Cleanrooms

Validation Report Prepared for:

Health CBD

Riverside House, Forge Lane, Halton, Lancaster, Lancashire, LA2 6RH, UK
+44 (0)1524 812899 www.connect2cleanrooms.com

Client Information

Client Name	Health CBD
Client Address	FAO Shiv Singh Unit 2 Block 2 Overbridge Road Salford Manchester M7 1SL
Validation Carried out at	Health CBD
Validation Address	As Client Address

Testing Organisation

Client Name	Connect 2 Cleanrooms
Client Address	Riverside House Forge Lane Halton Lancaster Lancashire LA2 6RH
Date of Test	4 June 2020
Test Engineer	Alek Linkowski
C2C Reference	Non C2C Cleanroom Issue Number: 1
Next Full Validation Due Date	4 June 2021 (Interim visit scheduled 6 months from full test date)

Report prepared by:	Job title:	Signature:	Date
John Merrill	Aftersales Lead		4 June 2020
Checked by:	**Job Title:**	**Signature:**	**Date**
Karen Keegan	Planning Lead		4 June 2020

Contents

Amendment Record

Amendment record			
Date	**Details**	**Sections affected**	**Ref / issue number**

Executive Summary

In order to show a cleanrooms environment is in control, it is necessary to demonstrate that the air supplied to the cleanroom is of sufficient quantity to dilute or remove the contamination generated within the cleanroom and that the air supplied to the cleanroom is of a quality that will not add significantly to the contamination levels. It is important that the air moves in the correct direction from clean to less clean areas and that the air movement within the cleanroom demonstrates that there are no areas within the room with high concentrations of contamination (Whyte 2010).

Within highly regulated critically controlled environments, there is a requirement to provide an appropriate amount of assurance that critical processes can be performed within controlled conditions in order to produce a final product that is of eminent quality, reliable, and safe for the end user.

The EN ISO 14644 is the prime standard adhered to for validation of cleanroom environments. According to the IS EN ISO 14 2 standard, every time a cleanroom is put into operation initially or changes its intended use, a validation must be perfor The initial setup of a cleanroom requires a validation to be performed over a specified period of time to ensure tha cleanroom is functioning as required. Over this period of time, historical data should be collected to ensure that the clean is performing effectively.

For the use of alternative governing bodies this table provide useful information to refer to the ISO 14644 standard.

Cleanroom Classification Table

Cleanroom Standard	Cleanroom Classification Guidelines					
ISO 14644-1	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Federal Standard 209E	1	10	100	1,000	10,000	100,000
EU GMP	-	-	A/B	-	C	D
Air changes / hour	360-540	300-540	240-480	150-240	60-90	5-48

ISO Classes of air cleanliness by particle concentration

For cleanrooms and clean zones shown in ISO 14644-1:2015

Airflow Volume and Velocity Tests

The more clean air supplied to the cleanroom, the cleaner the room will be. A cleanroom must have sufficient clean air supplied to dilute or remove any airborne contamination that may be present. This air supply to the cleanroom is often reported as air changes per hour. Air change rates within a cleanroom will usually be equal to and above 20/h; however, this measurement should be based on the level of contamination control required within the cleanroom, the number of people present or the level of activity within the room, the size of the room, and the process itself.

See 4.2 & 4.3 Test results for the recommended air change rates required to control the level of contamination in the specified ISO Class of room. Further guidance on air change rates can be found in the IEST guidance

Airborne Particle Count Test

The airborne particle count test verifies that the cleanroom, personnel, equipment, and process is performing to the intended classification or the clean level. The classification level of the cleanroom is based on the number of particulates present per cubic meter. This particulate level will change dramatically from when the room is first built compared to when the room is in full production due to increased activity from equipment and personnel which are all dispersing particles.

See 5.2 for the acceptance criteria for the particle counts, section 5.3 will hold the actual reading taken on the day of testing.

Validation versus Monitoring

After the room has been certified and validated, it must be monitored periodically, relative to risk, to prove that a clean manufacturing environment can be maintained throughout its life. Monitoring of the cleanroom is important to show that the cleanroom is performing satisfactorily under dynamic conditions, i.e., that all aspects of the construction and supporting equipment are fully operational and performing at the same level as when the room was certified, that the process within the room is not posing a risk to the environment, and that personnel working within the cleanroom are following protocol.

2.0 Standards

The tests that are detailed in this report are performed in accordance with:

BS EN ISO 14644-1: 2015 (Cleanrooms and associated controlled environments – Part 1: Classification of Air Cleanliness), BS EN ISO 14644-2:2015 (Cleanrooms and associated controlled environments – Part 2: Specifications for testing and monitoring to prove continued compliance with ISO 14644 Part 1) and BS EN ISO 14644-3:2005 (Cleanrooms and associated controlled environments Part 3: Test methods)

The guidance given in the EU GMP, rules governing medicinal products in the European Union, Volume 4, Good manufacturing practices – Medicinal products for human and veterinary use) Align closely to the ISO 14644-1 standard.

3.0 Scope of works

3.1 Validation work to be carried out

The purpose of the validation is to define whether the room identified on page 2 is operating as designed and in accordance with the standards as detailed in section 2 of this report.

Rooms to be included in this validation:

- Softwall

The tests included in this validation will be:

- Air Volumes and Air Change Rates
- Particle Counts
- Filter Integrity Testing

3.2 Recommendations

- Within cleanrooms operations need to be implemented to ensure best practice and cleanliness levels within the cleanroom are maintained and that it is still operating to the designed standard. This can be achieved by:
- Monitoring the cleanroom conditions (by means of particle counter / anemometer) at regular intervals.
- Controlling the entry method of people, machines and materials and ensuring all items are clean and suitable for use within the cleanroom i.e. step over bench located in the change area, all items are cleaned before entry etc.
- Suitable cleanroom garments should be worn to avoid contamination of the cleanroom and products inside the room. Garments should include gloves, face masks, hairnets, coveralls / laboratory coats and overshoes dependant of the level of cleanliness required.
- Implementing a cleaning regime for the cleanroom and utilising specialist cleaning methods, products and equipment available for cleanroom use.
- Customer should make sure monitoring equipment is calibrated to the correct standard ISO 21501 – 4, as per the ISO 14644 – 2: 2015 Monitoring to provide evidence of cleanroom performance related to air cleanliness by particle concentration.

4.0 Air volumes and change rates

4.1 Method Statement

The air volume entering the room is measured using an anemometer (vane or thermal) depending on accessibility. The room dimensions are taken from the approved validation drawing, and the room volume calculated. The total air changes per hour are calculated using the formula below:
Air Changes / Hour = (Supply Volume (m3/s) x 3600) / Room Volume (m3)

4.2 Acceptance Criteria

The calculated air changes (per hour) are equal to or greater than the minimum recommended air changes (per hour) for each room tested.

4.3 Test Results

Room Reference	Area Volume (m^3)	Minimum Recommended Air Changes (per hour)	Calculated Air Changes (per hour)
Main Area (ISO Class 7)	28.119	60 - 90	79.43

4.4 Comments

Please see Appendix 1 for raw data from airflow tests

On the day of testing the Main Area met the acceptance criteria and was within the recommended air changes per hour.

5.0 Particle Counts

5.1 Method Statement

The monitoring equipment will be set up in accordance with the manufacturer's instructions. Using a zero filter on the monitoring equipment a zero base line will be established. The number of sampling locations for the unit being tested will be defined from Table A of the ISO 14644-1:2015 standard. The sampling locations taken will either meet or exceed the requirements of the standard.

The volume sampled at each location shall be at least 2 litres, with a minimum sampling time at each location of one minute. Each location will be treated independently with at least a 95% level of confidence that at least 90% of the cleanroom or clean zone areas will comply with the maximum particle concentration limit for the target class of air cleanliness.

The particle counter will be positioned to align with the customer's plane of work, unless previously agreed.
The sampling requirements will follow the ISO 14644-1:2015, section A5 sampling procedure.
The unit is deemed to have met the specified air cleanliness limits if the averages of the particle concentrations measured at each of the locations are within the required values for the classification.

5.2 Acceptance Criteria

The air particulate count acceptance criteria for the room(s) being tested are detailed in the table below:

5.3 Air particulate count acceptance criteria

Room Reference	Classification Required	Occupancy State	Considered Particle Size(s) (µm)	Max Concentration Limit For Class /m³
Main Area	ISO Class 7	At Rest	>0.5 µm >5.0 µm	352,000 2,930

5.4 Test Results

Air particulate count results

Room Reference	Classification Achieved	Achieved Particle Counts /m³	Pass / Fail as per Acceptance Criteria
Main Area	ISO Class 7	N/A	N/A
		5,796	Pass
		244	Pass

Raw data from the Particle Counter is available on request.

5.5 Comments

On the day of testing the Main Area was within the required limits for an ISO14644-1:2015 ISO Class 7 clean room facility in the at rest state.

6.0 Filter Integrity Testing

6.1 Procedure

The Filter Integrity Testing was carried out in accordance with EN ISO 14644-3:2005 Section B6.

6.2 Equipment Used

Aerosol Generation	DOP Precision Aerosol Generator using Ondina EL oil Model Number: DOP2200-240V-NGB. Serial Number 4253613
Filter Scanning	DOP SP200DAS Linear Photometer Model Number: DOP3500 touch. Serial Number 425597

See appendix 2 for instrument calibration certificates.

6.3 Method Statement

The challenge aerosol was introduced into each filter housing via an upstream ductwork opening; a photometer was then used to check the upstream concentration level via the sample port at the rear of all the filters.

With the challenge aerosol entering the filter housings, each filter was scanned over the filter media and seals on the clean side of the filter.

6.4 Results

The upstream concentration levels were in excess of:

- NON C2C CLEANROOM – 11.4 µg/l

On the day of testing the filter in the Softwall Cleanroom, Non C2C Cleanroom, Filters S1 (RETEST) and S2 (RETEST) passed the leak test as the results were below the maximum penetration levels.
On the day of testing the filter in the Softwall Cleanroom, Non C2C Cleanroom, Filters S1 and S2 failed the leak test as the results were above the maximum penetration levels but after Filter S1 and Filter S2 was replaced and re-tested it/they subsequently passed, as per the results in Appendix 4. On the day of testing the filters listed in the Softwall Cleanroom Non C2C Cleanroom identified with a pass as it/they conformed to the requirements of EN ISO 14644-3:2005, Section B6 for particle challenge leak testing. Please see Appendix 4 for specific test data.

Report Summary

Review all sections of the certification report and summarise below

Air volumes and change rates

On the day of testing the Main Area met the acceptance criteria and was within the recommended air changes per hour. Please see Appendix 1 for raw data from the airflow tests.

Particle counts

On the day of testing the Main Area was within the required limits for an ISO14644-1:2015 ISO Class 7 clean room facility in the at rest state.

Raw data from the Particle Counter is available on request.

Filter integrity testing

On the day of testing the filter in the Softwall Cleanroom, Non C2C Cleanroom, Filters S1 (RETEST) and S2 (RETEST) passed the leak test as the results were below the maximum penetration levels.

On the day of testing the filter in the Softwall Cleanroom, Non C2C Cleanroom, Filters S1 and S2 failed the leak test as the results were above the maximum penetration levels but after Filter S1 and Filter S2 was replaced and re-tested it/they subsequently passed, as per the results in Appendix 4.On the day of testing the filters listed in the Softwall Cleanroom Non C2C Cleanroom identified with a pass as it/they conformed to the requirements of EN ISO 14644-3:2005, Section B6 for particle challenge leak testing. Please see Appendix 4 for specific test data.

Comments
• Deep Cleanroom recomended after new filter instalation
• 2 x Pre-Filters supplied and fitted
• 2 x HEPA Media supplied and fitted

Working Plane	1.2m

Pressure Gauge	Pressure Gauge Reading (Pa)
MG01	75

Speed Controllers	Speed Controller Reading (%)
SC01	Min

** Please see Validation Layout for Pressure Gauge and Speed Controller locations (Appendix 3)

Report prepared by:	Job title:	Signature:	Date
John Merrill	Aftersales Lead		4 June 2020
Checked by:	**Job Title:**	**Signature:**	**Date**
Karen Keegan	Planning Lead		4 June 2020

Appendix 1 – Airflow Test Results

Project:	**Non C2C Cleanroom - Health CBD - Main Area Airflow Counts - 04/06/2020**						
Filter Ref:	Average Fan speed (m/s):			Filter Area (m2)		Air Volume (m3/s)	
S1	0.49			0.66		0.3234	
S2	0.45			0.66		0.297	
						0.6204	Total m3 / sec
	L	W	H	Vol	x3600	2,233.44	Total m3 / hour
Room Size:	5.15	2.6	2.1	28.119	/	28.119	Room Volume (m3)
				28.119	m^3		
						79.43	Air changes / hour

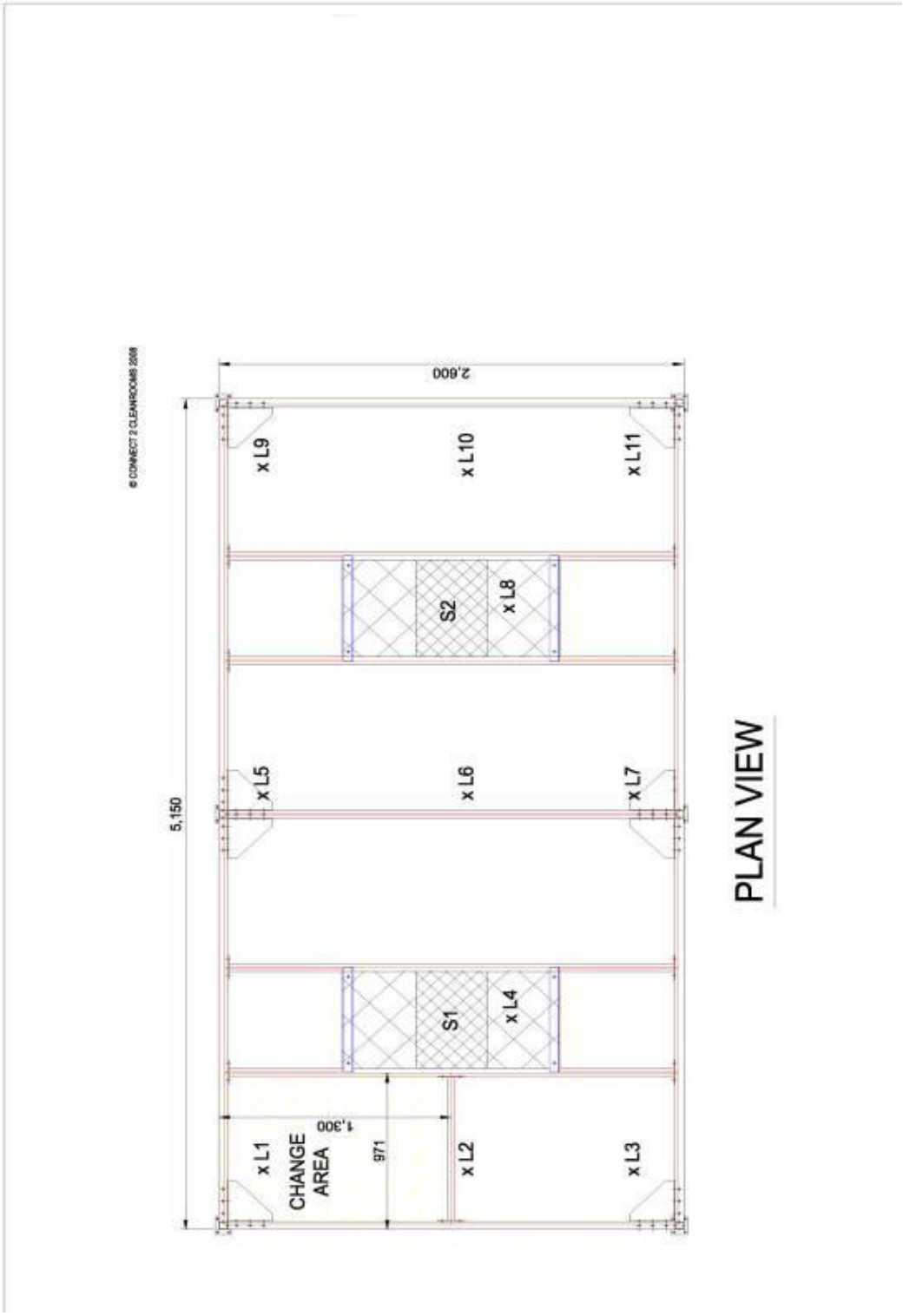
Appendix 2 - Equipment associated with validation

Equipment associated with validation

Calibration certificates will be issued as an attachment with the full report

Description of Items	Model of Equipment	Serial Number	Calibration Due Date
Vane Anemometer/Flow Hoods	KIMO LV110	1P180260647	28/02/2021
Particle Counter	Particles Plus - Model 8306	1259	18/03/2021
Linear Photometer	DOP Solutions	425597	11/09/2020
Precision Aerosol Generator	DOP Solutions	4256313	11/09/2020

Appendix 3 – Drawings associated with validation



Non

Appendix 4 - Filter challenge results

Pass Criteria: 0.01% maximum penetration

Cleanroom	Filter Reference	U.C.L	Penetration (%)	PASS/FAIL
NON C2C CLEANROOM	S1	11.4µg/l	0.998	Fail
NON C2C CLEANROOM	S2	17.9µg/l	4.7803	Fail
NON C2C CLEANROOM	S1 (Retest)	14µg/l	0.0028	Pass
NON C2C CLEANROOM	S2 (Retest)	14.8µg/l	0.0008	Pass

Conclusions

On the day of testing the filter in the Softwall Cleanroom, Non C2C Cleanroom, Filters S1 (RETEST) and S2 (RETEST) passed the leak test as the results were below the maximum penetration levels.

On the day of testing the filter in the Softwall Cleanroom, Non C2C Cleanroom, Filters S1 and S2 failed the leak test as the results were above the maximum penetration levels but after Filter S1 and Filter S2 was replaced and re-tested it/they subsequently passed, as per the results in Appendix 4.

On the day of testing the filters listed in the Softwall Cleanroom Non C2C Cleanroom identified with a pass as it/they conformed to the requirements of EN ISO 14644-3:2005, Section B6 for particle challenge leak testing. Please see Appendix 4 for specific test data.

Cleanrooms

UK & Europe's leading
Cleanroom provider

Proposal Information:

Prepared By:	John Merrill john.merrill@connect2cleanrooms.com 01524 813020
Checked By:	Karen Keegan karen@connect2cleanrooms.com 01524 813020
Issue Date:	04/06/2020