

National Building Code of Finland Indoor Climate and Ventilation in Buildings

Ken Colthorpe

In this article, Ken Colthorpe - a freelance contributor to the AIVC, reviews one of the most comprehensive sets of regulations to be published covering indoor climate and ventilation in buildings. Ken is currently updating the AIVC's work on building airtightness and ventilation standards.

These regulations are binding and replace those of October 1978. They came into effect on 1st January, 1988 and constitute part of the National Building Code of Finland. They apply to all buildings for which permit had been applied on or after that date. Previous regulations and guidelines however could be applied to buildings for which permit was applied before 1st July, 1988.

The regulations are to ensure that a satisfactory indoor climate is maintained in all occupied spaces under normal weather conditions and activities in the spaces. They cover the purity of the indoor air, the temperature and humidity, which must be kept under control, as well as draught, noise and excessive radiant heat.

Temperatures

Temperature control in summer is referred to and indoor air must generally not exceed +27 deg C. An allowance is given however when outdoor temperatures exceed +22 deg C for a five hour maximum period. Residential buildings are allowed to deviate from these values.

For winter design temperatures, outdoor values are referred to in Section D5 of the National Building Code of Finland "Calculation of performance and energy requirement for heating of buildings", which gives values for various localities. Indoor design temperatures however, are given for different types of buildings in Appendix 1 of its Standard. Effective temperature is also referred to and covers those spaces with large window areas or with radiant heating.

Purity of Air

Impurities in the indoor air must be kept below the guide values given for outdoor air which include sulphur dioxide, nitrogen dioxide, and carbon monoxide. Design indoor values are also given for formaldehyde, radon and carbon dioxide which must not be exceeded. The content of other impurities in non-exceptional spaces shall not exceed 1/10 of the content known harmful in working area air. (Table 1).

Humidity

Humidity levels must be controlled to prevent hazards to both health of the occupants and to the building structure. Some guidance is given on means of control and where humidification may be required.



Table 1. Summary of air quality requirements.

		annual ave.	daily ave.	hourly ave.
Sulfur dioxide	/m ³	40	200	500
Nitrogen dioxide	/m ³		150	300
Carbon monoxide	mg/m ³		10	30
Particles	/m ³	60	150	
1) 8 hours				
Formaldehyde	new buildings (existing buildings)	0.15 mg/m ³ 0.30 mg/m ³		
Maximum	new buildings existing buildings	200 Bq/m ³ 800 Bq/m ³		
Carbon Dioxide	2500 ppm (of which 1500 ppm is produced by metabolism).			

(If the outdoor air flows are controlled based on the carbon dioxide content of the indoor air, a maximum setpoint of 800 ppm (cm³/m³) may be used.)

Noise

Noise from mechanical ventilation plant must not exceed the values given in Appendix 1 of the Standard for the various spaces in different types of buildings. Section C1 "Soundproofing" of the National Building Code of Finland includes regulations concerning the total sound level caused by all HVAC equipment in combination.

Ventilation Requirements

These are dealt with in some detail. It mainly deals with the mechanical ventilation in buildings and gives design guidance for both smoking and non-smoking areas. Energy saving considerations are taken into account by giving guidance on how both mechanical and natural ventilation can be controlled. The rates of fresh outdoor air, and recirculated air are defined and values for the various spaces in buildings are given in Appendix 1 of the Standard. Typical requirements for offices are reproduced in Table 2. Tables are included in the Standard for 14 classifications of buildings. Such design aspects as air distribution, air pressures, outdoor air intake, and exhausts are all covered with guidance given. The discharge of exhaust air is based on five separate classifications with examples given of each. Details are given for the distances separating the location of exhaust openings for the different classifications of exhaust air, and the site of other openings or areas in or around the building that the discharge might affect.

Leakage of the mechanical ventilation system is limited to 6% of the total system flow rate at operating conditions. Three classes of air sealing are given for ventilation ductwork operating at different pressures and in different locations.

Performance

The ventilation system must be fully documented with all relevant information supplied. It must be commissioned and tested with permitted variations from design values given. It shall have been designed so as to facilitate the easy cleaning, maintenance and repair operations. It must be furnished with safety protection devices and suitable surveillance measuring devices, and shall be equipped with full operating instructions for the user.

Obtaining Finnish Standards

Information Centres and Authorities Responsible for Standards and Building Regulations.

National Organisations

1. Ministry of the Environment
PL 306, SF-00531,
Helsinki, Finland.
Tel: 90-1601
Publications: NTNL Building Codes.
2. The Building Information Institute,
PL 1004, SF-00101 Helsinki, Finland.
Tel: 90-6944911
Publications: Design rules and standard solutions.
3. SFS (Finnish Standards Association)
PL 205, SF-00121, Helsinki, Finland.
Tel: 90-661 693
Publications: Product Standards.
4. RIL (The Finnish Association of Civil Engineering),
Meritullinkatu 16 A 5, SF-00170, Helsinki, Finland.
Tel: 90-645601

Table 2. Summary of Office Building Requirements.

Space/Use	Air temp.	Eff. temp.	Draft char.	Outdoor air rate (transfer air - s)		Return air rate	Sound level
	°C	°C		$\frac{dm^3}{s,pers}$	$\frac{dm^3}{s,m^2}$	$\frac{dm^3}{s,unit}$	dB(A)
2.1 Office room	21	20	2	10	1		35
2.2 Open office	21	20	2	10	1.5		35
2.3 Conference Room	21	20	3	10	4		35
2.4 Drafting room	21	20	2	10	1.5		35
2.5 Spaces for public service	21	19	4	6	2		40
2.6 Exhibition space	20	18	4	5	1.5		40
2.7 Data processing rooms							
- processor room	21	19	5	4	0.4		55
- printer room	21	19	4	4	0.4		55
2.8 Archive, storage	20	18 (no work area) (s)				0.35/m ²	45
2.9 Cafeteria, rest rm.	20	19	3	10	5		40
2.10 Copying room	20	18			1	4/m ²	45
2.11 Office corridor, lobby	20	18	5				40
2.12 Smoking room	20	19	3	10	5	10/m ²	40
2.13 Classroom	21	20	3	10	4		35

Appendix 2

Covers the instructions and ventilation of Motor Vehicle Shelters, and applies mainly to car parks. They do not apply to vehicle repair or service shops, bus terminals or other spaces of continuous activity integrated with the car parks.

Air leakage of the building fabric

Whilst air sealing of fabric and windows are considered factors affecting the indoor climate, no values of allowable leakage rates are given in this document.

Distributors of Finnish Standards and Regulations Useful addresses

1. Building Books Ltd,
PL 1004, SF-00101, Helsinki, Finland.
Tel: 90-694911
Distributes all standards and regulations.
2. Valtin painatuskeskus
Statens tryckericentral
(Finnish Government Printing Centre)
Hakuninmaantie - 2,
SF-00430, Helsinki, Finland.
Tel: 90-56601
Distributes Government Publications.