EUROPEAN UNION European Regional Development Fund

Local Action Plan

Partner: TALLINN
Shortcut of the working title: ESIS
Working title of the Local Action Plan: Energy saving in social housing
Dominant 'SUITE Type': ENVI

Objectives:

- **to demonstrate the energy saving solutions in social housing,**
- **to transfer the solutions to the private sector,**
- **to support the development of energy saving policy on the local level.**

Content

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Social housing system in Tallinn

Tallinn has set up a system for the re-socialisation of excluded and homeless people that is divided into four levels. The clients have constant access to professional counselling and assistance by social workers and lodging facilities with amenities corresponding to the specific level.

I level

Night houses and shelters for the provision of emergency care.

Night houses are only for night-time use; those homeless people who because of their health cannot be sent out during the day are also allowed to remain in the shelter during the day; lodging facilities are extremely modest, with 10 to 20 people sharing one room; the service is free for the clients.

II level

Shelters for people with coping difficulties.

Shelter is meant for 24-hour use. Lodging conditions are modest and there are 6 to 10 people per room. In wintertime, when night houses are overcrowded, overnight lodging is also provided by shelters.

III level

Social housing units for people with coping difficulties.

Social housing units are meant for 24-hour use. Housing conditions are relatively modest. 1-3 people per room.

IV level

Social and municipal houses

Social and municipal houses are tenant buildings that belong to the city. Lodging conditions are similar to standard apartment houses and all persons or families have their own individual living premises. Tenants are required to pay for all communal services.

Social services are provided in the first three types of housing units, whereas the first type provides emergency care and the next two provide re-socialisation service. All levels have access to assistance and counselling by social workers.

General problems and interests of the city in social housing

Low-income people

The multi-level system of social housing motivates people to develop themselves so that they can improve their living standards.

Clients who have been using the re-socialisation service (shelters for people with coping difficulties and Social Housing Units) have reported improved health and growth in income. 25% of clients could pay more for living costs if they were able to obtain higher-level housing.

Pursuant to the above, for ensuring the functioning of the re-socialisation system, Tallinn has the need for additional social housing units and social and municipal houses. The weaknesses of already built social housing units are the lack of social rooms for low income groups, the low accessibility of social services, difficulties in grouping of persons inside the houses, planning of the houses.

Orphans

One of the priorities of municipal welfare is to ensure for children a favourable development environment for satisfying their basic and special needs in order to raise people who are healthy, capable and willing to work and develop. For promoting substitute care, one of the objectives of the Tallinn welfare is to reorganise a children's home into smaller units, with twin apartments and twin houses for up to 16 children. The weaknesses of existing model of orphanages are contained in concentration of children to the big isolated houses, which makes difficult the children's social integration. For the purpose of the re-organization of orphanages, two-family housing units will be built for the children in the Mustamäe and Kopli centre and social work in orphanages will be re-organised, as a result of which the children will be better prepared for independent life and integrate into society.

Environmental aspects in social construction

The City of Tallinn has set up the activities t reduce CO^2 emission by the year 2020 up to 20%. The heat supply of buildings is one of the most important possibilities in conserving energy. The renovation and insulation of existing buildings achieves up to 30% savings. New buildings will be built according to the requirements of EU directives. In the heat supply of buildings, the following conservation measures must be emphasised:

– Renovation must be preceded by a building energy audit;

– The energy label is a mandatory requirement for new buildings, necessary for buildings that change owners and recommended for all buildings;

– The installation of heating pumps should increase by 1.5 times;

– Widening the use of solar energy is important for buildings that have low energy consumption.

Financial means

By the year 2020 ca 13 million EUR will be spent on the renovation and insulation of municipally owned buildings. This is expected to provide an estimated energy saving from 50 to 100 GWh per year.

In addition to the city and investor funds, energy saving efforts can also be financed by use of various aid funds like the European Regional Development Fund (ERDF). The distribution of financing resources is organized through the Enterprise Estonia.

The new social construction in Tallinn is basically financed by ERDF (according to the local programme of urban areas). The priority is directed to the improvement of living environment, i.e. development of public infrastructure related to the increase in social security (more info http://www.eas.ee/index.php/for-public-and-non-profit-sectors/development-of-public-services/programme-for-the-development-of-urban-areas).

The construction of social houses

The objective is to make the social services more accessible for low-income groups through increasing the supply of social rooms. The result of the project is the best rehabilitation possibilities for the target group.

Two low-energy social houses will be constructed in the frame of the project (totally for 140 persons).

Social house Männiku 92 (for 90 persons):

Social house Varre 7 (for 50 persons):

The total cost of the project is 2 844 068 EUR, incl. 85% financed by ERDF and 15% city financing.

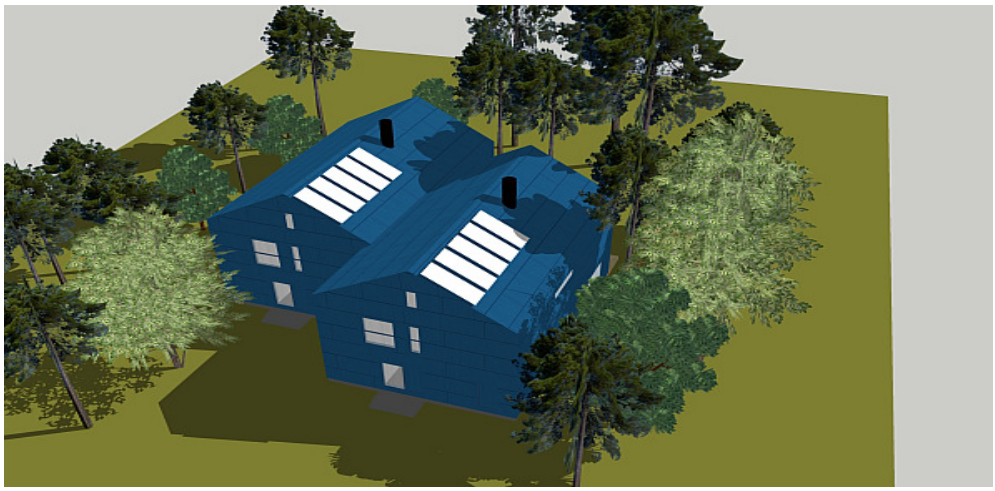
The construction of orphanages

The main objective is to minimize the difference in social behaviour of children living in families and children living in orphanages through construction of small houses at the same providing the orphans with family friendly conditions. The result is socially adopted child who has "family" experience to start the independent life.

Four double houses (totally eight families, six children in each family) and three detached houses (six children per every house) will be constructed in the frame of the project.

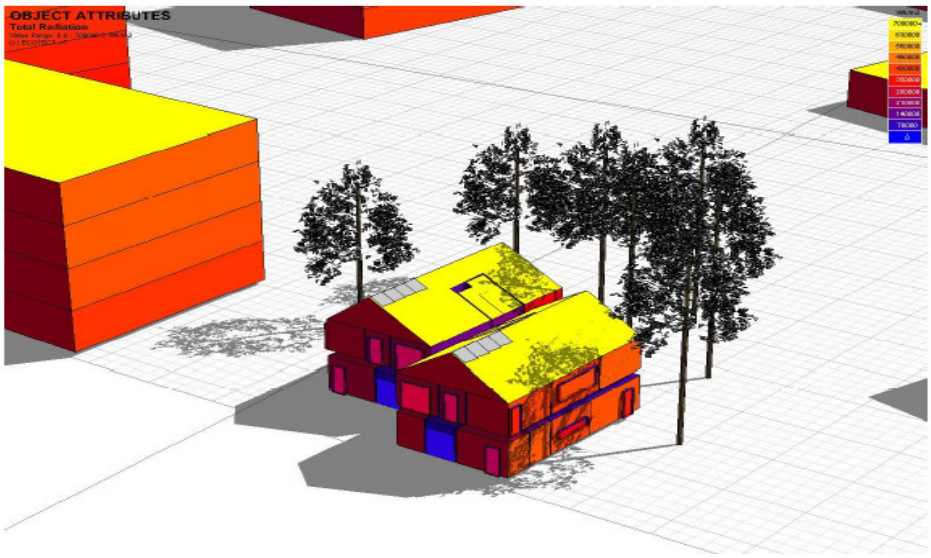
Total cost of the project is 2 876 024 EUR, incl. 85% financed by ERDF and 15% self-financing.

The general vision of double houses:



Implementation of energy saving and renewable energy elements

All project buildings have high quality insulation, the implemented solar panels for water heating purposes and the air-water heating pumps and ventilation systems with heat recovery. The aim is to produce the buildings with low energy consumption - < 40 kw/m² per year.



Location of collectors on building roofs (least shading).

Social impact

Social houses

The positive impact of the project is the social services are more accessible for low-income groups. The result is the best rehabilitation possibilities for the target group. The social services enable the person to independently cope in conditions that are as similar to standard conditions as possible. Low-income people can achieve the goal of independent life through meeting his or her housing need and the organization of daily life.

Orphanages

The project has a directly positive impact on equality, since it helps to promote equal opportunities between risk groups. The gap between the children's home and home children will shrink when children directed to the substitution service live in small units. Life in home-like conditions in small houses will help children from the children's home to better adapt to society in the future. The objective is to ensure that children without parental care have equal opportunities with other children for development and an independent life. What is important is that a child who lives in a substitute home does not feel excluded and is an active and accepted member of society and eligible on the labour market. A substitute home will help children from the children's home to obtain better preparation for independent life and normal life. Housing of children in smaller houses located around the city will reduce anonymity, increase the responsibility of families in organizing their daily life, help to reduce the children's problem behaviour, create a home feeling and help the children to better integrate into society.

Appendix I

Overview of the social welfare in Estonia
General statistics

The total number of institutions that provided social services (excl. providers of rehabilitation services) was 322 at the end of 2008, including 54 institutions that provided two or more services. The number of institutions that provided 24-hour welfare services was 177 (i.e., 55% of service providers), incl. six institutions that provided services to several target groups. 120 institutions provided institutional welfare services for adults (excl. adults with special mental needs), 28 provided welfare services for adults with special mental needs, and 35 institutions provided substitute home services. The number of staff members of social welfare institutions at the end of 2008 was over 5,70021. Nearly 56% of them were educational workers, caregivers and providers of nursing care. This percentage rises to 63% if we include nurses and social workers. The institutions providing 24-hour care service employed 4,500 persons at the end of the same period (79% of total staff providing welfare services).

The total expenditure on welfare services in 2008 amounted to 110 million EUR, including 40% (i.e., nearly 43,5 million EUR) paid by the state. The contribution of local governments was at the level of 38%, while the self-financing of service users was 22%. In comparison to 2003, the total expenditure increased by a times of 2.5. 58%, or 1,006 million EEK, of the funds used for the provision of social welfare services in 2008 were spent on the provision of 24-hour care services. At the same time, the share of 24-hour welfare services in the expenditure has decreased by 7.6 percentage points in 2008 in comparison to 2003. The main reason for this was a major increase in the expenditure of the state on the provision of open care services – rehabilitation service and purchases of subsidised technical aids.

The expenditure on the care for adults in social welfare institutions comprised 45% (28,9 million EUR) of the expenditure on 24-hour welfare services in 2008. In addition, this service was also the largest expenditure item, constituting over one quarter of the total expenditure on social welfare services. The total number of users of the 24-hour care service was nearly 8,850 at the end of 2008.

More than half (59%) of them were users of care services for adults, 26% were users of services for persons with special mental needs, and 15% were users of substitute home services. 66 of every 10,000 residents were on 24-hour care in a social welfare institution. In comparison to 2000, the number of service users per 10,000 residents has increased by 11. The users of care services for adults accounted for the main part of the increase, with an increase by 58%. The number of rehabilitation service users was 16,190 in 2008 and it has increased by almost a third (32.3%) in the last three years. This service was used mainly – 87% of the cases (14,033 persons) – by persons with disabilities or by persons who applied for certification of disability. This category included 4,156 children (aged 0–17 years), 5,392 persons of working age (18–64 years), and 4,485 elderly persons of at least 65 years of age. Every eighth (12.9% of service users, or 2,086 persons) user of rehabilitation services was a person with special mental needs. The number of service users has more than doubled in the group of under aged (up to 18) with behavioural special needs, increasing from 34 in 2006 to 71 in 2008.

Children

The number of new registrations of children left without parental care or children needing assistance increased in 2006 as a result of specification of statistical data, because unlike the previous years, the report now also included children needing assistance in their biological family whose cases have been referred to a social protection or child protection official. 1,732 children left without parental care and children needing assistance were registered for the first time in 2008.
The quality of the assistance provided to the children and families is linked with the number and professional qualifications of the specialists. The Concept of Child Protection approved by the Government of the Republic in 2005 has set a target where the number of children per child protection official would be 1,000. The number of child protection officials has increased to 162 specialists during the period 2003–2008. 80% of these officials have received specialised education. The target established in the Concept for Child protection – one child protection official per 1,000 children – is getting closer with each year: in 2008, there were, on the average, 1,535 children per one child protection official. On the one hand, this figure is influenced by the increased number of child protection officials and, on the other hand, by the decreasing number of children aged 0–17.

The number of children in foster care has decreased by times of 2.7 during the period 2003– 2008. Even though an adult could, in principle, also use this service, the majority (98–99%) of the users are children. The number of foster families has decreased in the review period as well, amounting only to 327 families in 2008 in comparison to 869 families in 2003. The number of adopted children has increased in comparison to 2003, amounting to 181 children in 2008. The number of children adopted by foreign nationals has been variable in different years, ranging from 10% to 15% of all adopted children. The number of children under guardianship has slightly decreased in comparison to 2003, amounting to 250 children in 2008.

The objective in the case of substitute care is to maximise the number of children, needing substitute care, who are raised in families. Unfortunately, a suitable family cannot be found for all children and, therefore, some children are referred to the substitute home service. In 2008, two thirds of children referred to substitute care found new homes in families, which is somewhat less than in 2003, when 73% of children found a family.

Appendix II

On the societal transformation, property reform and recent trends in the housing field

Restitution is a complex and controversial process in economic and social terms as well as in moral and cultural terms having denoted a considerable and distinct change of residential dispositions for individual actors involved in the process. Given the nature of changes, restitution was advantageous (although without problems) for restitutees in all terms and entirely disadvantageous for sitting tenants. Return of property restored the social justice, clearly increased the economic capacity of restitutees and broadened the scale of individual choices in the housing field as well as in any other field since the restituted property could be sold and invested as capital elsewhere. Tenants in the restituted sector were deprived of the economic prospects needed as part of individual starting positions in the developing housing market, in particular, on the background of privatisation of the formerly public property that had been available for the majority of the former sitting tenants. Very little state support (fixed rents, regulation of the duration of contracts between tenants and restitutees, compensation for non-restituted property and special compensation and loan schemes for new housing purchase for tenants) was granted to tenants as well as restitutees (to develop their property while bound to contracts with tenants) in Estonia.

Tenants in the restituted housing were as if caught in a historical paradox, in a 'social accident', which had not only unexpectedly changed their status in housing relations or deprived them from an opportunity of low-cost property appropriation within the general privatisation scheme, but also affected strongly on their weakening sense of home in a familiar residence.

Privatisation of public property, defined also as *'give-away privatisation'* with various discount schemes created enormous need for private investments into the renovation of property shared in large blocks. This situation, obviously, had no easy solutions for flat owners because of their highly stratified economic capacity. Consequentially, these strata were forming the clientele for the public sector and the demand for new construction of public housing, both municipal and social housing for people with special needs.

What has been significant about privatization is that it reproduced the social hierarchies having existed in the previous socialist type of social system: the higher the individuals' status had been in the previous society the better was the quality of the distributed housing and, thus, the higher appeared to be the value of their property after privatisation and individual actors' opportunities for further building of their housing career in market conditions. In such a curious way the legacy of the socialist housing system in its social and physical dimensions as well as, generally, in terms of social inequalities having been embedded in that system continued to define individuals' choices at the first instance of the transforming society.

Within the framework of major institutional restructuring of the field, with restitution and privatisation practices led upon differentiated individual capacity and structural opportunities on the background, the main challenges for the field development since the reform were related with:

- construction of strategies of provision of higher quality housing in the currently marginalized public housing sector for the groups with weakest capacity;
- creating opportunities for former sitting tenants willing or forced to leave the restitution-based private rental sector and enter the market or move to public housing;
- recurrent redefinition of social housing policy goals upon the emerging strata of homeowners with severely restricted potential for sustaining their status and property;
- introduction of strategies for the improvement of low quality and previously under-maintained housing stock as well as new forms of management and maintenance (e. g. flat owners' associations).

Provision of municipal and social housing became a priority task for local governments in order to meet the needs of the growing group of economically disadvantaged citizens (tenants in restituted private rental sector have been given priority) as well as groups with special needs (disabled, the elderly, low-income families with many children, young people leaving orphanage, individuals released from prison etc).

The city of Tallinn has made a continuous effort in this direction. Since the peak of privatization in the mid-nineties numbers of citizens applying for public housing in Tallinn, especially for flats in municipal blocks, had grown along with the increasingly emerging problems concerning either the tenants in restituted housing or other individuals incapable of solving their housing need individually. That demand has been met by introducing new housing policy strategies in the city: renovation and modernization of the existing stock as well as, and what is essential since the existing stock had been inadequate in size as well as quality, the construction of new municipal and social housing. In addition, the Tallinn city government has launched a special moving subsidy for people having been able to resolve their housing problem. As is seen from the dynamics of the data on applicants for municipal housing provision their number has to a considerable extent decreased during the last decade exponentially with the supply secured with enlargement of the housing stock. The burning issue of tenants in restituted housing has been practically solved by the year 2010. Among the most vulnerable, and therefore forming the major part amongst the current applicants for social housing are the people with health problems and the elderly, in particular, regarding the shared problems relating to aging modern societies facing economic recession. The immediate problems of adult as well as child homelessness and often a related problem of women and child abuse in families have also been alleviated by the gradual increase of safety homes.

Appendix III

Environmental aspects in social construction

The City Council of Tallinn has approved the Sustainable Energy Economy Development Plan of Tallinn, which main task is to reduce CO^2 emission by the year 2020 up to 20%.

Pursuant to the Sustainable Energy Economy Development Plan of the City of Tallinn:

The heat supply (clause 4.3) of buildings is one of the most important possibilities in conserving energy. This is something that all building owners must do, including the Tallinn City Government in the building and renovating of municipally owned buildings. The renovation and insulation of existing buildings achieves up to 30% savings. New buildings will be built according to the requirements of EU directives. In the heat supply of buildings, the following conservation measures must be emphasised.

4.3.1. Energy audits, thermographic studies and energy label

Renovation must be preceded by a building energy audit. It explains what the building's energy consumption is, identifies problem areas and how the most energy can be saved. The energy audit is supported by thermographics, which characterises the heat retention ability of the building and identifies weaknesses.

The building's energy consumption is characterised by the energy label. It is a mandatory requirement for new buildings, necessary for buildings that change owners and recommended for all buildings. It is the responsibility of a building's owner to commission an energy audit, thermographics and the issuing of an energy label. For municipally owned buildings, the works are ordered and funded by the city. An energy audit and energy label creates the preconditions for efficient and energy conservative renovation of a building.

4.3.2. Renovation and insulation of buildings

Renovation helps to improve living conditions in a building and reduce heat losses. It is important before renovation to make the necessary technical calculations and work design. Conducting the works according to the work design ensures the best outcome and maximum energy saving. Building renovation, together with everything involved, is the task of the buildings' owners, whether a city, enterprise, apartment society or private owner. At the same time the city can support their work and remuneration.

4.3.3. Building buildings with better heat retention

EU directives and Estonian legislation determine heat retention requirements for new buildings. According to them, the heat permeability factor of a building's wall must not exceed 0.2-0.24 W/m^2 ºC. It is important to ensure that all developed buildings comply with this requirement. Unfortunately, the concrete elements that are manufactured today do not meet these requirements – to say nothing of the objective set in several European countries, where the upper limit of the heat permeability factor of

walls must not exceed 0.2 W/m^2 ^{0}C. Special attention must be paid to constructing buildings with low energy consumption.

4.3.4. Wider use of heat pumps

A heat pump allows for energy savings of 2-3 times. At present, approximately 10 000 heat pumps have been installed in Tallinn and in the next three years their number should increase by 1.5 times. A heat pump is especially suitable for heat supply of private homes and smaller apartment buildings. This enables approximately 50 MW of energy to be saved per year.

4.3.5. Use of solar energy

Widening the use of solar energy is important for buildings that have low energy consumption. The easiest solution is to use solar panels for the hot water supply of buildings. This is applicable both for private homes and social buildings. In our climate the modern technical solutions enable to use solar panels also for producing electricity, but the electricity produced in this way is more expensive than the electricity supplied from the power network.

Whereas today the share of solar energy in energy supply is non-existent and will remain less than 1% over the next few years, the share of solar energy in energy supply will become significant, considering technical developments in the use of solar energy.

Financial means: According to the development plan, between EUR 3,2 million and EUR 51 million will be spent from 2010 until 2020 on the renovation and insulation of municipally owned buildings. This is expected to provide an estimated energy saving from 50 to 100 GWh per year.

Appendix IV

Content of the social services in orphanages

Care in social welfare institutions (children's home, youth home) is necessary for children who are without parental care and who have not been placed in a substitute family. In the institutions, children live as families and have an individual development plan and an assigned trustee-educator. Life in the institution must be as family-like as possible. By the time the child becomes an adult, the institution must ensure that he or she has the necessary skills for leading an independent life. As with all other children, those from the children's home must have access outside of the home to education, medical care, rehabilitation, hobby activities, and other services that are important for the child's development. The child who is under the care of the institution will be supervised and counselled by the child protection official.

Supervision over the organization of guardianship and care is a natural part of case management. The objective is to monitor the development of the case and to keep it under control. The method of child supervision is established in the case plan and in the child's development plan. In supervising the child, all aspects related to the meeting of the child's basic and special needs are considered. Issues to be observed are the child's living environment, access to education, health protection, social welfare services, leisure possibilities, communication opportunities, and the child's physical, mental and emotional development. The observations, conclusions, proposals and decisions made during the supervision are recorded in writing. Child protection officials have the responsibility to be constantly informed of the child's living conditions and development and to participate in making the decisions and choices that are important for the child. At the same time, child protection officials may assist in solving more complicated care-related issues in the care family or institution.

One goal of substitute care is to prepare the child for independent life. Preparation of the child for independent life is a natural part of caring for and raising children. In order to be independent, a young person must have a steady source of income, skills to manage one's finances and know how to deal with institutions, protect one's health and create a social network. The level of a young person's preparedness to lead an independent life must be assessed once a year, from the time the person turns 16. Young people who have undergone substitute care must be provided post-care. Essentially, this entails supervision and provision of support services until the young person becomes fully independent. Ideally, supervision is provided by the child protection official with whom the person in question has been in contact before and has a trusted relationship. Support services include day centre services, supported subsistence services and, if necessary, practical family assistance.

Appendix V

Content of the social services in social housing units

The objective of the service of the social housing unit is to enable the person to independently cope in conditions that are as similar to standard conditions as possible. The essence of the service is to support persons who have coping difficulties or who are being re-socialized, so that they can achieve the goal of independent life through meeting his or her housing need and the organization of daily life.

The service includes:

1) housing;
2) organization of daily life, based on individual work done with the client and on group activities;
3) coping study;
4) social counselling;
5) raising awareness about public and support services;
6) assistance in managing life;
7) support in search for work.

The service is targeted at persons who, according to the data of the population register, reside in Tallinn, are adults, and who need assistance because of coping difficulties and lack of housing.
Depending on the person's situation, the service is provided 2 to 4 hours a week for 2 to 12 months. (The re-socialization plan is drawn up for 6 months. It is then reviewed and extended, if necessary. Average time of service use is from 1 to 1.5 years, i.e., a person's re-socialization plan is reviewed and extended 3 times.)

The service is provided on the basis of a referral, by the social welfare department of the client's place of residence, for the use of the service, together with the person's application and re-socialization plan. The service is regulated by the service contract concluded between the service provider and the person. The service is provided in accordance with the re-socialization plan, until the person is able to once again cope independently or is placed in a social welfare institution.

The service is funded from the budget of the City of Tallinn. Housing costs are borne by the person in question, on the basis of the approved price list.

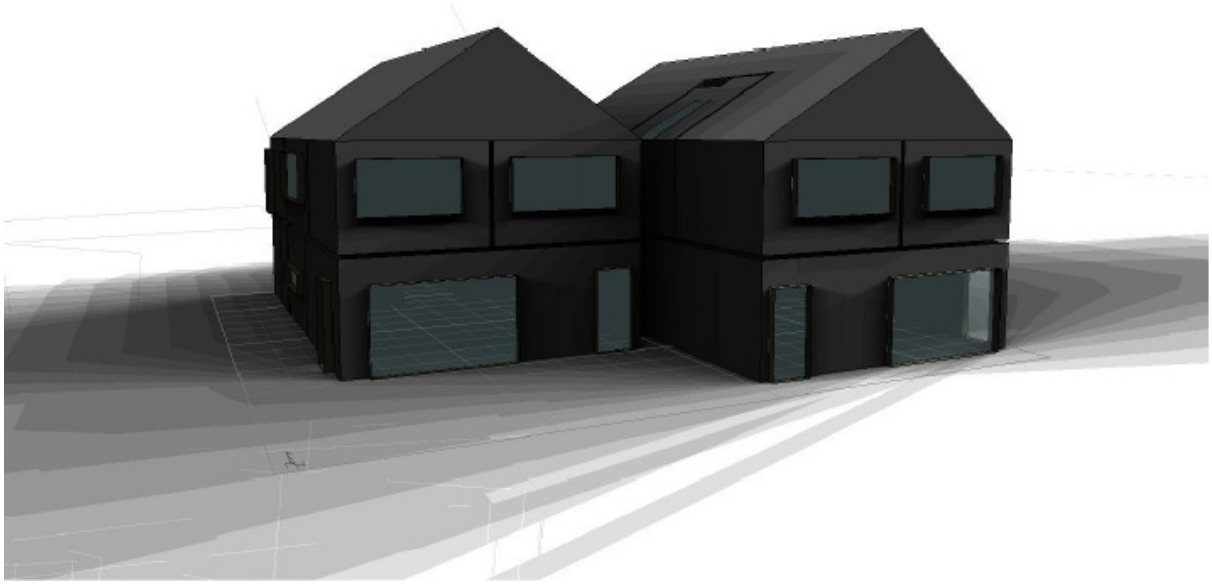
The number of staff depends on the extent of client needs for auxiliary assistance; however, there is a requirement of at least 1 social worker for every 25 clients.

Appendix VI

Energy consumption techniques and calculations for project buildings

All project buildings have high quality insulation, the implemented solar panels for water heating purposes and the air-water heating pumps and ventilation systems with heat recovery. The aim is to produce the buildings with low energy consumption - < 40 kw/m² per year.

To achieve the low energy consumption in building it is necessary to analyze the energy need, possible techniques and make certain calculations as shown below:



Productivity of the solar heating system of a building unit at Pihlaka 1b in accordance with the shading impact of the trees located on the property and surrounding buildings

Calculations of the productivity of the solar heating system are based on Estonian climate data and dynamic computation software POLYSUN. The shading impact of the trees located on the property and surrounding buildings was estimated using the simulation software ECOTECT.

Reduction of radiation as a result of natural or artificial objects has been highlighted in connection with the request of the architect to place the solar collectors on the roof, which limits the choice of placing collectors on the roof to areas facing east and west.

Since in Estonian latitudes most of the solar radiation falls on collectors facing west, a detailed estimation has been made regarding the shade falling on solar collectors placed on roof areas facing west, along with the percentage of the decline in system productivity.

The results are provided in the table below, and productivity graphs are presented as drawings.

In addition, there are drawings on the analysis of shading and recommended placement of collectors on the roof.

Table: calculation of productivity of solar heating systems, considering the shades of surrounding buildings and natural items

Building: according to the basic building design documentation	System 1	System 2
Collectors (pcs), collector surface 2.5 m2	4	5
Gradient (according to the roof gradient)	35 degrees	35 degrees
Volume of battery tank (l)	500	500
Orientation of collectors	South	West
Reduction of solar radiation on collectors from shade of sites (%)	18%	18%
Building's heat energy requirement (kWh/a)	6518	6518
Energy cost on hot consumer water (kWh/a)	3424	3424
Energy produced by the system (kWh/a)	2768	3253
Share of solar heating system in the heat energy need (%)	18.3	21.3
Share of solar heating energy in the energy need of hot consumer water (%)	30.5	35.1
Share of solar heating system in the total energy need (%)	24.1	28

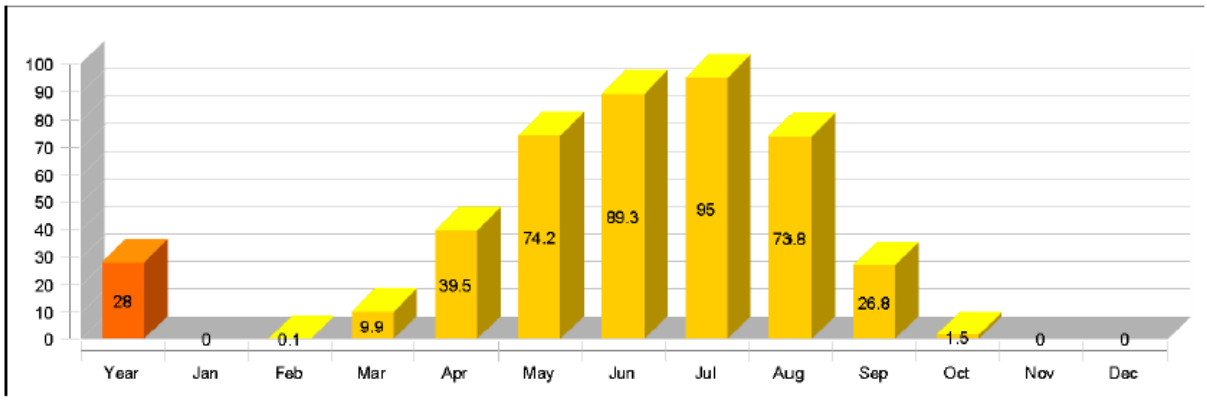


Figure: System 1, share of energy produced by solar heating system in the total energy need by months; with collectors facing west. The impact of items shading the property is considered.

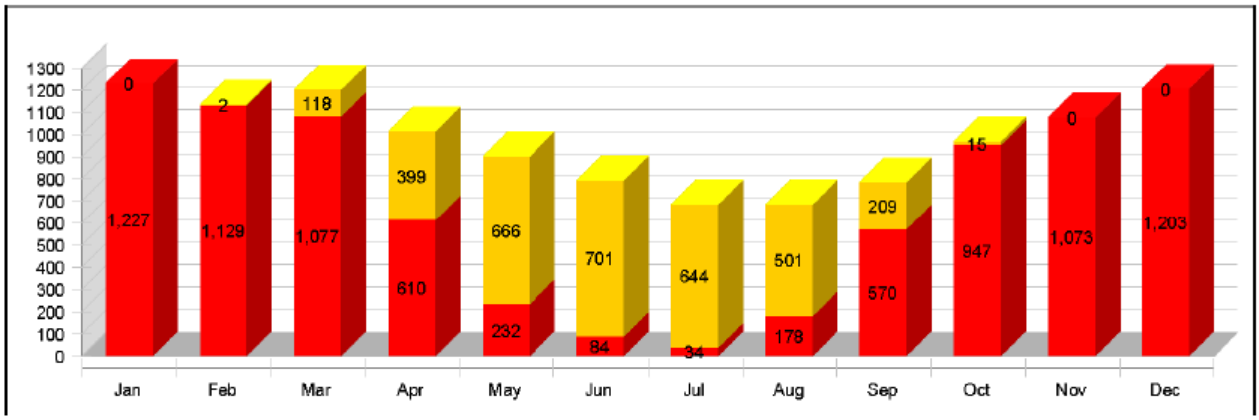


Figure: System 1, energy produced by solar heating system and needed additional energy by months; with collectors facing due west. The impact of items shading the property is considered.

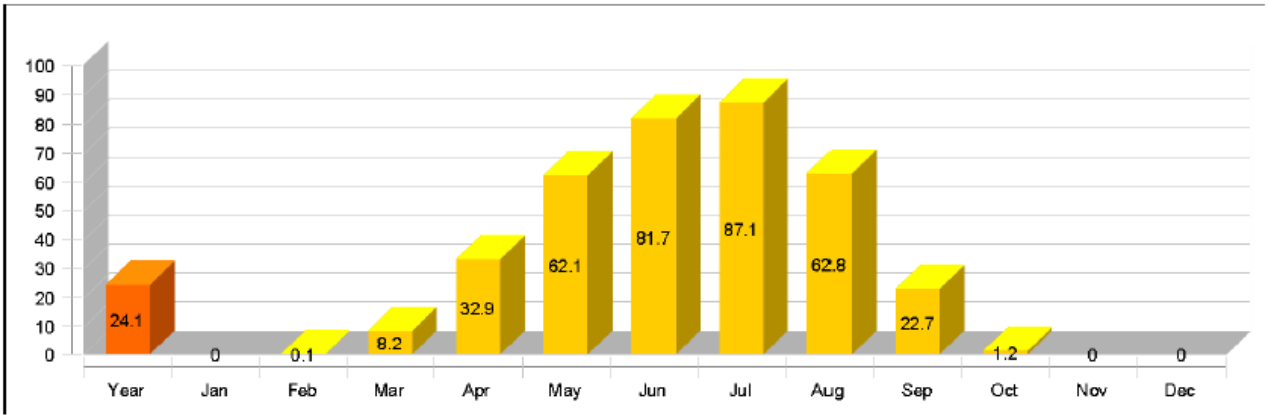


Figure: System 2, share of energy produced by solar heating system in the total energy need by months; with collectors facing west. The impact of items shading the property is considered.

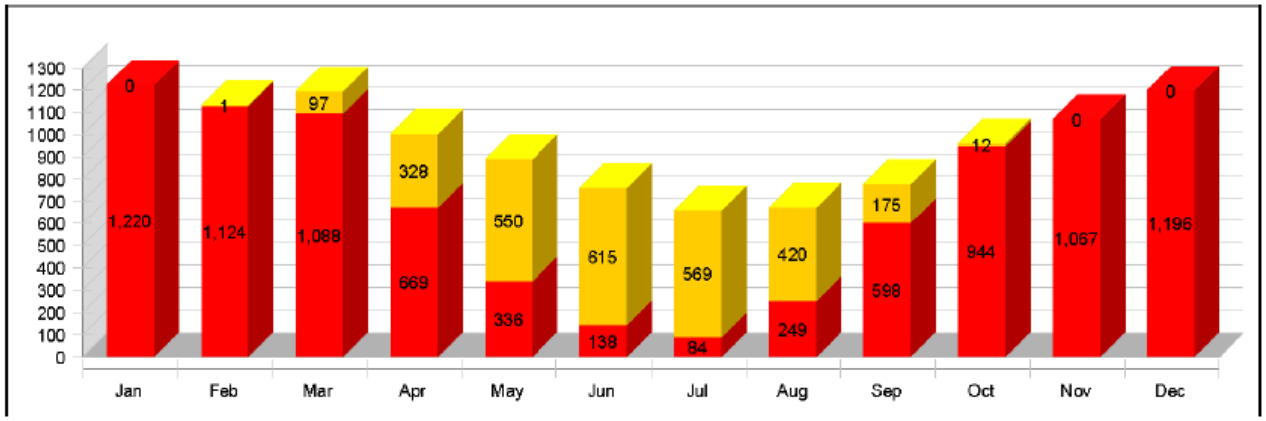


Figure: System 2, energy produced by solar heating system and needed additional energy by months; with collectors facing due west. The impact of items shading the property is considered.

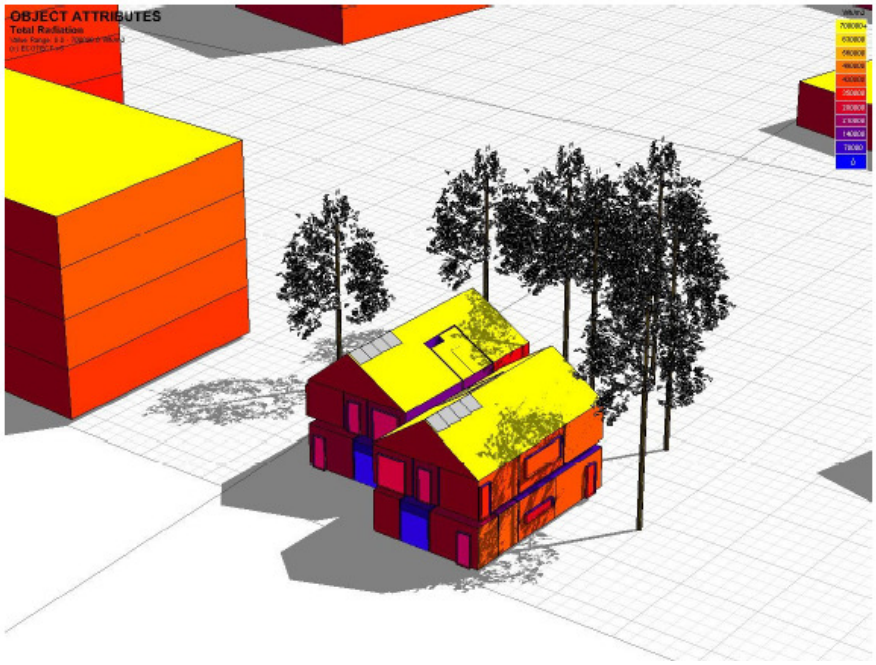


Figure: location of collectors on building roofs (least shading).

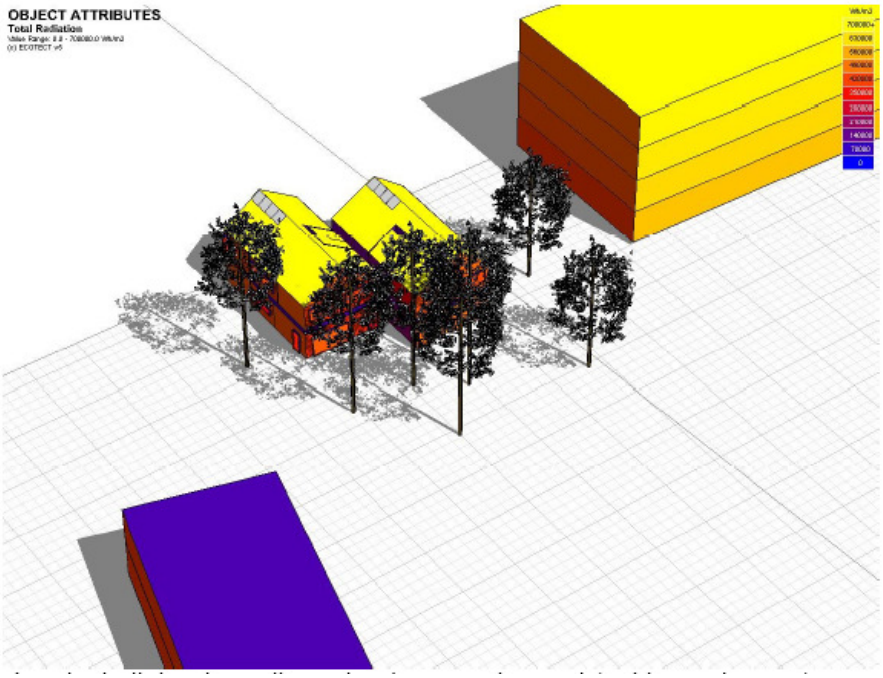


Figure: location of collectors on building roofs (least shading).

Energy simulation report of the basic building design documentation of Pihlaka 1b

The objective of this work is to assess the building's heat energy need on the basis of the architectural draft project.

The energy need was calculated using PHPP2007 software (standard EVS-EN 832).

The calculations are based on the basic building design documentation prepared by CELANDER Projekt OÜ.

The impact of auxiliary buildings, support pillars of extruding modules and natural sites have not been considered in the calculations. Account has been taken of the shading impact on specific windows as a result of the building's own geometry.

Calculations of the building's useful floor area are based on the specific method prescribed by the standard that regulates energy calculations. Therefore, the floor areas provided in the building design and calculations may differ to a certain extent. Floor areas used in calculations are always more conservative.

Building's energy balance by the submitted building basic design documentation and boundary structures

Building:

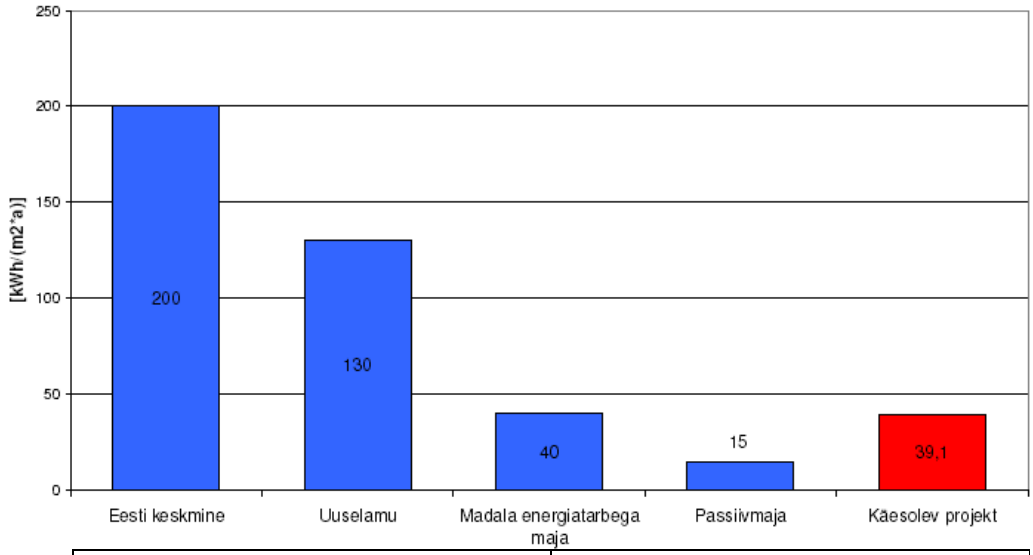
Useful floor area	312.3 m2
Volume	869.0 m3
Number of people	14
Heat emission of people and electric equipment	2.1 W/m2
Main facade	South
Ventilations' heat recovery	83%
Air retention in accordance with EVS-EN 13829:2000	**n50=0.8 1/h** (actual value is measured on site in accordance with the standard EVS-EN 13829:2000)
Ventilation	0.4 1/h
Line cold bridges	Ψ = 0.030 W/(m*K)
Energy need for heating	**39.3 kWh/(m2 a)**
or	**12 226 kWh/ a**

Wall structure and materials:

Boundary	**Material**	**Width mm**	**U-figure W/(m K)**
Outer wall VS-1	Gypsum board	26	0.111
	Rockwool	100	
	Rockwool	250	
	Windbreaker	20	
Ceiling P1			0.088
	Gypsum board	13	
	Rockwool	300	
	Rockwool	100	
	Plywood	15	
Floor on earth			0.223
	Concrete	80	
	EPS	150	
Roof gradient K1			0.096
	Gypsum board	26	
	Rockwool	150	
	Rockwool	200	
	Windbreaker	20	

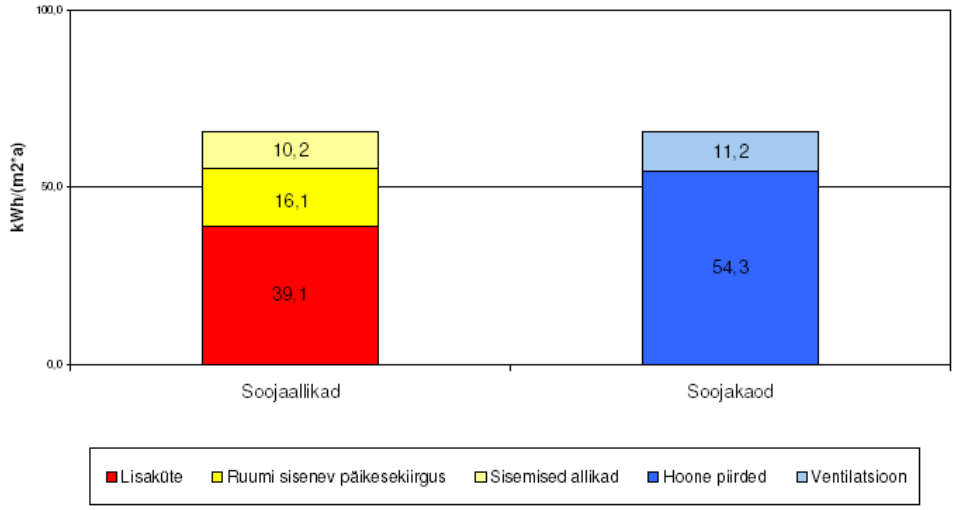
Windows			
	Glazed package	**g = 0.51**	**U = 0.74 W/(m K)**
	Frame		U= 1.1 W/(m K)

Building's energy need (kWh (m2*a)/ Figure Typical energy need of Estonian buildings and the current building design documentation.



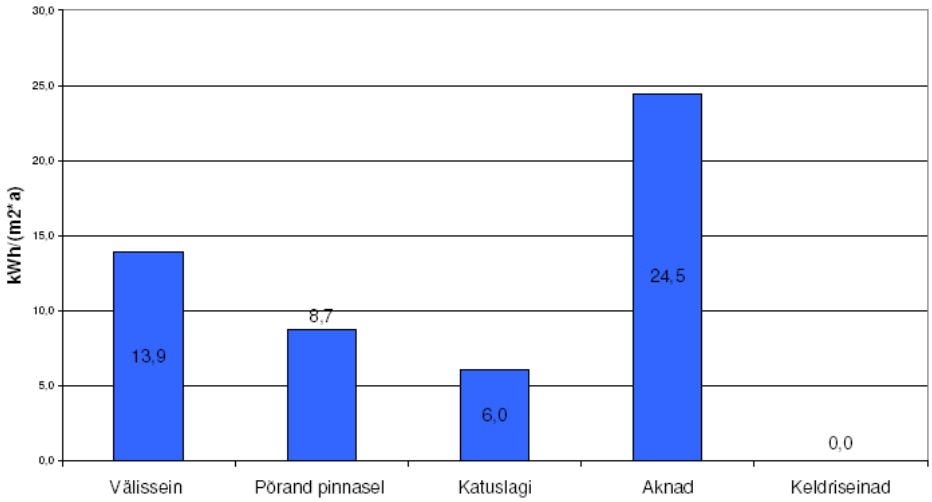
Eesti keskmine	Estonia's average
Uuselamu	New residential building
Madala energiatarbega maja	Low energy consumption house
Passiivmaja	Passive house
Käesolev projekt	This building design

Building's heat balance/ Figure Building's heat balance



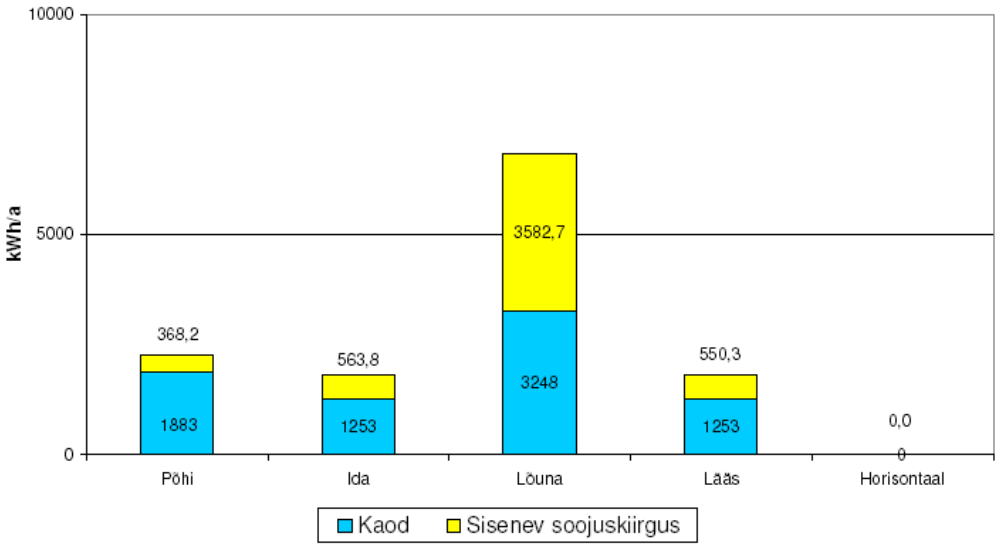
Soojaallikad	Heat sources
Soojakaod	Heat losses
Lisaküte	Additional heating
Ruumi sisenev päikesekiirgus	Incoming solar radiation
Sisemised allikad	Internal sources
Hoone piirded	Building's boundaries
Ventilatsioon	Ventilation

Heat losses through the building's outer boundaries (kWh/(m2*a))/ Heat losses by outer boundaries



Välissein	Outer wall
Põrand pinnasel	Floor on earth
Katuslagi	Ceiling
Aknad	Windows
Keldriseinad	Basement walls

Heat balance of windows by directions/ Balance of windows



Põhi	North
Ida	East
Lõuna	South
Lääs	West
Horisontaal	Horizontal

Kaod	Losses
Sisenev soojuskiirgus	Incoming heat radiation

Report on the energy simulation of variant calculations of Pihlaka 1b

The energy need was calculated using PHPP2007 software (standard EVS-EN 832).

The calculations are based on the basic building design documentation prepared by CELANDER Projekt OÜ.

The impact of auxiliary buildings, support pillars of extruding modules and natural sites have not been considered in calculations. Account has been taken of the shading impact on specific windows as a result of the building's own geometry.

Calculations of the building's useful floor area are based on the specific method prescribed by the standard that regulates energy calculations. Therefore, the floor areas provided in the building design and calculations may differ to a certain extent. Floor areas used in calculations are always more conservative.

1. Corrected option 1

Building:

Useful floor area	312.3 m2
Volume	869.0 m3
Number of people	14
Heat emission of people and electric equipment	2.1 W/m2
Main facade	South
Ventilations' heat recovery	**92%**
Air retention in accordance with EVS-EN 13829:2000	n50=0.8 1/h (actual value is measured on site in accordance with the standard EVS-EN 13829:2000)
Ventilation	0.4 1/h
Line cold bridges	Ψ = 0.030 W/(m*K)
Energy need for heating	**28.8 kWh/(m2 a)**
or	**8879 kWh/ a**
Heat burden (calculated at ambient temperature -20 degrees Celsius)	**6275 kWh/ a**
or	**20.1 W/m2**

Wall structure and materials:

Boundary	**Material**	**Width mm**	**U-figure W/(m K)**
Outer wall VS-1	Gypsum board	26	**0.096**
	Rockwool	**100**	
	Rockwool	250	
	Windbreaker	20	
Ceiling P1			0.088
	Gypsum board	13	
	Rockwool	300	
	Rockwool	100	
	Plywood	15	
Floor on earth			**0.169**
	Concrete	80	
	EPS	**200**	
Roof gradient K1			0.096
	Gypsum board	26	
	Rockwool	150	
	Rockwool	200	

	Windbreaker	20	
Windows			
	Glazed package	**g = 0.51**	**U = 0.74 W/(m K)**
	Frame		U= 0.71 W/(m K) (i.e., REHAU Clima design)

2. Corrected option 2

Building:

Useful floor area	312.3 m2
Volume	869.0 m3
Number of people	14
Heat emission of people and electric equipment	2.1 W/m2
Main facade	South
Ventilations' heat recovery	**92%**
Air retention in accordance with EVS-EN 13829:2000	**n50=0.6 1/h** (actual value is measured on site in accordance with the standard EVS-EN 13829:2000)
Ventilation	0.4 1/h
Line cold bridges	Ψ = 0.01 W/(m*K)
Energy need for heating	**24.1 kWh/(m2 a)**
or	**7340 kWh/ a**
Heat burden (calculated at ambient temperature -20 degrees Celsius)	**5528 kWh/ a**
or	**17.17W/m2**

Wall structure and materials:

Boundary	**Material**	**Width mm**	**U-figure W/(m K)**
Outer wall VS-1			**0.085**
	Gypsum board	26	
	Rockwool	**150**	
	Rockwool	250	
	Windbreaker	20	
Ceiling P1			**0.078**
	Gypsum board	13	
	Rockwool	300	
	Rockwool	**150**	

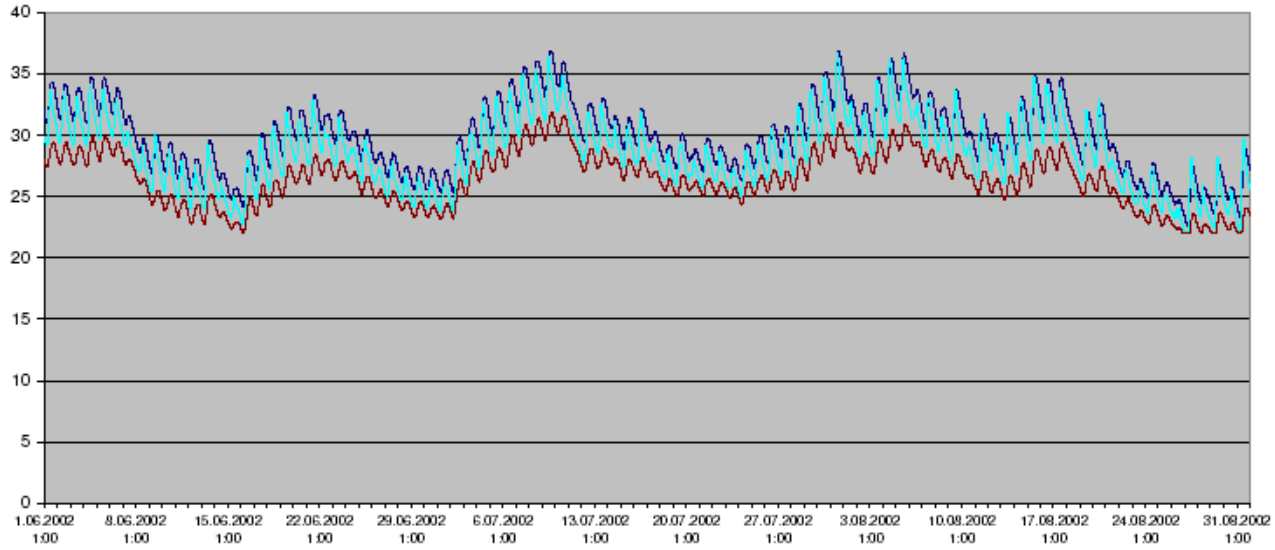
	Plywood	15	
Floor on earth			**0.136**
	Concrete	80	
	EPS	**250**	
Roof gradient K1			**0.085**
	Gypsum board	26	
	Rockwool	**200**	
	Rockwool	200	
	Windbreaker	20	
Windows			
	Glazed package	**g = 0.51**	**U = 0.74 W/(m K)**
	Frame		U= 0.71 W/(m K) (i.e., REHAU Clima design)

3. Impact of individual decisions on the building's heat energy need

Variable component	**Value**	**Building's achievable heat energy need (kWh/a)**	**Building's achievable heat burden (W) calculated at ambient temperature of -20 degrees Celsius**
Initial situation (in accordance with the details of the submitted basic building design documentation, 29 September 2009)		**12 226**	**7200**
Heat recovery efficiency of the ventilation device (momentary, %)	88%	11 851	7007
	92%	11 426	6853
Outer wall	+5 cm insulation	11 812	6993
	+10 cm insulation	11 375	6835
	+15 cm insulation	11 031	6710
Floor on earth	+5 cm insulation	11 890	7984
	+10 cm insulation	11 562	7005
Window frame	0.9 W/m*K	12 142	7097

	0.8 W/m*K	11 891	6947
	0.74 W/m*K	10 839	6935
n50	0.7 1/h	12 179	7014
	0.6 1/h	11 973	6828

4. Summer room temperatures in the rooms that have overheating risk



--- Air temperature (°C) the children's room (14 m2) on the first floor of the building, on the right, with uncovered windows
--- Air temperature (°C) with internal window blinds, children's room (14 m2) on the first floor of the building, on the right
--- Air temperature (°C) with outer shades, children's room (14 m2) on the first floor of the building, on the right