THE IMPACT OF AS7240-20 AND THE CLASSES OF ASPIRATING SMOKE DETECTION ON SYSTEM DESIGN IN AUSTRALIA

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AGENDA

• Welcome
• Basic Requirements of an ASD system
• Brief History of AS7240-20
• Classes of Sensitivity
• AS7240-20
• End of Smoke Test Values
• Class A, B & C Pro’s and Con’s
• System Design Considerations
• Q&A
ASPIRATING DETECTION: CODES & STANDARDS

Australian Standard

Automatic fire detection and alarm systems

Part 8: Multi-point aspirated smoke detectors
INSTALLATION STANDARD: BASIC REQUIREMENTS

- Each sampling port of an air sampling –type smoke detector shall be treated as a point type detector for the purpose of - “Location and Spacing”

- Sampling system piping shall be conspicuously identified as “SMOKE DETECTION SYSTEM— DO NOT PAINT,” with red striping along it’s length
Currently there are two Product Standards in Australia we need to be aware of both. These are referenced in AS 1670.1-2015

- **AS 1603.8 1996**: referenced in the current version of AS1670.1 which in turn is referenced in the current NCC. Will be excluded in the next edition of AS1670.1

- **AS 7240.20**: referenced in of AS1670.1 2015 which is referenced in the update of the NCC published mid 2016

The only Standard referenced in the NCC/BCA is AS1670.1 which references AS1603.8 and AS7240-20

The use of either standard is currently permitted.
ASPIRATING STANDARD: AS 1603.8

3.3 ASPIRATING DEVICES – Aspirating devices shall be capable of transporting smoke from all sampling points in the aspirating pipe network to the sensing assembly **within 90 seconds**

4.2 SENSITIVITY – When tested in accordance with AS 2362.17, the sensitivity of the worst-case sampling point shall be not less than 20% obscuration/m for photoelectric type detectors and not less than 0.5 mic X value for ionization type detectors. Adjustable alarm confirmation delay shall be set to minimum during the sensitivity test.

Accuracy of the system design tool shall be assessed against the maximum and minimum pipe lengths nominated by the manufacturer.
Australian Standard
Automatic fire detection and alarm systems
Part 8: Multi-point aspirated smoke detectors
CLASSES OF SENSITIVITY: AS7240-20

- For many years aspiration systems have only been considered as the high-sensitivity mission critical solution
- Over the years the possible application have expanded and cascaded down the markets segments
EXAMPLES OF CLASS SENSITIVITY: AS7240-20

- Data Centres
- Telco’s
- Cleanrooms
- MRI’s
- High value goods storage
- High ceiling applications
- Standard environment with airflow
- Heritage building
- Industrial applications
- Alternative to point detectors
- Maintenance access
- Warehouses/LOS
- Indoor swimming pool
- Waste recycling plants
PRODUCT STANDARD: AS 7240.20

Advises classes of sensitivity:

- **CLASS A:** High Sensitivity
  60 second transport time

- **CLASS B:** Enhanced sensitivity
  90 second transport time

- **CLASS C:** Equivalent to point detectors
  120 second transport time

**Note:**
Transport times as stated in AS1670.1
Table 2: EN 54-20 Sensitivity Classes vs. Typical Detection Scenarios

<table>
<thead>
<tr>
<th>Class A Very High Sensitivity</th>
<th>Class B Enhanced Sensitivity</th>
<th>Class C Normal Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoke is not visible due to low quantity of smoke and/or high dilution caused by air movement.</td>
<td>Smoke is visible but insufficient to be detected by point* or beam technologies*</td>
<td>Smoke visible and sufficient to be detected by point* or beam technologies*</td>
</tr>
</tbody>
</table>

* according to EN-54 Part 7 or 12

AS 7240.20 → (ISO 7240-20) → (EN54-20)
HOLE SENSITIVITY VS THRESHOLD SETTING

- Hole sensitivity is the calculated sensitivity at each sampling point
- Threshold setting factors in the number of holes on the system to achieve the target hole sensitivity required
- EN (AS7240-20) approved detectors are tested for hole sensitivity
- Each manufacturers product may require a different threshold setting to achieve a specific hole sensitivity
- UL Certified detectors are tested for threshold setting
OVERVIEW: AS 1670.1:2015

- **Hole spacing** reduces as class sensitivity increases
- **Transport time** reduces as class of sensitivity increases
**Technical Note**

### ASD Sensitivity Classes (AS 1670.1-2015)

The smoke obscuration values presented in Table 12 “Sensitivity Classes vs Detection Requirements” Appendix 1, AS 1670.1-2015, correspond to the worst case End-of-Test conditions for each of the three sensitivity classes using the TF2 test fires as specified in AS 7240.20 2012.

In the AS 7240.20 2012 assessment, the ASDs are exposed to a series of fires incorporating the “worst-case” arrangement with respect to dilution and smoke transport times.

For a pass condition, the ASDs shall generate an alarm signal before a time (T) after the end of test condition is reached. This time (T) accounts for the transport of smoke from the sampling point in the fire test room, up to a maximum of 60 seconds.

To ensure a pass condition with sufficient safety margin to a particular class, ASD hole sensitivities are set more sensitive than the worst case End-of-Test conditions to accommodate:

- Smoke transport times when the exceeds 60 seconds
- Smoke retention (loss) in pipe during transportation

The smoke obscuration values in Table 12, therefore, should only be used as descriptive of the worst case End-of-Test conditions of the TF2 test fires and do not reflect actual ASD hole sensitivity.

It is important when comparing the Sensitivity Classes of ASD, i.e. classes A, B, and C with system designers or clients, it is understood that there is no single universal sensitivity figure that can express ASD “Sensitivity Range” for the respective classes. Individual ASD manufacturers would have determined what sensor sensitivity, pipe and hole configurations are permissible to fall within the class or classes it is certified to, relative to AS 7240.20 2012. This information is required to be provided in all product literature, design guides and software modelling programs.

Table 12: VESDA-ASD product sensitivity ranges and transport time limits are detailed in the respective product documentation and embedded into the ASPIRE2 pipe modelling software.

**Table 12**

<table>
<thead>
<tr>
<th>Sensitivity Classes vs Detection Requirements</th>
</tr>
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<tbody>
<tr>
<td>Class (AS 7240.20)</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>TF2* end-of-test condition</td>
</tr>
<tr>
<td>Equivalent % obscuration per metre</td>
</tr>
</tbody>
</table>

* TF2 has different burn rates for each Class.

Question:
New standards AS 7240.20-2012 and AS 1670.1-2015 now allow for 3 sensitivity classes of aspirating smoke detector (A: Very High, B: Enhanced, C: Normal), with permitted transport times of 60s, 90s, and 120s respectively.

(1) Are aspirating smoke detectors complying with AS 7240.20-2012 permitted?

(2) Does the 90s maximum transport time period specified in clause 603.12 apply to AS 7240.20 or ISO 7240-20 compliant aspirating smoke detectors?

(3) Does the transport time period of clause 603.12 include the permitted equipment response delay of clause 204.6?

Interpretation issued by the Alarms and Detection Group:
(1) Yes. AS 7240.20-2012 is identical to ISO 7240-20:2010 which is already listed in clause 216.2.

(2) No. The 90s of clause 603.12 applies to AS 1603.8 aspirating smoke detectors. For AS 7240.20 and ISO 7240-20 aspirating smoke detectors the applicable maximum transport times are: 60s for Very High Sensitivity (Class A), 90s for Enhanced Sensitivity (Class B), and 120s for Normal Sensitivity (Class C) aspirating smoke detectors.

(3) No. The 15s (maximum) of clause 204.6 is additional.
CLASS A: PRO’S AND CON’S

PRO’S
• Provides earliest possible warning
• Effective in higher airflow high dilution environments
• Quantifies “high sensitivity”

CON’S
• Transport times are maximum 60s due to need for high sensitivity/fast response
• Max pipe lengths allowable for the detector may not be achieved due to transport time (however, VESDA provides highest number of holes per class)
• Target 80% system balance must be achieved.
• Possibility of nuisance alarms if not applied correctly
CLASS B: PRO’S AND CON’S

PRO’S
• Provides earlier warning.
• Useful where high sensitivity may generate false alarms
• Quantifies “lower sensitivity”

CON’S
• Transport times are maximum of 90s, however this has been the norm under AS1670.1
• Max pipe lengths allowable for the detector may not be achieved due to transport time (however, VESDA provides highest number of holes per class)
• Target 80% system balance must be achieved
CLASS C: PRO’S AND CON’S

PRO’S:
• Provides equivalency to point or beam detectors as defined by AS7240-7/12
• Lower maintenance cost for ASD
• Maximum pipe lengths may be utilised resulting in fewer units/project
• 120 second maximum transport time.
• Enables the use of ASD in a wide variety of environments

CON’S:
• Target 80% system balance must be achieved
SYSTEM DESIGN

- What Class of detection is best suited for protecting the risk?
- What are the airflow characteristics?
- What is the height of the enclosure?
- More than one detector may be required to meet 60s transport time in Class A
- Fewer detectors may achieve protection required for Class C due to increased transport time. Allowance (120sec)
- Software packages such as: Aspire & Pipe IQ perform these calculations

- AS7240-20 relates to hole sensitivity as opposed to threshold setting
- Now able to benchmark the sensitivity (Class) required
- Although Class C is sufficient, Class B may be preferable in certain applications due to value of goods, ceiling height or other factors
- Class C ASD can offer lifetime ownership cost benefits when used as an alternative to point detectors due to ease of maintenance and access
KEY TAKEAWAY POINTS

- Sensitivity of ASD systems can now be benchmarked.
- We can define “less sensitive”
- Consider what Class of sensitivity best suits your risk
- Class C provides a viable alternative to point detectors
- Good ASD units can be configured for any class via software in the event of a change being required on site
ANY BURNING QUESTIONS?

Any questions or comments please contact:

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