Cleanrooms and Standards
The Road Ahead

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About me…

My career – over 20 years covering:

- Production
- Design
- Construction
- Consulting
- Standards preparation

Committees

- Ex-president ISPE Australasian Affiliate
- Independent chair – Standards Australia "Controlled Atmospheres" committee ME-060
- Australian recognised expert for ISO TC/209 standards committee. Participating in WG1, 3, 4, 12 & 13

Topics

- Importance of Cleanrooms
- ISO Standards
- Standards Australia
  - AS 2252.5
  - AS 1807
  - AS 2252.7
- The Future

Importance of Cleanrooms

Not just a clean space.

CASE STUDY 1 – Importance of a cleanroom

- Fertility Clinic
- Removal of “background noise”
- Ability to focus on key process variables
- Staff issues!

Where are cleanrooms essential?

Legislated or required by Standards:

- Medicinal Products
- Medical Devices
- Sterile compounded products
  - Cytotoxic compounds
  - Antibiotics, analgesics etc.
- Radiopharmaceuticals
- Autologous preparations
- Sterile Animal Products

Where might they be useful?

No specific legislated or Standards requirements

- Operating theatres
- Theatre preparation areas
- Non-sterile compounded products
- PCR work
- IVF Clinics
- Other laboratory processes

Importance of Standards

Standards provide guidance, from base line to best practice.

- Standards provide boundaries to work within
- Only a few are legislated
- The challenge is to ensure standards are:
  - Relevant
  - Cost Effective
  - Practical
  - Up-to-date

Standards Governance

- ISO Standards
  - ISO derived from Greek word “isos” meaning “equal”
  - Australia founding member in 1947
  - Standards prepared by global network of industry experts within a technical committee
- Standards Australia
  - Public company (limited by guarantee)
  - Memorandum of Understanding with Federal Government recognising them as “peak non-government Standards body in Australia”

Key ISO 14644 Standards

Cleanrooms and associated clean environments

Part 1 – Classification of air cleanliness by particle concentration

Part 2 – Monitoring to provide evidence of cleanroom performance related to air cleanliness by particle concentration

Part 3 – Test Methods

Part 4 – Design, Construction and Start-Up

Part 5 – Operations

Part 7 – Separative Devices

New & Updated ISO 14644 Standards

Part 1 – Classification of air cleanliness by particle concentration
New version 2015

Part 2 – Monitoring to provide evidence of cleanroom performance related to air cleanliness by particle concentration
New version 2015

Part 3 – Test Methods
Being updated

Part 4 – Design, Construction and Start-Up
Being updated

Part 16 – Code of practice for improving energy efficiency in cleanrooms and clean air devices
New standard – in development (CD Status)

Part 17 – Particle Deposition Rate
Possible new standard

Key Changes – Parts 1 & 2

Part 1

- Particle sizes and concentration values
- Number of samples taken per room
- Sampling positions
- Data evaluation - simpler
- Particle counters – specific ISO calibration method

Part 2

- Emphasizes the need for a monitoring strategy
- Removal of recommended testing periods (to Part 3)

Part 1 - Particle Sizes

Table 1 — Selected airborne particulate cleanliness classes for cleanrooms and clean zones

ISO classification number (*N*)	Maximum concentration limits (particles/m³ of air) for particles equal to and larger than the considered sizes shown below [concentration limits are calculated in accordance with equation (1) in 3.2]					
	0,1 µm	0,2 µm	0,3 µm	0,5 µm	1 µm	5 µm
ISO Class 1	10	2				
ISO Class 2	100	24	10	4		
ISO Class 3	1 000	237	102	35	8	
ISO Class 4	10 000	2 370	1 020	352	83	
ISO Class 5	100 000	23 700	10 200	3 520	832	29
ISO Class 6	1 000 000	237 000	102 000	35 200	8 320	293
ISO Class 7				352 000	83 200	2 930
ISO Class 8				3 520 000	832 000	29 300
ISO Class 9				35 200 000	8 320 000	293 000

NOTE Uncertainties related to the measurement process require that concentration data with no more than three significant figures be used in determining the classification level

Key Changes Part 3

Part 3 – To become key Australian Standard

- Re-organisation of tests
- Update on how to use a particle counter for filter integrity tests
- New Segregation Test
- Highlighting the importance of agreement on tests and test methods between tester and customer
- New table for suggested periods between tests

Key Changes Part 4

- Removal of the air change rate table
- Replaced with a set of equations that can be used for determination of air supply rate
- Based on an estimation of the particle generation in the cleanroom (source strength)
- Update and simplification of the document

New Standards Parts 16 & 17

Part 16 – Energy savings in cleanrooms

- Methods for evaluating and making a business case for energy reduction
- Methods to ensure that suitable evaluation of process risk is performed
- Method for the evaluation of source strength and then estimation of corrected air flow
- 50% of cleanroom energy usage is through fans
- Periodic or permanent reduction of air flow can significantly reduce energy costs
- Method for benchmarking facilities

Part 17

- Potential new standard on Particle Deposition Rate

Standards Australia Update

Standards prepared under ME-060 – Controlled Atmospheres committee

- AS/NZS ISO 14644 Series
- AS1807 Series
- AS2252 Series
  - Biological Safety Cabinets (Class 1, 2 & 3)
  - Cytotoxic Drug Safety Cabinets
  - Clean Workstations
  - Pharmaceutical Isolators

AS 2252.5

Cytotoxic Drug Safety Cabinets (CDSCs) – Design, Construction, Installation, Testing and Use

- Combined the AS2567 and the AS2639 standards
- CDSCs must be located in a cleanroom environment to ensure safe aseptic preparation of compounded oncology products
- CDSC to be located in cleanroom capable of ISO 5 at rest
- Particle count to be performed in cabinet
- Example facility layout provided
- Document now current

AS1807

Cleanrooms, Workstations, Safety Cabinets and Pharmaceutical Isolators – Methods of test

- 27 published standards, all requiring review
- 7 standards are to be superseded and replaced with ISO 14644 Part 3
  - These include HEPA integrity test, airflow velocity and uniformity, particle counting (Part 1), room recovery rate and the determination of pressure, temperature and humidity
- Rest are to be combined into a single document for the testing of clean air devices
- Ongoing process. Released end of next year.

AS2252.7

Pharmaceutical Isolators – Design, Construction, Installation, Testing and Use

- To replace AS4273
- Will require siting in a low level cleanroom as a minimum
- Hopefully look at fumigation practices and hot cells
- Release hopefully end of next year

The Future

A few things to fix:

- Issue with AS2252.6
- Rescue/Removal of AS4260 – HEPA Filters
- Rescue/Removal of AS1324 Series

Possible new standards

- AS Adoption of new ISO standards
- New areas
  - Operating theatres
  - Other areas in infection control etc
  - Anything else?

Thanks…

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