

designer's electronic signature	electronic signature of the auditor
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INVESTOR ¹	Western Balkan Six Chamber Investment Forum Plazza della Borsa nr. 14 34121 Trieste, Italy
FACILITY ²	JU HIGH SCHOOL OF ELECTRICAL ENGINEERING "VASO ALIGRUDIĆ"
LOCATION ³	kp 1193, KO Podgorica I Municipality of Podgorica
PART OF THE TECHNICAL DOCUMENTATION ⁴	ADAPTATION PROJECT OF THERMOTECHNICAL INSTALLATIONS
DESIGNER ⁵	" THERMIA " DOO PODGORICA
RESPONSIBLE PERSON ⁶	Zagorka Božović Pejanović d.i.a.
RESPONSIBLE ENGINEER ⁷	Dejan Abazović, Bachelor of Mechanical Engineering
PROJECT ASSOCIATES ⁸	Despotović Marko, B.Sc.

1. Name of the investor;
2. Name of the projected object;
3. Construction site, planning document, urban plot, cadastral plot;
4. Architectural project, construction project, electrotechnical project, i.e. mechanical project (if it is the cover page of the part of the technical documentation);
5. The name of the business company, legal entity, or entrepreneur who prepared part of the technical documentation;
6. The name of the responsible person in the company, legal entity, that is, the name and surname of the entrepreneur;
7. Name and surname of the chief engineer;
8. Name and surname of collaborators on the preparation of part of the technical documentation.

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1. TEXTUAL DOCUMENTATION

TECHNICAL DESCRIPTION

1.1. TECHNICAL DESCRIPTION

1.1.1. General information about the facility

Facility:	JU HIGH SCHOOL OF ELECTRICAL ENGINEERING "VASO ALIGRUDIĆ"
Location:	kp 1193, KO Podgorica I Municipality of Podgorica
Investor:	Western Balkan Six Chamber Investment Forum Piazza della Borsa nr. 14 34121 Trieste, Italy
Project:	ADAPTATION PROJECT OF THERMOTECHNICAL INSTALLATIONS

1.1.2. Project parameters

- Climatic zone: I zone
- Summer outside temperature: 37°C
- Winter outdoor temperature: -6°C
- Summer indoor temperature:
- Refrigerated space 25°C
- Winter indoor temperature:
- Heated space 21°C

1.1.3. General concept of thermotechnical installations

Perception architectural solutions For the subject object , occasion designing and like I selection installation led is account Yes se choose the best solution with flats what investment - exploitation conditions and solution which will provide tall level comfort .

- The school building consists of classrooms and corridors.

1. Existing heating and cooling system

There are currently three heating systems in the facility:

- Radiator heating system for the entire facility, which is fed to the central boiler room of the facility
- Electric radiators in the rooms
- Wall-mounted split units for air conditioning.

The existing electric radiators are being dismantled due to low energy efficiency and the existing air conditioning system.

2. Air conditioning system with split wall systems

with an external and associated internal wall unit is planned for heating and cooling the classrooms .

System description: A split air conditioning system with a wall unit is a type of air conditioning system that consists of an indoor wall unit and an outdoor unit. This system is very popular because of its efficiency and ease of use.

Indoor wall unit: The indoor wall unit is mounted on the wall inside the room you want to air condition. It usually has an attractive appearance and adapts to the interior of the room. This unit is responsible for regulating the temperature in the room and distributing cold or warm air. The indoor unit has a fan that strongly circulates the air through the room and blows it out through the grille. It also has a compressor that is responsible for regulating the air temperature.

Outdoor unit: The outdoor unit is located on the outside of the building or house. This unit usually has a condenser, compressor, fan and other components responsible for generating cold or warm air. The compressor in the outdoor unit compresses the refrigerant, causing its temperature to rise. Then that heat goes to the condenser where it is expelled from the system. The outdoor unit's fan helps blow away heat and ensures efficient cooling of the system.

Functioning: A split air conditioning system with a wall unit works through the circulation of the refrigerant that passes through the outdoor and indoor units. When cooling is switched on, the outdoor unit extracts heat from the interior of the room and expels it outside the system. During heating, the system works in reverse – the outdoor unit takes heat from the outside environment and transfers it inside, thus heating the room.

Advantages: A split air conditioning system with a wall unit has many advantages. First, it allows precise temperature control and provides comfort in the room. Also, this system is relatively quiet and aesthetically pleasing, considering that the indoor unit is placed on the wall. A split system is also energy efficient, resulting in lower electricity bills. In addition, the split system enables the possibility of heating during the winter months, providing multiple functionality.

Conclusion: A split air conditioning system with a wall unit is a reliable and efficient way to cool and heat rooms. Its ease of use, temperature control and energy efficiency make it a popular choice for many homes and businesses .+

The multi split system is an inverter-controlled device of the latest generation that enables stable and reliable operation in a wide range of external temperatures, i.e. cooling in the range from -10 to +48°C and heating in the range from -18 to +18°C.

The connection of external and internal units is made with copper pipes of dimensions according to the manufacturer's recommendations, thickness and types according to valid standards (EN1075). Copper pipes are insulated with self-extinguishing synthetic rubber insulation with a thickness of 10 mm.

The pipeline is coated with thermal insulation to reduce losses along the pipeline route.

After assembly, the pipelines are vacuumed, tested with nitrogen under pressure and topped up with an additional amount of cooling fluid – freon (if necessary).

P VC pipes are provided for draining the condensate, which drain the condensate into the nearest gutter.

Pogorica, January. 2024

DESINGER:



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1.1.4. List of used regulations, standards and literature

The following regulations, standards and literature were used during the development of the MAIN MECHANICAL PROJECT:

■ REGULATIONS

- Law on Spatial Planning and Building Construction (Official Gazette of Montenegro, No. 64/17 and 44/18);
- Law on Protection and Rescue (Official Gazette of Montenegro No. 13/07, 05/08, 86/09, 32/11 and 54/16);
- Law on occupational health and safety (Official Gazette of Montenegro, no. 34/14 and 44/18);
- Law on noise protection in the environment (Official Gazette of Montenegro, no. 28/11, 28/12 and 01/14);
- Law on Waste Management (Official Gazette of Montenegro No. 64/11 and 39/16);
- Law on the Environment (Official Gazette of Montenegro No. 48/08 and 52/16);
- Law on Standardization (Official Gazette of Montenegro No. 13/08);
- Rulebook on the handling of construction waste, the method and procedure of construction waste processing, the conditions and method of disposal of cement asbestos construction waste (Official Gazette of Montenegro, No. 50/12);
- Rulebook on technical requirements for the protection of garages for passenger cars against fire and explosions (Official Gazette of Montenegro, No. 9/12);
- Rulebook on occupational health and safety measures against the risk of exposure to noise (Official Gazette of Montenegro, No. 37/16);
- Rulebook on safety measures and norms at work on work tools (Official Gazette of SFRY No. 18/91);
- Rulebook on limit values of noise in the environment, methods of determining noise indicators and acoustic zones and methods of assessing the harmful effects of noise (Official Gazette of Montenegro, No. 60/11);
- Rulebook on the method of preparation and content of technical documentation for the construction of the building (Official Gazette of Montenegro, No. 44/18).

■ STANDARDS

- ISO 5457 – Formats of technical drawings;
- MEST EN ISO 5455:2014 – Technical drawings – Dimensions.

■ LITERATURE

- Recknagel, Sprengler, Schramek, Čeperković: Heating and air conditioning, Interklima, Vrnjačka Banja, 2012.
- Branislav Todorović and Milica Milinković, Air distribution in air conditioning systems, SMEITS, Belgrade, 2003.
- Branislav Živković, Zoran Stajić, Small thermotechnical handbook, SMEITS, Belgrade, 2003.
- Boris Labudović and others, Manual for ventilation and air conditioning, 2nd edition, Energetika Marketing, Zagreb, 2003.
- Pogorica, January. 2024

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TECHNICAL REQUIREMENTS FOR WORK PERFORMANCE

1.2. TECHNICAL REQUIREMENTS FOR WORK PERFORMANCE

1.2.1. GENERAL TERMS

1. The construction of investment facilities can be started when the funds for financing the investment facility are provided and approval for the construction is obtained.
2. The investor and the contractor, who is entrusted with the construction of the investment object, i.e. the execution of the works, conclude a construction contract. In addition to the basic provisions, the contract must also contain provisions on the date of commencement and completion of the works, on professional supervision of the construction of the building, on the guarantee terms for the quality of the works performed, and on the method of payment.
3. The contractor is obliged to carry out the entire installation according to this project, and in accordance with the valid regulations on the construction of investment facilities.
4. The contractor is obliged to inform the supervisory authority about the date of commencement of the works, 8 days in advance.
5. The contractor is obliged to:
 - a) to perform works according to valid technical regulations, norms and mandatory standards that apply to the construction of that type of investment facility;
 - b) to install material that corresponds to the prescribed standards, that is, that has a certificate issued by an organization registered for the activity of testing that material, if there is no standard for that material;
 - c) to take timely security measures for the investment object, equipment and investment material, workers, passers-by, traffic and neighboring objects;
 - d) to comply with the investment-technical documentation on the basis of which the building permit was issued;
 - e) to ensure through internal control that the works are performed in accordance with the provisions under a, b, c;
6. The contractor is obliged to keep a construction diary and an inspection book separately for each building. If work is carried out on several buildings at the same place, which represent a technical or functional unit, one construction diary and one inspection book can be kept.
7. During the execution of works, the investor is obliged to provide professional supervision, which can be performed by an authorized employee of the investor, who has the appropriate professional training and practice determined by the general act of the investor.
8. If the contractor notices a deficiency in the investment-technical documentation, he is obliged to warn the investor of these deficiencies in a timely manner.
9. If the investor does not remove the defects that he was warned about, the contractor is obliged to inform the management authority, which gave approval for the construction of the building, and stop the work, if these defects endanger the safety of the building, the life and health of people, or neighboring buildings.
10. If the contractor notices during the execution of the works that subsequent works must be carried out on the building, which are not included in the contractual estimate, or when changes occur that may have an impact on the performance and the consumption of materials, he is obliged to immediately submit a subsequent estimate to the investor. The contractor will begin the performance of subsequent works, only after the investor approves the estimate for those works.
11. If the contractor carries out the installation according to the approved project and with the materials provided by this project, he bears responsibility for the proper functioning of the system only in terms of the works performed, the quality of the materials and the capacity of individual elements.
12. Arbitrary changes to the project by the contractor are strictly prohibited.
13. For minor changes in relation to the adopted project, the consent of the competent authority is sufficient. If there is a need for major changes to the project, then it is necessary for the designer to rework the project and the reworked project must be sent back to the investor for approval.

14. If the investor disposes of some material and transfers it to the contractor for the purpose of installing it in the plant, the contractor is obliged to inspect all the material and discard any that are defective. If the contractor considers that the investor's material is not of the prescribed quality, he will refuse to install it and will state this in the construction diary. If the supervisory authority expressly requires the installation of inappropriate material, the contractor will install it, but then he is not responsible for it, nor for the consequences, and the guarantee is excluded for that part of the installation, which is confirmed by appropriate documentation in written form and mandatory entry in construction log.
15. The contractor is obliged, if during the execution of the works, he notices that the proposed solution is technically incorrect, bad or incompatible with the construction object or other installations, which were created on the construction site during the execution, to immediately inform the investor and request a change of the project. Also, if the contractor determines that due to an error in the project or due to wrong instructions of the investor, i.e. works carried out by his supervisory body to the detriment of durability, stability, functionality and quality, he is responsible for the resulting damage if he does not warn the investor of these facts by entering them in the construction diary.
16. If, during installation, the contractor notices that subsequent works must be carried out on the plant, which are not included in the contractual example, or changes that have an impact on the performance or scope of the plant, he is obliged to immediately submit a preliminary invoice to the investor for these subsequent works or changes to the plant, i.e. installation. The contractor will start performing subsequent works or plant changes only after the investor approves the estimate for those works. The investor must respond to the supplementary offer within 8 ÷ 15 days, otherwise it will be considered that the offer has not been accepted.
17. Included in the price of installation, i.e. installation (if the contract does not define otherwise):
 - a) complete assembly of the installation, its testing, regulation and commissioning;
 - b) training of workers immediately after completion of assembly;
 - c) compensation for installers, their assistants and other persons necessary for testing, regulation and test operation.
18. For certain professional works, the contractor must have technical management personnel on the construction site who have the legal right to handle such works. All workers must have appropriate qualifications and the actual professional knowledge required to perform work on a given type of installation. The supervisory authority has the right and duty to order the contractor to remove non-professional personnel from the construction site through the construction diary.
19. All manufacturers of equipment, work tools and devices with mechanized and electric drive are obliged to provide the user with a certificate from the appropriate professional institution in accordance with the current laws on safety, protection and health at work.
20. All waste and garbage that the contractor and his workers create during the performance of these works, he is obliged to take at his own expense from the construction site to the place where he is designated (by local self-government order).
21. The contractor himself is obliged to take the safety measures for the employees on this job in accordance with the current regulations.
22. Financial obligations between the investor and the contractor are mutually regulated by a contract that also regulates the method of payment.
23. During the execution of the works, the contractor is obliged to keep a construction diary on the construction site. All changes and deviations from the main project must be recorded in it. The construction diary is certified by the supervisory authority and the representative of the contractor.
24. In addition to the construction logbook, the investor's supervisory body keeps a construction book for its own account, in which all performed works are recorded. The construction book serves as the basis for drawing up the billing situation, as well as for permanent documentation of the scope of the works performed. The construction book must be sealed and certified by the investor, and signed by the supervisory authority and the representative of the contractor.
25. After completion of assembly work, the entire plant must be tested. The examination is carried out by the contractor with the obligatory presence of the supervisory authority.

26. Minutes must be drawn up about the performed examination, which must contain:
- a) subject of examination;
 - b) list of persons who performed and attended the interrogation;
 - c) date and time of examination;
 - d) the circumstances under which the test was conducted (temperature, rain, snow, etc.);
 - e) test results with accurately obtained values, photos, videos and the like;
 - f) a conclusion stating that the test results are satisfactory or not;
 - g) handwritten signature of the persons who conducted the examination and who attended the examination.
27. After the completion of the works, a technical inspection will be carried out by an expert committee formed by the administrative authority that issued the construction permit. Persons who have the status of employees of the investor, of the organization that issued the investment technical documentation, or of the contractor, persons who performed professional supervision and persons who supervise the application of the provisions of the Law on Designing and construction of investment facilities.
28. For technical acceptance, the contractor or investor is obliged to complete and present the following documentation to the commission:
- a) approvals for construction with the consent of competent authorities and institutions (MUP, PTT, water management, energy, occupational safety, fire protection, urban planners, etc.);
 - b) complete investment-technical documentation (mechanical-technological, construction and electrotechnical project, workshop documentation, etc.) with changes and additions;
 - c) evaluation of the authorized professional institution for construction of facilities from the aspect of occupational safety and fire protection;
 - d) certification documentation of the installed material;
 - e) record of the control and acceptance of the plant before installation;
 - f) record, test report and test results;
 - g) welder certificates;
 - h) work diary and construction book;
 - i) report on the internal review of the performed works;
 - j) commissioning and maintenance manual with plant diagrams.
29. Approval for the use of the facility is issued within 15 days from the date of receipt of the technical committee's proposal for the use of the facility.
30. Approval for the use of the facility is given by the administrative authority, which formed the commission for technical inspection.
31. Approval for the use of the building is given at the request of the investor or contractor.
32. The warranty period established by the contract for the performed works is calculated from the day of acceptance of the object by the commission for technical inspection, i.e. from the day of obtaining approval for the use of the investment object.

Pogorica, January. 2024

ODGOVORNI PROJEKTANT:



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*THE PROGRAM CONTROLS / INSURANCE QUALITY WITH
CONDITIONS FOR FULFILLMENT BASIC REQUEST FOR OBJECT
DURING CONSTRUCTION / MAINTENANCE OBJECT*

1.3. THE PROGRAM CONTROLS | INSURANCE QUALITY WITH CONDITIONS FOR FULFILLMENT BASIC REQUEST FOR OBJECT DURING CONSTRUCTION | MAINTENANCE OBJECT

1. An integral part of the project documentation are:

- technical description,
- calculation,
- general, technical and technological conditions for works and designed equipment,
- quality control and assurance program,
- attached drawings.

2. All materials for the performance of the installation in question must be provided by the contractor according to the material specification in the project documentation, and in accordance with the applicable legal regulations.

3. Attestations and certificates proving the quality of the installed material must be submitted for all installed material and equipment.

4. The investor is obliged to ensure constant professional supervision over the execution of the contracted works.

5. Before the start of the works, the investor is obliged to provide the contractor with the names of authorized persons to perform professional supervision over the execution of the works.

6. The contractor is obliged to appoint his authorized representative - the works manager, before the start of the works, and to notify the investor in writing.

7. All problems regarding the contracted works will be solved by the investor with the contractor, through the person authorized to carry out expert supervision.

8. The contractor undertakes to regularly enter in the construction diary all the necessary data, which he is obliged to enter, and to enable the person authorized to carry out professional supervision to inspect the construction diary on a daily basis.

9. All works related to the installation in question must be professionally and qualitatively performed exactly according to the drawings and technical description, and according to the instructions of the designer and the supervisory authority.

10. The entire installation must be made completely airtight, which the contractor guarantees with appropriate certificates of the performed test at the appropriate pressure.

11. Upon completion of the contracted works, and before the start of use, i.e. putting the installation into operation, the investor is obliged to request a technical inspection of the performed works in order to determine their technical correctness.

12. The contractor is obliged to deliver all warranty cards, attestations and certificates of the installed material and equipment, together with all the necessary instructions for handling and maintenance of the completed installation, to the investor before the technical inspection.

13. The contractor guarantees the quality of the performed works for 2 (two) years from the date of technical acceptance, and for the installed equipment according to the equipment manufacturer's warranty card.

14. The contractor is not responsible for defects caused by violent damage or unprofessional use of the installed installation.

15. Inspections of installations should be performed at least once a year and a certificate of correct functioning of installations (certificate of installation functionality) should be obtained from the authorized organization.

Pogorica, January. 2024

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*INSTRUCTIONS FOR MANAGING CONSTRUCTION WASTE OR
HAZARDOUS WASTE GENERATED DURING CONSTRUCTION ,
DESTRUCTION OR REMOVAL OF BUILDINGS*

1.4. INSTRUCTIONS FOR MANAGEMENT OF **CONSTRUCTION WASTE, OR HAZARDOUS WASTE GENERATED DURING CONSTRUCTION , DISPOSAL OR REMOVAL OF BUILDINGS**

Waste were used when creating instructions for the management of construction waste, i.e. hazardous waste generated during the construction, use, or removal of an object . method and procedure of construction waste processing, conditions and method of disposal of cement asbestos construction waste (Official Gazette of Montenegro, no. 50/12).

Waste management is carried out in a way that does not create a negative impact on the environment and human health, and in particular:

- on water, air, soil, plants and animals;
- in terms of noise and smell;
- to areas of special interest (protected natural and cultural assets).

Waste management is based on the following principles:

- a) sustainable development, which ensures more efficient use of resources, reduction of the amount of waste and handling of waste in a way that contributes to the achievement of the goals of sustainable development;
- b) proximity and regional waste management, in order to process waste as close as possible to the place of generation in accordance with the economic justification of the choice of location, while regional waste management is ensured by the development and implementation of regional strategic plans based on national policy;
- c) precautionary measures, i.e. preventive action, by taking measures to prevent negative impacts on the environment and human health, even in the absence of scientific and professional data;
- d) "polluter pays", according to which the waste producer bears the costs of waste management and preventive action and the costs of remedial measures due to negative impacts on the environment and human health;
- e) hierarchy, which ensures compliance with the order of priorities in waste management, namely: prevention, preparation for reuse, recycling and other methods of processing (use of energy) and waste disposal.

Waste management plans and programs are given at the state and local level. The State Waste Management Plan is the basic document that determines the long-term goals of waste management and establishes the conditions for rational and sustainable waste management in Montenegro. The local plan is adopted by the assembly of the local self-government unit, for the period for which the National Plan was adopted. The local plan can be changed and supplemented as needed. The local plan must be harmonized with the national plan.

The municipal body or another state body that is responsible for spatial planning determines and approves the location for the disposal of soil excavated from the construction site and other construction waste. In accordance with this, the contractor is obliged to request a permit from the competent Municipality for the disposal of construction waste.

When construction waste is generated, it is necessary to create documents that record the amounts and types of waste. These records must be kept regularly in order to know the exact amount of waste that was generated as well as the waste that was taken over by the companies with which the contract was signed.

Hazardous waste management is the responsibility of the Ministry of Sustainable Development and Tourism, and the waste management system involves the participation of all entities from the local and national level.

The local self-government unit will organize the collection of hazardous waste, by providing free disposal of these types of waste in existing and newly constructed recycling yards. The collected quantities of this waste will be carried out by the company that manages the recycling yard and handed over to the authorized legal entity for the collection of hazardous waste, in accordance with legal regulations and obligations.

1.4.1. INSTRUCTIONS FOR MANAGEMENT OF CONSTRUCTION WASTE

1. Construction waste is waste generated during the construction, maintenance and demolition of construction facilities.
2. Dealing with construction waste at the construction site:
 - Construction waste on the construction site is stored separately by type of construction waste in accordance with the waste catalog and separately from other waste, in a way that does not pollute the environment;
 - Disposal of construction waste that is not temporarily stored on the construction site or in the facility where construction work is being performed can be done in containers placed on the construction site, next to the construction site or next to the facility where construction work is being performed;
 - Containers must be made in a way that enables waste to be transported to a facility for further processing without reloading;
 - The investor must ensure that hazardous construction material is separated from the building, in order to prevent the mixing of hazardous construction material with non-hazardous construction waste, if this is technically feasible;
 - Construction waste can be temporarily stored on the construction site until the completion of construction works, for a maximum of one year;
 - Construction waste can be temporarily stored at another construction site of the investor or another place arranged for the temporary storage of construction waste.
3. Construction waste management plan:
 - The investor of the building, whose volume of the building together with the earth excavation is greater than 2,000 m³, draws up a construction waste management plan;
 - The investor keeps records of the type and amount of construction waste in accordance with the law;
 - The construction waste management plan also contains information on:
 - a) the method of separation of hazardous construction waste before the removal of the building, if the removal of the building is foreseen;
 - b) method of separate collection of construction waste at the construction site;
 - c) method of processing construction waste at the construction site;
 - d) the estimated volume of earth excavation, caused by construction works on the construction site and its handling;
 - e) to the estimated volume of use of earth excavation on the construction site that was not caused by construction works on the construction site.
4. Construction waste is handed over to the construction waste collector or directly to the construction waste processing plant by the investor or construction contractor authorized by the investor.
5. The investor can process construction waste at the construction site based on a permit in accordance with the law.
6. Construction waste (waste concrete, bricks, ceramics and construction material based on gypsum or a mixture of construction waste with earth excavation) can be reused for construction work on the construction site where the waste was created if the volume of waste does not exceed 50 m³.
7. The collector of construction waste can store construction waste for a maximum of one year in a construction waste processing plant.
8. Construction waste processing:
 - Processing of construction waste is carried out in facilities for processing construction waste in accordance with the law;
 - The facility for processing construction waste must be surrounded by a fence at least two meters high to prevent access by unauthorized persons;
 - In the construction waste processing plant, measures must be taken to prevent dust emission, wind blowing of small construction material and noise emission, in order to protect the environment;

- The facility for processing construction waste must be equipped with equipment for washing vehicle wheels before entering the public road;
- In the construction waste processing plant, more than 70% of construction waste must be recycled;
- The facility for processing construction waste must ensure further processing or removal of the remains of construction waste generated during recycling in the facility for processing construction waste.

1.4.2. GUIDELINES FOR HAZARDOUS WASTE MANAGEMENT

1. Hazardous waste is waste that contains elements or compounds that have one or more of the following dangerous properties: explosiveness, reactivity, flammability, irritation, harmfulness, toxicity, infectivity, carcinogenicity, corrosivity, mutagenicity, teratogenicity, ecotoxicity, corrosiveness and the property of releasing poisonous gases by chemical or biological reaction and sensitivity/irritability, as well as waste from which, after disposal, another substance with some of the dangerous properties may be formed.
2. Mixing different types of hazardous waste and mixing hazardous with non-hazardous waste is prohibited.
3. The mixing of hazardous waste also includes the dilution of hazardous substances.
4. Waste can be mixed under the condition that mixing it increases the safety of waste processing procedures and if:
 - mixing is carried out in accordance with the waste processing permit;
 - the mixing of waste does not increase the negative impact on the environment and human health;
 - is a mixing procedure in accordance with the best available techniques.
5. During collection, transportation and temporary storage, hazardous waste is packaged and labeled in accordance with the law governing the transportation of hazardous materials.
6. Hazardous waste during transportation within the country must be accompanied by a document on the transportation of hazardous materials, in accordance with the law.
7. Hazardous waste can be in electronic form.
8. The collection, processing or disposal of hazardous municipal waste can be carried out by a company or an entrepreneur that has a permit for waste processing.
9. The collection or transport of waste can be carried out by a company or an entrepreneur if it has the equipment for the collection or transport of waste and the required number of employees.
10. It is forbidden for a business company or an entrepreneur to accept waste from an owner who does not generate waste in the course of carrying out activities or activities.
11. Means and equipment used to collect or transport waste must ensure the prevention of scattering or overflowing of waste and the spread of dust, noise and odors.
12. When carrying out the work of collecting, i.e. transporting waste in a vehicle used to transport waste, a company or entrepreneur must have:
 - a copy of the act of registration in the register of waste collectors or transporters;
 - waste transport form.
13. The means and equipment used to collect or transport hazardous waste must meet the conditions established by the law governing the transportation of hazardous materials.
14. Waste disposal is carried out at a location designated for that purpose by a spatial planning document, as well as in facilities or facilities that meet the conditions established by law.
15. Waste disposal is carried out in accordance with the law.
16. It is forbidden to burn waste in the open.

Pogorica, January. 2024

ODGOVORNI PROJEKTANT:

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2. BUDGET DOCUMENTATION

2.1 HEAT CALCULATION

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Loads summary

1. LOAD CALCULATION SUMMARY

1.1. Cooling

Zone cooling loads summary: Zone 1

	External					Internal		Ventilation			Total			
	A (m ²)	Conduction (W)	Solar (W)	Lat. inf. (W)	Sens. inf. (W)	Lat. (W)	Sens. (W)	Airflow (l/s)	Lat. (W)	Sens. (W)	Lat. (W)	Sens. (W)	Total (W/m ²)	Total (W)
Peak cooling loads per space														
MPS	66	2129	3602	1	204	1665	3815	0	0	0	1666	6238	180	7904
M1 kabinet (Kabinet)	33	934	1887	1	102	747	1457	0	0	0	748	2600	161	3348
M2 Kabinet	48	1812	447	24	147	1085	2116	0	0	0	1108	4248	121	5356
M3 kabinet (Kabinet)	48	1073	494	22	144	1080	2107	0	0	0	1102	4009	106	5111
M4 Kabinet	48	1074	494	22	144	1080	2108	0	0	0	1102	4010	106	5112
M5 Kabinet	48	1549	447	23	146	1080	2107	0	0	0	1103	4462	116	5565
M6 kabinet (Kabinet)	22	683	1275	0	69	504	983	0	0	0	504	3160	164	3665
K cajna kuhinja (Cajna kuhinja)	10	330	0	0	0	135	358	0	0	0	135	722	86	857
Zone simultaneous peak cooling load: 21 August at 15h (14 apparent solar time)														
Zone 1	324.0							0			7381	35544	132.49	42925

Abbreviations

A	Area
Conduction	Conduction heating load
Solar	Solar heating load
Lat. inf.	Latent infiltration
Sens. inf.	Sensible infiltration
Lat.	Latent
Sens.	Sensible

Loads summary

1.2. Heating

Zone heating loads summary: Zone 1

	A (m ²)	Φ_T (W)	Φ_V (W)	Φ_{RH} (W)	$\Phi_{HL,S}$ (W)	Φ_{HL} (W)
Space design heating load						
MPS	66.2	5782	533	795	7185	7465
M1 kabinet (Kabinet)	33.2	2419	267	398	3098	3238
M2 Kabinet	48.2	4430	388	578	5463	5666
M3 kabinet (Kabinet)	48.0	2760	386	576	3705	3908
M4 Kabinet	48.0	2761	386	576	3707	3909
M5 Kabinet	48.0	4208	386	576	5226	5429
M6 kabinet (Kabinet)	22.4	1792	180	269	2258	2352
K cajna kuhinja (Cajna kuhinja)	10.0	834	0	120	1002	1002
Zone design heating load						
Zone 1	324.0				31643	32969

Abbreviations

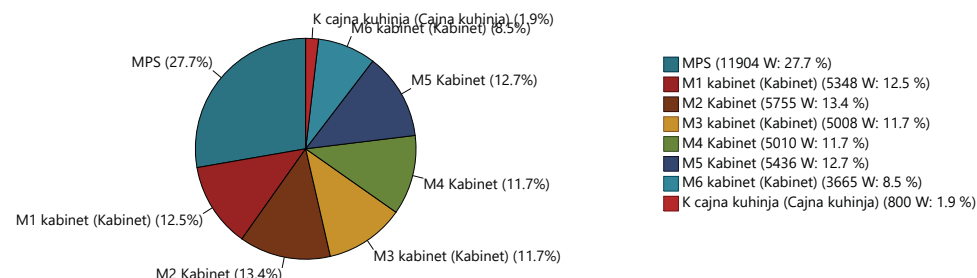
A	Area
Φ_T	Design thermal loss due to transmission
Φ_V	Design thermal loss due to ventilation and infiltration
Φ_{RH}	Thermal re-heating capacity
$\Phi_{HL,S}$	Design simultaneous thermal load
Φ_{HL}	Design thermal load

1.3. Graphs

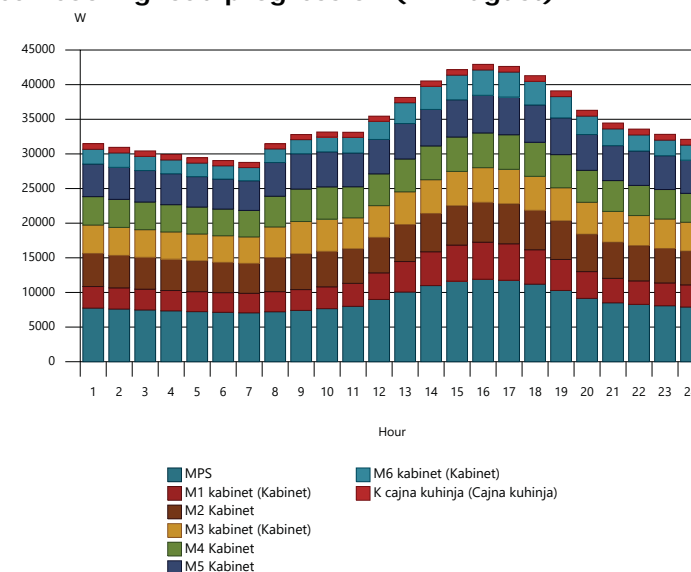
Simultaneous peak cooling load (42925 W)

21 August at 15h (14 apparent solar time)

Loads summary

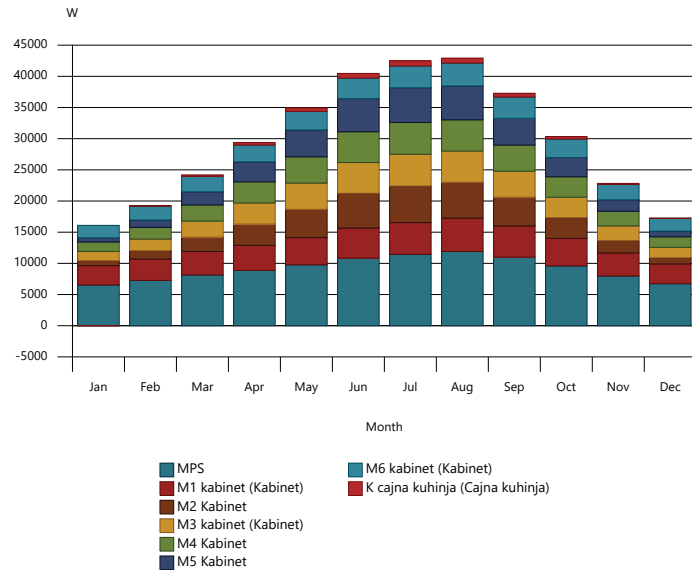


Hourly peak cooling load progression (21 August)

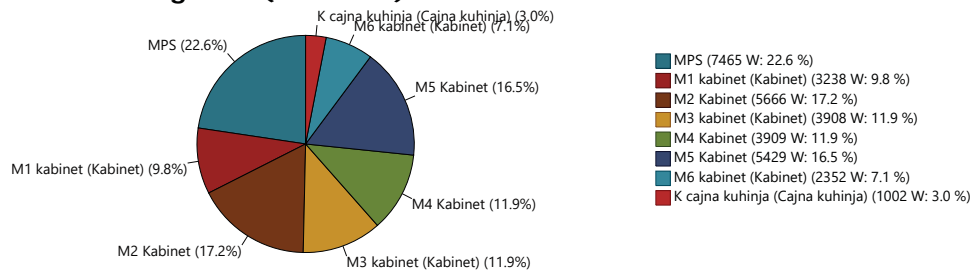


Annual peak cooling load progression

Loads summary



Peak heating load (32969 W)



Loads summary

2. LOAD CALCULATION PER SPACE

2.1. Cooling

Peak cooling load

Space: MPS

Zone: Zone 1

Net floor area = 66.2 m² Net volume = 178.79 m³

Design conditions

Indoor:

Outdoor:

Space air temperature = 25.0 °C

Dry-bulb temperature = 37.0 °C

Relative humidity = 50.00%

Wet-bulb temperature = 21.6 °C

Time of peak cooling load: 21 August at 15h (14 apparent solar time)

Conduction heat gains (opaque surfaces)

	T _{sa} (°C)	Ori. (°)	A (m ²)	U (W/(m ² ·K))	α	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Exterior surface									
Roof	51.3	N(0)	66.2	0.74	0.60	H(0)	211	161	372
Façade (NW)	46.8	NW(299)	15.1	2.35	0.60	V(90)	129	128	256
Façade (SW)	54.3	SW(209)	9.3	2.35	0.60	V(90)	99	91	190
TOTAL:									819

	A (m ²)	U (W/(m ² ·K))	b	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Zone boundary partition							

Loads summary

Partition wall	18.8	1.88	0.14	V(90)	32	16	47
TOTAL:							47
	A	U	T _{ad}	Convective component	Radiative component	Sensible load	
	(m ²)	(W/(m ² ·K))	(°C)	(W)	(W)	(W)	
Internal partition							
Intermediate floor slab	66.2	1.13	31.0	242	119	361	
TOTAL:							361
	Length		Ψ		Sensible load		
	(m)		(W/(m ² ·K))		(W)		
Linear thermal bridges							
Outward	2.70		0.50		16		
Outward	2.70		0.10		3		
Outward	5.60		0.40		27		
Outward	5.60		0.65		44		
Outward	2.70		0.50		16		
Outward	11.82		0.40		57		
Outward	11.82		0.65		92		
Outward	5.75		0.15		10		
Outward	2.00		0.15		4		
Outward	5.75		0.15		10		
Outward	2.00		0.15		4		
Outward	5.57		0.15		10		
Outward	2.00		0.15		4		
Outward	5.57		0.15		10		
Outward	2.00		0.15		4		
TOTAL:							310

Loads summary

Abbreviations

T_{sa}

Sol-air temperature

Ori.

Orientation

A

Area

U

Heat transmission coefficient

α

Absorptance

b

Adjacent space correction factor

Tilt

Tilt angle

T_{ad}

Adjacent space temperature

Length

Length

Ψ

Linear thermal transmission coefficient of the thermal bridge

Conduction heat gains (fenestration)

Ori.

A

U_{global}

Convective component

Radiative component

Sensible load

(°)

(m²)

(W/(m²·K))

(W)

(W)

(W)

Exterior surface

Exterior window

SW(209)

11.5

2.50

231

66

297

Exterior window

SW(209)

11.1

2.50

224

64

288

TOTAL:

584

A

U_{global}

b

Tilt

Convective component

Radiative component

Sensible load

(m²)

(W/(m²·K))

(°)

(W)

(W)

(W)

Zone boundary partition

Interior door

1.9

3.00

0.14

V(90)

5

3

8

TOTAL:

8

Loads summary

Abbreviations	
Ori.	Orientation
A	Area
U_{global}	Fenestration global thermic coefficient
b	Adjacent space correction factor
Tilt	Tilt angle

Solar radiation heat gain

	Ori.	A	A _s	θ	SHGC	Beam solar heat gain	Diffuse solar heat gain	Sensible load
	(°)	(m ²)	(m ²)	(°)		(W)	(W)	(W)
Exterior surface								
Exterior window	SW(209)	11.5	11.5	52.26	0.60	1597	662	1829
Exterior window	SW(209)	11.1	11.1	52.26	0.60	1549	642	1773
TOTAL:								3602

Abbreviations	
Ori.	Orientation
A	Area
A_s	Sunlit area
θ	Incident angle
SHGC	Center-of-glazing solar heat gain coefficient, SHGC

Internal heat gains

Loads summary

	Sensible heat gain	Convective component	Radiative component	Latent cooling gain/load	Sensible load
	(W)	(W)	(W)	(W)	(W)
Internal gains					
Occupancy	2590	1036	1554	1665	2590
Lighting	232	93	139	-	232
Internal equipment	993	795	199	0	993
TOTAL:				1665	3815

Ventilation and infiltration heat gains

	Airflow rate	Sensible heat recovery	Latent heat recovery	Latent load	Sensible load
	(l/s)	(W)	(W)	(W)	(W)
Ventilation					
Infiltration	15	-	-	1	204
TOTAL:				1	204

Total cooling load

Total load per unit area	Sensible heat factor	Latent load	Latent cooling factor (0.0%)	Sensible load	Sensible cooling factor (5.0%)	TOTAL COOLING LOAD
(W/m ²)		(W)	(W)	(W)	(W)	
179.77	0.86	1666	0.0	9750	487.5	11904 W

Loads summary

Peak cooling load	
Space: M1 kabinet (Kabinet)	Zone: Zone 1
Net floor area = 33.2 m ² Net volume = 89.62 m ³	
Design conditions	
Indoor:	Outdoor:
Space air temperature = 25.0 °C	Dry-bulb temperature = 37.0 °C
Relative humidity = 50.00%	Wet-bulb temperature = 21.6 °C
Time of peak cooling load: 21 August at 15h (14 apparent solar time)	

Conduction heat gains (opaque surfaces)

	T _{sa} (°C)	Ori. (°)	A (m ²)	U (W/(m ² ·K))	α	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Exterior surface									
Roof	51.3	N(0)	33.2	0.74	0.60	H(0)	106	81	186
Façade (SW)	54.3	SW(209)	4.2	2.35	0.60	V(90)	44	40	85
TOTAL:									271

	A (m ²)	U (W/(m ² ·K))	b	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Zone boundary partition							
Partition wall	14.1	1.88	0.14	V(90)	24	12	35
TOTAL:							35

	A (m ²)	U (W/(m ² ·K))	T _{ad} (°C)	Convective component (W)	Radiative component (W)	Sensible load (W)
Internal partition						

Loads summary

Intermediate floor slab	33.2	1.13	31.0	121	59	180
TOTAL:						180
	Length (m)	Ψ (W/(m²·K))	Sensible load (W)			
Linear thermal bridges						
Outward	2.70	0.50	16			
Outward	2.70	0.50	16			
Outward	5.93	0.40	28			
Outward	5.93	0.65	46			
Outward	5.92	0.15	11			
Outward	2.00	0.15	4			
Outward	5.92	0.15	11			
Outward	2.00	0.15	4			
TOTAL:						136

Abbreviations

T _{sa}	Sol-air temperature
Ori.	Orientation
A	Area
U	Heat transmission coefficient
α	Absorptance
b	Adjacent space correction factor
Tilt	Tilt angle
T _{ad}	Adjacent space temperature
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge

Conduction heat gains (fenestration)

Loads summary

	Ori.	A	U _{global}	Convective component	Radiative component	Sensible load	
	(°)	(m ²)	(W/(m ² ·K))	(W)	(W)	(W)	
Exterior surface							
Exterior window	SW(209)	11.8	2.50	238	67	305	
TOTAL:						305	
	A	U _{global}	b	Tilt	Convective component	Radiative component	Sensible load
	(m ²)	(W/(m ² ·K))		(°)	(W)	(W)	(W)
Zone boundary partition							
Interior door	1.9	3.00	0.14	V(90)	5	2	8
TOTAL:							8

Abbreviations

Ori.	Orientation
A	Area
U_{global}	Fenestration global thermic coefficient
b	Adjacent space correction factor
Tilt	Tilt angle

Solar radiation heat gain

	Ori. (°)	A (m ²)	A _s (m ²)	θ (°)	SHGC	Beam solar heat gain (W)	Diffuse solar heat gain (W)	Sensible load (W)
Exterior surface								

Loads summary

Exterior window	SW(209)	11.8	11.8	52.26	0.60	1647	682	1887
TOTAL:								1887

Abbreviations

Ori.	Orientation
A	Area
A_s	Sunlit area
θ	Incident angle
SHGC	Center-of-glazing solar heat gain coefficient, SHGC

Internal heat gains

	Sensible heat gain (W)	Convective component (W)	Radiative component (W)	Latent cooling gain/load (W)	Sensible load (W)
Internal gains					
Occupancy	1162	465	697	747	1162
Lighting	116	46	70	-	116
Internal equipment	179	143	36	0	179
TOTAL:				747	1457

Ventilation and infiltration heat gains

Airflow rate	Sensible heat recovery	Latent heat recovery	Latent load	Sensible load
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Loads summary

	(l/s)	(W)	(W)	(W)	(W)
Ventilation					
Infiltration	7	-	-	1	102
TOTAL:				1	102

Total cooling load						
Total load per unit area (W/m ²)	Sensible heat factor	Latent load (W)	Latent cooling factor (0.0%)	Sensible load (W)	Sensible cooling factor (5.0%)	TOTAL COOLING LOAD
161.11	0.86	748	0.0	4381	219.1	5348 W

Loads summary

Peak cooling load

Space: M2 Kabinet **Zone:** Zone 1

Net floor area = 48.2 m² Net volume = 130.15 m³

Design conditions

Indoor: Space air temperature = 25.0 °C
 Outdoor: Dry-bulb temperature = 36.9 °C
 Relative humidity = 50.00% Wet-bulb temperature = 22.1 °C

Time of peak cooling load: 21 July at 16h (15 apparent solar time)

Conduction heat gains (opaque surfaces)

	T _{sa} (°C)	Ori. (°)	A (m ²)	U (W/(m ² ·K))	α	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Exterior surface									
Roof	49.9	N(0)	48.2	0.74	0.60	H(0)	180	132	311
Façade (NE)	40.0	NE(29)	4.2	2.35	0.60	V(90)	45	36	82
Façade (SE)	40.0	SE(119)	21.9	2.35	0.60	V(90)	337	246	584
TOTAL:									977

	A (m ²)	U (W/(m ² ·K))	b	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Zone boundary partition							
Partition wall	14.1	1.88	0.14	V(90)	24	12	36
TOTAL:							36

	A	U	T _{ad}	Convective component	Radiative component	Sensible load
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Loads summary

	(m ²)	(W/(m ² ·K))	(°C)	(W)	(W)	(W)
Internal partition						
Intermediate floor slab	48.2	1.13	30.9	174	89	264
TOTAL:						264
	Length (m)	Ψ (W/(m ² ·K))	Sensible load (W)			
Linear thermal bridges						
Outward	2.70	0.10	3			
Outward	2.70	0.50	16			
Outward	5.95	0.40	28			
Outward	5.95	0.65	46			
Outward	8.10	0.40	38			
Outward	8.10	0.65	63			
Outward	5.93	0.15	11			
Outward	2.00	0.15	4			
Outward	5.93	0.15	11			
Outward	2.00	0.15	4			
TOTAL:						223

Abbreviations

T_{sa}	Sol-air temperature
Ori.	Orientation
A	Area
U	Heat transmission coefficient
α	Absorptance
b	Adjacent space correction factor
Tilt	Tilt angle
T_{ad}	Adjacent space temperature
Length	Length

Loads summary

Ψ | Linear thermal transmission coefficient of the thermal bridge

Conduction heat gains (fenestration)

	Ori.	A	U _{global}	Convective component	Radiative component	Sensible load	
	(°)	(m ²)	(W/(m ² ·K))	(W)	(W)	(W)	
Exterior surface							
Exterior window	NE(29)	11.9	2.50	236	70	305	
TOTAL:						305	
	A	U _{global}	b	Tilt	Convective component	Radiative component	Sensible load
	(m ²)	(W/(m ² ·K))		(°)	(W)	(W)	(W)
Zone boundary partition							
Interior door	1.9	3.00	0.14	V(90)	5	3	8
TOTAL:							8

Abbreviations

Ori.	Orientation
A	Area
U_{global}	Fenestration global thermic coefficient
b	Adjacent space correction factor
Tilt	Tilt angle

Solar radiation heat gain

Loads summary

	Ori.	A	A _s	θ	SHGC	Beam solar heat gain	Diffuse solar heat gain	Sensible load
	(°)	(m ²)	(m ²)	(°)		(W)	(W)	(W)
Exterior surface								
Exterior window	NE(29)	11.9	11.9	118.86	0.60	0	424	447
TOTAL:								447

Abbreviations

Ori.	Orientation
A	Area
A_s	Sunlit area
θ	Incident angle
SHGC	Center-of-glazing solar heat gain coefficient, SHGC

Internal heat gains

	Sensible heat gain	Convective component	Radiative component	Latent cooling gain/load	Sensible load
	(W)	(W)	(W)	(W)	(W)
Internal gains					
Occupancy	1687	675	1012	1085	1687
Lighting	169	67	101	-	169
Internal equipment	260	208	52	0	260
TOTAL:				1085	2116

Loads summary

Ventilation and infiltration heat gains

	Airflow rate	Sensible heat recovery	Latent heat recovery	Latent load	Sensible load
	(l/s)	(W)	(W)	(W)	(W)
Ventilation					
Infiltration	11	-	-	24	147
TOTAL:				24	147

Total cooling load

Total load per unit area	Sensible heat factor	Latent load	Latent cooling factor (0.0%)	Sensible load	Sensible cooling factor (5.0%)	TOTAL COOLING LOAD
(W/m ²)		(W)	(W)	(W)	(W)	
121.49	0.81	1108	0.0	4522	226.1	5856 W

Loads summary

Peak cooling load	
Space: M3 kabinet (Kabinet)	Zone: Zone 1
Net floor area = 48.0 m² Net volume = 129.58 m³	
Design conditions	
Indoor:	Outdoor:
Space air temperature = 25.0 °C	Dry-bulb temperature = 36.7 °C
Relative humidity = 50.00%	Wet-bulb temperature = 22.0 °C
Time of peak cooling load: 21 July at 15h (14 apparent solar time)	

Conduction heat gains (opaque surfaces)

	T _{sa}	Ori.	A	U	α	Tilt	Convective component	Radiative component	Sensible load
	(°C)	(°)	(m ²)	(W/(m ² ·K))		(°)	(W)	(W)	(W)
Exterior surface									
Roof	53.2	N(0)	48.0	0.74	0.60	H(0)	174	131	305
Façade (NE)	40.3	NE(29)	4.1	2.35	0.60	V(90)	42	35	77

TOTAL: 382

A	U	b	Tilt	Convective component	Radiative component	Sensible load
(m ²)	(W/(m ² ·K))		(°)	(W)	(W)	(W)

Zone boundary partition

Partition wall	14.1	1.88	0.14	V(90)	23	11	34
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TOTAL: 34

A	U	T _{ad}	Convective component	Radiative component	Sensible load
(m ²)	(W/(m ² ·K))	(°C)	(W)	(W)	(W)

Loads summary

Internal partition						
Intermediate floor slab	48.0	1.13	30.8	171	82	253

TOTAL: 253

Length	Ψ	Sensible load
(m)	(W/(m ² ·K))	(W)

Linear thermal bridges

Outward	5.92	0.40	28
Outward	5.92	0.65	45
Outward	5.92	0.15	10
Outward	2.00	0.15	4
Outward	5.92	0.15	10
Outward	2.00	0.15	4

TOTAL: 100

Abbreviations

T _{sa}	Sol-air temperature
Ori.	Orientation
A	Area
U	Heat transmission coefficient
α	Absorptance
b	Adjacent space correction factor
Tilt	Tilt angle
T _{ad}	Adjacent space temperature
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge

Conduction heat gains (fenestration)

Loads summary

	Ori.	A	U _{global}	Convective component	Radiative component	Sensible load	
	(°)	(m ²)	(W/(m ² ·K))	(W)	(W)	(W)	
Exterior surface							
Exterior window	NE(29)	11.8	2.50	232	65	296	
TOTAL:						296	
	A	U _{global}	b	Tilt	Convective component	Radiative component	Sensible load
	(m ²)	(W/(m ² ·K))		(°)	(W)	(W)	(W)
Zone boundary partition							
Interior door	1.9	3.00	0.14	V(90)	5	2	7
TOTAL:							7

Abbreviations

Ori.	Orientation
A	Area
U_{global}	Fenestration global thermic coefficient
b	Adjacent space correction factor
Tilt	Tilt angle

Solar radiation heat gain

	Ori. (°)	A (m ²)	A _s (m ²)	θ (°)	SHGC	Beam solar heat gain (W)	Diffuse solar heat gain (W)	Sensible load (W)
Exterior surface								

Loads summary

Exterior window	NE(29)	11.8	11.8	119.03	0.60	0	486	494
TOTAL:								494

Abbreviations

Ori.	Orientation
A	Area
A_s	Sunlit area
θ	Incident angle
SHGC	Center-of-glazing solar heat gain coefficient, SHGC

Internal heat gains

	Sensible heat gain (W)	Convective component (W)	Radiative component (W)	Latent cooling gain/load (W)	Sensible load (W)
Internal gains					
Occupancy	1680	672	1008	1080	1680
Lighting	168	67	101	-	168
Internal equipment	259	207	52	0	259
TOTAL:				1080	2107

Ventilation and infiltration heat gains

Airflow rate	Sensible heat recovery	Latent heat recovery	Latent load	Sensible load
--------------	------------------------------	-------------------------	----------------	------------------

Loads summary

	(l/s)	(W)	(W)	(W)	(W)
Ventilation					
Infiltration	11	-	-	22	144
TOTAL:				22	144

Total cooling load

Total load per unit area (W/m ²)	Sensible heat factor	Latent load (W)	Latent cooling factor (0.0%) (W)	Sensible load (W)	Sensible cooling factor (5.0%) (W)	TOTAL COOLING LOAD
106.49	0.78	1102	0.0	3818	190.9	5111 W

Loads summary

Peak cooling load

Space: M4 Kabinet

Zone: Zone 1

Net floor area = 48.0 m² Net volume = 129.62 m³

Design conditions

Indoor:

Outdoor:

Space air temperature = 25.0 °C

Dry-bulb temperature = 36.7 °C

Relative humidity = 50.00%

Wet-bulb temperature = 22.0 °C

Time of peak cooling load: 21 July at 15h (14 apparent solar time)

Conduction heat gains (opaque surfaces)

	T _{sa} (°C)	Ori. (°)	A (m ²)	U (W/(m ² ·K))	α	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Exterior surface									
Roof	53.2	N(0)	48.0	0.74	0.60	H(0)	174	131	305
Façade (NE)	40.3	NE(29)	4.2	2.35	0.60	V(90)	42	35	77

TOTAL: 382

A (m ²)	U (W/(m ² ·K))	b	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
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Zone boundary partition

Partition wall	14.1	1.88	0.14	V(90)	23	11	34
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TOTAL: 34

A (m ²)	U (W/(m ² ·K))	T _{ad} (°C)	Convective component (W)	Radiative component (W)	Sensible load (W)
------------------------	------------------------------	-------------------------	-----------------------------	----------------------------	----------------------

Loads summary

Internal partition						
Intermediate floor slab	48.0	1.13	30.8	171	82	253

TOTAL: 253

	Length (m)	Ψ (W/(m ² ·K))	Sensible load (W)
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Linear thermal bridges

Outward	5.93	0.40	28
Outward	5.93	0.65	45
Outward	5.93	0.15	10
Outward	2.00	0.15	4
Outward	5.93	0.15	10
Outward	2.00	0.15	4

TOTAL: 100

Abbreviations

T_{sa}	Sol-air temperature
Ori.	Orientation
A	Area
U	Heat transmission coefficient
α	Absorptance
b	Adjacent space correction factor
Tilt	Tilt angle
T_{ad}	Adjacent space temperature
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge

Conduction heat gains (fenestration)

Loads summary

	Ori. (°)	A (m ²)	U _{global} (W/(m ² ·K))	Convective component (W)	Radiative component (W)	Sensible load (W)
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Exterior surface

Exterior window	NE(29)	11.9	2.50	232	65	296
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TOTAL: 296

	A (m ²)	U _{global} (W/(m ² ·K))	b	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
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Zone boundary partition

Interior door	1.9	3.00	0.14	V(90)	5	2	7
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TOTAL: 7

Abbreviations

Ori.	Orientation
A	Area
U_{global}	Fenestration global thermic coefficient
b	Adjacent space correction factor
Tilt	Tilt angle

Solar radiation heat gain

	Ori. (°)	A (m ²)	A _s (m ²)	θ (°)	SHGC	Beam solar heat gain (W)	Diffuse solar heat gain (W)	Sensible load (W)
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Exterior surface

Loads summary

Exterior window	NE(29)	11.9	11.9	119.03	0.60	0	486	494
TOTAL:							494	

Abbreviations

Ori.	Orientation
A	Area
A_s	Sunlit area
θ	Incident angle
SHGC	Center-of-glazing solar heat gain coefficient, SHGC

Internal heat gains

	Sensible heat gain (W)	Convective component (W)	Radiative component (W)	Latent cooling gain/load (W)	Sensible load (W)
Internal gains					
Occupancy	1680	672	1008	1080	1680
Lighting	168	67	101	-	168
Internal equipment	259	207	52	0	259
TOTAL:				1080	2108

Ventilation and infiltration heat gains

Airflow rate	Sensible heat recovery	Latent heat recovery	Latent load	Sensible load
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Loads summary

	(l/s)	(W)	(W)	(W)	(W)
Ventilation					
Infiltration	11	-	-	22	144
TOTAL:				22	144

Total cooling load

Total load per unit area (W/m ²)	Sensible heat factor	Latent load (W)	Latent cooling factor (0.0%) (W)	Sensible load (W)	Sensible cooling factor (5.0%) (W)	TOTAL COOLING LOAD
106.48	0.78	1102	0.0	3819	191.0	5112 W

Loads summary

Peak cooling load	
Space: M5 Kabinet	Zone: Zone 1
Net floor area = 48.0 m ² Net volume = 129.57 m ³	
Design conditions	
Indoor:	Outdoor:
Space air temperature = 25.0 °C	Dry-bulb temperature = 36.9 °C
Relative humidity = 50.00%	Wet-bulb temperature = 22.1 °C
Time of peak cooling load: 21 July at 16h (15 apparent solar time)	

Conduction heat gains (opaque surfaces)

	T _{sa} (°C)	Ori. (°)	A (m ²)	U (W/(m ² ·K))	α	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Exterior surface									
Roof	49.9	N(0)	48.0	0.74	0.60	H(0)	179	131	310
Façade (NE)	40.0	NE(29)	4.1	2.35	0.60	V(90)	45	36	80
Façade (NW)	51.7	NW(299)	21.9	2.35	0.60	V(90)	213	199	412
TOTAL:									802

A	U	b	Tilt	Convective component (W)	Radiative component (W)	Sensible load (W)
(m ²)	(W/(m ² ·K))		(°)			

Zone boundary partition

Partition wall	2.9	1.88	0.14	V(90)	5	2	7
TOTAL:							7

A	U	T _{ad}	Convective component	Radiative component	Sensible load
(m ²)	(W/(m ² ·K))	(°C)	(W)	(W)	(W)

Loads summary

	(m ²)	(W/(m ² ·K))	(°C)	(W)	(W)	(W)
Internal partition						
Intermediate floor slab	48.0	1.13	30.9	174	89	262
TOTAL:						262

	Length (m)	Ψ (W/(m ² ·K))	Sensible load (W)
Linear thermal bridges			
Outward	5.92	0.40	28
Outward	5.92	0.65	46
Outward	8.10	0.65	63
Outward	5.92	0.15	11
Outward	2.00	0.15	4
Outward	5.92	0.15	11
Outward	2.00	0.15	4
TOTAL:			165

Abbreviations

T _{sa}	Sol-air temperature
Ori.	Orientation
A	Area
U	Heat transmission coefficient
α	Absorptance
b	Adjacent space correction factor
Tilt	Tilt angle
T _{ad}	Adjacent space temperature
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge

Loads summary

Conduction heat gains (fenestration)

	Ori.	A	U _{global}	Convective component	Radiative component	Sensible load
	(°)	(m ²)	(W/(m ² ·K))	(W)	(W)	(W)

Exterior surface

Exterior window	NE(29)	11.8	2.50	236	70	305
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TOTAL: 305

A	U _{global}	b	Tilt	Convective component	Radiative component	Sensible load
(m ²)	(W/(m ² ·K))		(°)	(W)	(W)	(W)

Zone boundary partition

Interior door	1.9	3.00	0.14	V(90)	5	3	8
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TOTAL: 8

Abbreviations

Ori.	Orientation
A	Area
U_{global}	Fenestration global thermic coefficient
b	Adjacent space correction factor
Tilt	Tilt angle

Solar radiation heat gain

Ori.	A	A _s	θ	SHGC	Beam solar heat gain	Diffuse solar heat gain	Sensible load
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Loads summary

		(°)	(m²)	(m²)	(°)		(W)	(W)	(W)
Exterior surface									
Exterior window	NE(29)	11.8	11.8	118.86	0.60	0		424	447
TOTAL:								447	

Abbreviations

Ori.	Orientation
A	Area
A_s	Sunlit area
θ	Incident angle
SHGC	Center-of-glazing solar heat gain coefficient, SHGC

Internal heat gains

	Sensible heat gain	Convective component	Radiative component	Latent cooling gain/load	Sensible load
	(W)	(W)	(W)	(W)	(W)
Internal gains					
Occupancy	1680	672	1008	1080	1680
Lighting	168	67	101	-	168
Internal equipment	259	207	52	0	259
TOTAL:				1080	2107

Ventilation and infiltration heat gains

Loads summary

	Airflow rate (l/s)	Sensible heat recovery (W)	Latent heat recovery (W)	Latent load (W)	Sensible load (W)
Ventilation					
Infiltration	11	-	-	23	146
TOTAL:				23	146

Total cooling load

Total load per unit area (W/m ²)	Sensible heat factor	Latent load (W)	Latent cooling factor (0.0%)	Sensible load (W)	Sensible cooling factor (5.0%)	TOTAL COOLING LOAD
115.96	0.80	1103	0.0	4249	212.5	5565 W

Loads summary

Peak cooling load

Space: M6 kabinet (Kabinet)

Zone: Zone 1

Net floor area = 22.4 m² Net volume = 60.44 m³

Design conditions

Indoor:

Space air temperature = 25.0 °C

Relative humidity = 50.00%

Outdoor:

Dry-bulb temperature = 37.0 °C

Wet-bulb temperature = 21.6 °C

Time of peak cooling load: 21 August at 15h (14 apparent solar time)

Conduction heat gains (opaque surfaces)

	T _{sa} (°C)	Ori. (°)	A (m ²)	U (W/(m ² ·K))	α	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Exterior surface									
Roof	51.3	N(0)	22.4	0.74	0.60	H(0)	71	54	126
Façade (SW)	54.3	SW(209)	2.8	2.35	0.60	V(90)	30	27	57
TOTAL:									183

	A (m ²)	U (W/(m ² ·K))	b	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Zone boundary partition							
Partition wall	8.9	1.88	0.14	V(90)	15	7	22
Partition wall	4.6	1.88	0.46	V(90)	25	12	38
Partition wall	4.5	1.88	0.19	V(90)	10	5	16
Partition wall	5.3	1.88	0.19	V(90)	12	6	18

Loads summary

TOTAL:						94
A	U	T _{ad}	Convective component	Radiative component	Sensible load	
(m ²)	(W/(m ² ·K))	(°C)	(W)	(W)	(W)	
Internal partition						
Intermediate floor slab	22.4	1.13	31.0	82	40	121
TOTAL:						121
Length		Ψ	Sensible load			
(m)		(W/(m ² ·K))	(W)			
Linear thermal bridges						
Outward	4.00	0.40	19			
Outward	4.00	0.65	31			
Outward	4.00	0.15	7			
Outward	2.00	0.15	4			
Outward	4.00	0.15	7			
Outward	2.00	0.15	4			
TOTAL:						72

Abbreviations

T _{sa}	Sol-air temperature
Ori.	Orientation
A	Area
U	Heat transmission coefficient
α	Absorptance
b	Adjacent space correction factor
Tilt	Tilt angle
T _{ad}	Adjacent space temperature
Length	Length

Loads summary

Ψ | Linear thermal transmission coefficient of the thermal bridge

Conduction heat gains (fenestration)

	Ori. (°)	A (m ²)	U _{global} (W/(m ² ·K))	Convective component (W)	Radiative component (W)	Sensible load (W)	
Exterior surface							
Exterior window	SW(209)	8.0	2.50	161	45	205	
TOTAL:						205	
	A (m ²)	U _{global} (W/(m ² ·K))	b	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Zone boundary partition							
Interior door	1.9	3.00	0.14	V(90)	5	2	8
TOTAL:						8	

Abbreviations

Ori.	Orientation
A	Area
U _{global}	Fenestration global thermic coefficient
b	Adjacent space correction factor
Tilt	Tilt angle

Solar radiation heat gain

Loads summary

	Ori.	A	A _s	θ	SHGC	Beam solar heat gain	Diffuse solar heat gain	Sensible load
	(°)	(m ²)	(m ²)	(°)		(W)	(W)	(W)
Exterior surface								
Exterior window	SW(209)	8.0	8.0	52.26	0.60	1111	460	1275
TOTAL:								1275

Abbreviations

Ori.	Orientation
A	Area
A_s	Sunlit area
θ	Incident angle
SHGC	Center-of-glazing solar heat gain coefficient, SHGC

Internal heat gains

	Sensible heat gain	Convective component	Radiative component	Latent cooling gain/load	Sensible load
	(W)	(W)	(W)	(W)	(W)
Internal gains					
Occupancy	783	313	470	504	784
Lighting	78	31	47	-	78
Internal equipment	121	97	24	0	121
TOTAL:				504	983

Loads summary

Ventilation and infiltration heat gains

	Airflow rate	Sensible heat recovery	Latent heat recovery	Latent load	Sensible load
	(l/s)	(W)	(W)	(W)	(W)
Ventilation					
Infiltration	5	-	-	0	69
TOTAL:				0	69

Total cooling load

Total load per unit area	Sensible heat factor	Latent load	Latent cooling factor (0.0%)	Sensible load	Sensible cooling factor (5.0%)	TOTAL COOLING LOAD
(W/m ²)		(W)	(W)	(W)	(W)	
163.70	0.86	504	0.0	3010	150.5	3665 W

Loads summary

Peak cooling load	
Space: K cajna kuhinja (Cajna kuhinja)	Zone: Zone 1
Net floor area = 10.0 m ² Net volume = 27.00 m ³	
Design conditions	
Indoor:	Outdoor:
Space air temperature = 25.0 °C	Dry-bulb temperature = 31.2 °C
Relative humidity = 50.00%	Wet-bulb temperature = 19.6 °C
Time of peak cooling load: 21 July at 21h (20 apparent solar time)	

Conduction heat gains (opaque surfaces)

	T _{sa} (°C)	Ori. (°)	A (m ²)	U (W/(m ² ·K))	α	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
Exterior surface									
Roof	27.2	N(0)	10.0	0.74	0.60	H(0)	47	29	76
Façade (NW)	31.2	NW(299)	6.7	2.35	0.60	V(90)	115	73	189

TOTAL: 264

A (m ²)	U (W/(m ² ·K))	b	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
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Zone boundary partition

Partition wall	4.8	1.88	0.14	V(90)	4	4	8
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TOTAL: 8

A (m ²)	U (W/(m ² ·K))	T _{ad} (°C)	Convective component (W)	Radiative component (W)	Sensible load (W)
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Loads summary

Internal partition						
Intermediate floor slab	10.0	1.13	28.1	19	17	36
TOTAL:						36
		Length (m)	Ψ (W/(m²·K))	Sensible load (W)		
Linear thermal bridges						
Outward		2.50	0.40	6		
Outward		2.50	0.65	10		
TOTAL:						16

Abbreviations

T _{sa}	Sol-air temperature
Ori.	Orientation
A	Area
U	Heat transmission coefficient
α	Absorptance
b	Adjacent space correction factor
Tilt	Tilt angle
T _{ad}	Adjacent space temperature
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge

Conduction heat gains (fenestration)

A (m ²)	U _{global} (W/(m ² ·K))	b	Tilt (°)	Convective component (W)	Radiative component (W)	Sensible load (W)
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Zone boundary partition

Loads summary

Interior door	1.9	3.00	0.14	V(90)	3	2	5
TOTAL:							5

Abbreviations

A	Area
U_{global}	Fenestration global thermic coefficient
b	Adjacent space correction factor
Tilt	Tilt angle

Internal heat gains

	Sensible heat gain (W)	Convective component (W)	Radiative component (W)	Latent cooling gain/load (W)	Sensible load (W)
Internal gains					
Occupancy	210	84	126	135	210
Lighting	40	16	24	-	40
Internal equipment	108	86	22	0	108
TOTAL:				135	358

Total cooling load

Total load per unit area (W/m ²)	Sensible heat factor	Latent load (W)	Latent cooling factor (0.0%) (W)	Sensible load (W)	Sensible cooling factor (5.0%) (W)	TOTAL COOLING LOAD
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Loads summary

85.77	0.84	135	0.0	688	34.4	857 W
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Loads summary

2.2. Heating

Peak heating load	
Space: MPS	Zone: Zone 1
Net floor area = 66.22 m ² Net volume = 178.79 m ³	
Design conditions	
Indoor:	Outdoor:
Indoor design temperature = 21.0 °C	Design external temperature = -6.0 °C
	Annual average external temperature = 6.9 °C

Design thermal loss due to transmission

	Ori. (°)	A (m ²)	U (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
Outside (opaque surface elements)					
Roof	N(0)	66.2	0.74	H(0)	1329
Façade (NW)	NW(299)	15.1	2.35	V(90)	958
Façade (SW)	SW(209)	9.3	2.35	V(90)	588
TOTAL:					2875
	Ori. (°)	A (m ²)	U _{global} (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
Outside (fenestration)					
Exterior window	SW(209)	11.5	2.50	V(90)	776
Exterior window	SW(209)	11.1	2.50	V(90)	752
TOTAL:					1528
	Length (m)	Ψ (W/(m ² ·K))	Thermal loss (W)		

Loads summary

Outside (linear thermal bridges)					
Outward	2.70	0.50		36	
Outward	2.70	0.10		7	
Outward	5.60	0.40		60	
Outward	5.60	0.65		98	
Outward	2.70	0.50		36	
Outward	11.82	0.40		128	
Outward	11.82	0.65		208	
Outward	5.75	0.15		23	
Outward	2.00	0.15		8	
Outward	5.75	0.15		23	
Outward	2.00	0.15		8	
Outward	5.57	0.15		23	
Outward	2.00	0.15		8	
Outward	5.57	0.15		23	
Outward	2.00	0.15		8	
TOTAL:				698	
	A (m ²)	U (W/(m ² ·K))	b _u	Tilt (°)	Thermal loss (W)
Via an unheated space (surface elements)					
Partition wall	18.8	1.88	0.14	V(90)	133
Interior door	1.9	3.00	0.14	V(90)	21
TOTAL:				154	
	A (m ²)	U (W/(m ² ·K))	T _{ad} (°C)	Tilt (°)	Thermal loss (W)
Via spaces heated at a different temperature					
Intermediate floor slab	66.2	1.13	14.0	H(180)	526
TOTAL:				526	

Loads summary

Abbreviations	
Ori.	Orientation
A	Area
U	Heat transmission coefficient
U_{global}	Fenestration global thermic coefficient
e_k	Correction factor for the exposure
b_u	Adjacent space correction factor
Tilt	Tilt angle
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge
T_{ad}	Indoor temperature of the adjacent space. (In heat transfer between spaces of different zones the mean temperature between indoor design temperature and outdoor dry-bulb temperature is considered as indoor temperature of the adjacent space).

Design thermal loss due to ventilation and infiltration

	Airflow rate (l/s)	η _v	Thermal loss (W)
Ventilation			
Infiltration	15	-	533
TOTAL:			533

Abbreviations

η _v	Thermal efficiency of the heat recovery system
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Thermal heating capacity

A	f _{RH}	Φ _{RH}
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Loads summary

(m ²)	(W/m ²)	(W)
66.22	12.00	795

Abbreviations

f _{RH}	Reheat factor
Φ _{RH}	Thermal re-heating capacity

Design thermal load

Φ _T	Φ _V	Φ _{RH}	f _s	Φ _{HL}
(W)	(W)	(W)		
5782	533	795	0.05	7465 W

Abbreviations

Φ _T	Design thermal loss due to transmission
Φ _V	Design thermal loss due to ventilation and infiltration
Φ _{RH}	Thermal re-heating capacity
f _s	Thermal loads safety factor
Φ _{HL}	Design thermal load

Loads summary

Peak heating load

Space: M1 kabinet (Kabinet) **Zone:** Zone 1

Net floor area = 33.19 m² Net volume = 89.62 m³

Design conditions

Indoor: Outdoor:
Indoor design temperature = 21.0 °C Design external temperature = -6.0 °C
Annual average external temperature = 6.9 °C

Design thermal loss due to transmission

	Ori. (°)	A (m ²)	U (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
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Outside (opaque surface elements)

Roof	N(0)	33.2	0.74	H(0)	666
Façade (SW)	SW(209)	4.2	2.35	V(90)	263

TOTAL: 929

	Ori. (°)	A (m ²)	U _{global} (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
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Outside (fenestration)

Exterior window	SW(209)	11.8	2.50	V(90)	800
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TOTAL: 800

	Length (m)	Ψ (W/(m ² ·K))	Thermal loss (W)
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Outside (linear thermal bridges)

Outward	2.70	0.50	36
Outward	2.70	0.50	36
Outward	5.93	0.40	64
Outward	5.93	0.65	104

Loads summary

Outward	5.92	0.15	24
Outward	2.00	0.15	8
Outward	5.92	0.15	24
Outward	2.00	0.15	8

TOTAL: 305

	A (m ²)	U (W/(m ² ·K))	b _u	Tilt (°)	Thermal loss (W)
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Via an unheated space (surface elements)

Partition wall	14.1	1.88	0.14	V(90)	99
Interior door	1.9	3.00	0.14	V(90)	21

TOTAL: 121

	A (m ²)	U (W/(m ² ·K))	T _{ad} (°C)	Tilt (°)	Thermal loss (W)
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Via spaces heated at a different temperature

Intermediate floor slab	33.2	1.13	14.0	H(180)	264
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TOTAL: 264

Abbreviations

Ori.	Orientation
A	Area
U	Heat transmission coefficient
U_{global}	Fenestration global thermic coefficient
e_k	Correction factor for the exposure
b_u	Adjacent space correction factor
Tilt	Tilt angle
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge

Loads summary

T_{ad}	Indoor temperature of the adjacent space. (In heat transfer between spaces of different zones the mean temperature between indoor design temperature and outdoor dry-bulb temperature is considered as indoor temperature of the adjacent space).
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Design thermal loss due to ventilation and infiltration

	Airflow rate (l/s)	η_v	Thermal loss (W)
Ventilation			
Infiltration	7	-	267
TOTAL:			267

Abbreviations

η_v	Thermal efficiency of the heat recovery system
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Thermal heating capacity

A	f_{RH}	Φ_{RH}
(m ²)	(W/m ²)	(W)
33.19	12.00	398

Abbreviations

f_{RH}	Reheat factor
Φ_{RH}	Thermal re-heating capacity

Design thermal load

Φ_T	Φ_V	Φ_{RH}	f_s	Φ_{HL}
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Loads summary

(W)	(W)	(W)		
2419	267	398	0.05	3238 W

Abbreviations

Φ_T	Design thermal loss due to transmission
Φ_V	Design thermal loss due to ventilation and infiltration
Φ_{RH}	Thermal re-heating capacity
f_s	Thermal loads safety factor
Φ_{HL}	Design thermal load

Loads summary

Peak heating load	
Space: M2 Kabinet	Zone: Zone 1
Net floor area = 48.20 m ² Net volume = 130.15 m ³	
Design conditions	
Indoor:	Outdoor:
Indoor design temperature = 21.0 °C	Design external temperature = -6.0 °C
	Annual average external temperature = 6.9 °C

Design thermal loss due to transmission

	Ori.	A	U	Tilt	Thermal loss
	(°)	(m ²)	(W/(m ² ·K))	(°)	(W)

Outside (opaque surface elements)

Roof	N(0)	48.2	0.74	H(0)	968
Façade (NE)	NE(29)	4.2	2.35	V(90)	267
Façade (SE)	SE(119)	21.9	2.35	V(90)	1385

TOTAL: 2620

	Ori.	A	U _{global}	Tilt	Thermal loss
	(°)	(m ²)	(W/(m ² ·K))	(°)	(W)

Outside (fenestration)

Exterior window	NE(29)	11.9	2.50	V(90)	800
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TOTAL: 800

	Length	Ψ	Thermal loss
	(m)	(W/(m ² ·K))	(W)

Outside (linear thermal bridges)

Outward	2.70	0.10	7
Outward	2.70	0.50	36
Outward	5.95	0.40	64

Loads summary

Outward	5.95	0.65	104
Outward	8.10	0.40	87
Outward	8.10	0.65	142
Outward	5.93	0.15	24
Outward	2.00	0.15	8
Outward	5.93	0.15	24
Outward	2.00	0.15	8

TOTAL: 506

	A	U	b _u	Tilt	Thermal loss
	(m ²)	(W/(m ² ·K))		(°)	(W)

Via an unheated space (surface elements)

Partition wall	14.1	1.88	0.14	V(90)	99
Interior door	1.9	3.00	0.14	V(90)	21

TOTAL: 121

	A	U	T _{ad}	Tilt	Thermal loss
	(m ²)	(W/(m ² ·K))	(°C)	(°)	(W)

Via spaces heated at a different temperature

Intermediate floor slab	48.2	1.13	14.0	H(180)	383
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TOTAL: 383

Abbreviations

Ori.	Orientation
A	Area
U	Heat transmission coefficient
U_{global}	Fenestration global thermic coefficient
e_k	Correction factor for the exposure
b_u	Adjacent space correction factor
Tilt	Tilt angle
Length	Length

Loads summary

Ψ	Linear thermal transmission coefficient of the thermal bridge
T_{ad}	Indoor temperature of the adjacent space. (In heat transfer between spaces of different zones the mean temperature between indoor design temperature and outdoor dry-bulb temperature is considered as indoor temperature of the adjacent space).

Design thermal loss due to ventilation and infiltration

	Airflow rate (l/s)	η_v	Thermal loss (W)
Ventilation			
Infiltration	11	-	388
TOTAL:			388

Abbreviations

η_v	Thermal efficiency of the heat recovery system
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Thermal heating capacity

A (m ²)	f_{RH} (W/m ²)	Φ_{RH} (W)
48.20	12.00	578

Abbreviations

f_{RH}	Reheat factor
Φ_{RH}	Thermal re-heating capacity

Design thermal load

Loads summary

Φ_T (W)	Φ_V (W)	Φ_{RH} (W)	f_s	Φ_{HL}
4430	388	578	0.05	5666 W

Abbreviations

Φ_T	Design thermal loss due to transmission
Φ_V	Design thermal loss due to ventilation and infiltration
Φ_{RH}	Thermal re-heating capacity
f_s	Thermal loads safety factor
Φ_{HL}	Design thermal load

Loads summary

Peak heating load	
Space: M3 kabinet (Kabinet)	Zone: Zone 1
Net floor area = 47.99 m ² Net volume = 129.58 m ³	
Design conditions	
Indoor: Indoor design temperature = 21.0 °C	Outdoor: Design external temperature = -6.0 °C Annual average external temperature = 6.9 °C

Design thermal loss due to transmission

	Ori. (°)	A (m ²)	U (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
Outside (opaque surface elements)					
Roof	N(0)	48.0	0.74	H(0)	963
Façade (NE)	NE(29)	4.1	2.35	V(90)	263
TOTAL:					1226

	Ori. (°)	A (m ²)	U _{global} (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
Outside (fenestration)					
Exterior window	NE(29)	11.8	2.50	V(90)	800
TOTAL:					800

	Length (m)	Ψ (W/(m ² ·K))	Thermal loss (W)
Outside (linear thermal bridges)			
Outward	5.92	0.40	64
Outward	5.92	0.65	104
Outward	5.92	0.15	24
Outward	2.00	0.15	8

Loads summary

Outward	5.92	0.15	24		
Outward	2.00	0.15	8		
TOTAL:			232		
A	U	b _u	Tilt	Thermal loss	
(m ²)	(W/(m ² ·K))		(°)	(W)	
Via an unheated space (surface elements)					
Partition wall	14.1	1.88	0.14	V(90)	99
Interior door	1.9	3.00	0.14	V(90)	21

TOTAL:					121
	A (m ²)	U (W/(m ² ·K))	T _{ad} (°C)	Tilt (°)	Thermal loss (W)
Via spaces heated at a different temperature					
Intermediate floor slab	48.0	1.13	14.0	H(180)	381
TOTAL:					381

Abbreviations

Ori.	Orientation
A	Area
U	Heat transmission coefficient
U_{global}	Fenestration global thermic coefficient
e_k	Correction factor for the exposure
b_u	Adjacent space correction factor
Tilt	Tilt angle
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge
T_{ad}	Indoor temperature of the adjacent space. (In heat transfer between spaces of different zones the mean temperature between indoor design temperature and outdoor dry-bulb temperature is considered as indoor temperature of the adjacent space).

Loads summary

Design thermal loss due to ventilation and infiltration

	Airflow rate (l/s)	η_v	Thermal loss (W)
Ventilation			
Infiltration	11	-	386
TOTAL:			386

Abbreviations

η_v	Thermal efficiency of the heat recovery system
----------	--

Thermal heating capacity

A (m ²)	f_{RH} (W/m ²)	Φ_{RH} (W)
47.99	12.00	576

Abbreviations

f_{RH}	Reheat factor
Φ_{RH}	Thermal re-heating capacity

Design thermal load

Φ_T (W)	Φ_V (W)	Φ_{RH} (W)	f_s	Φ_{HL}
2760	386	576	0.05	3908 W

Abbreviations

Loads summary

Φ_T	Design thermal loss due to transmission
Φ_V	Design thermal loss due to ventilation and infiltration
Φ_{RH}	Thermal re-heating capacity
f_s	Thermal loads safety factor
Φ_{HL}	Design thermal load

Loads summary

Peak heating load	
Space: M4 Kabinet	Zone: Zone 1
Net floor area = 48.01 m ² Net volume = 129.62 m ³	
Design conditions	
Indoor: Indoor design temperature = 21.0 °C	Outdoor: Design external temperature = -6.0 °C Annual average external temperature = 6.9 °C

Design thermal loss due to transmission

	Ori. (°)	A (m ²)	U (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
Outside (opaque surface elements)					
Roof	N(0)	48.0	0.74	H(0)	964
Façade (NE)	NE(29)	4.2	2.35	V(90)	263
TOTAL:					1227

	Ori. (°)	A (m ²)	U _{global} (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
Outside (fenestration)					
Exterior window	NE(29)	11.9	2.50	V(90)	800
TOTAL:					800

	Length (m)	Ψ (W/(m ² ·K))	Thermal loss (W)
Outside (linear thermal bridges)			
Outward	5.93	0.40	64
Outward	5.93	0.65	104
Outward	5.93	0.15	24
Outward	2.00	0.15	8

Loads summary

Outward	5.93	0.15	24		
Outward	2.00	0.15	8		
TOTAL:			232		
A	U	b _u	Tilt	Thermal loss	
(m ²)	(W/(m ² ·K))		(°)	(W)	
Via an unheated space (surface elements)					
Partition wall	14.1	1.88	0.14	V(90)	99
Interior door	1.9	3.00	0.14	V(90)	21

TOTAL:					121
	A (m ²)	U (W/(m ² ·K))	T _{ad} (°C)	Tilt (°)	Thermal loss (W)
Via spaces heated at a different temperature					
Intermediate floor slab	48.0	1.13	14.0	H(180)	381
TOTAL:					381

Abbreviations

Ori.	Orientation
A	Area
U	Heat transmission coefficient
U _{global}	Fenestration global thermic coefficient
e _k	Correction factor for the exposure
b _u	Adjacent space correction factor
Tilt	Tilt angle
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge
T _{ad}	Indoor temperature of the adjacent space. (In heat transfer between spaces of different zones the mean temperature between indoor design temperature and outdoor dry-bulb temperature is considered as indoor temperature of the adjacent space).

Loads summary

Design thermal loss due to ventilation and infiltration

	Airflow rate (l/s)	η_v	Thermal loss (W)
Ventilation			
Infiltration	11	-	386
TOTAL:			386

Abbreviations

η_v	Thermal efficiency of the heat recovery system
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Thermal heating capacity

A (m ²)	f_{RH} (W/m ²)	Φ_{RH} (W)
48.01	12.00	576

Abbreviations

f_{RH}	Reheat factor
Φ_{RH}	Thermal re-heating capacity

Design thermal load

Φ_T (W)	Φ_V (W)	Φ_{RH} (W)	f_s	Φ_{HL}
2761	386	576	0.05	3909 W

Abbreviations

Loads summary

Φ_T	Design thermal loss due to transmission
Φ_V	Design thermal loss due to ventilation and infiltration
Φ_{RH}	Thermal re-heating capacity
f_s	Thermal loads safety factor
Φ_{HL}	Design thermal load

Loads summary

Peak heating load	
Space: M5 Kabinet	Zone: Zone 1
Net floor area = 47.99 m ² Net volume = 129.57 m ³	
Design conditions	
Indoor:	Outdoor:
Indoor design temperature = 21.0 °C	Design external temperature = -6.0 °C
	Annual average external temperature = 6.9 °C

Design thermal loss due to transmission

	Ori. (°)	A (m ²)	U (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
Outside (opaque surface elements)					
Roof	N(0)	48.0	0.74	H(0)	963
Façade (NE)	NE(29)	4.1	2.35	V(90)	263
Façade (NW)	NW(299)	21.9	2.35	V(90)	1385

TOTAL: 2612

	Ori. (°)	A (m ²)	U _{global} (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
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Outside (fenestration)

Exterior window	NE(29)	11.8	2.50	V(90)	800
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TOTAL: 800

	Length (m)	Ψ (W/(m ² ·K))	Thermal loss (W)
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Outside (linear thermal bridges)

Outward	5.92	0.40	64
Outward	5.92	0.65	104
Outward	8.10	0.65	142

Loads summary

Outward	5.92	0.15	24
Outward	2.00	0.15	8
Outward	5.92	0.15	24
Outward	2.00	0.15	8

TOTAL: 374

	A (m ²)	U (W/(m ² ·K))	b _u	Tilt (°)	Thermal loss (W)
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Via an unheated space (surface elements)

Partition wall	2.9	1.88	0.14	V(90)	20
Interior door	1.9	3.00	0.14	V(90)	21

TOTAL: 42

	A (m ²)	U (W/(m ² ·K))	T _{ad} (°C)	Tilt (°)	Thermal loss (W)
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Via spaces heated at a different temperature

Intermediate floor slab	48.0	1.13	14.0	H(180)	381
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TOTAL: 381

Abbreviations

Ori.	Orientation
A	Area
U	Heat transmission coefficient
U_{global}	Fenestration global thermic coefficient
e_k	Correction factor for the exposure
b_u	Adjacent space correction factor
Tilt	Tilt angle
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge

Loads summary

T_{ad}	Indoor temperature of the adjacent space. (In heat transfer between spaces of different zones the mean temperature between indoor design temperature and outdoor dry-bulb temperature is considered as indoor temperature of the adjacent space).
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Design thermal loss due to ventilation and infiltration

	Airflow rate (l/s)	η_v	Thermal loss (W)
Ventilation			
Infiltration	11	-	386
TOTAL:			386

Abbreviations

η_v	Thermal efficiency of the heat recovery system
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Thermal heating capacity

A	f_{RH}	Φ_{RH}
(m ²)	(W/m ²)	(W)
47.99	12.00	576

Abbreviations

f_{RH}	Reheat factor
Φ_{RH}	Thermal re-heating capacity

Design thermal load

Φ_T	Φ_V	Φ_{RH}	f_s	Φ_{HL}
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Loads summary

(W)	(W)	(W)		
4208	386	576	0.05	5429 W

Abbreviations

Φ_T	Design thermal loss due to transmission
Φ_V	Design thermal loss due to ventilation and infiltration
Φ_{RH}	Thermal re-heating capacity
f_s	Thermal loads safety factor
Φ_{HL}	Design thermal load

Loads summary

Peak heating load

Space: M6 kabinet (Kabinet) **Zone:** Zone 1

Net floor area = 22.39 m² Net volume = 60.44 m³

Design conditions

Indoor: Outdoor:
Indoor design temperature = 21.0 °C Design external temperature = -6.0 °C
Annual average external temperature = 6.9 °C

Design thermal loss due to transmission

	Ori. (°)	A (m ²)	U (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
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Outside (opaque surface elements)

Roof	N(0)	22.4	0.74	H(0)	449
Façade (SW)	SW(209)	2.8	2.35	V(90)	177

TOTAL: 627

	Ori. (°)	A (m ²)	U _{global} (W/(m ² ·K))	Tilt (°)	Thermal loss (W)
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Outside (fenestration)

Exterior window	SW(209)	8.0	2.50	V(90)	540
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TOTAL: 540

	Length (m)	Ψ (W/(m ² ·K))	Thermal loss (W)
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Outside (linear thermal bridges)

Outward	4.00	0.40	43
Outward	4.00	0.65	70
Outward	4.00	0.15	16
Outward	2.00	0.15	8

Loads summary

Outward	4.00	0.15	16
Outward	2.00	0.15	8

TOTAL: 162

	A (m ²)	U (W/(m ² ·K))	b _u	Tilt (°)	Thermal loss (W)
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Via an unheated space (surface elements)

Partition wall	8.9	1.88	0.14	V(90)	63
Partition wall	4.6	1.88	0.46	V(90)	106
Partition wall	4.5	1.88	0.19	V(90)	44
Partition wall	5.3	1.88	0.19	V(90)	52
Interior door	1.9	3.00	0.14	V(90)	21

TOTAL: 286

	A (m ²)	U (W/(m ² ·K))	T _{ad} (°C)	Tilt (°)	Thermal loss (W)
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Via spaces heated at a different temperature

Intermediate floor slab	22.4	1.13	14.0	H(180)	178
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TOTAL: 178

Abbreviations

Ori.	Orientation
A	Area
U	Heat transmission coefficient
U_{global}	Fenestration global thermic coefficient
e_k	Correction factor for the exposure
b_u	Adjacent space correction factor
Tilt	Tilt angle
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge

Loads summary

T_{ad}	Indoor temperature of the adjacent space. (In heat transfer between spaces of different zones the mean temperature between indoor design temperature and outdoor dry-bulb temperature is considered as indoor temperature of the adjacent space).
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Design thermal loss due to ventilation and infiltration

	Airflow rate (l/s)	η_v	Thermal loss (W)
Ventilation			
Infiltration	5	-	180
TOTAL:			180

Abbreviations

η_v	Thermal efficiency of the heat recovery system
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Thermal heating capacity

A	f_{RH}	Φ_{RH}
(m ²)	(W/m ²)	(W)
22.39	12.00	269

Abbreviations

f_{RH}	Reheat factor
Φ_{RH}	Thermal re-heating capacity

Design thermal load

Φ_T	Φ_V	Φ_{RH}	f_s	Φ_{HL}
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Loads summary

(W)	(W)	(W)		
1792	180	269	0.05	2352 W

Abbreviations

Φ_T	Design thermal loss due to transmission
Φ_V	Design thermal loss due to ventilation and infiltration
Φ_{RH}	Thermal re-heating capacity
f_s	Thermal loads safety factor
Φ_{HL}	Design thermal load

Loads summary

Peak heating load	
Space: K cajna kuhinja (Cajna kuhinja)	Zone: Zone 1
Net floor area = 10.00 m ² Net volume = 27.00 m ³	
Design conditions	
Indoor: Indoor design temperature = 21.0 °C	Outdoor: Design external temperature = -6.0 °C Annual average external temperature = 6.9 °C

Design thermal loss due to transmission

	Ori. (°)	A (m²)	U (W/(m²·K))	Tilt (°)	Thermal loss (W)
Outside (opaque surface elements)					
Roof	N(0)	10.0	0.74	H(0)	201
Façade (NW)	NW(299)	6.7	2.35	V(90)	427
TOTAL:					628
	Length (m)		Ψ (W/(m²·K))		Thermal loss (W)
Outside (linear thermal bridges)					
Outward	2.50		0.40		27
Outward	2.50		0.65		44
TOTAL:					71
	A (m²)	U (W/(m²·K))	b _u	Tilt (°)	Thermal loss (W)
Via an unheated space (surface elements)					
Partition wall	4.8	1.88	0.14	V(90)	34
Interior door	1.9	3.00	0.14	V(90)	21

Loads summary

	A (m ²)	U (W/(m ² ·K))	T _{ad} (°C)	Tilt (°)	Thermal loss (W)
Via spaces heated at a different temperature					56
Intermediate floor slab	10.0	1.13	14.0	H(180)	79
TOTAL:					79

Abbreviations

Ori.	Orientation
A	Area
U	Heat transmission coefficient
e_k	Correction factor for the exposure
b_u	Adjacent space correction factor
Tilt	Tilt angle
Length	Length
Ψ	Linear thermal transmission coefficient of the thermal bridge
T_{ad}	Indoor temperature of the adjacent space. (In heat transfer between spaces of different zones the mean temperature between indoor design temperature and outdoor dry-bulb temperature is considered as indoor temperature of the adjacent space).

Thermal heating capacity

A (m ²)	f _{RH} (W/m ²)	Φ _{RH} (W)
10.00	12.00	120

Abbreviations

f_{RH}	Reheat factor
Φ_{RH}	Thermal re-heating capacity

Loads summary

Design thermal load				
Φ_T	Φ_V	Φ_{RH}	f_s	Φ_{HL}
(W)	(W)	(W)		
834	0	120	0.05	1002 W

Abbreviations

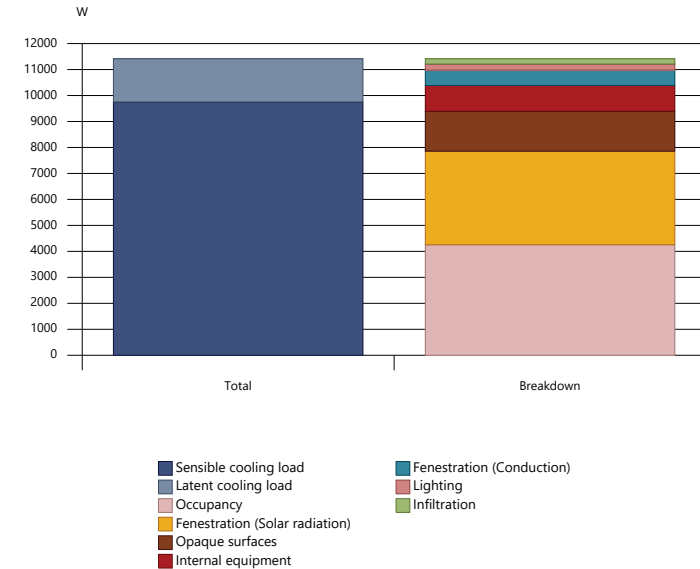
Φ_T	Design thermal loss due to transmission
Φ_V	Design thermal loss due to ventilation and infiltration
Φ_{RH}	Thermal re-heating capacity
f_s	Thermal loads safety factor
Φ_{HL}	Design thermal load

Loads summary

2.3. Graphs

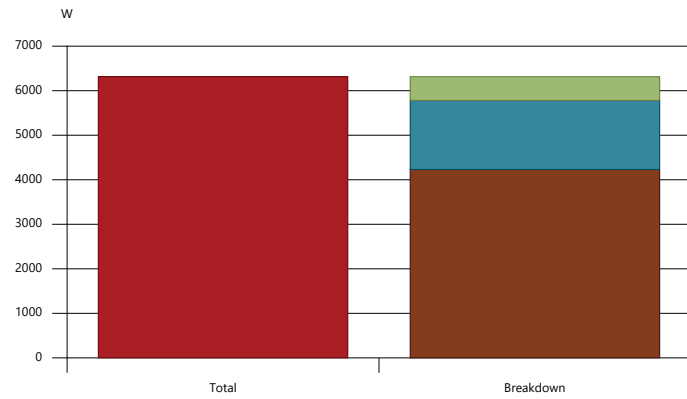
MPS

Peak cooling load (21 August at 15h)



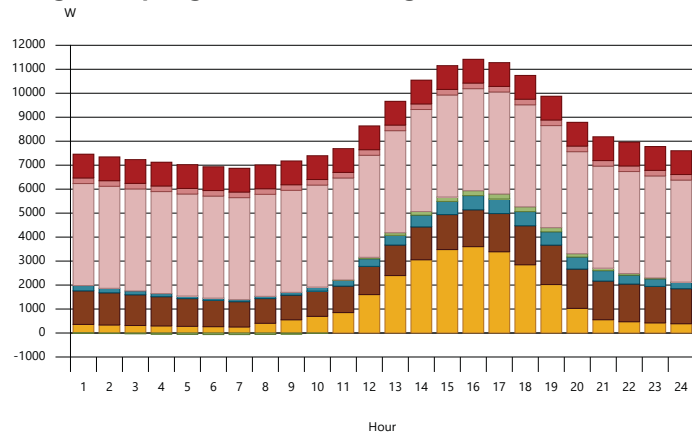
Peak heating load

Loads summary



■ Sensible heating load
 ■ Latent heating load
 ■ Opaque surfaces
 ■ Fenestration (Conduction)
 ■ Infiltration

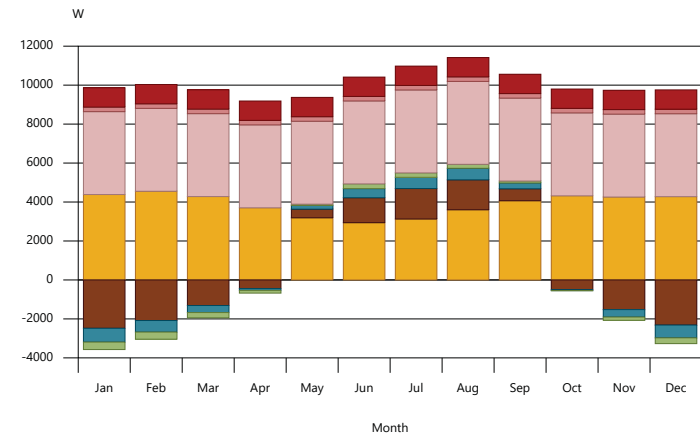
Hourly cooling load progression (21 August)



■ Fenestration (Solar radiation)
 ■ Internal equipment
 ■ Opaque surfaces
 ■ Fenestration (Conduction)
 ■ Infiltration
 ■ Occupancy
 ■ Lighting

Annual peak cooling load progression

Loads summary

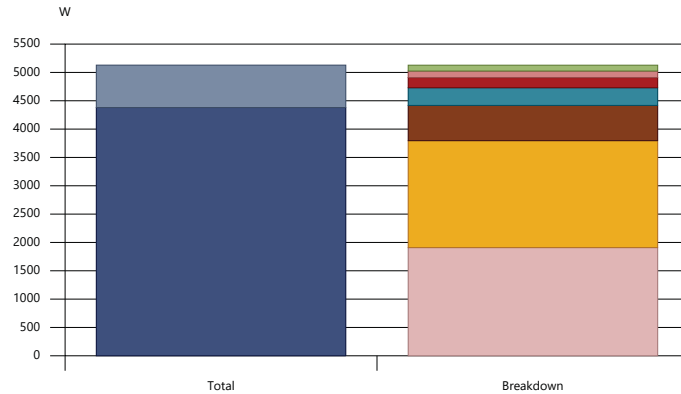


■ Fenestration (Solar radiation)
 ■ Internal equipment
 ■ Opaque surfaces
 ■ Fenestration (Conduction)
 ■ Infiltration
 ■ Occupancy
 ■ Lighting

Loads summary

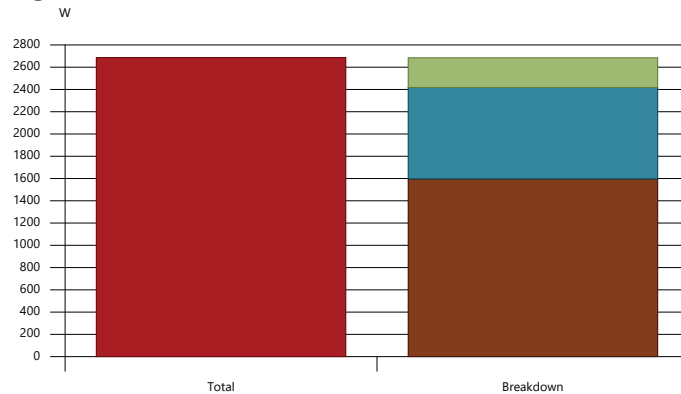
M1 kabinet (Kabinet)

Peak cooling load (21 August at 15h)



Sensible cooling load
 Latent cooling load
 Occupancy
 Fenestration (Solar radiation)
 Opaque surfaces
 Fenestration (Conduction)
 Internal equipment
 Lighting
 Infiltration

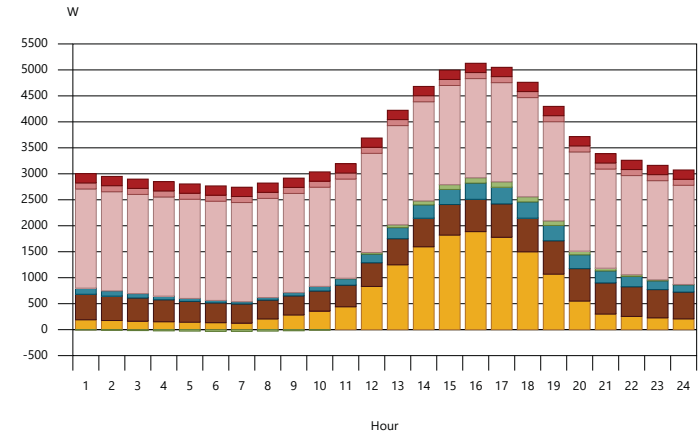
Peak heating load



Loads summary

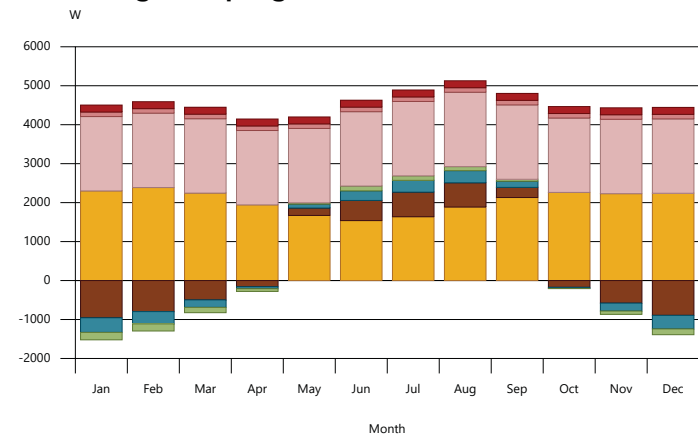
Sensible heating load
 Latent heating load
 Opaque surfaces
 Fenestration (Conduction)
 Infiltration

Hourly cooling load progression (21 August)

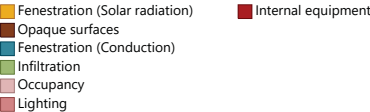


Fenestration (Solar radiation)
 Opaque surfaces
 Fenestration (Conduction)
 Infiltration
 Occupancy
 Lighting
 Internal equipment

Annual peak cooling load progression

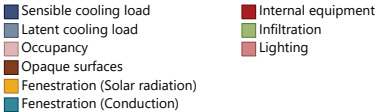
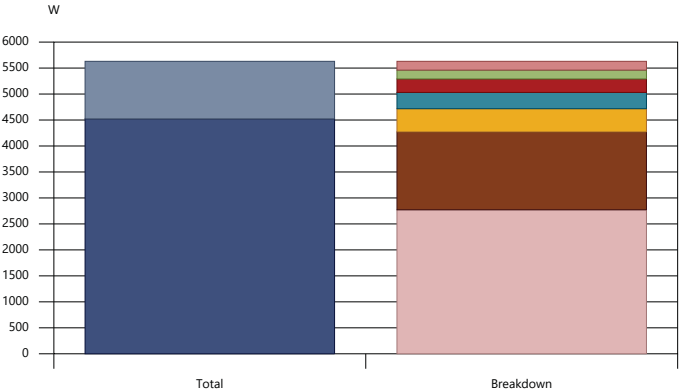


Loads summary

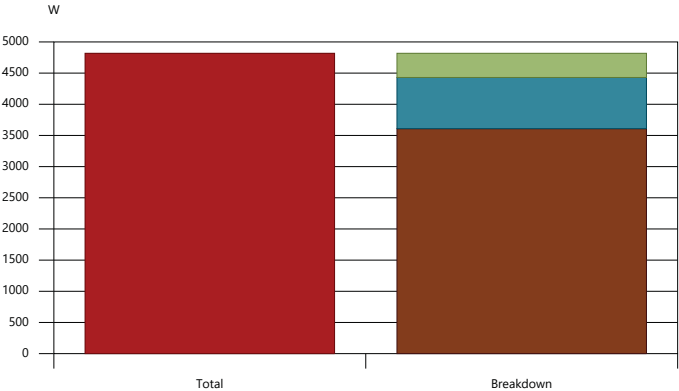


Loads summary

M2 Kabinet
Peak cooling load (21 July at 16h)



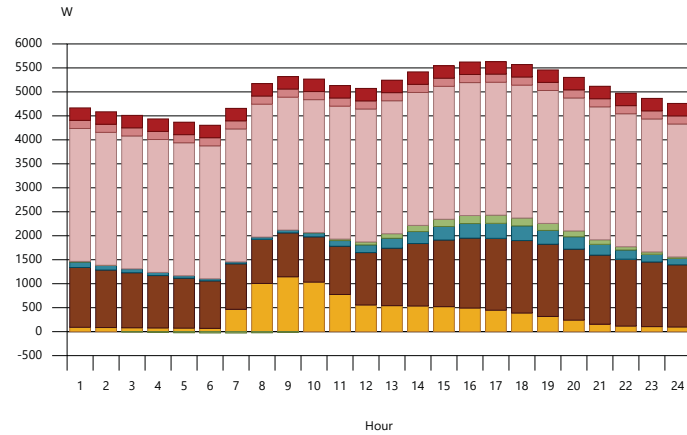
Peak heating load



Loads summary

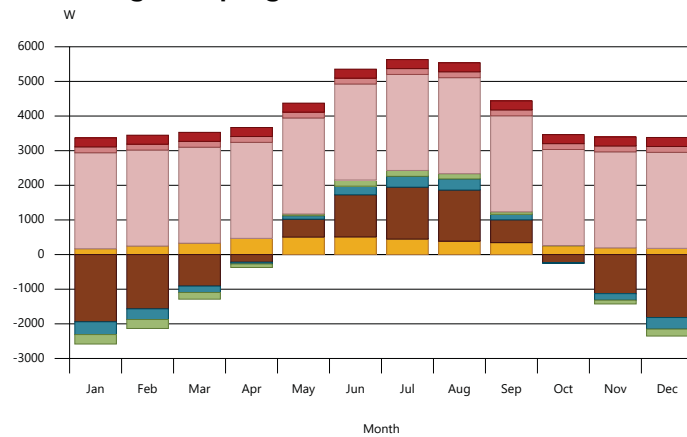
■ Sensible heating load
 ■ Latent heating load
 ■ Opaque surfaces
 ■ Fenestration (Conduction)
 ■ Infiltration

Hourly cooling load progression (21 July)



■ Fenestration (Solar radiation)
 ■ Internal equipment
 ■ Opaque surfaces
 ■ Fenestration (Conduction)
 ■ Infiltration
 ■ Occupancy
 ■ Lighting

Annual peak cooling load progression



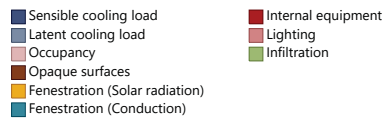
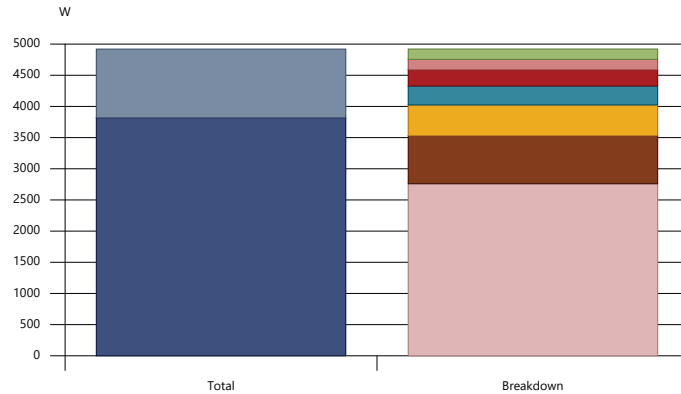
Loads summary

■ Fenestration (Solar radiation)
 ■ Internal equipment
 ■ Opaque surfaces
 ■ Fenestration (Conduction)
 ■ Infiltration
 ■ Occupancy
 ■ Lighting

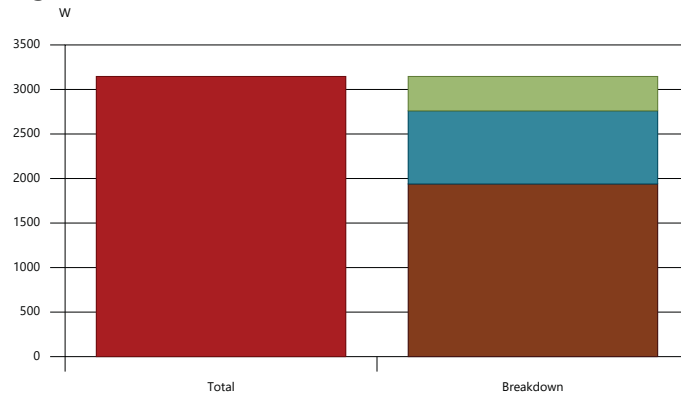
Loads summary

M3 kabinet (Kabinet)

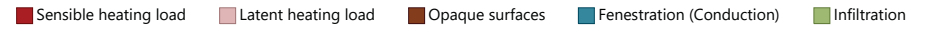
Peak cooling load (21 July at 15h)



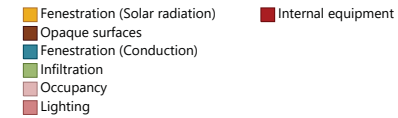
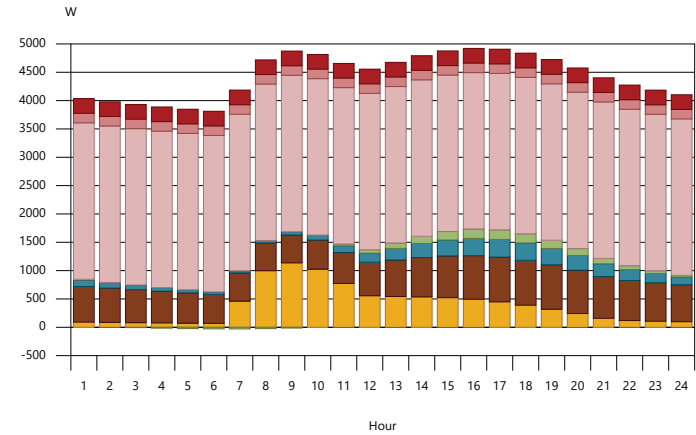
Peak heating load



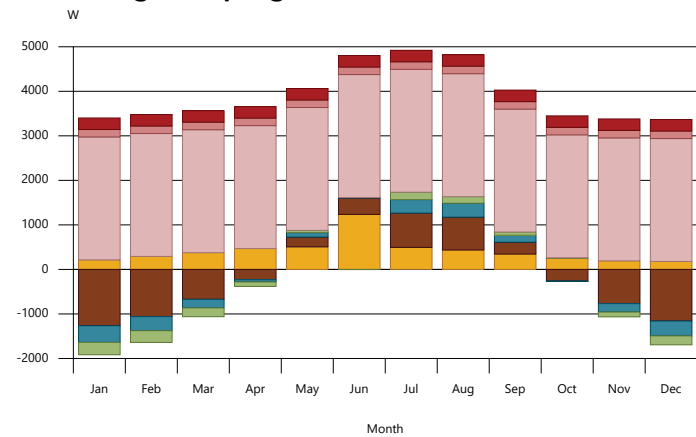
Loads summary



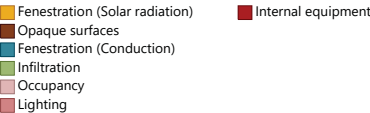
Hourly cooling load progression (21 July)



Annual peak cooling load progression

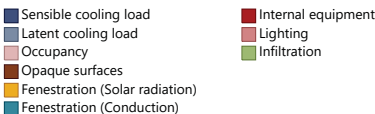
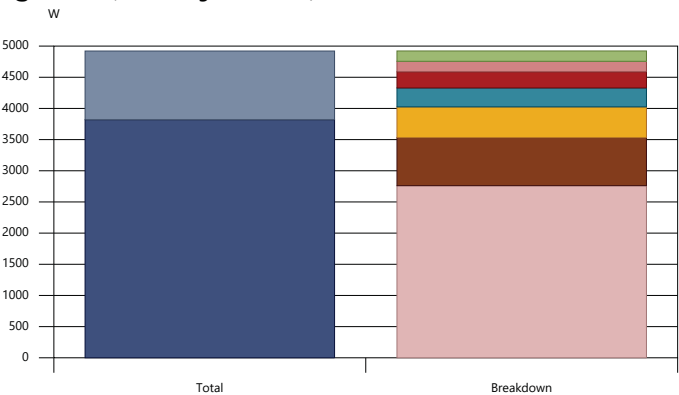


Loads summary

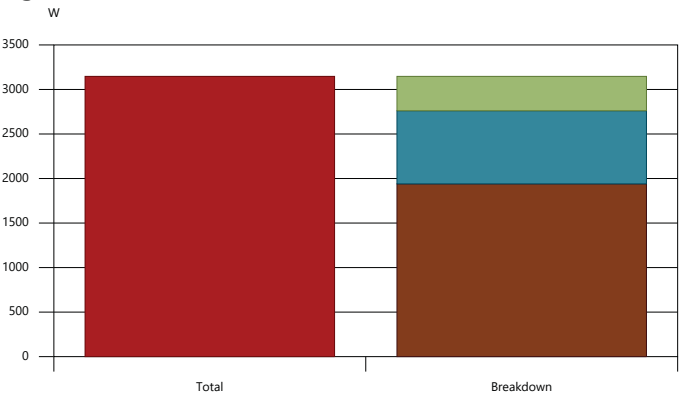


Loads summary

M4 Kabinet
Peak cooling load (21 July at 15h)



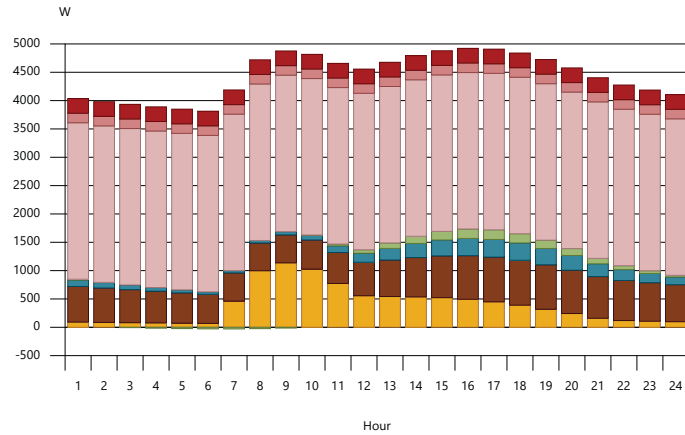
Peak heating load



Loads summary

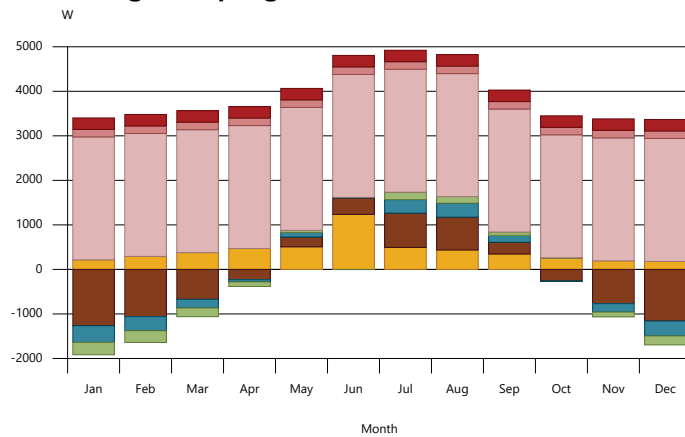
■ Sensible heating load ■ Latent heating load ■ Opaque surfaces ■ Fenestration (Conduction) ■ Infiltration

Hourly cooling load progression (21 July)



■ Fenestration (Solar radiation) ■ Internal equipment
■ Opaque surfaces
■ Fenestration (Conduction)
■ Infiltration
■ Occupancy
■ Lighting

Annual peak cooling load progression



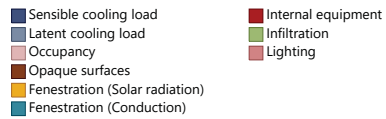
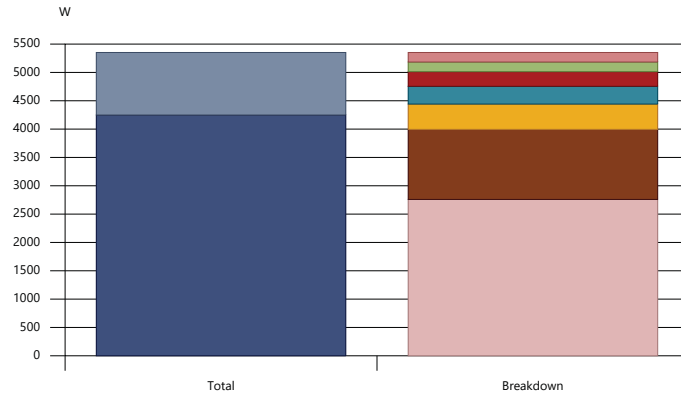
Loads summary

■ Fenestration (Solar radiation) ■ Internal equipment
■ Opaque surfaces
■ Fenestration (Conduction)
■ Infiltration
■ Occupancy
■ Lighting

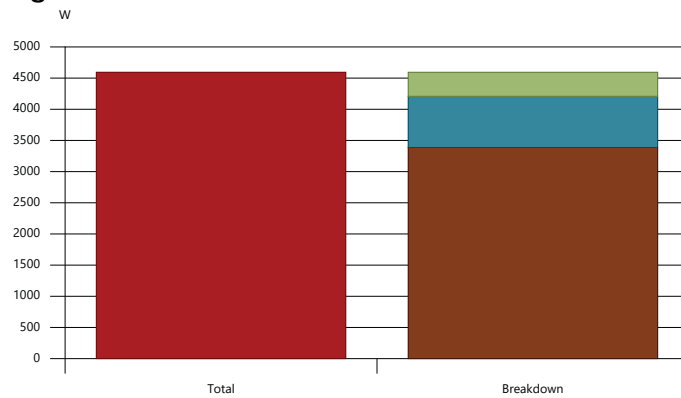
Loads summary

M5 Kabinet

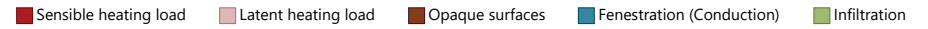
Peak cooling load (21 July at 16h)



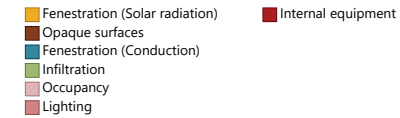
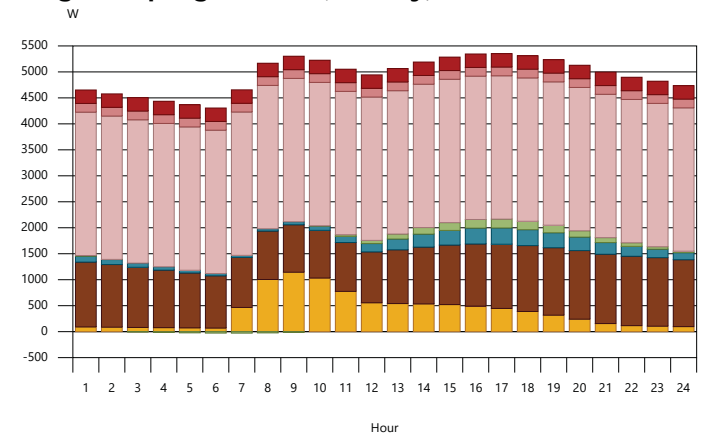
Peak heating load



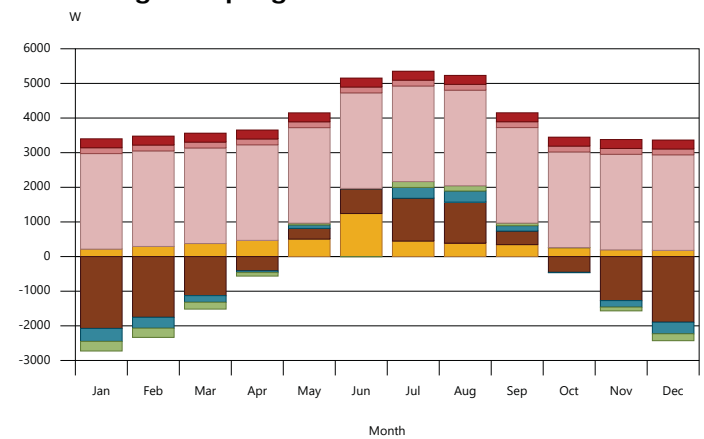
Loads summary



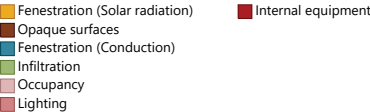
Hourly cooling load progression (21 July)



Annual peak cooling load progression

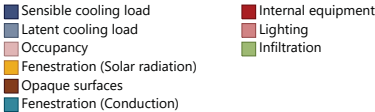
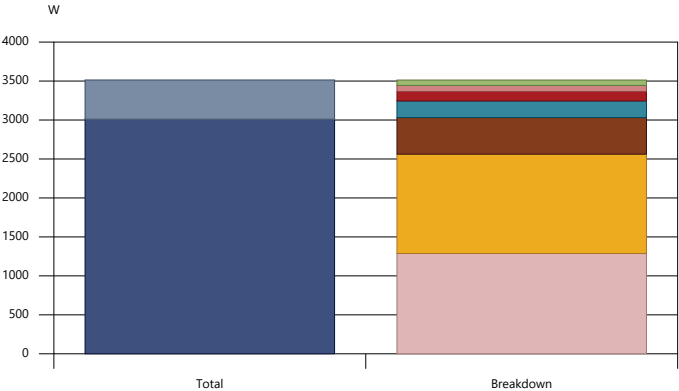


Loads summary

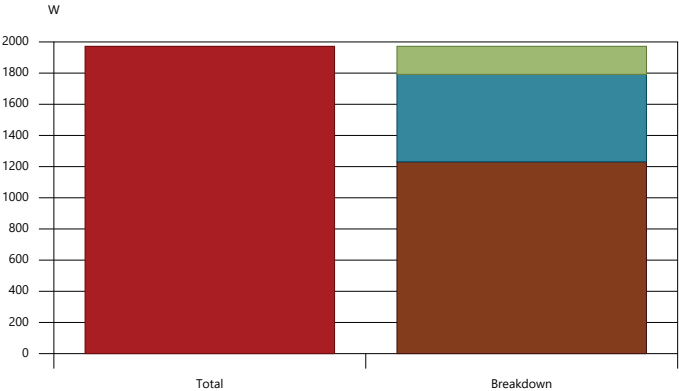


Loads summary

M6 kabinet (Kabinet)
Peak cooling load (21 August at 15h)



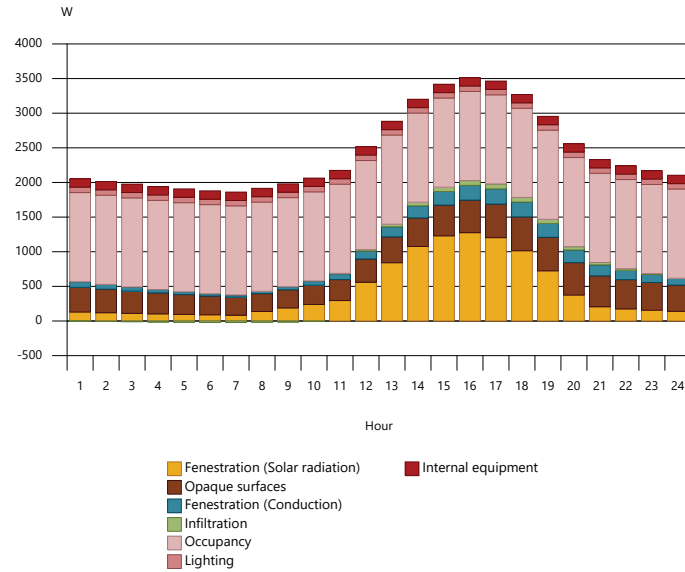
Peak heating load



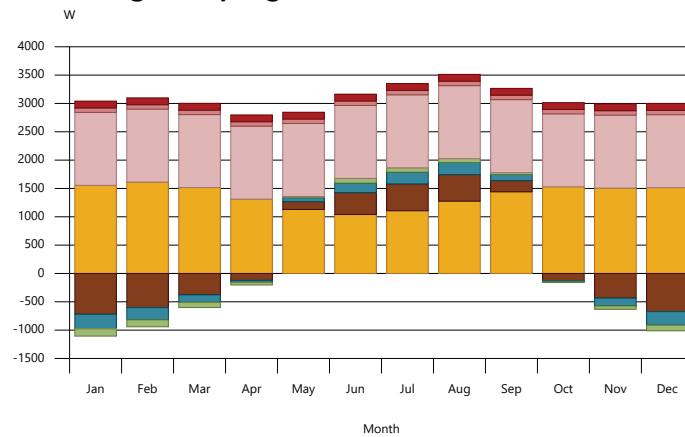
Loads summary

■ Sensible heating load ■ Latent heating load ■ Opaque surfaces ■ Fenestration (Conduction) ■ Infiltration

Hourly cooling load progression (21 August)



Annual peak cooling load progression



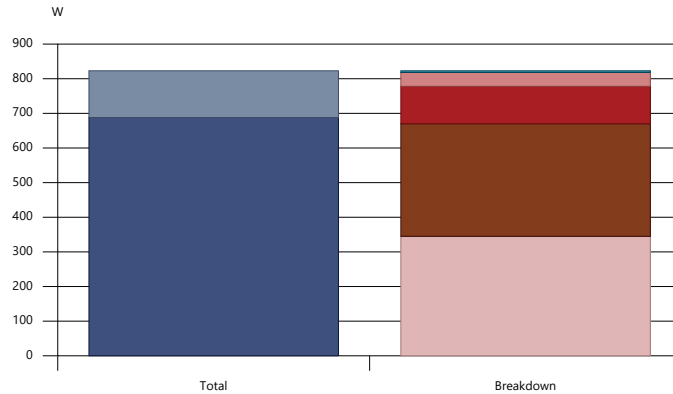
Loads summary

■ Fenestration (Solar radiation) ■ Internal equipment
■ Opaque surfaces
■ Fenestration (Conduction)
■ Infiltration
■ Occupancy
■ Lighting

Loads summary

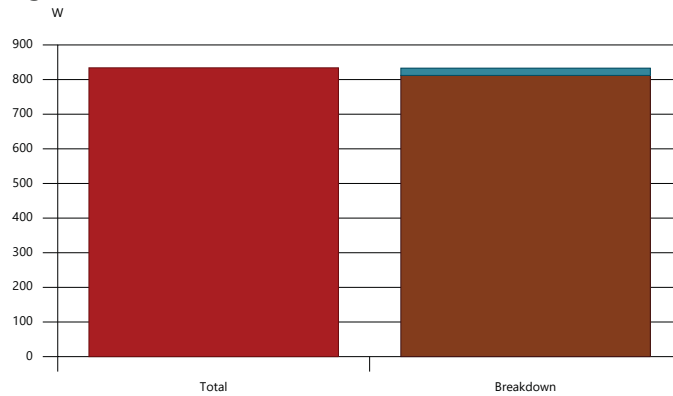
K cajna kuhinja (Cajna kuhinja)

Peak cooling load (21 July at 21h)



Sensible cooling load
 Latent cooling load
 Fenestration (Solar radiation)
 Fenestration (Conduction)
 Occupancy
 Opaque surfaces
 Internal equipment
 Lighting

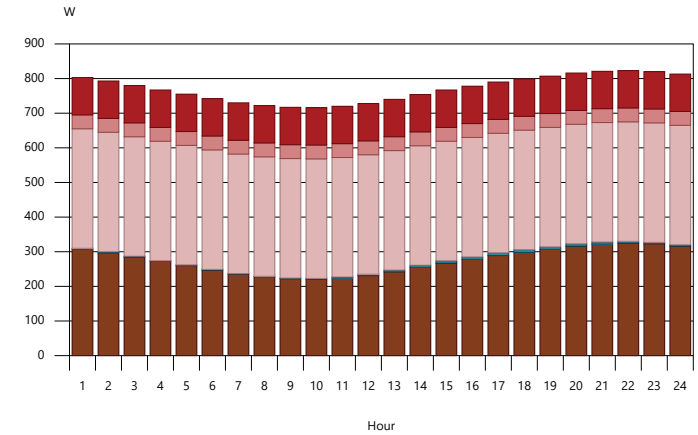
Peak heating load



Loads summary

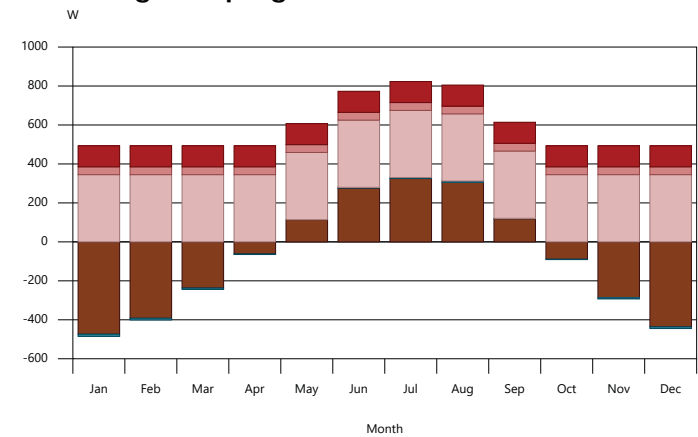
Sensible heating load
 Latent heating load
 Opaque surfaces
 Fenestration (Conduction)

Hourly cooling load progression (21 July)



Fenestration (Solar radiation)
 Opaque surfaces
 Fenestration (Conduction)
 Occupancy
 Lighting
 Internal equipment

Annual peak cooling load progression



Fenestration (Solar radiation)
 Opaque surfaces
 Fenestration (Conduction)
 Occupancy
 Lighting
 Internal equipment

2.2 SPECIFICATION

A row. No.	DESCRIPTION OF POSITION	Eat. Measure s	Quantity	Unit price (€)	Total (€)
A. DISMANTLING OF EXISTING EQUIPMENT					
1	Dismantling of the existing outdoor unit of the split system intended for room air conditioning. During dismantling, remove the outdoor unit support and the piping from the outdoor unit to the indoor unit.	pcs.	7		
2	Dismantling of the existing internal wall unit of the split system intended for air conditioning. During disassembly, remove the indoor unit support and the piping from the outdoor unit to the indoor unit.	pcs.	7		
3	Dismantling of the existing electric radiator intended for heating windows.	pcs.	5		
A. TOTAL DISMANTLING OF EXISTING EQUIPMENT					
B. AIR CONDITIONING EQUIPMENT					
1	Procurement, delivery and installation of indoor and outdoor units of the split system. Heating capacity: 3.0 kW Cooling capacity: 2.5 kW Energy class: A+ + Working fluid: Freon R32 Dimensions of the internal unit: 837×308×189 mm Dimensions of the internal unit: 717×495×230 mm Pipeline: Ø6.35/9.52mm Input current of indoor unit: 30W Input current of the external unit: 800W Power supply to the external unit: 1pH / 220-240V / 50Hz <i>Complete with a bracket for the outdoor unit.</i>	pcs.	1		
2	Procurement, delivery and installation of indoor and outdoor units of the split system. Heating capacity: 4.0 kW Cooling capacity: 3.5 kW Energy class: A+ + Working fluid: Freon R32 Dimensions of the internal unit: 837×308×189 mm Dimensions of the internal unit: 717×495×230 mm				

	Pipeline: Ø6.35/9.52mm Input current of indoor unit: 30W Input current of the external unit: 1080W Power supply to the external unit: 1pH / 220-240V / 50Hz <i>Complete with a bracket for the outdoor unit.</i>	pcs.	4
3	Procurement, delivery and installation of indoor and outdoor units of the split system. Heating capacity: 5.8 kW Cooling capacity: 5.0 kW Energy class: A++ Working fluid: Freon R32 Dimensions of the internal unit: 998×345×210 mm Dimensions of the external unit: 770×288×545 mm Input current of indoor unit: 30W Input current of outdoor unit: 1611W Power supply to the external unit: 1pH / 220-240V / 50Hz <i>Complete with a bracket for the outdoor unit.</i>	pcs.	4
4	Procurement, delivery and assembly of AL-pex pipe distribution for connecting condensate from indoor units.	m.	50
5	Procurement, delivery and cable PPY section 5x1.5 mm ² intended for communication between internal and external units.	m.	50
6	Procurement of materials and production of pipelines from copper pipes, for the production of pipe installations for the distribution of freon in a split system, with the following dimensions:		
	Cu Ø6.35	m.	50
	Cu Ø9.52	m.	30
	Cu Ø12.7	m.	20
7	For connecting and sealing material, elbows, brackets, holders, pipe clamps, pipe hangers, metal rosettes, wall bushings, acetylene, oxygen and similar material required for assembly, 50% of the value of the pipe is taken.		50%
8	Procurement of materials and production of pipe insulation, pipe insulation with a vapor barrier, 9 mm thick, together with mounting adhesive and tapes for gluing joints. Fire protection flammability class B1. (DIN4102, JUS.U.J1.055). It is paid per m of insulation.		

AC Ø6x9	m.	50
AC Ø9x9	m.	30
AC Ø12x9	m.	20

- | | | | |
|----|--|------|---|
| 9 | Drilling of a reinforced concrete wall for the passage of a copper pipeline with cleaning of rubble and removal to the landfill. The repair of the hole with concrete mortar is also included in the price | pcs. | 9 |
| 10 | Flushing the installation with nitrogen, permeability test (nitrogen pressure 45 bar for 24 hours) and vacuum drying. | pcs. | 9 |

B. TOTAL AIR CONDITIONING OF TECHNICAL PREMISES

C. PREPARATORY FINAL WORKS

- | | | | |
|---|--|------------|---|
| 1 | Preparatory works that include:
- familiarization with the object and technical documentation;

- creation of dynamic plans;
- opening of the construction site;

- keeping work logs, inspection books, completed work sheets (construction books) and other necessary documentation. | a lump sum | 1 |
| 2 | Final works that include:

- participation in all activities up to the handover of the facility;
- preparation of instructions for operation and maintenance of the installation;

- preparation of studies with attestation documentation. | a lump sum | 1 |
| 3 | Transport costs that include all costs for external and internal transport of materials and equipment. | a lump sum | 1 |

C. TOTAL PREPARATORY FINAL PAPERS TOTAL

RECAPITULATION

A. TOTAL DISMANTLING OF EXISTING EQUIPMENT

B. TOTAL AIR CONDITIONING OF TECHNICAL PREMISES

C. TOTAL PREPARATORY FINAL PAPERS TOTAL

IN TOTAL

VAT (21%)

ALL TOGETHER

ODGOVORNI PROJEKTANT:

Dejan Abazović dipl.ing.maš

2.3 ESTIMATION AND ESTIMATION OF WORKS

A row. No.	DESCRIPTION OF POSITION	Eat. Measure s	Quantity	Unit price (€)	Total (€)
A. DISMANTLING OF EXISTING EQUIPMENT					
1	Dismantling of the existing outdoor unit of the split system intended for room air conditioning. During dismantling, remove the outdoor unit support and the piping from the outdoor unit to the indoor unit.	pcs.	7		
2	Dismantling of the existing internal wall unit of the split system intended for air conditioning. During disassembly, remove the indoor unit support and the piping from the outdoor unit to the indoor unit.	pcs.	7		
3	Dismantling of the existing electric radiator intended for heating windows.	pcs.	5		
A. TOTAL DISMANTLING OF EXISTING EQUIPMENT					
B. AIR CONDITIONING EQUIPMENT					
1	Procurement, delivery and installation of indoor and outdoor units of the split system. Heating capacity: 3.0 kW Cooling capacity: 2.5 kW Energy class: A++ Working fluid: Freon R32 Dimensions of the internal unit: 837×308×189 mm Dimensions of the internal unit: 717×495×230 mm Pipeline: Ø6.35/9.52mm Input current of indoor unit: 30W Input current of the external unit: 800W Power supply to the external unit: 1pH / 220-240V / 50Hz <i>Complete with a bracket for the outdoor unit.</i>	pcs.	1		
2	Procurement, delivery and installation of indoor and outdoor units of the split system. Heating capacity: 4.0 kW Cooling capacity: 3.5 kW Energy class: A++ Working fluid: Freon R32 Dimensions of the internal unit: 837×308×189 mm Dimensions of the internal unit: 717×495×230 mm				

- Pipeline: $\varnothing 6.35/9.52\text{mm}$
 Input current of indoor unit: 30W
 Input current of the external unit: 1080W
 Power supply to the external unit: 1pH / 220-240V / 50Hz
Complete with a bracket for the outdoor unit. pcs. 4
- 3 Procurement, delivery and installation of indoor and outdoor units of the split system.
 Heating capacity: 5.8 kW
 Cooling capacity: 5.0 kW
 Energy class: A+ +
 Working fluid: Freon R32
 Dimensions of the internal unit: $998 \times 345 \times 210\text{ mm}$
 Dimensions of the external unit: $770 \times 288 \times 545\text{ mm}$
 Input current of indoor unit: 30W
 Input current of outdoor unit: 1611W
 Power supply to the external unit: 1pH / 220-240V / 50Hz
Complete with a bracket for the outdoor unit. pcs. 4
- 4 Procurement, delivery and assembly of AL-pex pipe distribution for connecting condensate from indoor units. m. 50
- 5 Procurement, delivery and cable PPY section $5 \times 1.5\text{ mm}^2$ intended for communication between internal and external units. m. 50
- 6 Procurement of materials and production of pipelines from copper pipes, for the production of pipe installations for the distribution of freon in a split system, with the following dimensions:
- | | | |
|-----------------------|----|----|
| Cu $\varnothing 6.35$ | m. | 50 |
| Cu $\varnothing 9.52$ | m. | 30 |
| Cu $\varnothing 12.7$ | m. | 20 |
- 7 For connecting and sealing material, elbows, brackets, holders, pipe clamps, pipe hangers, metal rosettes, wall bushings, acetylene, oxygen and similar material required for assembly, 50% of the value of the pipe is taken. 50%
- 8 Procurement of materials and production of pipe insulation, pipe insulation with a vapor barrier, 9 mm thick, manufactured by Armacell m, together with mounting adhesive and tapes for gluing joints. Fire protection flammability class B1. (DIN4102, JUS.U.J1.055). It is paid per m of insulation.

AC Ø6x9	m.	50
AC Ø9x9	m.	30
AC Ø12x9	m.	20

9	Drilling of a reinforced concrete wall for the passage of a copper pipeline with cleaning of rubble and removal to the landfill. The repair of the hole with concrete mortar is also included in the price	pcs.	9
10	Flushing the installation with nitrogen, permeability test (nitrogen pressure 45 bar for 24 hours) and vacuum drying.	pcs.	9

B. TOTAL AIR CONDITIONING OF TECHNICAL PREMISES

C. PREPARATORY FINAL WORKS

1	Preparatory works that include: - familiarization with the object and technical documentation; - creation of dynamic plans; - opening of the construction site; - keeping work logs, inspection books, completed work sheets (construction books) and other necessary documentation.	pcs.	1
2	Final works that include: - participation in all activities up to the handover of the facility; - preparation of instructions for operation and maintenance of the installation; - preparation of studies with attestation documentation.	pcs.	1
3	Transport costs that include all costs for external and internal transport of materials and equipment.	pcs.	1

C. TOTAL PREPARATORY FINAL PAPERS TOTAL

RECAPITULATION

A. TOTAL DISMANTLING OF EXISTING EQUIPMENT

B. TOTAL AIR CONDITIONING OF TECHNICAL PREMISES

C. TOTAL PREPARATORY FINAL PAPERS TOTAL

IN TOTAL

VAT (21%)

ALL TOGETHER

ODGOVORNI PROJEKTANT:

Dejan Abazović dipl.ing.maš

3 *GRAPHIC DOCUMENTATION*




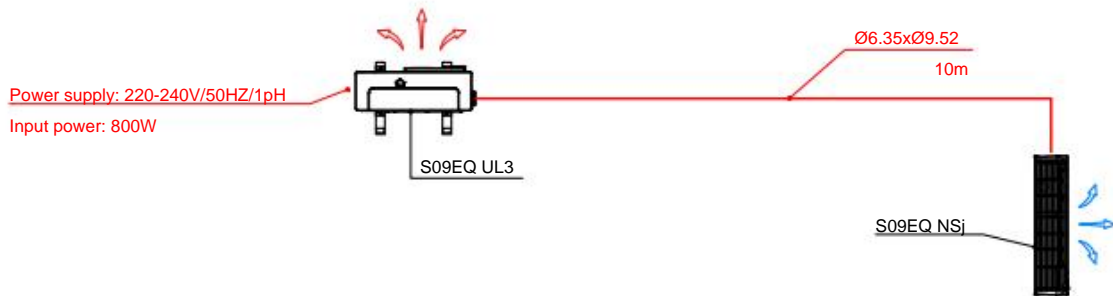
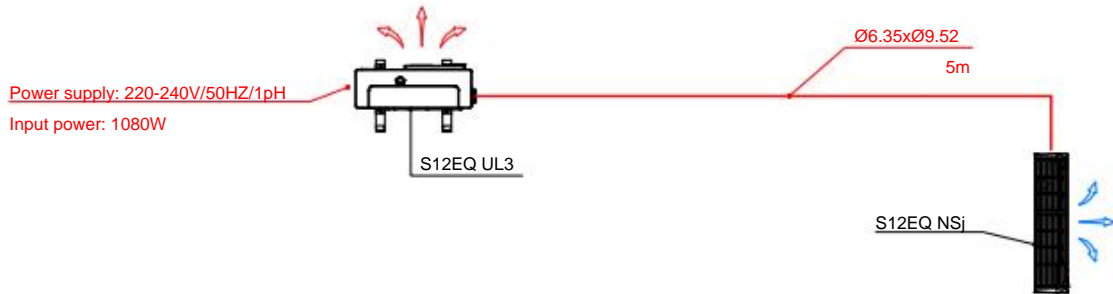
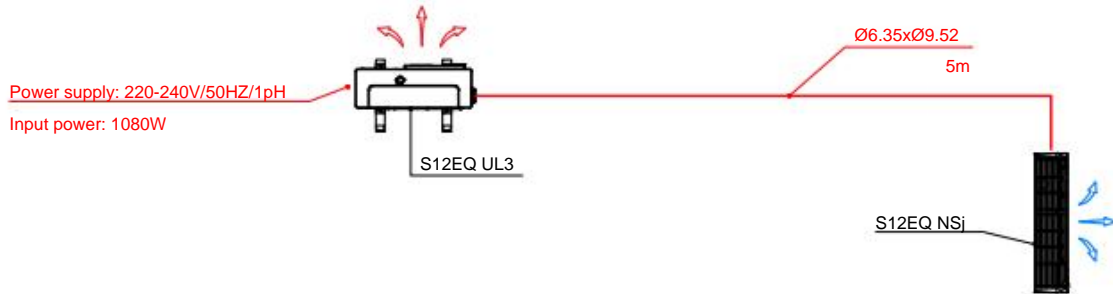
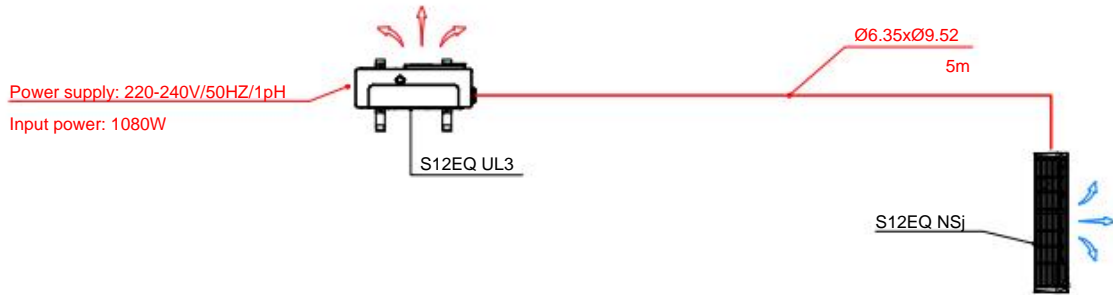
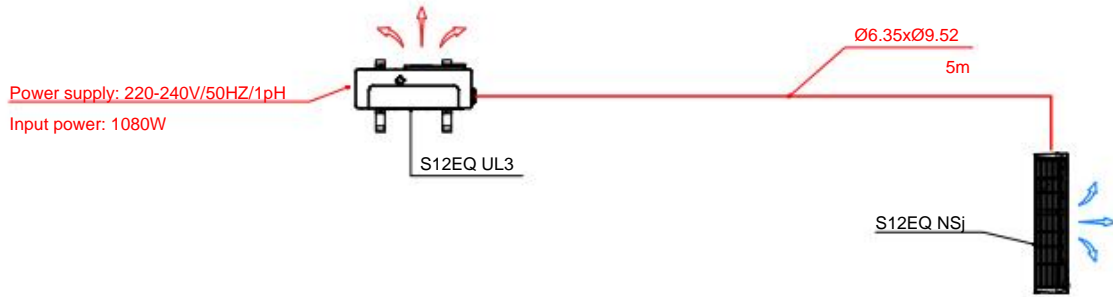
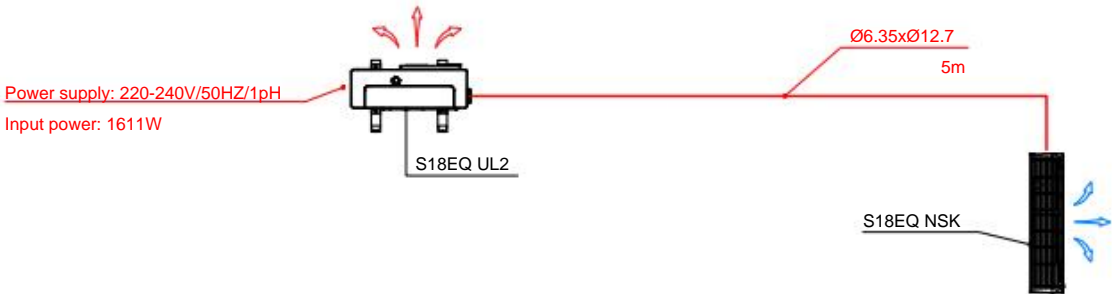
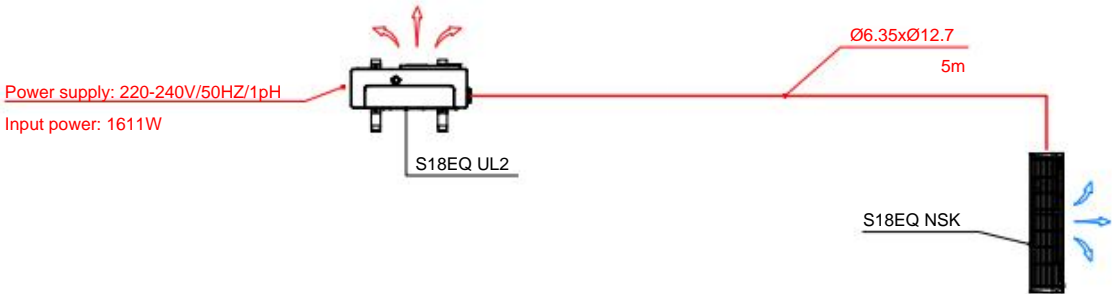
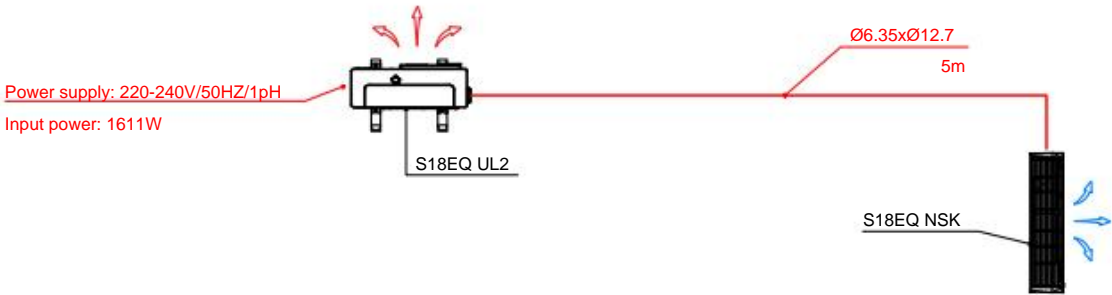
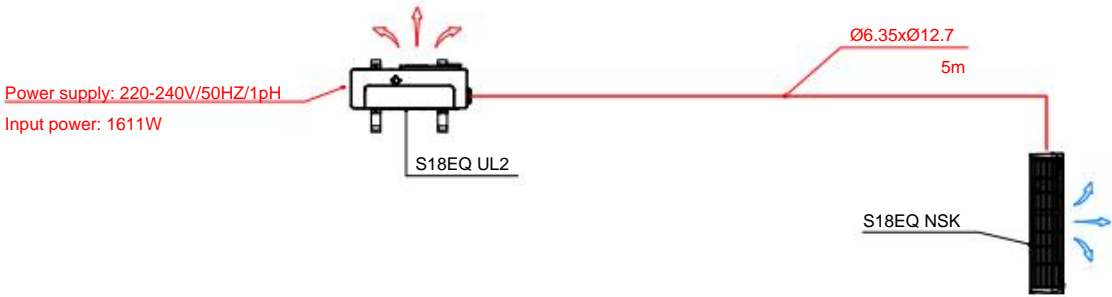
No.	Room H	Floor	Surface area
	corridor	stone slabs	49.63 m ²
T	toilet hand washing	ceramic tiles	3.80 m ²
T1	toilet vestibule	ceramic tiles	3.22 m ²
TM	men's toilet	ceramic tiles	1.53 m ²
TZ	women's toilet	ceramic tiles	1.53 m ²
M1	multifunction cabinet	parquet floor	33.18 m ²
M2	multifunction cabinet	parquet floor	47.93 m ²
M3	multifunction cabinet	parquet floor	47.93 m ²
M4	multifunction cabinet	parquet floor	47.93 m ²
M5	multifunction cabinet	parquet floor	47.96 m ²
M6	multifunction cabinet	parquet floor	22.40 m ²
MPS	multifunctional hall	parquet floor	66.22 m ²
K	kitchenette	parquet floor	10.00 m ²
total net av.			383.25 m ²

LEGENDA		
OPIS	OPIS	ROPOVITOK
	Dismantling of the existing outdoor unit of the split system intended for room air conditioning. During dismantling outdoor unit bracket removed and piping from outdoor to indoor unit.	7
	Dismantling of the existing internal wall unit of the split system intended for air conditioning. During dismantling removed the indoor unit bracket and the piping from the outdoor unit to the indoor unit.	7
	Dismantling of the existing electric radiator intended for heating windows.	5

Designer: THERMIA 3000 Podgorica Slovenia e-mail: office@thermia.me		Investor: Western Balkan Six Chamber Investment Forum Piazza della Borsa nr. 14 34121 Trieste, Italy	
Facility: "VASO ALIGRUDJI" HIGH SCHOOL OF ELECTRICAL ENGINEERING		Location: kp 1193, KO Podgorica I Municipality of Podgorica	
Main engineer: Zagorka Božović Pejanović dia	Initial:	Type of technical documentation: ADAPTATION PROJECT OF THERMOTECNICAL INSTALLATIONS	
Engineer in charge: Dejan Abazović, dip.eng.masch.	Initial:	Part of the technical documentation: MECHANICAL INSTALLATIONS	Scale: R=1:50
Collaborator: Marko Despotović, B.Sc.	Attachment: Graphic documentation		No. attachments: TT01
Drawing: Existing condition		Audit date and MoJ	
Date of manufacture and MP: January, 2024, year			




LEGENDA		
POSLOVKA	OPIS	REMARKS
S18EQ UL2	External units of the split system type: S18EQ UL2 Heating capacity: 5.8 Kw Cooling capacity: 5.8 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 770x545x288 mm Weight: 35 kg Power supply: 50Hz/220-240V/1Ph Input current: 1.61 kW	4
S12EQ UA3	Split system external unit type: S12EQ UA3 Heating capacity: 3.5 Kw Cooling capacity: 4.0 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 717x495x230 mm Weight: 25 kg Power supply: 50Hz/220-240V/1Ph Input current: 1.08 kW	4
S09EQ UA3	Split system external unit type: S09EQ UA3 Heating capacity: 3.3 Kw Cooling capacity: 2.5 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 717x495x230 mm Weight: 25 kg Power supply: 50Hz/220-240V/1Ph Input current: 0.8 kW	1
S18EQ NSK	Internal wall unit split system type: S18EQ NSK Heating capacity: 5.8 Kw Cooling capacity: 5.0 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 998x345x210 mm Weight: 11.9 kg Power supply: 50Hz/220-240V/1Ph Input current: 0.05 kW	4
S12EQ NSJ	Internal wall unit split system type: S12EQ NSJ Heating capacity: 3.5 Kw Cooling capacity: 4.0 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 837x308x189 mm Weight: 8.7 kg Power supply: 50Hz/220-240V/1Ph Input current: 0.05 kW	4
S09EQ NSJ	Internal wall unit split system type: S09EQ NSJ Heating capacity: 3.3 Kw Cooling capacity: 2.5 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 837x308x189 mm Weight: 8.7 kg Power supply: 50Hz/220-240V/1Ph Input current: 0.05 kW	1
Designer:		Investor:
 THERMIA 1000 Podgorica Sovraska 14, Podgorica e-mail: office@thermia.me		Western Balkan Six Chamber Investment Forum Piazza della Borsa nr. 14 34121 Trieste, Italy
Facility:		Location:
"VASO ALIGRUDJI" HIGH SCHOOL OF ELECTRICAL ENGINEERING		kp 1193, KO Podgorica I Municipality of Podgorica
Main engineer:	Initial.	Type of technical documentation:
Zorka Dragovij dia		ADAPTATION PROJECT OF THERMOTECNICAL INSTALLATIONS
Engineer in charge:	Initial.	Part of the technical documentation:
Dejan Abazovij, dip.eng.masch.		MECHANICAL INSTALLATIONS
Collaborator:	Marko Despotovij, B.Sc.	Attachment: Graphic documentation
Drawing:		No. attachments:
Newly designed condition		TT02
Date of manufacture and MP		Audit date and MoJ
January, 2024, year		



LEGENDA

OPIS:	OPIS:	OPIS:
S18EQ UL2	Split system outdoor units type: S18EQ UL2 Heating capacity: 5.8 Kw Cooling capacity: 5.0 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 770x545x288 mm Weight: 35 kg Power supply: 50Hz/ 220-240V/1Ph Input	4
S12EQ UA3	current: 1.61 kW Split system outdoor units type: S12EQ UA3 Heating capacity: 3.5 Kw Cooling capacity: 4.0 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 717x495x230 mm Weight: 25 kg Power supply: 50Hz/220-240V/1Ph	4
S09EQ UA3	Input current: 1.08 kW Split system outdoor unit type: S09EQ UA3 Heating capacity: 3.3 Kw Cooling capacity: 2.5 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 717x495x230 mm Weight: 25 kg Power supply: 50Hz/220-240V/1Ph	1
S18EQ NSK	Input current: 0.8 kW Internal wall unit split system type: S18EQ NSK Heating capacity: 5.8 Kw Cooling capacity: 5.0 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 998x345x210 mm Weight: 11.9 kg Power supply: 50Hz/220-240V/ 1Ph Input current: 0 ,05 kW Internal wall unit of the split system type: S12EQ NSJ Heating capacity: 3.5 Kw Cooling capacity: 4.0 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 837x308x189 mm Weight: 8.7 kg Power supply: 50Hz/220-240V/1Ph Input current: 0.05 kW Internal wall unit split system type: S09EQ NSJ Heating capacity: 3.3 Kw Cooling capacity: 2.5 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 837x308x189 mm Weight: 8.7 kg Power supply: 50Hz/220-240V /1Ph Input current: 0.05 kW	4
S12EQ NSJ	split system type: S12EQ NSJ Heating capacity: 3.5 Kw Cooling capacity: 4.0 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 837x308x189 mm Weight: 8.7 kg Power supply: 50Hz/220-240V/1Ph Input current: 0.05 kW Internal wall unit split system type: S09EQ NSJ Heating capacity: 3.3 Kw Cooling capacity: 2.5 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 837x308x189 mm Weight: 8.7 kg Power supply: 50Hz/220-240V /1Ph Input current: 0.05 kW	4
S09EQ NSJ	50Hz/220-240V/1Ph Input current: 0.05 kW Internal wall unit split system type: S09EQ NSJ Heating capacity: 3.3 Kw Cooling capacity: 2.5 kW Energy class: A++ Working fluid: Freon R32 Dimensions: 837x308x189 mm Weight: 8.7 kg Power supply: 50Hz/220-240V /1Ph Input current: 0.05 kW	1

Designer:		Investor:	
<div><div><p>PROJEKTOVANJE IZ OBLASTI GRAĐEVINARSTVA, VEŠTAČENJE, INŽENJERING I POSREDOVANJE POSREDOVANJE U PROMETU NEPOKRETNOSTI POSREDOVANJE U PROMETU POSREDOVANJE POSREDOVANJE U PROMETU POSREDO</p></div></div>			

