Translation from Finnish
Legally binding only in Finnish and Swedish
Ministry of Social Affairs and Health

Decree of the Ministry of Social Affairs and Health on Health-related Conditions of Housing and Other Residential Buildings and Qualification Requirements for Third-party Experts

(545/2015)

Section 1
Scope of application

(1) This Decree is applied to the monitoring of health-related conditions of housing and other residential buildings carried out under the Health Protection Act (763/1994). The requirements and related action limits laid down in this Decree for physical, chemical and biological exposure factors are applied when making decisions and issuing regulations referred to in section 27 or 51 of the Health Protection Act.
(2) Any health hazard caused by an exposure agent not referred to in this Decree shall be assessed based on the case-specific risk.

Section 2
Definitions

In this Decree:
(1) *action limit for exposure agent* means the concentration, measurement result or property which indicates that the party responsible for the hazard must take action laid down in section 27 or 51 of the Health Protection Act to identify the health hazard and, if necessary, to eliminate or restrict the hazard;
(2) *residential zone* means the section of a room space the lower surface of which is limited to the floor, the upper surface is 1.8 metres above the floor, and the side surfaces are 0.6 metres from the outer or inner wall or from a similar solid part of a building;
(3) *impulse-like noise* means noise containing repeated short sounds which can be detected acoustically or by measuring and which increase the harmful impact of the noise in premises exposed to noise;
(4) *narrow-band noise* means noise containing tonal or narrow-band components which can be detected acoustically or by measuring and which increase the harmful impact of the noise in premises exposed to noise;
(5) *chemical agent* means particulate or gaseous organic or inorganic matter or compound which is harmful to health and which originates from building materials, moisture-damaged structures, other facilities in the building, near-by buildings, soil, furnishing materials or ambient air;
(6) *volatile organic compounds* mean organic compounds with a boiling point between 50–260 degrees Celsius;

(7) *result determined as toluene equivalent* means the concentration calculated by comparing the compound's detector response to the detector response from toluene;
(8) *tobacco smoke* means the mixture of particles and gases produced from smoking cigarettes and other tobacco products;
(9) *respirable particles* (PM_{10}) mean particles with aerodynamic diameter under 10 µm;
(10) *fine particles* ($PM_{2.5}$) mean particles with aerodynamic diameter under 2.5 µm;
(11) *outdoor airflow* means air drawn in a controlled manner from outside to inside through ventilation.

Section 3
General evaluation principles regarding the physical, chemical and biological factors of housing and other residential buildings

(1) A health hazard shall be evaluated as an entity in a manner which in the application of the action limit for an exposure agent takes into account the probability, repeated nature and duration of exposure, possibilities to avoid exposure or to eliminate the hazard, and the circumstances caused by the elimination and other similar factors.
(2) When the requirements concerning the physical, chemical and biological factors referred to in this Decree are applied to unusual circumstances, such as during repair or modification work on a building or its part, special consideration shall be given to the duration of exposure and the risk of the potential health hazard.

Section 4
Measurement, sampling and analysis

(1) Measuring and sampling shall primarily be carried out in conditions equivalent to the ordinary use of the housing or other residential building. When investigating a health hazard, measuring and sampling shall be carried out using standardised methods or other similar reliable methods. The measuring and sampling equipment shall be calibrated in accordance with the manufacturer's instructions.
(2) A sample shall be taken and analysed according to the laboratory's specifications and quality assurance system. A statement containing measurement and analysis results shall always state the measuring, sampling and analysis method used, as well as the limit of determination and the principles applied when analysing the results.
(3) When evaluating whether an action limit is exceeded, uncertainty assessment regarding the measuring and sampling event and further analysis shall be performed. The action limit is exceeded if the numerical limits for exposure agents referred to in this Decree are exceeded, taking account of the measurement uncertainty.
(4) The reliability and repeatability of a new measuring method in investigating health hazards shall be proven by a professional and independent actor approved by the Ministry of Social Affairs and Health.

Section 5
Indoor air humidity

The indoor humidity level may not, for a prolonged period, be so high that it causes a risk of microbial growth in the structures, equipment or on their surfaces.

Section 6
Temperature and air velocity

(1) Indoor temperature can be measured in the residential zone as needed to determine a health hazard. The indoor temperature is measured at the height of approximately 1.1 metres.
(2) Temperatures shall meet the action limits laid down in Table 1 of Annex 1 to this Decree. The action limits are only applied in an apartment to assess the health-related safety of the room temperature. The temperatures may not cause the risk of microbial growth referred to in section 5.
(3) Air velocity may not exceed the velocity presented in the draught curve in Annex 1.

Section 7
Tap water temperature

The temperature of warm tap water from a hot water system shall be at minimum +50 degrees Celsius, and the temperature of water from a plumbing fixture may be at most +65 degrees Celsius.

Section 8
General evaluation principles for ventilation

(1) The outdoor airflow in the ventilation system shall be adequate with regard to the use of the building, and the air must be sufficiently clean. Ventilation shall be organised so that the indoor air of the entire residential zone is circulated. Inadequate ventilation shall not cause the risk of microbial growth referred to in section 5.
(2) The airflow rate may be below the values laid down in sections 9 and 10 during renovation of a housing structure or other residential building, if ventilation can be increased when necessary.
(3) The action limit for carbon dioxide in indoor air is exceeded if the concentration is 2 100 mg/m^3 (1 150 ppm) higher than the carbon dioxide concentration of outdoor air.
(4) Outside the building's operating time ventilation shall be such that the accumulation of pollutants released and carried from structural or furnishing materials or other sources in the indoor air does not cause a health hazard for those staying in the facilities during operating hours.

Section 9
Ventilation of housing

(1) During operation, the outdoor airflow rate of an apartment's ventilation system shall be at least 0.35 dm^3/s per square metre in all residential rooms.
(2) The outdoor airflow rate may be lower than that laid down in subsection 1 if it is ensured that the indoor air pollutant content and temperature do not rise to such a high level that they cause a health hazard, and that the humidity level does not

rise to such a high level that it could cause the risk of microbial growth referred to in section 5.

Section 10
Ventilation of other residential buildings

(1) In addition to the provisions of sections 8 and 9, the outdoor airflow rate in schools, day-care facilities and other similar residential buildings shall be at minimum 6 dm^3/s per person during use.
(2) However, the outdoor airflow rate may be 4 dm^3/s per person, if it is ensured that the indoor air pollutant content and temperature do not rise to such a high level that they cause a health hazard, and that the humidity level does not rise to such a high level that it could cause the risk of microbial growth referred to in section 5.

Section 11
Measurement of noise

(1) Measuring equipment that has been proven reliable with regard to accuracy and functions and that gives measurement results that can be compared to the action limits laid down in this Decree shall be applied to noise measurement.
(2) Noise measurement shall be performed in the residential zone. The measuring device shall be placed at a height and in a place that is appropriate for the purpose of experiencing the noise and harmful effects, usually at head level. The measurement point can also be a bed and the head area of a person lying on the bed. However, the measurement point may not, without justifiable cause, be located less than 0.5 metres from any room surface. When a noise level is measured, all windows, entrance doors and ventilation hatches shall be closed.

Section 12
Action limits for noise

(1) To verify the health-related conditions of housing or other residential building, the action limits in Table 1 of Annex 2 are applied to determine the average noise level for indoor noise during day- and night-time.
(2) In the case of low-frequency noise, action limits in Table 2 of Annex 2 are applied to night-time noise. Action limits for low-frequency noise apply to facilities intended for sleeping.
(3) Night-time (22.00 – 7.00) musical noise or other noise which may potentially cause sleep disturbances and which can be clearly distinguished from background noise may not exceed 25 dB as the average noise level $L_{Aeq,1h}$ for one hour (22.00 – 7.00) when measured in facilities intended for sleeping.
(4) Noise caused by technical equipment in residential rooms may not exceed the values in Tables 1 and 2 of Annex 2. The maximum night-time noise level L_{AFmax} (22.00 – 7.00) caused by technical equipment may not exceed 33 dB. If night-time noise occurs only occasionally or rarely the values may exceed this limit, as long as the level never exceeds 45 dB. Noise caused by someone running water in the same apartment is excluded when measuring noise referred to in this subsection.
(5) To avoid hearing impairment, noise levels may not exceed $L_{Aeq,4h}$ 100 dB, L_{AFmax} 115 dB or L_{Cpeak} 140 dB. If one or more of these limits is exceeded, noise

exposure shall be restricted by using hearing protection, reducing noise levels or limiting the time of the operation causing the noise.

Section 13
Correction of noise measurement results

(1) Due to the harmful nature of impulse-like noise, a calculated impulse correction of 5 dB or 10 dB, depending on the impulse-like characteristics of the noise, is added to the average noise level referred to in section 12(1).
(2) Due to the harmful nature of narrow-band noise, a calculated narrow-band correction of 3 dB or 6 dB, depending on the narrow-band characteristics of the noise, is added to the average noise level referred to in section 12(1).
(3) Impulse and narrow-band corrections are performed only for the time period when noise in the exposed premises demonstrates impulse-like or narrow-band features.

Section 14
Measurement of chemical agents

An air sample shall be taken in the residential zone in the middle of a space or room, at the height of approximately 1.1 metres. The sample shall be taken in a room or residential space that best represents the presence of the chemical compound to be investigated. Ventilation in the sampling area shall be equivalent to an ordinary exposure situation. Windows, entrance doors and ventilation hatches shall be closed during sampling. The time of measurement is the sampling time provided in the measurement method for each chemical substance.

Section 15
Volatile organic compounds

(1) The action limit for the total indoor concentration of volatile organic compounds determined as toluene equivalents is 400 µg/m³.
(2) The action limit for the total indoor concentration of a single volatile organic compound determined as toluene equivalent is 50 µg/m³.
(3) Notwithstanding the provisions of subsection 2, the action limits for the total indoor concentration of the following volatile organic compounds determined as toluene equivalents are:

Compound	Action limit
2,2,4-trimethyl-1,3-pentanediol diisobuty-rate (TXIB)	10 µg/m³
2-ethyl-1-hexanol (2EH)	10 µg/m³
Naphthalene	odour may not occur, 10 µg/m³
Styrene	40 µg/m³

Section 16
Formaldehyde

The annual average value of indoor formaldehyde concentration may not exceed 50 µg/m³, and the average short-time concentration during a 30-minute measurement may not exceed 100 µg/m³.

Section 17
Carbon monoxide

Momentary indoor carbon monoxide concentration may not exceed 7 mg/m³.

Section 18
Tobacco smoke

(1) Indoor air may not repeatedly contain organoleptically detectable tobacco smoke that is carried into the apartment or other residential space from outside or from elsewhere within the building. Measured as nicotine content, indoor air tobacco smoke content may not exceed 0.05 µg/m³.
(2) Besides organoleptic detection of smoke and nicotine content measurements, the movement of smoke into indoor air can be investigated with a tracer test.

Section 19
Particulate pollutants

(1) The indoor concentration of respirable particles (PM_{10}) may be at most 50 µg/m^3 during a 24-hour measurement.
(2) The indoor concentration of fine particles ($PM_{2.5}$) may be at most 25 µg/m^3 during a 24-hour measurement.
(3) The action limit for industrial mineral fibres is 0.2 fibres/cm^2 for dust accumulated on surfaces in two weeks.
(4) The occurrence of asbestos fibres in dust accumulated on surfaces indicates that the action limit has been exceeded. The indoor concentration of asbestos fibres may not exceed 0.01 fibres/cm^3.

Section 20
Microbes

(1) Action limit is deemed to be exceeded if unrepaired moisture or decay damage is discovered, microbial growth is organoleptically detected and, if necessary, analytically verified on the inner surfaces of the building or in the internal structures or thermal insulation when the insulation material is not in contact with outside air or the soil, or where microbial growth is found in another structure or facility if a person staying indoors may be exposed to it.
(2) Microbial growth is primarily verified on construction material by using serial dilution or direct cultivation method based on cultivating microbes and by microscopy analysis. Microbial damage can also be detected by serial dilution analysis of a surface swab sample or an air sample taken with a 6-stage impactor. With regard to the air sample, there shall also be other evidence of exceeding the action limit in addition to the air microbe concentration.

(3) A method other than serial dilution or direct cultivation can also be used to evaluate microbial growth in a building, provided that the reliability of the method has been proven in a manner referred to in section 4(4), or it has been verified that results gained with the method are consistent with results gained with the serial dilution method.

Section 21
Qualification requirements for a third-party expert

The training of a third-party expert referred to in section 49d(1) of the Health Protection Act shall include the competence requirements referred to in Annex 3. A third-party expert shall have a relevant degree and experience in the field as provided in Annex 3.

Section 22
Entry into force

This Decree enters into force on 15 May 2015.

Annex 1

ACTION LIMITS FOR TEMPERATURES AND AIR VELOCITY

Table 1. Action limits for temperatures

	Temperature action limits	*Temperature index TI*
In housing		
Indoor temperature during heating season	+18 °C – +26 °C	
Indoor temperature outside heating season	+18 °C – +32 °C	
Lowest average wall surface temperature	+16 °C	81
Lowest average floor surface temperature	+18 °C	87
Lowest point surface temperature	+11 °C	61
Service homes, retirement homes, child day-care units, educational institutions and similar facilities		
Indoor temperature during heating season	+20 °C – +26 °C	
Indoor temperature outside heating season: child day-care, educational institutions and other similar facilities	+20 °C – +32 °C	
Indoor temperature outside heating season: service homes, retirement homes and other similar facilities	+20 °C – +30 °C	
Lowest average wall surface temperature	+16 °C	81
Lowest average floor surface temperature	+19 °C	92
Lowest point surface temperature	+11 °C	61

Surface temperatures are assessed by using the temperature index when temperatures cannot be measured in –5 °C ± 1 °C outdoor temperature and +21 °C ± 1 °C indoor temperature. When using the temperature index, negative pressure in the building shall be taken into consideration when the average negative pressure exceeds 5 Pa.

Temperature index formula:

$$TI = \frac{(Tsp - To)}{(Ti - To)} \times 100\%, \text{where}$$

TI = temperature index
Tsp = inner surface temperature °C
Ti = indoor air temperature °C
To = outdoor air temperature °C

Air velocity must not exceed the velocity presented in the draught curve in Figure 1.

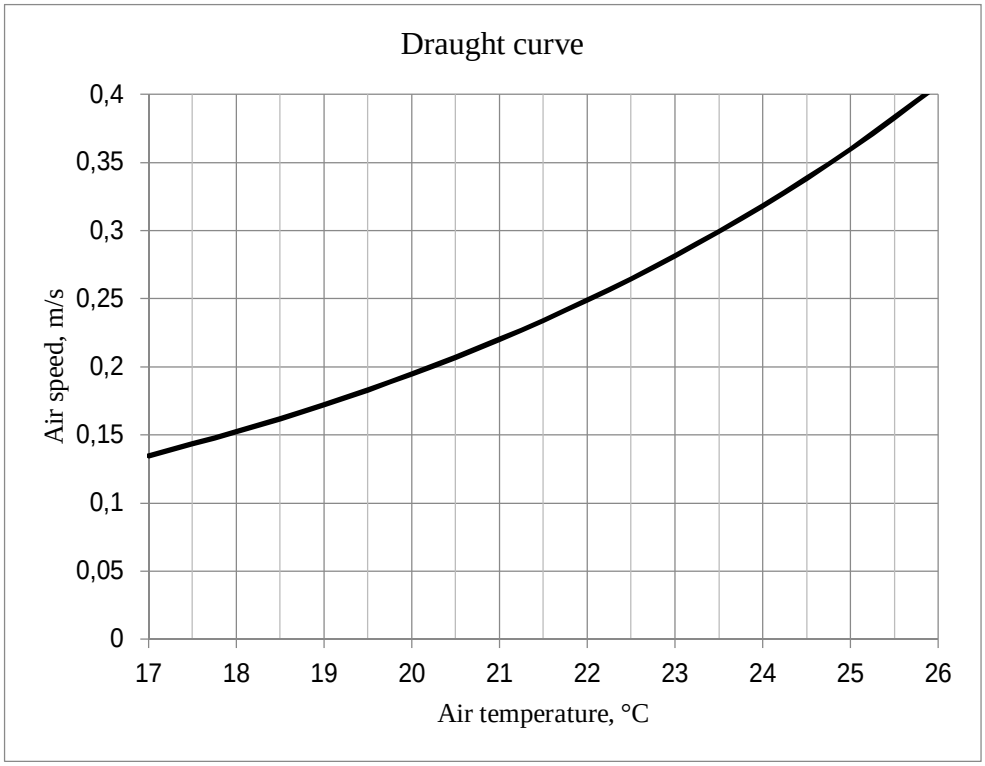

Figure 1. Maximum air velocity

Annex 2

ACTION LIMITS FOR NOISE

Table 1. Action limits for average day and night-time noise levels in housing and other residential buildings

Apartment and room space	*Day-time average noise level L_{Aeq} (7 a.m. – 10 p.m.)*	*Night-time average noise level L_{Aeq} (10 p.m. – 7 a.m.)*
Housing, service homes, retirement homes, child day-care units and similar facilities		
housing and residential facilities	35 dB	30 dB
other facilities and kitchen	40 dB	40 dB
Meeting and teaching venues		
space were the public is expected to hear the speaker without the use of sound reproducing equipment	35 dB	-
other meeting venues	40 dB	-
Office facilities (from customers' perspective)		
reception facilities and offices	45 dB	-

Table 2. Action limits for one-hour low-frequency indoor noise in facilities intended for sleeping

Frequency band/Hz	20	25	31.5	40	50	63	80	100	125	160	200
Night-time (22.00 – 7.00) $L_{eq,1h}$/dB	74	64	56	49	44	42	40	38	36	34	32

Values 5 dB higher than those presented in Table 2 are applied to day-time (7.00 – 22.00) low-frequency noise.

Annex 3

CONTENTS AND COMPETENCE REQUIREMENTS OF THE TRAINING OF A THIRD-PARTY EXPERT REFERRED TO IN SECTION 49 OF THE HEALTH PROTECTION ACT WITH RESPECT TO MOISTURE AND MOULD DAMAGES AND INDOOR AIR PROBLEMS

1 credit (cr) is equal to 27 hours of a student's work	Building health expert (total credit minimum 45 cr)	Indoor air specialist (total credit minimum 25 cr)	Moisture damage construction specialist (total credit minimum 27 cr)
	Can work alone as a third-party expert	Examinations related to an indoor air problem investigation in a building shall be carried out in cooperation between an indoor air specialist and moisture damage inspector	
BASIC TRAINING	1. Higher education degree in building (construction or HVAC), previous higher vocational level degree or a similar degree, or previous technician's degree or a similar degree 2. Higher or lower academic degree in natural sciences, environmental sciences and environmental	1. Higher or lower academic degree in natural sciences, environmental sciences and environmental health, previous higher vocational level degree or a similar degree, or previous technician's degree or a similar degree	1. Higher education degree in building (construction), previous higher vocational level degree or a similar degree, or previous technician's degree or a similar degree

	health, previous higher vocational level degree or a similar degree, or previous technician's degree or a similar degree		
PROFESSIONAL EXPERIENCE	Minimum of 3 years of research tasks related to the condition of and health hazards in buildings.		
A. INDOOR AIR POLLUTANTS, HEALTH EFFECTS, RESEARCH, PREVENTION	Total credit minimum 13 cr	Total credit minimum 13 cr	Total credit minimum 7 cr
part 1. Indoor air pollutants	minimum 8 cr a) Chemical indoor environment (min. 3 cr) b) Biological and microbiological indoor environment (min. 5 cr) Knows the most important indoor environment factors and their sources, measurement and sampling methods and action limits for pollutants. Can	minimum 8 cr a) Chemical indoor environment (min. 3 cr) b) Biological and microbiological indoor environment (min. 5 cr) Knows the most important indoor environment factors and their sources, measurement and sampling methods and action limits for pollutants. Can	minimum 5 cr a) Chemical indoor environment (min. 3 cr) b) Microbiological indoor environment (min. 2 cr) Knows the most important indoor environment factors and their sources, measurement and sampling methods and action limits for pollutants. Can

	manage the investigation process regarding an indoor air problem and use specialist services. Can interpret measurement results and draw a conclusion from the results gained from indoor environment and condition surveys performed on a building, and can report the results in both written and oral form and provide information about the results.	interpret measurement results and draw a conclusion from the results gained from indoor environment surveys performed on a building, and can report the results in both written and oral form and provide information about the results.	interpret results gained from indoor environment investigations together with condition survey results, and can report the results in both written and oral form and provide information about the results.
part 2. Indoor environment research methods	minimum 3 cr a) Chemical indoor environment (min.) 1 cr b) Biological and microbiological indoor environment (min.) 2 cr Knows the indoor environment examination methods and can perform the	minimum 3 cr a) Chemical indoor environment (min.) 1 cr b) Biological and microbiological indoor environment (min.) 2 cr Knows the indoor environment examination methods and can perform the	minimum 1 cr a) Chemical indoor environment (min.) 0.5 cr b) Microbiological indoor environment (min.) 0.5 cr Knows the indoor environment examination methods and understands the related uncertainty

	examinations as well as report the results and the related uncertainties.	examinations as well as report the results and the related uncertainties.	factors.
part 3. Health effects	minimum 2 cr Knows the most common health effects of different indoor environment factors. Knows the concept of health hazard pursuant to different statutes. Understands the significance of health hazard research and can collaborate with authorities and health care specialists.	minimum 2 cr Knows the most common health effects of different indoor environment factors. Knows the concept of health hazard pursuant to different statutes. Understands the significance of health hazard research and can collaborate with authorities and health care specialists.	minimum 1 cr Knows the significance of indoor environment for people's health. Knows the concept of health hazard pursuant to different statutes. Understands the significance of health hazard research and can collaborate with authorities and health care specialists.
B. BUILDING PHYSICS, PHYSICAL CONDITIONS, BUILDING CONDITION ANALYSIS METHODS, STRUCTURAL AND PRODUCTION ENGINEERING, AND LAW	Total credit minimum 14 cr	Total credit minimum 9 cr	Total credit minimum 17 cr

part 1. Building physics and physical conditions	minimum 5 cr Knows the physical conditions of indoor environment. Knows the salient concepts and definitions of building physics. Knows the sources of moisture in buildings, moisture transportation mechanisms and normal moisture contents in different structures. Knows the significance of thermal insulation, airtightness and sound-proofing, and can interpret the measurement results.	minimum 5 cr Knows the physical conditions of indoor environment. Knows the salient concepts and definitions of building physics. Knows the sources of moisture in buildings, moisture transportation mechanisms and normal moisture contents in different structures. Knows the significance of thermal insulation, airtightness and sound-proofing, and can interpret the measurement results.	minimum 5 cr Knows the physical conditions of indoor environment. Knows the salient concepts and definitions of building physics. Knows the sources of moisture in buildings, moisture transportation mechanisms and normal moisture contents in different structures. Knows the significance of thermal insulation, airtightness and sound-proofing, and can interpret the measurement results.
part 2. Building condition analysis methods	minimum 4 cr Knows the measurement methods for indoor physical conditions. Knows the principles of carrying out a condition assessment and analysis, and knows the condition	minimum 2 cr Knows the measurement methods for indoor physical conditions.	minimum 5 cr Can carry out measurements on indoor physical conditions. Knows the principles of carrying out a condition assessment and analysis so that can perform a condition

	analysis methods so that can order a constructional condition analysis and measurements, and can evaluate the significance of the results in terms of the functionality of the structures.		assessment and analysis as well as interpret and report the results and their significance in terms of the functionality of the structures.
part 3. Structural and production engineering	minimum 3 cr a) Structural engineering (min.) 2 cr b) Production engineering (min.) 1 cr Knows the most common building structures from different periods, as well as the related risks and alternative repair methods. Knows the special procedures related to fixing an indoor environment problem.	minimum 1 cr a) Production engineering (min.) 1.0 cr Knows the special procedures related to fixing an indoor environment problem.	minimum 5 cr a) Structural engineering (min.) 4 cr b) Production engineering (min.) 1 cr Knows the most common structural solutions from different periods, as well as the related risks and alternative repair methods. Can draw up initial repair plans. Knows the special procedures related to fixing an indoor environment problem.
part 4. Law	minimum 2 cr Knows and can, on a case-by-case basis, apply in practical work the legislation,	minimum 1 cr Knows and can, on a case-by-case basis, apply in practical work the legislation,	minimum 2 cr Knows and can, on a case-by-case basis, apply in practical work the legislation,

	regulations and instructions related to indoor environment and construction in different time periods, as well as contractual drafting and contract practices.	regulations and instructions related to indoor environment.	regulations and instructions related to indoor environment and construction in different time periods, as well as contractual drafting and contract practices.
C. VENTILATION AND AIR CONDITION TECHNOLOGY	Total credit minimum 3 cr	Total credit minimum 3 cr	Total credit minimum 3 cr
part 1. Theory	minimum 1.5 cr Understands the significance, task and operating principles of ventilation, as well as the related typical problems and their prevention.	minimum 1.5 cr Understands the significance, task and operating principles of ventilation, as well as the related typical problems and their prevention.	minimum 1.5 cr Understands the significance, task and operating principles of ventilation, as well as the related typical problems and their prevention.
part 2. Research methods	minimum 1.5 cr Can measure air volumes, air change rate and pressure differences between different building elements and determine the	minimum 1.5 cr Can measure air volumes, air change rate and pressure differences between different building elements and determine the	minimum 1.5 cr Can measure air volumes, air change rate and pressure differences between different building elements and determine the

	cleanliness of a ventilation system and transfer routes for pollutants in a building. Knows the methods of examining the air-tightness of a building.	cleanliness of a ventilation system and transfer routes for pollutants in a building. Knows the methods of examining the air-tightness of a building.	cleanliness of a ventilation system and transfer routes for pollutants in a building. Knows the methods of examining the air-tightness of a building.
THESIS	In addition to the above-mentioned education content, a building health expert shall complete a thesis worth at least 15 credits to demonstrate understanding of the significance of each thematic area.	-	-