

TEST REPORT: 7191251575-CHM21-YMG

Date: 15 JAN 2020

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SUBJECT

Test of LumenAire™ Pendant Light UV Air Disinfection Device Model PLP-ALU6063 on Its Performance on Clean Air Delivery Rate (CADR) in terms of PM2.5 Removal

CLIENT

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Attn: Mr. James Paul Pilande

SAMPLE SUBMISSION DATE / TEST DATE

7 Jan 2021 / 11 Jan 2021

DESCRIPTION OF PRODUCT

The photo of LumenAire™ Pendant Light UV Air Disinfection Device Model PLP-ALU6063 tested is showed in Annex A.

METHOD OF TEST

The Clean Air Delivery Rate (CADR) in terms of PM_{2.5} removal is performed by in-house method TTS-CHM-TM-027-08 in referring to AHAM AC-1-2015 Method for Measuring Performance of Portable Household Electric Room Air Cleaners and China GB/T 18801-2015 Air Cleaner.

Smoke is generated and introduced to a test chamber (Annex B). The LumenAire™ Pendant Light UV Air Disinfection Device Model PLP-ALU6063 is adjusted to maximum fan speed mode. The concentration of PM_{2.5} is monitored by a particle counter for every 1 minute in 15 minutes in both natural decay condition and operation condition.



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RESULTS

1. Results of PM_{2.5} Concentration Monitored in Clean Air Delivery Rate (CADR) Test


Table 1 Results of PM_{2.5} Concentration Monitored in Clean Air Delivery Rate (CADR) Test

Time, Minute	PM _{2.5} -Natural Decay unit: µg/m ³	PM _{2.5} - LumenAire™ Pendant Light UV Air Disinfection Device Model PLP-ALU6063, unit: µg/m ³	Apparent Removal
0	3,375	3,439	0.0%
1	3,242	3,310	3.8%
2	3,120	3,174	7.7%
3	3,042	3,044	11.5%
4	2,942	2,926	14.9%
5	2,845	2,834	17.6%
6	2,765	2,750	20.0%
7	2,707	2,653	22.9%
8	2,638	2,586	24.8%
9	2,579	2,519	26.8%
10	2,522	2,447	28.8%
11	2,479	2,361	31.3%
12	2,419	2,314	32.7%
13	2,369	2,238	34.9%
14	2,330	2,195	36.2%
15	2,310	2,142	37.7%

2. Calculation of Clean Air Delivery Rate (CADR) in term of PM_{2.5} removal

The calculation of Clean Air Delivery Rate (CADR) in terms of PM_{2.5} removal is referring to AHAM AC-1-2015 Method for Measuring Performance of Portable Household Electric Room Air Cleaners. Detail calculation steps are listed in Annex C. The result of Clean Air Delivery Rate (CADR) of LumenAire™ Pendant Light UV Air Disinfection Device Model PLP-ALU6063 in term of PM_{2.5} removal is expressed as follows.

$$\text{CADR}_{\text{PM}_{2.5}} \text{ of Model PLP-ALU6063} = 0.15 \text{ m}^3/\text{minute} = 8.8 \text{ m}^3/\text{hour} = 5.2 \text{ cubic feet/minute (CFM)}$$


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Annex A:

Product Name LumenAire™ Pendant Light UV Air Disinfection Device

Photo



Model PLP-ALU6063

SN B-PLPSG200001006

Electrical rating 220-240 AC, 50/60 Hz, UV Disinfection 96W, LED Light 156W



Annex B: Schematic of test chamber

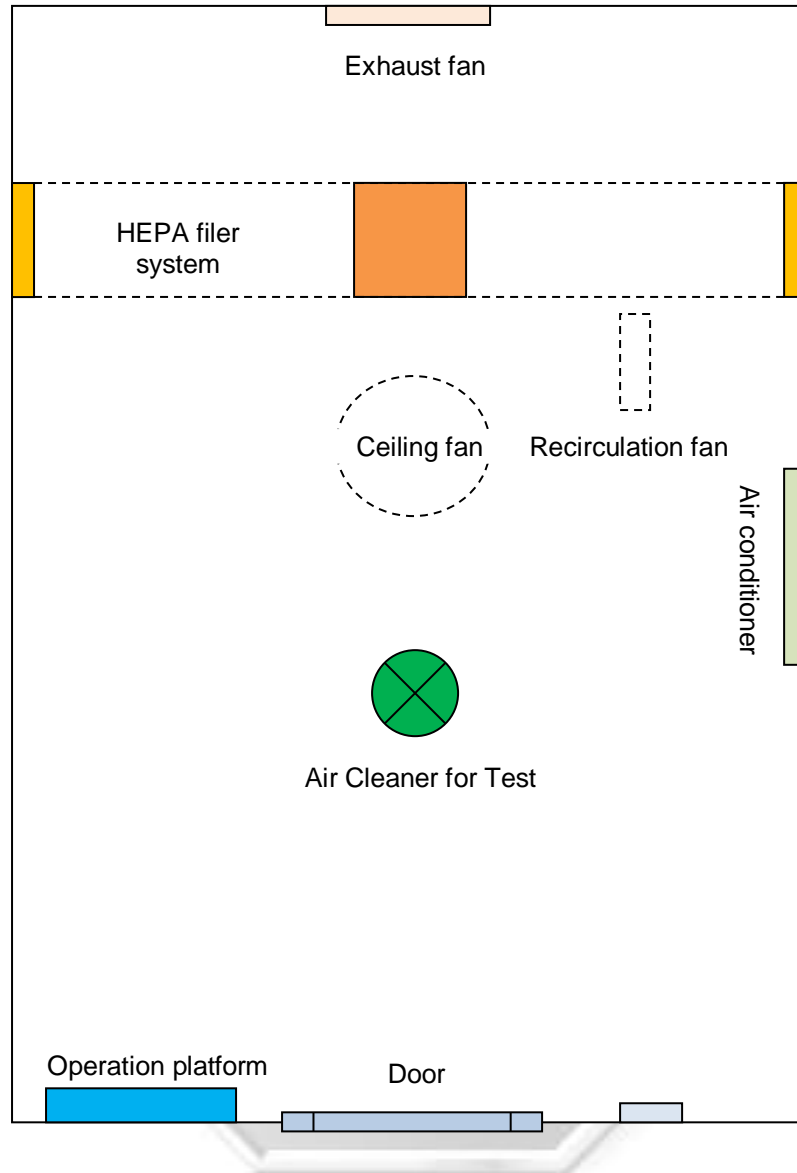


Figure 1 Schematic layout of the test chamber

Annex C: CADR Calculation method

(By referring to AHAM AC-1-2015 Section 8: Method for measuring performance of portable household electric room air cleaners)

8.2.1 The decay constant, k, for particulate matter is based on the formula:

$$C_{t_i} = C_i e^{-kt_i} \quad (\text{equation 1})$$

where:

C_{t_i} = concentration at time t_i (particles/cc)

C_i = concentration at $t = 0$ minutes

k = decay rate constant (minutes⁻¹)

t_i = time (minutes)

8.2.2 The decay constant, k, is obtained using the linear regression on the $\ln C_{t_i}$ and t_i using the formula:

$$k = \frac{S_{xy}}{S_{xx}} \quad (\text{equation 2})$$

where:

$$S_{xy} = \sum_{i=1}^n t_i \ln C_{t_i} - (1/n) \left(\sum_{i=1}^n t_i \right) \left(\sum_{i=1}^n \ln C_{t_i} \right) \quad (\text{equation 3})$$

$$S_{xx} = \sum_{i=1}^n (t_i)^2 - (1/n) \left(\sum_{i=1}^n t_i \right)^2 \quad (\text{equation 4})$$



8.4 Performance Calculation.

The performance of an air cleaner is represented by a clean air delivery rate (CADR). The method for calculating the clean air delivery rate is:

$$\text{CADR} = V(k_e - k_n) \quad (\text{equation 7})$$

where:

CADR = clean air delivery rate (cu. ft/min)

V = volume of test chamber, cu. ft.

k_e = total decay rate, min⁻¹

k_n = natural decay rate, min⁻¹

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