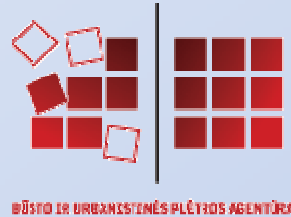


SIMPER®



Recommendation plan for the refurbishment (modernisation) of multi-apartment buildings

Contractor

Housing and Urban Development Agency

Organiser

UAB „SIMPER“

Speaker

UAB „SIMPER“

Director Tomas Dimavičius

2011 m.

INTRODUCTION

Housing and Urban Development Agency is implementing project No. VP3-1.1-AM-02-V-01-001, called "Promoting the refurbishment of multi-apartment buildings, Phase No. 1" funded by European Union funds and Lithuanian state budget. Recommendation plan for the refurbishment (modernisation) of multi-apartment buildings is one of the eligible activities of the incentive.

Purpose of recommendation plan - to identify the types of multi-apartment buildings, where the refurbishment (modernisation) is the most influential to the reduction of energy costs, environmental protection, and the quality of life.

MULTI-APARTMENT BUILDINGS CLASSIFIED ACCORDING TO

- construction year
- number of floors
- the external wall structural materials
- energy consumption for heating
- the typical project serial numbers

MULTI-APARTMENT BUILDINGS CLASSIFIED ACCORDING TO CONSTRUCTION YEAR

Period (years)	(%)
before 1918	3
1918 - 1940	11
1941 - 1950	4
1951 - 1960	8
1961 - 1970	19
1971 - 1981	25
1981 - 1990	25
1991 - 1996	5

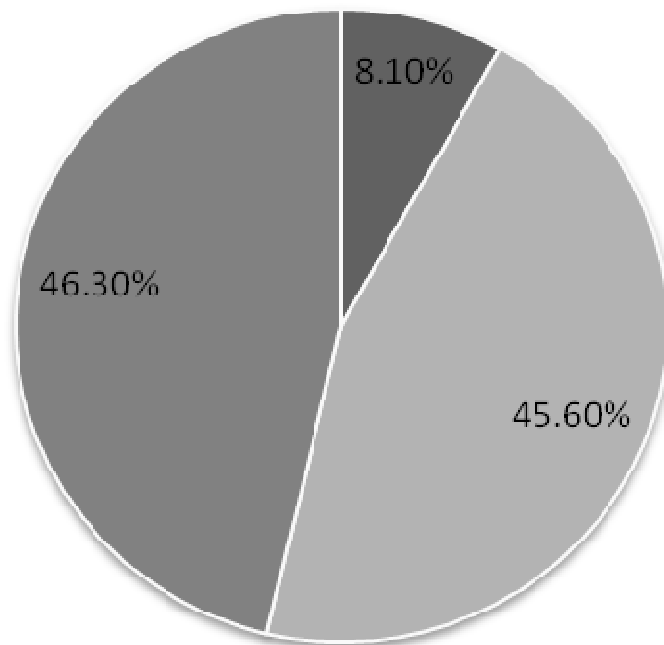
before 1940 – 10 051 multi-apartment building
 1941 - 1960 – 3 688 multi-apartment buildings
 1961 - 1993 – 20 507 multi-apartment buildings
In total: before 1993 there were built 34 246 multi-apartment buildings

Period	Years	Description
I	1900 – 1918	In the first two periods houses were built in bricks and wooden beams.
II	1918 – 1940	
III	1941 – 1960	In the third period there were only brick houses.
IV	1961 – 1990	The fourth period is characterised by mass industrial production of multi-apartment buildings homes with panel elements. The period marks the time when there was particularly rapid urbanisation process, urban growth industry, increase in urban population.
V	1991 – 2001	The last period – multi-apartment building construction numbness, economic stagnation, a significant decrease in volumes.

MULTI-APARTMENT BUILDINGS CLASSIFIED ACCORDING TO NUMBER OF FLOORS

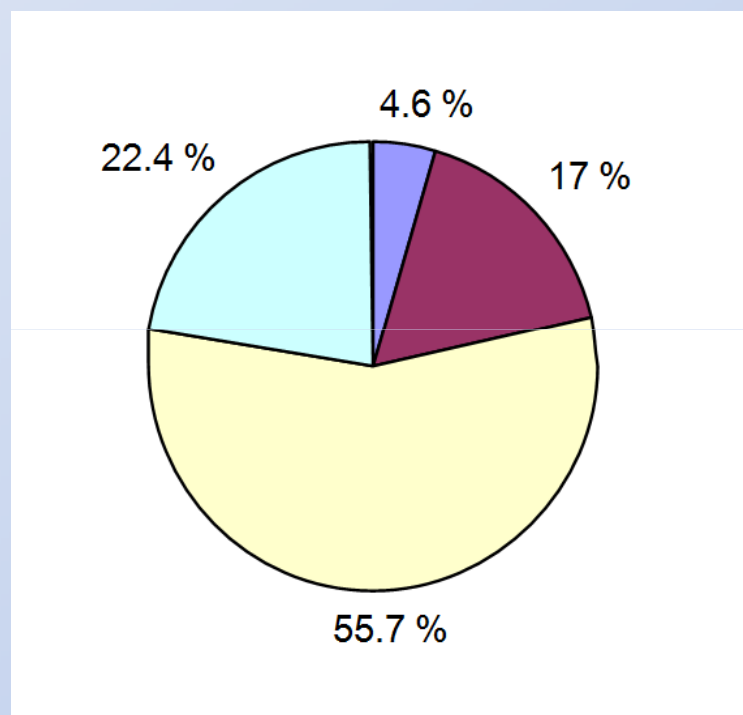
Number of floors	Part of the buildings according to number of floors (%)						
	1965	1970	1975	1985	1990	1995	1998
1 - 2	6	10	14	17	10	41	54
3 - 4	12	12	10	11	15	8	12
5	79	71	55	54	50	30	24
6 - 8	3	5	17	2	2	2	1
>9	-	2	4	22	25	19	9

MULTI-APARTMENT BUILDINGS CLASSIFIED ACCORDING TO THE EXTERNAL WALL STRUCTURAL MATERIALS



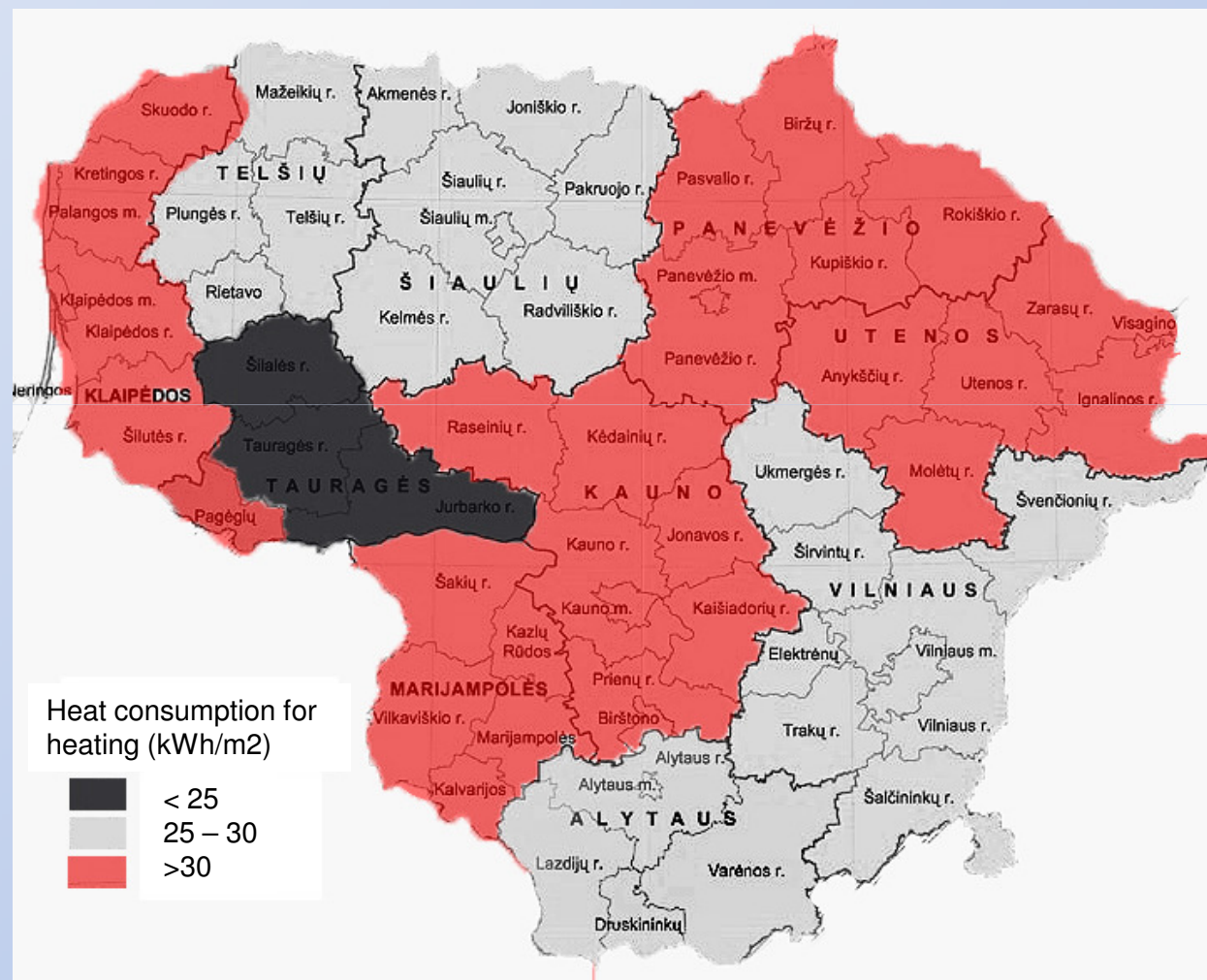
8,10 % - wooden (log, frame) construction
45,60 % - brick wall construction
46,30 % - panel construction

MULTI-APARTMENT BUILDINGS CLASSIFIED ACCORDING TO ENERGY CONSUMPTION FOR HEATING



- 4,6 % - newly constructed and economical buildings
(energy consumption for the heating - 9 kWh/m²)
- 17,0 % - buildings with better energy performance
(energy consumption for the heating - 19 kWh/m²)
- 22,4 % - buildings with a very poor thermal insulation amounts
(energy consumption for the heating - 40 kWh/m²)
- 55,7 % - old and not refurbished buildings
(energy consumption for the heating - 27 kWh/m²)

ENERGY CONSUMPTION FOR HEATING IN LITHUANIA BY REGIONS



MULTI-APARTMENT BUILDINGS CLASSIFIED ACCORDING TO THE TYPICAL PROJECT SERIAL NUMBERS

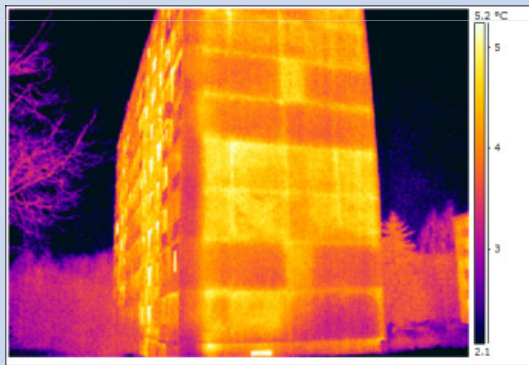
There are 4 main series of multi-apartment buildings in Lithuania:

Number of a series type	The construction of external walls
1-464	panel construction
120	panel construction
1-318	brick wall construction
1-117	brick wall construction

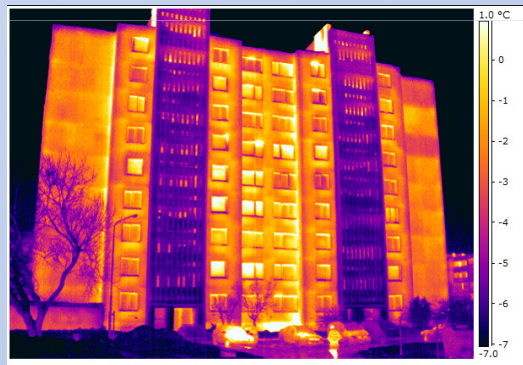
According to these types, the multi-apartment buildings were constructed in all Lithuania. Each Type of the project had several modifications:

Number of a series type	Modifications
1-464	1-464LI-51/1, 1-464LI-A16(P/L), 1-464AŠ-17LT, 1-464LI-53/1, 1-464LI-A53, etc.
120	111-120B-04/1, 111-120B-06/1, 111-120B-13/1, 111-120B-14/1, 120V-021/1, 120-038.13.86, etc.
1-318	1-318-12, 1-318-17, 1-318-18, 1-318-19, 1-318-20, 1-318-32P, 1-318-33, 1-318-33 P, 1-318-35/66, 1-318-51, 1-318-52/2, 1-318-91, etc.
1-117	117-03, 117-32, 117-52, 117-54, 114-117-30, etc.

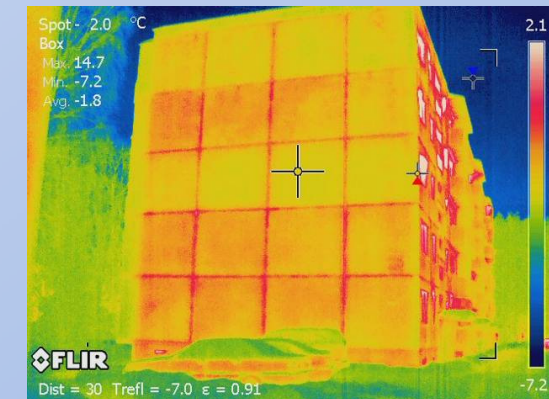
NUMBER OF A SERIES TYPE 1-464



*Kovo 11-osios g. 98, Kaunas
1-464LI-51/1*

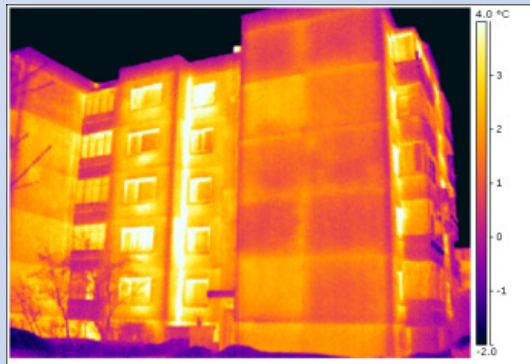


*Gedimino g. 37, Tauragė
1-464LI-A53*



*Čiurlionio g. 68, Druskininkai
1-464AŠ-17LT*

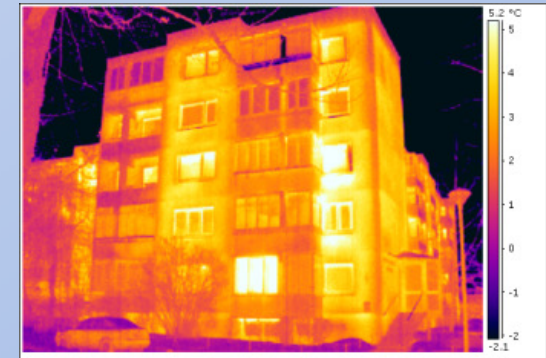
NUMBER OF A SERIES TYPE 120



*Taikos g. 120, Vilnius
11-120B-06/1*



*Ukmergės g. 228, Vilnius
111-120B-14/1*

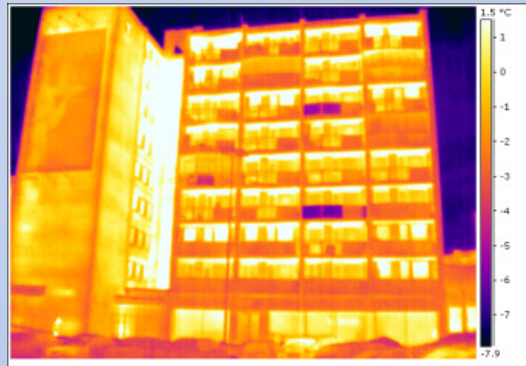


*Žirmūnų g. 62, Vilnius
111-120B-13/1*

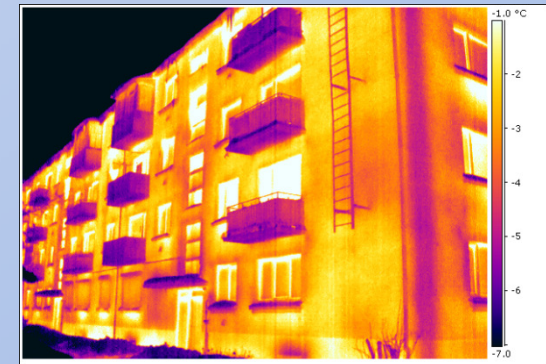
NUMBER OF A SERIES TYPE 1-318



*Antakalnio g. 76, Vilnius
1-318-19*

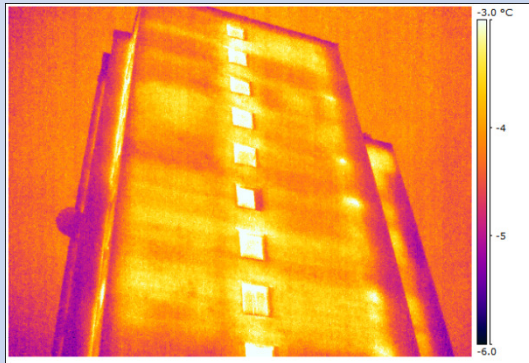


*Taikos pr. 43, Kaunas
1-318-35/66*



*Vasario 16-osios g. 5 Tauragė
1-318-18*

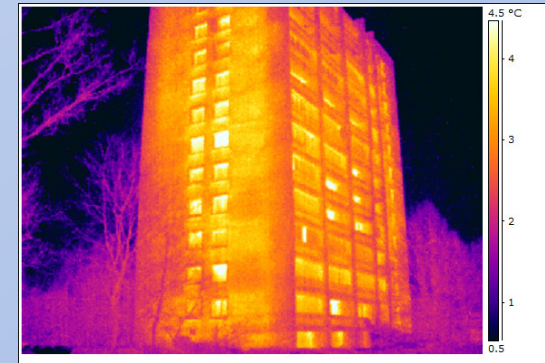
NUMBER OF A SERIES TYPE 1-117



*Darius ir Girėno g. 19 Panevėžys
114-117-30*



*Lietavos g. 1, Jonav4
117-32*



*Partizanų g. 200, Kaunas
117-54*

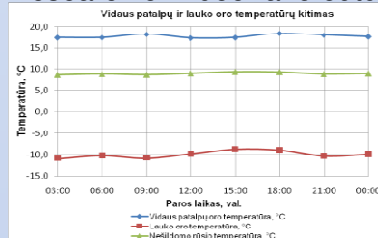
RESEARCH OF MULTI APARTMENT BUILDINGS

Recommendation plan for the refurbishment (modernization) of multi-apartment buildings is dressed according to real estate and cadastre data together with physical and visual inspection of the multi-apartment building and photographic material.

Aesthetic, hygienic, technical and energy status of the multi-apartment building is determined. The building partition constructional and wear tests detect ade determined; the actual heat transfer coefficients are made by measurements for individual building components, which influence the highest heat loss calculations; least one day of indoor and outdoor air temperature changes over time during are recorded, and at least one day a relative humidity in at least three rooms is measured at the same time capturing a falling into the house quantity of heat and etc.

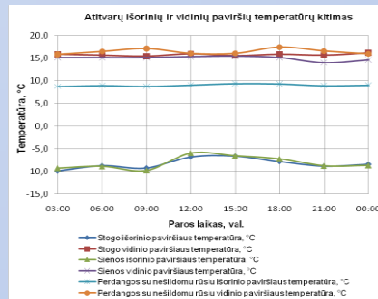
Research of multi apartment buildings:

- Research of indoor and outdoor air temperature



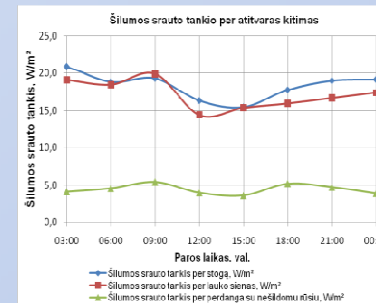
Example: Taikos g. 126, Vilnius

- Research of the walls internal and external surface temperature



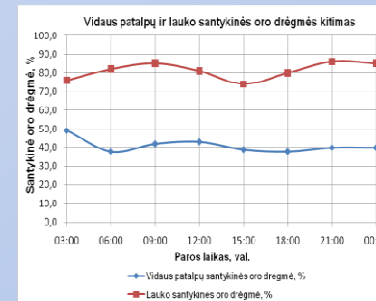
Example: Taikos g. 126, Vilnius

- Research of heat flow through the walls



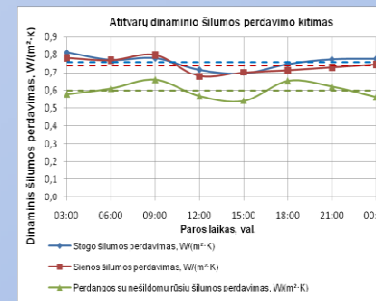
Example: Taikos g. 126, Vilnius

- Research of indoor and outdoor relative humidity changes



Example: Taikos g. 126, Vilnius

- Calculation of heat transfer coefficients



Example: Taikos g. 126, Vilnius

$$U_{wall} = 0,74 \text{ W}/(\text{m}^2 \cdot \text{K})$$

$$U_{roof} = 0,76 \text{ W}/(\text{m}^2 \cdot \text{K})$$

$$U_{floor plate} = 0,60 \text{ W}/(\text{m}^2 \cdot \text{K})$$

PHYSICAL AND TECHNICAL EVALUATION OF MULTI-APARTMENT BUILDINGS

Physical and technical condition of multi-apartment buildings

Inspection item	State description
Walls	Reinforced concrete slabs from the inside are plastered, painted on the outside. Between the slabs plaster is of a crumbled, present finishing are poor - paint peel off, plaster at the connection with other building elements is crumbled. The existing wall does not meet the thermal requirements of STR 2.01.01 (6): 2008 "Essential requirements for the building. Energy saving and heat retention, STR 2.05.01:2005 "Thermal technology of building elements" requirements.
Roof	Matched roofs are covered with bitumen roll coating. Poor condition of the roof structure over it cause serious heat loss. Roof coating, waterproofing leak at the sites. The existing roof does not meet the thermal properties of STR 2.01.01 (6): 2008 "Essential requirements for the building. Energy saving and heat retention", STR 2.05.01:2005 "Thermal technology of building elements" requirements.
Windows and doors to the balcony	Existing replaced windows and balcony doors are in accordance with STR 2.01.01 (6): 2008 "Essential requirements for the building. Energy saving and heat retention" and STR 2.05.01:2005 "Thermal technology of building elements" requirements, their condition is good. Remaining unchanged windows and balcony doors – wooden, paired. The wooden window frames and balcony doors are roted, in many places frames are deformed, glass cracks within deformed frames. For these violations windows and balcony doors frames are not tight, some cannot be completely shut, cold air circulates in a room. Their thermal properties do not correspond to STR 2.01.01 (6): 2008 "Essential requirements for the building. Energy saving and heat retention", and STR 2.05.01:2005 "Thermal technology of building elements" requirements.
Windows and outside doors in staircase and other common areas	The existing entrance doors are in accordance with STR 2.01.01 (6): 2008 The Essential building requirements. Energy saving and heat preservation" and STR 2.05.01:2005 „Thermal technology of building elements" requirements, their condition is good. Remaining unchanged stairwell windows – wooden, paired. The wooden window frames and balcony doors are roted, in many places frames are deformed, glass cracks within deformed frames. Their thermal properties do not correspond to STR 2.01.01 (6): 2008 "Essential requirements for the building. Energy saving and heat retention, and STR 2.05.01:2005 „Thermal technology of building elements" requirements
Base	Due to atmospheric precipitation and bad slopes in base part, the building results with the spots. Base part of the buildings the paint in places is detached, block the junctions are crumbled, junctions leak and the rain to falls inside. The repair works are necessary with expedient extra insulation from the outside. The current cap does not meet the thermal requirements of STR 2.01.01 (6): 2008 "Essential requirements for the building. Energy saving and heat retention "
Foundation	Within the foundation concrete no deformation, ruptures or significant degradation was observed. Series of concrete slabs around the building are curved, bad gradients. In some places they do not exist, due to this the foundation is damaged, vulnerable base finishing.

ENERGY EFFICIENCY OF MULTI-APARTMENT BUILDINGS

Indicators	Measurement unit	Average amount	
		Existing situation	Planning situation
The actual cost of thermal energy for heating consumption (according to the induction meter readings)	kWh	345 704,3	-
The actual cost of thermal energy for heating consumption (according to the induction meter readings)	kWh/m ² heated area /year	139,83	-
Computational costs of thermal energy for heating consumption (when indoor temperature is 20 °C)	kWh/m ² /per year	217,05	92,97
Computational costs of thermal energy for heating savings	kWh/m ² percents	-	56,74

Average amount is calculate using 30 different types of typical multi-apartment building projects. For research of multi-apartment buildings was taken 3 multi-apartment buildings of same type of typical multi-apartment building project (in total: 90 multi-apartment buildings). Each multi-apartment building was selected by statistic base of most actual cost of thermal energy for heating consumption.

THANK YOU FOR YOUR ATTENTION