Critical Environment Control
PO Box 818
Redondo Beach, CA 90277-0818
(310) 372-5011 **FAX** (866) 882-7457
www.ceccertify.com

Verification of Airborne Particulate Cleanliness & Environmental Conditions

Company	**Test Specification**	**Date of Certification**
Circor Aerospace Inc	Federal Standard 209 E	July 11, 2017
2301 Wardlow Circle	**Test Area**	**Certification Expires**
Corona, CA 91720	Cleanroom #1	July 15, 2018

Facility	**0.5 µm**	**5.0 µm**	**RH**	**Temperature**	**Certification**	**Status**
Cleanroom #1	67	1	57.5%	67.9	10,000 (at 0.5µm)	Operational

This Federal Standard 209E Certification is based on particle concentrations measured in this test and compared to maximum concentrations delineated in Table 1, Federal Standard 209E. If fewer than 10 locations were sampled a 95% upper confidence limit is applied.

Testing was performed with a Climet Instruments Model CI 500, calibrated at manufacturers recommended intervals. This instrument has been calibrated in accordance with ISO 10012-1, ANSI Z540-1 (which replaces MIL_STD-45662A) and relevant portions of ISO 14644, Federal Standard 209, ASTM F-50, and F-328. Calibration traceability to a National Measurement Standard (NMS) is established by using mono-disperse latex spheres as a calibration standard. These spheres are sized by methods traceable, by lot number, to the National Institute of Standards and Technology.

Critical Environment Control certifies that the test results recorded on this document are accurate as of the time of this test. Critical Environment Control hereby certifies that the above described systems met the acceptance criterion for the Air Cleanliness Classes delineated above.

Critical Environment Control

Critical Environment Control
PO Box 818
Redondo Beach, CA 90277-0818
(310) 372-5011 **FAX** (866) 882-7457
www.ceccertify.com

Verification of Airborne Particulate Cleanliness & Environmental Conditions

Company
Circor Aerospace Inc
2301 Wardlow Circle
Corona, CA 91720

Test Specification
Federal Standard 209 E
Equipment Tested
Laminar Flow Bench

Date of Certification
July 11, 2017
Certification Expires
July 15, 2018

Location	Bench #	0.5 µm	5.0 µm	Velocity	Certification
Manufacturing Area	2	37	0	68 FPM	100 (at 0.5µm)

This Federal Standard 209E Certification is based on particle concentrations measured in this test and compared to maximum concentrations delineated in Table 1, Federal Standard 209E. If fewer than 10 locations were sampled a 95% upper confidence limit is applied.

Testing was performed with a Climet Instruments Model CI 500, calibrated at manufacturers recommended intervals. This instrument has been calibrated in accordance with ISO 10012-1, ANSI Z540-1 (which replaces MIL_STD-45662A) and relevant portions of ISO 14644, Federal Standard 209, ASTM F-50, and F-328. Calibration traceability to a National Measurement Standard (NMS) is established by using mono-disperse latex spheres as a calibration standard. These spheres are sized by methods traceable, by lot number, to the National Institute of Standards and Technology.

Critical Environment Control certifies that the test results recorded on this document are accurate as of the time of this test. Critical Environment Control hereby certifies that the above described systems met the acceptance criterion for the Air Cleanliness Classes delineated above.

Critical Environment Control

Critical Environment Control

Test Results

Test Standard: **Federal Standard 209E**

Company: **Circor Aerospace Inc.**

Date Tested:	07/11/2017	Area Tested:	Cleanroom #1
Next Test:	07/15/2018	Classification:	10,000
Time of Test:	7:31 AM	Particle Size:	0.5µm
People in Rm:	3	Status:	Operational

Count Location	0.5 µm	5.0 µm	Rel. Humidity	Temperature
1	68	2	57.2%	70.2
2	73	0	56.0%	67.8
3	210	1	56.0%	68.2
4	74	2	54.8%	68.2
5	36	0	53.2%	67.8
6	55	1	53.6%	67.8
7	20	0	53.6%	67.8
8	10	0	53.6%	68.2
9	109	2	54.4%	65.8
10	86	2	56.8%	67.0
11	97	0	61.2%	67.4
12	22	2	65.6%	67.0
13	48	2	65.2%	68.2
14	25	1	63.2%	69.4
Averages:	67	1	57.5%	67.9

Average:	67	Certification:	***10,000 (at 0.5µm)***

Particle Count Location Map: **CR # 1**

Critical Environment Control

Test Results

Test Standard: **Federal Standard 209E**

Company: **Circor Aerospace Inc.**

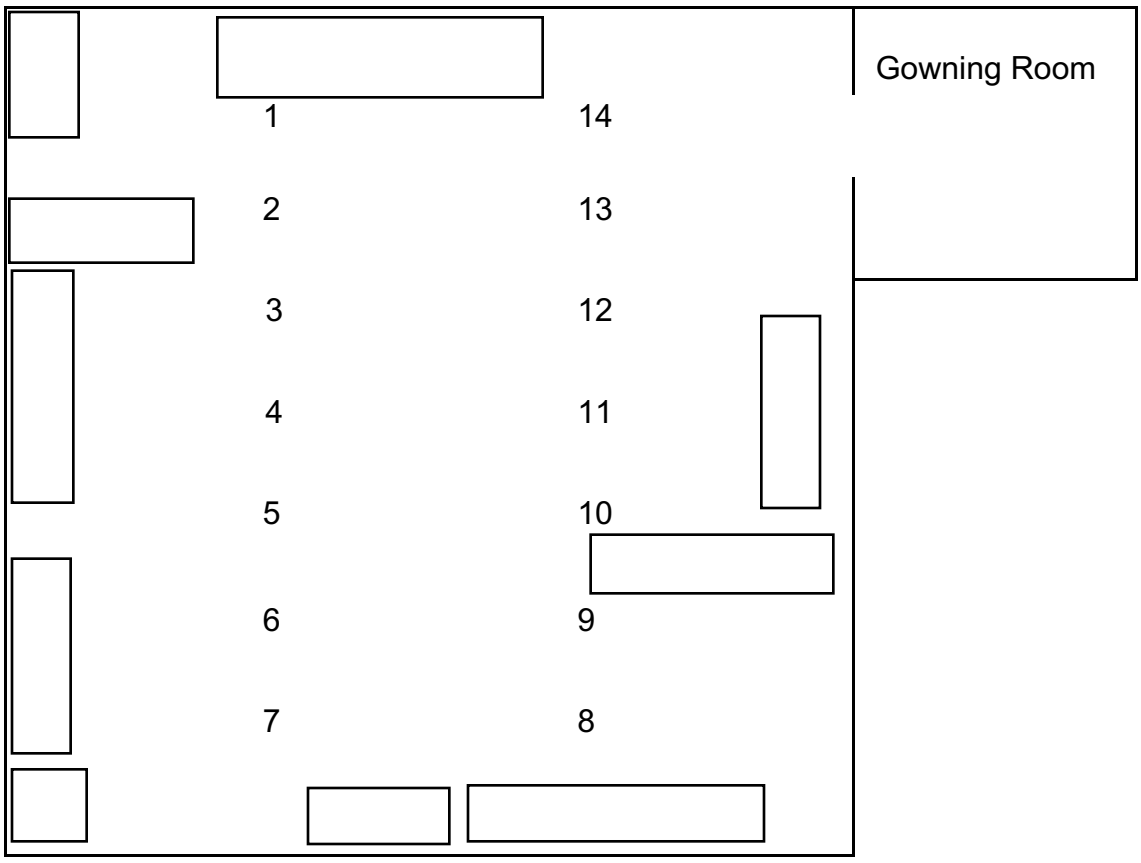
Date Tested: 07/11/2017 Next Test: 07/15/2018

Bench # 1 Classification: 100 (at 0.5µm)

Count Number	0.5 µm	5.0 µm	Velocity
1	18	0	60 FPM
2	53	0	50 FPM
3	1	0	80 FPM
4	0	0	70 FPM
5	8	0	80 FPM
Averages:	16	0	68 FPM
95% UCL:	37		Certification: ***100 (at 0.5µm)***

Critical Environment Control

Particle Count Location Map



Circor Aerospace Inc
2301 Wardlow Circle
Corona, CA 91718

Reference: CR #1

Information Regarding Your Test

Federal Standard 209E was cancelled on November 30, 2001. ISO 14644-1 and ISO 14644-2 have superseded Federal Standard 209E.

Your test was performed pursuant to information that you provided, applied to criterion of Federal Standard 209E. Applicable sections of the standard are included.

I. Definitions (3.)

Airborne Particulate Cleanliness Class (3.1): The Room Classification is taken from the maximum number of 0.5 micron particles per cubic foot of air sampled.

Clean Zone (3.4): A defined space in which the concentration of airborne particles is controlled to meet a specified Airborne Particulate Cleanliness Class.

Cleanroom (3.5): A room in which the concentration of airborne particles is controlled and which contains one or more clean zones.

Cleanroom Status:

As-Built (3.5.1) : Ready for operation, all services functional, *without* equipment or operational personnel present.

At-Rest (3.5.2) : All services functional, equipment operable, *without* operational personnel present.

Operational (3.5.3) : All services functional, equipment and operational personnel performing routine functions.

Monitoring (3.11): Routine determination of airborne particle concentrations, as well as other relevant conditions, in cleanrooms and clean zones.

Particle (3.13): An object of solid or liquid composition, or both, and generally between .001 and 1,000 microns in size

Particle Size(s) (4.1.1): Verification shall be performed by measurement at one or more of the particle sizes listed for the class in Table I.

U Descriptor (3.17): The maximum allowable concentration per cubic foot of air of applicable particle sizes.

Upper Confidence Limit (UCL) (3.20): An upper limit of the estimated mean which has been calculated so that, in a specified percentage of cases, its value exceeds the true population mean, both means having been sampled from a normal (Gaussian) distribution. Federal Standard 209E employs a 95% UCL.

Verification (3.21): The procedure for determining the compliance of air in a cleanroom or clean zone to an airborne particulate cleanliness class limit or a U Descriptor, or both.

II. Criterion for Passing (5.4.1):

The air in a cleanroom or clean zone shall have met the acceptance criteria for an airborne particulate cleanliness class or U Descriptor when the averages of the particle concentrations measured at each of the locations fall at or below the class limit or U Descriptor. Additionally, if the total number of locations sampled is less than 10, the mean of these averages must fall at or below the class limit or U Descriptor with a 95% UCL.

III. Information that you Provided

Frequency (5.1.1) : Intervals between verifications (testing for compliance).

Operating Conditions (5.1.2): Specific Operating Conditions Including the following:

Status (3.5.2 & 3.5.3) : After As Built Certification; **At Rest** or **Operational** and how either would be defined.

Number of Locations (5.1.3.1 & 5.1.3.3): Minimum of 2, Uniformly spaced throughout the clean zone. Sampling at more locations increases the precision of the data.

Number of Samples (5.1.3.1 & 5.1.3.3): Formula based on the class of the room and square footage. Minimum of 1 sample per location, a total of at least 5 samples per in each zone.

Particle Size(s) (4.1.1): Verification shall be performed by measurement at one or more of the particle sizes listed for the class in Table I.

IV. Airborne Particulate Cleanliness Classes (Excerpted from FS 209E, Table I)

Classification	0.1 Micron	0.2 Micron	0.3 Micron	0.5 Micron	5.0 Micron
1	35	7.5	3	1	
10	350	75	30	10	
100		750	300	100	
1,000				1,000	7
10,000				10,000	70
100,000				100,000	700