

## TEST REPORT

(This Report is issued subject to the terms & conditions set out below)

**SetSCO Services Pte Ltd**  
18 Teban Gardens Crescent  
Singapore 608925  
Tel : (65) 6566 7777  
Fax: (65) 6566 7718  
www.setsco.com  
Business Reg. No. 196900269D

Your reference No. : —  
Our reference No. : FB8500150567/1

Page 1 of 2

### BACTERIAL FILTRATION EFFICIENCY (BFE) TEST

**Date** : 16/03/2021

**Date Sample Received** : 08/03/2021

**Date Sample Analyzed** : 11/03/2021

**Tested For:** **Yeap Medical Supplies Pte Ltd**  
11 Yishun Industrial St 1  
#06-91 Northspring Bizhub  
Singapore 768089  
**Attn: Christopher**

**Sample Description:**  
3-Ply Surgical Masks



**Test Method:**

ASTM F2100 – 19 Standard Test Method for Evaluating the Bacterial Filtration Efficiency (BFE) of Medical Face Mask Materials, Using a Biological Aerosol of *Staphylococcus aureus*.

**Area of test specimen tested:** Approximately 100 cm<sup>2</sup>

**Area contacting with the bacterial challenge:** Inner surface of the mask

**Flow rate:** 28.3 L/min

DR WU JIEN  
HOD, MICROBIOLOGY

**BIOLOGICAL & CHEMICAL TECHNOLOGY DIVISION**

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**Results:**

Test sample / Controls	Stage 1, CFU	Stage 2, CFU	Stage 3, CFU	Stage 4, CFU	Stage 5, CFU	Stage 6, CFU	Sum of plate count for each stage, CFU	Average plate count of the controls, CFU	Mean Particle Size <sup>1</sup> (µm) <sup>1</sup>	BFE (%) <sup>2</sup>
Negative Control (Before)	0	0	0	0	0	0	0	0		
Negative Control (After)	0	0	0	0	0	0	0			
Positive Control 1	82	338	567	848	459	28	2322	2413	2.73	
Positive Control 2	66	367	766	610	531	51	2391		2.77	
Positive Control 3	144	308	588	963	426	34	2463		2.81	
Positive Control 4	125	315	650	759	488	34	2401		2.81	
Positive Control 5	94	367	508	1064	387	69	2489		2.72	
FB850015056701	0	0	0	0	0	0	0			100.0
FB850015056702	0	0	0	0	0	0	0			100.0
FB850015056703	0	0	0	0	2	0	2			99.9
FB850015056704	0	0	0	0	0	0	0			100.0
FB850015056705	0	0	0	0	0	0	0			100.0

**Remarks:**

The tested results apply only to the samples as received by the laboratory.

<sup>1</sup>Particle size to be in the range of 3.0 µm ± 0.3 µm.

<sup>2</sup>Based on the ASTM F2100 – Level 2, percentage of Bacterial Filtration Efficiency (BFE) must be ≥ 98.

  
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**Your Ref: -**

**Our Ref: FB-8500150567/SS/C**

**Date: 16/03/2021**

**Page 1 of 3**

**Subject** : Penetration by particulates using latex sphere test for Mask Testing sample submitted by Yeap Medical Supplies Pte Ltd on 08/03/2021

**Purpose** : The purpose of the test is to measure the particulate filtration efficiency of a medical face mask

**Tested For** : **YEAP MEDICAL SUPPLIES PTE LTD**  
11 Yishun Industrial Street 1  
#06-91 North Spring Bizhub  
Singapore 768089  
Attn: Mr Christopher Thia

**Method of Test** : ASTM F 2100-19 Standard Specification for Performance of Materials Used in Medical Face Masks – Clause 9.3 Sub-Micron Particulate Filtration; Determine particulate filtration efficiency as directed in Test Method F2299

**Description of Samples** : 10 pieces of Mask Testing sample were received (Refer to Photographs)



**Khairuddin bin Selamat**  
Testing Officer



**Salim Suwignjo**  
Principal Engineer (CMTD)  
Construction Technology Division

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LA-1994-0068-A LA-2012-0519-E  
LA-1987-0001-B LA-1987-0001-B-1



**Table 1 : Particulate Filtration Efficiency**

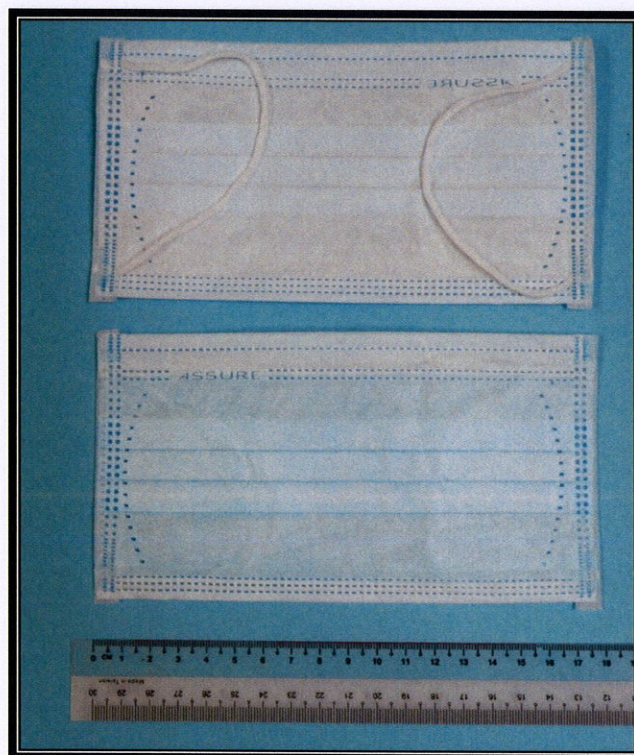
Sample Reference	Mask Testing				
Conditioning	From 12/03/2021 to 15/03/2021 @ 21°C, 52%RH				
Date of Test	15/03/2021				
Test Condition	23°C, 52%RH				
Flow rate (L/min)	28.3				
Size of Latex Particles (µm)	0.1				
Specimen Reference	S1	S2	S3	S4	S5
Thickness (mm)	0.45	0.45	0.45	0.45	0.46
Mass per unit area (g/m <sup>2</sup> )	96.86	94.20	93.56	93.55	96.96
Penetrance, P (%)	0	0	0	0	0
Filtration Efficiency, E (%)	100	100	100	100	100
Average PFE (%)	100				
<b>Requirement</b>	Sub-micron particulate filtration efficiency at 0.1 micron, %				
Accordance to ASTM F 2100-19	Level 1 ≥ 95				
	Level 2 ≥ 98				
	Level 3 ≥ 98				








Photograph 1 Mask Testing sample as received



Photograph 2 Mask Testing sample close-up

*h*

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### SYNTHETIC BLOOD PENETRATION TEST

**Date:** 19/03/2021

**Tested For:** **Yeap Medical Supplies Pte Ltd**  
11 Yishun Industrial St 1  
#06-91 Northspring Bizhub  
Singapore 768089  
**Attn: Christopher**


**Test Method:** ASTM F2100 – 19 Resistance of Medical Face Masks to Penetration by Synthetic Blood (Horizontal Projection of Fixed Volume at a Known Velocity).

**Date Sample Received:** 08/03/2021

**Date Sample Analyzed:** 19/03/2021

**Sample Description:** 3-Ply Surgical Masks



  
**DR WU JIEN**  
**HOD MICROBIOLOGY**

### BIOLOGICAL & CHEMICAL TECHNOLOGY DIVISION

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## Results:

Lab Sample ID No.	Pressure	Number of Test Articles Tested	Number of Test Articles Passed <sup>1</sup>
FB8500150567001	120 mmHg (16 kPa)	32	32

## Remarks:

The tested results apply only to the samples as received by the laboratory.

<sup>1</sup>As per ASTM F2100 - 19 Level II face masks, an acceptable quality limit of 4.0% is met for a normal single sampling plan when ≥29 out of 32 test articles show passing results.

  
DR WU JIEN  
HOD MICROBIOLOGY

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## SYNTHETIC BLOOD PENETRATION TEST

Test Items (3-Ply Surgical Masks)	Test Results (Blood penetration @ 160 mmHg)
Sample #1	None Observed
Sample #2	None Observed
Sample #3	None Observed
Sample #4	None Observed
Sample #5	None Observed
Sample #6	None Observed
Sample #7	None Observed
Sample #8	None Observed
Sample #9	None Observed
Sample #10	None Observed
Sample #11	None Observed
Sample #12	None Observed
Sample #13	None Observed
Sample #14	None Observed
Sample #15	None Observed
Sample #16	None Observed

### Remarks:

The tested results apply only to the samples as received by the laboratory.

As per ASTM F2100 - 19 Level II face masks, an acceptable quality limit of 4.0% is met for a normal single sampling plan when  $\geq 29$  out of 32 test articles show passing results.

DR WU JIEN  
HOD MICROBIOLOGY

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## SYNTHETIC BLOOD PENETRATION TEST

Test Items (3-Ply Surgical Masks)	Test Results (Blood penetration @ 160 mmHg)
Sample #17	None Observed
Sample #18	None Observed
Sample #19	None Observed
Sample #20	None Observed
Sample #21	None Observed
Sample #22	None Observed
Sample #23	None Observed
Sample #24	None Observed
Sample #25	None Observed
Sample #26	None Observed
Sample #27	None Observed
Sample #28	None Observed
Sample #29	None Observed
Sample #30	None Observed
Sample #31	None Observed
Sample #32	None Observed

### Remarks:

The tested results apply only to the samples as received by the laboratory.

'As per ASTM F2100 - 19 Level II face masks, an acceptable quality limit of 4.0% is met for a normal single sampling plan when  $\geq 29$  out of 32 test articles show passing results.

  
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**Date: 16/03/2021**

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**Our Ref: FB-8500150567/SS/D**

**Page 1 of 3**

**Subject** : Differential pressure test for Mask Testing sample submitted by Yeap Medical Supplies Pte Ltd on 08/03/2021

**Purpose** : The purpose of the test is to measure the differential pressure of a medical face mask

**Tested For** : **YEAP MEDICAL SUPPLIES PTE LTD**  
11 Yishun Industrial Street 1  
#06-91 North Spring Bizhub  
Singapore 768089  
**Attn: Mr Christopher Thia**

**Method of Test** : BS EN 14683 : 2019 Medical Face Masks – Requirements and Test Methods Clause 5.2.3 Annex C Method for determination of breathability (differential pressure)

**Description of Samples** : 10 pieces of Mask Testing sample were received  
(Refer to Photographs)



**Khairuddin bin Selamat**  
Testing Officer



**Salim Suwignjo**  
Principal Engineer (CMTD)  
Construction Technology Division

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LA-1994-0068-A LA-2012-0519-E  
LA-1987-0001-B LA-1987-0001-B-1



**Test Result : Differential Pressure**

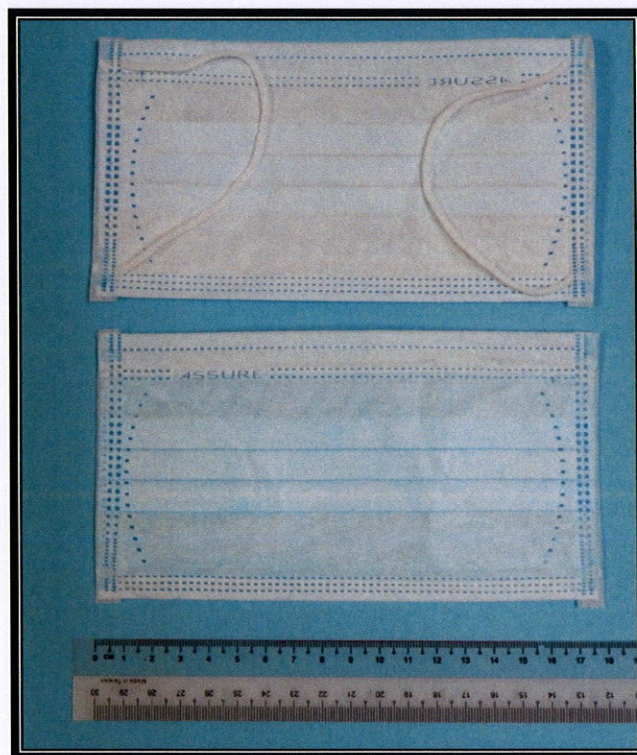
Sample Reference		Mask Testing				
Conditioning		15/03/2021 From 1000hrs to 1400hrs @ 21°C, 80%RH				
Date of Test		15/03/2021				
Test Condition		23°C, 52%RH				
Air Flow	(L/min)	8				
Tested Area	(cm <sup>2</sup> )	4.9				
Type of Mask		Single Material Mask				
Specimen Reference		S1	S2	S3	S4	S5
Differential Pressure, ΔP (Pa/cm <sup>2</sup> )	Spot 1	60.82	47.35	47.35	53.88	51.02
	Spot 2	64.90	55.92	49.59	46.53	51.02
	Spot 3	61.63	60.00	53.47	62.86	68.57
	Spot 4	62.04	45.10	49.80	50.20	58.78
	Spot 5	66.53	52.04	50.61	57.35	58.16
	Average	63.18	52.08	50.16	54.16	57.51
<b>Requirement</b>  BS EN 14683 Clause 5.2.7 Summary of Performance Requirements		Differential Pressure, (Pa/cm <sup>2</sup> )  Type I < 40  Type II < 40  Type IIR < 60				








Photograph 1 Mask Testing sample as received



Photograph 2 Mask Testing sample close-up

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**Our Ref: FB-8500150567/SS/E**

**Page 1 of 3**

**Subject** : Flammability test for Mask Testing sample submitted by Yeap Medical Supplies Pte Ltd on 08/03/2021

**Purpose** : The purpose of the test is to determine the flammability of a medical face mask

**Tested For** : **YEAP MEDICAL SUPPLIES PTE LTD**  
11 Yishun Industrial Street 1  
#06-91 North Spring Bizhub  
Singapore 768089  
**Attn: Mr Christopher Thia**

**Method of Test** : ASTM F 2100-19 Standard Specification for Performance of Materials Used in Medical Face Masks – Clause 6.2 / 9.5 Flammability ; Determine flammability as specified in 16 CFR 1610

**Description of Samples** : 50 pieces of Mask Testing were received  
(Refer to Photograph 1)



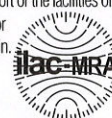
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Testing Officer



**Salim Suwignjo**  
Principal Engineer (CMTD)  
Construction Technology Division

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LA-1994-0068-A LA-2012-0519-E  
LA-1987-0001-B LA-1987-0001-B-1



**Test Result : Flammability**

Sample Reference	Mask Testing				
Drying of Specimen	15/03/2021 From 1400hrs to 1430hrs @ 105°C				
Date of Test	15/03/2021				
Test Condition	23°C, 52%RH				
Specimen Reference	S1	S2	S3	S4	S5
Flame Application Time	1 second				
Burn Time (sec)	No burn time	No burn time	No burn time	No burn time	No burn time
Visual Observation	DNI	DNI	DNI	DNI	DNI
Classification	Class 1	Class 1	Class 1	Class 1	Class 1
Requirement Accordance to ASTM 2100-19	Flame Spread – Class 1				

**REMARKS:**

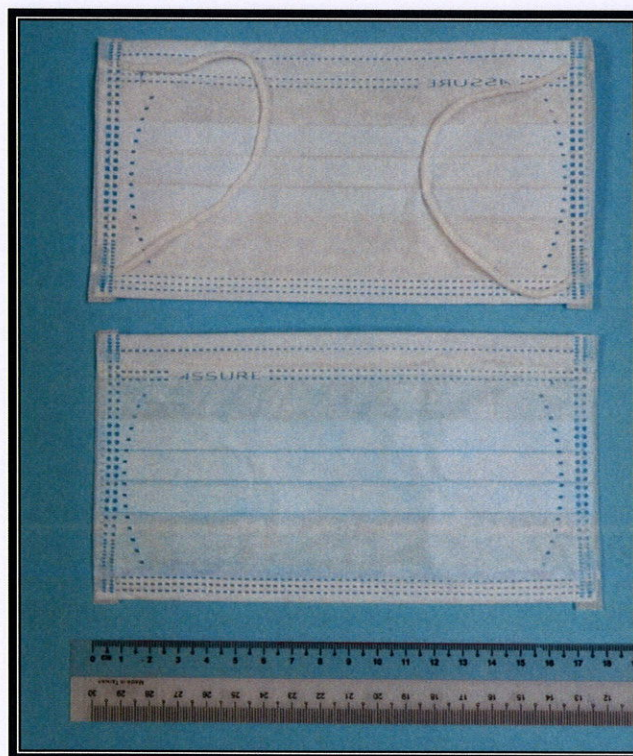
- Specimens were tested in their original state
- DNI = Did not ignite








Photograph 1 Mask Testing as received



Photograph 2 Mask Testing Inner (Top) and Outer (Bottom)

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**Your Ref:**

**Our Ref: FB 8500150567**

**Subject** : Bioburden Testing for "3-Ply Surgical Mask" sample submitted by Yeap Medical Supplies Pte Ltd on 08/03/2021 and testing commenced on 12/03/2021.

**Tested For** : **Yeap Medical Supplies Pte Ltd**  
11 Yishun Industrial St 1,  
#06-91, Northspring Bizhub  
Singapore 76808  
**Attention: Christopher**

**Test Method** : BS EN 14683:2014 / ISO 11737-1:2018 (Bio-burden Test)

**Sample Reference** : 3-Ply Surgical Mask

**Results** :  
Counts of Test Microorganisms Used for Validation

Test Microorganisms	ATCC Strain	Colony Forming Unit
<i>Staphylococcus aureus</i>	ATCC 6538	12
<i>Pseudomonas aeruginosa</i>	ATCC 9027	28
<i>Bacillus atrophaeus</i>	ATCC 9372	12
<i>Candida albicans</i>	ATCC 10231	10
<i>Aspergillus niger</i>	ATCC 16404	12



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### Growth Promotion Test & Environmental Sterility

Control	Medium Type	Results
Media Sterility	SCDA	No Growth
Media Sterility	SDA	No Growth
<i>Staphylococcus aureus</i>	SCDA	14
<i>Pseudomonas aeruginosa</i>	SCDA	39
<i>Bacillus atrophaeus</i>	SCDA	13
<i>Candida albicans</i>	SDA	12
<i>Aspergillus niger</i>	SDA	14

### Product Inoculation Test (Method Suitability Test)

Test Microorganisms	Control (cfu/100ml)	Sample (cfu/100ml)	Recovery Efficiency %
<i>Bacillus atrophaeus</i>	15	14	93.33

### Sample Test

Sample	Filtered Volume	Weight (g)	SCDA	SDA	CFU/sample	CFU/g	Conclusion
1	100 ml	2.81	2	2	4	1.42	<b>Pass</b> 2 cfu/g < 30 cfu/g
2		2.81	4	2	6	2.14	
3		2.82	5	2	7	2.48	
4		2.81	5	2	7	2.49	
5		2.82	6	3	9	3.19	
Average cfu/g						2.34	

#### **Remark:-**

1. SCDA-Soybean Casein Digest Agar, 32.5± 2.5°C
2. SDA - Sabouraud Dextrose Agar, 22.5± 2.5°C
3. The tested results apply only to the samples as received by the laboratory.

#### **Conclusion:**

From the above analysis criteria, the sample **passed** the microbial cleanliness test (bioburden) by achieving < 30 cfu/g in accordance with BS EN 14683:2014.



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