

2014



REPORT
on thermal survey findings for the
residential apartment block No.
234, building 3, located at
prospect Krasnoi Armii, in the city
Sergiyev Posad.



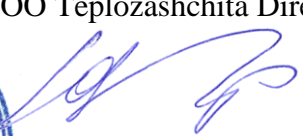
ООО ТЕПЛОЗАЩИТА

Limited Liability Company Teplozashcita

APPROVED

By OOO Teplozashchita Director




(signed) Iu.F. Kolkhir
14 February 2014

Seal:

Russia, Volgograd Oblast, Volzhsky *
Limited Liability Company *
TEPLOZASHCHITA *

REPORT

**on thermal survey findings for the residential apartment block No. 234,
building 3, located at prospect Krasnoi Armii, in the city Sergiyev Posad,
Moscow Oblast.**

Table of content

1. Object input data
2. Object thermal survey findings prior to works execution.
3. Executed works description/
4. Object thermal survey findings after works execution.
5. Comparative thermal survey data
6. Summary
7. Applications
 - 7.1 Appendix 1. Thermal calculation based on the building thermal imaging survey results before works execution.
 - 7.2 Appendix 2. Thermal calculation based on the building thermal imaging survey results after works execution.
 - 7.3. Permit certificate for specific activities or types of activities on project documentation development, having impact on capital construction objects safety No. СРОГП-125.1-2112012, dated 21.11.2012, issued to SRO member – ООО Teplozashchita by SRO Non – commercial Partnership of Designers GLAVPROEKT.

1. Object input data

Object – residential apartment block No. 234, building 3, located at prospect Krasnoi Armii, the city Sergiyev Posad, Moscow Oblast.

Number of storeys – 14 storeys, technical basement storey, attic storey.

Number of entrances – 3.

Pedestal. Finishing material – ceramic tiles. Pedestal area is 280 m².

External walls. Material: 320 mm thick haydite concrete wall panels. Wall area above grade level is 6,620 m², excluded from the total wall area are glazed recessed balconies with the area of 1,112 m² (80 % of all recessed balconies), glazed projected balconies with the area of 416 m² (80% of all projected balconies), clear window opening area of 1,213 m².

Total interpanel joint length: 3,555 linear meters.

Exterior jamb area: 152 m².

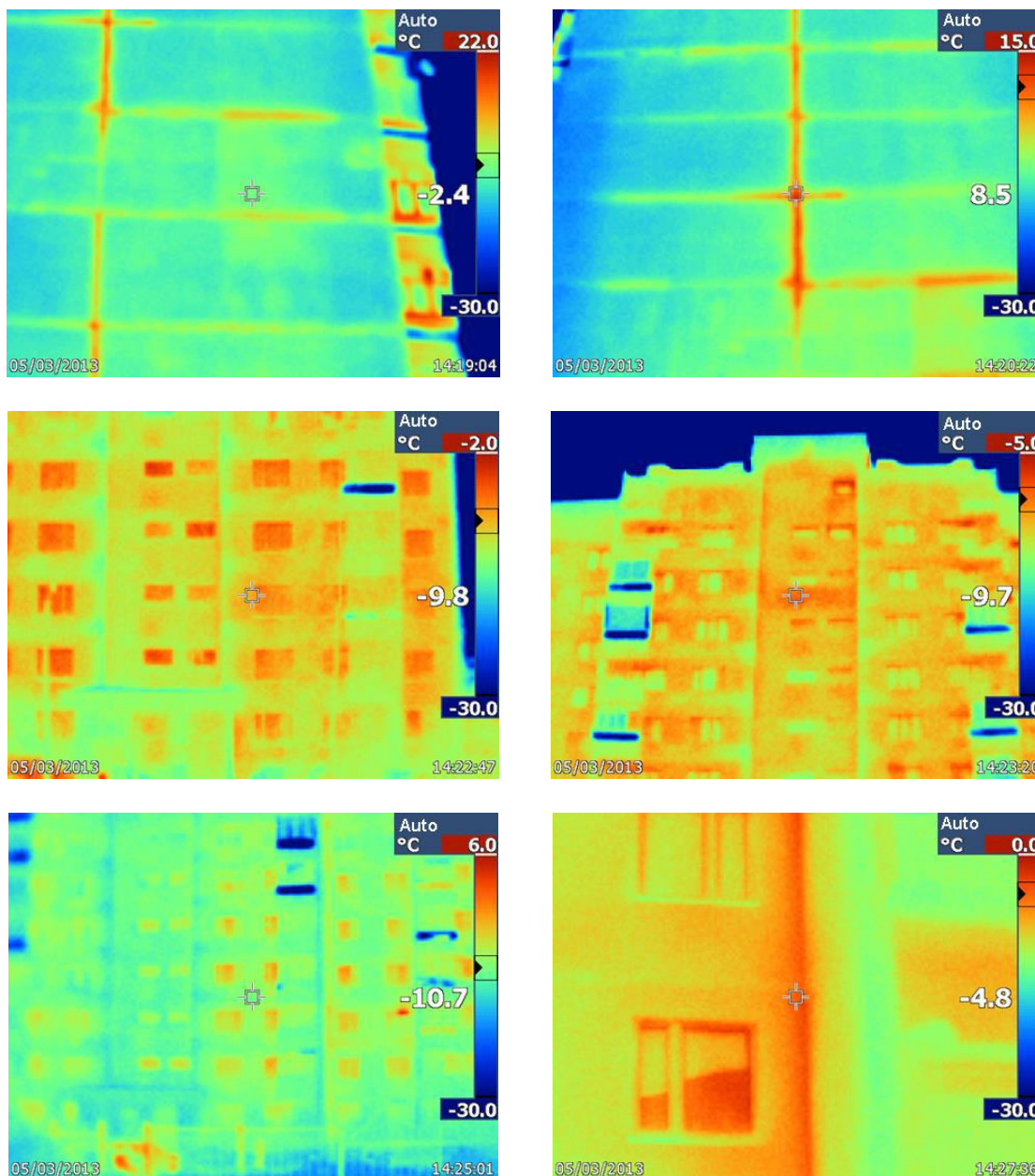


16 January 2013.

2. Object thermal survey findings prior to works execution.

The present survey was initiated by multiple residents' applications and complaints to low air temperatures in the apartments and condensation on indoor exterior wall during the heating season.

Thermal imaging survey data as of 05 March 2013. Outdoor air temperature is minus 20 °C.



Thermal survey findings (Appendix 1) were used to calculate the actual building enclosing structures heat transfer resistance. Averaged wall external surface temperature is applied as the calculation input parameter.

Wall external surface temperature is assumed to be equal to minus **10.7 °C**.

Surveyed building enclosing structure design heat transfer resistance is 1.51 m² °C /W.

Surveyed building enclosing structure actual heat transfer resistance **is maximum 0.90** m² °C /W.

Based on the sanitary regulations, surveyed building enclosing structure required heat transfer resistance is 1.38 m² °C /W.

Based on the energy efficiency standards, surveyed building enclosing structure required heat transfer resistance for the 1 phase is 1.83 m² °C /W.

Surveyed building does not meet the sanitary regulations, all enclosing structures require winterization.

3. Executed works description/

Thermal insulation was applied on the building exterior enclosing structures during the period from August to September 2013. TEMP-COAT® thermal insulation was used as insulating coating. Manufacturer – the company TEMP-COAT® Brand Products, LLC, USA. Supplier and contractor – the company ZAO Teploenergo.

Insulating coating thickness and insulated surface area are presented in the table No. 1 below.

Table 1.

Object description	Area, m ²	Insulation thickness, mm
Building façade for insulation	6,620	1.0
Jambs	152	1.2
Pedestal	280	0.5

In addition, TEMP-COAT® insulation prevents corrosion, has water-proof and sound-proof properties. Total heat transfer resistance of 1.0 mm coating is equal to 1.0 m² °C/W.

Coating application labor input is comparable with painting application labor input, materials are spray, brush or roller applied. Thermal coating service life under standard service conditions is AT LEAST 20 YEARS. Being moisture proof, the coating is easily washable, if dirty. The coating has low resistance to vapor permeability.

TEMP-COAT® is a liquid latex ceramic form of insulation. It is different from other types of insulation, presenting just conductive and convective heat flux barriers. The product consists of billions of ceramic spheres. Low-density gas inside the spheres produces cold and heat barrier. The coating deploys the processes, known as spherical surface emissive and reflective capacities, as well as de-aired spheres low heat conductivity. Coating detailed technical data are presented in the specification TU-5768-001-62595647-2009.

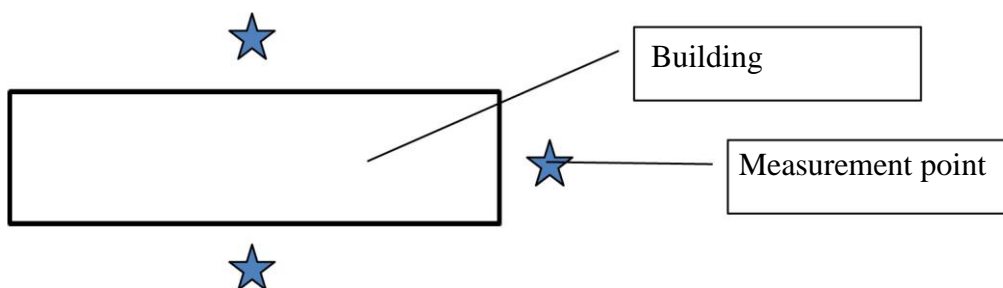


7 October 2013.

4. Object thermal survey findings after works execution.

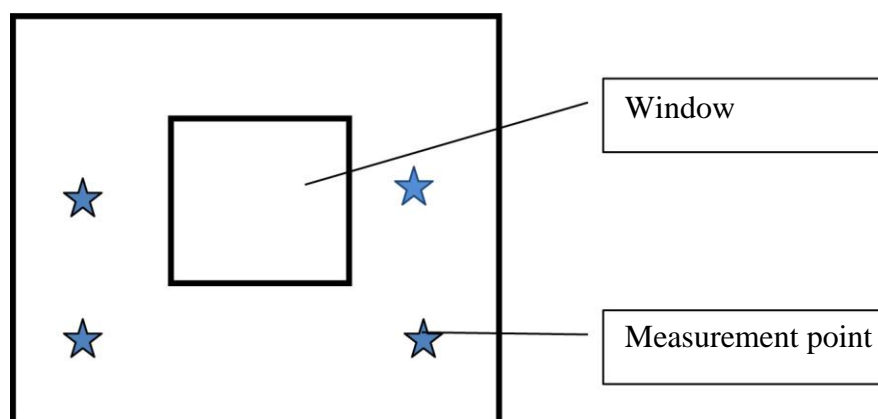
Temperature measurement points schematic diagram.

1. Atmospheric air temperature.

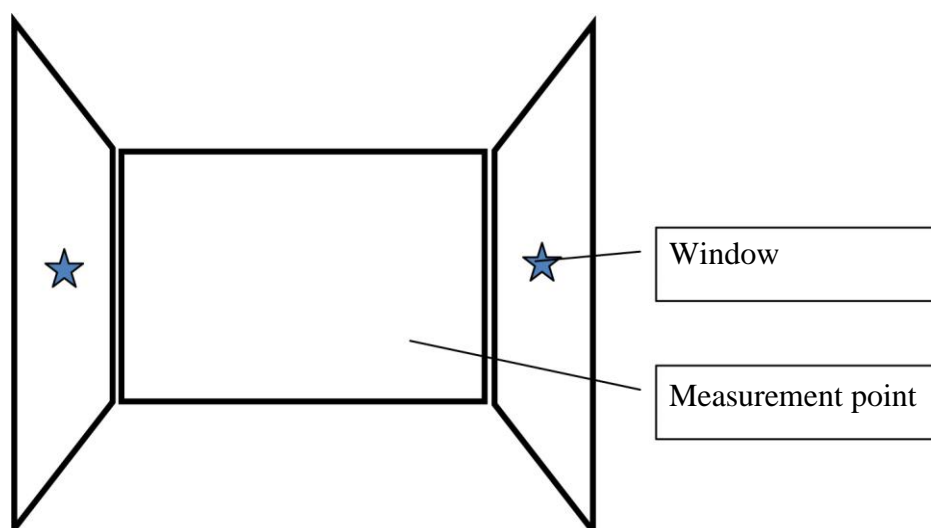


Temperature was measured at 2 m distance from the building wall surface and at 2 m elevation from the ground surface.

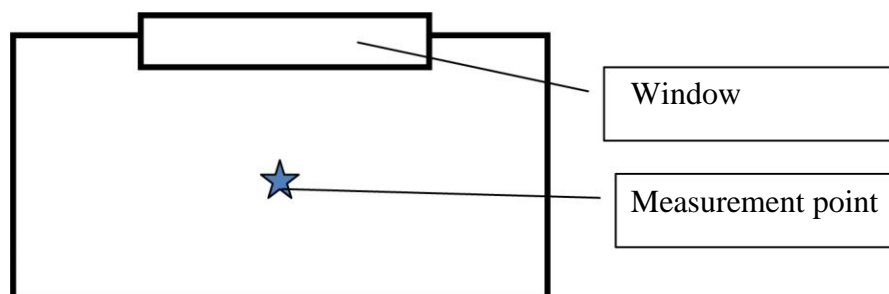
2. External enclosing structure inner surface temperature.



3. Jamb inner surface temperature.



4. Indoor air temperature. Indoor air relative humidity.



Temperature was measured at 2 m distance from the room exterior wall surface and at 2 m elevation from the floor surface.

Temperature and humidity measurements by apartments. 29 January 2014. Outdoor air temperature is minus 23 °C.

Apartment 353, 6th floor.

Kitchen, plastic window

Замер	Room center	Point 1. Left side, top	Point 2. Left side, bottom	Point 3. Right side, top	Point 4. Right side, bottom	Point 5. Left jamb, top.	Point 6. Right jamb.
Humidity (%)	26	26.1	26	27	27.4	26.9	26.8
Temperature (° C)	21	20.8	20.9	20.4	19.9	19	19.2

Bedroom, plastic window

Замер	Room center	Point 1. Left side, top	Point 2. Left side, bottom	Point 3. Right side, top	Point 4. Right side, bottom	Point 5. Left jamb, top.	Point 6. Right jamb.
Humidity (%)	26.2	25.6	25.5	22.5	26	26	26.3
Temperature (° C)	22.7	22.1	21.8	22	19.4	21	21.3

Sitting room, plastic window

Замер	Room center	Point 1. Left side, top	Point 2. Left side, bottom	Point 3. Right side, top	Point 4. Right side, bottom*	Point 5. Left jamb, top.	Point 6. Right jamb.
Humidity (%)	25.7	25.8	27.9	27	25.8	26.3	26
Temperature (° C)	22.5	20.9	20.5	22.8	23.7	22.5	22.9

Apartment 301, 7th floor.

Kitchen, wooden window

Замер	Room center	Point 1. Left side, top	Point 2. Left side, bottom	Point 3. Right side, top	Point 4. Right side, bottom	Point 5. Left jamb, top.	Point 6. Right jamb.
Humidity** (%)	16.1	16.1	16.1	16.1	16.1	16.1	16.1
Temperature (° C)	21	19.1	18.6	18.7	18.5	18	18.1

Bedroom, wooden window

Замер	Room center	Point 1. Left side, top	Point 2. Left side, bottom	Point 3. Right side, top	Point 4. Right side, bottom	Point 5. Left jamb, top.	Point 6. Right jamb.
Humidity** (%)	19.4	19.4	19.4	19.4	19.4	19.4	19.4
Temperature (° C)	22.2	20	19	19	18.5	18.2	18.2

Apartment 280, 2nd floor

Kitchen, plastic window

Замер	Room center	Point 1. Left side, top	Point 2. Left side, bottom	Point 3. Right side, top	Point 4. Right side, bottom	Point 5. Left jamb, top.	Point 6. Right jamb.
Humidity (%)	33.9	33.9	33.9	33.9	33.9	33.9	33.9
Temperature (° C)	22	21.2	18.6	20.2	20.5	19.6	19.3

Bedroom, plastic window

Замер	Room center	Point 1. Left side, top	Point 2. Left side, bottom	Point 3. Right side, top*	Point 4. Right side, bottom.	Point 5. Left jamb, top.	Point 6. Right jamb.
Humidity (%)	24.2	24.2	24.2	24.2	24.2	24.2	24.2
Temperature (° C)	22.7	22.3	21.3	22.9	22.7	22.2	22.8

Sitting room, plastic window

Замер	Room center	Point 1. Left side, top	Point 2. Left side, bottom	Point 3. Right side, top	Point 4. Right side, bottom	Point 5. Left jamb, top.	Point 6. Right jamb.
Humidity (%)	25.2	25.2	25.2	25.2	25.2	25.2	25.2
Temperature (° C)	22.2	21.8	21.8	21.2	20.4	20.9	20.7

Study room, plastic window

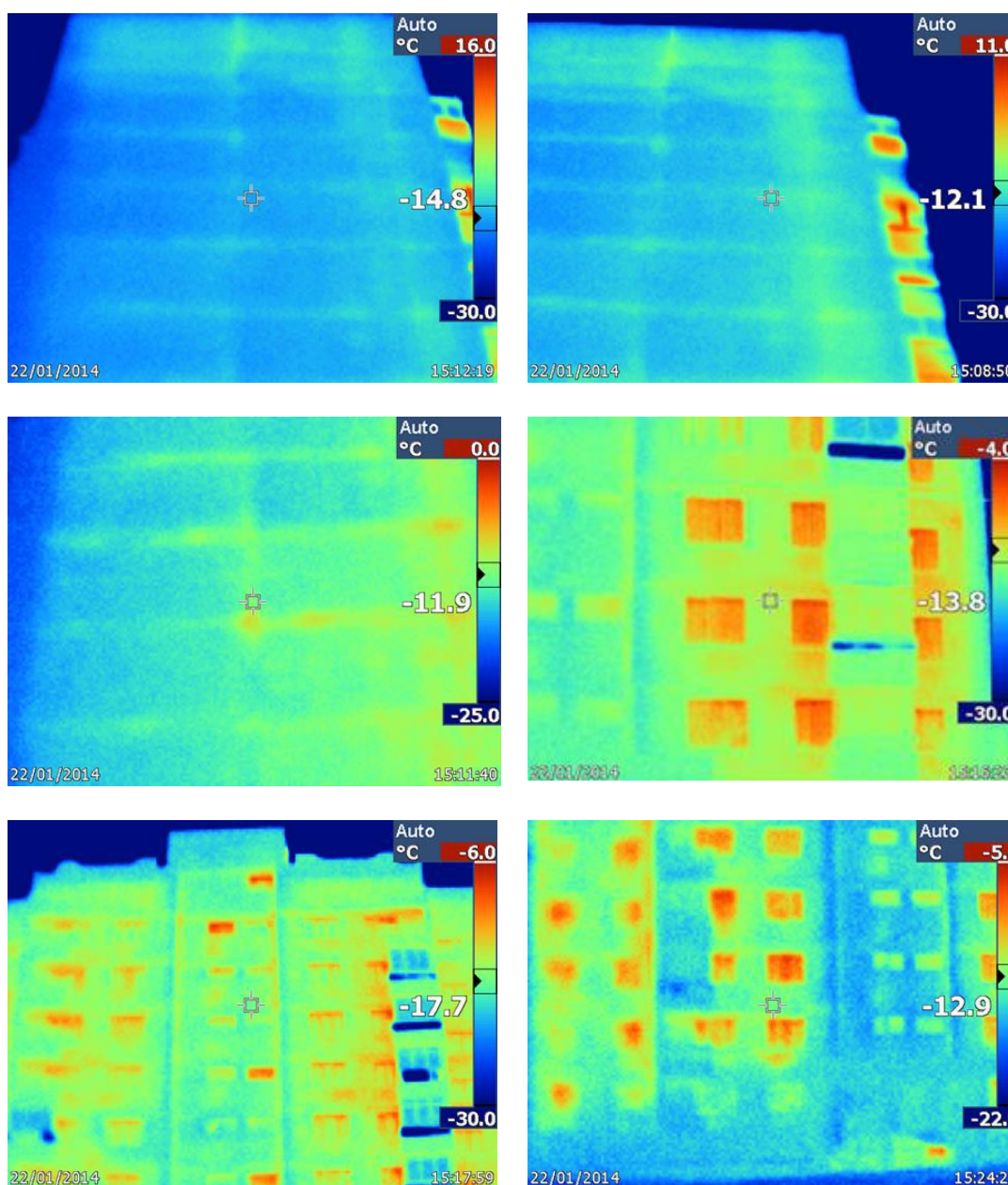
Замер	Room center	Point 1. Left side, top*	Point 2. Left side, bottom	Point 3. Right side, top	Point 4. Right side, bottom	Point 5. Left jamb, top.	Point 6. Right jamb.
Humidity (%)	28.9	28.9	28.9	28.9	28.9	28.9	28.9
Temperature (° C)	21.9	23.2	21.6	20.8	19	21.8	21.8

Notes.

*Wall surface temperature exceeds indoor air temperature due to heating radiator, located close to the measurement point. Such values are disregarded in the calculations.

**Apartment No. 301. Indoor air humidity is lower than average values, as measured in other apartments. This is explained by loose-fitting wooden window frames. Natural ventilation draft is increased due to atmospheric air inflow through window area gaps. This causes room exterior wall excessive cooling.

Thermal imaging survey data. 22 January 2014. Outdoor air temperature is minus 20 °C.



Thermal survey findings (Appendix 2) were used to calculate the actual building enclosing structures heat transfer resistance. Averaged wall external surface temperature is applied as the calculation input parameter.

Wall external surface average temperature is assumed to be equal to **minus 17 °C**.

Surveyed building enclosing structure design heat transfer resistance is $1.51 + 1.0 = 2.51 \text{ m}^2 \text{ °C /W}$ (rated design solution value is applied).

Surveyed building enclosing structure actual heat transfer resistance is **over $2.51 \text{ m}^2 \text{ °C /W}$** .

Based on the sanitary regulations, surveyed building enclosing structure required heat transfer resistance is $1.38 \text{ m}^2 \text{ °C /W}$.

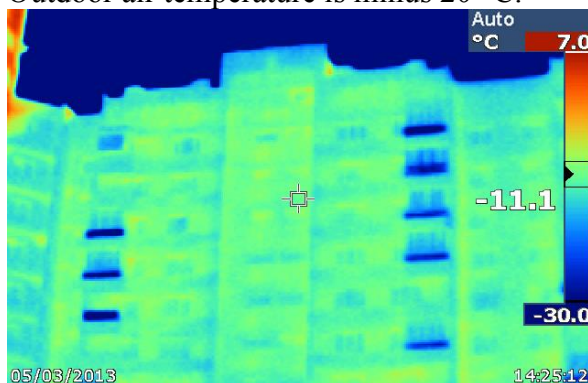
Based on the energy efficiency standards, surveyed building enclosing structure required heat transfer resistance for the 1st energy saving phase is **$1.83 \text{ m}^2 \text{ °C /W}$** .

5. Comparative thermal survey data

Before thermal insulation application

(05.03.2013).

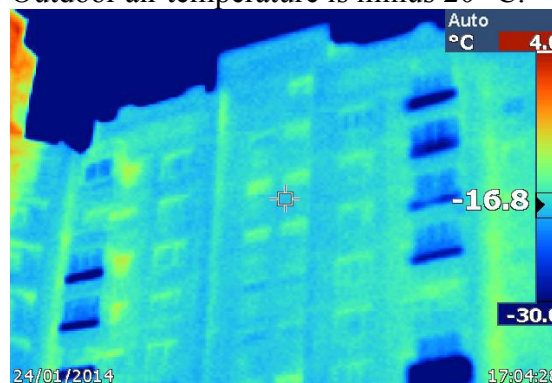
Outdoor air temperature is minus 20 °C.



After thermal insulation application

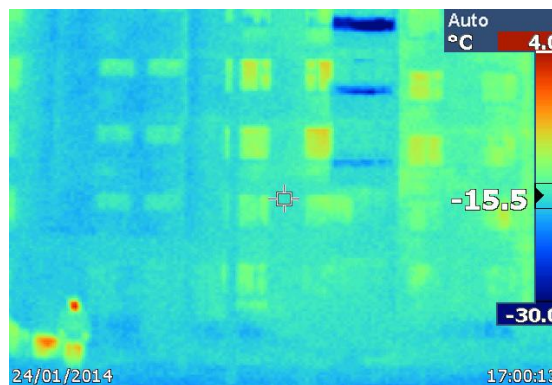
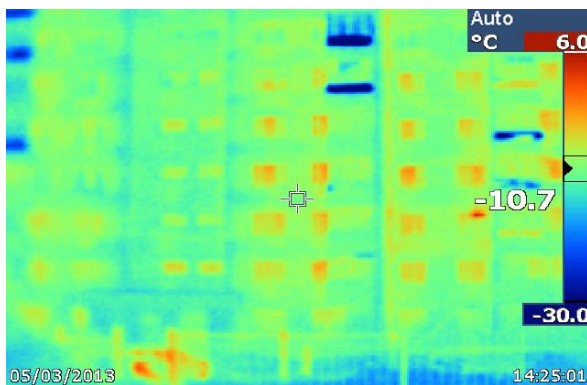
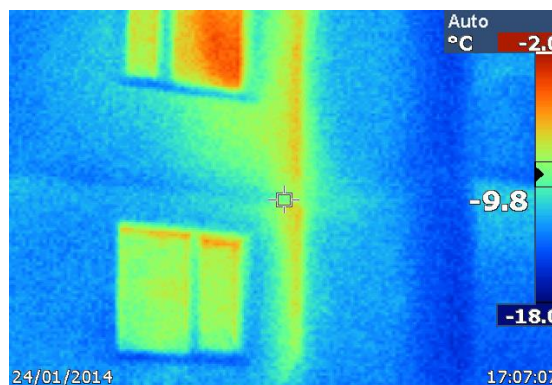
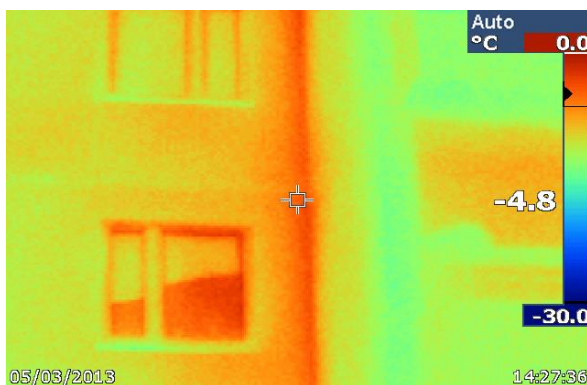
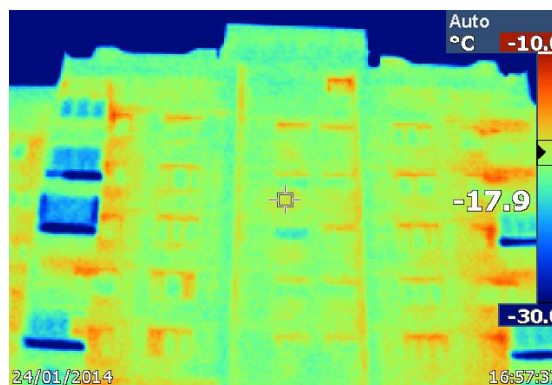
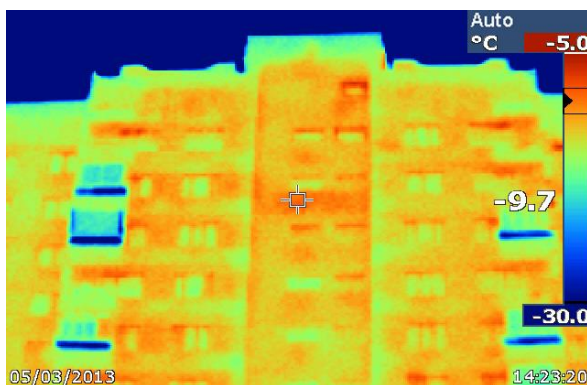
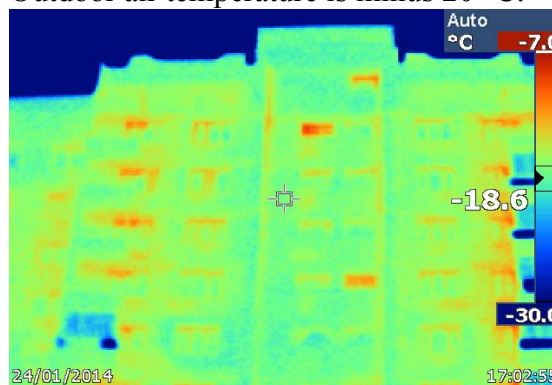
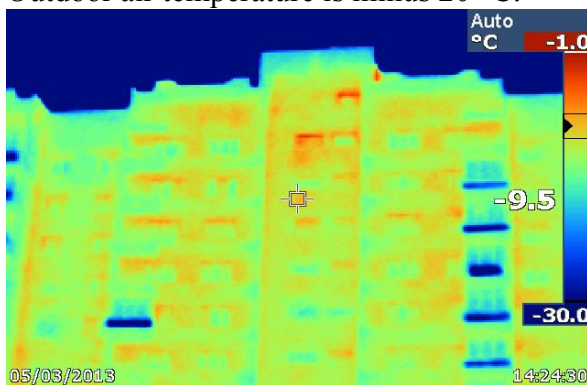
(24.01.2014).

Outdoor air temperature is minus 20 °C.



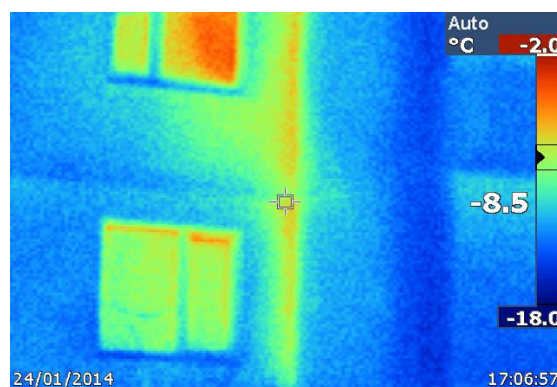
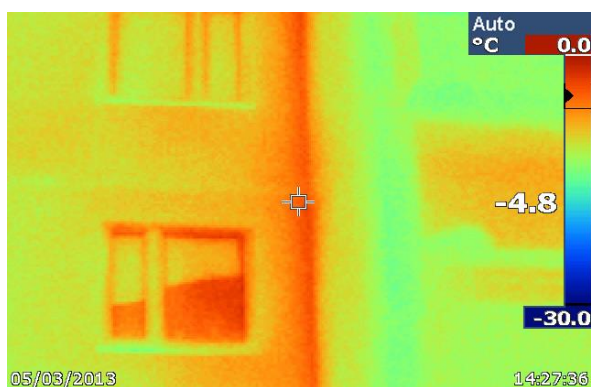
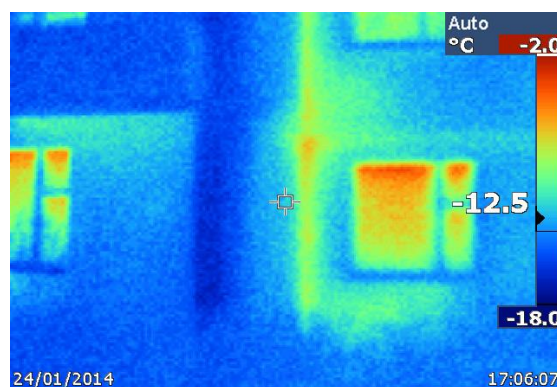
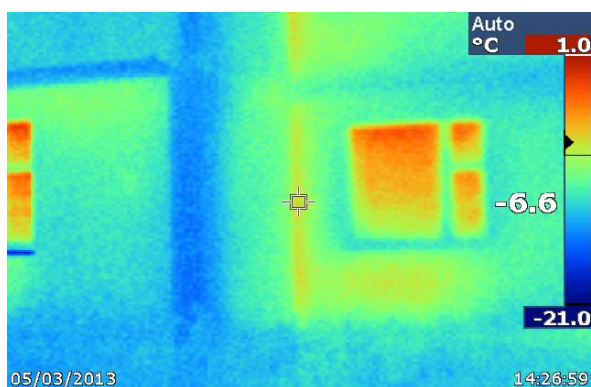
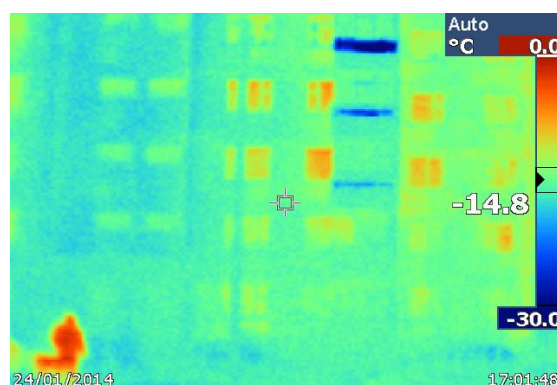
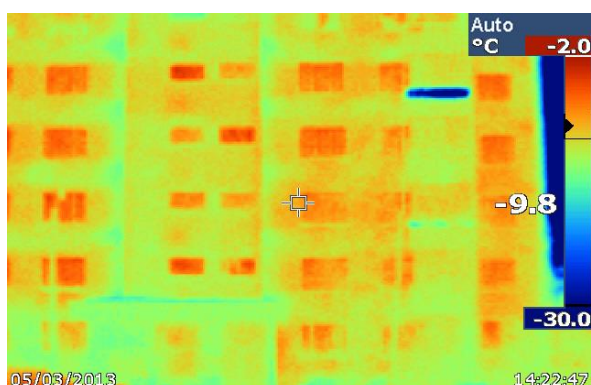
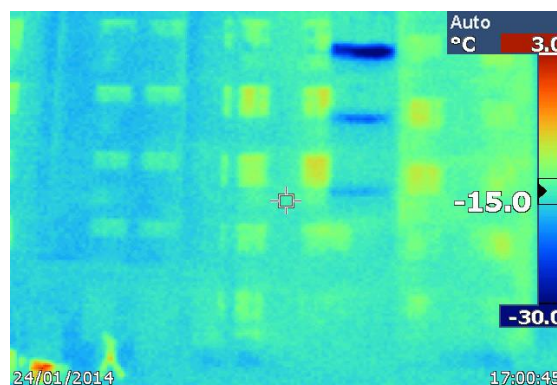
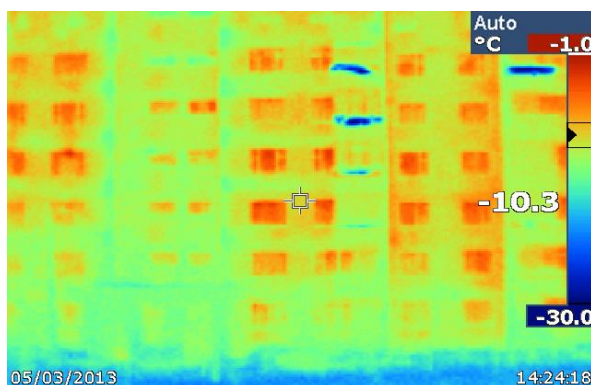
Before thermal insulation application
(05.03.2013).
Outdoor air temperature is minus 20 °C.

After thermal insulation application
(24.01.2014).
Outdoor air temperature is minus 20 °C.



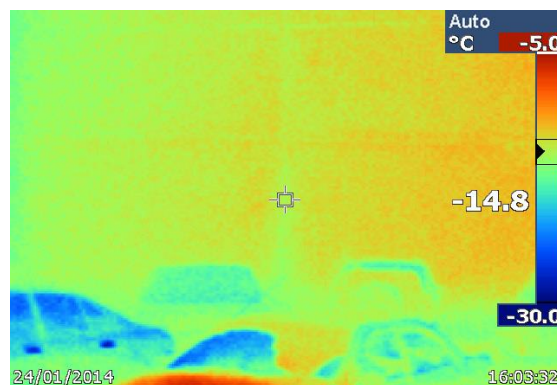
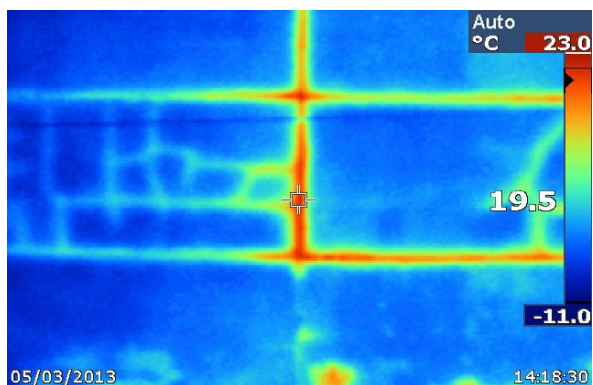
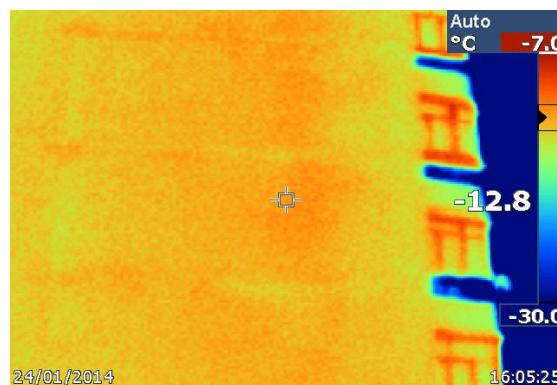
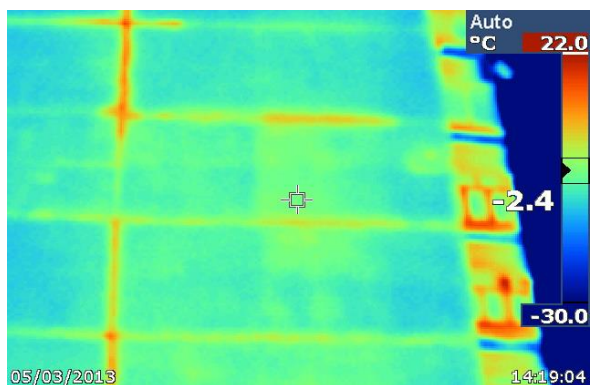
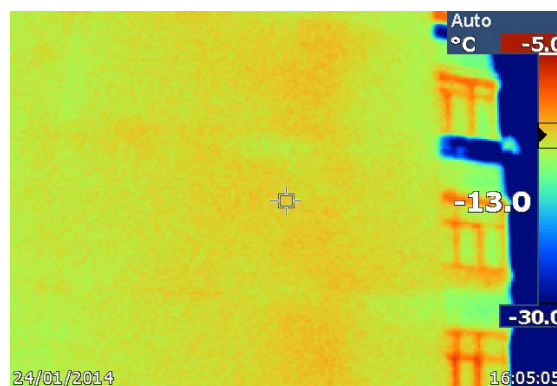
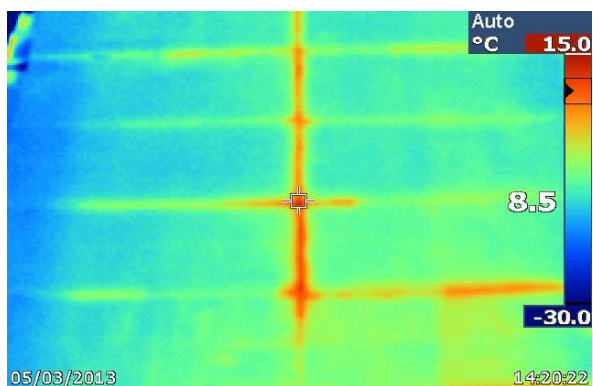
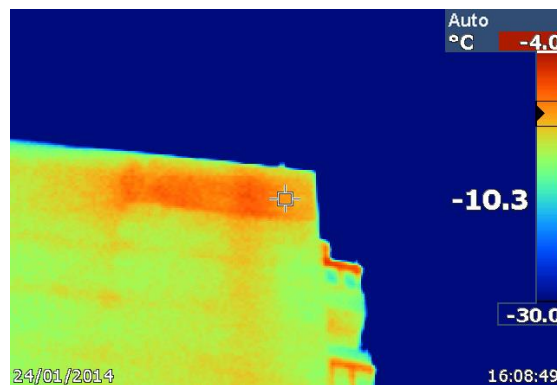
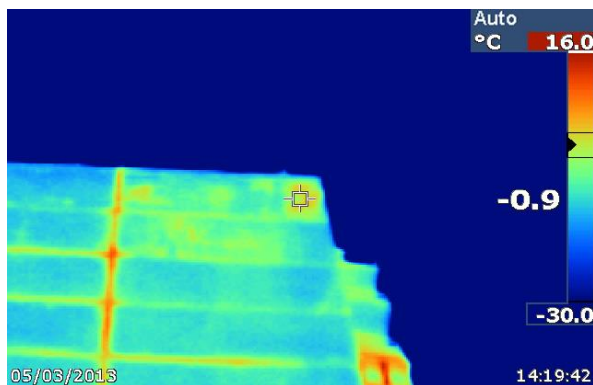
Before thermal insulation application
(05.03.2013).
Outdoor air temperature is minus 20 °C.

After thermal insulation application
(24.01.2014).
Outdoor air temperature is minus 20 °C.



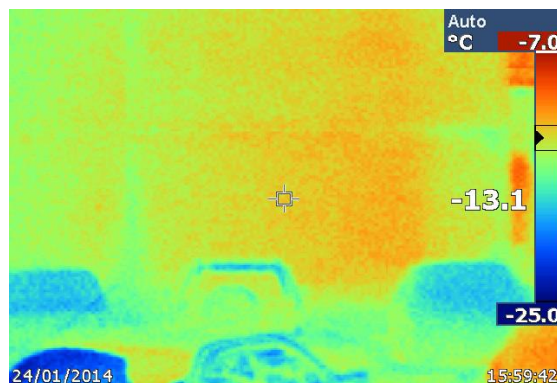
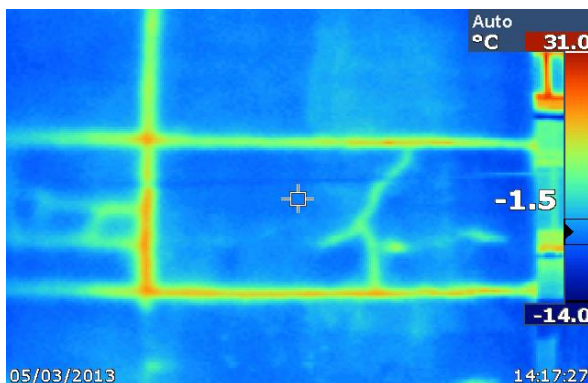
Before thermal insulation application
(05.03.2013).
Outdoor air temperature is minus 20 °C.

After thermal insulation application
(24.01.2014).
Outdoor air temperature is minus 20 °C.



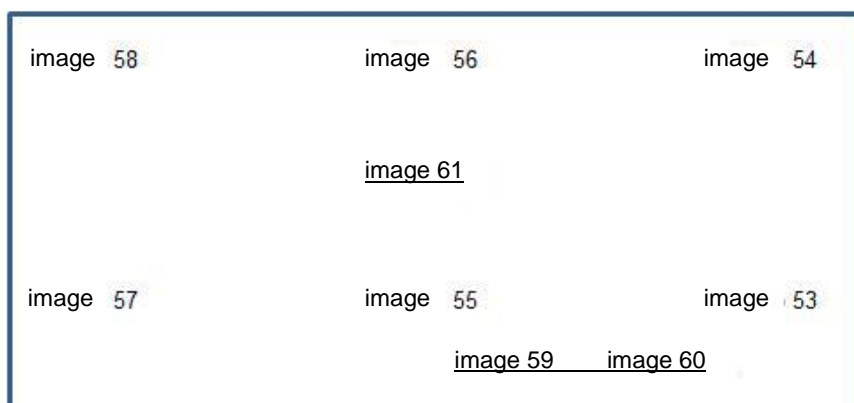
Before thermal insulation application
(05.03.2013).
Outdoor air temperature is minus 20 °C.

After thermal insulation application
(24.01.2014).
Outdoor air temperature is minus 20 °C.

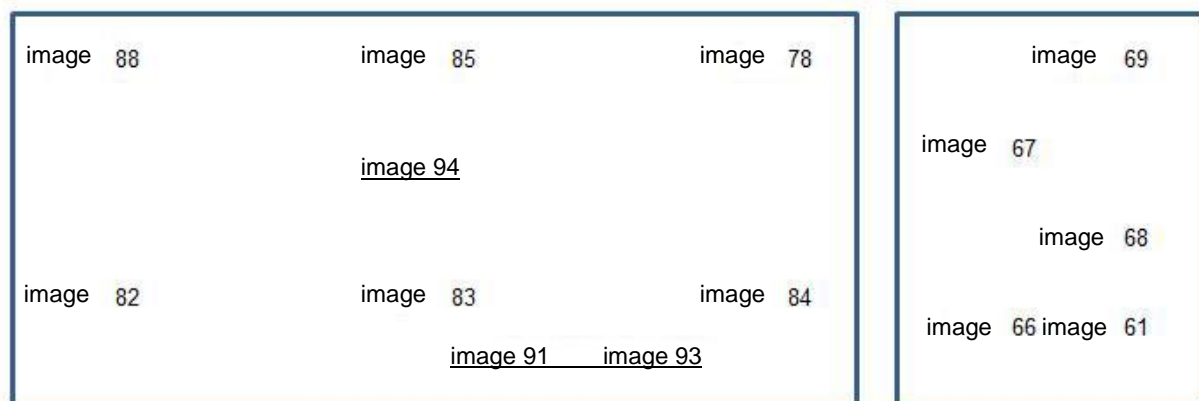


Thermal imaging survey layout.

Before thermal insulation application (05.03.2013).



After thermal insulation application (24.01.2014).



6. Summary

Prior to the building thermal insulation application.

Surveyed building enclosing structure design heat transfer resistance is $1.51 \text{ m}^2 \text{ }^\circ\text{C} / \text{W}$.

Surveyed building enclosing structure actual heat transfer resistance **is maximum $0.90 \text{ m}^2 \text{ }^\circ\text{C} / \text{W}$** .

Based on the sanitary regulations, surveyed building enclosing structure required heat transfer resistance is $1.38 \text{ m}^2 \text{ }^\circ\text{C} / \text{W}$.

Actual indoor air temperature is plus $18 \text{ }^\circ\text{C}$.

Enclosing structure inner surface temperature is plus $13 \text{ }^\circ\text{C}$.

Multiple residents' applications and complaints to low atmospheric temperatures in the apartments and condensation on indoor exterior walls during the heating season.

After the building thermal insulation application completion.

Based on the energy efficiency standards for the 1st phase of energy saving, surveyed building enclosing structures required heat transfer resistance (for refurbished apartment blocks) is **$1.83 \text{ m}^2 \text{ }^\circ\text{C} / \text{W}$** .

As insulation coating thermal insulation TEMP- COAT® is applied. Manufacturer is TEMP- COAT® Brand Products, LLC, USA. Supplier – ZAO Teploenergo. **Thermal insulation coating thickness is 1.0 mm** . Extra heat transfer resistance is **$1.0 \text{ m}^2 \text{ }^\circ\text{C} / \text{W}$** .

Design heat transfer resistance of the surveyed building enclosing structure **with account for the actual** heat transfer resistance is equal to $0.90 + 1.0 = \mathbf{1.90 \text{ m}^2 \text{ }^\circ\text{C} / \text{W}}$.

Actual heat transfer resistance of the surveyed building enclosing structure is **over $1.90 \text{ m}^2 \text{ }^\circ\text{C} / \text{W}$** .

Based on the results of the thermal survey of the residential apartment block No. 234, building 3, located at prospect Krasnoi Armii in the city Sergiyev Posad, Moscow Oblast, the building meets the sanitary and energy efficiency norms, applied to refurbished buildings.

7. Applications

Форма № П 5 1 0 0 1

Федеральная налоговая служба
СВИДЕТЕЛЬСТВО
о государственной регистрации юридического лица

Настоящим подтверждается, что в соответствии с Федеральным законом «О государственной регистрации юридических лиц и индивидуальных предпринимателей» в единый государственный реестр юридических лиц внесена запись о создании юридического лица

Общество с ограниченной ответственностью "Теплозащита"
(полное фирменное наименование юридического лица с указанием организационно - правовой формы)

ООО "Теплозащита"
(сокращенное фирменное наименование юридического лица)

22 сентября 2011 за основным государственным регистрационным номером
(дата) (месяц прописью) (год)

1 1 1 3 4 3 5 0 1 0 1 5 0

Инспекция Федеральной налоговой службы по г. Волжскому Волгоградской области
(Наименование регистрирующего органа)

Должность уполномоченного лица регистрирующего органа
Исполняющий обязанности начальника инспекции Жидкова И.Н.
(подпись, Ф.И.О.)

серия 34 №003694618

Форма № 1-1-Учет

Федеральная налоговая служба
СВИДЕТЕЛЬСТВО
О ПОСТАНОВКЕ НА УЧЕТ РОССИЙСКОЙ ОРГАНИЗАЦИИ В НАЛОГОВОМ ОРГАНЕ ПО МЕСТУ НАХОЖДЕНИЯ НА ТЕРРИТОРИИ РОССИЙСКОЙ ФЕДЕРАЦИИ

Настоящее свидетельство подтверждает, что российская организация **Общество с ограниченной ответственностью "Теплозащита"**

(полное наименование в соответствии с учредительными документами)

ОГРН 11113435010150
поставлена на учет в соответствии с положениями
Налогового кодекса Российской Федерации 22 сентября 2011 г.
(число, месяц, год)

в налоговом органе по месту нахождения ИФНС России по г. Волжскому
Волгоградской области 3 4 3 5

(наименование налогового органа и его код)

и ей присвоен
ИНН/КПП 3 4 3 5 1 1 0 7 8 0 / 3 4 3 5 0 1 0 0 1

Свидетельство подлежит замене в случае изменения приведенных в нем сведений.

Исполняющий обязанности начальника Жидкова И.Н.
(подпись, Ф.И.О.)

серия 34 №003592851

125П.

ГЛАВПРОЕКТ
САМОРЕГУЛИРУЕМАЯ ОРГАНИЗАЦИЯ
ИНЖЕНЕРНО-ТЕХНИЧЕСКОГО ОБЕСПЕЧЕНИЯ

197227, г. Санкт-Петербург, улица Гаврилевская, д.21, лит. А
www.glavproekt.ru
СРО-П-173-03082012

г. Санкт-Петербург «21» ноября 2012 года

СВИДЕТЕЛЬСТВО
о допуске к определённому виду или видам работ по подготовке проектной документации, которые оказывают влияние на безопасность объектов капитального строительства № СРОП-125.1-21112012

Выдано члену саморегулируемой организации
Общество с ограниченной ответственностью «Теплозащита»

404122, РФ, Волгоградская область,
г. Волжский, ул. Кирова, д. 22
ОГРН 1113435010150 ИНН 3435110780

Основание выдачи Свидетельства: Решение Совета Некоммерческого партнерства проектировщиков «ГлавПроект», протокол № 084 от 21.11.2012г.

Настоящим Свидетельством подтверждается допуск к работам, указанным в приложении к настоящему Свидетельству, которые оказывают влияние на безопасность объектов капитального строительства.

Начало действия с «21» ноября 2012г.

Свидетельство без приложения не действует
Свидетельство выдано без ограничения срока и территории его действия.

Генеральный директор А.И. Казин
0000125 *

Приложение
1.2 К СВИДЕТЕЛЬСТВУ О ДОПУСКЕ К ОПРЕДЕЛЕННОМУ ВИДУ ИЛИ ВИДАМ РАБОТ ПО ПОДГОТОВКЕ ПРОЕКТНОЙ ДОКУМЕНТАЦИИ, КОТОРЫЕ ОКАЗЫВАЮТ ВЛИЯНИЕ НА БЕЗОПАСНОСТЬ ОБЪЕКТОВ КАПИТАЛЬНОГО СТРОИТЕЛЬСТВА ОТ «21» НОЯБРЯ 2012г. №СРОП-125.1-21112012

ВИДЫ РАБОТ
которые оказывают влияние на безопасность объектов капитального строительства (включая особо опасные и технически сложные объекты капитального строительства (кроме объектов использования атомной энергии)) о допуске к которым член Саморегулируемой организации Некоммерческого партнерства проектировщиков «ГлавПроект»

Общество с ограниченной ответственностью «Теплозащита» имеет Свидетельство:

№ п/п	Наименование вида работ
1.	РАБОТЫ ПО ПОДГОТОВКЕ СХЕМЫ ПЛАНИРОВОЧНОЙ ОРГАНИЗАЦИИ ЗЕМЕЛЬНОГО УЧАСТКА:
1.1.	Работы по подготовке генерального плана земельного участка
1.2.	Работы по подготовке схемы планировочной организации трассы линейного объекта
1.3.	Работы по подготовке схемы планировочной организации полосы отвода линейного сооружения
2.	РАБОТЫ ПО ПОДГОТОВКЕ АРХИТЕКТУРНЫХ РЕШЕНИЙ
3.	РАБОТЫ ПО ПОДГОТОВКЕ КОНСТРУКТИВНЫХ РЕШЕНИЙ
4.	РАБОТЫ ПО ПОДГОТОВКЕ СВЕДЕНИЙ О ВНЕШНЕМ ИНЖЕНЕРНОМ ОБОРУДОВАНИИ, ВНУТРЕННИХ СЕТЯХ ИНЖЕНЕРНО-ТЕХНИЧЕСКОГО ОБЕСПЕЧЕНИЯ, О ПЕРЕЧНЕ ИНЖЕНЕРНО-ТЕХНИЧЕСКИХ МЕРОПРИЯТИЙ:
4.1.	Работы по подготовке проектов внутренних инженерных систем отопления, вентиляции, кондиционирования, приточной вентиляции, теплоснабжения и холодоснабжения
4.2.	Работы по подготовке проектов внутренних инженерных систем водоснабжения и канализации
4.3.	Работы по подготовке проектов внутренних систем электроснабжения*
4.4.	Работы по подготовке проектов внутренних слаботоковых систем*
4.5.	Работы по подготовке проектов внутренних диспетчеризации, автоматизации и управления инженерными системами
4.6.	Работы по подготовке проектов внутренних систем газоснабжения
5.	РАБОТЫ ПО ПОДГОТОВКЕ СВЕДЕНИЙ О НАРУЖНЫХ СЕТЯХ ИНЖЕНЕРНО-ТЕХНИЧЕСКОГО ОБЕСПЕЧЕНИЯ, О ПЕРЕЧНЕ ИНЖЕНЕРНО-ТЕХНИЧЕСКИХ МЕРОПРИЯТИЙ:
5.1.	Работы по подготовке проектов наружных сетей теплоснабжения и их сооружений

1

ПРИЛОЖЕНИЕ	
5.2.	Работы по подготовке проектов наружных сетей водоснабжения и канализации и их сооружений
5.3.	Работы по подготовке проектов наружных сетей электроснабжения до 35 кВ включительно и их сооружений
5.4.	Работы по подготовке проектов наружных сетей электроснабжения не более 110 кВ включительно и их сооружений
5.5.	Работы по подготовке проектов наружных сетей электроснабжения 110 кВ и более и их сооружений
5.6.	Работы по подготовке проектов наружных сетей слоботочных систем
5.7.	Работы по подготовке проектов наружных сетей газоснабжения и их сооружений
6.	РАБОТЫ ПО ПОДГОТОВКЕ ТЕХНОЛОГИЧЕСКИХ РЕШЕНИЙ:
6.1.	Работы по подготовке технологических решений жилых зданий и их комплексов
6.2.	Работы по подготовке технологических решений общественных зданий и сооружений и их комплексов
6.3.	Работы по подготовке технологических решений производственных зданий и сооружений и их комплексов
6.4.	Работы по подготовке технологических решений объектов транспортного назначения и их комплексов
6.5.	Работы по подготовке технологических решений гидротехнических сооружений и их комплексов
6.6.	Работы по подготовке технологических решений объектов сельскохозяйственного назначения и их комплексов
6.7.	Работы по подготовке технологических решений объектов специального назначения и их комплексов
6.8.	Работы по подготовке технологических решений объектов нефтегазового назначения и их комплексов
6.9.	Работы по подготовке технологических решений объектов сбора, обработки, хранения, переработки и утилизации отходов и их комплексов
6.11.	Работы по подготовке технологических решений объектов военной инфраструктуры и их комплексов
6.12.	Работы по подготовке технологических решений объектов очистных сооружений и их комплексов
7.	РАБОТЫ ПО РАЗРАБОТКЕ СПЕЦИАЛЬНЫХ РАЗДЕЛОВ ПРОЕКТНОЙ ДОКУМЕНТАЦИИ:
7.1.	Инженерно-технические мероприятия по гражданской обороне
7.2.	Инженерно-технические мероприятия по предупреждению чрезвычайных ситуаций природного и техногенного характера

2

ПРИЛОЖЕНИЕ	
7.3.	Разработка декларации по промышленной безопасности опасных производственных объектов
7.4.	Разработка декларации безопасности гидротехнических сооружений
8.	РАБОТЫ ПО ПОДГОТОВКЕ ПРОЕКТОВ ОРГАНИЗАЦИИ СТРОИТЕЛЬСТВА, СНОСУ И ДЕМОНТАЖУ ЗДАНИЙ И СООРУЖЕНИЙ, ПРОДЛЕНИЮ СРОКА ЭКСПЛУАТАЦИИ И КОНСЕРВАЦИИ*
9.	РАБОТЫ ПО ПОДГОТОВКЕ ПРОЕКТОВ МЕРОПРИЯТИЙ ПО ОХРАНЕ ОКРУЖАЮЩЕЙ СРЕДЫ
10.	РАБОТЫ ПО ПОДГОТОВКЕ ПРОЕКТОВ МЕРОПРИЯТИЙ ПО ОБЕСПЕЧЕНИЮ ПОЖАРНОЙ БЕЗОПАСНОСТИ
11.	РАБОТЫ ПО ПОДГОТОВКЕ ПРОЕКТОВ МЕРОПРИЯТИЙ ПО ОБЕСПЕЧЕНИЮ ДОСТУПА МАЛОМОБИЛЬНЫХ ГРУПП НАСЕЛЕНИЯ
12.	РАБОТЫ ПО ОБСЛЕДОВАНИЮ СТРОИТЕЛЬНЫХ КОНСТРУКЦИЙ ЗДАНИЙ И СООРУЖЕНИЙ
13.	РАБОТЫ ПО ОРГАНИЗАЦИИ ПОДГОТОВКИ ПРОЕКТНОЙ ДОКУМЕНТАЦИИ, ПРИВЛЕКАЕМЫМ ЗАСТРОЙЩИКОМ ИЛИ ЗАКАЗЧИКОМ НА ОСНОВАНИИ ДОГОВОРА ЮРИДИЧЕСКИМ ЛИЦОМ ИЛИ ИНДИВИДУАЛЬНЫМ ПРЕДПРИИМАТЕЛЕМ (ГЕНЕРАЛЬНЫМ ПРОЕКТИРОВЩИКОМ)

*-> Данные виды и группы видов работ требуют получения свидетельства о допуске на виды работ, влияющие на безопасность объекта капитального строительства, в случае выполнения таких работ на объектах, указанных в статье 48.1 Градостроительного кодекса Российской Федерации.

ООО «Теплозащита»

вправе заключать договоры по осуществлению организации работ по подготовке проектной документации для объектов капитального строительства, стоимость которых по одному договору не превышает (составляет)

5 000 000 (пять миллионов рублей)

Генеральный директор А.Б. Козин

3



THERMAL CALCULATION
Based on the building thermal imaging results,
dated 05 March 2013.

Introduction

1. Any inquiries, related to this thermal calculation, shall be forwarded to OOO Teplozashchita, telephone (844) 331-39-50, www.teploza.ru, teploza@mail.ru.

2. **Region** *Sergiyev Posad,
prospect Krasnoi Armii, 234, building 3,
Moscow Oblast.*

3. **Object**

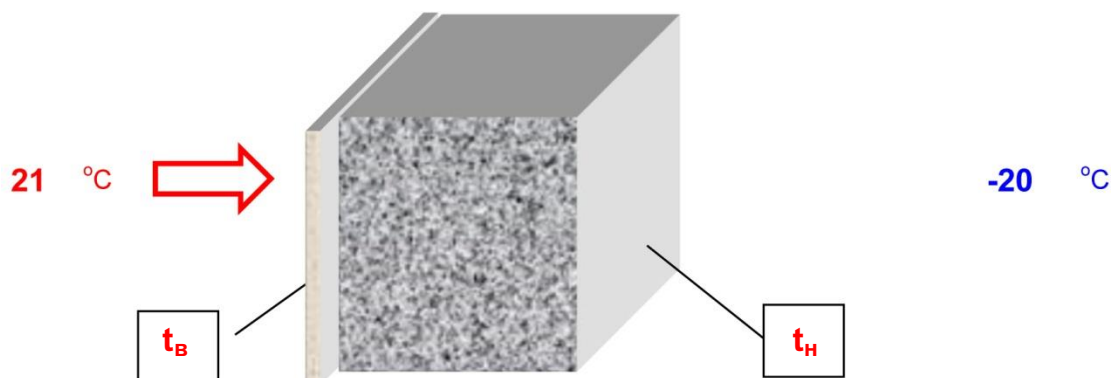
Residential apartment block thermal insulation.

Phase 1 – building thermal imaging prior to insulation application.

4. **Input data**

t_B	Rated indoor air temperature	21°C
t_{on}	Average temperature of the heating period (SNiP 23-01-99, table 1)	minus 3.1 °C
t_H	Average temperature of the coldest five-day period (SNiP 23-01-99, table 1)	minus 27 °C
t_H	Ambient air temperature at time of thermal imaging	minus 20 °C

Enclosing structure design.



Thermal imaging survey layout.

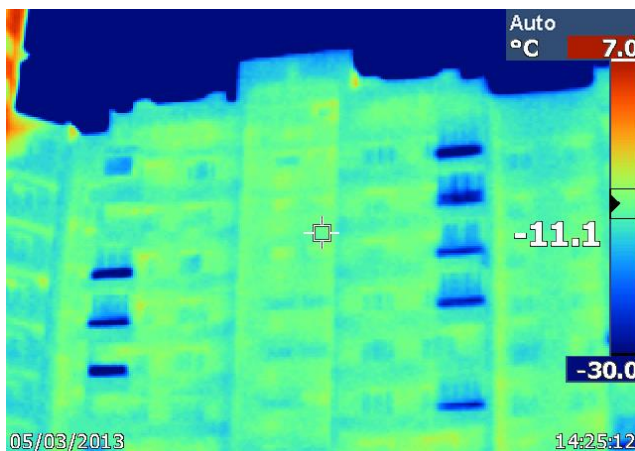
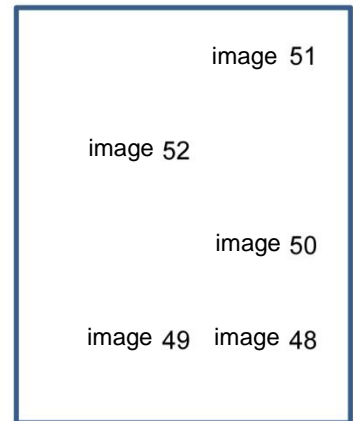
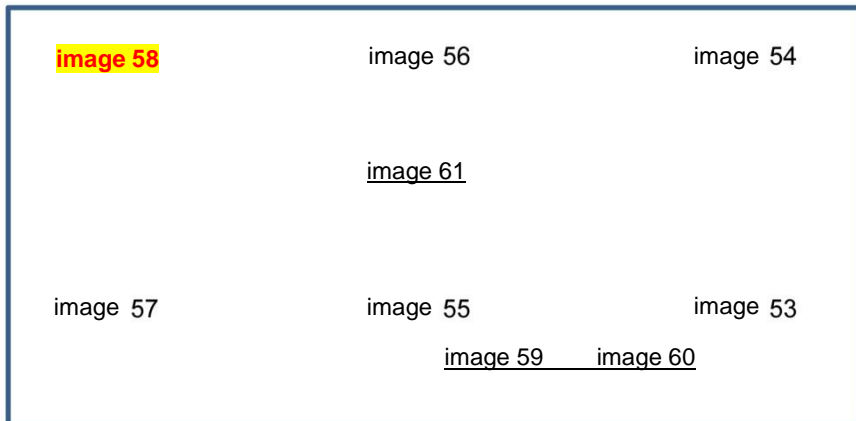


Image 58

Surface temperature in the measurement point: minus **11.1** ° C.

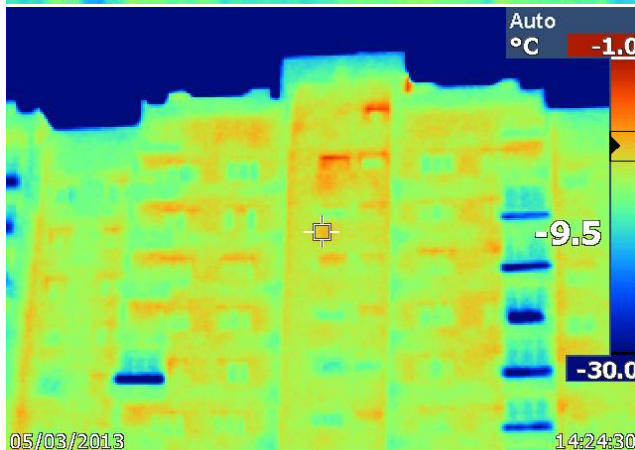


Image 56

Surface temperature in the measurement point: **minus 9.5** °C.

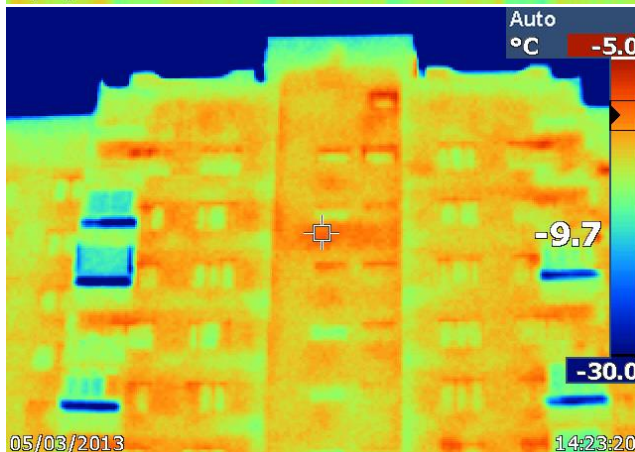


Image 54

Surface temperature in the measurement point: **minus 9.7** °C.



Image 61

Surface temperature in the measurement point: **minus 4.8 °C**

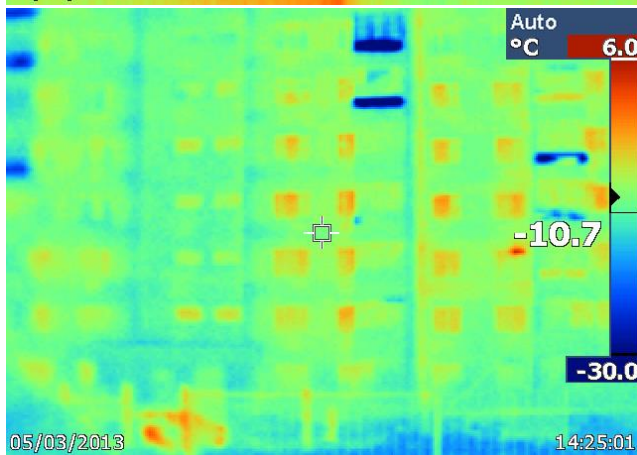


Image 57

Surface temperature in the measurement point: **minus 10.7 °C**.

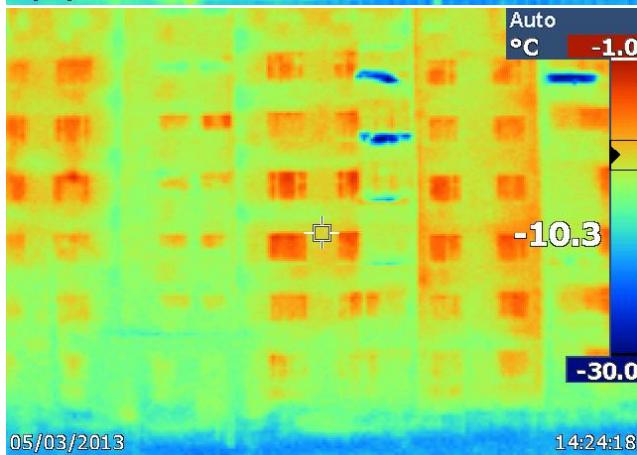


Image 55

Surface temperature in the measurement point: **minus 10.3 °C**.

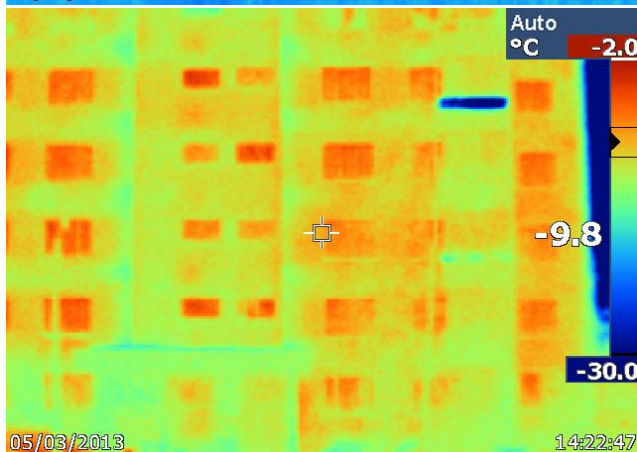


Image 53

Surface temperature in the measurement point: **minus 9.8 °C**.

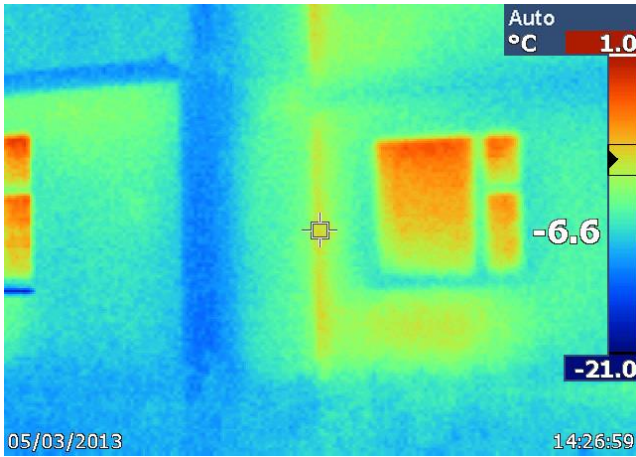


Image 59

Surface temperature in the measurement point: **minus 6.6 °C**.



Image 60

Surface temperature in the measurement point: **minus 4.8 °C**.

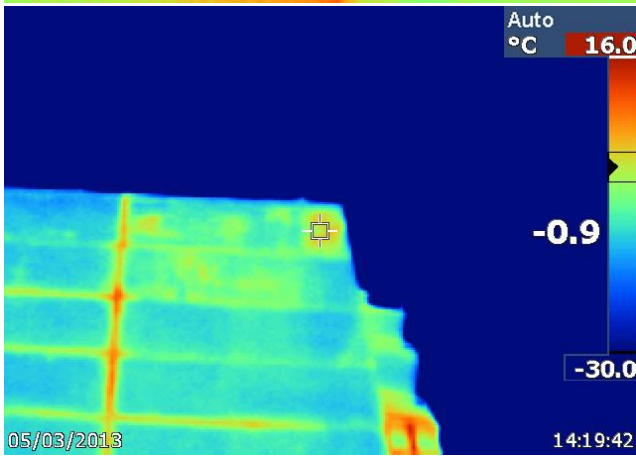


Image 51

Surface temperature in the measurement point: **minus 0.9 °C**.

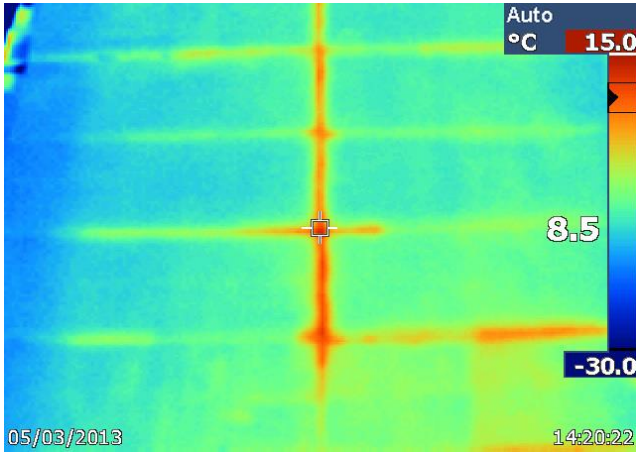


Image 52

Surface temperature in the measurement point: **8.5 °C**.

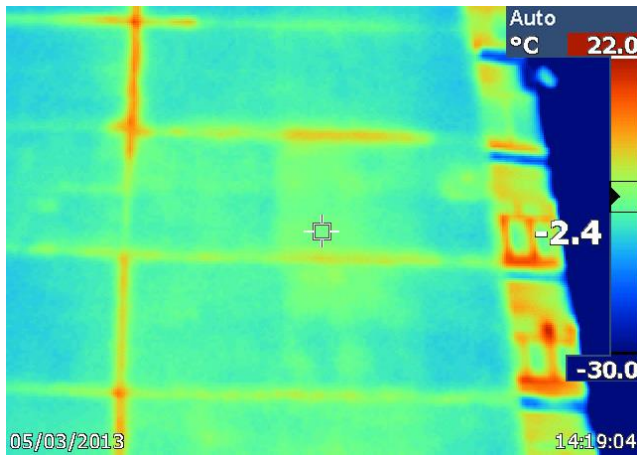


Image 50

Surface temperature in the measurement point: **minus 2.4 °C.**

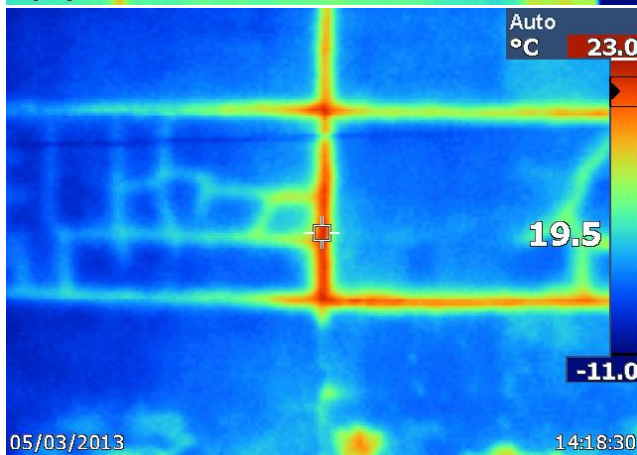


Image 49

Surface temperature in the measurement point: **19.5 °C.**

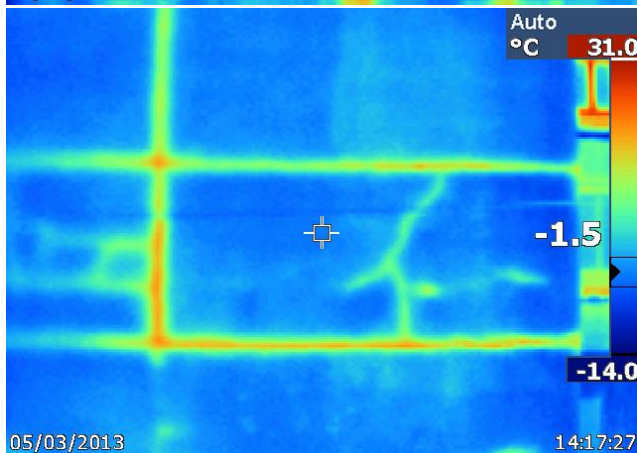


Image 48

Surface temperature in the measurement point: **minus 1.5 °C.**

Enclosing structure heat transfer resistance value determination

Region	<i>The city Sergiyev Posad</i>		
Structure	<i>Plastering with cement – sand grout</i>	δ_1	<i>0.02 m</i>
		λ_1	<i>0.93 W/m °C</i>
	<i>Haydite concrete slab $\gamma=800 \text{ kg/m}^3$</i>	δ_2	<i>0.32 m</i>
		λ_2	<i>0.24 W/m °C</i>
	<i>NA</i>	δ_4	<i>0.00 m</i>
		λ_4	<i>1.00 W/m °C</i>
	<i>NA</i>	δ_4	<i>0.00 m</i>
		λ_4	<i>1.00 W/m °C</i>
	<i>NA</i>	δ_5	<i>0.00 m</i>
		λ_5	<i>1.00 W/m °C</i>
	<i>NA</i>	δ_6	<i>0.00 m</i>
		λ_6	<i>1.00 W/m °C</i>

1. Rated heat transfer resistance of this wall

$$R_o = 1/\alpha_B + \delta_1/\lambda_1 + \delta_2/\lambda_2 + \delta_3/\lambda_3 + \delta_4/\lambda_4 + \delta_5/\lambda_5 + \delta_6/\lambda_6 + 1/\alpha_H$$

Where

R_o	Heat transfer resistance	1.52 m ² °C/W
α_B	Wall heat absorption coefficient SNiP II – 3- 79* table 4.	8.70 W/ m ² °C
δ_1	Cement – sand grout plastering	0.02 m
λ_1	Heat conductivity coefficient	0.93 W/ m ² °C
δ_2	Haydite concrete slab $\gamma=800 \text{ kg/m}^3$	0.32 m
λ_2	Heat conductivity coefficient	0.24 W/ m ² °C
δ_3	NA	0.00 m
λ_3	Heat conductivity coefficient	1.00 W/ m ² °C
δ_4	NA	0.00 m
λ_4	Heat conductivity coefficient	1.00 W/ m ² °C
δ_5	NA	0.00 m
λ_5	Heat conductivity coefficient	1.00 W/ m ² °C
δ_6	NA	0.00 m
λ_6	Heat conductivity coefficient	1.00 W/ m ² °C
α_H	Wall heat transfer coefficient SNiP II-3-79* table 6*	23 W/ m ² °C

2. Estimation of heating season degree – day (HSDD).

$$\text{HSDD} = (t_B - t_{OП}) Z_{OП}$$

Where

HSDD	Heating season degree - day	5157 °C day
t_B	Rated indoor air temperature	21 °C
$t_{OП}$	Average heating season temperature SNiP 23-01-99 table 1	minus 3.1 °C
$Z_{OП}$	Heating season period SNiP 23-01-99 table 1	214 days

According to SNiP II-3-79*, tables 1a and 1b. enclosing structure full heat transfer resistance shall be as follows:

Sanitary – hygienic specification:	$R_o^{TP} =$	1.38 m ² °C /W
Energy efficiency specification, phase 1	$R_o^{TP} =$	1.83 m ² °C /W
Energy efficiency specification, phase 2	$R_o^{TP} =$	3.2 m ² °C /W

3. Rated heat loss

$$q = \frac{t_B - t_H}{R_o}$$

Where

		Winter	Theoretical	
q	Heat loss	16	27	W/m ²
t _B	Indoor air temperature	21	21	°C
t _H	Outdoor air temperature	minus 3.1	minus 20	°C
R _o	Heat transfer resistance, calculation 1, item 2	1.51	1.51	m ² °C/W

4. Enclosing structure exterior surface temperature

$$T_B = t_B - n(t_H - t_B)/R_o \alpha_B$$

Where

		Winter	Theoretical value	Actual value (image 58)	
T _B	Surface temperature	minus 1	minus 16.9	minus 11.1	°C
t _H	Outdoor air temperature	minus 3.1	minus 20	minus 20	°C
n	Coefficient SNIIP II – 3-79* table 3*	1	1	1	
t _B	Indoor air temperature	21	21	21	°C
R _o	Heat transfer resistance (calculation 1)	1.51	1.51	0.53	m ² °C/W
α _B	Coefficient of heat transfer to the ambient air	8.7	8.7	8.7	W/m ² °C

5. Enclosing structure inner surface temperature

$$T_B = t_B - n(t_B - t_H)/R_o \alpha_B$$

Where

		Winter	Theoretical value	Actual value	
T _B	Inner surface temperature	16	15	13	°C
t _B	Indoor air temperature (as measured in apartment 280)	18	18	18	°C
n	Coefficient SNIIP II – 3-79* table 3*	1	1	1	
t _H	Outdoor air temperature	minus 3.1	minus 20	minus 20	°C
R _o	Heat transfer resistance (calculation 1)	1.51	1.51	0.90	m ² °C/W
α _B	Coefficient of enclosing structure heat absorption (SNIIP II – 3-79* table 4*)	8.70	8.70	8.70	W/m ² °C

SUMMARY

Wall exterior surface averaged temperature was applied as input for the surveyed residential apartment block enclosing structure heat transfer resistance calculation.

The measurements were made using thermal imaging survey.

Ambient air temperature was minus **20 °C** at time of the thermal imaging survey.

Wall exterior surface average temperature was minus **10.7 °C**.

1. Surveyed building enclosing structure design heat transfer resistance: **1,51 m² °C /W**.
2. Surveyed building enclosing structure actual heat transfer resistance: **0.90 m² °C /W**
3. Surveyed building enclosing structure heat transfer resistance as required by the sanitary norms: **1.38 m² °C /W**
4. Surveyed building enclosing structure heat transfer resistance as required by energy efficiency norms: **1,83 m² °C /W**.

The surveyed building does not comply with the sanitary norms, all enclosing structures shall be winterized.

In addition, all inter-panel joints shall be inspected and winterized.

List of references .

SNiP 23 - 01 – 99. Construction Climatology.

SNiP 23 - 02 – 2003. Thermal Protection of Buildings.

SNiP II - 3 - 79*. Construction Heat Engineering.

Reference Book. Thermal Insulation. STROIIZDAT - 1976.

TU -5768-001-62595647-2009. Super-thing thermal insulation coating TEMP-COAT[®].

THERMAL CALCULATION
Based on the building thermal imaging results,
dated 24 January 2014.

Introduction

1. Any inquiries, related to this thermal calculation, shall be forwarded to OOO Teplozashchita, telephone (844) 331-39-50, www.teploza.ru, teploza@mail.ru.
2. **Region** *Sergiyev Posad,
prospect Krasnoi Armii, 234, building 3,
Moscow Oblast.*
3. **Object**

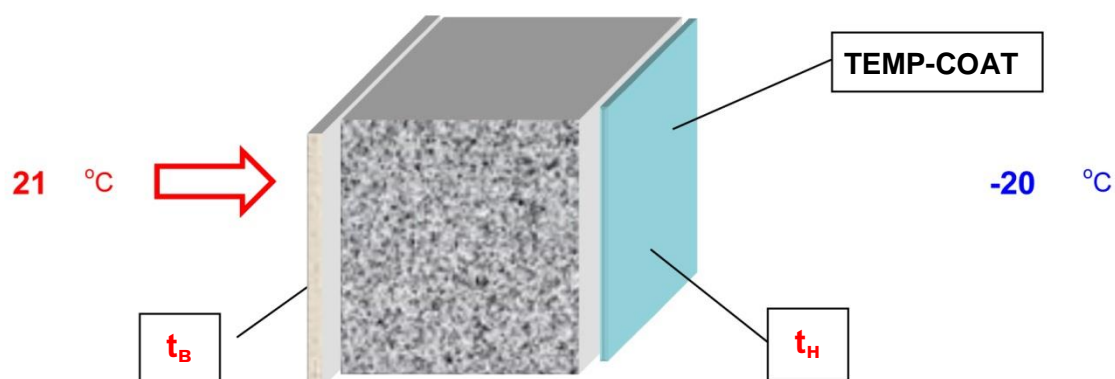
Residential apartment block thermal insulation.

Phase 2 – building thermal imaging after thermal insulation application.

4. Input data

t_B	Rated indoor air temperature	21°C
t_{on}	Average temperature of the heating period (SNiP 23-01-99, table 1)	minus 3.1 °C
t_H	Average temperature of the coldest five-day period (SNiP 23-01-99, table 1)	minus 27 °C
t_H	Ambient air temperature at time of thermal imaging	minus 20 °C

Enclosing structure design.



Thermal imaging survey layout.

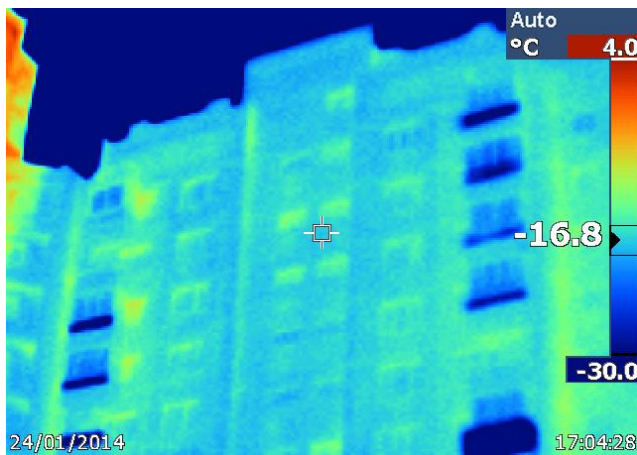
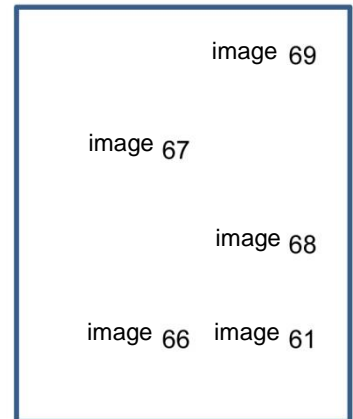
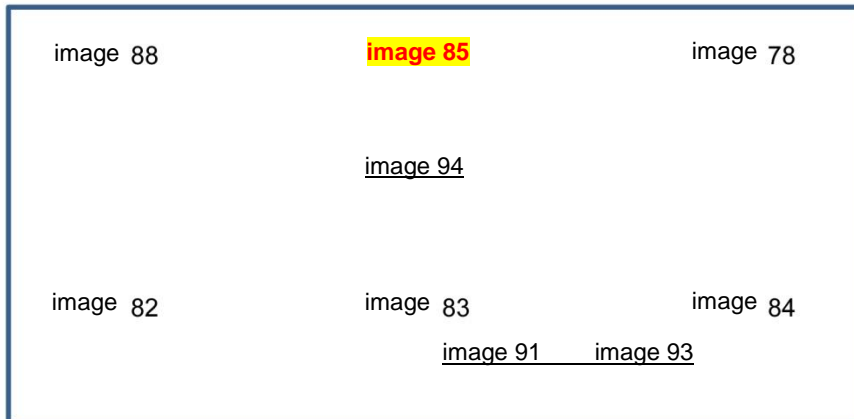


Image 88

Surface temperature in the measurement point: **minus 16.8 °C.**

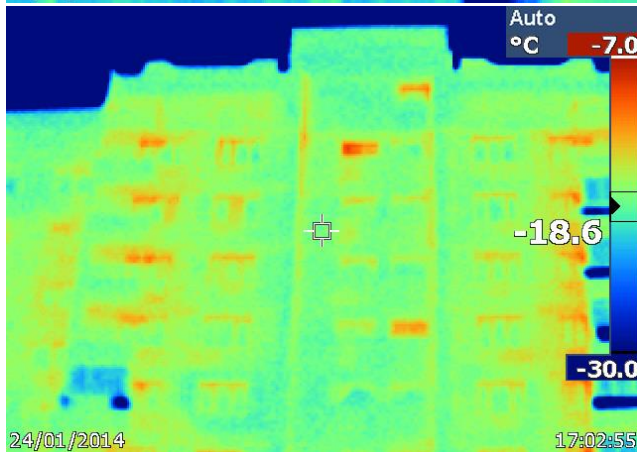


Image 85

Surface temperature in the measurement point: **minus 18.6 °C.**

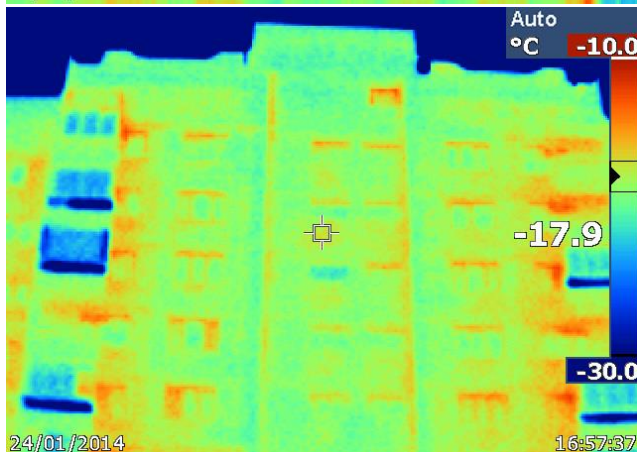


Image 78

Surface temperature in the measurement point: **minus 17.9 °C.**

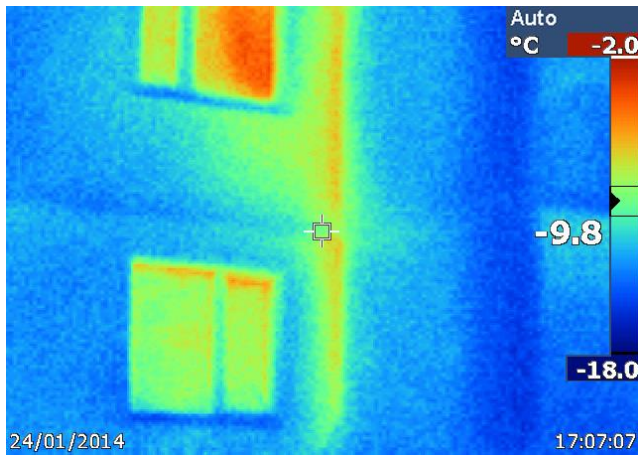


Image 94

Surface temperature in the measurement point: **minus 9.8 °C**

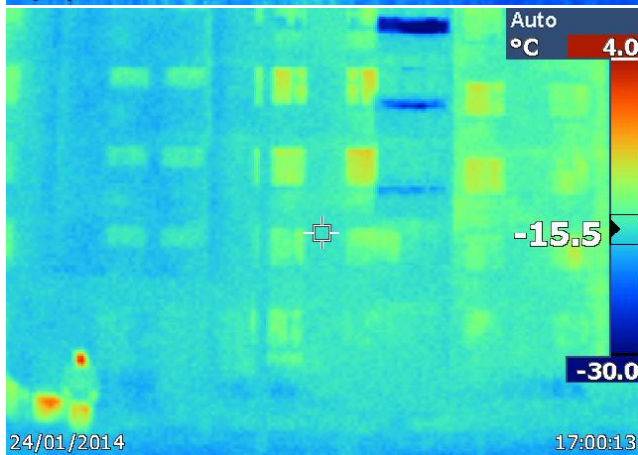


Image 82

Surface temperature in the measurement point: **minus 15.5 °C.**

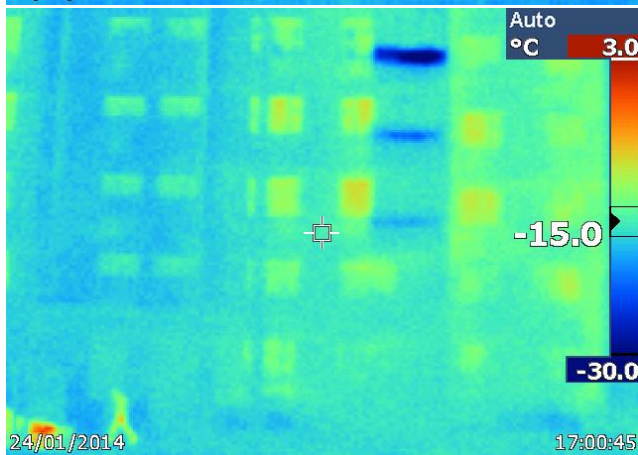


Image 83

Surface temperature in the measurement point: **minus 15 °C.**

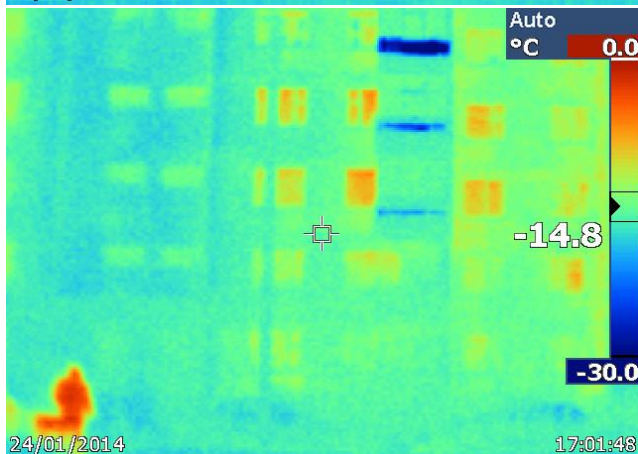


Image 84

Surface temperature in the measurement point: **minus 14.8 °C.**

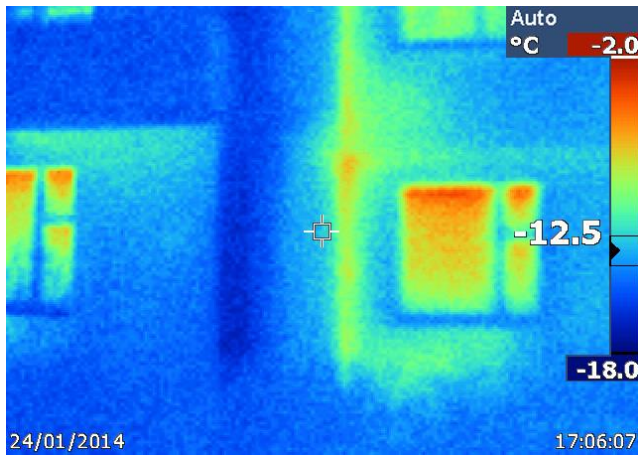


Image 91

Surface temperature in the measurement point: **minus 12.5 °C.**

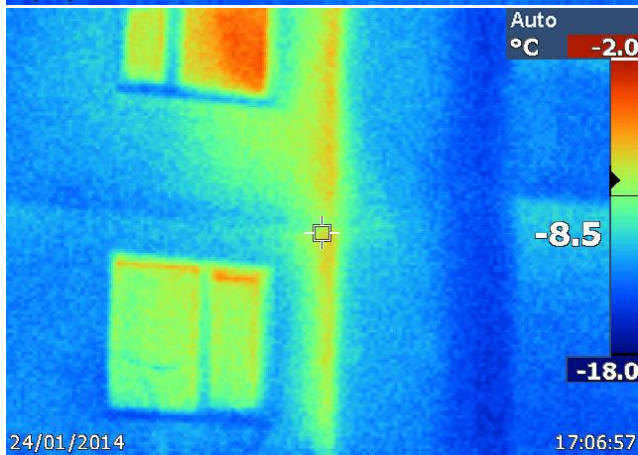


Image 93

Surface temperature in the measurement point: **minus 8.5 °C.**

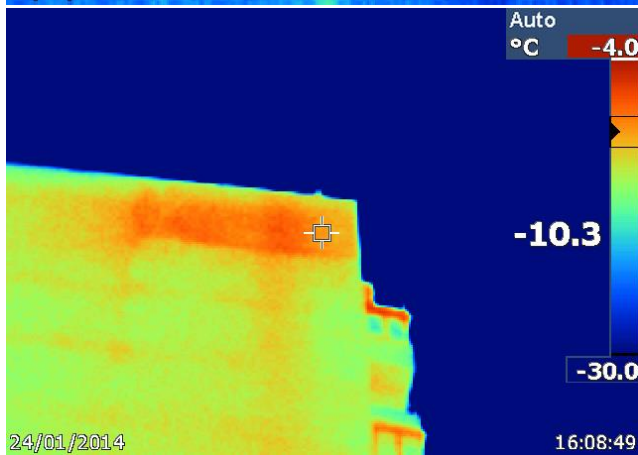


Image 69

Surface temperature in the measurement point: **minus 10.3 °C.**

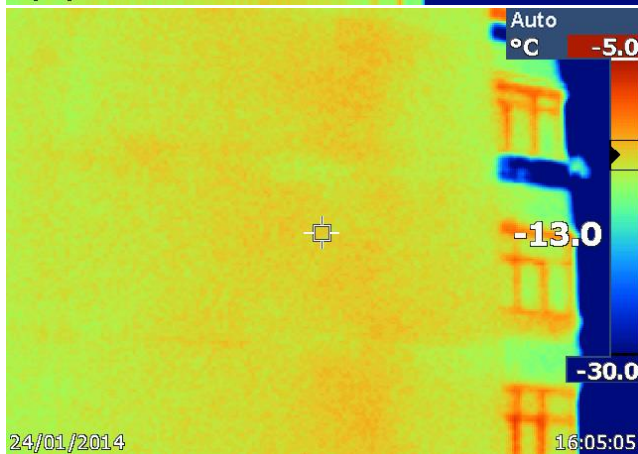


Image 67

Surface temperature in the measurement point: **minus 13 °C.**

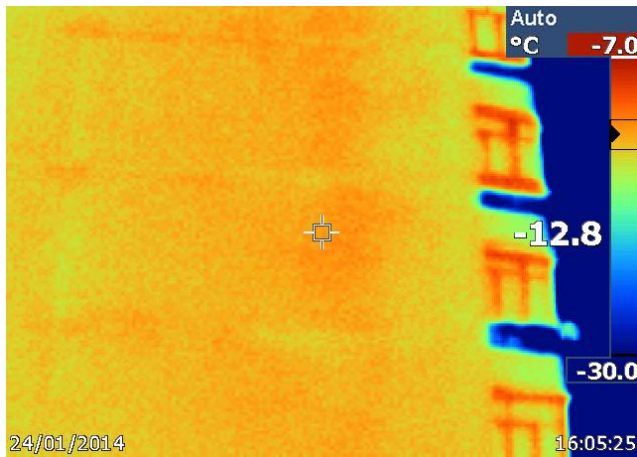


Image 68

Surface temperature in the measurement point: **minus 12.8 °C.**

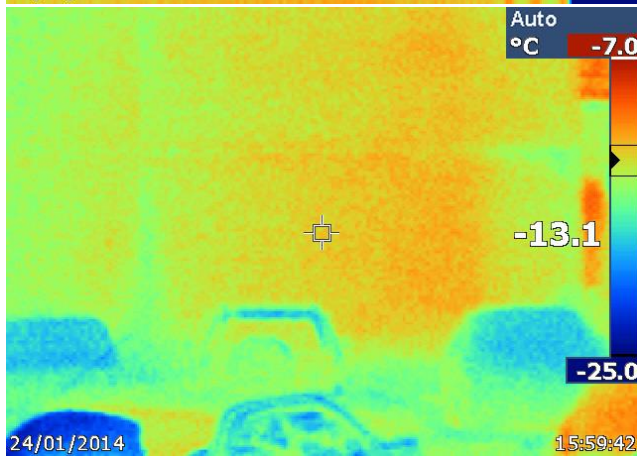


Image 66

Surface temperature in the measurement point: **minus 14.8 °C.**

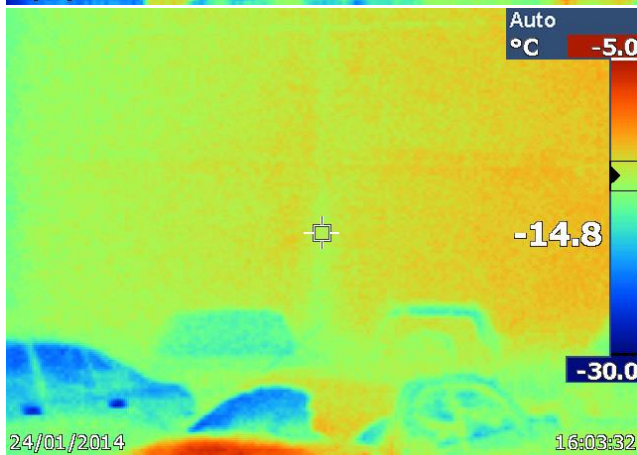


Image 61

Surface temperature in the measurement point: **minus 13.1 °C.**

Enclosing structure heat transfer resistance value determination

Region	<i>The city Sergiyev Posad</i>		
Structure	<i>Plastering with cement – sand grout</i>	δ_1	<i>0.02 m</i>
		λ_1	<i>0.93 W/m °C</i>
	<i>Haydite concrete slab $\gamma=800 \text{ kg/m}^3$</i>	δ_2	<i>0.32 m</i>
		λ_2	<i>0.24 W/m °C</i>
	<i>Thermal insulation coating TEMP-COAT</i>	δ_4	<i>0.001 m</i>
		λ_4	<i>0.001 W/m °C</i>
	<i>NA</i>	δ_4	<i>0.00 m</i>
		λ_4	<i>1.00 W/m °C</i>
	<i>NA</i>	δ_5	<i>0.00 m</i>
		λ_5	<i>1.00 W/m °C</i>
	<i>NA</i>	δ_6	<i>0.00 m</i>
		λ_6	<i>1.00 W/m °C</i>

1. Rated heat transfer resistance of this wall

$$R_o = 1/\alpha_B + \delta_1/\lambda_1 + \delta_2/\lambda_2 + \delta_3/\lambda_3 + \delta_4/\lambda_4 + \delta_5/\lambda_5 + \delta_6/\lambda_6 + 1/\alpha_H$$

Where

R_o	Heat transfer resistance	2.51 m ² °C/W
α_B	Wall heat absorption coefficient SNiP II – 3- 79* table 4.	8.70 W/ m ² °C
δ_1	Cement – sand grout plastering	0.02 m
λ_1	Heat conductivity coefficient	0.93 W/ m ² °C
δ_2	Haydite concrete slab $\gamma=800$ kg/m ³	0.32 m
λ_2	Heat conductivity coefficient	0.24 W/ m ² °C
δ_3	Thermal insulation coating TEMP-COAT	0.001 m
λ_3	Heat conductivity coefficient	0.001 W/ m ² °C
δ_4	NA	0.00 m
λ_4	Heat conductivity coefficient	1.00 W/ m ² °C
δ_5	NA	0.00 m
λ_5	Heat conductivity coefficient	1.00 W/ m ² °C
δ_6	NA	0.00 m
λ_6	Heat conductivity coefficient	1.00 W/ m ² °C
α_H	Wall heat transfer coefficient SNiP II-3-79* table 6*	23 W/ m ² °C

2. Estimation of heating season degree – day (HSDD).

$$HSDD = (t_B - t_{o\pi}) Z_{o\pi}$$

Where

HSDD	Heating season degree - day	5157 °C day
t_B	Rated indoor air temperature	21 °C
$t_{o\pi}$	Average heating season temperature SNiP 23-01-99 table 1	minus 3.1 °C
$Z_{o\pi}$	Heating season period SNiP 23-01-99 table 1	214 days

According to SNiP II-3-79*, tables 1a and 1b. enclosing structure full heat transfer resistance shall be as follows:

Sanitary – hygienic specification:	$R_o^{TP} =$	1.38 m ² °C /W
Energy efficiency specification, phase 1	$R_o^{TP} =$	1.83 m ² °C /W
Energy efficiency specification, phase 2	$R_o^{TP} =$	3.20 m ² °C /W

3. Rated heat loss

$$q = \frac{t_B - t_H}{R_o}$$

Where

	Winter	Theoretical	
q	10	16	W/m ²
t _B	21	21	°C
t _H	minus 3.1	minus 20	°C
R _o	2.51	2.51	m ² °C/W

Heat loss calculation 1, item 2

4. Enclosing structure exterior surface temperature

$$T_B = t_B - n(t_H - t_B)/R_o \alpha_B$$

Where

	Winter	Theoretical value	Actual value (image 85)	
T _B	minus 2	minus 18.1	minus 18.6 minus 18.6	°C
t _H	minus 3.1	minus 20	minus 20	°C
n	1	1	1	
t _B	21	21	21	°C
R _o	2.51	2.51	3.40	m ² °C/W
α _B	8.7	8.7	8.7	W/m ² °C

Surface temperature calculation 1, item 2

5. Enclosing structure inner surface temperature

$$T_B = t_B - n(t_B - t_H)/R_o \alpha_B$$

Where

	Winter	Theoretical value	Actual value	
T _B	21	20	20	°C
t _B	21.9	21.9	21.9	°C
n	1	1	1	
t _H	minus 3.1	minus 20	minus 20	°C

Inner surface temperature calculation 1, item 2

R_o	Heat transfer resistance (calculation 1)	2.51	2.51	2.51	$m^2 \text{ } ^\circ\text{C/W}$
α_B	Coefficient of enclosing structure heat absorption (SNiP II – 3-79* table 4*)	8.70	8.70	8.70	$W/m^2 \text{ } ^\circ\text{C}$

SUMMARY

Wall exterior surface averaged temperature was applied as input for the surveyed residential apartment block enclosing structure heat transfer resistance calculation.

The measurements were made using thermal imaging survey.

Ambient air temperature was minus **20 °C** at time of the thermal imaging survey.

Wall exterior surface average temperature was minus **17 °C**.

1. Surveyed building enclosing structure design heat transfer resistance: **2,51 $m^2 \text{ } ^\circ\text{C /W}$** .
2. Surveyed building enclosing structure actual heat transfer resistance: **2.51 $m^2 \text{ } ^\circ\text{C /W}$**
3. Surveyed building enclosing structure heat transfer resistance as required by the sanitary norms: **1.38 $m^2 \text{ } ^\circ\text{C /W}$**
4. Surveyed building enclosing structure heat transfer resistance as required by energy efficiency norms: **1,83 $m^2 \text{ } ^\circ\text{C /W}$** .

The surveyed building complies with the sanitary and energy efficiency norms, applied to the first phase of buildings refurbishment.

List of references .

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TU -5768-001-62595647-2009. Super-thing thermal insulation coating TEMP-COAT[®].