SEE PAGE 5 OF PDF FOR OZONE LEVELS PRODUCED BY ATMOS AIR GLASS ION TUBE TECHNOLOGY AND AERISA (NOW PLASMA AIR) GLASS ION TUBE TECHNOLOGY

EVALUATION OF MITIGATION STRATEGIES FOR REDUCING FORMALDEHYDE CONCENTRATIONS IN UNOCCUPIED FEDERAL EMERGENCY MANAGEMENT AGENCY-OWNED TRAVEL TRAILERS

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APPENDIX A

OZONE AND UV LIGHT EMISSION TESTING METHODS AND RESULTS

Ozone Testing

All powered air purification devices being considered for this evaluation were assessed for ozone emissions. Units relying solely on ventilation or those relying on diffusion were not tested. A portable Ozone Monitor (2B Technologies, Inc.; Model # 205; Serial #: 635DB) was used to assess ozone omission; the instrument provided concentration measurements in ppb. For evaluation purposes, all devices were operated according to manufacturers' instructions. At the time of testing, ambient room temperature was approximately 22°C (72°F).

Before testing, background concentration measurements of ozone were made in the laboratory where the ozone testing was taking place. After recording the laboratory background concentration, the mitigation units' ozone emissions were measured. The sampling tube of the ozone monitor was placed approximately at 10–20 cm from the major output air stream of each device. Sampling from the output air stream occurred for approximately 10 minutes, allowing ozone generation (if ozone was being generated) to stabilize and reach a steady state. At this point, the ozone concentration reading was recorded.

The results presented in Table A-1 show all of the devices tested and the resultant ozone produced. Units that produced significantly elevated ozone levels (highlighted in grey) were excluded from the evaluation and returned to the originator.

Table A-1. Ozone emission test results for air purification units. Gray shaded devices were not evaluated in the test trailers due to high ozone output. Pink shaded devices were not evaluated in the test trailers due to high UV light output.

Device	Company	Technology	Back-ground Concen-tration (ppb)	Unit Concen-tration (ppb)
Formal X	So-Brite Chemicals International, Inc.	Treated Filter	Not Tested	
Forever Fresh	Worldwide Sales, Inc.	Passive diffusion/ adsorption	Not Tested	
Prototype	Safehome	Potassium Permanganate	4.9	1.1
HEPAiRx	Air Innovations	Ventilation	Not Tested	
AiroCide Ser No ACKS-251-111940	KES	Photocatalytic Oxidation	5.1	3.3
AiroCide Ser No ACKS-251-111893	KES	Photocatalytic Oxidation	6.2	3.3
S900 Ser No 000032	Airsopure	Photocatalytic Oxidation	6.2	5.0
S900 Ser No 000033	Airsopure	Photocatalytic Oxidation	6.5	3.9
Prototype	ANGUS Chemical	Treated Filter	1.8	2.4
Eraldehyde MODEL 802	MicroSweep Corp	Treated Filter	4.9	1.2
MaxxAir Turbo/ Maxx™ - 3550	Maxxair Vent Co.	Ventilation	Not Tested	
Prototype	Fluid Lines	Photocatalytic Oxidation	3.9	3.0
Prototype	PURETi	Photocatalytic Oxidation	3.1	1.5
Prototype Unit #1	Texas A&M University	Photocatalytic Oxidation	5.5	4.6
Prototype Unit #2	Texas A&M University	Photocatalytic Oxidation	3.8	3.3
Prototype	Nanocepts	Photocatalytic Oxidation	3.9	2.2
Prototype	Aria Acqua	Photocatalytic Oxidation	Not Tested	
Prototype	AirOcare	Reactive Oxygen Species	1.0	7.9
Coleman-Mach Air Conditioner	Airxcel, Inc	Ventilation	Not Tested	
Nanobreeze, Unit #1	NanoTwin Technologies	Photocatalytic Oxidation	5.4	10.5

Nanobreeze, Unit #2	NanoTwin Technologies	Photocatalytic Oxidation	6.9	10.3
Prototype	ActiveTek	ActivePure Technology (H_2O_2)	4	115.9
AF1000, Ser No. 008011	Air Fantastic	Quadruple Ion Technology	6.7	287.9
AF1000, Ser No. 002813	Air Fantastic	Quadruple Ion Technology	4.9	305.5
AFMini, Ser No. 008033	Air Fantastic	Quadruple Ion Technology	4.9	745.4
AFMini, Ser No. 008031	Air Fantastic	Quadruple Ion Technology	5.5	459.3
Prototype	AERISA	Cold Plasma	4.4	42.8
AtmosAir T-400 Ser No. 401107MTG1220	Clean Air Group	Bipolar Ionization	3.5	892.6
AtmosAir T-400 Ser No. 401107MTG1227	Clean Air Group	Bipolar Ionization	5.1	1297
AirOCare, Ser No 0033, with screen*	AirOcare	Reactive Oxygen Species	5.5	88.5
AirOCare, Ser No 0033, no screen*	AirOcare	Reactive Oxygen Species	5.5	61.6
AirOCare, Ser No 0034, with screen*	AirOcare	Reactive Oxygen Species	3.4	115.5
AirOCare, Ser No 0034, no screen*	AirOcare	Reactive Oxygen Species	3.4	82.5

* According to the manufacturer, a "screen' was provided with this unit to improve air cleaning. The unit could be operated with or without this screen.

EPA OZONE LIMIT = 0.05 PPM

ATMOS AIR T-400 OZONE OUTPUT = 0.8926 PPM and 1.297 PPM!!

UV Testing

The photocatalytic oxidation air cleaning units were evaluated for UV light emissions due to the use of a UV light source as a fundamental component of their oxidation process. UV light emissions were measured on those units where the UV light source was visibly exposed. Five units of three different models were assessed. An Ocean Optics Spectroradiometer (HR2000+ Spectrometer) was used to measure UV irradiance from UV-PCO units that had visually exposed light bulbs. An integrating sphere (~ 5 cm diameter) was attached to the input fiber optic of the Ocean Optics spectroradiometer, enabling the spectroradiometer to function as a cosine receptor irradiance sensor. A quartz-tungsten-halogen lamp (FEL #523) calibrated by Optronics Laboratories against a National Institute of Standards and Technology (NIST)-calibrated FEL