

SS 554:2016+A1:2021
(ICS 13.040.20; 91.040.01)

SINGAPORE STANDARD

Code of practice for indoor air quality for air-conditioned buildings

Incorporating Amendment No. 1

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Sep 2021*

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Foreword

This Singapore Standard Code of Practice was prepared by the Technical Committee on Building Maintenance and Management under the direction of the Building and Construction Standards Committee.

This Code specifies indoor air quality that will be acceptable to the majority of building occupants, and will minimise the risk of adverse health effects. It also provides information, advice and guidance on measures to improve the quality of air in air-conditioned environments.

This code is a revision of SS 554: 2009. The key changes include:

- a) Aligning acceptable limits of indoor air quality parameters to national and international standards.
- b) Specifying the reference methods and indicative methods where relevant.
- c) Enhancing the recommended filter ratings and providing information on filter use.
- d) Specifying the number of sampling points according to floor sizes and ventilation types, in addition to number of floors.

Minor changes include alignment with ISO 16814 : 2008 and text revision for better clarity.

This Code is intended to complement Singapore Standard 'Code of practice for air-conditioning and mechanical ventilation in buildings (SS 553).

This Code will be useful to building owners, management corporations, building occupants, and those responsible for designing, operating and maintaining the building environment, as well as others involved in servicing the ventilation and air-conditioning systems.

In preparing this Code, reference was made to the following publications:

1. ISO 16814 : 2008 Building environment design – Indoor air quality – Methods of expressing the quality of indoor air for human occupancy
2. NEA Guidelines for good indoor air quality in office premises (1996)

Permission has been sought from the following organisation / authors for the reproduction of:

3. Figures A.2 and A.4 from Dr Olli Seppanen and Dr William Fisk
4. Figure A.3 from Dr Pawel Wargocki
5. Table E.1 from the NAFA Guide to Air Filtration, 4th Edition 2007, Addendum 7.1 'A Brief Description of the ANSI/ASHRAE Standard 52.2 Test Method'
6. Some of the definitions, 5.5.1 and B.3.2 from ISO 16814 : 2008 published by the International Organization for Standardization

Acknowledgement is made for the use of information from the above organisations / authors.

This Code is expected to be used by all stakeholders, including relevant public agencies, consultants, facility owners and managers and employers. Occupiers, employers and building managers functioning in enclosed air-conditioned premises are encouraged to use this Code to help fulfil their general duties as specified in the Workplace Safety and Health Act.

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

- 1. Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions. Where SSs are deemed to be stable, i.e. no foreseeable changes in them, they will be classified as "Mature standards". Mature Standards will not be subject to further review, unless there are requests to review such standards.*
- 2. An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore and the Singapore Standards Council shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR. Although care has been taken to draft this standard, users are also advised to ensure that they apply the information after due diligence.*
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Code of practice for indoor air quality for air-conditioned buildings

1 Scope

The Code applies to all air-conditioned premises where air-conditioning is used intermittently or continuously, with the exception of residential premises, factory production areas, hospitals, polyclinics and laboratories.

It applies to all types of air-conditioning and air-distribution systems.

The recommended minimum ventilation rates in the Code should be used in conjunction with the SS 553, which provides guidance for the design, construction, installation, testing, commissioning, operation and maintenance of air-conditioning and mechanical ventilation (ACMV) system. Neither SS 553 nor this Code prescribes specific ventilation rate requirements for smoking zones. ASHRAE Standard 62.1 may be referred to if smoking zones are present (see also 5.1.6).

In setting indoor air quality (IAQ) standard, this Code considers environmental factors, which include thermal, physical, chemical and biological factors. The purpose of this Code is to specify indoor air quality that will be acceptable to building occupants, and to minimise the potential of adverse health effects.

Due to the diversity of contaminants generated from indoor and outdoor sources, the contaminants covered in this Code are not exhaustive. The Code provides limits for contaminants commonly found in an indoor environment, and limits for parameters that are indicative of the quality of the indoor air.

Meeting the requirements of this Code may not result in an acceptable indoor air quality for everyone in all air-conditioned buildings. The possible reasons are:

- a) Diversity of sources and contaminants in indoor air which may warrant further investigation;
- b) Inadequate cleaning of outdoor air which is unacceptable;
- c) Variation in occupants' perception of and preference for different levels of air temperature, humidity, noise, lighting etc.; or
- d) Variation in susceptibility of individuals.

2 Normative references

This Code incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed thereafter. For dated references, subsequent amendments to or revisions of any these publications apply to this Code only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ASHRAE Standard 52.2	Method of testing general ventilation air-cleaning devices for removal efficiency by particle size
ASHRAE Standard 55	Thermal environmental conditions for human occupancy
ASTM D5075	Standard test method for nicotine and 3-ethenylpyridine in indoor air
EN 779	Particulate air filters for general ventilation – Determination of the filtration performance

EN 12341	Ambient air. Standard gravimetric measurement method for the determination of the PM ₁₀ or PM _{2.5} mass concentration of suspended particulate matter
ISO 7730	Ergonomics of the thermal environment – Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria
ISO 8672	Air quality – Determination of the number concentration of airborne inorganic fibres by phase contrast optical microscopy – Membrane filter method
ISO 10312	Ambient air – Determination of asbestos fibres – Direct transfer transmission electron microscopy method
ISO 10313	Ambient air – Determination of the mass concentration of ozone – Chemiluminescence method
ISO 12039	Stationary source emissions – Determination of carbon monoxide, carbon dioxide and oxygen – Performance characteristics and calibration of automated measuring systems
ISO 14966	Ambient air – Determination of numerical concentration of inorganic fibrous particles – Scanning electron microscopy method
ISO 16000	Indoor air Part 2: Sampling strategy for formaldehyde Part 3: Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air – Active sampling method Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS or MS-FID Part 15: Sampling strategy for nitrogen dioxide (NO ₂)
NIOSH 0800	Bioaerosol sampling (indoor air)
NIOSH Method 2551	Nicotine
SS 553	Code of practice for air-conditioning and mechanical ventilation in buildings