

WP 4 Energy Supply

Concept for EER of buildings and modernization of the supply infrastructure in the Jelgava TA

SUMMARY

April, 2011



City of Jelgava



Table of Contents

Jelgava Center building types, the project description and typical defects	4
Typical defects of 103 rd and 104 th series five-story apartment buildings	5
Common technical depreciation of 103 rd and 104 th series five-story residential buildings	8
Proposals.....	8
Typical defects of the 316 th and 318 th series five-story apartment buildings.....	9
Proposals.....	12
Jelgava Center building heat consumption, heat saving potential	12
Renovation construction costs assessment profile	13
Renovation construction costs of building Model calculations	13
Ways of apartment building energy-efficient renovation and funding attraction	14
Benefits of the Renovation (Study).....	14
Imprint	18
ANNEX	19

The main volume up to 75% of multi-apartment buildings in Latvia are serial standard type project living houses constructed during the period of time 1946-1993. Average standardized heating energy consumption of these multi-apartment buildings is 166 kWh/m² per year.

Results of multi-apartment building energy efficient renovation projects, including rational and efficient insulation of external building structures, change of wooden window frames, change of heating system to horizontal distribution system for each apartment and efficient arrangement of ventilation - recuperation system, provided in European countries and Latvia show that it is possible to reduce heating energy consumption by 40-60%.

The Republic of Latvia accepted the Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings which determines increasing energy efficiency to comply with the Kyoto Protocol on reducing emissions of CO₂ which causes greenhouse effect. During the period of time from the beginning of 2008 till June, 2010 in the Republic of Latvia there are adopted Laws on state and EU Funds support to realize energy efficient renovation of multi-apartment buildings, as well as provided several activities o promote renovation projects, however the realization of such projects is not mass practice.

The traditional way of realization of renovation projects of multi-apartment buildings should be changed - owners of the apartments should be released from the organization of procedures of professionally qualified renovation construction process and raising funds. There should be developed the new service - renovation product - preparation of the construction process documentation for particular multi-apartment building: energy audit report, conclusion of technical inspection, technical design, estimate of construction works, renovation payment volume and schedule, draft contract of renovation realization including defined obligation of both sides.

Content of the study “Concept of energy efficiency increase of multi-storey buildings” complies with the objective - to explain to the owners of the apartments of the buildings the structure of the renovation process and the potential benefits from the renovation process, so that by receiving the service - renovation product offer - owners of the apartments could be able to make justified decision on renovation of the building.

Characteristics of the main operational and construction defects of the standard type buildings of the Jelgava city center is provided in the Chapter 1 of the justification of the Concept of energy efficiency increase in Jelgava city center buildings.

In the Chapter 2 the analysis of heating energy consumption by the type of the building for the period of time from 2006 to 2009 is provided. Buildings within the construction series are grouped by the heating energy consumption to one square meter of heating space of the building.

In the Chapter 3 the construction works of energy efficient reconstruction of building types for two renovation programs are listed, excluding or including air circulation organization in apartments and heating energy recovery using recuperation.

In the Chapter 4 is given comparison of economy of heating energy and costs of financially advantageous renovation, volume of construction costs according to renovation programs are simulated.

In the Chapter 5 is given the overview of fund raising methods for renovation process, as well as provided analysis of decision making process of the owners of the apartments according to existing legislation of the Republic of Latvia.

Existing experience and problems regarding complex energy efficient renovation of multi-apartment buildings is given in the Chapter 6. Analysis is proved by monitoring reports of renovated buildings, renovation of which are completed before 2008. It is pointed out that no one of the finished renovation projects includes improved air circulation and microclimate of premises.

In the Chapter 7 the study of necessity to improve microclimate of the premises is given.

Chapter 8 contains the recommendations for practical renovation realization in Jelgava city. In the result of building renovation in Jelgava city the significant heating energy economy should be reached, attractive architectural image of the buildings of city center should be created, new work places should be created and skills of renovation construction works should be developed.

Jelgava Center building types, the project description and typical defects

Downtown area 103rd and 104th series of buildings built in different years after the modified 1976 model projects that by their very constructive solution are not significantly different



103rd serie



104th serie

Typical defects of 103rd and 104th series five-story apartment buildings

Building entrance nodes were established separately from the foundation, they pin and cause cracks in building walls:



Heating, water supply and sewerage systems occupied in the basement have not been changed and is physically and morally outdated:



Red trim brick walls bricks found in areas where moisture and the influence of the island started to be degraded:



The ends of surveyed cross (load bearing) walls based on metal plates, which does not pass the weight of wall and are concaved, and in result of deformation there are formations of cracks in walls:



Slabs due to incorrect mounting plates are passed vertically several centimeters within:



Roof covering of ceiling panels above the entrance door is not timely replaced, therefore, started to rust reinforcement and plaster finish:



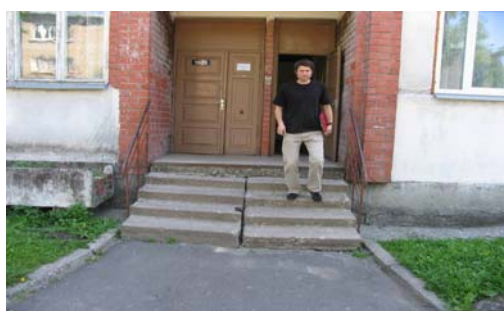
On the roof surface is not formed properly fall to the drainage traps, formed pools, which promote the ingress of water below the surface ruberoid :



Rainwater drainage risers placed in the staircase and covered by a brick wall, those are difficult to correct if necessary :



Most of the buildings windows and doors have not been changed, hence the large heat loss:



Common technical depreciation of 103rd and 104th series five-story residential buildings

Depreciation of building foundation and the base	30%
Depreciation of bearing walls and columns beams	30%
Depreciation of basement, mezzanine, attic roof	30%
Depreciation of roof elements	40%
Depreciation of heating, water supply and sewerage systems	100%
Depreciation of power supply systems and installation	100%
Depreciation of building common technical	50%

Table 1. Thermal parameters of the 103rd and 104th series buildings outer walls

Serie	Construction Year from	Before energy-efficient renovation		After energy-efficient renovation		
		Outer walls thermal resistance R, m ² K/W	Outer walls heat permeability factor U, W/(m ² ×K)	Outer walls thermal resistance R, m ² K/W	Outer walls heat permeability factor U, W/(m ² ×K)	U decrease, times
103	1969	0,95	1,05	3,85	0,26	~4,0
104		0,61	1,64	3,33	0,30	~5,5

Proposals

- Must be made reinstatement of input nodes roofing roof covering, the rust must be cleaned from the reinforcement and a new mortar coating covered, providing the rain water drainage;
- To prolong the service life of buildings, in addition to the buildings surveyed cross (load bearing) walls, divide, they must be strengthened with metal constringers;
- Brick walls and wall panels must be insulated;
- Building a fifth-floor insulation above the ceiling or roof insulation must be installed;
- Plinth and basement floors must be insulated;
- The utilities systems and installations must be replaced;
- Wooden windows must be replaced to double-glazed windows and doors - to solid construction doors.

316th and 318th series five-storey residential houses were built after the Latvian model project, which was based on the project of the Lithuanian Building Committee "Pilsetprojekts". 316th and 318th series residential houses are built in different years after the modified project, which is not significantly different from a constructive solution, except roof: 316th series homes - combined roof, but the 318th - gable roof design.



318th serie

Typical defects of the 316th and 318th series five-story apartment buildings

A defective rain water drainage system. The concrete edging and backing of a building are damaged.



Heating, water and sewage pipelines have not been changed since the building was placed in service.



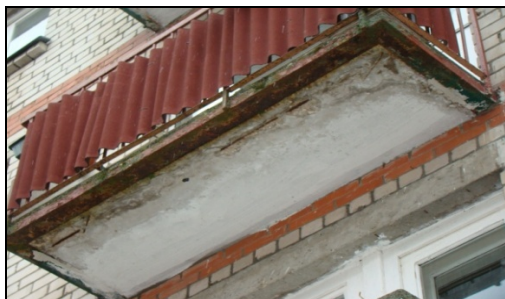
There are cracks in brick walls.



Icicles testify for insufficient heat insulation on the top floor covering (attic floor).



Balcony load-bearing concrete slabs are nipped into masonry external walls. Plates embedded along the perimeter of the metal frame because of an external atmospheric exposure is rusty - preventive painting not extant, there are damage of bearing reinforcement



Roof lathing and assistant rafters damaged at the duct outlet on the roof.

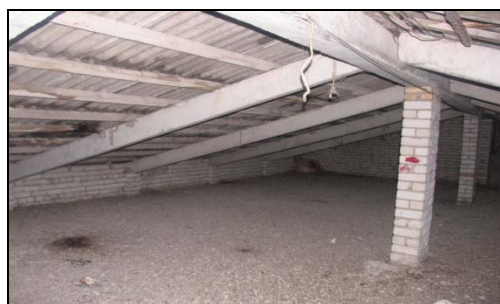


Table 2. Thermal parameters of the 316th and 318th series buildings outer walls

Series	Construction Year from	Before energy-efficient renovation		After energy-efficient renovation		
		Outer walls thermal resistance R, m ² K/W	Outer walls heat permeability factor U, W/(m ² ×K)	Outer walls thermal resistance R, m ² K/W	Outer walls heat permeability factor U, W/(m ² ×K)	U decrease, times
318/ 316	1969	0,76	1,32	3,48	0,29	-4,6

Proposals

Entry nodes must be complex renovated, providing enough density of street doors and proper rain water drainage, roof slab reinforcement must be cleaned of corrosion and new mortar coating covered;

External enclosing buildings - brick wall must be insulated.

Building a fifth-floor insulation above the ceiling or roof insulation must be installed;

Plinth and basement floor must be insulated;

The utilities systems and installations must be exchange;

Wooden windows must be replaced to double-glazed windows and doors - to a solid construction doors;

It is recommended to replace the building and engineering equipment, which is in practice to the retired.

Jelgava Center building heat consumption, heat saving potential

Annex 1 summarizes the estimated average total specific heat consumption and the average specific heat consumption for heating, as well as shown heat saving potential for buildings in the center of Jelgava for two renovation programmes.

Program 1 includes insulation of building envelope, window replacement according to LBN 002-01 requirements, heating renovation work to the thermostat and use measuring devices. In the program are not intended ventilation systems in addition to the works. Depending on the current state of the building and renovation works of quality, heating, heat energy savings can range from 7% to 63%, compared to consumption prior to refurbishment (see Table 3).

Program 2 includes building envelope insulation works in accordance with European Union directives relating to low energy building design and standards that will apply in most European countries by 2020. This program provides for building walls and other structures with insulation Neoporu the guide thickness $b = 25\text{cm}$, window replacement of windows with the heat transfer coefficient of 0.8 to 1.1 W/m²K; heating system renovation analogous for Program 1, the ventilation system in accordance with the LR and EU laws and regulations. In the case of implementation of this program thermal heating savings are of 40% to 79% range, compared to consumption prior to renovation.

Table 3. Jelgava apartment building heat saving potential

Type of building	Average specific heat consumption, kWh/m ² per year	Consumption of heat-saving potential, realizing the 1 st renovation program, %	Consumption of heat-saving potential, realizing the 2 nd renovation program, %
Buildings of individual series	190-75	63-7	79-42
316 serie	135-86	49-19	71-54
318 serie	146-89	52-22	73-55
103 serie	150-81	53-14	73-40
104 serie	98-80	29-13	59-50

Renovation construction costs assessment profile

Renovation construction costs of the series buildings in Jelgava are carried out in accordance with the LBN 501-06 "Procedure for determining construction costs", a separate building costs and time standards used in determining the numerical value of "Public works bidding directory 2010". Construction costs for two above described renovation programs are estimated at 2010 prices.

To realize the apartment building renovation accordingly to Program 2, resulting in up to two times more heat energy savings for heating, construction costs will be about 1.5 times higher than construction costs in the case of Program 1. Such a cost would be between the first and second energy efficiency program in different buildings may be different, because the real costs of construction can be determined accurately only after energy audit review, technical inspection of the opinion of the design and renovation, as well as taking into account the real time actual market prices for construction and building workers' wages. However, to make a choice between one or the other energy efficiency program, it is used.

Renovation construction costs of building Model calculations

Model calculations are made for Jelgava center four series of buildings analyzed above, in order to evaluate the thermal energy-saving and payment balance of renovation of the various renovation schemes and other parameters of the model.

Model calculations are carried out for 20 years of renovation refund period.

Ways of apartment building energy-efficient renovation and funding attraction

As the main financial mechanism in 2010th must be mentioned activity 3.4.4.1. "Apartment House Improvement of Heat Insulation" of the program "Infrastructure and Services", which was launched in February 2009 (Cabinet 2009th of 11th February Regulations. 138). In framework of that the available funding is in amount LVL 44.337 million, what can get in amount of 50% of home renovation eligible expenses, if in result of renovation heat energy saving is at least 20% of the total amount of thermal energy.

Apartment building managers are taking the initiative to organize a house of apartment owners' meetings, informative seminars and clarifying, until receive in accordance with the Latvia's legislation its statutory consent of the owners of apartments in the number of renovation preparatory work (energy audit review, technical inspection and preparation of the opinion of the design) to carry out and submitting an application for EU support.

Eligible expenses of apartment houses renovation include: the construction plan preparation costs, costs of preparation of energy audit report, if it is not done by state or local government assistance, construction supervision costs, the cost of measures to reduce energy consumption in buildings.

Since 2009 it is possible to combine commercial bank loans for renovation of apartment buildings with the support of the European Union (ERDF), thus gaining a considerable reduction of the effective interest rate.

In 2010, loans to renovation in the Latvia, are granted by the Swedbank, Nordea, SEB and DnB Nord Banka.

Depending on the submitted building renovation project quality, as well as the criteria listed in the indicators, the credit rate ranges from 3:00 + EURIBOR to 4.65 + EURIBOR, in exceptional case, if the project is very high quality, the customer has a high degree of reliability and security for a loan repayment timeliness, it is possible to get 2.5 + EURIBOR.

Standard credit agreement also provides the establishment of the security deposit at the credit bank one to three months of payment up to, as well as the loan time is limited - 15 years.

Benefits of the Renovation (Study)

The quality of renovation works is a crucial part of the renovation project implementation to ensure a successful outcome of the project as a whole. In result quality of construction works directly provides saving of heat energy heating. Depending on the apartment building "start" position and quality of the renovation process, the savings of thermal energy can be quite a broad spectrum - from 10% to 70%, depending on the goals initially set, and quality of all the ingredients of the construction project performance.

Heating heat energy saving is just one of the apartment building renovation results, although the best known. Essential benefit of the apartment' buildings renovation is residential premises microclimate improvement.

For optimum indoor air comfort parameters are considered: the temperature ranges from 20oC to 24oC, relative humidity from 40% to 60% and CO2 content of no more than 1,000 ppm (0.1% by volume).

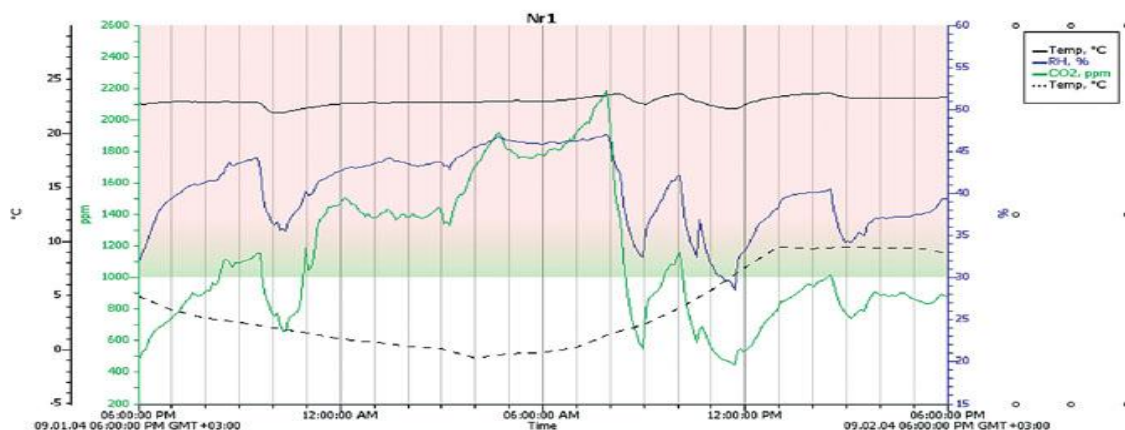


Figure 1 : Residential indoor air temperature, relative humidity and CO2 concentration changes during the day. Source: Borodiņecs A., A. Krēsliņš Air quality apartments / / Latvian Construction No. 5, 2009/http://www.abc.lv/?id=ventilacija2&template=abc_raksts&article=gaisa

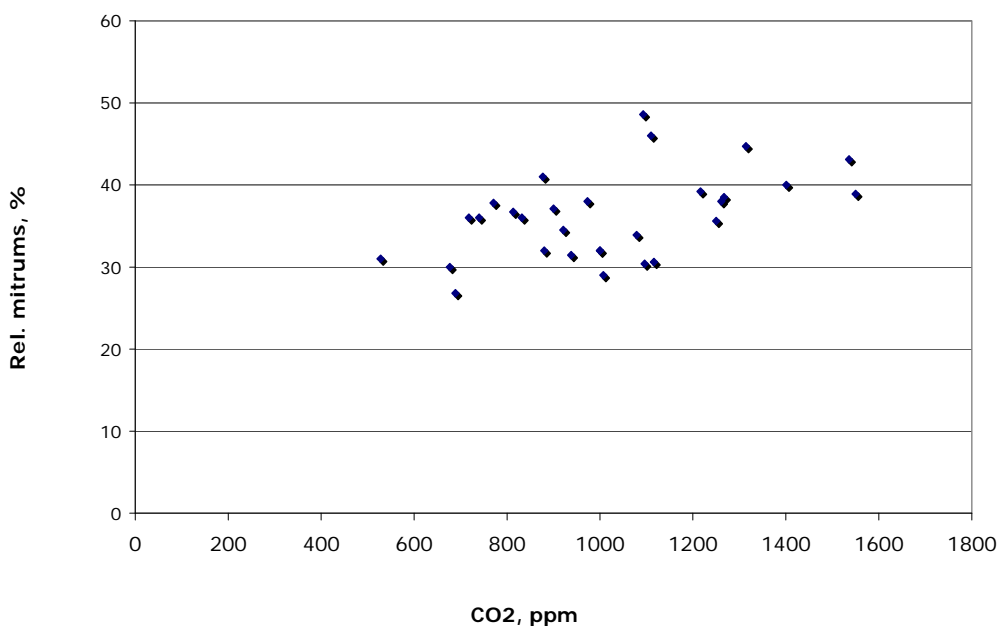


Figure 2: Non renovated living space relative humidity and CO2 concentration measurements. Source: Dimdins I., Otimization of ventilation systems of apartment buildings. MSc work / / Riga, RTU, 2010 - 62.page.

Non renovated buildings, which, due to the dense structures and increased of disorganized air infiltration, could expected CO₂ concentration with the norm, however the CO₂ concentration is above the regulatory level.

In general, energy-efficient apartment building renovation projects, realized by 2008, let conclude follows:

1) understand and evaluated the role of external building thermal performance improvement. Exterior wall, attic and basement slab insulation is made for all realized projects (excluding basement floor insulation in 4.līnija 1, Jelgava). Windows, balcony doors and the building entrance doors replacement node is performed in all realized projects.

2) understand and appreciated the housing heating system rebuilding, from the single-pipe system to a two-pipe system, thus obtaining possibility for the apartments to regulate heat consumption for heating and pay for consumption.

Questionnaires of renovated buildings inhabitants indicate, that possibility to regulate heat consumption, paying after his individual meters together with renovated buildings total heat consumption, are considered to be the major benefits of renovation.

In order to organize residential energy-efficient renovation in large quantities and to get acceptance from apartment owners of buildings, directly heating heat saving, the possibility to regulate the heating in his apartment and timely opportunity to settle in, must be highlighted and demonstrated deeply, as a result of already studied and easier to understand building energy-efficient renovation.

3) air exchange in renovated apartment building are almost no planned, leaving it to the apartment owners' own terms, cleaning the channels of an existing ventilation system and includes a new double-glazed windows with PVC frame for winter ventilation treatment in one case. This results from the limited state of knowledge of the air exchange building heating energy investment of renovation project manager, as well as by the fact that the people did not feel the physical space to air quality impacts on their well-being and health before existing window replacement.

4) in frame of projects developed previous are not analyzed the systemic renovation of residential buildings - improvement in general. In most of buildings staircase renovation also are carried out, but are no data about such technical systems as elevator repairs, attic and cellar tidying for civilian use.

5) in frame of projects developed previous are not solved the architectural image-building and improvement issues of the renovated buildings, and are not solved the redevelopment works. Consequently, the psychological renovation results in a separate building quickly "wear out".

6) none of the monitoring reports do not analyze a mutual balance between the cost of renovation and savings of heat energy payments. Directly a reduction or increase, their predictability is one of the essential prerequisites for apartment owners in the decision taking whether realized or not home renovation projects.

7) projects of apartment building renovation, implemented during the period from 1999 to 2008, has steered the organization IWO (Initiative Wohnungswirtschaft Osteuropa) in collaboration with the German Environment, Nature Conservation and Nuclear Safety Federal Ministry, to conclude contracts with the Latvian Ministry of Environment and Latvian state-owned Latvian Mortgage and Land Bank.

Imprint

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ANNEX

Table 1
General heat consumption in Buildings of individual projects

Address	General area, m ²	MWh 2006	MWh 2007	MWh 2008	MWh 2009	Total MWh (2006-2009)	Average heat consumption per year MWh (2006-2009)
Raiņa iela 21	2872,79	520,64	538,50	465,72	488,30	2013,16	503,29
Raiņa iela 23	2892,27	502,50	489,50	454,51	513,60	1960,11	490,03
Akadēmijas iela 28	2562,50	525,31	485,55	424,59	491,55	1927,00	481,75
Akadēmijas iela 2	3136,10	477,25	478,75	439,07	467,49	1862,56	465,64
Pasta iela 42	2941,30	599,52	451,61	409,48	399,00	1859,61	464,90
Zemgales prospekts 4	2866,00	483,20	448,04	395,67	407,03	1733,94	433,49
Lielā iela 3	2690,10	429,99	432,39	404,43	426,85	1693,66	423,42
Zirgu iela 9c	2237,34	425,79	415,63	412,00	412,91	1666,33	416,58
Zirgu iela 9a	1896,11	408,64	403,95	388,41	382,16	1583,16	395,79
Stacijas iela 6	1953,45	435,24	401,36	370,68	366,42	1573,70	393,43
Zirgu iela 3	1911,60	419,15	388,54	362,78	370,79	1541,26	385,32
Uzvaras iela 5	1975,63	389,43	383,52	369,32	391,75	1534,02	383,51
Sudrabu Edžus iela 7	3394,14	396,51	423,46	388,62	312,05	1520,64	380,16
Sudrabu Edžus iela 11	2746,00	426,42	391,85	289,53	340,27	1448,07	362,02
Zirgu iela 1	1902,00	366,55	381,58	344,14	339,90	1432,17	358,04
Katoļu iela 1		359,54	337,40	352,95	343,64	1393,53	348,38
Zirgu iela 5	1906,73	379,99	337,17	307,14	345,55	1369,85	342,46
Zirgu iela 9b	2255,00	360,83	332,00	322,87	348,23	1363,93	340,98
Pētera iela 9	2835,30	345,43	327,27	313,54	336,67	1322,90	330,73
Katoļu iela 8	1780,30	343,86	328,94	309,39	309,42	1291,62	322,90
Lielā iela 5	2184,70	307,01	313,56	269,19	277,48	1167,24	291,81
Katoļu iela 6	1768,20	311,63	289,07	271,00	256,80	1128,50	282,13
Lielā iela 7	2691,20	284,66	282,07	250,60	288,74	1106,07	276,52
Pētera iela 11	2224,10	283,22	263,09	254,74	272,06	1073,11	268,28
Mātera iela 28	2080,50	274,35	259,94	246,76	263,54	1044,59	261,15
Zemgales prospekts 5	1782,00	258,24	263,13	249,27	240,03	1010,67	252,67
Svētes iela 21	2101,02	258,76	243,66	242,60	258,24	1003,27	250,82
Lielā iela 13	1453,80	241,12	239,89	224,53	227,54	933,07	233,27
Raiņa iela 24	1550,32	215,38	191,22	194,38	206,91	807,89	201,97
Raiņa iela 22	1548,70	212,08	187,89	187,42	202,12	789,51	197,38
Pētera iela 13	1561,30	208,72	187,81	187,74	200,51	784,77	196,19
Mātera iela 53		281,70	260,66	226,77	257,24	1026,37	256,59
Svētes iela 28	527,30	113,25	116,00	103,79	599,66	932,70	233,18
Raiņa iela 16	2112,50	228,82	216,95	231,77	231,45	908,99	227,25
Akadēmijas iela 22	1064,47	236,89	231,27	200,43	197,34	865,93	216,48
Lielā iela 18	1794,50	222,49	208,47	208,52	212,70	852,19	213,05
Lielā iela 20	1387,80	235,73	215,87	194,85	187,99	834,43	208,61
Akadēmijas iela 16	1136,00	231,09	224,52	190,50	187,15	833,26	208,31
Lielā iela 15	1310,28	220,80	212,65	199,07	160,95	793,47	198,37

Address	General area, m ²	MWh 2006	MWh 2007	MWh 2008	MWh 2009	Total MWh (2006-2009)	Average heat consumption per year MWh (2006-2009)
Pasta iela 45		209,92	210,08	175,70	196,02	791,72	197,93
Lielā iela 22	1353,40	208,67	191,96	183,14	188,83	772,60	193,15
Stacijas iela 13	1804,00	133,84	217,90	241,88	163,96	757,58	189,40
Krišjāna Barona iela 10		193,41	191,56	181,53	186,68	753,18	188,30
Svētes iela 7	1045,30	200,77	201,42	172,75	164,81	739,75	184,94
Akadēmijas iela 7	2225,00	176,17	195,34	157,40	186,57	715,48	178,87
Raiņa iela 19	1226,70	167,65	175,81	159,90	177,80	681,16	170,29
Stacijas iela 5b	950,70	189,07	166,67	154,73	166,54	677,01	169,25
Stacijas iela 5c	966,20	177,48	167,87	143,90	148,95	638,20	159,55
Svētes iela 26	688,40	136,60	169,10	156,20	113,70	575,60	143,90
Stacijas iela 5a	689,60	144,90	124,41	123,78	133,17	526,26	131,57
Pulkveža O.Kalpaka iela 5	523,20	148,50	116,27	111,61	125,47	501,85	125,46
Raiņa iela 17	815,94	138,72	129,25	95,61	112,30	475,87	118,97
Svētes iela 24	691,00	104,14	97,20	82,02	186,76	470,12	117,53
Zemgales prospekts 6	635,70	111,33	112,36	110,70	120,29	454,68	113,67
Pulkveža O.Kalpaka iela 7	540,99	114,92	104,06	93,89	113,35	426,22	106,55
Svētes iela 5	532,31	111,01	106,28	92,90	92,87	403,06	100,76
Raiņa iela 18	675,80	109,03	102,80	96,71	93,66	402,20	100,55

Table 2
General heat consumption in Buildings of 316th series

Address	General area, m ²	MWh 2006	MWh 2007	MWh 2008	MWh 2009	Total MWh (2006-2009)	Average heat consumption per year MWh (2006-2009)
Čakstes bulvāris 9	5557,20	785,73	766,44	729,47	701,93	2983,57	745,89
Čakstes bulvāris 13	5609,30	773,70	713,30	619,88	693,01	2799,89	699,97
Mātera iela 23/25	4675,80	595,99	565,39	499,88	541,08	2202,34	550,58
Katoļu iela 15	2785,40	419,78	422,42	410,47	397,09	1649,76	412,44
Lielā iela 36	2217,40	373,69	384,20	396,85	390,31	1545,05	386,26
Sudrabu Edžus iela 2	2791,60	431,46	403,86	352,72	336,45	1524,49	381,12
Blaumaņa iela 10	3117,60	363,52	388,94	368,20	399,50	1520,16	380,04
Uzvaras iela 11	2164,00	416,25	388,26	344,33	349,92	1498,76	374,69
Lielā iela 34	2571,50	375,27	373,26	351,63	398,37	1498,53	374,63
Čakstes bulvāris 11	2779,00	394,79	399,71	321,92	349,65	1466,07	366,52
Lielā iela 30	2183,80	404,80	365,19	341,23	349,92	1461,14	365,29
Mātera iela 22	2974,30	385,67	369,92	335,76	343,39	1434,74	358,69
Sudrabu Edžus iela 4	2770,20	365,42	346,25	344,73	375,72	1432,12	358,03
Uzvaras iela 2	2273,10	382,86	358,83	357,28	327,44	1426,41	356,60
Uzvaras iela 6	2117,00	392,38	351,41	326,93	341,66	1412,38	353,10
Uzvaras iela 3	2315,20	391,01	363,46	327,30	326,91	1408,68	352,17
Blaumaņa iela 8	2785,30	394,34	322,90	321,80	343,24	1382,28	345,57
Uzvaras iela 7	2100,84	362,39	322,56	294,80	321,00	1300,75	325,19
Lielā iela 32	2632,20	364,34	307,90	294,38	306,41	1273,03	318,26
Raiņa iela 10	2281,70	335,23	312,26	292,70	305,42	1245,60	311,40
Lielā iela 27	2391,70	301,88	336,60	271,28	296,59	1206,35	301,59
Pētera iela 2	2278,10	307,30	304,80	289,00	304,50	1205,60	301,40
Uzvaras iela 4	2148,00	329,83	308,17	276,33	286,13	1200,46	300,12
Lielā iela 28	1985,40	303,68	308,20	297,60	290,70	1200,18	300,05
Lielā iela 26	1981,30	305,50	315,60	282,90	293,40	1197,40	299,35
Lielā iela 21	1727,30	304,70	293,21	270,90	293,22	1162,03	290,51
Lielā iela 24	1979,10	295,16	279,13	257,50	268,83	1100,62	275,16
Lielā iela 9	1847,90	281,74	277,91	233,00	258,20	1050,85	262,71
Pasta iela 24	1891,30	270,40	283,66	238,57	232,71	1025,34	256,34
Lielā iela 25	1990,50	264,25	255,65	234,33	254,37	1008,60	252,15
Driksas iela 5	1533,10	266,10	246,00	227,26	235,89	975,24	243,81
Lielā iela 23	1511,00	262,20	250,15	208,75	233,10	954,20	238,55
Pasta iela 41	1525,30	245,50	236,00	214,40	209,49	905,39	226,35

Table 3
General heat consumption in Buildings of 318th series

Address	General area, m ²	MWh 2006	MWh 2007	MWh 2008	MWh 2009	Total MWh (2006-2009)	Average heat consumption per year MWh (2006-2009)
Pasta iela 18	5020,60	712,73	658,07	657,84	758,07	2786,71	696,68
Mātera iela 17		485,20	498,00	454,88	486,62	1924,70	481,18
Mātera iela 63	3230,00	525,00	468,50	453,99	452,68	1900,17	475,04
Mātera iela 61	3226,00	527,50	465,10	455,51	448,01	1896,12	474,03
Svētes iela 35	3277,00	675,16	626,76	578,30	0,00	1880,22	470,06
Mātera iela 19		475,39	462,53	468,75	446,34	1853,01	463,25
Raiņa iela 26	3385,30	470,00	479,40	434,13	454,80	1838,33	459,58
Raiņa iela 9	3317,00	482,34	444,86	382,40	414,81	1724,41	431,10
Sudrabu Edžus iela 2	2791,60	450,12	417,76	367,83	354,55	1590,25	397,56
Dobeles iela 17	2486,90	389,60	402,71	363,81	355,78	1511,90	377,98
Sudrabu Edžus iela 1		399,89	374,88	349,60	377,57	1501,94	375,49
Krišjāna Barona iela 3	2205,47	348,30	340,79	327,28	338,51	1354,88	338,72
Zirgu iela 9	1891,00	368,16	336,72	315,86	315,15	1335,89	333,97
Krišjāna Barona iela 5	2179,96	331,90	348,16	333,08	319,37	1332,51	333,13
Lielā iela 10	2216,30	343,87	342,30	304,50	320,41	1311,08	327,77
Zirgu iela 7	1884,00	342,13	319,92	298,15	325,02	1285,22	321,31
Pasta iela 20		316,77	311,36	301,60	308,40	1238,13	309,53
Krišjāna Barona iela 19	1850,00	324,38	311,90	280,89	290,85	1208,02	302,01
Lielā iela 16	1594,05	289,30	272,67	260,28	252,89	1075,14	268,79
Lielā iela 14	2277,40	250,48	241,23	222,98	251,78	966,46	241,62
Pasta iela 35	1305,70	254,59	222,17	211,62	222,55	910,93	227,73
Lielā iela 12	1618,70	225,88	220,18	202,60	198,92	847,58	211,89
Lielā iela 8	1262,48	254,37	219,94	176,66	175,00	825,97	206,49
Pasta iela 33	1323,20	220,62	191,88	171,28	182,26	766,04	191,51

Table 4
General heat consumption in Buildings of 103rd series

Address	General area, m ²	MWh 2006	MWh 2007	MWh 2008	MWh 2009	Total MWh (2006-2009)	Average heat consumption per year MWh (2006-2009)
Pulkveža O.Kalpaka iela 35a	5647,70	890,40	824,92	782,50	794,90	3292,72	823,18
Sudrabu Edžus iela 15	5677,30	972,18	844,40	732,70	700,87	3250,15	812,54
Pulkveža O.Kalpaka iela 35	5718,20	748,54	724,30	729,76	852,64	3055,24	763,81
Pētera iela 12	4593,90	826,00	779,03	700,20	724,60	3029,83	757,46
Krišjāna Barona iela 12	4675,30	692,77	748,54	692,94	692,10	2826,35	706,59
Mātera iela 33	6175,20	654,01	701,30	568,17	665,86	2589,34	647,34
Mātera iela 31	5854,00	698,23	663,20	610,04	613,89	2585,36	646,34
Sudrabu Edžus iela 13a	3914,50	583,40	607,70	512,80	520,78	2224,68	556,17
Jāņa iela 2	3961,00	473,06	435,65	416,62	462,40	1787,73	446,93
Zemgales prospekts 2	2040,00	453,58	434,38	383,13	383,24	1654,33	413,58
Blaumaņa iela 3	2574,50	410,76	405,32	384,20	391,07	1591,35	397,84
Sudrabu Edžus iela 5	2854,50	374,93	350,34	334,62	361,10	1420,99	355,25
Pasta iela 61		322,23	313,17	266,36	286,44	1188,20	297,05
Pasta iela 57	2214,40	336,82	292,42	273,22	278,98	1181,44	295,36
Pasta iela 59		278,25	271,12	251,88	261,56	1062,81	265,70
Pasta iela 55	1890,00	263,31	253,73	241,53	257,09	1015,66	253,92

Table 5
General heat consumption in Buildings of 104th series

Address	General area, m ²	MWh 2006	MWh 2007	MWh 2008	MWh 2009	Total MWh (2006-2009)	Average heat consumption per year MWh (2006-2009)
Katoļu iela 17	7131,30	1036,19	1010,02	922,87	908,86	3877,94	969,49
Pasta iela 38	5115,10	743,63	691,59	610,95	665,86	2712,03	678,01
Pasta iela 34	5140,80	757,10	737,01	568,06	606,91	2669,08	667,27
Raiņa iela 3	5399,80	672,57	655,99	629,15	675,34	2633,05	658,26
Pasta iela 36	5009,80	616,69	591,22	545,38	551,01	2304,30	576,08

Table 6
Specific heat consumption and heat saving potential in buildings of individual projects

Address	General area m ²	Average specific heat consumption kWh/m ² per year (2006-2009)	Consumption of heat- saving potential, realizing the 1 st renovation program ,kWh/m ² per year	Consumption of heat- saving potential, realizing the 2 nd renovation program, kWh/m ² per year	Consumption of heat- saving potential, realizing the 1 st renovation program,%	Consumption of heat- saving potential, realizing the 2 nd renovation program,%
Stacijas iela 5a	689,60	190,79	120,79	150,79	63	79
Akadēmijas iela 28	2562,50	188,00	118,00	148,00	63	79
Pulkveža O.Kalpaka iela 5	523,20	179,32	109,32	139,32	61	78
Stacijas iela 5b	950,70	178,03	108,03	138,03	61	78
Svētes iela 24	691,00	170,09	100,09	130,09	59	76
Stacijas iela 5c	966,20	165,13	95,13	125,13	58	76
Svētes iela 26	688,40	163,75	93,75	123,75	57	76
Akadēmijas iela 22	1064,47	154,88	84,88	114,88	55	74
Uzvaras iela 5	1975,63	154,72	84,72	114,72	55	74
Akadēmijas iela 16	1136,00	153,52	83,52	113,52	54	74
Zirgu iela 9a	1896,11	151,36	81,36	111,36	54	74
Pulkveža O.Kalpaka iela 7	540,99	148,80	78,80	108,80	53	73
Svētes iela 28	527,30	145,65	75,65	105,65	52	73
Zirgu iela 3	1911,60	143,59	73,59	103,59	51	72
Stacijas iela 6	1953,45	142,71	72,71	102,71	51	72
Katoļu iela 8	1780,30	138,37	68,37	98,37	49	71
Svētes iela 7	1045,30	138,03	68,03	98,03	49	71
Lielā iela 13	1453,80	135,50	65,50	95,50	48	70
Zirgu iela 1	1902,00	133,81	63,81	93,81	48	70
Raiņa iela 24	1550,32	130,28	60,28	90,28	46	69
Zemgales prospekts 6	635,70	129,80	59,80	89,80	46	69
Zirgu iela 5	1906,73	129,48	59,48	89,48	46	69
Zirgu iela 9c	2237,34	129,34	59,34	89,34	46	69
Raiņa iela 21	2872,7	129,17	59,17	89,17	46	69

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Raiņa iela 23	2892,2 7	128,64	58,64	88,64	46	69
Svētes iela 5	532,31	127,55	57,55	87,55	45	69
Raiņa iela 22	1548,7 0	127,45	57,45	87,45	45	69
Pētera iela 13	1561,3 0	125,66	55,66	85,66	44	68
Mātera iela 28	2080,5 0	125,52	55,52	85,52	44	68
Stacijas iela 13	1804,0 0	123,78	53,78	83,78	43	68
Lielā iela 3	2690,1 0	123,55	53,55	83,55	43	68
Raiņa iela 17	815,94	122,39	52,39	82,39	43	67
Lielā iela 15	1310,2 8	121,09	51,09	81,09	42	67
Pētera iela 11	2224,1 0	120,62	50,62	80,62	42	67
Zemgales prospekts 4	2866,0 0	119,66	49,66	79,66	42	67
Svētes iela 21	2101,0 2	119,38	49,38	79,38	41	66
Akadēmijas iela 2	3136,1 0	117,73	47,73	77,73	41	66
Pētera iela 9	2835,3 0	116,65	46,65	76,65	40	66
Raiņa iela 18	675,80	116,33	46,33	76,33	40	66
Raiņa iela 19	1226,7 0	112,08	42,08	72,08	38	64
Sudrabu Edžus iela 7	3394,1 4	112,00	42,00	72,00	38	64
Katoļu iela 6	1768,2 0	111,53	41,53	71,53	37	64
Zemgales prospekts 5	1782,0 0	110,72	40,72	70,72	37	64
Zirgu iela 9b	2255,0 0	107,50	37,50	67,50	35	63
Pasta iela 42	2941,3 0	105,91	35,91	65,91	34	62
Lielā iela 5	2184,7 0	105,20	35,20	65,20	33	62
Lielā iela 20	1387,8 0	96,49	26,49	56,49	27	59
Lielā iela 22	1353,4 0	94,44	24,44	54,44	26	58
Lielā iela 18	1794,5 0	91,56	21,56	51,56	24	56
Raiņa iela 16	2112,5 0	88,26	18,26	48,26	21	55
Akadēmijas iela 7	2225,0 0	80,39	10,39	40,39	13	50
Lielā iela 7	2691,2 0	75,59	5,59	35,59	7	47

Sudrabu Edžus iela 11	2746,0 0	69,51	0,00	29,51		42
Katoļu iela 1						
Pasta iela 45						
Krišjāna Barona iela 10						
Mātera iela 53						
Average		128,70	70	40		

Table 7
Specific heat consumption and heat saving potential in Buildings of 316th series

Address	General area m ²	Average specific heat consumption kWh/m ² per year (2006-2009)	Consumption of heat-saving potential, realizing the 1 st renovation program kWh/m ² per year	Consumption of heat-saving potential, realizing the 2 nd renovation program, kWh/m ² per year	Consumption of heat-saving potential, realizing the 1 st renovation program, %	Consumption of heat-saving potential, realizing the 2 nd renovation program, %
Uzvaras iela 11	2164,00	135,97	65,97	95,97	49	71
Lielā iela 21	1727,30	134,15	64,15	94,15	48	70
Lielā iela 36	2217,40	133,58	63,58	93,58	48	70
Driksas iela 5	1533,10	130,71	60,71	90,71	46	69
Lielā iela 23	1511,00	126,52	56,52	86,52	45	68
Uzvaras iela 6	2117,00	125,78	55,78	85,78	44	68
Uzvaras iela 3	2315,20	121,24	51,24	81,24	42	67
Lielā iela 30	2183,80	120,25	50,25	80,25	42	67
Uzvaras iela 2	2273,10	119,12	49,12	79,12	41	66
Pasta iela 41	1525,30	117,73	47,73	77,73	41	66
Lielā iela 26	1981,30	115,70	45,70	75,70	39	65
Uzvaras iela 7	2100,84	115,60	45,60	75,60	39	65
Lielā iela 28	1985,40	114,72	44,72	74,72	39	65
Lielā iela 34	2571,50	110,28	40,28	70,28	37	64
Katoļu iela 15	2785,40	110,23	40,23	70,23	36	64
Lielā iela 24	1979,10	108,42	38,42	68,42	35	63
Lielā iela 9	1847,90	108,29	38,29	68,29	35	63
Raiņa iela 10	2281,70	107,97	37,97	67,97	35	63
Pasta iela 24	1891,30	106,51	36,51	66,51	34	62
Čakstes bulvāris 11	2779,00	104,69	34,69	64,69	33	62
Pētera iela 2	2278,10	104,44	34,44	64,44	33	62
Uzvaras iela 4	2148,00	104,06	34,06	64,06	33	62
Čakstes bulvāris 9	5557,20	103,34	33,34	63,34	32	61
Sudrabu Edžus iela 2	2791,60	100,38	30,38	60,38	30	60
Lielā iela 27	2391,70	96,73	26,73	56,73	28	59
Sudrabu Edžus iela 4	2770,20	96,21	26,21	56,21	27	58
Čakstes bulvāris 13	5609,30	95,33	25,33	55,33	27	58
Mātera iela 22	2974,30	94,83	24,83	54,83	26	58
Lielā iela 25	1990,50	94,75	24,75	54,75	26	58
Blaumaņa iela 10	3117,60	93,80	23,80	53,80	25	57
Mātera iela 23/25	4675,80	92,55	22,55	52,55	24	57
Blaumaņa iela 8	2785,30	92,51	22,51	52,51	24	57
Lielā iela 32	2632,20	86,83	16,83	46,83	19	54
Average		109,79	70	40		

Table 8
Specific heat consumption and heat saving potential in Buildings of 318th series

Address	General area m ²	Average specific heat consumption kWh/m ² per year (2006-2009)	Consumption of heat-saving potential, realizing the 1 st renovation program, kWh/m ² per year	Consumption of heat-saving potential, realizing the 2 nd renovation program, kWh/m ² per year	Consumption of heat-saving potential, realizing the 1 st renovation program, %	Consumption of heat-saving potential, realizing the 2 nd renovation program, %
Sudrabu Edžus iela 3	2507,90	146,52	76,52	106,52	52	73
Pasta iela 35	1305,70	138,89	68,89	98,89	50	71
Lielā iela 16	1594,05	135,56	65,56	95,56	48	70
Krišjāna Barona iela 3	2205,47	123,29	53,29	83,29	43	68
Zirgu iela 7	1884,00	122,12	52,12	82,12	43	67
Zirgu iela 9	1891,00	120,09	50,09	80,09	42	67
Lielā iela 8	1262,48	118,76	48,76	78,76	41	66
Krišjāna Barona iela 5	2179,96	116,09	46,09	76,09	40	66
Dobeles iela 17	2486,90	115,18	45,18	75,18	39	65
Krišjāna Barona iela 19	1850,00	114,56	44,56	74,56	39	65
Lielā iela 12	1618,70	113,26	43,26	73,26	38	65
Lielā iela 10	2216,30	112,47	42,47	72,47	38	64
Pasta iela 33	1323,20	112,18	42,18	72,18	38	64
Mātera iela 63	3230,00	108,20	38,20	68,20	35	63
Svētes iela 35	3277,00	103,07	33,07	63,07	32	61
Mātera iela 61	3226,00	102,86	32,86	62,86	32	61
Pasta iela 18	5020,60	98,81	28,81	58,81	29	60
Raiņa iela 9	3317,00	98,02	28,02	58,02	29	59
Raiņa iela 26	3385,30	94,15	24,15	54,15	26	58
Lielā iela 14	2277,40	89,54	19,54	49,54	22	55
Mātera iela 17						
Mātera iela 19						
Sudrabu Edžus iela 1						
Pasta iela 20						
Average		114,18	70	40		

Table 9
Specific heat consumption and heat saving potential in Buildings of 103rd serie

Address	General area m ²	Average specific heat consumption kWh/m ² per year (2006-2009)	Consumption of heat-saving potential, realizing the 1 st renovation program, kWh/m ² per year	Consumption of heat-saving potential, realizing the 2 nd renovation program, kWh/m ² per year	Consumption of heat-saving potential, realizing the 1 st renovation program, %	Consumption of heat-saving potential, realizing the 2 nd renovation program, %
Zemgales prospekts 2	2040,00	150,48	80,48	110,48	53	73
Pētera iela 12	4593,90	124,12	54,12	84,12	44	68
Krišjāna Barona iela 12	4675,30	115,66	45,66	75,66	39	65
Sudrabu Edžus iela 13a	3914,50	108,58	38,58	68,58	36	63
Blaumaņa iela 3	2574,50	108,15	38,15	68,15	35	63
Pulkveža O.Kalpaka iela 35a	5647,70	103,09	33,09	63,09	32	61
Sudrabu Edžus iela 15	5677,30	100,40	30,40	60,40	30	60
Pulkveža O.Kalpaka iela 35	5718,20	95,39	25,39	55,39	27	58
Pasta iela 57	2214,40	95,08	25,08	55,08	26	58
Sudrabu Edžus iela 5	2854,50	92,67	22,67	52,67	24	57
Pasta iela 55	1890,00	86,03	16,03	46,03	19	54
Jāņa iela 2	3961,00	81,47	11,47	41,47	14	51
Mātera iela 33	6175,20	67,99	0,00	27,99	0	41
Mātera iela 31	5854,00	67,03	0,00	27,03	0	40
Pasta iela 61						
Pasta iela 59						
Average		99,72	70	40		

Table 10
Specific heat consumption and heat saving potential in Buildings of 104th series

Address	General area m ²	Average specific heat consumption kWh/m ² per year (2006-2009)	Consumption of heat-saving potential, realizing the 1 st renovation program ,kWh/m ² per year	Consumption of heat-saving potential, realizing the 2 nd renovation program, kWh/m ² per year	Consumption of heat-saving potential, realizing the 1 st renovation program,%	Consumption of heat-saving potential, realizing the 2 nd renovation program,%
Katoļu iela 17	7131,30	98,20	28,20	58,20	29	59
Pasta iela 38	5115,10	97,23	27,23	57,23	28	59
Pasta iela 34	5140,80	93,74	23,74	53,74	25	57
Raiņa iela 3	5399,80	81,60	11,60	41,60	14	51
Pasta iela 36	5009,80	80,65	10,65	40,65	13	50
Average		90,28	70	40		

