Programme operator

The Finnish Building Information Foundation RTS sr

RTS - Environmental Classification v1.1

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Process **Economy** **Environment and Energy** **Indoor Air and Wellbeing** **Innovations**

Classification Criteria for new construction and overhaul of Office and Service Buildings 2018

Environmental Classification of the RTS CER building project

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Preface

This document presents the RTS Environmental Classification Criteria for Office and Service Buildings 2018. The document presents the corresponding content that is available in the RTS Environmental Tool including all criteria, certification requirements, and additional information.

The purpose of this printed document is to facilitate the RTS environmental consulting by collecting all input parameters as a printout or as a pdf document.

Documents 1.1 – 2.11.2018

- Update of Classification of Indoor Environment 2019 and E-value
- Y1.2 Materials efficiency as a new criterion

Documents 3.11 - 22.2.2019

- Y2.1 Energy efficiency- lower E-value for hospitals
- Y2.2 Energy metering- new reference and a consumer feedback requirement
- Y4.2 Cyclist and strollers' spaces– a New Sizing spaces requirement for bicycles and updated reference standard

Documents 22.2.-6.5.2019

- energy efficiency requirements table revised to correspond former requirements

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Content

Preface 0
Content 1

1. Summary of the set of criteria 2
1.1 Overview of the set of criteria 2
1.2 Classification scale 3
1.3 Minimum requirements 3

2. Process 4
P1.1 Design phase audit 4
P1.2 HVAC Commissioning 4
P1.3 User guide and training 7
P2.1 Moisture safe design 8
P2.2 Moisture safe construction 12
P3.1 Sustainable construction 15
P3.2 Site dust management 18

3. Economy 20
T1.1 Life cycle costs 20
T2.1 Durability 22
T2.2 Maintainability 24
T2.3 Adaptability 26

4. Energy and environment 28
Y1.1 Life cycle carbon footprint 28
Y1.2 Material resource efficiency 31
Y2.1 Energy efficiency 34
Y2.2 Energy metering 37
Y2.3 Consumption targets 39
Y2.4 Core system efficiency 40
Y3.1 Water efficiency 43
Y4.1 Ecological value 44
Y4.2 Cyclist and strollers spaces 47

5. Indoor air and wellbeing 50
S1.1 Indoor temperature 50
S1.2 Air quality 53
S1.3 User controls 55
S1.4 Material emissions 57
S2.1 Daylight 59
S2.2 Lighting quality 60
S3.1 Space acoustics 61
S3.2 Sound insulation 63

6. Innovations 64
I1.1 Innovations 64

1. Summary of the set of criteria

1.1 Overview of the set of criteria

Welcome to examine the categories in the "Set of criteria for office and service buildings 2018". This overview of the set of criteria shows the subject areas that are addressed under each criterion, along with the associated weightings. The total number of points is 100, and an extra 10 points can be awarded for innovation.

Table 1. RTS - Environmental Classification v1.1 summary and weightings.

Main group		Groups		Criteria		
Process	23	Commissioning	8	P1.1	Design phase audit	3
				P1.2	HVAC Commissioning	3
				P1.3	User guide and training	2
		Moisture safety	10	P2.1	Moisture safe design	4
				P2.2	Moisture safe construction	6
		Site sustainability	5	P3.1	Sustainable construction	3
				P3.2	Site dust management	2
Economy	12	Life cycle costs	3	T1.1	Life cycle costs	3
		Maintenance	9	T2.1	Durability	3
				T2.2	Maintainability	4
				T2.3	Adaptability	2
Environment and Energy	35	Carbon footprint	12	Y1.1	Life cycle carbon footprint	7
				Y1.2	Material resource efficiency	4
		Energy	16	Y2.1	Energy efficiency	8
				Y2.2	Energy metering	3
				Y2.3	Consumption targets	3
				Y2.4	Core system efficiency	2
		Water	3	Y3.1	Water efficiency	3
		Local impacts	4	Y4.1	Ecological value	3
				Y4.2	Cyclist and strollers spaces	2
Health and Wellbeing	30	Indoor Air Quality	18	S1.1	Indoor temperature	6
				S1.2	Air quality	7
				S1.3	User controls	2
				S1.4	Material emissions	3
		Visual comfort	6	S2.1	Daylight	4
				S2.2	Lighting quality	2
		Acoustics	6	S3.1	Space acoustics	3
				S3.2	Sound insulation	3
Innovations	10	Innovation	10	I	Innovation	10

1.2 Classification scale

The classification scale is presented with a five-level star rating which is based directly on the points obtained. In addition, certain levels have mandatory minimum requirements that must be met.

There are 28 criteria to evaluate, and the highest possible number of points is 110.

Table 2. Classification scale of environmental quality: star ratings and corresponding requirements.

Classification scale	Requirement level/Points	Description
No classification	< 25 p.	
★	≥ 25 p.	Standard quality
★★	≥ 40 p.	Better than standard
★★★	≥ 55 p.	Good quality
★★★★	≥ 70 p.	High quality
★★★★★	≥ 85 p.	Excellent

1.3 Minimum requirements

Table 3 presents the minimum requirements for reaching different classification levels. The minimum levels apply to moisture management, indoor air quality and energy efficiency.

Table 3. RTS - Environmental Classification v1.1: the minimum requirements of classification levels.

Criterion	1 star	2 stars	3 stars	4 stars	5 stars
Points	25	40	55	70	85
P1.2 HVAC Commissioning			50%	50%	50%
P1.3 User guide and training				100%	100%
P2.1 Moisture safe design			75%	75%	75%
P2.2 Moisture safe construction		75%	75%	75%	75%
Y1.1 Life cycle carbon footprint			15%	30%	30%
Y2.1 Energy efficiency		20%	30%	40%	40%
S1.1 Indoor temperature			25%	50%	50%
S1.2 Air quality		50%	50%	50%	50%
S1.4 Material emissions			50%	50%	50%
In-use audit after 1or 2 years					YES

2. Process

P1.1 Design phase audit

By systematically inspecting the environmental targets set for the project in the design phase based on design and contract documentation, it is possible to ensure the end result also meets the target.

Systematic process of classification, 100% of the weighted value:

1: An interim audit has been scheduled for the project at the design phase

Designer: Design phase audit

Developer:

User:

P1.2 HVAC Commissioning

Implementing of HVAC commissioning between systems and preparing for the commissioning already at the design phase.

The project is subject to high-quality HVAC Commissioning according to the following requirements:

HVAC Commissioning, 50% of the weighted value

1: HVAC, electricity and construction experts in charge of auditing of design, construction and commissioning have been named for the project.

Designer: Naming auditors and generating commissioning task lists

Developer: Commissioning reports of system operational testing

User: Reports of seasonal adjustment during the warranty period

2: A commissioning plan has been scheduled for the project, in which the tasks of the commissioning are described and the responsibilities have been shared.

Designer: A commissioning plan AND inspection lists of the plans made by auditors

Developer: Summary report of the commissioning

User: Report of detected flaws

3: Auditing of remaining old systems in basic renovation has been made

Designer: Commissioning plan

Developer: Operational test reports and lists of flaws, in which the responsibility and timetable for corrections have been agreed.

User: A follow-up memo for correction of detected flaws, where all detected deficiencies have been verified as corrected.

Operational metering according to best practices, 50% of the weighted value

4: Operational metering of the commissioning has been made according to best practices.

Designer: Commissioning plan with requirements

Developer: Summary and commissioning report of the metering OR metering reports

User:

5: The results of the measurements and their correspondence to the objectives of the project have been analysed and the recommendations for improvement have been documented.

Designer:

Developer: Summary and commissioning report of the metering and list of flaws

User: A follow-up memo for correction of detected flaws

Additional information

Commissioning plan

The commissioning plan presents responsibilities, tasks, timetables and reports in the delivery and commissioning phases. The plan must address at least the following:

- Energy efficiency objectives of the facility (Y2.3 and Y2.4 content can be considered if their requirements are in order)
- Commissioning process and responsibilities and documentation for at least installation audits, operational audits, operational metering, and follow-up monitoring during the warranty period (p. 108)
- The operational audits and operational metering required for commissioning are presented for at least the following systems: ventilation, cooling, heating, lighting control, renewable energy production systems, building automation, energy metering (ToVa Manual, Chapter 4.5.4 p.111)
- Verification of metering of targets during the operating phase (Y2.2 and Y2.4 content can be considered if their requirements are in order)
- Verifying the energy target during the operating phase (Y2.3 content can be considered if its requirements are in order)

For more information, see the VTT ToVa Manual (page 34 ToVa phase 5) and Appendix A: ToVa Inspection list 6 Delivery and Commissioning verification (A21-A25)

Commissioning responsibilities

The commissioning plan provides responsibilities to the various project partners. In an acceptable commissioning, the named experts are responsible for conducting operational tests or at least attend as supervisors to operational tests.

Operational tests according to best practices

The following measurements or equivalent procedures are equivalent to best practice:

Construction, air tightness measurement according to SFS-EN ISO 9972

- Confirmation of air tightness in accordance with building regulations

Heating systems for buildings, SFS-EN 14336: 2005 Central heating systems

- System pressure test reports
- Pump adjustment reports
- Commissioning report

Ventilation systems, SFS-EN 12599: 2000 Ventilation of buildings, Commissioning of ventilation and air-conditioning systems and measurement methods

- Airflow measurement report and pressure levels on unit EN12599 6.1
- Air tightness test of ductwork
- Specific Fan Power (SFP) measurements (LVI 30-10349)
- Airflow, temperatures and filter pressure loss of the air handling unit (EN12599 6.1)
- Supply air temperature of ventilation room terminals ((EN12599 6.1, appendix D according to level B)

Refrigeration systems and heat pumps, SFS-EN 378-2: 2016 + A1 Refrigerating systems and heat pumps. Safety and environmental requirements - Part 2: Design, construction, testing, marking and documentation

- System pressure test reports
- System air tightness test
- Operational test report, SFS-EN 378-2:2016 6.3.4

Hot water system, no standard

- Flow measurements of water fittings (washbasins, toilets, showers, kitchen faucets), no technical facilities and manufacturing kitchens
- Temperature monitoring of return hot water
- Measuring hot water temperature at critical points in the system (the most distant points from the heat distribution room)

Lighting systems, guide, Illuminating Engineering Society (IES) of Finland

- Illumination measurements as point tests in different types of spaces (measurement > = target +20% considering the ageing factor 0,8), ST 58.07 Lighting quality assessment and measurement
- Inspection list for lighting controls (motion, occupy and daylight sensors)
- Lighting programming report (delays, control levels) by type of space

Building Automation, ST 711.04, ST 730.01, ST 730.0

- The installations are to be checked for the functionality of the setting curves, the correct rotation directions of the devices and the functioning of the alarm points
- Function and control of setting curves

Summary report of the commissioning plan

Commissioning is reported in the scope of the commissioning plan by providing a written summary of the process in different phases.

Background information

- VTT ToVA Manual (VTT Publication 2413)
- The above standards related to best practices.

P1.3 User guide and training

Ensuring the designed use of the building by promoting smooth communication and guidance.

High-quality user guide, 100% of the weighted value

1: A separate user guide for the end-user.

Designer: The developer's promise to make a user guide

Developer: User guide printout

User: Ensuring availability of user guide for the end-users

2: The system administrators have a separate System administrator's training guide that provides basic information about the building systems and the designed operation for new people.

Designer: The developer's promise to compile a System administrator's training guide

Developer: Planning and compiling the contents of the System administrator's training guide

User: Checking that the System administrator's training guide is available

Additional information

Contents of the user guide

The user guide should address at least the following:

- Project description, general characteristics and environmental strategy, e.g. targets for energy, water or waste management efficiency
- Adjustability of indoor environment parameters according to type of space, operation of control devices, impact potential and visual user instructions
- Facility services and use of services (reservations etc.)
- Social facilities and their use (dressing rooms, showers, saunas)
- Parking areas and parking guidance
- Visitor instructions (e.g. access and security procedures, parking)
- Special spaces of the building and their specific instructions (laboratories, etc.)
- Local services and public transport stops
- Essential contact information and feedback There is no official requirement for the user guide form. A simple and compact guide, e.g. on the Intranet, is the best solution. Note. the user guide must be kept up-to-date.

System administrator's training guide

The technical information found in a typical service manual is too detailed to get a quick overview of the overall picture. In the induction, questions arise very quickly and only a few of the people concerned are present. The training program prepares a training material for new people to get a quick overview of the operation and technical systems of the building. The training guide may also be compiled from the material of training session held during the commissioning. The training guide must include at least the following:

- Service manual content and the requirements for usage
- Control of conditions in different types of space and controllers and sensors in the space
- Description of the heating system and default settings
- Summary of ventilation system and service areas
- Operation descriptions of the air handling units
- Operating hours and control values for ventilation
- Space control principles and operation reports
- Summary reports of operation and control charts of cooling applications and systems
- Control charts of the main technical systems
- List of light fixtures and summary of lighting control
- List of consumption meters and description of metering
- Description of the operation of the special systems (geothermal, condensate heat recovery, etc.) and control charts

Standards

- VTT ToVA Manual (VTT Publication 2413)
- SFS-EN 12599 Ventilation for buildings. Test procedures and measurement methods to hand over air conditioning and ventilation systems.

P2.1 Moisture safe design

Design phase includes identification of moisture risks and managing the risks by ensuring that the design solutions will work.

High-quality management of moisture risks (75% of the weighted value) can also be fulfilled by acquiring the Drychain10 status.

Management of moisture-related risks during the design phase, 75% of the weighted value.

1: A qualified and impartial Moisture Safety Expert, whose supervisory responsibilities cover the phases of general design and implementation planning, has been named for the project.

Designer: Contract on appointing a person in charge and a list of tasks.

Developer:

User:

2: The site has been subjected to a moisture risk assessment, which was prepared by all designers. Based on the risk assessment, a specific risk category for each building section has been defined.

Designer: Moisture risk management report and memo of the procedure.

Developer: A report of reviewing the moisture risk assessment with the contractor.

User:

3: Drying times for critical structures have already been calculated in the design phase, thus ensuring a realistic construction schedule in which the drying times are being considered by adding the critical times of the project to the schedule.

Designer: A general schedule completed with critical times of the project.

Developer:

User:

4: The moisture risk management of the building project have been made based on description of the risk management in a separate document or risk list.

Designer: Moisture risk management report and memo of the procedure.

Developer: A report of reviewing the moisture risk assessment with the contractor.

User:

5: Renovation: input parameters for renovation purposes has been obtained from a condition assessment of the building. If indoor air problems have been detected before the renovation, a qualified building health expert must be included in the project.

Designer: Summary report of the condition assessment of the building, audit report of the building health expert AND report on the risks that have been taken into account in the plans for the design phase moisture safety plan.

Developer: A report of reviewing the moisture risk assessment with the contractor.

User:

Separate inspections for moisture risk structures, 25% of the weighted value

: For high (category R2) and very high (category R3) moisture risk structures (according to moisture risk assessment) a separate building physics audit has been performed by an impartial building physics engineer OR the building has only normal structures considering moisture risks.

Designer: Building physics audit report OR moisture risk assessment for R1 category.

Developer: A report of reviewing the moisture risk assessment with the contractor.

User:

7: The project task force has dealt with the risks identified during the building physics audit, risk management plan has been decided and remarks are corrected in the plans.

Designer: A report of the risks identified during the audit AND confirmation of settled repairs.

Developer: Audit reports of moisture risk assessment of constructions (risk categories R2 and R3) on construction site by a qualified moisture management supervisor.

User:

Additional information

Moisture risk categories of constructions

The moisture risk categories of constructions are defined in moisture risk classification of RIL 250:2011 publication (Appendix 3, Tables L3.3 and L3.4. The risk categories of spaces and constructions based on location, environment and complexity of the design solution are defined based on the classification.

The moisture risk categories are as follows:

- R1 Normal, normal construction conditions and solutions that do not involve any special risk
- R2 High, solutions involve increased risks and complexity regarding moisture safety
- R3 Very High, the solutions involve significant risks and complexity regarding moisture safety

Impartial Moisture Safety Expert

A separate impartial Moisture Safety Expert has been named for the project. The requirement for impartiality is realized if the Moisture Safety Expert has no other planning responsibility for the project. The responsibility of the Moisture Safety Expert at the design phase is to, at least, to:

- ensure and approve the report of moisture management risks
- verify the feasibility of the project's timetable
- take into account the specific requirements of risk structures in the implementation plans
- ensure that the plans contain a sufficient number of detail photos to ensure the correct implementation of risk structures

Qualification requirements of the Moisture Safety Expert

Qualification requirements of the Moisture Safety Expert according to moisture risk classification (RIL 250: 2018). The requirements presented in the guidelines of drychain10 for planning and construction phases are as follows:

- qualification requirements for the building physics engineer (according to the project's moisture risk category)
- qualification requirements of the corresponding work supervisor
- the qualification for the construction supervisor granted by FISE (RAV), or senior supervisor (RAVS) or equivalent qualification

Buildings with normal moisture risk category (no construction is in risk category R2 or R3) the first requirement may also be met by a structural engineer with adequately qualification.

The feasibility of the project's timetable

To assess the feasibility of the project's timetable, it has to contain the most important steps for successful completion and also the initial drying times for critical structures. The project's timetable presents at least the following steps:

- completion of the rooftop and prevention of the wetting of constructions
- reaching the point of drying conditions (TE> +15°C / RH <50%)
- completion of structures critical of drying time
- drying time of structures critical of drying time
- initiation of flooring

Structures with long drying periods (over 15 weeks) are considered as critical structures, the adequate drying with respect to the project's timetable is uncertain or if good drying conditions are not achieved (drying does not reach completion if temperature is below 15°C or humidity over 50%).

Moisture risk assessment of constructions

The moisture risk assessment of constructions is implemented and the moisture risk categories (R1 Normal, R2 High or R3 Very High) of building elements and spaces are defined according to RIL 250:2018 publication (Appendix 3) OR another equally comprehensive procedure accepted separately.

Impartial building physics audit

The impartial building physics audit of the designs made by an independent expert outside the design team must include all the structures in the moisture risk categories R2 and R3, but the audit is recommended for all building elements.

Qualification requirements of the expert conducting special moisture risk inspection

The expert who conducts special moisture risk inspection of the high moisture risk (R2) structures must at least have the qualification of requirement category (V) for building physics engineers.

Buildings with very high moisture risk (R3) elements, the expert must have the qualification equivalent to the V+ requirement category.

For basic renovations, adequate qualification is the V requirement category. Other similar qualifications must be approved separately.

The moisture risk assessment can also be conducted by the Moisture Safety Expert of the project. In moisture damaged, full or partial renovation projects, the Moisture Safety Expert must be a building health expert.

The qualification of the building physics expert must be demonstrated by e.g. a certificate of competence or other similar means.

Drychain10

Acquiring the Drychain10 status, is considered as a procedure fulfilling the main criteria (75%).

Background information

- Kuivaketju10.fi (drychain10 operating model website)
- Kosteudenhallinta.fi (Moisture safety website)
- Rakenteiden lämpö- ja kosteustekninen suunnittelu; Lehtinen, Viljanen; Teknillinen korkeakoulu talonrakennustekniikan laboratorion julkaisuja 119, 2001
- RIL 250-2018 Kosteudenhallinta ja homevaurion estäminen,
- Rakennuksen kosteus- ja sisäilmatekninen kuntotutkimus, Environment Guide 28, Ministry of Environment 2016

P2.2 Moisture safe construction

Moisture damage and indoor air problems during usage can be prevented by moisture safe construction site and high-quality construction.

Moisture safety has been conducted according to best practices and during construction site phase the following tasks have been verified:

High-quality moisture safety of the construction site 75% of the weighted value

1: A qualified and impartial Moisture Safety Expert, who has a sufficient task content for a successful complementation of the inspections, has been named.

Designer: The requirement is presented in the contract documents

Developer: Designation of a Moisture Safety Expert in contract documents

User:

2: The drying times calculations have been updated for critical structures and calculated drying times at the target position (> 20°C, <50%) as well as in a risk situation (15°C and / or 60%). Moisture-critical times have been marked on the site schedule and the adequacy of drying times is ensured.

Designer: The requirement is presented in the contract documents

Developer: Presentation of drying times in the construction site timetable, ensuring the adequacy of drying times and the tasks required

User:

3: All building materials and products intended for indoor use, are stored on site on dry conditions protected from moisture.

Designer: The requirement is presented in the contract documents

Developer: storage plan and inspections during construction site

User:

4: Before the surface coating, a moisture control plan has been carried out for the site and reliable humidity metering of the structures has been carried out in spaces by a qualified moisture control expert.

Designer: The requirement is presented in the contract documents

Developer: Moisture control plan AND measurement reports before surface coating

User:

5: Drying conditions and moisture prevention are observed and all detected flaws are handled separately at every site meeting.

Designer: The requirement is presented in the contract documents

Developer: Reports of site meetings or annexes of moisture safety control report.

User:

6: Drying conditions are monitored and reported at least with weekly temperature and humidity metering in a sufficient number of premises and / or structures during the construction site phase.

Designer: The requirement of conditions in different phases during construction is presented in the contract documents

Developer: A follow-up plan of drying conditions and the results are presented on a weekly basis during the construction site phase.

User:

Follow-up of drying of the moisture risk structures, 25% of the weighted value

7: The drying of the critical structures shall be observed with means of, at least two humidity metering or continuous metering during drying time, in which case the implementation of drying timetable can be observed and corrective measures be taken.

Designer: The requirement is presented in the contract documents

Developer: Moisture metering reports by drying phase

User:

Additional information

Moisture Safety Expert

An impartial Moisture Safety Expert, who is not dependent of the main constructor or the construction site organisation, has been named for the construction site phase.

Qualification requirements of the Moisture Safety Expert according to moisture risk classification (RIL 250: 2018): Normal, High, Very high. The requirements presented in the guidelines of drychain10 for planning and construction phases are as follows:

- equivalent qualification requirements for the building physics engineer
- qualification requirements of the corresponding work supervisor
- the qualification for the construction supervisor granted by FISE (RAV), or senior supervisor (RAVS) or equivalent qualification

Moisture safety plan

Defines, for example, metering points and methods and the metering equipment. Monitoring methods, responsibilities and schedules for moisture safety are described in the plan.

Storage of building materials and products

Materials and products must be stored in dry conditions on site. Materials and products intended for indoor use, are to be stored either in a sufficiently large indoor space or in outdoors in a separate storage shelter. Usage of only tarpaulin outdoors as only means of protection is not accepted. Wetted materials must not be installed in the building.

Tasks of an impartial Moisture Safety Expert at the construction phase

The tasks of an impartial Moisture Safety Expert should be sufficiently wide to ensure the success of control. Inspection tasks must include and document at least the following:

- reviewing and approval of the moisture safety plan of site
- reviewing the drying time estimates of the structures
- monitoring the quality, design and work methods of moisture safety construction
- monitoring the schedule of drying conditions of constructions
- participation in start-up meetings of operations with high risk of moisture
- monitoring of moisture metering and reports
- monitoring of site storage
- attendance in inspections of moisture risk structures, 25% of the weighted value
- inspections of correct implementation of moisture risk structures, 25% of the weighted value
- documentation and photographing during construction site phase

The Moisture Safety Expert documents the situation for each site meeting as a separate issue. Documentation is started at a reasonable time for the progress of work and continues until the end of the site.

Calculations of drying time

Publication "*Betonirakenteiden kosteusmittaus ja kuivumisen arviointi*" by Suomen Betonitieto Oy is used as a guideline for calculations of drying time. Drying times can be calculated with the use of

- BY1021 drying time calculator by 'Betoniyhdistys'
- equivalent, reliable calculation method or
- moisture safety simulation of constructions

Follow-up plan of drying conditions

The drying conditions should be monitored at least weekly and compared to the drying condition of the drying time calculations. Reporting should state the situation in relation to the target condition and possible corrective measures if the target conditions are not met.

Moisture management

The requirement of moisture management is that the follow-up report of moisture management is handled at each site meeting. The follow-up report contains at least the following

- Inspections of drying of the structures (metering)
- Results of monitoring the drying conditions and deviations from targets
- Drying times related risks in the implementation of construction site timetable
- The observed moisture-technical problems (failure of protection, deformation of the structures, deformation deviations) and corrective measures

Drying time critical structures

Drying time critical structures are building components with a long drying period (over 15 weeks), if a sufficient dryness of the structure within the project schedule is uncertain or if good drying conditions cannot be achieved (drying time is not sufficient if the indoor temperature is below 15°C or humidity is above 50%).

Reliable moisture measuring

Surface moisture meter is not a reliable moisture measuring tool. The following methods by a qualified expert are accepted:

- sample method
- drill hole method duplicated to eliminate the measurement error
- a structure fixed measurement method with a demonstrated reliability

Qualification requirements of the moisture measurer

Qualification requirements of the moisture measurer are national certifications e.g.

- moisture measurer degree (PKM) or
- certificate of moisture measurer for structures

Drychain10

Acquiring the Drychain10 status, is considered as an alternate procedure to fulfil the main criteria (75%).

Background information

- Kuivaketju10.fi (drychain10 operating model website)
- Kosteudenhallinta.fi (Moisture safety website)
- RT14-10984 Measurement of relative humidity of concrete

P3.1 Sustainable construction

The requirements of the construction site are aimed at implementing an energy efficient construction site with minimal disturbances and controlled environmental impacts and risks.

A good environmental control, 50% of the weighted value:

1: Implementation of best practices of an energy efficient construction site.

Designer: Recording of requirements into contract documents.

Developer: Inspection list for best practices during the construction site phase.

User:

2: Construction site security, management and notifications of disturbances realized according to best practice.

Designer: Recording of requirements into contract documents.

Developer: Bulletins sent by the site and address book, inspection list of the construction site.

User:

3: Clearly marked waste containers on the site; sorting of construction and demolition waste in at least 7 waste categories in addition to soil and unsorted construction waste.

Designer: Recording of requirements into contract documents.

Developer: Waste management plan and waste report of the construction site.

User:

4: The site reports monthly energy consumption (heat, electricity, fuels for heating), water consumption and waste quantities by category.

Designer: Recording of requirements into contract documents.

Developer: The final situation and the cumulative report on the monthly reports of the site.

User:

5: The vicinity of the site has been cleaned and damages to the adjacent area caused by the site has been fixed before the commissioning.

Designer: Recording of requirements into contract documents.

Developer: Inspection list of cleaning the vicinity and fixing the damages caused by the site in the commissioning phase.

User:

Managing the environmental impact of the site, 100% of the weighted value:

6: The environmental risks posed by the site have been taken into account by implementing the best practices in environmental risk prevention and the proper storage of hazardous substances.

Designer: Recording of requirements into contract documents.

Developer: Environmental plan of the construction site or equivalent, which presents the methods of environmental managementUser:

7: Stormwater pumped from the site must be at least sand filtered before being removed from the site.

Designer: Recording of requirements into contract documents.

Developer: Area plan presenting the treatment of stormwater.

User:

Additional information

Partial repairs

In addition to the basic requirements:

- Additionally, to requirement 2: Equivalent notification of disturbances distributed to the building users. In addition, discussions with users have taken place and special requirements of working hours of different users have been accounted for. Possible noise limitations, however, must not significantly impede the implementation of the site (noise limitations up to 1–2 h/day).

Energy efficiency of construction site

Best practices of construction site security, management and notifications of disturbances have been carried out in accordance with the Inspection list P3.1.

- Energy-efficient and controlled workplace lighting
- Directed outdoor lighting
- Energy-efficient and controlled indoor lighting
- Openings and windows sealed during heating period
- No central heating
- Gas is not used for heating

- Heating of the concrete formwork is carried out by insulated formworks or by heating wires in the mould.

Disturbances of the construction site

Best practices for pay attention to the neighbourhood have been carried out in accordance with the Inspection list P3.1:

- Informing the neighbours before the start of the construction site
- Complaints collect and actions recorded
- Restricting noisy work as needed
- Use of radio forbidden on outdoor areas
- Collecting of dust from quarrying and drilling
- Placement of crushing mills
- Coating of work site tracks to prevent dust formation
- Outgoing dusty loads are irrigated / covered
- Cleanliness of nearby public roads
- Fine material storage protected

Environmental hazards of the site

Best practices for management of environmental risks have been carried out in accordance with the Inspection list P3.1:

- Double skin tanks
- The ground of the fuelling depot of the site is sheeted and coated
- Storage of hazardous waste on a tight-based ground

Sorting of construction waste

The sorting of construction waste on site is to be implemented according to the government degree, or in case sorting is not required, the reasons are to be presented.

Section 16 of government degree 19.4.2012 / 179 on Waste collection and utilization of construction and demolition waste requires that a separate waste collection must be arranged for at least the following types of waste:

1) concrete, bricks, mineral tiles and ceramics,
2) gypsum,
3) non-impregnated wood,
4) metal,
5) glass,
6) plastic,
7) paper and cardboard,
8) soil and aggregate.

The aim is that, in 2020 with activities referred to in subsections 1 and 2, the utilization of construction or demolition waste, except for hazardous waste, soil material and aggregates removed from rock or soil is at least 70% by weight.

Standards and guidelines

"Ympäristönsuojelumääräysten noudattaminen rakennustyömailla Helsingin kaupungin alueella, Summanen", Publications of the City of Helsinki, 4/2013.

Government decree on waste 19.4.2012/179

P3.2 Site dust management

Minimizing the amount of dust, remaining after construction, in the systems and spaces by implementing a good dust management in the site. Implementing the best practices for cleanliness in construction and ventilation work in accordance with the cleanliness class P1.

Cleanliness management in accordance with the cleanliness class P1, 75% of the weighted value.

1: In basic repairs, the construction site is separated from the spaces under use with dense panel walls; the cleaning process is designed for spaces under shared use and the rest of the structures (lifts, etc.) are protected by plates from bumps caused by transportations.

Designer: Requirements in contract documents

Developer: Inspection list in the starting phase of the site.

User:

2: A separate P1 dust management plan is prepared for the site, which shows the implementation of the required measures and areas for cleanliness management.

Designer: Class P1 requirements recorded on contract documents.

Developer: P1 cleanliness management plan of the construction site.

User:

3: The cleanliness management is monitored regularly during the interior construction phase of the site.

Designer: Monitoring of cleanliness of the site is described in contract documents.

Developer: Date of site inspections and example of a commissioning report.

User:

4: Ventilation work is carried out in a P1 cleanliness classified space.

Designer: Requirements of cleanliness class P1 in contract documents

Developer: Cleanliness management plan for ventilation works

User:

5: Dust accumulation in P1 cleanliness class space and before the start of operational tests corresponds to P1 cleanliness class requirements. The dust accumulation of horizontal surfaces, floors, ventilation ducts and above the suspended ceiling is visually inspected before the operational tests.

Designer: Requirements of monitoring and documenting are recorded on contract documents.

Developer: Commissioning report of dust accumulations before the operational tests.

User:

6: Dust accumulations correspond to allowable dust concentrations of cleanliness class P1 prior to the commissioning of the building. Dust accumulations have been visually inspected.

Designer: Requirements of monitoring and documenting are recorded on contract documents.

Developer: Measuring reports of dust accumulations before the operational tests and commissioning of the building.

User:

Cleanliness verified with measuring the dust accumulation, 25% of the weighted value

7: Dust accumulations are measured with accepted method before operational tests and commissioning.

Designer: Dust accumulation measurements recorded on contract documents.

Developer: Measuring reports of dust accumulations before the operational tests and commissioning of the building.

User:

Additional information

Allowable dust accumulations

The allowable dust accumulations of cleanliness class P1 are used as the allowable dust accumulations. Allowable dust accumulation on above the ceiling and on the level surfaces before the ventilation operational tests is 5.0%. Allowable dust accumulation before the commissioning of the building is 1.0% on the level surfaces and 3.0% on the floor surfaces. The allowable dust accumulation of ventilation ducts before the operational tests is less than 0.7 g/m².

Accepted measuring methods

Accepted measuring methods are the following:

- Filter with vacuum (Pasanen et. al. 1999) Section 6.
- Gelatine tape, INSTA 800, Appendix D.1"

Standards

- Classification of Indoor Environment 2008
- RT 07-10805 Criteria for implementing a healthy house
- RT 91-10970 Consideration of cleanliness management in building design
- Ratu 1225-s

3. Economy

T1.1 Life cycle costs

Consideration of life cycle and maintenance costs in the project promotes the usage cost and maintenance of the building during the design process.

The lifecycle costs have been calculated for the building project, 50% of the weighted value:

1: The calculation of the life cycle cost objectives has been carried out with acceptable accuracy no later than the end of the general design phase.

Designer: Life cycle cost report and PTS (maintenance plan)

Developer:

User:

2: The building project has a preliminary PTS, which shows the repair and renewal needs arising from the planning solutions for 50 years. In the case of renovation, PTS also includes repairing and renewal needs of remaining old building components and systems.

Designer: Life cycle cost report and PTS (maintenance plan)

Developer: PTS print of the service manual

User:

3: The magnitude and changes in maintenance costs have been estimated with comparison analysis.

Designer: Comparison report of the maintenance costs

Developer: Comparison report of the maintenance costs

User: Comparison report of the maintenance costs

4: The design team has had a separate meeting where the calculation of life cycle costs and the possibilities to reduce maintenance costs have been dealt with.

Designer: A memo of the life cycle cost meeting

Developer:

User:

Estimation of maintenance costs based on performance, 25% of the weighted value

5: The calculation of the maintenance costs in the implementation planning phase is based on critical parts for the performance-based calculation. The results of the calculations have been compared to the actual maintenance costs and the reasons for the differences have been analysed.

Designer: The results of separate input-based calculations

Developer:

User: A memo of the life cycle cost meeting

Comparison of the life cycle costs 25% of the weighted value

6: Comparisons between at least four options affecting to maintenance costs (BSE Building Service Engineering, structures, surface materials) have been made for life cycle costs, which have led to the selection of the most cost-effective option.

Designer: Comparison calculations of the life cycle costs

Developer:

User:

Additional information

Allowable accuracy

The allowable accuracy of life-cycle cost calculations is considered to comply with the calculation guideline of "Life cycle indicators of Buildings" published by GBC Finland with the following specifications:

- In addition to the construction costs, the investments include rental or purchase costs
- Maintenance costs are divided into cost items of maintenance, including all costs except rental costs (such as cleaning of leased premises).
- Maintenance and repair cost estimates for main structures and units have been made for a 50-year period.

Life cycle cost meeting

The purpose of the separate life cycle cost meeting is to go through the costs and to think about the possibilities of influencing the costs and critical subjects. The aim of the meeting should include at least the following topics: Maintenance costs by title, Maintenance phases according to PTS-maintenance plan and the Costs by title.

Participants of the Life cycle cost meeting

At least the following project partners must take part in the Life cycle cost meeting: Owner, Developer, Lead designer, Architect, Structural engineer, HVAC engineer, Electrical engineer and Maintenance representative. The Maintenance representative may be either a person responsible for the upcoming maintenance of the project or a separate designated maintenance expert.

Comparison analysis of the maintenance costs

Comparison of the maintenance costs should present the specific features of the maintenance items at the main level, affecting the cost incrementally or decreasingly.

The benchmarks should, depending on the situation, show comparisons to the following levels:

- Normal or average maintenance costs of the corresponding construction type.
- The realised maintenance costs in the basic renovation projects before the renovation, if the use of the building does not change so significantly that the actual comparison is not reasonable.

- During the commissioning phase, a comparison of estimated maintenance costs in accordance with maintenance agreements. Differences between the estimated and realised and are highlighted.
- Comparison of previous results over the operating phase with the actual maintenance costs of the previous year.

As an acceptable benchmark may be used the maintenance cost of a previous corresponding project, the average maintenance cost for the corresponding projects or public maintenance cost source such as the KTI maintenance cost index, municipal statistics, or residential property comparative data by Statistics Finland.

Performance-based calculation

As a basis for performance- and quantity-based calculations of maintenance costs, bid information or calculations based on building design solutions, can be used. Critical parts include at least 3. Outdoor area management, 4. Cleaning, 5. Heating, 7. Electricity and gas, and 11. Property tax.

Comparison of life cycle costs

Comparison of life cycle costs should take into account the differences between service costs, maintenance costs and energy costs of the different options. The life cycle cost calculation should be made to the shortest period of the following: the target lifetime of a building or the expected lifespan of the compared system.

Standard

GBC Finland, Life cycle indicators for buildings, calculation instructions for life cycle costs http://figbc.fi/elinkaarimittarit/laskentaohjeet/elinkaarikustannusten-laskenta/

T2.1 Durability

The durability of the building's shared spaces against normal personal and logistic use is ensured by design solutions.

Design solutions for durability,100% of the weighted value:

1: Building's exterior walls and annexe in risk areas are protected from potential damage caused by vehicle traffic. For basic renovation projects, similar measures are also made for existing structures.

Designer: An area layout showing the risk routes of vehicle traffic and the corresponding plans for protective measures.

Developer: Inspection list for implementation of planned protective measures.

User:

2: The risks for snow-clearing have been identified and adequate protection has been implemented.

Designer: An area layout showing the risks for snow-clearing and the corresponding protective measures.

Developer: Inspection list for implementation of planned protective measures.

User:

3: Logistic routes have been identified and solutions to improve durability are presented. In addition, basic repairs are also made for existing structures.

Designer: A layout or a report showing the logistic routes and the corresponding protective measures.

Developer: Inspection list for implementation of planned protective measures.

User:

4: Durable flooring and wall surfaces are chosen on the main pedestrian walkways. In addition to basic renovations, the corresponding measures are also made for existing structures.

Designer: A layout or a report where the protective measures for pedestrian walkways are highlighted.

Developer: Inspection list for implementation of planned protective measures.

User:

Additional information

Risk areas of vehicle traffic

The risk areas of vehicle traffic are points where daily vehicle traffic or goods transport takes place less than 2 m from the building or structure (roofs etc.). This requirement does not apply to service areas.

Risks for snow-clearing

In the case of snow-clearing, solutions for durability are among the following:

- the routes along the wall of the building or structure
- areas of bicycle racks
- the pillars of shelters
- protections for gateways

Vehicle traffic protection

Accepted durability solutions for vehicle traffic areas, are for example:

- Exterior wall durability to at least 2 m above ground (e.g. brick or concrete wall)
- The durability of the structures is assured at a height of at least 1.5 m on a concrete slab.
- The rainwater gutters in the traffic areas are reinforced up to 1.5 m above ground.
- Lightweight structures are protected
- Structures are protected by a guardrail or similar method

Goods transport routes

When designing the transport routes for goods, one should take into account, at least:

- Main routes for goods transport (including office supplies and the like)
- Routes leading from the loading platform
- Good transport of kitchen spaces
- Transport of waste bins

- Transport routes for waste bins in the premises. If the main door is designed as the transport route, the same requirements apply to it.

Protections for goods transport routes

As regards the durability of goods transport routes, the following measures must be taken:

- The wall structures of active storerooms (including garbage rooms) are protected against impacts to over meter-height or the wall structure is wear-resistant.
- access doors are equipped with hold-open devices to protect the doors from bumps caused by traffic.
- On goods transport routes, all outer corners are reinforced.
- Floor surfaces have been selected to withstand planned traffic
- Guardrails of lifts prevent the walls being damaged
- Walls of goods transport routes have impact protection.

Main walkways for pedestrians

Main walkways for pedestrians are at least entrances, lobbies, lift lobbies, stairwells, shopping corridors and dining halls.

Durability of floors

The durability of floors can be demonstrated by, for example, the following classifications:

- Flooring material durability rating 33 or 34
- The selected floor material is durable (concrete floor)

T2.2 Maintainability

Ensuring the proper maintenance of the building, service routes and avoiding problematic solutions for maintenance.

Best practices for maintenance, 50% of the weighted value:

1: The transport routes within the site are designed to verify the renewal of all building service units. A separate plan is presented on the transport routes within the site.

Designer: A plan and layouts showing the BSE transport routes and implementation method of transport routes.

Developer: Inspection list for implementation according to plans.

User:

2: The risks of regular maintenance have been identified and maintenance considerations have been described in the plans. In the basic renovation projects, a report of maintainability problems in existing systems concerning remaining constructions was carried out in collaboration with the maintenance at the latest in the general design phase.

Designer: Report of the risk locations of maintenance and consideration of maintainability in design solutions.

Developer: Inspection list for implementation according to plans.

User:

3: The building has been designed with best practice service routes.

Designer: Roof layout and/or plan view showing maintenance routes for the roof and attic.

Developer: Inspection list for implementation according to plans.

User:

4: The project is designed for snow dumping sites that are far enough away from the building. The design of the main paths, roofs and gates allows for mechanical snow ploughing.

Designer: An area layout featuring snow dumping sites and widths of snow ploughing routes.

Developer: Inspection list for implementation according to plans.

User:

Consideration of maintenance needs, 50% of the weighted value:

5: A maintenance plan for the constructions of building envelope has been carried out in the implementation planning phase, which shows the maintenance needs, repairs and replacements of parts required over the next 50 years.

Designer: Maintenance plan for technical building components.

Developer: Reviewed the contents of the service manual's maintenance plan taking into account the building and BSE components.

User:

6: The repair needs of the constructions of the building envelope have been dealt with and easy maintenance and repairability are presented with solutions. The general design phase of the renovation will introduce measures to correct the functioning of the remaining systems to the required level.

Designer: A report of reviewing the maintenance needs.

Developer: Checked PTS (maintenance plan) of the service manual including maintenance required by the building envelope.

User:

7: In the basic renovation projects, a report of maintainability problems in existing systems concerning remaining constructions was carried out in collaboration with the maintenance at the latest in the general design phase.

Designer: Report of the risk locations of maintenance and a report of how to improve maintainability.

Developer: Inspection list for implementation according to plans.

User:

Additional information

Risk locations of maintenance

The following risk locations of continuous maintenance should be considered and serviceability solutions must be presented in accordance with the T2.2 Inspection list:

- Cleanability of glass surfaces
- Lighting maintenance

Best practices of access routes

The best practices for access routes are carried out according to the Inspection list T2.2:

- Access bridges and routes
- Access to technical and AHU facilities

Ease of maintenance

In the case of cleanliness, at least the requirements set out in T2.2 Inspection list for furniture and cleaning facilities have been taken into account

- Widths of passageways
- lighting timeline
- Floor-specific cleaning facility
- Space-specific requirements
- Furnishing requirements

Standards

- RT 85-11132, Vesikaton turvavarusteet. 2013
- RIL 198-2001 Valoa läpäisevät rakenteet
- RT 91-10970 Puhtauden hallinnan huomioonottaminen rakennussuunnittelussa

T2.3 Adaptability

Consideration of the building's modularity according to the 'SUKE' procedure.

Implementation of open construction, 50% of the weighted value:

1: The design team has divided plans into the flexible and fixed spaces according to the principle of open construction.

Designer: Flexible planning of spaces and dimensioning needs.

Developer:

User:

2: The dimensioning requirements of the flexible space has been taken into account in the design of the main systems and paths of the fixed space. The dimensioning is presented for HVAC, electrical and automation systems as well as for structural loads at the main system level in plans of fixed space.

Designer: The flexible space and the dimensioning requirements.

Developer: Inspection list for dimensioning of the construction and BSE systems.

User:

3: In the case of a fixed space, the plans are presented separately, without the structures and systems of the flexible space.

Designer: Architectural, HVAC and electricity plans for fixed space

Developer:

User:

Alternative uses have been defined, 50% of the weighted value

4: The project has been presented with at least one alternative use and the corresponding technical requirements and their consideration in the plans.

Designer: Description of alternative use and technical requirements in a flexible space.

Developer: Inspection of implementation of construction, structural and BSE solutions for alternative use.

User:

Additional information

Fixed space

The fixed space is a permanent part of the building designed to provide weather-protected space. It can be divided into individual apartments. The fixed space includes all common building parts such as exterior walls, entrances, stairwells, lifts and solid body parts of electrical, water, gas and other systems to the boundary of each individual space area.

Flexible space

Flexible spaces take care of space areas by providing HVAC & electric systems, dividing partitions, doors, appliances, kitchen and sanitary fixtures, interior surfaces, etc.

Alternative use

Presented at least one intended use for the future for which the technical characteristics have been met for at least the following factors:

- Carrying capacity of structures and intermediate floors
- Additional requirements and routes for technical systems
- Design values for ventilation and cooling and the effect on space requirements
- Changed power requirements of the electrical system
- Impacts on security systems and fire compartmentation
- Impact on dimensions and amounts of vertical connections

Standard

- Tavoitteiden asettaminen rakennuksen muunto- ja käyttöjoustavuudelle, Saari, 2010

4. Energy and environment

Y1.1 Life cycle carbon footprint

The carbon footprint of the building provides a tool for measuring the savings of carbon footprint during a building's life cycle relative to conventional construction.

Calculation of the carbon footprint of the construction phase, 25% of the weighted value

1: The calculation of the carbon footprint of building materials according to the GBC Finland Building Life Cycle Meters Guide has been made. The carbon footprint of the construction phase has been reported on the GBC Finland Building passport and passport's background document or similar documents.

Designer: Building passport of the project phase.

Developer:

User:

2: The results of the carbon footprint of building materials have been compared to the carbon footprint of similar targets in construction, and the reasons behind the differences have been analysed.

Designer: Report of calculation results and comparison to typical values.

Developer:

User:

Saving of the carbon footprint of life cycle, 75% of the weighted value

3: Saving of the carbon footprint of life cycle relative to the reference solution according to the table below. The savings are calculated using a separate life cycle carbon footprint counter.

Designer: CO_2 calculation based on design stage and energy certificate.

Developer: Updated CO_2 calculation.

User:

Rating	Savings relative to reference level
0%	No savings
15%	6% or more
30%	12% or more
45%	18% or more
60%	24% or more
75%	30% or more

4: Reasons of the construction site, corrections and specific emissions of energy deviating from reference values, have been presented in the calculation of the carbon footprint.

Designer: Reports of repair needs emissions and specific emissions of energy.

Developer: Construction site emission reports.

User:

Additional information

Reporting the carbon footprint of the construction phase

Acceptable calculation of the carbon footprint of the construction phase has taken into account all parts of the area, house, space and BSE according to GBC Finland's "Lifecycle Footprint" calculation.

In order to clarify the results of the construction phase calculations and to support the assessment of the accuracy of the results, the results should be reported at least by according to Construction 2000 classification (site elements, building elements, internal space elements and services elements).

Carbon Footprint Calculator

The Carbon Footprint Calculator is a separate calculation model which baseline data consists of energy consumption from manufacturing of building materials, construction site emissions and energy consumption data obtained from energy certificates. The calculator compares the carbon footprint of the construction and operation phases to a reference level.

Please find the calculator at RTS-website cer.rts.fi.

Life cycle phases

As the phases of the life cycle, the calculation results and a comparison of the calculation results must provide sufficient accuracy to verify the quality of the calculation, which must include at least the following breakdown:

- Product phase A1-A3 divided into building elements, internal space elements and services elements (according to main categories of Construction 2000)
- Construction phase A4-A5 divided into transport and construction site
- Usage and management phase B1-B2
- Maintenance phase B3-B4
- Consumptions B6-B7 divided into heat consumption and production, electricity consumption of facility, lighting and user and water consumption
- Demolition phase C1-C4

Reference solution

A project with the following principles is used as a reference solution:

- A1-A3 Based on the calculation of the specific carbon footprint
- A4-A5 with the default value by GBC
- B1-B2 with the default value by GBC
- B3-B4 20%of the carbon footprint of the construction phase
- B6-B7 Energy consumption (excluding user appliance) based on the calculation of energy efficiency according to the average C/B level of the building regulations.

Facility electricity usage complies with the reference values of D3 and the heat corresponds to the remaining energy efficiency.

- B6 In the comparison, the average value or local district heat and average characteristic emission value of electricity of Finland are used as the specific emissions of energy for heating.
- C1-C4 with the default value by GBC.

Specific emissions of energy

The profiles of Finland's average electricity (Statistics Finland) and local district heat are used as the specific emissions of energy. If district heating is not possible, the average emission of district heating in Finland is used as the specific emissions of energy as reference.

In the case of cogeneration, the specific emissions of energy, used in the calculation of the carbon footprint of a life cycle are based on the electricity and heat emissions calculated using the allocation method of benefits.

As the specific emissions of energy should primarily be used the emissions of the entire fuel chain, which also takes into account emissions from energy production, fuel production and fuel transportation. If the only available value is the specific emissions of energy reported by a power plant, the value is to be increased by 20% for the fuel production and transport emissions.

As a source of emissions, the 5-year rolling average value of the specific CO_2 emissions of electricity or district heating as presented in an annual energy statistics table published by Statistics Finland (Table 12.3.2 "CO_2 emissions of energy and heat production (allocation method of benefits)". Since the statistics show only emissions from energy production, 20% of fuel production emissions should be added to the values, as instructed above. In 2016, the specific emissions of CO_2 according to Statistics Finland were as follows:

- Electricity production 164 x 1.2 = 197 g/kWh
- District heating 172 x 1.2 = 206 g/kWh

Consideration of basic renovations

For the building elements to be preserved in basic renovations, the carbon footprint can be calculated as zero. By main titles in the carbon footprint calculator of the life cycle, the proportion of the new building elements can be used as a factor by which the project's specific carbon footprint is derived from the reference level. The value is calculated as follows:

- Area structures according to the retained part of hard surface structures (% of the contract area). If outside areas are not part of the contract area, reference values are used in both
- The proportion of ground, top and intermediate floors and building envelope (% of the final surface area) structures to be renewed, taking account only the contract area
- Interior structures according to the area of the partition walls, suspended ceilings and floor surfaces (% of the final surface area)
- Building services according to the number of systems to be maintained (heat production, heat transfer, heat transfer, AHUs, ventilation ducts, cold units,

cooling piping, space cooling units, water pipes, sewers, water fittings). As a percentage of the preserved systems in relation to the all systems.

Background material

- Life cycle indicators of buildings - The carbon footprint of life cycle, GBC Finland

Y1.2 Material resource efficiency

Promote material efficiency when selecting material in the project and environmental awareness of production of building materials. A separate material efficiency calculator is used for gathering the results of material efficiency.

Material efficiency, 75% of the weighted value

1: A procurement plan of materials has been made to meet the requirements of material efficiency and the requirements are recorded in the contract documents.

Designer: Material procurement plan and the material efficiency requirements recorded in the contract documents.

Developer:

User:

2: Rating according to the table below, based on how many construction titles have met the material efficiency requirements. The fulfilment of the requirements is demonstrated by means of a material efficiency calculator.

Designer: The target calculation of the design phase based on the material procurement instructions.

Developer: Calculation of material efficiency coefficient based on implementation and calculation reports.

User:

Rating	The material efficiency requirements are met
25%	1 construction title
50%	3 construction titles
75%	6 construction titles

Use of environmentally aware products, 25%

3: The building project uses construction products that have available environmental information from at least 10 different construction products manufacturers or titles.

Designer: Material procurement instructions and requirements for contractors.

Developer: Contractor's summary of material procurement and list of products used in the project.

User:

Additional information

Material procurement plan

The material procurement plan describes the developer's intentions and requirements for the use of alternative raw materials in the design phase of the project. The procurement guide describes the requirements for the construction products as required by the calculation result of the design phase.

The procurement plan may also be part of other contractual documentation.

Material efficiency requirements

Construction products that meet one of the following requirements or a combination of requirements, are considered as material-efficient.

- 10% of recycled construction products that have been extracted from a demolition site
- 25% recycled material (EPD secondary material)
- 50% industrial side products or waste material
- 50% renewable material
- 80% of the construction product has been retained in the renovation

Construction titles to be considered in the review:

The review of material efficiency is limited to the most important Construction 2000 titles as follows:

- 111 Ground elements: soil used on site and imported
- 113 Paved areas: limited to hard paving
- 112& 121 Soil stabilisation and reinforcement elements and foundations
- 122 Ground floors
- 123 Structural frame
- 124 Façades
- 126 Roofs
- 1311-1312 Partitions & glass partitions
- 1321-1322 Floor surface elements & floorings
- 1323-1324 Ceiling surface elements & finishings

Material efficiency calculator

A separate material efficiency calculator is used to search possibilities and evaluate the fulfilment of material efficiency requirements. The verified characteristics of procurements are inputted into the calculator. The calculator is in Finnish.

The calculator can be found at http://cer.rts.fi/

Environmentally aware products

Construction products are considered as green products if they fulfil one of the following requirements of a responsible procurement:

- The product is verified by a third-party environmental declaration (EPD)
- The product is certified by a third-party environmental classification, which includes the manufacture of the product and the production of the main raw material OR the manufacturers of the main raw materials also have a certified environmental classification (ISO14001/EMAS)

Documentation of material efficiency

As evidence of achieving material efficiency is to present the mass or volume distribution of the material to different construction products. Surface area may also be used for interior surfaces (suspended ceilings and floors) and coatings.

Evidence of the material efficiency of a construction product is required by a written document by manufacturer demonstrating the calculated material efficiency of the product.

The number of construction products

Construction product titles must be specified according to the three-digit code of Construction 2000 classification. Products of different manufacturers under same title (e.g. 626 Building boards/wood-based boards) are approved. Environmental information of the manufacturer for the same title is only taken into account once. As an example, plasterboard products from one manufacturer are only considered once.

Background material

- EN 15804
- ISO 14001
- EMAS
- PEFC
- FSC

Y2.1 Energy efficiency

Evaluation of the energy performance of the building based on the energy certificate. The rating according to the new regulations is based on a linear correlation between the minimum level and 70% of the A-energy class. For basic renovations, the start of the correlation is the energy grade C.

Energy efficiency of a building based on the E-value 0–100% of the weighted value

Energy efficiency of a building based on the E-value with the following scale:

1: The calculation of energy efficiency has been carried out by a qualified expert

Designer: A high level qualification certificate of energy efficiency calculations with the exception of residential buildings.

Developer: A high level qualification certificate of energy efficiency calculations with the exception of residential buildings

User:

2: For new buildings, the energy efficiency calculated according to E-value (2018) of the building is the same or lower than presented in the comparison table below

Designer: Energy certificate attached to the building permit.

Developer: Final energy certificate updated at the commissioning phase.

User:

		Row house	Multi-storey building	Office	Commer-cial building	Accom-mo-dation	Educa-tion	Gym-nasium	Hospital
0%	Code level	105	90	100	135	160	100	100	320
10%		100	86	96	128	150	96	96	303
20%	2 stars minimum	95	83	91	121	141	93	93	286
30%	3 stars minimum	90	79	87	113	131	89	89	269
40%	4 stars minimum	85	75	82	106	121	85	85	252
50%		81	71	78	99	112	82	82	235
60%		76	68	74	92	102	78	78	218
70%	A+	71	64	69	85	92	74	74	201
80%		66	60	65	77	82	70	70	184
90%		61	56	60	70	73	67	67	167
100%	A++	56	53	56	63	63	63	63	150

3: For basic renovations, the energy efficiency calculated according to E-value (2018) of the building is the same or lower than presented in the comparison table below

Designer: Energy certificate attached to the building permit.

Developer: Final energy certificate updated at the commissioning phase.

User:

		Row house	Multi-storey building	Office	Commercial building	Accom-mo-dation	Educa-tion	Gym-nasium	Hospital
0%	Energy grade C	150	130	170	240	240	170	170	450
10%		141	122	159	222	222	159	159	420
20%	2 stars minimum	131	115	147	205	205	149	149	390
30%	3 stars minimum	122	107	136	187	187	138	138	360
40%	4 stars minimum	112	99	124	169	169	127	127	330
50%		103	91	113	152	152	117	117	300
60%		94	84	102	134	134	106	106	270
70%	A+	84	76	90	116	116	95	95	240
80%		75	68	79	98	98	84	84	210
90%		65	60	67	81	81	74	74	180
100%	A++	56	53	56	63	63	63	63	150

4: Better energy efficiency calculation values than the setpoint values of energy certificate are documented in the energy auditing annexes.

Designer: Calculations and evidence to support better values in comparison to setpoint values.

Developer: Inspection list of the final implementation matching the calculation values of the energy certificate.

User:

Additional information

Energy efficiency of buildings with different types of use

The energy efficiency of the building is assessed according to the main purposes of the building. If the building has several different uses, the surface-weighted average is used as the setpoint level and for the A ++ energy grade calculation. It can also be taken into account in the weighting if a part of the property is under renovation and other part consist of new building.

The project-specific average can be calculated using a separate "Project-specific average calculator", available at cer.rts.fi

Documentation of energy certificate calculation values at design phase

If calculation values used for calculating energy efficiency are better than the setpoint values, they should be documented by, for example, the following documents:

- U-values of the envelope with structural layouts
- The U- and g-value of windows with work specification requirement
- The air tightness with work specification requirement and with obligation of metering
- Annual efficiency of heat recovery of AHUs with summary table showing the supply air temperature ratio, the calculation value of frost resistance and the annual efficiency according to Guide 122.
- Requirement for Specific Fan Power (SFP) of AHUs with work specification requirement
- Demand-based control according to space-specific control description and documenting the demand-based control setpoint values. The effect of the demand-based control on the space-specific minimum and maximum values and with documenting the control type.
- Lighting efficiency and controls by type of space with calculations of lighting and with work specification
- Calculation basis for heat production systems (heat pumps, solar systems, etc.) and design power.

Documentation of energy calculation values at the commissioning phase

The following calculation values require the measurement reports as verifiable documents (if deviated from the setpoint level):

- U- and g-value from windows manufacturer's product specifications
- Summary of the air tightness measurement results
- The annual heat recovery efficiency of AHUs with a summary table showing the supply air temperature ratio, the frost resistance value, and the annual efficiency in accordance with Guide 122
- Specific Fan Power (SFP) measurements of AHUs
- Lighting efficiency and controls – audit report

Part renovation

Part renovations according to other criterion, but the E-value should be calculated for the renovated area only, taking into account the main systems serving the area.

Other building types

For buildings in the use category 9 Other buildings, there are no direct reference levels in building codes or energy certificates. Buildings in use category 9 should be best calculated using the best suitable calculation values for the intended use category.

Background information

Standards

- Ministry of the Environment's handout 122: Ventilation heat recovery in heat loss compensation calculations
- D3 calculation guide: Separate reviews of the power density and demand-based lighting in the calculation of the E-value

Changes

Hospital E-value has been corrected, to get 100% of the points E-value should be 150 instead of 105. No other revisions in 22.2.2019.

Y2.2 Energy metering

Comprehensive function-specific consumption metering allows for efficient monitoring of the use of energy in the building and controlling problems in system operation.

Energy metering for main systems, 50% of the weighted value

1: Implement sufficient energy metering of the building to the extent required.

Designer: Metering plans and charts.

Developer: Inspection list for usable metering methods in building automation.

User:

2: Significant technical systems are equipped with continuous automatic performance monitoring.

Designer: Metering plan and operating charts for efficiency measurements.

Developer: Inspection list for usable metering methods in building automation.

User: Consumption monitoring for at least one month of measurements.

3: All measurements of energy consumption are collected at the site and measurements are achieved on a daily, weekly and monthly level.

Designer: Description of the operation of the energy monitoring system.

Developer: Inspection list for usable metering methods in building automation.

User: Consumption monitoring for at least one month of measurements.

Measured power consumption of users, 25% of the weighted value

4: Measured consumption of electricity per user and by activity.

Designer: List of measurements.

Developer: Inspection list for usable metering methods in building automation.

User: Consumption monitoring for at least one month of measurements.

Implemented active energy usage information, 25% of the weighted value

5: Distribute a consumer feedback in real time using intranet pages or displays in storeys or lobby.

Designer: Description of the implementation of consumption feedback.

Developer: Inspection list of a consumption feedback system.

User: Inspection list of a consumption feedback system.

Additional information

Consumption measurements of building

The metering of energy consumption must be carried out with the following definitions:

- the production of heat energy or the purchase energy for each heat source used
- domestic hot water production
- electricity consumption of fixed lighting in communal spaces (excluding tenant and housing areas)
- electricity consumption of ventilation, excluding small separate exhausts
- electricity consumption of the cooling system (including compressors, condensers and condenser circuit pumps) and network pumps
- Total electricity consumption of tenants (including tenants having their own energy meters)
- Significant defrosts (definition of significant is presented in Y2.4)

Metering per user and by activity

The requirement for user electricity metering is a tenant-specific electricity metering. Metering is not required for small rental units, but the metering must be at least storey- and block-specific metering of user electricity consumption. The measurements do not require separation of lighting and appliance power.

Metering of user electricity requires sub-measurement of significant energy consuming specific functions to monitor specific energy consumption targets. Separate items of electricity metering include manufacturing and heating kitchens, server rooms, separate major appliance rooms, extensive outbuildings, parking spaces etc. significant energy-consuming functions.

Continuous system performance monitoring

Continuous operational efficiency monitoring for automation should be carried out for the following technical systems:

- Daily heat consumption kWh/day/average temperature of day
- Efficiency of the cooling system COP (excluding small units of less than 10 kW)
- Coefficient of performance of heat pumps COP
- Cooling efficiency produced by heat pumps or geothermal cooling COP
- Corresponding energy production systems

Changes

There have been made changes to the text of the criterion, reference to an old building code part D3 has been deleted. Requirements for sufficient energy metering of the building has been defined in 22.2.2019.

Y2.3 Consumption targets

System-level targets for energy consumption give a concrete expectation for building's energy consumption during use and, together with energy metering, speed up the response to system failures.

Calculated target consumption, 50% of the weighted value

1: Target consumptions of main systems have been calculated at annual, monthly and weekly levels. Target consumption has been updated based on the measurement results and implementation of the deployment at the time of commissioning. The differences and reasons between the design phase targets have been analysed. The actual consumption is compared to the computational target and the building fulfils the set target levels.

Designer: Calculation report of energy consumption.

Developer: Updated calculation report of energy consumption.

User: Reference report of energy consumption.

2: The target daily energy consumption kWh/d calculated in relation to the outdoor temperature has been calculated for heat consumption. The actual heat consumption is compared to the calculated target value and the building fulfils the set target levels.

Designer: Calculation report of energy consumption.

Developer:

User: Reference report of energy consumption.

3: The most important assumptions regarding the calculation of target consumption are summarized in the calculation document. The consumption of operation phase has been compared to the designed target values and the differences have been analysed.

Designer: Calculation report of energy consumption.

Developer: Reference report of energy consumption.

User: Reference report of energy consumption.

4: Target values of energy consumption have been recorded in the log book of maintenance or energy monitoring system in the meter level.

Designer: A record of the claim is presented in the instructions of log book of maintenance or in another contractual document.

Developer: Printout from a log book of maintenance or similar plan.

User:

Calculated target value of baseline power, 50% of the weighted value

5: The baseline power is assessed by calculations and the target values are defined by the main system. The realised baseline power consumption in the commissioning phase has been compared to the target values and the causes of the deviations have been clarified.

Designer: Report of the target values of baseline power and their criteria.

Developer: Metering report of baseline power and comparison with target values.

User: Comparison of the baseline power with target values and documenting the deviations.

Additional information

Calculation requirements

The calculation of energy must be based on dynamic simulation with at least hourly based calculation.

Main systems

The target values of energy consumption should be set at least for the following systems (suitable for the project):

- Space heating (outdoor temperature compensation)
- Domestic hot water
- Lighting (common facilities)
- Electricity for AHUs
- Cooling system and cooling pumps
- Significant processes
- User's electricity consumption. The appliance and lighting electricity consumption of tenants can be measured by a single metering.

The most important calculation assumptions

The most important calculation assumptions should include at least the following:

- Space Heating (AHU operation times)
- Supply air heating (operation times of units, temperature efficiency, effect of demand-based control)
- Domestic hot water (consumption target for Domestic hot and cold water, cooling of DHW cycle)
- Lighting (by type of space, operation times, lighting control factors, specific power W/m²)
- Electricity consumption of ventilation (SFP values)
- Cooling (COP of production, control value of free cooling (°C), space cooling power)
- Processes (target consumption)
- Energy production (COP of geothermal heat, solar energy efficiency %)

Standard

Measurement of the baseline power is instructed in building's life cycle indicators.

- http://figbc.fi/elinkaarimittarit/laskentaohjeet/pohjateho/

Y2.4 Core system efficiency

The energy efficiency and controls of systems outside of energy certificate are in line with good practices.

Core systems are energy efficient, 100% of the weighted value

1: Core systems have been implemented with energy efficiency and the environmental impacts of systems have been taken into account. If the site does not have core systems, the requirement will automatically be met.

Designer: Verifying the presented requirements.

Developer: Verification of requirements for final procurement, implementation and building automation.

User:

Additional information

Core systems

Core systems that use energy, are:

a) Outdoor lighting over 1 kW

b) All façade or accent lighting

c) Garages, which are semi-heated or heated and have an air exchange rate of more than 1 m^3/s

d) Cold units with a cooling power of more than 30 kW

e) Defrosting with district heating and electrically over 5 kW (ca. 60 m^2)

f) Kitchens with capacity over 500 servings per day

The review is limited to equipment belonging to the property, where the special premises of tenants (such as cold trade, server rooms or restaurant kitchens by tenants) are not taken into account in the assessment.

a) Outdoor lighting

The average luminous flux output (noting that output = luminaire efficiency x light source efficiency) of the outdoor lighting per input power must be above 50 lm/W (based on the luminaire-specific values and taking into account the Light Output Ratio (LOR)). Upward Light Ratio (ULR) should be less than 5%. Outdoor lighting is controlled, if necessary, by a light sensor, for example. Outdoor lighting must be divided into groups so that most of it (> 75% of the power) can be switched off systemically outside the actual operation time or controlled, if necessary, by a motion detector, for example.

b) Façade lighting

The luminous efficacy of the façade lights should be over 70 lm/W. The façade lighting control must be implemented with a light sensor and time program so that façade lighting can be switched off for night-time. A typical off time can be, for example, 23-06.

c) Garages

Ventilation of garages must be implemented with control based on indoor air quality and it must be equipped with heat recovery if the indoor temperature is above 15°C.

d) Cold units

COP of cold production should be over 3.0 (compressors, condenser pump and condensers taken into account). If the cold unit serves both ventilation and space cooling, the pumps must be equipped with double pumps or with sufficient control for the use of partial power during winter season. The system must be equipped with a variable temperature cold production so that during the winter season cooling fluid below 12°C is not unnecessarily produced. If the

building has a space cooling network, the system must be equipped with free cooling with a deployment limit of more than +7°C.

e) Defrosting

The areas that are to be kept unfrozen, each has to be designed as an independent control area, which can be automatically controlled by setting regionally specific control values. Controls and adjustments must be based not only on the outside temperature, but also on surface temperatures, rain sensing or equivalent demand-based control. In addition to the above-mentioned defrosting control requirements, all control areas over 500 m² must be subjected to a weather-based adjustment.

f) Kitchen appliances

Demand-based and automatic cooking appliances are selected. Considering the Energy Efficient Professional Kitchen guides of Motiva and TTS. Defining the calculated amount of energy per serving, which may be up to a maximum, determined for the type kitchen in publication 'Energy Efficient Professional Kitchen' by Motiva.

Standards

- Motiva: Energy Efficient Professional Kitchen
- TTS: Energy Efficient Professional Kitchen Guide

Y3.1 Water efficiency

By choosing technical systems, ensure that there is no unnecessary water consumption in the building.

Implemented water efficient system, 100% of the weighted value

1: The sub-measurements of significant individual consumers for cold and warm water have been implemented and the meters have been linked to continuous monitoring

Designer: Description of meters and Schematic diagram of metering.

Developer: Inspection list on building automation.

User:

2: Automatic leak alarms have been implemented and have alarms

Designer: Description of leak alarms and their operation.

Developer: Inspection list on building automation.

User:

3: The water consumption of the building has been reduced by low-consumption water fittings. The flow rates of the water fittings to be repaired must be adjusted to a standard flow rate.

Designer: List of water fittings which shows fitting types and their flow rates.

Developer: Measurement report of water fittings flow rates.

User:

4: The pressure of the water supply is adjusted so that the net pressure at the top most water faucets does not exceed the requirements of water fittings over 50 kPa.

Designer: Pressure measurement of the building's water connection and description of pressure management system.

Developer: Pressure measurement report of water supply system.

User:

Additional information

Water fittings with low flow rates

The water supply system must be designed so that, at least, the requirements of the SrMK D1 are met. Water fittings with low flow rates are e.g. the following:

- Toilet flushing up to 6/3 liters per flush
- Automatic urinals up to 2 liters per flush or waterless
- Customer restrooms with automatic water faucets or flow rates are up to 5 dm^3/min
- Flow rate of water faucets in restrooms up to 5 dm^3/min
- Flow rate of showers up to 11 dm^3/min

Facilities with significant water consumption

The following types of spaces are considered as facilities with significant water consumption: salons, restaurants, laundry, car wash, DIY car washing premises, manufacturing and heating kitchens, swimming pool premises and water-using process facilities.

Leak alarm

The leak alarm can be implemented, for example, with automatic monitoring of the night-time water consumption and setting up an alarm at least in the main meter.

Standard

Finnish national building code, Part D1

Y4.1 Ecological value

Promoting biodiversity and safeguarding the viability of soil and vegetation, and taking into account the characteristics of local landscapes, considering the structures involved in controlling stormwater. Diverse construction is acknowledged by taking into account the existing natural values and by multifaceted landscaping, which also considers the stormwater management structures.

Good green efficiency, 25% of the weighted value

1: The property's existing vegetation has been inspected for natural values and a statement of the preservation possibilities has been made at the design phase.

Designer: Landscape inventory mapping and an area layout of the current situation as well as a plan for preserving natural values.

Developer:

User:

2: To preserve the selected nature values, the property and its boundaries have been adequately protected before the start of the construction site.

Designer: Recording protection requirements in work specification or equivalent document.

Developer: Initial inspection of the protective measures prior to the start of the construction site, commissioning reports during the construction site AND inspection of the preserved trees and vegetation at the end of construction.

User: Object inspection of the preservation of natural values during the operating period.

3: The Green Factor of the property is equal to at least the target value of Green Factor specified with the Green Factor method.

Designer: Landscaping or 'Green design' and calculations using the *Green Factor method.*

Developer: Inspection list on the implementation of the 'Green design', as well as an updated 'Green design' and Green Factor calculation.

User: Verification of vegetation maintenance and its conformance to the plan.

High green efficiency, 50% of the weighted value

4: The Green Factor of the property exceeds the target value with at least 0.2.

Designer: Landscaping or 'Green design' and calculations using the Green Factor method.

Developer: Inspection list on the implementation of the 'Green design', as well as an updated 'Green design' and Green Factor calculation.

User: Verification of vegetation maintenance and its conformance to the plan

Reducing the stormwater load, 25% of the weighted value

5: Based on the iWater calculation of the Green Factor, no more than 25% of the property's rainfall is delayed. In the delay, both the reduction of the stormwater load with different solutions and the use of various stormwater constructions.

Designer: Landscaping or 'Green design' and calculations using the Green Factor method.

Developer: Inspection list on the implementation of the 'Green design', as well as an updated 'Green design' and Green Factor calculation.

User:

Additional information

No actions on the property

If there are no actions on the property at the renovation, the criterion is not achievable. The criterion can be achieved by verifying the green efficiency of existing vegetation and the compliance of the stormwater system with requirements.

Inventory of the property's environmental values

The environmental values of the property are listed as the existing trees, vegetation and other natural values such as cliffs, beaches, biota, etc. If the site

does not have any existing vegetation or other environmental values or the value of vegetation is low, the inventory can be replaced by photographs.

Preservation possibilities and preserved vegetation outside the construction area (buildings, structures, roads and passageways) must be presented.

Protective measures during the construction site phase

During the construction site phase, the vegetation and nature areas are to be protected according to the InfraRYL requirements as follows:

- Defining protected nature areas clearly with e.g a wooden construction site fence. In principle, a mere flagged line not accepted.
- In the excavation area, the tree trunks are protected with boarding up to height 4 m and the roots at least 2 m from the tree. Other preserved low vegetation is protected with a fixed fence 1 m distance from vegetation. The supply of water and nutrients for preserved trees should also be ensured during construction site.

Green Factor method

The Green Factor method estimates the green efficiency of the property by measuring green efficiency and providing a target value depending on the property type and type of property.

Green Factor = rated green area / total area

The calculation of the Green Factor is influenced by the amount of green area, selected vegetation, stormwater areas, bonus elements and selected pavements of traffic areas.

By default, the Green Factor Tool of the city of Helsinki is to be used for the calculation of the Green Factor. If a specific Green Factor tool has been developed for a local area, the local tool is to be used.

http://www.stadinilmasto.fi/viherkerroin/

Green Factor target

The target level limits set by the municipality are to be used as the target of the Green Factor. The target is calculated with a Green Factor Tool and is affected by the property and parking arrangements as well as the type of the property. If target limits are not set, the following target values for the city type of Helsinki are used:

- Residential areas 0.9
- Service areas 0.8
- Business and commercial building areas 0.7
- Industry and logistic areas 0.5

Calculating the stormwater delay of the property

The amount of delayed stormwater of the property (% of total rainfall) is compared to a fully paved property where all rainwater is carried out from the property (rainfall 0.1 m^3/m^2). In delaying, various green areas, large trees, stormwater management structures and delay pools according the iWater calculator are taken into account.

Background information

http://www.stadinilmasto.fi/viherkerroin/

Y4.2 Facilitating and safety of walking and cycling

Ensuring the safety of cyclists and walking on the site. Promoting cycling and walking by implementing high quality bicycle storage and social facilities.

Safety of the traffic area of the property, 50% of the weighted value

1: Walking and bicycle routes clearly separated from car traffic areas on property and off-site road intersections. The width of the routes is at least 2 m. The traffic routes lead from the site to bicycle storage facilities and entrances.

Designer: Site plan

Developer: Inspection list for implementation according to plans.

User:

2: The safety of different traffic types in intersections is ensured with a sufficiently low speed and with good visibility.

Designer: Site plan which shows safety measures for intersections and speed limits for vehicle traffic.

Developer: Inspection list for implementation according to plans.

User:

3: Cyclists or pedestrian routes do not cross with the freight transport routes to the loading bay on the site.

Designer: Site plan

Developer: Inspection list for implementation according to plans.

User:

4: The traffic routes on the site are sufficiently lit.

Designer: Lighting calculations of outside areas and average illumination levels of different areas.

Developer: Inspection list for implementation according to plans.

User:

High-quality facilities supporting cycling, 50% of the weighted value

5: Provide adequate amount of safe bicycle storages. If there is a parking garage, reserve at least some portion of the parking spaces.

Designer: Site and floor layouts showing weights, quantities and bicycle rack types.

Developer: Inspection list for implementation according to plans.

User:

6: Provide adequate bathing facilities and locker rooms connected to them, as well as reserved lockers.

Designer: Layouts showing locker rooms, number of lockers and showers.

Developer: Inspection list for implementation according to plans.

User:

7: Reserve a sufficient number of bicycle racks next to the main entrance of the building.

Designer: Site plan with pictures of bicycle racks.

Developer: Inspection list for implementation according to plans.

User:

Additional information

Safe intersection

Safety requirements apply only to intersections on the property. These include the following requirements:

- The safety of intersections of different traffic types (cars, pedestrian, cycling) must be ensured by systematically reducing the speed of the traffic at intersections with reducing the width of the route or with a speed bump (raised pedestrian crossings etc.). Reduced speed limits are not enough for safety.
- The intersections must have sufficient visibility, which is ensured by leaving at least 5 m view from the intersection to all traffic directions. Do not place fences, high shrubs or other hindrance on the line of view. Requirements do not apply to areas with occasional traffic.

Adequate lighting

Requirements for adequate lighting in traffic areas are set in standard EN 12464-2.

Sizing spaces

Washing facilities must meet the requirements of RT 94-10969: at least 1 shower/50 employees and minimum number of bicycle storages according to RT-card 98-11207 (quantity and quality) or by Design instructions for bicycle storage of Helsingin Kaupunki per building type.

According to design instructions for bicycle storage of Helsingin kaupunki, the design requirements are following per building type (bp= bicycle place):

- Nursery, Schools, other learning centers and institutions
  - comprehensive school 1 bp / 2 student
  - other learning institutions 1 bp / 4 student
  - personnel 1 bp / 3 employee
- Work Places, Offices
  - personnel 1 bp / 3 employee
  - customer traffic 1 bp / 1000 m2
  - customer bicycle storage in public places according to instructions (library, concert hall, museum, health club)
- Commercial buildings
  - personnel 1 bp / 3 employee
  - customer bicycle storage in grocery stores and special grocery stores according to instructions

The number of lockers is the same as the minimum number of bicycle racks. There must be a drying cabinet in the dressing rooms.

Property bounded by a street

If the main entrance is bounded by a street where placing bicycle racks is not possible, the location of the closest bicycle racks on the site is indicated with signs.

Safe storage

A safe storage space is a fixed bicycle rack in an external, unlocked storage where the bicycle can be attached to the frame or alternatively a lightweight rack in a locked storage space that is only available to users of the building (eg separate storage, parking garage or yard).

Standards

- EN 12464-2. Light and lighting. Lighting of work places. Part 2: Outdoor work places
- RT 94-10969 Pysyvien työpaikkojen puku-, pesu- ja WC-tilat
- ~~RT 98-11207 Polkupyörien pysäköinti ja säilytys~~
- Design instructions for bicycle storage, Helsingin kaupunki, Kaupunkisuunnitteluvirasto, 2016
    - https://www.hel.fi/hel2/ksv/julkaisut/los_2016-1.pdf

Changes

A new standard, Design instructions for bicycle storage, has been added in 22.2.2019

5. Indoor air and wellbeing

S1.1 Indoor temperature

Good thermal conditions have a significant impact on work productivity and wellbeing. The indoor thermal conditions are based on the operative indoor temperature and its limits are set according to the Classification of Indoor Environment 2018.

Monitorability of thermal conditions, 25% of the weighted value

1: All occupied zones of workspaces have a sufficient number of continuous indoor temperature measurements connected to building automation.

Designer: Building contracting floor layouts marked with the location of temperature sensors and a list of all points of temperature sensors of the premises.

Developer: Inspection list for the implementation of automation and sensors.

User: Documented verification of the thermal conditions, where the individual temperature stability is shown.

Thermal conditions of indoor environment category S2, 25% of the weighted value

2: The operative temperature of the workspaces remains within the limits set by Indoor environment category S2 at least 90% of the operating time and the maximum level is not exceeded during the service life of the building. The temperature limits are shown in the Classification of Indoor Environment 2018.

Designer: Thermal condition simulation report with summary.

Developer: Inspection list for the implementation of the basis for calculating the thermal condition simulations.

User: Inspection list for inspection of thermal conditions based on space-specific temperature monitoring in summer and winter seasons.

OR

3: The perceived quality of the Indoor Climate Survey in thermal conditions is consistent with user satisfaction with indoor air quality classification S2, where 75% of users are satisfied with thermal conditions in summer and winter.

Designer:

Developer:

User: Indoor Climate Survey asking for satisfaction with both the summer and winter thermal conditions.

Thermal conditions according to Indoor environment category S1, 50% of the weighted value

In addition to 2 and 3:

4: *The operative temperature of the occupied spaces* is within the limits according to Indoor environment category S1 at least 90% of the operating

time. The temperature limits are shown in Classification of Indoor Environment 2018.

Designer: Summary of *thermal conditions simulation report*.

Developer: Inspection list of the calculation basis of thermal conditions simulation.

User: Inspection list for checking summer and winter season thermal conditions based on room-specific temperature monitoring.

OR

5: The perceived quality of the thermal conditions corresponds to the user satisfaction of the Indoor environment category S1, where 85% of the users are satisfied with the thermal conditions in summer and winter.

Designer:

Developer:

User: Indoor Climate Survey about satisfaction with both summer and winter thermal conditions.

Additional information

Working spaces

Primarily, the requirements apply to all spaces with continuous occupation. These include: offices, meeting rooms, schools and business premises. More detailed information in a separate list.

Continuous monitoring of indoor temperature

Sufficient number of working spaces should be equipped with room temperature monitoring. Temperatures should be monitored in all types of rooms. For example, offices, one for each four direction, shall be chosen as type-specific spaces, as well as different sizes of offices, such as smaller offices and open offices. Meters are not required for all spaces.

Space cooling

If the building has both supply air cooling and space cooling, Indoor environment category S2 according to criteria 2 can be assumed to be filled in all those spaces where there are no particularly high heat loads. Particularly large loads are taken into account on the premises if

- the window surface area of the space is more than 30% of the floor area or
- The total heat load of lighting, appliance and persons is over 60 W/m².

Operative temperature

The operative temperature describes well the thermal conditions that are felt by the user, because it takes into account not only the temperature of the air but also the temperature of the surfaces and the radiant heat from them.

Passive cooling

As a means of passive and free cooling, can be considered e.g. external solar shading, window film, curtains and venetian blind solutions, night ventilation, night cooling, and geothermal cooling solutions without heat pumps, such as ground-cooled floor cooling.

Simulations of thermal conditions

Simulations should be made using dynamic simulation software that can simulate room temperatures with an accuracy of at least one hour throughout the year.

The simulation report should include a summary of the results, as well as simulation results showing the loads, the initial data for calculation, as well as the stability of the operative temperature of the space within the limits of indoor environment category during the usage of the space, as well the location of the spaces.

Heat loads in the simulations of thermal conditions

Simulations are to be made with the actual usage values of the building for lighting, appliance and personnel loads and actual operating times. If the actual usage is not known or loads based on estimated usage are lower than the default values given in Table 2.4.1 (Classification of Indoor Environment), the values in Table 2.4.1 are used in the calculation.

In simulations, the usage rate should be calculated as time-depended usage rate. For example, the usage rate of 0.6 is considered as the space having a full load of 60% of the operating time and not a load of 60% at all times.

Inspection list for the implementation of the basis for the thermal condition simulations at the end of the construction phase

The inspection list verifies the accordance of the basis of simulation calculation with the implementation. Verification ensures that solar shading, space cooling system, lighting type and control, as well as appliance and personal load correspond to the simulations for all simulated spaces.

Checking the implementation of thermal conditions during the operating period

The results of the indoor room temperature monitoring are presented on an annual basis (stability) and in critical situations (hourly trend of the warmest and coldest days) and as a verification on the fulfilment of indoor conditions by type of space.

Indoor Climate Survey

The indoor climate survey should be carried out under normal operating conditions, when the personnel is normally at the workplace. The survey may not be conducted during holiday periods.

More general level satisfaction is explained by an indoor climate survey that is targeted at all users of the building. In connection with this criterion, the survey should include thermal comfort in both heating and cooling periods. Users are offered seven answer options: +3 very satisfied, +2 satisfied, +1 partially satisfied, 0 neutral, -1 partially dissatisfied, -2 dissatisfied, and -3 very dissatisfied. The percentage of dissatisfied is calculated from -1 or lower.

If the survey is conducted on any other scale, it can be computationally modified to correspond to the above scale.

In order to use the survey as assessment tool, the number of survey respondents/recipients must be sufficient. A response rate of at least 40% is considered sufficient.

Background information

Classification of Indoor Environment 2018 (Finnish Society of Indoor Air and Climate (FiSIAQ))

Life cycle indicators for buildings - Percentage of users satisfied with the indoor environment

http://figbc.fi/elinkaarimittarit/sisaymparistoon-tyytyvaisten-kayttajien-osuus

Indoor Climate Survey by Finnish Institute of Occupational Health

https://www.ttl.fi/palvelu/sisailmastokysely/

S1.2 Air quality

The quality of indoor air and the factors affecting it, such as adequate ventilation, filtration of supply air and high-quality materials, are the foundation of a good indoor climate.

Indoor air quality according to category S2, 50% of the weighted value

1: Sufficient ventilation is provided in the occupied spaces to keep the additional carbon dioxide concentration in the limit range according to Indoor environment category S2 during the use of the space. Limit values are given in Classification of Indoor Environment 2018.

Designer: Room-specific air quantity measurement table, computational inspections of air quality OR results of conditions simulations.

Developer: Measurement and adjustment report of air flows.

User: The results of the indoor climate survey and inspection list of realisation of air quality for risk areas.

2: Rooms with large and variable user load have a room-specific air quality metering with room-specific demand-based ventilation control.

Designer: Building contracting layouts showing location of air quality sensors.

Developer: Checklist for implementation of space controllers and control values for automation.

User: Inspection list of air quality monitoring and setpoint values.

3: In basic renovations where the supply air is taken directly from the outside, the supply air must be preheated to a temperature of at least 12°C before it enters the room.

Designer: Description of procedures and computational analysis of Preheating of supply air.

Developer: Inspection list for implementation according to plan.

User: Measurement results of pre-warming the supply air in a cold winter situation.

Indoor air quality according to category S1, 50% of the weighted value

3: The additional carbon dioxide concentration in the occupied spaces should be below the target value of Indoor environment category S1 during the usage of the space. Limit values are given in Classification of Indoor Environment 2018.

Designer: Room-specific air quantity measurement table, computational inspections of air quality OR results of conditions simulations.

Developer: Measurement report of air flows.

User: The results of the indoor climate survey and inspection list of realisation of air quality.

Additional information

Occupied space

Primarily, the requirements apply to all spaces with continuous occupation. These include: offices, meeting rooms, schools and business premises and lobbies. More detailed information in a separate list.

Rooms with large and variable user load

The requirement applies to rooms with high user load, where the number of persons varies strongly. This includes typically spaces designed with less than 3 m²/person. These include: high-traffic lobbies, dining areas, auditoriums, cafes and restaurant facilities, and conference rooms. More detailed information in a separate list.

Type-specific spaces

Type-specific spaces are some of the selected spaces for each required type of space. For example, offices, one for each four direction, shall be chosen as type-specific spaces, as well as different sizes of offices, such as smaller offices and open offices.

Adequate ventilation

Adequate ventilation can also be proved by filling the space-specific outdoor air flows according to category S2 or S1.

Compliance with the requirement can be demonstrated by calculations, simulations or by designing the spaces with design values according to Table 2.4.3 “Output Flow Values” in the Classification of Indoor Environment 2018.

The dimensioning summary should include reference values for the required indoor environment category. Alternatively, the fulfilment of conditions can be demonstrated by air quality simulations or calculations. The calculation reports must include a compilation page of the calculation results.

Number of occupants

In premises, the measurement of air quality is based directly on the area-based design value of the Classification of Indoor Environment 2018, because there are many changes in the space type and the dimensioning cannot be made based on the furniture used in the first period of operation.

In service buildings, the designing the outdoor air flow is based on the following:

- designed space-specific number of users or
- default value of space usage efficiency according to the Indoor environment category and corresponding default airflow for space type.

If, based on the use of the space, it can be shown that the future number of users of the space does not reach the default airflow of the indoor environment category, lower values (e.g. school technical workspace) may be used.

Preheating the supply air

The purpose of requiring the supply air to be Preheated is to eliminate draft caused directly by the replacement air. The requirement is to preheat the supply air in a winter situation, for example by using the target heating or the supply air window.

Demand-based control

As demand-based ventilation is accepted space-specific airflow controllers and dampers, room-specific control by dedicated AHU, and area control with AHU or zone damper according to the weakest condition. Demand-based control should reduce the outdoor air flow of the measurement situation by at least 50%.

Measuring the air quality

The measurement of air quality must be based on a measurement method based on measurement of indoor air quality and space usage emissions. For example, CO_2, VOC or other air quality sensor can be used as a measurement sensor. Indirect measurements, that can be shown to assure air quality in the space, such as full boost with motion detector control, are accepted. Mere temperature control is not accepted as an air quality measurement.

Background information

Standards and guidelines

Classification of Indoor Environment 2018 (The Finnish Building Information Foundation RTS sr, Finnish Society of Indoor Air and Climate (FiSIAQ))

S1.3 User controls

Thermal and lighting conditions suited for personal preferences increase flexibility and improve user satisfaction.

User-adjustable lighting, 50% of the weighted value:

1: Working spaces have an adjustable control of the lighting level.

Designer: Summary of lighting controls for different space types.

Developer: Inspection list of control implementation.

User:

2: Users have the option of adjusting the amount of daylight and preventing glare from direct sunlight at the workplace.

Designer: Recording in the work specification how controlling the amount of daylight and glare from direct sunlight (e.g. operation of blinds) is implemented..

Developer: Commissioning report of implementation.

User:

3: The lighting control is set to automatic shutdown when the building is not in use.

Designer: Description of lighting controls in the contractor agreements.

Developer: Inspection list of control implementation in building automation.

User: Checking the automatic shutdown of lighting.

Adjustable thermal conditions, 50% of the weighted value:

4: User or zone-specific indoor temperature control in the working spaces.

Designer: Contractor layout showing the controllers.

Developer: Inspection list of control implementation and user-level controls.

User:

5: The building automation system is limiting the user-level adjustability, such as lower and upper temperature limits.

Designer: Control chart of zone control.

Developer: Inspection list of control implementation.

User: Inspection list of setpoints.

Additional information

Working spaces

Primarily, the requirements apply to all spaces with continuous occupation. These include: offices, meeting rooms and schools. More detailed information in a separate list.

Lighting control

There must be at least two lighting situations: partial power and full power. Adjustability can also be achieved with separate basic lighting and workplace lights, if implemented for all users as part of the furnishings.

Adjustable indoor temperature and control limits

The user-level control range must be within ± 1–2°C of the set-point temperature. A room-level or zone-level (open offices) indoor temperature adjustment is required for both summer and winter seasons. The adjustment zone must not exceed 30 m² and the window and centre zone must be controlled separately. The temperature control must be accessible to the user without the use of tools.

In premises with variable use (auditoriums, classes, etc.), individual user control is not required, but the room temperature should be adjustable from building automation.

Daylight adjustment and anti-glare

The amount of daylight and the glare caused by direct sunlight at the workplace can be controlled, for example, with blinds or curtains. The total light transmittance T_v of the solar shading must be less than 0.25.

Standards and guidelines

Classification of Indoor Environment 2018 (The Finnish Building Information Foundation RTS sr, Finnish Society of Indoor Air and Climate (FiSIAQ))

S1.4 Material emissions

Low-emission materials have been effective in significantly reducing the total concentration of harmful indoor pollutants.

Low-emission indoor materials, 50% of the weighted value:

1: Paints, adhesives, carpets and floor coating used inside the vapor barrier and wood panels meet the emission limits of materials.

Designer: Recording of material requirements into contract documents.

Developer: Summary of the used products and certificates.

User:

2: Fixed furniture is low-emission or manufactured from low-emission materials (adhesives and coatings)

Designer: Requirements are recorded in the plans.

Developer: Fixed furniture certificate or sub-component list and certificates.

User:

3: The inorganic fibres must be shielded or encapsulated in all indoor spaces. In renovation, all existing unprotected fibre sources should be removed or encapsulated.

Designer: Requirement to encapsulate the inorganic fibres.

Developer: Inspection lists for building components containing inorganic fibres.

User:

4: In renovation, contaminants (PAHs, creosote, asbestos) should be removed from the contract area

Designer: Clarification of contaminants if construction year before 1990.

Developer: Inspection lists for removing contaminants.

User:

Room air quality is indicated by measurements, 50% of the weighted value

5: Measurements made using approved measurement methods in the commissioning of a building indicate that total room air concentrations are on acceptable level before the use of the building.

Designer: Measurement obligation is recorded in the contract material.

Developer: Measurement report.

User: Measurement report.

Additional information

Materials to consider in the review

The assessment will take into account all materials inside the building's vapor barrier, except for technical facilities that do not have direct contact with indoor areas (district heating substation, AHU-rooms, etc.) and products that are connected to indoor air.

Material listing

The low-emission of products is reported at the site phase with a list showing the name of the product, the manufacturer, target of use, and note of the emission certificates.

Emission requirements of materials

The following certification marks and levels are approved for material emissions certifications:

- Emission class M1 for building materials
- GEV Emicode EC1 and EC1Plus
- Blue Angel
- GUT

Alternatively, low emissions can be demonstrated by verifying equivalence with the emission class M1 requirements for materials by an acceptable test method (EN 16516: 2017 + EN ISO 16000-9: 2006 + ISO 16000-28: 2012).

Low-emission base materials such as concrete, natural stone, ceramic and crimped tiles, as well as untreated timber are approved directly and are not required to be certified. In renovation, it is assumed that all residual surface materials can be thought to be low-emission in an existing situation.

Inorganic fibres

Inorganic fibres include e.g. fibreglass (technical fibreglass) and mineral wool fibres.

Mineral wool fibres are used in thermal insulation materials for exterior walls, ground and top floor structures, thermal, sound and fire insulation materials in ventilation ducts, in air filters and in room acoustic insulation materials such as acoustic boards and panels.

As a protective measure is accepted e.g. coating, encapsulation, paint coating of open surfaces.

Requirements for indoor air total concentrations

Measurements are made as one-time measurements in type-specific spaces before users with ventilation already in use. The measured concentrations must be below the following limit values before use:

- Formaldehyde ≤ 100 µg/m³, 30 min average
- TVOC ≤ 1000 µg/m³, 30 min average

The concentrations measured during the operating phase must be below the following limits:

- Formaldehyde ≤ 50 µg/m³, 30 min average
- TVOC ≤ 200 µg/m³, 30 min average

Accepted measurement methods for indoor air concentrations

Measurements of concentrations should be made according to the following standards:

- Formaldehyde: ISO 16000-3
- TVOC: ISO 16000-5 and ISO 16000-6 or ISO 16017-1

Background information

- M1-emission classification
- Helena Järnström's thesis (2008)

S2.1 Daylight

Daylight has positive impacts on the users, among other things, improving the activity.

Sufficient daylight in working spaces, 100% of the weighted value

1: The daylight factor of working spaces should be 2% at least 80% of the room's surface area.

Designer: Calculation report of the daylight factor AND layouts showing the work area considered in calculation.

Developer: Inspection list on the implementation of computational properties by type of space.

User:

OR

2: The total area of the daylight openings in the working space shall be at least 15% of the floor area. At least 80% of the working area shall be at the distance of at most 2 times the height of the top of the daylight openings from the floor, when typical solutions are used.

Designer: Layouts accompanied by calculations of the ratio or daylight opening area to total floor area by room type.

Developer: Inspection list of working spaces and space properties.

User:

Additional information

Working spaces

The requirements apply to all working spaces with fixed workplaces continuous use. These include: offices, meeting rooms, schools and business premises. More detailed information in a separate list.

Daylight factor

Daylight Factor describes the ratio of daylight entering the horizontal surface (work desk) from the amount of light entering the roof surface. A more detailed

definition is given in EN 15193, Annex C. The daylight factor is calculated by simulation software in a diffuse light situation with an outdoor illuminance of 10,000 lx. Calculating daylight factor takes into account e.g. window properties, external solar shading and surface reflectance.

Daylight opening area

The area of the daylight opening corresponds to the surface area of the window glass without the frames.

Typical solutions for daylight assessment

The second requirement may be applied when the calculation values are typical, fulfilling at least the following requirements:

- Light color of ceiling and walls
- The color of the floor is not dark
- Light transmittance (LT) of the window is over 55%
- Window has no significant external shadings, such as a flag or a nearby building.

Standard

- EN 15193

S2.2 Lighting quality

Adequate amount of light and good quality of lighting ensure safe working environment which is good for the eyes.

Good lighting quality, 100% of the weighted value:

1: The illumination levels of working spaces must meet the requirements of EN 12464-1 for illuminance (lx) and uniformity of the luminance distribution. User satisfaction with lighting quality is over 85%.

Designer: Lighting calculations in type-specific spaces as well as summary of calculations and comparison of results to requirements.

Developer: Inspection list of interior lamps and their conformance to plans. Updated lighting calculations. if necessary.

User: User satisfaction survey results.

2: The surface luminosity of workplace lights and UGR (Unified Glare Rating) value meet the requirements of the EN 12464-1 interior type.

Designer: The UGR tables and surface luminosity specifications of workplace lights.

Developer: Inspection list of interior lamps and their conformance to plans. Updated lighting calculations. if necessary.

User:

3: Outdoor lighting in traffic areas must meet the requirements of EN 12464-2 for average illuminance (lx).

Designer: Lighting calculations for outdoor and traffic areas.

Developer: Inspection list of interior lamps and their conformance to plans.

User:

Additional information

Working spaces

The requirements apply to workspaces with fixed workstations or continuous use. These include: offices and schools. More detailed information in a separate list.

Standard EN 12464-1 specifies required target values for illumination by type of space. For example, for standard office and meeting rooms, the requirement is 500 lx in the task area.

Uniformity of the luminance distribution

The uniformity of luminance distribution is described as the ratio of the luminance of the working area and the region in its immediate vicinity. For example, in the office task area, the light uniformity E must be at least 0.6.

UGR - Unified Glare Rating

EN 12464-1 provides a UGR dazzle index for status-specific target values Standard EN 12464-1 gives target values of UGR for each type of space which have to be met. For example, the requirement for standard office work and conference rooms, is 19 or less.

Standards

- EN 12464-1
- EN 12464-2

S3.1 Space acoustics

Good space acoustics ensures a natural working environment and supports the activity of users.

Implementation of good space acoustics, 50% of the weighted value:

1: The reverberation time of the work and occupied spaces must meet the requirements of the B-class (Standard SFS 5907) or category S1 (Classification of Indoor Environment 2018, Table 1.3.4), and the percentage of users satisfied with acoustic conditions is at least 90%.

Designer: Reverberation time calculations and summary by type of space.

Developer: Measurements of reverberation time as spot measurements OR inspection list showing type of acoustic surfaces and the ratio of implemented quantity of acoustic surfaces to design phase requirement.

User: Results of Indoor Climate Survey.

2: In the presentation and teaching premises, the Speech Transmission Index (STI) must meet the requirements of the B-class (Standard SFS 5907) or category S1 (Classification of Indoor Environment 2018, Table 1.3.4).

Designer: STI calculations and summary

Developer: Inspection list on conformance of acoustic solutions with calculation parameters of STI OR measurements of STI.

User:

Implementation of good space acoustics of open-plan offices, 50% of the weighted value:

3: *Spatial decay of speech* in open-plan offices must meet the requirements of RIL 243-3-2008 according to ISO 3382-3, in which case the percentage of users satisfied with acoustic conditions of open-plan offices is 85%.

Designer: Calculations and summary of spatial decay of speech.

Developer: Inspection list on conformance of the implementation of systems affecting the acoustics with calculations.

User: Indoor Climate Survey limited to questions about acoustic conditions of open-plan offices

Additional information

Occupied spaces

Primarily, the requirements apply to all spaces with continuous occupation. These include: offices, meeting rooms, schools, business premises and lobbies. More detailed information in a separate list.

Reverberation time

The reverberation time describes the distribution of the sound in space and it affects, among other things, the intelligibility of speech. Standard SFS 5907 provides space-specific target values of reverberation time that must be in accordance with requirements of class B. For example, in an office room for one person and in a conference room, the reverberation time should not exceed 0.6 s on below 3 m room height. The reverberation time can be reduced by design, for example, by increasing surfaces that absorb sound.

Open-plan offices

Open-plan offices include spaces with more than 10 workstations and education premises where several groups work simultaneously. A more detailed separation of the spaces to be considered is given in a separate space type list. If there are no open work environments, the criterion can be assumed to be fulfilled.

Spatial decay of speech

Reverberation time is not used as a design tool in open-plan offices, but RIL 243-3-2008 is applied, according to which the spatial decay of speech in an open office should be at least D2S > 7 dB (ISO 3382-3).

Speech Transmission Index (STI)

The Speech Transmission Index (STI) describes the distinctness and intelligibility of speech in the room. Standard SFS 5907 sets target values for STI for the presentation and teaching premises, which must be met according to the B-class level. For example, in the classroom, the STI should be at least 0.8.

Background information

- SFS 5907:2004
- ISO 3382-3p
- RIL 243-3-2008 open offices

S3.2 Sound insulation

Good soundproofing of structures reduces sound from one room to another and reduces interference experienced by user.

Structural sound insulation better than the required level, 100% of the weighted value:

1: All load-bearing and non-load-bearing structures must meet the requirements of class B (SFS 5907) for Airborne Sound Insulation Index R'w (dB). Compliance must be verified by measurements.

Designer: Summary of the Airborne Sound Insulation Index of structures, comparison with requirements AND measuring requirements recorded on contract documents.

Developer: Measuring results of the commission and comparison with requirements.

User:

2: In renovation, the airborne sound insulation index of old structures should be determined by measurements. The identified deficiencies must be solved by presenting the requirements to achieve the SFS 5907 C class.

Designer: Inspection list on the acoustic conformance of the structures with requirements.

Developer: Measurement results of commissioning.

User:

Additional information

Airborne Sound Insulation Index

Airborne Sound Insulation Index describes the structure's ability to dampen the sound from one space to another. The standard SFS 5907 provides structure-specific target values for Airborne Sound Insulation Index that must meet the requirements of Class B. For example, between individual office rooms, airborne sound insulation should be at least 40 dB.

Airborne sound insulation measurement

Measurements of sound insulation between premises must be carried out in accordance with standard SFS-EN ISO 16283-1 and measurements of the impact sound between the premises in accordance with standard SFS-EN ISO 16283-2.

Standards and guidelines

- SFS 5907:2004
- RIL 243-X-2007 -series
- SFS-EN ISO 16283-1
- SFS-EN ISO 16283-2

6. Innovations

I1.1 Innovations

Enabling approval of non-classified innovations and, rewarding of clear surpassing of criteria requirements.

Implementing the approved innovation, 20% of the weighted value for each innovation:

1: Implementing accepted innovation by fulfilling the requirements related to innovation.

Designer: Planning material and verification of the requirements for innovation.

Developer: Inspection list on fulfilling the requirements of implementation.

User:

2: Description of reaching targets using the proposed innovation.

Designer: Application of innovation

Developer: Inspection list on fulfilling the requirements of implementation

User:

Additional information

Accepted innovation

The Finnish Building Information Foundation RTS sr updated a list of accepted innovations and compliance requirements for at the website of the tool. The project can make use of these already-accepted innovations, if the requirements are met.

Acceptance of innovations

The process for acceptance of innovations is as follows:

- Completing the innovation application as instructed
- Sending an innovation proposal for processing (applying for classification)
- The RTS Steering Group will process the proposal
- Approved innovations will be added to interpretations on the main level

Limitation of innovation

Innovations should use the same limitation as in determining the actual classification criteria. Therefore, innovations cannot be applied to areas that are excluded from the classification model. With this limitation, innovations will not be accepted e.g. in the following areas:

- Criteria related to the location or selection of the property
- Improvements to the level of public transport
- Contamination of property's soil and cleaning
- Green electricity or regional renewable energy
- Agreements and organizational issues related to facility management
- Factors for the maintenance phase outside the classification confirming operational phase

Standards and guidelines

- SFS 5907:2004
- RIL 243-X-2007 -series
- SFS-EN ISO 16283-1
- SFS-EN ISO 16283-2