AG&G SERVICES
Complete Compliance and Validation

AG&G Testing and Validation Launceston General Hospital Operating Theatre 4

November 2024

Test Report Number: 1962.24
AG&G testing and validation in:
287-291 CHARLES STREET
LAUNCESTON, TAS 7250
Contact: Shane Toon – 0419 146 979
Starting test date: 01/11/2024

TABLE OF CONTENTS

The tests result, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Laboratory accreditation n.15401
Accredited for compliance with ISO/IEC 17025-Testing

1. INTRODUCTION

This protocol includes the periodic AG&G testing, validation and reporting in the area in object, meeting the requirements stated in the correspondent current Australian and International Standards:

- *AS ISO 14644.3 (2021) – Determination of air velocity and uniformity of air velocity.*
- *AS 1807:2021 Clause 4.4 – Determination of integrity of terminally mounted HEPA filter installations.*
- *AS 1807.7 (2000): Determination of integrity of not-terminally mounted HEPA filters.*
- *AS ISO 14644.1 (2017) – App. A Cleanrooms and associated controlled environments.*
- *AS ISO 14644.3 (2021) – B.1 Determination of air pressure of cleanrooms and pharmaceuticals isolators.*
- *AS ISO 14644.3 (2021) – B.5, B.6 - Determination of relative humidity & temperature in cleanrooms.*
- *AS 1807:2021 Clause 4.5 - Determination of Illuminance.*
- *AS 1807.16 - Determination of sound level in cleanrooms.*
- *AS ISO 14644.3 (2021) – B.4 - Determination of recovery times of cleanrooms.*

2. RESPONSIBILITY

AG&G Services PTY LTD:

- Prepares and reviews the document in accordance with reference standards listed above.
- Performs the tests described in this protocol.
- Checks the correspondence of the data obtained with the criteria of acceptability.
- Fills in the deviation forms present in this document.

CUSTOMER:

- Certifies and reviews the approval of this Protocol pursuant to its contents, standards and customer's SOPs.
- Assists tests described in this protocol, ensures adherence of the activities carried out in this Protocol.
- Decides and approves the corrective action in case of deviation.

3. EXECUTION PROCEDURE

3.1. Test modules

Each qualification test corresponds to a module composed by the following elements:

1. Module number: identifies the test. It's a progressive identification number.
2. Test title: briefly describes test object.
3. Execution method: short description of the procedures adopted for tests execution.
4. Acceptance criteria: defines the acceptance criteria to be applied to each test to determine the success or failure.
5. Comments: space for writing any information or observation taken at the time of test. Each non-compliance is described briefly in the comments field.
6. Date of execution

3.2. How to Compile Modules

1. Data manually collected must be clearly written and readable, using blue ink pens non-erasable.
2. The format of the date is: "*dd/mmm/yyyy*" (e.g. 12/DEC/2004) or "*dd/mm/yyyy*" (e.g. 12/12/2004).
3. Data compiling must take place at the very moment when they are detected. The outcome of the execution is registered with the words "PASS" (or "POSITIVE") or " FAIL " (or NEGATIVE) in the field provided or using an "X" on the word "PASS / FAIL" (if present in the pre-printed).
4. Any space for compiling left blank should be crossed out.
5. In case of compiling error, proceed as follow:
   - Mark with single line to maintain the readability of the data.
   - Enter the appropriate information, dated and initialed by the checker and if necessary justification.
   - It is not allowed to be covered or removed.

3.3. Personnel Identification Module

In this module, all personnel involved in the execution of the tests described in this Document should identify themselves by writing their name, company affiliation and function and put their extended signature and initials.

3.4. Deviations Module

The presence of any deviation must be discussed by departments involved and indicated in proper section of the document.
Corrective actions must be plan together with the customer to overcome the deviation and identify the functions entrusted with the implementation of these corrective actions.

3.5. TEST SUMMARY

Once performed all tests present in this Document, compile the "TEST SUMMARY MODULE". In this module, functions described in Personnel Identification Module check, approve and sign the conclusion of the Document.

4. MODULES LIST

This table lists the modules to be completed during tests execution:

INDEX	TEST METHOD	DESCRIPTION
Module 1	AS ISO 14644.3 (2021) - B.2, B.3	Determination of **air velocity** and uniformity of air velocity in laminar flow cleanrooms.
Module 2	AS 1807:2021 Clause 4.4	Determination of **integrity** of terminally mounted HEPA filter installations.
Module 3	AS ISO 14644.1 (2017) – App. A	Cleanrooms and associated controlled environments - Classification and **air cleanliness**
Module 4	AS ISO 14644.3 (2021) – B.1	Determination of **air pressure** of cleanrooms and pharmaceuticals isolators.
Module 5	AS ISO 14644.3 (2021) - B.5, B.6	Determination of relative **humidity** & **temperature** in cleanrooms
Module 6	AS 1807:2021 Clause 4.5	Determination of **Illuminance**.
Module 7	AS 1807.16	Determination of **sound level** in cleanrooms.
Module 8	AS ISO 14644.3 (2021) - B.4	Determination of **recovery times** of cleanrooms.
Module 9	/	Test equipment calibrations.
Module 10	/	Personnel identification.
Module 11	/	Deviations.
Module 12	/	Test Summary.

Comments:

5. AIR VELOCITY / AIR CHANGE VERIFICATION - MODULE 1

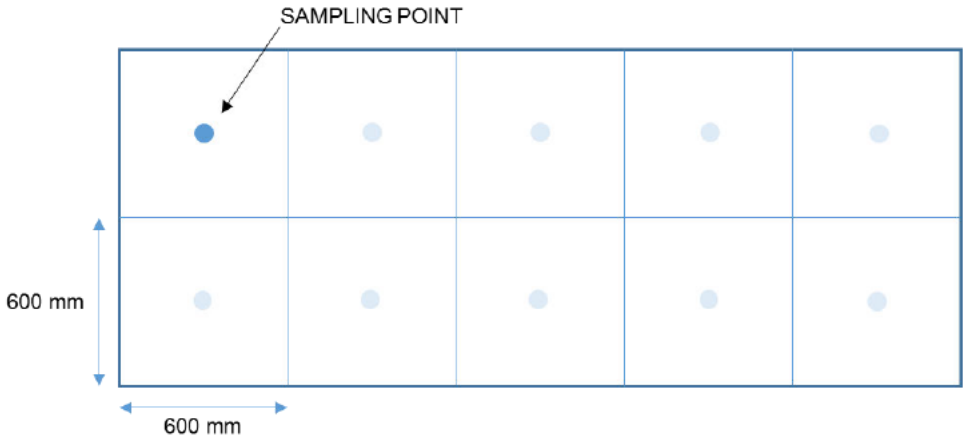
5.1. Objective

To verify that the velocity of air supplied by filters is suitable to guarantee the required number of air changes per hour (not-unidirectional air flow).

5.2. Test Procedure

The test must be performed with all doors closed and in "working condition".

- Use a proper instrument calibrated for measuring the air velocity (hot wire or fan anemometer);
- The air velocity must be measured under the top air inlet, at approximately 150 mm to 300 mm from the filter face, in compliance with **AS ISO 14644.3 paragraph B.2**;
- The measuring time at each position should be also sufficient to ensure a repeatable reading;
- Divide the entrance and exit planes of the work zone into grids of equal area having approximate dimensions of 600 mm × 600 mm:



- Measure the speed of each node of the grid (no less than 4 points should be measured, as per ISO 14644.3);
- During the measurement wait at least 15 seconds, to have a value sufficiently stable;
- Record the measured velocity at each grid point.

5.3. Documentation Procedure

Document the test by compiling the table in paragraph below.

5.4. Acceptance Criteria

- Minimum of **20 air changes per hour (AC/H)** in Operating Theatres;
- Minimum of **15 air changes per hour (AC/H)** in Sterile Stores and Set Up rooms;

(SOURCE: DGHDPC - Part E Building Services and Environmental Design)

5.5. Data recorded

Below table with data recorded accordingly to procedure above, and calculation of average speed and air changes per hour:

	OPERATING THEATRE				ANAES.
	HEPA 1	HEPA 2	HEPA 3	HEPA 4	HEPA 5
Filter media size [mm]	610	610	610	610	610
	610	610	610	610	610
Records required:	4	4	4	4	4
v1 [m/s]	0.76	0.75	0.73	0.74	0.83
v2 [m/s]	0.74	0.74	0.74	0.73	0.82
v3 [m/s]	0.73	0.75	0.73	0.75	0.83
v4 [m/s]	0.76	0.76	0.72	0.75	0.84
v5 [m/s]					
v6 [m/s]					
Velocity with CORRECTION FACTORS APPLIED					
v1 [m/s]	**0.75**	**0.74**	**0.72**	**0.73**	**0.82**
v2 [m/s]	**0.73**	**0.73**	**0.73**	**0.72**	**0.81**
v3 [m/s]	**0.72**	**0.74**	**0.72**	**0.74**	**0.82**
v4 [m/s]	**0.75**	**0.75**	**0.71**	**0.74**	**0.83**
v5 [m/s]					
v6 [m/s]					
Vmed[m/s]	0.74	0.74	0.72	0.73	0.82
Pressure drop initial [Pa]	NO PROVISION				
Pressure drop final [Pa]					
Surface [m²]	0.372	0.372	0.372	0.372	0.372
Filter air quantity [m³/h]	985.2	988.6	961.8	978.5	1095.8
Total air quantity [m³/h]	3914.2				2706.8
Volume [m³]	132.48				N.A.
Acceptance criteria [vol/h]	20.00				
Air changes/hour [vol/h]	**29.5**				
COMPLIANCE:	**PASS**				

Uncertainty according to calibration certificate no. S32964 valid until NOV-2024

Comments: _____

Test conformity to acceptance criteria:	PASS ☒ FAIL ☐	DATE: same as starting date

6. HEPA FILTERS INTEGRITY VERIFICATION - MODULE 2

6.1. Objective

This test is performed to check that the filtration system is properly installed and that no leaks are present during filtration.

6.2. Test Procedure

The test must be performed in "at rest" conditions, below AG&G approved methods:

Method	Method used
DOP method - As per ISO 14644.3(2021) **Par.B.7.2**: the test is performed by introducing tracer particles through a suitable generator of aerosol (EMERY oil, or other tracers allowed) upstream the filter and by performing a scan of the filter medium by means of a photometer suitably calibrated.	☐
DPC method - As per ISO 14644.3(2021) **Par.B.7.3**: the test is performed scanning with a Discrete Particle Counter the surface of the filter. Detection of particles must be investigated with a stationary measurement of the point: if during the stationary measurement there is still detection of particles it indicates a presence of a leak.	☒

6.3. Documentation Procedure

Document the test by compiling map and table below.

6.4. Acceptance Criteria

A filter is considered intact when no leaks have been detected using methods described above, as per ISO 14644.3 Par.B.7.2 (**DOP method**) and Par.B.7.3 (**DPC method**).

6.5. Data recorded

Filter N.	Filter size Height [mm]	Width [mm]	Depth [mm]	Seal type	Media type [CEN-EN 1822]	Leaks detected	COMPLIANCE
OPERATING THEATRE							
HEPA 1	610	610	149	Mechanical	H14	NO	PASS
HEPA 2	610	610	149	Mechanical	H14	NO	PASS
HEPA 3	610	610	149	Mechanical	H14	NO	PASS
HEPA 4	610	610	149	Mechanical	H14	NO	PASS
ANAESTHETIC 4							
HEPA 5	610	610	149	Mechanical	H14	NO	PASS

Comments: _____

Test conformity to acceptance criteria:	PASS ☒ FAIL ☐	DATE: same as starting date

7. NON VIABLE PARTICLE CONTAMINATION VERIFICATION - MODULE 3

7.1. Objective

The objective of this test is to verify that, inside each area in object, the considered airborne particulate grade classification conditions are met in the status ("at rest" / "operational") required.

7.2. Test Procedure

Sampling locations have been defined according to **AS ISO 14644.1 - 2017, Annex A.4 Establishment of sampling locations**:

Area of cleanroom (m^2) less than or equal to	Minimum number of sampling locations to be tested (N_L)
2	1
4	2
6	3
8	4
10	5
24	6
28	7
32	8
36	9
52	10
56	11
64	12
68	13
72	14
76	15
104	16
108	17
116	18
148	19
156	20
192	21
232	22
276	23
352	24
436	25
636	26
1 000	27
> 1 000	$N_L = 27 * (A / 1000)$

where N_L is the number of sampling locations and A is the room surface measured in m^2. The sampling point layout is present at the end of this module.

The verification is performed in each location calculated using an automatic particle counter properly calibrated.

- Sample time each location: Grade A (or ≤ ISO 5) = 10min, Grade B = 7min, Grades C, D (or > ISO 5) = 1min.
- Air volume sampled: Grade A (or ≤ ISO 5) = 1 m^3, Grade B = 0.7 m^3, Grades C, D (or > ISO 5) = 0.1 m^3.

The result and the print-out for each location shall be recorded as a cumulated count normalized to m^3.

7.3. Documentation Procedure

Document the test by compiling the table in paragraph 7.5.

7.4. Acceptance Criteria

7.4.1. AS ISO 14644.1 (2017) **Par. 4.3** – ISO Class Number

CLASS	Maximum concentration limits for particles equal to and larger than:		
	0.5 [µm]	1.0 [µm]	5.0 [µm]
ISO 1			
ISO 2			
ISO 3	35		
ISO 4	352	83	
ISO 5	3,520	832	
ISO 6	**35,200**	**8,320**	**293**
ISO 7	**352,000**	**83,200**	**2,930**
ISO 8	3,520,000	832,000	29,300
ISO 9	35,200,000	8,320,000	293,000

- ULTRA CLEAN ROOMS: particle concentration (class of room) to AS/NZ ISO 14644.1, **class 6**.
- CONVENTIONAL ROOMS: particle concentration (class of room) to AS/NZ ISO 14644.1, **class 7**.

(SOURCE: DGHDPC, AS ISO 14644.1-2017)

7.5. Data recorded

Below table with data recorded and calculated accordingly to procedure above:

Total surface: A =	45 m^2
Number of sample Locations (Loc. X) =	10 samples
Status =	AT REST

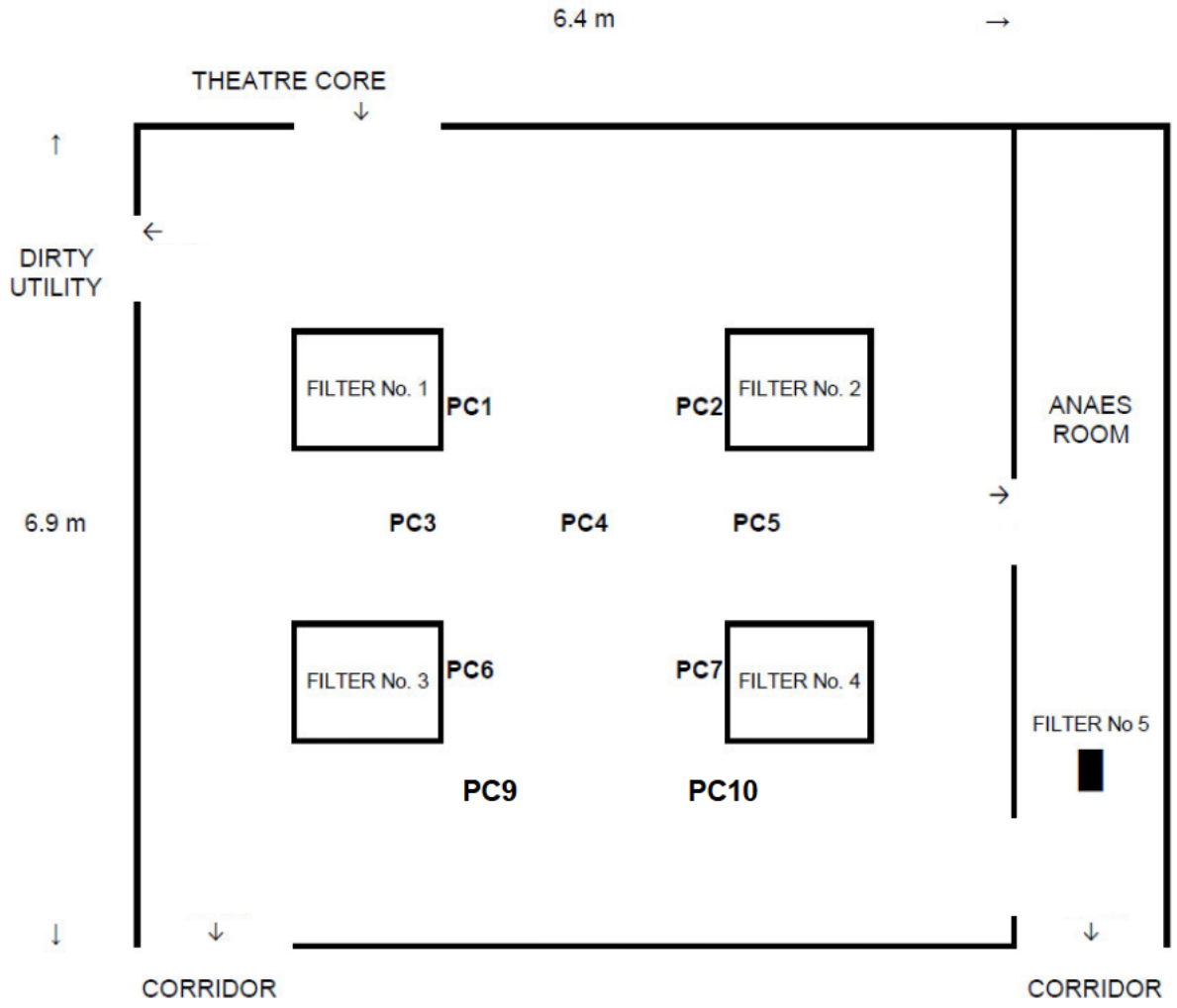
	0.5µm	5.0µm
Loc. 1	27740	1030
Loc. 2	27780	1150
Loc. 3	26800	1030
Loc. 4	27630	880
Loc. 5	24290	490
Loc. 6	32630	930
Loc. 7	37330	1970
Loc. 8	30920	1190
Loc. 9	26800	690
Loc. 10	24820	440
Loc. 11		
Loc. 12		
Loc. 13		
Loc. 14		
Loc. 15		

REQUIREMENT DISCRIPTION	REQUIREMENT	TEST RESULTS
TGA/GMP minimum room classification requirement	ISO 7	PASS
Total sample test positions required	10	10
Maximum concentration of Particles/m^3 of air (0.5 µm)	352,000	37,330 Loc.7
Maximum concentration of Particles/m^3 of air (5.0 µm)	2,930	1,970 Loc.7

PARTICLE SIZE	0.5µm	5.0µm
AVERAGE MEAN	28,674.0	980.0
RESULT:	**PASS**	**PASS**

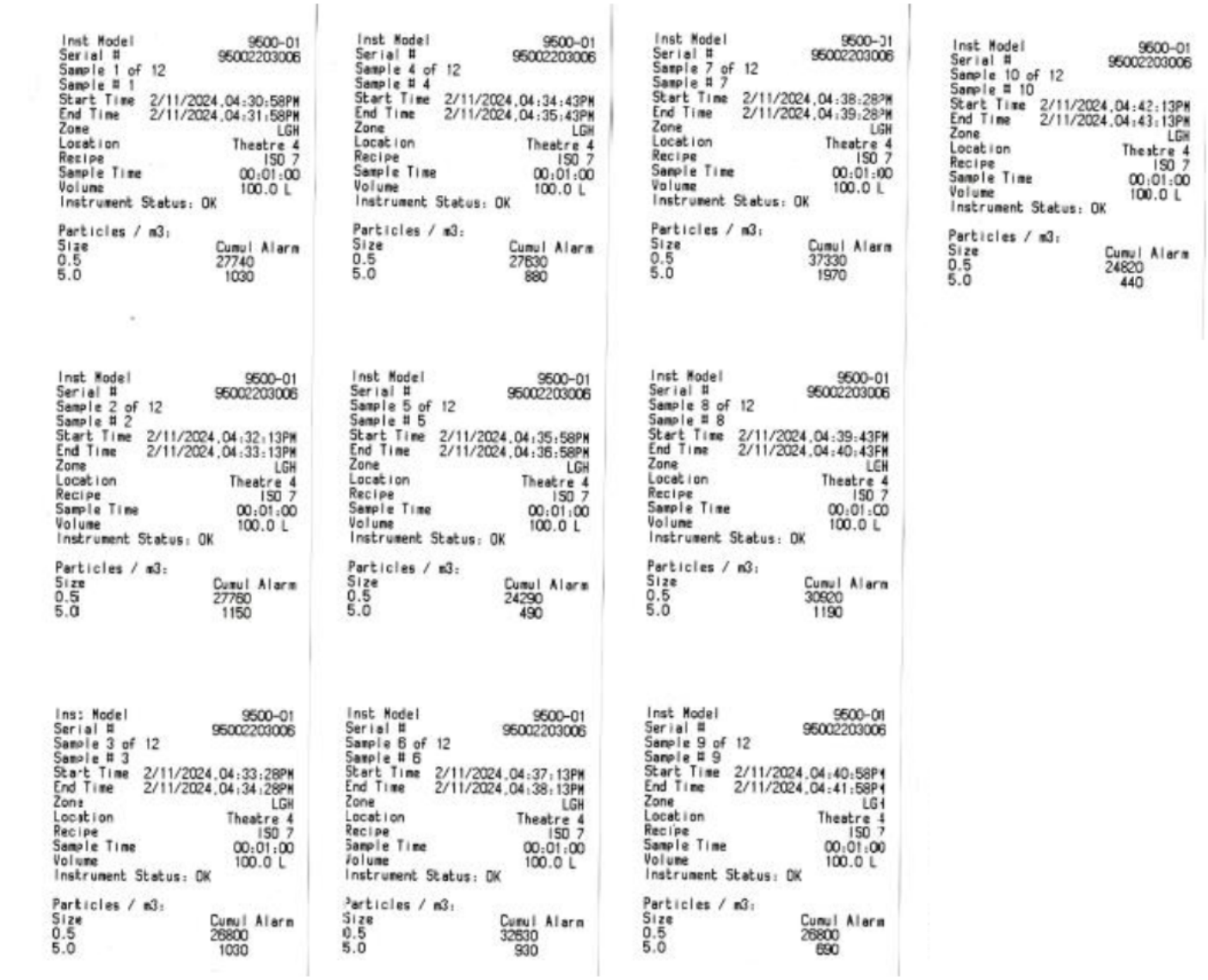
Comments:

Below map showing particle count sampling locations:



Comments:

Below particle count printout scans:



Inst Model 9500-01
Serial # 95002203006
Sample 1 of 12
Sample # 1
Start Time 2/11/2024,04:30:58PM
End Time 2/11/2024,04:31:58PM
Zone LGH
Location Theatre 4
Recipe ISO 7
Sample Time 00:01:00
Volume 100.0 L
Instrument Status: OK

Particles / m3:
Size Cumul Alarm
0.5 27740
5.0 1030

Inst Model 9500-01
Serial # 95002203006
Sample 4 of 12
Sample # 4
Start Time 2/11/2024,04:34:43PM
End Time 2/11/2024,04:35:43PM
Zone LGH
Location Theatre 4
Recipe ISO 7
Sample Time 00:01:00
Volume 100.0 L
Instrument Status: OK

Particles / m3:
Size Cumul Alarm
0.5 27630
5.0 880

Inst Model 9500-01
Serial # 95002203006
Sample 7 of 12
Sample # 7
Start Time 2/11/2024,04:38:28PM
End Time 2/11/2024,04:39:28PM
Zone LGH
Location Theatre 4
Recipe ISO 7
Sample Time 00:01:00
Volume 100.0 L
Instrument Status: OK

Particles / m3:
Size Cumul Alarm
0.5 37330
5.0 1970

Inst Model 9500-01
Serial # 95002203006
Sample 10 of 12
Sample # 10
Start Time 2/11/2024,04:42:13PM
End Time 2/11/2024,04:43:13PM
Zone LGH
Location Theatre 4
Recipe ISO 7
Sample Time 00:01:00
Volume 100.0 L
Instrument Status: OK

Particles / m3:
Size Cumul Alarm
0.5 24820
5.0 440

Inst Model 9500-01
Serial # 95002203006
Sample 2 of 12
Sample # 2
Start Time 2/11/2024,04:32:13PM
End Time 2/11/2024,04:33:13PM
Zone LGH
Location Theatre 4
Recipe ISO 7
Sample Time 00:01:00
Volume 100.0 L
Instrument Status: OK

Particles / m3:
Size Cumul Alarm
0.5 27760
5.0 1150

Inst Model 9500-01
Serial # 95002203006
Sample 5 of 12
Sample # 5
Start Time 2/11/2024,04:35:58PM
End Time 2/11/2024,04:36:58PM
Zone LGH
Location Theatre 4
Recipe ISO 7
Sample Time 00:01:00
Volume 100.0 L
Instrument Status: OK

Particles / m3:
Size Cumul Alarm
0.5 24290
5.0 490

Inst Model 9500-01
Serial # 95002203006
Sample 8 of 12
Sample # 8
Start Time 2/11/2024,04:39:43PM
End Time 2/11/2024,04:40:43PM
Zone LGH
Location Theatre 4
Recipe ISO 7
Sample Time 00:01:00
Volume 100.0 L
Instrument Status: OK

Particles / m3:
Size Cumul Alarm
0.5 30920
5.0 1190

Ins: Model 9500-01
Serial # 95002203006
Sample 3 of 12
Sample # 3
Start Time 2/11/2024,04:33:28PM
End Time 2/11/2024,04:34:28PM
Zone LGH
Location Theatre 4
Recipe ISO 7
Sample Time 00:01:00
Volume 100.0 L
Instrument Status: OK

Particles / m3:
Size Cumul Alarm
0.5 26800
5.0 1030

Inst Model 9500-01
Serial # 95002203006
Sample 6 of 12
Sample # 6
Start Time 2/11/2024,04:37:13PM
End Time 2/11/2024,04:38:13PM
Zone LGH
Location Theatre 4
Recipe ISO 7
Sample Time 00:01:00
Volume 100.0 L
Instrument Status: OK

Particles / m3:
Size Cumul Alarm
0.5 32630
5.0 930

Inst Model 9500-01
Serial # 95002203006
Sample 9 of 12
Sample # 9
Start Time 2/11/2024,04:40:58PM
End Time 2/11/2024,04:41:58PM
Zone LGH
Location Theatre 4
Recipe ISO 7
Sample Time 00:01:00
Volume 100.0 L
Instrument Status: OK

Particles / m3:
Size Cumul Alarm
0.5 26800
5.0 690

Comments:

Test conformity to acceptance criteria:	PASS ☒ FAIL ☐	DATE: same as starting date

8. ENVIRONMENT AIR PRESSURE DIFFERENTIAL - MODULE 4

8.1. Objective

Differential pressures verification test is performed in "At rest" conditions.

The purpose of this test is to verify, by means of a suitably calibrated micro-manometer or equivalent instrument, air pressure in the innermost cleanroom relative to that of another room, area, or reference condition.
The measured values should:
a) comply with the differential pressures between the different rooms of the cleanroom;
b) ensure the protection of cleanroom from outside contamination;
c) ensure the containment of dust.

8.2. Test Procedure

Once identified rooms in object, test is performed as follows:

1. Measure the pressure differential that exists between the room in object and the reference environment, making sure that all doors of the area are closed.
2. Record the measurement for each adjacent area.

8.3. Documentation Procedure

Document the test by reporting records into table below and/or layout in following page(s).

8.4. Acceptance Criteria

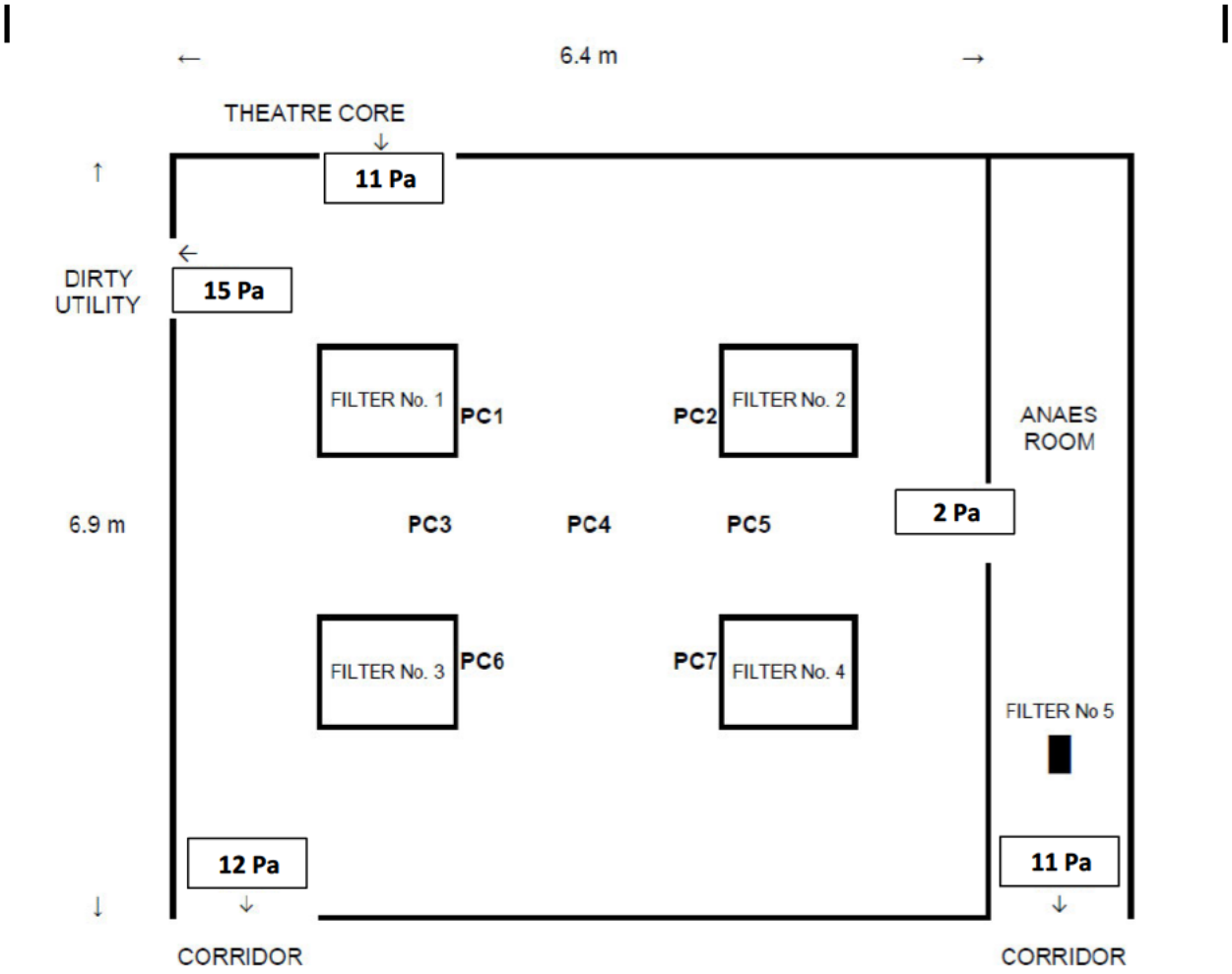
- The air pressure within the operating room shall be maintained above that of the adjacent enclosures, other than sterile store and set-up rooms.
- The air pressure within the sterile store and set-up enclosures shall be maintained higher than that in adjacent enclosures.

(SOURCE AS 1668.2-2012)

SYSTEM	PRESSURE TO ENVIRONMENT [PA]	ACCEPTANCE CRITERIA [PA]	CONFORM [YES/NO]
OT4 to CORRIDOR	12	> 0	YES ☒ NO ☐
OT4 to ANAES	2	> 0	YES ☐ NO ☒
ANAES to CORRIDOR	11	> 0	YES ☒ NO ☐
OT4 to UTILITY	15	> 0	YES ☒ NO ☐
OT4 to THEATRE CORE	11	> 0	YES ☒ NO ☐

8.5. Data recorded

Below layout with data recorded accordingly to procedure above:



Comments: _____

Test conformity to acceptance criteria:	PASS ☒ FAIL ☐	DATE: same as starting date

9. RELATIVE HUMIDITY AND TEMPERATURE - MODULE 5

9.1. Objective

Temperature control is required to provide stable conditions for personnel wearing cleanroom garments and for materials and instruments.
Humidity control is necessary to prevent corrosion, prevent condensation on surfaces, eliminate static electricity and provide personnel comfort.
The objective of this test is to verify that, inside each area in object, temperature and humidity meet the acceptance criteria listed below.

9.2. Test Procedure

Following test procedure is valid, as per standard AS ISO 14644.3-2021 – B.5 & B.6, for cleanrooms within the temperature range of 5°C to 40°C and where the tolerance for relative humidity is not less than ±4%.

a) Select location(s) where the air constitutes a representative sample, and is least affected by the proximity to machinery, personnel, or other sources of thermal radiation.
b) Set the instrument used in operation for at least 2 minutes or until stable readings are obtained.
c) Read and record temperature and humidity for each location selected at point "a".

9.3. Documentation Procedure

Document the test by compiling the table below.

9.4. Acceptance Criteria

Temperature/Humidity limits should be specified in conjunction with users and operators of the cleanroom.

Suggested criteria:
a) Operating theatres: temperature between **16 – 27 °C**, humidity between **30 – 60%**
b) Sterile stores and preparation rooms: temperature between **20 – 23 °C**, humidity between **30 – 60%**

(SOURCE: DGHDPC - Part E Building Services and Environmental Design)

9.5. Data recorded

Area	Temperature [°C]		COMPLIANCE	Humidity [%]		COMPLIANCE
	Recorded	Acceptance criteria		Recorded	Acceptance criteria	
Operating Theatre	20.5	16 < T < 27	PASS	45.3	30 < RH < 60	PASS

Comments:

Test conformity to acceptance criteria:	PASS ☒ FAIL ☐	DATE: same as starting date

10. ILLUMINANCE - MODULE 6

10.1. Objective

The normal lighting level is established to provide a reasonable level of illuminance for the process without causing the operator eye fatigue. The objective is to verify that illuminance meets acceptance criteria below.

10.2. Test Procedure

A portable photoelectric photometer with digital or analog display shall be used.

Following test procedure is valid, as per Standard AS 1807-2021 Clause 4.5, for cleanroom, workstations, safety cabinets and pharmaceutical isolators.

a) Operate the lamps for at least 1 h.
b) For workstations, safety cabinets and pharmaceutical isolators, take measurements in the normal working area surface on the centre-line across the full width of the cabinet at approximately 300 mm centres, starting in 150 mm from each side.
c) For cleanrooms, take measurements at representative locations, or where required at critical work levels
d) Record each measurement.

10.3. Documentation Procedure

Document the test by compiling the table(s) below.

10.4. Acceptance Criteria

As per *AS/NZS 1680.2.5:2018 Interior and workplace lighting – Hospital and medical tasks*, for normal operating procedures is required an average illuminance within the range 200-800 lux (15 lux for procedures requiring darkened conditions).

10.5. Data recorded

Below table with data recorded and calculated accordingly to procedure above:

Area	Sample Location	Instrument reading [LUX]	Corrected Result [LUX]	Acceptance Criteria [LUX]	COMPLIANCE
Operating Theatre	1	733	**806**	> 200	PASS
	2	704	**774**	> 200	PASS
	3	712	**783**	> 200	PASS
	4	723	**795**	> 200	PASS
		MINIMUM:	**790**	**> 200**	**PASS**

Comments: _____

Test conformity to acceptance criteria:	PASS ☒ FAIL ☐	DATE: same as starting date

11. SOUND LEVEL - MODULE 7

11.1. Objective

Noise is one of the most difficult variables to control within contamination control equipment, because of the high volumes of air necessary to provide the cleanness levels required and because of the hard and reflective surfaces incorporated in the enclosure.
The purpose of this test is to verify, using a suitably calibrated sound-meter or equivalent instrument, that the noise level meets the limit described below.

11.2. Test Procedure

As per AS 1807.16 standard, sound levels are measured at specified positions under operating conditions, as follows:

1. Select the point to measurement, it shall be at user head level during user's normal work position(s).
2. Ensure that equipment is operating within specification (airflow, containment, etc.).
3. Using the sound meter determine sound level in each chosen location and record data.

11.3. Documentation Procedure

Document the test compiling the table below.

11.4. Acceptance Criteria

When measured in accordance with AS 1807.16, the sound level of the cleanroom shall be not greater than 68 dB(A).

11.5. Data recorded

Below table with data recorded and calculated accordingly to procedure above:

Area	Ambient Sound level [dB]	Operating Sound level [dB]	Corrected Sound level [dB]	Acceptance Criteria [dB]	COMPLIANCE
Operating Theatre	N.A.	57.2	**57.2**	< 68	PASS

Comments: _____

Test conformity to acceptance criteria:	PASS ☒ FAIL ☐	DATE: same as starting date

12. RECOVERY TIME - MODULE 8

12.1. Objective

This test is performed to determine the ability of the installation to eliminate airborne particles.
The **Recovery time** (100:1 or 10:1) is defined as the time required by the system to reduce by 100 times (or 10 times) the initial particles concentration.
The **Recovery rate** is defined as the velocity to reduce a particles contamination over time. Hence this definition is different from the above one because it doesn't involve a specific initial concentration.
(ISO 14644.3 B 4.2 Cleanliness recovery performance)

12.2. Test Procedure

As per AS ISO 14644.3-2021 – B.4, recovery time is calculated as follows:

1. Set up the DPC in accordance to manufacturer's instructions and place the probe at the most critical location (found in the cleanliness test At Rest).
2. Choose a particles size to record, recommended less than 1 µm.
3. Keeping the AHU still in operation, contaminate the area with an aerosol trying to raise the concentration at 100 times the target cleanliness level, where applicable, otherwise at 10 times the target class limits.
4. Record data every minute until the concentration gets back to target class cleanliness levels.

12.3. Documentation Procedure

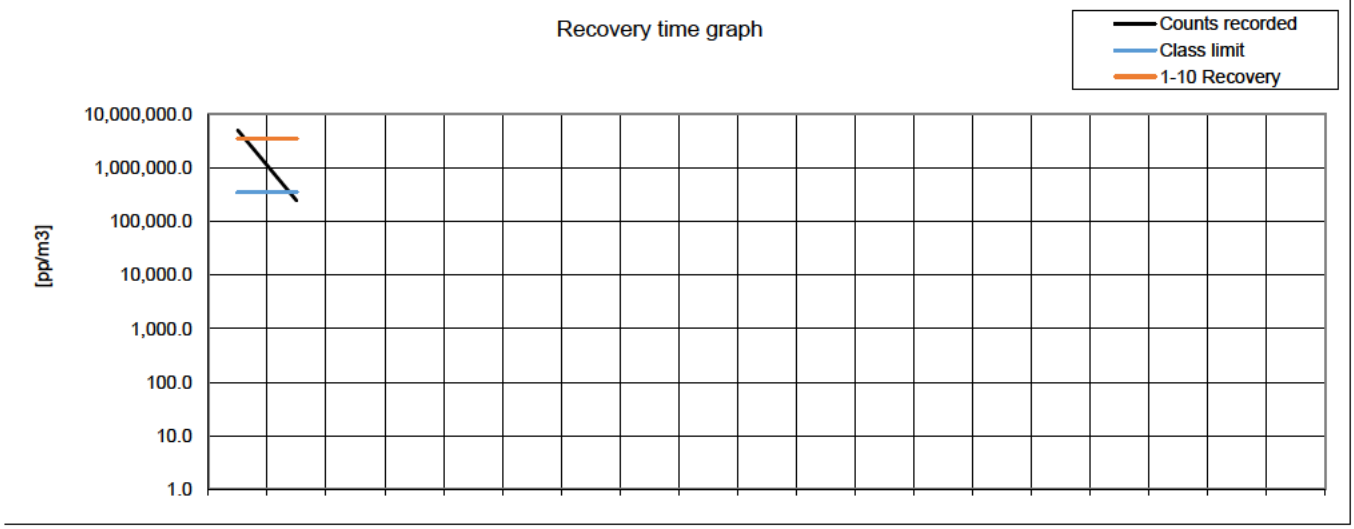
Document the test by filling the table below and attaching particle count printouts.

12.4. Acceptance Criteria

AS ISO 14644.3 doesn't impose a specific acceptance criteria, PICS GMP set instead this limit between 15 and 20 minutes (depending on cleanliness class level and agreed between customer and supplier).
(PIC/S GMP PE 009-14, 2020).

12.5. Data recorded **OPERATING THEATRE**

[hh.mm.ss] minute of sampling	pp ≥ 0,5 [µm] Recorded	pp class ≥ 0,5 [µm]	pp ≥ 0,5 [µm] 10÷1 "OPER"
18:22:24	5,061,460.0	352,000	3,520,000
18:23:24	242,840.0	352,000	3,520,000



	Reference concentration (max value) [pp/m³] 0,5 [µm]	First concentration in class [pp/m³] 0,5 [µm]	Recovery time [hours:minutes]
Recovery time	5,061,460	242,840	**0:01**

Particle counts printout:

```
Inst Model                    9500-01
Serial #                  95002203006
Sample 1 of ∞
Sample # 76
Start Time  2/11/2024,06:22:24PM
End Time    2/11/2024,06:23:24PM
Zone                        Recovery
Location                  Theatre 4
Recipe                      Recovery
Sample Time                 00:01:00
Volume                       100.0 L
Instrument Status: OK

Particles / m3:
Size                      Cumul Alarm
0.5                       5051460
```

```
Inst Model                    9500-01
Serial #                  95002203006
Sample 2 of ∞
Sample # 77
Start Time  2/11/2024,06:23:24PM
End Time    2/11/2024,06:24:24PM
Zone                        Recovery
Location                  Theatre 4
Recipe                      Recovery
Sample Time                 00:01:00
Volume                       100.0 L
Instrument Status: OK

Particles / m3:
Size                      Cumul Alarm
0.5                       242840
```

Comments:

Recovery time identified for this theatre:	**1 min**	DATE: same as starting date

13. TEST EQUIPMENT CALIBRATIONS - MODULE 9

13.1. Objective

To verify that all instruments used for the qualification in object are properly calibrated and have a currently valid calibration certificate:

Test	Instrument	Brand	Model	Serial number	Calibration certif. No.	Next calibr. due	Equipment used
Air velocity and uniformity	**ANEMOMETER VANE**	TESTO	0635 9370	20980953	S32964	NOV-2024	Yes ☒ No ☐
Pressure differential	**PRESSURE INDICATOR**	TESTO	0560 0400	61915499	D82291	NOV-2024	Yes ☒ No ☐
Airborne particle counting	**PARTICLE COUNTER**	TSI	Aerotrak 9500-01	95002203006	C232383	MAY-2025	Yes ☒ No ☐
HEPA Integrity	**AEROSOL PHOTOMETER**	Air Technologies	2i	39518	14006/23	DEC-2024	Yes ☐ No ☒
HEPA Integrity (DPC method)	**PARTICLE COUNTER**	TSI	Aerotrak 9500-01	95002203006	C232383	MAY-2025	Yes ☒ No ☐
Temperature	**HOTWIRE**	TESTO	0635 1570	20663978	T226126	NOV-2024	Yes ☒ No ☐
Humidity	**HOTWIRE**	TESTO	0635 1570	20663978	F87682	NOV-2024	Yes ☒ No ☐
Light intensity	**LUXMETER**	DIGITECH	QM1587	130502059	LL24916	NOV-2024	Yes ☒ No ☐
Sound level	**SOUND METER**	CASTLE	GA216	069732	CT-7695	FEB-2025	Yes ☒ No ☐
	ACUSTIC CALIBRATOR	CASTLE	GA601	044957	CT-7696	FEB-2025	Yes ☒ No ☐

14. PERSONNEL IDENTIFICATION - MODULE 10

All the people involved in the tests execution described in the present protocol are identified filling the following table, pointing out his/her name and surname in capital, the signature, the initials, the company of affiliation and the activities beginning date.

Name and surname	Signature	Initials	Department/Company	Date
Tung Le			AG&G Services	01/11/2024

15. DEVIATION - MODULE 11

~~DEVIATION # _____~~ ~~PAGE 1 OF __~~

TITLE OF THE TEST: _____

DEVIATION DESCRIPTION:

DEVIATION CAUSES:

TJ

01/11/2024

CORRECTIVE ACTIONS PROPOSAL:

CORRECTIVE ACTIONS RESULT:	COMPLIANT ☐	NOT COMPLIANT ☐
CLOSED DEVIATION:	YES ☐	NO ☐
NECESSITY OF ADDITIONAL TEST:	YES ☐	NO ☐

Test conformity to acceptance criteria:	PASS ☐ FAIL ☐	DATE: /

This page can be duplicated.

16. TEST SUMMARY - MODULE 12

	TEST DESCRIPTION	RESULT		
AS ISO 14644.3 (2021) - B.2, B.3	Air velocity and uniformity	PASS ☒	FAIL ☐	N.A. ☐
AS 1807:2021 Clause 4.4	HEPA Filter integrity	PASS ☒	FAIL ☐	N.A. ☐
AS ISO 14644.1 (2017) – App. A	Classification and air cleanliness	PASS ☒	FAIL ☐	N.A. ☐
AS ISO 14644.3 (2021) – B.1	Air pressure differential	PASS ☒	FAIL ☐	N.A. ☐
AS ISO 14644.3 (2021) - B.5, B.6	Temperature and humidity	PASS ☒	FAIL ☐	N.A. ☐
AS 1807:2021 Clause 4.5	Light intensity	PASS ☒	FAIL ☐	N.A. ☐
AS 1807.16	Sound level	PASS ☒	FAIL ☐	N.A. ☐
AS ISO 14644.3 (2021) - B.4	Recovery Time	**1 minutes**		
/	Test equipment calibrations	PASS ☒	FAIL ☐	N.A. ☐

Comments:

HEPAs installed DEC 2020

AG&G Signatory: TUNG LE — 03/11/2024 ENDING DATE

Checked by: DARREN WIND — 28/11/2024 ISSUE DATE

November 2025 NEXT TEST DUE

Department of Health

Tasmanian Government

File No.:

File Note

Prepared by: Julia Bullock Acting Nursing Director Surgery

Phone: (03) Personal Information

Date Prepared: 30/9/2025

Subject: Communication with Work Safe Incident 5507

- 26/9/2025 approx. 1600 hours WorkSafe notification complete via phone
- 26/9/2025 approx. 1730 hours WorkSafe regulator contact via phone with update provided and planned actions Saturday 27/9/2025 and 28/9/2025
- 29/9/2025 Phone notification from Tania Giddens senior inspector that planned site visit to occur approx. 1000 hours
- 29/9/2025 approx. 1025 Tania Giddens and colleague Andrew attended LGH and walk through of ORS and inspection of ORS4 undertakes whilst gathering information on incident and subsequent actions
- 29/9/2025 2124 requested additional information emailed to Tania Giddens
- 30/9/20251254 email update to Tania Giddens re delay in arrival of environmental testing consultant and resources arriving onsite
- 30/9/2025 1533 phone call to Tania Giddens with proposed testing arrangements for consideration of testing whilst cleaning undertaken in OR4. Referred to Shane Toon and environmental testing consultant for additional detail and proposed actions
- 30/9/2025 1537 phone call from Shane Toon to advise Tania Giddens WorkSafe had given approval to progress with planned testing and cleaning of OR4

From: Operating Room Suite Nurse Unit Manager <orsnum@ths.tas.gov.au>
Sent: Friday, 6 February 2026 11:34 AM
To: Bullock, Julia M [redacted]@ths.tas.gov.au>
Subject: Signal communication

Hey there

Here are some screenshots of info on the signal ap

Madeleine Postmus

NUM Operating Room Suite

Launceston General Hospital

Level 5, Charles St, Launceston TAS 7250

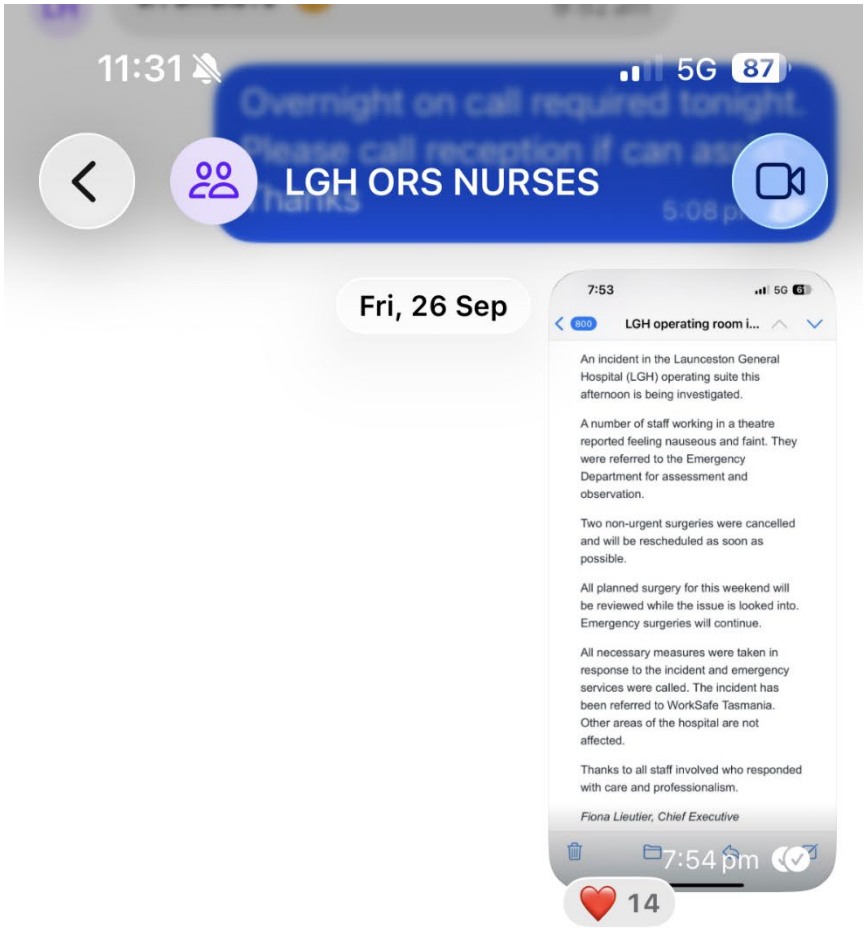
phone: [redacted]

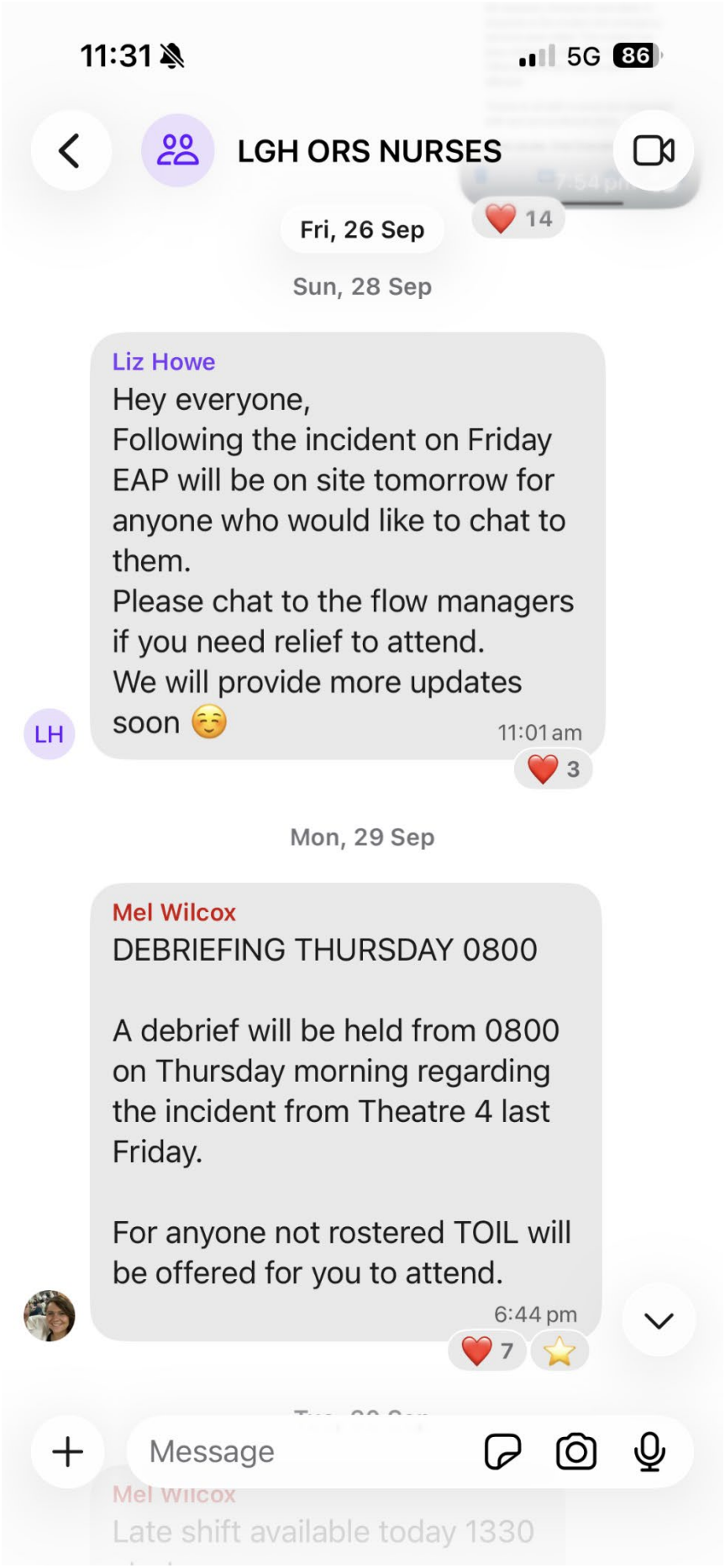
mobile: [redacted]

email: [redacted]

I acknowledge and respect Tasmanian Aboriginal people as the traditional owners and ongoing custodians of the land on which I work and live, and pay respect to Elders past, present and emerging.

From: Postmus, Madeleine J <[redacted]>
Sent: Friday, 6 February 2026 11:33 AM
To: Operating Room Suite Nurse Unit Manager <orsnum@ths.tas.gov.au>
Subject:


11:31
5G 87
LGH ORS NURSES
Fri, 26 Sep
7:53
LGH operating room i...
An incident in the Launceston General Hospital (LGH) operating suite this afternoon is being investigated.
A number of staff working in a theatre reported feeling nauseous and faint. They were referred to the Emergency Department for assessment and observation.
Two non-urgent surgeries were cancelled and will be rescheduled as soon as possible.
All planned surgery for this weekend will be reviewed while the issue is looked into. Emergency surgeries will continue.
All necessary measures were taken in response to the incident and emergency services were called. The incident has been referred to WorkSafe Tasmania. Other areas of the hospital are not affected.
Thanks to all staff involved who responded with care and professionalism.
Fiona Lieutier, Chief Executive
7:54 pm
14
Sun, 28 Sep
Liz Howe
Hey everyone,
Following the incident on Friday EAP will be on site tomorrow for anyone who would like to chat to them.
Please chat to the flow managers if you need relief to attend.
We will provide more updates soon
11:01 am
LH
3
Mon, 29 Sep
Message


11:31
5G 86
LGH ORS NURSES
14
Fri, 26 Sep
Sun, 28 Sep
Liz Howe
Hey everyone,
Following the incident on Friday EAP will be on site tomorrow for anyone who would like to chat to them.
Please chat to the flow managers if you need relief to attend.
We will provide more updates soon ☺️
11:01 am
LH
3
Mon, 29 Sep
Mel Wilcox
DEBRIEFING THURSDAY 0800
A debrief will be held from 0800 on Thursday morning regarding the incident from Theatre 4 last Friday.
For anyone not rostered TOIL will be offered for you to attend.
6:44 pm
7
Message
Mel Wilcox
Late shift available today 1330

From: Giddens, Tania (DoJ)
To: Bullock, Julia M
Subject: Inspection Report and Request for Further Documentation
Date: Wednesday, 1 October 2025 4:24:26 PM
Attachments: image001.png
image002.png
Inspection Report - INS-15304 - ORG-12812.pdf

Good afternoon Julia,
Please find attached the inspection report prepared by Inspector Oakley and I from our initial attendance on Monday. Thank you for facilitating our inspection of the affected area and for promptly providing the requested information via email and phone calls.
Could you kindly forward the following documents at your earliest convenience (or upon completion):

- The final written air monitoring report
- Notification of completion of the chemical audit
- Confirmation of monitor installation
- Any further recommendations provided by the Occupational Hygienist
- Details of any additional actions undertaken to address the issue and/or any further information you consider relevant to the incident

Your assistance is greatly appreciated.

Kind regards

Tania Giddens
Senior Inspector | Industry Safety

Department of Justice
Henty House, Level 3, 1 Civic Square
Launceston Tasmania 7250 Australia
P: 03 Personal Information | **M**: Personal Information
E: Personal Information **W**: worksafe.tas.gov.au
Available: 7am – 4pm

Mon	Tue	Wed	Thurs	Fri
✓	✓	✓	✓	×

received this email and any attachments by mistake, and delete them. If this email and any attachments include advice, that advice is based on, and limited to, the instructions received by the sender. Any unauthorised use of this email and any attachments is expressly prohibited. Any liability in connection with any viruses or other defects in this email and any attachments, is limited to re-supplying this email and any attachments.

Department of Justice

Tasmanian Government

INSPECTION REPORT
Work Health and Safety Act 2012

Date of Report: 01/10/2025
Name of Inspector: Tania Giddens
Phone Number: Personal Information
Email: Personal Information
Entry Date and Time: 29/09/2025 10:25
Departure Date and Time: 29/09/2025 12:10

Name of business or undertaking: The Crown in the right of the State of Tasmania (Tasmanian Health Service)

ABN: 15 359 196 040 **ACN:**

Phone No: **Mobile:**

Email:

Main address of business or undertaking:

George Town Hospital 47 Anne Street, George Town TAS 7253, Australia

PLACE ENTERED

Trading name (if different from above): Tasmanian Health Service

Address of attendance: Launceston General Hospital Launceston General Hospital 274-280 Charles St, Launceston TAS 7250, Australia

---

OTHER PERSONS ATTENDING WITH INSPECTOR

Regulator staff: Andrew Oakley **HSR:** Kylie STUBBS

PERSON SPOKEN WITH DURING INSPECTION

Name: Julia BULLOCK	**Tel:**	Personal Information	**Role:** A/Nursing Director
Name: Kylie STUBBS	**Tel:**	Personal Information	**Role:** HSR
Name: Madeleine POSTMUS	**Tel:**		**Role:** Manager

INSPECTION DETAILS

Purpose of Entry

Incident

Summary of Inspector's Observations

On Monday 29.09.25, Inspectors Tania GIDDENS and Andrew OAKLEY attended Launceston General Hospital, 274-280 Charles Street, Launceston. I met with Julia BULLOCK, A/Nursing Director . We identified ourselves as inspector's with WorkSafe Tasmania, appointed under the *Work Health and Safety Act 2012,* and produced my identification card. I explained the reason for the visit, being the incident that occurred on involving staff feeling unwell in theatre 4.

I observed and discussed the following:

- theatre 4 and equipment contained within
- scrub area
- chemicals used for cleaning
- summary of incident and procedures followed
- remedial action undertaken

INSPECTION OUTCOMES SUMMARY

Actions Agreed, Advice provided

Agreed Actions; to be forwarded to inspector

- TFS finding
- Biotech test results
- Summary of incident and procedures followed
- summary, followed by Air monitoring Report from Occupational hygienist upon completion

Advice provided;

- ensure that results of air monitoring are readily accessible to staff

Guidance to information to assist with compliance

www.worksafe.tas.gov.au

www.legislation.tas.gov.au

www.safeworkaustralia.gov.au

Guidance to Codes of Practice to assist with compliance

Managing Risks of Hazardous Chemicals in the Workplace

Managing the Risks of Plant in the Workplace

Work Health and Safety Consultation, Cooperation and Coordination

GIVING OF REPORT

Name of person given to:	Julia BULLOCK	**Date:**	01/10/2025
Person's position:	Manager		
Person's email:	Personal Information		
Method of giving:	Email		
Name of person given to:	Kylie STUBBS	**Date:**	01/10/2025
Person's position:	HSR		
Person's email:	Personal Information		
Method of giving:	Email		

DISCLAIMER

This report only deals with matters the subject of the specific inspection. It does not purport to indicate overall compliance status of the relevant duty holder(s) with work health and safety laws.

INTERNAL REVIEW OF CERTAIN INSPECTOR DECISIONS

You are able to apply for internal review of a decision made by an inspector during this visit. Information on how to seek an internal review is available on our website: www.worksafe.tas.gov.au.

FEEDBACK

If you want to clarify any matter that is covered by the Inspection Report and any associated Notices or Directions, please contact the issuing Inspector, whose name and contact details appear at the top of this Inspection Report.
If you want to provide feedback about any aspect of how this inspection was conducted, please lodge a complaint through our website at www.worksafe.tas.gov.au.

PERSONAL INFORMATION PROTECTION

Personal information we collect from you will be used by WorkSafe Tasmania for that purpose and may be used for other purposes permitted by legislation and policies administered by WorkSafe Tasmania or WorkCover Tasmania. Your personal information may be disclosed to contractors and agents of WorkSafe Tasmania, WorkCover Tasmania, law enforcement agencies, courts and other public sector bodies or organisations authorised to collect it. This information will be managed in accordance with the *Personal Information Protection Act 2004* and may be accessed by you on request to this Department.

FURTHER INFORMATION

WorkSafe Tasmania has a range of publications to explain your legal responsibilities and help you make your premises/site safer. To inquire about these publications, telephone 1300 366 322 (inside Tasmania) or (03) 6166 4600 (outside Tasmania) or visit our website www.worksafe.tas.gov.au.

From: Wilson, Ronald
To: Parnell, Alan D; Prabhat, Prabhat
Cc: Toon, Shane A; Bullock, Julia M; Postmus, Madeleine J; Day, Stuart K; Chen, Sunny
Subject: Re: LGH ORS 4. Biomed Investigation.
Date: Saturday, 27 September 2025 5:44:15 PM

Alan/Sunny,

Thanks very much for sending this through and for all your amazing effort last night and today.

Thank you!
Ron

Get Outlook for Android

From: Parnell, Alan D <Personal Information>
Sent: Saturday, September 27, 2025 4:48:15 PM
To: Prabhat, Prabhat <Personal Information>
Cc: Toon, Shane A <Personal Information>; Wilson, Ronald Personal Information >; Bullock, Julia M <Personal Information>; Postmus, Madeleine J <Personal Information>; Day, Stuart K <Personal Information>; Chen, Sunny <Personal Information>
Subject: LGH ORS 4. Biomed Investigation.

Hi Prabhat,

As discussed, Sunny and I have spent the day thoroughly inspecting and testing all Biomed equipment in ORS 4.

Over a period of many hours today, we have found no issues.

In Particular - Sunny spent many hours giving the Anaesthetic machine a full check / service and has verified its full functionality.

There are no leaks of anaesthetic agents or Nitrous Oxide from the machine. (looks like Nitrous was not in use at the time anyway).

We are also satisfied that both the detachable Desflurane and Sevoflurane cassettes present in the theatre had no agent leaks.

Other Equipment that was present in the theatre such as Smoke Extractors, Diathermy, and patient warmers, operating table, theatre lights etc, the were all run for some hours to verify their integrity.

No equipment exhibited any unusual odours or malfunctions, and all passed electric safety testing.

I can also verify there is no fridge in the Theatre or Anaesthetic Bay. (rules out a refrigerant gas leak).

Happy to discuss further if anyone requires any more information.

Kind regards

Alan Parnell
Senior Biomedical Technician
Biomedical Engineering
Launceston General Hospital.

Tel Personal Information

From:	Toon, Shane A
To:	Bullock, Julia M
Cc:	Wilson, Ronald; Matthews, Cameron T
Subject:	FW: 144866M LGH air quality L5 theatre 4
Date:	Wednesday, 1 October 2025 7:37:52 AM
Attachments:	image001.png image002.png

FYI

From: Samantha Clarke <Personal Information>
Sent: Wednesday, 1 October 2025 7:25 AM
To: Toon, Shane A <Personal Information>
Subject: 144866M LGH air quality L5 theatre 4

Good morning Shane,

Please find below a summary of findings following our site Assessment undertaken at the Launceston General Hospital (LGH), 274-280 Charles Street, Launceston TAS 7250 on the 27th and 30th of September 2025 (the Site).

Background

Around 2pm on Friday the 26th of September 2025, adverse health effects were reported by Tasmanian Health Services (THS) surgical staff during a routine procedure within operating theatre 4 on Level 5 at the Launceston General Hospital (LGH).

Objective

The objective of the Assessment was to assist the THS with investigating potential sources of hazardous airborne contaminants within the nominated areas of the LGH.

Scope of Works

The scope of this Assessment was limited to operating Theatre 4, Level 5 at the LGH, including the adjacent anaesthetic bay and clean up room (the Work Area). As part of this Assessment, Prensa conducted a visual inspection and indoor air quality sampling within nominated areas of the Site. Discussions with LGH staff, from Facilities, BioMed and Theatre, and a review of available data information was also undertaken as part of the Assessment.

Discussions with Key Stakeholders

Based on discussions with THS staff, Prensa understands the following:

- At approximately 3:30 pm on Friday the 26th September 2025, the LGH Facilities team were notified that surgical staff, working in operating theatre 4, were experiencing various symptoms including feeling hot, irritated eyes, nausea, and syncope (the Event). Three (3) staff members reported to the LGH Emergency Department, and one (1) additional staff member later reported adverse health effects from home;
- Adverse health effects occurred approximately one (1) hour into the routine abdominal surgery, with approximately twenty (20) staff present in theatre 4;
- One (1) staff member described a smell like ‘dry cleaning’;
- Theatre 4 was evacuated, except for only essential staff who (utilising medical

oxygen) completed the medical procedure;

- As per LGH protocol, the Tasmanian Fire Service was notified and conducted air monitoring to measure airborne concentrations of oxygen, carbon monoxide, carbon dioxide, hydrogen disulphide, lower explosive limit, hydrogen cyanide and volatile organic compounds (VOC's). No airborne concentrations of these gases were detected during the sampling period;
- Results from health monitoring, collected from affected staff members, did not identify any findings of concern;
- THS Biomed staff conducted a full service, and functionality checks, of the anaesthetic machines and confirmed no leaks of anaesthetic agents or nitrous oxide, and that both Desflurane and Sevoflurane cassettes were verified as leak-free;
- Theatre equipment, including smoke extractors, diathermy, patient warmers, operating table, and lights operated without odours or faults. Equipment passed electrical safety testing and no fridge was present in the theatre or anaesthetic bay
- Gauges for gas inlets to the theatre were also confirmed to not leak;

- No sterilisation of instruments is conducted in LGH theatres;
- No ethylene oxide or glutaraldehyde has been utilised at the LGH for some time;
- Plastering works were conducted on the day of the event in surgical Theatres 1 and 2, with hording and sealing of doors observed, to isolate the area. Theatre 3 was between Theatres 1 and 2, and Theatre 4;
- Other concurrent maintenance works included vinyl laying in Ward 4D, which is not near the Level 5 surgical theatres;
- Surgical theatre 3, adjacent Theatre 4, was also in use at the time of the event, to with no health symptoms or concerns reported on the day of the Event;
- Inspections and checks to Theatre 4 air handling unit (AHU) were conducted by THS Facilities staff, without any findings of concern;
- AHUs to Theatres 3 and 4, and adjacent recovery rooms all shared the same fresh air intake;

- The heating, ventilation and air-conditional (HVAC) system was designed to ensure Theatre 4 is maintained at a positive pressure;
- Temperature data indicated typical set points and measured temperatures within Theatre 4 around the time of the Event;
- Spill air data indicated maximum available fresh air contribution to the Theatre 4 recirculation system around the time of the Event;
- No data was available for carbon dioxide concentration or humidity within Theatre 4;
- Cleaning of the theatres, in between procedures, is conducted throughout the

shift. A terminal clean is conducted by cleaning staff at the end the shift;

- Disposable personal protective equipment (PPE) available in Theatre 4 was isolated for inspection;
- Typical cleaning chemicals were observed to be stored together and presumed to be combined during disposal in the 'slop hopper' or sink, both within the clean-up room; and
- Flushing of the 'slop hopper' and sinks was conducted on the 28th September 2025.

Preliminary Findings

- An indoor air quality assessment was conducted within Theatre 4 and the adjacent anaesthetic bay and clean-up room on the 30th of September 2025;
- Prior to the Assessment, the Work Area had been sealed and purged by the HVAC system;
- Pressurisation of Theatre was observed visually;
- The following instrumentation was used;
    - A TSI Q-trak was used to measure carbon monoxide, carbon dioxide, temperature, and relative humidity throughout the Work Area; and
    - A ppbRAE3000 photo ionising detector (PID) to conduct a targeted sweep for total volatile organic compounds (TVOC's) throughout the Work Area; and
- Instrumentation was hired from a specialist supplier and provided with current calibration certificates. Instruments were zeroed as per manufacturer's requirements prior to use.

Preliminary Results

The following table outlines the results of a range of parameters within the Work Area, during no activities and low occupancy.

Indoor Air Quality Assessment Findings							
Room	CO ppm	CO^2 ppm	Temp deg C	RH %	TVOC Baseline ppb	TVOC max sustained ppb	TVOC spike ppb
Theatre 4	ND	500-600	20-21	45-48	0	0	0
Clean up room	ND	550-700	20-22	46-51	0	0	0
Anaesthetic bay	ND	550-650	20-22	48-53	0	0	0
Acceptable	<2.0	<800	20 –	40 –	<200	<1000	<5000

range	24	60

Additional monitoring was conducted during cleaning activities within Theatre 4 and adjacent rooms. All gaseous, temperature and humidity readings were within acceptable ranges. Total volatile organic compound (TVOC) concentrations did spike over 1000ppb, during chemical cleaning activities.

Discussion

- All monitoring found indoor air parameters at acceptable levels during the Assessment;
- Identification of TVOC's was confirmed during the assessment, including from chemical cleaning products containing S 29 Security Information and S 29 Security Information;
- Previous inspections confirmed that gas feeds to the Work Area, the anaesthetic machine and other surgical equipment in the Work Area and the HVAC system to the Work Area were as functioning effectively, and without any identified faults; and
- The likelihood of elevated concentrations of carbon dioxide, due to a reduction of oxygen partial pressure was not assessed, in the absence of typical activities and occupancy within the Work Area.

Conclusion

Based on Prensa's visual inspection, monitoring, and discussions with staff, the Event appears to have been transient. Whilst a definite source was not identified, multiple credible causes were ruled out and potential contributors were removed or mitigated. The findings from the Assessment show that the area is suitable for re-occupation. Recommendations for additional investigation and controls to reduce the likelihood of a recurring event are made below.

Recommendations

Prensa make the following recommendations for additional investigation to continue to attempt to identify the source of concern from the event, as well as provide assurances to theatre staff of a safe work environment:

- Conduct further monitoring within the Work Area during routine occupancy of the Work Area, to confirm the effectiveness of the HVAC system during normal operation;
- Install fixed carbon dioxide sensors in theatres and a system to identify when theatres require reduced (essential roles only) occupancy; and
- Ensure all chemicals are effectively managed within the LGH Chemalert chemical management system, including up-to-date area-based registers, regular storage incompatibility checks and routine inspections.

A formal report will be issued prior to the end of the week. I'll give you a call later today to discuss further. However, feel free to contact me in the meantime with any further questions.

Kind regards,

Sam.

Samantha Clarke | Principal Occupational Hygienist **| Prensa Pty Ltd**
Certified Occupational Hygienist (COH) | FAIOH
Office: Launceston | Tasmania
Phone: (03) Personal Information **| Mobile:** Personal Information
Email: Personal Information
| Web: www.prensa.com.au

From: Toon, Shane A
To: Bullock, Julia M
Cc: Wilson, Ronald
Subject: RE: Required information
Date: Monday, 29 September 2025 3:37:18 PM
Attachments: Fw Hazmat Gas leak - Tas Fire Service.msg
image001.png
1962.24 - LGH - NOV 2024 - Operating theatre 4.pdf

Hi Julia
Please see below responses in red. A quick reply let me know if I need to expand(possible around the 3rd question, I am happy to take you for a tour of the equipment in the plant room if needed as the worksafe contact)

O2 – Oxygen
CO – Carbon monoxide
CO2 – Carbon Dioxide
H2S – Hydrogen sulphide
LEL – Lower explosive limit
HCN – Hydrogen cyanide

Regards
Shane Toon
Site Coordinator North | Facilities and Engineering
Launceston General Hospital Level 2, 274-280 Charles St, Launceston TAS 7250
phone: Personal Information | mobile: Personal Information | email: Personal Information |
www.dhhs.tas.gov.au

THS SB Dark Blue with TasGov Logo

From: Bullock, Julia M Personal Information >
Sent: Monday, 29 September 2025 1:46 PM
To: Toon, Shane A <Personal Information >
Subject: Required information

Hi Shane,

Can I please have:
TFS report from Friday Attached
Gasses that we test for H2S, CO, LEL and O2 level
Any commentary around air intake, air handling recirculating that you think I don't know
Attached AG&G report from last NATA certification.
Planned testing with Presna – what do they check for? Will reply to this after install to give a 100% accurate answer.

Thank you!

Julia Bullock | Acting Nursing Director Surgical and Perioperative Services, THS Hospitals - North
Department of Surgery, Level 4, Launceston General Hospital, Charles Street, Launceston TAS 7250
Mob: Personal Information | email: Personal Information | www.dhhs.tas.gov.au
Work Days
Monday, Tuesday, Wednesday & Friday
'I work flexible hours so I'm sending this email now as it is a time that works for me. Feel free to read, action or reply at a time that works for you. I work flexibly and may send emails outside normal working hours. I do not expect an immediate response'

From: Wilson, Ronald
To: Toon, Shane A
Subject: Fw: Hazmat Gas leak - Tas Fire Service
Date: Saturday, 27 September 2025 11:37:52 AM

Hi Shane,

TFS information. To be shared with Prensa, noting that it's confidential.

Kind regards,
Ron

Get Outlook for Android

From: Williams, Alisdair <Personal Information>
Sent: Saturday, September 27, 2025 11:23:25 AM
To: Wilson, Ronald Personal Information>
Cc: Mahnken, Rick (TFS) <Personal Information>
Subject: Hazmat Gas leak - Tas Fire Service

> You don't often get email from alisdair.williams@fire.tas.gov.au. Learn why this is important

Good morning Ron,

I was provided your contact details by Shane Toon from the LGH following discussions this morning regarding the above-mentioned incident. I would like to provide you with a summary of our operations and findings from our attendance yesterday.

The initial call was received as:
"Hazmat Gas Leak – Theatre – Staff have fainted, unsure what gas it may be."

On arrival:

- Theatres were in the process of being evacuated.
- Doors had been opened to assist with ventilation.
- A briefing was received from staff at reception, advising:
  - Incident occurred in Theatre 4 with approximately 20 people present.
  - Four people were affected, all of whom were later reported in recovery.
  - Some staff remained in the room to complete the surgical procedure and were unaffected.
  - Three gases are utilised in theatres: Tool Air, CO_2, and Nitrous Oxide.

Atmospheric monitoring:

- Monitoring commenced prior to entering theatre reception and continued through to the entrance of Theatre 4 (doors open). Zero readings were obtained at this stage.
- Two LFB members entered Theatre 4 and conducted systematic monitoring using two detectors (one pump and probe, one diffusion).
- Monitoring covered all levels of the room (floor to ceiling) including corners where stagnant air could collect, as well as equipment and associated waste.
- Detection equipment is capable of identifying 150+ products; however, it does not

detect Nitrous Oxide (confirmed to be plumbed into the theatre but switched off prior to our arrival).

Atmosphere monitored for:

- O_2
- CO
- CO_2
- H_2S
- LEL
- HCN
- VOCs/PID 10.6ev (140+ products)

Interviews and observations:

- While monitoring was underway, I attended recovery and spoke with three of the four affected staff. Key details:
  - Order of onset: Persons 1, 2, and 3 (closest to the patient).
  - Persons 1 & 2 had a more compact stature, suggesting that if a gas was involved, it may have been heavier than air.
  - The Doctor affected confirmed there was nothing unusual about the patient or procedure.
- Discussions were also held with LGH maintenance, engineering, anaesthetist, and management staff regarding possible causes and theatre history.

Findings:

- After 30 minutes of systematic monitoring, no contaminants were detected.
- Theatre 4 was then closed, plumbed gases reinstated, and a detector left on the operating table in diffusion mode for one hour. No readings were recorded.
- At completion, LGH staff were advised that:
  - No gas was detected in Theatre 4.
  - The absence of findings, combined with the fact that staff who remained during the incident were unaffected, suggests that the occurrence was acute in nature, had resolved prior to our arrival, and was no longer present.

Kind regards

Al Williams
Senior Station Officer
Northern Region

Tasmania Fire Service
Service | Professionalism | Integrity | Consideration

Launceston Fire Station | 89 Patterson Street Launceston 7250
Mobile Personal Information
Personal Information | www.fire.tas.gov.au

Tasmanian Government

TASMANIAN HEALTH SERVICE

Debriefing the incident that occurred in Theatre 4 on Friday 26th September 2025

Venue:	ORS TEAROOM
Date:	02.10.2025
Time:	0800

Item	Discussion	Action	Action Officer
1.0			
1.	Julia Bullock and Madeleine Postmus opened the debriefing at 0800		
	Friday 26th September an incident occurred in Theatre 4. Members of our team presented with headaches, feeling dizzy, faint and nauseous within a 10-minute period. Theatre 4 staff involved were Hannah Moore, Janice Van Riel, Di Wallache, Annie Walker, Helen Esdale, Dan Aras, a gynae reg and a med student. Front desks were notified. Theatre 4 was assessed by Liz Howe, the Flow Manager and a code yellow was called. Staff that were affected were moved to PACU by orderlies to be monitored and treated as necessary. 5 beds were allocated to theatre staff in emergency if we required them. Director from emergency and ICU doctors were aware and attended PACU. The surgeon a remaining staff in theatre 4 was able to safely complete their case with additional PPE, and the patient was also transferred to recovery.		

	Bloods were taken from the patient, which came back with no indication of anything that could have caused such symptoms. The patient had open disclosure of the incident once awake and alert in PACU. Facilities and Engineering arrived at the suite within a few minutes of being called, Tas Fire Services in 6 minutes. Once the theatre was empty a team from Facilities and Engineering along with Tas Fire checked and tested the theatre for anything abnormal over the next two hours. Gases were turned off to the theatre. They could not detect anything that could have caused a response like what was experienced. Further testing continued Saturday for 5-6 hours and did not detect anything. Other surgeries that were being carried out at the time were able to continue and finish safely, with theatres being decanted as cases concluded and nonessential staff awaiting further instructions in the tearoom. Constant risk assessments were performed on the other operating theatres and deemed safe to continue and close. Two elective surgeries were cancelled on Friday, and only emergency cases continued. Theatre 3's patient who had been anesthetised prior to the incident but had yet to be operated on was woken up, transferred to PACU and talked about the incident and explained why their operation was to be postponed. Further open disclosure was undertaken with the patient later that day. Saturday and Sunday elective cases were postponed, emergency cases continued. Theatre 1 and 2 were checked for any capital works that may have influenced theatre 4 and came back clear. The builders had left at midday, no one was in Theatre 1 and 2 at the time of the incident. Theatre 1 and 2 will be painting and laying vinyl in the coming days and weeks, there will be ongoing challenges to reduce the smell of those fumes.		

	A meeting point was set up within PACU for the directors to stay up to date with any changes, monitor the situation and alert staff as required. In theatre 4 the day prior, the staff alerted the Flow Manager to a strange smell in the morning. Engineering was alerted and came to the theatre to assess. Noted that the smell was from a new fan belt within the air conditioning system and nothing of concern. This incident has been confirmed to not relate to the incident the following day, and no one within theatre 4 that day was unwell or had any symptoms. It is being hypothesised that 2 chemicals were poured into the sink in theatre 4's clean up room, alcohol and chlorine and created chloroform, and transferred to the theatre by the door being opened and closed a few times within a short time frame. With the way the HVAC units transfer air within the suites and provide fresh air every two minutes, there has been no way to confirm if this is the cause or not. There is no confirmed evidence, and ongoing testing may will likely not confirm this hypothesis due to the transient nature of the event and staff impact. Theatres 1 – 6 share a plant room and duct supplies air from outside to these theatres. Testing has taken place and confirmed that there was nothing in the outside air coming in that could have caused the incident at the time, nor any of the capital works around the LGH. When air is recycled within the theatres, it is only recycled from the theatre it came from, no where else. **What has happened since –** Environmental testing has been taking place in theatre 4 since the incident. Nothing has been detected. On going welfare checks with the team/ staff impacted. EAP was available in the meeting room for anyone requiring it.		

	Huddling often, keeping the teams up to date with any changes. WorkSafe have been on site to answer any questions and give guidance. Theatre 4 reopened on Wednesday 17th. Any staff that did not feel comfortable being in the theatre were able to be allocated elsewhere. Air reports are available. On going monitoring on theatre 4. Secretary and unions have been informed. The staff within theatre 4 at the time of the incident noted a residual headache for 24 hours following the incident, no further symptoms. Injury management and workers compensation was available to the affected staff. Once theatre 4 was reopened, there was not open disclosure with every patient that came through alerting them of the incident, however full transparency was given when asked. **What went well –** Clear escalation of the situation. Clear, kind communication between all. Theatre 4 was aired out as soon as possible. Welfare checks to team members carried out over the following days. Theatre 4 staff appreciated staying together in PACU. Decanting staff to the tearoom once noted that noise levels had escalated.		
Meeting Closed	**0844**		
Signed **Chairperson** **Date:** **Recorder of Minutes**	 M Postmus and J Bullock 25.09.2025 C Lund		

HOSPITALS AND PRIMARY CARE NORTH

SITUATION REPORT (SITREP) # One (1)

Operating Room Suite Friday 26 September 2025

Date: 26 September 2025. **Time:** 22:00

CURRENT SITUATION SUMMARY:

- Notification received at 14:20 that multiple staff in Operating Theatre (OT) Four (4) felt faint.
- EDOP, ND & CD attended ORS – Facilities & Engineering, ND & CD DoM & In-charge Operating Suite Rooms (ORS) already in attendance.
- 4 Staff feeling nauseas and unwell – requiring oxygen and monitoring in PACU. Remaining staff in OT 4 feeling symptoms - ? gas leak
- Code Yellow initiated at 14:35.
- Tas Fire Brigade contacted via 222 –? gas leak in OT 4 and requested review.
- Code Yellow Huddle commenced:
    - Essential only staff in theatre 4 to finish operating on patient – Surgeon and Anaesthetist wear respirator.
    - All non-essential staff moved from area and requested to stay in staff break room on level 4.
    - All remaining theatres to finish up operating on patients and no further procedure to commence until source of issue identified ? if entire ORS affected.
    - WACs notified to determine if any labouring women who my need emergency procedure
    - Emergency list reviewed for life threating cases only
    - ND IOC in attendance and Pt flow creating capacity.
    - ED & ICU notified to create capacity for ?5 staff – CD DOM requested CD ICU to attend PACU to review affected staff
    - Once final patient completed in OT 4 – all staff to be reviewed in PACU (x14 staff + 5 others from other ORS
    - Tas Fire in attendance to review OT 4 – no initial indication of ongoing issue or leak. OT appears to have been ventilated well post issue.
    - 1 General Surgery/Urology patient who had commenced anaesthetic, awoken and brought out of OT to PACU – open disclosure to occur when patient back on inpatient ward.
    - OT 1& 2 undergoing infrastructure works – Infrastructure contacted to determine if any chemicals or cases have been used in last 48hrs – Confirmed by Foreman Dan Fox that plastering has only occurred.
    - LGH fire warden requested to attend ORS to attend huddles.
    - EDOP updated CE
    - Request for any staff required to access OT 3 & 4 Corridor to wear N95 mask.
    - Staff in other OT not experiencing any symptoms.
- 15:15 – Huddle regrouped in PACU
    - Tas fire brigade undertaking testing in OT 4 – Tas Fire and LGH Infrastructure. 1 hour of testing OT 4 for any gas leaks.
    - Update on situation given to ORS in break room – advised staff not to come up to ORS until given all clear and to monitor for any symptoms. To sign out when finishing shift so aware have left ORS.
    - Update given to affected staff in PACU – advised to come back to ED if not feeling well
    - Staff member x 1 sent to ED as still feeling unwell with nausea and headache
    - EDOP updated CE
- 16:15 – Huddle regroup in ORS Meeting Room
    - All clear by Fire brigade @16:20 – require further environmental cleaning
    - 2 Staff member who had finished shift phoned ORS and not feeling well at home – advised to attend ED (ED aware) – total of 3 Staff from OT 4 being reviewed in ED.
    - Request for OT 1 & 2 Forman to attend site and review infrastructure site
    - SAFE work notification by ND Surgery – Incident # 5507.
    - All gases in OT 4 to remain switched off
    - OT 4 to be closed off – register of staff who need to access corridor of OT 32 & 4 to commence
    - EDOP updated CE - request for Environmental Analysis of OT 4 to be undertaken this weekend
    - All medical and electrical equipment in OT 4 to be checked by biomed
    - Cleaning products for OT 4 to be reviewed.
    - Discussion with senior clinical staff concerning Emergency cases and planned elective cases for weekend – agreement by senior clinical group to undertake emergencies in OT 5 -8 and postpone all elective for the weekend until cause of issue known.
    - ORS staffing for the weekend to remain the same so extra staff on site if any further symptoms occur in OT5-8. Weekend senior clinicians aware of plan
    - Code yellow stood down by EDOP.
    - Huddle for Saturday morning using regular IOC weekend catch up – ND Surgery, EDOP & CE. ND Surgery Senior Nurse on Call this weekend.

- CE updated of status.

- 17:30 – 21:00
  - Code yellow standdown advised to switch in person by EDOP
  - Open disclosure by ND Department of Surgery & EDOP to patient that was awoken from anaesthetic without procedure commencing. Situation explained and pt advised to contact us at any time if has concerns.
  - Planned patients for weekend contacted by ND Department of Surgery and postponed– one client distressed as had travelled from NW and was in hotel alone, anxious and requesting assistance to return home to the NW this evening. Cab voucher arranged and food package delivered to client in hotel by EDOP – EDOP stayed with client until taxi arrived. ND Surgery contacted client's son to provide updates.
  - IOC – pt flow and AHNM given update of code yellow and requirement for OT 4 to remain closed.
  - Infrastructure organising environmental testing
  - Biomed organising review of all OT 4 equipment.

ACTIVATION STATUS:

e.g. protocol activation status, status of IMT setup (site/regional) etc.

Code Brown ☐	Code Yellow ☒	Code Orange ☐	Code Red ☐	Code Purple ☐	Code black ☐

CURRENT OBJECTIVES OR PRIORITIES:

Restore to normal service delivery in 48 hours.

1. Emergency Theatres continue	2.

SUMMARY OF CURRENT RESPONSE MEASURES DEPLOYED:

- As above summary

SUMMARY OF EXPECTED ISSUES OR RISKS OVER NEXT 24-72 HOURS:

1. Continuation of ORS	Cause of issue remains unknow. Emergency Theatres to continue. Extra staffing institu to assist over weekend if any issues arise. Planned theatre cases postponed. OT 4 closed – gases switched off. Corridor to OT 3 & 4 closed – register of any staff requiring access.
2. Environmental & Bio Med Testing	Infrastructure to arrange environmental testing of OT 4 Biomed testing of equipment in OT 4 arranged to commence this weekend.

SUMMARY OF RESPONSE MEASURES FOR NEXT 24-72 HOURS:

- Planned Surgery postponed
- Emergency OT only for Sat/Sun – in OT 5-8.
- Extra staffing for weekend
- Senior Clinicians over weekend aware of next steps. Huddle Saturday morning with ND Surgery, EDOP and CE.
- Biomed to undertake full review of all equipment in OT 4
- Infrastructure arranging environmental testing for OT4

RESOURCES INCLUDING RESOURCE ISSUES:

- ORS had extra weekend staffing for planned lists – extra staffing to remain over weekend to assist with Emergency OT and any further issues.

INFRASTRUCTURE AND IT ISSUES:

- Infrastructure to organise environmental cleaning to occur ASAP & undertake test on gas pipes this weekend.

DEPARTMENTAL/CONSULTATIVE SERVICE CONSIDERATIONS:

- WACS, ED & ICU informed of progress and access to emergency theatres continues.

SERVICES IMPACTED:

- 2 planned surgery postponed on Friday 26 September
- Planned Surgery for 27 & 29 September (10 cases postponed)

DOH STAKEHOLDERS IMPACTED OR TO BE ADVISED:

H & PC N ☒	H & PC NW ☐	H & PC S ☐	AT ☐	EPRU ☒	SHECC/SHC ☐

SITREP DISTRIBUTION LIST

Chief Executive – Hospitals North

Prepared by:	Alexander Smeaton - EDOP
	Date: 26/09/2025 Time: 22:00
Approved by:	Insert name/title (e.g: Commander)
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Indoor Air Quality Assessment
Launceston General Hospital

274-280 Charles Street, Launceston, Tasmania

Tasmanian Health Service (Department of Health)
October 2025

Client No: T0151
Job No: 144728M

Statement of Limitations

This document has been prepared in response to specific instructions from the Client to whom the report has been addressed. The work has been undertaken with the usual care and thoroughness of the consulting profession. The work is based on generally accepted standards, practices of the time the work was undertaken. No other warranty, expressed or implied, is made as to the professional advice included in this report.

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Recommendations for Further Study

The industry recognised methods used in undertaking the works may dictate a staged approach to specific investigations. The findings therefore of this report may represent preliminary findings in accordance with these industry recognised methodologies. In accordance with these methodologies, recommendations contained in this report may include a need for further investigation or analytical analysis. The decision to accept these recommendations and incur additional costs in doing so will be at the sole discretion of the Client and Prensa recognises that the Client will consider their specific needs and the business risks involved. Prensa does not accept any liability for losses incurred as a result of the Client not accepting the recommendations made within this report.

Table of Contents

Abbreviations

Abbreviation	Description
CO	Carbon Monoxide
CO_2	Carbon Dioxide
HVAC	Heating Ventilation and Air Conditioning
IAQ	Indoor Air Quality
WHS	Work Health and Safety
ppm	Parts Per Million
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
mg/m^3	milligram per cubic metre
$\mu g/m^3$	micrograms per cubic metre

1 Introduction

Prensa undertook an Indoor Air Quality (IAQ) Assessment (Assessment) for Tasmanian Health Service (THS) at the Launceston General Hospital, located at 274-280 Charles Street, Launceston, Tasmania (the Site). The Assessment was undertaken between the 27th of September and the 15th of October 2025, at the request of Shane Toon of THS. The Site was occupied during the Assessment.

2 Background

It is understood that at approximately 2pm on Friday the 26th of September 2025, adverse health effects were reported by THS surgical staff during a routine procedure within Theatre 4 on Level 5 at the Site. These reportedly included feeling hot, eye irritation, nausea and light-headedness.

As such, THS requested that Prensa attend Site and undertake an IAQ Assessment of the area to conduct monitoring of various airborne contaminants and to recommendations, if deemed necessary.

3 Objective

The objective of the Assessment was to assist THS in investigating potential sources of hazardous airborne contaminants within the nominated areas of the LGH.

4 Scope of Works

The scope of works was limited to the following, as requested by THS:

- Review of documentation relating to air quality complaints, as provided by THS and LGH;
- Site inspection of Theatre 4, including adjacent Anaesthetic Bay and Clean-up Room, and the Site plant room. These rooms will henceforth be referred to as the Work Areas;
- Discussions with THS Facilities, Biomedical and Surgical staff; and
- Static real-time air monitoring within the Level 5 Theatre 4, including the adjacent Anaesthetic Bay and Clean-up Room.

The following parameters were measured during the Assessment:

- Carbon monoxide (CO);
- Carbon dioxide (CO_2);
- Temperature;
- Relative humidity; and
- Total Volatile Organic Compounds (TVOCs).

5 Methodology

5.1 Review of Documentation

As part of this Assessment, Prensa reviewed the following documentation provided by the LGH:

- Tas Fire Service email '*Hazmat Gas leak - Tas Fire Service*' , emailed 27th September 2025, 11:23 am;
- Biomedical Department email '*LGH ORS 4. Biomed Investigation*', emailed 27th September 2025, 4:48pm; and
- AG&G Testing and Validation, *'Launceston General Hospital Operating Theatre 4'*, Test Report Number 1962.24 (November 2024).

5.2 Site Inspection and Discussions with Key Personnel

Prensa undertook a walkthrough inspection of the Site and held discussions with Site personnel to gain an understanding of the air quality concerns at the Site and the associated reports of illness.

5.3 IAQ Monitored Parameters

The Assessment was conducted using calibrated TSI VelociCalc and MultiRAE data logging devices. The following air quality parameters were monitored for up to fifteen (15) minutes at each location:

- Carbon monoxide (CO);
- Carbon dioxide (CO_2);
- Temperature;
- Relative humidity; and
- Total Volatile Organic Carbons (TVOCs).

On the 30th of September 2025, real time, investigative monitoring was taken within the unoccupied Work Area. After Theatre 4 recommenced surgeries, static background monitoring was conducted (adjacent the operating bed) between the 1st and the 15th of October 2025.

6 Adopted Guidelines

Guidelines adopted for this Assessment are detailed in **Table 1**. The guidelines for airborne contaminants are prescribed by the Building Code of Australia's *National Construction Code (NCC) 2022: Volume One*. Thermal comfort parameters (temperature and relative humidity) are derived from the ANSI/ASHRAE Standard 55-2020, *Thermal Environmental Conditions for Human Occupancy*.

Table 1: Adopted IAQ Guidelines

IAQ Parameter	Adopted Guidelines*
Carbon Monoxide	≤10 ppm (8 hour mean)
Carbon Dioxide	≤850 ppm (8 hour mean)
Temperature	20-23°C (winter) / 23-26°C (summer)**
Relative Humidity	30 – 60% RH**
Total Volatile Organic Compounds	≤500 µg/m³ , 0.12 ppm (1 hour average)

* Values adopted from NCC 2022 Table F6V1

** Values adopted from ANSI/ASHRAE Standard 55-2020

7 Health Effects of the Parameters Measured

7.1 Temperature and Relative Humidity

Temperature and relative humidity in an indoor environment are comfort factors that may be impacted by radiant heat through glass windows, unbalanced heating, air movement, ventilation and air-conditioning (HVAC) systems, or poorly adjusted thermal controls.

Furthermore, individual occupants' activity levels and clothing as well as their individual preferences and conditioning will impact on their sense of comfort. As such, it is inevitable that some discomfort will be experienced by some occupants. The goal should therefore be to maintain a consistent thermal environment at which most occupants will feel comfortable.

7.2 Carbon Monoxide (CO)

CO is produced because of incomplete combustion of carbon-containing fuels such as petrol, wood, diesel and natural gas. A greater production of CO occurs with inefficient fuels and where there is poor ventilation or entrainment of an external source.

CO is a toxicant that combines with haemoglobin more strongly than oxygen and therefore reduces the blood's ability to carry oxygen to the body's cells, where it is required. Elevated concentrations of CO may detrimentally impact on concentration, memory and potentially cause vision problems. At even greater levels, it can cause headaches, fatigue, chest pain and nausea.

7.3 Carbon Dioxide (CO_2)

CO_2 is a metabolic waste product of the human respiration system. At a high exposure, CO_2 can influence a person's comfort and health by causing giddiness, headaches and a loss of mental acuity. More commonly, elevated levels of CO_2 will result in a sense of stuffiness and occupants may feel lethargic.

The earth's atmosphere is currently made up of approximately 400 ppm of CO_2 and normal well-functioning buildings may have carbon dioxide concentrations at twice the ambient levels. Where fresh air supply to a building is inadequate or the building is excessively occupied, higher concentrations may lead to occupant complaints of stuffy air.

8 Results

8.1 Document and Data Review

As part of this Assessment, Prensa reviewed the following documentation, provided by the LGH:

- Tas Fire Service email '*Hazmat Gas leak - Tas Fire Service*', emailed 27th September 2025, 11:23 am – TasFire attended the Site and conducted air monitoring for thirty (30) minutes measuring for oxygen, carbon monoxide, carbon dioxide, hydrogen disulphide, lower explosive limit, hydrogen cyanide and volatile organic compounds. No contaminants were detected. Monitoring was repeated after Theatre 4 was closed and plumbed gases reinstated. No contaminants were detected. The email concluded that "*the occurrence was acute in nature, had resolved prior to our (TasFire) arrival, and was no longer present*";
- Biomedical Department email '*LGH ORS 4. Biomed Investigation*', emailed 27th September 2025, 4:48pm - A thorough service and functional checks of the anaesthetic machine was undertaken and found no faults or leaks (and nitrous oxide wasn't in use). Both Desflurane and Sevoflurane cassettes were inspected with no leaks detected. All other theatre devices (smoke extractors, diathermy, warmers, operating table, and lights) were run for hours without odour or malfunction and passed electrical safety tests. There was no fridge in the theatre or anaesthetic bay—effectively ruling out equipment or refrigerant leaks as contributors;
- AG&G Testing and Validation, *'Launceston General Hospital Operating Theatre 4'*, Test Report Number 1962.24 (November 2024) – Several tests were conducted in accordance with specific Australian and other standards, including for air velocity and uniformity, HEPA filter integrity, classification and air cleanliness, air pressure differential, recovery time, temperature and humidity. All tests passed. This annual assessment is due in November 2025; and
- Online LGH ventilation data was reviewed on the 27th of October – The heating, ventilation and air-conditional (HVAC) system is designed to ensure that Theatre 4 maintains positive pressure. Ventilation data from room sensors confirmed:
    - Around 28 air changes per hour;
    - Typical temperature set points and measurements within Theatre 4 around the time of the Event; and
    - Spill air data indicated maximum available fresh air contribution to the Theatre 4 recirculation system around the time of the Event.

No previous Theatre 4 data was available for carbon dioxide concentration or humidity.

8.2 Visual and Olfactory Observations

Site inspections were conducted within the Site plant room on the 27th October 2025 and within the theatre and adjacent rooms on the 30th September 2025.

During attendances the following was observed and/or perceived:

- No damage was observed to the AHU or other units in the plant room;
- No evidence of chemical spills or gas leaks were observed; and
- No malodours associated with the IAQ parameters tested, as a part of this Assessment, were perceived.

8.3 Information Provided

It is understood from information provided by LGH and THS that five (5) Theatre staff reported physical symptoms and illness at similar time points whilst performing a list operation.

Prensa understands that there are concerns regarding the air quality of the area and whether that this might be having effects on Site staff/personnel, resulting in these symptoms.

LGH personnel suspected the side effects to be due to chemical mixing occurring in peripheral areas of Theatre 4 producing toxic gases/fumes, with side effects only being experienced with Theatre 4.

8.4 Discussions with Key Personnel

Based on discussions with THS staff, Prensa understands the following:

- At approximately 3:30 pm on Friday the 26th September 2025, the LGH Facilities team were notified that surgical staff, working in operating Theatre 4, were experiencing various symptoms including feeling hot, irritated eyes, nausea, and syncope (the Event). Three (3) staff members reported to the LGH Emergency Department, and one (1) additional staff member later reported experiencing adverse health effects from home;
- Adverse health effects were reported by theatre staff approximately one (1) hour into the routine abdominal surgery, with approximately twenty (20) staff present in Theatre 4;
- One (1) staff member described a smell like 'dry cleaning';
- Theatre 4 was evacuated, except for essential staff who (utilising medical oxygen) completed the medical procedure;
- As per LGH protocol, the Tasmanian Fire Service was notified and conducted air monitoring to measure airborne concentrations of oxygen, carbon monoxide, carbon dioxide, hydrogen disulphide, lower explosive limit, hydrogen cyanide and volatile organic compounds (VOC's). No airborne concentrations of these gases were detected during the sampling period;
- Results from blood samples, collected from affected staff members, did not identify any health findings of concern;
- THS Biomedical staff conducted a full service, including functionality checks, of the anaesthetic machines and confirmed no leaks of anaesthetic agents (Desflurane and Sevoflurane cassettes) or medical gases (nitrous oxide, oxygen, carbon dioxide). Theatre equipment, including smoke extractors, diathermy, patient warmers, operating table, and lights were also inspected and noted to operate without odour or fault. Equipment passed electrical safety testing and no other sources of gas (eg. Fridge) were present in the Work Areas;
- LGH does not utilise ethylene oxide or glutaraldehyde sterilisation products, historically associated with 'off smells' in hospital settings, and various short- and long-term health effects;
- Plastering works were conducted on the day of the event in surgical Theatres 1 and 2, with hording and sealing of doors observed to isolate the area. Theatre 3 is located between Theatres 1 and 2, and Theatre 4;
- Other concurrent maintenance works understood to have occurred included vinyl laying in Ward 4D. However, this is known to not be located near the Level 5 surgical theatres (the Work Areas);
- Surgical Theatre 3, adjacent Theatre 4, was also in use at the time of the Event, with no health symptoms or concerns reported in a similar timeframe;
- Inspections and checks to the Theatre 4 air handling unit (AHU) were conducted by THS Facilities staff, without any findings of concern;
- AHU's to Theatres 3 and 4, and adjacent recovery rooms, all share the same fresh air intake;

- Prensa understands that cleaning of the theatres, in between procedures, is conducted by theatre staff. A 'terminal' clean is conducted by cleaning staff at the end each shift;
- [redacted]' tablets (to make up a cleaning solution) and [redacted] cleaners were advised to be stored together above the sink in the clean-up room. A reaction between [redacted] and [redacted] leading to formation of [redacted] was hypothesised by staff. Both the 'slop hopper' and sinks in the clean-up room were subsequently flushed on the 28th September 2025; and
- Theatre staff advised that the door between a theatre and the adjacent clean up room should be kept closed during list procedures. A nurse adversely affected during the Event, noted that this door had been opened at least three (3) times within the first hour of the procedure, prior to them feeling unwell.

8.5 IAQ Parameter Results

Prensa conducted investigative air monitoring in representative locations throughout the Work Areas, prior to re-occupancy, including additional TVOC monitoring during theatre cleaning activities. Static background sampling was also conducted, adjacent the theatre bed after routine activities recommenced. A summary of results is represented in **Table 2**. Exceedances above the relative adopted guidelines, as outlined in **Table 1** above, have been underlined and bolded.

Table 2: Summary of Sampling Data

Monitoring Type	Date	CO (ppm)	CO_2 (ppm)	Temperature (°C)	Humidity (%)	TVOCs (ppm)
Investigative	30.9.2025	<1	<850	21 – 22	48-55	<0.1
Cleaning	30.9.2025	-	-	-	-	<5.0*
Background	1 - 15.10.2025	<1	<850	20 - 22	52-59	<0.1

(* Spikes at source of cleaning alcohol only)

Table 3 provides a summary of surgical procedures conducted in Theatre 4 between the 1st and 15th of October 2025.

Table 3: Summary of Surgical Procedures

Date	Number of Surgeries	Duration* (hh:mm)	Procedures	Number of Personnel in Attendance
1/10/2025	3	2:47	Orthopaedics, Plastics	7-10
2/10/2025	4	9:14	Ob/Gyn	11-15
3/07/2025	5	6:49	General, Plastics	7-10
6/10/2025	4	10:00	Plastics	9-10
7/10/2025	7	8:55	Dental, Plastics	7-11
8/10/2025	3	6:18	Ob/Gyn	10
9/10/2025	-	-	**PUBLIC HOLIDAY**	-
10/10/2025	5	9:14	Plastics	10
13/10/2025	9	8:31	Plastics/Orthopaedic	8-11
14/10/205	1	9:40	Laparoscopic/robotic	13
15/10/2025	5	6:33	General	10-11

* Calculated from first scheduled procedure to final case arriving in Recovery.

9 Discussion

Initial observations, anecdotal data and environmental context indicated that the incident was unlikely to have resulted from a typical chlorine gas release or other routine airborne contamination. Reported exposures were transient, an appears to quickly resolve once ventilation was restored. The findings, together with information from site personnel regarding concurrent chemical disposal activities, prompted consideration of an alternative chemical interaction within the drainage system as a potential source.

Co-disposal of S.29 Security Infomation and S.29 Security Infomation into the same drain, with limited flushing is considered plausible. In stagnant or trapped water, S.29 Security Infomation can oxidise S.29 Sec to form S.29 Security Inf with sufficient active S.29 Security Info and favourable reactive conditions, S.29 Security Info can undergo haloform chemistry to generate small quantities of S.29 Security Infomati and other S 29 Security Information

This hypothesis aligns with the specific symptoms reported by several staff on the day of the Event: including sensations of warmth and/or light-headedness, nausea, and near-syncope, with little/no eye- or throat-burning and no characteristic chlorine odour. Airborne concentrations appear to have dissipated rapidly once the room was opened and ventilation/pressurisation restored—consistent with a short-lived, dense solvent-vapour plume dispersing rapidly under theatre air-change rates. A transient loss of positive pressure in the theatre (associated with clean-up room door access) may have facilitated the migration of this vapour plume from the clean-up room plumbing into the theatre.

Although this cannot be confirmed retrospectively, it represents a credible but unproven transient exposure pathway. Preventative controls have since been implemented, including stricter segregation of incompatible chemicals, improved trap management and reinforcement of door and ventilation protocols to minimise recurrence.

Prensa conducted the Assessment as part of the client's incident investigation. The objective was to help identify any potential ongoing sources contributing to the initial event and to provide and to provide assurance to Theatre staff regarding acceptable IAQ.

Over the two-week period of background monitoring conducted under routine occupancy, IAQ parameters in Theatre 4 remained within applicable industry standards and guidelines. Whilst the TVCs spiked, the hourly average remained below the applicable guidelines. These results supported the re-occupancy with the above assurance measures in place.

10 Conclusion

Prensa's findings aligned with the client's conclusions and supported the decision to reopen Theatre 4. Based on Prensa's visual inspection, monitoring, and anecdotal data, the IAQ within the Work Areas were generally within applicable industry standards and guidelines. While a definitive source could not be confirmed, client investigations ruled out multiple plausible causes and removed or mitigated other potential contributors. The overall evidence is consistent with a credible but unverified transient solvent vapour exposure associated with operational and room pressure dynamics, rather than a persistent HVAC or equipment fault. Recommendations to reduce the likelihood of a recurrence are provided in **Section 10**.

11 Recommendations

Based on Prensa's Assessment, the following recommendations should be carried out to assist LHG in preventing a recurrence of this Event:

- Conduct regular checks to verify that [redacted] and [redacted] are segregated, during use and storage;
- Investigate a suitable product [redacted], to neutralise the [redacted] before disposal (draining and flushing);
- Develop procedures and checklists to ensure wastewater traps are primed regularly;
- Repair dry and/or remove unused wastewater traps;
- Reinforce the requirement to keep doors between theatres and the adjacent clean-up room closed during surgical procedures; and
- Conduct regular checks to verify that theatres maintain positive pressure ventilation.

12 Limitations

The following limitations are noted based on the Assessment scope of works:

- The assessment was undertaken after the event had occurred, and as such, no direct air samples or environmental measurements were collected during the incident itself. The identified exposure pathway and chemical interactions are therefore based on plausible mechanisms supported by available evidence and witness accounts, rather than direct confirmation;
- The reported symptoms and suspected vapour release appear to have been short-lived, likely dispersing rapidly with the restoration of ventilation. This limited the ability to reproduce or directly quantify airborne concentrations or chemical by-products associated with the event;
- The investigation and subsequent IAQ assessment were informed by documentation, site observations, and information provided by LGH, THS, and staff interviews. Prensa did not independently verify all operational or procedural aspects described by site personnel;
- The indoor air quality monitoring conducted by Prensa occurred post-event, under normal occupancy and operating conditions. Results represent the air quality at the time of sampling only and may not reflect conditions during the original incident;
- The IAQ monitoring program was designed to identify potential airborne contaminants of concern and assess overall ventilation performance. It did not include detailed speciation of trace chlorinated compounds or low-level volatile reaction products that may have been generated transiently during the event; and
- While the chemical interactions described are scientifically plausible, they remain unverified without direct analytical confirmation. The conclusions drawn should therefore be considered indicative, not definitive.