATTN: IAQ Laboratory Via Europa, 9, I – 22060 – Cabiate (Como), Italia
ULE - Vietnam	UL VS (VIET NAM) CO. LTD., Lot C5, Conurbation 2, Street K1, Cat Lai Industrial Zone, Thanh My Loi Ward, District 2, Ho Chi Minh City, Vietnam
UL - Shimadzu	Shimadzu Techno-Research, Inc. 1, Nishinokyo-Shimoaicho Nakagyo-ku, Kyoto 604-8436 Japan
KCL	Korea Conformity Laboratories #805, I-Valley, 149 Gongdan-ro Gunpo-si, Gyeonggi-do, 15849 Korea

This test is accredited under the laboratory's ISO/IEC 17025 accreditation issued by International Accreditation Service. Refer to certificate and scope of accreditation TL-441.

This test report is for intended use in certification programs.

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TABLE 2

Product Description	COMPACT (Phenolic), 2.0mm to 25mm Thickness		
TVOC CHAMBER CONCENTRATIONS, EMISSION FACTORS AND PREDICTED AIR CONCENTRATIONS			
Elapsed Exposure Hour*	**Chamber Concentration µg/m³**	**Emission Factor µg/m²•hr**	**Predicted Air Concentration** µg/m³**
0 (Background)	BQL	BQL	---
6	3.9	1.9	< 1
24	2.8	1.4	< 1
48	NA	NA	NA
72	2.9	1.4	< 1
96	3.0	1.5	< 1
168	2.9	1.4	< 1
Power Law Decay Constant = k_T = 0			

FORMALDEHYDE CHAMBER CONCENTRATIONS, EMISSION FACTORS AND PREDICTED AIR CONCENTRATIONS				
Elapsed Exposure Hour*	**Chamber Concentration µg/m³**	**Emission Factor µg/m²•hr**	**Predicted Air Concentration****	
			µg/m³	**ppm**
0 (Background)	BQL	BQL	---	---
6	55.0	27.3	8	0.007
24	45.0	22.4	7	0.006
48	39.5	19.6	6	0.005
72	35.5	17.6	5	0.004
96	34.3	17.0	5	0.004
168	29.4	14.6	4	0.004
Power Law Decay Constant = k_F = 0.213				

TARGET LIST ALDEHYDES CHAMBER CONCENTRATIONS, EMISSION FACTORS AND PREDICTED AIR CONCENTRATIONS				
Elapsed Exposure Hour*	**Chamber Concentration µg/m³**	**Emission Factor µg/m²•hr**	**Predicted Air Concentration****	
			µg/m³	**ppm**
0 (Background)	BQL	BQL	---	---
6	55.0	27.3	8	0.007
24	45.0	22.4	7	0.006
48	39.5	19.6	6	0.005
72	35.5	17.6	5	0.004
96	34.3	17.0	5	0.004
168	29.4	14.6	4	0.004
Power Law Decay Constant = k_A = 0.213				

*Exposure hours are nominal (± 1 hour).
BQL = Below quantifiable level of 0.04 µg based on a standard 18 L air collection volume for VOCs and 0.1 µg based on a standard 45 L air collection volume for aldehydes.

**Predicted Air Concentrations are based on GREENGUARD modeling predicted concentration parameters. For more information click here.
NA: data not available due to instrument malfunction.

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TABLE 3

Product Description	COMPACT (Phenolic), 2.0mm to 25mm Thickness						
CHAMBER CONCENTRATIONS OF IDENTIFIED INDIVIDUAL VOLATILE ORGANIC COMPOUNDS							
CAS Number	**Compound**	**Elapsed Exposure Hour (µg/m³)**						
		0 (BG)	**6**	**24**	**48**	**72**	**96**	**168**
108-95-2	Phenol†		6.0	4.3	NA	4.4	4.6	4.4

TABLE 4

Product Description	COMPACT (Phenolic), 2.0mm to 25mm Thickness						
EMISSION FACTORS OF IDENTIFIED INDIVIDUAL VOLATILE ORGANIC COMPOUNDS							
CAS Number	**Compound**	**Elapsed Exposure Hour (µg/m²•hr)**					
		6	**24**	**48**	**72**	**96**	**168**
108-95-2	Phenol†	3.0	2.2	NA	2.2	2.3	2.2

*Indicates NIST/EPA/NIH best library match only based on retention time and mass spectral characteristics.
†Denotes quantified using multipoint authentic standard curve. Other VOCs quantified relative to toluene.
Quantifiable level is 0.04 µg based on a standard 18 L air collection volume.
NA: data not available due to instrument malfunction.

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TABLE 5

Product Description	COMPACT (Phenolic), 2.0mm to 25mm Thickness

CHAMBER CONCENTRATIONS OF TARGET LIST ALDEHYDES

CAS Number	Compound	Elapsed Exposure Hour (µg/m³)						
		0 (BG)	6	24	48	72	96	168
4170-30-3	2-Butenal	BQL	BQL	BQL	BQL	BQL	BQL	BQL
75-07-0	Acetaldehyde	BQL	BQL	BQL	BQL	BQL	BQL	BQL
100-52-7	Benzaldehyde	BQL	BQL	BQL	BQL	BQL	BQL	BQL
5779-94-2	Benzaldehyde, 2,5-dimethyl	BQL	BQL	BQL	BQL	BQL	BQL	BQL
529-20-4	Benzaldehyde, 2-methyl	BQL	BQL	BQL	BQL	BQL	BQL	BQL
620-23-5 /104-87-0	Benzaldehyde, 3- and/or 4-methyl	BQL	BQL	BQL	BQL	BQL	BQL	BQL
123-72-8	Butanal	BQL	BQL	BQL	BQL	BQL	BQL	BQL
590-86-3	Butanal, 3-methyl	BQL	BQL	BQL	BQL	BQL	BQL	BQL
50-00-0	Formaldehyde	BQL	55.0	45.0	39.5	35.5	34.3	29.4
66-25-1	Hexanal	BQL	BQL	BQL	BQL	BQL	BQL	BQL
110-62-3	Pentanal	BQL	BQL	BQL	BQL	BQL	BQL	BQL
123-38-6	Propanal	BQL	BQL	BQL	BQL	BQL	BQL	BQL

TABLE 6

Product Description	COMPACT (Phenolic), 2.0mm to 25mm Thickness

EMISSION FACTORS OF TARGET LIST ALDEHYDES

CAS Number	Compound	Elapsed Exposure Hour (µg/m²•hr)					
		6	24	48	72	96	168
4170-30-3	2-Butenal	BQL	BQL	BQL	BQL	BQL	BQL
75-07-0	Acetaldehyde	BQL	BQL	BQL	BQL	BQL	BQL
100-52-7	Benzaldehyde	BQL	BQL	BQL	BQL	BQL	BQL
5779-94-2	Benzaldehyde, 2,5-dimethyl	BQL	BQL	BQL	BQL	BQL	BQL
529-20-4	Benzaldehyde, 2-methyl	BQL	BQL	BQL	BQL	BQL	BQL
620-23-5 /104-87-0	Benzaldehyde, 3- and/or 4-methyl	BQL	BQL	BQL	BQL	BQL	BQL
123-72-8	Butanal	BQL	BQL	BQL	BQL	BQL	BQL
590-86-3	Butanal, 3-methyl	BQL	BQL	BQL	BQL	BQL	BQL
50-00-0	Formaldehyde	27.3	22.4	19.6	17.6	17.0	14.6
66-25-1	Hexanal	BQL	BQL	BQL	BQL	BQL	BQL
110-62-3	Pentanal	BQL	BQL	BQL	BQL	BQL	BQL
123-38-6	Propanal	BQL	BQL	BQL	BQL	BQL	BQL

Quantifiable level is 0.1 µg is based on a standard 45 L air collection volume.

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TABLE 7

SUPPLEMENTAL EMISSIONS INFORMATION

The table below represents this product's identified chemical emissions found on certain regulatory lists. This list only provides a statement regarding possible health effects associated with this compound and not the relative risks of exposure. Proper interpretation of the risks associated with exposure to a given regulated compound requires a more detailed evaluation of toxicological activity. Certain purchasing programs may require this information be submitted.

Product Description	COMPACT (Phenolic), 2.0mm to 25mm Thickness						
CAS Number	**Compound**	**✓() = FOUND IN LISTING (CLASS)**					
		CAL PROP. 65	**NTP**	**IARC**	**CAL AIR TOXICS**	**CREL**	**TLV**
50-00-0	Formaldehyde	✓(1)	✓(2A)	✓(1)	✓(IIA)	✓	✓
108-95-2	Phenol†			✓(3)	✓(IIA)	✓	✓

†Denotes quantified using multipoint authentic standard curve

CAL Prop. 65: California Health and Welfare Agency, Proposition 65 Chemicals
1 = known to cause cancer
2 = known to cause reproductive toxicity

NTP: National Toxicology Program
2A = known to be carcinogenic to humans
2B = reasonably anticipated to be carcinogenic to humans

IARC: International Agency on Research of Cancer
1 = carcinogenic to humans
2A = probably carcinogenic to humans
2B = possibly carcinogenic to humans
3 = unclassifiable as to carcinogenicity to humans
4 = probably not carcinogenic to humans

California Air Toxics
I = Substances identified as Toxic Air Contaminants, known to be emitted in California, with a full set of health values reviewed by the Scientific Review Panel.
IIA = Substances identified as Toxic Air Contaminants, known to be emitted in California, with one or more health values under development by the Office of Environmental Health Hazard Assessment for review by the Scientific Review Panel.
IIB= Substances NOT identified as Toxic Air Contaminants, known to be emitted in California, with one or more health values under development by the Office of Environmental Health Hazard Assessment for review by the Scientific Review Panel.
III = Substances known to be emitted in California and are NOMINATED for development of health values or additional health values.
IVA = Substance identified as Toxic Air Contaminants, known to be emitted in California and are TO BE EVALUATED for entry into Category III.
IVBA =Substance NOT identified as Toxic Air Contaminants, known to be emitted in California and are TO BE EVALUATED for entry into Category III.
V = Substance identified as Toxic Air Contaminants, and NOT KNOWN TO BE EMITTED from stationary source facilities in California based on information from the AB 2588 Air Toxic "Hot Spots" Program and the California Toxic Release Inventory.
VI = Substances identified as Toxic Air Contaminants, NOT KNOWN TO BE EMITTED from stationary source facilities in California, and are active ingredients in pesticides in California.

CREL: California Office of Environmental Health's Hazard Assessment (OEHHA), Chronic Reference Exposure Levels
✓ = Found in Listing

ACGIH TLV American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents.
✓ = Found in Listing.

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CHAIN OF CUSTODY

SF108165689720

2

90510

INTERNAL Use Only			
Project #	1001066065		
Product #	3402506		
Order #	13558602		
Task Line	2.1	UL BU	WL US
__ of __			

3402506

3402506

Description
COMPACT (Phenolic), 2.0mm to 25mm Thickness

Customer: SHANGDONG SUNFU.. INDUSTRIAL CO
Received Date: 2020-NOV-16 03:50:46 PM
Aurora Project No.: 1001066065
Order No.: 13558602
Oracle Project No.:

1 of 1

☐ *Rush Request – Subject to upcharge. Customer must confirm with UL prior to submitting product.*

GREENGUARD Test Information

Test Type	☒ Certification Test • Annual/Initial Year 8	☐ Out-of-Scope Test
	☐ Quarterly Test • Year Quarter	☐ Profile Study Test
Service Line	☒ GREENGUARD ☒ GREENGUARD GOLD ☐ Other	
Test Group	Surfacing Materials - 01(Surfacing Materials - 01(Laminate) (formerly Penglai Huasheng)	
Product Category	Surfacing Materials	**Subcategory**
Application	☐ Floor/Ceiling ☐ Panel ☐ Wall ☐ Work Surface ☐ Other:	
Wet Products Only	Coverage Rate	Density / Specific Gravity

Product and Company Information

Product Description	COMPACT (Phenolic), 2.0mm to 25mm thickness		
Manufacture ID#			
Company Name	Shandong Sunfull Industrial Co.,Ltd	**Date Manufactured** mm/dd/yyyy	09/01/2020
		Contact Name	Ms. Sarah
Address		**Job Title**	
		Contact Phone	
		Contact Email	huasheng@hec-genor.com

Collection Information

Collector Name		**Date Collected** mm/dd/yyyy	09/10/2020
Collector Phone		**Time Collected**	
Collector Signature		**Collection Location**	

Shipping Information

Carrier			
Shipper Name		**Date Shipped** mm/dd/yyyy	09/18/2020
Shipper Phone		**Time Shipped**	
Shipper Signature		**Air Bill #**	

Sample Submitted to

☐ UL Environment (Marietta) 2211 New Market Pkwy Suite 105 Marietta, GA 30067, USA	☐ UL Verification Services (Guangzhou) Building A1, 3F, Nansha Science and Technology Innovation Ctr No. 25, South Huanshi Avenue, Nansha District, Guangzhou [illegible], China	☐ UL International Italia S.r.l ATTN: IAQ Laboratory Via Europa, 3 I – 22060 – Cabiate (Como), Italia	☐ UL VS (Vietnam) Co., Ltd Lot C5, Cornerstone 2, Street K1, Cat Lai Import Zone Thanh My Loi Ward, District 2 Ho Chi Minh City, Vietnam

Post Testing Sample Disposition

(Samples will be disposed of 30 days after report is issued if information below is not provided)

Return Shipping Co.		**Customer Shipping Acct #**	

Internal Use Only - Receiving Information

Receiver Name		Receiver Signature	UL
Condition Upon Arrival	☑ Acceptable ☐ Not Acceptable	Receive Date	2020.11.16
Condition Notes		Receive Time	9:30
Completed By	ULE	Based On Program Testing Schedule	Date 08/17/2020

05-EN-F0503 – Issue 8.0

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APPENDIX 1

GREENGUARD GOLD RESULTS SUMMARY

Product Description	COMPACT (Phenolic), 2.0mm to 25mm Thickness			
COMPLIANCE WITH GREENGUARD GOLD STANDARD				
GREENGUARD Gold Acceptable IAQ Criteria		**168 Hour Predicted Concentration****		**Product Compliance for IAQ**
		Office	**Classroom**	
TVOC	**≤ 0.22 mg/m³**	< 0.001 mg/m³	< 0.001 mg/m³	Yes
Formaldehyde	**≤ 0.0073 ppm**	0.0037 ppm	0.0015 ppm	Yes
Total Aldehydes	**≤ 0.043 ppm**	< 0.001 ppm	< 0.001 ppm	Yes
1-Methyl-2-Pyrrolidinone	**≤ 0.16 mg/m³**	< 0.001 mg/m³	< 0.001 mg/m³	Yes
Individual VOCs	**≤ 1/100 TLV and ≤ ½ chronic REL**	See Below		

**Predicted Air Concentrations are based on GREENGUARD Gold modeling predicted concentration parameters.

TOP TEN MOST ABUNDANT IDENTIFIED VOCS, INCLUDING ALDEHYDES					
CAS Number	**Compound**	**168 Hour Chamber Concentration (µg/m³)**	**168 Hour Emission Factor (µg/m²•hr)**	**Predicted Air Concentration** (µg/m³)**	
				Office	**Classroom**
50-00-0	Formaldehyde‡	29.4	14.6	4	2
108-95-2	Phenol†	4.4	2.2	1	0.3

CHEMICALS OF CONCERN WITH EXISTING TLV, CREL, CA PROP 65 OR CAL TOXIC AIR CONTAMINANT VALUES									
CAS Number	**Compound**	**168 Hour Chamber Concentration (µg/m³)**	**168 Hour Emission Factor (µg/m²•hr)**	**168 Hour Predicted Concentration** (µg/m³)**		**✓ INDICATES PRESENCE ON LIST**			
				Office	**Classroom**	**CA PROP 65**	**CA TAC**	**CA CREL**	**ACGIH TLV**
50-00-0	Formaldehyde‡	29.4	14.6	4	2	✓(1)	✓(IIA)	✓	✓
108-95-2	Phenol†	4.4	2.2	1	0.3		✓(IIA)	✓	✓

COMPARISON OF COMPOUNDS FOUND WITH EXISTING TLV AND/OR CHRONIC REL						
CAS Number	**Compound**	**1/100 TLV[a] (µg/m³)**	**½ CA Chronic REL[b] (µg/m³)**	**168 Hour Predicted Concentration** (µg/m³)**		**Product Compliance**
				Office	**Classroom**	
108-95-2	Phenol	190	100	1	0.3	Yes

[a]American Conference of Governmental Industrial Hygienists. Threshold Limit Values for Chemical Substances and Physical Agents. Cincinnati, OH: ACGIH.
[b]Chronic Reference Exposure Levels (CRELs) adopted by the State of California Office of Environmental Health Hazard Assessment (OEHHA).
†Denotes quantified using multipoint authentic standard curve. Other VOCs quantified relative to toluene.
‡Indicates compound identified and quantified by DNPH derivitization and HPLC/UV analysis with multipoint authentic standard.
*Identification based on NIST mass spectral database only.
**Predicted Air Concentrations are based on modeling predicted concentration parameters shown above.

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